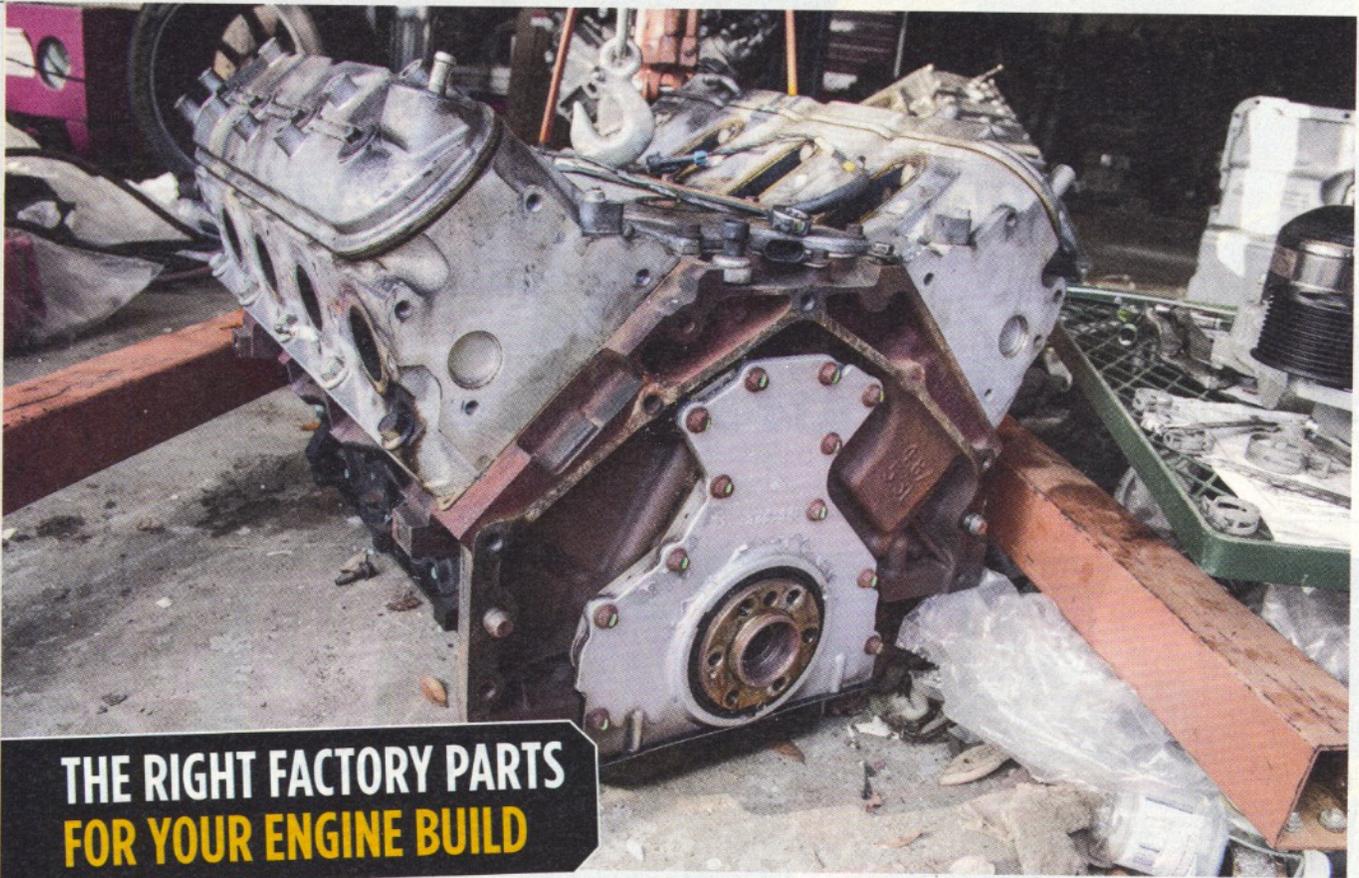




# PICKER'S GUIDE TO **LS** ENGINES



## THE RIGHT FACTORY PARTS FOR YOUR ENGINE BUILD

*The number of variations* of the popular LS engine is downright scary if you are new to the game and trying to figure out which one to grab at the junkyard or online. So let's start from the beginning. The Gen III small-block V-8 era began with the 1997 Corvette's 5.7L LS1. Like all Gen III and IV engines, it had the same 4.400-inch bore spacing as its small-block predecessors. The clean-sheet design had a deep-skirted block with six-bolt mains that would be carried throughout the lineup, as well as a new firing order (1-8-7-2-6-5-4-3) and high-flowing, 15-degree cathedral port aluminum heads to top it off. The LS1 was just under 350 cubes (346 cid to be exact) with a 3.89-inch bore aluminum block and 3.62-inch stroke. The rotating assembly consisted of durable hypereutectic aluminum pistons, 6.089-inch powdered metal connecting rods, and a nodular iron crankshaft. Aside from the later and higher-horsepower Gen IV engines, this was also carried throughout in varying sizes. A few changes were made to the camshaft and intake, which accounted for the varying power levels from the LS1's initial launch through its use in the

Camaro, Firebird, and GTO. A higher-performance version was created for the 2001-'04 Corvette Z06, dubbed the LS6, with higher-flowing heads, hotter cam, and an improved block. This engine was later used in the first-generation Cadillac CTS-V.

In the meantime, GM had taken the original LS1 design and cast it in iron for trucks. The efficiency of the engine lent itself well to these applications, albeit in a more affordable package. The 4.8L LR4 and 5.3L LM7, L59, and LM4 have become something of Internet folklore—make 1,000 hp with your junkyard engine! All four share an

identical block that is very rigid. The difference in displacement is due to the 3.27-inch stroke crank on the LR4. The camshaft and even the pistons vary among the five 3.78-inch bore blocks, including the aluminum L33. However, all five can be honed to 3.89-inches to use LS1 or LS6 pistons. If it is a large bore that you crave, the 6.0L blocks (LQ4 and LQ9) are the best of the Gen IIIs. These iron anchors were used in

the heavier duty trucks, SUVs, and vans. Unlike the 5.7L aluminum blocks, which only take a light hone, the 4.00-inch bores could be enlarged 0.030 over like a typical small-block. In fact, some blocks have proven capable of even larger bores (around 4.125-inch) through magnafluxing. On average, though, any 6.0L will go up to 408 cubic inches by taking the stroke up to 4.00 inches. Longer stroke cranks are available, but not

recommended with this block because it has the shortest cylinders of the bunch. As the piston pops out of the hole (at bottom dead center) it becomes unstable and causes premature skirt wear. In case you're wondering, the easiest way to tell the iron truck blocks apart is via the engine size cast onto the front and back of the block. Unfortunately, though, there is no way to tell the 4.8L from the 5.3L externally.



When trying to identify a block, one place to start is next to the water passages on the front. Many of the blocks like this LS1 have the year it was cast. Between the different LS1 castings, you typically want the later blocks because the machining improved over the years, not to mention the actual casting. The '99-and-later blocks featured added strength, thicker cylinder liners, and improved cam bearings, as well as better oiling.



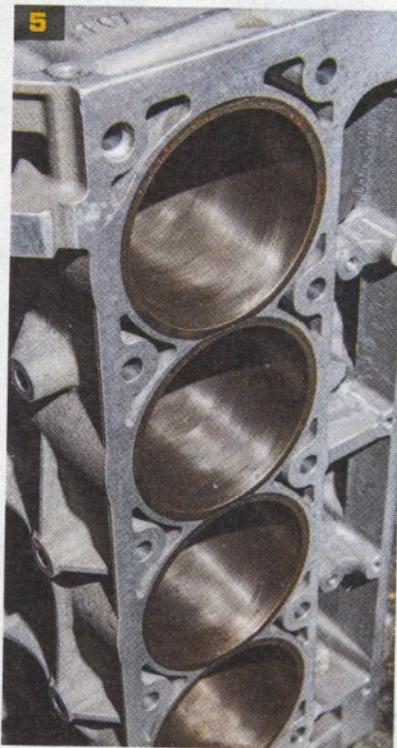
The oil passage is a dead giveaway, but if it is covered up—all early blocks carry casting number 12550592. This is an LS6 block, the most desirable 5.7L because it has improved crankcase breathing. It uses the same 319-T5 aluminum, centrifugally spun iron cylinder liners, powdered metal (steel) six-bolt main caps, and 3.89-inch bore. In case you are wondering, all OEM LS blocks have a 4.400-inch bore spacing and 9.240-inch deck height.



The engine size is also cast right into the front and rear of the block. From the factory, either the 4.8L or 5.3L would be circled with marker. Unfortunately over time it wears off and it is impossible to tell a 4.8L from a 5.3L from the exterior. The blocks are identical; it's just that the 4.8L has a shorter stroke crankshaft (3.267 vs. 3.620).



This trend continues throughout the lineup of LS engines, including this 6.0L LQ4/LQ9 block. These are some of the strongest factory LS blocks made. It was rumored that the wall thickness was unchanged from the aluminum LS1 design, making it much thicker than it needs to be. Perhaps that is why some people have found that certain blocks can actually be bored out to 4.125-inches. 4.030-inches is pretty much the universal standard, though, and the head boltholes can be drilled out for 1/2-inch studs if you plan on adding boost. Note: the head bolt length changed throughout the run of iron and aluminum blocks. Later castings have shorter bolts.



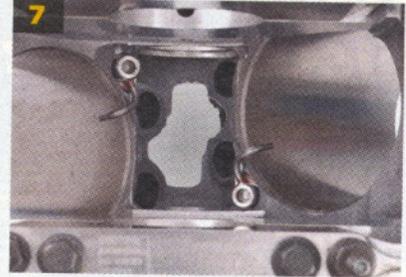
The limitation of the platform is the 4.400-inch bore spacing. On this machined LS7 block you can see just how thin it gets between the cylinders with a 4.135-inch bore (4.125-inch is stock). Unlike the other aluminum blocks, the LS7 has press-in liners. And the thin separation makes this the most fragile block, and not suited to boost or nitrous.



The 5.7L, by comparison, has greater support for each cylinder. However, for higher boost levels an iron block is still preferred.

Among the Gen III engines produced from 1997-'07, there are essentially two to three head designs. The early design is the most common, which is based off the original LS1 ("241" casting) head. You'll find this on every 5.3L or 4.8L truck engine. The others vary only in valve and combustion chamber size. The LS1 has 67.3cc chambers with 2.00/1.55-inch valves.

Meanwhile, the "852" and "706" heads from the 4.8L/5.3L have 61.15cc chambers and 1.89/1.55-inch valves. These are more suited to high-compression builds with larger valves and porting, but pale in comparison to the LS6-based "799" castings from the L33. The LS6-based "243" designs took the cathedral design to the next level with larger intake (210cc vs. 200cc) and



The LS9 and LSA blocks are the exception to the rule, as they were engineered for boost. Case in point, these piston oil squirters cool the pistons for better longevity and resistance to detonation. In addition to the squirters, these blocks are a much stronger design overall. The LS9 even uses a stronger 319-T7 alloy and 1045 forged steel main caps.

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This is an original LS1 cylinder head—the cathedral port that started it all, carrying casting number 241. At 200 cc, the runner design is pretty high velocity yet still flowing 233 cfm at 0.600-inch. With porting, around 300 cfm can be achieved.