THE 327 CHEVY CAPER

OK, you Chevy lovers, here's the "investigation" you've all been hollerin' for: A full-tromp, blueprinted breakdown on how you can pull up to 467 hp from your 327-inch Stovebolt—unblown and on pump gas! So get out the toolbox, Sherlock

by Jim McFarland

■ "One thing's for certain, that valve train will never hold up." With this much of an unenviable public observation, the Chevy V8 came into being. Specifications of 162 hp and 257 ft-lbs of torque garnished the little 2-bbl 265-incher presented to the automotoring public in 1955. Events since that time point out that this one introductory shot began a revolution in performance engines second perhaps only to that of the bent-eight backbone of early hot rodding — the nostalgic flathead Ford. As it turned out, not only did the dubious valve train survive the rigors of daily passenger car use, but managed to contain related components of the new valve train to revs that suddenly caused the extension of scale readings by tach designers to an eight with three zeros. It was unheard of for an American production engine. Success? Pick your own understatement. By early '57, GM had a selection of hard-lifter cams, a fuel injection package, high-ratio pistons and a growing list of other performance options shelved for the wrench-bending enthusiast who was using the little "honker" for everything from fuel rail drag cars to water ski toters.

In 1962, the 283 that had grown from the smoking success of the 265 gave way to a last step in small block Chevys — the 327. The "new" engine was initially met with somewhat the same reluctance that had confronted the early 265, but of a different nature; was the 327 actually an improvement? After all, Chevrolet was going to need a crackling encore to follow an act like the 265/283 combination. Already surpassed by the other two engines, the 1-hp-per-cubic-inch rule of thumb thought the pinnacle of many domestic production engines prior to the early Chevy V8's seemed doomed to also fall prey to the 327. Of course it happened, again and again, spurred on by engine builders all over the country. So much, in fact, that it has become a real trick to startle Chevy followers with performance figures boasted by this Stovebolt or that. A few weeks back, however, a telephone call from L.A.'s Vic Edelbrock broke the calm of this precedence. "Thought you might want to know we just pegged a corrected figure of 467 horses on the dyno (a reliable one at that) with a carburetted, unblown, gas-burning 327." Nobody got excited, but you might want to make note that

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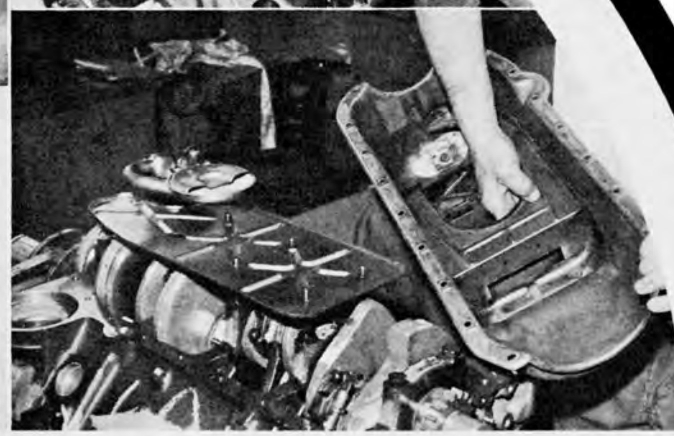
Vic and Bob "sleuthing" for clues in support of dyno evidence. Exhibits A thru L (at right) show areas of importance in small block Chevy modification. Threaded Allen plugs facilitate total flushing of block. Headers shown are both of Hedman design; the set at right is available for passenger car installation. Note the selection of collectors in the big tube jobs. Holley 3-bbl is shown with cut-out C-4B intake manifold. Alteration of 180° divider in manifold boosted 3-bbl's performance. Holley plate with inserted drill bits indicates points of jet opening enlargement. In rocker arm department, choose the late model units that can be identified by small "O" cast into the tip of the rocker body. Don't mix old rocker balls and new rockers or you'll be asking for conditions which will compound the inherent heat problem between rocker/ball units. For comparison, both stock and high performance timing chains and gears are shown. Bob's preference is the Teflon-toothed gear and the Morse chain. Note the small aluminum plug fitted into the center of the stock gear. Such a plug should be used regardless of your choice of gear types. These buttons prevent forward movement of camshaft when under the influence of distributor gear thrust. A reduction in timing chain wear will result in addition to ensurance against erratic valve timing. Heavy chain also serves to support loadings which are a part of performance type valve springs. It takes more energy than you think to keep a valve train functioning with such poundage.

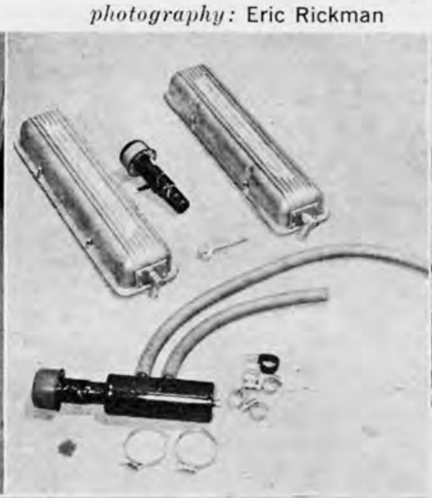
A little minor grinding will remove the shroud that frequently restricts oil flow past the pump/main cap juncture. Don't get brutal; just remove a little iron and smooth things up a bit. Block shot with exposed bottom reveals the high performance type pan (with trap door) and the horizontal plate used as additional baffling between the oil pump and block.





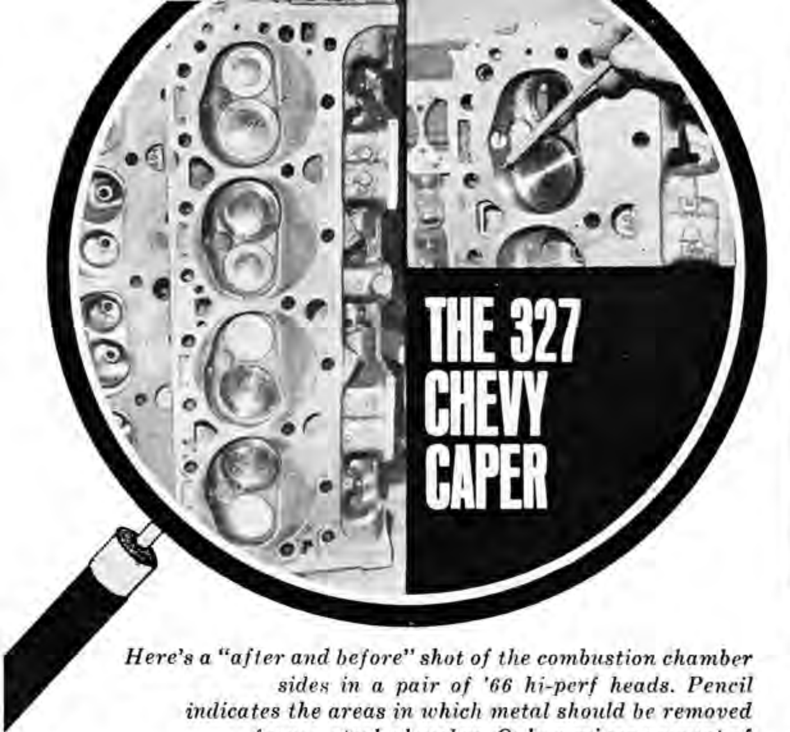


photography: Eric Rickman




Also in same photo, note the use of special studs that carry the stamped plate. You can also see the small braze-work used to tack the pump pickup to the pump's housing. Do it. A close-up look at stock breather tube shows the position of inserted baffle material. Weld 'em in. A pair of cork end-gaskets for intake manifolds will stop shift leaks for good. Vapor control is aided by the fabrication of parts you see with the valve covers. Check story for construction particulars.



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Specifications to which the engine was brought during "blueprinting" operations:

1. Block was line-bored (a **must** with the small block Chevys).
2. Mains were cut .001-inch under the stock diameter.
3. Rods were machined .005-inch (each) to yield **total** of .025-inch for an installed pair.
4. Rod and main bearing clearance was set at .0025-.003-inch under stock GM bearings.
5. Skirt clearance on the Fireslot pistons was opened to .007-inch.
6. Deck height was reduced to .022-inch with the proper block cut.
7. Total filled cylinder volume (with the #0861-C gasket) was fixed at 62cc — this with the decking cut, .020-inch removed from the block-side of the heads, and the installed Forgedtrue/CSC slugs.
8. Major torquings were: heads, 70 ft-lbs; mains, 80 ft-lbs; rods, 35 ft-lbs.
9. The oil pump was modified as per instructions listed in the story.
10. The entire reciprocating and rotating assembly of the engine was balanced at Edelbrock's Balancing Service.

Here's a "after and before" shot of the combustion chamber sides in a pair of '66 hi-perf heads. Pencil indicates the areas in which metal should be removed from a stock chamber. Only a minor amount of polishing is evident – a point strongly emphasized by Bob. He's cut many a chamber arriving at this.

we got to Vic's shop just about in time to see him hang up the phone. Ever see a Chevy with its tongue hanging out? Vic and a prominent West Coast Chevy engine builder (Bob Joehnck of Santa Barbara, California) had just finished ringing the sap out of the little Chevy, and happily for you, the fellas recorded their proceedings – every step of the way. Although we'd been dropping in and out of Vic's establishment during early stages of the work, we were not aware the results would be so notable. (Neither, incidentally, were Vic or Bob.) So with an occasional bit of explanation regarding the "why's" behind the "what's" and a few suggestions as to how you can approach the results already buttoned down, here's the "whole ball of wax."

Subject for the test was the 350 hp (factory rated) 327 as snatched from Vic's '66 Corvette. With a total advance of 36° (12° of this on the crank), a set of AC-44 plugs and the stock 3605 Holley, the engine made its dyno debut with 313 hp at 6000 rpm. Valves floated at 6200. (Incidentally, all hp readings in this story are corrected 5% for dyno gear box loss and 3% for atmospheric influence.) Following this single run, the engine was disassembled for thorough inspection and the subsequent blueprinting steps that are shown in the accompanying chart. Of interest is the fact that deck height variation was .012-inch and the factory-listed 11:1 compression ratio was an actual 10.85:1 with a total volume of 68cc in a filled cylinder/chamber pair. The Fitzgerald copper-asbestos-copper head gaskets (part #0861-C) with the K&W sealer, a .020-inch cut from the heads, a set of Forgedtrue Fireslot pistons available from CrankShaft Co. and 62cc in the cylinder (chamber included and heads installed) all combined to work out a static ratio of 12.42:1.

This assembly formed the basis for all subsequent dyno testing. Careful study of the specs and tabulated test data should put you in a rather authoritative position when Chevy V8 rebuild or rework time comes 'round again.

To this end, Bob Joehnck consented to a tour through his "secret shop" in Santa Barbara, California. Many of the accompanying photos and much of what is to follow are the product of Bob's years of rubbing elbows with performance engines. Chevy V8 mortality rates and performance levels are certain to rise following the unveiling of this information.

In the area of proper block preparation, you should always subject blocks to hot-tank cleaning, following the removal of *all* cam bearings and freeze plugs. To further ensure cleanliness, remove the knock-out plugs (shown in pics), tap the exposed holes and screw in some Allen-headed plugs. Flushing the block through these holes is mandatory for debris removal following honing and/or boring operations.

Oil pumps should have pickup tubes brazed into position. In this fashion, you'll fix the attitude of tubes (preventing possible drop out) and prevent the entry of air to the pump chamber. Aerated oil leaves much to be desired for proper lubing. You may need to stretch pressure relief springs slightly, but strive for no more than about ⅜- ½-inch of compression during spring installation. And before you mount the pump onto the rear main cap, radius the oil transfer hole in the cap as per the photo.

Use the high performance oil pan with its stock baffling and trap door (check the pics again). The plate and required main bearing studs that go with this shield should be used in conjunction with the pan. Simply specify the hi-perf unit as you lean on the counter at your local Chevy parts house.

Frequently, high-revving Chevy engines experience oil vapor venting problems. You can eliminate such difficulties by two or three inclined hacksaw cuts in the intake manifold oil breather tube and the insertion and brazing of baffle material placed in these slots (note the pics). For serious racing, build yourself a unit of the type you see with the fitting-mounted valve covers. In this instance, the little black can is fittted with a small drain plug for condensed oil vapor removal. You'll have no more blown oil problems. The second alternative usually involves plugging the hole where the block-mounted rear breather tube goes. Bob is planning a kit of these parts, to be available soon.

Distributors from '57 and later Chevys (utilizing centrifugal advances only) should have point plates tack-brazed to housings. This will prevent plate wobble and attending point dwell change during high rpm action.

In the head department, there are a number of relatively simple but effective changes you can make. High performance heads for '66 327's (casting #3782461) are adequate for unblown gas-burning engines. For street engines where valve spring seat pressures run in the neighborhood of 100 pounds (single springs), use Perfect Circle VS-2 valve seal sets and the PC Teflon units (VS-24) for competition spring work.

Screw-in rocker stud attitude seems to be dependent upon the shoulder onto which the stud lock nut faces. To assure correct stud alignment, Bob removes about ¼-inch of metal from the top of the stud bosses by setting the head up in a milling machine. Use machine-type washers under all head cap screws when installing heads. This will prevent scuff

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DYNAMOMETER RESULTS

Test Number	ENGINE RPM 5000	5500	6000	6500	7000
1	296	311	313		
2	357	380	389	390	378
3	368	379	387	409	389
4	366	388	398	409	408
5	376	387	409	425	409
6	385	396	410	430	416
7	388	411	417	430	419
8	393	403	430	452	436
9	385	396	411	430	415
10	371	382	436	440	430
11	390	411	443	454	446
12	396	407	443	455	450
13	403	414	452	467*	457
14	381	420	431	434	420
15	344	366	390	393	387
16	342	375	396	404	393
17	348	382	404	404	396
18	344	382	409	420**	409

* Peak horsepower from multiple carburetion: Edelbrock XC-8 ram manifold and a pair of Holley 1-14 jugs (600 cfm flow rates)

** Peak horsepower from single carburetion: Edelbrock C-4B high rise 4-bbl manifold modified to accept Holley 3-bbl carburetor (#3085) Horsepower readings are corrected 5% for gearbox loss and 3% for atmospheric conditions.

Test #1 — Completely stock engine — no air cleaner or alternator — 4435 actual miles on engine — 50 psi of oil pressure — 36° total advance — AC-44 plugs — (a change to Autolite AT-3's added 5 hp @ 6000 rpm).

Test #2 — Grant Flamethrower ignition with 39° total advance in the engine — Autolite AT-3 plugs set at .028-inch (Use a step or two hotter for street running; this is much too cold for home-to-grocery store operation.) — Edelbrock XC-8 ram manifold with 1-13 Holleys and stock jetting — narrow ring CSC/Forgedtrue pistons — a Racer Brown RB-X103 cam (.520-inch net lift with 29°-76° intake timing, 76°-29° exhaust and 285° duration at .020 check clearance — valve lash (hot) of .012-inch and .014-inch for intake and exhaust respectively — rod side clearance of .025-inch for two rods — main journals cut .001 below stock with the .0025-.003-inch oil clearance on both rods **and** mains — combustion chambers set at 62cc with .022-inch deck height — a pair of Fitzgerald copper-asbestos-copper head gaskets — heads cut .020-inch, .007 clearance on the piston skirts and a set of "dyno" pipes; 1¾-inch o.d., 36 inches long into mufflers.

Test #3 — "New" type Hedman headers (the competition type shown in the pics) — total ignition timing bumped to 44° — good street header, this type.

Test #4 — Same as test #3 except secondary plate was drilled from .062-inch to .067 — intermediate secondary plate holes were opened from .026 to .055 in an effort to reduce or eliminate the "stumble" normally experienced when the secondary side of the carb opens — no other changes were made.

Test #5 — A Racer Brown cam was installed (66R with the following timing and lift specs: 50°-76° intake and 80°-46° exhaust with net lift of .560-inch) — This cam requires adequate piston/valve separation, facilitated in this case by use of the Fireslot pistons. If you select this shaft, check with Racer for any allowances you'll need to make for proper clearance in **your** engine. Although this "stick" failed to produce improvement at this point in testing, it indicated headwork was needed. Good cam, this one! Also installed a set of Hedman's special headers of the following specs: 1¾-inch o.d. tubing, 30 inches to collectors of 3-inch o.d. pipe of a 25-inch length. These are sprint car jobs.

Test #6 — Cut 3-inch o.d. pipe to a length of 13 inches and blew a head gasket at 6000 rpm. Even the pro's make mistakes. Both Vic and Bob felt the cause was their failure to re-torque heads after initial run-in following cam installation. Don't **you** make this mistake. Always re-torque heads after you've worked the engine for a short time. A new gasket was stuffed under the head in question, and the readings you see on the chart were taken.

Test #7 — Changed secondary plates from .067 to .070 (in 1-13 Holleys). Lost some horses in the process, too. Switched to collector-type headers and lost more hp. A change of some sort was necessary.

Test #8 — Engine was returned to the conditions of test #4 and fitted with a set of Joehnck's reworked heads. Grinding consisted of metal removal as shown in the pics and dropped the static compression ratio about .5 points.

Test #9 — Exhaust manifolding from Hedman (HCH-U12; passenger car types) — no other engine changes from test #8.

Test #10 — Back to the exhaust system of test #7 Holley 1-13's with .065 primaries and .067 secondaries — exhaust porting in heads reworked as per story — 11 hp picked up at 7000 rpm.

Test #11 — Changed to exhaust tubing of test #8 — no other changes to engine.

Test #12 — Cut 3½ inches from exhaust collector length — total of approximately 31 inches.

Test #13 — Drilled secondary plates (main metering holes in "big end" of plate) to .070-inch in a pair of 1-14 Holley jugs (600 cfm units) — total ignition lead increased to 45°.

Test #14 — Carburetion changed from 1-14 Holleys to a pair of AFB Carters (3705's) — .0785 secondaries with stock primaries and metering rods — timing reduced 3° to 42° total — still running Edelbrock XC-8 dual ram manifold.

Test #15 — Changed to single 4-bbl high-rise manifold (C-4B) and a 3310 Holley — #70 primary and #76 secondary jetting — timing still 42° total.

Test #16 — Removed the dividing manifold chamber from below the carburetor — manifold operating with modified plenum chamber beneath carb base — jetting in the 3310 Holley changed to #72 primaries and #78 secondaries — note hp pickup over that of test #15.

Test #17 — Altered another C-4B manifold to accept a 3-bbl 3085* Holley (#75 primary jets with secondary plate openings of .098-inch) — timing remained at 42°.

Test #18 — Jetting in the 3-bbl changed to #75 primaries and from .098- to .086-inch secondary plate openings — performance on the dyno and subsequent plug readings indicated jetting was a shade lean.

*Vic is developing this carb for Holley. Check with him.

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cracks and subsequent fatigue openings after a head is "worked." A mild cut or a surface grind should be applied to any Chevy head. Characteristically, slight variations exist in surface trueness, so you need to clean things up a bit even if you don't remove a sizeable slice. Of the four basic types of head gaskets, Bob suggests use of the Fitzgerald copper-asbestos-copper design (compressed thickness of .023-inch, as compared to .023 for steel gaskets and .016 copper, .023 steel-asbestos-steel. Soak pack-types in water for 15 minutes prior to a coat of K&W (SC-12) or comparable sealer. Install with the beaded edges directed toward head surfaces (not the block). Torque head bolts in increments of about 15 ft-lbs to a finish of 70 (60 ft-lbs if you are using SAE-threaded head studs), and retorque 'em after a brief run-in period. You stand to lose a gasket if you don't.

And finally, everybody likes to remove a little metal from ports and the chamber side of heads. However, charging into the situation like a blind bull can often rob you of more horsepower than you might otherwise gain. The photos should provide you with clues as to where metal should be removed from chambers. Don't be too eager. Shiny spots in "used" combustion chambers will denote the areas where gas activity is high and metal wants to be removed. Do *not* remove metal from around the backs of intake valve seats. You can, if you want, remove the venturi neck from behind exhaust valve seats. In general, you need only "straighten up" intake and exhaust runners in the head. Leave the "frosting" on exhaust valves and try to concentrate on metal removal in the chambers (as per pics). This is where the greatest gains will be realized. By the way, smoke this idea in your pipe: Don't narrow the valve seats! Chevy heads seem to respond either not at all or negatively from such metal cutting. And since spark plug location in Chevy heads is such that plugs get a real "shower bath" during fuel entry, you can generally run a hotter plug than comparable engines and get by without detonation.

Think this will hold you for a month or so? Could be you prefer a few more inches than the 327 involved in this story. If so, keep your eye open for the exposé we're planning that involves a pair of 370 inchers — both Chevys. Each engine is already running, providing some rather startling results and shoving a couple of test cars to speeds and e.t.'s you'll want to hear about. Stay tuned to this station; same time, same magazine, more horsepower — still for fifty cents. ▪▪