**2004 Honda Accord Sedan : Model Overview**

**INTRODUCTION**
The seventh-generation Honda Accord moves the Accord lineup to new levels of style, sophistication and performance. Both the Accord Sedan and Coupe have been designed and engineered for high intermediate class standards in the areas of performance, ride and handling, and comfort in sporty, driver-oriented packages.

**MARKETING POSITION**
Accord’s development team targeted not only traditional competitors, but also upscale European cars in terms of design, engineering and “emotional appeal” in an effort to move Accord to advanced levels of sophistication and performance.

The Accord model line represents the finest selection ever produced. The Accords excel in key areas of performance, handling, and interior and exterior design, while providing value and durability, quality and reliability (DQR) that have made the Accord brand a popular choice of North American consumers the past 25 years.

**Top Competitive Models**

<table>
<thead>
<tr>
<th>Sedan V6(Primary)</th>
<th>Sedan V6(Secondary)</th>
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<tbody>
<tr>
<td>Toyota Camry V6</td>
<td>Nissan Maxima</td>
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<tr>
<td>Nissan Altima V6</td>
<td>Volkswagen Passat</td>
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<tr>
<td>Mazda 6</td>
<td>Pontiac Grand Prix</td>
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<td>Oldsmobile Intrigue</td>
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<table>
<thead>
<tr>
<th>Sedan L4(Primary)</th>
<th>Sedan L4(Secondary)</th>
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<tbody>
<tr>
<td>Toyota Camry L4</td>
<td>Pontiac Grand Am</td>
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<tr>
<td>Nissan Altima L4</td>
<td>Chevrolet Malibu</td>
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<tr>
<td>Mazda 6</td>
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<td>Volkswagen Jetta</td>
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**KEY DEMOGRAPHICS**

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<thead>
<tr>
<th>Accord Sedan</th>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Median Age</td>
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<tr>
<td>Marital Status</td>
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<tr>
<td>Education</td>
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<tr>
<td>Household Income</td>
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<tr>
<td>Household with children</td>
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<td>Occupation</td>
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<td>Purchase Experience</td>
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2004 Honda Accord Sedan: Body

4-CYLINDER ENGINE OVERVIEW
Representing the state-of-the-art combination of performance, economy and ultra-clean operation, the Accord’s standard 2.4-litre i-VTEC engine is a showcase of Honda’s latest technologies. Building on the solid foundation of the original VTEC design, this latest 16-valve i-VTEC engine transforms the character of the 4-cylinder Accord, providing unprecedented levels of acceleration and fuel efficiency with minimal tailpipe emissions.

This strong running engine equals or betters the old engine’s peak torque figure over an impressive 3000-rpm range. Even though it develops significantly more horsepower (+7%) and torque (+6%), this engine also meets stringent LEV II LEV Tier 2 – bin 5 emission standards.

This compact and lightweight 4-cylinder engine comes well prepared to serve as the powerplant of choice for roughly 70 percent of Accord buyers. Fitted with internal balance shafts for additional smoothness and cast-in iron cylinder liners to enhance durability, it is designed from the start to deliver years of trouble-free operation. Except for inspections and fluid changes, the first scheduled maintenance is not required until 168,000 kilometers.

### Engine Comparison: Current Generation vs. Previous Generation

<table>
<thead>
<tr>
<th></th>
<th>Current Generation</th>
<th>Previous Generation</th>
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</thead>
<tbody>
<tr>
<td>Engine</td>
<td>In-Line 4 DOHC i-VTEC</td>
<td>In-Line 4 SOHC VTEC</td>
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<tr>
<td>Displacement</td>
<td>2354cc</td>
<td>2254cc</td>
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<tr>
<td>Compression Ratio</td>
<td>9.7:1</td>
<td>9.3:1</td>
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<tr>
<td>Fuel Type</td>
<td>Regular Unleaded</td>
<td>Regular Unleaded</td>
</tr>
<tr>
<td>HP</td>
<td>160 hp @ 5500 rpm</td>
<td>150 hp @ 5700 rpm</td>
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<tr>
<td>Torque</td>
<td>161 lb.-ft. @ 4500 rpm</td>
<td>152 lb.-ft. @ 4900 rpm</td>
</tr>
<tr>
<td>Transmission</td>
<td>5MT/5AT</td>
<td>5MT/4AT</td>
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<tr>
<td>City/Highway L/100 km</td>
<td>9.8 / 7.1 (AT)</td>
<td>10.2 / 7.1 (AT)</td>
</tr>
<tr>
<td>Emissions Certification</td>
<td>LEV II LEV</td>
<td>LEV I LEV</td>
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### KEY 4-CYLINDER ENGINE TECHNOLOGIES
The 2.4-litre Accord engine incorporates a host of advanced technologies, highlighted by the adoption of Honda’s latest i-VTEC (“intelligent”) valve-control system. Developed from technology initially seen in the world of Formula One racing, Honda’s original VTEC (Variable valve Timing and lift Electronic Control) system changed the valve lift, timing and duration to suit the engine’s running condition.

With continuous phase adjustment of the intake camshaft, i-VTEC adds VTC (Variable Timing Control) to the mix. This latest enhancement, first used on the Acura RSX and also found on the new Honda CR-V and Civic SiR, provides further improvements to power and torque figures while optimizing overall operating efficiency and minimizing tailpipe emissions.

With its greater output, the i-VTEC engine provides the Accord with better total performance under all types of driving conditions and terrain.

With all-aluminum construction and a 16-valve DOHC design, the 2.4-litre Accord
develops 160 horsepower at 5500 rpm and 161 lb.-ft. of torque at 4500 rpm. The combination of VTEC technology with the VTC provides the engine with even stronger low- and mid-range power as well as a robust high end.

The “intelligent” variation on the basic theme retains the original VTEC hardware that permits the optimization of valve lift and duration as the engine transitions from low-speed to high-speed operation, while adding the ability to continuously vary phasing of the intake cam based on both rpm and load factors. The net result is optimized idle stability, emissions, torque and power.

To further improve its operating efficiency, the engine has been rotated 180 degrees from the previous Accord 4-cylinder. This change permits the catalytic converter to be mounted closer to the exhaust manifold (now on the rear side of the engine), which promotes quicker light-off and thereby helps further reduce cold-start emissions.

CYLINDER HEAD AND VALVETRAIN
The i-VTEC engine is crowned by a compact, lightweight cylinder head made of pressure-cast aluminum alloy. Its 4-valve-per-cylinder design has double overhead camshafts activated by a silent chain drive to ensure extremely precise control of the cam phasing. The cam drive is maintenance-free throughout the life of the engine. The combustion chamber is designed with a relatively large “squish” area that promotes faster flame propagation on the ignition stroke. This results in more complete burning of the air-fuel mix and subsequently, lower levels of Carbon Monoxide and Hydrocarbon emissions.

4-CYLINDER i-VTEC
Honda’s original VTEC (Variable Valve Timing and Lift Electronic Control) has been elevated to a new plateau with the introduction of i-VTEC. This “intelligent” form of the highly effective VTEC package adds an element to the mix in the form of VTC (Variable Timing Control), which provides for continuously variable phasing of the intake camshaft.

The formidable pairing of VTEC and VTC results in several major improvements to drivability, including more horsepower and torque at lower rpm levels, enhanced fuel economy and significantly lower emissions.

The VTEC system on the 2.4-litre DOHC 4-cylinder employs two rocker arms with friction-reducing roller followers for each pair of intake valves, along with an intake cam that has separate lobes configured to optimize both low- and high-speed operation. Depending on engine load and rpm, an electronic controller determines which cam profile will be used and exactly how each intake will operate.

At low revs, where low lift and shorter duration provide optimal operation, the timing of the two intakes is staggered and the lift asymmetrically skewed in favour of the primary valve. This helps to create a swirl effect within the combustion chamber that increases the efficiency of the burn process.

At higher rpm, a hydraulically actuated spool valve causes a locking pin to engage the secondary rocker arm with the primary one, transitioning the secondary valve into a high-lift/long-duration mode that improves output on the top end.

VTC allows the timing of the intake camshaft to be continuously varied throughout the engine’s entire rpm range. Along with helping boost power, VTC also provides a more stable idle (allowing idle speed to be reduced) and reduced pumping losses by effectively creating an internal Exhaust Gas Recirculation (EGR) effect at low and mid engine speeds.

The result is increased fuel economy and lowered NOx emissions. Operation of the VTC is electronically controlled and is determined by input from sensors that monitor rpm, timing, throttle opening, cam position and exhaust gases.

Depending on the above-listed conditions, VTC can vary the phasing of the intake cam
VTC activation is accomplished hydraulically via a spool valve that sends high-pressure oil to passages in the cam’s drive sprocket.

At idle, the timing is almost fully retarded to minimize valve overlap. In normal highway driving, the intake camshaft is advanced to provide overlap for EGR effect. With the throttle wide open, valve timing starts in an advanced position at lower rpm and continuously changes to a retarded position when redline is approached. This allows optimum cylinder scavenging and pumping efficiency and provides outstanding power and torque throughout the rpm range.

ENGINE BLOCK, CRANKSHAFT AND OIL PAN
The 2.4-litre engine uses a two-piece, die-cast aluminum block and bearing cap design that helps maximize strength and rigidity while minimizing noise and vibration. The compact upper element features cast-in iron cylinder liners for outstanding durability while the lower element consists of a single-casting crankshaft carrier fitted with ferrous-carbon bearing-cap inserts that add to its overall structural rigidity. Each journal on the forged-steel crankshaft is micropolished to help reduce internal friction and improve durability.

FUEL INJECTION
The Accord V6 is fitted with the latest iteration of Honda’s sophisticated Programmed Multi-Port Fuel-Injection (PGM-FI) system. It’s controlled by a 32-bit microprocessor that uses a comprehensive array of sensors to monitor throttle position, intake manifold pressure, coolant temperature, intake air temperature, atmospheric pressure and the oxygen content of the exhaust gases, as well as the relative positions of the camshafts and crankshaft. Based on the input it receives, the PGM-FI signals an efficient multi-orifice injector for each cylinder to introduce the proper amount of atomized fuel at the precisely timed instant to ensure ideal combustion. Internal feedback circuitry allows the PGM-FI to custom match its real-time operation to accommodate the specific air-fuel conditions that exist in each individual cylinder.

INTERNAL BALANCE SHAFTS
To improve smoothness throughout the rpm range and help lower noise levels, the Accord 4-cylinder is fitted with an internal balancer unit. Consisting of a pair of chain-driven counter-rotating shafts located in the oil pan, the balancing system helps quell the inherent second-order harmonic vibrations that normally impact in-line 4-cylinder engines.

SERPENTINE DRIVE BELT
The Accord 4-cylinder uses a single, serpentine belt to operate all of the engine’s accessory drives. In addition to saving space compared to the dual-belt system used on the previous four, this maintenance-free component features an integral auto tensioner.

EXHAUST SYSTEM
A high-efficiency exhaust system and a high-density catalytic converter helps the 4-cylinder engine meet stringent Tier 2 – Bin 5 LEV II LEV emissions certifications. Both of these components function more effectively as the result of the engine having been rotated 180 degrees in the bay.

Exhaust gases pass through a low heat-mass/dual-wall stainless steel manifold as they now exit the "downstream" side of the engine via a double-walled pipe, that also helps limit heat loss.

The combination of higher relative temperatures and a more direct path to the catalytic converter yields quicker light-off, which contributes to lower levels of hydrocarbon and NOx emissions.

EXHAUST SYSTEM WITH COMPACT SILENCER
The exhaust system of the i-VTEC powered Accord is designed to deliver both functional and cosmetic benefits. Several elements contribute to a reduction in total system weight.

These include shortening the engine-to-tailpipe distance (as the result of rotating the engine
180 degrees), eliminating a tailpipe connector flange and adopting a new design for the resonator.

Lighter and more compact than the previously fitted unit, the silencer uses a "pipe turn" internal configuration that helps attenuate exhaust noise levels by 5-7 dB. The narrower cross section also permits the bumper fascia to be lowered by 25 mm, thereby providing a cleaner appearance to the rear of the car.

**V6 ENGINE OVERVIEW**

The Accord's 24-valve V6 engine shares several basic design elements with its predecessor, including a 60-degree/3.0-litre configuration. But a host of technological advances makes it significantly more powerful, more fuel efficient and with lower emissions.

The V6 engine is nearly 9 kg lighter and 25 mm shorter than the V6 it replaces. A 3-rocker VTEC system replaces the two-rocker version used in the previous engine. It develops 20 percent more horsepower and 7 percent more torque, using regular unleaded gasoline. Despite these major output gains, the new V6 also is expected to boost estimated fuel economy numbers in the City.

Honda engineers designed the V6 engine to require only minimal care throughout its lifetime by incorporating components like platinum-tipped spark plugs and a space-saving, self-tensioning serpentine accessory drive belt. Except for periodic inspections and normal fluid replacements, the V6 engine requires no scheduled maintenance until the 168,000-km mark. **Oil changes are scheduled for every 6,000 km.**

<table>
<thead>
<tr>
<th>V6 Engine Comparison</th>
<th>Current Generation</th>
<th>Previous Generation</th>
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<tbody>
<tr>
<td>Engine</td>
<td>60º V6SOHC VTEC</td>
<td>60º V6SOHC VTEC</td>
</tr>
<tr>
<td>Displacement</td>
<td>2997cc</td>
<td>2997cc</td>
</tr>
<tr>
<td>Compression Ratio</td>
<td>10.0:1</td>
<td>9.4:1</td>
</tr>
<tr>
<td>Fuel Type</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>HP</td>
<td>240 hp @ 6250 rpm</td>
<td>200 hp @ 5500 rpm</td>
</tr>
<tr>
<td>Torque</td>
<td>211 lb.-ft. @ 5000 rpm</td>
<td>195 lb.-ft. @ 4700 rpm</td>
</tr>
<tr>
<td>Transmission</td>
<td>5AT</td>
<td>4AT</td>
</tr>
<tr>
<td>Expected City/Highway L/100 km</td>
<td>11.2 / 7.8</td>
<td>11.6 / 7.8</td>
</tr>
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<td>Expected Emissions Certification</td>
<td>LEV II - ULEV/ LEV</td>
<td>LEV I - TLEV/ LEV</td>
</tr>
</tbody>
</table>

**KEY V6 ENGINE TECHNOLOGIES**

Several key changes to the induction system, exhaust system, and valvetrain combine with a significant increase in the compression ratio to generate major output gains in the current generation Accord V6. Primary contributors on the intake side include a high-inertia manifold, a large and electronically controlled throttle body and even more precise measurement and control capabilities for both air and fuel. These features account for about one-third of the additional 40 horsepower the V6 engine pumps out.

On the downstream side, higher capacity components throughout the entire exhaust system
increase the flow rate by 30 percent and are responsible for another third of the overall power increase. The remaining output gains result from improvements in combustion efficiencies derived from larger intake valves, the 3-rocker VTEC system (replacing a two-rocker design), and a bump in compression ratio from 9.4:1 to 10.0:1.

Several factors work together to help the V6-powered Accord achieve improved fuel economy. A more precise electronic knock control system permits the boost in compression ratio. The wider gear ratio range of the new 5-speed automatic transmission boosts operating efficiency and also reduces internal friction. Improved aerodynamics also contributes to improving fuel economy.

Numerous innovative features contribute to the V6 engine’s low emissions status, including an advanced fuel injection management system, and unique “unified” exhaust manifold and cylinder head design with close-coupled catalytic converters. This sophisticated system features an ultra-precise linear airflow sensor in addition to a conventional Oxygen sensor in the secondary under-floor converter. The engine also incorporates an electronic EGR system that helps minimize NOx emissions.

**CYLINDER HEADS WITH INTEGRAL EXHAUST MANIFOLDS**

One of the most innovative aspects of the Accord V6 is the design of its cylinder heads. Made of pressure-cast, low-porosity aluminum, these lightweight components have tuned exhaust manifolds as integral parts of the casting, a unique feature that improves overall packaging and permits optimal positioning of the primary close coupled catalytic converters.

While the V6 maintains the basic SOHC design, 4-valves-per-cylinder and VTEC, configurations, refinements significantly boost operating efficiencies. As before, each camshaft is inserted into the head from the front of the engine – an approach that saves weight and complexity by eliminating the need for bolt-on cam caps. And the crankshaft still drives each cam via a fiberglass-reinforced toothed timing belt. However, the diameter of the intake valves has been increased to improve breathing and the ports have been reconfigured to more ideally match the flow characteristics of the new, high-inertia intake manifold.

Finally, the VTEC (Variable valve Timing and lift Electronic Control) system has been changed from a 2-rocker to a 3-rocker design for improved throttle response at low rpm and increased top-end power.

**3-ROCKER VTEC SYSTEM**

Honda used expertise gained from its successful racing programs to develop the innovative VTEC system more than a decade ago. Since then, various forms of VTEC have become familiar features on many of Honda’s engines. VTEC makes it possible to vary the relative timing and lift of the intake valves to optimize overall performance, netting good low-end torque as well as improved high-end horsepower.

Basic operation of the 3-rocker VTEC setup used on the 2003 Accord’s V6 is similar to that of the 2-rocker version used on the DOHC 4-Cylinder, where rocker arms fitted with low-friction roller followers actuate the intake valves.

The heart of the VTEC system is a unique camshaft and rocker arm system. For each cylinder’s set of two intake valves, there are three rocker arms and three corresponding lobes on the camshaft. The two outboard lobes each have a profile maximizing cylinder swirl to suit low- to mid-rpm operation. The third or centre cam lobe has a dramatically different profile designed for longer duration and higher lift. This lobe profile is designed to optimize breathing and horsepower production at high engine speeds.

At low engine rpm, the outboard lobes operate the valves. During high-speed operation the VTEC computer sends a signal to a spool valve, which in turn delivers engine oil pressure to small pistons in the rocker arms. Oil pressure causes the pistons to move, locking all three rocker arms together. Once locked, the rocker arms are forced to follow the centre cam lobe,
increasing top-end performance. The crossover from low lift to high lift occurs in 0.1 seconds and is virtually undetectable to the driver.

ENGINE BLOCK
At the core of the Accord’s lightweight V6 is an exceptionally strong, rigid aluminum-alloy block that employs cast-iron cylinder liners to enhance durability. Die-cast and heat-treated, the block has a high natural resonant frequency and an optimal 60-degree V-angle, features that contribute to the engine’s inherently smooth, quiet operation as well as to its relatively compact size. A short deck height also improves its overall packaging efficiency.

CRANKSHAFT, CONNECTING RODS AND PISTONS
Internal components of the Accord V6 deliver an outstanding combination of efficiency and durability. The central element is an extremely rigid forged steel crankshaft with microfinished journals that minimize friction and improve durability. Compression ratio of the lightweight cast-aluminum pistons has been increased to 10.0:1, up from 9.4:1 in the previous engine.

The precision-contoured piston crowns have a unique charge-centralizing design that maximizes volumetric efficiency and a large squish area that facilitates more complete combustion and leads to decreased emissions. The pistons are fitted with full-floating wrist pins to help eliminate the "slapping" noise that can occur on cold starts.

The crank and pistons are linked by compact connecting rods that employ a special weight-saving, direct-thread fastener in place of the conventional nut-and-bolt configuration typically used on other engines.

FUEL INJECTION
The Accord V6 is fitted with the latest iteration of Honda’s sophisticated Programmed Multi-Port Fuel-Injection (PGM-FI) system. It’s controlled by a 32-bit microprocessor that uses a comprehensive array of sensors to monitor throttle position, intake manifold pressure, coolant temperature, intake air temperature, atmospheric pressure and the oxygen content of the exhaust gases, as well as the relative positions of the camshafts and crankshaft. Based on the input it receives, the PGM-FI signals an efficient multi-orifice injector for each cylinder to introduce the proper amount of atomized fuel at the precisely timed instant to ensure ideal combustion. Internal feedback circuitry allows the PGM-FI to custom match its real-time operation to accommodate the specific air-fuel conditions that exist in each individual cylinder.

ELECTRONIC THROTTLE CONTROL
Another factor that contributes to the world-class performance of the Accord’s V6 engine is an all-new electronic throttle control (ETC) system. This system controls the throttle during transmission shifts for improved smoothness. It also allows for throttle control to be incorporated in the traction control system and integrates the cruise control function into the ETC. This computer controlled drive-by-wire (DBW) package is a feature that will be incorporated into other future Honda powerplants. Key system components include an accelerator position sensor, electronically controlled throttle body, DBW driver unit, and the main electronic control unit (ECU).

HIGH INERTIA INTAKE MANIFOLD
Air passing through the ETC enters through a new, high-inertia intake manifold with a runner design that’s specifically matched to optimize output characteristics. It features a unique plenum configuration that effectively transitions incoming air from a negative to a positive waveform. This helps create a natural supercharging effect and is designed to complement the intake port design.

DIRECT IGNITION AND KNOCK CONTROL
Ideally balancing performance, economy and low emissions demands precise control of the spark timing as well as an effective ignition system to ensure optimum burning of the air-fuel mixture under all operating conditions. To help accomplish this goal, a sensor determines the onset of engine “knocking” and modifies spark timing before improper detonation causes damage. The system allows the engine to run with a greater amount of spark advance and a
higher compression ratio than the previous V6, increasing efficiency. A compact, high-energy ignition coil positioned directly atop each respective plug bore in the cylinder head activates each spark plug in the new engine.

**HIGH-FLOW EXHAUST SYSTEM WITH CLOSE-COUPLED CATALYZERS**
The high efficiency exhaust system incorporates several key elements that work in concert with the engine’s uniquely designed cylinder heads to help boost performance, reduce tailpipe emissions and trim weight.

Major system components include two close-coupled primary catalytic converters, a secondary underfloor catalytic converter, a centrally positioned, high-flow resonator and dual rear silencers. Integrating the exhaust manifold into the head casting allowed the primary catalytic converters to be mounted directly to the exhaust orifice. This location ensures an extremely rapid light-off for the high-efficiency 900-cell per square inch converters, which directly contributes to the engine’s exceptionally low emissions.

A high-flow hydroformed 2-into-1 collector pipe that transfers exhaust gasses to the secondary 350-cell converter also reduces exhaust backpressure.

The net result is a 30-percent drop in backpressure compared to the previous Accord V6. These improvements account for 15 of the extra 40 horsepower the V6 develops.

Eliminating a flange on the rear portion of the exhaust pipe and adopting a more compact design for the rear silencers also trimmed weight from the system. Because these smaller silencers are easier to package, the rear of the Accord has a more refined appearance.

**ENGINE MOUNT SYSTEM**
The Accord has an engine mount system, used with both the 4-cylinder and V6 engines. The system combines the strengths of an inertia axis system with those of a centre-of-gravity engine mount system to achieve both excellent NVH and ride and handling.

The system starts by supporting the engine on two large mounts placed below the centre of gravity of the powertrain. Combined with the subframe mounts, the engine mounts provide a “double isolation,” or double rubber isolating elements between the engine and the passenger compartment, for excellent engine noise attenuation. The front of these two centre of gravity mounts is hydraulic and electronically controlled (except on the 4-cylinder with manual transmission which uses a hydraulic mount).

The hydraulic characteristics switch between two settings – one to optimize vibration performance at idle and one to optimize powertrain damping performance at higher speeds and over rough roads. The rear-most mount is a hydraulic mount for damping of the powertrain over rough roads. A dual mode engine side hydraulic mount is placed high on the engine connecting to the frame rail to best control powertrain motion during handling maneuvers. An upper transmission mount is added high on the transmission, connecting to the frame rail, again to control powertrain motion during handling maneuvers, and serves to provide symmetry in motion control. Finally, two rubber lower transmission mounts complete the setup.

The end result is a system providing excellent noise and vibration attenuation, superior powertrain damping over rough roads, and positive powertrain lateral motion control for excellent handling response. In addition, the mount system was engineered to compliment the subframe “sliding mode” during a front collision event, effectively increasing available crush length by 100 mm.

**5-SPEED MANUAL TRANSMISSION FOR 4-CYLINDER ENGINES**
The manual transmission paired with the Accord 2.4-litre 4-cylinder engine is a lightweight, compact 5-speed, housed in a rigid die-cast aluminum case. Multi-cone synchronizers used on first through fourth gears contribute to a smoother, more fluid shift feel, while helping reduce
throw distances by 50 mm. A repositioned shift lever further facilitates quick, direct gear changes.

The clutch assembly is an equally compact design that features low-torsion springs in the pressure plate to keep pedal effort low and eliminate judder while ensuring a smooth, progressive engagement.

5-SPEED AUTOMATIC TRANSMISSION FOR 4-CYLINDER ENGINES
The 5-speed automatic transmission is lightweight and compact and designed to provide best-in-class performance and fuel economy. It also reduces shift shock and improves shift smoothness, thanks to a linear solenoid with direct control.

The transmission also features an updated grade logic control system. By using sensors that monitor throttle position, vehicle speed and acceleration/deceleration and then comparing these inputs with a map stored in the transmission’s computer, the system is able to determine when the vehicle is on an incline and adjust the shift schedule for improved climbing power or downhill engine braking.

5-SPEED AUTOMATIC TRANSMISSION FOR V6 ENGINES
The 5-speed automatic transmission used in V6 Accord models is different from the one in 4-cylinder models. This wide ratio transmission’s lower gears provide quick acceleration while the tall top gear ratios result in low cruising rpm levels for reduced noise and lower fuel consumption. One difference from the TL transmission is the addition of the Electronic Throttle Control (ETC) system to further enhance shift smoothness by momentarily closing the throttle (reducing torque) at shift points.

Because the transmission shares idler and third-gear clutches, the transmission provides five ratios in a unit approximately the same size of a conventional 4-speed automatic transmission. The transmission also incorporates a first gear one-way clutch for smoother shifts, plus a heat exchanger that controls and moderates transmission operating temperatures for both durability and improved shifting smoothness.

Linear solenoids provide precise, real-time control of the clutch on/off pressure. This superior clutch-engagement accuracy allows the grade logic control to operate smoothly under all conditions. For added refinement, a bearing supports the idler shaft.

To manage overall powertrain operation, the Powertrain Control Module (PCM) provides precise management of the transmission-engine interaction. For instance, by limiting engine output torque and/or transmission clutch pressure, hard driveline shocks are limited. The system also prevents the engine from exceeding 5000 rpm when the transmission is in neutral or park. It also has an upgraded grade logic control system similar to the one in the 5-speed automatic transmission for 4-cylinder engines.

**2004 Honda Accord Sedan : Chassis**

**INTRODUCTION**
To develop the Accord chassis, Honda engineers took on the challenge of providing both dynamic performance and ride comfort. Balancing world-class levels of ride quality, cornering prowess, steering and braking response into one versatile intermediate-size package was no easy task. Establishing the parameters entailed benchmarking an international field of vehicles with the goal of providing a more exciting driving experience for Accord owners. Meeting those parameters called for enhancing some areas of the already popular Accord chassis.

The Accord retains the basic double-wishbone suspension design that has long made it a favourite. As before, the rear hardware employs an additional multi-link configuration that adds a supplemental lateral link for improved toe control.

For this generation Accord, a totally new front sub-frame, refinements to the front suspension
geometry and refinements to the rear sub-frame stiffness and suspension geometry provided a more sophisticated overall character, enhancing body control under acceleration/deceleration, high and low cornering loads and in transient maneuvers. Despite its greatly expanded dynamic envelope, these changes also yield significant improvements in both ride quality and overall isolation.

**ACCORD CHASSIS HIGHLIGHTS**

**Improved Linear Steering**
- Rack-and-pinion power steering system incorporates an orifice-type steering damper for improved high-speed feel
- A steering kickback reduction valve improves steering feel, particularly during cornering
- Improved suspension geometry and body rigidity helps sharpen steering response

**Braking**
- Large front disc brake rotor diameters (all 4-cylinder models)
- Electronic Brake Distribution (EBD) on all Accord models with 4-wheel disc brakes (EX-L 4-cylinder as well as all V6 models)
- ABS is standard on all Accord models
- A Traction Control System for V6 models integrates full-range Electronic Throttle Control (ETC), reducing wheelspin and improves vehicle dynamics at all speeds
- A lightweight, high-efficiency master cylinder
- A 10-inch brake booster replaces previous 8- and 9-inch tandem setup
- Pedal feel improved – more positive action
- Pedal stroke distance reduced

**Ride, Handling and Stability**
- A powertrain mount system provides optimum NVH benefits along with ride and handling enhancements
- The front suspension geometry slightly lowers the roll axis and improves anti-dive/squat characteristics
- Stiffened rear sub-frame with revised geometry raises the roll axis and increases anti-lift characteristics
- Better roll/pitch control
- Large wheels and tires on most models
- Large, high-compliance bushings in front lower control arms reduce impact shocks

**ENHANCED GEOMETRY**

Improving the Accord’s dynamic capabilities entailed significant revisions to the suspension geometry. These modifications were intended to impart a more sophisticated overall character, enhancing body control under acceleration/deceleration, high and low cornering loads and in transient maneuvers as well as improving stability for cornering.

This comprehensive recalibration process involved changing control arm lengths and locating points on both ends of the car. Up front, this resulted in a lowering of the roll centre height and a lengthening of the virtual roll arm length. In the rear, roll centre height was raised and the virtual roll arm was lengthened. The rear toe curve was also modified.

Collectively these changes have transformed the Accord’s driving dynamics. With quickened steering response and with roll and weight jacking curtailed during spirited cornering, the car feels more planted and balanced. The revised suspension geometry paid similar dividends in reducing the Accord’s pitch tendencies. By increasing the front anti-dive/anti-squat and rear anti-lift angles, these undesirable weight transfer motions were reduced by 25 percent under braking and by 29 percent under acceleration.

**DOUBLE-WISHBONE FRONT SUSPENSION**

A key contributor to the Accord’s ride and handling balance is its front double-wishbone suspension. This latest expression of Honda’s suspension technology is an evolution from the
The system is comprised of a large lower arm that pivots from the front subframe, with a smaller upper arm that's positioned above the wheel and tire and wraps around the spring/damper unit to pivot on the mounts in the unibody structure.

The front suspension geometry was reworked to impart a more sophisticated overall character, enhancing body control under acceleration/deceleration, high and low cornering loads and in transient maneuvers as well as improving stability in cornering.

**5-LINK DOUBLE-WISHBONE REAR SUSPENSION**

The Accord’s subframe-mounted 5-link double wishbone rear suspension is designed to provide precise camber and toe control, exceptional ride compliance and good space efficiency. The system consists of a series of tubular steel links that precisely position the upright that carries each rear wheel through its full suspension motion. The upper and lower links control camber when cornering, so that the tire contact patch remains flat (the optimum position for maximum adhesion) throughout the wheel’s range of movement. The lateral links compensate for the inherent toe deviation of independent rear suspensions, which tends to steer the car as it corners (roll-steer). As a result, the Accord tracks accurately around curves with no noticeable roll-steer effect.

**HIGH CAPACITY FRONT COMPLIANCE BUSHINGS**

Large compliance bushings fitted to the Accord’s front lower control arms help improve overall comfort by allowing significantly more fore and aft movement in the front suspension. On small bumps, pavement seams and patches, the performance of these bushings is a critical component of overall ride quality and road isolation.

**RACK AND PINION STEERING WITH IMPROVED STABILITY AND REDUCED KICKBACK**

The Accord’s well-weighted and highly responsive power rack-and-pinion steering system provides an exceptionally linear and consistent feel regardless of pavement conditions. The Accord’s power assist is steering-torque sensitive; hydraulic boost is applied to the system in direct proportion to the amount of force (torque) created between the tire and the road as the wheel is steered. As the force increases, the system increases the amount of power assist accordingly. Regardless of speed, an increase in effort is countered by an increase in boost (for example, if the wheels encounter a rough surface with a greater coefficient of friction).

To provide the Accord’s steering with a high level of useful feedback without excessive harshness, the system incorporates two features. The first is a steering damper that smoothes the level of assist provided by the power steering pump, with the benefit of improved steering stability at higher speeds and an improved “feel” throughout all speeds.

A kickback reduction valve reduces harsh feedback felt through the steering wheel over rough or uneven surfaces, especially during cornering. With conventional steering systems, steering kickback increases in intensity as lateral g-forces and steering torque increase. The Accord’s system substantially reduces the rate of kickback increase.

**UPGRADED BRAKING SYSTEMS**

Stopping power was enhanced across the Accord lineup. In addition to multiple hardware refinements that enhance stability and help trim braking distances, the Sedan now boasts best-in-class pedal feel and stroke. ABS has been made standard equipment on all Accords.

Other key changes include a single, high-efficiency 10-inch booster in place of the 8-inch/9-inch tandem unit used previously; a lighter, more efficient master cylinder; and a new front disc package with increased rotor sizes. On 4-cylinder Accords, the diameter dimension rises from 259 to 282 mm, equal to that found on automatic transmission V6 models.

Precision optimization of mechanical and hydraulic pressure ratios in the new system yields major improvements to the pedal feel and stroke under both low- and high-effort stopping situations. Brake stroke on the new Accord has been reduced by 11 percent compared to the previous generation.
ELECTRONIC BRAKE DISTRIBUTION (EBD)
The EBD system used with 4-wheel disc brakes (EX-L 4-cylinder as well as all V6 models) complements the function of the ABS by adjusting braking force front-to-rear depending on passenger (or cargo) positioning to deliver enhanced stability and stopping performance. When brake force is applied, the ABS computer’s EBD function estimates the proper distribution of braking pressure based on the difference between the front wheel and rear wheel speeds.

Hydraulic pressure to the rear wheel brakes is adjusted via the oil pressure controlling actuator. With a heavy payload under hard braking, the maximum amount of braking force is applied to the rear wheels.

V6 TRACTION CONTROL SYSTEM (TCS)
A state-of-the-art traction control system is standard equipment on all V6 Accords. Computer controlled and driver-selectable, this TCS improves the Accord’s handling, stability and traction at all speeds and with all types of low-grip road conditions. Unlike the previous system that only interfaced with the Accord’s ABS circuitry at speeds under 40 km/h, this new-generation TCS also incorporates full-range throttle control that prevents undesirable wheel-spin regardless of vehicle velocity and extends active braking control up to 85 km/h.

TIRE SIZES
To take full advantage of their improved dynamic capabilities, all Accords are fitted with more performance-oriented all-season tires that enhance ride and handling characteristics. These upgrades appear on both 4-cylinder and V6 models.

<table>
<thead>
<tr>
<th>Accord Sedan Tire Sizes</th>
<th>Current Generation</th>
<th>Previous Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX 4-cylinder</td>
<td>P195/65R15</td>
<td>P195/70R14</td>
</tr>
<tr>
<td>LX 4-cylinder</td>
<td>P205/65R15</td>
<td>P195/65R15</td>
</tr>
<tr>
<td>EX 4-cylinder</td>
<td>P205/60R16</td>
<td>P205/65R15</td>
</tr>
<tr>
<td>LX/EX V6</td>
<td>P205/60R16</td>
<td>P205/65R15</td>
</tr>
</tbody>
</table>

2004 Honda Accord Sedan: Interior

INTRODUCTION
For the current generation Accord, Honda designers wanted to bring new levels of style and sophistication to the interior, and to incorporate “emotion” into the Accord’s interior.

Designers worked extensively to reach their design goals. They sought to blend driver-oriented features with information-oriented technologies and they used many subtle cues to transform the Accord’s interior from that of its predecessor.

The proportions and relationships are new, with a higher beltline and more prominent dashboard lending a feeling of substance andsolidity. Dramatically more supportive seating with a tilt and new telescoping steering provide a fresh driving position aimed at making Accord the fun-to-drive standout in its class. There’s also more useful space and more storage throughout the cabin.

The technology is apparent as soon as you enter the vehicle, embodied in the instrument faces, which are illuminated by LEDs and present a dark appearance when the car is at rest. Audio systems were upgraded. EX-L and EX V6 models have separate temperature controls for
left- and right-side front seat occupants. To open up more storage space, the functions of the audio head unit and climate control unit (HVAC) were consolidated into a single, easy-to-use display.

The Accord interior also exhibits Honda’s trademark attention to function and utility and the thoughtful features that have come to separate Honda from its competitors.

**INTERIOR DIMENSIONS**

Like its predecessor, the Accord Sedan will carry an intermediate car classification. While interior volume is virtually identical to the old car, this Accord has more useful space in many key areas. Front and rear headroom have been increased, and there is greater clearance between the passenger’s head and outer roof rails. The driver has more knee room, while the front seat passenger has more foot room.

<table>
<thead>
<tr>
<th>Current Generation Interior Dimensions</th>
<th>Current Generation</th>
<th>Previous Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headroom, front/rear, mm (in.)</td>
<td>1026 / 978 (40.4 / 38.5)</td>
<td>1016 / 956 (40.0 / 37.6)</td>
</tr>
<tr>
<td>Legroom, front/rear, mm (in.)</td>
<td>1082 / 935 (42.6 / 36.8)</td>
<td>1070 / 963 (42.1 / 37.9)</td>
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<tr>
<td>Shoulder Room, front/rear, mm (in.)</td>
<td>1445 / 1425 (56.9 / 56.1)</td>
<td>1445 / 1425 (56.9 / 56.1)</td>
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<tr>
<td>Hip room, front/rear, mm (in.)</td>
<td>1387 / 1356 (54.6 / 53.4)</td>
<td>1395 / 1373 (54.9 / 54.1)</td>
</tr>
<tr>
<td>Interior Volume</td>
<td>3313 L (117 cu. ft.)</td>
<td>3279 L (116 cu. ft.)</td>
</tr>
<tr>
<td>Passenger Volume</td>
<td>2917 L (103 cu. ft.)</td>
<td>2888 L (102 cu. ft.)</td>
</tr>
<tr>
<td>Trunk Volume</td>
<td>396 L (14 cu. ft.)</td>
<td>399 L (14 cu. ft.)</td>
</tr>
</tbody>
</table>

**ACCOMMODATING DRIVING POSITION**

The Accord’s driving position was totally revised in pursuit of enhanced comfort and control. During development of the car, a three-continent research project revealed key driving position dimensions that work well for a wide range of drivers. This data was used to develop a more adjustable driving position for the Accord, which is more comfortable and adaptable than ever before.

Relative to the previous Accord, the steering wheel was tilted towards the driver by 4 degrees and raised 20 mm. The steering column is aligned ideally with the driver’s body, instead of being slightly offset laterally. In addition, the steering wheel telescopes 40 mm, while retaining its tilt feature. By releasing a single steering column-mounted lever, the driver can position the steering wheel as desired.

**SEATING FEATURES AND TECHNOLOGY**

Besides reducing driver fatigue on long trips, the Accord’s front bucket seats improve the driving posture and better stabilize the body to create a more secure feeling when cornering, accelerating or braking. The seat has a 40 mm taller backrest, and is 43 mm wider. The cushion design and material were redesigned to reduce vibration, and complements the spring design.

EX-L and EX V6 models have a Shukra-type adjustable lumbar support mechanism that fits the body more comfortably, without the noticeable edges found with some conventional plate-type adjustable lumbar support systems.

**MANUAL SEAT HEIGHT ADJUSTMENT MECHANISM**

Front bucket seats in LX-G models have a lever-operated, ratchet-type seat height adjustment. Compared to knob-type height adjusters, this system requires less effort and more precise positioning. The seat’s vertical travel has also been increased from 25 mm to 40 mm.
**FLAT CARPET**
To improve the sense of craftsmanship of the floor surface, the Accord utilizes a formed urethane insulator to allow the carpet surface to be perfectly flat. Thicker than the cushion in the previous generation Accord, this molding integrates the front seat mounting rails for a more finished appearance and helps improve sound deadening and the airflow efficiency of the heater.

**LED INSTRUMENTATION**
Supporting the Accord’s driver-oriented nature are large LED instruments that are easy to read and rich in appearance. These types of LED meters have never been used before in a car in this price range, and are typically found in vehicles with a higher Manufacturers Suggested Retail Price.

Standard analog instrumentation includes a large format speedometer, 0-8500 rpm tachometer, fuel and coolant temperature gauges. EX-L and EX V6 models have an outside temperature indicator as part of the odometer/tripmeter digital display.

**INTERIOR LIGHTING**
Enhancements to interior illumination provided added visibility in the EX interior. The console is illuminated at all time by an overhead light that bathes the console in a subtle glow. The power window switches in all four doors are also internally illuminated.

Accord’s instrument system uses progressive illumination to establish a "dialog" with the driver. When the door is opened, the instrument brightness clicks on at 10 percent – a "welcome" for the driver. When the key is put in the ignition, the illumination ramps up to 100 percent in one second. When the ignition is turned on, the illuminated instrument needles and annunciator lights come on, indicating all systems are go.

After the drive, the process reverses itself. When the ignition is turned off, the instrument lights dim to 10 percent brightness over the course of one second. When the key is taken out of the ignition, the lights dim to zero in one second. The entire process is purposely subtle, but illustrates the level of detailed engineering built into the Accord’s interior.

**AVAILABLE DUAL-ZONE CLIMATE CONTROL**
Standard in leather-equipped 4-cylinder EX-L models and all EX V6 models is a dual-zone climate control system. Easy-to-use rotary temperature knobs are positioned within easy reach of each front seat occupant. The selected temperature for each side appears in the central audio/climate control display.

**ONE-TOUCH MAX A/C**
In Accords with manual climate control systems (all DX, LX-G and LX V6 versions) a one-touch "MAX A/C" button makes it easy to cool the interior quickly, without having to manually select "A/C" and recirculate.

**EXPANDED INTERIOR STORAGE**
The sliding armrest, which adjusts fore and aft to suit different sized drivers and front seat passengers, highlights the expanded list of interior storage choices. Even when extended forward its full 80 mm, the armrest still provides enough clearance for the cupholder to accommodate a large-size beverage cup. Inside, the console has coin storage and includes hooks for a cell phone cord to prevent it from being caught when the lid is closed. With the integration of audio and climate controls into a single unit, additional storage has been created. Up to 12 CDs can be stored in the lidded compartment immediately below the audio/HVAC unit.

**INTEGRATED SWITCH CONTROLS**
For enhanced styling and functionality, the cruise control switches and audio controls (EX-L, LX V6 and EX V6 models) are an integral part of the steering wheel design instead of the previous style module attached to the side of the wheel.
Special care was taken to insure that all switches used throughout the Accord cabin have a uniform quality and tactile feel. Switches on the instrument panel and door panels have complimentary force levels and strokes.

**KEYLESS ENTRY SYSTEM**
The remote keyless entry system offers features more commonly found on more expensive vehicles. Functions formerly relegated to a remote entry key fob have been expanded and are also integrated into the head of the Accord’s new high security "wave" ignition key itself. **All the windows can be opened remotely, along with the usual door lock/unlock functions.** With an FM superheterodyne signal, the remote has resistance to interference from strong electrical fields such as pager bases or aviation communications.

The remote is also simple to use. A single push of the “unlock” button unlocks the driver’s door. A second push unlocks all the doors. Push the unlock button down again for more than one second continuously, and all the power windows begin to lower, an added feature that is particularly useful for hot, sunny days. Release the button, and the windows stop. Similar functions can be accomplished with the ignition key inserted in the door lock. Like previous models, turn the key to the unlock position once and the driver’s door unlocks. Return it to the normal position and then back to the unlock position and all the doors unlock. In addition, hold the key in the unlock position for more than one second and the windows start to open, until you return the key to the normal position.

The key can also close the windows while in the driver’s door lock. A single turn to the locked position will again lock all the doors. A return to the normal position followed by a turn to the lock position closes the windows. Any time the key is returned to the normal position, the windows stop.

**CARGO UTILITY**
The Accord Sedan has approximately the same trunk space as the model it replaces. Close attention to the shape of the trunk and its access allow it to handle the same size and quantity of cargo items as its predecessor.

**AUDIO SYSTEMS**
*The Accord features three different audio systems to suit differing buyers and price points.* DX and LX-G models have AM/FM/CD head units with 120 watts of power. The DX model has four speakers while LX-G, EX-L, LX V6 and EX V6 models have six speakers. Compared to the previous generation Accord, the front speakers are upgraded with Neodymium speaker magnets and polypropylene cones, and the tweeters have been improved for frequency response.

Five-point parametric equalization helps tune each system’s frequency response to the unique acoustic properties of the Accord’s interior to deliver fuller, more accurate sound quality. Relative to the previous generation Accord, the current system advances sound quality on all fronts, most notably in the high and mid frequencies.

EX-L, LX V6 and EX V6 models adds an in-dash 6 CD changer to the AM/FM system in place of the single CD unit, along with Neodymium magnet/polypropylene cone 6 x 9” rear speakers for reduced distortion with superior accuracy and increased bass power and clarity.

For superior sound performance, the Accord V6 Coupe with 6-speed manual transmission is equipped with a special Premium Audio System. This system features an AM/FM/6-disc, in-dash CD changer with a high-power amplifier that delivers 180 watts. Twin-Neodymium speakers with polypropylene cone woofers and soft dome tweeters are used up front, with twin 6 x 9” Twin-Neodymium polypropylene cones in back.

All the Accord systems feature 2-band compression that improves the sound quality at low volume settings. Since some audio system frequencies are masked by vehicle noise, this digital sound compression boosts select frequencies and reduces others. The result is clearer, more balanced audio at low listening levels.
2004 Honda Accord Sedan: Powertrain

4-CYLINDER ENGINE OVERVIEW
Representing the state-of-the-art combination of performance, economy and ultra-clean operation, the Accord’s standard 2.4-litre i-VTEC engine is a showcase of Honda’s latest technologies. Building on the solid foundation of the original VTEC design, this latest 16-valve i-VTEC engine transforms the character of the 4-cylinder Accord, providing unprecedented levels of acceleration and fuel efficiency with minimal tailpipe emissions.

This strong running engine equals or betters the old engine’s peak torque figure over an impressive 3000-rpm range. Even though it develops significantly more horsepower (+7%) and torque (+6%), this engine also meets stringent LEV II LEV Tier 2 – bin 5 emission standards.

This compact and lightweight 4-cylinder engine comes well prepared to serve as the powerplant of choice for roughly 70 percent of Accord buyers. Fitted with internal balance shafts for additional smoothness and cast-in iron cylinder liners to enhance durability, it is designed from the start to deliver years of trouble-free operation. Except for inspections and fluid changes, the first scheduled maintenance is not required until 168,000 kilometers.

### Engine Comparison: Current Generation vs. Previous Generation

<table>
<thead>
<tr>
<th></th>
<th>Current Generation</th>
<th>Previous Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine</td>
<td>In-Line 4 DOHC i-VTEC</td>
<td>In-Line 4 SOHC VTEC</td>
</tr>
<tr>
<td>Displacement</td>
<td>2354cc</td>
<td>2254cc</td>
</tr>
<tr>
<td>Compression Ratio</td>
<td>9.7:1</td>
<td>9.3:1</td>
</tr>
<tr>
<td>Fuel Type</td>
<td>Regular Unleaded</td>
<td>Regular Unleaded</td>
</tr>
<tr>
<td>HP</td>
<td>160 hp @ 5500 rpm</td>
<td>150 hp @ 5700 rpm</td>
</tr>
<tr>
<td>Torque</td>
<td>161 lb.-ft. @ 4500 rpm</td>
<td>152 lb.-ft. @ 4900 rpm</td>
</tr>
<tr>
<td>Transmission</td>
<td>5MT/ 5AT</td>
<td>5MT/ 4AT</td>
</tr>
<tr>
<td>City/Highway L/100 km</td>
<td>9.8 / 7.1 (AT)</td>
<td>10.2 / 7.1 (AT)</td>
</tr>
<tr>
<td>Emissions Certification</td>
<td>LEV II LEV</td>
<td>LEV I LEV</td>
</tr>
</tbody>
</table>

**KEY 4-CYLINDER ENGINE TECHNOLOGIES**
The 2.4-litre Accord engine incorporates a host of advanced technologies, highlighted by the adoption of Honda’s latest i-VTEC (“intelligent”) valve-control system. Developed from technology initially seen in the world of Formula One racing, Honda’s original VTEC (Variable valve Timing and lift Electronic Control) system changed the valve lift, timing and duration to suit the engine’s running condition.

With continuous phase adjustment of the intake camshaft, i-VTEC adds VTC (Variable Timing Control) to the mix. This latest enhancement, first used on the Acura RSX and also found on the new Honda CR-V and Civic SiR, provides further improvements to power and torque figures while optimizing overall operating efficiency and minimizing tailpipe emissions.
With its greater output, the i-VTEC engine provides the Accord with better total performance under all types of driving conditions and terrain.

**With all-aluminum construction and a 16-valve DOHC design, the 2.4-litre Accord develops 160 horsepower at 5500 rpm and 161 lb.-ft. of torque at 4500 rpm.** The combination of VTEC technology with the VTC provides the engine with even stronger low- and mid-range power as well as a robust high end.

The “intelligent” variation on the basic theme retains the original VTEC hardware that permits the optimization of valve lift and duration as the engine transitions from low-speed to high-speed operation, while adding the ability to continuously vary phasing of the intake cam based on both rpm and load factors. The net result is optimized idle stability, emissions, torque and power.

To further improve its operating efficiency, the engine has been rotated 180 degrees from the previous Accord 4-cylinder. This change permits the catalytic converter to be mounted closer to the exhaust manifold (now on the rear side of the engine), which promotes quicker light-off and thereby helps further reduce cold-start emissions.

**CYLINDER HEAD AND VALVETRAIN**
The i-VTEC engine is crowned by a compact, lightweight cylinder head made of pressure-cast aluminum alloy. Its 4-valve-per-cylinder design has double overhead camshafts activated by a silent chain drive to ensure extremely precise control of the cam phasing. The cam drive is maintenance-free throughout the life of the engine. The combustion chamber is designed with a relatively large “squish” area that promotes faster flame propagation on the ignition stroke. This results in more complete burning of the air-fuel mix and subsequently, lower levels of Carbon Monoxide and Hydrocarbon emissions.

**4-CYLINDER i-VTEC**
Honda’s original VTEC (Variable Valve Timing and Lift Electronic Control) has been elevated to a new plateau with the introduction of i-VTEC. This “intelligent” form of the highly effective VTEC package adds an element to the mix in the form of VTC (Variable Timing Control), which provides for continuously variable phasing of the intake camshaft.

The formidable pairing of VTEC and VTC results in several major improvements to drivability, including more horsepower and torque at lower rpm levels, enhanced fuel economy and significantly lower emissions.

The VTEC system on the 2.4-litre DOHC 4-cylinder employs two rocker arms with friction-reducing roller followers for each pair of intake valves, along with an intake cam that has separate lobes configured to optimize both low- and high-speed operation. Depending on engine load and rpm, an electronic controller determines which cam profile will be used and exactly how each intake will operate.

At low revs, where low lift and shorter duration provide optimal operation, the timing of the two intakes is staggered and the lift asymmetrically skewed in favour of the primary valve. This helps to create a swirl effect within the combustion chamber that increases the efficiency of the burn process.

At higher rpm, a hydraulically actuated spool valve causes a locking pin to engage the secondary rocker arm with the primary one, transitioning the secondary valve into a high-lift/long-duration mode that improves output on the top end.

VTC allows the timing of the intake camshaft to be continuously varied throughout the engine’s entire rpm range. Along with helping boost power, VTC also provides a more stable idle (allowing idle speed to be reduced) and reduced pumping losses by effectively creating an internal Exhaust Gas Recirculation (EGR) effect at low and mid engine speeds.

The result is increased fuel economy and lowered NOx emissions. Operation of the VTC is
electronically controlled and is determined by input from sensors that monitor rpm, timing, throttle opening, cam position and exhaust gases.

Depending on the above-listed conditions, VTC can vary the phasing of the intake cam (change its position relative to the crankshaft) by +/- 25 degrees. VTC activation is accomplished hydraulically via a spool valve that sends high-pressure oil to passages in the cam’s drive sprocket.

At idle, the timing is almost fully retarded to minimize valve overlap. In normal highway driving, the intake camshaft is advanced to provide overlap for EGR effect. With the throttle wide open, valve timing starts in an advanced position at lower rpm and continuously changes to a retarded position when redline is approached. This allows optimum cylinder scavenging and pumping efficiency and provides outstanding power and torque throughout the rpm range.

ENGINE BLOCK, CRANKSHAFT AND OIL PAN
The 2.4-litre engine uses a two-piece, die-cast aluminum block and bearing cap design that helps maximize strength and rigidity while minimizing noise and vibration. The compact upper element features cast-in iron cylinder liners for outstanding durability while the lower element consists of a single-casting crankshaft carrier fitted with ferrous-carbon bearing-cap inserts that add to its overall structural rigidity. Each journal on the forged-steel crankshaft is micropolished to help reduce internal friction and improve durability.

FUEL INJECTION
The Accord V6 is fitted with the latest iteration of Honda’s sophisticated Programmed Multi-Port Fuel-Injection (PGM-FI) system. It’s controlled by a 32-bit microprocessor that uses a comprehensive array of sensors to monitor throttle position, intake manifold pressure, coolant temperature, intake air temperature, atmospheric pressure and the oxygen content of the exhaust gases, as well as the relative positions of the camshafts and crankshaft. Based on the input it receives, the PGM-FI signals an efficient multi-orifice injector for each cylinder to introduce the proper amount of atomized fuel at the precisely timed instant to ensure ideal combustion. Internal feedback circuitry allows the PGM-FI to custom match its real-time operation to accommodate the specific air-fuel conditions that exist in each individual cylinder.

INTERNAL BALANCE SHAFTS
To improve smoothness throughout the rpm range and help lower noise levels, the Accord 4-cylinder is fitted with an internal balancer unit. Consisting of a pair of chain-driven counter-rotating shafts located in the oil pan, the balancing system helps quell the inherent second-order harmonic vibrations that normally impact in-line 4-cylinder engines.

SERPENTINE DRIVE BELT
The Accord 4-cylinder uses a single, serpentine belt to operate all of the engine’s accessory drives. In addition to saving space compared to the dual-belt system used on the previous four, this maintenance-free component features an integral auto tensioner.

EXHAUST SYSTEM
A high-efficiency exhaust system and a high-density catalytic converter helps the 4-cylinder engine meet stringent Tier 2 – Bin 5 LEV II LEV emissions certifications. Both of these components function more effectively as the result of the engine having been rotated 180 degrees in the bay.

Exhaust gases pass through a low heat-mass/dual-wall stainless steel manifold as they now exit the "downstream" side of the engine via a double-walled pipe, that also helps limit heat loss.

The combination of higher relative temperatures and a more direct path to the catalytic converter yields quicker light-off, which contributes to lower levels of hydrocarbon and NOx emissions.
INTELLIGENT ECU
The ECU on the new i-VTEC engine is fitted with an on-board data recorder that constantly monitors operation of both the automatic transmission and fuel-injection circuitry.

The system is unique in that it tracks operating parameters before and after a fault occurs, which makes troubleshooting much simpler. The data stream can be downloaded into a diagnostic analyzer at the dealer, where the cause can be identified and proper corrective action taken.

EXHAUST SYSTEM WITH COMPACT SILENCER
The exhaust system of the i-VTEC powered Accord is designed to deliver both functional and cosmetic benefits. Several elements contribute to a reduction in total system weight.

These include shortening the engine-to-tailpipe distance (as the result of rotating the engine 180 degrees), eliminating a tailpipe connector flange and adopting a new design for the resonator.

Lighter and more compact than the previously fitted unit, the silencer uses a “pipe turn” internal configuration that helps attenuate exhaust noise levels by 5-7 dB. The narrower cross section also permits the bumper fascia to be lowered by 25 mm, thereby providing a cleaner appearance to the rear of the car.

V6 ENGINE OVERVIEW
The Accord’s 24-valve V6 engine shares several basic design elements with its predecessor, including a 60-degree/3.0-litre configuration. But a host of technological advances makes it significantly more powerful, more fuel efficient and with lower emissions.

The V6 engine is nearly 9 kg lighter and 25 mm shorter than the V6 it replaces. A 3-rocker VTEC system replaces the two-rocker version used in the previous engine. It develops 20 percent more horsepower and 7 percent more torque, using regular unleaded gasoline. Despite these major output gains, the new V6 also is expected to boost estimated fuel economy numbers in the City.

Honda engineers designed the V6 engine to require only minimal care throughout its lifetime by incorporating components like platinum-tipped spark plugs and a space-saving, self-tensioning serpentine accessory drive belt. Except for periodic inspections and normal fluid replacements, the V6 engine requires no scheduled maintenance until the 168,000-km mark.

Oil changes are scheduled for every 6,000 km.

<table>
<thead>
<tr>
<th>V6 Engine Comparison</th>
<th>Current Generation</th>
<th>Previous Generation</th>
</tr>
</thead>
<tbody>
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<td>60º V6SOHC VTEC</td>
<td>60º V6SOHC VTEC</td>
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<td>Displacement</td>
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<td>Fuel Type</td>
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<td>Regular</td>
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<td>HP</td>
<td>240 hp @ 6250 rpm</td>
<td>200 hp @ 5500 rpm</td>
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<tr>
<td>Torque</td>
<td>211 lb.-ft. @ 5000 rpm</td>
<td>195 lb.-ft. @ 4700 rpm</td>
</tr>
<tr>
<td>Transmission</td>
<td>5AT</td>
<td>4AT</td>
</tr>
<tr>
<td>Expected City/Highway L/100 km</td>
<td>11.2 / 7.8</td>
<td>11.6 / 7.8</td>
</tr>
</tbody>
</table>
Expected Emissions Certification

| LEV II - ULEV/ LEV | LEV I - TLEV/ LEV |

**KEY V6 ENGINE TECHNOLOGIES**

Several key changes to the induction system, exhaust system, and valvetrain combine with a significant increase in the compression ratio to generate major output gains in the current generation Accord V6. Primary contributors on the intake side include a high-inertia manifold, a large and electronically controlled throttle body and even more precise measurement and control capabilities for both air and fuel. These features account for about one-third of the additional 40 horsepower the V6 engine pumps out.

On the downstream side, higher capacity components throughout the entire exhaust system increase the flow rate by 30 percent and are responsible for another third of the overall power increase. The remaining output gains result from improvements in combustion efficiencies derived from larger intake valves, the 3-rocker VTEC system (replacing a two-rocker design), and a bump in compression ratio from 9.4:1 to 10.0:1.

Several factors work together to help the V6-powered Accord achieve improved fuel economy. A more precise electronic knock control system permits the boost in compression ratio.

The wider gear ratio range of the new 5-speed automatic transmission boosts operating efficiency and also reduces internal friction. Improved aerodynamics also contributes to improving fuel economy.

Numerous innovative features contribute to the V6 engine’s low emissions status, including an advanced fuel injection management system, and unique “unified” exhaust manifold and cylinder head design with close-coupled catalytic converters. This sophisticated system features an ultra-precise linear airflow sensor in addition to a conventional Oxygen sensor in the secondary under-floor converter. The engine also incorporates an electronic EGR system that helps minimize NOx emissions.

**CYLINDER HEADS WITH INTEGRAL EXHAUST MANIFOLDS**

One of the most innovative aspects of the Accord V6 is the design of its cylinder heads. Made of pressure-cast, low-porosity aluminum, these lightweight components have tuned exhaust manifolds as integral parts of the casting, a unique feature that improves overall packaging and permits optimal positioning of the primary close coupled catalytic converters.

While the V6 maintains the basic SOHC design, 4-valves-per-cylinder and VTEC configurations, refinements significantly boost operating efficiencies. As before, each camshaft is inserted into the head from the front of the engine – an approach that saves weight and complexity by eliminating the need for bolt-on cam caps. And the crankshaft still drives each cam via a fiberglass-reinforced toothed timing belt. However, the diameter of the intake valves has been increased to improve breathing and the ports have been reconfigured to more ideally match the flow characteristics of the new, high-inertia intake manifold.

Finally, the VTEC (Variable valve Timing and lift Electronic Control) system has been changed from a 2-rocker to a 3-rocker design for improved throttle response at low rpm and increased top-end power.

**3-ROCKER VTEC SYSTEM**

Honda used expertise gained from its successful racing programs to develop the innovative VTEC system more than a decade ago. Since then, various forms of VTEC have become familiar features on many of Honda’s engines. VTEC makes it possible to vary the relative timing and lift of the intake valves to optimize overall performance, netting good low-end torque as well as improved high-end horsepower.
Basic operation of the 3-rocker VTEC setup used on the 2003 Accord’s V6 is similar to that of the 2-rocker version used on the DOHC 4-Cylinder, where rocker arms fitted with low-friction roller followers actuate the intake valves.

The heart of the VTEC system is a unique camshaft and rocker arm system. For each cylinder’s set of two intake valves, there are three rocker arms and three corresponding lobes on the camshaft. The two outboard lobes each have a profile maximizing cylinder swirl to suit low- to mid-rpm operation. The third or centre cam lobe has a dramatically different profile designed for longer duration and higher lift. This lobe profile is designed to optimize breathing and horsepower production at high engine speeds.

At low engine rpm, the outboard lobes operate the valves. During high-speed operation the VTEC computer sends a signal to a spool valve, which in turn delivers engine oil pressure to small pistons in the rocker arms. Oil pressure causes the pistons to move, locking all three rocker arms together. Once locked, the rocker arms are forced to follow the centre cam lobe, increasing top-end performance. The crossover from low lift to high lift occurs in 0.1 seconds and is virtually undetectable to the driver.

ENGINE BLOCK
At the core of the Accord’s lightweight V6 is an exceptionally strong, rigid aluminum-alloy block that employs cast-iron cylinder liners to enhance durability. Die-cast and heat-treated, the block has a high natural resonant frequency and an optimal 60-degree V-angle, features that contribute to the engine’s inherently smooth, quiet operation as well as to its relatively compact size. A short deck height also improves its overall packaging efficiency.

CRANKSHAFT, CONNECTING RODS AND PISTONS
Internal components of the Accord V6 deliver an outstanding combination of efficiency and durability. The central element is an extremely rigid forged steel crankshaft with microfinished journals that minimize friction and improve durability. Compression ratio of the lightweight cast-aluminum pistons has been increased to 10.0:1, up from 9.4:1 in the previous engine.

The precision-contoured piston crowns have a unique charge-centralizing design that maximizes volumetric efficiency and a large squish area that facilitates more complete combustion and leads to decreased emissions. The pistons are fitted with full-floating wrist pins to help eliminate the “slapping” noise that can occur on cold starts.

The crank and pistons are linked by compact connecting rods that employ a special weight-saving, direct-thread fastener in place of the conventional nut-and-bolt configuration typically used on other engines.

ELECTRONIC THROTTLE CONTROL
Another factor that contributes to the world-class performance of the Accord’s V6 engine is an all-new electronic throttle control (ETC) system. This system controls the throttle during transmission shifts for improved smoothness. It also allows for throttle control to be incorporated in the traction control system and integrates the cruise control function into the ETC. This computer controlled drive-by-wire (DBW) package is a feature that will be incorporated into other future Honda powerplants. Key system components include an accelerator position sensor, electronically controlled throttle body, DBW driver unit, and the main electronic control unit (ECU).

HIGH INERTIA INTAKE MANIFOLD
Air passing through the ETC enters through a new, high-inertia intake manifold with a runner design that’s specifically matched to optimize output characteristics. It features a unique plenum configuration that effectively transitions incoming air from a negative to a positive waveform. This helps create a natural supercharging effect and is designed to complement the intake port design.
**DIRECT IGNITION AND KNOCK CONTROL**
Ideally balancing performance, economy and low emissions demands precise control of the spark timing as well as an effective ignition system to ensure optimum burning of the air-fuel mixture under all operating conditions. To help accomplish this goal, a sensor determines the onset of engine “knocking” and modifies spark timing before improper detonation causes damage. The system allows the engine to run with a greater amount of spark advance and a higher compression ratio than the previous V6, increasing efficiency. A compact, high-energy ignition coil positioned directly atop each respective plug bore in the cylinder head activates each spark plug in the new engine.

**HIGH-FLOW EXHAUST SYSTEM WITH CLOSE-COUPLED CATALYZERS**
The high efficiency exhaust system incorporates several key elements that work in concert with the engine’s uniquely designed cylinder heads to help boost performance, reduce tailpipe emissions and trim weight.

Major system components include two close-coupled primary catalytic converters, a secondary underfloor catalytic converter, a centrally positioned, high-flow resonator and dual rear silencers. Integrating the exhaust manifold into the head casting allowed the primary catalytic converters to be mounted directly to the exhaust orifice. This location ensures an extremely rapid light-off for the high-efficiency 900-cell per square inch converters, which directly contributes to the engine’s exceptionally low emissions.

A high-flow hydroformed 2-into-1 collector pipe that transfers exhaust gasses to the secondary 350-cell converter also reduces exhaust backpressure.

The net result is a 30-percent drop in backpressure compared to the previous Accord V6. These improvements account for 15 of the extra 40 horsepower the V6 develops.

Eliminating a flange on the rear portion of the exhaust pipe and adopting a more compact design for the rear silencers also trimmed weight from the system. Because these smaller silencers are easier to package, the rear of the Accord has a more refined appearance.

**ENGINE MOUNT SYSTEM**
The Accord has an engine mount system, used with both the 4-cylinder and V6 engines. The system combines the strengths of an inertia axis system with those of a centre-of-gravity engine mount system to achieve both excellent NVH and ride and handling.

The system starts by supporting the engine on two large mounts placed below the centre of gravity of the powertrain. Combined with the subframe mounts, the engine mounts provide a “double isolation,” or double rubber isolating elements between the engine and the passenger compartment, for excellent engine noise attenuation. The front of these two centre of gravity mounts is hydraulic and electronically controlled (except on the 4-cylinder with manual transmission which uses a hydraulic mount).

The hydraulic characteristics switch between two settings – one to optimize vibration performance at idle and one to optimize powertrain damping performance at higher speeds and over rough roads. The rear-most mount is a hydraulic mount for damping of the powertrain over rough roads. A dual mode engine side hydraulic mount is placed high on the engine connecting to the frame rail to best control powertrain motion during handling maneuvers. An upper transmission mount is added high on the transmission, connecting to the frame rail, again to control powertrain motion during handling maneuvers, and serves to provide symmetry in motion control. Finally, two rubber lower transmission mounts complete the setup.

The end result is a system providing excellent noise and vibration attenuation, superior powertrain damping over rough roads, and positive powertrain lateral motion control for excellent handling response. In addition, the mount system was engineered to compliment the...
subframe “sliding mode” during a front collision event, effectively increasing available crush length by 100 mm.

5-SPEED MANUAL TRANSMISSION FOR 4-CYLINDER ENGINES
The manual transmission paired with the Accord 2.4-litre 4-cylinder engine is a lightweight, compact 5-speed, housed in a rigid die-cast aluminum case. Multi-cone synchronizers used on first through fourth gears contribute to a smoother, more fluid shift feel, while helping reduce throw distances by 50 mm. A repositioned shift lever further facilitates quick, direct gear changes.

The clutch assembly is an equally compact design that features low-torsion springs in the pressure plate to keep pedal effort low and eliminate judder while ensuring a smooth, progressive engagement.

5-SPEED AUTOMATIC TRANSMISSION FOR 4-CYLINDER ENGINES
The 5-speed automatic transmission is lightweight and compact and designed to provide best-in-class performance and fuel economy. It also reduces shift shock and improves shift smoothness, thanks to a linear solenoid with direct control.

The transmission also features an updated grade logic control system. By using sensors that monitor throttle position, vehicle speed and acceleration/deceleration and then comparing these inputs with a map stored in the transmission’s computer, the system is able to determine when the vehicle is on an incline and adjust the shift schedule for improved climbing power or downhill engine braking.

5-SPEED AUTOMATIC TRANSMISSION FOR V6 ENGINES
The 5-speed automatic transmission used in V6 Accord models is different from the one in 4-cylinder models. This wide ratio transmission’s lower gears provide quick acceleration while the tall top gear ratios result in low cruising rpm levels for reduced noise and lower fuel consumption. One difference from the TL transmission is the addition of the Electronic Throttle Control (ETC) system to further enhance shift smoothness by momentarily closing the throttle (reducing torque) at shift points.

Because the transmission shares idler and third-gear clutches, the transmission provides five ratios in a unit approximately the same size of a conventional 4-speed automatic transmission. The transmission also incorporates a first gear one-way clutch for smoother shifts, plus a heat exchanger that controls and moderates transmission operating temperatures for both durability and improved shifting smoothness.

Linear solenoids provide precise, real-time control of the clutch on/off pressure. This superior clutch-engagement accuracy allows the grade logic control to operate smoothly under all conditions. For added refinement, a bearing supports the idler shaft.

To manage overall powertrain operation, the Powertrain Control Module (PCM) provides precise management of the transmission-engine interaction. For instance, by limiting engine output torque and/or transmission clutch pressure, hard driveline shocks are limited. The system also prevents the engine from exceeding 5000 rpm when the transmission is in neutral or park. It also has an upgraded grade logic control system similar to the one in the 5-speed automatic transmission for 4-cylinder engines.

2004 Honda Accord Sedan : Safety

SAFETY OVERVIEW
An all-out engineering effort was made to ensure that the Accord would rank at the top of the intermediate class in the safety crash tests conducted by the U.S. government’s National Highway Traffic Safety Administration (NHTSA) and the private Insurance Institute for Highway Safety (IIHS). These tests include frontal (both NCAP and certification tests), IIHS offset frontal, side impact (NCAP and certification) and rear end impact.
Among the most rigorous tests is the IIHS 64-km/h (40-mph) offset frontal, where the entire impact energy is focused on the left-front corner of the vehicle. The Accord was targeted to achieve a “Good” rating, the best rating possible. In the challenging 56-km/h (35-mph) NCAP frontal collision, a “Five Star” rating was expected. In side-impact tests, the Accord was expected to earn a NCAP “Four Star” rating for front and rear occupants.

To make the unibody both stronger and lighter, 48 percent of the Accord’s structure uses “high-strength” steel. This material, along with carefully designed load paths within the body structure, helps maintain the integrity of the passenger compartment during a collision.

**FRONT SUBFRAME**

In a severe frontal collision, the Accord’s steel subframe (that carries the engine/transmission unit and lower front suspension arms) can move rearward in a controlled manner (an additional 100 mm more than the previous generation) to further absorb impact energy.

**REPAIR COSTS**

As Honda developed the Accord, it benchmarked intermediate competitors such as the Toyota Camry, Nissan Altima, Volkswagen Passat and others, not only for passenger crash safety, but also for repair costs associated with low-speed collisions.

Based on the IIHS test standards, the Accord is expected to have the lowest repair costs for low-speed impacts of any car in the intermediate class. These bumper impact tests include both flat and angled 8-km/h (5-mph) front barrier tests, as well as flat barrier and pole 8-km/h (5-mph) rear bumper impact tests.

**ANTI-LOCK BRAKING SYSTEM (ABS)**

The Accord’s standard ABS system employs 4-wheel speed sensors and three control channels. The speed sensor at each wheel sends signals to the ABS control unit, which in turn independently modulates the brake fluid pressure to each front wheel and the rear wheels in tandem. This system enhances the driver’s ability to maintain steering control during hard stops on all types of surfaces. The ABS function is particularly effective on split-friction surfaces in which the wheels on one side of the vehicle have significantly less traction than those on the other side.

**FRONT SEAT SIDE AIRBAGS WITH PASSENGER-SIDE POSITION SENSOR**

The Accord’s front passenger seat is equipped with an innovative system designed to prevent injury to a small child or small-statured adult by preventing side air bag deployment if they lean into the side air bag deployment path. Seven sensors in the passenger seatback determine the height and position of the occupant to assist the system in determining if it is safe to deploy the side air bag. If the passenger is in the deployment path of the side air bag, the system will prevent the side air bag from inflating. When the passenger returns to an upright seating position, the side air bag will reactivate so it can deploy and protect the passenger in a side impact.

**ANTI-THEFT FEATURES**

The Accord is protected by a variety of anti-theft features. All models now feature the “wave” key for door, ignition and trunk locks. This type of lock is much more resistant to “picking” than conventional designs. Door and hood locks and their operating cables are now more thoroughly protected to prevent a “Slim Jim” or other jimmying device from being used to force entry. The engine immobilizer system used on previous generation Accords to shut down the engine’s electronic control unit (ECU) has been further enhanced with the addition of a rolling code.