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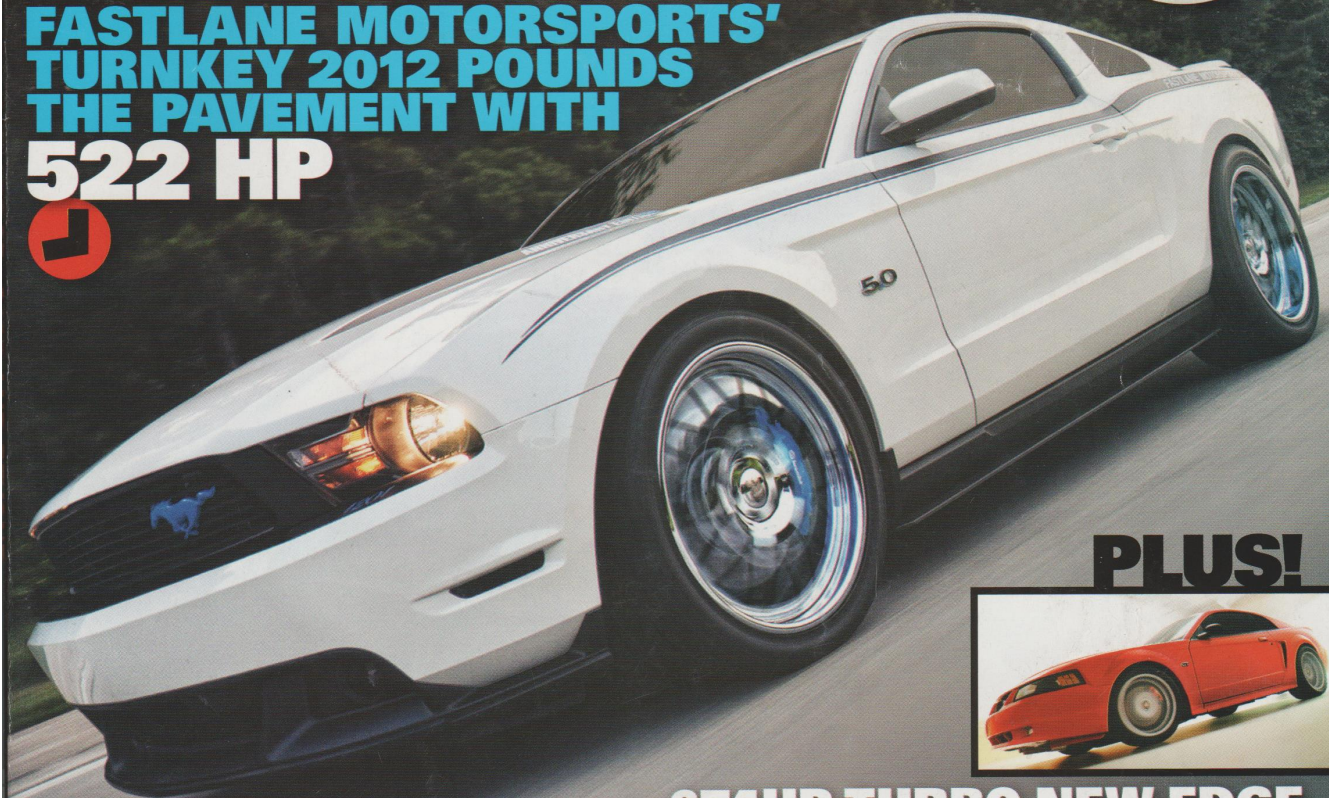
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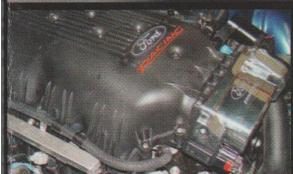
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# New Life

PRO-DYNO BUMPS UP THE HORSEPOWER ON A RETIRED MUSTANG SPEC RACER By Jeff Huneycutt Photos courtesy of Pro-Dyno

**T**he unfortunate reality is that race cars seldom enjoy retirement. If they aren't destroyed in a crash and hauled off for scrap, most wind up parted out. It's a hard life, no doubt about it. Fortunately there are a few people out there who are willing to give an old race car a second chance.

Roger McQueen gave this Miller Cup Mustang FR500S a new life when he purchased it and brought it to the East Coast to use as a track car. Tagged by Ford as the FR500S, this Mustang is a factory-built racer that was produced by Ford in 2007 and 2008. Seventy five examples were offered at \$75,000 each, specifically to be raced in the eight race Ford Racing Mustang Challenge as part of the Miller Cup racing series.

Performance-wise, the cars were built to a spec just below the full-zoot FR500C Boy Racer factory car that competes in the Grand Am Koni Challenge. The front suspension is upgraded with two-way adjustable dampers, along with adjustable sway bars on both the front and rear. Four-piston Brembo brakes are installed on all four corners, and an FIA-spec roll-cage protects the driver, who is belted into a Sparco racing seat. Lightweight Lexan supplanted the factory glass, and the front splitter and rear wing are not there only for looks.

That all sounds great. Underhood, however, a nearly stock, naturally aspirated Three-Valve 4.6-liter engine resides. Sure, Ford upgrades things a bit with a Bullitt cold-air kit, Borla headers, and an X-shape crossover, but the power still tops out at a relatively pedestrian 325 hp. In a spec series like the Miller Cup, where everyone has the same thing under the hood, that can make for some great fender-to-fender racing, but for track-day fun, Roger wanted a bit more punch.

Of course, Roger wanted to keep the naturally aspirated feel of the car intact. He brought the car to Ford performance specialist Pro-Dyno in Fort Mill, South Carolina, where owner Dan Desio put together an upgrade package designed to help the FR500S amplify its original feel on the race track. On top of that, Dan retained the car's Ford factory heritage by using mainly components chosen from

the Ford Racing Performance Parts catalog. It's as if Ford decided to produce the FR500S+.

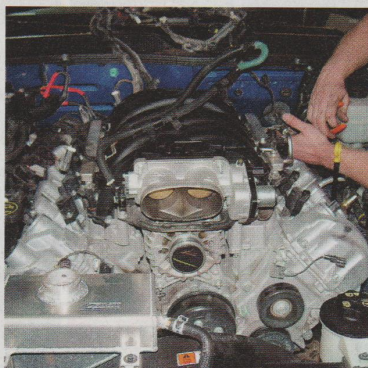
Among the upgrades are new heads, a new intake, and a 66mm throttle body

from FRPP, as well as camshafts custom ground by Comp Cams. Previously tuned at Pro-Dyno, it was producing 299 hp at the rear wheels when this build began. After it was all said and done, power

Continued on page 80



▲ After receiving a new intake, cams, and heads, Roger Miller's FR500S Mustang track car gained 43 hp without forced induction.



▲ Here's a look at what comes under the hood from the factory. It's essentially the same Three-Valve Modular power plant you find in a Mustang GT, plus a cold-air kit. Technician Paul Conner disconnects the wiring harness and fuel lines so that he can remove the entire engine and transmission from the car.



▲ If you're going to yank the heads on a mod motor, it will be a lot easier if you bite the bullet and drop the complete engine—along with the suspension's K-member—right out of the bottom. Of course, it's simpler if you have access to a lift.

**HORSE SENSE:** The Mustang Challenge series is over, so these days Ford Racing's latest turnkey Mustangs—the Boss 302Rs—compete in the Grand-Am Continental Tire Sports Car Challenge.

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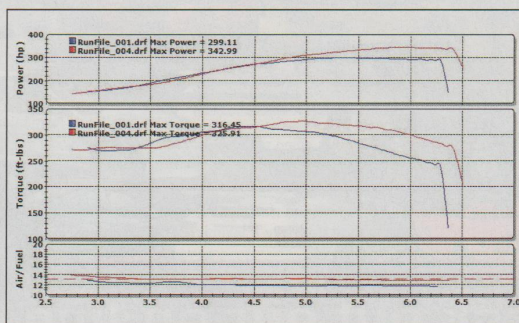
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**Check**

ON THE **DYNO**

RPM	BASELINE			HCI			DIFFERENCE		
	POWER	TORQUE	A/F	POWER	TORQUE	A/F	POWER	TORQUE	A/F
2,900	151.25	273.78	13.28	157.41	275.56	13.46	6.16	1.78	0.18
3,000	157.00	274.87	13.06	163.90	277.69	13.41	6.90	2.82	0.35
3,100	161.52	273.65	13.16	169.07	277.49	13.35	7.55	3.84	0.19
3,200	166.49	273.26	13.09	174.06	277.02	13.28	7.57	3.76	0.19
3,300	172.78	274.98	13.02	179.02	276.54	13.22	6.24	1.56	0.20
3,400	181.14	279.81	13.00	184.91	277.48	13.13	3.77	-2.33	0.13
3,500	190.82	286.33	13.04	191.50	279.37	13.09	0.68	-6.96	0.05
3,600	201.73	294.30	13.08	199.41	283.06	13.14	-2.32	-11.24	0.06
3,700	210.45	298.74	13.14	208.12	287.63	13.20	-2.33	-11.11	0.06
3,800	217.55	300.68	13.19	217.54	292.95	13.23	-0.01	-7.73	0.04
3,900	225.75	304.01	13.07	228.92	300.58	13.22	3.17	-3.43	0.15
4,000	234.13	307.43	12.97	238.53	305.54	13.18	4.40	-1.89	0.21
4,100	242.15	310.19	12.96	248.07	310.20	13.18	5.92	0.01	0.22
4,200	250.34	313.04	12.93	255.78	312.42	13.22	5.44	-0.62	0.29
4,300	259.94	317.49	12.90	263.72	314.79	13.22	3.78	-2.70	0.32
4,400	267.89	<b>319.77</b>	12.89	270.60	315.81	13.22	2.71	-3.96	0.33
4,500	273.70	319.46	12.86	278.50	317.97	13.21	4.80	-1.49	0.35
4,600	277.70	317.08	12.81	288.63	322.53	13.25	10.93	5.45	0.44
4,700	281.72	314.82	12.78	297.91	325.98	13.30	16.19	11.16	0.52
4,800	286.12	313.07	12.77	306.37	<b>328.39</b>	13.32	20.25	15.32	0.55
4,900	290.40	311.26	12.74	311.41	327.11	13.26	21.01	15.85	0.52
5,000	295.67	310.58	12.70	315.92	325.34	13.16	20.25	14.76	0.46
5,100	300.06	309.00	12.68	320.99	324.21	13.13	20.93	15.21	0.45
5,200	303.78	306.83	12.72	324.63	321.70	13.11	20.85	14.87	0.39
5,300	304.02	301.28	12.72	329.41	320.40	13.11	25.39	19.12	0.39
5,400	<b>304.72</b>	296.38	12.66	333.92	318.87	13.10	29.20	22.49	0.44
5,500	304.58	290.87	12.69	337.85	316.86	13.10	33.27	25.99	0.41
5,600	303.95	285.08	12.70	340.22	313.49	13.09	36.27	28.41	0.39
5,700	304.33	280.42	12.64	343.29	310.87	13.04	38.96	30.45	0.40
5,800	302.08	273.55	12.59	343.73	305.99	12.98	41.65	32.44	0.39
5,900	303.46	270.14	12.61	344.01	301.14	12.95	40.55	31.00	0.34
6,000	301.12	263.59	12.64	<b>344.40</b>	296.54	12.94	43.28	32.95	0.30
6,100	300.78	258.97	12.60	341.46	289.26	12.96	40.68	30.29	0.36
6,200	300.10	254.21	12.51	340.55	283.91	13.01	40.45	29.70	0.50
6,300	290.12	241.86	n/a	337.42	276.90	13.03	<b>47.30</b>	<b>35.04</b>	n/a
6,400	n/a	n/a	n/a	336.13	271.59	n/a	n/a	n/a	n/a
6,500	n/a	n/a	n/a	303.18	241.40	n/a	n/a	n/a	n/a

**H**ere are the results. The blue lines are the original baseline horsepower and torque figures. Red shows the results after all the new goodies have been installed. The 43 extra peak horsepower is nice, but it's that extra area under the curve from 4,500 to 6,500 rpm that will really be felt on the track.



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Continued from page 76

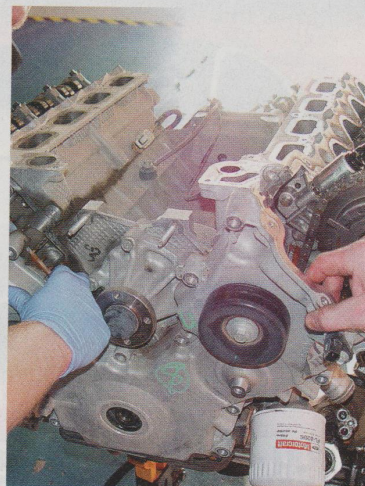
production was upped to 342 hp, but that hardly tells the whole story. Power is significantly improved in the usable rpm zone from 4,500 rpm all the way to 6,500. The mods also extended the redline by 200 rpm from stock to help the car stretch its legs on the track just a bit more.

Because these are all catalog compo-

nents (the cams are a custom grind but Pro-Dyno sells them regularly), these same improvements are easy to be had for any Three-Valve 4.6 Mustang—street or track. Plus, this makes an excellent foundation that will really respond to power adders, such as nitrous or a turbo, that can be added in the future.



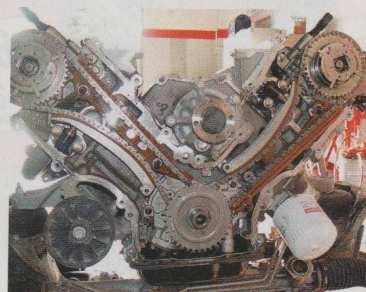
▲ The coils will be reused, but the CNC-ported heads from Ford Racing Performance Parts use a different 12mm spark plug (PN 2008-2010), so after pulling them Paul will install new rubber boots to fit the new plugs.



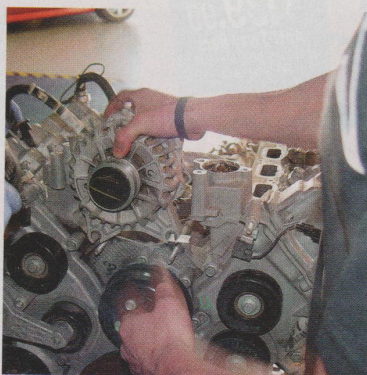
▲ The last step before we can finally get to the good stuff is to pull the damper and unbolt the front cover to expose the timing chains.



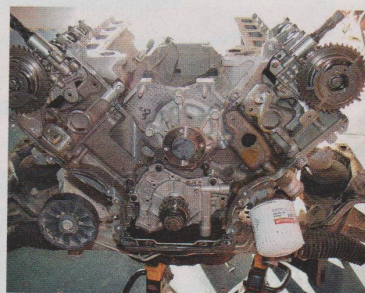
▲ Next to come off are the fuel rails—which also will be reused—and the intake manifold. They share a few bolts so it's just simpler to yank both at the same time.



▲ This car hasn't seen a lot of miles, so the chain tensioners and guides are still in good shape and will be reused. We're still dealing with stock parts here, so if there is any doubt, it's a good idea to play it safe and replace these components with new ones.



▲ The alternator and water crossover come off easily once the intake is out of the way. Like the fuel rails, these are saved to go back on later.



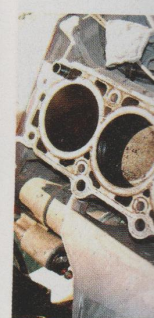
▲ Those large assemblies on the cam gears are the camshaft phasers. Ford uses them to advance or retard cam timing to improve low-end torque and driveability. But they aren't helpful in full-bore performance applications, and severely limit how much cam you can run. As such, Pro-Dyno will lock out the phasers to allow a more aggressive cam profile.



▲ Paul regularly re-ers still installed a with damage to the route is to remove lot easier if you use a pressor from Ford.



▲ With the cam and finally have access to removed and pull the



▲ There's practically from pouring out of the when you pull them or plenty of rags or a she as quickly as you can. rebuild is complete is

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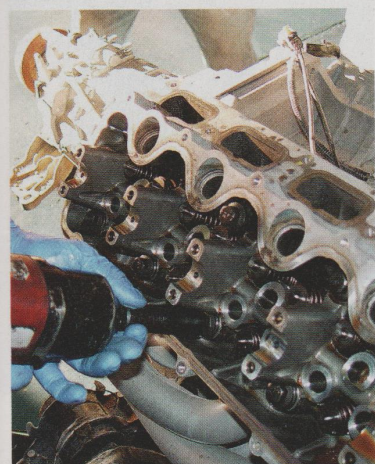
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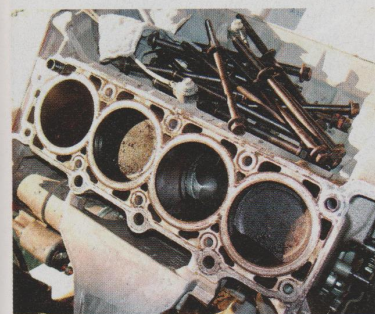
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▲ Paul regularly removes camshafts with the followers still installed and says he's never had a problem with damage to the cam caps or bolts. But the safer route is to remove the followers first. The task is a lot easier if you use an on-head valvespring compressor from Ford.



▲ With the cam and followers out of the way, you finally have access to the head bolts so they can be removed and pull the cylinder head.



▲ There's practically no good way to keep coolant from pouring out of the heads and into the cylinders when you pull them off. Just be prepared with plenty of rags or a shop vac to get the water out as quickly as you can. Changing your oil after the rebuild is complete is also an excellent idea.

# MUSTANG STYLE!

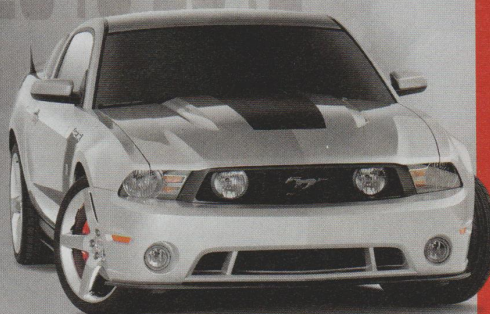
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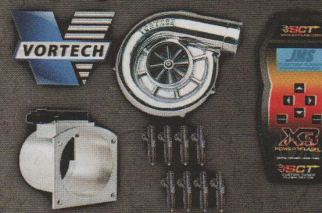


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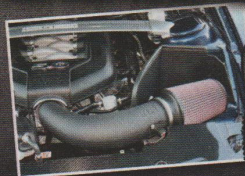
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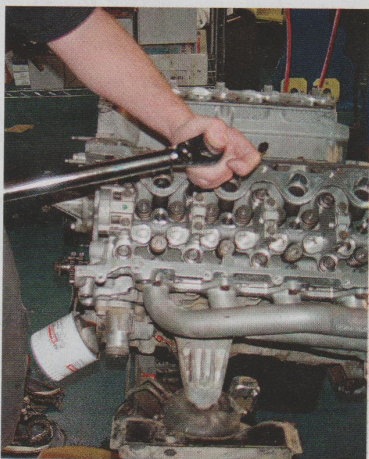
## THREE-VALVE BUILDUP



▲Ford Racing's CNC-ported Three-Valve head (PN M-6050-N3VPA) features a slightly larger 53cc combustion chamber (compared to 51). The CNC-cut intake ports are sized at 202 cc's and flow 272 cfm at 0.600 lift. The exhaust ports measure 73 cc and flow 272 cfm at the same amount of lift. They include valves and springs, but no lash adjusters.



▲It's a really tight fit between the headers and the K-member, so Paul bolts up the headers to the cylinder heads first before bolting the heads to the block.



▲Unless you are using a power adder that's pumping a lot of boost into the combustion chambers, stock replacement Ford cylinder head bolts are more than adequate—and quite economical. But unlike most aftermarket head bolts, they are torque-to-yield, meaning they are good for only one use.



▲Locking out the cam phasers is relatively easy. Paul uses this aluminum block that fits inside the phaser's slots to keep it from moving.



▲Here's another look at the lockout in the phaser assembly. To install it, unbolt four of the five bolts holding the cover on and loosen the fifth. Now you can spin the cover enough to expose the cavity and drop the lockout in place.

▲Pro-Dyno v series of cust this project D These do requ springs and re inder heads a

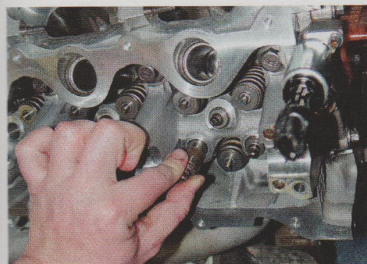
▲Ford's lash washed off and

▲After the last ers are next. Be assembly lube i

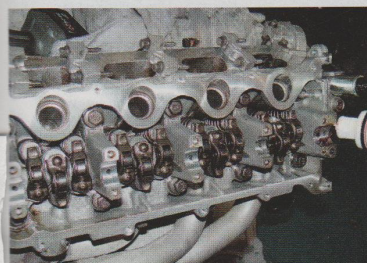
▲The phaser as right banks of the are disabled, you reinstalled correc



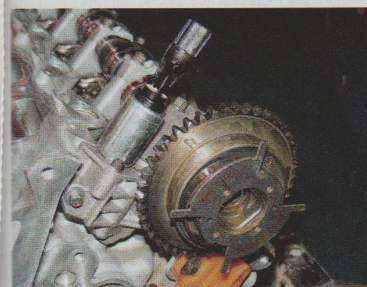
▲Pro-Dyno worked with Comp Cams to produce a series of custom grinds for their exclusive use. For this project Dan chose Pro-Dyno's Stage 2 cams. These do require more robust valvesprings, so the springs and retainers that came installed on the cylinder heads are replaced with new Comp Cams gear.



▲Ford's lash adjusters will last forever, so they are washed off and reinstalled.



▲After the lash adjusters are installed, the followers are next. Before installing the cams, use a little assembly lube in the cam tower bores.



▲The phaser assemblies are specific to the left and right banks of the engine. Even though the phasers are disabled, you still need to make sure they are reinstalled correctly.

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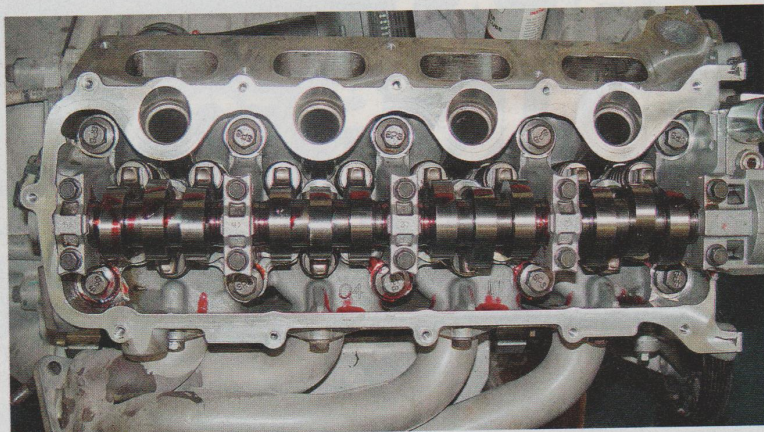
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## THREE-VALVE BUILDUP



▲ The new cams are installed and the fasteners on the cam caps are torqued to 150 in.-lb.



▲ One of the great features of the Three-Valve head, its single camshaft makes setting the timing easy. Make sure the dot on both the cam gear and the crank gear line up with the black links on the chain and you know you're good to go.

### SOURCES

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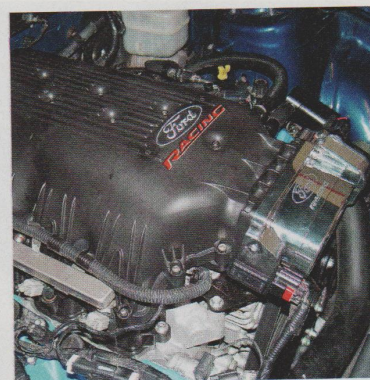
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▲ Now it's simply a matter of reversing the previous steps to reinstall the front cover, damper, alternator, water crossover, and other components.



▲ It won't add power, but the new Ford Racing blue valve covers are undeniably cool.



▲ FRPP's Three-Valve intake features an open plenum for improved air supply at high-rpm levels and compatibility with larger throttle bodies. Its composite construction helps keep the incoming air cooler, and weighs less than an aluminum intake. It will fit underneath the stock hood without modifications, but the fit is too tight to also allow a standard strut-tower brace.



▲ Here's the completed engine back in the car. Attached to the intake manifold is a Ford Racing 62mm throttle body and a JLT cold-air intake.



▲ Since this is a dedicated track car, neither Dan nor Roger were willing to give up a strut-tower brace just because the intake manifold is too tall. Instead, they modified the existing brace by cutting off the bottom half of the tubing in the center section, and then reinforcing it by welding in flat plates. **5.0**

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