2009 Vortec 4.8L V-8 (LY2)
VORTEC 4.8L Gen IV V-8 (LY2) TRUCK ENGINE
2009 Model Year Summary

Carryover engine content and benefits from 2008 model year

- New Engine for 2008 Chevrolet Express and GMC Savana
- Gen IV Cylinder Block
- Returnless Fuel Injection with Stainless Steel Fuel Rail
- Advanced Electronic Throttle Control
- E38 Engine Control Module
- 58X Ignition System
- Enhanced Noise, Vibration and Harshness Control
- Smaller Ignition Coils
- Iridium Tip Spark Plugs
- Low Modulus A/C Compressor Belt

Full Description of New and Update Features

4.8L LY2 Engine – Used in Tahoe/Yukon and Chevrolet Express and GMC Savana

The Vortec 4.8L V-8 is standard in the Tahoe and Yukon full-size sport-utility vehicles and optional in the Silverado and Sierra pickups. It is also now offered in the Chevrolet Express and GMC Savana vans. It is teamed up with GM Powertrain's Hydra-Matic 4L60 (M30), four-speed automatic transmission in the pickups and utilities and with the 4L80 (MT1) in the Vans.

The Vortec 4.8L is the smallest displacement engine in GM Powertrain's new line of Gen IV Vortec V-8s. These engines are the fourth-generation descendents of one of the most important and successful engines in automotive history—the original Chevrolet small-block, which debuted in 1955. The Gen IV Vortecs feature technology creators of the first small block could not have imagined, yet they share one fundamental trait with the original: a market-leading balance of performance, sophistication, economy and durability.

Gen IV Cylinder Block

The Gen IV cylinder block shares two key design elements with GM's original small block V-8: a 90-degree cylinder angle and 4.4 inch bore centers. Beyond that, the latest small block applies design, casting and machining technologies that were unfathomable in the 1950s.

The Gen IV block debuted in 2005 as the foundation for the 400-hp LS2 V-8 in the Chevrolet Corvette, and Pontiac GTO, and the Cadillac CTS-*v* in 2006. Although it's constructed of cast iron rather than aluminum, the Vortec 4.8L engine block applies the same improvements as in the LS2, tailored for the demands of truck application. It was developed with the latest math-based tools and data acquired in GM's racing programs, and it provides an exceptionally light, rigid foundation for an impressively smooth engine. Its deep-skirt design helps maximize strength and minimize vibration. The bulkheads accommodate six-bolt, cross-bolted main-bearing caps that limit crank flex and stiffen the engine's structure. A structural oil pan further stiffens the powertrain.

The new-generation small block is cast with oil ports in its V, or valley, to accommodate new technologies offered in the latest Vortec V-8s, and others still to come. As a result, knock sensors located in the valley on Gen III Vortec V-8s have been moved to the outside of the block, while the cam sensor has been moved from the rear of the block to the front cover.

Cylinder Heads
The Vortec 4.8L cylinder heads, originally developed for the vaunted LS6 Corvette, were revised for further high mileage durability. Both the intake and exhaust valve seats underwent a material change as well as the intake valves. These changes were all done in order to further harden the engine to the demands of the engine under truck usage.

Crankcase Ventilation System
The Positive Crankcase Ventilation (PCV) system now incorporates a larger 2.75mm flow orifice and, to aid assembly, has quick-connect fittings for the connections on the engine.

Accessory Drive
For 2009, a new low modulus A/C compressor belt was employed. This design eliminates the need for a separate belt tensioner, further simplifying the design and reducing mass.

Returnless Fuel Injection with Stainless Steel Fuel Rail
The Vortec 4.8L is equipped with a "returnless'' fuel injection system, also known as a demand system, and the latest-generation Multec injectors with USCAR connectors. The Gen IV V-8s represent GM's first applications of USCAR-standard electrical connectors for the fuel injectors. The standard was developed to promote common, reliable connections across the auto industry and streamline regulatory oversight. The connectors are more compact than previous connectors, and designed for improved sealing.

Recently introduced on the Gen III Vortec V-8s, returnless fuel injection represents a paradigm shift for GM, developed to improve performance and decrease evaporative emissions. Previously, Vortec 4.8Ls used a return line between the engine and the fuel tank to manage fuel pressure by bleeding off excess fuel at the fuel rail and returning the excess to the tank. The new system eliminates the return lines and moves the fuel pressure regulator from the fuel rail on the engine to the fuel tank. Because it delivers only the amount of fuel needed by the injectors, and returns no fuel to the gas tank, the returnless system essentially eliminates heat transfer from the engine to tank. This reduces the amount of vapor generated in the tank and captured by the vehicle's Onboard Refueling Vapor Recovery (ORVR) system.

With the returnless system, the 4.8L uses a fuel rail manufactured of stainless steel. The stainless steel rail allows installation of baffles that manage fuel pulses in the returnless system and reduce noise.

Advanced Electronic Throttle Control
GM Powertrain has led the industry in applying electronic throttle control (ETC) to its Vortec V-8s, which are now equipped with ETC in all applications. The Gen IV Vortec 4.8L introduces the next generation in truck ETC.

With ETC, there is no mechanical link between the accelerator pedal and the throttle body. A sensor at the pedal measures pedal angle and sends a signal to the engine control module (ECM), which in turn directs an electric motor to open the throttle at the appropriate rate and angle. ETC delivers a number of benefits to the customer. Besides throttle pedal angle, the ECM measures other data, including the transmission's shift patterns and traction at the drive wheels, in determining how far to open the throttle. ETC delivers outstanding throttle response and greater reliability than a mechanical connection, which typically uses a cable that requires adjustment. Cruise control electronics are integrated into the system, further improving reliability and simplifying engine assembly.

The Gen IV Vortec 4.8L takes ETC to the next level by taking advantage of capability built into its advanced E38 ECM (below) and further streamlining the system. Its up-integrated ETC system eliminates a Throttle Actuator Control (TAC) module. The TAC takes commands from the ECM and then operates the electric motor that opens and closes the throttle. The E38 manages the throttle directly, without a TAC. Eliminating the TAC reduces cost and improves reliability. The direct link between the ECM and the throttle motor improves throttle response time (albeit in millisecond increments that are not apparent to the driver) and improves system security by removing a device (the TAC) the must be monitored for malfunction.

The throttle body bore has been further optimized with two slight tapers known as "nostrils". These ever so slight machining changes to the bore provide additional resistance to harmful throttle body deposit formation.

E38 Engine Control Module

An advanced controller manages the multitude of operations that occur within the Vortec 4.8L every split second. The E38 is the mid-line controller in GM's new family of three engine control modules (ECM), which will direct nearly all the engines in Powertrain's line-up. It features 32-bit processing, compared to the conventional 16-bit processing in previous Vortec engines. The E38 operates at 59 MHz, with 32 megabytes of flash memory, 128 kilobytes of RAM and a high-speed CAN bus, and it synchronizes more than 100 functions, from spark timing to cruise control operation to traction control calculations. The E38 works roughly 50 times faster than the first computers used on internal combustion engines in the late 1970s, which managed five or six functions.

The family strategy behind GM's new ECMs allows engineers to apply standard manufacturing and service procedures to all powertrains, and quickly upgrade certain engine technologies while leaving others alone. It creates both assembly and procurement efficiencies, as well as volume sourcing. In short, it creates a solid, flexible, efficient engine-control foundation, allowing engineers to focus on innovations and get them to market more quickly. The family of controllers means the ECM and corresponding connectors can be packaged and mounted identically in virtually every GM vehicle. Powertrain creates all the software for the three ECMs, which share a common language and hardware interface that's tailored to each vehicle.

The E38 also applies a new, rate-based monitoring protocol sometimes known as run-at-rate diagnostics. Rate-based diagnostics improve the robustness of the Onboard Diagnostics System (OBD II) and ensure optimal performance of emissions control systems. The new software increases the frequency at which the ECM checks various Vortec 4.8L systems, and particularly emissions-control systems such as the catalytic

converter and oxygen sensors. Rate-based diagnostics more reliably monitor real-word operation of these systems, and allow regulatory agencies to more easily measure and certify emissions compliance.

58X Ignition System
The Vortec 4.8L has an advanced 58X crankshaft position encoder to ensure that ignition timing is accurate throughout its operating range. The new 58X crankshaft ring and sensor provide more immediate, accurate information on the crankshaft's position during rotation. This allows the E38 ECM to adjust ignition timing with greater precision, which optimizes performance and economy. Engine starting is also more consistent in all operating conditions.

In conjunction with 58X crankshaft timing, the Gen IV Vortec V-8s apply the latest digital cam-timing technology. The cam sensor is now located in the front engine cover, and it reads a 4X sensor target on the cam sprocket. The target ring has four equally spaced segments that communicate the camshaft's position more quickly and accurately than previous systems with a single segment.

The dual 58X/4X measurement ensures extremely accurate timing for the life of the engine. Moreover, it provides an effective back-up system in the event one sensor fails.

Enhanced Noise, Vibration and Harshness Control
The Gen IV Vortec V-8s were developed for quieter operation, with virtually every system or component reviewed in an effort to reduce noise, vibration and harshness. Quiet features built into the engines are complemented by improved engine cradles and mounting systems. These help reduce vibrations transmitted through the chassis and into the passenger compartment.

The NVH enhancements include floating pin pistons, which reduce noise and increase durability. These pistons have wrist pins that "float" inside new lead-free rod bushings and the piston pin bores. Compared to a conventional fixed pin assembly, in which the connecting rod is fixed to the piston's wrist pin and the pin rotates in the pin bore, the floating pins reduce stress on the pin. They allow tighter pin to pin-bore tolerances and reduce noise generated as the piston moves through the cylinder. To further reduce wear, the pistons are coated with a polymer material, which limits bore scuffing, or abrasion of the cylinder wall over time from the piston's up-down motion. The polymer coating also dampens noise generated by the piston's movement. The result for the customer is less engine wear, improved durability and quieter operation.

The Gen IV Vortecs also feature a new heavy-duty timing chain developed expressly for quiet operation. The chain, which connects the cam and crankshaft, is validated for 200,000 miles of operation and fitted with a new leaf-spring dampener. Even the most durable chains stretch with time. In many engines they must be adjusted or replaced at scheduled intervals. The Vortec 4.8L's chain dampener maintains optimal chain tension for the life of the engine and eliminates any flapping motion that might develop as the chain stretches with mileage. It ensures that the timing chain operates as smoothly and quietly as new, even as the engine accumulates high mileage.

Exhaust manifolds were developed to improve durability and sealing and reduce operational noise. Cast nodular iron was the material of choice for its basic durability and excellent heat management properties. The manifolds feature saw cuts along their

cylinder head mounting flange. Originally developed for the big-block Vortec 8.1L, these cuts split the flange into three separate sections, allowing each section to move under extreme hot-cold temperature fluctuations without interacting with, or creating stress on, another section. The cuts virtually eliminate friction on –and movement of—the exhaust manifold gaskets. This helps ensure proper sealing for the life of the engine and reduces the chance of gasket failure.

The exhaust manifolds are fitted with new triple-layer heat shields fabricated from stainless steel and insulating material. The shields limit heat transfer from the engine to the engine bay, allowing the Vortec 4.8L to reach optimal operating temperature more quickly, yet reducing heat in the engine compartment once that temperature is achieved. They also dampen the sound of exhaust gas rushing through the manifolds and further reduce the amount of engine operational noise that finds its way into the vehicle interior.

Advanced Ignition Coils
The Vortec 4.8L's individual coil-near-plug ignition features advanced coils developed for the LS2 and LS7 Corvette V-8s. The new coils are smaller and lighter than those used on previous Vortec V-8s. They are still mounted on the rocker covers, but they attach with a new mounting bracket that simplifies engine assembly. An individual coil for each spark plug delivers maximum voltage and consistent spark density, with no variation between cylinders.

Iridium Tip Spark Plugs
Improvements to the Vortec 4.8L's ignition system include advanced spark-plug technology. Its spark plugs have an iridium electrode tip and an iridium core in the conductor. The iridium plug has a recommended life of 100,000 miles, but it offers a number of advantages over the platinum-tip plugs previously used in Vortec V-8s.

The iridium spark plug has higher internal resistance, maintaining optimal spark density over its useful life. Its "self-cleaning" properties are improved, decreasing potential for plug fouling and further reducing the likelihood of maintenance over the 100,000-mile plug life. The electrode design improves combustion efficiency for maximum fuel economy and minimum emissions. Finally, iridium is more plentiful than platinum, reducing the plug's material cost and preserving scarce noble metals.

Overview
The Vortec 4.8L delivers V-8-grade towing capability, more horsepower than the competition's small V-8s and the fuel-efficiency of some six-cylinder engines. It's the right engine for many full-size pickup and sport-utility vehicle buyers. The all-new Gen IV 4.8L simply extends its advantage.

The latest Vortec V-8s are the most powerful, durable and efficient in the vaunted history of GM's small-block V-8. They generate higher specific output—horsepower per liter of displacement—yet operate with lower noise and vibration levels. They were developed to improve fuel economy and reduce emissions. Compared to the typical truck engine a decade ago—much less the original small block in 1955—the new Vortec V-8 generates 90 percent fewer exhaust and evaporative emissions. And they should last longer than any of their predecessors, with nothing more than routine maintenance (which is limited to oil changes for the first 100,000 miles).

The new Vortecs have undergone the toughest, most comprehensive validation in five decades of small-block development, in laboratories and through road-testing in extreme climates. The Vortec 4.8L has been dyno tested to the equivalent of 150,000 miles.