

## Dyno Cap for 2013 944 Spec

Posted by Sterling Doc - 30 Oct 2012 08:14

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Guys, for 2013 will be moving to a dyno cap of  $(HP + TQ)/2 = 138$ , with a 2 HP allowance for dyno variation. I know there will be many questions on the whys and how's of this, so I'll go through many of the ones I expect below. Please pull up a chair, and read all of the following before commenting on this thread.

### ***Why is this necessary?***

It is important to go back to the foundation of our rules,- the purpose and claim that have defined our rules from the beginning to understand this, so I've copied it below:

#### *1 Definition and Claim*

*The Porsche 944™-924S™ spec class is a class for those individuals that wish to race a Porsche in a competitive series with limited expense and low cost of operation. These rules are intended to control costs and reduce any performance advantage from the cars so that driving ability and*

*race setup are the greatest factors in determining winners. The following are approved and disapproved items for the class. **The spirit of the class is for all cars to be equal in weight and horsepower and be competitive with one another. The focus will be on driver ability and not dollar ability. This class is not intended to be an engine builder or innovator's class.***

When the class started 10 years ago, a good motor was in the low 130's. As the class has grown, become more competitive, and talented engine builders have become involved, we now have reliable dyno data to show legal motors reaching into the mid 140's in HP & TQ. It is has come time to codify the spirit of the rules to allow standard, well built motors to remain competitive, at the highest levels. Over the last two years of testing and data collection (nearly 100 dyno tests), we have found a very good standard rebuild produces around 134-5 HP, give or take a couple. This rule is built around those cars - the meat of the class.

This 138 HP cap can be approached by any solid motor build, low or high compression, with a bit of tuning. This cap can also be met by higher output motors through simple, cheap, and reliable means of detuning. Both of these things have been tested extensively through NASA's support, and we will provide a clear path to tuning up lower HP cars, and detuning cars that fall over the cap (details to follow). The result will be a tighter spread of horsepower throughout the class, better racing, and it will make the class more accessible to new drivers/builders for less build cost. This is the spirit of 944 Spec rules, as carefully laid out by the class founders.

***What are the specifics?***

The rule will be  $(HP + TQ)/2 = 138$ , +2 to account for dyno variation. While the intent is for cars to approach an average of 138 HP and TQ, disqualification will not occur until a car reaches  $(HP + TQ)/2 = 140$  or greater. This number will be determined by the average of 3 dyno pulls, with a very tight dyno procedure, including a spec for tire pressure (30 PSI), and oil temperature (>160 degrees), using SAE correction, smoothing factor 5. This procedure dramatically reduces dyno variations when followed correctly.

***Will a dyno be required to start the season?***

No. At this time, this rule will be used for enforcement, but will not require a dyno test before competing in 2013. The cap is set at a level that most standard built motors will not fall out. However, not having a dyno done will not excuse a violation of this rule if tested.

It is *highly recommended* that competitors put their car on the dyno once, and not just for rules compliance. As we have sought out previously untested cars for reference, we have found many of them running dangerously lean in Spec configuration. We have also found many issues on the dyno that would have resulted in a DNF, or motor failure in the future. It is far cheaper to find this on the dyno, than to waste a race weekend. Additionally, we have found HP gains of 2-5 HP through correcting air fuel ratios, on most all cars tested. If there was a part that would add 2-5 HP for \$100, there would be a long waiting list for this part! A dyno test session will do that for you. Local series directors can work on organizing group dyno days to help each region do this in a cost effective manner. This will also help enhance transparency in the class. Locally, it cost me \$100/hour to rent the dyno for my car. In recent testing, it took me less than 1/2 that time to dial in my motors air fuel ratios, and gain 2 HP. The other test car gained 5 HP (was running dangerously lean to start with!).

It is possible that a baseline/pre-competition dyno may be required in the future, but the intent now is not to require it by force of rule.

***Will I have to pay for a compliance dyno?***

No. Cars selected for verification at an event will not have to pay for a dyno. These costs are borne by NASA. The results are then the property of NASA, and not the racer. Air/fuel ratios are not assessed.

### ***How do I detune my car if needed?***

Our testing has shown several effective paths to detuning:

- The cheapest is to turn the fuel quality switch to position 4, which retards timing. This was a factory allowance to deal with lower octance gas. Our testing has shown it lowers removes about 4 HP. This lowers power throughout the HP curve, and nicely mimics a lower performance motor
- Our throttle bodies are 55mm in diameter. Placing a 52mm diameter restrictor between the throttle body, and intake manifold, removes about 2 HP, and slightly less torque, though it does seem to affect power through the rev range as well. A 50mm restrictor takes away 3-3.5 HP. Smaller restrictors should see similar incremental losses in HP. These plates can be made with simple sheet aluminum for nominal cost. There is no regulation on the restrictor itself, only its effect on horsepower.
- A more restrictive muffler is effective as well. For reference, a Dynomax Hushpower muffler removed 3-5 HP over the rev range versus a short staight pipe.
- We found no modifications that significantly manipulated the area under the curve, while chopping off the peak HP, within Spec rules. It would seem to require custom chip tuning to accomplish this, which is not legal in Spec rules. Our cars have very flat TQ curves as is, which would be hard to improve on significantly.

### ***How do I tune up my lower performing motor to come closer to the cap?***

- First it is critical that the cars ignition, fuel, and air intake systems are in top shape. We have found an amazing amount of pathology here. In particular, make sure you AFM is in good repair. A testing procedure is here: <http://www.clarks-garage.com/pdf-manual/elect-22.pdf> . You can also see how it performs on the dyno. A good AFM will give you a nice flat air fuel ratio throughout the rev range.
- The next critical step is to tune the air fuel ratios on the dyno - significant gains are often found here. Look here for tips: <http://www.944spec.org/944SPEC/forum/general/11260-tuning-afm?limit=6&start=18>
- Head shaving is worthwhile, especially for low compression cars. Personally, I would stay a good 10 thousandths above the stated minimums in the rules for low, and high compression pistons.
- Beyond that is small potatoes. Opening the internal restriction on the factory collector (Y-pipe just beyond the headers) seems to be worth about 1.5 to 2 HP. Hanksville Hotrods has an elegant bolt on solution, or the merge area can be modified by an exhaust shop. David Dirks has an effective method that he can share.
- Some cars seem to like certain computers better than others, but we could not find any pattern. The '88 computer was not found to be universally better. Engine hardware (early vs. late) is less important than the state of tune, for the average builder.
- We tested aftermarket chips, and found them \*not\* to be an effective bolt on solution. They will remain

not legal for this class

***Was this rule driven by cheating, or junkyard motors?***

No. I am proud of the level of integrity this class has shown. I do not expect that junkyard motors will be nationally competitive with this rule, and that is not its intent. It was driven the spirit of the rules, the progression of motor builds, and my conversation with racers and series directors across the country. Many of these conversations were in person through my efforts to visit the different regions, others by phone and email. The regional directors have been in the loop, and are in agreement, even the ones who will have to detune as a result of this. I understand not everyone is on board with this, and that I have not talked to all of you. My overall impression remains firm.

***Can't racers cheat around this rule?***

Yes. However, I expect we will continue to maintain our high level of integrity. Keep in mind, that a disqualification for being over HP, like being under weight, must be taken as a "0" in points (i.e cannot be dropped). Push the limit at your peril. Dynos are not frequently available outside of nationals, but it does happen. Many other classes deal with this same issue. As all the current Spec rules remain in place, the situation cannot be worse than it is as far as the spread of power.

***Why not just add weight?***

*The spirit of the class is for all cars to be **equal** in weight and*

*horsepower and be competitive with one another..*

Adding weight adds complexity, wear and tear, and creates the opportunity to create "horses for different courses" - high/HP weight for one track, and lower HP/weight for another track. Balanced is not the same as equal.

Sorry this is so long, but it is important!

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**Re: Dyno Cap for 2013 944 Spec**

Posted by AgRacer - 31 Oct 2012 13:57

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**RacerX wrote:**

**Sterling Doc wrote:**

Dan found the HP, and I hope more guys do with dyno testing. He has my low compression motor from last year, which was a serious effort at making a LC motor competitive. Many solid motors just don't have that potential, and are stuck where Dan is, w/o an expensive rebuild.

If I understand this correctly.....even guys with good solid motors won't be able to make 138HP?

Then why 138 with a 140 cap?? Why not 136 with a 138 cap or even a little lower, say 135 with a 137 cap?? Something that everyone would be able to attain without such a "serious effort"?? That serious effort sounds like serious \$\$\$\$\$.

As I understand it, the number was decided upon based on where the majority of the cars lie on the power output. I believe they are assuming that the bell curve average of cars all across the country to be in the 135-136 HP range. In order to capture the vast majority of the cars without impact, they chose a cap just above where the vast majority sit on that bell curve. Additionally, I think they understand that there will be further progression in output as people get more efficient at massaging these motors together. I believe this to affect only a very few of us but in time, the class will get better at tuning/building to that number.

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## Re: Dyno Cap for 2013 944 Spec

Posted by cbuzzetti - 31 Oct 2012 13:58

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Eric, my mistake I assumed that you were listing the 1,2&3 place cars.

As far as the video goes I was pointing out that better corner exit speed will look like HP. A lot of drivers will make an assumption that the guy driving away from them on corner exit is HP when it is most likely better car set up and driving skill.

I am stating this as a driver who has seen and been on both sides of this situation.

It is good to see this many drivers voicing their opinion on this subject.

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## Re: Dyno Cap for 2013 944 Spec

Posted by joeblow - 31 Oct 2012 16:12

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**cbuzzetti wrote:**

Hi Eric, are the numbers below for the 09-10 Miller Nationals numbers that you got from Ryan or are these numbers from the internet? If the 143 number shown is one you got from me or from a post I made that was from 2010 At Buttonwillow before Nationals and should not be used he as a comparrison. That same car at Nationals at Miller dynoed at 137. I was using this as a comparison for variations in dynos.

This was also a car that had a head on it that became illegal after Nationals based on the head thickness rule. I installed a Milledge head after Nationals to keep in compliance with the new rules for heads. The car HP did not change.

I am also unclear about the HP ratings for the 2012 Nats. You have 141, 140.5 and 136 listed. In a post made today you are quoting smaller numbers for your car. Please clarify.

Thanks,

**Sterling Doc wrote:**

Charlie, I'll do my best. I was not at Miller, and did not see every dyno there, so those years are less clear.

2007 - 137, 135 (few dynos done)

2008 - 139 (first "pro-built" motor), 137 (still few dynos, second pro built motor blew up before tested)

2009, 2010 (Miller) 143, 139 (may be others)

2011 - 139, 138, 135

2012 - 141, 140.5, 136

With Nationals back at Miller, we expect a bigger turnout, and a bigger number of highly tuned cars for

2013.

This only represent cars that showed up at Nationals, not all the dynos we see and evaluate.

What question do have on the formula?

At the suggestion of John Brown, I changed how it was typed to be more mathematically correct, but it should be clear.

Altitude.

Altitude is an important factor that most of us ignore, yet it affects the engine's performance possibly more than any other element. The general formula for power loss with increases in altitude is 3 percent for every 1,000 feet above sea level. If you race in Colorado at 5,000 feet instead of in California at sea level, you can expect to lose about 15 percent of the engine's potential power output, if the engine is tuned properly.

Air is thinner at higher altitudes, which means there's less fuel-burning oxygen than at sea level. You might sense a common theme here: less air (oxygen) means less fuel to maintain the proper air/fuel ratio. So, running at higher altitudes requires a leaner mixture setting than running at sea level.

So if you were making 137 at 4000ft altitude well then you are making really big power at sea level.

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## Re: Dyno Cap for 2013 944 Spec

Posted by Sterling Doc - 31 Oct 2012 16:46

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SAE correction does attempt to correct for altitude. In raw numbers, Charlie's car was making a lot less than 137 HP at Miller (on that dyno run). Our cars altitude correction is primitive, at best, and major changes throw the cars out of tune. Re-tuning is easier than changing jets on a carb, but not automatic & precise like modern EFI systems. Our cars are 25+ years old now!

Ag Racer - well said

Charlie - its all good, we're just getting deep in the weeds. I get your point on corner exit speed. Some day, it would be interesting to sit down with data.

What I'm really liking in this thread is all the enthusiasm for getting back to Nationals!

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## Re: Dyno Cap for 2013 944 Spec

Posted by cbuzzetti - 31 Oct 2012 21:55

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It would be awesome to see 25+ cars at Miller again.

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