Fat and Wet

Testing the Split Second Programmable Signal Calibrator

TECH FACTS:
Split Second Programmable Signal Calibrator (PSC1)

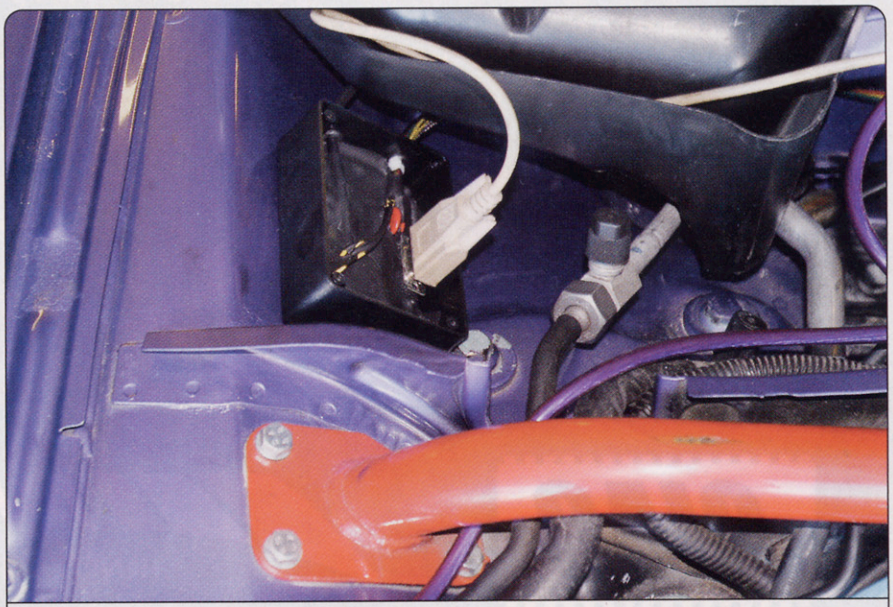
MSRP:
$339

PERTINENT INFO:
Split Second has designed a programmable module to control fuel, and it piggybacks on the stock ECU. This allows stand-alone-style tuning, while retaining all of your factory sensors. The PSC1 comes with a software package named R4 that allows you to change the air/fuel ratio through a laptop computer. The unit will work on forced-induction or naturally aspirated applications, and it lets you fine-tune your modified engine.

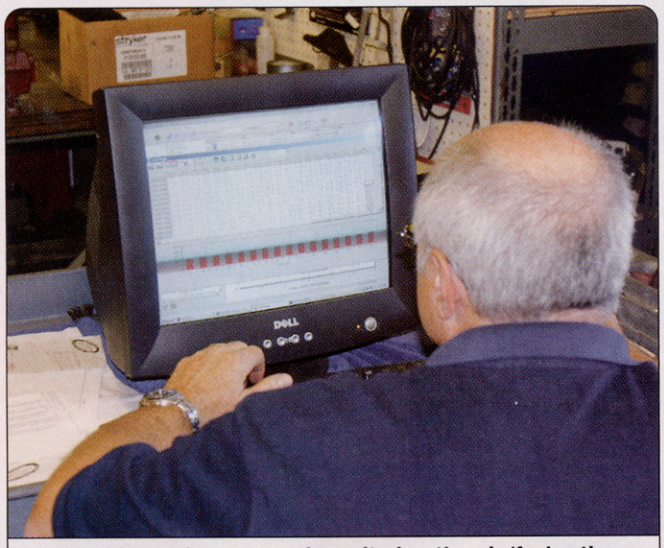
SHAMELESS PLUG:
Split Second, 949/863-1359, www.splitsec.com

Words & Photos: *Jason Jackman*

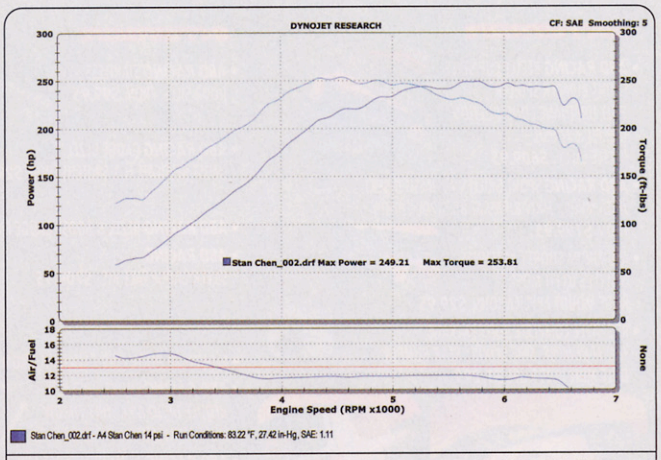
Recently, Stan Chen of DTM Autohaus and Marc Amarandos from Split Second invited us to South Coast German Cars in Costa Mesa, California, to a dyno test-and-tune session using the Split Second Programmable Signal Calibrator (PSC1). The PSC1 was being used on Stan's highly modified 1.8T Audi A4 to correct a fueling problem. The car houses an AEB 1.8T and has been upgraded with a PES Stage III turbo kit. Stan has also had custom headwork performed, as well as having the fuel pump replaced and upgrading to 550cc injectors. The problem Stan was having in his air/fuel ratios was due to the modifications he performed after the PES kit was installed; the extensive headwork increased the amount of air he could push and pull. The simple fact of the matter was, with all of the modifications Stan had performed on top of the PES



We mounted the PSC1 inside the engine bay. As you can see, the only thing needed to interface with the module is a male/female DB9 serial cable.



After making a dyno run and monitoring the air/fuel ratio, we added some fuel through the R4 program.



The first run at 14 psi yielded 249.21 hp and 253.81 lb-ft of torque. The car was staying too lean for too long at the bottom end of the curve, so fuel was added to compensate. As you can see, the a/f ratio stayed above 13.0:1 until 3,700, where it dropped back down just below 12.5:1.

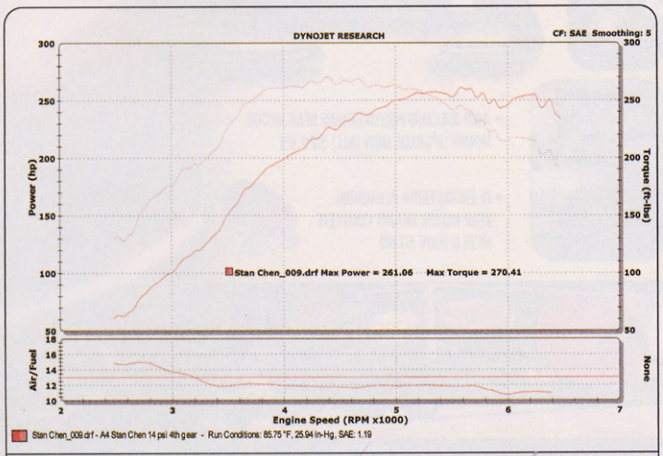
kit, there just wasn't enough fuel being delivered anymore. Such is the world of custom modifications.

Because Stan was only having fueling problems due to the increased airflow, he didn't believe it was reason enough to install a stand-alone engine management system. Instead, he chose the Split Second PSC1 as his solution. The PSC1 is a piggyback signal calibrator that allows you to make adjustments to your fuel control signals from a laptop computer. The module is placed in line of the MAF harness and manipulates the voltage sent from the factory unit to the ECU. This in turn "tricks" the ECU into feeding more fuel to the motor, and the amount of fuel is modified through the soft-ware, allowing you to tune your car in a stand-alone fashion without having to fork out the big bucks for stand-alone engine management.

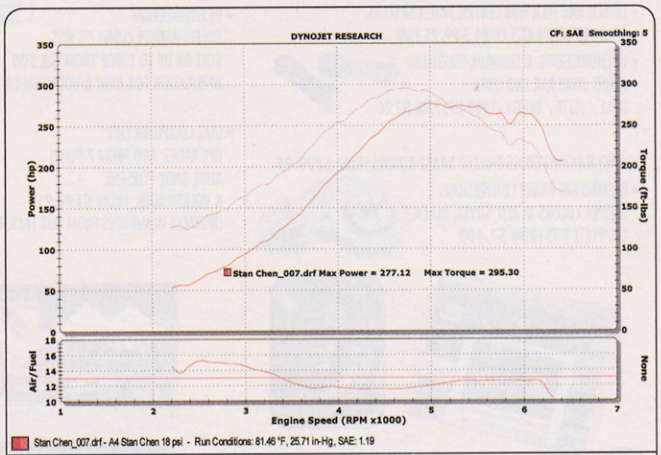
Like we stated earlier, the PSC1 is controlled through a laptop computer and doesn't have front-panel adjustments on it. The PSC1 uses onboard memory to store the most recent calibration data. The interface for the unit is located under a cover and the connection is made using a standard male/female serial-port cable. That old serial cable extension you had for your mouse, back in the days before USB and wireless, will again become useful to you. (Now you can tell the girlfriend or wife that it was a good thing you kept that old Commodore 64 all those years.) The software the PSC1 uses is called R4 and is a Windows-based application, so all you Linux users out there will have to run an emulator to use the software and all you Mac guys are swingin' in the wind — but we're sure you're used to that by now.

As we stated before the Mac bashing, the software is Windows based and is compatible with the 95/98/2000/XP platforms. The R4 software allows you to create and store an unlimited number of files. Inside the files are 3-D maps with settings for fuel control delivery, ignition timing, and a number of other settings. The software also allows you to log data from multiple inputs in order to review and decide the adjustments you'd like to make. To calibrate some of the other settings in R4 you would need the additional programmable modules that Split Second offers; the PSC1 only controls fueling.

At 14 psi, Stan's car was lean at the bottom end of the rev range, like most cars. The problem was it was staying lean for far too long into the curve. After looking at the graphs and charts that

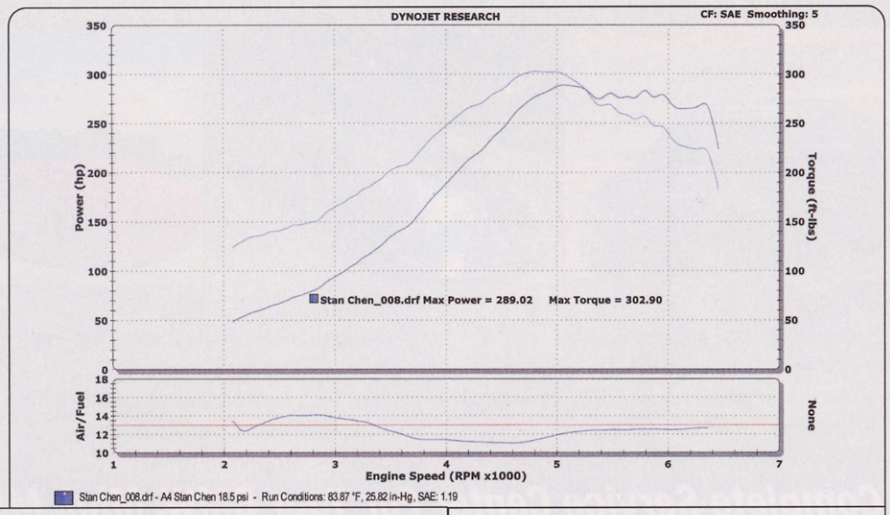


After the adjustments were made, the motor came down to a much more reasonable 12.4:1 a/f ratio by 3,300 rpm and held it until about 5,800, where it got richer. The horsepower also went up to 261.06 with 270.41 lb-ft of torque. The curve changed quite dramatically and power ramped up much quicker now.



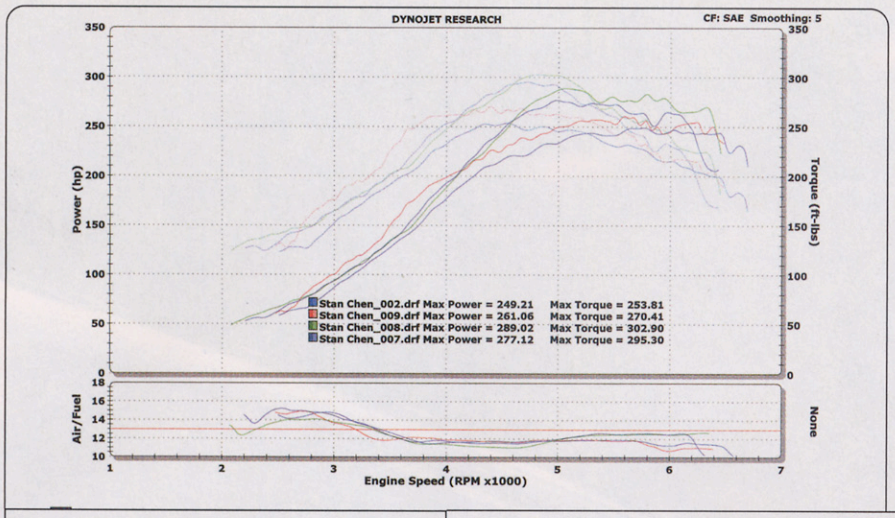
This is the first run where we upped the boost to 18 psi. Take a good look at the a/f ratio. The car stays pretty lean until 3,600 rpm, where it dips back below 11.0:1 and comes back to the mid 12s at around 5,200 rpm. The car made 277.12 hp and 295.30 lb-ft of torque.

the software can create from its data logging, we found out exactly where the car was leaning out. Then, in the software, we changed the values in the cells under that RPM range in order to add fuel where it was needed. After making some adjustments, we dyno'd the car again. It made a jump in horsepower from 249.21 to 261.06 at the wheels, and the torque increased from 253.81 lb-ft to 270.41 lb-ft. Other than the 11 hp and 16 lb-ft of torque gained at the wheels, the curve under peak also made a drastic change. The power ramps up much quicker from about 2,600 rpm on up and maintains around a 20hp difference all the way up to peak where the power curves are separated by 11 hp. The torque is no different, except that the separation under peak is more dramatic than the horsepower's curve.



Here we upped the boost just a bit more to 18.5 psi and added more fuel to compensate for the lean condition at low rpms. After two runs and constantly adding more fuel, the a/f ratio remained the same. The car made a jump in power to 289.02 and 302.90 lb-ft of torque, but the a/f ratio didn't change at all. This prompted us to take a look at the fuel pressure and what duty cycle the injectors were running at.

Once we had the car dialed in at 14 psi, we decided to dial it up to 18 psi of boost to see how much power we could get. We soon found out that we were running out of fuel somewhere between the 14psi setting and 18.0 psi of boost. What first alerted us to the issue was when we made an adjustment from 18 psi on one dyno run to 18.5 on the next run. Although the horsepower jumped from 277.12 to 289.02 and the torque had gone from 295.30 to 302.90, the air/fuel ratio didn't change. Both runs, the boost spiked at 21 psi and settled back to its relative setting of 18 or 18.5 psi. On the first of the two runs with the boost set at 18.5 psi, we noticed the a/f ratios looked pretty close to the 18 psi run, so we went to the computer and changed the values. After running the car again, we noticed that the a/f ratio hadn't changed a bit; it



As you can see from this comparative chart, the 14 psi run with the a/f dialed in created the best power down low with the best a/f ratios. The 18.5 psi run produced the most peak power, but as you can see, the a/f ratio is nearly identical to the 18 psi run.

was still heading dangerously close to a 13.0:1 ratio at the top end. That is a bit lean for a forced induction motor, as you want them to run a bit more "wet" (somewhere around 12.0:1) because of the extra heat the turbo creates, so we decided to dive into the problem a bit more.

At first, we decided to check the fuel pressure to see if we just needed to up the voltage at the fuel pump to give us more fuel. However, after watching the fuel pressure gauge peak at damn near 80 psi on a dyno run, we decided that if we added any more pressure, it would be less likely to run as smoothly in low-rpm, low-load situations at the 14psi setting that Stan wanted to run on the street. So we left well enough alone and dialed the boost back down to 14 psi. We uploaded our 14psi file to the PSC1's memory and called it a day.

If you want the "in-a-nutshell" explanation, the Split Second PSC1 impressed us, and it did so for a number of reasons. The data logging and graphs are excellent features in the software, allowing you to compare multiple sessions and make changes accordingly. The ease of use was also very impressive; the software is very intuitive and allows room for novice tuners, as well as offering the flexibility the pros want to see. The other thing that stood out to us about this module is that it's very effective, and the PSC1 does everything it claims to. The system is not meant to replace the chip you already have; it just allows you to fine-tune your current setup to your specific needs by adjusting the fueling. With the addition of a few other modules, you can also play with a number of settings to gain power or improve the delivery of it, all for a fraction of the cost that it would take to install and tune a stand-alone engine management system. Not bad, not bad at all. ef