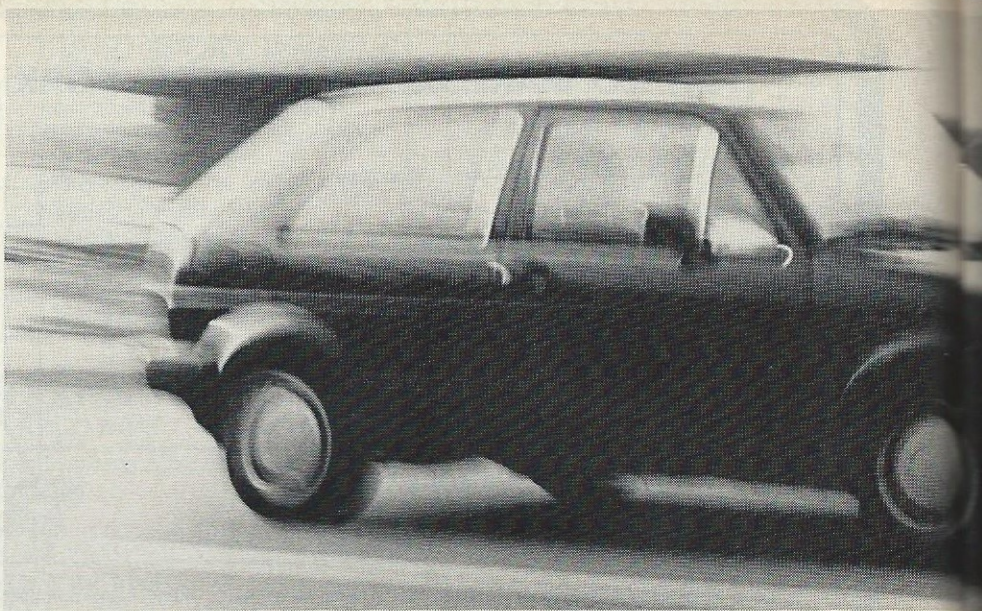


BIG BORE VW POWER



Making 8 valves run hotter than 16

By James Sly

The tests we feature in this issue show the results of building up to the Techtonics 2020 BigBore engine, a conversion guaranteed to make any VW 1800cc run better. The dynamometer testing of the Techtonics 2020 confirmed the old adage, "There's no substitute for cubic inches."

The Techtonics 2020 conversion, (a 94.5mm crank and Techtonics BigBore 82.5mm pistons) with the Neuspeed/Techtonics 268 cam, 12-degree initial timing, TechtonicsTuned exhaust and StreetPort head gave us peak torque 28 percent improved over stock, with 139.3 ft-lb at 4500 rpm, and a horsepower increase to 136.1 hp at 5500 rpm, a 35 percent gain.

Background

In our last three issues, we've detailed the extensive Techtonics dyno

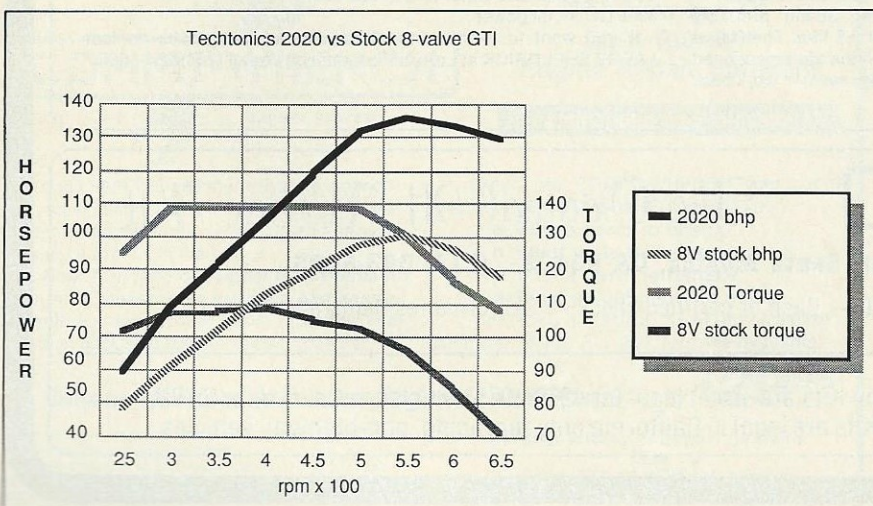
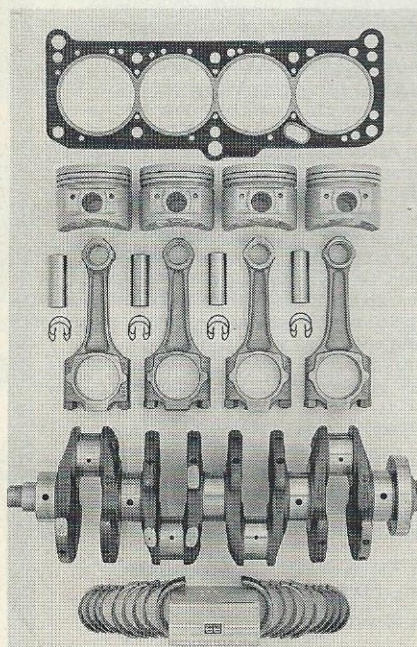
test program for Volkswagen's 8-valve high-performance HT and RD engines in the 1985-87 GTI and GLI models. The tests featured exhaust systems (the sturdy German-made Gillet was the overall winner) and cam testing (the overwhelming first choices were the Shrick 268 cam and the new Neuspeed/Techtonics 268 cam).

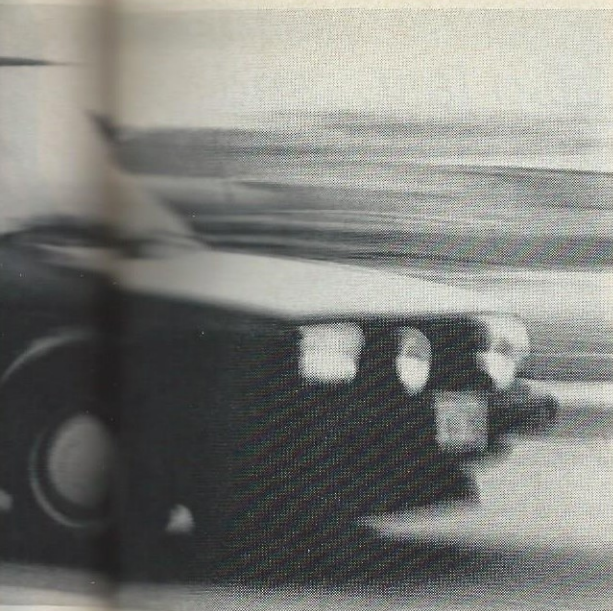
The tests in the June issue centered on the Techtonics Tuning StreetPort cylinder head, a head conversion using stock GTI valves for good airflow velocity and wear, plus careful porting work to preserve important low-rpm torque.

With "all of the above," an engine equipped with a Neuspeed/Techtonics cam, a Drake header, Gillet exhaust, ignition timing advanced to 12-degree BTDC, and the StreetPort head, Techtonics was able to upgrade the stock motor's 102 hp to a new peak of 115 hp. That's approaching a 16-valve's output and with a fatter torque curve. A good many performance do's and don'ts were discovered along the way, not all of them obvious. Check out the hard facts and numbers in the December, April and June issues of *VW & Porsche*.

The cubic inch path to enlightenment

The bolt-ons are a good start, but when it comes down to really getting the horsepower, one method stands out. The simple expedient of increasing the size of the motor in order to get more flexibility, torque and horsepower is well-known to most manufacturers—Volkswagen included. Detroit's heavy metal performance cars of the Sixties all featured the exponent of big displacement to move them faster down the strips and into the winner's





cylinder from the factory in the future.

More compression, too

As the factory engines have moved upward on the horsepower curve, more sophisticated engine management systems have allowed them to increase the compression ratio. Increasing the

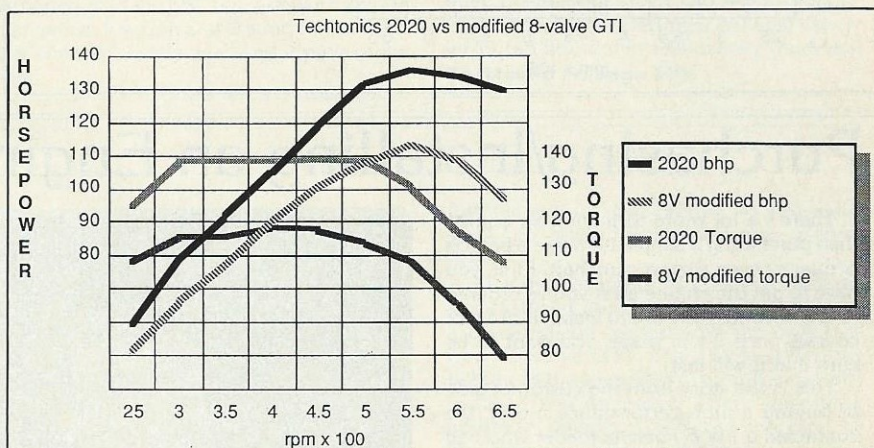
compression ratio is a win-win situation, up to a point. Unlike many hot-rod tricks which can hurt low-end performance, like a wild cam or bigger valves, an increased compression ratio brings with it lots of advantages and very few negatives. The higher compression ratio yields increased torque and horsepower and improved fuel mileage. The Technics 2020 uses the same high compression ratio as the latest generation factory engines, keeping the advantages that the factory built in.

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circle—on the strip, on the street, and in the showroom.

In VW's case, increasing the displacement has had a fairly steady upward path since 1939, when the first VW air-cooled prototypes had sub-900cc motors. The water-cooled, second-generation VWs have been a part of this climb as well, with an almost consistent increase in displacement (and horsepower) from the 1975 1471cc motor to the 1780cc "1800" motor currently in use. We expect to see even larger versions of the VW four-



16V VS 8V HP vs. 2020

Technics 2020 with StreetPort Head, 268-degree Cam, TechnicsTuned Exhaust, 12-degree timing vs. stock 16-valve GTI, modified 8-valve GTI and stock 8-valve GTI.

Brake Horsepower

rpm x 100	25	30	35	40	45	50	55	60	65
2020 bhp	59.4	79.0	92.1	105.3	119.4	131.6	136.1	133.5	129.0
16V bhp	50.5	62.4	74.2	88.8	102.2	113.0	122.1	124.8	120.2
8V modified bhp	51.5	66.0	77.0	90.0	100.4	108.0	113.3	108.6	96.6
8V stock bhp	48.3	61.2	71.8	82.8	90.0	97.5	100.7	96.6	87.8

Foot pounds of Torque

rpm x 100	25	30	35	40	45	50	55	60	65
2020 torque	124.8	138.2	138.0	138.2	139.3	138.2	129.8	116.8	107.6
16V torque	106.1	109.2	111.0	116.6	119.2	118.7	116.6	109.2	97.1
8V modified torque	108.2	115.5	116.0	118.2	117.1	113.4	108.2	95.1	78.8
8V stock torque	101.3	107.1	107.6	108.7	105.0	102.4	96.1	84.5	70.9

Horsepower Comparison

rpm x 100	25	30	35	40	45	50	55	60	65
2020 vs. 16V	+ 8.9	+16.6	+17.9	+16.5	+17.3	+18.6	+14.0	+ 8.7	+ 8.8
2020 vs. modified 8V	+ 7.9	+13.0	+15.1	+15.3	+19.0	+23.6	+22.8	+24.9	+32.4
2020 vs. stock 8V	+11.1	+17.7	+20.3	+22.5	+29.4	+34.1	+35.4	+36.9	+41.2

Maximum Horsepower Gains

15% @ 5000 rpm
29% @ 6500 rpm
41% @ 6500 rpm

Torque Comparison

rpm x 100	25	30	35	40	45	50	55	60	65
2020 vs. 16V	+18.7	+29.0	+26.9	+21.6	+20.1	+19.5	+13.2	+ 7.6	+10.5
2020 vs. modified 8V	+16.6	+22.7	+22.7	+20.0	+22.2	+24.8	+21.6	+21.7	+28.8
2020 vs. stock 8V	+23.5	+31.1	+30.6	+29.5	+34.3	+35.8	+33.7	+32.3	+36.7

Maximum Torque Gains

24% @ 3000 rpm
24% @ 6500 rpm
34% @ 6500 rpm

The Modified 8-valve GTI was fitted with StreetPort Head, Neuspeed/Technics 268-degree cam, TechnicsTuned exhaust and 12-degree timing.

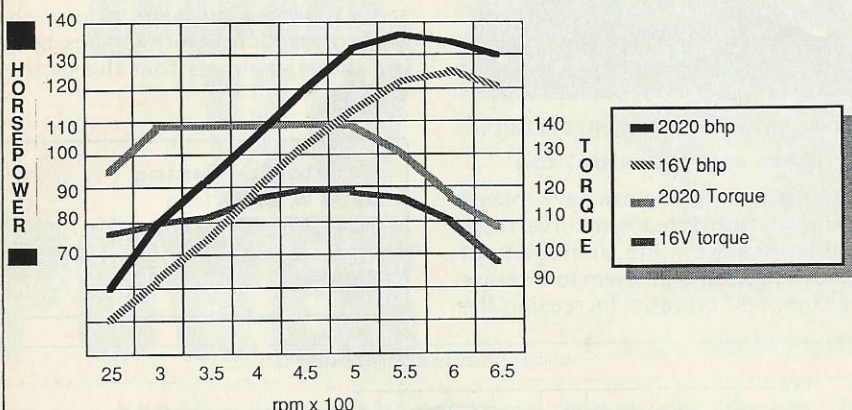
The Techtonics 2020

There are three ways to increase the displacement of a motor: increase the bore, lengthen the stroke, or both. VW has increased its water-cooled engines in steps through the years using all

three approaches. The current stroke has grown to 86.4mm from the original 80mm and the GTI's 81mm bore is up from the earlier 79.5mm piston size.

The Techtonics 2020 takes the factory increases several millimeters and
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Techtonics 2020 vs Stock 16 Valve GTI



And the first will also last...and last and last



The Techtonics motor has been absolutely trouble free. Regular oil and filter changes and four valve adjustments in the last 50,000 miles have been the only maintenance on the engine. Oil consump-

Purchasing/Installing an Engine

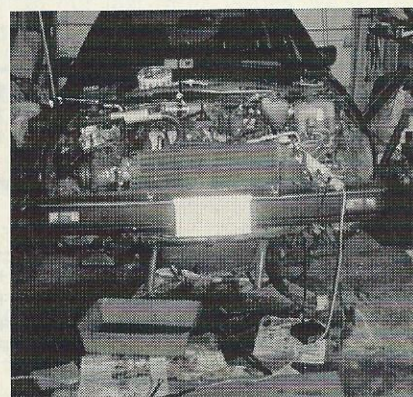
There's a lot more to buying an engine than purchasing a simple item like a bolt-on spoiler or even a sport camshaft. First, you have to get the engine after you've ordered it, and second, you have to install it. And, of course, once it's in place, you want to be sure that it will last.

This is the story from the customer side of buying a high-performance motor. We contacted a VW & Porsche reader who had just purchased a Techtonics 2020 motor for his 1985 GTI, and this is how he rated the experience of buying, installing and using that motor.

David Jalali's car is a black 1985 GTI. In the VW & Porsche tradition, the car was more than a little modified. David had been closely following our series on bolt-on performance and his GTI was already equipped with a Schrick 268 camshaft, Euro-downpipe and Gillet Exhaust. The timing was bumped to 12-degrees initial, and the computer has been converted to the 1986 ignition map. Performance was improved over stock, with a 0-60 time down to about 10 seconds, and top-end performance that was getting closer to 16V territory. But, if a little performance is good, a lot of performance is much, much better, right? With this in mind, David was ready for the next step.

David spent some time reading all the ads, articles and talking to people building engines before deciding on Techtonics technology. He called and placed the order for a 2020 motor for his 1985 GTI, and he found out this: To minimize the down time on your car, Techtonics maintains a supply of "core" engines. David paid a deposit and Techtonics built up a 2020 motor with one of their cores and shipped it out. After he received the BigBore engine, he scheduled a week-end at a friend's garage to remove his car's stocker.

Since he'd ordered a short-block from Techtonics, he removed his stock head and



bolted it onto the Techtonics motor. It was then bolted into place, everything was buttoned up and ready to test. It took more than a few hours—from 6 p.m. Friday until the final completion at 4 in the wee hours Sunday night. (Somehow, it seems that engine

swaps always finish up late at night.) The actual time involved was about 20 hours of work. The flat-rate manual allows 24 hours, and since Washington, D.C. area Volkswagen dealers are asking about \$75 per hour for removing and replacing engines, David felt that the \$1800 saved was worth the effort!

With the swap out of the way, David shipped his old motor back to Techtonics. No fuss, no rush. The Techtonics system is great—there's no waiting for turn-around time, no unexpected delays and a minimum of hassles.

David is not an experienced mechanic, but with the help of friends and fellow members of the National Capitol Area Volkswagen Club, a rented engine hoist and many hours of sweat, he managed to take out his stock engine and replace it with the Techtonics 2020. That old standard helper, the Bentley service manual, provided most of the information needed to complete the swap.

Most of the front of the car has to be removed, including the radiator, to get the old motor out and the new one in, but the work is straightforward and uncomplicated. For the most part, the instructions provided by the Bentley were correct, but David had a couple of hints that might make the job easier for the next guy:

1. The Bentley manual says to simply loosen the front motor mount. David says that it is much easier to completely remove the front motor mount before trying to lift the motor out.

2. While the manual suggests simply tying the axles up and out of the way, David and friends found that the best idea was to remove the axles completely.

An important caution: A front-wheel-drive Volkswagen should always be supported when the axles are pulled, and should never be rolled around with the axles removed. It's quite easy to damage the wheel bearings by moving the car with the front axles remov-



tion between changes has been negligible. The stock 60-amp alternator was swapped for the 90-amp alternator from an '85 GTI, a simple swap that helps provide the juice for high-output driving lights.

We tested the compression and ran a leak-down test on the motor to see what shape it's in after these miles of hard driving. Cylinders 1 through 4 read as follows: 220 psi, 210 psi, 210 psi, 215 psi—all very good

readings. A leak-down test, an even better indicator of engine condition, showed a leakdown between eight and 10 percent. A reading as low as 20 percent would be no cause for alarm, so the Techtonics leakdown results must be viewed as excellent.

What about drivetrain reliability? Well, Collin repacked the CV joints once. (They're stock, not heavy duty CVs.) A Quaife limited-slip differential was added to help get the power to the ground, but other than that the transmission required no attention.

The Sachs clutch disc was replaced at 30,000 miles. It was not worn-out, Collin is quick to say, but was destroyed as a result of overrevving. The engine showed no signs of damage. This is a standard 210mm clutch, not a high-performance or sport clutch, so the wear and clutch life have been admirable.

In short, maintenance is completely normal, the same as a box-stock motor. It's only the fun factor that has significantly improved. We haven't driven a faster normally aspirated 8-valve VW, nor one with better manners at low rpm and around town. Floor it at any rpm, in any gear, and it pulls, right now.

Judging by the large number of letters we've had on the subject, our Bolt-On series of performance modifications for the 1985-87 GTI and GLI motors has been invaluable to many of our readers. One of the more frequently asked questions involves reliability: Will a Techtonics BigBore engine last as long as a stock motor? Another frequently asked question: Will the extra horsepower affect the reliability of other drivetrain components?

Collin Gyenes, a Techtonics employee with a passion for quality high performance, has just the car to help us answer those questions. His 1980 Jetta was featured in the June 1987 issue of VWP and now, 14 months later, has turned over 50,000 miles with one of Techtonics BigBore motors.

The motor in question displaces 1977cc, using a Techtonics welded stroker crank with a 92.5 stroke and Techtonics BigBore 82.5mm pistons. "Audi" or Ingolstadt-style rods are used. The cylinder head is a more elaborate version of Techtonics StreetPort head, fitted with stock GTI 40mm intake valves and 35mm Oettinger exhaust valves for durability. Collin extensively modified

Continued on page 105

ed. At most of the VW shops we know, they use an old stub axle off a damaged CV joint to replace the axle and allow the car to be moved without damaging the bearings.

3. Expect problems removing the clamps that fasten the exhaust downpipe to the manifold. Even with the excellent removal tool from Zelenda Tool and Machine Company, it takes the use of two large pry bars to remove the clamps.

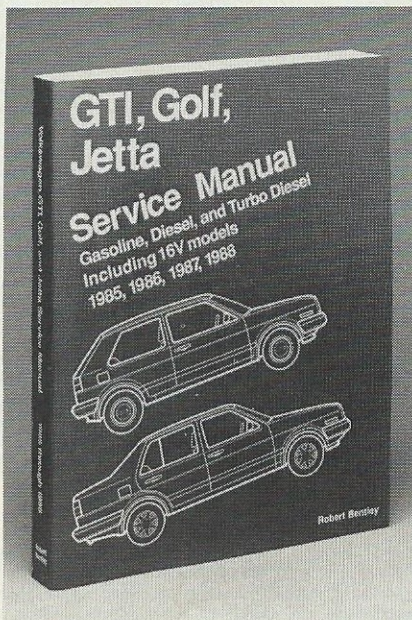
Before starting the motor, they pre-oiled it by spinning the oil pump shaft until there was oil pressure. Then, the moment of truth, and the motor started right up.

David followed Techtonics break-in instructions, which are quite simple: concentrate on getting on and off the throttle while driving, and avoid high rpm and sustained high-speed driving. This gives the rings a workout to seat them quickly. On David's car, the rings seated almost immediately, and it took the 3500 miles for the first 1/2 quart of oil to be consumed.

While the car normally uses a Mecca EC1 45 oil filter, a standard Fram filter was used and changed frequently for the first couple of weeks. It's cheap insurance against the foreign particles that can be found in your engine after a rebuild. We highly recommend the Fram filter if you're not going to be using something like the Mecca.

A g-analyst from Valentine research and a Vericom VC-200 performance computer were used to record the test results and ensure accuracy. With the motor broken in, it was time to test the performance. As we mentioned, the best previous 0-60 time for the modified engine was 10.0 sec. With the Techtonics 2020 just broken in, David was able to drop that to 8.7 sec, right down there with the performance of a 16 Valve GTI—or a \$30,000 Porsche 944. We expect the motor to get even stronger as it "loosens up".

The previous highest peak g recorded in first gear with the g-analyst was .42 g. With



the Techtonics motor, that jumped to .48 g, a 14 percent improvement over the modified stock motor. In the quarter mile, the best previous top speed recorded was 79 mph. That jumped to 83 mph with the new motor.

The Vericom gives an interesting statistic, a calculated value based on acceleration called "horsepower per pound" or HPP. The stock motor's best reading was .42 HPP. The 2020 showed a significantly better .53 HPP.

Enough with the numbers; does it work? You bet. The motor is incredibly tractable. You can let it idle down below 800 rpm in any gear, stand on it, and the motor just flat pulls. The torque is enormous, and by 4500 rpm the motor is already pulling stronger than the modified 8-valve at its power peak! The torque curve is flat from 3000 to 5000 rpm, making for less shifting and more com-

fortable around town driving, as well as instant "go" when the accelerator is pushed down.

As a final example of what the all-dyno and road-test numbers mean, David got in a casual speed contest with the owner of new 16-valve GTI. The 16V was falling behind as the speed built up, and it had only the driver on board. There were four adults in David's GTI! That's the kind of horsepower that really shows up.

Would David do it over again? He says, yes. Dealing with Techtonics has been one of the most straightforward of the high-performance purchases he's made. The quick delivery surprised him, as many enthusiasts had told him how long it had taken for their engines. It was his first engine swap, and he really appreciated the help from his more experienced friends, George Dold and Seth Balsam. (Both George and Seth own high-performance VWs of their own.)

The best is the engine itself, of course. It's a performance motor that's more driveable than the stock motor, and quicker to boot. It makes the owners of \$14,000 16Vs take notice. And it will take exactly the same maintenance as stock. That's a hard combination to beat. —J.S.

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