

010 Product Familiarization

GENERAL	010-1	TRANSMISSIONS	010-18
PRODUCT OVERVIEW	010-1	Manual transmissions	010-18
Technical data	010-3	Sequential Manual Gearbox (SMG)	010-19
BMW 5 Series specifications (2004 Sedan) ..	010-3	Automatic transmissions	010-19
MODEL YEAR HIGHLIGHTS	010-5	BMW xDrive	010-20
Model year 2004	010-5	SUSPENSION, STEERING AND BRAKES ...	010-20
Model year 2005	010-6	Front suspension	010-20
Model year 2006	010-7	Rear suspension	010-21
Model year 2007	010-8	Dynamic drive (active stabilizers)	010-22
Model year 2008	010-8	Steering	010-22
Model year 2009	010-9	Brakes	010-23
Model year 2010	010-10	Dynamic stability control (DSC)	010-24
ENGINES	010-10	BODY	010-25
M54 engine (2004 - 2005)	010-10	Sports Wagon (E61)	010-26
N52 engine (2006 - 2007)	010-11	Interior	010-27
N52K engine (2008 - 2010)	010-13	Airbag systems	010-28
N54 engine (2008 - 2010)	010-14	ELECTRICAL SYSTEM	010-28
Valvetronic V8 engines (2004 - 2010)	010-16	Power management and voltage supply	010-29
		Dashboard and controls overview	010-31

GENERAL

The information in this section is based on introductory material for 2004 through 2010 BMW 5 Series vehicles sold in the USA and Canada. The reference material provided is intended to serve as a product familiarization guide and is subject to change.

WARNING —

- Check BMW factory repair information at www.bmwtechinfo.com or the publisher's website at [www. \[redacted\] .com](http://www. [redacted] .com) for information that may supersede information in this section.

PRODUCT OVERVIEW

The 5th generation 5 Series (E60) was introduced in the US in model year 2004 as a replacement for the 1997 - 2003 5 Series (E39) and was produced through model year 2010.

The rear-wheel drive Sedan was introduced first. Sports Wagon (E61) and all wheel xDrive (Sedan and Sports Wagon) versions were introduced in 2006.



010-2 Product Familiarization

2004 model introduction

E60 4-door Sedan	525i (184 hp, 6 cylinder)
	530i (225 hp, 6 cylinder)
	545i (325 hp, V8)

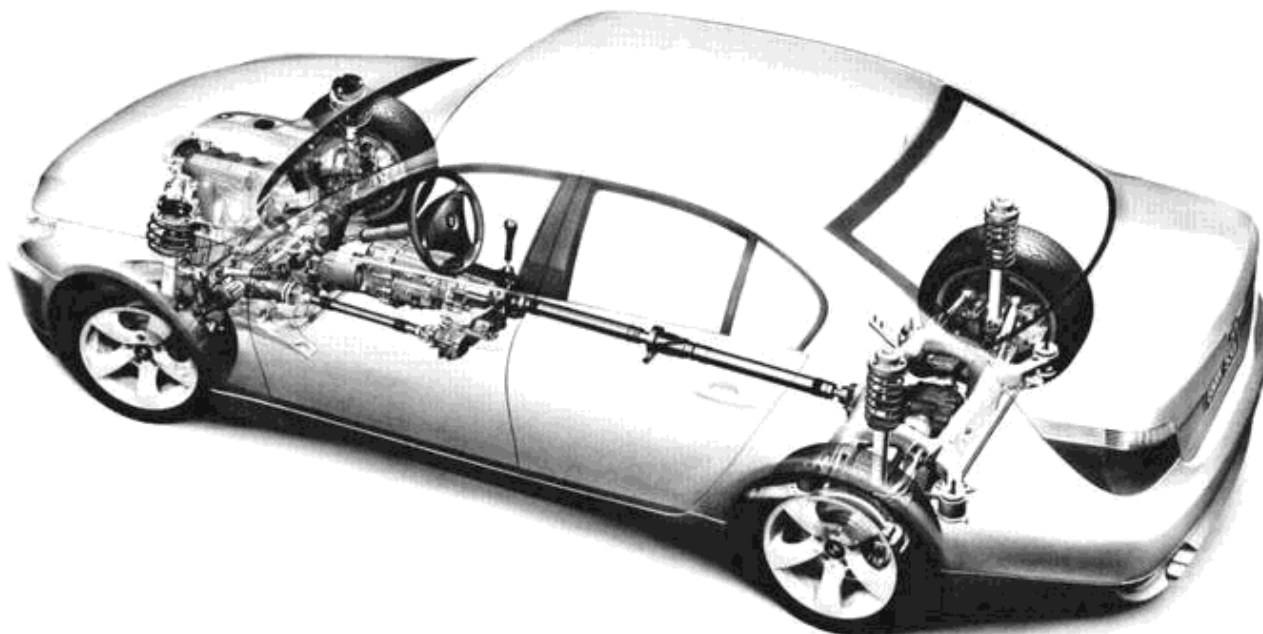
The E60 5 Series is a larger car than the corresponding E39 chassis it replaced, adding both interior passenger room and wheelbase length.

Body dimensions were increased to improve roominess in the rear compartment (additional 1.97 in knee room) and to increase the luggage compartment capacity (at 520 L the largest capacity of all the BMW vehicles, including the E65).

Compared to the outgoing model, more generous exterior dimensions ensure even greater spaciousness and comfort for all passengers. At 178.0 inches, the length increased by 2.5 inches. The width at 72.7 inches increased by 1.8. Vehicle height is 57.8 inches, an increase of 1.3 inches. The wheelbase is 2.3 inches longer at 113.7 inches.



**5 Series sedan
with xDrive**



BentleyPublishers
COM

B510010006

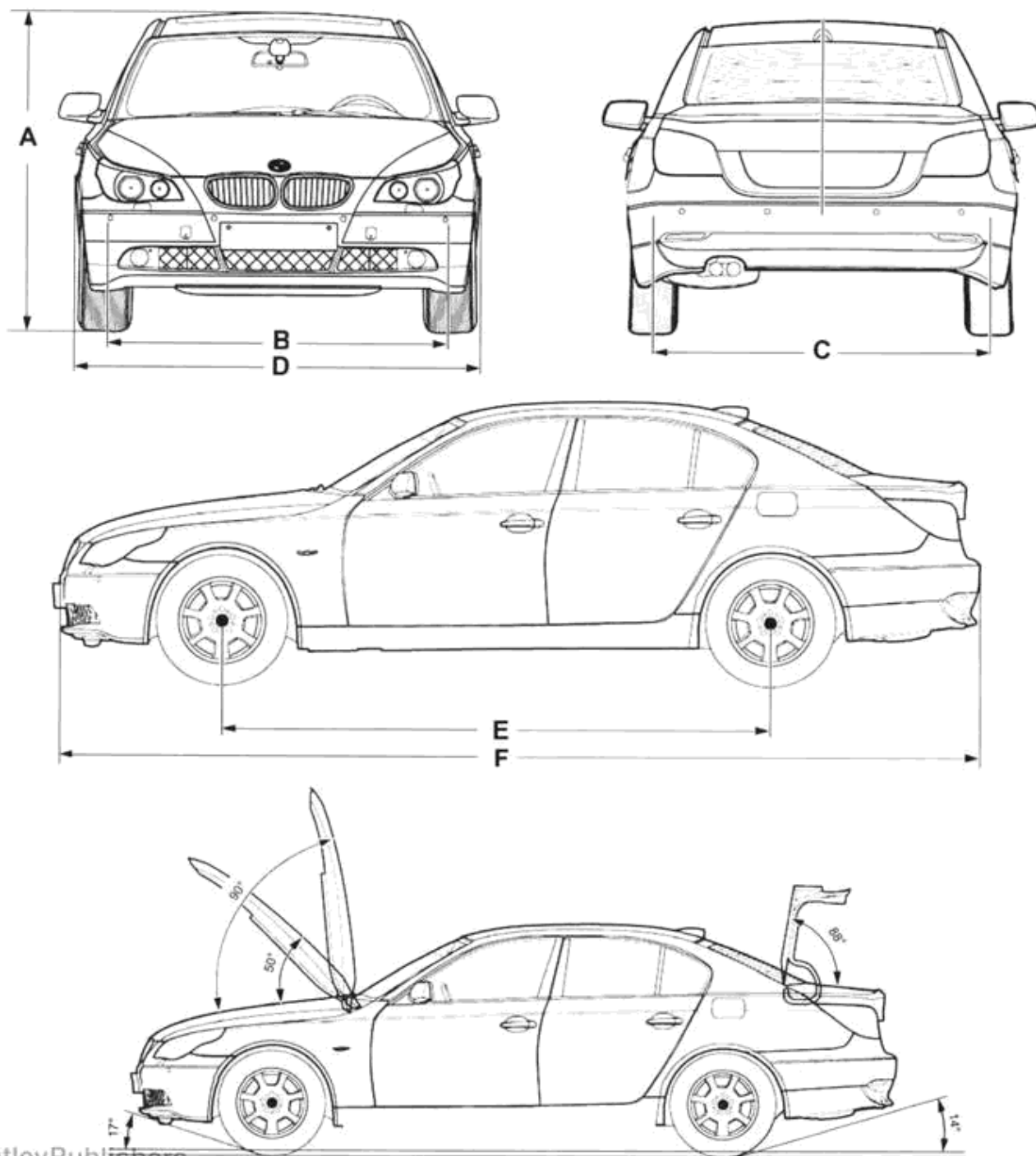
Technical data

BMW 5 Series specifications (2004 Sedan)			
	525i	530i	545i
Exterior			
Doors	4	4	4
Height (A)	58.0 in (1473 mm)	58.0 in (1473 mm)	58.0 in (1473 mm)
Front track (B)	61.3 in (1558 mm)	61.3 in (1558 mm)	61.3 in (1558 mm)
Rear track (C)	62.3 in (1582 mm)	62.3 in (1582 mm)	62.3 in (1582 mm)
Width (D)	72.7 in (1846 mm)	72.7 in (1846 mm)	72.7 in (1846 mm)
Wheelbase (E)	113.7 in (2888 mm)	113.7 in (2888 mm)	113.7 in (2888 mm)
Length (F)	190.6 in (4841 mm)	190.6 in (4841 mm)	190.6 in (4841 mm)
Interior			
Front headroom	39.1 in (993 mm)	39.1 in (993 mm)	39.1 in (993 mm)
Rear headroom	38.1 in (967 mm)	38.1 in (967 mm)	38.1 in (967 mm)
Front legroom	41.5 in (1054 mm)	41.5 in (1054 mm)	41.5 in (1054 mm)
Rear legroom	36.0 in (915 mm)	39.1 in (993 mm)	36.0 in (915 mm)
EPA passenger compartment vol.	99.1 cu ft (2806 liters)	38.1 in (967 mm)	99.1 cu ft (2806 liters)
Cargo (trunk) capacity	14.0 cu ft (396 liters)	41.5 in (1054 mm)	14.0 cu ft (396 liters)
Engine			
Engine configuration, cylinders / valves per cyl.	2.5 liter in-line 6 / 4	3.0 liter in-line 6 / 4	4.4 liter V8 / 4
Displacement	2494 cc (152 cu in)	2979 (182)	4398 (268)
Stroke / bore (mm)	84.0 / 75.0	88.0 / 85.0	92.0 / 82.7
Rated power	184 @ 6000 rpm	255 @ 6600 rpm	325 @ 6100
Max. torque (lb-ft)	175 @ 3500 rpm	220 @ 2750rpm	330 @ 3600
Compression	10.5 : 1	10.2 : 1	10.5 : 1
Fuel requirement	Premium unleaded	Premium unleaded	Premium unleaded
General			
Final drive ratio	3.15 : 1 (MT); 3.73 : 1 (AT)	2.93 : 1 (MT); 3.46 : 1 (AT)	2.93 : 1 (MT); 3.38 : 1 (AT)
Fuel tank capacity	18.5 US gal	18.5 US gal	18.5 US gal
Unladen weight (manual)	3428 lb	3472 lb	3803
Gross vehicle weight (GWR)	4530 lb	4575 lb	4905 lb
Coefficient of drag (C _d)	0.29	0.29	0.29
Max. roof load	100 lbs.	100 lbs.	100 lbs.
Acceleration (0 - 60 mph)	7.8 sec (est)	6.6 sec (est)	5.7 sec (est)

010-4 Product Familiarization

BMW 5 Series specifications (2004 Sedan)

Vehicle dimensions



MODEL YEAR HIGHLIGHTS

Below are the 5 Series year-to-year highlights through model year 2010. Major changes are detailed later in this repair group.

010

**Model year 2004**

The E60 sedan was introduced with many new features (some optional). Most notable were the following:

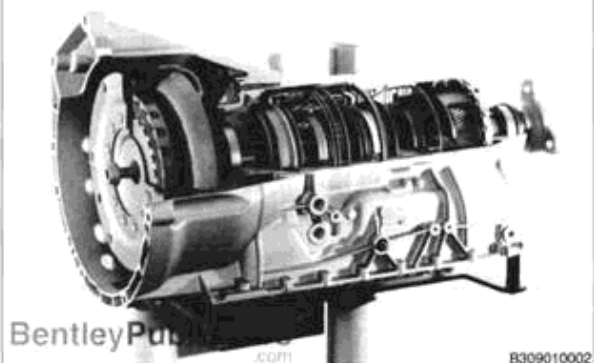
- Innovative lightweight construction with an aluminum front end and an all-aluminum suspension. iDrive control with available head-up display that projects important information in the form of a virtual image directly into the driver's field of vision.
- Directional headlights that adapt continuously to the steering angle to illuminate around the bend in the road.



010-6 Product Familiarization

Model year 2005

6-speed Steptronic transmission



Active steering mechanism



2005 M5 V10 powerplant



Additional features for 2004:

- Choice of a 2.5- and 3.0-liter inline 6-cylinder engines or a 4.4-liter Valvetronic V8 engine.
- Choice of 6-speed transmissions: manual, STEPTRONIC automatic and Sequential Manual Gearbox (SMG).
- Revised chassis features (suspension, steering, brakes).
- Automatic headlight control and rain-sensing windshield wipers standard on all models.
- iDrive control system for many features and functions.
- Active cruise control (ACC).
- Voice command system (included with optional navigation system).
- Flat tire monitor (FTM) monitors tire pressures while vehicle is driven.
- Run-flat tires with all sport packages.
- Adaptive brake lights, enlarged brake light area under heavy braking.
- Sport package with active front steering, active roll stabilization and run-on flat performance tires (standard on 545i 6-speed manual, otherwise optional).
- German built; production of 530i began July 1, 2003, other models September 1, 2003.

Model year 2005

New for 2005 was the launch of the 4th generation E60 M5.

- The 5.0 liter 500 horsepower V10 engine was mated to a seven-speed SMG transmission. With this new powertrain, the M5 offered the best power-to-weight ratio in its class. In the tradition of BMW M, the chassis was engineered to keep up with the power while the exterior treatment was distinctively subtle.

M5 (S65) engine specifications

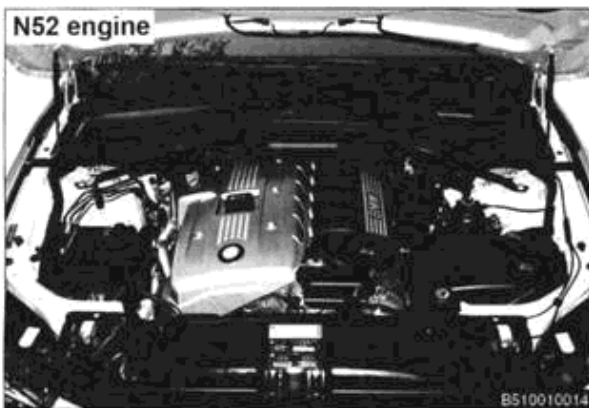
Configuration	90° V10 with high-pressure double VANOS, steplessly variable valve timing, 10 individual electronically controlled throttles
Construction	Aluminum block and heads
Displacement (liter / cid)	4.999 / 305.1
Bore x stroke (mm)	92.0 x 75.2
Power output (bhp / kW) @ rpm	500 / 373 @ 7750 rpm
Torque (Nm / ft-lb) @rpm	520 / 383 @ 6100
Maximum engine speed	8250
Compression ratio	12.0 : 1
Valves / cyl	4
Engine management	MS S65
0 - 60 mph	4.6 s



Model year 2006

2006 was a significant update year for the 5 Series: Valvetronic 6-cylinder engines, a more powerful 4.8 liter V8 engine, the introduction of all-wheel drive, and a Sports Wagon body style are the most notable updates.

- 6-cylinder all-wheel drive models with new badge designations 525xi and 530xi.



- 6-cylinder models were powered by BMW's advanced N52 engines.
 - New generation 6-cylinder engines, called N52, both with 3.0-liter displacement:
 - 525i: 215 hp @ 6250 rpm, 185 lb-ft. torque @ 2750 rpm, single-stage induction system.
 - 530i: 255 hp @ 6600 rpm, 220 lb-ft. torque @ 2750 rpm, 3-stage induction system.
 - Magnesium-aluminum composite construction, Valvetronic variable valve lift, electric coolant pump and many other innovations.



- The new Sports Wagon, an appealing concept combining 5 Series sophistication with enhanced load-carrying versatility, was introduced as an all-wheel drive model for 2006.



- 550i model with 4.8-liter Valvetronic V8 engine, 360 hp, 360 lb-ft. torque, a 35 hp increase over the previous 545i.

010-8 Product Familiarization

Model year 2007



Additional features for 2006

- Start Stop button replaces former key switch; new-type remote control.
- Comfort access system (can be ordered as an option as of September 2005 production) featuring keyless access.
- Numerically higher final drive ratios for the 6-cylinder models.
- Xenon adaptive headlights standard on 530i and 530xi models.
- All models fitted with chrome vertical grille slats (previously 545i only).

Model year 2007

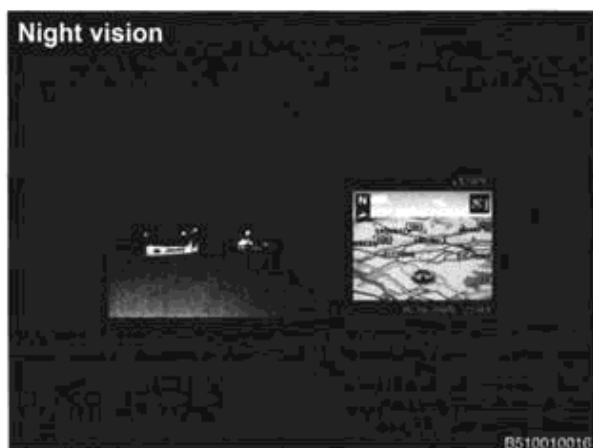
- Night vision became an available option. The system uses a thermal-imaging camera that constantly monitors the road ahead and displays images according to their temperature on the iDrive screen.
- Tire pressure monitor, replacing previous flat tire monitor, constantly monitors tire pressures and displays a warning on the iDrive screen when it detects a significant change in tire pressure.
- High definition (HD) radio available as an option; offers CD quality FM and raises AM reception to the same level as analog FM broadcast.
- Real time traffic information for navigation system, for up-to-the-minute reports on local traffic conditions.
- Auxiliary input for iPod or MP3 player is now standard; located between the two power sockets at rear of center console.
- Revised sport package with 20-way multi-contour seats. Seats include articulated upper backrest, adjustable-width backrest, adjustable thigh support and 4-way lumbar support. Sport package also added 3-spoke steering wheel.

Model year 2008

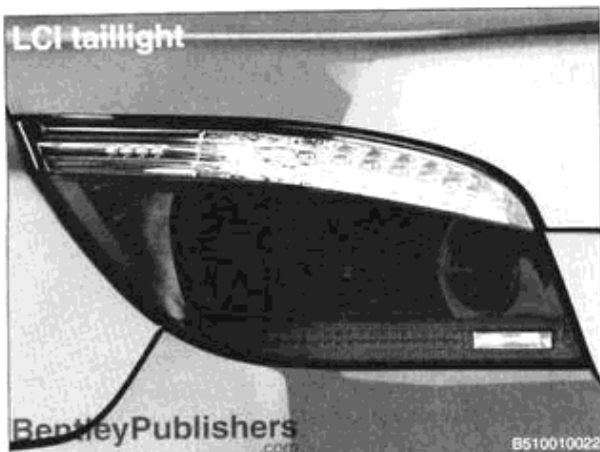
The biggest visual change for 2008 (as of 03 / 2007 production) was the mid-life update, called Life Cycle Impulse (LCI) by BMW.

LCI exterior updates included:

- Reconfigured optical headlight lenses emphasized with chromed tubes.
- New front air dam with reshaped opening and up turned ends.
- Relocated amber DOT lenses; headlight area is completely white.



LCI taillight



- Taillights include new white design with fewer reflectors, red lines in optical lenses.

- Reshaped rear bumper, with revised diffuser below bumper.



- Model year 2008 introduced new models with new engines:

- 528i and 528xi Sedan and Sports Wagon replaced 525i and 525xi. These models received a more powerful 3.0-liter inline six-cylinder engine, generating 230 hp and 200 lb-ft of torque, for an increase of 15 hp and 15 lb-ft over the previous engine.
- 535i and 535xi Sedan and Sports Wagon replaced 530i and 530xi. These models were fitted with the N54 3.0-liter twin-turbocharged inline 6-cylinder engine producing 300 hp and 400 lb-ft of torque, an increase of 45 hp and 80 lb-ft.

Additional features for 2008

- Active cruise control (optional) with stop-and-go braking function
- Bi-xenon headlights
- Optional lane departure warning



- Freshened interior with additional leather and extended wood trim for a more elegant look.

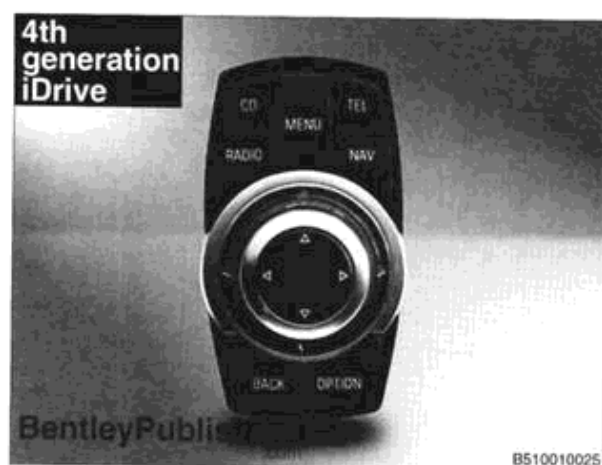
- Ergonomic changes included more convenient window switches, relocated console ashtray and electronic shifter.
- Technically updated STEPTRONIC automatic transmission with shift-by-wire electronic shifter (a no-cost option in 2008).
- Optional Sport automatic transmission included steering-wheel paddle shifters and rpm-matching during downshifts, with Sport button for quicker, more dynamic shifting (beginning 06 / 2007 production).

Model year 2009

For 2009, the BMW 5 Series had very few changes: new standard wheels on the 528i and 528i xDrive models (17" double-spoke wheels with all-season tires), and on the 535i and 535i xDrive models (17" V-spoke wheels with all-season tires).

010-10 Product Familiarization

Model year 2010



Model year 2010

For 2010, the BMW 5 Series experienced two significant changes:

- 4th-generation iDrive system with new graphics and controls on vehicles equipped with optional on-board navigation system. High-resolution 8.8 in. control display. Optimized menus, expanded range of functions. Greater convenience and more intuitive operation via direct-select buttons at controller, plus more programmable memory keys.

Available M Sport Package included anthracite headliner, exterior aerodynamic package with Shadowline trim, M-specific wheels, door sills, footrest, gearshift lever, and steering wheel. Some M exterior colors were also available on vehicles with M Sport Package.

ENGINES

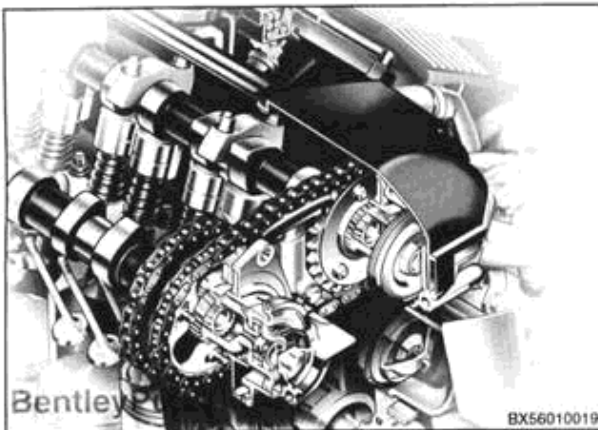
There are 4 variants of the 6-cylinder engines and two variants of the V8 engines of the used in the 5 Series. See **100 Engine-General** for a full engine application chart.

M54 engine (2004 - 2005)

- 2004 and 2005 525i and 530i models are fitted with the M54 engine. This aluminium-block engine features overhead camshafts, four valves per cylinder, hydraulic valve adjustment and double-VANOS system (variable valve timing) to optimize torque, power and emissions.



M54 engine specifications	
Displacement (cm ³)	
525i	2494
530i	2979
Bore x stroke (mm)	
525i	84.0 x 75.0
530i	84.0 x 89.6
Power output (bhp) @ rpm	
525i	184 @ 5900 RPM
530i	225 @ 5800 RPM
Torque (Nm / ft-lb) @rpm	
525i	175 @ 3500
530i	214 @ 3500
Compression ratio	
525i	10.5 : 1
530i	10.2 : 1
Valves / cyl	4
Engine management	Siemens MS 45.1 drive-by-wire throttle



- The double-VANOS system is a combined hydraulic and mechanical camshaft control device controlled by the Siemens engine management system.

The VANOS system uses camshaft adjusters to continuously modify intake and exhaust camshaft timing as a function of accelerator pedal position and engine speed.

Double-VANOS significantly enhances emission management, increases output and torque, and offers better idling quality and fuel economy.

N52 engine (2006 - 2007)

- In 2006, the new generation N52B30 in-line 6-cylinder engine was introduced. This engine featured many innovations, including a composite crankcase, Valvetronic system and the 3-stage DISA intake manifold. The oil level dipstick was eliminated.

The same basic 3.0 liter engine was shared on the 525i and 530i, with the difference in power ratings being achieved with intake manifold tuning and DME software.

**N52 3.0 liter
Valvetronic engine**



N52 engine specifications	
Displacement (cm ³)	2996
Bore x stroke (mm)	85.0 x 88.0
Power output bhp @ rpm	
525i	215 @ 6250 RPM
530i	255 @ 6600 RPM
Torque (Nm / ft-lb) @rpm	
525i	185 @ 2750
530i	220 @ 2750
Maximum engine speed	7000
Compression ratio	10.7 : 1
Valves / cyl	4
Engine weight (kg)	161 kg (355 lb)
Engine management	Siemens MSV70
Emission compliancy	ULEV 2

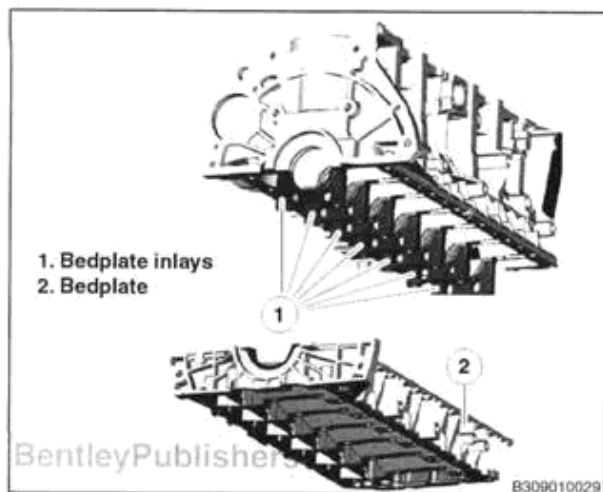
**Magnesium alloy
composite crankcase**



- The N52 engine weighed 22 lbs. less than its predecessor M54 engine. The primary weight savings came from the composite magnesium alloy crankcase and the lightweight exhaust manifold.

010-12 Product Familiarization

N52 engine (2006 - 2007)

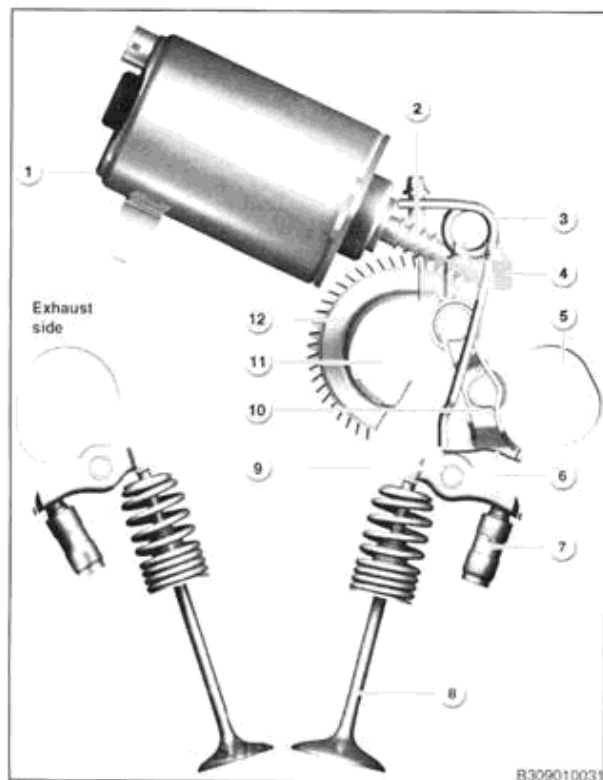


➤ The magnesium bedplate and cylinder head cover also played a role in overall weight reduction.

The traditional belt driven coolant pump from previous engines was replaced by an electric coolant pump. This allowed for the addition of a single belt drive.

Additional N52 engine features:

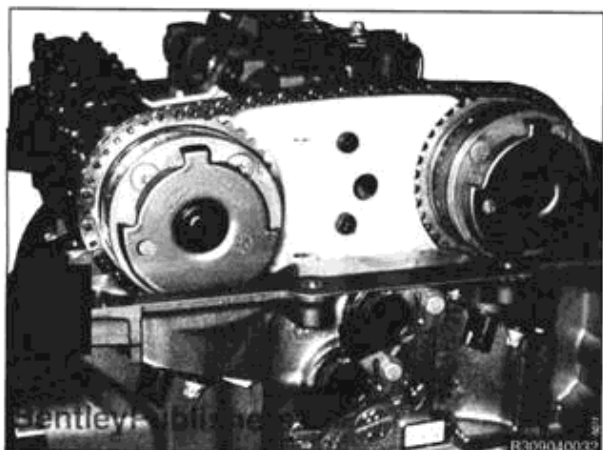
- Trapezoidal connecting rods (weight optimized).
- Aluminum silicon (AluSil) cylinder head
- Timing case integrated in crankcase and cylinder head
- Cylinder head gasket with silicon sealing lip
- Weight-optimized double VANOS
- Crankcase ventilation with integrated heater
- Volumetric flow controlled oil pump



Valvetronic replaces the conventional throttle butterfly with an electromechanical system that controls the amount of lift of the individual intake valves. The Valvetronic engine is able to breathe freely, delivering better performance while using less fuel.

➤ Valvetronic valvetrain uses a stepper motor to control a secondary eccentric shaft fitted with a series of intermediate rocker arms that control the degree of valve lift. The throttle butterfly is no longer needed as a means of controlling the air supply, though for safety reasons it is still fitted as an emergency back-up. Valvetronic improves cold start behavior, lowers exhaust emissions and provides smoother, more immediate power.

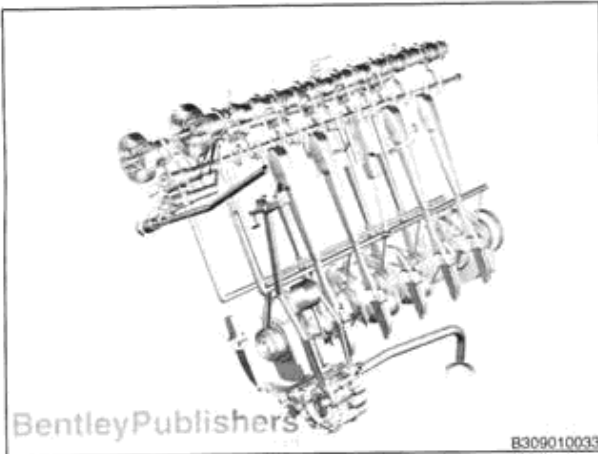
1. Actuator
2. Worm shaft
3. Return spring
4. Gate block
5. Intake camshaft
6. Ramp
7. Hydraulic valve adjuster (HVA), intake
8. Intake valve
9. Roller cam follower
10. Intermediate lever
11. Eccentric shaft
12. Worm gear



➤ The compact VANOS units use vane-type construction which is less complex and easier to service than previous VANOS designs. The VANOS units have integrated sprockets and are attached to the camshaft via a central bolt.

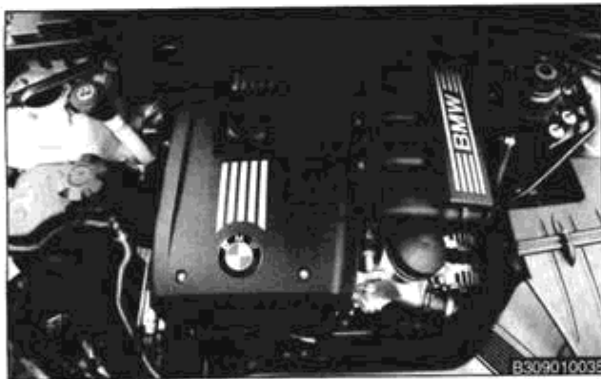
NOTE—

- Due to the different spread ranges for the intake and exhaust camshaft, the VANOS units cannot be interchanged. Doing so would cause engine damage.



BentleyPublishers

B309010033



B309010035

- To meet the oiling requirements of the N52, a volumetric-flow controlled oil pump is utilized. Systems such as VANOS require a large volume of oil, particularly at low engine speeds.

This pump only delivers as much oil as each operating range of the engine requires. A conventional oil pump would have to be approximately three times the size of that in the N52 engine. A larger oil pump would also consume excess energy and therefore the new pump design allows:

- Increased power output
- Reduced weight
- Optimized fuel consumption
- Reduced exhaust emissions

N52K engine (2008 - 2010)

- For 2008, the N52 base engine from the 525i was replaced by the more powerful N52K engine (230 hp vs. 215 hp). The N52K engine was an improved and cost-optimized version of the N52 and was first available in the 528i and 528xi from March 2007 production.

There are not many changes to the emission systems on this engine. The N52KP continued to use the composite magnesium-aluminum alloy engine block from the existing N52.

The technical highlights of the N52KP include:

- New engine management (MSV80)
- New hot film mass air flow sensor (digital HFM)
- EGAS8 throttle with magnetoresistive position feedback
- Plastic valve cover with integrated crankcase vent valve and oil separation
- Stronger connecting rods
- Exhaust valve stem increased to 6 mm
- Second-generation electric coolant pump
- Lightweight camshafts (hydroformed)

N52K engine specifications

Displacement (cm ³)	2996
Bore x stroke (mm)	85.0 x 88.0
Power output (bhp) @ rpm	230 @ 6250 RPM
Torque (ft-lb) @rpm	200 @ 3000
Maximum engine speed	7000
Compression ratio	10.7 : 1
Valves / cyl	4
Engine management	Siemens MSV80
Emission compliancy	ULEV 2

010-14 Product Familiarization

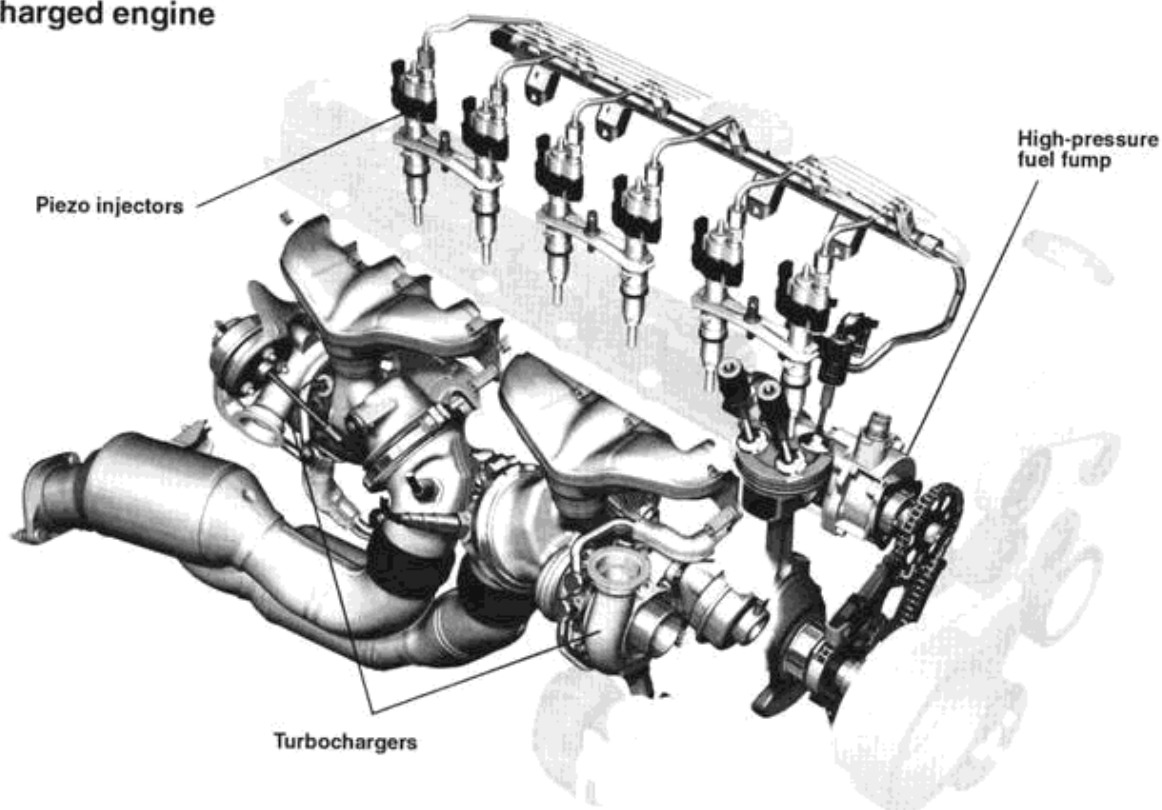
N54 engine (2008 - 2010)

N54 engine (2008 - 2010)

The N54 engine used in the 2008 and later 535i models is the high-performance powerplant utilizing twin-turbo technology and high-pressure direct gasoline injection.

The N54 delivers uncompromising response and high torque output in a unit that is about 150 pounds lighter than a V8 engine. The new technology used in the N54 allows for maximum efficiency and the low exhaust emissions to meet ULEV II guidelines.

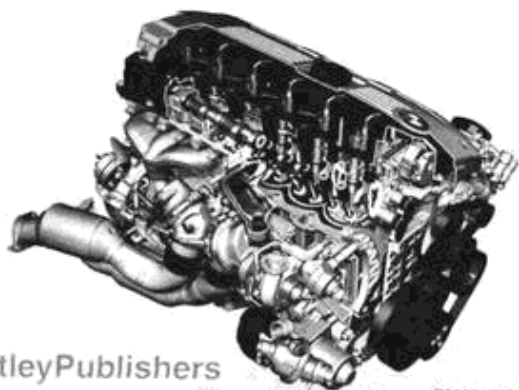
N54 3.0 liter turbocharged engine



BentleyPublishers

B309010040

N54 engine



BentleyPublishers

B309010034

➤ The N54 is officially referred to as the N54B30O0. The "O" designates the "upper" output range and the "0" indicates the first generation in this series.

HPI piezo injector



BentleyPublishers
B309010039

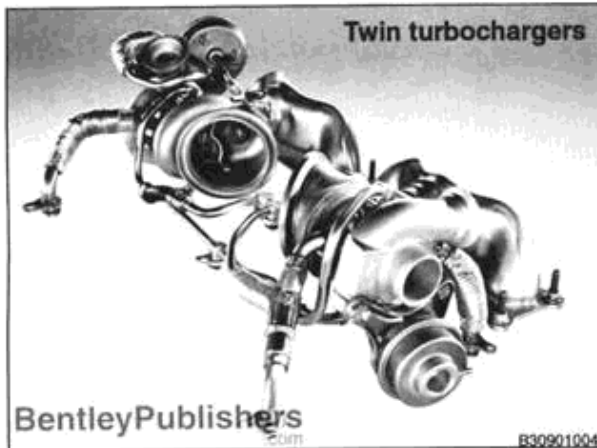
The N54 uses HPI injection system, which is capable of pressures of up to 200 bar (2900 psi). This system features piezo injector technology with outward opening injectors.

Developing 300 hp and peak torque of 400 Nm or 295 lb-ft, this new engine offers the highest standard of spontaneous and superior power and performance.

N54 engine specifications

Displacement (cm3)	2979
Bore x stroke (mm)	84 x 89.6
Power output (kw / bhp)	225 / 300 @ 5800 RPM
Torque (Nm) @rpm	400 @ 1300 - 5000
Maximum engine speed	7000
Compression ratio	10.2 : 1
Valves / cyl	4
Engine weight	187 kg (412 lb)
Engine management	MSD80, MSD81
Emission compliancy	ULEV 2
Injection system type	HPI (DI 2)

Twin turbochargers



BentleyPublishers
B309010041

The 3.0 liter N54 engine features the following:

- Exhaust driven twin turbocharger
- Air to air intercooler
- Second generation direct injection (HPI) with piezo injectors
- New engine management (MSD80, MSD81)
- Bi-VANOS
- All aluminum crankcase with iron cylinder liners (similar dimensions to N52)
- External oil cooler
- New high output electric coolant pump (400 W)
- Aluminum cylinder head with plastic valve cover
- Steel crankshaft



BentleyPublishers
B309010042

010-16 Product Familiarization

Valvetronic V8 engines (2004 - 2006)

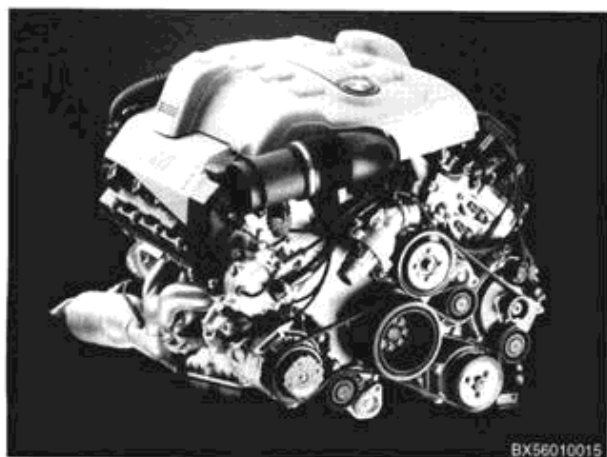
Valvetronic V8 engines (2004 - 2006)

The 2004 through 2010 V8 models were fitted with the new generation Valvetronic engines. There are two variants of the N62 Valvetronic motor:

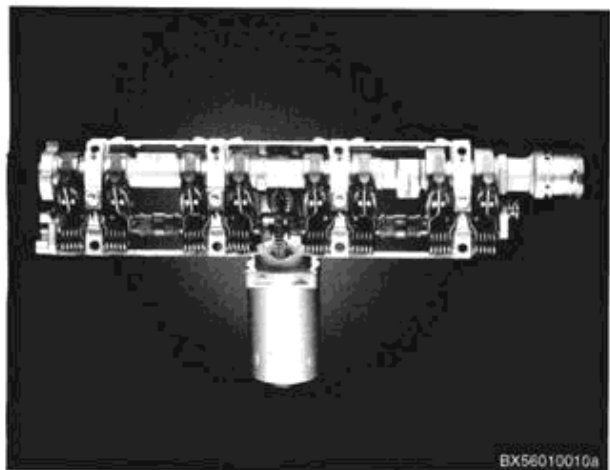
- 2004 - 2005 models had a 325-hp 4.4 liter version called the N62
- 2006 - 2010 models had 360-hp 4.8 liter version called the N62 TU

N62 and N62 TU motors are mated to either a 6-speed automatic transmission or a 6-speed manual.

N62 and N62 TU engine specifications	
Displacement (cm ³)	
N62 (2004 - 2005)	4398
N62TU (2006 - 2010)	4799
Bore x stroke (mm)	
N62 (2004 - 2005)	92 x 82.7
N62TU (2006 - 2010)	93 x 88.3
Power output (bhp) @ rpm	
N62 (2004 - 2005)	325 @ 6100
N62TU (2006 - 2010)	360 @ 6300
Torque (Nm) @rpm	
N62 (2004 - 2005)	330 @ 3600
N62TU (2006 - 2010)	360 @ 3400
Compression ratio	
N62 (2004 - 2005)	10.0 : 1
N62TU (2006 - 2010)	10.5 : 1
Valves / cyl	4
Engine management	
N62 (2004 - 2005)	Bosch ME 9.2
N62TU (2006 - 2010)	Bosch ME 9.2.2
Emission compliancy	ULEV 2



BX56010015



BX56010010a

N62 engine (2004 - 2005)

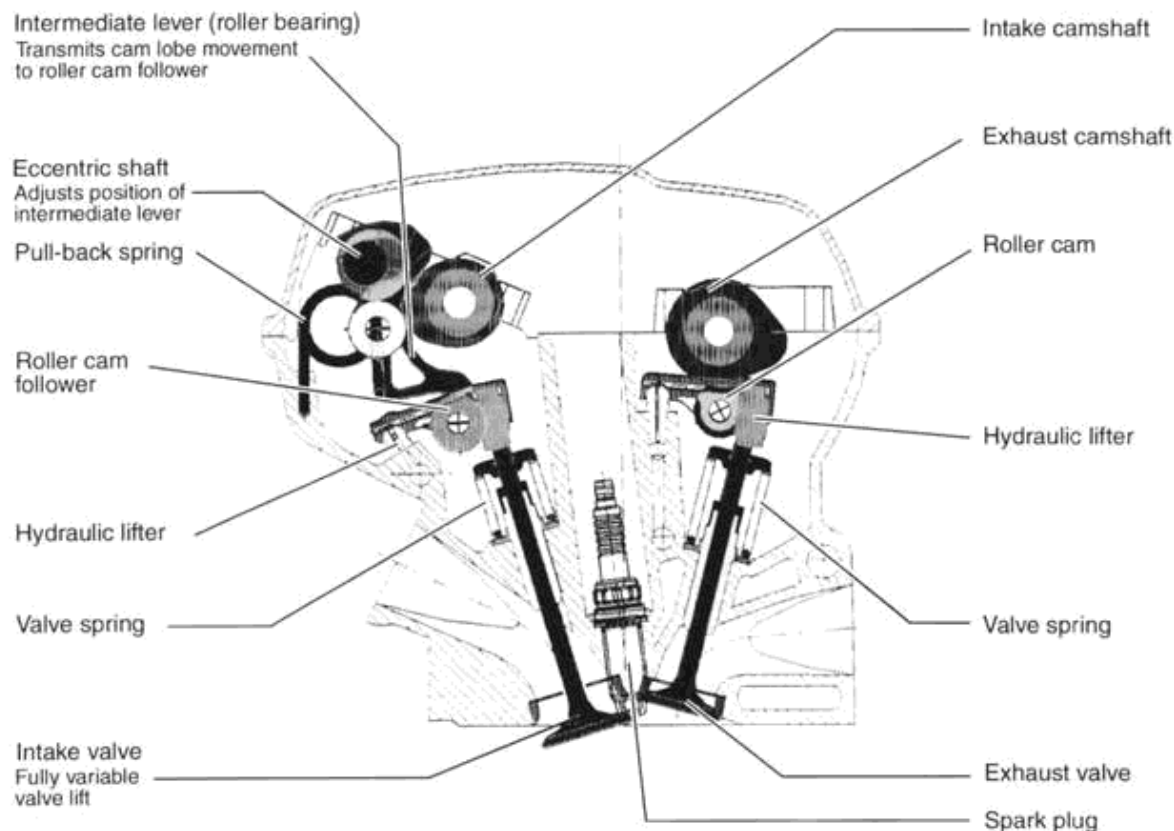
- 545i model with 4.4-liter V8 engine, 330 hp, 325 lb-ft. torque.

N62 engine features:

- Valvetronic
- Fully variable intake manifold
- Bi-VANOS

- Valvetronic is a patented BMW system that varies valve lift to control engine power. Instead of a conventional throttle, Valvetronic varies valve lift all the way from 0.3 mm (for idling) to 9.7 mm (for full-power operation). By eliminating pumping losses associated with a throttle plate, Valvetronic plays a major role in boosting power on the 4.4 liter engine. It also helps make the engine smoother.

Valvetronic operation



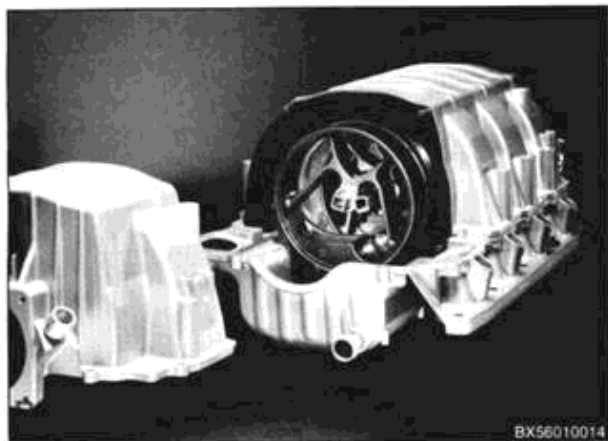
BentleyPublishers

BX56010013

The Valvetronic mechanism sits atop the intake valves on both of the V8 cylinder banks. Each of the engine's 32 valves (4 valves per cylinder) is actuated as the camshaft lobe deflects a finger-type rocker arm with hydraulic clearance adjustment. On the intake side there is an additional element between the cam lobe and rocker arm, called an intermediate lever.

Upon contact by the camshaft lobe, the intermediate lever actuates the rocker arm and, in turn, the valve. The intermediate lever is held in place by an eccentric shaft that is rotated by an electric servo motor. The eccentric shaft position determines the intermediate lever's pivot point, and therefore valve lift. Eccentric shaft position commands come from the Bosch engine management system in response to accelerator pedal movements.

- V8 engines employ a steplessly variable intake manifold that optimizes performance across the entire engine speed range.



BX56010014

010-18 Product Familiarization

Manual transmissions



- In addition to Valvetronic, the N62 engine also uses a double VANOS system similar to that used on the 6-cylinder engine. This arrangement varies valve timing by rotating the intake and exhaust camshafts steplessly to optimize engine power, emissions and fuel efficiency. The combination of VANOS and Valvetronic is exclusive to the new N family of power plants.



N62 TU engine (2006-2010)

- The 550i Sedan, replacing the 545i in 2006, is powered by 4.8-liter Valvetronic V8 engine. This engine is very similar to the 4.4 liter Valvetronic engine. The greater displacement and other minor engineering improvements make this unit even more powerful: 360 hp and 360 lb-ft. of torque, up from the previous 4.4-liter engine's 325 hp / 330 lb-ft.

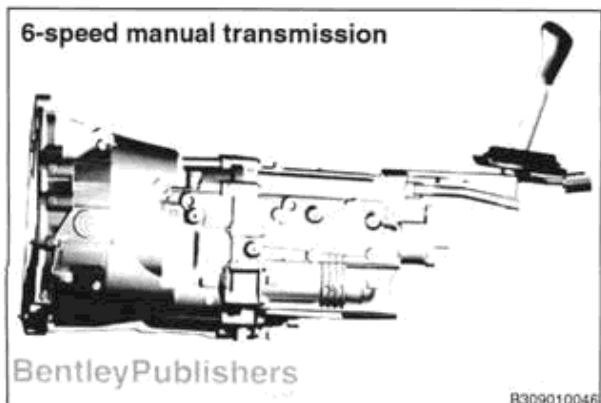
This engine utilizes Bosch ME 9.2.2 and maintains Valvetronic and dual-VANOS controls.

TRANSMISSIONS

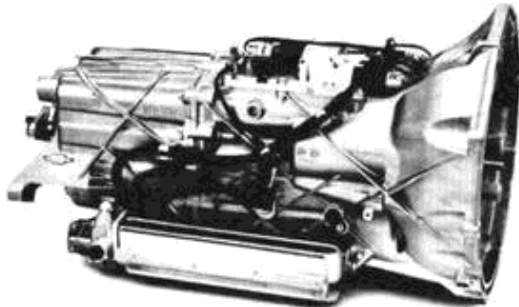
In the E60 5 Series models covered by this manual, all transmission choices are 6-speed.

Manual transmissions

- The 6-speed manual gearbox, standard on all models, is engineered to provide precise control and a high level of driving pleasure. The manual transmission has a lifetime oil fill. Both Getrag and ZF manufactured units are installed on the 5 Series cars covered by this manual. See **200 Transmission-General** for application information.



Sequential Manual Gearbox (SMG)



BentleyPublishers

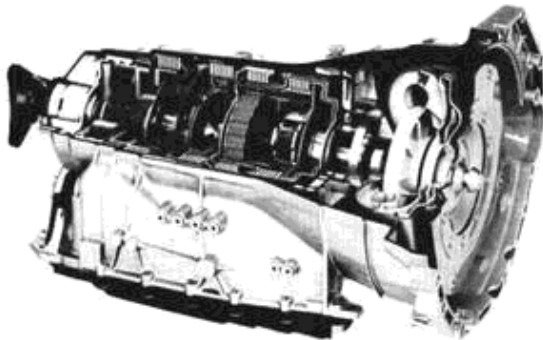
B510010036

Sequential Manual Gearbox (SMG)

- Available as an option, the sequential manual gearbox (SMG) functions like a clutchless manual transmission. Clutch operation is handled via a computer controlled hydraulic unit to engage and disengage the clutch, as well as shift gears. See **200 Transmission-General** for application information.

010

6-speed automatic



BentleyPublishers

B510010037

Automatic transmissions

- A 6-speed automatic transmission is available for 5 Series cars. Compared to the 5-speed unit it replaces, it is 10% lighter, has a more efficient torque converter and operates with fewer internal clutches. See **200 Transmission-General** for application information.

The automatic transmission is controlled by the mechatronics module that is made up of a combination of the valve body and electronic transmission control unit (EGS). The drive range switch (for drive ranges P, R, N and D) is located in the mechatronics module, which is mounted in the ATF sump. It is operated by the selector lever in connection with a bowden cable assembly.

The Steptronic feature offers Normal, Sport and Manual modes. The Sport mode, in which shifts occur at higher engine speeds, is engaged by moving the lever from D; from here, the Manual mode is engaged when the driver manually chooses a gear by tipping the lever forward (for downshifts) or rearward (for upshifts).

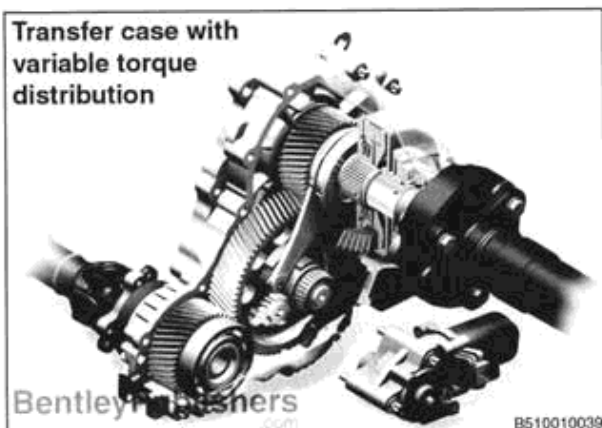
Torque converter



E

B309010045

- The torque converter uses an integrated torsion damper which avoids unnecessary slip and power loss. The converter clutch is closed immediately after the vehicle starts off. In this way, it feels similar to a manual transmission, with short response and shift times. With precise control and a low level of converter slip, the 6-speed automatic transmission also improves fuel economy, particularly at highway speeds when 6th gear is in use.



BMW xDrive

xDrive is BMW's intelligent all-wheel drive system. It was introduced on the E60 and E61 cars in model year 2006.

xDrive optimizes traction, while enhancing stability on slippery road surfaces. Via the same type of logic that DSC employs to recognize and correct for excessive over- or understeer, xDrive adjusts the front to rear torque split to avoid these tendencies.

NOTE—

- 2009 and later models with all-wheel drive no longer carry xi on the trunk badge. Instead, there is an xDrive badge on the front fender designating the all-wheel drive configuration.

xDrive operates as follows:

- Driving torque is always transmitted to the front and rear wheels.
- The portion of torque transmitted to the front wheels is controlled by a multi-disc clutch attached to the transfer box. The torque split between front and rear wheels is steplessly variable.
- Engagement pressure on the multi-disc clutch is directed by an electronic control system in response to actual road and driving conditions.

SUSPENSION, STEERING AND BRAKES

E60 and E61 cars feature a highly evolved chassis, including front and rear aluminum suspension systems for low unsprung weight and outstanding handling and ride comfort. The front and rear suspension also include accommodations for active stabilizer bars as part of the dynamic drive system (optional equipment, Sport package).

The steering is an engine-speed-sensitive variable-assist power rack-and-pinion design. Also available as an option was active steering, which electromechanically varies the steering ratio on the basis of vehicle speed and other driving conditions.

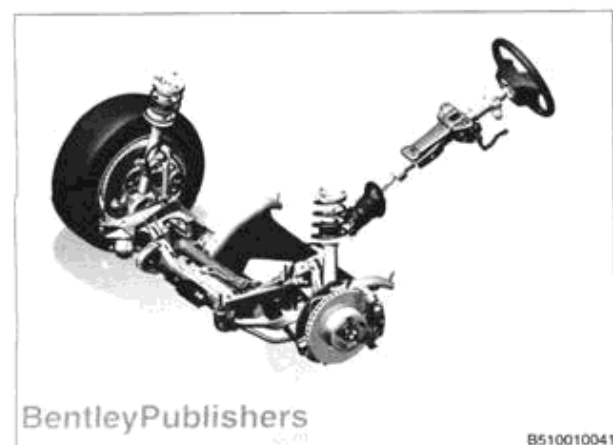
Standard equipment includes four-wheel ventilated brake rotors and a new generation dynamic stability control (DSC) system.

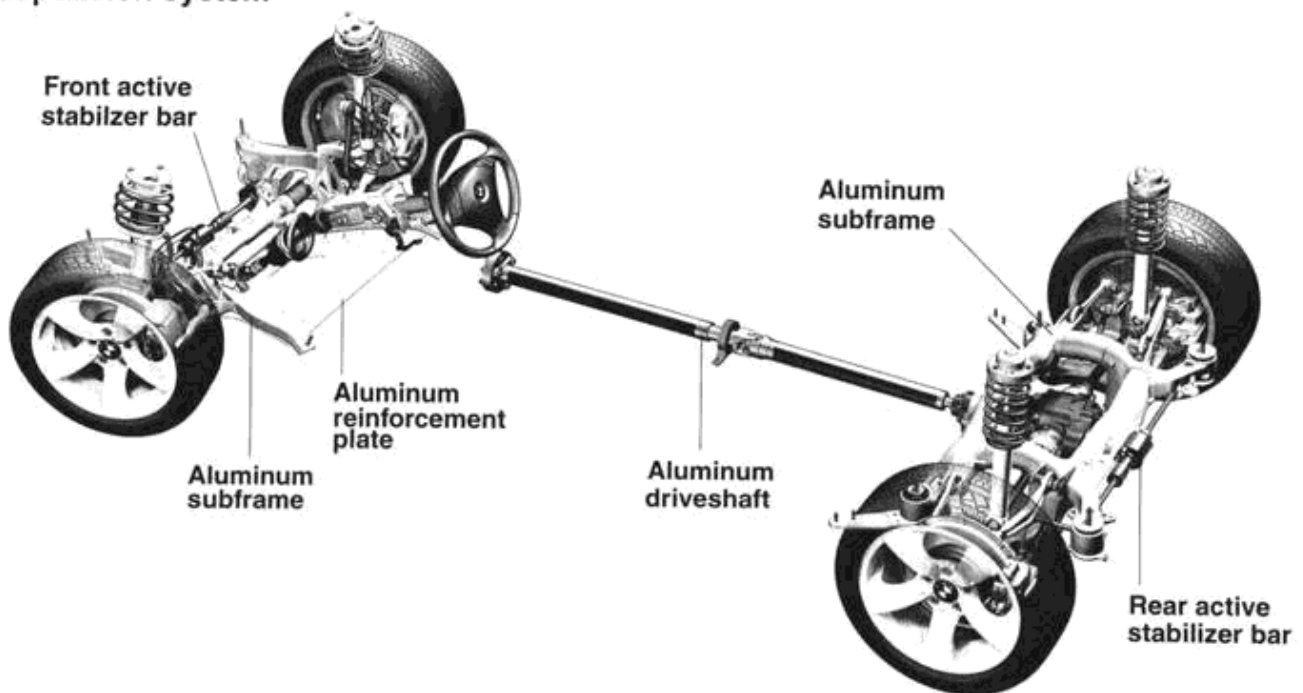
Front suspension

The aluminum front suspension utilizes a double pivot axle with MacPherson struts. All models benefit from the reduced sprung and unsprung weight of aluminum for optimal suspension responsiveness.

- Unsprung aluminum components:
 - Both lower arms (two per side)
 - Steering knuckles
 - Strut tubes
- Sprung aluminum components:
 - Spring pads
 - Subframe
 - Front end reinforcement plate
 - Steering rack

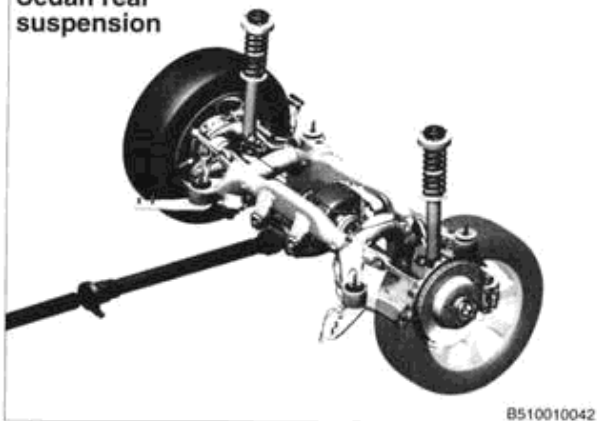
Other aluminum components further contribute to overall weight savings: engine mounting brackets, transmission crossmember and mounting brackets, and power steering pump housing.



BMW E60 aluminum suspension system

BentleyPublishers

B510010040

Sedan rear suspension**Rear suspension**

- ◀ The rear axle is designed around BMW's highly sophisticated multi-link Integral system.

As in the front suspension, aluminum is extensively used in the rear suspension.

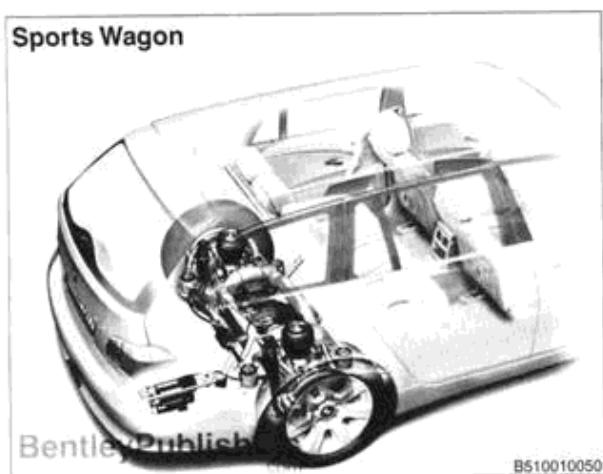
- Sprung aluminum components:
Subframe
Spring pads
- Unsprung aluminum components:
All links of the 4-link Integral system
Shock absorber tubes

The aluminum rear subframe, which carries the entire rear suspension system and final drive (differential), is mounted to the main structure with four large rubber bushings that help absorb road shocks. The final drive unit is mounted to the subframe through its own rubber bushings. With these two stages of vibration and noise absorption, the differential is acoustically decoupled from the body, minimizing gear and driveline noise.

010-22 Product Familiarization

Dynamic drive (active stabilizers)

Sports Wagon



Air suspension (Sports Wagon)

- E61 cars are equipped with an automatic self-levelling air suspension (EHC) at the rear axle. This suspension system is a variant of BMW's integral link rear axle and was specifically developed for the Sports Wagon to facilitate a completely flat luggage compartment floor while providing a very large through-load space.

Rear air suspension is particularly advantageous on vehicles with high payload (such as the Sports Wagon) as the load at the rear axle changes when loading and unloading the car.

With conventional steel springs, a change in axle load affects not only the ride height but also vehicle vibration and suspension geometry. There is a change in rear wheel camber at high payloads. This can result in increased load at the inner shoulders of the tires, in turn reducing the load bearing capacity of the tires. EHC eliminates many of these problems by maintaining a constant rear ride height regardless of the load.

Rear air springs and shock absorbers are supported independently on the floor pan of the cargo compartment.

The air supply system is located on the underbody between the spare wheel well and battery box.

Dynamic drive (active stabilizers)

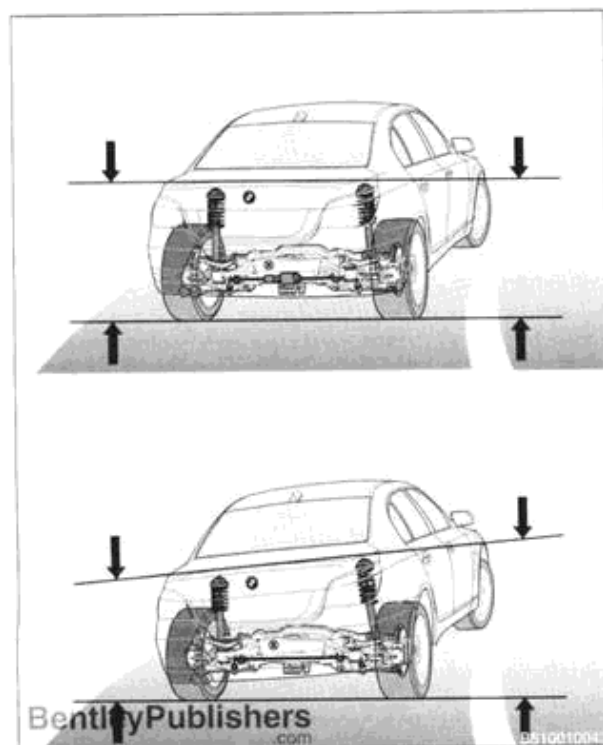
- BMW's innovative dynamic drive (also called active stabilizers or ARS) ensures that under- or oversteering is reduced, resulting in enhanced safety, greater comfort and an impressively dynamic driving experience. Dynamic drive minimizes body roll and distributes it between both axles, ensuring a comfortable flat ride.

Dynamic drive is fitted to the 5 Series as part of the Sport Package. In the dynamic drive system, front and rear hydraulically-actuated active stabilizer bars replace conventional solid stabilizer bars.

During cornering, the active bars counteract the vehicle's tendency to roll in a corner. By working together with acceleration and position sensors, an electronic management system and other components, the system ensures a high degree of agility at all speeds, balanced reactions to load changes and precise steering.

The system continually adapts to driving conditions. For example, when driving straight ahead, dynamic drive reduces the pressure on the active stabilizer bars, treating them individually. This results in a highly comfortable ride.

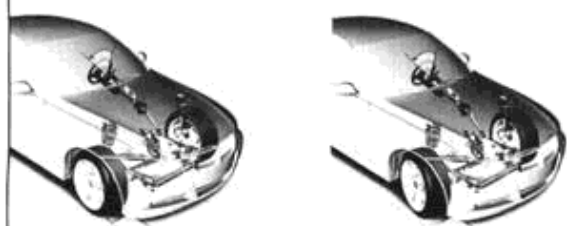
Additional information on dynamic drive, including system troubleshooting, can be found in **300 Suspension, Steering and Brakes-General**.



Steering

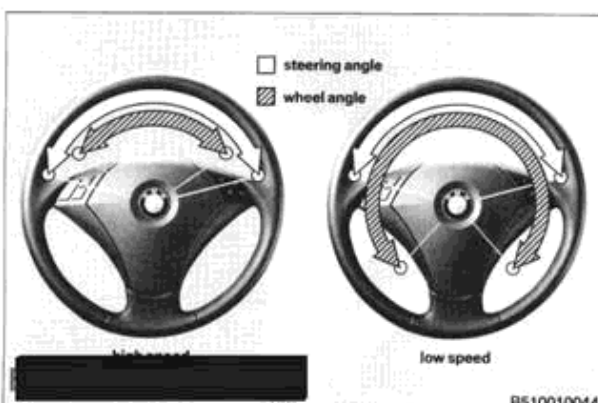
The vehicle-speed-sensitive variable-assist power rack-and-pinion steering system was standard on all models. Together with the redesigned suspension and subframe, the steering reaction to inputs is precise and sharp.

Active front steering



BentleyPublishers

B309010065



B510010044

Active steering

Active steering is a revolutionary development from BMW (included in Sport Package option, rear-wheel-drive models). Active steering offers many benefits:

- Wide variable steering ratio; steering-wheel movements for parking maneuvers, U-turns and sharp corners are greatly reduced for amazing agility.
- Vehicle stabilization; in critical situations, can intervene to preserve stability. For example, if the driver applies the brakes while driving on a surface on uneven traction (one side of the road slippery, the other grippy), active steering can steer against the instability.

This sophisticated system electronically varies the degree to which the front wheels turn in relation to steering input from the driver. Under normal driving conditions at low and medium speeds the steering ratio becomes more direct, meaning the wheels turn more in relation to input from the driver, reducing the amount the steering wheel must be turned. Fewer than 2 turns are needed to move the steering wheel from one lock to the other.

At high speeds, on highways for instance, the steering gear ratio becomes increasingly more indirect. The simultaneously increasing steering wheel torque level prevents unintentional steering movements and the driver can feel an improvement in directional stability.

Brakes

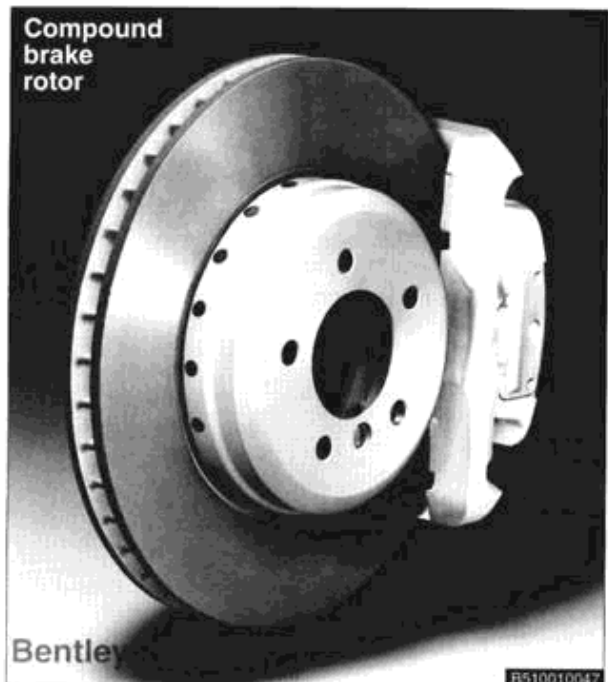
The E60 has a hydraulic dual-circuit brake system with front to rear split. The electric precharge pump for the DSC function is no longer used. The brakes use ventilated cast iron rotors all around, and aluminum calipers at the front as a contribution to balanced weight distribution. Braking power is enhanced by large diameter rotors.

A new coating eliminates rusting on portions of the rotors not swept by the brake pads. Separate front and rear pad wear sensors allow the mileage remaining on the front and rear pads to be displayed and appropriate service scheduled. See **020 Maintenance** for accessing the CBS (condition based service) menu.

Some models use lightweight compound brake rotors made of two components: the high-carbon cast iron outer portion, which functions conventionally, and an aluminum hat in the center. Advantages include:

- Reduced unsprung weight, complementing the aluminum suspension system. Actual reductions are approximately 2.2 lb. at the front, 1.5 lb. at the rear.
- Reduced rotor deformation under hard braking, meaning less tendency of the brakes to vibrate when very hot.

Compound brake rotor

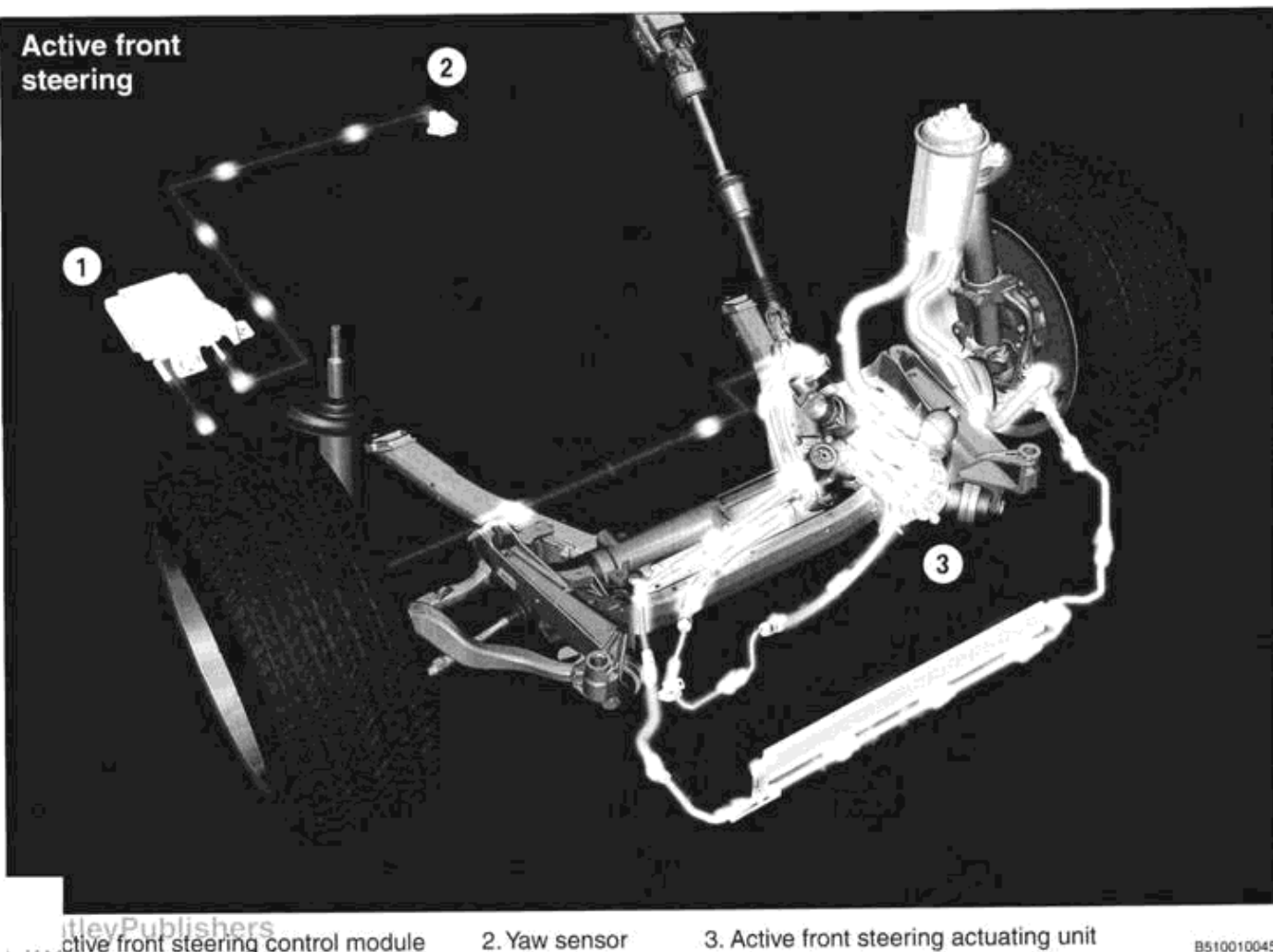


Bentley

B510010047

010-24 Product Familiarization

Dynamic stability control (DSC)



Dynamic stability control (DSC)

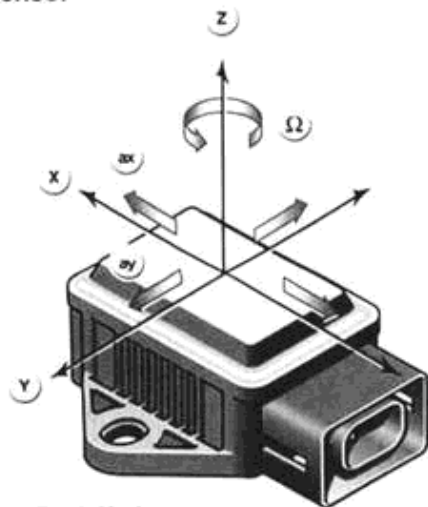
The 5 Series dynamic stability control (DSC) system is referred to as DSC8 (DSC8+ on later models). The DSC control unit uses vehicle speed, steering angle and lateral acceleration signals to calculate vehicle yaw while cornering. DSC intervention is performed depending on whether the vehicle is oversteering or understeering. The DSC function can be deactivated by means of the DSC button.

- The DSC sensor is a key component in the DSC8 system. It is installed under the front passenger's seat next to the transmission tunnel. The DSC sensor contains the yaw rate sensor (Ω), a transverse acceleration sensor (ay), a longitudinal acceleration sensor (ax) for the drive-off assistant function.

The following advanced functions contribute to increased directional stability, optimized comfort, enhanced system availability and response plus reduced braking distance.

- ABS Antilock braking system
- ASC Automatic stability control
- MSR Engine drag torque control
- DSC dynamic stability control

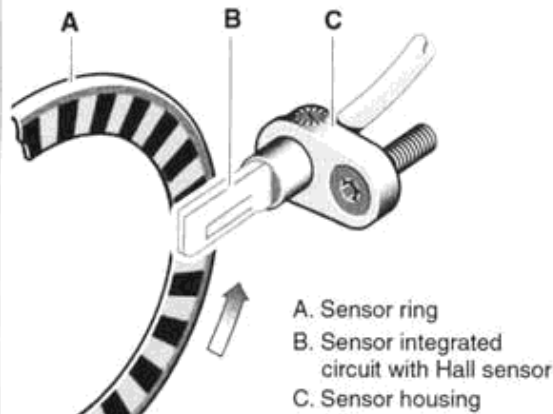
DSC sensor



BentleyPublishers

B510010048

Active wheel speed sensor



BentleyPublishers

BS10010047

- **DBC** Dynamic brake control
- **CBC** Cornering brake control
- **ECD** Electronically controlled deceleration (active cruise control only)
- **EBV** Electronic brake-force distribution
- **DTC** Dynamic traction control
- **RPA** Tire defect indicator
- **BBV** Brake-pad wear indication

There are additional DSC8+ functions for 2006 and later cars: Dry braking, brake standby, automatic soft-stop, fading warning and assistance, drive-off assistant, hill descent control

Additional xDrive DSC (also called DCX) functions:

- **TCC** Transfer case control (control of multi-disc clutch in transfer case)
- **ASC-X** Automatic stability control X (special function for all-wheel drive vehicles)
- **ADB-X** Automatic differential brake X (special function for all-wheel drive vehicles)
- **HDC** Hill descent control

Body

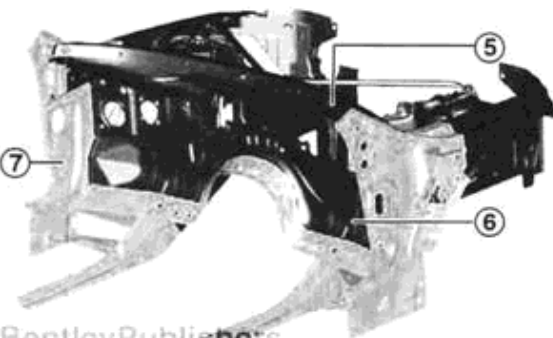
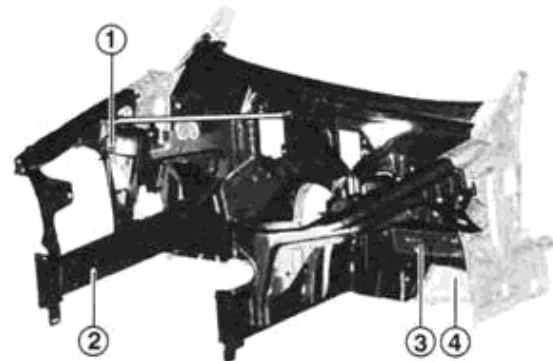
A new BMW platform always means exciting new technology and innovative, meaningful features. The most noteworthy feature of the E60 body is the lightweight aluminum chassis technology.

- In order to make the E60 significantly lighter, BMW designed a reduced weight aluminum front end (GRAV). The front end consists almost entirely of aluminum (blue shading) while the transition to steel occurs in the front bulkhead area.

The weight saving at the front end not only reduces the total weight of the vehicle but is also a significant factor in the E60 attaining the ideal axle load distribution of 50 / 50.

The transition from the aluminum front engine support rail to the steel rail section joint is produced by bonding and punch riveting. To increase conductivity, ground points are located on the two rails and are connected with a ground strap.

In addition to the underhood strut tower reinforcement brace, the bumper carrier and an aluminum front end reinforcement panel provide additional reinforcement and structural rigidity.



BentleyPublishers

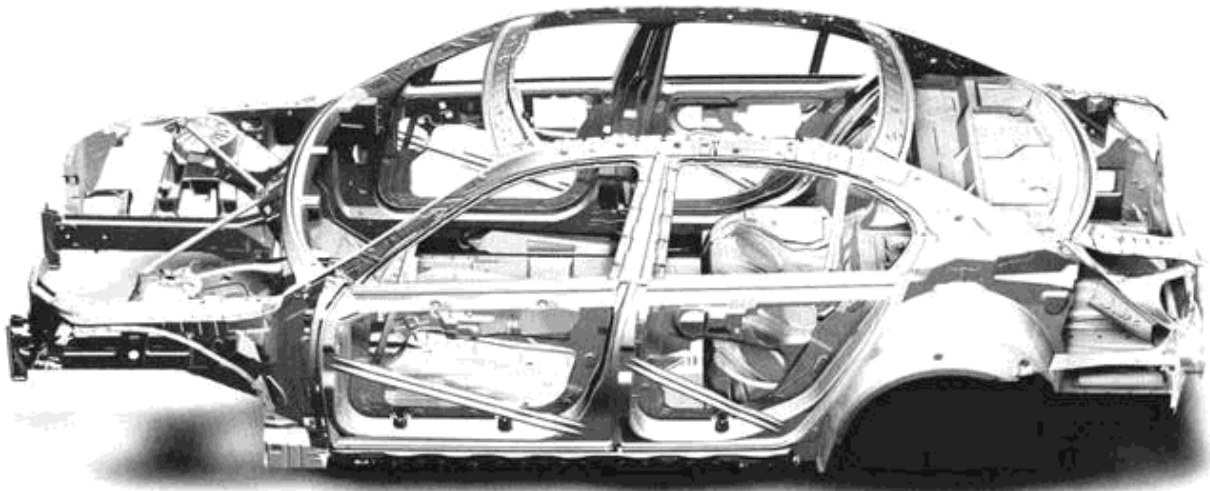
- | | |
|-----------------------------|---------------------------|
| 1. Spring Support | 5. Bulkhead Cross Member |
| 2. Engine Support | 6. Bulkhead |
| 3. Bulkhead carrier support | 7. Inner A-pillar (steel) |
| 4. Outer connection (steel) | |

BS10010055

010-26 Product Familiarization

Sports Wagon (E61)

GRAV (aluminum front end)



BentleyPublishers

BS10010049

Sports Wagon (E61)

The Sports Wagon offers essentially the same accommodations and features as the Sedan, including the aluminum front end. Front and rear leg room are identical for the two body styles; the Sports Wagon's standard split folding rear seats offer essentially the same functions and benefits as those that are optional in the Sedan.

- ◀ The big difference is aft of the rear seats where, in terms of load-carrying ability and versatility, the Sports Wagon offers many advantages over the Sedan, such as a high-lift tailgate and separately opening rear window, for convenient loading without opening the tailgate.

The rear hatch is set at a low level in the interests of a low loading sill. The tailgate is comprised of two segments (the rear window can be opened separately). An indentation in the rear bumper reduces the height of the loading sill for easier loading.



B

BS10010051

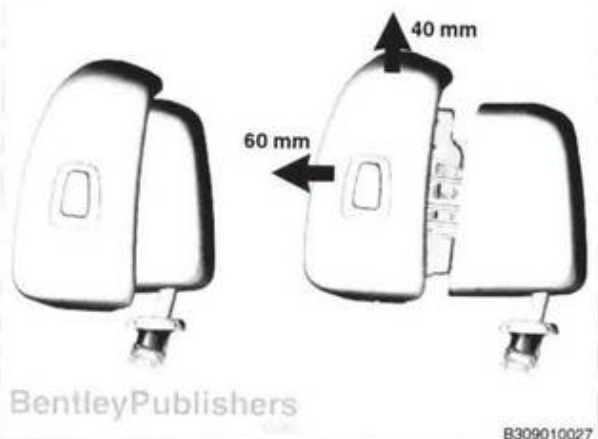
Interior

On the inside, the 5 Series continues the harmonious balance between sportiness and elegance, with an ergonomically designed cockpit for the driver and purposeful materials carefully chosen to please the senses.

Some of the interior highlights include:

- Greater space for passengers and cargo compared to previous 5 Series: 0.5 in. more shoulder room and 0.3 in. more head room for front-seat occupants. 1.3 in. more shoulder room, 0.7 in. more head room, 1.8 in. more leg room for rear-seat passengers and a 26% increase in trunk volume.
- Evolved iDrive system with optional Navigation: A simplified version of the iDrive system first seen in the 7 Series, with a 6.5-in. color monitor* displaying 256 colors at 400 x 240-pixel resolution. *2010 models with the navigation used a larger screen.
- Refined automatic climate control, standard rain-sensing windshield wipers.
- Advanced safety and security systems, including front and rear head protection, and optional active (crash sensitive) head restraints.

Crash sensitive head restraint





Airbag systems

➤ The latest generations of the airbag systems provide enhanced passive protection for vehicle occupants in case of a serious collision. Two system variants were used on the E60 and E61 cars, depending on model year.

- Advanced Safety Electronics (ASE) on 2004 - 2005 models
- Advanced Crash and Safety Management (ACSM) on 2006 - 2010 models.

The differences between the two systems relate mainly to the updated electrical plan on the 2006 and later cars. These sophisticated safety systems differ from previous MRS systems in that the reaction time is decreased and accuracy is increased due to the addition of the door pressure sensors and crash sensors in the engine compartment. See **721 Airbag System (SRS)** for additional information.

ELECTRICAL SYSTEM

Multiple control modules are involved in the operation of the vehicle electrical system. BMW calls this the distributed functions approach. There are several systems (i.e. central locking, power windows and interior lighting) whose functions are distributed across multiple control modules.

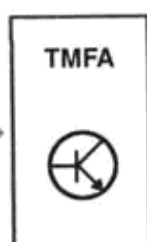
The primary control modules are:

- **SGM** Safety gateway module (2004 - 2006)
- **TMFA** Driver's door module (2004 - 2005)
- **TMBF** Passenger door module (2004 - 2005)
- **MPM** Micro power module (2004 - 2005)
- **KGM** Body gateway module (2006 - 2010)
- **CA** Comfort access (2006 - 2010)
- **KBM** Body basic module
- **CAS** Car access system
- **LM** Light module

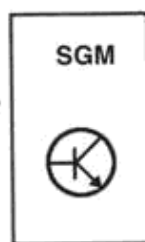
Distributive function

Opening of rear window at driver's door switch

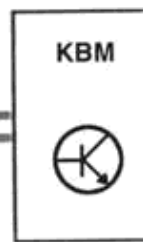
Power window switch



byteflight



K-CAN



Power window motor

Power management and voltage supply

Supply voltage is monitored during both driving and parked conditions to reduce the possibility of unwanted closed current draws and insure that adequate battery power is available for starting. The state of charge (SoC) and the state of health (SoH) of the battery are determined continuously with the E60 power management system.

The power supply system consists of the following components:

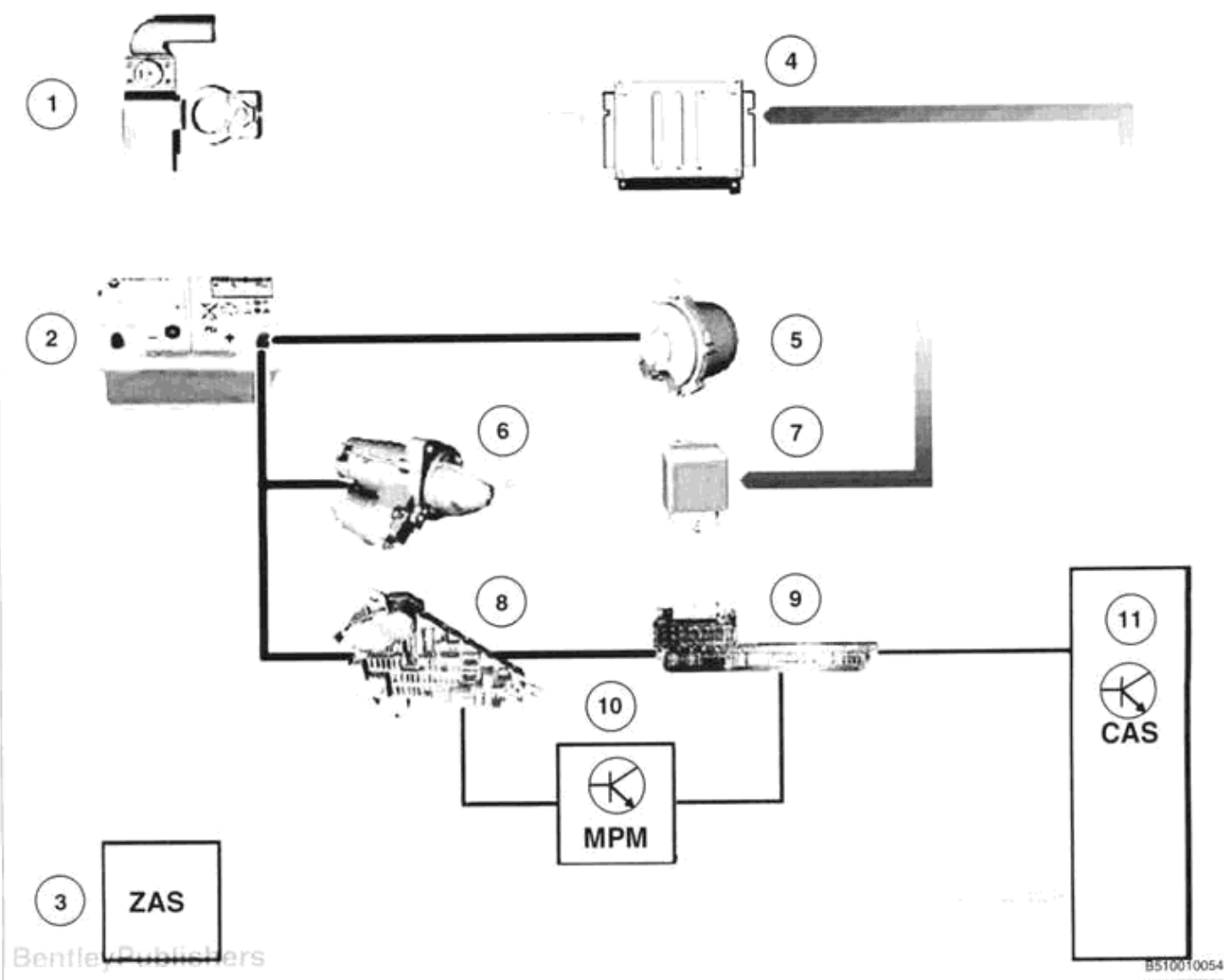
- Vehicle ground points: Owing to the aluminum front end construction, additional grounding techniques are employed improves the electromagnetic compatibility (EMC) of the vehicle.
- Battery and battery cable.
- Intelligent battery sensor (IBS) with ground lead: A sensor installed directly at the negative battery terminal. It constantly measures battery terminal voltage, battery charge / discharge current, battery acid temperature and reports this information to the DME.
- Terminal 30g relay prevents increased closed-circuit current consumption by switching off electric loads in a defined manner. This happens approx. 60 minutes after turning the ignition OFF (terminal R off). Terminal 30g relay is actuated by car access system (CAS).
- Micro power module (2004 - 2005 only): In the same way as with terminal 30g, the micro power module (MPM) facilitates defined deactivation of electric loads. The MPM is installed in the spare wheel recess.
- DME: Power management software is contained in the DME. When the vehicle is at rest, the IBS is partially responsible for power management.
- Car access system (CAS): Responsible for ignition and starter functions, remote key, immobilizer (EWS), central locking, power windows, condition based service (CBS), as well as many other distributive electrical functions.

See **600 Electrical System-General** for additional information on the electrical system and buses.

010-30 Product Familiarization

Power management and voltage supply

Typical voltage supply for 6-cylinder models



1. Intelligent battery sensor (IBS)
2. Battery
3. Ignition and starter switch (ZAS)
4. DME

5. Alternator
6. Starter
7. Starter relay
8. Rear fuse and relay panel with terminal 30g

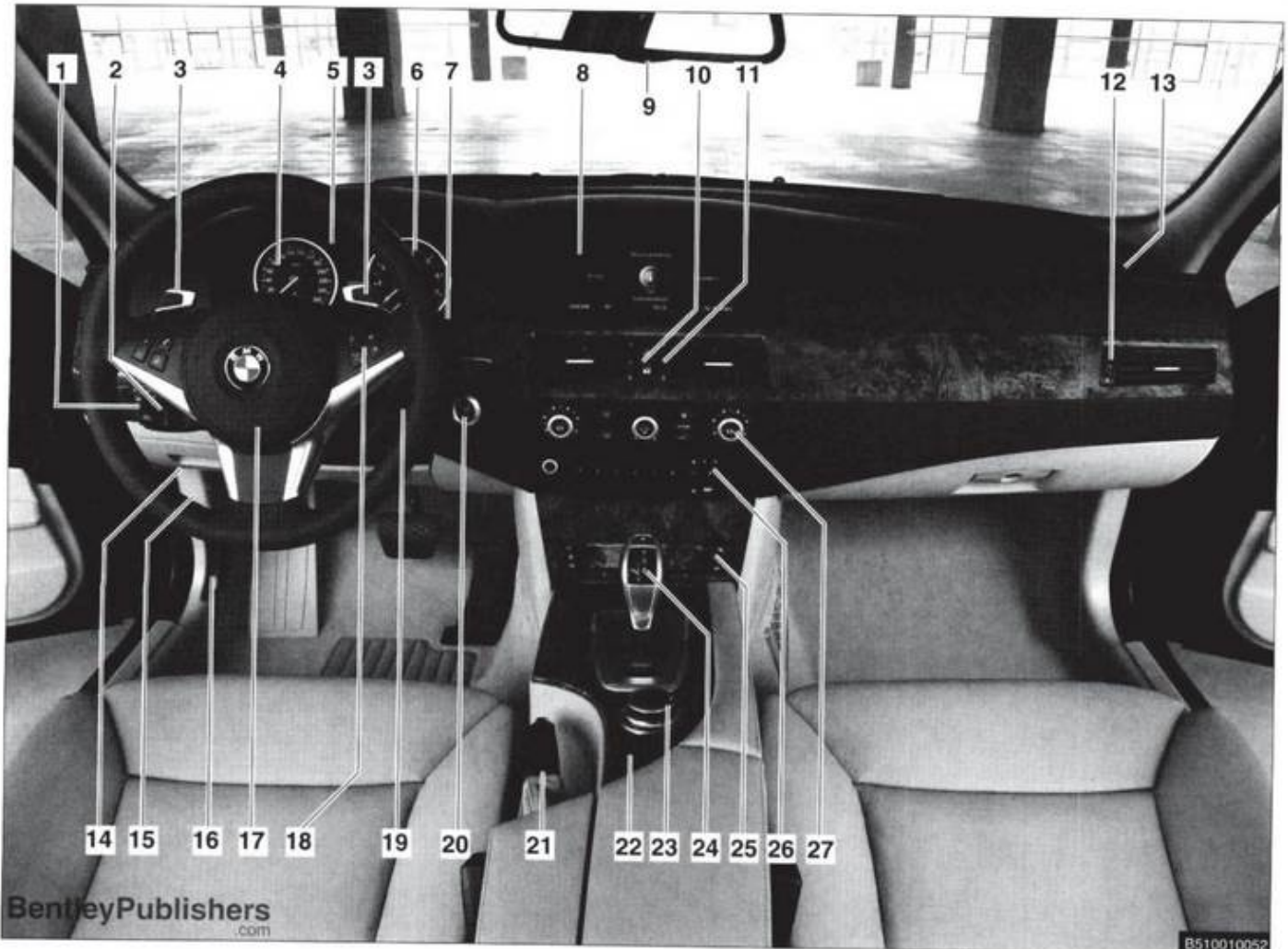
9. Front fuse and relay panel
10. Car access system (CAS)
11. Micro power module (2004 - 2005)

Bentley Publishers

B510010054

Dashboard and controls overview

010



BentleyPublishers.com

B510010052

1. Light switch
2. Cruise control stalk switch
3. Paddle shifter
4. Speedometer, fuel gauge
5. Instrument cluster LCD screen
6. Tachometer, engine coolant temperature gauge
7. Wiper and washer stalk switch
8. Navigation and iDrive display screen
9. Central locking and anti-theft alarm indicator
10. Hazard warning and central locking switch
11. Center air outlets adjuster
12. Side air outlet adjuster
13. Side window defroster outlet
14. Trunk lid or tailgate release button
15. OBD II plug cover
16. Engine hood release
17. Horn, airbag
18. Multifunction steering wheel switches
19. Remote key slot
20. START STOP switch
21. Parking brake handle
22. iDrive main menu button
23. iDrive controller
24. Gear shift switch (GWS)
25. Center console switch cluster
26. Radio and navigation control
27. Climate control knobs

NOTE—

• Features and equipment may vary from the illustration.

