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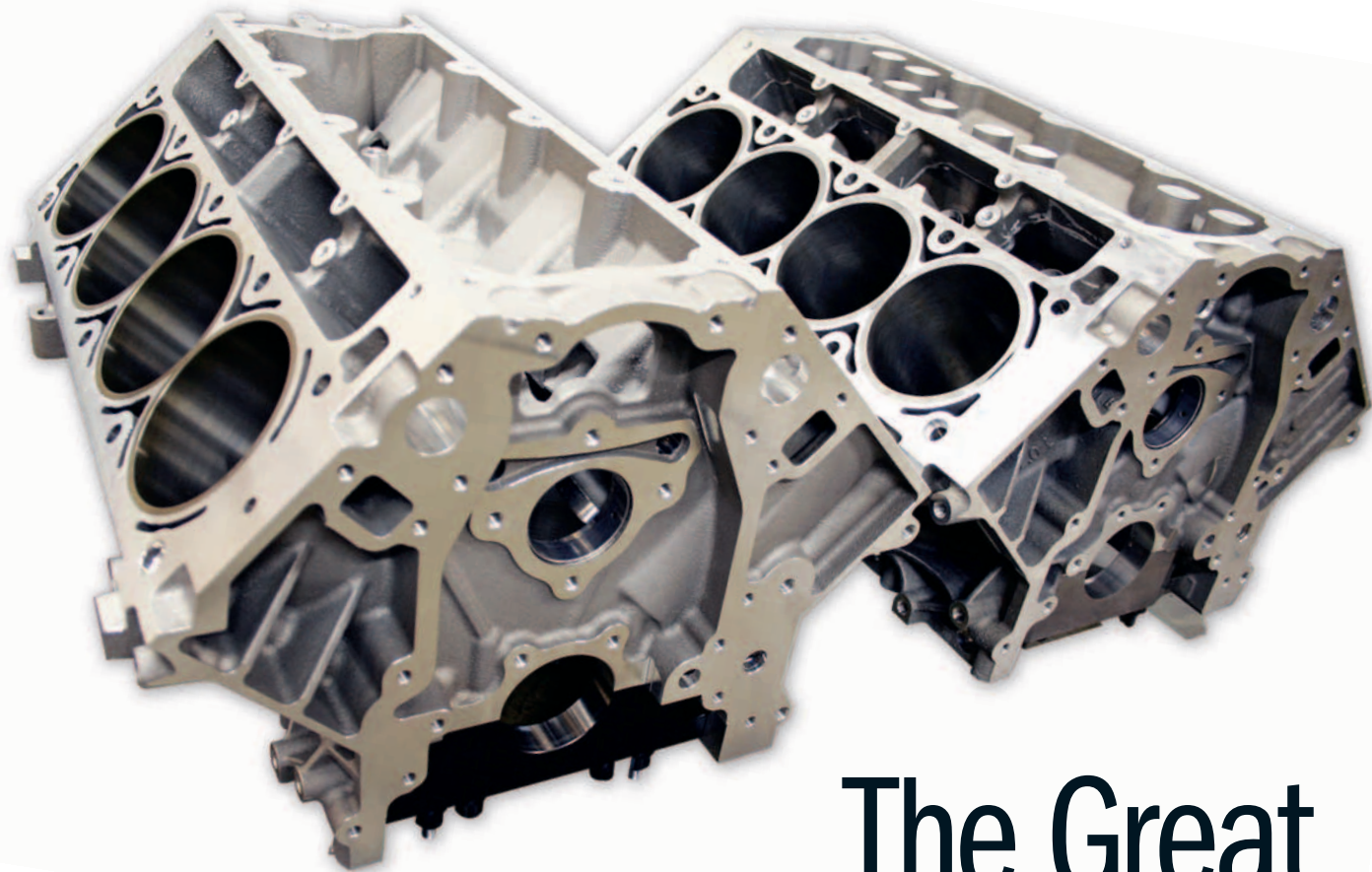
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# The Great **CYLINDER-BLOCK** Debate

BY BARRY KLUCZYK  
PHOTOGRAPHY BY THE AUTHOR

Race-designed C5-R or economical LS7: two choices  
for building a 427 street engine

**B**etween 1999 and 2005, the Corvette C5-R racing program annihilated the competition in the American Le Mans Series. The team collected 45 wins in 66 starts—a win ratio of about 70 percent. It will certainly go down in history as the most auspicious racing program in the Corvette's history.

Much of the credit for those continuous wins can be ascribed to the fortitude of the powerful C5-R 7.0L racing engine. The C5-R was based on GM's Gen III small-block V-8 but featured numerous enhancements designed to provide the strength needed for daylong endurance races. It was also designed as a structural

member of the Corvette C5-R race car's chassis.

After some internal prodding by far-thinking employees and external begging from some deep-pocketed enthusiasts, GM Racing released the C5-R cylinder block for civilian use through the GM Performance Parts (GMPP) network. Weekend racers and street enthusiasts rejoiced—and winced. The retail price for a C5-R was (and is) more than \$6,000. That's just the cylinder case, mind you—not a whole engine. Granted, for the money, one receives a race-prepped block with some serious hardware. To date, about 500 C5-R blocks have been purchased outside of

the Corvette racing program.

A paradigm shift in affordable big-inch LS engines has taken place with GMPP's release of the LS7 cylinder block (PN 17802854). Like the C5-R, the LS7 block is an aluminum block that enables the construction of a 427ci engine. The LS7's production manufacturing, however, means it costs substantially less than the C5-R block. In fact, at around \$3,200, the LS7 block costs about half as much.

This is huge. It opens up a new world of engine-building possibilities for those who have trouble rationalizing a \$6,000 charge on the American Express card.

## The High Cost of Racing

Invariably, the question is begged ... if the LS7 is half the price of the C5-R block, is it only half as strong or half as good? Not at all, according to GM Racing's Bob Cross. "The C5-R block was originally designed only for competition use, so it features a lot of exotic production treatments and racing hardware," he says. "This block was never intended to be offered to the public, and its cost reflects the processes involved in its manufacture."

In other words, the cost disparity between the C5-R and LS7 has less to do with what the LS7 lacks than what goes into manufacturing the C5-R.

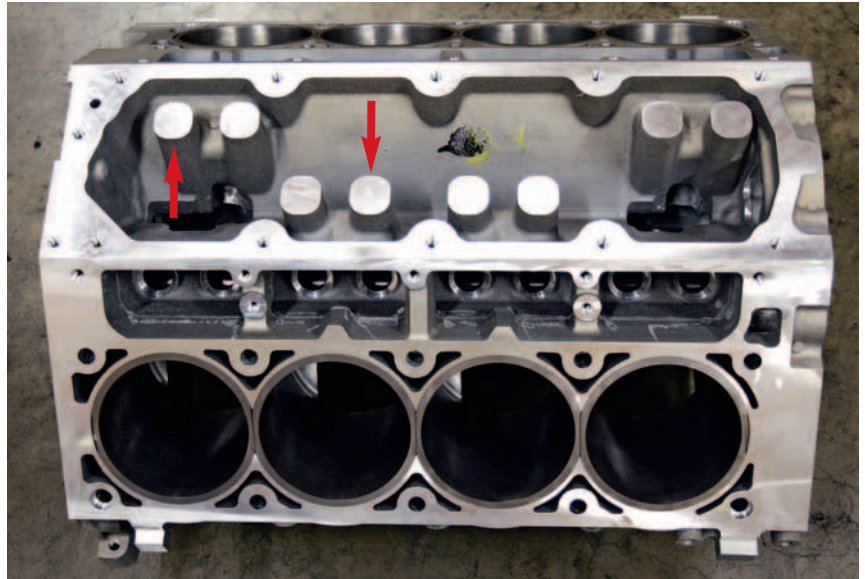
"Keep in mind, the LS7 was designed to support up to 650 hp," says Cross. "The C5-R was designed for 750 normally aspirated horsepower, but it also had to integrate with-in the chassis as a structural member and last for 24 hours of all-out competition."

Admittedly, those are performance parameters most private enthusiasts won't push—making the LS7 look even more like a value. One of the caveats of jumping onto the LS7 bandwagon is the current absence of an over-the-counter controller from GM for the engine. But just as engine builders have adapted stand-alone systems for their C5-R-based engines, so too will they find a workaround for LS7-based buildups. FAST, for example, recently introduced an adapter that allows the factory LS7 MAF to clip onto the LS2 wiring harness, making the swap that much easier.

## Side By Side

There are obvious differences between the LS7 and C5-R blocks. Production differences include details such as varied external ribbing—the C5-R has increased ribbing because the engine was designed as a structural member of the race-car chassis—and conventional (LS7) versus screw-in (C5-R) galley plugs. The major differences are the ones that account for much of the price disparity between the two blocks.

To begin, the C5-R block is cast with a very specific recipe of 356M aluminum. Once cast, it is heat-treated and *hipped*. Hipping, a reference to hot isostatic pressure, is a procedure in which the block undergoes a multistep treating process that pressurizes, heats, and cools it to ensure strength and all but eliminate porosity. Approximately 20 percent of the



*The LS7 block (top) is based on the same casting as other Gen IV engines, including those with the cylinder-deactivating Active Fuel Management (AFM) feature. The cast towers of the LS7 are carryovers from Gen IV engines with AFM, but because the engine isn't equipped with it, the towers aren't machined. The C5-R block doesn't have AFM provisions.*

C5-R block castings that undergo this expensive (several hundred dollars per block) and time-consuming process are rejected. The production LS7 block doesn't receive this treatment, but it also wasn't designed for professional endurance.

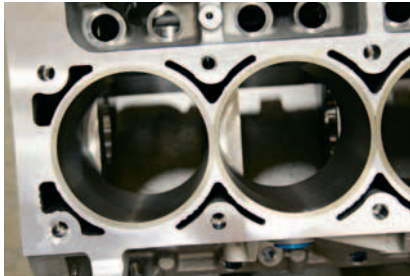
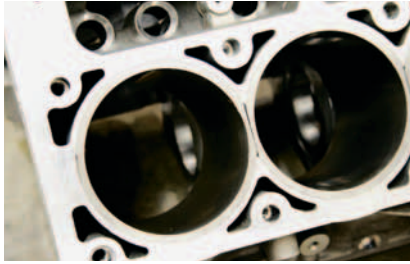
Both the LS7 and C5-R blocks receive precise machining and leak testing, but the C5-R block features align-honed camshaft and crankshaft journals. The align-honed cam journals ensure the camshaft and crankshaft are squared up, which is essential to engine life under extreme racing conditions.



*The large hole at the rear of the Gen III-based C5-R block is a boss for the camshaft-position sensor. The LS7 block is based on the Gen IV design, which also includes the LS2. Gen IV engines have a front sensor mounted in the timing cover.*



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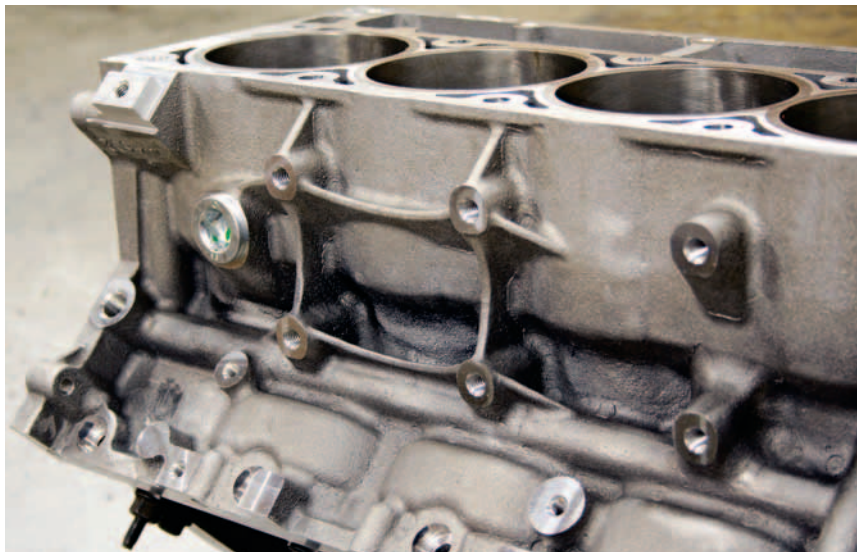
A look at the decks of both the LS7 block (top) and the C5-R reveals several differences. The water jackets are slightly different, and the casting of the C5-R block shows more material in the lifter-tray mounting pad. Also, the C5-R uses more-expensive G3 material for the cylinder liners. The LS7 bores are 4.125 inches, and the deck height is 9.240 inches. The bores are honed with a deck plate in place, and development of the block was based on the performance of the C5-R block.



The fronts of the blocks are similar, but the C5-R (above) has more-pronounced oil galleries and water jackets.



The LS7 block's rear bulkhead has a cast-in reminder of its intended displacement.



A comparison of the outer walls reveals apparent differences, too. The LS7 (above) doesn't have the screw-in galley plugs of the C5-R (below). The C5-R also has more-pronounced ribbing. The screw-in plugs cover ports in the water jackets that were used during the casting process to hold the core firmly in place and keep the jackets more stable. Look closely, and you'll see the water jackets are a little deeper on the C5-R. Also, the extra ribbing on the C5-R was designed into the Corvette race cars because the engine is a structural member of the chassis, something that's not an issue with street cars.



As on the front of the block, the C5-R (right), has its water jacket pushed farther outward in order to get more water around the No. 8 cylinder. Also note the vertical

The main caps are also significantly different between the blocks. The LS7 uses strong, powdered-metal caps and bolts, while the C5-R uses billet-steel caps with racing-spec A1 Technologies stud fasteners. Also, when ordered from GM Performance Parts, the C5-R block includes a hardware kit with premium fasteners—and it ain't a bag of cheap nuts and bolts.

The C5-R block obviously carries the street cred of the haloed C5-R racing program, but for street enthusiasts, the LS7 block will likely prove to be the cylinder case of choice. It's strong, well designed, and comparatively affordable.

"There's no denying the strength and capability of the C5-R. It exceeds at the performance it was designed to deliver," says Cross. "But the LS7 is an exceptionally strong foundation that will serve most enthusiasts well. It offers tremendous value for the money."

When building a big-inch street engine on a budget, value is just as important as surviving 24 hours of racing at Le Mans.



A look at the rear corner of the LS7 block shows the inlet for the engine's dry-sump oiling system.



casting between the cam and crank journals, which is absent from the LS7 block. It's a more pronounced oil gallery. ▲

## Retro-Carb Capability

OK, here's the scenario: You've just decided to "restify" that old C2 or C3 in your garage, and the Gen IV LS7 seems like the hot ticket to put a post-modern 427 in the car. Trouble is, the production engine doesn't look at home under a Stinger or L-88 hood.

Solution: Ditch the port fuel injection for a carburetor. The swap is much easier than you might think, and GM Performance Parts has the replacement intake manifold to do it, too. You'll need an ignition driver after that, but they're readily available.

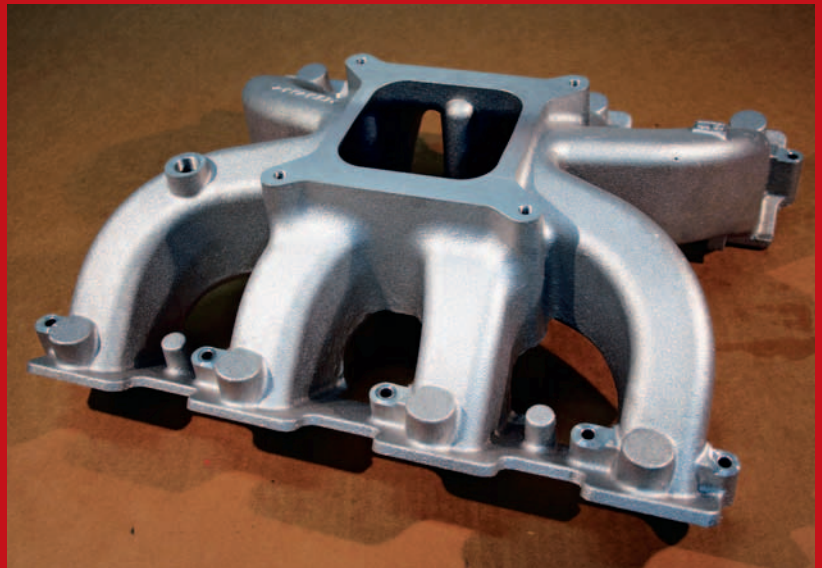
The carb manifold is based on the Gen IV's square-port cylinder-head design. GMPP already offers a carb intake for Gen III (LS1, LS2, and LS6) engines with "cathedral" port

heads (PN 88958675).

The Gen IV intake features an open plenum and a 4150-type square-bore mounting pad. Bosses are cast at the base of each runner, with some versions machined with injector bosses for EFI applications (yes, the bosses can be used for nitrous).

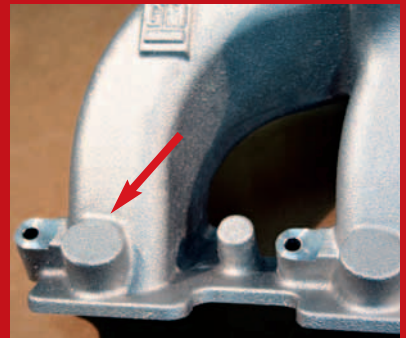
Four versions of the Gen IV intake are available—two for the LS7 and its higher, squarer ports, and two for L92 heads used in the Cadillac Escalade/GMC Yukon Denali. The two versions for each engine include a nonmachined carb version and the machined-for-EFI version. Here are the part numbers for each Gen IV intake.

Manifold	Part Number
LS7 carb	25534394
LS7 EFI-machined	25534413
L92 carb	25534401
L92 EFI-machined	25534416



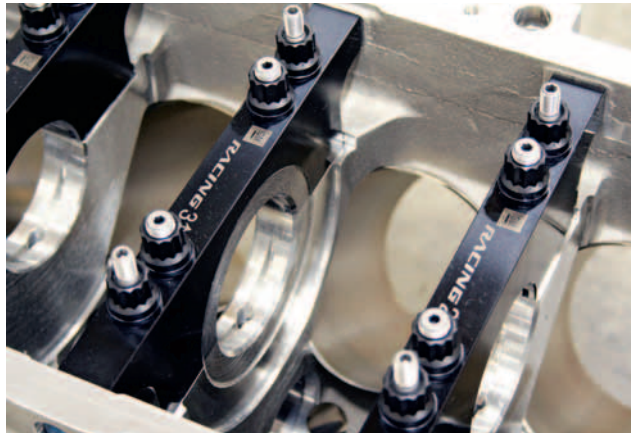
▲ A new carburetor-type intake manifold is available for the LS7, allowing the factory port-injection system to be replaced with a simple carb setup. An ignition driver is all that's needed to complete the swap. Versions are available for both the LS7 and L92 heads.

Cast-in bosses on the intake manifold are machined for EFI on some versions. Nitrous can also be plumbed through the bosses. ►





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Other details of the main-bearing caps include machined bay-to-bay windows on the C5-R. The LS7 has cast-in windows (the machining chore adds cost to the C5-R). Also, the webbing beneath the main caps is a little thicker on the C5-R. Finally, the C5-R main-cap hardware is supplied by A1 Technologies.



One of the most significant differences between the LS7 block and C5-R block can be found in the main caps. On the LS7 (top), they're made of powdered metal; on the C5-R, they're 8620 billet steel.

## SOURCE

GM Performance Parts  
[www.gmperformanceparts.com](http://www.gmperformanceparts.com)