

The SuperNatural Callaway CR-1. Many members have seen Steve Davidson's blue C4 at Woody's and other venues and may have wondered exactly what was done to make it look and sound so different from the others in the C4 generation. In fact, his car started off as a ZR-1, which in itself was a significant departure from a standard Corvette of that era. However, Steve took his car a giant step above the ZR-1 and I have asked him to be a "guest" writer for this month's Technical article. You can see for yourself that this car is nothing like any Corvette you will ever see and has undergone changes that put it in a class by itself.

In 1990 Chevrolet, in response to the new Dodge Viper Supercar, unveiled the Corvette ZR-1. Then Corvette Chief Engineer, Dave McLellan, referred to the ZR-1 as "a Corvette, only more so." This model had a Lotus Engineering designed, Mercury Marine built, all aluminum 32 valve 4 overhead cam 5.8 liter 375 bhp V8, special rear quarter panel and rear clip body work to accommodate larger rear wheels and tires, first ever selective ride control, CD player, Valet Switch to enable/disable secondary fuel injectors, and an 8000 RPM tachometer mounted in the instrument panel.

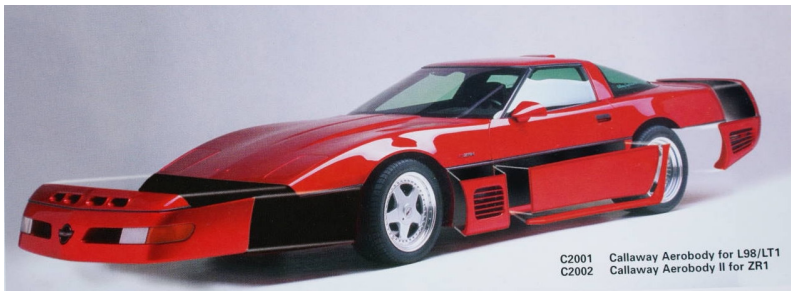
I acquired my 1990 red/black ZR-1 in early spring of 1991. The car had 1500 miles as a terminated GMAC lease. The original purchase price was \$85,000 (\$20,000 "special" dealer market adjustment over list.)

In the spring of 1991 I joined the newly formed ZR-1 Owners' Registry. Members of the Registry were always looking to make their cars even "more special" by increasing power and performance. After many discussions re: Lingenfelter vs. Callaway modifications, I decided to opt for the super powerful, tasteful, road going touring Supercar package that Callaway offered. This included an owner's selection of engine management, suspension design, aerodynamic and tire/wheel technology modifications. I also selected the then new Viper GTS Metallic Blue paint for the re-body after seeing the then new '97 Viper GTS coupes being unloaded from a factory enclosed trailer at a local Viper dealer.

A two-year plan was developed to winter over the car at Callaway Cars in Old Lyme, Ct. Winter of 1996 was set aside for modifications to the body, suspension, exhaust and drive train that would prepare the car to receive the highly modified engine the following winter.

November '96 to April '97:

Callaway Aerobody installation: The Aerobody was developed for the experimental Callaway Sledgehammer Corvette, which had recently set a track record of 254.76 mph at the Transportation Research Center in Ohio. The Aerobody was designed to "re-engineer airflow management outside the vehicle for added stability at high speeds. Internal airflow was revised to provide additional cooling to the engine, radiator and (if equipped) intake charge coolers. ."



All panels below the beltline were removed and discarded. Vinylester resin/ S glass matrix nose, tail, rocker and gill panels with functional slotted vents designed for heat exchangers were installed. A supplemental skin was installed over the top of the original door panels in order to house a much wider wheel and tire package. All traces of the original factory red paint were removed or prepped, and the entire car received '97 Dodge Viper GTS Metallic Blue paint, which was then wet sanded and polished to an extremely high standard.



Suspension and Exhaust systems: In order to accommodate the owner selected new custom built center line exhaust, the rear spare tire, carrier tray, transverse leaf springs, anti roll bar and factory split rear exhaust were removed. The Callaway Coil Over Independent Link Suspension package (C.O.I.L.), consisting of a coil spring placed around each of the four replacement new Bilstein shock absorbers, was installed. Custom mounts were fabricated. The lower spring perch of the COIL System is infinitely adjustable with an included specially designed Callaway tool, allowing the ride height of the car to be set precisely front-to-rear and side-to-side. The rate (pitch) angle can be adjusted nose down for high-speed cruising, nose up for serious straight-line acceleration (drag racing). Cross-weight can be adjusted, higher on the driver's side if the car usually carries no passenger, or flat to accommodate driver and passenger.



To accommodate the tremendous increase in spent engine exhaust gasses from the anticipated SuperNatural 500 bhp engine, the Callaway SuperNatural Tubular Exhaust Manifold System was installed. The 2.00" diameter primary tubes were hand fabricated and TIG welded from 14 gauge 304 stainless steel mandrel bent tubing. As Callaway had been building B2K Twin Turbo Corvettes, which could be ordered thru GM dealers, the Header-Cats were developed and refined on engine dynos and in the emissions lab to produce the most emissions legal horsepower possible from the ZR-1's LT5 engine. The system is fully emission compliant and legal for installation even in California under Callaway's CARB EO D-319-2 Certification. The specially designed, emission compliant, mini-catalytic converters with inline 14 gauge T304 stainless steel collectors were then mounted inside the custom designed and fabricated ZR-1 headers,

then mated to a custom fabricated large center resonator, then mated to high flow mufflers and the center-line outlet custom built stainless steel Double-D tipped exhaust system which could not be fitted until the Aerobody, with center exhaust port cut-outs, was installed.

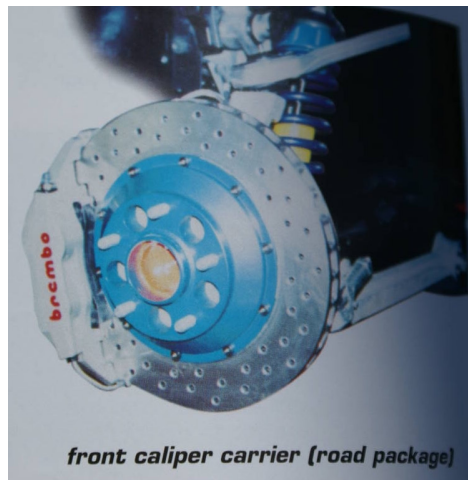
The stock forty pound dual mass flywheel, installed by GM to reduce noise, vibration, and harshness, was replaced by a Callaway designed and fabricated nodular iron single mass Centerforce flywheel. The Single Mass Flywheel/Clutch system reduced rotating driveline mass by 19+ pounds, resulting in faster acceleration, less clutch and gearbox synchro wear, and quicker shifts.



November '97 to April '98:

The stock all aluminum 32 valve 4 overhead cam 375 bhp LT5 motor was removed from the engine compartment. Using CNC milling and computer controlled equipment, the Callaway engine shop applied the following SuperNatural techniques: "cylinder port refinements for larger capacity and better flow, precise combustion chamber shaping and sizing, camshaft verification and timing, precision assembly, dyno tuning and software engineering."

Dyno testing, done in the owner's presence, shows 500 peak STD Corrected bhp Horsepower @7000rpm and 415 lb-ft of STD Corrected Torque @5500 rpm, in "street-legal, emission compliant form, so as not to run afoul of the long arm of the law."



front caliper carrier (road package)

To help haul the car down from a now estimated top speed of close to 200 mph, Callaway/Brembo Brakes were installed. Notations of the Brembo System from the Callaway SuperNatural catalog: "Callaway thinks, and designs, in terms of the whole vehicle: power, handling, aerodynamics, appearance and...brakes. So when we increase the power, and thus the velocity potential, of a Callaway vehicle we also think about, and design for, its safe and repeated velocity reduction. We use larger and thicker Brembo Lola IndyCar billet calipers combining lightweight and great heat rejection capacity with increased pad size for maximum friction surface. Also, the brakes have four hydraulic pistons, two on each side of the rotor. The rotors are massive nodular iron casting with pillar vents. They are cross-drilled and pillar vented for maximum heat transfer through the rotor-to-air surface. Drilling also provides an escape path for the gasses generated by the pads at operating temperature and keeps them from losing contact with the rotor surface.... Blue anodized mounting hats are custom engineered and fabricated in order to mount the Brembo Brakes. The standard Anti-lock Braking System, controlled by speed sensors on the hubs, is retained, operation is no affected by Callaway's changes in brake rotors, calipers and pads." All factory brake lines were replaced with high performance braided stainless steel lines.

For maximum braking system ventilation, maximum road grip, traction, and least unsprung weight, OZ Mito modular three piece wheels, 18x10 fronts, 18x12 rears, and Pirelli P Zero (yellow) Asimmetrico tires, 275/35/ZR18 fronts, 335/30/ZR18 rears, were installed.

To increase engine cooling at low speed, the stock radiator was removed and replaced with an oversized racing radiator with "Water-Wetter" heat transfer agent added to the radiator fluid. A manual over-ride three-position switch was installed to activate the twin radiator fans at any time to increase low speed cooling.



Reeves Callaway personally signs the CR-1 engine block



All modifications thru 1998 totaled \$60,000, and created one of only twelve "full boat" Callaway Aerobody SuperNatural 500 bhp CR-1s in the world. Reeves Callaway himself signed the engine block at a ZR-1 Owners Registry gathering at the home of Gordon Killibrew, one-time head of the Corvette Action Center.

My Callaway SuperNatural 500 Aerobody CR-1, plate # (formerly NY: 500HPCR1) now FL: CAL ZR1, was featured as Callaway of the Month August '04 on the Callaway Owners Group Website. Many pictures of the building of the car can also be found at COG Website: <http://www.callawayownersgroup.com/COTM/2004August/cotm.htm>

CAL ZR1 has been on many high-powered adventures, and won lots and lots of trophies and events, before its "retirement" from competition in 2005.

EDITOR'S NOTE: Reeves Callaway is signing the engine block in the above picture. Who is the other world famous Corvette enthusiast in the picture with Callaway? Extra credit at Woody's if you get the answer right.