RED ALPHA α
BY ALPHA PERFORMANCE

ALPHA α

Q50 Q60 RED ALPHA INJECTORS
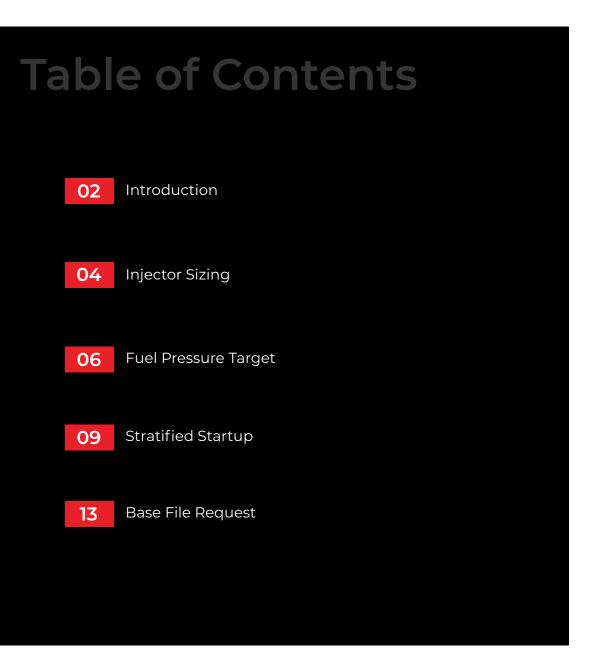# TUNING GUIDE

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

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.**

SC#1

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:

	High Pressure Fail	High Pressure	Normal	Low Pressure
Peak Current	16.4	15.4	14	12
Hold 1	7	6.6	5.4	5.4
Hold 2	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.

SC#2

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.**

SC#3

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 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.

SC#4

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.**

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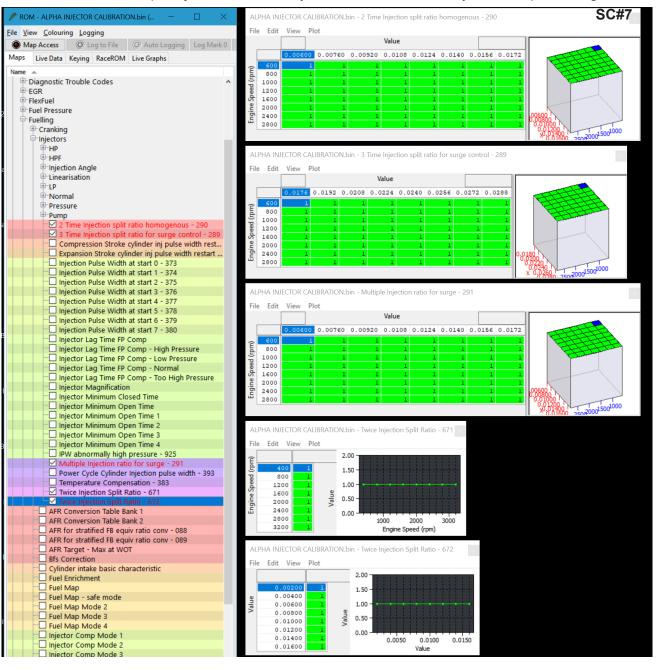
This is due to the very narrow pulse width of the factory startup, split injection, and injection angle of the startup. Under these conditions, the Alpha injectors would be commanded to inject such a small amount of fuel per injection stage that there can be a discrepancy between the amount of fuel being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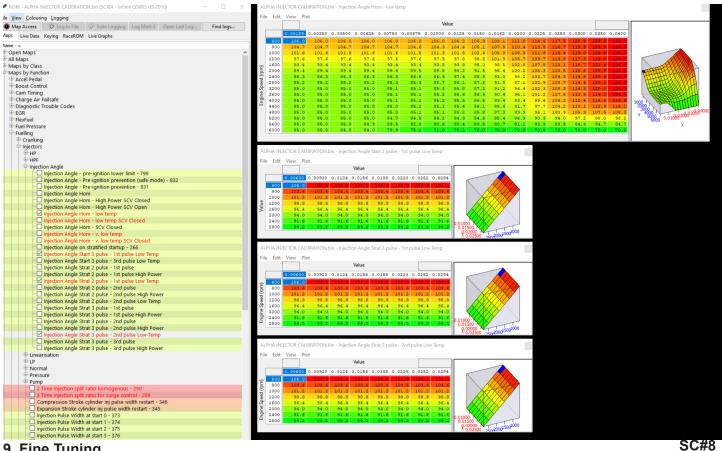
7. Turn Off Split Injection (Optional)

1. If you are experiencing some stumbling or misfires at lower rpm and higher load or when transitioning from lower to higher load, you may be experiencing missed injections due to very low pulse widths introduced by the ECU splitting the main injection pulse into either two or three injections during a single combustion cycle.

• If you log the "Injection Pulse Width 1,2 and 3", you will se when the ECU is changing modes, and you will also see some very small pulse widths.
• As known with larger injectors on other platforms, its generally understood that larger injectors are not as precise when injection pulse widths are very small. This is also true with the Alpha KDI injectors for the VR30, and therefor the split injection modes may need to be turned off if you are experiencing issues.

10. AMS Fuel Sensor Upgrade Offset & Multiplier Values

The "Offset" and "Multiplier" values are only for customers that have replaced their OEM fuel sensor with the AMS Red Alpha High Pressure Fuel Sensor (ALP.28.07.0010-1) on the direct injection rail.

Offset (MPa) = - 4.3

Multiplier (MPa/V) = 6.30

Codes That May Appear During Installation:

Turning off these codes ensures that the ECU will not falsely throw a DTC when running the Alpha FPS. The reasoning for turning off these codes, is that during normal operation the voltage from the sensor will differ from that of the factory sensor. The ECU compares these new sensor voltage readings to a known value range for diagnostics, and since the voltage differs from the predetermined diagnostic thresholds, error reporting function is then determining an error and reporting the DTC. Ideally, the better route for calibration other than turning off the codes would be to calibrate the diagnostic thresholds for the fuel pressure sensor, but these tables are currently unavailable in the current software revision.

• P0193 - Fuel rail pressure sensor "A" circuit high
• P119C - FUEL PRESSURE SENSOR (Fuel pressure sensor)

11. Base File Request

• If you are not comfortable with adjusting the tables or do not have access to some of the tables outlined in this document, please let us know by emailing your AMS sales representative.
• Please provide your current calibration ID and the injector magnification calibration that was provided with the injectors.
• We are more than willing to help assist with any injector calibration needs.

Any questions or concerns that are not outlined in this tuning guide should be forwarded to your AMS sales representative.

Thank you and enjoy!