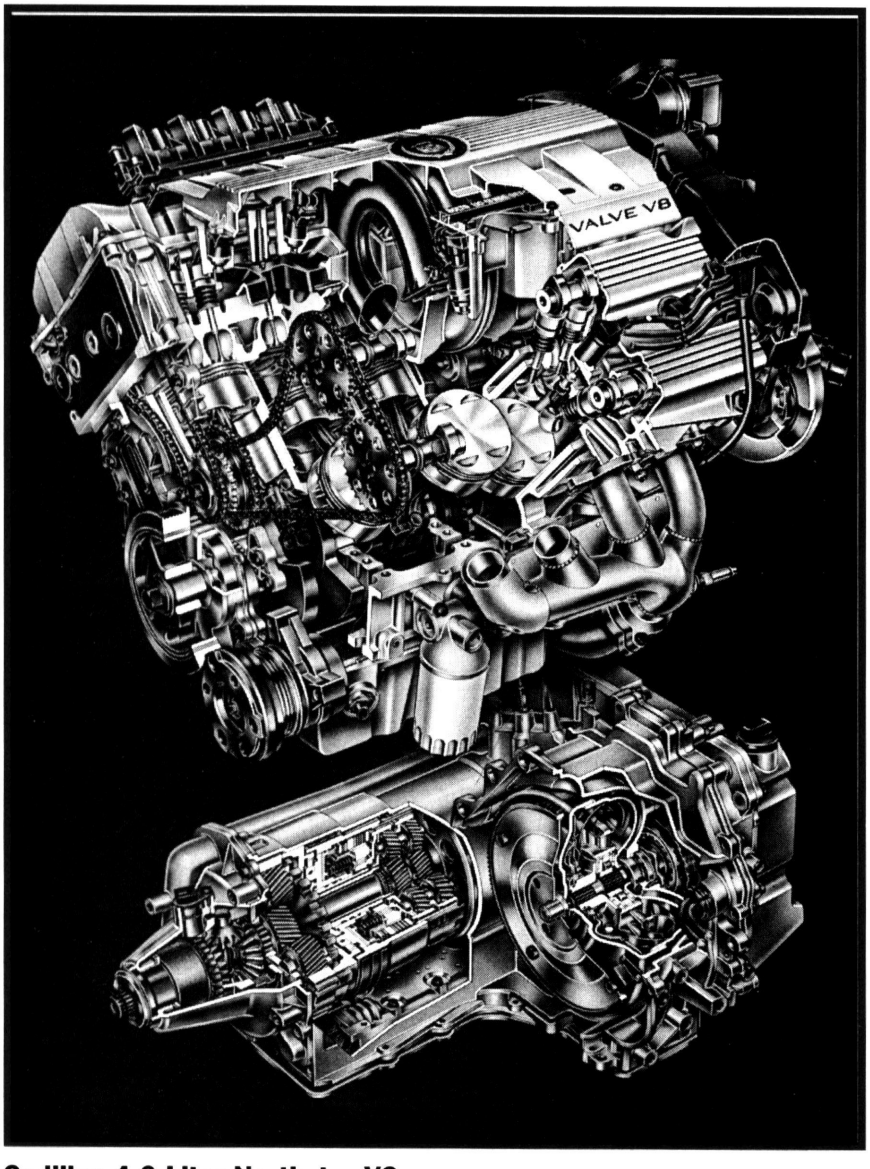
Future Engine Swaps

Visionary Conversions For Tomorrow's Engine Swappers



Cadillac 4.6-Liter Northstar V8

By Al Kirschenbaum

PERFORMANCE POWERPLANTS are the foundation of engine swapping. But for the Nineties and beyond, new and undeveloped powerplants will be explored. This review of alternative power sources is designed to be your wishbook guide to some of the hot new conversion material that's either currently available, or will be accessible reasonably soon.

Envision a turbocharged multi-cam V6-powered rear-drive Geo. Perhaps you'd prefer a low-profile Plymouth Duster with an injected V10 stuffed between its subframe rails?

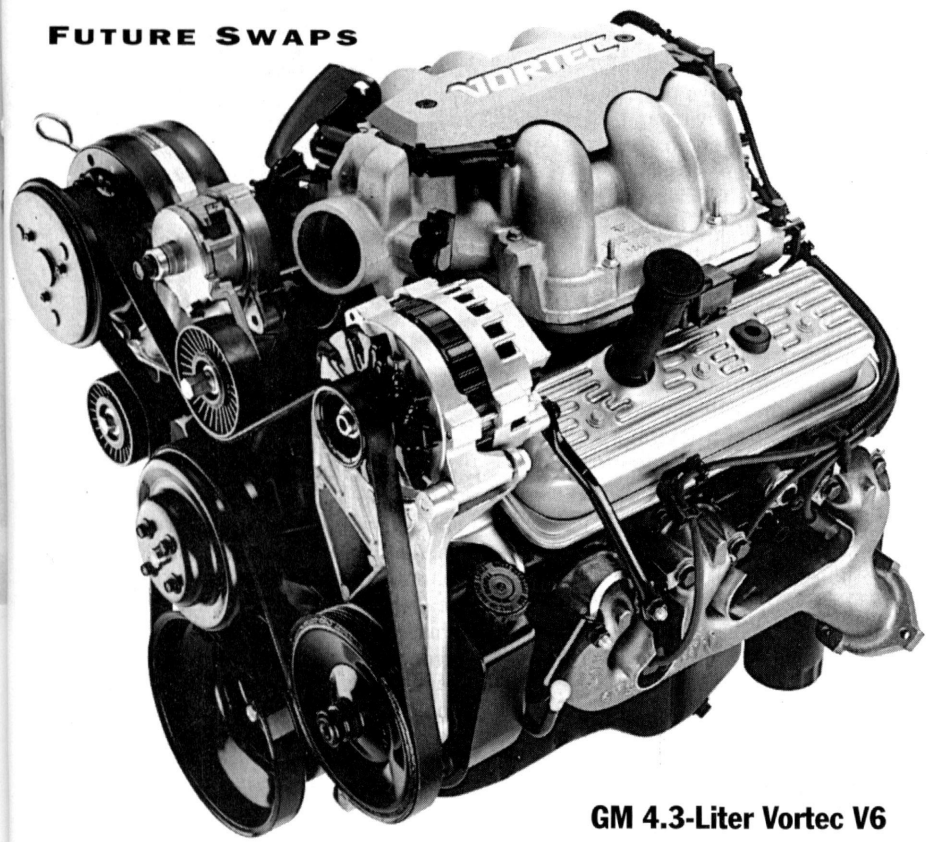
GM 4.3-Liter V6

When General Motors introduced this series of 90-degree V6 engines for 1978, CAR CRAFT referred to Chevrolet's new 200-incher as a "three-quarter scale" small-block. At the time, the comparison was based on the engine's familiar 3.48-inch stroke and 5.7-inch-long forged-steel connecting rods. But when the 4.3-liter '85 Vortec version premiered for truck service, its resemblance to a scaled-down Chevy V8 effectively became complete; its bore was expanded to 4 full inches—the same size as the 350-cube corporate small-block.

The current 4.3L Vortec V6 is based on a lightweight cast-iron two-bolt cylinder block with a cast-nodular-iron, splayed-journal, even-fire crankshaft that's finished with deep-rolled fillets. Blocks cast for 1987-and-later applications have longer lifter bosses with machined tops and mounting bosses in their valley walls for the late-motor's roller tappet guide retainers. In other departures from the original V6 family's design, all 4.3s feature larger 2.25-inch crankpins (to maximize stiffness with their crank's larger journal offset), while 1986-and-later shafts now have a one-piece rear main oil seal that's similar to GM's latest V8s. Original-equipment Vortec pistons are dished-dome aluminum castings with four-valve clearance reliefs and they're fitted with a low-tension moly-topped ring set.

Vortec's iron heads are equipped with generously sized 1.94-inch intake and 1.50-inch exhaust valves, and the high-swirl inlet ports and fast-burn combustion chambers promote combustion-enhancing turbulence. But all production castings are severely performance-limited by shortages of removable material around their intake runners. Fortunately, Chevy's RaceShop offers high-flow cylinder head designs in both iron and aluminum.

And on the subject of Bow Tie parts, the RaceShop also offers a full line of extra-duty 4.3 cylinder blocks in both iron and aluminum, as well as high-output



GM 4.3-Liter Vortec V6

hardware for all other areas of the Vortec engine. For future swap reference, this V6's vital measurements include a 20.73-inch width (spark plug to spark plug), an 18.63-inch height (pan rail to the top of the distributor cap), and a 23.24-inch length (from the block's bellhousing face to the front of the water pump pulley).

GMC Turbocharged/Intercooled 4.3-Liter V6

As the unofficial maximum-performance version of the Vortec V6, GMC's turbocharged and intercooled Syclone engine is a small-displacement tactical nuke. In this high-output application, the 4.3's gray cast-iron block is fitted with upgraded nodular iron maincaps, specific intake and exhaust manifolding, a new EFI system, and cast hypereutectic heat-treated aluminum alloy pistons from the L98 Corvette. Attesting to the base 4.3 engine's nearly bulletproof construction, the Vortec's standard cast-nodular-iron crank, low-tension piston rings, wrist pins, roller lifters, hydraulic cam, and forged connecting rods are retained. The cast-iron cylinder heads also carry over from the base V6 but a special graphite composite head gasket with stainless flanges and annealed steel fire rings was specially developed by Victor Products to deal with its elevated cylinder pressures.

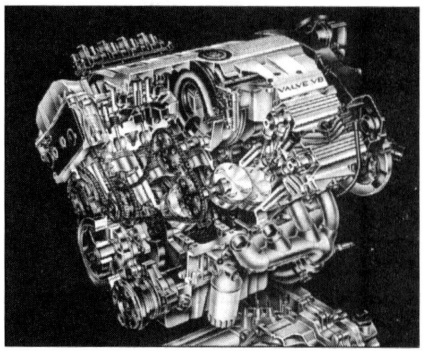
The same Bosch throttle body and top-feed pintle-type fuel injectors used on the L98 Corvette's 350 V8 meter fuel to the Syclone V6 through a two-piece aluminum intake manifold. Engine management is via a speed density EFI system using a closed-loop engine module engineered by GM's AC/Delco division. Electronically regulated by an integral wastegate to develop a maximum of 14 pounds of boost, the turbocharger itself is a Mitsubishi TD06 unit with a water-cooled center bearing. In this limited-production setup, pressurized air from the turbo outlet is plumbed through a liquid-to-air intercooler before it's fed to the throttle body and intake manifold.

Cadillac 4.6L Northstar V8

Cadillacs have always been sources of traditional engine swap hardware. Scheduled to debut in Cadillac's 1993 Allante and for later service in Seville and Eldorado models, the division's long-awaited Northstar V8 displaces a mere 280 cubic inches (4.6-liters). The Northstar is an all-aluminum double-overhead cammer with four valves per cylinder and ram-tuned electronic fuel-injection that all adds up to a mere 404-pounds without accessories.

Internally, the 32-valve, 90-degree, lightweight eight involves a die-cast aluminum block comprising a separate upper cylinder case with iron bore liners and a lower crankcase section incorporating four-bolt maincap clamping provisions. A cast-iron crankshaft carries heat-treated and shot-peened forged-steel connecting rods with bronze-bushed small-ends for the forged-aluminum pistons' full-floating wrist pins. A 7-quart capacity cast-aluminum oil pan

Cadillac 4.6-Liter Northstar V8



incorporates a scraper baffle to limit aeration and splash, while a special lube sensor monitors the oil level in its sump.

Sporting 1.31-inch intake valves and 1.14-inch exhausts, the low-mass, high-strength aluminum cylinder heads are not interchangeable bank-to-bank. Their valve seats and guide inserts are powdered metal and all valves close onto competition-style three-angle seats. For optimum flame travel and complete combustion, all spark plugs are positioned close to the volumetric centers of the combustion chambers. And topped off by cast-magnesium covers, the four chain-driven camshafts act directly on bucket-style hydraulic tappets.

A unique intake system consists of eight thermoplastic runners (or tuning tubes), a nylon fuel rail assembly, manifold absolute pressure and temperature (MAP/MAT) sensors, high-volume injectors, and an upper cover and a lower housing cast from magnesium. Enclosed in the lower housing, the tuning tubes are designed to offer flow efficiency equivalent to that of perfectly polished straight sections of pipe. The entire induction system is thermally isolated from the rest of the engine via two phenolic resin distribution plates that insulate the runners themselves from the cylinder heads. Contained within the lower housing for maximum sound insulation, the injectors in the sequential electronic fuel supply network continuously adjust for a wide range of operating conditions.

Ignition is via a direct-firing distributorless system with four coils and almost no moving parts. A reluctor ring with 32 gaps is cast into the center of the crank while a pair of magnetically triggered sensors in the block and oil pan determine crank position and speed. The Northstar's distinctive firing order (1-2-7-3-5-4-6-8) reduces loading on the front main bearing and also cuts down on torsional vibration and noise.

This collection of contemporary engine wizardry adds up to seamless operation and the kind of exciting raw material that fast fans are bound to have all sorts of future fun with.

FUTURE SWAPS

Dodge Viper V10

In terms of physical size (internal and external), the Viper motor is a giant. With 488 cubic inches (8.0 liters) of swept piston volume, the all-aluminum assembly tips the scales at 630 pounds bare and 716 pounds fully dressed. And although it's essentially an A-series Chrysler small-block V8 (including the 360's 4-inch bore size), with an extra cylinder added to each bank, it simply looks like a very large engine.

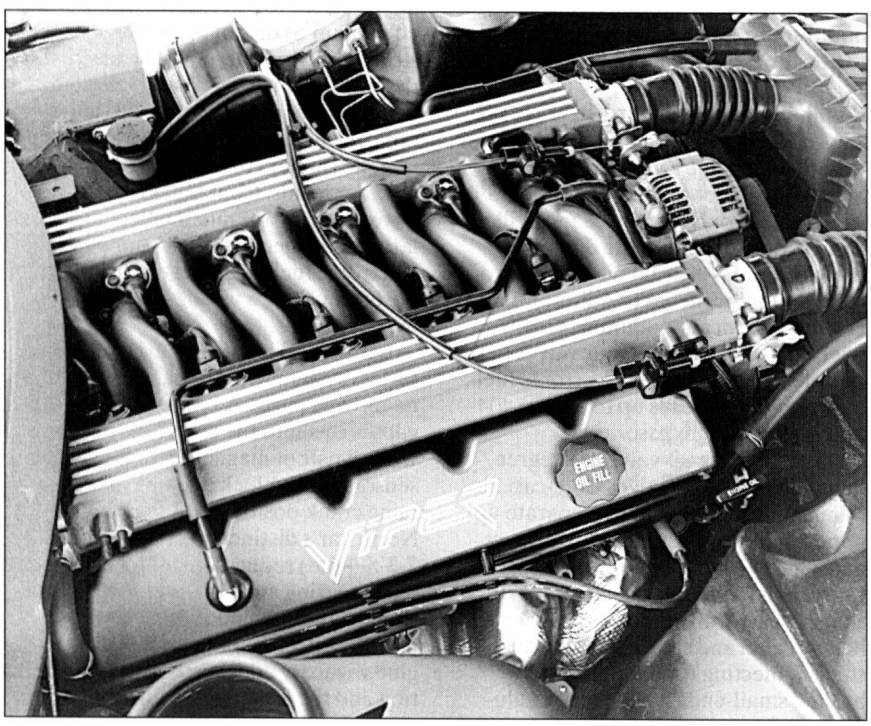
Initially, a cast-iron version of this same motor was (and still is) scheduled to power Dodge's 1994 T300 pickup truck. But under the pressures of imminent Viper production, an all-alloy incarnation of the big V10 was selected for service in the sportscar in mid-1989.

Mechanically, the 90-degree water-cooled V10 is based around an aluminum engine block with free-standing cast-iron cylinder liners and a dry lifter valley. For cooling considerations, the alloy casting's bore centers have been spread from the A-series' 4.46 to 4.54 inches. And overlap stiffness in the forged steel six-main-bearing crankshaft is derived from larger main journals plus pressure-rolled fillets at each of its cheeks. Carrying impact-extruded flat-top aluminum pistons, the Viper's forged-steel connecting rods are among the few components common to the current 360 V8 truck motor.

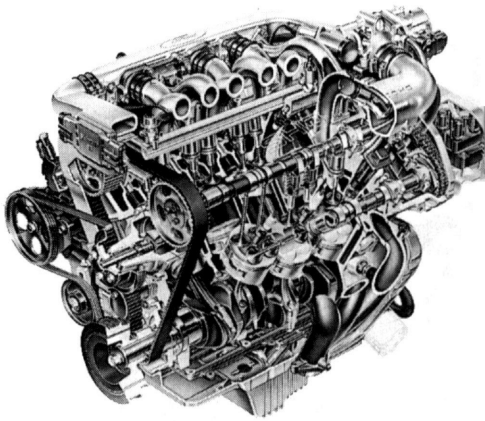
Although cast from high-grade aluminum, the wedge-style swirl-chambered cylinder heads use only two valves per bore, and pushrod-operated stamped-steel shaft-mounted rocker arms are straightforward yestertech items swiped directly from the company's 1971-92 5.9-liter V8. Contributing to the big 10's conservative 6000-rpm redline, a relatively mild hydraulic camshaft is used to activate the engine's roller tappets. One striking contemporary touch is effected, however, in the form of red-ribbed cast-magnesium valve covers. And for dietary considerations, magnesium accessory brackets are also fitted.

In contrast to all this conservative technology, the V10's intake system involves dual ram-tuned intake plenums with separate throttle bodies for each bank of cylinders. Tuned crossover runners feed inlet air to the heads while fuel is mixed through integral fuel rails and a multi-point sequential electronic injection system with high-impedance bottom-feed injectors. This helps reduce engine height and allows the injectors to run quieter and cooler. Ignition is handled by a distributorless system, while waste gasses are disposed of through two-piece, multi-branch thinwall-cast alloy steel manifolds. A single accessory belt drives the water pump, alternator, and the power steering pump, but factory air conditioning is not part of the present production plan.

A factory V10 short-block can be ordered through authorized Dodge dealers under PN 5245048. There's no price assigned to this cast-aluminum assembly as yet, but we can report that one of the bare alloy cylinder heads (PN 5245150) lists for a mere $1100.



Dodge Viper 8.0-Liter V10



Ford 3.0-Liter SHO V6

Ford 3.0-Liter SHO V6

Originally developed by Ford with design and manufacturing aid from Yamaha, the respected Japanese motorcycle manufacturer, the 24-valve double-overhead-cam SHO motor is a technically sophisticated, normally aspirated, 3-liter screamer that cranks out 1.2 horsepower per cube. And although the engine has been successfully tested to 8500-plus rpm, its rev limiter has been set to 7300 rpm to protect its accessory drives.

Known for its exceptionally smooth idle and seamless low-speed operation, the SHO motor's reciprocating assembly employs a forged-steel crankshaft and connecting rods, and high-pressure die-cast aluminum pistons. A die-cast aluminum oil pan complete with exotic-looking cooling ribs is included along with an oil-to-water lube cooler that's plumbed in between the block and filter.

Beneath aluminum covers, a pair of camshafts top each of the aluminum cylinder heads. The intake cams are both belt-driven off the crank while the exhaust shafts are spun by separate short chains off the rear of each intake cam. Valve action is induced, in turn, by direct-acting bucket-style tappets.

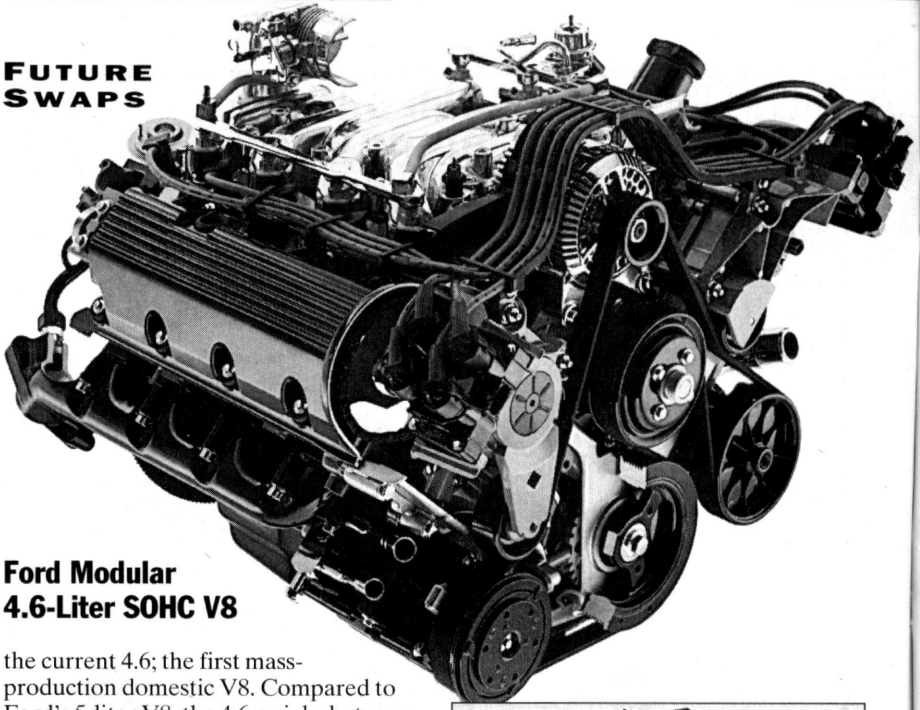
The engine's visual and mechanical highlights center around its "bundle of snakes" induction system. This layout involves a pair of inlet runners feeding each of the six cylinders. To help maintain the assembly's compact dimensions, the accessory-drive system uses separate poly-vee belts for the alternator and air conditioning compressor as well as for the water and power steering pumps. Overall, the SHO motor is nearly ¾ inch shorter than Ford's conventional 3.0L V6.

Ford Modular 4.6-Liter V8s

In its debut incarnation, FoMoCo released a mundane 4.6-liter single-overhead-cam V8 version for use in the 1991 Crown Victoria, Lincoln Town Car, and Mercury Marquis. But Ford's already announced a 32-valve dual overhead cammer scheduled for the '93 Lincoln Mark VIII.

But there's plenty worth discussing in

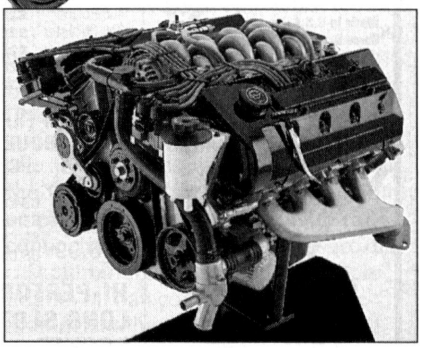
FUTURE SWAPS



Ford Modular 4.6-Liter SOHC V8

the current 4.6; the first mass-production domestic V8. Compared to Ford's 5-liter V8, the 4.6 weighs between 20 and 40 pounds less and generates almost equal output numbers. It's also shorter overall for easy transverse installation in future front-drive applications.

Cast-aluminum cylinder heads feature centrally located spark plugs and high-swirl fast-burn combustion chambers configured for performance, efficiency, and reduced emission. Inside the chambers and ports, sintered-iron valve seats and guide inserts are fitted for maximum durability. To ensure rigidity and smoothness of operation, both cams are clamped by carriers that firmly support them at each of their journals. Roller finger-type cam followers reduce friction on the lobes, while drive is supplied by a roller chain and a hydraulic tensioner that serves as a slack-controller.



Ford Modular 4.6-Liter DOHC V8

On the inlet end, a one-piece aluminum manifold sits on horizontal head port projections to trim the engine's vertical dimensions. And as with most modern Ford motors, an EEC-IV-controlled

Engine Specifications (1)

Engine	Model Years	Size	Bore	Stroke	Compression Ratio	Horsepower @ rpm	Torque @ rpm
GMC V6 Vortex	1985-1992	262ci 4.3L	4.00-in. 101.6 mm	3.48-in. 88.39 mm	9.3:1	200 @ 4400 (2)	260 @ 3600
GMC V6 Syclone/Typhoon	1991-1992	262ci 4.3L	4.00-in. 101.6 mm	3.48-in. 88.39 mm	8.35:1	280 @ 4200 (3)	350 @ 3600 (3)
Buick V6 Turbocharged	1986-1987	231ci 3.8L	3.80-in. 96.52 mm	3.40-in 86.36 mm	8.0:1	276 @ 4400 (4)	360 @ 3000 (4)
Ford/Yamaha V6 SHO	1989-1992	182ci 3.0L	3.50-in. 89.0 mm	3.15-in. 80.0 mm	9.8:1	220 @ 6200	200 @ 4800
Ford V8 Modular SOHC	1991-1992	281ci 4.6L	3.55-in. 90.2 mm	3.54-in. 90.0 mm	9.0:1	210 @ 4600 (5)	270 @ 3400 (5)
Dodge V10 Viper	1992	488ci 8.8L	4.00-in. 101.6 mm	3.88-in. 98.6 mm	9.1:1	400 @ 4600	450 @ 3600
Cadillac V8 Northstar	1993	278ci 4.6L	3.66-in. 93.0 mm	3.31-in. 84.0 mm	10.3:1	290 @ 5600	290 @ 4400

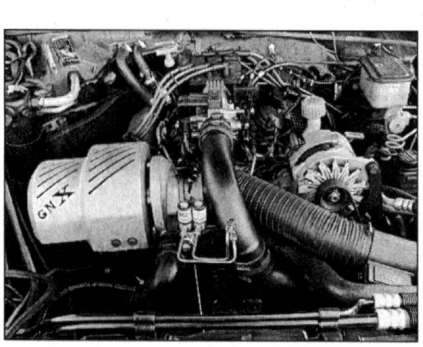
NOTE (1): Specifications may vary slightly from year-to-year. Most recent versions shown unless otherwise noted.
NOTE (2): Horsepower 200 @ 4500 in GMC Jimmy due to exhaust system variations.
NOTE (3): Ratings applied to 1992 Syclone/Typhoon; 1991 Syclone output ratings 280 @ 4400, 360 @ 3600.
NOTE (4): Ratings applied to 1986-87 Buick GNX; 3.8L Turbo V6 first offered for 1978.
NOTE (5): Horsepower 190 @ 4200; torque 260 @ 3200 with single exhaust.

sequential electronic port fuel injection system provides precise metering for driveability, economy, response, and low emission. Ignition is a distributorless system that connects each plug to its own coil tower, reduces spark scatter, and eliminates timing adjustments. Up front, the A/C compressor, alternator, and power steering pump are mounted directly to the engine. While this bracketless arrangement requires more precise manufacturing, it eliminates vibration and improves the alignment of the self-tensioning serpentine drive belt for quieter, more durable operation.

General Motors 3.8L V6/V6 Turbo

At the peak of its performance form, ongoing developments had improved the 3.8's output mainly through more boost, modified electronics, and streamlined manifolding. To keep pace with all the power being produced, Buick Division also released a steady stream of heavy-duty hardware for both production and off-road versions of this engine. And in 1986, they showed supreme confidence in the parts program by fielding 800-horsepower methanol-fueled stock-block entries in the Indianapolis 500.

In standard form, a cast-iron 90-degree turbo V6 weighs in at 390 pounds. It packs a cast-nodular-iron crankshaft that's finished with rolled rod and main journal fillets as well as cast-nodular-iron connecting rods and cast-aluminum pistons. Except for '85-'86 N-body cylinder heads that were designed to fit those cars' narrower engine bays, all the iron castings used on 3.8s come with conservatively sized 1.71-inch intake valves and 1.50-inch exhausts. We should also point out that Chevy also made 90-degree 3.8L V6 engines, but these had a rear-mounted distributor, rather than the front-mount location used by Buick. Front-drive 3.8L Buicks use GM's standard "metric" FWD bellhousing bolt pattern and FWD-style engine mounts. Modern rear-drive production, Stage I and Stage 2 V6s used the Buick/Olds/Pontiac bellhousing pattern with conventional side engine mounts. The oil pan flange and starter motor locations also differ between front- and rear-drive versions.



GM 3.8-Liter V6 Turbo