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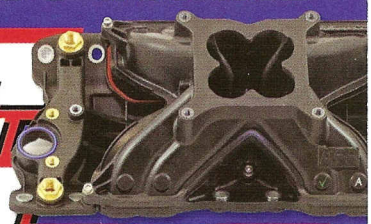

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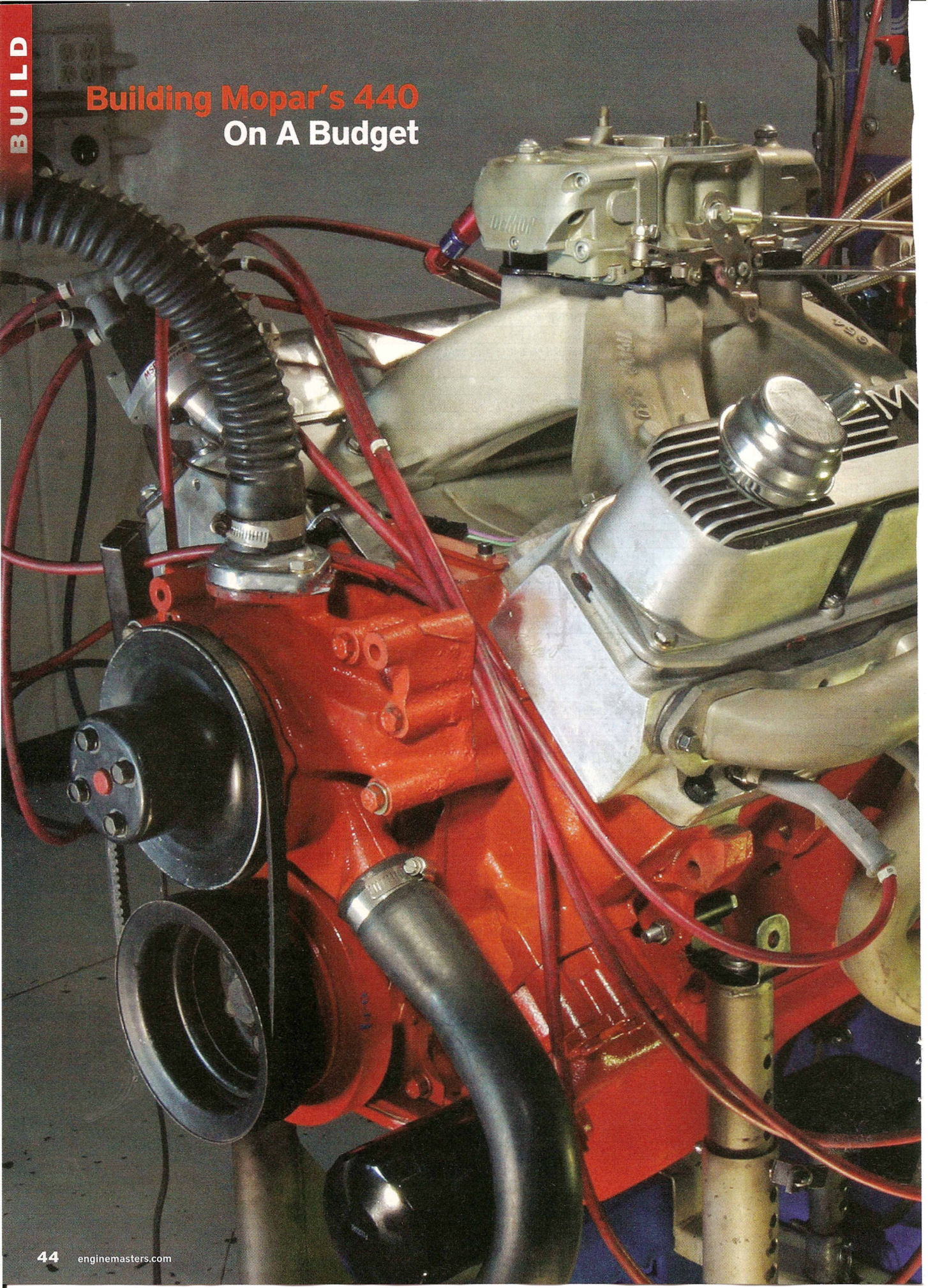
Building Mopar's 440
On A Budget



BASIC BUT POWERFUL

By Steve Dulcich

Chrysler built the 440 engine in vast quantities between the engine's introduction in 1966 and the last year of production in 1978. While that 12-year run ended decades ago, for Mopar fans the engine represents the fast track to cheap power. Other Mopar big-block engine combinations have gained favor in recent years, with the advent of readily available and affordable aftermarket blocks and stroker combinations, but for the working man on a real-world budget, the 440 still offers the most performance value for the buck. Just take the factory package, add some quality rebuild and performance parts, and making hero power is not a problem.

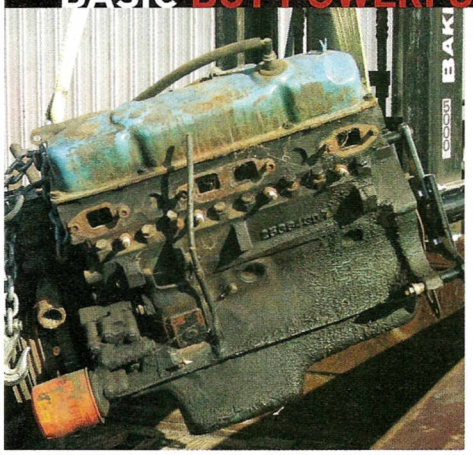
We were looking to build just such a street engine, destined for duty in a '72 Charger. When it comes to Mopar bragging rights alone, the 440 engine has the cache that is still going strong to this day. When the subject is a B-Body Mopar, a 440 means making no excuses when asked what's underhood. The nice thing is when that 440 has the muscle to back up its reputation, and the even sweeter part is when the engine is basic enough to be affordable.

The Base

Chrysler's 440 went through several changes over the production run, but few of these will have an affect on selecting the appropriate core for a performance build. First, let's consider cylinder heads. All of the OEM iron heads had similar performance potential, with a slight nod toward the '67's castings for the superior chamber, though some of those were factory equipped with small exhaust valves. Our build plan included going with aftermarket cylinder heads, so the entire top end of the engine core is not a relevant factor. If building with iron heads, the aforementioned '67's castings definitely offer a performance advantage once prepped, while the later castings are all relatively close in power potential, even the later "smog heads". While a set of aftermarket aluminum heads might seem contrary to the concept of a budget build, bear in mind that a full reconditioning and performance build of a set of factory iron heads can close in on the cost of the aftermarket heads. Right from the get-go we decided that a set of Edelbrock Performer RPM heads would be the anchor part for our build plan. These heads have become a very popular option for those looking to build big-block Mopar power.

The Edelbrock heads are reasonably priced, while offering out-of-the-box performance that is superior to all but the very best fully race-prepped ported factory heads. The Edelbrocks already come with 2.14-/1.81-inch valves, compared to the factory 2.08-/1.78-inch pieces, and performance valvesprings

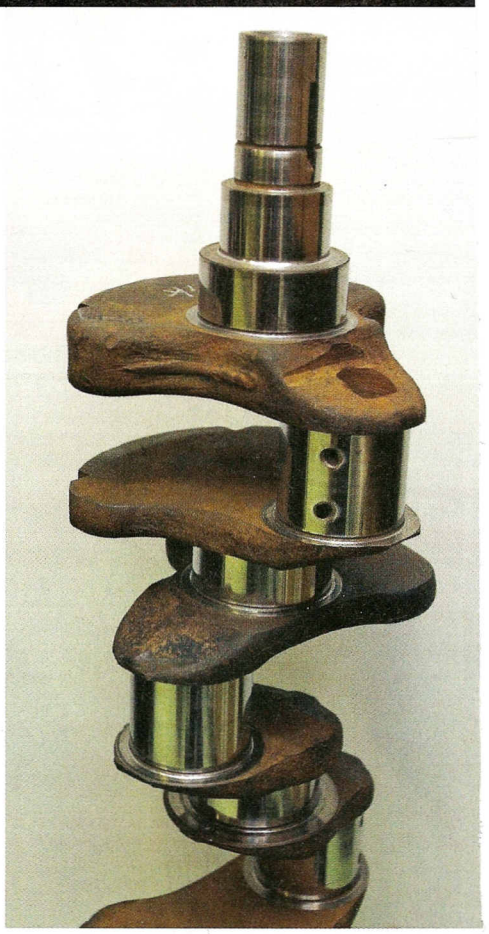
BASIC BUT POWERFUL



When it comes to 440 Mopar engines, any usable core is a suitable starting point for a high-performance build, but the earlier engines have the advantage of a very good forged steel crankshaft.

Mopar OEM 440 rods came in two basic configurations, the much more common standard rod, marked "LY" on the beam (*right*), and the heavy duty rods used after 1970 on HP engines (*left*). Either can handle the power of a hot street combination with resizing and fresh high-strength bolts.

An alternative to reconditioning the stock rods is to step up to a set of aftermarket units. If replacing the rods, stay with a reputable manufacturer as some of the very low-line rods can be a gamble



A standard forged crank went into the bottom end for our build. The crank simply received a .010-inch grind on the journals, and was installed with a set of Clevite bearings.

that are well suited to a typical high-performance hydraulic flat-tappet cam. Expect a flow peak in stock form in the 270-285 range, depending upon who's flow bench you believe, which is a far cry from the 205-215 cfm you'll see from a set of factory castings. There is a large power gain in the Edelbrock heads.

Now that we have pretty much eliminated the factory top end package from our plan, the next area of attention goes to the bottom end. Considering factory cores, all of the blocks are plenty beefy for a stout street package, and most can accept an overbore of .060 inch, though sonic testing is advisable for peace of mind when contemplating overbores of this size or more. The '70-and-later blocks did receive stiffening ribs to the outside of the block, but their inclusion or exclusion is by no means a deal breaker when considering a typical hot street application.

When it comes to core selection, by far the biggest differentiation in the OEM engine packages is the crankshaft. The early 440 engines all featured forged steel cranks, and these can easily handle 600 hp or more with reliability. In 1973 some cast cranks began to appear in production 440 engines, and by 1974 virtually all were manufactured by the casting process. These cast crank 440 engines are definitely not as desirable, but should not be counted out, even when considering a performance build. A factory cast crank can reliably handle 500 hp in a street application, and we have seen examples live remarkably long lives at much higher power outputs. However, the bottom line is that a forged steel crank is stronger than a cast-iron one. Since our plan was to build to the factory stroke and keep the stock crankshaft, our preference was for a forged crankshaft.

A final point to think about when considering the engine core is the connecting rods. While these days a strong argument could be made to replace the factory forgings with aftermarket rods in any build, we have found that the factory rods can offer adequate durability in a street performance application. You will find two types of rods in factory 440 engines, the standard rod used in most 440s, commonly referred to as the "LY" rod for the letters forged in the beams, or the much rarer Six Pack rods. The Six Pack rod is actually a bit of a misnomer, since the triple Holley–equipped Six Pack engine was introduced in mid 1969 with the standard "LY" connecting rods, while all HP 440 engines after 1970 (including four barrels) were equipped with the so-called Six Pack rods. These rods featured much beefier and broader beams than the standard rod, though they used the same ⅜-inch fasteners as the standard units.

Many Mopar engine guys will even say that the extra beam thickness offered no durability advantage over the standard rod for the added weight. I would disagree with this assessment, but the bottom line is that any of the Mopar factory rods can live in a moderate street performance engine. Keep in mind that the engines equipped with Six Pack rods used an externally balanced damper and flexplate to make up for the extra weight of the rods. When used with lighter weight aftermarket pistons, the rotating assembly can easily be zero balanced.

For our build we had a virgin standard-bore '70 engine assembly. This engine was the standard performance unit from a large Chrysler car, rather than the factory HP unit. Keep in mind that all of the major parts that would be retained in this type of build

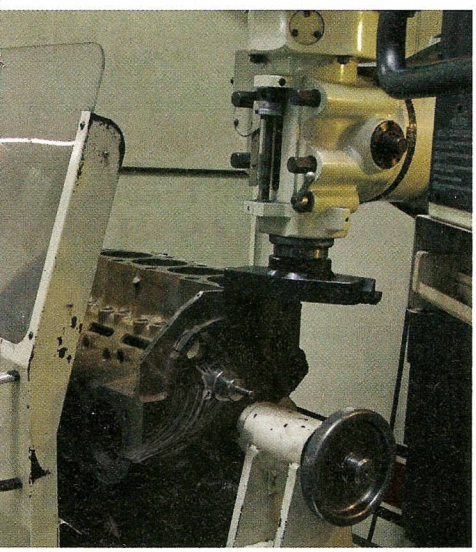
are identical whether the engine was a factory HP unit, or a standard 440, with the exception of the rods in '70-and-up HP engines, and the unique induction used on the Six Pack. The block, crank, and even the head castings and intake manifolds were used across the board in any given year, regardless of the application. Actually, given the low-performance application of our engine core, we could reasonably assume less fatigue stress to the major original equipment components that we would retain.

We wanted the strength of a forged piston, and found the Probe units offer a good value. Even in a budget buildup, the extra cost of a forged piston is money well spent.

The Build

Our plan for this 440 was to keep it as simple and straightforward as possible, essentially a mixture of a basic rebuild with just the right amount of aftermarket equipment to really make the engine pop. Starting with the block machining, the list of operations was relatively short, just the cleaning and inspection, followed by boring the block +.030-inch over and decking the block to offer a zero deck with our set of forged Probe pistons. The factory LY rods were resized, with ARP bolts added, while the crank was ground .010/.010 undersize. We had the rotating assembly balanced, and then it was home from the machine shop for assembly.

What we had on hand at this point was nothing exotic, in fact, little more than a basic "rebuilder's" bottom end, but with upgraded forged pistons and a balance job. As simple as that may seem, it was plenty for our plans with this engine.

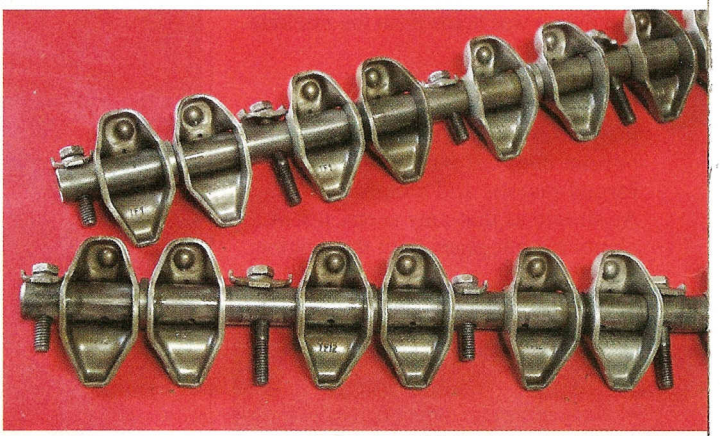


We kept the block machining to only the necessary operations. A bore, hone, and deck job sums up the major block machining.

Experience has shown that moly faced rings provide much improved bore life compared to the cheap "rebuilders" iron ring. These Speed-Pro rings are also much more durable than plain cast-iron rings and provide a power advantage.

To drive the cam we used a COMP roller timing set. This standard set comes with three keyways at the crank gear to adjust the cam timing +/-4 degrees. Further fine-tuning of the cam timing will require the use of offset bushings at the cam gear indexing pin.

A flat tappet hydraulic cam is far and away the most cost-effective setup in a mild performance engine, especially if the OEM valvetrain is retained. This COMP XE285HL is a fairly radical stick.

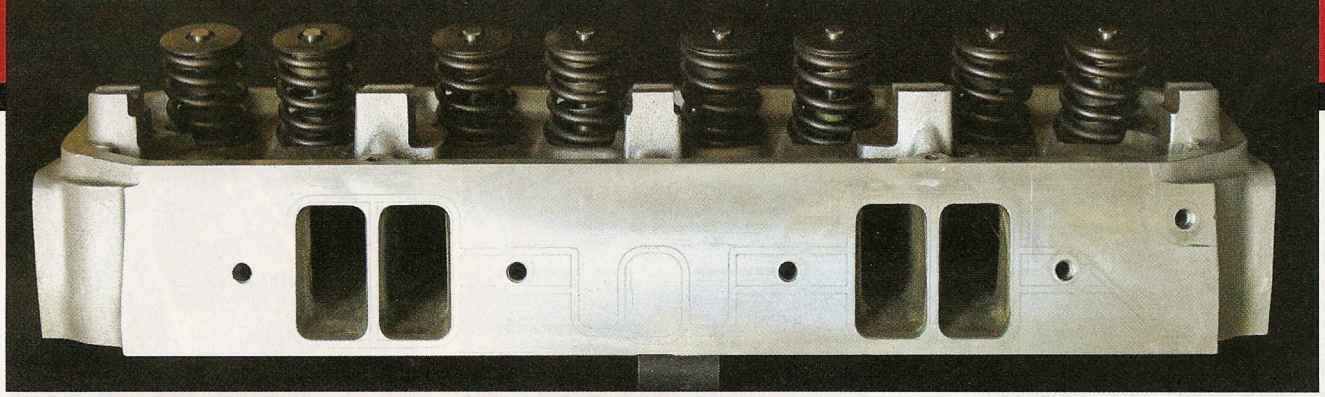


The factory stamped steel rocker setup looks primitive, but it is very lightweight and effective. We simply cleaned off the stockers for reuse in our 440.

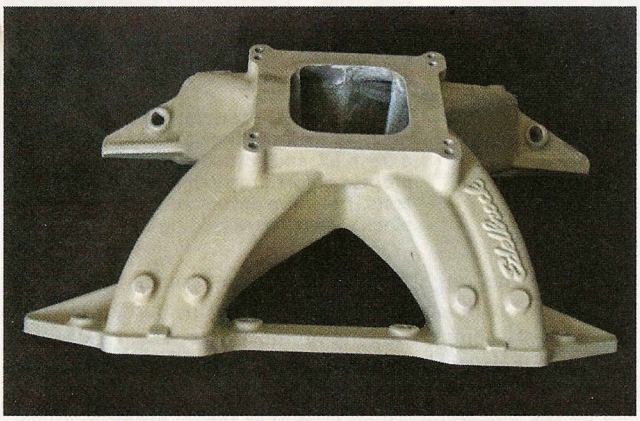
Making it come to life from here would be simply a case of parts selection, and here too we worked with an eye toward a cost-effective combination. As previously mentioned, the cylinder heads would be the Edelbrock units, so that end of the game was handled. Looking for top-end power, we opted for a single-plane intake manifold, selecting an Edelbrock Victor. The manifold choice here is dependent upon the power curve you are after. A dual-plane Edelbrock RPM manifold will have a definite advantage in low and mid range torque.

So we had the short-block and top end figured, and that just leaves the heart of the engine: the cam and the valvetrain. Here we decided to go with a hydraulic flat tappet cam, mainly because it would shave several hundred dollars from the cost of the engine by allowing us to retain the factory valvetrain. The OEM stamped steel rocker arm system on big-block Mopar engines have all the eye appeal of a pile of junk, but actually the setup is extremely lightweight, and offers very good performance and rpm potential with a hydraulic camshaft. We just cleaned the factory rockers for reuse.

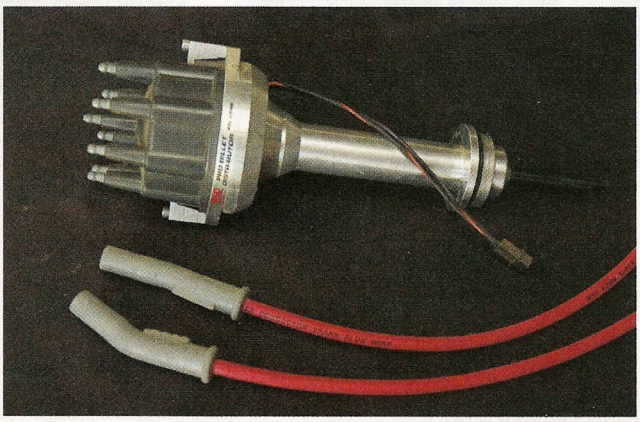
To put the motion to the rockers we opted for a 'stick that really delivers in Mopar engines, a COMP XE-HL grind. This series of hydraulic lifter cams from COMP is designed to maximize the rate of lift available from Mopar's large factory lifter diameter of .904 inch, for a very quick lift curve. We went with the XE285HL, a grind that has the specification to



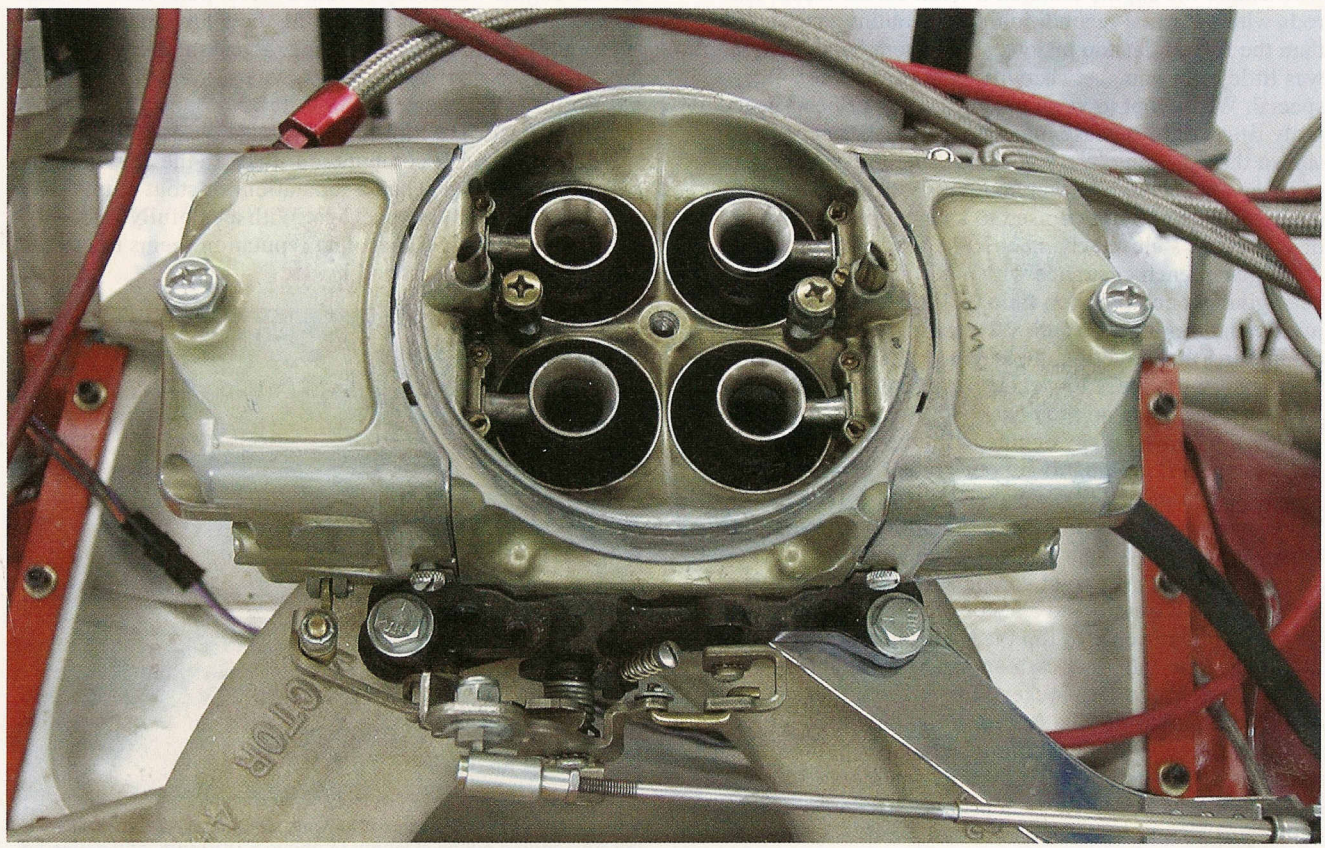
The cylinder heads are a key part to power production. For an application like this it is hard to beat the Edelbrock RPM heads. These heads feature far improved flow in comparison to the OEM heads, and we find the quality control very good right out of the box.



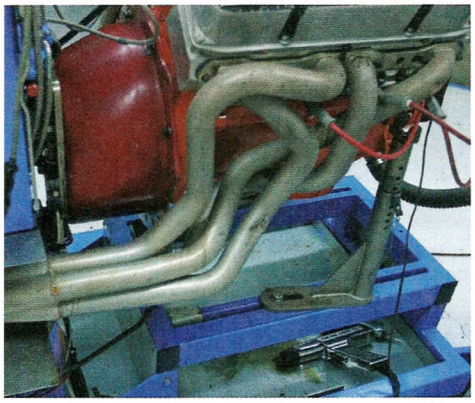
The manifold complements the cylinder heads, and here we opted for the top end charge of a single-plane Edelbrock Victor. For more low and mid range power, the RPM intake would be a better choice.



For dyno testing purposes, our favored distributor setup is the MSD Pro Billet. Although not a bargain piece, it is incredibly reliable, and plugs right into the dyno installation. For street use, a Mopar Performance vacuum advance distributor is a viable alternative.

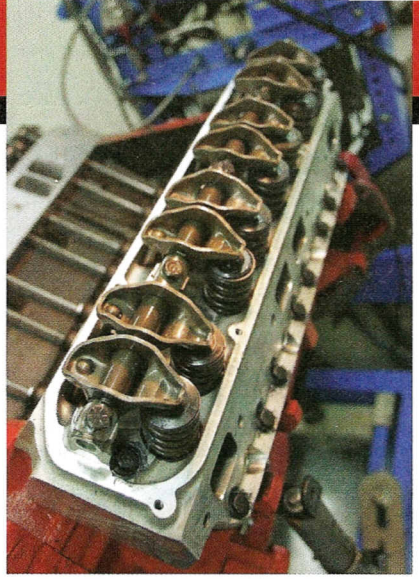


For carburetion on the dyno, we went with the largest 4150-style carb on hand, the Race Demon RS with the large 975-cfm sleeves installed. This carb would perhaps be overkill on the street, but a more moderate carb can be substituted with a minimal impact on power.



Exhaust is another important factor in making good output. These 1⅞-inch Hooker Comp headers are sized about perfectly for a 440 in the 450-550 hp range.

We ran the engine on the dyno with the OEM-style mechanical water pump driven by a pulley set at about a 1:1 ratio to crank rpm.



After the initial break-in and calibration runs, we took the time to change the oil to a fresh fill, and go through an inspection process before proceeding with the power tests. The valve covers were pulled and the stock rockers were holding up fine.

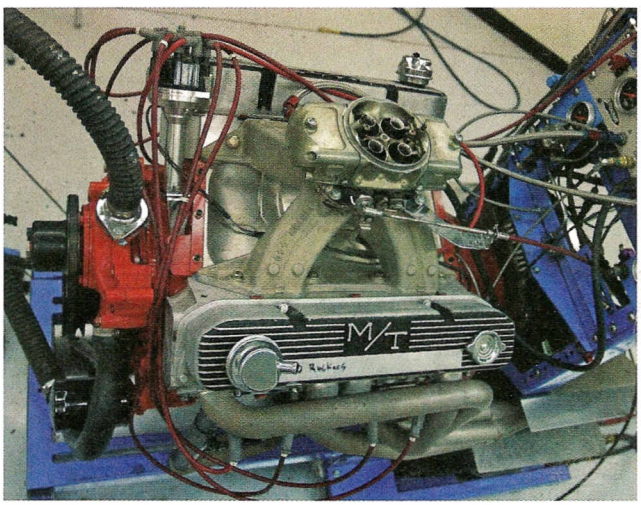
deliver plenty of power, while still being streetable. Looking at the tail of the tape, the specifications read 295/297 degrees gross duration, 241/247 duration at .050 inch, and .545-/.545-inch lift. This is definitely not your typical old-school mild cam, it's a really stout hydraulic 'stick with a very aggressive valve opening rate.

Wrapping It Up

It's worthwhile to review just what we had in this build. Downstairs the engine featured a stock block, crank, and rods with the usual reconditioning and nothing more. Other than the forged flat-top pistons and custom balancing, there was little difference between this engine and a rebuilder's special. We did opt to wrap the pistons with Speed-Pro moly rings, only because many years of experience has shown that anything less is really selling the engine short of its potential durability and output. With a zero deck this short-block is perfectly poised to take a top end consisting of Edelbrock's closed chamber RPM heads for a perfect .040-inch quench clearance with a set of Fel-Pro head gaskets, giving a compression ratio of 10.3:1. With a COMP juice cam working the stock valvetrain and a Victor intake completing the induction, the engine build is simple enough to lay out in the preceding short paragraph, and build in your own garage in no time flat.

When it comes to any engine build the report card is the dyno sheet, and looking to get our grade we hauled the engine over to Westech Performance Group for the numbers. We wanted to see this 440 make some serious steam, just to prove a point—Mopar power can be bought for nickels on the dollar with the right components. We had plugged in an MSD distributor and a set of MSD wires, but came to the test without a carb to top the Victor intake. This dyno facility has virtually any carb on hand you might desire, and we opened the carb locker and yanked out the biggest 4150 piece on the shelf, a Race Demon RS, fitted with the 975-cfm sleeves. While anything but budget, it didn't cost us a dime to wrench it on the intake for our test. We bolted a set of Hooker Comp 1⅞-inch primary headers—a size that is just about perfect for a hot street mill—and we were ready to make some noise.

After the routine bench settings, we had the engine fired to life, and the long COMP hydraulic cam made its presence known with a noticeable thump at idle and a steady 7.5 in-hg of vacuum showing on the gauge. This COMP 'shaft is simply not going to be mistaken as a Sunday driver. We spun the distributor for 36 degrees total advance, and let the SuperFlow dyno take over for its break-in cycle. Once completed, we pulled the handle for a few static pulls on the dyno to get a read on the steady-state mixture. Reading in the safe zone at mid 12s on the Lambda, we could see the engine was ready to run. Several pulls later we had the initial numbers, easily cresting the 500hp mark on a short pull to 5,200 rpm and rising. Tweaking the timing and mixture to their optimal settings, we recorded 537 hp at 5,800 rpm, with a healthy 538 lb-ft of torque at 4,400-4,600 rpm. This basic 440 Mopar really made obscene power considering the humble combination. Back in the day the big Mopar wedge always had a reputation for stout output on a relatively conservative package. With a carefully selected set of aftermarket goodies, that reputation seems to grow more valid as the years roll by. *EM*



With the preliminaries out of the way, we moved on to power testing. The engine pulled strongly to above 6,000 rpm, and delivered very impressive torque throughout the test range. Power was substantial, showing 537 hp at 5,800 rpm

DYNO RESULTS

440 CHRYSLER BIG-BLOCK
SUPERFLOW 902 ENGINE DYNO
TESTED AT WESTECH

RPM	Torque	Horsepower
3,600	527	361
3,800	526	381
4,000	533	406
4,200	535	428
4,400	538	451
4,600	538	471
4,800	532	486
5,000	527	501
5,200	521	516
5,400	513	527
5,600	502	535
5,800	487	537
6,000	467	533

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