

# BOLT-ON PERFORMANCE UPGRADES FOR YOUR PORSCHE

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**O**ur normally aspirated Porsches (read non-Turbos) leave the factory in Stuttgart with engines that are leaders in the automotive industry in terms of specific power output--horsepower per liter. The Boxster and Boxster S engines are rated at 80 hp/l and 78 hp/l, respectively, and the new 2002 996 engine is rated at 89 hp/l. In comparison, the 2002 Corvette engine outputs range from 61 to 71 hp/l. Run of the mill BMW, Jaguar, Lexus, and Mercedes-Benz engine outputs are in the 65 to 75 hp/l range. The Ferrari 550 Maranello, known for its "off the scale" performance, has an engine that is rated at 88 hp/l, comparable to the 996. High specific power output engines are not a new Porsche feature, the 1969 911S engine was rated at 85 hp/l, thirty-three years ago, producing 170 hp from its 2.0 liter displacement engine. All of the foregoing may be just "folksy news" after completing a series of driver's education days, a time trial or a season of Arizona Region autocrosses and we find ourselves wishing for more top speed down a straight or faster acceleration out of a corner.

All non-turbocharged Porsche engines from the Model Year 1984 and on are equipped with an electronic engine management system called Digital Motor Electronics (DME). The heart of the DME system is a digital microprocessor (chip) that controls the fuel flow to the injectors as well as controlling the ignition spark timing. A reliable bolt-on increase of 12 to 15 horsepower can be obtained from a good Stage 1 chip that is programmed to be compatible with the fuel octane level available here in Arizona and leaves the rev limiter cutoff unchanged. Authority, Fabspeed Motorsport and Weltmeister are recognized suppliers of replacement DME chips.

Performance gains from bolt-on aftermarket exhaust systems are minimal at best. They sound wonderful, even sound more powerful, but at most 5 additional horsepower is the very best one can expect when the stock engine rpm range and the stock camshaft profile is maintained. Keep in mind that 5 horsepower is within the power variations that exist from the tem-

perature from a hot day to a cold day. Porsche really does a very good job of providing sufficient muffler flow capacity with their Original Equipment exhaust systems, they are just too quiet for some folks.

On the air intake/filter side of the engine, Porsche's design and OEM parts provide intake air flow that is nonturbulent and properly metered for good drivability. Again, bolt-on modifications in the way of air boxes and special filters result in a more sporting sound but little if any power increase. The addition of five or six 1 inch to 1 1/2 inch diameter holes in your OEM plastic air box outer cover will enhance airflow a little while certainly making a nicer sound at wide open throttle. Expect no more than 5 horsepower from the addition of these extra air inlet holes.

The sum of the above parts is between 20 and 25 horsepower at the top end which will provide some noticeable gains in top speed from your basic stock engine--not bad. The on-board Mass Air Flow Sensor and the oxygen sensors in the exhaust will make the corrections necessary to handle these subtle power gains. Still not satisfied? Read on, but bring your checkbook.

Larger bolt-on engine power increases, thirty or more horsepower, can be achieved through a compatible combination of a "mapped" DME chip upgrade, a high flow air intake system and a high performance exhaust system. A chip may be "mapped" (read programmed) to account for changes in compression ratios, camshaft profiles, air mass flows, exhaust headers, and other modifications. The rev limiter cutoff value and fuel/air ratio in the cylinders can be altered and controlled as well. Pay particular attention to the words "compatible combination" when thinking about chips, air boxes and exhaust systems. Remember, a mapped chip upgrade that provides a marked increase in the fuel flow rate to the injectors will not increase the engine's power output without a matching increase in the amount of air flowing into the cylinders from the intake system to maintain the mapped fuel/air mixture ratio. A higher performance exhaust system is also required to collect and handle the increased flow of exhaust gases exiting the cylinders. In other words, the total performance goal is sort of like sitting on a three legged stool where all three legs must be present and compatible with each other for a good balanced result.

To take advantage of the higher potential gains from a Stage 2 or Stage 3 mapped chip, some internal engine parts will need upgrades to operate at the higher engine revs where the additional power is made and the performance is felt. The 3.2 liter and 3.6 liter 911 engines from 1984 through 1998 all need higher strength connecting rod bolts, and, higher strength valve springs and retainers to operate above 7000 rpm for prolonged periods. These modifications may stretch the term "bolt-on" somewhat past the limit, but the experiences of those going down this road before us have proven them to be wise and necessary investments. A higher performance camshaft upgrade should be considered as well when the valve spring and retainer changes are made.

The high flow intake system that matches up with the Stage 2 or Stage 3 mapped performance chips can be either an internal velocity cone type like a Power-Flow unit or a performance air box type like a Weltmeister or even your drilled out Original Equipment air box. A K&N air filter's higher flow capacity would be compatible with these air box setups. The matching high performance exhaust system should consist of a header system for collection and flowing of cylinder gases to a muffler/exhaust pipe system. A local area manufacturer and Going Places advertiser, B&B Fabrication, is a well known high performance exhaust system provider. A properly matched Stage 2 or Stage 3 setup will provide a real and measurable performance increment from the additional raw power output plus the higher rev capacity available.

We have now established both ends of the "bolt-on" upgrade performance spectrum. The 20-25 horsepower upgrade can be created under your engine lid for several hundred dollars. A Stage 3 or higher upgrade which may boost power by 35-45 horsepower will set you back several thousand dollars including the internal engine upgrades required for sustained higher rpm operation. You pick your horsepower and pay the price so to speak. It is worthy to note here that the first 20 horses come fairly cheaply and easily but the next 20 horses come at a much higher price due to the complexity and the related upgrades needed.

Besides the engine, there are other areas of your Porsche where bolt-on performance upgrades will improve your lap times or run times--suspension and brakes. Upgrading these components as the engine power is increased will keep the car in overall bal-

ance. Again, the three legged stool analogy--if you add more go power, you should add more handling control and stopping power to keep the total performance of your car in balance. Consider a set of performance springs or torsion bars plus a set of performance struts and/or shocks along with the addition of a front strut tower brace to keep the suspension members in touch with Mother Earth in all competitive situations. Brake caliper, brake pad and brake rotor upgrades can be added much like the stages of the mapped DME chips to keep your Porsche's stopping power matched to the go power selected.

Our Porsches are one of a very few automobiles in the world that can be tuned and improved stage by stage with OEM quality bolt-on performance upgrades. There is a vast array of choices, options and products out there that have proven track records, no pun intended. Each owner can create his or her own unique performance niche with bolt-on upgrades depending upon the height of their expectations and the depth of their pockets.

Enjoy!