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FEBRUARY 2015

NCM Sinkhole pt. 4 → C7 Supercharger Install → C1 Suspension

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PAGE 16



STREET Annihilator

MUSEUM SINKHOLE PART 4

- '91 ZR-1 PROTOTYPE SPYDER
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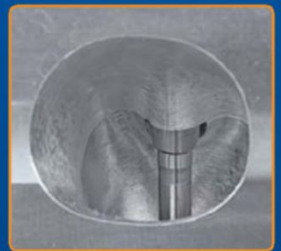
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.400	296	212
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.600	375	249
.700	393	254

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Specialties

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While rummaging through the GM archives we came across this cool shot and just had to run it. If you like midyears then check out the prototype retrospective on **page 52** for even more sweet shots.



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COVER

*If you like your Corvettes fast and oozing with attitude then you'll love Blackdog Speed Shop's insane C6. **Robert McGaffin** was fast enough on the shutter to catch it in action for our cover. We also embrace the boost with a story on Chevrolet's blower ready LSX376 and a new C7 LT1 supercharger from Edelbrock.*

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IDLE CHATTER

STEVEN RUPP EDITOR

FLIP SIDE



Have you ever heard the story about a guy that makes a grand exit, but once he gets out to the parking lot he realizes that he left his car keys back inside? He's then forced to slink back inside, killing his whole moment.

Well, this time that guy is me. In the December issue I relinquished the editor's chair to Nick Licata so I could go back to penning technical stories. Next thing I know Nick is running our sister publication, *Chevy High Performance*. So, slinking back from the parking lot I retook my spot in the big chair. Well, that sorta negated my December editorial, but that's OK. I'm happy to jump back in a put together this great magazine. After all, I love fast cars and Corvettes more than qualify. So to be clear, I'm only running things for now. Eventually someone else will sit in the big chair and I'll return to my full-time gig of finding and writing interesting stories for you to ingest.

were modded quite a bit. With the testing done we're now ready to start wrenching. Bigger, much bigger, front Falken tires will give us more grip and we've been working with racer Danny Popp on a suspension formula that will involve parts from a variety of sources, including JRi, Van Steel, Wilwood, and others. There's a shiny new LS3 crate engine from Chevrolet Performance sitting in our tech center waiting to be worked over with a new cam



WE TOOK THE VETTE **AUTOCROSSING** WHERE IT ONCE AGAIN DID OUTSTANDING AGAINST CARS THAT WERE MODDED QUITE A BIT. WITH THE TESTING DONE WE'RE NOW READY TO START WRENCHING."

Right now one of my big projects is getting to know my new '99 FRC. I came to the conclusion that I needed to experience and quantify the car in stock form before releasing the hounds and modifying it. So, it's been hitting the track. The first time was when another of our other sister publications, *Super Chevy*, needed a baseline car for some testing they were doing on Pro Touring Chevys over at Willow Springs Raceway. The stock Z51 Vette on "iffy" Sumitomo 300-treadwear tires did great against cars that had way more power and much better tires. The FRC felt very balanced and was easy to push hard around the track. At the end of the day the front tires were trashed on the outside edges, but we were happy with the Corvette's performance. A few weeks later, after finding two used replacement front tires, we took the Vette autocrossing where it once again did outstanding against cars that

and other bits from COMP before it hits the dyno. The '99 felt great before, so we're dying to drive it once we inject it with a bit more grip and a lot more power. Look for these stories to start showing up in the next issue. We still maintain that this model C5 is one of the best performance bargains out there. Should be fun.


In any event, it's good to be back, even if I never really left. Then again, the only thing constant in life is change. **VETTE**



CURRENTS

STEVEN RUPP WORDS

BARRETT-JACKSON TO SELL FIRST PRODUCTION Z06 CONVERTIBLE AT SCOTTSDALE


 Chevrolet has chosen Barrett-Jackson's flagship Scottsdale event to offer their first retail production '15 Corvette Z06 convertible. Over the last several years, Barrett-Jackson has been Chevrolet's choice to showcase the crown jewels of their model lineup by offering VIN 001 of a new model Corvette to benefit various charities. According to Gary Bennett, vice president of consignments at Barrett-Jackson, the beneficiary of the '15 Z06 convertible proceeds will be the United Way of Michigan.

In January 2013, the first production '14 Corvette Stingray coupe, of the long anticipated seventh generation, was hammered sold to collector, motorsports icon, and Chevrolet dealer Rick Hendrick for \$1.05M. Then in April of the same year, at Barrett-Jackson's Palm Beach auction, Hendrick coughed up another \$1M and added the first production '14 Corvette Stingray convertible to his collection. A year later, this past April, again at Barrett-Jackson's Palm Beach event, Hendrick successfully bid another \$1M for the first production '15 Z06 coupe.

You might want to contact your financial advisor and broker if you want to be the proud owner of the first production Z06 convertible. After all, you'll most likely be bidding against Hendrick, who is the odds-on favorite to complete his matched C7 set of seventh-generation Corvette models and add the '15 Corvette Z06 convertible to his premier Chevrolet collection in North Carolina.



WINNER DRIVES FROM NEW JERSEY TO INDIANA TO CLAIM PRIZE

 The winner of the 26th Annual Classic Corvette Giveaway benefiting Saint Bernard Parish and School in Rockport, Indiana, drove over 820 miles from Southamton, New Jersey, to claim his prize: a 1957 Corvette convertible.

Robert Drayton arrived in Rockport on July 28. "I purchased eight tickets this year for \$200," said Drayton. "What a great deal for a car this beautiful! It's fuel injected, which makes it even more valuable." Drayton's name was drawn at the conclusion of the Saint Bernard Summer Social on Sunday, July 13.

Drayton says he has purchased raffle tickets every year for as long as he can remember. He owns many other classic cars and trucks, and he says this classic will be the nicest of his collection. After a few photos, Drayton took a test drive through the streets of Rockport before loading his prize on a car hauler for the trip back to New Jersey.

Over 10,500 tickets were sold for this year's raffle. People from as far away as Australia, Italy, Germany, and New Zealand purchased tickets. Tickets will go on sale for the 27th Annual Corvette raffle in January 2015. Proceeds benefit Saint Bernard Parish and Saint Bernard Elementary School.



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PRODUCT PREVIEW



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SHOCKING DEVELOPMENT

There was a time when an air-bagged suspension was your only choice if you wanted to easily change the ride height of your Chevy "on the fly" but, thanks to the guys over at JRi there's now a better way. Unlike typical systems that operate with air, JRi's Ride Height System is 100 percent hydraulic, working directly upon the coilover spring. It features 2 to 3 inches of ride height adjustment all while retaining the ride and performance benefits of a coilover shock.

Traditional air-ride systems are sufficient for lowering your car for a show but come with several deficiencies: air is inconsistent and it changes dramatically with temperature and elevation thus affecting handling and performance.

The state-of-the-art JRi Ride Height System uses

NEW FINISH

The folks at Mickey Thompson are at it again with the development of several new finish options for the popular Street Comp SC-5 wheel. Choose the original gloss black/machined, the flat black, or the hypersilver/machined finish. A perfect complement to the Street Comp ultra-high performance tire, the Street Comp SC-5 wheel is lightweight and available in 12 popular 17-, 18-, and 20-inch sizes in each finish. Specially engineered for late-model muscle cars in offsets that deliver better fit and a wider vehicle stance, the Street Comp SC-5 is the foundation for Mickey Thompson's Enhanced Stance System (ESS). For more information visit mickeythompson tires.com or call 877.337.9866.



FLUID DYNAMICS

Our classic Chevys are great, but some of the "old-school" technology, like mechanical clutch linkage, can be a pain to work around. The gearheads over at Silver Sport Transmissions (SST) have a fix in the form of their new hydraulic clutch actuator system. But keep in mind that not all hydraulic clutch systems are equal. Some aftermarket models suffer from frequent bleed down due to inadequate piston and fluid line seal designs while some models even lack a preload spring, contributing to poor clutch release and bearing noise. In addition, most hydraulic clutch systems are one-size fits all requiring the installer to rectify pushrod angles and proper mounting angles. The SST Perfect-Fit hydraulic clutch kits are custom engineered and comes with everything needed, including detailed instructions. They also feature a Wilwood master cylinder and a heavy-duty concentric slave cylinder. To find out more visit their website at shiftsst.com or ring them at 865.609.8187.



PUMP IT UP

➤ DeatschWerks has just released the newest member of their fuel pump line; the DW350iL. This high-flow, 350 liter per hour (lph) pump is their first externally mounted in-line piece. It's also the highest flowing pump they've ever offered. Flowing 350 lph at 40 psi and over 300 lph at 70 psi, it can support over 700 hp. The internals utilize a roller-vane technology that allows for a flatter flow curve, which is especially important in turbo and supercharger applications. The pump includes -8 AN ORB female fittings on the inlet and outlet, rubber boots for the power terminals, and two T-bolt mounting brackets with rubber isolators. The DW350iL is engineered to fit Bosch 044 surge tanks and comes with a 3-year warranty. To find out more visit deatschwerks.com or ring them up at 800.419.6023.



BIG STICK

➤ Lunati has just introduced their new Bootlegger series of camshafts for hot rodders looking for a more aggressive stick for their engine. These are the most powerful series of street performance cams ever produced by the Lunati design team and feature ultra-fast opening rates, a controlled closing, and far more area under the lift curve.

Bootlegger Cams are designed with a 108-degree lobe separation angle and a 104-degree intake centerline for overall nastiness that cannot be found anywhere else. This extremely aggressive design provides tons of low- and mid-range power along with a killer exhaust note that sends a message before you even arrive. When put to the test on an engine dyno, Lunati Bootlegger camshafts provide proven gains of more than 40 horsepower over the stock GM Hot Cam in a ZZ4 small-block Chevy. To get the 411 call 662.892.1500 or click on over to bootleggercams.com.



PLASTIC FANTASTIC

➤ The Eastwood Company has just introduced Plastic Resurfacer, a product that permanently restores the appearance of faded and weathered black automotive plastics and urethanes. Plastic Resurfacer reflows the plastic and impregnates black resins to provide a lasting repair.

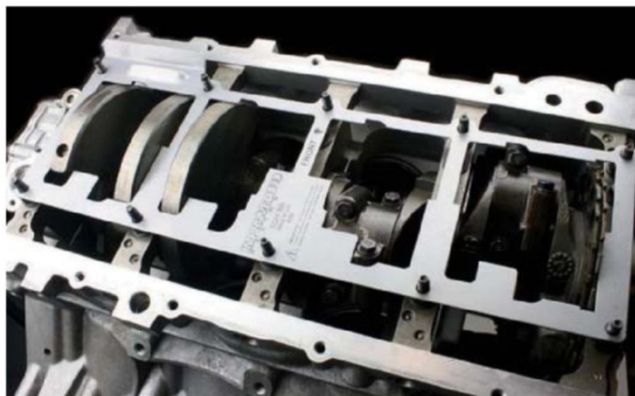
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SCRAPING BY

➤ Improved Racing has just released a line of engine crankshaft scrapers for GM LS and Vortec V-8 engines. The company's crank scrapers help reduce oil starvation by closely contouring the crankshaft to remove excess oil, ensuring more oil makes it to the bottom of the sump. Crank scrapers also help reduce parasitic drag and windage losses caused by excess oil on the crank, resulting in a typical gain of 2-4 horsepower at the wheels. Two models are currently available, one for '98-'02 LS1 Camaro/Firebird (PN EGM-300, \$73) and a universal version (PN EGM-301, \$69) designed to fit all factory 3.622-inch stroke LS and Vortec V-8 engines, like those found in most C5 and C6 Corvettes. They can be purchased on Improved Racing's website at improvedracing.com or by calling 407.705.3054.



FROM THE ARCHIVES

DREW HARDIN WORDS
TEN ARCHIVES PHOTOS

ALL-AMERICAN SPORTS CAR



The white Corvette in this press release photo from Chevrolet shows off a couple of the subtle changes Chevy made to the Vette for the '59 model year. The car went through a major styling revision in '58, growing in size and gaining quad headlamps, bigger bumpers, simulated air ducts flanking the grille, hood louvers, and chrome trim on the trunk lid and in the coves. As if sensing they had taken the gingerbread a bit too far, Chevy's stylists removed the trunk lid trim and smoothed the hood for '59, while making a few small revisions to the interior as well.

Ray Brock, *Hot Rod* magazine's technical editor, spent two weeks testdriving a fuel-injected '59 and devoted quite a few column inches to the review in the May '59 issue. Right off the bat, in the story's subhead, he called the Vette "rugged, fast and well finished" and said the car "competes with Europe's best at a fraction of the cost." Later in the story he wasn't afraid to name names among the Vette's racing competition. "Since the Corvette is a sports car in the truest sense, the car can be very effectively used in road races. Owners who plan to race their Corvettes can order heavy-duty chassis parts from the factory, which will give the car the necessary improvement in roadability to outrun such high priced foreign machinery as the Mercedes 300 and Ferrari Grand Turismo coupe."

Brock was a big guy. By his own admission in the story he "leans toward the beefy side with 220 pounds lumped here and there on a six-foot two-inch frame." So as you might imagine, he found the Corvette a snug fit. He likened it, in fact, to putting on a new pair of shoes—"they're tight!" But he also recognized that, like new shoes, the car "showed promise of being much more comfortable after a bit of wearing."

His initial driving impressions were colored by his size versus the Vette's. He felt constricted, with the steering wheel too close despite the seat being moved all the way back. "We had difficulty getting accustomed to the Corvette when it came to corners, mainly because we didn't have enough arm room to swing the wheel back and forth smoothly." But once he got used to the snug quarters, he found the car to be "an agile piece of machinery. It will corner very fast and flat even with the standard suspension parts and, with the four-speed transmission, can be dropped into the proper slot for fast acceleration any time before, during, or after making the corner."

His test car was equipped with the 250hp version of the fuel-injected 283 V-8 and 4.11 gears—but no Positraction, equipment he said would have been a "welcome addition" to the drivetrain since he had to feather the throttle to keep the inside wheel from spinning in tight corners.

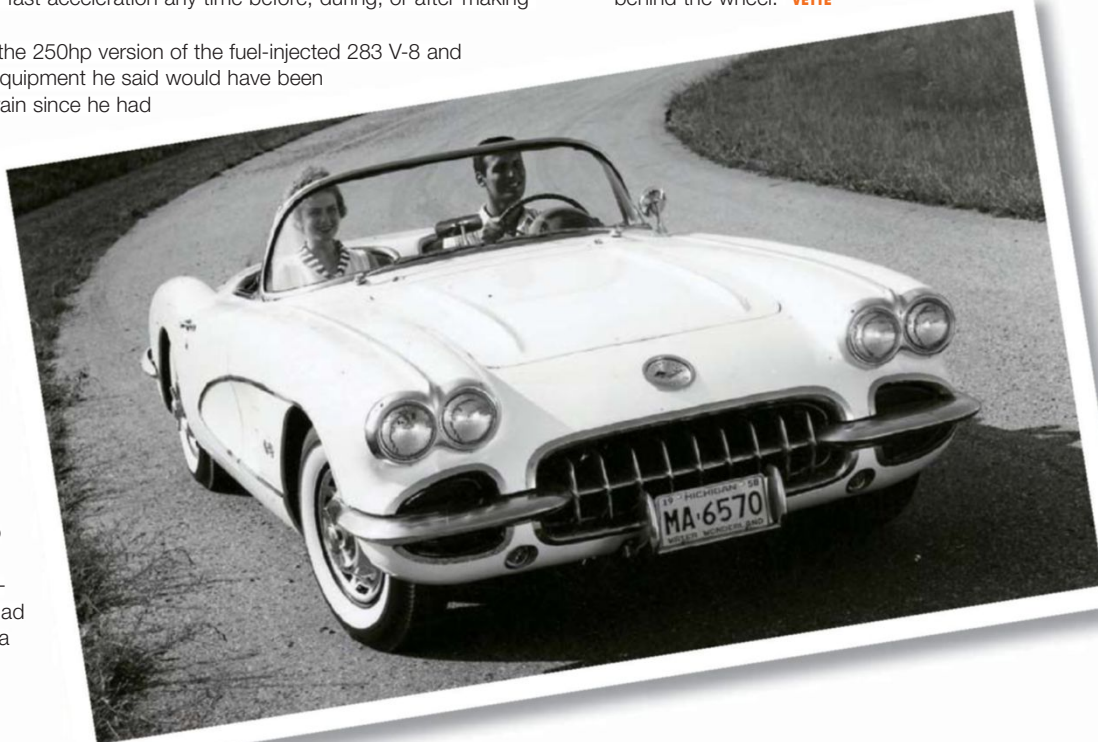
The lack of a Posi in the diff also made it tough for Brock to get acceleration figures. He compensated by dropping the air pressure in the right rear tire to 18 pounds while leaving the left rear at 28 and got an average 0-60 time of 7.6 seconds and a quarter-mile e.t. of 15.65 seconds at 92 mph. Traction aids and "a sharp injection specialist" could likely drop the e.t. and add a couple miles per hour to the trap speed, he said.

Why didn't he opt for the top-of-the-line 290-horse fuelie mill? He had sampled a pre-production version a

year before and felt this engine "had more than enough power for the average public." Plus, he said later in the story, the 270- and 290hp versions of the 283, with their "wild cams," were "a bit too noisy for the average driver."

Brock was very complimentary about the fuelie engine, mentioning its smoothness several times. He did call it out as an expensive option, considering it only added 5 hp over the same engine equipped with dual quads. He also said it could be "a little temperamental to start after the engine was hot and the car left sitting for an hour or so."

Yet despite the car's snug confines (and a complaint about how the cockpit had "an overpowering odor of gasoline" after "fast cornering or leaving the car in the hot sun with a full load of fuel"), he came away appreciating the car's sporty nature. "Drive the Corvette and it doesn't take you long to start feeling like one of the sporty set. The slightly choppy ride, flat cornering, quick acceleration and maneuverability have you imagining that you're Juan Fangio's replacement after a very short time behind the wheel." **VETTE**



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TECHNICALLY SPEAKING

JAMES BERRY CORVETTE TECH GURU

QUICK QUESTIONS AND ANSWERS

The great news is that we're getting lots of letters from our readers. The not-so-great news is that the questions are piling up on my desk. So for this installment of Technically Speaking, I'm not going to be as detailed as I normally am so I can get several questions answered. As you know, trying to give a quick answer to anything is difficult for me, but I'm going to give it a shot. Thanks and keep the questions coming.



Q: I am having a problem with my '08 Corvette coupe with factory navigation. When I am driving the car, at times the navigation screen will go blank. The radio will continue to play but the controls for the radio and navigation will not work at all. If I shut the car off, then restart the car, everything works fine for about 10 minutes then the navigation screen goes blank again.

Thanks,
Paul

A: This condition may be caused by a radio software timing anomaly. There is a Technical Service Bulletin (TSB) "#09-08-44-019: Intermittent Navigation or Radio Screen Blank after Vehicle Starts, Radio Controls May Not Function (Update Radio Audio Software Using Disc)" regarding your problem.

This requires you to take your vehicle to the dealer to have the radio audio software updated. The update programming disc covers all '07-'09 Corvettes with navigation radios. The blank screen syndrome is one of the issues that this programming update covers.

Check with your dealership since you live in a small town to see if they have the update disc. It is only shipped to dealers that request the disc for vehicle repair. The disc is PN 20906717. Thanks, and good luck Paul.

Q: Hello Vette. My problem is that my steering column sounds like a little girl screaming when I turn the steering wheel slowly, like in a parking lot, for instance. It sounds like it is coming from a rubber boot near the firewall.

Thanks,
Mike

A: I am not sure what year Corvette you have but the repair is simple. Locate the opening at the lower bearing where you can inject lithium grease. This will eliminate the rubbing or squealing noise when the steering wheel is turned. Mike, that is the shortest answer I have ever given. Thanks and good luck.

Q: I just finished reading your column in the October issue and found it very informative. I still have some questions, including clarification of the clutch reservoir refill. I own a '08 Z06, which I bought brand new. The car currently has 1,625 pampered miles, and I drive it on a limited basis each month to local car shows.

Over the past two years, I've noticed intermittent, difficult/notchy-shifting during the 1-2 and 2-3 shifts at mid-range to spirited rpms. I notice this issue less when the car is hot and driven more than 25 miles at a time.

I continually monitor the condition of the clutch fluid, and replace the fluid using GM DOT 4 clutch fluid before it becomes darker than honey. The clutch reservoir has two markings: "min" and "max." Following the owner's manual, I never fill beyond the "min" marking. I am wondering if I'm doing this correctly, or could this be contributing to the shifting problem.

I am also curious if the factory replacement fluid is the best choice? I am considering purchasing a return spring kit from Lingenfelter as a precaution. I do not want to have the car disassembled or wrenched-on at this time if it's not imperative. Can you further advise?

Sincerely,
Richard Kachadurian
Lakeland, Florida

A: Richard, there is a Technical Service Bulletin (TSB) regarding the issue of difficult/notchy-shifting during the 1-2 and 2-3 shifts on vehicles equipped with a Tremec manual transmission when the vehicle is cold.

The repair is a new transmission synchronizer design for the 2008 and 2009 models. The new synchronizer will make a noise on the 1-2 shift in temperatures at or below 32 degrees F.

This noise/feel is a normal characteristic and will go away after the transmission warms up. Warm-up should occur after approximately 15 miles of normal driving. This condition is



normal and requires no repair by the dealer.

Richard, I always recommend using the factory fluid and you are correct in replacing the fluid when it becomes dark. When bleeding the clutch system, one of the more difficult things is accessing the bleeder screw, which is difficult to see without using a mirror.

Look where the master cylinder line connects to the slave cylinder and just above the lines at the very top of the transmission you will feel a hex-shaped rod about two inches in length. That is the bleeder screw.

To bleed the system on some models you will need a 7/16-inch thin wall socket. Take care not to drop the socket or it will end up at the bottom of the bellhousing, making it difficult to retrieve. It may be a good idea to tape the components of your tools together. On other models the bleeder screw is much easier to access and you will only need a 9mm wrench.

1. If you plan to bleed the clutch traditionally, you will need two people. One person under the car operating the bleeder screw and another person in the car to pump up the pedal and keep the reservoir full of fluid.

2. Open the bleeder screw and let the fluid run out until it becomes clear. Be sure to keep the clutch reservoir full so no air can be introduced.

3. Once the fluid is clear, close the bleeder screw, then pump the clutch pedal 50 to 100 times. Open the bleeder again and look for air or dirt in the fluid. Repeat this step until a steady stream of clear (clean) fluid comes out.

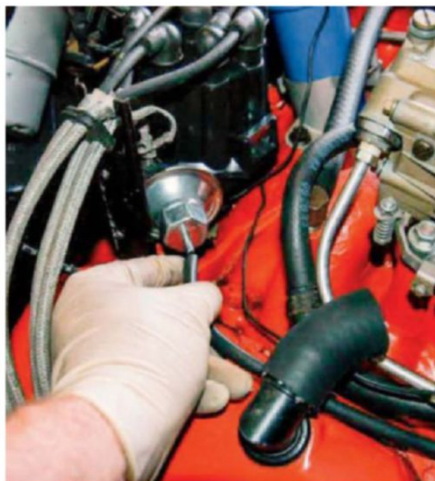
4. After you think all of the air, dirt, and residue has been removed from the system, pump the clutch pedal again 50 to 100 times with the bleeder closed and take the top off the reservoir. Let the vehicle sit for about 30 minutes while you have lunch or a few beers.

5. Fill the clutch reservoir roughly 1/16-inch below the "min" mark so when the clean, dry moisture barrier and lid are installed the fluid will read between the "min" and "max" marks.

Hopes this helps you out and good luck, Richard

Q: I own a fairly stock '62 Corvette that I drive every day. My question is that I am running my vacuum advance on ported vacuum, is this correct for performance? My '69 GTO is using manifold vacuum for the vacuum advance. I know these are different vehicles; I just want to make sure this is correct.

Thanks for your help,
Greg Smith



A: Greg, for optimum engine performance and driveability on stock pre-emissions points-style distributors used on Corvettes or any GM vehicle you need the vacuum advance to be connected to full manifold vacuum. The vacuum advance is intended to advance the ignition timing at idle, since the engine needs more spark advance at idle in order to fire the leaner fuel mixture. The vacuum advance is also designed to respond to sudden changes in operating conditions by helping provide the correct spark advance based on engine demand.

To test a port to determine if the vacuum is manifold or ported, connect a vacuum gauge to the port. At idle, if the vacuum gauge reads 15-20 inches of vacuum this is considered to be manifold vacuum, and if this port is not used it would be ideal to use for your vacuum advance.

If no vacuum is shown at idle, but as you open the throttle you start to read vacuum, this is considered to be ported vacuum.

Thanks, Greg. You should find you will get better performance and fuel mileage once you switch to manifold vacuum.

→ QUESTIONS?

Got a question for our Tech Corner expert? Just jot it down on a paper towel or a lightly soiled shop rag and send it to us at *VETTE* Magazine, Attn: Technically Speaking, 1733 Alton Parkway, Suite 100, Irvine, CA 92606. Alternatively, you can submit your question via the Web, by emailing it to us at vette@sorc.com. Be sure to put "Technically Speaking" in the subject line.

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BEWARE OF BLACKDOG!

PATRICK HILL WORDS | ROBERT MCGAFFIN PHOTOS



Sometimes Corvette owners get a bad rap. It's assumed that every one who owns one has leather driving gloves, antiquated leather Corvette jacket, driving cap, and an ample supply of cloth diapers in the boot to wipe the car down if even the slightest spec of grime gets on the car. Driving fast means breaking the 60-mph barrier, and it typically takes them a decade to crack 10,000 miles on the odometer.

In the *Vette* world though, such assumptions get blown out of the water by cars like



the Blackdog Speed Shop 510 Corvette.

Originally started as a pro race team about 10 years ago, Blackdog Racing quickly evolved into Blackdog Speed Shop, a place where street cars go for a dose of racing-inspired performance to make them dominant on any surface. More well-known for building cars with boosted engines, Blackdog decided they wanted to build a legitimate street Corvette with racing performance and handling, but with the driving comfort of a street car. And without the need for a supercharger or turbo system.



WHAT COULD BE THE ULTIMATE STREET CORVETTE PACKS AN 802-HORSEPOWER BITE AND RACE-INSPIRED HANDLING TO CHASE DOWN ANYTHING



To build a Bruce Banner/Incredible Hulk type of car, the starting point had to be a good one. After some research, Blackdog decided on an '06 Z06. The first mods were to replace the factory hood, roof, rockers, A-pillars, and B-pillars with carbon-fiber pieces from Blackdog Speed Shop. Carbon-fiber Gurney flaps and rear spoiler were also installed. Besides reducing the car's weight further, the carbon-fiber pieces serve a very functional part into this Z06's blistering performance. The Blackdog louvered carbon-fiber hood works in conjunction with a Blackdog carbon-fiber street

splitter to help create extra downforce, while evacuating more hot air from under the hood. The rear spoiler, Gurney flaps, and rocker panels help increase rear downforce, so in hard maneuvering the Blackdog 510 stays planted firmly on the asphalt, even when the full wrath of its monster LS engine is unleashed.

Moving inside, the factory seats were pitched in favor of Cobra carbon seats, mounted to the factory seat tracks so they could be adjusted just like the stock ones. To keep driver and passenger secure in even the highest g turns and acceleration, a harness



[FEATURE]

BEWARE OF BLACKDOG!



TO MAKE THE MOST OF ALL THE HANDLING AND SUSPENSION MODIFICATIONS, A PLAIN OLD LS7 JUST WOULDN'T CUT IT. THE GOAL WAS FOR PERFORMANCE SIMILAR TO A BOOSTED ENGINE, BUT WITH FULL STREETABILITY AND MANNERS.



bar and full harnesses were also installed.

Underneath, Blackdog Racing-developed spherical control arm bushings/bearings replace the factory bushings, and in-house designed three-way adjustable shocks replace the stock dampers. Blackdog's three-way street shocks are based on the design of the same shocks they developed for the Blackdog World Challenge GT Corvette racer. With a mind for well-mannered street driving along with track day handling, the three-way street shocks offer enough adjustability that you can go from street mode to an aggressive track handling mode within minutes of arriving at the track. Finishing things off are a set of Dynamag carbon-fiber wheels with magnesium centers,





[FEATURE]

BEWARE OF BLACKDOG!

wrapped in Pirelli P-Zero rubber.

To make the most of all the handling and suspension modifications, a plain old LS7 just wouldn't cut it. The goal was for performance similar to a boosted engine, but with full streetability and manners. A 510-inch LS engine, using a tall deck block with a bore of 4.200 inches and a forged crankshaft with throws of 4.600 inches, was the answer. The



heads are custom-ported factory LS7 units, and the valvetrain has been upgraded with a custom-ground camshaft to handle the rpms and quick accel/decel of track use. Feeding air to those heads is a custom-built intake by Wilson Manifolds, spec'd out to feed the massive Mouse plenty of air and fuel. The LS7's dry-sump oiling system was retained, but customers can order the 510 engine package with wet-sump oiling if they so desire. It breathes through 2-inch diameter American Racing headers, with a measured output of 802 horsepower at 6,800 rpm and 692 lb-ft of torque at 5,600 rpm.

That power is fed through a carbon-fiber driveshaft using Blackdog billet driveshaft couplers into a '10 ZR1 six-speed transmission—torn apart, modified, and reassembled by Blackdog Speed Shop—to handle the torque and track abuse the C6 was destined to see. The clutch is an RPS billet carbon twin-disc



SPEC SHEET

BLACKDOG SPEED SHOP 510 Z06

ENGINE	510-cid Gen III small-block with ported LS7 heads, custom camshaft and Wilson Manifolds intake, American Racing Headers 2-inch long-tube headers, and Aeromotive Stealth fuel pump
TRANS	'10 ZR1 Tremec six-speed rebuilt and modified by Blackdog Speed Shop
CLUTCH	RPS billet carbon twin-disc
DRIVESHAFT	Carbon-fiber w/ Blackdog Speed Shop driveshaft couplers
SUSPENSION	Stock Z06, with Blackdog Speed Shop three-way adjustable shocks, and Blackdog Speed Shop spherical control arm bearings
BRAKES	Front – Brembo six-piston calipers w/ slotted rotors; Rear – Brembo four-piston calipers w/ slotted rotors
WHEELS	Dymag carbon-fiber wheels w/ magnesium centers
TIRES	Pirelli P-Zero, 285/30ZR19 front; P-Zero 345/25ZR20 rear
SEATS	Cobra Carbon seats on factory tracks



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[FEATURE]

BEWARE OF BLACKDOG!

setup. The rearend is factory Z06. Slowing the fun down in the turns and on the street are Brembo calipers and slotted rotors, six-piston binders up front, four-piston units out back.

The goal of the Blackdog 510 Corvette was to earn the title of ultimate street Corvette, combining the vast wealth of racing knowledge Blackdog had accumulated with their World Challenge Corvette, with the proven methods for great street cars. The result, a C6 that's just as much fun to drive to and from the track as it is to drive on it. **VETTE**



THE GOAL OF THE BLACKDOG 510 CORVETTE WAS TO EARN THE TITLE OF ULTIMATE STREET CORVETTE, COMBINING THE VAST WEALTH OF RACING KNOWLEDGE BLACKDOG HAD ACCUMULATED WITH THEIR WORLD CHALLENGE CORVETTE.



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GETTING A HANDLE

PART 1: FRONT SUSPENSION UPGRADES NET HUGE IMPROVEMENTS ON OUR '58 CORVETTE PROJECT

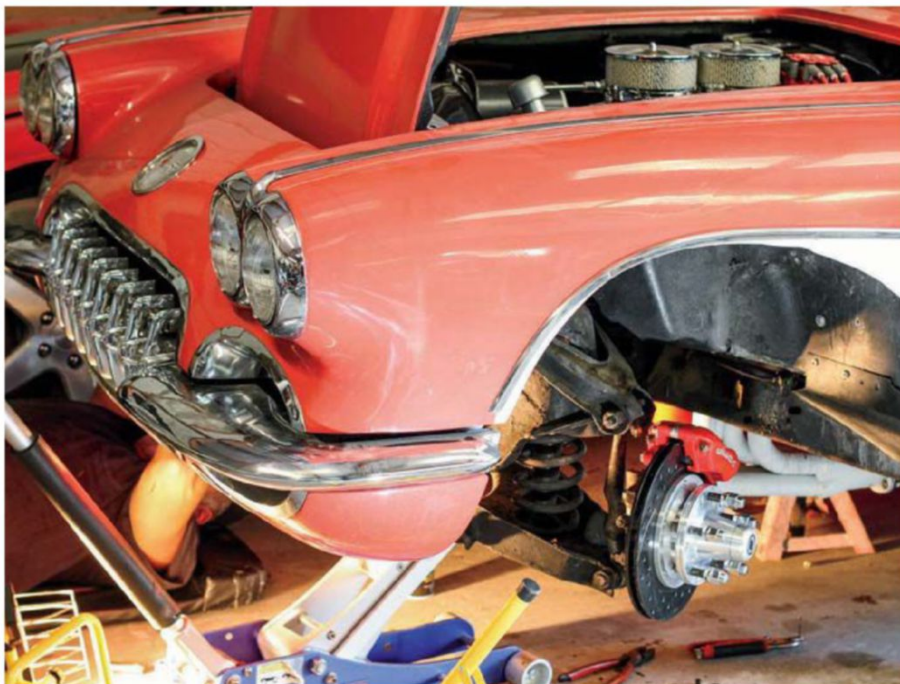
SCOTT PARKER WORDS | PHOTOS

Purchasing a '58 Corvette fulfilled one of Greg Lovell's lifelong dreams, however its loose frontend and steering made the dream more of a nightmare. In fact, on his first drive he noted that it was the only thing preventing the Vette from being a total blast on the street. With so many advances in the aftermarket over the years, there is no reason to dread driving your classic Corvette. Chances are if you have a problem, there is an aftermarket solution. That was certainly the case for Greg's C1 Corvette.

For a little background, let's keep a few things in mind. The '53-'62 Corvettes all sported the same basic frontend as a '49-'54 Chevy passenger car. (Gasp!) Yes, it's true. The bad news is that it isn't exactly the most technically advanced setup. In fact, there are almost no bushings in the entire frontend, which means there's plenty of metal to become fatigued and worn out over time. The good news is that there are plenty of interchangeable parts, such as '53-'54 passenger car spindle uprights, which can help drop the front end by 3/4 inch. Unlike a more modern car that might use lowering springs, spindle uprights are the only way to lower first-gen Corvettes.

Our mission was two-fold: replace all of the worn-out parts in the '58 Corvette's frontend and make it lower to the ground for a more modern ride height. Accomplishing the second task turned out to be a little trickier than we anticipated since it came with '53-'54 passenger car spindle uprights. The solution was to purchase a set of Fatman Fabrications' drop spindle uprights for a total of 2.5 inches. These uprights move the spindle mount up as far as it will go for the lowest of the low. As for the frontend, rather than piecemeal all the parts we might need together, we made a quick call to Corvette Central for a frontend rebuild kit (PN 571001) and upper control arms (PN 571004) along with Bilstein shocks (PN 571104) and some other goodies we will go into later.

If you've been following this series at Anti-Venom, then you'll know that our '58 Corvette project isn't far from a complete overhaul. On the last two installments, we covered the brakes and rearend upgrades. Be sure to check out Part 2 of this story where we tackle the steering system and button up the frontend up for good. **VETTE**



01 Greg Lovell kicks things off at Anti-Venom Skunkworks by unhooking the '58 Corvette's steering shaft. The cotter pin is pulled first, and then a flat-head is used on the pin before rotating out to disconnect from the Pitman arm.

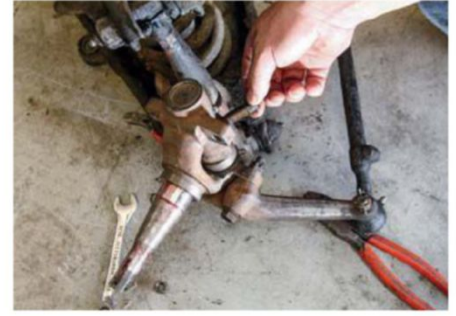
02 A total of eight bolts (per side) hold the front subframe to the C1's frame. The radiator shroud must be removed to reach the nuts on the front two inner bolts. If the bolts are seized it actually negates this chore since you won't need to get a wrench on the nut.



03 Here you can see these rotted old (factory) subframe spacer plates. We'll be replacing those with new pieces in the Corvette Central kit.



04 As you can see, the engine does not connect to the front subframe on the C1, making this job a bit easier. Greg will tear down the subframe before sending it out to powdercoat and starting the rebuild process.



05 Greg starts on the spindle by removing the nut and then the pin.



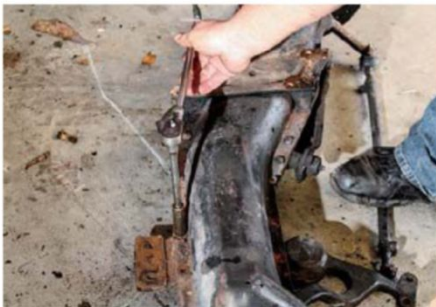
06 The caps are pried off before pulling the retaining clips to get to the kingpin.



07 The kingpin is chiseled out with a mallet.



08 The cotter pins are removed from the third arm, along with the attached nut.



09 The entire third arm is then removed with four bolts.



10 Perhaps one cause for the frontend issues in the '58 is that the spindle upright was not centered in the upper A-arm. Centering the control arms is a crucial part of the installation process, which we'll cover later.



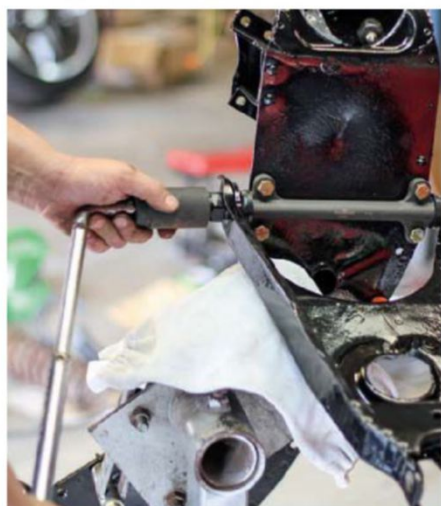
11 Greg unbolts the struts, first from the top, and then removes out the bottom. To save time, we are going to omit the dangerous part where Greg compresses the springs and unbolts the cross-shafts that attach the spindle uprights to the A-arms. However, you'll get your fill of that during the installation in a second. Once you've removed the cross-shafts and finished stripping the crossmember, it is a good time to inspect the upper inner shaft on the crossmember to make sure that the metal bushings are in good shape (ours were). These are welded in, so replacing them is a bit of a pain (but not impossible).



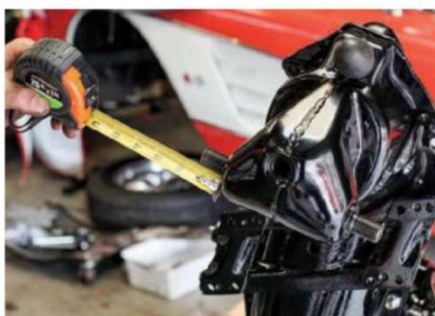
12 Corvette Central sent us a new set of springs, subframe spacers, sway bar endlinks, bumpstops, upper control arms, and Bilstein struts (and shocks) to help overhaul the frontend of the AntiVenom '58 Corvette. New cross-shafts (four per side) are not pictured, but central to the frontend rebuild kit (PN 571001) since they take most of the abuse in the suspension. The struts, shocks, and upper control arms are not included but are highly recommended. Greg also plans to install a front sway bar (hence the endlinks) to this former drag car to complement these additions.



13 When the bare crossmember came back from powder-coat, Greg bolted it up to an engine stand to make it easy to work on. The first piece to be bolted to it is the new Corvette Central (lower inner) cross-shaft. There are no rubber or polyurethane bushings in the control arms, just metal on metal, which is exactly why it wears out.



14 Greg checks and rechecks that the lower control arm is centered before the final tightening of the cross-shaft nuts.



15 Greg uses a measuring tape to ensure the upper cross-shafts are perfectly centered upon installation. The upper cross-shafts are a bit trickier than the lowers, since it threads through the crossmember and must go in from the front. The forward threads are larger than the rear. Replacement shafts (like these) are 0.008-inch oversized, making it even more difficult, and must be installed dry (without lube).



16 The factory nut (bushing) was used as an installation tool before greasing the Corvette Central nut for a final tighten.



17 Greg used a homemade spring compressor that consists of a piece of all-thread with nuts. The new spring is sandwiched between the control arms, and then the nuts are tightened to compress the spring.



18 Drop spindles, or spindle uprights, like these from Fatman Fabrications (top) effectively raise the mounting point of the wheel up into the wheel-well, rather than decreasing the suspension travel

with lowering springs or coilovers like on a late-model car. It is the only way to effectively lower the ride height on a C1.



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19 All of the cross-shafts eventually get greased, so it is crucial that you install the seals properly on the outer cross-shafts or they will leak profusely. The lowers are particularly difficult to install without tearing with this setup, and you may have to resort to using some O-rings.



20 Like the inner cross-shafts that attach the control arms to the crossmember, the outer cross-shafts (that attach the control arm to the spindle upright) must also be centered before tightening. Greg uses an impact gun to seat the nuts since this is a press-fit situation.



21 Greg used a three-stone brake cylinder hone to bore out the spindle for the kingpin bushings, which will ride on a bearing and bushings. Shims are also used to keep the spindle tight to the upright since the gap is over 0.006-inch with the thrust bearing in place.



22 The kingpin is tapped into place with a mallet. It should be stiff to rotate (if not, it needs more shims). Just as you saw during removal, caps and locking rings secure it. The convex side of the cap goes outwards.



23 Last but not least, here is a little preview of what the AntiVenom '58 Corvette will look like on the ground. Now that's proper fender-to-tire gap! We'll wrap this up next time, including the addition of some steering upgrades. Stay tuned!

Sources

ANTIVENOM

813.381.3995
antivenomefi.com

CORVETTE CENTRAL

800.345.4122
corvettecentral.com

FATMAN FABRICATIONS

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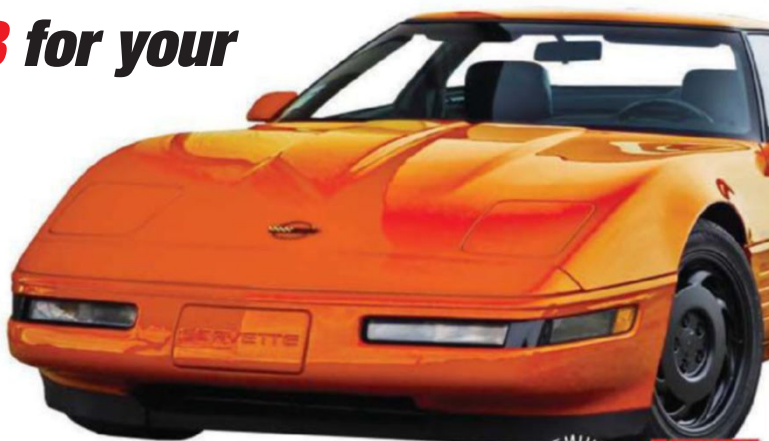


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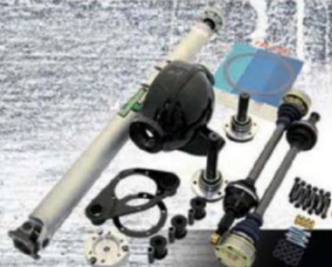
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DARK MATTER

JASON LEMEK'S '63 IS
BLACKED OUT AND BADASS

JOHN MACHAQUEIRO WORDS | PHOTOS

The latest statistics place the average age of a new Corvette buyer at 59. That is up from 54 only a decade ago. Equally telling are the ever-increasing prices on many older Corvettes. Perhaps that might be part of the reason that 36-year-old Pennsylvanian, Jason Lemek states, "When I've been out in this car, I've gotten a lot of older guys tell me, 'You better take your dad's car home!'" The car he is referring to is his '63 convertible, which you see on these pages. While Jason often needs to make it clear that he hasn't borrowed the car,

the story on his C2 does indeed start with his dad, Don Lemek.

The elder Lemek has been a life-long Corvette junkie, with a particular fixation for C2s. This enthusiasm for that body style was one he hoped to pass along to his sons, so in the early '80s, he started buying wrecked midyears from local junkyards for them to rebuild when they were old enough. Penndel Body Works in Penndel, Pennsylvania, was one of his favorite spots. According to Jason, when you drove up to the place, you could see wrecked midyears stacked on top of tractor-trailers behind the building. "Every time there



was a Corvette wreck on the Pennsylvania Turnpike, they would go pick it up," Jason further explains. "They had about 20 at one point that were crashed, and I think my dad ended up buying all of them."

In 2010 Jason decided to take his dad up on the offer, and asked for a body to work on. "My two favorite cars were the '63 split-window and the '67 big-block convertible," he notes. "My dad didn't have any '63 coupe bodies, so I got the '63 convertible, but at that point I figured that I wouldn't be putting the car back to original. The original motor was long gone, along with all the factory parts, so I decided to build something that I wanted to enjoy, and make it look more like a '67."

What he got, or didn't get, was much of a car to work on. The starting point was a bare shell missing the front clip, doors, and fenders. The only positive was that the birdcage was in exceptionally nice condition. At the time, his brother Mike had a Corvette repair shop, so he was able to take the body there to work on. With the help of his dad, Mike, and his other brother Ryan, they hung new fiberglass panels and did all the rough work. "Body" Bob Hamilton, who worked at the shop, and is a master at shaping fiberglass, performed the finish work. Once the body was razor sharp, Brandon Good laid down the deep DuPont ChromaSystem Super Jet Black basecoat/clearcoat paint. The entire process was rather lengthy

because everything was being allowed to expand and contract to avoid issues once the car was finished.

While the body was taking shape, Jason pondered his direction and decided to alter his plans for the car. Initially, he was content to slide a stock frame under the body and drop in a big-block that looked period correct. While it would be like many other C2s, it wouldn't have that much of a personal stamp. At that point, he decided that a modern drivetrain would be the direction going forward. He explains, "I went and checked out a bunch of different chassis at the 2012 Corvettes at Carlisle show. I spoke to quite a few people in trying to figure out the best route. At the time, everyone was



[FEATURE]

DARK MATTER

building chassis using C4 suspension, and I didn't want to go that route. I was looking for something more modern." During the show, he spoke to Jeff Page, the owner of Heartland Customs about the C2 chassis they were developing with the Roadster Shop. At the time, the Fast Track C2 Corvette chassis was still months out so he held off. The appeal of this design was that it was fully hand-fabricated using 10-gauge boxed framersails with the factory body mount locations. Their front suspension uses proprietary geometry utilizing C6 ZO6 spindles, along with larger upper and lower control arms, which have been designed to accept a wider wheel and tire combination without losing turning radius. The quality of the workmanship was also a big selling point. Jason describes it as "a piece of artwork." At that point in the build with the

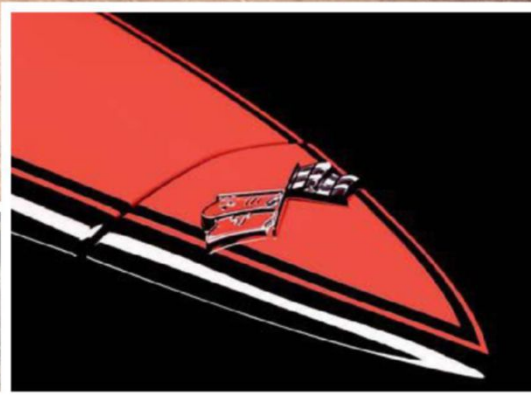
frame sorted out, the body was moved to his garage at home, where the rest of the work would take place.

Propulsion was also a mixed bag of choices. There were plenty of options from mild to wild, yet there is something to be said for reliability that is backed up by a warranty. With that in mind, Jason opted for an LS376/525 crate engine from Chevrolet Performance's catalog. The LS3 6.2L naturally aspirated mill produces a respectable 525 horses at 6,300 rpm and 489 lb-ft of torque at 4,400 rpm.

Mated to

a Tremec TKO 600 five-speed, it transmits the power via a custom-made driveshaft to a 9-inch rear stuffed with 3.90:1 gears. All those ponies require proper breathing, so he opted for a set of SLP SS headers that purge into Stainless Specialties custom polished side pipes with internal mufflers.





When it came time to choose the rolling stock, Jason knew that the wheel and tire choice could make or break the stance on the car, so he opted for an inconspicuous set of ZR1-style black powdercoated wheels (18x9.5 front, 19x12 rear) wrapped in Nitto NT05 radials (245/40ZR18 front, 335/30ZR19 rear). The last piece of the performance puzzle was the braking, and for that he went with a set of massive Wilwood six-piston calipers and 14-inch rotors at the front, and Wilwood four-piston calipers and 12-inch rotors at the rear.

The last major hurdle, aside from assembling everything, was the interior. While the direction of the build changed,

the choice of exterior and interior colors remained a constant. Midway into the project, Jason started looking for someone to tackle the interior, which led him to contact a few local automotive upholstery shops. Most of the conversations generated ideas that gravitated towards using off-the-shelf repro parts, like door panels, which was a direction he didn't want to go. He had some specific ideas, yet was not finding the right person to execute them. That changed when he met Chris McClintock, the owner of Bux Customs in Pottstown, Pennsylvania. Jason explained what his vision was for the interior and Chris delivered the goods. The C2 interior has been fully wrapped in red

[FEATURE]
DARK MATTER



leather, with custom seats, and door panels. Other highlights include Vintage Air, Sat Nav, power windows, and a Billet Specialties D-shaped steering wheel, along with an iPad controlled sound system. Progress was steady, but challenging, since most of the work was being done in his garage, which didn't have a lift.

After about three years of steady progress with no clear completion date set, Jason decided to ramp up the work to try and make the 2014 North East Rod & Custom show in Oaks, Pennsylvania. Two weeks before the show, the car was moved to AG Automotive in Ivyland, Pennsylvania. Owned by

Brandon's dad, Andy, the shop played a crucial role in getting the final work done on the car because of their fabrication capabilities. In the end, it went right down to the wire, with everyone working on the car until the day before the show.

Since then, Jason has been enjoying the car. Some might look at it and think it's a trailer queen, however, he says "there are a few chips in the paint already, but I drive it like I stole it." Beyond the sheer enjoyment of driving the car, he plans to do the same for his children that his father did for him, by stashing some Corvette projects away for them to play with when they are older. **VETTE**



SPEC SHEET

1963 CHEVROLET CORVETTE CONVERTIBLE

OWNER	Jason and Andrea Lemek, Willow Grove, Pennsylvania
ENGINE	Chevrolet Performance LS376/525 crate engine
BLOCK	Chevrolet Performance cast-aluminum with six-bolt, cross-bolted main caps
ROTATING ASSEMBLY	Chevrolet Performance nodular-iron crankshaft, powdered metal steel connecting rods, hypereutectic aluminum pistons
HEADS	Chevrolet Performance aluminum L92-style port with 68cc chambers
CAMSHAFT	Chevrolet Performance 226/236-at-0.050 hydraulic roller, 0.525/0.525-inch lift, 110-degree LSA
VALVETRAIN	Chevrolet Performance 2.165 intake/1.590 exhaust valves, investment-cast roll trunnion 1.7:1 rocker arms
INDUCTION	Chevrolet Performance EFI intake with fuel rails, injectors, and throttle body
EXHAUST	SLP SS headers, Stainless Specialties custom side pipes with internal mufflers
TRANSMISSION	Tremec TKO 600 five-speed, Ram hydraulic clutch, Tremec shifter
FRAME	Roadster Shop/Heartland Customs Fast Track C2 Corvette chassis
REAR AXLE	9-inch IRS with 3.90:1 gears and Driveshaft Shop axles
FRONT SUSPENSION	Roadster Shop Fast Track with coilover suspension
REAR SUSPENSION	Roadster Shop Fast Track IRS with coilover suspension
BRAKES	Wilwood 14-inch rotors with six-piston calipers, front; 12-inch rotors with four-piston calipers, rear
WHEELS	ZR1 wheels, 18x9.5, front; 19x12, rear
TIRES	Nitto NT05 245/40ZR18 front, 335/30ZR19 rear



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MILESTONES

THE NATIONAL CORVETTE MUSEUM CELEBRATES ITS 20TH ANNIVERSARY

WALT THURN WORDS | PHOTOS

On September 2, 1994 the Corvette hobby celebrated a historic event, after many years of planning and fund-raising, the National Corvette Museum (NCM) opened in Bowling Green, Kentucky. Many Corvette celebrities were present, including Zora Arkus-Duntov. The Bowling Green Corvette Assembly plant is located about a quarter of a mile north of the NCM. This close location allows visitors to take a plant tour and visit the NCM on the same day. Many enthusiast groups became involved in helping the museum grow and flourish. During its 20 years the museum has reached a number of milestones. Many of these can be credited to longtime Bowling Green banker Wendell Strode. Wendell became the NCM's Executive Director in 1996 and has dedicated himself to putting the museum on sound financial footing. This included expanding the facility to accommodate more visitors in 2009. The finished expansion now covers 115,000 square feet.

Work on developing the 20th Anniversary Celebration began several years ago. The NCM staff continued promoting this event, including appointing someone to help organize a nationwide Corvette caravan. This task fell to longtime NCM member Paul Mariano of Huntersville, North Carolina. Paul was named chairman of the National Corvette Caravan and appointed caravan captains and starting locations for every state in the U.S. and Canada. Thousands of Corvettes flocked to the NCM during the Labor Day weekend. They were parked everywhere and the museum scheduled continuous events to keep every visitor occupied.

The biggest news was the grand opening of the NCM Motorsports Park. Tour buses ran for extended hours transporting visitors from the museum to the Motorsports Park. Once

they arrived they could attend seminars and take part in driving events during the three-day event. Meanwhile, back at the museum the Bowling Green staff were present to answer questions and explain the new features of the '15 Corvettes. A wide variety of new models were parked in the courtyard in front of the museum. This included several of the new Z06s that will be available early next year.

Many informative seminars were held at the museum, including one by former Corvette Chief Engineer Dave McLellan. Dave talked about why the '83 Corvette was never built. This was the only year a Corvette was not produced since production began in 1953. Only one '83 Corvette exists and it is located inside the NCM. Drs. Leslie North and Jason Polk from Western Kentucky University discussed how the NCM sinkhole happened. They explained that Bowling Green is a well-known karst area. Karst is formed from the dissolution

The National Corvette Museum opened on September 2, 1994 to much fanfare and celebration. On August 27-30, 2014 the museum held its 20th anniversary celebration.

of soluble rocks such as limestone, dolomite, or gypsum. It creates underground drainage systems that cause sinkholes and caves like what happened in the NCM Skydome. The best solution is to completely fill the site with concrete grout and steel reinforcement. On August 30, 2014, the NCM board voted to do exactly that. Work will begin in November 2014 and is expected to be completed in six months. All of the eight damaged cars have been relocated into the Skydome so visitors can inspect them. The NCM board also announced that only three of the eight damaged Corvettes would be repaired. They are the ZR1, the 1-millionth, and the '62 convertible. Chevrolet will fund an outside resource to restore the '62 Corvette and Chevrolet will restore the other two



The new Z06 was the star of the Chevrolet display. This Shark Gray '15 Z06 was protected by this temporary barrier, but still attracted crowds throughout the weekend.



(Above) The Bowling Green Assembly Plant staff was on hand to explain the changes to the '15 models. This Shark Gray eight-speed automatic convertible attracted a lot of interest.



(Left) Thousands of Corvettes converged on the museum in well-organized caravans. Designated Team Captains were responsible for leading the caravans to Bowling Green from all around the country. Long lines of Corvettes were a familiar sight on the many highways leading to the National Corvette Museum.



This local police department's Corvette was on hand to greet the caravans and NCM visitors.



Corvettes were packed into every available parking spot on the museum grounds. A large auxiliary parking lot was opened up south of the museum to accommodate overflow parking.

Corvettes in-house. The remaining cars will be put on permanent display in their as-recovered condition. Filling the hole was a difficult board decision as attendance has soared 66 percent, but this is a safer and less expensive option than keeping even a portion of the sinkhole preserved. General Motors is providing \$250,000 to help the museum recover from some of its sinkhole expenses.

Several authors were present to sign their books, including retired Corvette Plant Manager Wil Cooksey. His book titled *No Time to Cry* covers his difficult childhood and how he conquered hardships through dedication and hard work. Wil spent many hours signing and discussing his book for his fans. Wil was inducted into the NCM Hall of Fame in 2013. Speaking of the Hall of Fame, three new Corvette celebrities were inducted during the anniversary weekend. They were Corvette engineer and racing driver John Heinrich, author Jerry Burton, and the late Dave McDonald, a former Corvette racing champion. On Saturday, the event ended with a parade lap around the new Motorsports Park. By the many smiles we saw on the visitors faces, the 20th anniversary celebration was a huge success. The NCM is alive and well, which is a great tribute to the best sports car in the world—Corvette! **VETTE**



Noted author Jerry Burton (right) was inducted into the Hall of Fame. He presented a seminar about his well-received book on Zora Arkus-Duntov. Former Corvette Chief Engineer Dave McLellan (left) and retired development engineer Gib Hufstader (center) shared their memories of working with Zora.



The Hall of Fame ceremony is held at each yearly anniversary event. The late Dave McDonald was a well-known Corvette driver on the West Coast. He was lost at an Indianapolis accident in 1964. Three of his favorite cars were displayed at the museum. His family and friends gathered behind them to celebrate his memory.



Retired Corvette Chief Engineer Dave McLellan (left) presents Hall of Fame inductee John Heinrich with his plaque. John is a brilliant engineer and continues to be an accomplished championship-winning race car driver.



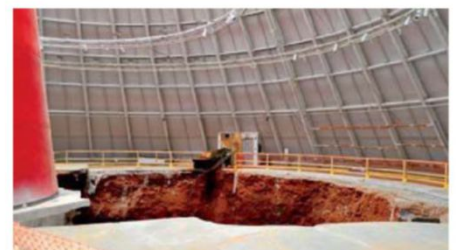
Many vendors were on hand during the event, including Corsa Exhaust systems. Owners lined up to find the right sound for their Corvette.



This 1-millionth Corvette is one of three cars that will be restored to their previous condition. Chevrolet will complete the restoration.



Two other Corvettes will be restored to their previous condition, the blue ZR1 in the foreground and the black '62 convertible (third from the left). The other five damaged cars will become part of the museum's permanent sinkhole display.



On August 30, 2014, the NCM Board of Directors met and decided to completely fill in the sinkhole that is inside the Skydome. The cost of leaving even some of it exposed turned out to be very expensive.

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FEATURE

RAPID PROTOTYPING

*BY BUILDING THE MOST POWERFUL C7 CORVETTE ON EARTH,
STEVEN FEREDAY DEVELOPED ALL-NEW LT1 SPEED PARTS IN NO TIME FLAT*

STEPHEN KIM WORDS | PHOTOS



Standing in at 170 pounds, Steven Fereday isn't exactly an imposing figure. The dude's so skinny complete strangers hand him Burger King gift certificates on the street. Maybe that's part of his cover, because in the racing world looks can be very deceiving. This is a man that built the first LS-powered street machine to run 7s on a stock suspension. Since then, he's routinely man-handled a 6-second Firehawk and is currently building a twin-turbo, alcohol-injected, big-block Camaro with high-3s in the 1/8-mile as the goal. Oh yeah, Steven and his buddy Josh Ledford also run Late Model Racecraft, a Houston-based speed shop responsible for creating some of the most wicked late-model GM performance cars on the street. And that's



where his latest daily driver—a '14 Corvette Stingray—comes into play. From day one, it has served as a development mule to help deliver innovative parts to the direct-injected LT1 market. Not surprisingly, within weeks of delivery he transformed it into the most powerful C7 on earth. Can you say 1,292 rear-wheel hp?

If Steven's slender frame doesn't throw people off, his youth certainly will. Granted that he's just a hair past 30 years old, but he's been building and racing fast cars most of his life. He started street racing at 17, and soon his 9-second '98 Camaro earned quite a reputation. "I street raced everywhere I could, from Texas to Oklahoma. After a while, the car became so well-known that I couldn't get any races anymore," he recalls. "That's when I



[FEATURE]

RAPID PROTOTYPING

started racing in the LS1Tech.com drag series, and won all four of the True Street class events in its first year. After that, the car won three Clash of the Titans events in True Street and True 10.5. That car eventually got a 91mm turbo and ran 7.98 at 175 mph on a stock suspension. While I was still in college, people started asking me to work on their cars for them, so I partnered up with my friend Josh Ledford and started up Late Model Racecraft.”

Between then and now, Steven's had brief stints with a C6 Corvette and a Viper, but most

of his daily drivers have been rather tame.

That all changed when he picked up one of the first C7 Corvettes in Houston, complete with the Premiere Edition package. The day the car showed up at the shop, the LMR crew tore it down and got to work. “We want to be the best, and since the Gen V engine platform is so different from the Gen IV, the entire purpose of buying this car was to stay on top of the late-model GM performance industry. We worked with A&A Performance to help develop a supercharger kit using a Vortech YSi head



IT'S HARD TO GET TRACTION FROM A STANDSTILL, BUT THE TIRES HOOK UP VERY WELL FROM A ROLL. THE WAY THE POWER BUILDS PROGRESSIVELY WITH A CENTRIFUGAL SUPERCHARGER REALLY HELPS PUT THE POWER DOWN.



unit," Steven explains. "We also used this car to develop a custom fuel system, CNC-ported cylinder heads, camshafts, cold-air induction kit, PCV breather system, engine mounts, and coilovers for the C7 platform. Tuning the high-pressure, direct-injection setup on the new GM Gen V small-blocks can be very challenging. It took lots of hard work to figure out, but we were one of the first shops in the country to successfully tune these cars using the stock computer."

Considering Steven's background with

insanely fast drag cars, merely bolting on a supercharger wasn't enough. He wanted to max the thing out to, so he enlisted Late Model Engines to build him a short-block that was up to the challenge. Now displacing 416 cubic inches, the LT1 was bored to 4.070 inches, then fitted with a forged Calles 4.000-inch steel crank and rods, and 10.5:1 Diamond pistons. The Vortech-pressurized air molecules travel through LMR CNC-ported LT1 cylinder heads, and a custom LMR hydraulic roller camshaft actuates the valves.

Wringing the supercharger out for every last psi it was worth netted a touch over 1,000 horsepower on the chassis dyno, but that still wasn't enough. A big dose of spray, courtesy of Nitrous Express, and a Snow methanol injection system bumps output to a stunning 1,292 rear-wheel horsepower.

It all seems like an exercise in wretched excess in some respects, but there's good reasoning behind pushing a brand-new Corvette to over 1,500 (flywheel) horsepower. "The compression ratio might seem kind of high



on paper, but we learned that direct-injection actually needs a lot of compression. In fact, you can run into detonation issues if the compression ratio is too low," Steven reports. "The stock engine mounts won't cut it at this power level, so we developed our own mounts that are now available to the public. We also worked with the Driveshaft Shop to develop a set of C7 axles capable of handling this kind of power."

A testament to the C7's world-class suspension, the Stingray's Z51 underpinnings are more than up to the task of planting the power. LMR developed an all-new C7 coilover system for the car, but otherwise the suspension is unchanged. Providing the stick are 20-inch HRE P104 wheels wrapped in Michelin 265/30R20 tires up front and Toyo R888 315/30R20 steamrollers in the back. Although Steven does most of his racing on the track these days, the C7 has smoked a Lamborghini

or two in its day. "It's hard to get traction from a standstill, but the tires hook up very well from a roll. The way the power builds progressively with a centrifugal supercharger really helps put the power down," says Steven.

Accelerating aftermarket parts development for the latest and greatest GM has to offer is all in a day's work for Steven and his LMR crew. That's not too shabby at all for a guy that looks more like a paperboy than a hard-core racer that manhandles 4,000-horsepower drag cars down the track. With the bulk of development work complete on his C7 Stingray, Steven is already planning replacing it with a new Z06 as soon as it hits the street. Maybe then someone (probably Steven) will finally break the horsepower record set by LMR's stroked, boosted, and nitrous'd C7. All the while, C7 owners of the world will once again rejoice with a stack of new parts available for their new Z06s in no time flat. **VETTE**



SPEC SHEET

2014 CHEVROLET CORVETTE STINGRAY

OWNER	Steven Fereday, Houston, TX
ENGINE	GM LT1 small-block
DISPLACEMENT	416 cubic inches (6.8 liters)
BLOCK	Factory aluminum, bored to 4.070 inches
ROTATING ASSEMBLY	Callies steel crankshaft and rods, Diamond forged 10.5:1 pistons
CAMSHAFT	LMR custom hydraulic roller (specs classified)
HEADS	LMR CNC-ported factory aluminum castings
VALVES	Stainless 2.13/1.59 inch
INDUCTION	A&A supercharger kit with Vortech YSi head unit, Nitrous Express nitrous system, Snow Performance methanol injection
EFI	Stock GM ECU tuned by LMR
IGNITION	Stock GM
EXHAUST	American Racing 1.875-inch headers, stock dual 2.75-inch mufflers
TRANSMISSION	Tremec TR 6070 seven-speed manual, McLeod RST twin-disc clutch
SUSPENSION	Stock Z51 with LMR coilovers
BRAKES	Factory 13.6-inch rotors and four-piston Brembo calipers, front; 13.3-inch rotors and four-piston Brembo calipers, rear
WHEELS	HRE P104 20x9, front; 20x12, rear
TIRES	Michelin 265/30R20, front; Toyo R888 315/30R20, rear
OUTPUT	1,292 rear-wheel horsepower



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POWER PLAY

CHEVROLET PERFORMANCE'S LSX376-B8 IS AN AFFORDABLE CRATE ENGINE FOR C3/C4 SWAPS

BARRY KLUCZYK WORDS | PHOTOS



When it comes to high-performance heart transplants, it's easy to understand the shift to GM's LS family. They're compact and relatively lightweight powerhouses—especially when you compare them against their low-revving, all-iron small- and big-block predecessors. And while we would never suggest swapping out the L88 427 in your numbers-matching '67 roadster, dropping an LS engine into a malaise-era C3 or C4 is a great way to not only dramatically increase performance but to also improve overall balance by taking more than a few pounds off the snout of those nose-heavy Corvettes.

Used LS1, LS2, and LS3 engines from C5 and C6 Corvettes, as well LS1 donors from Camaros, are out there, but not exactly cheap these days. The engines are in demand from builders from all corners of the automotive

realm, so you've got to pounce on them when they pop up on Craigslist. Even salvage-yard truck engines are somewhat scarce and pricey, considering the relative performance from what are typically iron-block 5.3-liter engines.

Chevrolet Performance has a number of LS crate engines, and as we've scanned the prices from retailers such as Scoggin-Dickey, Summit Racing Equipment, Pace Performance, and the like, we've discovered what appears to be a real sleeper of a bargain: The LSX376-B8 (PN 19260831), which is good for about 450 horsepower with a single four-barrel carburetor. We found it for around \$5,700 online. That's for a long-block assembly, mind you—no induction system or oil pan. Nevertheless, considering the cost of buying and reconditioning an LS1 and bringing it to the LSX376's power level, it's a strong value. Heck, if you change the camshaft to Chevrolet

Performance's lumpy "ASA" grind, it will produce around 515 horses. That's more than an LS7. Have you priced them lately?

The LSX376-B8 is built on the foundation of the durable LSX Bowtie cylinder block. Yes, the block is iron, and it ain't exactly a featherweight, but the heads are aluminum and, depending on whether you go with factory-style fuel injection or a carburetor, you'll be using either a plastic or aluminum intake manifold, so you're still pounds ahead when compared to the all-iron anchor you yanked from your project car. The engine is delivered without the oil pan or intake system because the range of applications for it is virtually unlimited, so it's less expensive to start with the basics and adapt the other parts as necessary.

By the way: The "B8" in the engine's name refers to the amount of boost that can be safely fed to it. In fact, it was designed to

support a blower or turbo and is built with forged aluminum pistons—a feature you won't find on any used production engine except the LS9. If you're serious about building boost, there's also the LSX376-B15 (PN 19299306), which features a forged steel crankshaft and lower-compression pistons to support—you guessed it—up to 15 psi of pressurized air. It'll also cost you about \$1,500 more.

The LSX376-B8 and -B15 crate engines are assembled at Performance Assembly Solutions (PAS), a specialized facility in the Detroit area, which blends the best of hand-assembly and production-line techniques. Every component associated with the rotating assembly the respective holes they fill in the block are mic'd with ultra-precise air gauge tools and their specifications recorded in a master file for each engine. Think of it as high-tech blueprinting.

Computer-controlled and calibrated torque wrenches ensure consistency with every engine, too, but they don't replace the eyes and experience of specially trained builders who guide each engine from start to finish. There are only four stations involved with each engine's assembly, with a single builder at each one responsible for specific tasks. In the first station, the rotating assembly and engine block are inspected, measured, and prepped for assembly. At the second station, the bottom end of the engine is installed and at the third stage, the heads and other top-end parts are added. The final station is an inspection stop, where each engine is subjected to a roster of checks, including leaks, compression, and oil pressure.

We asked and Chevrolet Performance agreed to let us document the assembly process for the LSX376 engines at PAS. It was a fascinating look at how a crate engine comes to life, which we are sharing in the accompanying photos. And be sure to check out our sidebar story on tips for adding an LS engine to your C3 or C4. **VETTE**

Sources	
CHEVROLET PERFORMANCE	chevroletperformance.com
HOOKE HEADERS	270.781.9741 holley.com
MARCH PERFORMANCE	239.593.4074 marchperf.com
MELROSE CORVETTE	815.758.2783 melrosecorvette.com
STAINLESS HEADERS	952.890.9219 stainlessheaders.com
VETTAID	770.464.9466 vettaid.com



01 Prior to assembly, the components of the rotating assembly are collected and prepped for a series of inspections and measurements to ensure each conforms to the factory specifications. Here, a custom air gauge is used to measure the outer diameter the pistons. Each is rotated within the fixture and air jets are used to determine the diameter, which is recorded on a master file for the engine.



02 Like the pistons, each rod is measured with a custom air gauge tool, which measures the small and big ends simultaneously. This one passed with flying colors and is headed for our project engine. Powdered metal rods are used and they're very strong. The LSX376-B15 engine uses the rods from the supercharged LSA engine.



03 The roller lifters are measured, too—not simply to confirm their diameters. Out-of-round and taper is measured, as well.



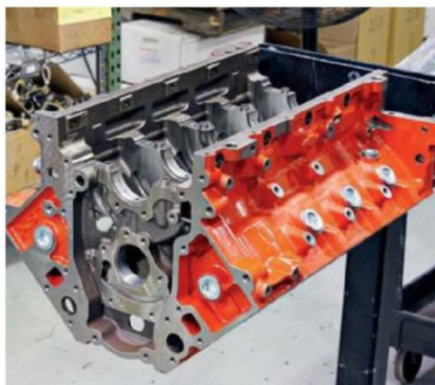
04 With the camshaft, the part number is verified and recorded in the master file, and then the journals are measured with another air gauge. Out-of-round and taper are also determined.



05 With all of the respective measurements completed, work begins with assembling the rod-and-piston assemblies.



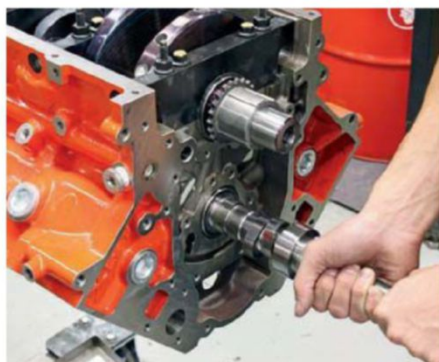
06 The rotating parts are then arranged on custom carts, which have a location for each component, and pushed to the next assembly station where they'll meet the cylinder block.



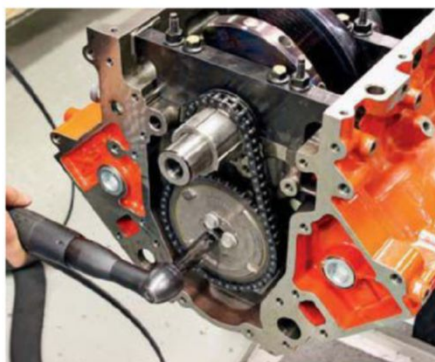
07 A cast-iron LSX Bowtie block with the regular-production 9.240-inch deck height is the engine's foundation and is delivered to the assembly line already honed and cleaned. A deck plate is used while honing the cylinders, simulating the clamping pressure of the cylinder head on the deck to ensure optimal bore dimensions when the engine is assembled.



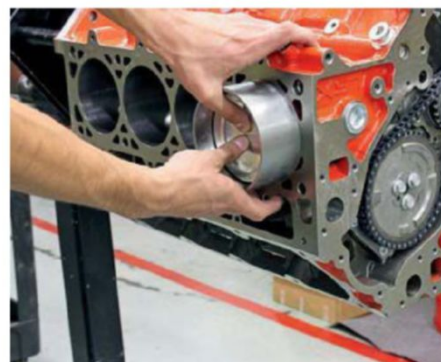
08 A production cast crankshaft with a 58X reluctor wheel is carefully lowered into place. Prior to installation, the rod and main journals are measured in four places to calculate out-of-round and taper. Also, the crank's snout and the damper's internal diameter are measured to calculate the interference fit. The LSX376-B15 gets a forged crankshaft.



09 In goes the camshaft. For our "B8" engine, it's a mild hydraulic roller with 0.551/0.522-inch lift and 204/211-degree duration at 0.050-inch.



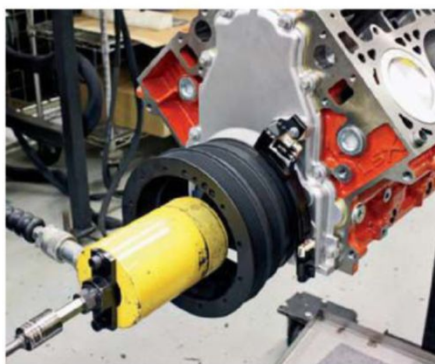
10 With the crankshaft and camshaft in place, the roller timing chain setup is installed, after which the high-volume, wet-sump oil pump from the LSA production engine is installed on the crank snout.



11 The piston assemblies are slid into place after the rod bearing received a coat of oil. Guide tools threaded onto the ends of the rods and a piston ring compressor ensure an easy, damage-free installation. The connecting rod caps are then torqued down to 64 ft-lb.



12 With the engine upright, the roller lifters are carefully tapped into place and their respective keepers cinched down.



13 It takes a lot of pressure to drive the damper onto the crank snout, so a hydraulic cylinder is used for the task. Then, the damper bolt is tightened with a 6:1 gear-reduction tool, because of the high-torque rating: 37 ft-lb plus 140 degrees.



14 Both the LSX376-B8 and -B15 engines use multilayer steel cylinder head gaskets that offer exceptional cylinder sealing for supercharged and turbocharged engine combinations—and they're plenty good at sealing naturally aspirated engines.

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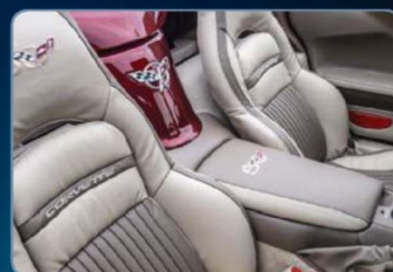
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15 The engine breathes through Chevrolet Performance's LSX-LS3 cylinder heads, which are based on the high-flow, rectangular-port design of the standard LS3 head, but with a six-bolt configuration that greatly enhances the clamping strength when compared to production-style four-bolt heads.



16 The heads also offer tremendous air-flow attributes. They have rectangular ports similar in design to the LS7, with large 2.160-inch hollow-stem intake and 1.590-inch solid-stem exhaust valves. The valves are held at a 15-degree angle.



18 A valley cover caps the engine and essentially completes the engine assembly. The LSX376 "B" engines are delivered without an intake manifold to make it easier and more economical to accommodate a blower or turbo. And because vehicle installations vary so wildly, they're delivered without an oil pan, too. A dust cover is installed over the crankshaft.



17 The valvetrain comes next and includes LS3 pushrods and a set of LS7-style 1.7-ratio rocker arms, which feature an offset design on the intake-side arms. They're torqued down to 30 Newton-meters.



19 After the engine is assembled, it's moved to the final inspection station, where it is leak-tested by pumping the water passages with about 20 psi of compressed air. The engine is also primed with warm oil to validate oil pressure, and the compression is checked. And that's it. From here, it's crated up and ready to ship.

TOP 10 CONSIDERATIONS FOR C3/C4 LS ENGINE SWAPS

Adapting an LS engine to a C3 or C4 Corvette requires fabrication, but more and more parts are coming to market to make this type of swap easier. Here are the top 10 things you need to consider for your swap project:

- 1. Engine Mounts.** You'll need them, and the easiest way is Hooker's adapters, PN 12611HKR. You bolt them to the engine, which allows the engine to be attached to the original small-block engine mounts, placing the engine in the correct position.
- 2. Exhaust Headers.** You'll need them, too. Stainless Headers (stainlessheaders.com) makes them for C3 swaps—including side-exhaust versions! Melrose Corvette (melrosecorvette.com) has them for C3 and C4 swaps.
- 3. Oil Pan.** Most production oil pans won't fit the C3 or C4 so you'll need the Chevrolet Performance Muscle Car Oil Pan kit, PN 19212593. It's basically a fourth-gen F-body oil pan and does the trick on both generations of Vettes. Some builders use the C5-style "batwing" pan, but it can cause fitment issues with other parts, like the headers.
- 4. Accessory Drive System.** This is a toughie. Factory accessory drive systems vary among the different LS-powered production vehicles. Most have the air-conditioning compressor mounted too low, generating crossmember interference issues, while the truck accessory drive system mounts items like the alternator high enough to make hood clearance a problem. If you can find a C5 system, you can probably make it work, but you'll have to get creative with the A/C compressor. Call March Performance (marchperf.com) and talk to their experts. They've helped with plenty of these swaps.



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5. Fuel Pump. If you're going with a production-style injection system, you'll need to remove the fuel tank on a C3 and have it adapted for a high-pressure in-tank system to support about 58 psi. It's a pretty simple procedure, but it will require adding baffles to the inside of the tank. For L98 and LT1 C4s, the factory in-tank pump is only good for about 45 psi, so you'll have to upgrade to at least a 58-psi pump. You'll also need to figure out things like pressure regulators, return lines, etc.

6. Radiator. Simply put, the original radiator in a C3 and even the C4 has to go. You'll need more cooling capacity, but try to fit the accessory drive system first so you have an idea of the clearance between the front of the engine and the radiator. And don't forget to take into account the depth of the electric cooling fan(s).

7. Air Conditioning. If you can find room under the hood for an air-conditioning compressor, you can make cold air blow in your LS-swap vehicle. We don't know of any direct bolt-on kits, but by mixing and matching components, you can make it work. Talk to the guys on the tech line at Vintage Air first: 800.862.6658.

8. Engine Controller & Harness.

You'll need one of each to get your LS engine running. Chevrolet Performance offers a number of universal controllers for a variety of LS crate engines, while companies such as Vettaid (vetaid.com) offer custom harness kits for C3 and C4 LS swaps. Talk to one of these experts before you start ripping out wires from your project car.

9. Sensors & Throttle Pedal.

A variety of sensors will have to be adapted to not only make the engine run without throwing a code in the controller, but you'll also want things like the gauges to work. That means you may have to get creative with things like the coolant temperature sensor. On most applications, for example, the coolant temp sensor for the gauge can be screwed into the LS cylinder head. If you're using an engine with an electronic throttle, you'll have to get the special gas pedal kit from Chevrolet Performance.

10. Transmission. This is more of a C3 thing than a C4 issue, because after you go to the trouble of dropping in an LS engine, there's no way we're letting you hook it up to an old three-three slushbox or weak four-speed. Do your homework and fit a 4L60 or Tremec manual transmission. And for you C4 builders, there's even an adapter out there to let you use the factory ZF manual transmission with the LS engine. Nice, huh?

TREND SETTING —PART 4

*A LOOK BACK AT
CHEVROLET'S EXPERIMENTAL,
PROTOTYPE, CONCEPT CAR, AND
SHOW CAR CORVETTES.*

SCOTT TEETERS WORDS | ILLUSTRATIONS
GENERAL MOTORS PHOTOS

General Motors makes hundreds of kinds of cars and trucks. Some sell hundreds of thousands of units a year, which makes Chevrolet's Corvette a complete enigma. Given the small number of Corvettes sold every year, it is a modern American manufacturing miracle that the car survived for 61 years.

The Corvette was "officially" born on January 17, 1953 at the GM Motorama Show at the Waldorf Astoria Hotel, in New York. To understand the impact of Harley Earl's two-seater sports car concept car, you have to look at typical cars of 1953. The car was low and sleek, and wasn't over festooned with styling gimmicks. Based on the response from attendees, Chevrolet rushed the car into production, and the rest is history.

Today, the Corvette is GM's flagship car. When Chevrolet unleashes a new Corvette, the automotive world stops to take notice. But things were not always this way. Up to the C4, there were many inside GM that wanted to see the Corvette go away. For the first 20-some years, the car suffered from an identity crisis. Inside GM there were always those that wanted the Corvette to be something different; a lightweight sports car, a mid-engine car, a rear-engine car, a four-seater personal luxury car, powered by a boxer-type flat-six, Wankel rotary-powered, turbocharged small-displacement hemi-headed double-overhead cam powered, and even an all-aluminum car. Chevrolet kept the loyal faithful stoked with two or three experimental, prototype, show car Corvettes per year. From an enthusiast's perspective, this was endlessly fascinating.

This is part four of a chronological look back at Chevrolet's high-profile experimental, prototype, concept car, and show car Corvettes. Some of the cars had exotic names such as, "Astro-I," "Astrovette" and "Geneve."



Others had experimental prototype numbers, such as "XP-700" and "XP-882." And some had sexy names, such as, "Nomad," "Mulsanne," "Snake Skinner," "Mako Shark," and "Tiger Shark." In retrospect, a few of the cars were the shape of things to come, but most were simply, "Here's an idea of something we're working on." Either way, it was all a ton of fun!

1961 Mako Shark I

What looked like a prototype Corvette was in actuality another in a long line of teaser show cars. After nine seasons, Corvette lovers were ready for a new machine. The XP-755, called the "Mako Shark," was truly the shape of the future. What Corvette fans didn't know was that while the Mako Shark was knocking their socks off, Chevrolet was hard at work sorting out the final design of the '63 Corvette. This was no small task, as everything except for the engine, transmission, and brakes was completely new. Except for details such as vent placement, grille, and bumper shapes, the second-generation Corvette was nailed down.

Meanwhile, Zora Arkus-Duntov was having a field day making an all-new, advanced chassis for the new Corvette. Outside consultants Jerry Titus, John Fitch, and Karl Ludvigsen were given the opportunity to drive a prototype for their evaluation. Zora and Bill Mitchell had a volcanic



argument over the new Sting Ray's rear "split-window" design. Mitchell was offended that a lowly engineer on a low-volume Chevy line would dare to tell him how to style his pet car. According to Larry Shinoda, the fur really flew! Zora called Mitchell a "red-faced baboon" and Bill called Zora a "White Russian." Consequently, Mitchell was not invited to drive Dunton's latest chassis prototype! So, Bill built an exaggerated version of the XP-720 as a show/personal car.

Officially, Mitchell felt that the automotive press was getting too close to the real Sting Ray (the Stingray Racer was a BIG hint), so a radical show car version was needed to "throw off the scent." While lead stylist Larry Shinoda was in charge of the styling details, when designers asked Mitchell, "How far should we go?" Bill answered, "Keep going it until I say ouch!" Shinoda stretched the nose 12 inches from what would be the real Sting Ray and the headlights were recessed well below the legal height limit. The name and the iridescent blue to white paint design mimicked an actual mako shark that Mitchell

fender humps were exaggerated and surface add-ons decorated the car almost to the point of overkill, but hey, it was supposed to be a show car. The Plexiglas, bubbletop, and prismatic periscope were carryovers from Mitchell's XP-700 dream car.

Originally, the Mako Shark had a stock '61 Corvette interior, except for tight bucket seats and a Ferrari steering wheel that was gift from Enzo Ferrari. The engine was a 327 with a small, Roots-type supercharger and four side-draft carburetors. Outrageous four-pipe side-pipes exited from each front fender. Chromed Dayton knock-off wire wheels gave the car that European look. Years later, the interior was redesigned with flat panels and gauges, a 427 engine with an automatic transmission was installed, and alloy lace wheels with wide ties were used.

As per Mitchell's command that show cars be functional cars, the Mako Shark was a beast—just the way Bill liked them. The Mako Shark looked like a street version of the '59 Stingray Racer. For a time, the Mako Shark, as well as the Stingray Racer were Mitchell's daily rides. It was good to be the VP of Design. Corvette fans were more than ready for the real thing, but had to wait 18 months.

1963 Pininfarina Rondine

Have you ever noticed the similarity between exotic Italian cars and Corvettes? Many have and there's a clear reason. Harley Earl and Bill Mitchell were quintessential "designers." They lived in a world and at a time of beautiful design. Italian design was always about passion and lust. That's why their cars tended to be curvaceous and sometimes busty.



caught while on vacation in Bimini.

Since its debut at Elkhart Lake and then the official unveiling at the New York Auto Show in April 1962, the Mako Shark had gone through numerous detail and hardware changes, yet still looked essentially the same. Built on a '61 Corvette chassis, the XP-755 shape was "close" to the developing '63 model. The

While attending the 1957 Turin Auto Show, Bill Mitchell was the heir apparent to the throne of GM Design. Working at the side of Harley Earl, Mitchell knew everyone who was anyone in design. Mitchell was very impressed and inspired with Battista "Pinin" Farina's Abarth 750 Bialbero land speed record car. Mitchell staged an in-house



competition among his designers with the Pininfarina speed machine as their inspiration. Designers Peter Brock and Chuck Pohlman's sketches won the competition. From there Pohlman and Larry Shinoda made a full-size model to make molds from, and the Stingray Racer was born. This was the car that launched the "Shark-look." So, you could say that Battista "Pinin" Farina is a first cousin of the classic Corvette shark look.

Bill and Battista had an established professional and personal friendship as "car guys" and "designers," and Pininfarina was in the exotic coach building business, designing and

the Ferrari 330 2+2, the Fiat 124, and the De Tomaso Pantera.

The name "Rondine" is Italian for "swallow" after the design's "pinched in" rear treatment. Made in steel, the Rondine's definitive side crease that kicks up at the back of the doors, then slopes down to the back and then forms the "pinched swallow look," was later used on the Fiat 124 Sport Spider. By extending the sharp horizontal beltline farther towards the front, it gave the look of having the interior farther back. Dual headlights were semi-hidden and mounted behind Plexi covers, with a small top door that opened when the headlights

were turned on. The front bumpers were styled very much like the Sting Rays but were longer with a more radical back sweep on the lower part of the bumpers. The center grille section had horizontal ribs with two vertical dividers. The design looked a little like the '61-'63 Thunderbird—sort of.

As shown originally in 1963, the glass stopped just behind the B-pillar, then dropped down, like the '63 Mercury Monterey. The second and current configuration is a graceful, all-glass, wraparound semi-fastback. This design opened up the otherwise very small rear compartment area and brightened up the stock, white leather-trimmed upholstery. Extra details were added to the lower edges of the door panels and the doorjamb were chrome.

Painted metallic turquoise, the Rondine made its debut at the Paris Salon Auto Show in October 1963. Pininfarina was hoping to generate some custom coach-building business with the Rondine. It didn't work out. Although the Rondine is a beauty in its own right, it just didn't set anyone on fire with desire. After making the rounds in the car magazines, the Rondine became a permanent part of the Pininfarina Museum until 2008 when it was sold at the Barrett-Jackson Scottsdale auction for \$1.6 million. A private collector in Connecticut now owns the Rondine.

1963 Grand Sport Corvette

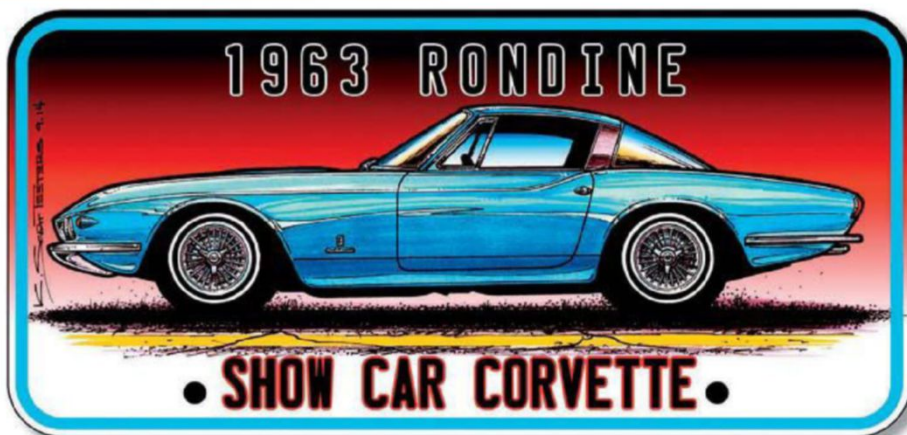
The 1963 Grand Sport is arguably the greatest "could'a been" Corvette. For this series, we'll look at the Grand Sport from inception to the International Bahamas Speed Week event in Nassau, in December 1963.

Beginning in 1957, Duntov made sure that would-be racers could buy well-engineered parts for their Corvettes. As the new '63 Corvette worked its way into production, Duntov developed a new option to take advantage of the new suspension and layout. RPO Z06 cost a whopping \$1,818, plus \$430 for the 327 fuelie engine. This should have been enough, but Duntov wanted more. Four months before the debut of the Cobra, Duntov convinced Chevrolet general manager Semon Knudsen that an ultra-lightweight, factory-produced Corvette was



manufactured cars for Ferrari, Alfa Romero, Lancia, and others. When the new '63 Sting Ray was released, Mitchell thanked his friend by sending him a '63 Sting Ray roadster with a 327/360hp fuelie and a four-speed transmission. The basic instruction was, "Re-body any way they wish."

Pininfarina charged American designer Tom Tjaarda with the task of designing an edgy car using the Corvette's basic structure. While Ferraris were famous for their voluptuous curves, there was a new move in European design that was more linear, with sharp creases; something Mitchell loved because to him, it looked like a freshly pressed suit. Designer Tom Tjaarda later went on to design





necessary. In June 1962 Knudsen approved Duntov's plan to build 125 "lightweights": 25 for Chevrolet and 100 for privateers. Construction began in July 1962 and the first "Grand Sport" was completed in November 1962.

However, trouble was spotted at the Los Angeles Grand Prix in October 1962, when the new Z06 and the Cobra made their debut. Four Z06s were entered, one finished, and won the race, ONLY because the leading Cobra broke an axle hub, allowing Mickey Thompson's Z06 to take First place. Two months later, Duntov took the first Grand Sport to Sebring for testing and was only seconds off the track record. Things were looking bright until GM chairman Frederick Donner reiterated the official "we do not race" edict, thus killing the Grand Sport. Five Grand Sports had been produced and while Chevrolet wasn't allowed to race them, three Grand Sports were loaned out to favored racers, but were starved for support. The first win didn't happen until August 1963 at Watkins Glen for Grand Sport #004 with Dr. Dick Thompson driving. In October, with the season over, Duntov had the three raced Grand Sports returned for "improvements" for the upcoming International Bahamas Speed Week event in Nassau.

The Grand Sports had a steel tube ladder-type chassis and lightweight suspension, but the car looked almost like a stock '63 Corvette. All-aluminum experimental 377 small-block engines with a special cross-ram fuel-injection system were installed for extra grunt, making the entire engine and drivetrain lightweight aluminum. With 485 horsepower on tap, the Grand Sport needed bigger tires. The original 15x6 Halibrand wheels were replaced with 15x9.5 wheels in the front and 15x11 wheels in the rear, shod with the latest Goodyear Stock Car Special tires. To cover the big tire/wheel setup, a muscular set of fender flares were grafted to the body and a tall, wide domed-hood with two forward-facing scoops helped feed the aluminum engine. Lastly, the fake front fender vents were made functional and across the back, eight vent holds were added between the brake lights to release heat and trapped air. Finally, the Grand Sport looked MEAN.

There were three Nassau races, the December 1, 99-Mile Tourist Trophy Race, the December 6, 112-Mile Governor's Trophy Race, and the December 8, 252-mile Nassau Trophy Race. During the Tourist Race,

overheating differentials forced the two entered Grand Sports to drop out. The solution was to install a small radiator on the rear deck, just behind the rear window. The fix worked and in the 112-Mile Governor's Trophy Race, the three Grand Sports took First, Second, and Third place in the prototype class! A Cobra came in Eighth. For the December 8 Nassau Trophy Race, the Grand Sports took First and Third in the prototype class with a Cobra coming in Seventh.

The Grand Sports simply out-powered the 289 Cobras. Duntov, Knudsen, and the entire team set their sites on Daytona and Sebring. The two remaining Grand Sports were to be converted into roadsters. Duntov had Le Mans in mind. But everything came to a halt in January 1964 when Donner threatened Knudsen's yearly bonus. Money talks and the Grand Sport adventure was finished. The cars were loaned out and eventually sold to privateers but had minimal success. **VETTE**





SINKHOLE CORVETTES -PART 4

EXPLORING THE HISTORY OF THE '91 AND '01 SINKHOLE CORVETTES

WALT THURN WORDS | WALT THURN AND NCM PHOTOS

This is the final installment of our National Corvette Museum (NCM) sinkhole series. Parts 1, 2, and 3 provided you with information about the '09 ZR1, '62 convertible, '92 1-millionth, '93 40th anniversary coupe, '09 1.5-millionth, and the '84 PPG Pace Car. Part 4 covers the two remaining Corvettes that received significant damage and might not be repairable.

1991 ZR-1 Prototype Spyder

On January 12, 1991, Don Runkle, GM's Chief of Advanced Engineering and the American Sunroof Company (ASC), unveiled this unique ZR-1 prototype Spyder. Mechanically, it started life as a '90 ZR-1 coupe before being converted by ASC in late 1990. It carries a unique EX (experiential) VIN # (000DRZEX386640962). The DR in the VIN stands for Don Runkle. The exterior was Blade



This is all that remains of that once beautiful and unique ZR-1. The crew had difficulty locating areas that were secure enough to withstand the stress of the lift. It was successfully raised on April 1, 2014.

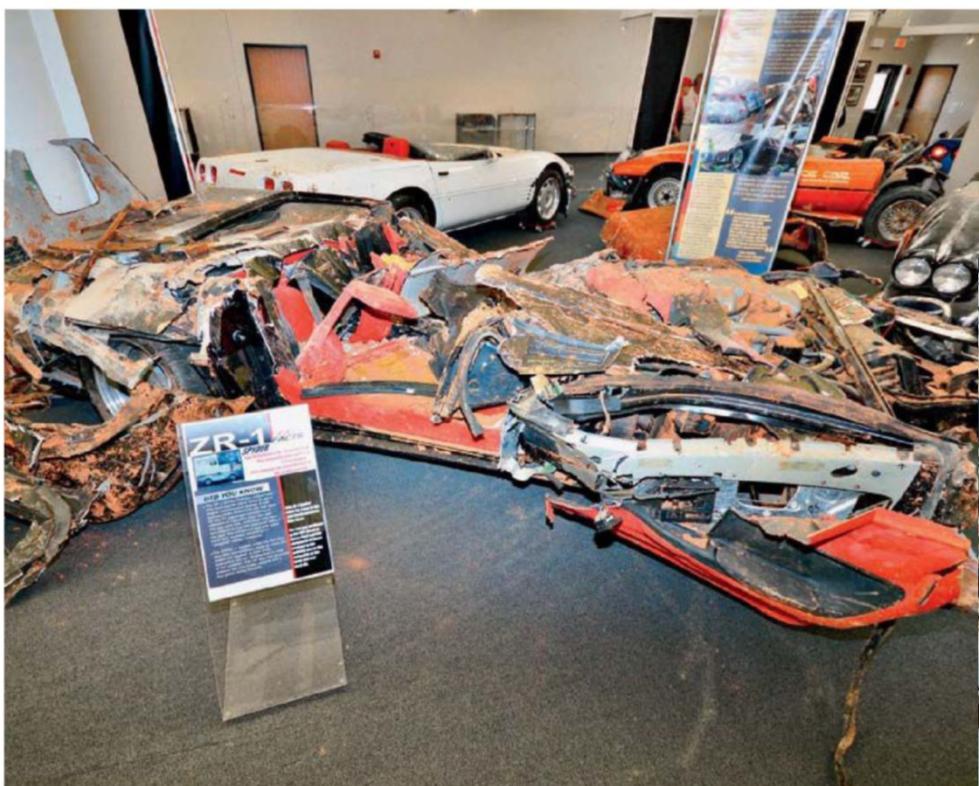


This is how the ZR-1 Spyder looked when it arrived at the Bowling Green assembly plant to be refurbished. Notice some of the discarded Corvette body parts in the background.



Silver with a startling Day-Glo yellow leather trimmed interior. It featured unique hood and front quarter-panel vents to aid engine cooling. It also featured custom billet wheels that were highly polished. The windshield was chopped to half its normal height and the seats were bolted directly to the floorpan to lower them by several inches. A small custom top was stowed behind the seats that could be raised in case the driver was caught in an unexpected rainstorm. The center high-mounted safety light (CHMSL) was located in the fuel filler door and popped up when the brakes were applied. The 5.7-liter ZR-1 engine remained stock at 375 hp. This Corvette was built to gauge the public's reaction to a ZR-1 convertible and remained on the show circuit for several years (a ZR-1 convertible was never offered). It was sent to the Bowling Green assembly plant in 1993 to be refurbished. It was painted Sapphire Black and the Day-Glo yellow interior was replaced with Torch Red leather. The plant workers autographed the underside of the hood, so their work would become part of this unique car's history. GM loaned this Corvette to the National Corvette Museum in 2006. On February 12, the Spyder dropped into the void at the NCM and was unfortunately found near the bottom of the pile of other Corvettes. The Scott, Murphy & Daniel Construction crew located it and carefully uncovered what remained of this special Corvette. It was raised from the bottom of the sinkhole on April 1, 2014 and now rests in the NCM exhibit hall. It does not appear that it can be repaired but experts will carefully examine the remains before making their final decision.

The assembly plant repainted the Spyder black and added a Torch Red interior. This is how it looked when it was displayed while on loan from Chevrolet. The ZR-1 engine remained stock.



This is all that remains of the ZR-1 Spyder. The right side door is bent forward from the cockpit and the safety side door beam is exposed. The autographed hood can be seen in the background leaning against the wall.



AntiVenom LSX Performance in Tampa, Florida, did extensive engine work on this Mallett and added a custom-designed carbon-fiber hood to cover the fuel injection system.

2001 Mallett Hammer Corvette

Kevin and Linda Helmintoller donated their '01 Mallett Corvette (Mallett serial #009) to the National Corvette Museum on December 2, 2013. The couple gave the car up to help the NCM grow. In addition, they felt that the Mallett would be a good training vehicle for the new Motorsports Park. They are both lifetime members of the Museum and have participated in many R8C Museum Deliveries. This Corvette carries VIN# 1G1YY125415134460 and Mallett completed its conversion in June 2002. AntiVenom installed an AV436ci engine into the Mallett in June of 2008. It produces 700 hp at the flywheel and has been clocked at 10.6 seconds at 128 mph in the quarter-mile. It had a total of 16,000 miles on its clock when Kevin and Linda donated it to the museum. This car was featured on the cover of *GM High-Tech Performance* magazine. It was the last car to be found and it was located at the very bottom of the sinkhole. It took some time to uncover it and it was raised with a chain wrapped around its rear crash bumper. The Corvette was so badly damaged that it now rests on a specially constructed wooden dolly with wheels. The remains of this once proud Corvette rocket are now on display in the NCM exhibit hall. **VETTE**



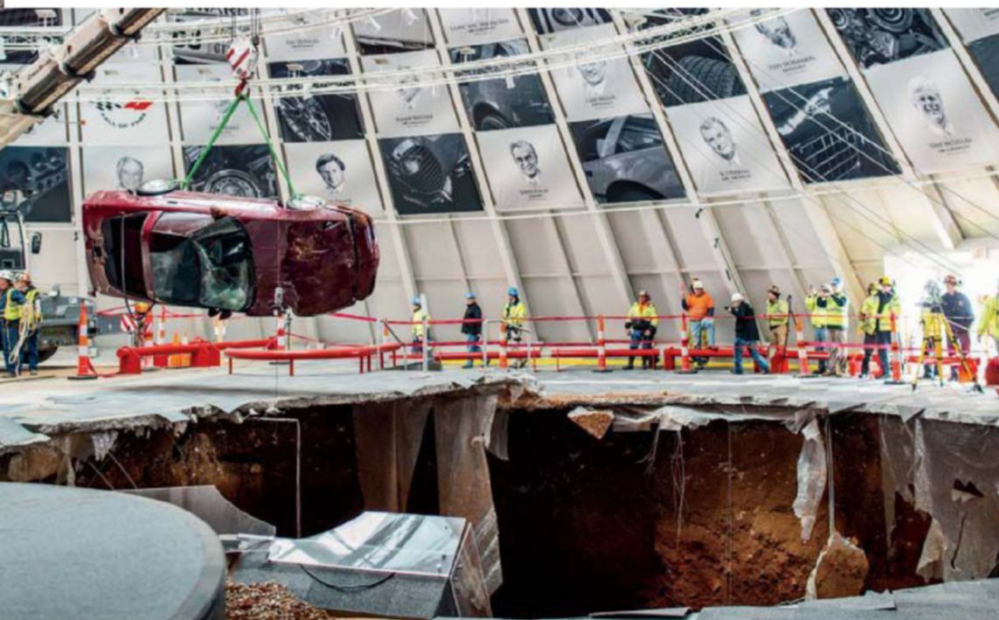
The Mallett Hammer is shown entering the NCM exhibit hall after its owners Linda and Kevin Helmintoller donated this highly modified Corvette to the museum.



Very little remains of the Mallett Hammer Corvette. Since it appears to be the first car to fall into the void, it received the most extensive damage.



It is difficult to even identify this completely destroyed mess as a Corvette. It appears to have been crushed flat by two large boulders.



This concludes our four-part series about these eight significant National Corvette Museum Corvettes. The good news continues to be that nobody was injured or lost when this event happened. Recently, the museum board developed three options on how to proceed with the sinkhole repairs: fill it, keep a portion of it, or preserve the entire sinkhole. It appears that the board favors filling half the hole and the repair estimate is between \$3 and \$5 million. How much the insurance will cover is still being determined. It must be mentioned that the NCM staff has handled this event in a professional and open manner. If you are in the area we highly recommend stopping by for a visit. For updates go to corvettemuseum.org.

PUTTING THE “STING” IN STINGRAY

EDELBROCK E-FORCE C7 SUPERCHARGER KIT CRANKS OUT 551 RWHP

SCOTT PARKER WORDS | PHOTOS

Let's face it; the Gen V LT1 in the '14 Corvette Stingray is a complicated animal. Variable Valve Timing (VVT), Active Fuel Management (AFM), Direct Injection (DI)—and plenty of other acronyms I can't think of right now—sit beneath a metallic motherboard that looks nothing like last year's valley cover. So a simple solution that bolts on and adds over 120 rwhp is like a breath of fresh air. Of course, “simple” is not an adjective that the Edelbrock engineers would attribute to their E-Force Supercharger Kit for the '14 Stingray.

Adapt a C6 supercharger kit, they said. It will be fun, they said. Not so much. Internally, the supercharger is similar to the E-Force C6 ('05-'13 Corvette) kit. The Eaton TVS2300 guts

we've come to know and love are inverted to blow up into the plenum, and then down through the intercoolers and into the runners. However, the air-to-water intercoolers use higher density cores that are more efficient, and have the benefit of a much larger heat exchanger and a pump that flows 40 percent more water. According to Rob Simons, Edelbrock's Vice President of Engineering, the real key to the C7 kit's design is that it uses modular runners that bolt to the heads [and blower housing] instead of being integrated like the C6. This design solved the packaging issues that, he says, forced GM to use the smaller 1.7L Eaton R1740 on the '15 Corvette Z06. In fact, Rob says Edelbrock's modular design will allow it to adapt this kit to the Z06, which

affords larger rotors and intercoolers.

Externally, the differences between the E-Force C6 and C7 kit are even greater. Instead of using the factory's 6-rib pulley system to drive the supercharger, the C7 kit uses a proprietary harmonic balancer with a dedicated 10-rib drive. The drive pulley bolts to the balancer like many aftermarket types, allowing the use of an overdrive pulley for more boost. The aesthetics of the supercharger were deliberately given a unique touch to signify that this kit is not simply an adapted C6 kit. This fact is even more apparent when you see how well the supercharger integrates with the factory equipment from the DI fuel system all the way down to the heat extractor hood and airbox. About the only compromise needed to take a '14 Corvette Stingray from 460 to 624 horsepower is the loss of Active Fuel Management (aka DOD). This was necessary to dial-in the supplied tuning, and not considered a high priority among its customers. However, with custom tuning this may be rectified.

Just because the E-Force is on the market, that doesn't mean Edelbrock isn't still on the move. Certification is pending with the California Air Resources Board (CARB), and Edelbrock expects an EO number for the C7 by the time you read this story. In addition to the previously mentioned accessories and Z06 kit, engine dyno testing is also being conducted to reach the upper limit of the E-Force's capabilities. The engineers say that 640-650 hp is about the extent of the factory fuel system, which is only a pulley change away from the 624-horse Stage 1 Street Kit. Edelbrock's in-house 416-cid stroker with ported heads uses a COMP Cams camshaft with a redesigned fuel pump lobe to



Sources

EDELBROCK, LLC
310.781.2222
edelbrock.com

REDLINE MOTORSPORTS
954.703.5560
redline-motorsports.net



01 The Edelbrock E-Force Supercharger for the '14 Corvette Stingray (PN 1570) is advertised to turn 460 hp into 624 hp—just a tick under the upcoming Z06. Kits are available for the dry- or wet-sump Stingray as well as with or without a tuner. An Eaton TVS2300 rotor package, air-to-water intercooler, bolt-on runners, and a dedicated 10-rib drive system are the principle components. Though the runners are more than half as short as the C6 kit due to packaging constraints, Edelbrock says the spark curve used with Direct Injection helps make up the torque.

boost fuel flow. Using race gas, they've already hit 830 hp, with more room to go.

We first laid eyes on Edelbrock's E-Force Supercharger for the C7 at the SEMA Show last November. Since the '14 Stingray had only been on the street for a few months, it was one of the only boosted C7s on the show floor. At the show, Edelbrock stated that the C7 kit, like the C6, would be 50-state legal and come with a 5-year/100,000-mile powertrain warranty as delivered. With such confidence behind its product, clearly Edelbrock has put its share of engineering into the C7 kit. We couldn't wait to get our greasy hands on it, so we hooked up with Redline Motorsports in Deerfield Beach, Florida. Redline is no stranger to the pages of *Vette* or to the E-Force family of superchargers, having installed quite a few C6 superchargers.

"We have been working with the team at Edelbrock since the introduction of the E-Force on the C6," stated Howard Tanner, Redline proprietor. "From day one we have been impressed with the engineering and attention to detail. The systems have a very OEM factory design, which leads to maximum reliability, [which is] critical for our company's reputation. Our customers love the appearance of the new system and most certainly the big, flat torque curve that this positive displacement supercharger produces!"

Our test subject is a seven-speed manual equipped Z51 model with dry-sump oiling. We'll be putting the E-Force Stage 1 Street kit (PN 1570) to the test on Redline's Land & Sea chassis dyno for some before and after comparison. Follow along as this Stingray adds some serious sting. **VETTE**



02 Compared to the factory C6 ZR1 supercharger, the E-Force is inverted—placing the rotors at the bottom, which blow up into the plenum and then down into the intercoolers. The use of individual runners, rather than an open plenum, is another key feature of the E-Force that enhances torque. Note: the MAP sensor is not provided and must be reused from the stock manifold.



04 Redline technician Nick Ward got started by removing the factory air intake, scoop, and air filter (leaving the air-box intact). Underneath, he had to remove the bellypan to make room for the heat exchanger and removal of the balancer.



06 The low-pressure feed line is unhooked using a GM fuel disconnect tool (3/8-in).



03 Many improvements in the air-to-water intercooler system were made over the C6 E-Force kit, including a pump with 40 percent more flow and a larger heat exchanger. The finish on the materials such as the reservoir tank is what makes the kit look factory.



05 After removing the engine cover and unclipping the wiring harness, the intake manifold simply unbolts and slides right off.



07 The hard line (to the right) is unbolted and replaced with Edelbrock's reshaped version.



08 Now on to the cooling system: the radiator is drained, all hoses are unhooked, and both the electric fan and radiator are removed.



09 Rather than completely removing the A/C condenser, it can simply be pulled out of the way and wire-tied to save time and money.



10 Edelbrock provides this template in the extremely detailed instruction manual. It simply needs to be cut out and taped up in the appropriate spot on the inside of the radiator shroud. These holes will be cut with a hole saw for the water lines on the heat exchanger.



11 Two squares were cut in the bottom portion of the radiator shroud (using another template) where the heat exchanger mounting tabs slide through.



12 Two holes must be drilled to bolt the top tabs in place, and then the A/C condenser can slide back in place.



13 To make room for the balancer, the steering rack and sway bar must be unbolted and moved out of the way. The work initiates topside by unbolting the steering shaft and the ABS module from the bracket. Below, Nick unbolts the sway bar brackets, but not the endlinks, just to rotate it forward and out of the way.



14 The ABS bracket is unbolted from the bottom and removed, and finally the rack can be unbolted and moved forward.



15 With full access, Nick uses a balancer removal tool to pull off the stock piece.



16 Edelbrock's replacement balancer is pressed on, using the installation tool, until it's between 2.4 and 4.8 mm from the snout of the crank to the face of the pulley (balancer bore). The final measurement was 3.6mm before torquing down the balancer bolt, treated with blue Loctite.



17 The second piece of the balancer contains the 6-rib pulley to drive the accessories and a dedicated 10-rib to drive the supercharger. It has three bolts that must be torqued to spec.

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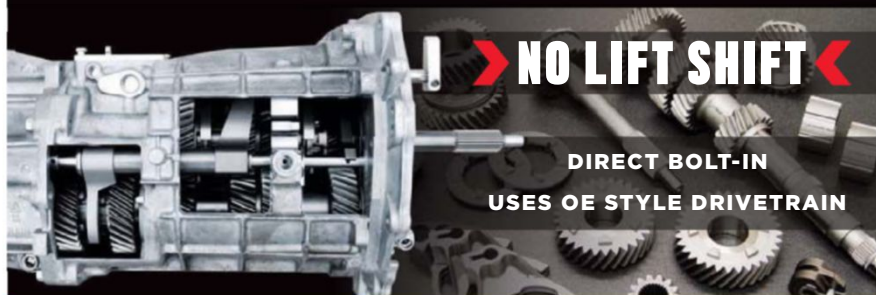
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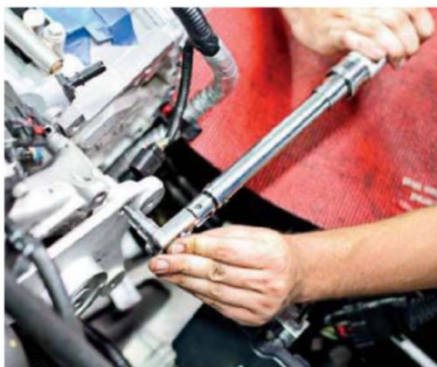


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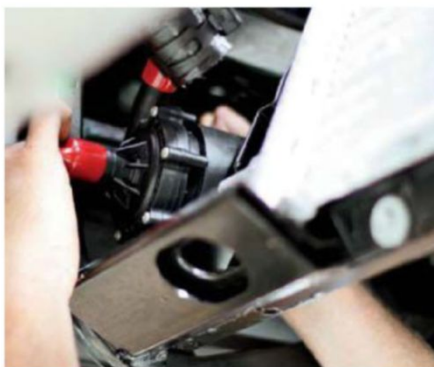
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18 After installing the 6-rib belt, Nick removes some of the water pump bolts to install the Edelbrock tensioner for the 10-rib belt.



19 The rack, sway bar, and ABS are installed before starting on the heat exchanger pump and lines. The pump has a rubber-isolated bracket to attach to the lower radiator support. Once the lines are connected, the radiator and fan can be reinstalled.



20 Moving topside, Nick scavenges the intake O-rings off the factory manifold to install on the Edelbrock runners.



21 The intake runners are installed with the provided bolts, treated with blue Loctite. Edelbrock says the narrow bolt pattern necessitated a two-piece design. A keen eye will also notice that the foam valley insert has been trimmed (for the new fuel line) and reinstalled.



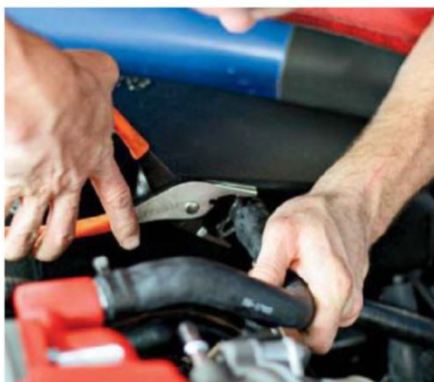
22 It takes two sets of hands to lower the blower in place before bolting it to the intake runners. From here on out it seems like you are almost done, but it takes a painfully long time to fully button it up—especially if you are hovering over the tech's shoulder with a camera.



23 The belt goes on immediately after installing the blower, using a ratchet to move the tensioner.



24 Since the MAP sensor had already been installed (on the bottom of the blower), bolting up the throttle body makes it complete.



25 The intercooler lines (feed and return) are installed and clamped down before bolting down the reservoir for good.



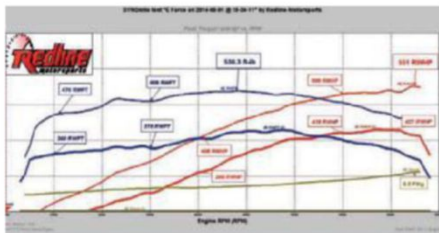
26 Edelbrock's intake pipe is clamped down to the throttle body and is noticeably devoid of all the silencing baffles of the stock piece.



27 The rest of the hoses and wires are connected to look like stock. The plastic piece that connects the air-box to the intake (and houses the MAF) is reused, as is the airbox. Not shown is the high-performance air filter Edelbrock provides that Nick slyly installed when I wasn't looking. No doubt this compatibility is the reason this kit will soon have a CARB EO #.



28 The "Supercharged" coil covers are a perfect mashup of OEM and after-market. Some assembly is required.



29 The supplied pulley made 8.5 psi in "hell's sauna" (aka August in south Florida), which was good enough for 551 rwhp (SAE) on Redline's Land & Sea chassis dyno (using Edelbrock's tune). That's nearly a 125hp gain! Most impressive, though, is the instant torque that hits 470 lb-ft practically at tip-in, and peaks around 4,500 rpm at 538 lb-ft. It doesn't start to drop off until 5,500 rpm. Now, where's that other pulley?

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RESTORED 16,000-MILE STINGRAY HAS HOLES IN ITS HISTORY

SCOTT ROSS WORDS | BILL ERDMAN PHOTOS

Several months back, we brought you the story of an L88-powered '69 Corvette Stingray ("The Pride of Paoli, July '14").

How about another C3 powered by the highest-output RPO version of the engine *Hot Rod* magazine once called "Chevrolet's Mystery V8"?

The mystery here isn't in its closed-chamber-head-equipped 427, but in the car's ownership history.

According to Lee Jones, son of current owner Scott Jones, this Shark swam to Chicago after it rolled out of the St. Louis assembly plant. "It came from Jennings Chevrolet in Chicago," he says. "The original owner was the service manager there, and a Corvette guy."

This Stingray would not suffer the indignities of a first owner who didn't know about the L88's cold-weather grumpiness or its appetite for 103-octane premium gasoline. Lee continues, "He ordered it to have something a little bit different than everybody else, and a little bit faster, and it fit his lifestyle at the time."

Whether that included quarter-mile blasts at US 30 Dragstrip near Gary, Indiana, or Great Lakes Dragaway in Union Grove, Wisconsin, or road course runs at Road America in Elkhart Lake, Wisconsin, or Blackhawk Farms Raceway in South Beloit, Illinois is unknown.

It's also unknown when that original owner sold it, or why. Lee says its history from that point to well into the 1980s is a mystery, one that research that he and his father, Scott, have yet to solve. "That is where we're not

sure," says Lee, "because from there the story goes to a point where, in the late '80s, the car was brought into a salvage yard in the Chicago area, South Side Liquidators."

That yard dealt with "distressed" cars and trucks. "The vehicles that went into South Side Liquidators were typically stolen, or insurance-recovery cars," he says. "This car came in without any police record, or anything." But it was, as far as anyone can tell, complete.

According to Lee's research, another owner then entered the picture. "The car was thought to be owned by a Dave Ruthers or David Carruthers," states Lee. "Possibly, at that time and given some of the drug situations going on in the Chicago area—and this is hearsay—there's some thought that somehow a drug dealer got his hands on the car, and



MONSTER-MOTORED MYSTERY



Carruthers—when someone got into trouble—had a way of making these cars go away for a while.”

If that was the case, it was stashed away when Federal and Illinois law regarding the assets of those in the “contraband commodities” business were toughening up to include seizure and forfeiture of anything purchased with illegally derived funds.

Lee picks up the story. “The car went to Crestwood Car Pool, and it stayed there for several years, and then it became owned by the owner of Crestwood Car Pool, Danny Albright.” It’s likely the ownership transfer then was from a mechanic’s lien put on the car for an unpaid storage bill. Lee adds that Danny Albright, who’d obtained a salvage title for it, later sold it to George Ball, who owned a shop called George’s Auto Rebuilders.

All this time, the car was likely not regarded as anything special. “At this point, we’re not sure that those

[FEATURE]

MONSTER-MOTORED MYSTERY



three gentlemen knew what the car was," notes Lee. "To them, it may have been just another 427 Corvette."

But someone knew what was under that Shark's original no-hit fiberglass skin, as Lee continues. "George's son had a friend by the name of Paul Petrick. He purchased the car, then he sold it to Jerry Janota, and at that point Jerry realized what the car was."

That was in 1998, but by then a critical original component was gone. "Paul had installed a new gas tank, and threw away the old one," says Lee. "Jerry asked him about it, but Paul didn't know what happened to the tank sticker."

A few months later, Kevin Mackay entered the picture when he bought it from Jerry. "The car had 16,000 original miles on it, a totally original interior, engine, transmission, frame

tags, and rearend—as real as it could be," recalls Kevin. "It had the original tires, and it was an original factory side exhaust car."

Kevin then sold it, then later bought it back and eventually sold it to Scott Jones. "He was looking for another project, and he wanted an L88 car," says Kevin, who adds, "I didn't want to sell it, but I had things that I had to do, and I was looking for other cars. I sold it to him, and he had us completely restore it."

Two years later, when it rolled out of Kevin's Corvette Repair shop in Valley Stream, New York, it was more than ready for the show judges. "In 2013, this car won NCRS Top Flight, and it was also certified Gold with the original engine" Kevin says proudly. "From there, it went to Chicago, where it won the Triple Diamond award."

Since then, this C3 has logged very few

miles under its own power, and those original bias-ply tires are a big reason why.

"The most we've driven it is off the trailer at Bloomington Gold, onto the judging field, and then back on the trailer," says Lee. "This is not a car that I can drive, and not have to worry about something happening to it. This is a car that's fun to own because it's a piece of history."

If the thought of discovering an as-yet-undiscovered L88 strikes your fancy, Lee has this advice. "Do your homework. I think there are still more 'diamonds in the rough' to be found. With the Corvette market now, and what L88s are doing, a lot of people are looking."

You just might find one of those "430hp" screamers in a garage or barn, waiting for you to unlock its mysteries. **VETTE**



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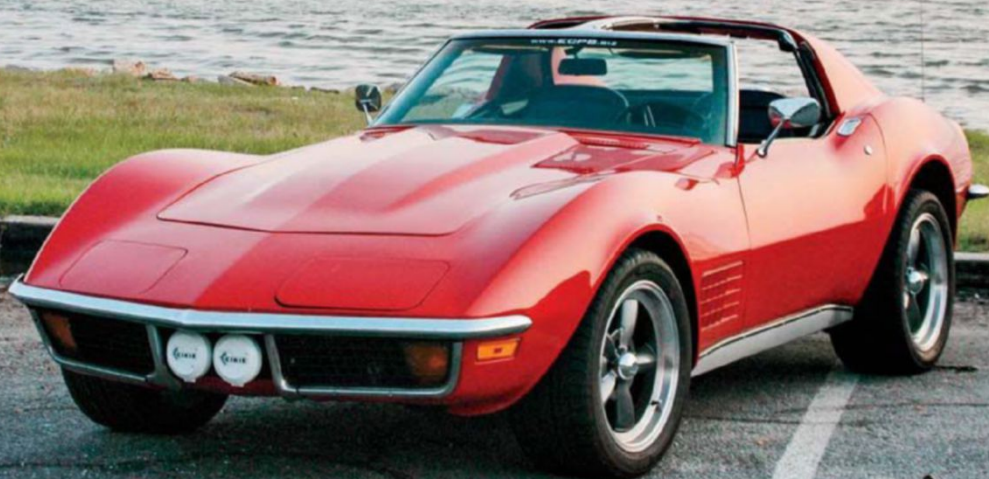
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BARBECUED SHARK

REPLACING THE FACTORY WIRING HARNESS ON OUR '72 PROJECT CAR

JEREMY D. CLOUGH WORDS | PHOTOS

01 Scarlett, our '72 coupe project car. With her 600-plus hp stroker LS3 in place, piped, plumbed, and bolted to a Tremec six-speed. It's time to start getting her wired by replacing the factory harnesses.



If you've been following our series on Scarlett, our '72 coupe project car, you may recall the ugliness we found under the hood and dash when we stripped out the factory wiring. Even at best, the wiring that wasn't wrapped in duct tape, held in place with twist nuts, or stained with the occasional scorch mark was still 40 years old, and well overdue for replacement. Although the old joke goes that Corvette fires usually start with the payment book, improper or damaged wiring is a surefire way to burn a Vette to the ground, and it's something we're not willing to risk considering all of our hard work. When you're in this deep, there's no sense in reinstalling old electrical components.

While we'll go through wiring up the FAST computer and other associated engine components in a separate installment, here we'll cover replacing the front and rear wiring harnesses with factory correct Lectric Limited ones provided by Zip Corvette. In stock guise, our C3 has two other major harnesses: one for the engine and another for the dash, which we'll cover when we do the gauge installation. The front lamp harness has the headlights, corner markers, and turn signals, as well as the alternator wiring and other associated circuits. The rear harness has all the rear lighting, as well as the dome light, door switches, and most of the alarm wiring.

The good thing about a "correct" harness, and this is likely to be the only correct part on this car, is that the wire color and size match the factory spec, so it's easy to compare them with what's already in the car and with the factory wiring diagram found in the assembly manual. It's important to know, though, that the wiring harness is just that: just wires, with the connectors at the end of each wire so that it can plug into whatever it mates with, be it a bulb, relay, subharness, whatever. Along the way you'll find smaller parts that it connects to that are broken or missing, such as our long-gone horns or broken door switches, so you'll need to order these separately. In our case, we made a list of parts as we put the harness in and ordered new replacements for virtually everything, even ones that weren't obviously broken.

After seeing the condition of our factory harnesses, rewiring is probably one of the first things I'll do to any older car I buy. Assuming you're not modifying it (that comes later), you can probably do these two harnesses in a long day: I worked fairly slowly, and spent a full weekend of 8-hour days on these, and got a running start on the more tedious dash harness. Hopefully we won't barbecue this shark when we put the juice to her. **VETTE**



02 Our factory-correct harnesses, probably the only correct parts in the car, were provided by Zip Corvette. In addition to the complete harnesses made by Lectric Limited, they also provided a laminated wiring diagram that's an indispensable part of any serious wiring project, and shows each circuit, marked by color and gauge or wire.

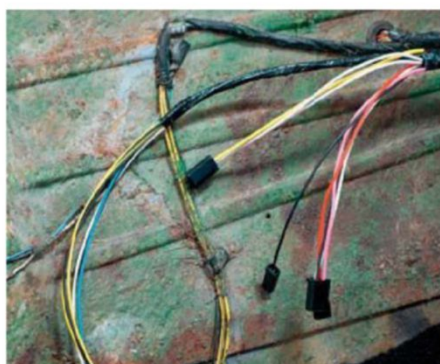
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03 One of the first parts of wiring the car is to get the harnesses laid out to make sure it's the same as the one you're taking out. You certainly can do a wiring project a little at a time, but it helps to have plenty of space and time to lay things out. We laid out many of the ancillary wiring parts along with the harnesses.



05 If you have the option of not completely removing the old harness, it makes installation much easier to lay the new harness over the old one to make sure you're making all the correct connections. Using a factory correct harness also makes it easier, as you simply match wire colors to know where each one goes, assuming yours is largely unmolested.



06 The part of the rear harness going into the jack well passes through a split rubber grommet that reduces the risk of abrasion from the sharp edge of the hole in the fiberglass.



08 There are four door switches in the '72: one at the front of each door opening, and one at the rear. The fronts run the courtesy lights, while the rears control the alarm. We unscrewed the switches and pulled them out, then used a thin piece of welding rod with the new wires taped to it to get the flexible wires guided through the hole so they could be connected to the switch.



09 With the door switches and the wiring for the seatbelt warning lights and alarm in place, we moved toward the rear of the car. The harness runs over the rear wheelwell, just under the rubber Astro Ventilation tubes, to the rear of the luggage compartment.



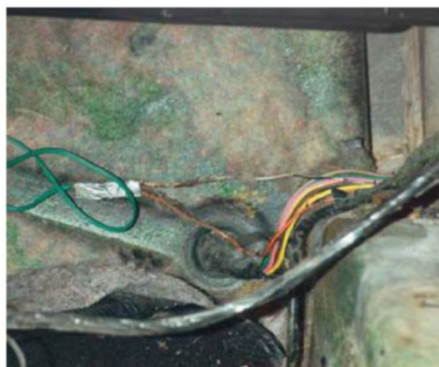
04 We did the rear harness first and started by removing the Corbeau seats as well as the five-point harness mounting bar and rear trim pieces and peeling back the carpet. This part of the wiring harness contains the seatbelt warning light circuits as well as the glovebox light and the wiring and flasher unit for the alarm, which are found in the rear well that holds the jack.



07 There are three flashers in the C3: one on the fuse box, one under the passenger side dash, and one in the jack well. Factory flashers work based on the amount of resistance each bulb creates, but since we'll be changing all the bulbs to LEDs that don't provide enough resistance for a thermal flasher to work, we ordered LED-specific flashers from Corvette America. In addition to plugging in, they'll also need to be grounded.



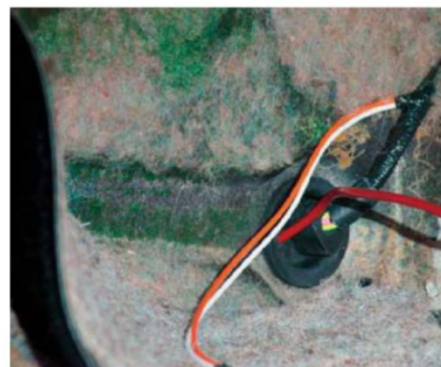
10 The factory Astro Ventilation tubes are held in place by rivets, but ours had been replaced with stainless screws. Even though the harness is held in place by the bent metal clips, we later capped the threaded part of the screws with rubber caps to avoid abrasion.



11 The rear harness passes to the underside of the car through a rubber grommet at the rear of the luggage compartment. There are always surprises when you start peeling back the carpet, and one of ours was finding the green speaker wire that someone had used to wire up the rear dome light.



12 The only thing more surprising than the fact that the rear dome light hadn't caught on fire is that it actually worked. Only the bold need peel back the duct tape here on the back of the dome light assembly. We ordered a new socket to replace it.



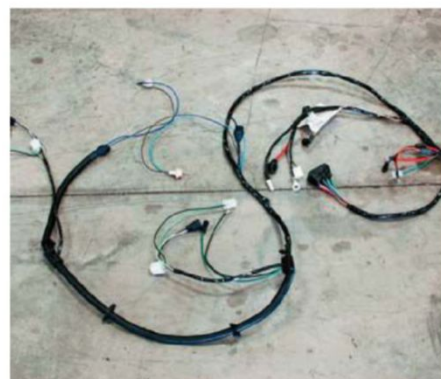
13 The new harness in place. The orange and white wires are the correct ones for the dome light. Before we put the rubber grommet in place, we made a hole in it to run the separate heavy-gauge red wire that goes to our Aeromotive A1000 in-tank fuel pump.



14 Inexplicably, the horn for the factory alarm system was still bolted in place in its position up beneath the car above the driver-side rear wheelwell, and when we put a pair of hot wires to it, shocked us all by working. It got a good cleaning, and went right back in place.



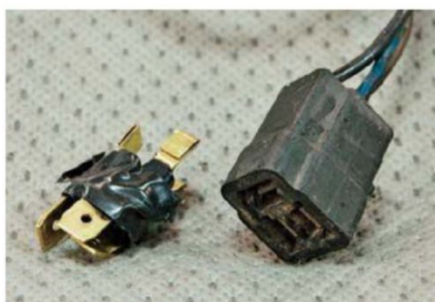
15 The rear harness ends with the wiring for the alarm switch and the rear lights. The taillights each have a pair of threaded bolts protruding from them: a ground wire, to which we added a larger washer, bolts to the bottom bolt, while the harness has mounting loops, shown here near the bottom of the photo, that are bolted in place on the upper ones.



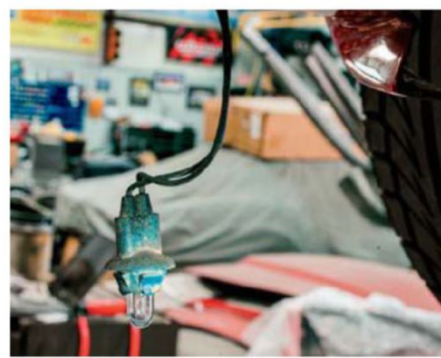
16 The front wiring harness contains the lighting circuits, including headlights, turn signals, and corner markers, as well as the alternator wiring and horn circuit. The horn relay, which is tucked just behind the front fender, serves as a power distribution point for the rest of the car.



17 In addition to the headlights, the front lamp harness also feeds power to the corner markers, via the blue-and-white wires, and the turn signals, which are fed by a separate subharness that plugs into it.




18 The plug for the front turn signal subharness is a female one, and as it turned out, our mismatched subharness itself also had a female plug, which a previous owner had handled by making this taped abomination to go between the two plugs. I remain grateful but mystified at the fact that the resultant mass of black-taped goo neither caught on fire nor ever stopped working.



19 The harness includes new plugs for the corner markers, which use a 194 bulb. We'll be replacing the front ones with amber LEDs, and the rears with red ones. Note the blue overspray on the plug. Add one more color to the red and black that Scarlett has been painted at different times in her life.

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Scott Parker Apr 11, 2014


First Look: 2015 Corvette Z06 Convertible

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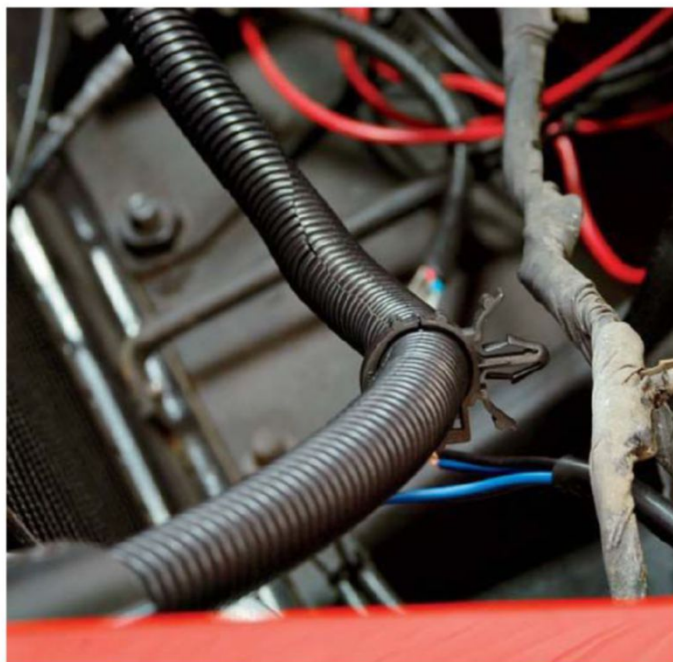
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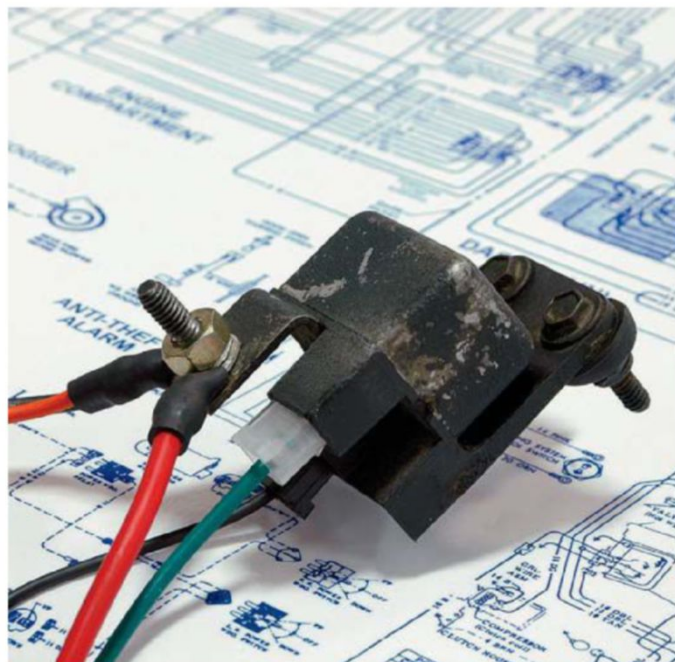
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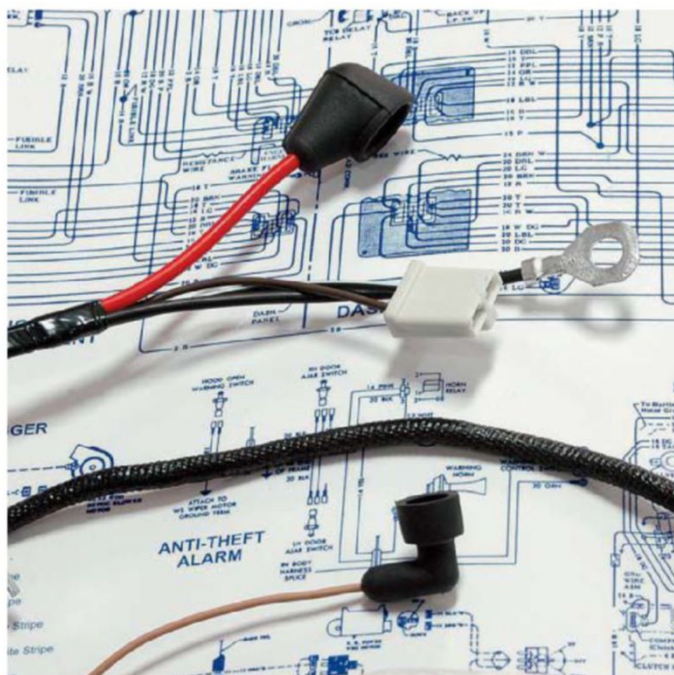
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20 The new front lamp harness is on the left: note the thick conduit and the plastic clip that holds it in place under the car's nose just forward of the hood, compared with the older harness on the right, which is bundled with traditional loom tape and has a steel clip.



21 The all-important horn relay, which bolts to the rear of the driver-side fender skirt opposite the alternator, serves as a power distribution point for the rest of the car. The red 10 gauge wire is fed directly by the alternator; since our LS has an alternator on the opposite side of the engine than a standard small-block, we'll be pulling this wire out of the harness and replacing it with a longer one that's properly routed to reach the new alternator.



22 Several wires exit the front lamp harness around the alternator: the top three go to the alternator (positive, ground, and voltage regulator), the middle is for the temperature sending unit, and the bottom plug is for the brake warning light sending unit.



23 The bulkhead plugs for the front lamp harness (bottom/left) and the engine harness (top/right). The wiring harness plug slides into place, interlocking with the engine harness, and the assembled plug is bolted into place on the bulkhead connector on the opposite side of the fuse box.



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JIM PAINE'S **EXCELLENT CORVETTE** ADVENTURE, PART 1



"I was leaving the Chevrolet store and asked the salesman if there were any other Corvettes, and he said, 'Yeah, I know of a '56 Corvette with 16,000 miles on it.'"

Jim Paine didn't believe the salesman, but he would go take a look if he could. After all, he'd just bought a one-owner '68 from this same man.

Paine's Excellent Corvette Adventure started one night during dinner at his home

in Pittsburgh, Pennsylvania. His brother Gary, who lives about three hours away in Columbus, Ohio, called and said, "I'm at a Chevrolet store buying a new car and this salesman told me they just took in a '68 427 Corvette convertible on trade."

The dealer was Jack Maxton Chevrolet, the same dealer that sold this '68 brand new back in the day. In fact, Paine learned the salesman, now 86 years old, who originally sold the car in 1968, still worked at this dealership selling new Chevrolets.

A long-time Corvette enthusiast, Paine shortened his early dinner and jumped on his cell to call before the sales day was completely over. He discovered the '68 Corvette was a white convertible powered by a 400-horsepower 427

Tri-power (L68 option) and backed by a four-speed transmission. Maxton Chevrolet had maintained the car since new. The owner was a typical engineer who kept notes on everything he did and had been meticulous with the car. Furthermore, the '68 came with every single piece of paperwork the car ever had: the little key packet, the window sticker, the bill of sale, the Protect-O-Plate. It had Everything.

Paine was sold. He wanted the car. The problem being he was three hours away in Pittsburgh. Undaunted, Paine dealt for the car sight unseen. He talked to the salesman (not the older man who sold the car originally) who informed him "the owner wants \$45,000 for the Vette and is firm on that price." Paine stayed calm and offered \$42,000. As proof he was serious, he would give his credit card number over the phone. The salesman replied, "Well, he's not going to take that."

"I said, 'Would you at least ask the owner?'" Paine waited on the phone for over five minutes, as the salesman called the owner. "He came back and said the owner would take my \$42,000 offer."

Elated, Paine gave the salesman a \$1,000 deposit on his credit card to hold the car.

The next day, Paine and his son, Jake (his car-chasing friend), drove down to Columbus. Sure enough, what Paine figured would happen was true. The salesman told him there





were about five people who wanted to buy the car that night before they closed.

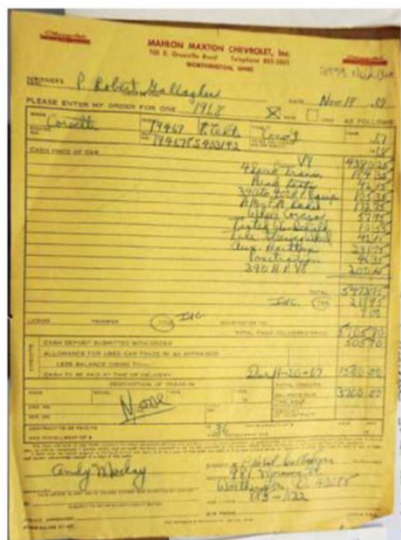
While the salesman was doing the paperwork for the transaction, he asked Paine if he would like to meet Andy MacKay, the salesman who sold the car brand new in 1968.

Feeling that Andy was part of the car's history, he was excited to meet him. In fact, Paine got a photo of himself and Andy shaking hands at the dealership—a little something to immortalize the purchase.

Paine's Vette excitement wasn't over yet. He wanted to know more about that '56 Corvette the salesman mentioned.

Was this car for real? Did a little old lady from Columbus actually have a '56 Vette for sale?

Flip to this column next month for Part 2 of Jim Paine's Excellent Corvette Adventure. **VETTE**



Say hello to Justin Abbott, the "brain" of Zip-brand R&D. His office door says VP, but you're more likely to find him underhood or under the lift – improving a Corvette. In short, Justin lives performance. So much so, we're pretty sure high-test runs through his veins.



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READERS' RIDES



SEEING RED

WHO: Bruce and Cindy Warren

WHERE: Wilmington, Ohio

WHAT: '99 convertible & '13 convertible

To us, owning one Corvette makes you a lucky individual, but some can't stop at just one. As Bruce Warren explained to us, "In the spring of 1999 I sold my silver '66 Corvette convertible to a friend, and my wife and I purchased a new '99 bright-red six-speed Corvette convertible. We originally were looking for a coupe, but after the test drive my wife liked the convertible better and who was I to argue? Fifteen years and 30,000 miles later we still enjoy the car. Our family has made many memories with it including vacations, proms, homecoming parades, and senior pictures. It continues to be a joy to drive.

"This spring my wife and I purchased a red '13 Corvette 427 convertible. My son stated that it is like the '99 on steroids. The car delivers incredible power, handling, and comfort. In the late-'80s my wife had purchased a yellow '76 Corvette, which she loved, but sold for a down payment on a house. It is good to be a two Corvette family once again and we're reveling in the experience of owning our two red beauties and living the Corvette lifestyle."



CORVETTE DREAMIN'

WHO: Cathy and Derek DeCaupa

WHERE: Brooklyn, New York

WHAT: '82 coupe

As kids, most of us had that "When I grow up I'm going to have a ..." moment. For Cathy DeCaupa her dream was to have a C3 Corvette. As she told us, "To me, no other car could ever match the beauty of those lines. But, believing this dream could never become reality, I put it to rest." Fast forward to 2009 when she saw a '75 that was for sale in her neighborhood. She didn't buy it, but it woke up that dormant dream of a Corvette and a year later she was the proud owner of this '82.

She named the car Rudy, after the movie,

since the theme of holding onto your dreams and making them happen resonated deeply. "When I look at this car, hear it start up, or drive it, I am overcome with a feeling of ecstasy that I can only describe as that pure joy you experienced as a kid on Christmas morning, or that feeling you get in the pit of your stomach when you are in love. When I am in my car, I am a different person. I feel proud and confident, like there's nothing I can't do. My Corvette has transformed me in ways that I never could have imagined," remarked Cathy. Supported by her husband, Derek, Cathy has taken her Vette to shows and has been constantly making it better. Best of all, she's living her childhood dream.

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SURPRISE PARTY

WHO: Gary and Cheryl Hofsheier

WHERE: Monterey, California

WHAT: '06 C6

Gary Hofsheier must have scored some big points when he came up with the idea to surprise his wife with a Monterey Red C6 for her Christmas present back in 2006. As he told it, "I parked it in the garage and told her I needed some wrapping paper, she went in the garage to get the wrapping paper and I heard her scream 'You bought me a Corvette!!!' We've added a Borla exhaust system and a Blackhawk high-flow air cleaner to improve power and Budnik wheels for a different look. In the past I've owned a '61 and then a '68 Vette, so you could say I'm a fan. We have looked at the new C7s and maybe next Christmas I can surprise her again."



HAPPY BELATED FATHER'S DAY

WHO: Carl and Valerie Jaskeiwicz

WHERE: East Troy, Wisconsin

WHAT: '13 C6 427 Collector Edition

It warms our collective hearts around here to see Corvette fans passing on their passion to their kids. Such is the case with Valerie Jaskeiwicz. As she tells it, "My dad began my passion for Corvettes by taking me to the Corvette Museum and Assembly Plant in Bowling Green, Kentucky. The memories that we made will last a lifetime, I will never forget this wonderful trip. After that, my dad and I became true Corvette enthusiasts for life. I will forever love Corvettes thanks to my dad." Valerie's dad, along with her husband, Carl, have tinkered with her Vette, but the white 427 is still mostly stock. Then again, it's a hell of a car even in stock form. To Valerie's dad we just want to say thanks for raising her right!



KEEPING UP THE PACE

WHO: Kenn and Dean Deike

WHERE: Plainfield and Waverly, Iowa

WHAT: '78 & '08 Pace Cars

Kenn Deike and his cousin Dean are the proud owners of a pair of killer Indy Pace Cars. Kenn's is an '08 registered track car with a Lingenfelter engine and supercharger. When Kenn got his car it had 8,000 miles on the odometer and he found out the suspension was set up for left-hand (Indy track) turns only. Dean's '78 Pace Car is upgraded and has a worked-over 700-R4 trans. Both belong to the Cedar Valley Corvette Club in Northeast Iowa. As Kenn relayed, "We both belong to the Cedar Valley Corvette Club and are very lucky to both have wives that enjoy going for trips with the Vettes. They don't scream too much on the curves either! We enjoy the Vette mag and tech hints. Keep up the good work."

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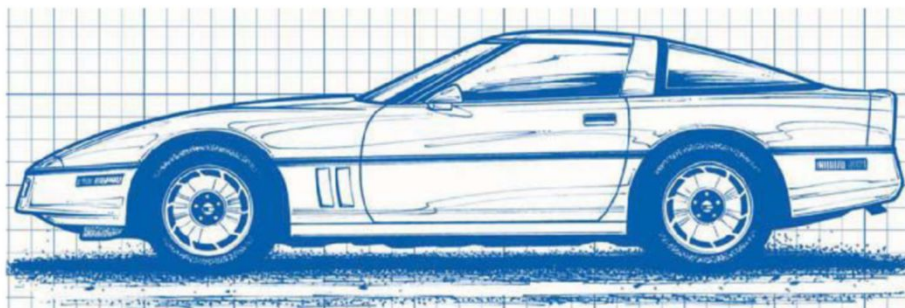
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1982-1984 **CROSS-FIRE** INJECTION

1982 was a serious year of challenges facing Dave McLellan and his design team with several interesting "firsts." 1982 was the first year since the '53-'54 Corvettes that a manual transmission was not available. However, it was the first year that a four-speed automatic with Fourth gear as an overdrive. 1982 was also the first year since 1965 that a fuel-injection system was used and the first time ever that a Corvette had an electronic fuel-injection system.

While the Cross-Fire injection system was a hodgepodge of parts, it was essential for several reasons. Emissions and safety standards were increasing every year and had nearly choked to death every carbureted performance car. Carbureted induction systems could not deliver the necessary EPA standards for engine certification. So, as the cars put on more weight and their engines were restricted more and more, performance went down the tubes. Electronic fuel injection was simply a requirement. Also in the works was the development of the all-new structure of the C4 Corvette—the first seriously fresh structural redesign of the Corvette since the



early '60s! A contributing factor to the adoption of the Cross-Fire injection system was the fact that the hood height of the new C4 was lower than that of the C3—so the engine had to be shorter. "How" they made it all work was amazing.

McLellan and his team made it all happen thanks to ingenuity and GM's parts bin. The two main features of the Cross-Fire injection system were the unique Trans-Am racing intake manifold and two fuel injectors, the same as used on select '81 Cadillacs. On the '81 Corvette a single injector was inserted into the Rochester carburetor to help the

engine to pass emissions, but it was still a carbureted engine. The top plate of the Trans-Am manifold was modified to take two injectors where the racing carbs would have been. While the manifold performed well for a high-rpm racing application, it wasn't happy under low speed, normal driving conditions. According to Chief Engineer Dave McLellan, "The flat Trans-Am manifold gave such poor cylinder-to-cylinder distribution that we had to compensate with more fuel."

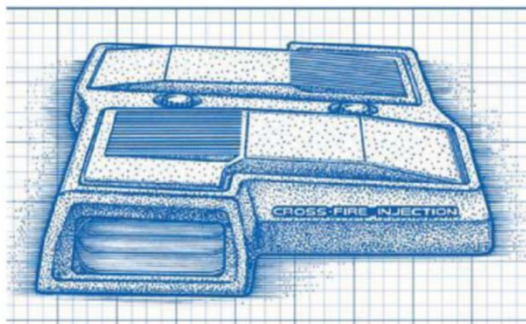
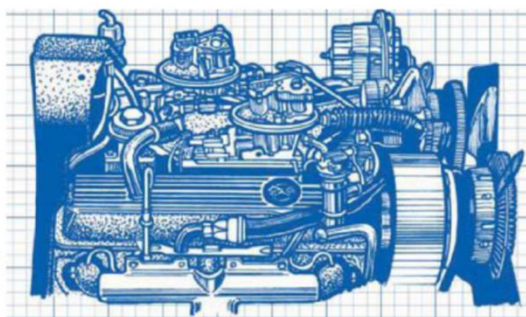
The dual fuel injectors were controlled by Chevrolet's latest Computer Command Control unit that delivered 80 spurts per-second, instead of the 10 delivered by its predecessor. The computer took inputs from the throttle position, coolant temperature, engine vacuum, ignition timing, and oxygen sensors. In response to the gathered data, the electric fuel pump, mounted inside the fuel tank, varied

the pump pressure between 9 and 13 psi. Then, solenoids above the two fuel injector units operated the fuel injectors. It was all a balanced dance between electronic pulses and mechanical devices. It was as simple as an electronic fuel-injection system as there could be.

Many less-advanced, hot rod-type features were incorporated into the '82 Corvette. A solenoid-operated cold-air induction system was integrated into the hood. The exhaust system used a smaller, lighter catalytic converter and the exhaust pipe from the manifold to the converter was redesigned to deliver hotter exhaust to the converter for better efficiency. And a small-diameter fan was used. When the '82 model was completed and ready for sale, the L81 Cross-Fire injection engine was rated at 200 horsepower, up 10 from the '81 engine.

"Performance" was ... well, let's not go there, except to say that most road tests of the '82 model consistently reported that driveability and throttle response was much improved, as well as fuel mileage. In general, the '82 Corvette was a "nice car" and the Collector Edition was a beauty. The L81 Cross-Fire injection engine served its purpose—it got certified for production and the slightly improved '84 version delivered enough grunt to wow the press in the new and vastly improved C4. However, when the L81 was replaced with the for-real fuel-injected L98 in '85, no one shed a tear for the Cross-Fire injection engine. **VETTE**

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