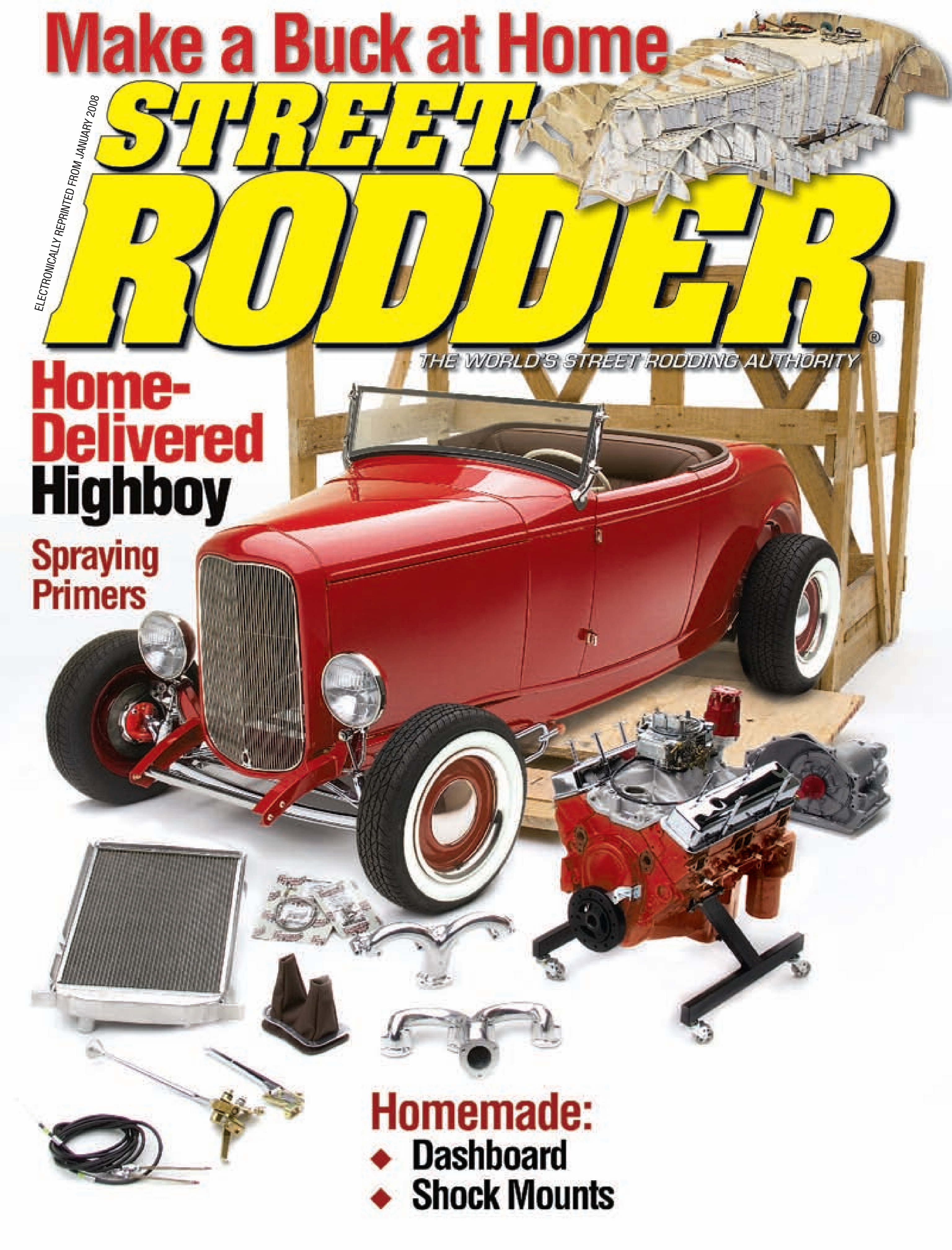
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Back to the Westech dyno we go. This time around we're checking out what gains we might make with the addition of a set of roller rockers from COMP Cams. We'll check out both a set of 1.52s and 1.60s and see what happens.

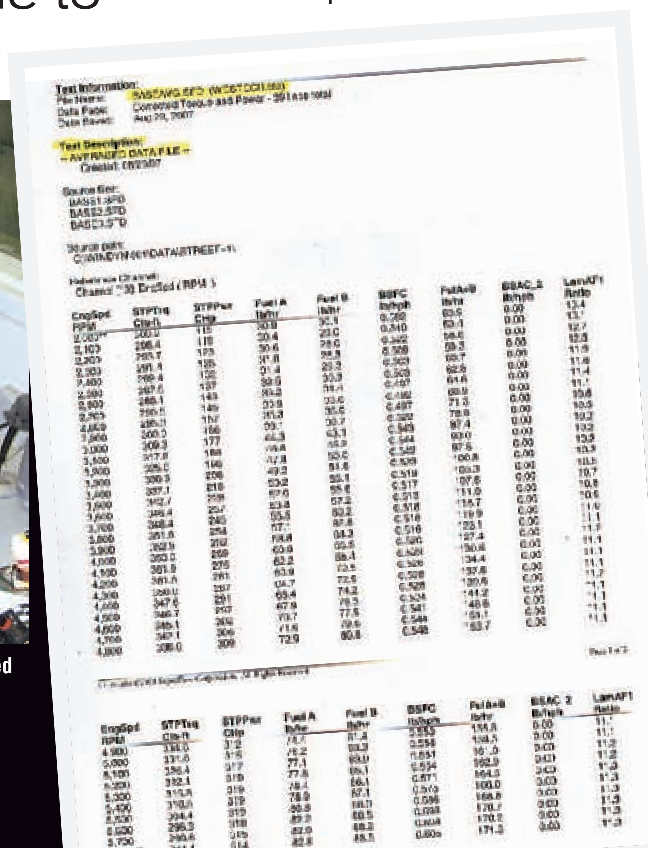
CRATE CREATIONS: PART III

from basic to bitchin'

The first two installments of this series touched on the myriad of choices available to us as we build a couple of engine we're doing for upcoming *STREET RODDER* project vehicles, along with how Editor Brennan chose a few affordable, base-model factory small-block crate long-blocks (a 350 from Chevrolet and a 302 from Ford) as the foundations for those project-vehicle powerplants in question.

As we've mentioned, it'd be interesting to chronicle not only what it takes to transform a pair of factory long-block crate assemblies into complete and running engines, but to perform a series of tweaks and upgrades to them using a combination of OEM and aftermarket parts.

This month we're back to our 350-cube Chevy long-block assembly (GM PN 12499529). It's an affordable starting point for a street rod powerplant that delivers a claimed 290 hp @ 5,100 rpm and a solid 326 lb-ft of torque at 3,750 rpm. We initially set it up on Westech



The corrected baseline torque and power numbers for this set of tests (with stock 1.50-ratio stamped rockers) ended up with maximums of 319 hp @ 5,300 rpm and 351.9 lb-ft of torque @ 4,100 rpm. These are the numbers we'll use to make our comparisons.

Another set of baseline pulls was the first step. We wanted to make sure we started as close as possible to the numbers we arrived at on the other machine since we ended up on the second of the two engine dynos in Westech's facility this time.

Once the baselines were completed, Eugene (one of the talented Westech dyno technicians on staff) began swapping out the stock stamped rockers.

The components should be in near-new condition since we're working on a fresh engine, but an inspection of the pushrods, rocker arm studs, and stud bosses is always a good idea. You should always closely inspect these items if you're performing a rocker arm swap on a used engine; in fact, it's best to swap out the original pushrods for new ones when changing rockers so all components have a fresh start and break in together.

Eugene decided to first swap out the stock rockers with the new COMP 1.52-ratio rockers. The first step is to remove the new rockers from their package and give them a good cleaning using denatured alcohol or lacquer thinner and blow them dry with compressed air. Once clean, soak them in engine oil or spray them liberally with COMP Cams Valve Train Assembly Spray.

Performance's dyno to get some baselines. After a pull or two, Steve Brule of Westech thought it was running a bit fat. He had a jet assortment on hand so he swapped out the stock 72s for a pair of 65s and tried it again. That time it dyno'd (with the smaller jets) at 309.5 hp and 340.2 lb-ft at the aforementioned rpm readings—not too shabby at all.

Steve then decided to see what'd happen with a bit of a distributor re-curve, so he swapped out the stock weights and springs for some aftermarket pieces to see what we'd get. The re-curve netted 8 hp and 3 lb-ft of torque (for 317 hp @ 5,100 rpm and 343 lb-ft @ 3,750 rpm). We did one last set of pulls before we wrapped up that first day, swapping out the existing plug wires with a set of solid-core performance wires from Granatelli Motor Sports. The wires netted us an additional 3 hp and 1.9 lb-ft of torque for a total of 320 hp and 344.9 lb-ft total—another respectable gain for little labor and cost.

This time around, we thought we'd see what kind of results we'd get if we swapped out the stock stamped rockers for a set of roller rockers. From what I understand, though conventional rockers get the job done they can do so less than optimally. More often than not, a factory rocker arm's ratio is less than specified. For example, many stock Chevy small-block rockers "check" at between 1.4:1 and 1.47:1, so obviously not all attain the advertised number of 1.5:1. No big deal? Maybe not for a grocery-getter, but it does matter for a performance vehicle. For example, if a camshaft has a lift of .300, multiplying by the advertised rocker ratio of 1.5:1 gives the engine a theoretical valve lift of .450. If the stock rockers only have a ratio of 1.4:1, then the real valve lift is actually .420.

You are not only more assured of correct ratios with performance rockers, but you can also play with alternate ratios. Swapping rockers is easier than swapping a cam, and often you can pick up a decent power increase with a simple rocker-arm swap alone.

Aftermarket performance rockers offer improvements over stock. Stamped-steel models might look similar to stock components, but actually aren't. The ratios are held to much tighter tolerances, and typical features include grooved rocker balls along with jam nuts, longer-than-stock slots, and higher-than-stock ratios. Constructed from high-strength steel, aftermarket rockers usually feature more material in the pushrod cup location. Plus, the valve-tip contact surface is often smoother than the corresponding stock mass-produced rockers.

Other benefits of rockers such as COMP Cams' Hi-Tech and Pro Magnum series roller rockers include a stronger-than-stock pushrod cup area. Also, many of these rocker arms have grooves that direct oil from the pushrod to the rocker ball. With a conventional stamped-steel rocker, the tip (the area that contacts the top of the valve) is pushed and dragged across the tip of the valve as the rocker nose is forced down by the camshaft and lifted by the spring. Instead of dragging a steel rocker across the valve tip, the roller rocker rolls over the valve tip. Consequently, wear to both the valve guide and tip's face is reduced.

The unique design of the Pro Magnum Rocker uses large trunnions equipped with needle bearings, which spread the load evenly and reduce the friction associated with the standard non-bearing pivot balls used in stamped-steel conventional rockers. These roller rockers also include integral pushrod seats that ensure accuracy and save weight, and this unique rocker design also provides plenty of clearance for most high-performance valvesprings.

Pro Magnum Rockers are made of 8650 chrome-moly steel. This material is some three times stronger than the 7075-T6 aluminum used in many aluminum rocker arms. COMP added strength where it was needed and reduced mass in low-stress areas, resulting in less weight (5 percent) at the valve than most aluminum rockers, in turn increasing rpm and aiding valvetrain stability.

Install the pushrods into the motor with both ends coated with a small amount of assembly lube. If the pushrod has a long hardened tip, make sure it rides properly in the guideplate. If the pushrod has an arrow, be sure to install it pointing up. It is recommended that all the pushrods be pre-oiled through the pushrod holes. Apply a small amount of COMP Cams assembly lube to valve stem tips and rocker arm pushrod seats.

Install the rocker arm on the rocker stud, paying special attention to the pushrod and rocker arm positioning. Be sure that the pushrods are seated in the lifter and rocker arm seats. Install poly locks loosely on the studs with the setscrews backed off; do not tighten the poly locks or setscrews until you go through the proper sequence of lifter adjustment. Install the remainder of rocker arms in this manner. After carefully checking to be sure all pushrods are seated in the lifter and rocker arm, it is time for valve lash adjustment.

Roller rockers offer another advantage in their pivot or fulcrum area. As engine speed increases, the rockers are cycled at a higher rate. Higher in the rpm range, the rockers are almost always stressed. Lubrication between the rocker arm body and the rocker ball can be less than generous under these conditions in standard stamped rockers; oil is supplied through the pushrod hole but unfortunately not specifically directed to the rocker-ball area.

Some performance roller rockers solve this problem by using roller bearings instead of rocker-ball pivots. A roller bearing produces far less friction and heat than the stock rocker's sliding action. Because of this, oil flow to the topside of the engine can be restricted. Not only does this reduce the overall engine oil temperature, it can help produce more usable horsepower.

There's also a distinct difference when it comes to rocker ratios (the ratio is the distance between the pushrod cup and the rocker's pivot point). A small-block Chevy has a stock theoretical ratio of 1.5:1. If that ratio is modified to 1.6:1, then the gross valve-lift numbers increase without affecting the valve-seat timing, so the advertised duration actually stays the same, but the lift is increases.

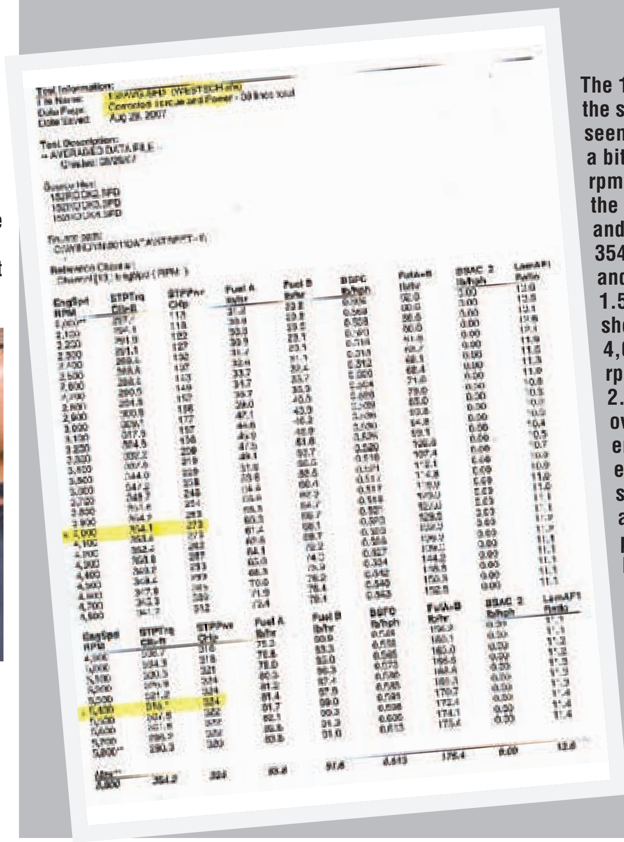
In addition to increased lift, a larger-than-stock-ratio rocker also opens the valve quicker and closes the valve slightly later—but there are some possible trade-offs, like spring coil bind. It's also possible that the faster acceleration and deceleration rates produced by high-ratio rockers may produce a certain amount of valvetrain instability at high rpm with stock-rate springs.

We recommend you work with one cylinder at a time. Using the crankshaft dampener bolt in the snout of the crankshaft, turn over the engine by hand in the direction of its running rotation until the exhaust pushrod just begins to move upward to open the valve. Stop rotation. The lifter is now on the base circle of the cam and the intake valve is ready to be adjusted. In the case of hydraulic lifter cams like ours, tighten the poly lock until all the slack is taken out of the rocker arm and pushrod. By lightly turning the pushrod with your fingers as you tighten the poly lock, you will discover or feel a point at which there will be slight resistance. At this point, you have taken all the excess slack out of the pushrod. You are now at what's referred to as zero lash. Turn the poly lock one-half turn more, and tighten the setscrew using a T-handle or Allen wrench while holding it with a wrench. This'll give you the ideal preload of the rocker arm, pushrod, and lifter. Repeat this procedure for each cylinder and carefully adjust all intake valves.

To adjust exhaust valves, turn over the engine until the intake pushrod moves all the way up. Rotate past maximum lift, approximately one-half to two-thirds of the way back down. The lifter is now on the base circle and the exhaust valve can be adjusted. Again, with hydraulic lifter cams, like the one in our SBC, rotate the exhaust pushrod with your fingers and begin to tighten the exhaust poly lock. When you feel the resistance on the pushrod, you are at zero lash. Rotate the poly lock one-half turn more and then tighten the setscrew. Go through the exhaust valves and repeat the procedure carefully. Now all of the valves are adjusted with the proper preload.

You may have noticed in the previous image that we pictured a different set of valve covers than earlier. This was because the chromed covers we initially outfitted our SBC with were of a shallow configuration—something we hadn't given much thought to before our swap. Luckily for us, we were able to "borrow" a set off another engine nearby for use during our testing, but we will have to get ourselves a proper set as soon as we can. Here you can see the two sets of COMP rockers we're working with, one with a 1.52 ratio and one with a 1.60 ratio. Now let's take a look at our results.

Unfortunately, we had planned on showcasing the same modification and resulting increases on our SBF here as well, but I was unable to meet my deadline (don't tell the boss) do to dyno scheduling; but rest assured, I'll make sure we see what happened on the Ford motor in our next installment!



Test Information:
File Name:
Date Saved: Aug 28, 2007

Test Description:
AVERAGED DATA FILE

EngSpd RPM	STPTrq CB-ft	STPPwr CHp	Fuel A lb/hr	Fuel B lb/hr	BSFC lb/hph	FulA+B lb/hr	BSAC 2 lb/hph	LamAFl Ratio
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The 1.52s appeared to work best with the stock valvesprings. The 1.60s seemed to overwork the stock springs a bit more than the 1.52s at high rpm. The results went like this: With the 1.60s, our best corrected torque and power average worked out to be 354.9 lb-ft of torque @ 3,900 rpm and 315 hp @ 5,300 rpm. With the 1.52 ratio, we ended up with (as shown here) 354.1 lb-ft of torque @ 4,000 rpm and 324 hp @ 5,400 rpm. This worked out to be a solid 2.2 hp and 5 lb-ft torque increase over the stock stamped steel rockers. I'm sure we would have had even greater results had we swapped out the stock springs for a matching set of appropriate performance ones, but 2 hp and 5 lb-ft of torque is a step in the right direction.

With that said, let's get back to the dyno room at Westech and see what happens with our mule. Who knows—there could be some extra horsepower lurking under those valve covers. SR

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