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David J. Buchko
BMW Product Communications Manager
201-307-3789 / dave.buchko@bmwna.com

THE NEW 7:
MOVING BOLDLY INTO
THE FUTURE OF LUXURY AUTOMOBILES

Woodcliff Lake, New Jersey, October 1, 2001...The new BMW 7 Series, while remaining true to BMW traditions and philosophy, moves boldly into the future with new design, new engineering and technology, and new solutions to the challenges of contemporary driving. It is a fascinating exercise in the application of original thought to virtually every area of automotive concepts.

In contrast to the somewhat broader line of 7 Series models being introduced to the European market, which include two sizes of V-8 engines (and other engine configurations to come), the initial U.S. offering will consist of two models, both powered by the larger V-8: the **745i** (available January 2002) and the long-wheelbase **745Li** (March 2002). Both are 2002 models. Standard and optional equipment will also reflect differences between the European and U.S. markets, which will be explained in the course of this text.

THE CONCEPT:
A NEW "DESIGN LANGUAGE"
AND NEW APPROACHES THROUGHOUT

There are times when evolution is appropriate, and there are times when bolder steps are justified. Indeed, evolution is more often the appropriate way to proceed in the development of motor vehicles; almost by definition, revolution cannot occur frequently.

For some time now, BMW has been on an evolutionary path, carefully and intelligently refining highly successful basic concepts. With the occasional exception of a conceptually new product such as the Z3 or X5, BMW Series – 7, 5 and 3 being the most established lines – follow an

evolutionary line from generation to generation. Each recent new generation – the E38 [1] 7 Series in 1995, E39 5 Series in 1997, E46 3 Series in 1999 – has brought with it new design and technology: an abundance thereof, to be sure, but not the most revolutionary sorts of breakthroughs.

The new 7 Series for 2002 breaks with this pattern. Even its internal "E" designations – for the first time there are more than one, E65 and E66 [2] – signal a bold departure from the past. But there is more, much more, to the "new 7" story than that. The utterly new look is apparent enough at the first glance, but underneath and inside the innovative design is one of the richest palettes of new concepts and new technology ever to appear in a new BMW vehicle generation: Altogether, there are more than 60 significant improvements over the predecessor Series.

Not out of necessity is BMW taking this step; for the past four decades, the marque has moved from strength to strength, and in recent years U.S. BMW sales have been trending dramatically upward. Rather, BMW is seizing the initiative of future-oriented leadership. Here, then, is the story of the new 7: the luxury-performance automobile that redefines luxury, performance, design and technology – and in doing so, launches a new era of automotive excellence.

THE LOOK:
A KEYWORD IS "PRESENCE"

The present E38 7 Series, introduced in 1995 and produced through the 2001 model year, is an excellent performance-luxury design in the BMW tradition. "Tradition" is in fact a keyword for the E38: It was not radical when introduced, and today it is an archetype of conservative luxury-car design. At the same time, for a large luxury car, it has a look that outwardly represents its inner values: performance, agility, quality, elegance. Over its production years, independent experts have confirmed again and again the qualities that make it the BMW of luxury cars: In a November 1999

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1 – "E" numbers signify BMW's internal naming of platforms.

2 – Though all long-wheelbase models are designated E66, this text will refer to E65 throughout.

comparison test, *Car and Driver* magazine declared the 740iL winner against four key competitors. After praising the big BMW's spacious back seat, the magazine concluded: "But forget the back seat, because that's not where the fun happens. 'Planted, secure, and confident,' wrote one tester. 'No other [car in this test] tells me more clearly what it's doing and where its limits reside.' And that's why we like the 740iL best."

For all the 7 Series' excellence, customers in certain countries – notably North America and Asia – have been telling BMW they would like a 7 Series with more "presence" – a big BMW that looks bigger, more prestigious, more impressive. And of course they want BMW to accomplish this while retaining, even improving, the traditional BMW traits of strong performance and active driving pleasure. This is precisely what the new 7 does.

Christopher Bangle, Director of Design at BMW AG, explains the E65 design philosophy: "The Board of Directors requested that we exercise strong design leadership," says Bangle, who believes that "A leader is someone who takes you where you don't want to go."

"To produce an excellent product and outstanding design," adds Bangle, "you must believe in what you're doing. We believe strongly in this car."

Bangle and his design team set a progressive direction for the new look. "The dynamic is all BMW. But the presence is new. The 'greenhouse' – the passenger cabin, that is – is set back, making it clear that there is Power up front. The wheels are big," continues Bangle. In fact, for the U.S., the standard wheels and tires are 18-in., with 245/50 tires. Together with an inch-and-a-half greater height, these underscore the new models' "presence."

See and be seen. At the front, the traditional BMW "kidney" grilles take on a higher, more assertive position and look. The "eyes," also in the BMW tradition with four round headlights, are set relatively low by virtue of carrying the turn indicators (eyebrows) above them. They incorporate new technology: The outboard beams are Bi-Xenon, with high-intensity-discharge low and high beams (previously only the low beams were Xenon). The inboard lights are conventional halogen high beams. All four beams are outlined by light

rings, which function as parking lights and illuminate whenever the parking- or headlights are switched on. A high-pressure headlight cleaning system is standard.

Though not the most romantic part of a vehicle, the windshield-wiper/washer system is important to safety and driving ease; BMW engineers have devoted a lot of attention to it. The reversing of direction that occurs each wiping cycle is now accomplished by an electronically controlled reversing motor rather than via the wiper linkage; this allows the system to bring the wiper right up to the driver's-side A-pillar at all vehicle and wiping speeds, and with less noise and impact. The actual wiped area is up 10%, improving the driver's field of vision in the rain; in their intermittent setting, the wipers are rain-sensing as before.

In their parked position, every three days or so the wipers move, so that the rubber wiper blades do not get "set" into a distorted position from being stationary. And the washer nozzles are now on the wiper arms themselves, saving washer fluid by applying it right where it is needed.

As before, the windshield itself is of the infrared-reflecting Climate Comfort type to reduce solar heat in the cabin.

From the rear, the new 7 looks (and is) wider than its predecessor. The main taillight units are outboard, and incorporate new 3-dimensional LEDs for their tail and brake lights. Additional taillamps, the backup light, and the newly standard rear foglights are in a light band across the trunklid. A new "world first" feature here is **adaptive brakelights**, which signal the intensity of the 7 Series driver's braking to following drivers:

- Under normal braking, the outboard and 3rd brakelights illuminate as usual.
- Under hard braking or when the ABS is activated, the taillights and rear foglight join the brake lights (at the same lighting intensity as the brakelights) for a significant increase in visibility of the brakelights.

In case of burnout of certain exterior bulbs, a nearby bulb (one normally used for a different function) is "commandeered" automatically until the defective bulb is replaced. The Check Control monitor system alerts the driver to the burned-out bulb.

With its general lack of decoration and no body-side moldings, the new 7 is notable for its purity of line. Overhangs – the distances from wheel centers to the ends of the vehicle – are compact (actually shorter than those of the predecessor, though overall length is up slightly); this contributes to the substantial, yet sporty look.

UNDER THE HOOD: A BRAND-NEW ENGINE WITH UNIQUE, PATENTED TECHNOLOGY

The new 7 doesn't merely look new; **it is new**, through and through.

Under the long aluminum hood, for example, is a brand-new engine. While its bore, stroke and displacement are unchanged from the previous (and much praised) M62 unit, the new engine – designated N62, N for "new" – makes dramatic strides in torque, power, accelerator response and efficiency. There are detail refinements throughout, but two major new technologies are the main driving force behind the engine's dramatically improved capabilities.

Both of the initial U.S. models are powered by the entirely new 4.4-liter V-8 engine that produces almost exactly the same power as the current 750iL V-12 engine, or 325 horsepower; this is a good 15% more than the predecessor V-8. Equally remarkably, fuel economy is expected to be maintained at about the same level as that of the 2001 740i/iL engine. And response to the accelerator pedal – one can no longer say "throttle" – is markedly livelier, more spontaneous.

VALVETRONIC: REVOLUTIONARY NEW "BREATHING" CONCEPT

Many contemporary automotive engines have variable valve timing, including all of BMW's. BMW achieves variable valve timing by rotating the camshafts relative to their driving sprockets. Some manufacturers also have systems that vary valve lift, or the distance the valves open.

BMW's new Valvetronic system also varies lift – but to a far greater, and more fundamental, degree than existing systems. Indeed, Valvetronic varies intake-valve lift to such an extent that it assumes the function of the traditional engine throttle; engine breathing is thus controlled entirely by the

valves, and the traditional throttle simply goes away. Thus we can no longer call that right-hand pedal on the floor a “throttle pedal.” We might as well go back to the old term “accelerator pedal.”

The Valvetronic mechanism sits atop the intake valves on each of the new V-8’s two 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, however, there is an additional element between the cam lobe and rocker arm, called an **intermediate follower**.

Upon contact by the camshaft lobe, this intermediate follower actuates the rocker arm and, in turn, the valve. But the intermediate follower isn’t merely an extra piece between the camshaft and rocker arm. At its top, it is held in place by another sort of cam lobe – not of a regular engine camshaft, but as part of an **eccentric shaft** that can be rotated by a servo motor. This eccentric shaft, whose commands come from the electronic engine management system in response to the driver’s accelerator-pedal movements, determines the intermediate follower’s pivot point.

The surface of the intermediate follower that transmits motion to the rocker arm is so contoured that according to where its pivot point is positioned by the eccentric shaft, the motion imparted by the camshaft lobe produces more or less motion at the rocker arm, and hence more or less valve lift. Like many ingenious developments, it’s straightforward in principle, though someone had to think it up in the first place. It was BMW engine engineers who thought it up, and BMW has patented Valvetronic.

Particulars and refinements of the Valvetronic system follow.

- **Intake valves assume function of throttle.** The Valvetronic mechanism varies valve lift in a major way: from 0.3 mm to 9.7 mm. Engine breathing – air intake – is controlled by varying this lift. The driver’s foot gives the commands; the eccentric shaft turns to control the intermediate follower’s pivot point; valve lift varies accordingly. At minimum lift, the engine is idling or decelerating; at maximum lift, it is producing full power.
- **Greater efficiency.** It may seem surprising that so fundamental an engine component as a throttle (in BMW M engines, throttle**s**) has a

fundamental drawback. But it does: As a throttle closes, it imposes a restriction that incoming air has to snake around. This causes so-called "pumping losses," which take an increasing portion of engine power as the engine is more and more lightly loaded. Thus elimination of the throttle offers the opportunity to increase engine efficiency at "low-load" operation, i.e. when driving gently. At full power, a throttle is fully open and pumping losses are minimal. By eliminating the throttle(s) [3] and letting the valves control the breathing, Valvetronic essentially eliminates pumping losses. (Diesel engines do not have throttles; this is one of the reasons why they achieve relatively high fuel efficiency.)

- **More spontaneous engine response.** In BMW M engines, an individual throttle for each cylinder, positioned very close to the cylinder, improves engine response by bringing atmospheric pressure right up to the cylinder. Valvetronic goes a step further. When one drives the new 7, one is going to be struck by how spontaneously and quickly the engine responds to the accelerator pedal.
- **More power.** High valve lift contributes to high power output; yet in a traditional engine one cannot simply increase valve lift, as too-high lift would detract from efficient and responsive operation at low speeds and light loads.
- **Refined engine operation.** In light-load driving, operation is especially smooth because of the relatively small valve lift of 0.5 to 2 millimeters. Customers may notice this especially in the engine's ultra-smooth idling.
- **Excellent cold starting.** The small valve opening promotes highly effective vaporization of fuel, even when the engine is started from cold.
- **No mechanical throttle linkage.** Current BMW engines have electronically controlled throttles, so-called "drive-by-wire." With Valvetronic, the driver's call for power is transmitted electronically to the eccentric shaft's electric servo motor.

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[3] – Actually, there is a throttle for a specific function only: to produce vacuum (suction) for the fuel-tank ventilation system. This operates only when necessary, and imposes very little restriction on air intake.

- **Stepless variation of valve lift.** Valve lift is varied continuously and smoothly all the way from minimum to maximum lift.
- **Lighting-fast system response.** Clearly, variation of valve lift is fundamental to the performance of a Valvetronic engine. The system can vary lift all the way from minimum to maximum is just 300 milliseconds, or 0.3 sec. To achieve this lightning-fast system response, BMW developed a dedicated Valvetronic microprocessor, which networks with the 40-megahertz/32-bit primary engine computer.
- **Low friction, precision components.** Every "rubbing point" in the Valvetronic mechanism is not a rubbing (friction) point at all. Instead, a low-friction **roller** transmits the motion: from cam lobe to intermediate follower, from intermediate follower to rocker arm, from eccentric shaft to intermediate follower. The follower itself is manufactured to an extremely high degree of precision: a precision casting in the first place, machined to virtual perfection. Its "boomerang" contour – the working surface that actuates the rocker arm – is machined to a tolerance of 8/1000ths of a millimeter. To ensure quiet operation, zero valve clearance is maintained by a hydraulically adjusted pedestal on which the rocker arm pivots; this feature is known from the existing BMW V-12 engine.

  Rocker arms, by the way, are not part of the current V-8 engine; its overhead camshafts actuate the valves via "bucket-type" valve lifters – cylindrical components that incorporate hydraulic adjustment of valve clearance. Rocker arms, rather than bucket valve lifters, are essential to the Valvetronic concept.

DOUBLE VANOS: BMW'S VARIABLE VALVE TIMING MAKES ITS CONTRIBUTION TOO

In recent years, BMW engines have benefited from VANOS – **VA**riable **NO**ckenwellen **S**teuerung, German for variable camshaft control or variable valve timing.

Where the predecessor engine had VANOS steplessly variable intake-valve timing, the new one incorporates **Double VANOS**, affecting the intake and exhaust valves. In response to operating conditions and the

driver's demands for power, Double VANOS rotates the intake and exhaust camshafts steplessly between "earliest" and "latest" valve timing. (These extremes of the timing adjust are 40º apart for the intake camshafts, 25 º apart for the exhaust camshafts.)

As in other BMW engines, Double VANOS enhances the engine's torque, efficiency and emission control. In the new N62 engine, it operates in combination with Valvetronic to help achieve heretofore unknown levels of performance, efficiency and general operational excellence.

FULLY VARIABLE INTAKE MANIFOLD: ANOTHER MAJOR NEW TECHNOLOGY

A number of contemporary engines, including BMW's 2.5- and 3.0-liter inline 6-cylinder units (3, Z3, 5 and X5 Series), employ 2-stage intake manifolds. Generally, these have a flap mechanism that switches between two different paths for air entering the engine: one shorter, one longer. One of the two paths is tuned for low- to medium-speed operation (improving torque and response), the other for high-speed operation (improving top-end power).

For the new V-8 engine, BMW engineers have evolved this concept into a **fully, steplessly variable intake manifold.** To achieve this, the engine team conceived an internal mechanism consisting of two intertwined helical elements which, rotated by an electric servo motor, vary the effective intake length steplessly between 215 and 607 mm (8.5–23.9 in.). Like Valvetronic and the stepless Double VANOS, this manifold concept dispenses with traditional compromises to achieve truly optimum performance.

ADVANCED FEATURES CONTINUE: LIQUID-COOLED ALTERNATOR, ALUMINUM BLOCK

Continuing an advanced feature introduced about two years ago, the electrical/electronics system of all 7 Series models continues to be powered by a liquid-cooled alternator. Compared to conventional air-cooled types, the liquid-cooled alternator is more compact, produces more electrical power, and is fully encapsulated for exceptional quietness.

As before, the engine's cylinder block is of Alusil – silicon-impregnated cast aluminum – for light weight and long-wearing durability. A new feature here is that instead of the aluminum being chemically etched away, a so-called "soft honing" machine removes just enough of the aluminum to leave silicon crystals as the ultra-hard working surfaces of the cylinders. Bore and stroke dimensions are unchanged from the previous V-8.

TO COME LATER: A BRAND-NEW V-12 ENGINE FOR THE TOP OF THE SERIES

Presently, the 7 Series V-8 (740i/iL) and V-12 (750iL) engines are completely different units; the V-8 is a 4-cam, 4-valve-per-cylinder concept, the V-12 a 2-cam, 2-valve-per-cylinder architecture. In the new 7 Series, the V-8 (745i/Li) and V-12 (760Li) are members of the same engine family, sharing essential engineering and technological elements.

Scheduled for fall of 2002 for the 2003 model year, the **760Li** will be powered by a V-12 engine called the N73. With 6.0-liter displacement, it is significantly larger than the present 5.4-liter M73 unit, but it is not just larger; it is completely new.

MAJOR EVOLUTIONARY STEP: A NEW 6-SPEED AUTOMATIC TRANSMISSION

Over the decades, automatic transmissions have gradually acquired more and more forward gears to accommodate and exploit engines' ever-wider rpm ranges. After introducing its first automatic in the 1960s, BMW has worked through 3- and 4-speed types to arrive at today's 5-speed units.

The new 7 makes the next leap forward with an all-new **6-speed automatic transmission** that is the first of its type [4]. Compared to the previous 5-speed automatic, the ZF transmission's six ratios provide –

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[4] – To be fair, we mention the CVT automatic offered by BMW's former subsidiary Rover in its MG F roadster. In addition be providing continuously variable ratios, this unit also lets the driver select from 6 fixed ratios. Audi is offering a similar Continuously Variable Transmission in the new A4, also with 6 fixed ratios that are "artificially" programmed into the unit.

- Numerically higher 1st and 2nd gears, enhancing off-the-line response
- Essentially equal gearing in 3rd
- Numerically higher 4th and 5th gears, enhancing response at medium speeds
- A numerically lower 6th gear, for even more relaxed high-speed cruising.

Remarkably, the new unit is lighter and more compact than the 5-speed it replaces, thanks mainly to a new type of planetary gearset called **Lepelletier**. A new type of control system, called **Mechatronic**, combines hydraulic and electronic controls inside the transmission case and thus reduces external wiring. Additionally, a new feature called Standby Control partially disengages one of the internal clutches to reduce fuel consumption and tendency to creep during idling in gear. (More to come about "creep.")

In addition to the improved performance delivered by the more powerful engine and 6-speed transmission, there are innovative aspects to the transmission's operation. Most obvious to the driver is that the transmission selector has migrated from the center console to a position just ahead of the steering-wheel rim.

The connection between selector and transmission is **electric**, not mechanical; the selector provides three basic positions. One pushes the selector in the desired direction; whenever the selector is released, it returns to its middle position:

- Park – push inward (to the left) on the Park button
- Neutral – transmission will be in neutral anytime the engine is first started. To reach Neutral from Reverse or Drive, push downward or upward to the pressure point.
- Reverse – press upward past the pressure point.
- Drive – press downward past the pressure point.

Because of EPA test procedures, there is a mileage penalty associated with STEPTRONIC [5]; thus this feature is not included on the initial

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[5] – This penalty is more relevant to the EPA mileage ratings than to actual on-the-road fuel economy.

745 models. Instead, there is a “limiting mode” that provides for driver-controlled downshifting.

This is accomplished via the upper right-hand button on the multi-function steering wheel, labeled L/D (for Limit/Drive). Actuation of this button puts the transmission in its “limit mode,” which captures the gear currently engaged as the highest gear the transmission will reach (6th, 5th, 4th, etc.). Then, the driver may drop the transmission down to L5, L4, L3, L2 and L1 by successively pressing either of the twin shift buttons near the steering wheel’s rim. To return to normal automatic operation, the driver need only press the “L/D” button again. Indications for “L” operation and the range currently engaged (4, 3, 2, etc.) appear in a window below the R-N-P-D indicators in the instrument cluster.

STEPTRONIC shifting will be included with the V-12 760Li and the models’ 745 Sport Package, both scheduled for later introduction. Continuing a refinement of present BMW transmissions, automatic shifting is adaptive; that is, shift programming automatically adapts to driving and environmental conditions as well as the driver’s driving style.

AUTOMATIC HOLD: “HILLHOLDER” OR NO-CREEP FUNCTION

Via the iDrive monitor’s Configuration menu, the driver can select the Automatic Hold feature. This automatically holds hydraulic pressure to the four wheel brakes anytime the vehicle comes to a stop, eliminating any tendency of the vehicle to “creep” when the engine is idling and the transmission engaged. The feature can also hold the vehicle stationary when it is stopped on a hill; also, when it is activated the electromechanical parking brake engages automatically anytime the engine is switched off. “Auto P” appears in the instrument cluster when Auto Hold is selected.

HANDLING, RIDE AND BRAKING: TRADITIONAL BMW ATTRIBUTES, PLUS NEW-AGE INNOVATIONS

The new 7 comes with a generous helping of the advances one traditionally expects of a new BMW: namely, evolution in suspension,

steering, brakes, wheels and tires. But make no mistake: The new 7 also propels the road capabilities of the largest BMW Series decisively into the future with fascinating innovations.

Body engineering. The unitized body/chassis structure is a decisive influence on the ride, handling and crash safety of any motor vehicle. One does not expect a revolution here, as BMW has been at the forefront of body construction for a long time. However, there are evolutionary improvements over the outstanding predecessor Series:

- **Greater use of high-strength steels**, up from 18% to 85% of the total steel in the "body in white." This helps achieve greater strength without a corresponding increase in weight.
- **Increased use of ultra-strong adhesives.** Called "spot-weld adhesives" by the body engineers, these epoxy materials are applied at various points to bond steel to steel. In combination with conventional welding, they optimize structural strength to a remarkable extent.
- **The result: an even stronger shell.** Torsional rigidity is up 10% over the predecessor Series.
- **Dynamic rigidity: still outstanding.** The "natural frequencies" of the body (i.e. the frequency at which the structure would vibrate naturally if set in motion) are essentially unchanged at a high 26 Hertz in bending, 29 Hertz in torsion. As before, the two frequencies differ substantially – an important factor in maintaining resistance to vibration.

Aluminum suspension. While maintaining BMW's unique and proven system of struts and double-pivot lower arms, the front suspension is new in virtually all its components. In the predecessor, only the lower arms were made of aluminum; in the new 7, virtually everything is of this weight-saving, comfort-improving material:

- Subframe
- Lower arms (links)
- Strut housings
- Steering knuckles.

The rear suspension, also evolutionary in the sense that it retains BMW's 4-link Integral system, makes the evolution to aluminum in –

- Its subframe
- All links.

Use of aluminum rather than steel in suspension's moving parts (links and front strut housings) reduces **unsprung weight**. In terms of riding comfort and handling, this is absolutely the ideal place to reduce weight, for reduced unsprung weight improves the suspension's ability to respond to bumps and other road irregularities. This can markedly improve riding comfort and, on any irregular road surface, handling as well.

It was the current 5 Series – E39 – that truly launched BMW's move toward aluminum suspension systems. Accolades for their combination of ride and handling continue to the present day: in its February 2001 issue, *Automobile* Magazine had this to say about the 5 Series: "...and the car's every movement and nuance seem to be transmitted telepathically to our nerve endings. On the road, these dynamic qualities, in cahoots with an incredible supple ride..." [quote goes on to other 5 Series strengths].

The aluminum suspension has similar effects on the new 7 Series' ride and handling. The new aluminum subframes do not reduce unsprung weight, but do reduce overall vehicle weight for a positive effect on performance and fuel efficiency. Furthermore, the new 7 employs **aluminum brake calipers** all around, which **do** reduce unsprung weight.

Thus the 7 Series moves to BMW's most advanced suspension materials and – as we shall now see – technology. And not to be neglected here is that the **hood and front fenders are of aluminum**, contributing to the excellent front/rear weight distribution for which BMWs have long been known. Preliminary data for European models indicate near-50/50 distribution for both 745 models.

Active Roll Stabilization. Combining with the evolutionary aluminum suspension, Active Roll Stabilization is a distinctly high-tech suspension innovation.

The primary function of Active Roll Stabilization is to **reduce body roll** in cornering. This improves handling by virtue of improved suspension geometry (wheel angles relative to vertical) resulting from the reduced roll.

ARS consists of –

- Two **active anti-roll bars**, replacing the conventional purely mechanical ("passive") front and rear bars of most BMWs.
- A **valve/sensor block** containing various system valves and various sensors.
- A **lateral-acceleration sensor** to detect how hard the vehicle is cornering.
- An **electronic control unit** (ECU) that regulates the entire system.
- A **tandem oil pump** which, via its two sections, provides hydraulic pressure for ARS and for the power steering.
- An **oil cooler**, reservoir, filter, oil-level sensor and the various hoses, mounting brackets and other minor components.

Whenever the vehicle enters a corner or curve – or, for that matter, turns in any manner or begins an avoidance maneuver – lateral acceleration is generated. This is read by the sensor, which transmits a signal indicating the level of lateral acceleration to the ECU.

The ECU processes this signal and transmits it to the valve/sensor block. In turn, the valve/sensor block determines the amount and direction of hydraulic pressure applied to the active anti-roll bars to control body roll.

The key word here is "active." Here's what ARS does:

1. The hydraulic actuator situated between the two halves of each anti-roll bar twists the two halves oppositely to resist body roll. (Actually, the "halves" are not literally halves, as the actuator is not in the middle.)

2. Whereas a conventional bar resists roll in direct proportion to lateral acceleration, the ARS electronic control strategy "tailors" anti-roll action to more sophisticated criteria. Within the range of lateral acceleration experienced by most drivers most of the time – up to about 0.5g – ARS reduces body roll dramatically: in cornering at 0.4g, the body of a 7 Series prototype without ARS rolled 2.8°, with ARS a mere 0.5°.

Yet body roll is an important subjective factor for letting the driver know that he or she is approaching a severe cornering level. Therefore, the ARS engineering team has provided that beyond 0.6g, body roll is allowed to increase more sharply; at 0.8g, the body is tilting at 1.8 º and the driver is reminded that the basic laws of physics still apply!

3. Conventional anti-roll bars resist any relative vertical movement of two opposite wheels (left front vs. right front, left rear vs. right rear). In a curve, the outside wheel is pushed upward relatively to the body; the inside wheel moves downward. By resisting this, an anti-roll bar reduces body roll.

However, anytime one side of the car encounters a bump, this same relative motion between two opposite wheels occurs, and again the anti-roll bar resists. This adversely affects riding comfort. As ARS produces no anti-roll action in response to bumps, this compromise is virtually eliminated and side-to-side "rocking" movements of the body are significantly reduced.

4. Because of the reduced body roll angles, the suspension operates closer to its ideal vertical wheel angles. This raises the level of lateral acceleration – the "cornering g's" – that the vehicle can achieve [6].

5. Again because of the reduced body roll angles and more optimum wheel angles, steering response is improved; understeer is reduced in the normal driving ranges, without pushing the vehicle toward unwanted oversteer near the cornering limits. The system is also designed to preclude greater anti-roll action at the rear than at the front, which is an oversteering influence; this is provided for even in the event of a system malfunction.

ARS is **standard on every new U.S. 7 Series model**, though not on all European models.

ELECTRONIC DAMPING CONTROL: UPDATED AND IMPROVED

As in the previous 7 Series, Electronic Damping Control is offered as part of an optional Adaptive Ride Package for discerning customers who

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[6] – It must be noted, however, that drivers should not attempt to exploit the full cornering potential of any modern automobile on public roads.

want to take handling and ride capabilities to an even higher level. Yet EDC is no longer merely EDC; it is now EDC-K, the “K” being for “kontinuierlich” or “continuous.” In the U.S., however, this system will still be called simply EDC.

“Continuous” is better described as “stepless.” The previous EDC switched the shock absorbers among three levels of firmness according to road and driving conditions. The new system controls them to **any level of firmness** between their softest and firmest settings, and thus more precisely adapts their firmness to the conditions at hand. In particular:

- Ride firmness is always at the optimum level for the current road conditions, vehicle speed and the load the vehicle is carrying (passengers and luggage).
- On smooth roads, the shock absorbers are kept “soft” for best riding comfort.
- When the vehicle is rounding a sharp corner or curve, the shock absorbers are automatically and instantly adjusted to a firmer, just-right level.
- When the vehicle encounters irregular road surfaces, such as bumps or ripples (“washboard” surface), the shocks are automatically and instantly adjusted to the optimum level of firmness to control ride motions, keep riding comfort at an acceptable level, and maintain adhesion to the road.
- Additionally, there is (as before) a Sport setting via a console switch that increases firmness under all conditions for a sportier driving feel.

According to Siegfried Kölbel, who has headed development of the chassis technology, the new EDC is “dramatically better,” and EDC was already very good. Kölbel is referring to the system’s overall benefits in terms of combining firm handling with the highest possible level of riding comfort; but in particular, the Sport mode is more sophisticated. Instead of simply setting the shocks to their firmest setting, EDC varies them according to conditions but always keeps them at a higher level of firmness than Normal.

A user’s preferred EDC setting can be captured in the Key Memory settings. (Vehicle and Key Memory is BMW’s system of tailoring vehicle functions to customers’ and individual users’ preferences.)

REAR AIR SUSPENSION:
A NEW PATH TO SELF-LEVELING

As with the previous 740i/iL models, self-leveling rear suspension is available on the 745i/Li as part of the optional Adaptive Ride Package. However, the self-leveling system is completely new.

The new system, with air springs for its self-leveling action, is simpler and lighter than the previous hydraulic system. Air springs replace the rear coil springs; self-leveling is achieved by an electric air compressor and sensors that recognize changes in vehicle loading. Whenever the sensors detect a longer-term change in the ride height at the rear (as with a full passenger load or heavy loads in the trunk), the pressure in the air springs is increased to bring the vehicle back to its normal attitude.

NEW TO THE 7 SERIES:
RACK-AND-PINION STEERING

Although other makers earlier adopted rack-and-pinion steering systems for their luxury cars, BMW has taken a more cautious approach. The challenge has been to achieve the advantages of the rack-and-pinion mechanism while overcoming its one drawback: greater road shock felt at the steering wheel. Rack-and-pinion's advantages are:

- Precision of road feel
- Lack of "free play" at the steering's center position
- Lower weight, because there is no center arm.

BMW's 3 Series has long used rack-and-pinion steering; the Z3 Series and Z8 have it too, as do the 5 Series 6-cylinder models and all X5s. For the most luxurious models, including the V-8 5 Series and all 7 Series models, BMW has kept recirculating-ball steering, which transmits less road shock to the steering wheel. Now, careful development has produced a rack-and-pinion system that brings the above advantages to the 7, while meeting the highest standards in isolating road shock from the steering wheel.

To enhance the fundamental weight advantage, the rack-and-pinion housing is made of aluminum. It also includes a feature seen on the 6-cylinder 5 Series models and Z8: a **variable steering ratio**. The rack-

and-pinion gear teeth are profiled to make the steering ratio 10.6% “quicker” as the wheel is turned away from the center position. This fine-tunes steering response according to the situation one is in, be it on an Interstate at today’s high cruising speeds or maneuvering into a parking space.

Power assist is also variable, via the **Servotronic** vehicle-speed-sensitive system. This reduces steering effort in parking and at very low road speeds more than the engine-speed-sensitive system of most other BMW models, as is appropriate for BMW’s largest, most luxurious cars.

Variable steering ratio and variable power assist are not the same thing; they are two separate features, here optimally complementing each other.

BRAKES:
AMONG BMW'S LARGEST, MOST POWERFUL YET

The swift, sure stopping power of BMW brakes is legend, so it should be no surprise that The new 7 incorporates one of the most powerful ever employed in a production BMW, plus the most advanced engineering features to optimize their performance. There are also some new braking features that offer appealing, unique benefits.

For the first time, all 7 Series models will have ventilated discs all around: up to now this distinction has been reserved for top-of-line 750iL models. All discs are also of significantly larger dimensions than before:

	2001 740i/iL	**2001 750iL**	**2002 745i/Li**
Front discs	324 mm/12.8 in. ventilated	332 mm/13.1 in. ventilated	348 mm/13.7 in. ventilated
Rear discs	324 mm/12.8 in. solid	328 mm/12.9 in. ventilated	345 mm/13.6 in. ventilated

Aluminum calipers have been adopted to reduce unsprung weight; these can be seen as part of the overall "aluminum suspension" theme and the clear benefits it brings to the customer in terms of riding comfort and handling, particularly on uneven road surface.

Electronic brake proportioning. Via the Dynamic Stability Control wheel-speed sensors, this system actually measures the amount of slip at each wheel when the brakes are applied, and apportions pressure to the front and rear brakes accordingly. This makes best use of the available braking traction at the tires and helps distribute brake and tire wear more evenly. The brake proportioning is also designed to prevent over-braking of the rear wheels, and thus help preserve stability, should the ABS malfunction.

Dynamic Brake Control reinforces the driver's pedal effort in emergency braking and thus helps the driver achieve the shortest possible stopping distance. It was already present in the current 7 Series and other BMW models.

Electromechanical parking brake. The first of its type in a production automobile, the parking brake is applied electrically rather than directly by human effort. To engage it, the driver presses a button at the lower left side of the instrument panel. The electromechanical brake also functions as an emergency brake in the unlikely event of a failure of both circuits of the wheel brakes: In this instance the driver presses the brake button, and the parking brake then retards the vehicle at a preset, moderate rate of deceleration.

Automatic Hold. Described earlier, this is the function that holds the brakes anytime the vehicle comes to a stop, then releases them when the driver steps on the accelerator pedal again. It operates through the regular wheel brakes, not the parking brake. However, if the driver shuts off the engine with the vehicle stopped and this feature activated, the parking brake then engages automatically.

Brake-wear display. Instead of a simple warning indicating that it's time to renew the brake pads, the iDrive monitor offers in its Vehicle menu a display of the estimated mileage at which replacement of the pads will be due.

18-INCH WHEELS AND TIRES STANDARD, 19-INCH OPTIONAL

In a dramatic move to enhance the new 7's handling and appearance, BMW decided to make 18-in. wheels and tires standard on all models for the U.S. market.

The 18 x 8.0 wheels in a new Double Spoke design carry 245/50R-18 V-rated all-season tires; as on most BMW models, the spare wheel/tire is a full-use one. V-rated all-season tires are new; previously, the highest speed rating for all-season tires on BMWs was H.

To further enhance handling and sporty appearance, optional on both models are even more generously dimensioned 19 x 9.0 front / 19 x 10.0 rear Star Spoke wheels with 245/45R-19 front / 275/40R-19 rear performance tires.

STABILITY-ENHANCING TECHNOLOGY: A NEW CAPABILITY CALLED DYNAMIC TRACTION CONTROL

It has always been possible to de-activate BMW's All Season Traction (earlier models) or Dynamic Stability Control (all current models) via a console switch. The new 7's DSC system adds a new capability, called Dynamic Traction Control or DTC.

DTC improves the vehicle's utilization of available road traction under specific conditions, including –

- on sand, gravel, deep snow or packed snow
- climbing hills with deep or packed snow
- when there is deep snow on only one side of the road
- when driving with tire chains.

Via the iDrive monitor's Configuration menu, the driver may either fully de-activate DSC, or activate the DTC mode. With DTC selected, the traction-control logic is reset to allow more wheelspin. With DTC selected, DSC's stabilizing action is reduced somewhat to favor the traction priority, but not completely de-activated.

When DTC is selected (as also when DSC is de-activated), the DSC indicator in the instrument cluster flashes to remind the driver. If the vehicle reaches a speed of approximately 43 mph, normal DSC operation is re-instated until speed once again drops below this threshold, at which point DTC operation resumes. When the engine is shut off and re-started, the system defaults to full DSC operation.

iDRIVE: THE NEW WAY TO COMMAND BMW

Contemporary automobiles – particularly luxury cars – pose an ever-growing challenge to their designers: how to accommodate the extensive functions that modern technology offers without overwhelming the driver and creating a driving environment cluttered with controls. **iDrive** is BMW's solution to this challenge.

By dividing the vehicle's control environment into two areas – Driving and Comfort – iDrive separates those functions that pertain directly to

vehicle operation from those that relate more to occupants' comfort and well-being.

THE DRIVING ZONE

The basic driving functions have not changed in any fundamental way. As always in BMWs, all primary driving controls are clustered around the steering wheel – now including the automatic-transmission selector, which has been moved from the center console to a position that allows fingertip operation from the steering wheel. Similarly, functions that drivers and front passengers use often – basic climate and audio controls – are also in their customary places, and operate in familiar ways.

The "primary area" of iDrive, as it is that area most directly associated with driving. It is composed of the following elements:

New multi-function remote control. The remote control no longer includes a conventional key for insertion into the ignition switch. Instead, one inserts the remote itself into a slot. The remote includes all functions of the current remote, including –

- "Car finder" (press "lock" when vehicle is locked to turn on the interior and exterior door lights)
- Trunklid opening
- Opening the windows and moonroof
- Coded Driveaway Protection; an electronic "rolling code" that must correspond between the remote and the vehicle's electrical system ensures that the vehicle can only be operated with a remote that belongs to the vehicle.
- A long-life battery that charges anytime the remote is inserted in the ignition slot

The choice of whether all doors, the trunk and the fuel-filler door unlock at once, or the driver's door first, is also programmable on the iDrive Configuration screen.

A small "reserve key" is carried inside each remote (two remotes are supplied with each new vehicle; the Key Memory can accommodate up to four remotes). Its primary function is to lock the center-console compartment

separately, but it may also be used in a conventional lock in the driver's door, but it is not designed for constant use.

Start/Stop button. After inserting the remote into slot, the driver actuates the adjacent Start/Stop button to start the engine and turn on the instrument lighting. 1-touch starting, which allows the driver to start the engine with just a quick touch of the button, continues as a standard 7 Series feature. The Start/Stop button is also used to switch off the engine.

The brake pedal must be depressed for the Start/Stop button to start the engine. If it is not, the button can be pressed alternately to switch on the accessory or ignition current (these correspond to BMW's traditional "1" and "2" positions) and to switch everything off again.

Electric transmission selector on the steering column, the L/D selector on the steering-wheel face, and the downshift buttons near the steering-wheel rim. Note: the main selector is **electric**, not electronic.

Other steering-column stalks. Like the transmission selector, the other steering-column stalks (there are four in all) operate electrically rather than mechanically, always returning to their central position after being actuated in one direction or the other.

Main instruments with LCD displays. In a perfect combination of BMW tradition and iDrive future, the entire instrument cluster – including the speedometer and tachometer faces – is available for the many warnings, indicators and displays that help keep the 7 Series driver informed of what's going on with the vehicle and environment.

For example, in the tachometer face the main and trip odometers are not displayed permanently, but can be called up when desired; when the ignition is first switched on, the Service Interval Indicator briefly shows the mileage remaining until maintenance is required. The fuel gauge (in bar-graph style) appears only when the fuel tank reaches its reserve level. Onboard Computer, Check Control and GPS Navigation indications can appear in the tachometer face; those for GPS Navigation give visual instructions and location information closer to the driver's direct line of sight than the more extensive GPS display in the monitor.

Many other indicators, including those for the transmission range and gear, turn signals, high beams, outside temperature, and clock, are displayed to the driver as appropriate in the cluster.

Illumination of the cluster, which is used day and night, automatically adjusts to ambient light levels (transmissive at night, reflective in daylight). As in the M5 and M3, the tachometer's warning field varies according to engine temperature, indicating a low rpm limit when the engine is cold and increasing this limit as the engine warms up.

Electromechanical parking brake and Automatic Hold. Described earlier, these innovations are also part of the iDrive system's Driving area.

Programmable cruise control. With the vehicle stationary, the driver can pre-program up to six desired speeds, corresponding to various speed limits or driving preferences, and then retrieve them at any time by pushing the stalk forward or pulling it rearward past a detent. Thus, for example, if one had programmed 55 mph and was entering a "reduced speed" zone where the limit is 55, one would pull the stalk rearward past the detent until the preset 55 (as indicated by an arrow in the speedometer face) is reached. The current speed can also be captured as one of the programmed speeds.

THE COMFORT ZONE

This extensive set of functions, or "secondary zone," is positioned centrally in the front occupant compartment. Though characterized as the Comfort Zone, it actually encompasses a wide range of comfort, convenience and informational features and also presents users with some interesting and highly useful choices in how certain features and functions operate.

Here, BMW has applied the well-developed and proven concept of the Navigation System that has been standard on the previous 7 Series and optional on many other BMW models: a **color monitor** with control menus, and a **controller**. The main conceptual differences here are that more functions than ever are controlled in this manner, and that the controller has migrated from the monitor panel to a central position between the front seats. A further refinement is that the controller is endowed with **force feedback**: According to the functions it is currently controlling, it

communicates to the user an appropriate tactile feedback. The controller is equally accessible to the driver and front passenger, and is finished in high-quality satin aluminum.

THE MENUS:
EIGHT "COMPASS POINTS"

Each time the remote control is inserted into the ignition lock, the monitor displays its **start menu**. This shows the eight directions in which the controller can be moved to select the control menus, and the names of these menus appear in the border of the monitor screen. Beginning at "north" (top) and proceeding in steps of 90º around the monitor, the **primary menus** are:

- Communications – phone functions
- Navigation – Onboard Computer and GPS Navigation.
- Entertainment – radio and CD player/changer
- Climate – selection of air distribution (override of automatic control), adjustment of (optional) heated front seats, automatic ventilation.

The **secondary menus** are at "diagonal" positions of the compass. Beginning with "northwest" (top left), these are:

- BMW Assist – for reaching BMW Roadside Service or Emergency Assistance
- Vehicle – maintenance requirements, Check Control warnings and indications
- Help – explanations of iDrive functions and operation
- Configuration – vehicle parameters such as Dynamic Stability Control, Dynamic Traction Control, operation of central locking system and other functions; selection of units of measurement (i.e. miles per gallon or liters/100 km, 24- or 12-hour clock, º F or º C, etc.) and language, setting date and time, and others.

THE MENUS ONE-BY-ONE

Communications. Memory phone dialing and other functions: similar to those in today's Navigation System.

Navigation. Encompasses the Onboard Computer and GPS Navigation.

- Onboard Computer. Similar to that in BMW's familiar Onboard Navigation System; range on remaining fuel, distance to destination, average fuel economy, average speed, estimated time of arrival and other functions. An instantaneous fuel-economy readout can be selected in the Onboard

Computer menu and displayed in the tachometer. One can also sequentially display each Onboard Computer function in the tachometer face by pressing inward on the turn-signal stalk.

- Speed warning and stopwatch functions are also selectable on this screen.
- GPS Navigation. Appearance and operation essentially as in the updated wide-screen version of the BMW Onboard Navigation System recently phased into the 7 and 5 Series. A new feature is that simplified route instructions appear in the tachometer face.

Entertainment. In addition to basic audio controls on the instrument panel, extensive functions (FM/AM/CD selection, radio tuning and station presets, tone, DSP of optional Logic 7 system, etc.) are available on this screen.

Climate. Frequently used climate controls are permanently located at dash center, more rarely used settings are in the Climate screen. After selecting this screen, one may override the automatic airflow settings by setting preferred flow levels and relative temperature levels to defroster, dash vents and footwells, for the driver's and passenger's side as always in 7 Series models. Airflow and temperature are depicted graphically in the monitor.

A new and unique feature here is the ability to vary the relative heating levels of the available heated front seats' cushions and backrests by as much as 5°F; the heating levels are depicted in a graphic of the seat as this is done.

BMW Assist. Basically familiar from the current Navigation System screen, this screen is the simplest of all, offering three choices: BMW Roadside Assistance, Emergency Assistance, and Vehicle Position as determined by the onboard GPS equipment.

Vehicle. A highly useful menu, including –

- Specific service recommendations. In addition to a display of the remaining miles to the next required service that appears in the speedometer face each time the ignition is switched on, this screen offers more specific, **condition-based** service recommendations, such as RENEW BRAKE PADS with the mileage and approximate date at which this service will be required. At the left of each recommendation is a

colored field, showing green, yellow or red according to urgency of the recommendation.

- Check Control indications. This long-standing BMW monitoring system appears in expanded form; the wordings in the monitor are more detailed than those in the instrument cluster. A symbol appears in the monitor's status line, indicating three possible Check Control conditions: no malfunctions, Priority 2 (not urgent) and Priority 1 (urgent). Priority 2 includes conditions such as trunk open and "fill washer fluid." Priority 1 includes more urgent indications, such as "release parking brake" or a DSC malfunction; the indications remain until the malfunction or problem is corrected. Check Control monitors more than 100 functions in the vehicle.

Help screen (Information). Appears in a split screen with other screens; the user puts the cursor on a function on the screen in question, and sees its explanation on the adjacent help screen.

Configuration. Here the user has choices regarding the human/machine interface. One can choose the units in which information is displayed, such as mpg, liters/100 km or km/liter; a 12- or 24-hour clock; or the language in which all displays read (English, German, French).

This is also the screen where one can –

- Activate or de-activate DSC and DTC
- Select the EDC Sport or Comfort settings
- Initialize the available Tire Pressure Monitoring system
- Select or de-select Automatic Hold
- Select a new graphic for the available Park Distance Control, depicting in color on a vehicle plan view the fields that PDC monitors and showing where actual obstacles are encountered by the system.
- Choose certain Vehicle and Key Memory settings –
  - Selective unlocking (first activation of UNLOCK on remote unlocks all doors, trunk and fuel-filler door, or only driver's door [7]).
  - Automatic locking when vehicle reaches 5 mph.

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[7] – In initial production, this setting done by BMW center; as of 3/02 production, can be done by user

  - Electronic Damping Control, if present: Comfort or Sport setting.
- Execute a number of other features and functions. There's even a button here by which the user can program a desired function for a "blank" switch on the steering wheel.

These functions automatically become associated with the remote currently inserted in the ignition switch.

When present, the optional Tire Pressure Monitoring is always active. Should the system note a loss of pressure in any tire, a diagram of the vehicle appears in the monitor. If all tires have gradually lost pressure (as is normal with any tire), the tires in the display change from their normal green to yellow. If an individual tire loses pressure, that tire is displayed in red.

OTHER INTERIOR FEATURES: LUXURY, CONVENIENCE AND TECHNOLOGY

Throughout The new 7's cabin, just about everything is new and much is innovative.

Stepless door checks. Even with the 2-position door checks of current BMWs, how many times have we wished for another place to hold the door open so that we could get in or out while avoiding hitting a wall or pillar with the door? The new door checks are hydraulic and stepless, holding the door at any position to which the occupant opens it. They are effective with the vehicle pointing uphill up to 10°, or leaning to one side or the other up to 6°.

Soft-close doors are available as part of the Convenience Package; see **options & accessories**.

More space inside. Model for model, The new 7 is slightly longer (1.8 in.), wider (1.6 in.) and taller (1.4 in.) than its predecessor, but its wheelbase (117.7 in. for the 745i, 123.2 in. for the 745Li) is a substantial 2.3 in. longer. These gains in vehicle size translate to 0.9 in. greater shoulder room in the front compartment and 0.6 in. greater rear head room. Though not dramatic increases, these are significant and mean even greater space than in the roomy predecessors.

Multi-function steering wheel with new functions. The multi-function steering wheel, a concept familiar from the current 7, 5, 3 and X5 Series, continues and evolves.

Brand-new are buttons at the rim for downshifting the transmission through its “limit modes,” described earlier. As before, the steering wheel is power-adjustable by 2.0 in. in tilt, 3.1 in. telescopically, included in the memory system, and equipped with auto tilt-away for the driver’s entrance and exit.

Auto-dimming inside and outside mirrors now standard. Formerly part of the optional Convenience Package.

Seating: new choices, new control locations. The head restraints are newly coupled with fore-aft seat adjustment: farther forward (shorter driver), lower head restraint and vice versa. (Fine adjustment of the head restraints is manual.) Counting the head-restraint movement as a power adjustment, the front seats are 14-way driver / 12-way passenger, including 4-way power lumbar. The standard memory system captures preferred positions for the driver’s seat, steering wheel, outside mirrors and safety-belt height.

Front Comfort Seats with expanded functions. As before, Comfort front seats are standard in the long-wheelbase model (now 745Li) and optional in the regular-wheelbase 745i. While retaining the distinctive separately adjustable upper backrest section, they add significant new amenities:

- Adjustable thigh support, as in BMW sport seats
- Adjustable backrest width, as in M3 models
- Memory for passenger’s seat
- Active head restraints (see **safety features**) with side support.

In contrast to the standard seats, fine adjustment of head-restraint height is powered. The restraints include fold-out sides that help support the head of an occupant using them as headrests, as for example when sleeping.

Further front seating options. The following options can be combined with either the standard 745i seats or the Comfort seats (for details see **options & accessories**):

- Heated front seats, stand-alone or as part of the Cold Weather Package.
- Fatigue-reducing Active Seats as before, now combined with new Active Seat Ventilation.

New seat controls. Power seat controls are newly located on the sides of the front center console and (with optional rear seating) rear center armrest. They are also newly arranged, each set with a “menu” and a “motion switch.” The “menu” consists of pushbuttons representing the various portions of the seat; the portion to be adjusted is selected by pressing its button. The motion switch can be pressed upward or downward, or rotated as appropriate to the desired motion.

Preferred seat settings for individual users can be programmed by the BMW center in the Key Memory system. The memory buttons are also on the console sides, as are controls for the available seat heating and ventilation.

Multifaceted console compartment. Between the front seats is an uncommonly spacious console compartment with dual, opposite-opening, lockable lids. The compartment is climate-controlled and illuminated; it holds the phone handset, a coinholder and the trunk-release lockout.

New power-window controls with lift-to-close, push-to-open switches and a new refinement: As each window approaches fully closed or open, it slows down gradually. This reduces any noise at these points.

Automatic climate control. In its range of functions, the climate-control system is essentially similar to that of the previous 7 Series in that it includes –

- Left/right temperature controls
- Left/right automatic airflow volume and distribution
- User override of airflow volume and distribution
- Activated-charcoal microfilter
- Automatic recirculation control (2 gas sensors)
- Solar sensor for front compartment
- Temperature-controlled rear air outlets, left/right controllable
- Heat at Rest function
- Automatic ventilation system
- Preferred override settings for individual users via Key Memory.

New features include –

- Air outlets in the B-pillars (for rear passengers, airflow adjustable)
- Even more powerful air-conditioning performance.

Basic climate controls, as used for normal (predominantly automatic) operation, are positioned conventionally and conveniently at the instrument panel's center, the assumption being that these are relatively frequently used and should not require accessing a monitor screen.

For overriding automatic airflow distribution, adjusting the temperature and flow of air from the dash vents, and other functions, one selects the CLIMATE screen on the color monitor and adjusts with the controller.

Audio systems. The base 10-speaker, 180-watt audio system comes with an in-dash single-disc CD player; a cassette player may be substituted at no extra cost. Consistent with the climate system, the audio controls likely to be used most frequently are "out in the open," centrally located on the dash; other, less frequently used, controls are found in the monitor and selected via the ENTERTAINMENT screen. The optional Logic 7 audio system is described under **options and accessories**.

Standard BMW Cellular Phone System with Mayday feature and Telecommander. BMW's CPT 8000 Timeport phone system is standard, and includes the following features:

- **Tri-mode, dual-band phone** with 1900-MHz CDMA/TDMA, 800 MHz CDMA/TDMA, or analog operation.
- **Mayday features –** automatic notification of BMW Roadside Assistance upon airbag deployment or triggering of alarm system. 1-touch assistance and emergency calls are possible via the iDrive monitor or dedicated buttons above the windshield.
- New **Telecommander**. This second phone keypad, carried in a convenient pull-out tray in the dash near the driver, lets the driver manually dial, send or end calls and turn the phone system on or off – all more easily than with the handset in the center console compartment. For safety, the actual console handset is inoperable when the vehicle is in motion.

Voice Input System. Via the hands-free microphone, voice input can be used to activate a number of phone, navigation and notepad functions.

So that conversations can be held inside the vehicle without accidentally activating the phone or other systems, Voice Input must be enabled before

each use by a control on the multi-function steering wheel. This system was introduced into the previous 7 Series during the 2001 model year.

Interior lighting. Includes all the amenities of previous 7 Series lighting, plus numerous new ones.

Upholstery and trim. Standard in both 745 models is a new leather grade called New Classic. Includes microperforations for natural ventilation; these facilitate the available Active Seat Ventilation that's available for the front seats.

New matte-finish Black Cherry wood trim is standard. With Beige, Flannel Gray, Natural Brown and Stone Green interiors, the wood is light in color; with Black, it is dark. Door handles and lock buttons are in aluminum-look, reflecting the material of the central controller.

Trunk. A new "transverse orientation" optimizes the trunk's useful space. Specifically, it can now carry four golfbags transversely: four 45-in., or three 46-in. plus one 45-in. In terms of luggage, the trunk has been configured for five standard pieces: two large, two medium and one small. A new concept in trunk hinging, the single-link tubular hinge, eliminates any intrusion of the hinges into the trunk space and facilitates both the standard full opening (via a spring pack) and the newly available automatic trunk opening/closing (see **options and accessories**.

SAFETY ENGINEERING AND FEATURES

When your point of departure is an automobile with an outstanding safety record and a comprehensive, impressive range of safety engineering and features – the existing 7 Series – you do not need or expect a revolution in the safety aspect of the new models. Yet BMW undertook to make the new 7 even safer; according to Josef Mahalek, Manager of Development of Safety-Systems Electronics, BMW's goal was "to develop the safest automobile in the world."

The driver's and passenger's front-impact airbags continue the Smart Airbag technology already found in all BMW models. Likewise, the door-mounted front-seat side-impact airbags, which have proved themselves in BMWs since the 1997 model year, continue.

Active Knee Protection. Over and above European equipment, U.S. BMW models incorporate additional knee protection in the lower instrument-panel areas. The new 7 advances this feature with Active Knee Protection: a dedicated airbag ahead of the padded surfaces that meet the occupants' knees in a frontal impact. This accomplishes several things:

- Reduces the amount of space occupied by the knee protection, leaving room for features customers value.
- Increases the knee protection's effectiveness.
- For belted occupants, allows finer "tuning" of the other restraint systems (safety belts and front airbags).

Head Protection System, now front and rear. BMW was the first carmaker to offer Head Protection. The front HPS, with a Inflatable Tubular Structure (ITS) deploying from the A-pillar and roof to protect the driver's and front passenger's heads, has been heralded by independent safety experts as a highly effective system – particularly in side impacts, but also in complex accident sequences as HPS remains effective for approximately 7 seconds after inflation. Front HPS continues in the new 7, the 5 and X5 Series, and closed-body 3-Series models.

In June 1999, the International Brain Injury Association presented BMW with its **Safe Car of the Millennium** award for HPS. "As motor-vehicle crashes are the leading cause of brain injury worldwide," explained the Association's president, "BMW is to be applauded for their achievement in making automobiles safer."

With the new 7, BMW extends the unique HPS concept to rear-seat passengers. Called AHPS (Advanced Head Protection System) II, the front/rear system will be optional in U.S. models in connection with door-mounted rear side airbag, again leaving this important equipment choice to the discretion of our customers.

Whereas the familiar front HPS extends from the A-pillar to a point over the rear door, AHPS II extends all the way from the A-pillar to the C-pillar, with a "sail" connecting it to the roof structure between these two points. The sail is of airbag-type material; between it and the long ITS itself, essentially all of the body-side and side-window area that would likely be impacted by an occupant's head is covered by the sail and ITS.

According to BMW safety engineers, the new front/rear system –

- Combines the best protective attributes of BMW's HPS and competitive "curtain"-type systems.
- Offers the same advantage as the front-only HPS in extended crash sequences (such as a rollover) in that after deployment, it remains inflated for approximately 7 seconds.
- Because of its relative rigidity once inflated, provides protection against shattered glass and intrusions from the outside.
- Is capable of protecting persons of small or large stature.
- Requires only one gas generator per side, as compared to two for some competitive curtain-type systems.

APHS II is not merely the addition of a rear HPS to the standard front one; instead it is an integrated system from front to rear.

Active Head Restraints. Although some competitors already offer a similar feature, BMW's version employs pyrotechnic activation that BMW believes to be faster-reacting than their mechanical deployment. Via two additional impact sensors at the rear of the vehicle, a rear-end collision causes the front head restraints to pivot forward into close proximity with the occupants' heads. Thus occupants are able, if they prefer, to adjust the restraints away from direct contact with their heads, yet gain optimum protection against whiplash or more serious neck/head injuries.

The Active Head Restraints are included with the front Comfort Seats, part of the optional Active Ventilated Seats Package for the 745i and standard in the 745Li.

Automatic belt tensioners. BMW was an "early adopter" of this technology, which automatically tensions safety belts in the event of a frontal collision. Up to now, only the front belts have included tensioners; they now appear in connection with the new, optional rear Comfort Seats.

Occupant recognition. Long a standard BMW feature on the front seats, this electronic logic recognizes whether or not a passenger seat is occupied and controls accordingly whether its belt tensioner and airbag are deployed in a frontal collision. In connection with the optional rear Comfort Seats, it now appears in the rear compartment and determines whether the belt tensioners there are to be deployed in a frontal collision.

Safety-belt force limiters. These devices, which after the belt tensioner has deployed set an upper limit on the amount of force the belt can exert on an occupant, continue as standard equipment on the front safety belts.

ISIS, the Intelligent Safety and Information System. ISIS is an evolution of BMW's Integrated Deployment system, developed to further improve the restraint systems' response to real-world accidents. In particular, the safety engineers at BMW's Engineering and Research Center in Munich set out not to merely meet governmental safety regulations, but to surpass them and to tailor the restraint systems' response to a more precise reading of each accident sequence.

To achieve this, ISIS employs fully **14 sensors**. Together, these multiple sensors achieve the "tailoring" goal; they also help minimize unnecessary deployment of airbags. In addition, airbag deployments will be more finely tuned to actual accident circumstances. Much of the progress is due to faster, more powerful electronics and the use of fiber-optic cables that are less susceptible to extraneous electromagnetic disturbances. System software can be updated over the life of the vehicle; data useful to safety researchers can be retrieved from accident vehicles.

The list of safety tests to which the new Series has been subjected is staggering, simulating virtually any conceivable type of crash impact:

Frontal impacts –

- Into barrier at 30 mph, belted and unbelted occupants.
- Into barrier at 30°, 30 mph, belted and unbelted occupants.
- The *auto motor und sport* offset test, named after a prominent German auto magazine that conducts its own crash tests; 64 km/h (almost 40 mph), with 50% of the front end contacting the crash barrier.
- Offset crash, 35 mph into barrier with 40% of front end (driver's side) contacting rigid barrier.
- Offset crash, 64 km/h with 40% of front end striking a deformable barrier
- Frontal impact into pole at 35 mph.
- NCAP (New Car Assessment Program) test, frontal at 35 mph – the test whose results are reported to the U.S. public in terms of "stars."
- Vehicle-into-vehicle side-impact test
- Pole into side of vehicle at 25 mph –

- At front seating area
- At fuel tank

...and more.

Rear impacts:

- Offset at 50 km/h (31 mph), 40% coverage, battery or fuel-filler side, with rigid barrier
- Straight impact at 30 mph
- Offset at 50 km/h (31mph), 40% coverage on fuel-filler side with deformable barrier

Rollovers:

- Straight rollover
- Angled rollover (one side of vehicle goes up ramp, vehicle rolls).

With any entirely new BMW vehicle, the latest knowledge is incorporated into the entire vehicle structure to achieve even better absorption and management of impact energy. Altogether, the new 7 benefits from thoroughgoing research and development in all areas relevant to occupant safety; it meets the expectation that any all-new BMW will be **even safer** than the one that went before it.

OPTIONS:
A SELECTION OF FAMILIAR AND NEW

The selection of factory options for the new 7 consists of familiar ones and those that represent the new Series' many innovations. What follows relates purely to the U.S. market, as standard equipment, options, and especially option Packages, are specifically matched to the markets of individual countries.

Adaptive Ride Package. Continuing the contents of the previous Package of the same name, this Package is nevertheless quite new because its two features appear in new, improved form:

- **EDC** (Electronic Damping Control, stepless) – replacing the EDC of the predecessor Package, EDC-K delivers an even more capable, sophisticated combination of handling prowess and riding comfort.
- **Self-leveling rear suspension** – now consisting of air springs; previously the self-leveling was effected by hydraulic struts.

Cold Weather Package. Consists of four features:

- **Heated steering wheel.** Controlled by a newly placed switch, on the left side of the steering column. Also available as stand-alone option.
- **Heated front seats,** incorporating two sophisticated new capabilities:
  - **Rapid heating.** Each seat incorporates four heating zones. The center zones heat at full power almost to their regulated heat level; then the outer zones join and all zones are brought up to the regulated level.
  - **Balance control.** Relative heating level of the cushions and backrests can be varied by as much as 5°F from each other using the monitor's Climate screen; the heating levels are depicted clearly and attractively in a graphic of the seat as this is done. Included in Key Memory.

  The heated front seats are also available as a stand-alone option.
- **Heated rear seats.** 3-stage heating, but without the balance control.
- **Ski bag.** This popular feature continues as a feature of the Cold Weather Package, and is also available as a stand-alone option.

Convenience Package – different from the like-named Package in 2001:

- **Soft-close doors.** Already familiar from the previous 7 Series' trunk; this extends "soft-close" to the doors. The user closes the door gently and the electric mechanism then draws it fully in. Easier, quieter door closing; helps ensure perfect weathersealing.
- **Automatic trunk opening/closing.** Trunk opening from the remote or dash is standard. This option adds power opening and closing of the lid.

Active Ventilated Seat Package. Brings together the new and enhanced front Comfort Seats; the familiar fatigue-reducing Active Seats feature; and the new Active Ventilated Seats. Front Comfort Seats are standard in the 745Li, so are not included in this Package for the long-wheelbase model.

- **Front Comfort Seats.** Add two power adjustments (four additional "ways") to the 16-way Comfort Seats offered previously: thigh support and backrest width. Thus these are **20-way** power seats. Another new feature is **memory for both front seats** rather than only the driver. The Comfort seats are also available as a stand-alone option in the 745i.
- **Active seats.** Two stretchable hollow cavities are filled and emptied alternately with a freeze-proof mixture of water and glysantine. This slow, gentle process (repeating about once a minute) creates a cyclical raising and lowering of the seat cushion's left and right halves by 15 mm, or a good half an inch; driver and passenger can switch on or off as desired. Helps relieve fatigue and discomfort during extended trips.
- **Ventilated seats.** Ventilator fans built into the seat (front in 745i, front and rear in 745Li) gently blows air upward through an internal web and the microperforated leather to provide active ventilation, helping reduce occupants' perspiration.
- **Heated front and rear seats.**

Premium Sound Package. A state-of-the-art upgrade audio system.

- **Logic 7 audio system.** Upgrades the entire audio system with –
  - Increased audio power (420 watts vs. standard 180)
  - Even higher-caliber speakers throughout, plus additional speakers (total 13 speakers, vs. standard 10)
  - Digital Sound Processing (DSP), with controls in the iDrive monitor
  - Surround Sound simulation.

  Developed by Lexicon, related to Harman Kardon within the Harman International group, Logic 7 incorporates a new and exciting Surround Sound process, as featured in all current Harman Kardon home A/V receivers. Exclusive to Harman International brands, this process provides truly unique and realistic reproduction, generating a true 360º sound field and accurately re-creating the acoustic intent of the original studio master.
  - 6-disc CD changer in dash. Retains a magazine for easy loading and unloading, as opposed to one-disc-at-a-time insertion/ejection of CDs.

19-in. Sport Wheels with performance tires. With 18-in. wheels and tires standard, the Sport Wheels option brings 19-in. wheels and tires with

differentiated front/rear sizes to the 7 Series for the first time. The Star Spoke wheels are 19 x 9.0 front / 19 x 10.0 rear, and carry 245/45R-19 front / 275/40R-19 rear performance tires.

Tire Pressure Monitor. Also known by the initials for its German name, RDC; alerts the driver to any significant loss of tire pressure. Measures wheel rotation via the DSC sensors, compares each wheel's rotational speed with the average of the other wheels, and recognizes any major deviation of pressure in individual tires. Within 1-3 minutes, TPM triggers a pressure-loss signal via an indication in the Check Control system. Also recognizes and indicates normal loss of pressure in all tires over longer periods of time.

Park Distance Control. Employs four ultrasonic sensors each in the front and rear bumpers to warn the driver when the vehicle is approaching obstacles that may not be visible to the driver. The front sensors cause a higher-pitched tone that emanates from the front; the rear ones trigger a lower-pitched tone at the rear of the cabin. New is a plan-view vehicle diagram in the iDrive monitor, which graphically and colorfully depicts the obstacle's location relative to the vehicle.

Rear Comfort Seats (available in 745Li only). These **14-way power** seats bring most of the benefits of the front Comfort Seats to rear passengers; an upgrade over even the power rear seats of the previous top-of-line 750iL model. The outboard rear seats are configured as individual seats and have the following power adjustments:

- Fore-aft, 100 mm/3.9 in.
- Cushion angle, adjustment range 6.2º.
- Backrest angle, from 2 º in upright "work" position to 6 º in "recline" position; with the seat in its fully forward position, the backrest can be leaned back a further 9 º.
- Angle of upper backrest, 20 º adjustment range.
- Firmness of lumbar support.
- Height of lumbar support.
- Head-restraint height, 65-mm/2.6-in. adjustment range; also, the head restraint rises automatically to its preset position when an occupant sits in the seat and retracts when the seat is not occupied.

The front passenger's seat can be adjusted from the right rear seat's power controls, and there is a switch that returns the rear Comfort Seat to its "home" or base position. Finally, like the front seats, the rear Comfort Seats include a 2-position memory system. The center seat is fixed.

Included in this option are **automatic safety-belt tensioners** for the outboard seats, also a plus over previous offerings. The belt receptacles move with the seat cushions, helping occupants achieve optimum belt fit.

Power rear/side sunshades. Whereas the predecessor offered a power rear-window sunshade and manual rear door-window shades, the new 7 offers optional power shades for the rear window **and** rear door windows. Each rear door even gets two sunshades: one for the movable window, one for the fixed rear quarter glass.

High-gloss Ash wood trim. As an alternative to the standard matte-finish Dark Cherry, light or dark Oak trim with high-gloss finish is available optionally. The optional wood includes an additional wood trim strip just behind the rear seats; its color is keyed to the interior color scheme.

BMW Break-resistant Security Glass (available as of March '02 production). This continues as an option for both models. Its purpose is to hinder or prevent theft via breaking windows. Includes steel sunroof in place of the standard glass moonroof.

Rear-seat side-impact airbags and Head Protection System. Like the standard-equipment front side-impact airbags, the rear ones are built into the doors. In the new 7, they are combined with the extraordinary Advanced Head Protection System II (AHPS II) described earlier.

As before, the rear side protection is offered as a special-order option so that customers may make the conscious decision to have it or not. Vehicles so equipped come from the factory with the door airbags de-activated but the entire HPS activated.

The new 7, this E65/E66 platform, is one of the most completely new vehicles BMW has ever created or offered, and truly a landmark in the history of the automobile. BMW presents it with pride and the anticipation that it will bring new pleasure to its owners: pleasure of ownership, of driving, of fascination with the creativity that is behind it.

FULL MAINTENANCE PROGRAM INCLUDED

Like all 2002 BMW models, the 745i and 745Li come standard with BMW's 4-year/50,000-mile Limited Warranty, Roadside Assistance for the same period, and BMW's Full Maintenance Program for 3 years or 36,000 miles. This reassuring package of product backing and customer service makes every BMW model even more appealing from a cost standpoint than its value-oriented base price would indicate.

PERFORMANCE WITH A CONSCIENCE

BMW strives to produce its motor vehicles and other products with the utmost attention to environmental compatibility and protection. Integrated into the design and development of BMW automobiles are such criteria as resource efficiency and emission control in production; environmentally responsible selection of materials; recyclability during production and within the vehicle; elimination of CFCs and hazardous materials in production; and continuing research into environmentally friendly automotive power sources. Tangible results of these efforts include the recycling of bumper cladding into other vehicle components; water-based paint color coats and powder clear coats; and various design and engineering elements that help make BMWs easier to dismantle at the end of their service life.

BMW GROUP IN AMERICA

BMW of North America has been present in the United States since 1975. Since then, the BMW Group in the United States has grown to include marketing, sales and financial service organizations for the BMW, BMW Motorcycles and MINI brands; a South Carolina manufacturing operation; DESIGNWORKS/USA, an industrial design firm in California; a technology office in Silicon Valley and various other operations throughout the country. The BMW Group is represented in the U.S. through a network of 341 car, 321 Sports Activity Vehicle and 153 motorcycle retailers. BMW US Holding Corp., the Group's headquarters for North, Central and South America, is located in Woodcliff Lake, New Jersey.

Information about BMW Group products is available to consumers via the World Wide Web on the BMW homepage at http://www.bmwusa.com, http://www.bmwmotorcycles.com and http://www.miniusa.com.

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