

L98 Engine Induction - Stealth Mode TPI

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Building a 458-hp L98 street sleeper

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While it has been a decade since its demise, there is plenty to like about the original GM Tuned Port Injection system.

Small-block Chevys have come a long way since their introduction back in the mid '50s. They have grown in displacement, technology, reliability, and (most importantly) power production. The modern LS2 is a worthy successor to the original Mouse motor. Despite the impressive efficiency and all-aluminum construction offered by the modern Mouse (to say nothing of the 505-hp offered by the factory LS7), we here at Super Chevy have not abandoned our 23-degree roots.

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Sure, the modern Mouse is lightweight, powerful, and efficient, but let's not forget where we came from, or the fact

that the original small-block can be powerful. With millions of small-blocks still in existence, it will be some time before the LS-series motors replace the original as the powerplant of choice for Chevy enthusiasts. Given the dedicated following, it is not likely that we will ever see the demise of the small-block, at least not until current reserves of fossil fuels dry up.



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Looking like an arachnid-based alien warship, the long runners in the stock TPI system were designed to promote impressive mid-range torque production.

Before Chevy introduced the current LS1 architecture, it offered an intermediate update to the original Mouse motor in the form of the LT1 (and more powerful LT4). Prior to that, the final configuration was code named L98. Fans of Tuned Port Injection will remember that the final small-block came equipped with a modern direct-port fuel injection. While the earlier Cross-Fire (and TBI) injection introduced fans to the merits of electronic fuel injection, it was TPI that launched the modern EFI performance era back in '85. Unlike previous carburetors (including the computer-controlled varieties), the TPI system offered precise metering of the fuel under all operating conditions. This was especially important to help meet the ever-tightening emissions laws. Fuel efficiency and emissions were optimized by balancing fuel delivery to each individual cylinder. Unlike carbureted, TBI, and even the Cross-Fire EFI systems, TPI provided fuel injectors for each port, thereby balancing power production (and fuel usage) in each cylinder. Even fuel delivery is difficult (if not impossible) in a typical carbureted (or TBI) application, so the air/fuel is tuned to the leanest cylinder. Unfortunately, this also means other cylinders run rich. This cylinder imbalance decreases power while increasing fuel consumption and exhaust emissions.

In addition to the introduction of individual port injection, the TPI systems also provided a unique induction system.

Designed to flow air (the injectors are positioned at the base of the intake to flow fuel only into the head port), the TPI systems incorporated tuned runner lengths to optimize power production at the lower rev ranges. With long, small-diameter intake ports, the TPI system enhanced low- and mid-range torque production.



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The TPI induction system featured a dual-blade throttle body. Though adequate for our mildly modified L98, it proved inadequate to feed the needs of our Stealth Mode stroker.

To illustrate this point, torque production from a typical L98 Vette motor exceeded horsepower production by roughly 100 lbs-ft. Rated at 250 hp, the TPI system helped the 350 pump out an amazing 350 lbs-ft of torque. Naturally this over abundance of mid-range torque came with a penalty. The same runners in the TPI system that were designed to enhance power production below 5000 rpm, lost efficiency rapidly thereafter. TPI motors were all about instant gratification. There was never any waiting to come on the cam, just plenty of torque to get things going in a hurry. Unfortunately, the long runner lengths quickly put an end to the party.

A stock Tuned Port motor offers impressive looks and torque production. But who wouldn't like some more power from their L98? More power is what it's all about. While it is possible to turbo or supercharge an L98 (anyone remember the Callaway Corvettes?), we decided to travel the normally aspirated route for this exercise. For this exercise, not only will the L98 retain its TPI setup, we even hoped to conceal most of our mods, thus officially taking our modified TPI into Stealth Mode.

Given the constraints of the build up, we decided that the power gains would take a three-fold approach. The three methods of improving the power output of the 350 cubic-inch L98 would include displacement, compression, and breathing. Before tackling any of the three, we needed to run an L98 test engine to illustrate what to expect from a

healthy TPI small-block. What we thought was a stock L98 pulled from an unsuspecting Corvette turned out to have a mild Comp cam. Sometime in its life the owner replaced the factory hydraulic roller cam with a 270HR Magnum cam from Comp Cams. The single-pattern Magnum profile offered .500 lift, 215 degrees of duration, and a 110-degree lobe separation angle. Given our accelerated dyno schedule, we didn't have time to replace the cam with a stock version. Thus our L98 was run with the cam, a set of Hooker long-tube (1 5/8-inch) headers, and the FAST XFI engine management system.



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To the stoker short-block, we added a Comp XR264HR that offered a .487/.495 lift split, a 212/218 duration split, and a 110-degree lobe separation angle.

Run with no accessories (only an electric water pump), a pair of 3-inch Magnaflow mufflers, and no induction system (only the stock throttle body), the L98 produced peak numbers of 327 hp at 4400 rpm, and 397 lbs-ft of torque at 3800 rpm. In typical TPI fashion, torque production from the L98 exceeded 350 lbs-ft from 2800 rpm to 4900 rpm. Even down at 2500 rpm, the TPI motor thumped out 340 lbs-ft. It was only after 5000 rpm that the torque curve plummeted rapidly, eventually dropping down below 250 lbs-ft at 6000 rpm.

Keeping our TPI small-block in stealth mode meant minimizing external modifications. Since a stroker is not externally visible, we decided to increase the displacement of the L98 from 350 cubic inches to 383 cubic inches via a 3.75-inch stroker crank and .030-inch overbore. The stroker kit supplied by Coast High Performance featured forged pistons that combined with our stock (but ported) L98 heads to produce a static compression of 10.6:1. The CHP kit included a cast crank (more than adequate for our power and rpm needs), a set of forged rods, and the forged .030-over pistons. The block was precision machined to accept the new reciprocating assembly, including

slight clearance of the bottom of the cylinder bore for the rod bolts.



Extrude Hone also worked its magic on the factory L98 lower intake and upper plenum.

The short-block was further enhanced with a (still mild) XR264HR cam that offered a .487/.495 lift split, a 212/218 duration split, and a 110-degree lobe separation angle. While the aftermarket is chock full of performance headgear, we decided to retain the stock look by subjecting the L98 aluminum heads to porting. The heads were sent to Extrude Hone for porting and finished up with a competition valve job. After all the work, the flow rate of the stock-appearing L98 castings was up to nearly 260 cfm.

The factory TPI lower intake was also given the stealth treatment, as Extrude Hone worked over the lower manifold, dramatically increasing the flow potential without any externally visible cues. Since the factory runners featured paper-thin walls, we had no choice but to run a set of big tubes from TPI Specialties. While they were not specifically factory, they looked a lot like the stock stuff, only larger. The factory TPI plenum was retained, but was treated to mild port matching, and flow enhancement via Extrude Hone porting. We knew the TPI system would be the limiting factor in terms of maximum power production, so every effort was made to maximize the flow rate of the individual induction components.

While we hoped to rely on a stock TPI throttle body, in the end we went with another TPIS piece to ensure that our new 383 had a sufficient airflow. With the new throttle body and TPIS runners, our new stroker motor looked like a mildly modified L98-we could live with that. It was what was underneath that counted, and we just knew the new stealth mode 383 was not going to disappoint.



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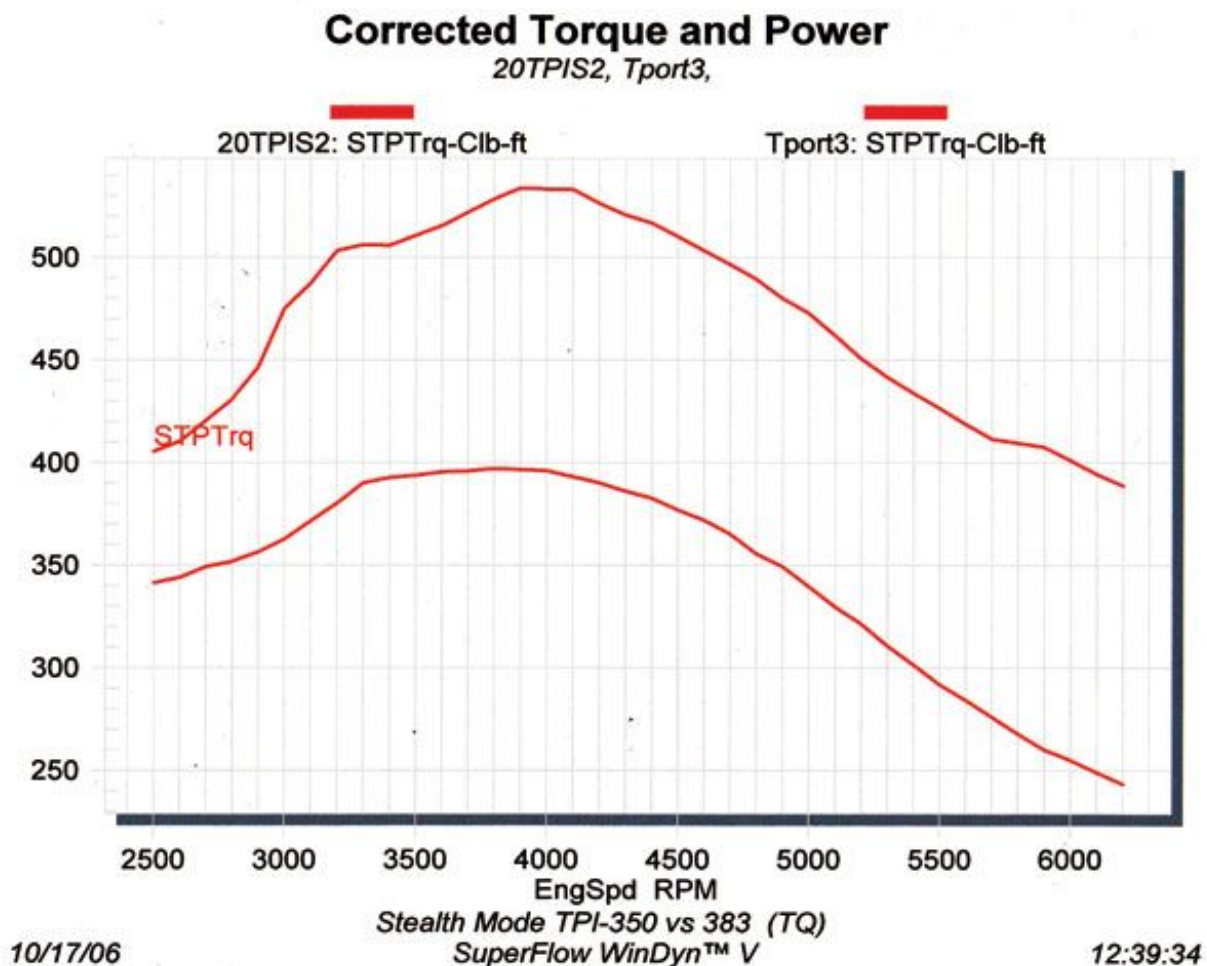
Though the ultra smooth wall finish was impressive, we were most interested in the airflow improvements.

The stroker was run once again with a set of Hooker headers, FAST XFI management system, and an MSD distributor. Although we installed a set of aftermarket valve covers on the 383, it will go back in the car with the factory covers, though it will be necessary to clearance them for the 1.5-ratio roller rockers. The new motor was first subjected to a break-in procedure with conventional Lucas oil, but was then switched over to synthetic oil after the break-in.

Tuned with the FAST management system, the 383 eventually produced 458 hp, and an amazing 534 lbs-ft of torque. You read that right, 534 lbs-ft of torque from a small-block. Talk about the perfect street stroker. The combination of displacement, cam timing, and airflow improvements added up to a gain of 131 hp (measured peak to peak), but that gain exceeded 150 hp out at 6000 rpm.

The torque gains were equally impressive, especially given the already torquey nature of the stock L98. While most small-blocks struggle to produce 500 lbs-ft of torque, this 383 not only produced 534 lbs-ft of torque, but also exceeded 500 lbs-ft from 3200 rpm to 4600 rpm. It was like we added a blower or turbo kit without anyone being the wiser.

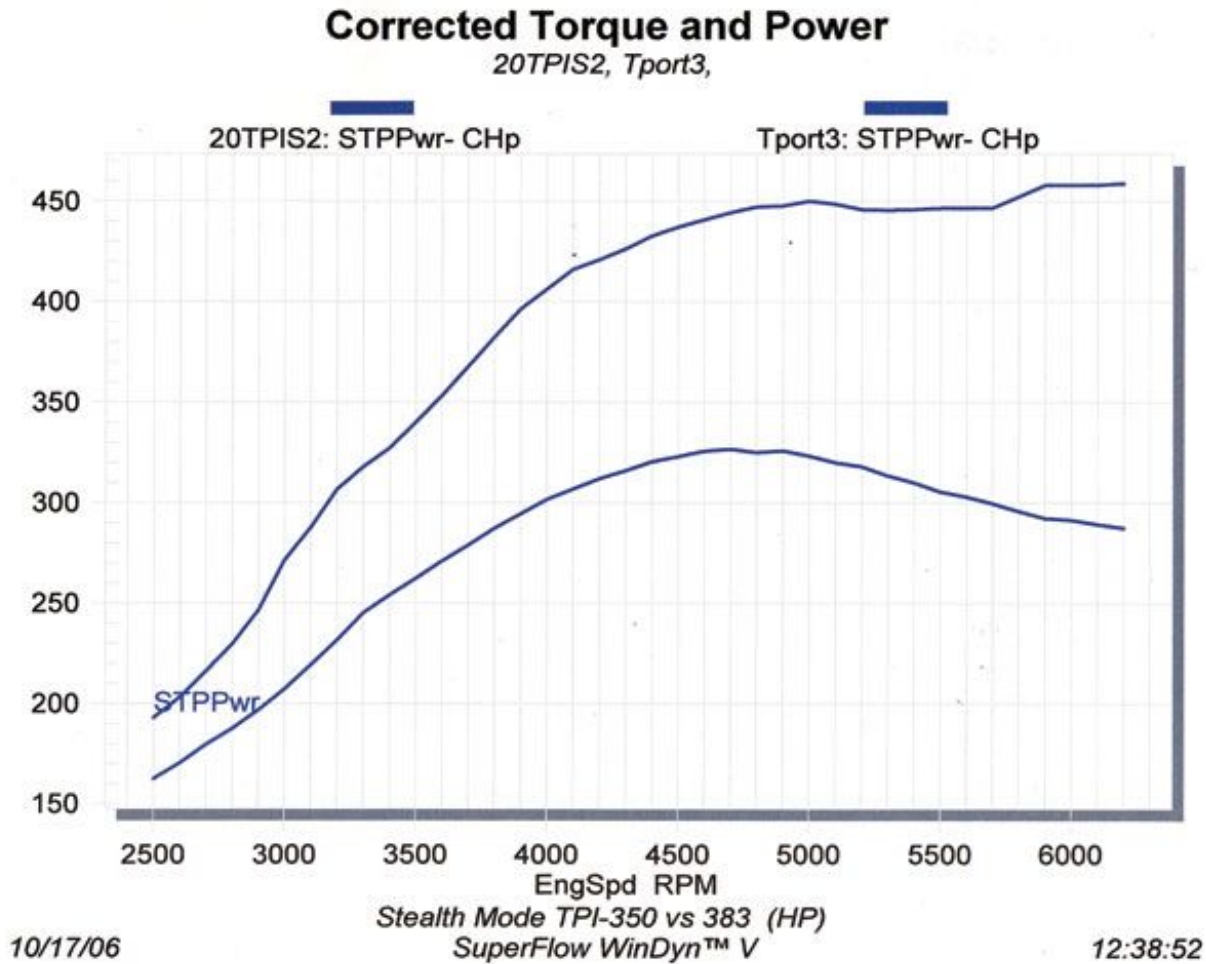
TPI strokers rule.



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The combination of displacement and improved efficiency via the ported heads, cam, and induction had a positive effect on the horsepower production. Where the L98 350 produced peak power at 4700 rpm and fell off significantly thereafter, the improved breathing offered by the ported heads, cam, and intake mods allowed the 383 to carry power production out to 6000 rpm. Had the original L98 350 been equipped with a stock cam, the drop in power would have been even more significant past 5000 rpm. Stepping up in displacement, compression, and efficiency

improved the peak power output by 131 hp. Out near 6000 rpm, the gains exceeded 150 hp, while looking like nothing more than a stock L98 equipped with headers and a throttle body.



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Given the more aggressive cam timing, we half expected the low-speed torque production to be down, but credit the hike in displacement and slight bump in static compression for the additional 65 lbs-ft of torque at just 2500 rpm. Measured peak to peak, the 383 upped torque production by nearly 140 lbs-ft. With nearly 540 lbs-ft of torque available, this is one TPI small-block that will pull like a big-block (at least through the mid range). The torque advantage continued all the way through 6000 rpm. We've always been fond of 383 strokers, but combining the additional displacement with the modified TPI induction makes one serious torque monster.