U-Tune

Supplement
by
Gadget

URD Additional Injector Calibrators

INTRODUCTION:

URD has several Additional Injector Calibrators (AIC). They are used to fuel engines converted to forced induction.

The concept is simple: Let the stock engine control unit (ECU) and fuel system control the engine during cold start, warm up, and normal driving. When the boost exceeds the stock ECU and fuel system capability to properly control and fuel the engine, the additional injector(s) activate, adding fuel to maintain the desired fuel mixture. This approach yields OEM like drivability and fuel economy in normal operation, and it allows you to properly fuel and tune your aftermarket forced induction system.

In the past AIC units where crude in operation resulting in uneven cylinder fuel distribution. Most systems only fired the injector once per engine revolution. A V8 engine will have 4 intake events per revolution and a V6 engine will have 3 intake events per revolution. If a V8 engine has 4 cylinders requiring fuel and air at slightly different times, and an additional injector is firing only once, there is a potential problem with even fuel distribution. URD's AIC units are very advanced and we can match the cyclic rate of the additional injector to the engine's intake events. The results in much more even fuel distribution to all cylinders. URD's AIC units control the additional injector(s) using a true three dimensional map table providing you with very precise fuel control.

All URD AIC units use an internal high precision Manifold Absolute Pressure Sensor (MAP). This is utilized for the load scale input for the high resolution tuning map table.

Many URD's AIC units calibrate ignition timing to supress any boost induced spark knock. This can be VERY critical to preventing engine damage especially on newer higher compression engines that use lightweight pistons and other lightweight internal components.

This guide is meant to be a supplement to URD's U-Tune Guide. Before attempting to tune your AIC unit you should download and read the entire U-Tune Guide for MAF/Timing Calibrators. There is a lot of background information in that guide that you must know before you start tuning.

APPLICATION:

The URD AIC Unit will function on most any engine. All that is needed is a 12+ volt ignition switched power source, a negative ground source, a proper Tach/RPM signal from the ignition system, and a Vacuum/Boost from the intake manifold for the internal MAP sensor.

The URD AIC/Timing Calibrators are engine specific. The ignition timing calibration circuits are designed to work on specific engines. Units are available for most all of the current production Toyota engines.

This is a picture of the URD AIC unit that does not have timing calibration. It is a plastic box and the top cover is removed to access the serial port for tuning.

This is the URD AIC/Timing Calibrator. It has timing control and is enclosed in a high quality anodized aluminum case. The serial connection is on the end of the case.

AIC MODEL AND APPLICATION INFO:

Model AIC	Basic 2 injector (plastic case)
Engine	5VZ-FE 3.4 V6 1MZ-FE 3.0 V6
Year	All
Engine Settings	3 Cylinders / 2 Stroke
Map A Controls	Primary injector
Map B Controls	Second injector or water injection

Model AIC	Basic 2 injector (plastic case)
Engine	2UZ-FE 4.7 V8
Year	2000-2004
Engine Settings	2 Cylinders / 2 Stroke
Map A Controls	Primary injector
Map B Controls	Second injector or water injection

Model AIC	Basic 2 injector (plastic case)
Engine	2RZ-FE 3RZ-FE
Year	1995-2004
Engine Settings	2 Cylinders / 2 Stroke
Map A Controls	Primary injector
Map B Controls	Second injector or water injection

Model AIC	6 injector controller (URD Turbo Port Fueler)
Engine	5VZ-FE
Year	1995-2004
Engine Settings	6 Cylinders / 4 Stroke
Map A Controls	Nothing
Map B Controls	All 6 Injectors

Model AIC/Timing Calibrator	AIC with Timing Control
Engine	5VZ-FE 3.4 V6, 1MZ-FE 3.0 V6, 1GR-FE 4.0 V6
Year	All
Engine Settings	3 Cylinders / 2 Stroke
Map A Controls	Timing Calibration
Map B Controls	Injector control

Model AIC/Timing Calibrator	AIC with Timing Control
Engine	2UZ-FE 4.7 V8
Year	All
Engine Settings	4 Cylinders / 2 Stroke
Map A Controls	Timing Calibration
Map B Controls	Injector control

INSTALLATIO N:

The URD AIC Units should be installed inside the dash and connected according to URD's vehicle specific connection guide. All connections to the ECU harness should be soldered to ensure proper operation.

Installation inside the dash is critical to prevent RF interference entering the harness and causing unwanted performance issues. This is critical for ignition timing calibrator units. It will also protect the units from excessive mositure and heat from the engine compartment.

The vacuum line must be connected to a port on the engine's intake manifold that will provide a proper boost/vacuum signal. Without this the internal MAP sensor will not operate correctly.
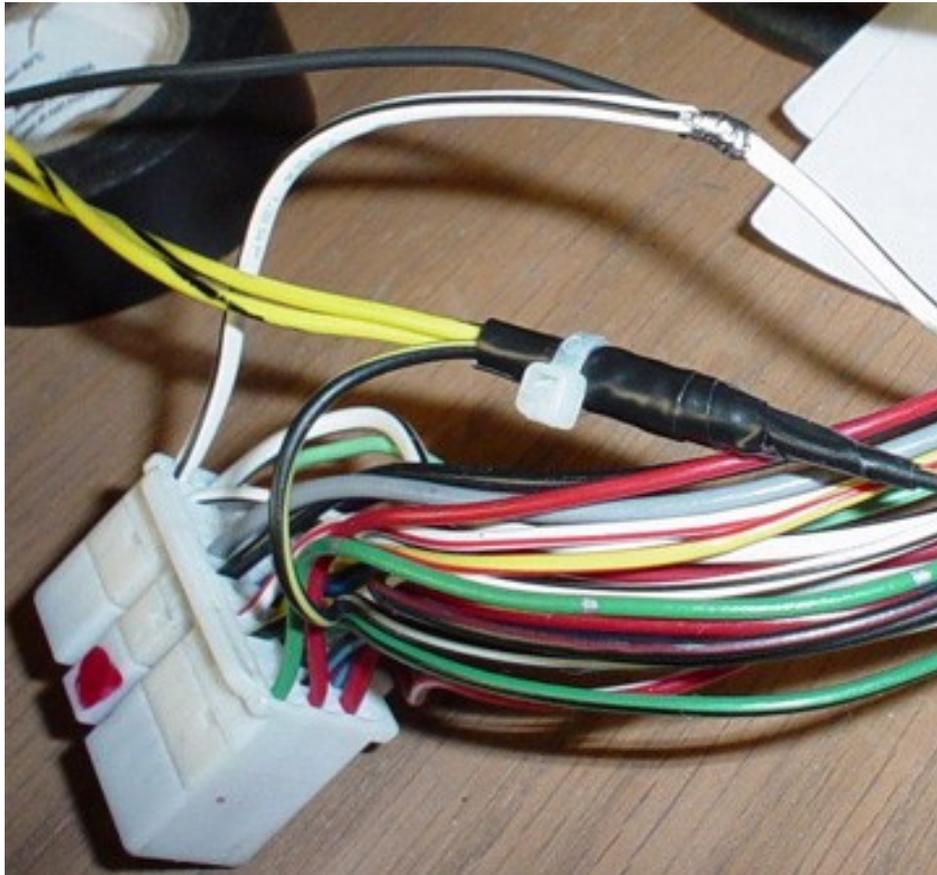
This is an example of a TAP connection. Notice how the insulation has been pealed back on the White wire w/Black Stripe to expose the wire. The Black PCU wire has been wrapped around the first wire and then soldered to complete the connection. The connection should then be wrapped in high quality electrical tape (3M). Then a wire tie should be wrapped around the tape to ensure it can never come off. You can see a completed TAP connection where the Yellow w/Black Stripe PCU wires have been tapped into Black w/Yellow Stripe ECU wire.
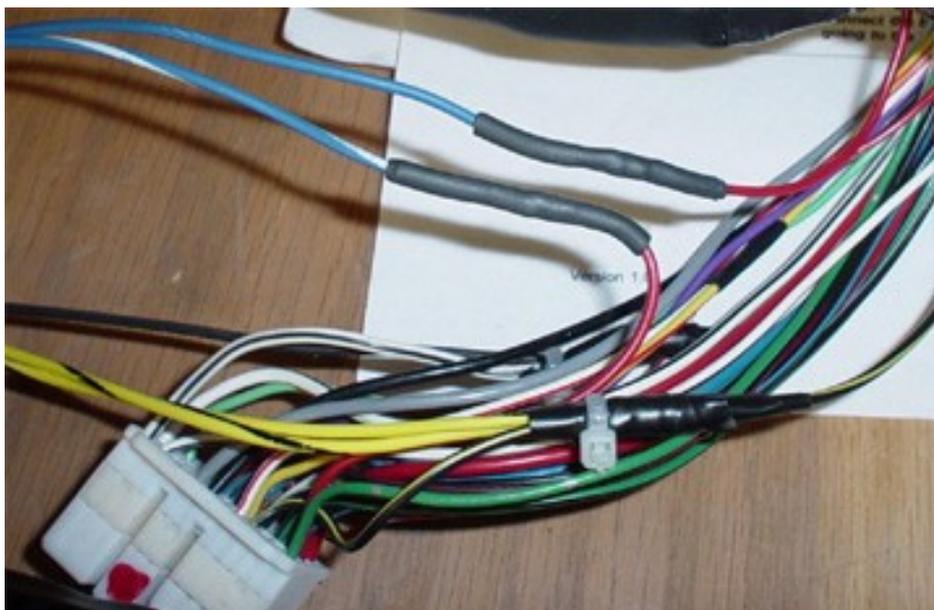
This is an example of a splice connection. Note how the timing signal wire has been cut. That leaves two ends of the wire. That signal must be passed through the PCU to be modified. So in this picture the wire without the stripe is soldered to the signal wire and carries that signal into the PCU. The signal is modified and then comes out of the PCU and is soldered to the wire going to the PCU plug. Each PCU and engine ECU is different. Follow the vehicle specific connection guide for your PCU and ECU to get the correct wire color codes and plug and pin location.

SETUP:

The URD AIC with Timing Retard Calibrator is programmed using the R4 tuning software. You will need a Windows PC with a serial port to connect to the Calibrator. You will also need a wideband sensor and display unit so you will know what the air/fuel ratio is. This will allow you to see how your changes are affecting the mixture.

Load the tuning software on your PC and then connect to it with a true serial cable. The metal cased units have the serial connection on the end of the case.

The units with plastic cases have the serial connection inside of the box. You will need to remove the top cover to expose the serial connection port.
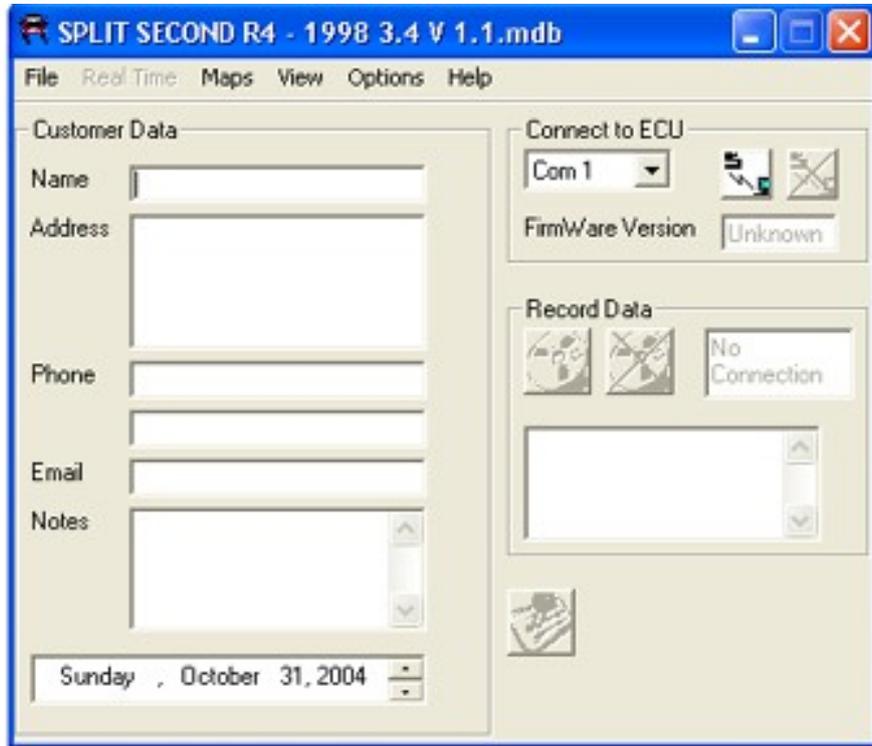
This is the main page of the Split Second R4 tuning software.

The first thing to do is the initial setup of the tuning software. Open the R4 Tuning software in your Windows PC and:

1. Click on FILE in the menu and select NEW CUSTOMER.

2. TYPE whatever name you want for the new file you are creating and click SAVE.

3. Click FILE and OPEN CUSTOMER.

4. SELECT the file that you just named.

This will open a new map in the R4 Tuning software. Now you must configure the basic settings:

1. CLICK on OPTIONS in the menu.

2. Select SYSTEM SETTINGS. In DISPLAY MODE select VACUUM/PRESSURE and in APPLICATION select ADDITIONAL INJECTOR CONTROLLER. Now close that window.

3. Click on OPTIONS in the menu.

4. Select ENGINE SETTINGS, and then select the ***CORRECT*** number of cylinders and stroke for your engine for you engine form the engine list in the APPLICATION section of this guide. This is usually very different from what you expect. Then close out that window.

   NOTE: When you first start the engine with the AIC connected to your PC check the RPM reading and make sure it is correct. Some Toyotas are a little different in how the ignition system is setup and we will have to adjust for that to get the correct RPM reading. For example the V6 will require a setting of 3 cylinder 2 stroke to get the proper RPM reading and match the injector cyclic rate to engine intake events.

If your URD AIC or AIC/Timing Calibrator was preloaded with a "startup" map, you will need to pull the preloaded map out of the AIC to your PC. To do this:

1. Connect your PC to the Calibrator with a true serial cable. Select the proper serial port. Turn on the vehicle ignition key to power up the Calibrator, and then click on the CONNECT TO ECU button. This will connect you to the Calibrator. The disconnect button should become active once the connection is made.

   TIP- Do not connect your Windows PC to the AIC until AFTER the PC has finished booting. If it is connected while it is booting up, the Windows "Plug-N-Play" will think the AIC is a mouse and try to install it as such. This will conflict with your current mouse and you will see the cursor go nuts and constantly jump all over the place rendering your PC useless. If you have this happen, disconnect from the Calibrator and reboot to clear the problem.

2. Click on MAPS in the menu and select FUEL MAPS. This will open the map page.

3. In the upper left corner of the map page are two buttons. One will write data to the ECU (AIC) and one will read data from the ECU (AIC). You

want to click on the "READ DATA FROM ECU" button. This will pull the map from the AIC to your PC so you can start tuning.

4. Go back to the OPTIONS menu on the main page and make sure none of the previous settings have changed. These settings DO NOT download from the AIC and if you don't have them properly set, when you write back to the AIC it will change them in the AIC and you will have some strange things happen that you do not want.

It is recommended that you save a copy of the map as a backup in a safe place before doing any editing. This way you can get back to where you started if necessary.

If your unit was not shipped with a preloaded startup map you will need to clear the diagnostic test map form the unit. The diagnostic test map is loaded as part of a final quality control check. The test map is loaded and then the unit is run on an automatic test stand to ensure it performs as it should prior to shipping to you. This test map is not a map that you will want to attempt to operate the engine on. Here is how to do this:

1. Connect to the AIC using the above steps stopping with number 2 in the section just before this one.

2. Select map A and then click in the upper left corner of the map. Like a spreadsheet program this will highlight every cell in the map.

3. Find the button called "FILL SELECTED" and CLICK on it.

4. TYPE 0 (zero) in the box that opens and click OK. This will put a value of 0 (zero) in every cell on the map.

5. Select map B, and do the same as above filling all the cells with a value of 0 (zero).

6. Now, locate the second button from the left labeled "WRITE DATA TO THE ECU (AIC)" and CLICK on it. This will write the map you just made to the AIC. It will take a few seconds to complete.

With all the URD AIC and AIC/Timing Calibrator units a map cell value of ZERO is the OFF or NEUTRAL setting. With all the cells set to ZERO the unit will do nothing. Anything above ZERO things start to happen.

Remember that the function of the maps changes depending on what unit you have. Review the info in the APPLICATION section of this guide for which map controls what in your specific unit.

On the INJECTOR CONTROL map, the cell value of ZERO has the injector turned off. Any value above ZERO activates the injector in millisecond on time. A fuel injector is either open or closed and there is nothing in between. Another important thing to remember is response time. It takes a minimum amount of time for the command to get to the injector and have it respond and actually open. This minimum time for most injectors is 1.1 milliseconds. Any value less then 1.1 in the map cell will essentially do nothing for you because the injector cannot function in a time less then that. Use no value on the injector control map that is less than 1.1 milliseconds. That covers the minimum on time. There is also a maximum on time.

The duty cycle of the injector is determined by the ratio of the time it is on to the time it is off. An injector that is completely off is at 0% duty cycle. An injector that is on all the time and is not off at all is at 100% duty cycle. If the injector is on the same amount of time it is off, then that is a 50% duty cycle. The important thing to remember here is that once 100% duty cycle is reached, inputting a map cell value that is larger will not accomplish anything. No mater what you do 100% is the absolute physical limit of injector flow. If you have reached 100% and are not getting enough fuel into the engine you will need a larger injector or more injectors. You also will need to make sure that your fuel pump is flowing enough fuel to sufficiently supply the injectors with the fuel they need.

There is an injector duty cycle display built into the injector map table. If you click the mouse on a specific map cell the duty cycle for that cell will be displayed in the upper left corner of the map, but depending on how you have the software setup, it may not be accurate and you will have to correct it. If you have a V6 engine and have the engine settings in the software set to 6 cylinder, 4 stroke it will read correctly. However that is not how we set the engine settings in most applications. The normal settings we use for the V6 applications is 3 cylinder 2 stroke. With our recommended alternative settings, you will need to double the duty cycle displayed to get the correct duty cycle. For example if it is displaying 32% the actual duty cycle is 64%. This applies to all of the recommending alternative settings we use. The URD 5VZ Turbo Port Fueler will use the actual engine type settings (6 cylinder, 4 stroke) and the duty cycle display will read correctly.

Concept behind ignition timing calibration:

Before we speak about ignition timing, it is important to understand how the stock system works and what the knock threshold is.

The stock system is dynamic and it is constantly adjusting the ignition timing to keep it as far advanced as possible and keep it right at the knock threshold. This gives you the best performance and the best fuel economy.

The knock threshold is the point where there will start to be some spark knock. The engines knock sensors pick up spark knock and when the ECU sees that spark knock is starting to occur it will reduce the ignition timing slightly. Then after a programmed period of time will start advancing the timing again until it sees knock and the process repeats, many times a second. Just remember the ignition timing is dynamic. This means it is constantly self-adjusting and the ECU keeps the timing right at the knock threshold.

Now lets talk about some things that affect the knock threshold. In our test engine the ignition timing will usually be about 20 degrees advance at Wide Open Throttle (WOT) and redline. The normal things that affect the knock threshold are the octane level of the fuel, the fuel mixture, induction air temperatures, engine temperatures, compression ratio and so on.

Now we stuff in 6 PSI of boost in this same engine with a centrifugal supercharger that builds boost as the engine RPMs increase. The ECU is now reporting that the ignition has dropped to 14 degrees of advance with a reduction of 6 degrees.

With forced induction installed on our test engine pushing in 6 PSI the cylinder pressure has increased and that has made the cylinder charge more prone to knock. This causes the knock threshold to be much lower then on the stock engine. The ECU is still doing its dynamic ignition timing adjustments, and has self adjusted the ignition timing down to the new knock threshold.

You might get the impression that the ECU can handle the ignition timing all by its self with a forced induction conversion. It might, but if it cannot, it may lead to an engine failure. The problem is that the stock ECUs are not programmed to run properly with a forced induction conversion and was not intended to do so. Because of this, there is usually a very limited amount of adjustment range that the ECU has to adjust the ignition timing. When that range is used up, it cannot retard the timing any more, and if you need more then you can have an engine failure.

When tuning the ignition timing your goal is to restore the ECUs internal adjustment range so it will have sufficient control authority to prevent boost induced spark knock. Remember in our stock test engine it was 20 degrees

advance at WOT and full RPM? Then we boosted it with 6 PSI and it dropped to 14 degrees. We have used up 6 degrees of its internal retard range. What if it only has 7 degrees available and you go boosting on a hot day? You can easily use up what is left and drive down the road knocking and pinging and destroying your engine. Our goal in tuning the ignition system is to restore the ECUs full internal adjustment range so you will have a sufficient safety margin. We call this the safety window.

You may have some people tell you if you add in retard, you will loose power. Not so. You are not changing the knock threshold; you are just restoring the ECUs adjustment range or the safety window.

When setting up your base timing map you already know that at full boost (6 PSI), full RPM our test engine has reduced the knock threshold by 6 degrees. So, find the pressure column that corresponds to the 6 PSI level and put 6 degrees in that column.   Find the ZERO pressure column and put ZERO throughout the whole column. Now highlight the ZERO column and all the way out to the 6 PSI column. Select the AUTOFILL function and the tuning software will populate the table automatically scaling the retard between the two points.

You do not want to have all ZEROs past the point of max boost just incase something goes wrong and you have a boost spike you will have enough retard needed. Populate the rest of the boost section of the table using the same concept all the way to the end of the map. Write that new map to the Performance Calibration Unit.

When you first drive the truck you will see that your scan tool will show that the ignition timing will slowly move back to near the same timing advance you had on the stock engine. It may take a few runs or more for it to self adjust back the knock threshold, but it will.

When the ECU gets the timing back to the knock threshold, you need to interpret what the scan tool is telling you. If the scan tool is telling you that the ECU timing is 20 degrees advanced, and you have 6 degrees of retard dialed in, your true timing is 14 degrees. As long as you understand this tuning will be much easier for you.

Different types of forced induction systems build boost differently. A positive displacement supercharger will make max boost at very low RPMs. With this type of supercharger you may need to use more retard in the lower RPMs to prevent boost induced spark knock. This may be more then you need in the upper RPMs so tune accordingly.

Turbochargers may not make any boost at lower RPMs and then suddenly spool and make a lot of boost. The peak boost may be inconsistent depending on how the truck is being driven and this may make proper ignition tuning a little more difficult.

You may hear some people tell you that you can make more power if you advance timing. On a stock engine that has been converted to forced induction you have already reduced the knock threshold. You also know that there is a limited adjustment range programmed into the stock ECU. On our test engine, remember it was 20 degrees advance stock. When we boosted it to 6 PSI the knock threshold dropped to 14 degrees and we used up 6 degrees of its internal adjustment range. Now what will likely happen if you jack in 6 degrees advance instead of retard? Well, since you are not directly affecting the knock threshold, you will force the ECU to retard another 6 degrees to keep the timing at the knock threshold. Does the ECU have another 6 degrees of retard ability left in it? Not likely.

When you take a stock engine, install a forced induction system on it, then advance the ignition timing, you are making an expensive bomb. I suggest that you stay away from this. If you want to test a tuner's knowledge when he tells you to advance timing with a forced induction conversion, simply ask him this question, "how do you alter the knock threshold by advancing timing?" Sit back and enjoy his answer…

Now you should have a very good understanding on how the stock ignition system works and how to tune your aftermarket ignition timing calibrator.

There is a fairly inexpensive tool that you can install and use to keep an eye out for any boost induced spark knock. We are pretty fond of the KnockLite from XS Turbo. This device interfaces with your stock knock sensors and give you a warning light if knock is detected. You may be surprised how many times your engine knocks without you hearing any of it.

TUNING:

Injector Calibration:

The very best way to start your tuning is to learn how your vehicle operates while STOCK. Before you start making substantial modifications like forced induction systems, fuel pumps, and a programmable calibrator, take some time to learn how your vehicle operates.

Hook up the scan tool and wideband unit, drive the vehicle normally and monitor the fuel trims, air/fuel ratios, and most importantly how the ECU switches from OPEN LOOP to CLOSED LOOP operation.

Generally we want to mimic much of the stock operation as much as possible and use the AIC to prevent lean out in high load conditions where the limits of the stock fuel system will be exceeded. By observing these things before you start installing all your modifications, you will learn valuable information and greatly speed up your tuning time. However, most people install everything first, and then try to figure out how to tune, or hope it will not need tuning.
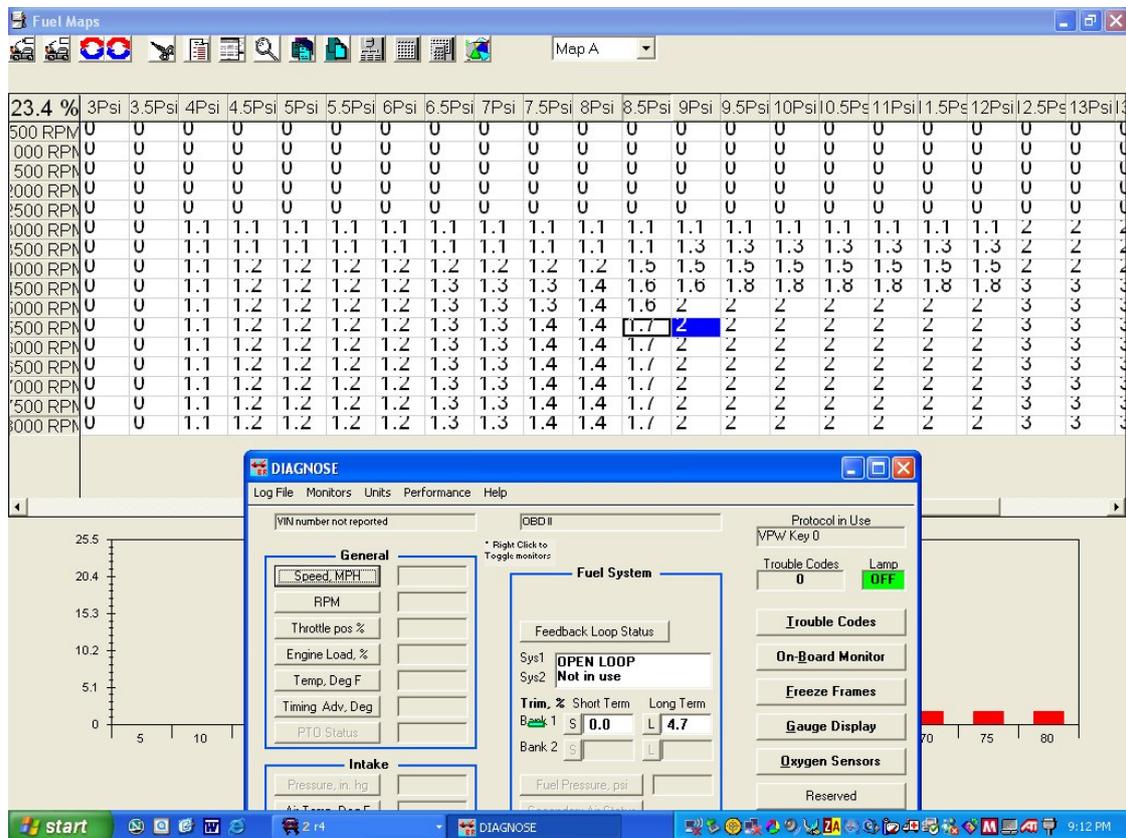
In this image, the vehicle is at WOT, full boost, and 5500 RPM. The wideband is reporting 11.5-1 AFR. A map cell value of 2 milliseconds supplied the needed fuel the stock injectors could not to correct the high RPM lean out.

The additional injector is at 46.8% duty cycle. Look at the upper left corner and see the duty cycle meter is reporting 23.4%. Since this is a 5vz and we are using our recommended settings we double the meter and get the true injector duty cycle.

Note that this engine did not need any additional fuel until 3000 RPM and 4 PSI of boost.

You should find that the overall tuning process with the AIC is very simple. Always work from normal driving and slowly advance the power and look for signs that the engine is starting to lean out. The first place you may see this is in the internal ECU fuel trims. While the ECU is still in CLOSED LOOP mode you may see the fuel trims moving very positive in an attempted to maintain the CLOSED LOOP fuel mixture the ECU is programmed to maintain. If you see this start adding fuel with injector control map to attempt to move those positive fuel trims back toward ZERO.

As the ECU transitions to OPEN LOOP mode as indicated on the scan tool you will need a quality wideband display unit to know what the actual fuel mixture is.

Generally when the ECU is in CLOSED LOOP you will tune by canceling or countering fuel trims and in OPEN LOOP you will tune by using the wideband and then adjusting the map to get the air/fuel ratio you are looking for.

It is important to know that you cannot alter the fuel mixture in CLOSED LOOP with the AIC alone. To do that you will need to use the Split Second ESC1 for Toyotas that use an old style O2 sensor for CLOSED LOOP feedback, or the URD AFR Sensor Calibrator. The URD AFR Sensor Calibrator is used on Toyotas that use the new style air/fuel ratio sensors for CLOSED LOOP feedback. With those devices it is possible to change the fuel mixture in CLOSED LOOP mode.

When tuning in conjunction with the Split Second ESC1, you will notice that when the unit activates the ECU fuel trims will roll very positive. When this happens you should not cancel the fuel trims. Instead you should add fuel with the injector to make the mixture rich. In many cases this will be as rich or richer then your full throttle OPEN LOOP fuel mixtures. For example, if your WOT fuel mixture is tuned to 12.0:1, you will want to tune the CLOSED LOOP range covered by ESC1 operation to 11.0-1 AFR. This will give you a very torquey and smooth CLOSED LOOP boosted operation.

The URD AFR Sensor Calibrator works a little different then the ESC1. Starting in 1999 Toyota started installed a highly upgraded O2 sensor in some of the trucks. This new sensor is called an Air Fuel Ratio Sensor and it is Toyota's version of a wideband sensor.

The URD AFR Sensor Calibrator is used to modify the signal from this sensor and it changes what the ECU thinks is 14.7:1 AFR that it is programmed to maintain in CLOSED LOOP mode. By altering what it believes is 14.7:1 it will allow you to run a richer mixture in CLOSED LOOP while boosting the engine.

When tuning the URD AIC along with a URD AFR Sensor Calibrator, the AFR

Sensor Calibrator should be tuned first to set the AFR target in CLOSED LOOP. Then retune the AIC to cancel the fuel trims back to ZERO. This will give you a very smooth and torquey engine while boosting in CLOSED LOOP mode.

It is important to remember that with the ESC1 you must allow the fuel trims to roll very positive and with the URD AFR Sensor Calibrator you cancel fuel trims with injector tuning.

To start tuning it is best to find some closed road or abandoned airport and have a helper drive the vehicle for you. Setup your PC and connect to the AIC with a serial cable and activate the connection between your PC and the AIC.

Timing Calibration:

From your observations of the stock truck with the scan tool, you should already have a very good idea on how to setup your base timing map. Now drive the vehicle and repeat those same operating conditions, but now with boost and see how much the timing has been reduced to the new knock threshold.

Adjust your timing map values to restore the same approximate timing advance reported on the scan tool. If your stock engine was reporting 20 degrees of ignition advance at WOT and full RPM adjust your timing map to restore that same timing value.

Then as you drive the vehicle look for any odd things, like sudden unexpected drops in the timing advance. If you see this, you may have some boost induced spark knock that the ECU is seeing and responding to. Work to identify that location on the timing map where this occurred and increase the timing retard in that area to prevent this from happening.

Obviously if you can physically hear engine knock you will most certainly increase the timing retard in the area where it is occurring to supress it.

If you install the Turbo XS KnockLite, you can use that to keep an eye out for knock that you are not expecting.

Some may tell you that a little knock is OK. Please do not fall for this trap. The newer engines use very lightweight internal components and can be easily damaged by knock especially with boost. Your goal with tuning is to properly fuel your engine under all conditions and to eliminate any boost induced spark knock.

Fuel Maps — Map A

0 %	-1Hg	0Hg	0.5Psi	1Psi	1.5Psi	2Psi	2.5Psi	3Psi	3.5Psi	4Psi	4.5Psi	5Psi	5.5Psi	6Psi	6.5Psi	7Psi	7.5Psi	8Psi	8.5Psi	9Psi	9.5Psi
500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
1000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
1500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
2000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
2500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
3000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
3500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
4000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
4500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
5000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	**4.2**	4.5	4.7
5500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
6000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
6500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
7000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
7500 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7
8000 RPM	0	0	0.2	0.5	0.7	1	1.2	1.5	1.7	2	2.2	2.5	2.7	3	3.2	3.5	3.7	4	4.2	4.5	4.7

DIAGNOSE

Log File Monitors Units Performance Help

VIN number not reported — OBD II — Protocol in Use: VPW Key 0

General
* Speed, MPH
* RPM
* Throttle pos %
* Engine Load, %
* Temp, Deg F
* Timing Adv, Deg — 20.0
* PTO Status

Intake
* Pressure, in. hg
* Air Temp, Deg F

* Right Click to Toggle monitors

Fuel System
* Feedback Loop Status
* Sys1 — OPEN LOOP
* Sys2 — Not in use
* Trim, % Short Term Long Term
* Bank 1 S 0.0 L 4.7
* Bank 2 S L
* Fuel Pressure, psi
* Secondary Air Status

Trouble Codes: 0   Lamp: OFF

* Trouble Codes
* On-Board Monitor
* Freeze Frames
* Gauge Display
* Oxygen Sensors
* Reserved

In this image, this 5vz is at full throttle, full boost, and 5000 RPM. The amount of retard programmed into the table has restored the timing advance to the same level as the engine reported stock. Our timing safety window has been fully restored.

Select the proper map table for the timing map. On the AIC/Timing Calibrators this will usually be map A. Overlay the scan tool and activate the timing advance display using the right mouse button.

In the above example, this 5VZ with a TRD Supercharger and a URD 2.2" pulley needed 4.2 degrees of retard to restore the full timing safety window.

When tuning was completed there was absolutely no boost induced spark knock at any RPM or boost level. This is exactly the way it should be.