

ROBERTS NITROUS SERVICE

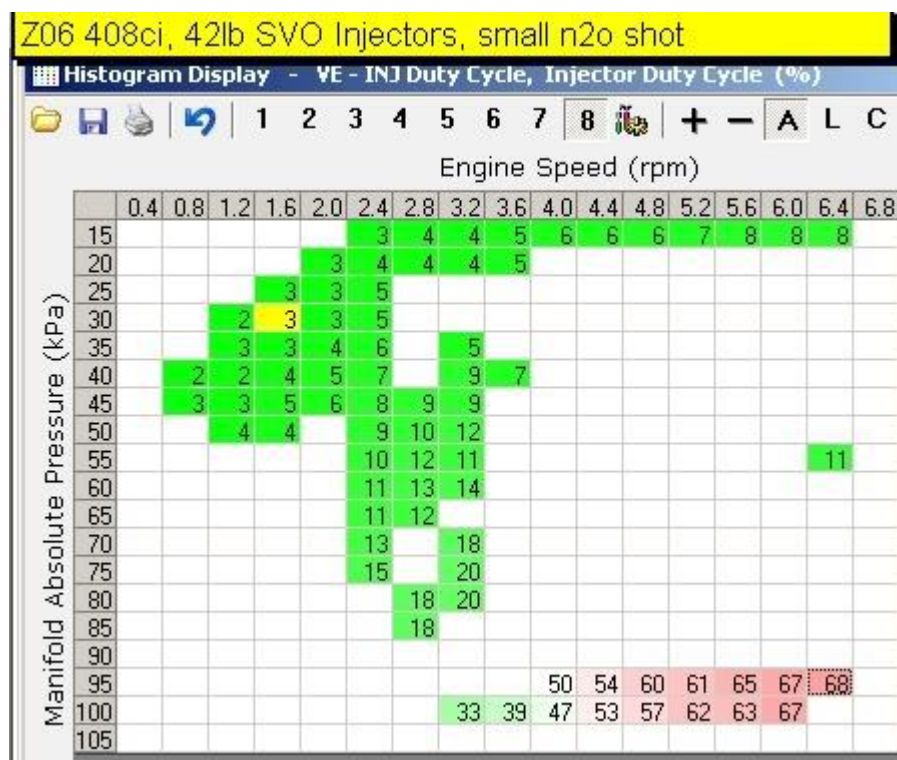
NITROUS SALES/TUNING/SET-UP/, AND GENERAL N2O INFO

INJECTOR SCALING/SIZING

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On the dry hits injectors can play a roll on whether or not we go lean (as well as a fuel pump that won't meet demands). The stock 28lb injectors, on a stock or near motor, can generally support about a 100/125hp dry shot. Though, we need to see injector duty cycle (Picture #1), as we try to keep maximum usage to about 80%, however, going over 80% for a short 1/4 run does not seem to be an issue, users choice. Another method to see if injectors are running at maximum or above is the use of a Wide Band (WB). Watching WB, if your A/F is fine at lower RPMs, but goes leaner as you go up in RPMs, then this can be an indicator of injectors running out, given a known good fuel pump. Then time for further diagnosis like checking the Injector Duty Cycle (IDC, or DC) on your tuner program.

Picture #1 These are Ford SVO 42lb injectors. Notice duty cycle as all less than the recommended 80% max, though other Histograms show much higher with bigger Dry hits.



SIZING INJECTORS: METHOD #1

The math for sizing injectors is really quite simple. We just plug in our numbers and we then receive a basic starting point. I always suggest going up in size from what the math shows; Why? Because, we all know that you'll be upsizing your dry shot.

$$(\text{BHP} \times \text{BSFC}) \div (\text{No. of Inj} \times \text{Duty Cycle}) = \text{Injector Size to meet rec 80\%}$$

Here it is in a little easier formula,

$$(\text{Projected Crank HP} \times .5) \div (8 \times .8) = \text{Inj Size}$$

or even easier

$$(\text{BHP} \times .5) \div 6.4 = \text{Inj Size}$$

BSFC is normally .5 for N/A applications, and .6 for Turbos/blowers. I use .5 for nitrous, however, you can use .55 if you like. *Note: The above bottom two formulas are for V8 engines only.*

Lets say we want to figure the Injectors I need for my projected 750rwhp. First we need to change RWHP to Flywheel or BHP. So, we need to add 15% to my rwhp number;

$$750\text{rwhp} + 15\% = 862.5 \text{ Flywheel HP}$$

So,

$$862 \times .5 = 431$$

$431 \div 6.4 = 67.34$ -lb Injectors needed to meet the recommended maximum 80% Duty Cycle.

We are in luck, as Racetrronics has just released High Impedance 80lb'ers that will work with the stock PCM. The limit with stock PCM has been 60lb'ers, and after that an aftermarket controller was needed to use Low Impedance injectors of larger size. The low impedance injectors require the use of special drivers, as they would draw too much current through the stock PCM. Remember, my calculations are conservative, but that's better than being on the edge, IMO.

One thing to point out when choosing injectors, the industry standard is to rate at 3-Bar pressure which is 43.5psi (Ford). At our pressure of 58psi just add 15% to the 3-Bar rated injector. My Ford 3-bar SVO 42lb'ers become 48.3lb'ers at my 58psi fuel pressure.

Below info supplied by MotleyDrew @ **Corvetteforum**

83lb Seimens Dekka EV1 High Impedance

83lb or 870cc/min Rated Flow also available in 750cc

High Impedance for use with stock computers

60mm O-Ring to O-Ring

ev1 (Jetronic) Electrical Connector or the new style USCAR plug as in the newer cars. No need for wire adapters. This is a modified injector (drilled out), but some other non-drilled out style coming.

4 bar of fuel pressure required to flow at full 83lbs

For LSx, Mustangs, Nitrous, Supercharged, etc.

INJECTOR SIZING: METHOD #2

Here is a spreadsheet from RedHardSupra for sizing injectors. Usefull, but for some it may be a little more difficult. Also, this is another Excel needed spreadsheet.

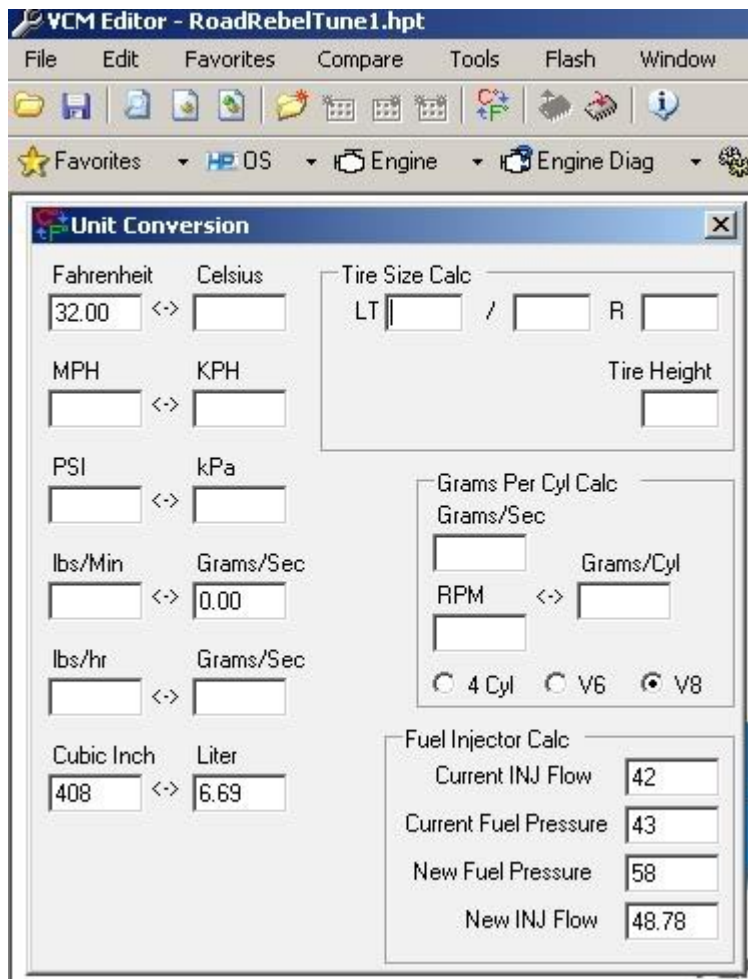
<http://www.marcintology.com/tuning/INJsize.xls> (<http://www.marcintology.com/tuning/INJsize.xls>)

INJECTOR SCALING

Step #1

First we need to convert our new injectors to a new Injector flow. What we are doing is using our Unit Conversion table in HPT, see Picture #2 below. The first thing to do is to enter your new injector data. In this case, we are scaling new 42lb Ford SVO injectors. So, we input 42 into Current INJ Flow, then Current Fuel Pressure (Ford uses 43psi) of 43, and finally New Fuel Pressure (LSx Platform 58psi) of 58. Conversion table calculates the New INJ Flow as 48.78. This means that the Ford 42lb'ers actually run as 48.78lb'ers at the LSx's higher fuel pressure. Now, we will use this data in the next step.

Picture #2



Step #2

Now we must go to Injector Flow Rate (IFR) vs KPA VAC in HPT: The value in the look up table is the injector Flow rate in g/sec, and is used to tell the PCM what size injectors are being used and also how flow rate varies with manifold vacuum.

So now we need find our common denominator to use in our Injector flow Rate vs KPA table's equation table, Picture #3. You can see the IFR Multiplier/common denominator in the box next to =, + and x, and it is 1.67. How we came up with 1.67 is an easy equation; Just take your New INJ Flow (48.78), from the Unit Conversion table above, and divide it by your INJ Flow in 0 Vacuum from your IFR vs KPA which mine was 29.14, below Pic #3. So the equation looks like this: $48.78 / 29.14 = 1.67$.

Picture #3

The screenshot shows the VCM Editor interface for a Z06 engine. The 'Fuel Control' tab is active, displaying various tuning parameters. Below the main interface, a window titled 'Injector Flow Rate vs. KPA VAC' is open, showing a table of flow rates for different manifold vacuum levels. A multiplier of 1.67 is entered in the software's multiplier field.

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Flow	29.14	29.33	29.51	29.70	29.89	30.01	30.20	30.38	30.57	30.75	30.94	31.06	31.25	31.44	31.56	31.75	31.93

Step #3

Now we need to take the multiplier and use it across the entire IFR vs KPA look up table to get our new Inj flow rate to correspond with the 42lb's. It's easy, just highlight your 29.14 box and drag it all the way across to the end and thus highlighting all the numbers in the boxes. Remember we have the multiplier in place at 1.67. Next you just hit the times (x) button, and bingo all your Flow rates become set for our new SVO 42lb injectors. Very simple indeed. Here is the new scaling I run on my Z06, Picture #4 (well actually my numbers are in reality a little different, but won't go into why at this time). Don't forget to save this tune, and name it a little different from your other tunes. I do this in a way that every step I take is a new tune saved. That way, if you make a mistake, you can go back one tune and start the new step/procedure over. I think mine is named blah, blah inj scaling #6.bin. So, it's progressive tune #6 from the stock tune in steps.

Picture #4

The screenshot shows the VCM Editor interface with the 'Fuel Control' tab selected. The 'Injector Flow Rate vs. KPA VAC' window is open, displaying a spreadsheet with the following data:

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Flow	48.67	48.98	49.29	49.60	49.91	50.10	50.41	50.72	51.03	51.34	51.65	51.90	52.21	52.52	52.70	53.01	53.32

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INJECTOR SCALING: METHOD #2

Here is a spreadsheet for scaling injectors, author unknown, and will work for any tuner program. Just transfer your results to your IFR vs KPA look up table. I have used this spreadsheet with great results. Again, Excel will be needed. I will add more info on this process, as time allows.

<http://www.marcintology.com/tuning/injectors.xls> (<http://www.marcintology.com/tuning/injectors.xls>)

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