

# Make a Buck at Home

ELECTRONICALLY REPRINTED FROM JANUARY 2008

# STREET RODDER

THE WORLD'S STREET RODDING AUTHORITY

## Home-Delivered Highboy

### Spraying Primers

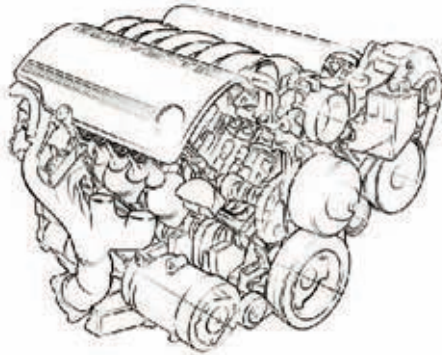


### Homemade:

- ◆ Dashboard
- ◆ Shock Mounts

# HIGH-TECH TRADITION

a look at gen III and IV gm engines



The all-aluminum LS1 was a completely new design and shared virtually nothing with earlier small-blocks. Measuring 28 3/4 inches from the fly-wheel to the end of the water pump, 24 3/4 inches wide, and 28 1/4 inches high, the complete package tips the scales right at 430 lbs.

**W**hile our hobby is certainly steeped in tradition, technology has always played more of a role than is often recognized. Although the Flathead Ford is archaic by today's standards, it was cutting edge in 1932, and it didn't take long for enthusiasts to forsake their four-bangers for the revolutionary V-8. Then, when the new crop of OHV engines began to appear in '49, lots of Flatheads were given the heave-ho in favor of the more sophisticated contemporary powerplants. And when the 265 Chevy came on the scene in '55, it was a brave new world for hot rodders. But since the small-block Chevy first appeared, there have certainly been some advancements in engine technology, two of the most notable being General Motors' Gen III and IV series of engines, but for some reason, it's taken rodders longer to embrace them.

The first engine in the Gen III series was the LS1, which featured a bore of 3.897 inches and a stroke of 3.662 inches, resulting in a displacement of 345.69 ci; however, Chevrolet called it a

A hopped-up version of the aluminum-head/cast-iron block 5.3 LS is available from GM Performance under PN 19165628. Originally rated at 295 hp and 325 lb-ft of torque, a cam and piston update raises those numbers to 332/352, respectively.



350, or a 5.7L engine. Based on an aluminum block that weighed a scant 107 lbs, thanks to the deep skirt design and six-bolt main caps, it was every bit as rigid as its 160lb cast-iron predecessor. Also found inside the block were cast-iron liners, a new, shorter nodular iron crankshaft, and powdered metal rods. While the curmudgeons among us scoff at the thought of connecting rods being made in a manner reminiscent of baking a cake, the truth is, these are the strongest rods ever to find their way inside a production GM engine.

The LS1 architecture is considerably different to those familiar with the traditional small-block Chevy, which means just about every street rodder on the planet. Some of the most obvious differences are up top. Cast from 356 aluminum and heat-treated to T6 specs, the new heads have a long list of advantages over previous designs. Upon close inspection, one of the most obvious is that all the intake ports are all identical, as are the exhausts, which simply means that all cylinders breathe equally well. Less obvious differences in the new heads are the valve angles. It's generally agreed that the shallower the valve angles the better. The LS1 valves are at a 15-degree angle, considerably less than the earlier small-block's 23 degrees. But one of the LS head's most important attributes is the location of the fuel injectors. As these heads were designed for fuel injection rather than retrofit with it, the injector's fuel streams are aimed directly at the back of the intake valves.

GM Performance Parts offers this complete LS1 engine assembly (PN 17801267). Rated at 350 hp and 365 lb-ft of torque, it includes a Corvette-style oil pan, electronic drive-by wire throttle body, intake manifold, exhaust manifolds, fuel rail with injectors, balancer, and 14-inch automatic transmission flex-plate; no electronics or wiring harness included.



If you're looking for lots of grunt, the 5.7L LS6 makes 405 hp and 400 lb-ft of torque thanks to a higher lift cam and increased compression. It comes with the Camaro/CTS-V-styled oil pan and is found under PN 17801268.



Like most contemporary engines, the LS1 uses roller lifters as well as investment cast roller rockers. But one of the pieces that makes old-timers do a double take is the “plastic” intake manifold. Frankly, the common lament that those manifolds won’t be around in 75 years like a Flathead Ford’s makes us want to point out that neither will we. The fact is, making the manifold from composite material allows for the curved runner configuration, plus it’s light and cost effective. Another unique feature found on the manifold is the fly-by-wire throttle body. The LSI was the first GM car to use a computer-controlled throttle (light-duty diesel trucks began using them in ’95).

Cataloged as PN 19156261, the 6.0L LS2 produces 400 hp. Cylinder heads are high-flow pieces used previously on Corvette LS6 engines. GM Performance offers a reference guide to help install this engine in older cars.



Want an LS family engine without the complication of fuel injection? The LS 364/440 (PN 17802134) is based on the LS2 and features a four-barrel intake manifold. Other features include lightweight flattop pistons with a 10.9:1 compression, and LS6-style cylinder heads.

Called the LQ9, the 6.0L (PN 19156262) is based on the iron-block/aluminum-headed Cadillac Escalade engine and makes 345 hp and 380 lb-ft of torque.



Of all the features of the LS1 that are out of the ordinary, the most obvious are the rocker cover-mounted coil assemblies. Each cylinder has its own coil and coil driver assembly with a short secondary wire connecting to each spark plug. The reasons given for moving the coils to the covers were the shorter plug wires lost less energy so more was delivered to the plug as well, as reduced radio frequency interference with on-board computers. A less noticeable feature is the change in firing order; no longer using the familiar 1-8-4-3-6-5-7-2 sequence, new engines fire 1-8-7-2-6-5-4-3.

Sold without an ECM and wire harness, the L92 (PN 19165485) is the same 6.2L engine found in the ’07 Cadillac Escalade and GMC Yukon Denali and is good for an astounding 403 hp and 417 lb-ft of torque. Note the accessory drive and top cover are not included.



The LS7 produced 505 hp and 470 lb-ft of torque in the ’06 Z06 Corvette. That same engine is available in crate form as PN 17802397. Based on a 7.0L aluminum dry-sump block, it features CNC-ported cylinder heads, and titanium rods and valves.

With all that is unique on the LS1, one of the pieces that almost escapes notice is the pan—but there’s more to it than meets the eye. There have been a half-dozen or more cast-aluminum pans used on these engines; the Corvette, or batwing pan, is a two-piece and has two wings to the sides, and the Camaro and Firebird pans have a shallow rear sump. But no matter what the shape is, in all cases the pan becomes a part of the engine’s structure when screwed in place and contributes to the block’s rigidity. Another unique feature is these pans also provide a mount for the oil filter.

## FAMILY TREE

General Motors’ new engines can be broken down into two series: Generation III and Generation IV. They share the same features and attributes in most respects.

Gen III blocks were made from cast iron in 4.8L/5.3 and 6.0L sizes (used primarily in trucks) and aluminum for 5.3L, 5.7L, and 6.0L. While iron blocks are heavier, they can easily be bored over-size during a rebuild; the aluminum blocks shouldn’t be bored more than .010-inch according to GM.

As we said, there are various versions of the Gen III, but the following are most sought-after:

**LS1** The 5.7L LS1 was the first in the Gen III series. The engine was used in the ’97 Corvette C5 and was later found in the Camaro, Firebird, and GTO. Horsepower varied from 305 to 350 depending on the application. A cast-iron version of this engine appeared in trucks in 1999.

**LS6** Debuting in the C5 Z06 Corvette in 2001, this engine was an enhanced version of the LS1. The block was improved, the intake manifold modified, the cam was more aggressive, and compression was increased. While the displacement remained the same, the LS6 produced 385 hp when introduced, and it was cranking out 405 ponies by 2002.

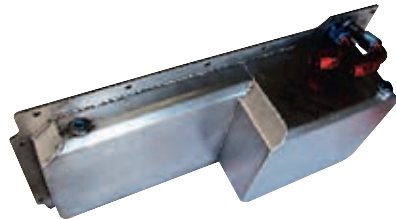
From Billet Specialties comes the LSX Tru Trac system. It includes the alternator and power steering pump, with or without the air-conditioning compressor.



While there are readily available means to make the throttle-by-wires systems work, there are more conventional cable-operated 90mm aftermarket alternatives—this one is from FAST.



There are several choices when it comes to oil pans. The LS2 ships with a low-profile cast-aluminum oil pan (note the integral oil filter mount partially obscured by the pickup tube). Street & Performance modifies pans (front) for problem applications.

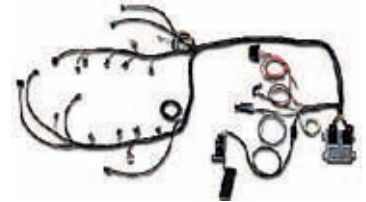


Another oil pan option is this road race piece from ATS. Note the fitting for a remote oil filter.



Headers are available in four-tube and shorty styles. These are ATS race headers for LS-powered F-body cars.

At one time, installing a computer-controlled engine in a street rod meant unwrapping an OEM wiring harness and trying to figure out what to keep and what to toss. Now kits come complete with factory-style plugs.



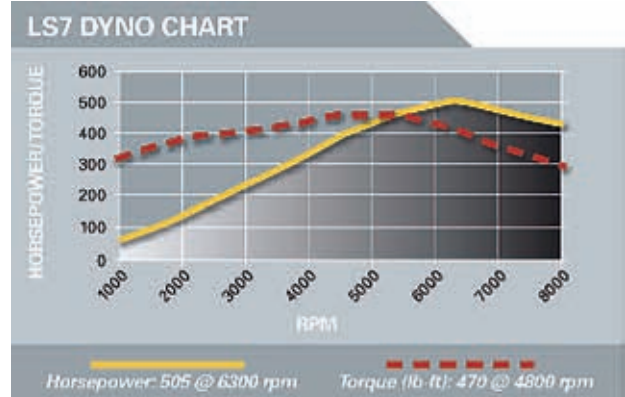
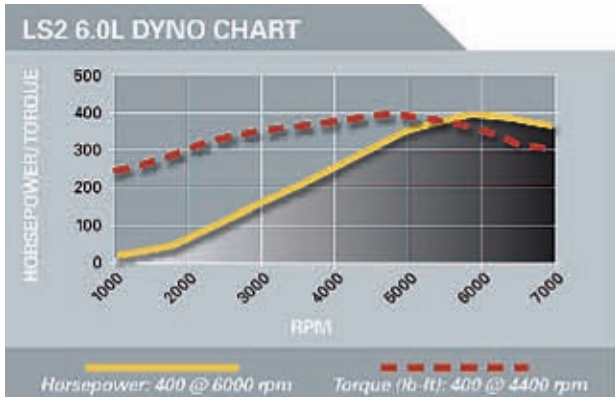
The aftermarket can provide a variety of ECMs to make all the electron-hungry components of an LS function as they should. The FAST unit can be programmed without a laptop with up to four different performance levels that can be changed with the flip of a switch.

the oil galleys were modified. For our purposes, the benefit is these blocks will accept a larger bore.

**LS2** Gen IV engines introduced the big-bore versions of the LS series. The 6.0L LS2 was the new base engine for the Corvette beginning in 2005. With a 4-inch bore and a 3.62 stroke displacement, it comes out to 364 ci. Compression was 10.9:1 and it was rated at 400 horses with 400 lb-ft of torque.

In addition to Corvettes, these engines were also found in Cadillac CTS-Vs, Chevrolet SSRs, and the TrailBlazer SS.

**LS3** Introduced as the new base engine for the 2008 Vette, the LS3 uses a modified LS2 block. A bigger 4.06-inch



The LS2 makes impressive numbers right out of the box, or should we say crate? While the horsepower numbers are good, the flat torque curve makes it an ideal street rod engine.

If you're looking for rear retina-separating performance, the LS7 will provide it with no more fuss than the average grocery-getter's powerplant.



March has introduced Gen III and IV pulley and bracket systems that replace the cumbersome stockers.

bore results in 6.2L, or 376 ci. High-flow heads, a bigger cam, an improved intake manifold, and larger injectors

result in 430 hp with 424 lb-ft of torque.

**LS7** Found in the 2006 Corvette Z06, the LS7 has a 4.125-inch bore and a 4.125-inch stroke that results in 7.0L/427 ci. Horsepower is 505 at 6,300 rpm, torque is 470 lb-ft at 4,800 rpm, and the redline is at 7,000 rpm. Inside, the aluminum block is some tough stuff—the crankshaft and main bearing caps are forged steel, connecting rods are forged titanium, and the pistons are hypereutectic. The LS7 is the only Gen IV engine to feature dry-sump lubrication.

**LSX** GM Performance Parts recently introduced the LSX, an all-new cast-iron racing block based on the LS7 engine. Designed with input from legendary drag racer Warren Johnson, it offers displacements ranging from 364 to 511 ci.

**LS9** This new, mystery motor is rumored to be everything from the powerplant for the new Corvette Stingray and/or Camaro to a truck engine. Speculations persist that the engine will be supercharged and pump out 600-plus horsepower.



Want the latest throttle by wire? GM Performance Parts is about to release new engine controller kits for LS2, LS3, and LS7 crate engines. Each system plugs into the factory-validated harness and features

a custom calibration for each crate engine family. Included are the controller, an accelerator pedal compatible with the electronic throttle, complete engine harness, oxygen sensors, and a mass airflow sensor. The kit will be available in early 2008 and carry the following part numbers: LS2, 19166568; LS3, 19201861; and LS7, 19166567.

## WHAT IT TAKES TO JOIN THE NEW GENERATION

Installing computer-controlled engines in a street rod has become just as easy as any other engine swap. Look no further than our advertisers index at the back of the magazine or the list below (for LS-related components) to find everything you need, including complete engines, computers, wiring harnesses, throttle bodies, headers, and all the other little doodads necessary. However, there is one little oddity that you should be aware of if you're contemplating a Gen III or IV engine installation: the positions of the cooling systems inlet and outlets. They stick straight out and may require some clever plumbing so as not to use up valuable under-hood space in an early car.

With everything these new-generation engines have to offer, we'll be seeing more of them in street rods. After all, new technology really is a tradition. **SR**

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