



Q50 Q60 RED ALPHA INJECTORS

TUNING GUIDE

Introduction

The goal of AMS Performance is to provide the highest quality, best performing products available. By utilizing research and development, and rigorous testing programs AMS Performance will never compromise the quality or performance of our products. In addition, AMS Performance will only provide the finest customer service offering only parts and advice that are in the best interests of the customer. AMS Performance was built on a foundation of integrity. This is who we are; this is what you can count on.

A vehicle modified by the use of performance parts may not meet the legal requirements for use on public roads. Federal and state laws prohibit the removal, modification, or rendering inoperative of any part or element of design affecting emissions or safety on motor vehicles used for transporting persons or property on public streets or highways. Use or installation of performance parts may adversely affect the drivability and reliability of your vehicle, and may also affect or eliminate your insurance coverage, factory warranty, and/or new OEM part warranty. Performance parts are sold as-is without any warranty of any type. There is no warranty stated or implied due to the stresses placed on your vehicle by performance parts and our inability to monitor their use, tuning, or modification.

These instructions are provided as a guide only as there are many variables that cannot be accounted for concerning your particular vehicle, including but not limited to model year differences, model differences, the presence of non-OEM parts, and modifications that may already be or were previously installed. A basic knowledge of automotive parts and systems is helpful but a better understanding of the parts and systems on your particular vehicle may be required.

If you have any questions or issues at any time during the installation of your AMS Performance product(s) please call us for technical assistance. The AMS Performance tech line can be reached during business hours at 847-709-0530 for AMS Performance products only.

Table of Contents

02 Introduction

04 Injector Sizing

06 Fuel Pressure Target

09 Stratified Startup

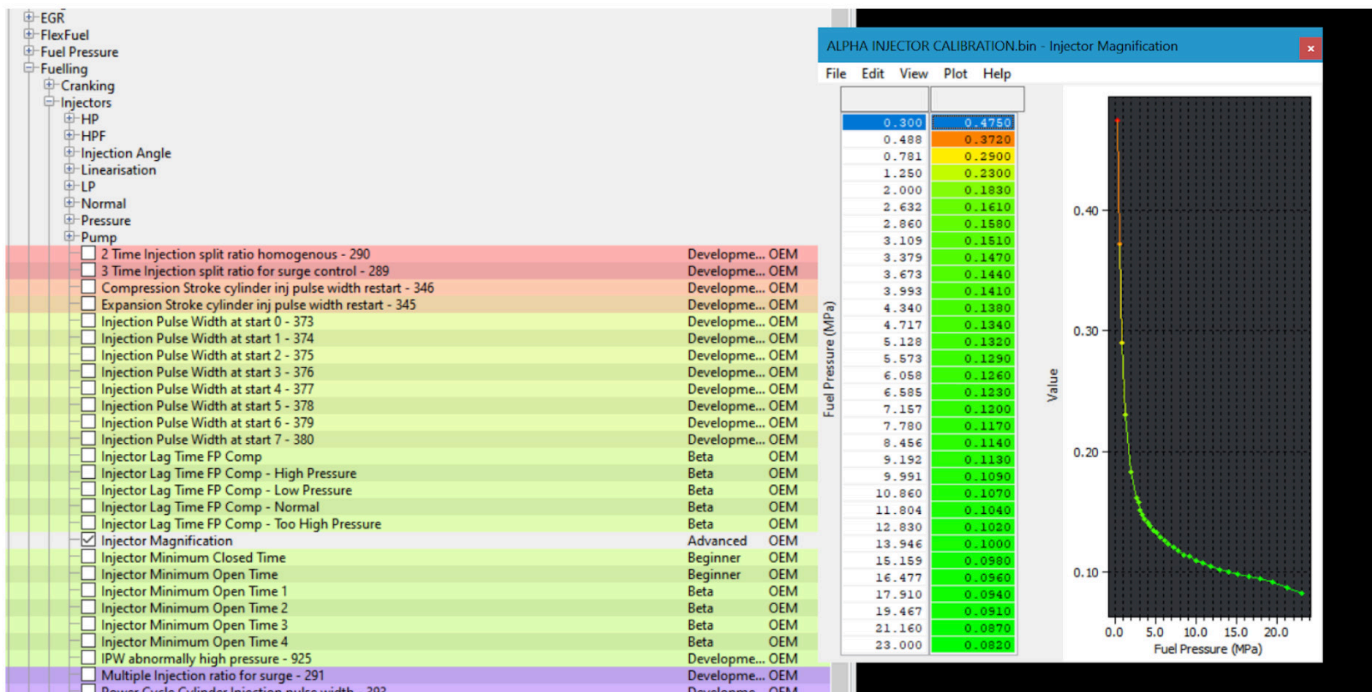
This tuning guide was made using EcuTek software. Other software may not use the same naming conventions for their tables.

ALPHA / Nostrum Injector Calibration Steps

Note: If any of these required MAPs are not available in your ROM, they may need to be requested from ECUtek. Please ensure these MAPs are present before beginning the tuning process.

1. Injector Sizing

- Calibration of the ALPHA/Nostrum KDI injectors requires modification of the calibration data in the injector data table “Injector Magnification.”
 - This calibration table works very similarly to a standard injector scale table for a port injected vehicle. Coarse global fueling adjustments can be made here in respect to injector flow rate changes.
 - This Calibration Table is in the Folder as shown in the screen capture below.
 - Please note, the ALPHA/Nostrum KDI injectors flow approximately ~40% more fuel than the stock injectors and a coarse “Injector Magnification” adjustment could be made to accommodate this, however we
 - recommend the starting point for this calibration table be directly transposed from the data that is provided with your injector purchase.
- 1. Injector calibration from one matched set of 6 injectors may differ slightly than another matched set of 6. Please keep this in mind when calibrating.**



2. Injector Drive Current

- Calibration of the ALPHA/Nostrum KDI injectors require modification of the calibration data in the injector data tables responsible for injector drive current.
- The ALPHA/Nostrum KDI Injectors for the VR30DDTT engine require a higher drive current than stock to open fully. The recommended drive currents are listed below:

	<i>High Pressure Fail</i>	<i>High Pressure</i>	<i>Normal</i>	<i>Low Pressure</i>
<i>Peak Current</i>	16.4	15.4	14	12
<i>Hold 1</i>	7	6.6	5.4	5.4
<i>Hold 2</i>	3.6	3.6	3	3

- The ALPHA/Nostrum KDI Injectors for the VR30DDTT engine also require the highest drive current to be utilized at a lower injection pressure.

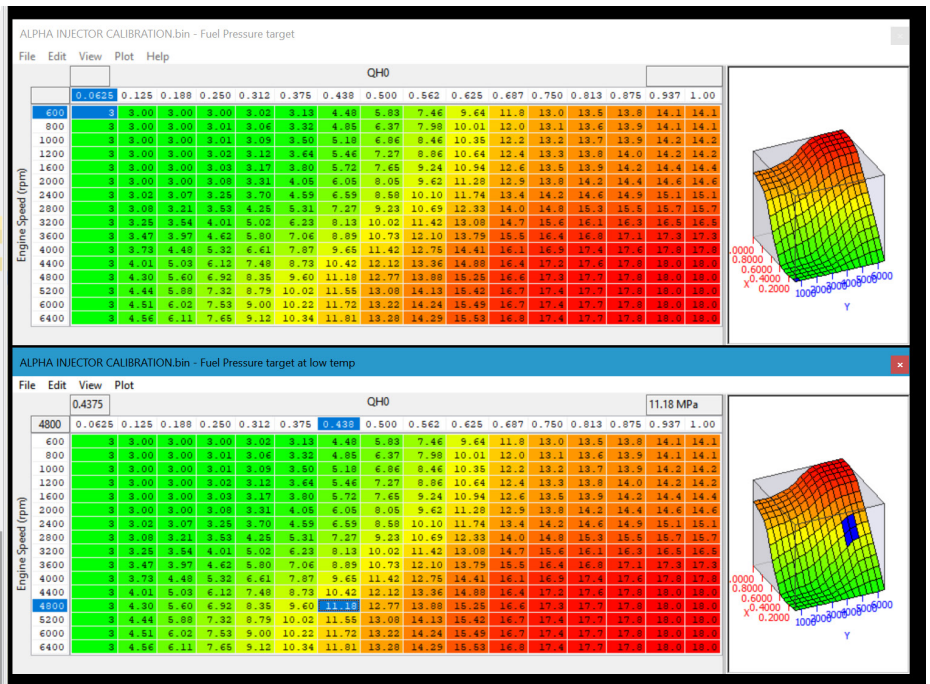
1. The recommended value for this pressure threshold is 20MPa.

- These Calibration Tables are in the following folders as shown in the screen capture below.

The screenshot displays a software interface for injector calibration. On the left, a tree view shows the calibration structure under 'Fuel Pressure', 'Fuelling', and 'Pressure'. The 'Pressure' folder is expanded, showing sub-folders for 'High Pressure', 'Low Pressure', 'Normal', and 'Fuel Pressure - Peak Injector Current'. The 'Fuel Pressure - Peak Injector Current' folder is selected, and its contents are shown in a table below. The table lists parameters such as 'Peak Current (A)' and 'Hold Current (A)' for different pressure conditions. The values are: High Pressure (Peak: 15.4, Hold 1: 6.6, Hold 2: 3.0), High Pressure Fail (Peak: 16.4, Hold 1: 7.0, Hold 2: 3.6), Low Pressure (Peak: 12.0, Hold 1: 3.4, Hold 2: 3.0), and Normal (Peak: 14.0, Hold 1: 5.4, Hold 2: 3.0). The 'Fuel Pressure (MPa)' is set to 20.0.

3. Fuel Pressure Target

- Calibration of the ALPHA/Nostrum KDI injectors require modification of the calibration data responsible for fuel rail pressure targets.
 - Adjustment of the fuel pressure target tables is required as the nominal operating pressure of the ALPHA/Nostrum KDI is lower than that of the factory injectors. This is due to design characteristics that affect all GDI Injectors.
1. **GDI injectors have a max pressure at which the force of the fuel can prevent the injector from opening, and we need to be sure that this pressure is not reached.**
 2. **Pressures above approximately 24 MPa may prevent the injector opening thus it is important to have adequate fuel pressure control to limit pressure oscillations.**
- AMS and Nostrum recommend targeting a maximum fuel pressure of 18 MPa on all three fuel pressure tables as shown in the screen capture below.
 - AMS and Nostrum also recommends that the fuel pressure target near idle and low rpm, low load cruising be lowered to 3MPa and that the fuel pressure target does not rise or fall during idle operation.
1. **This will ensure a more consistent injection quantity at low load and low injector pulse-width to prevent any AFR oscillations.**



4. Narrow Injector Pulse Width

- Calibration of the ALPHA/Nostrum KDI injectors require modification of the Injector calibration data responsible for narrow fuel injection pulse width compensation.
- The “Narrow IDW” tables correct for the non-linear injector flow target characteristics at low injector pulse widths.
- These tables are specific to the OEM injectors and for this reason they should be zeroed out when changing injectors.
- These Calibration Tables are in the folder as shown in the screen capture below.

The screenshot displays a software interface for injector calibration. On the left is a tree view of parameters, and on the right are eight graphs showing Pulse Width (ms) vs Time (ms) for different conditions.

Name	User Level	Origin
Linearisation		
<input type="checkbox"/> Fuel Pressure High - High Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure High - Idle Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure High - Low Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure High Target - High Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure High Target - Idle Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure Normal - Idle Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure Normal - Low Threshold	Beta	OEM
<input type="checkbox"/> Fuel Pressure Normal Target - High Threshold	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW High Target Fuel Pressure - Normal Pressure	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW High Target Fuel Pressure - Pressure too high	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Idle Target Fuel Pressure - High Pressure	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Idle Target Fuel Pressure - Normal Pressure	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Idle Target Fuel Pressure - Pressure too high	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Low Target Fuel Pressure - High Pressure	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Low Target Fuel Pressure - Normal Pressure	Beta	OEM
<input checked="" type="checkbox"/> Narrow IPW Low Target Fuel Pressure - Pressure too high	Beta	OEM
LP		
<input type="checkbox"/> Normal		
<input type="checkbox"/> Pressure		
<input type="checkbox"/> Pump		
<input type="checkbox"/> 2 Time Injection split ratio homogenous - 290	Developme...	OEM
<input type="checkbox"/> 3 Time Injection split ratio for surge control - 289	Developme...	OEM
<input type="checkbox"/> Compression Stroke cylinder inj pulse width restart - 346	Developme...	OEM
<input type="checkbox"/> Expansion Stroke cylinder inj pulse width restart - 345	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 0 - 373	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 1 - 374	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 2 - 375	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 3 - 376	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 4 - 377	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 5 - 378	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 6 - 379	Developme...	OEM
<input type="checkbox"/> Injection Pulse Width at start 7 - 380	Developme...	OEM
<input type="checkbox"/> Injector Lag Time FP Comp	Beta	OEM
<input type="checkbox"/> Injector Lag Time FP Comp - High Pressure	Beta	OEM
<input type="checkbox"/> Injector Lag Time FP Comp - Low Pressure	Beta	OEM
<input type="checkbox"/> Injector Lag Time FP Comp - Normal	Beta	OEM

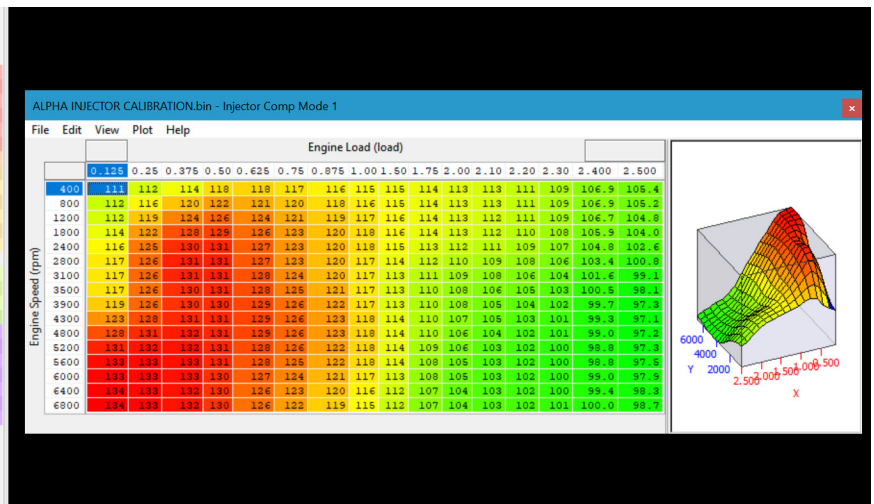
The graphs on the right show Pulse Width (ms) vs Time (ms) for various conditions. Each graph has a table of data points:

Pulse Width (ms)	Time (ms)
0.350	0.00000
0.450	0.00000
0.501	0.00000
0.600	0.00000
0.701	0.00000
0.800	0.00000
0.901	0.00000
1.000	0.00000

5. Base Fueling Compensations

- Calibration of the ALPHA/Nostrum KDI injectors require careful consideration of the calibration tables responsible for fine tuning fueling.
 - These tables are labeled “Injector Comp Mode 1,2,3,4) and as shown in screen capture.
 - It is worth noting that if you have previously applied fueling compensations utilizing these calibration tables due to the modifications on the car or oxygenated fuel, this may be a good place to start for fine tuning your new set of injectors.
1. If you are unsure of your current “Injector Comp” calibration, please “zero” the table out where all cells are equal to 100 as this will apply no fueling corrections and work well as a starting point.

- Fuel Pressure
- Fuelling
 - Cranking
 - Injectors
 - AFR Conversion Table Bank 1 Advanced OEM
 - AFR Conversion Table Bank 2 Advanced OEM
 - AFR for stratified FB equiv ratio conv - 088 Developme... OEM
 - AFR for stratified FB equiv ratio conv - 089 Developme... OEM
 - AFR Target - Max at WOT Advanced OEM
 - Bfs Correction Developme... OEM
 - Cylinder intake basic characteristic Developme... OEM
 - Fuel Enrichment Developme... OEM
 - Fuel Map Beginner OEM
 - Fuel Map - safe mode Beginner OEM
 - Fuel Map Mode 2 Intermediate RaceROM
 - Fuel Map Mode 3 Intermediate RaceROM
 - Fuel Map Mode 4 Intermediate RaceROM
 - Injector Comp Mode 1 Beginner RaceROM
 - Injector Comp Mode 2 Intermediate RaceROM
 - Injector Comp Mode 3 Intermediate RaceROM
 - Injector Comp Mode 4 Intermediate RaceROM
 - Intake theoretical flow Developme... OEM
 - Target AFR idle RO2 off - 021 Developme... OEM
 - Target AFR initial RO2 off - 020 Developme... OEM
 - Target AFR prop factor during CAT diag 1 - 433 Developme... OEM
 - Target AFR prop factor during CAT diag 2 - 434 Developme... OEM
 - Target AFR proportional Factor - 828 Developme... OEM
 - Target AFR proportional Factor - 829 Developme... OEM
 - Target AFR RO2 off - 019 Developme... OEM
- Gear Ratio
- Gear Shift
- Idle Control
- Ignition Timing
- Launch Control
- Limiter

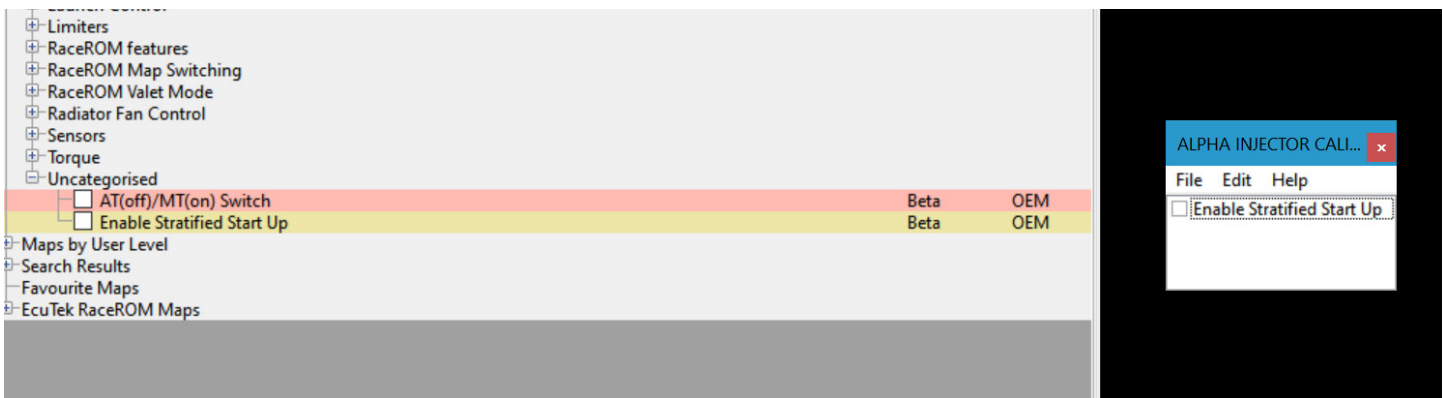


SC#5

6. Stratified Startup

- Calibration of the ALPHA/Nostrum KDI injectors require the toggle “Enabled Stratified Startup) to be disabled. (not checked)
- Leaving this table “checked”, will cause poor cold and warm startup conditions.

This is due to the very narrow pulse width of the factory startup, split injection, and injection angle of the startup. Under these conditions, the Alpha injectors would be commanded to inject such a small amount of fuel per injection stage that there can be a discrepancy between the amount of fuel being commanded for injection, and the amount of fuel actually injected.



Option	Beta	OEM
<input type="checkbox"/> AT(off)/MT(on) Switch	Beta	OEM
<input type="checkbox"/> Enable Stratified Start Up	Beta	OEM

7. Fine Tuning

- After you have completed all the previous steps it's time to start the engine and start tuning.
- Dialing in your new injectors to maintain a target AFR with minimal fuel trim corrections will be an iterative process of driving at various engine speeds and engine loads and reviewing your datalogs.
- The first task you should work on is fine-tuning the injector magnification table.
 1. **You will want to calibrate this table so that the average of the fuel trims at each fuel pressure is within +/- 10%.**
 2. **This injector magnification curve should remain quite smooth**
- If your collected data suggests otherwise you can make up for it in the next step using the injector compensation table.
- Secondary fuel adjustments after adjusting the "Injector Magnification" table will be taken care of in the previously mentioned "Injector Comp" tables.
 1. **Adjustments to this table should have smooth transitions for good drivability.**
 2. **Please reference SC#5 for the location of this table, and for the smoothness of the data.**

Any questions or concerns that are not outlined in this tuning guide shall be forwarded to your AMS sales representative. Thank you and enjoy!