

September 5, 2002: GM Powertrain's 2004 Northstar V8 Sets New Standard

FOR RELEASE: September 5, 2002

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Cadillac XLR and SRX to Benefit from Next-Generation Northstar Performance and Refinement Improvements

WARREN, Mich. -- When Cadillac debuted the Northstar V8 engine in the 1993 Allanté, it quickly became a benchmark for sophisticated performance. GM Powertrain has taken the Northstar 4.6-liter, dual-overhead-camshaft (DOHC) V8 to a higher level of performance and refinement by developing a next-generation version of the highly regarded engine for the 2004 Cadillac XLR and SRX. The next-generation Northstar is the first adaptation to rear-wheel-drive (RWD) and all-wheel-drive (AWD) configurations.

"The next-generation Northstar was extensively re-engineered to provide drivers with a technologically advanced powerplant that will establish a new benchmark for luxury vehicles in performance, refinement and the total driving experience," said John Zinser, GM Powertrain Northstar chief engineer. "We want our customers to experience the full exhilaration of driving, which includes performance and acceleration plus the feel of the road, sound of the engine, and a strong sense of being in control and in touch with

the driving experience.

"This new Northstar does just that with smooth, refined performance throughout its entire operating range. It is quiet, yet tuned to give the driver feedback from the environment. It operates even more cleanly and efficiently than its predecessors with excellent reliability and durability."

Improved Performance

While refined operating characteristics were a priority in developing the new Northstar, the overall goal was exceptional performance. The performance targets are best exemplified by the XLR roadster: 0-60 mph acceleration in under six seconds; the quarter mile in less than 14.7 seconds, and a top speed of 155 mph, the industry's voluntary limit for high-performance cars.

In both new Cadillac models, the Northstar delivers a higher output across the entire operating range with targeted output of 315 horsepower (235 kW) @ 6400 rpm and 310 lb-ft (420 Nm) of torque @ 4,400 rpm. In addition to these peak values, new four-cam continuously variable timing has freed the engine from the traditional constraints of fixed-cams that can only provide either high horsepower or high torque.

The Northstar also has an increased 10.5:1 compression ratio. While premium fuel is recommended for maximum performance, it can be operated on regular unleaded fuel.

New Technology and Design Features

The Northstar V8 is a 90-degree, DOHC, four-valves-per-cylinder engine featuring an aluminum block and cylinder heads, and a valvetrain configuration with roller finger followers. While maintaining these basic features, the new RWD version provides a host of Northstar "firsts," new technologies and design features to position it as a segment leader:

- **Four-cam continuously variable valve timing (VVT).** The RWD Northstar is the first to use VVT for improved performance, refinement, economy and emissions. Electronically controlled, hydraulically actuated intake and exhaust cam phasers on all four camshafts take VVT to an impressive level of control. They allow intake and exhaust valves to operate independently of each other. This assures precise timing for opening and closing the valves and extremely accurate control of fuel injection and more efficient combustion with minimal compromise between emissions and performance, all through the operating range from idle to high speed. The new VVT system also eliminates the exhaust gas recirculation (EGR) system and associated emissions hardware, reducing complexity and weight.
- **Electronic throttle control (ETC).** This is the first adaptation of ETC for Northstar, providing additional driving refinement. This allows the engine control system to precisely and seamlessly tailor vehicle performance to driver demands, relative to the conditions in which the vehicle is operating - with the driver only aware of the engine's smooth, instantaneous response. It also enables other functions, such as cruise control, torque management and traction control, to be fully integrated, eliminating hardware complexity and improving reliability.
- **Low restriction intake and exhaust manifolds and cylinder head ports.** Cylinder

head ports and exhaust manifolds were redesigned to ensure optimum airflow and cylinder-to-cylinder distribution for maximum performance and emissions control.

- Close coupled catalytic converters, mounted directly adjacent to the exhaust manifolds

. They reach effective operating temperature more rapidly after engine start-up and minimize the time for emissions "light off." They also eliminate the need for supplemental converters or air injection reaction (AIR) systems to meet emissions requirements.

- **A new air induction system, redesigned for enhanced capacity and noise attenuation.** It features tuned resonators, additional resonators in the clean air duct and use of isolator pads in the clean air duct mounting.
- A more powerful engine control module (ECM) and high-speed local area network (LAN) communication system dedicated to engine and transmission control

. An extremely powerful, state-of-the-art ECM, with a 16-bit, 24 MHz dual microprocessor, high memory capacity, and a redundant "safety" processor backing up the ETC enables the Northstar engine to provide its advanced capabilities. The controller is also designed for a GM LAN communication protocol speed of 500 kbit/second and has a 185-pin connection system for enhanced input/output capability. Currently, 120-pin systems are more the norm. GM's LAN communication protocol is an adaptation of the industry-wide CAN-Bus (control area network).

- **A new engine mounting system and more rigid block structure for outstanding operating smoothness and quietness.** The XLR engine is not directly mounted to the transmission, but to a torque tube bell housing. The XLR transmission is mounted in the rear. This provides the vehicle with nearly 50/50 weight distribution. The SRX engine mounts to the transmission in a conventional manner.
- **Polymer-coated pistons, a steel crankshaft, and cast-iron manifolds to further reduce noise, vibration and harshness:**

- Polymer piston skirt coating allows a tighter fit, minimizing piston-to-bore noise potential. A larger piston pin helps dampen internal noise.
- The steel crankshaft increases stiffness over more conventional cast-iron crankshafts.
- Cast iron manifolds absorb noise more readily than fabricated manifolds.

- **The first longitudinal application of the 4.6-liter Northstar V8**

. To optimize coolant and oil flow for the new application, the water pump was moved to the front of the engine, which required changing all of the coolant passages and engine cavities - in effect, a virtual redesign of the block and heads.

- A specifically designed acoustic cover over the engine for more complete radiated noise containment.

The cover, in addition to providing measurable noise reduction, maintains the attractive, neat and orderly underhood harmony of the previous Northstar's installations. Any components not shielded by the cover have been carefully reviewed for finish and corrosion resistance.

- Cartridge block heater with "dry" installation to eliminate potential coolant leaks.

The heater, which can be added for faster warm-ups in extremely cold weather, fits into a compartment outside the coolant passageway (rather than within the coolant circulation system) to eliminate any potential leaks.

Specifications

Configuration	4.6L V8	Horsepower	315 @ 6400
Bore x stroke	93 mm x 84 mm	Torque (lb-ft)	310 @ 4400
Displacement	4565 cc	Fuel system	Sequential fuel injection
Valvetrain	DOHC 4 valves per cylinder	Cylinder block	Aluminum
Compression ratio	10.5:1	Cylinder heads	Aluminum

GM Powertrain is a global producer of engines, transmissions, castings and components for GM vehicles and other automotive, marine, and industrial OEMs. Headquartered in Pontiac, Mich., GM Powertrain has operating and coordinating responsibility for GM's powertrain manufacturing plants and engineering centers in North America, South America, Europe, and the Asia-Pacific region.

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