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■ Tech

Buick Power Part 1

By Chris Endres

Photography: Johnny Hunkins

Once upon a time, in a decade long ago, Buick built a kick-ass little turbocharged V6 engine and dropped it into the handsome rear-wheel drive Regal. Rated at (wink, wink) 245 horsepower (in 1987), the mill was strong enough to push the barn door-like Buford down the dragstrip in the high 13-second range at about 98 mph. While this may not sound like much to brag about these days, in the mid-eighties, a high 13-second car was damn quick. As such, the blown Buicks were known to give the Corvette guys of the day fits, and contributed to more than a little inter-division rivalry inside GM. The turbo engine was so good that even Pontiac did the unthinkable by commandeering the V6 for installation in its 20th Anniversary Trans Ams.

The Turbo Buicks quickly became a favorite of the street racing set, as they were quiet and stealthy, had prodigious torque on tap and a hard-hooking factory four-link suspension. Basically, all the key elements were in place to make them the perfect weapon of choice for the urban street brawler. Many a big-block musclecar was humbled by the upstart buzzin' half-dozen. In a short time, the mill proved itself very responsive to minor bolt-ons, being just a few key parts (and traction) away from high- to mid-twelve second timeslips.

Buick's turbocharged V6 made not only incredible power, but it also proved itself as a durable piece, able to shrug off startling amounts of abuse with nary a complaint. While it was strong, it was not completely immune to the ravages of detonation. As the years passed, the casualties began to mount. A bad load of gas here or an over boost situation there made history of untold numbers of head gaskets, or in worst-case scenarios, hard parts such as pistons. When the worst happened, many turned to their local machine shop for assistance in rebuilding the engine. While a few had good luck with the local rebuilds, scores more did not. Soon it was discovered that GM had hundreds of new old stock replacement engines in inventory. This seemed to be the perfect solution, as the factory engines had certainly proven capable of taking their lumps. Alas, GM's supply of crate engines ran out in the mid-nineties, leaving Buick performance fans again in search of a viable solution.

Enter Jack Merkel Performance Engines. "I saw that there was no one filling the demand for 10- and 11-second street car engines," said Merkel. "I spent a lot of time fixing other peoples' mistakes in these engines, and decided I could do a better job." Merkel has recently moved

into the same building as Ron's Custom Auto and is the primary supplier for Buick engines to RCA. While there is no direct connection between the two, there is a shared dedication to the turbocharged Buick V6 powerplant and a wealth of engine-building knowledge resulting from this closeness. Merkel offers a wide range of services ranging from stock rebuilds to custom crate engines such as the one we are about to detail for you here.

While it is true that almost any competent machine shop has the ability to properly rebuild a Turbo V6 engine, the trick is whether they will do it correctly or just apply the usual Chevy small-block conventional wisdom to the rebuild. A shop doing the latter is asking for trouble. Merkel: "If you build a Buick V6 like a small-block Chevy, be sure you pack a large shovel. You're gonna need it to pick up the pieces." Finding a machine shop that understands the special needs of a Buick is a daunting task, to be sure.

Jack Merkel Performance Engines performs many mods for the unique needs of the Buick turbo V6 engine. Due to its rather unorthodox oiling system, the engine has some unique bearing clearance needs. "Common small-block Chevy thinking manifests itself by allowing too much bearing clearance. This works fine for the SBCs, which commonly spin 6-, 7-, or even 8-thousand rpm. But the Buick motors usually spin 5200-5600 rpm max. They have very high cylinder pressures at low rpm and can produce in excess of 600 lb.-ft. of torque under 3000 rpm. If the main bearings are hemorrhaging oil pressure at low rpm, the rods are going to be in an oil starvation situation. They will overheat and this will cause a spun bearing," explains Merkel.

Another key element in the machine work phase of the buildup is the act of balancing the rotating assembly. "V6s are notorious as rough running engines," said Merkel. "I have found that the crank is usually close but the rods can be all over the place." According to Merkel, it is not at all uncommon to see connecting rod weight variances in the 5-8 gram range. While that might not sound like a lot, it makes all the difference to engine smoothness and longevity. "It makes a tremendous difference in the way the car runs. You can really tell a difference at high rpm, as well as with the car just idling in gear," said Merkel. "It is a lot smoother."

What follows is the first of three parts that will take us to a completed Buick V6 capable of running low 11s. We will deal with the basic machine work on the block and rotating assembly in part 1, concentrating on those tricks that are unique to the Buick V6. Part 2 will focus on short-block assembly and special oiling issues unique to the Buick V6, and part 3 will deal with the induction. Follow along as Jack Merkel takes us through the machining steps of building serious Buick power!

SHORT-BLOCK SHOPPING CART*

ARP rod bolts - part No. 123-6002... \$122.77

ARP main studs - part No. 123-5401... \$64.95

Pro Gram Engineering billet main caps - part No. B4.1V6C... \$199.95

TRW forged pistons - part No. L2481F-30... \$469 per set

Speed Pro plasma moly rings - part No. R10499-30... \$140.47
 Fel-Pro two-piece neoprene rear main seal - part No. BS-40613... \$22.23
 Federal Mogul main bearing - part No. 107M... \$94.29
 Federal Mogul rod bearings - part No. 6-3755APA... \$32.57
 Federal Mogul cam bearings - part No. 1755M... \$14.36
 Federal Mogul core plugs - part No. 381-8073... \$9.24
 Comp Cams custom grind cam - part No. 206/206... \$200.00
 Speed Pro timing set - part No. 220-3129... \$71.01
 Federal Mogul high volume oil pump kit - part No. 224-518-V... \$44.86
 Federal Mogul oil pump thrust plate - part No. 224-518TP... \$14.69

TOTAL SHORT-BLOCK LABOR

(including machine work) \$1900.00

total short-block cost: \$3299.00

* Note that some items which appear in the shopping cart will not be discussed until the next installment. Also, the total short-block turnkey cost is less than the actual total.



This particular line boring setup is a military surplus model ("LBM") that was originally designed to be used in the field with a half-inch electric drill.

Over the service life of an engine, the main journals become eccentric. The process of line boring re-establishes the concentricity of the journal while keeping it in line with the other main journals. Here, Jack Merkel is line boring a V6 block with a set of Pro Gram Engineering caps torqued in place. These billet caps have about .040-inch extra material in the journal area to compensate for differences in blocks. Jack needed five passes with the boring bar to get all the way into the metal of the block.



This block will use a .030-inch over TRW forged piston (part No. L2481F-30, \$469 per set) so Jack bores the cylinders out to 3.827 inches. The remaining diameter will be taken out during the bore honing process.



Here's a trick that will pay big dividends down the road. For some strange reason, Buick made the No. 2 and No. 3 main journal oiling holes 1/4 inch when the front oiling hole is 7/16 inch and the rear one is 5/16 inch. As a consequence, the oil delivery to the two center mains is restricted. For a stock motor, this is not a problem, but on a 500-hp mill like this it could lead to premature bearing failure. Merkel increases the size of the two center holes to 3/8 inch to improve the oil supply to the main bearings and connecting rods 2 through 5.



The advantage of the portable line-boring setup is that it allows the block to be bored with the cylinder heads torqued in place. Buick experts determined a long time ago that the webbing around the main journals distorts once the heads are bolted on, specifically around the center main journals. Shops not familiar with the Buick's boring needs may inadvertently create the potential for future bearing problems.



Some Buick experts contend that the 3.8 Buick V6 does not need to be torque-plate



Here you can see the stock sized 1/4-inch main journal oiling hole on the left, and the larger 3/8-inch hole Merkel drills on the right.



Pro Gram Engineering billet steel caps (right, part No. B4.1V6C, \$199.95) are approximately three times as strong as the factory cast-iron caps. They also fit into the

honed, but as Jack Merkel demonstrated to us with a dial-bore gauge and a torque plate, the bore diameter does indeed deviate between the thrust axis and the longitudinal axis, as well as the length of the bore. Merkel torque-plate hones all his blocks for true bore concentricity—the benefit is better power and longer wear for the rings, pistons and cylinder bores.



The boring process takes the cylinders out to 3.827 inches. The honing process will take the bores all the way out to 3.8315 inches. This is done in stages with the final half thousandth being taken out with a fine honing stone. The final bore diameter will produce with TRW forged pistons a piston-skirt-to-bore clearance of 4.5 thousandths. That's about 1 thousandths more than the minimum recommended by TRW but without the extra clearance, the expansion of this piston is great enough to cause scuffing at



This is why the main journal oiling mod is so important. The oil is fed to the mains past the camshaft bearings that further restrict oil flow. In this picture you can see the 3/8-inch drill bit intersect the cam journal and going to the passenger-side oil galley. In the foreground you can see where the galley comes out to the timing cover area.

block registers tighter than the stock caps, helping prevent cap walk in high-output applications.



Rod prep for Buicks is pretty much the same as for other engines with one important difference: the rod caps from the factory will exhibit a peened edge at the top of the rod bolthole. This is because the factory does not chamfer the hole before assembly. This creates a burr around the hole for subsequent rebuilds. You can see how the chamfered cap on the left allows the ARP rod bolt to seat properly on the cap. The cap on the right has not been chamfered so the connecting rod bolt cannot sit flat on the cap.

higher temperatures and boost levels.



This picture from the top of the caps shows the chamfer that Merkel adds (cap on left). The stock cap is on the right. Merkel uses ARP 2000 rod bolts (part No. 123-6002) which have a higher tensile strength (190,000 psi) than ordinary bolts.



Weighing the reciprocating and rotating masses is straightforward engine building. The rods are the only part of the equation that count for both rotating and reciprocating weight. This means both ends of the rod must be calculated and entered into the bobweight formula (the reciprocating weight is obtained by measuring the total weight and then subtracting the rotating weight from the total weight).



The balancing process for a Buick V6 is pretty much the same as any other engine. The weights of the piston, rings, wrist pin, connecting rods and rod bearings are established and the values are written on a bobweight card. Bobweights are calculated using a formula unique to an even-fire 90° V6 and then attached to the recipient crankshaft. Merkel's Pro-bal computer balancing machine then tells him where to add or remove material from the crankshaft counterweights. The Buick Turbo V6 is an externally balanced assembly so the crankshaft must have the proper damper and flexplate attached to achieve a vibration-free balance.



This interesting chart

shows the different bobweight multiplication factors for the total reciprocating weight on a V6 bobweight card. While V8s are all 50 percent, V6s are all over the place, ranging from 35 percent for an Olds diesel to 50 percent for many others. The Buick even-fire V6 calls for 36.6 percent with rubber motor mounts and 50 percent for solid motor mounts. Some specialty Buick builders even call for a 52 percent over-balance, which would be used for a high-rpm solid motor-mount race engine.

SOURCES

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■ Tech

Buick Power Part 2

Our stock-block Buick 3.8 Turbo buildup continues with more insider assembly tips.

By Chris Endres

Photography: Johnny Hunkins

Often has it been said that the Buick Turbo V6 is a different kind of animal. This animal is not easily tamed, and more than a few engine builders have fallen victim to its idiosyncrasies. New Jersey race engine builder Jack Merkel specializes in these high-pressure over-achieving mills. He knows all the cool tricks, and what's better is that he doesn't mind sharing this expertise. In the first installment of Buick Power (May 2002), Merkel walked us through the machine work necessary to build a long-lived engine. In this issue, he will show us the finer points of short-block assembly.

"The single most important issue in building Buick V6s is verifying that the bearing clearance is correct. If you set up the bearings loose like a small-block Chevy, you'll be lucky to make it down the track more than a couple of times," says Merkel. "Turbo V6s produce tremendous low-rpm torque and that creates extremely high rod bearing journal temperatures. Since the rod bearings are fed by the mains, it is absolutely critical to keep the main bearing clearance tight. Otherwise, the mains will bleed off oil pressure and starve the rod bearings."

Connecting rod side clearance is another critical area often overlooked by novice Buick builders. Says Merkel: "Side clearance is very important. You want to have no more than .015-inches clearance. You will know this is the case because it sounds like a bad lifter or a solid cam." Merkel recommends measuring rod side clearance during assembly with a dial indicator or a feeler gauge.

High volume oil pumps are always a good idea in Buick engines, but you can't just slap in the pump and call it done. You must also enlarge the four main bearing holes or risk premature wear on the cam sensor, which drives the oil pump. Conversely, if you enlarge the holes without using a high-volume pump, you will have dangerously low oil pressure. Another oil pressure problem spot is cam bearing oil hole alignment. "Many builders incorrectly assume that the oil holes in the block are in the same location as Chevy motors. If they bothered to look, they would see this is not the case. The most critical cam bearing is number 1, as this is where the majority of oil pressure is lost. The position of the number 1 cam bearing is also critical to ensure sufficient oil flow to the driver's side lifters and valvetrain."

It is no secret that a double roller timing chain has many benefits when building a performance engine, but caution needs to be exercised here, too. "Buick used a silent chain timing set with a hard rubber tensioner. Many novices make the mistake of re-using this tensioner with a replacement double roller chain. The nylon quickly disintegrates and fouls the oiling system."

Perhaps the most hotly debated item in building a Turbo V6 is cam selection. "Camshafts are not that critical," says Merkel. "There are plenty of cars going mid-10s with the stock cam. This proves that you don't need a lot of cam. You are much better off under-camming one of these engines than over-camming it."

So there you have it. Study the accompanying photos carefully and pay attention to the details. Doing so goes a long way toward guaranteeing your engine a long life. Next issue: cylinder heads!

SHORT-BLOCK SHOPPING CART:

ARP rod bolts - part No. 123-6002... \$122.77
 ARP main studs - part No. 123-5401... \$64.95
 Pro Gram Engineering billet main caps - part No. B4.1V6C... \$199.95
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 Speed Pro plasma moly rings - part No. R10499-30... \$140.47
 Fel-Pro two-piece neoprene rear main seal - part No. BS-40613... \$22.23
 Federal Mogul main bearing - part No. 107M... \$94.29
 Federal Mogul rod bearings - part No. 6-3755APA... \$32.57
 Federal Mogul cam bearings - part No. 1755M... \$14.36
 Federal Mogul core plugs - part No. 381-8073... \$9.24
 Comp Cams custom grind cam - part No. 206/206... \$200.00
 Speed Pro timing set - part No. 220-3129... \$71.01
 Federal Mogul high volume oil pump kit - part No. 224-518-V... \$44.86
 Federal Mogul oil pump thrust plate - part No. 224-518TP... \$14.69

TOTAL SHORT-BLOCK LABOR

(including machine work) \$1900.00

Total short-block cost: \$3400.39



As you can see in this chart, the standard replacement main bearing for a Buick turbo is a heavy duty copper-lead piece which has a maximum load capacity of 12,000 psi. Merkel uses a Federal Mogul super duty copper lead

Merkel likes to see no more than 2 thousandths clearance (1.5 is preferred) in the main bearings due to the fact that there are no 3/4 groove main bearings available for Buick V6s. (We should note here that 3/4 groove bearings should

bearing with a max capacity of 15,000 psi. This is crucial with a boosted engine that can generate severe forces on the bearings under acceleration.

be available from Federal Mogul by the time you read this.) Oiling for the rods is very important in a Buick because six rods are doing the work of eight. Merkel says, "These engines don't see a lot of rpm so the important thing is to keep the main clearance tight to ensure adequate oil volume to the rod bearings. Typically a small-block Chevy will run a higher rpm to produce the same horsepower on the motor, so they need more clearance."



Here you can see how Merkel enlarged the oil hole in the main bearing shell to match the larger oil feed hole drilled into the block. As covered in Part 1, the oil feed holes in the number two and three mains were enlarged to 3/8 inch to improve oil volume.



After applying a film of moly assembly lube, the ARP studs are torqued down to 90 lbs.-ft. Once the fasteners are torqued, they must be loosened and re-torqued four more times. According to ARP, all fasteners should be torque cycled so they will produce a true and consistent clamping load throughout the life cycle of the fastener. The reasoning is that when a fastener is first torqued, there is more friction in the threads and this produces a false clamp load. After a few torque cycles, however, the clamp load becomes



Here's an important Buick tip you'll want to take note of. The application of a small amount of Permatex Ultra Blue across the rear main cap will prevent oil migration out the back of the block. Many Buick owners assume they have a bad rear main seal when it's actually coming from the rear cap.

consistent.



This Buick V6 is a fairly low-buck piece that uses a forged TRW factory replacement piston and reconditioned stock rods. The forged TRW slugs are designed to take press-fit pins like the factory pieces (note the rod heater in the background), but are much stronger than a factory casting. At this point, all the rod/piston assemblies have already been balanced and their weights used to calculate a bobweight card for crankshaft balancing (see Part 1).



Jack Merkel has found the Speed Pro plasma moly rings (part No. R-10499-30) to show extremely consistent end gaps right out of the box. In this case, Merkel is looking for 20 thousandths gap and that's what he finds most of the time. It should be noted that the precision of the boring and honing process is largely to account for this accuracy. An increase in bore diameter of 1 thousandth will increase end gap by over 3 thousandths. We also found that Speed Pro is recommending more end gap in the second ring than in previous years. They have found this reduces inter-ring pressure which in turn reduces ring flutter and blow-by. Based on this recommendation, Merkel uses 20 thousandths end gap in the second ring as well.



Here's another insider Buick tip: Federal Mogul makes two rod bearing sets for the factory cast-iron crank, part No. 6-3755AP and part No. 6-3755APA. The first is recommended by the factory as the proper replacement part but the second (6-3755APA) is actually ten percent wider (left) and has a much greater load carrying capacity based on the additional surface area. This is the one Merkel uses for all his Buick V6s.



Just like the main bearing clearance, Jack Merkel likes to see 2 thousandths clearance



Prior to installing the piston, it's recommended that you coat the rod bearings



Merkel torque-cycles the rod bolts three times at 50 lbs.-ft. as per the ARP guidelines

on the rod bearings in order to achieve adequate oil pressure. Prior to torquing the rod cap, the bearings are polished with oil and Scotchbrite.

with break-in lube and the piston skirt and pin with motor oil. Make sure to protect the rod journal when tapping the piston in!

for rod bolts. Not shown but equally important is the piston-to-wall clearance and crankshaft end-play. These should be checked and set at 4.5 and 6 to 8 thousandths, respectively.



The cam of choice for Merkel's street engines is a custom mild flat-tappet cam with 206* of duration and .447-inch valve lift. The 109* lobe separation of this cam might not sound wide enough for power-adder engine builders, but according to Jack Merkel it produces the most torque on the dyno.



Need we say it again? Always degree your cam--do not assume that your timing chain and camshaft are 100 percent accurate. Our Buick cam was checked and found to be right on the money.



With the V6 Buick, the oil pump is integrated into the timing cover. As a result, all the lube feed and supply lines pass through the timing cover. Like all Buick engines before it, the Buick V6 is notoriously weak in the oiling department, so it pays to blueprint the timing cover in key areas. All of Merkel's engines go out the door with key mods to improve oiling. The feed and return passages in the block are larger than those in the timing cover (shown) so the timing cover holes are enlarged to match the block. A booster plate is also added to improve oil volume and the pump is blueprinted to reduce flow restrictions.



This little item is



Compare the stock oil



One of the biggest

known as a booster plate. Stock Buick V6s do not have a booster plate, so having one at all is a big improvement. The idea is to provide a fresh thrust surface for the pump gears, which have usually worn out the aluminum facing on the oil filter housing. Pressure is boosted by providing tighter clearances and by cutting the "back feed" within the pump itself. Merkel improves further on the booster plate by enlarging the passage on the pressure side to match the passage in the oil filter housing (right side, top hole).

filter housing to Merkel's blueprinted housing (right, pointer). The feed passage is deburred and ported for better flow. Merkel recommends that a "biggie" oil filter kit be used with this mod to further improve flow. This converts the oil filter from a PF47/PF52 to a Buick big-block PF24 which has far more flow capacity. This is good for an additional 3 psi of oil pressure.

complaints from Buick guys is the leakage that comes from the original design rope seals at either end of the motor. Rather than use the replacement rope front main seal in the Fel Pro rebuild kit, Merkel uses a Federal Mogul No. 472319 which is a more durable, better sealing neoprene design. While we're on the topic of seals, we should mention that this engine was also upgraded to a neoprene two-piece rear seal from Fel-Pro (part No. BS 40613). This shot of the timing cover install does not show the cam thrust button which was upgraded from a plastic OEM piece to a steel roller ball bearing thrust button (Sealed Power, part No. MR-1874).

SOURCES

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■ Tech



As we have shown you, building a Buick Turbo V6 isn't rocket science, but accurate machine work and meticulous assembly procedures make all the difference when it comes time to key the ignition.



The fully-ported exhaust runner is well worth the effort on a street turbo car. Think about it this way: at 16 pounds of boost, a turbo V6 is flowing the same amount of air as a 484 cubic-inch naturally-aspirated engine. By porting the exhaust runner you're moving more gas volume through the combustion chamber and producing less exhaust backpressure in the cylinder. This exhaust port flows 158 cfm (with no flow tube extension) at .500-inch lift.

Buick Power Part 3

The final installment of our Buick engine trilogy gets serious with induction and assembly tips.

By Chris Endres

Photography: Johnny Hunkins

Jack Merkel Performance Engines is serious about Turbo Buick powerplants. "I saw that there was no one filling the engine demands for guys with 10- and 11-second cars," says Merkel. "I spent a lot of time fixing other peoples' mistakes in these engines, and decided I could do a better job." Merkel offers a wide range of services ranging from stock rebuilds to custom crate engines.

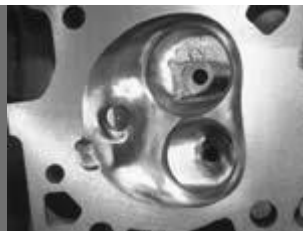
As you may recall from Part 1 (May 2002), we concentrated on the basic machine work necessary to the block and rotating assembly, focusing on those tricks that are unique to the Buick V6. Jack also gave us a short tutorial on balancing the rotating assembly. "Balancing makes a tremendous difference in the way the engine runs. You can really tell a difference at high rpm, as well as with the car just idling in gear," said Merkel. We learned that balancing also plays an important part in engine longevity.

Part 2 (July 2002) examined short-block assembly and the oiling system issues particular to the Buick six. Due to its rather unorthodox oiling system, the engine has some unique bearing clearance needs. "Common small-block Chevy thinking doesn't take into account the very high cylinder pressures at low rpm that the Buick routinely sees. A turbo V6 can produce in excess of 600 lbs.-ft. of torque under 3000 rpm," explains Merkel.

What follows is the final installment that will take us to a completed engine capable of running low 11s. Once again, follow along as Jack Merkel shows us the cylinder head mods necessary for building serious Buick power!



Exhaust valves, from left to right: stock, stock undercut exhaust, and Ferrea (all sizes 1.50 inch). Unlike the intake valve, there are some advantages to retaining the stock exhaust valve, but only if it's undercut (center). Merkel found that a 25* undercut on the stock exhaust valve provided almost the same amount of flow through .500-inch lift as the aftermarket Ferrea. Beyond .500 inch, the Ferrea performed better, but this would only benefit a solid roller cam race motor. The quality of the metallurgy aside, the stock replacement stainless exhaust valves are considerably cheaper than race pieces. This engine is using the Ferrea because the owner already had them from an old motor, but the undercut stock unit would work just as well.



Through extensive flow bench research, Jack Merkel has discovered that a pocket-ported intake bowl flows just as much as a fully-ported runner up to about .500-inch lift. For a street car with a hydraulic flat-tappet lifter, this is ample lift. On the exhaust side you'll note a fully-ported runner which, according to Merkel, is the only way to go with a turbo motor. Merkel gets about \$1,500 for a fully-ported set of assembled heads, but a set like this runs about \$1,100. That's a \$400 savings that you'll never miss on the performance end.



Intake valves from left to right: the stock 1.71-inch, a stock 1.71-inch with an undercut, a Ferrea 1.775-inch, and an undercut 1.775-inch Ferrea. What you need to know about Buick intake valves is that the stocker is not worth using, even with an undercut, as the gains just aren't significant enough to warrant the extra work. The undercut helps to boost low-lift flow, which is especially important on a street motor with a mild cam, but if you're looking for the best solution, a larger 1.775-inch valve with an undercut provides the most return on the investment. The undercut Ferrea valve at the far right is what this particular engine is using and provides (along with a mild bowl job) 196 cfm at .500-inch lift.



Jack Merkel uses a JKM Custom Flow 400 flow bench for all his testing. We've found that compared to a



Jack recommends that the heads be o-ringed for all but the most tame, low-boost street engines. The process



On a stock cast-iron head, a .041-inch stainless wire is carefully hammered into the .039-inch wide

Superflow SF-600, the JKM bench measures about 11 percent less, so if you're comparing our flow numbers to others out there in readerland, you'll want to tack on another 11 percent to our figures to get you into the Superflow ballpark.

costs about \$130 extra on a set of heads and prevents the gasket from moving around under very high cylinder pressures. Once the gasket moves, it loses seal and blows. The head can still lift with the o-ring in place, but the gasket will not shift. Here, Jack uses a BHJ tool (the same one used for Fel-Pro lock-wire gaskets) to cut a .039-inch groove.

by .032-inch deep groove for a .002-inch interference fit and .009-inch protrusion from the deck surface. On an aluminum alloy head such as the Champion GN1, a copper wire (of the same diameter) is recommended to eliminate the galvanic corrosion that occurs between steel and aluminum.



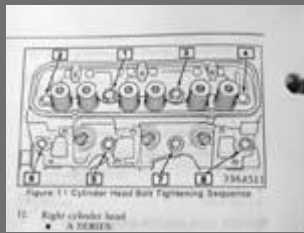
Old-style LT-1 springs (note: not modern LT1!) are used for Merkel's Buick heads (Speed Pro part No. VS-739R). These have 105 to 110 lbs. of seat pressure at an installed height of 1.700 inch and 290 lbs. open; they're great because they're very affordable and compatible with the stock retainers and locks. When it's time to buy valvetrain parts the Buick's low-rpm nature works to your advantage as costly super light-weight race pieces aren't necessary and don't pay large dividends anyway.



Here's another interesting Buick tidbit: the factory Buick exhaust valve (on the right) has an oil scraper step on the valve stem. This cost-saving measure was adopted in lieu of a valve seal and sometimes caused problems with visible smoke on start-up. In fact, a common warranty solution was to pull the valves and install straight-stemmed replacements. The valve Merkel uses (on left) has no step and requires the factory valve guide to be cut down so a regular oil-control seal can be used. Note that retainer-to-guide interference becomes a problem when lift exceeds about .420-inch if the valve guide is unmodified.



More odd Buick trivia: the factory chintzed out on the head bolt length by installing its heads with only two lengths of bolts when there are actually three different lengths of holes. To solve the problem, ARP offers a correct length set of head bolts in its professional series line (part No. 223-3703). This is the only way to achieve a proper even clamping load across the cylinder head mating surface.



The torque sequence is straightforward with a Buick, however there are two distinctly different recommended torque sequences, both of which are equally effective (Jack likes to use this one). Torque the bolts in a stepped sequence at 45 lbs.-ft, then 60 lbs.-ft, and finally 75 lbs.-ft. Note that these settings should be used when assembly moly lube is utilized. If you opt to use straight weight motor oil, the numbers will be significantly higher.



The most important aspect of head bolt torque is to torque-cycle the fasteners at least five times to the required torque load (final torque setting only). This will pre-stretch the bolt and break in the threads. A loss of clamping load will result in a blown gasket; so don't skip this tedious task! Also, make sure to put a good portion of moly assembly lube on the threads and under bolt heads. This is the only way to get an accurate torque reading and ensure a proper head gasket seal.



One of the many great things about the Buick V6 is that they're very easy on valvetrain parts. As long as you're using a flat-tappet hydraulic lifter setup, there is no special care or special parts that need to go into the motor. Just bolt the stock rocker setup right back on and reuse the original pushrods (assuming they're straight). Obviously, the motor will need new stock lifters to go with a new cam, but that's the only real precaution necessary. Merkel says factory GM lifters (which are more expensive) will make less noise with a fast ramp lobe profile, but an aftermarket replacement-style lifter (such as Sealed Power part No. HT-969) will work fine, just with a little more noise.

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