

## NEW SIX-CYLINDER POWERS VOLVO 964

Volvo's new top-of-the-line 960 is powered by a sophisticated new inline six-cylinder engine. It is the first of a family of modular engines designed and built by Volvo. Designated the B6304F, the engine is powerful, efficient, and smooth. It is capable of delivering the kind of performance people expect from a luxurious European car. At the same time, its relatively small displacement and high efficiency deliver very respectable fuel mileage. You might say the 960's new power plant is tuned for our times.

Volvo engineers believed it would take an engine of about three liters displacement to provide the kind of performance they wanted for their new flagship model 960. Realizing that buyers in this segment are very sensitive to noise and vibration, they decided to build a six cylinder. An inline configuration was chosen because it is inherently well balanced and smooth. The one drawback to an inline six is typically its length, but Volvo engineers have been able to hold the length of the new engine to just four inches more than their proven 2.3 liter four cylinder.

Weight was an important consideration in achieving the high fuel efficiency the 960 should have, so aluminum alloy was selected as the material for all major castings. The use of aluminum, in combination with finite element analysis techniques, has produced a very compact engine which is both light and strong. To help insure the kind of durability Volvo engines are famous for, the cylinders

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have cast-in iron liners. A very sophisticated casting technique also allows the use of cast iron reinforcements in the main bearing caps which are cast into a single lower crankcase. All the main bearing caps are cast into one lower crankcase unit for additional strength and durability. This design is often found in racing engines.

The engine is composed of five major sections, like the layers of a cake. Starting from the top, they are: the camshaft housing, cylinder head, cylinder block, lower crankcase, and oil pump. These five cast aluminum sections are fastened together with bolts and assembled with liquid gaskets instead of traditional gasket materials to assure close tolerances.

The cylinder head has been designed to maximize flow and to optimize combustion. A toothed belt drives two overhead camshafts which operate the valves via hydraulic tappets that require no adjustment. Each of the pent-roof combustion chambers has four valves for good breathing. The shape of the chamber allows a high 10.7:1 compression ratio which is good for efficient burning. By carefully controlling the combustion process, Volvo engineers have been able to make this high compression engine operate on regular unleaded fuel.

The complex job of engine management is controlled by a Bosch Motronic 1.5 system which handles both the fuel injection and ignition functions. The traditional distributor is absent, replaced by six individual coils sitting directly atop their respective plugs. The Motronic system has a self diagnostic function to speed repair in the unlikely event of a failure.

To capture all the potential of the new engine, the entire path of gases flowing into and out of combustion chambers was studied. The result was a large spherical intake plenum with long, smooth, individual runners to each cylinder. On the

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exhaust side, twin exhaust manifolds combine with twin double walled exhaust pipes that curve smoothly to meet at the catalytic converter. Easy in, Easy out.

That's enough of the engineering talk. Now you probably want to know how it performs. In a word, great! From its 2.9 liters or 178 cubic inches of displacement, the robust little engine delivers 201 hp at 6000 rpm. That is over one horsepower per cubic inch! A decade ago, you had to look at race car engines to see that kind of output. The horsepower number is impressive. At 201, this is the most powerful engine Volvo has ever put into production. In everyday driving, it is really torque, not horsepower that makes a car feel responsive. With 197 lb. ft. of torque at 4300 rpm, this engine should feel very responsive indeed. Adding to the pleasant driving experience, is the fact that 80% of that torque is available from only 1000 rpm. Another impressive achievement.

And let's consider fuel economy. The 960 delivers 18 mpg city and 26 mpg highway on the EPA test cycle. No gas guzzlers here. Of course, it is not only the engine but the transmission which contributes to this fine performance, and Volvo has news here as well.

The AW40 is a four-speed electronically controlled automatic transmission, developed and programmed specifically for the Volvo's new six-cylinder engine. The transmission senses throttle position, road speed, engine speed, and engine load, then it calculates the correct gear, appropriate shift point, and converter lock-up status. The electronic control unit provides smooth gear changes, improved fuel economy and a choice of driving modes.

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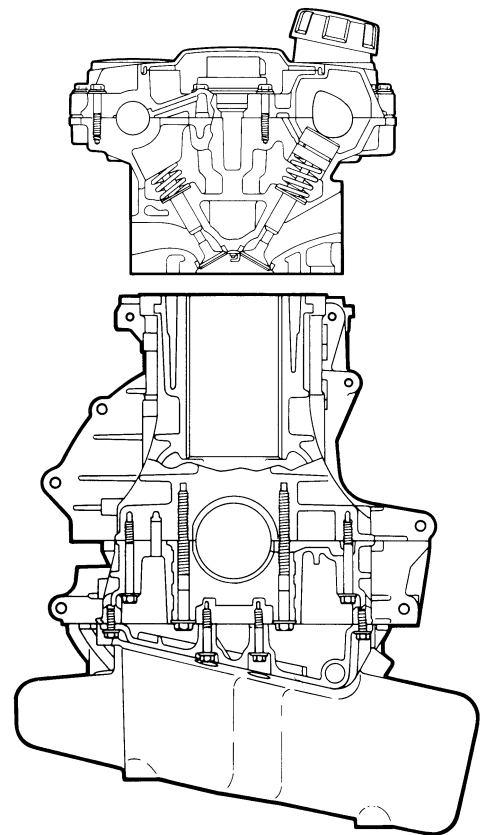
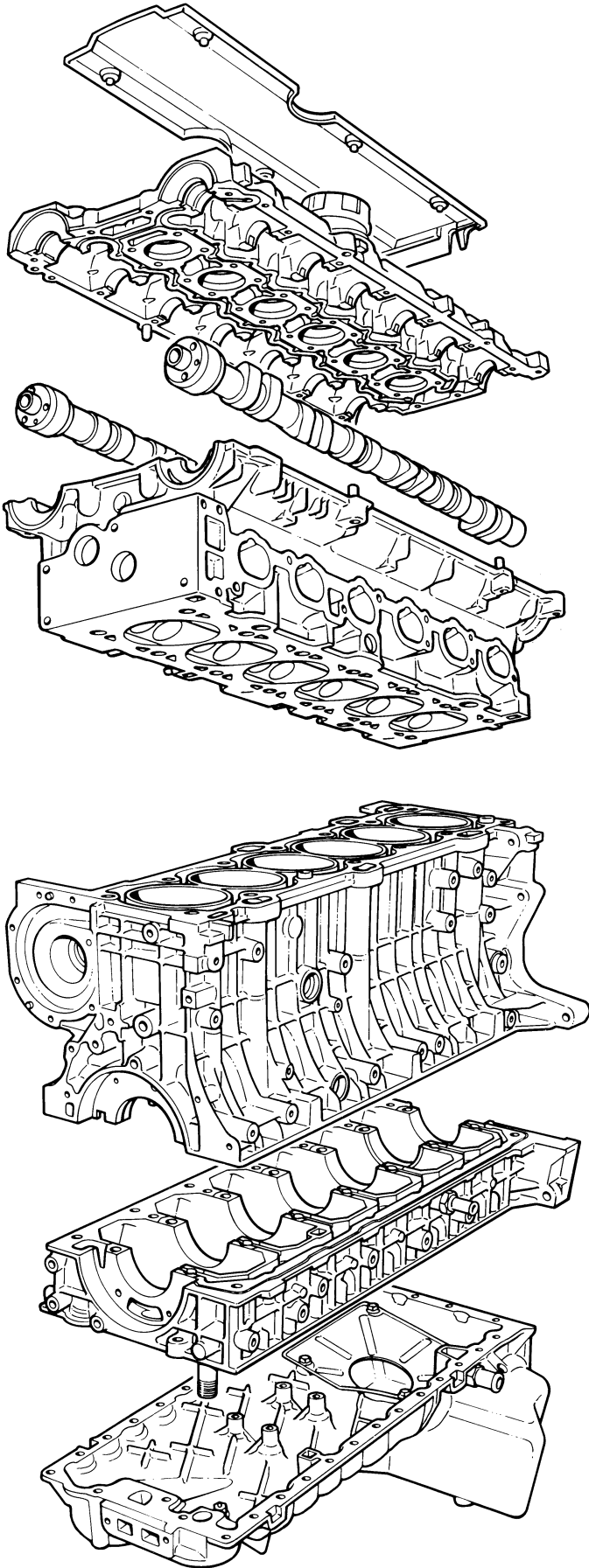
The 960 driver can select from three driving modes : economy, sport, or winter. In the economy mode, upshifts are gentle and executed at relatively low engine speeds for best fuel economy. Switching to sport mode allows the engine to rev higher before shifting for increased performance. The winter mode will lock out first and second gear so that starting off in low traction conditions, like ice and snow can be accomplished with minimal wheel spin. The 960 also features an automatic locking differential which further assists starting traction in slippery driving conditions.

Another unique feature of this transmission is the "down-slope mode" which senses when the car is descending a hill and automatically engages a lower gear to provide engine braking. This feature is typical of the attention to details that Volvo engineers are famous for.

Volvo's new six-cylinder engine and four-speed electronically-controlled transmission are extremely impressive on paper. But that is only half the story. The best way to really appreciate the performance, low noise level and smoothness of the 960, is to drive it! Then you can determine for yourself how well the Volvo designers achieved their goals.




# VOLVO

B6304F Engine  
Aluminum Alloy  
In-Line 6 Cylinder  
3 Liter 24 Valve  
201 HP at 6000 RPM  
197 lb ft at 4300 RPM



# AW40

## Driving modes

-  **Winter**
-  **Sport**
-  **Economy**

