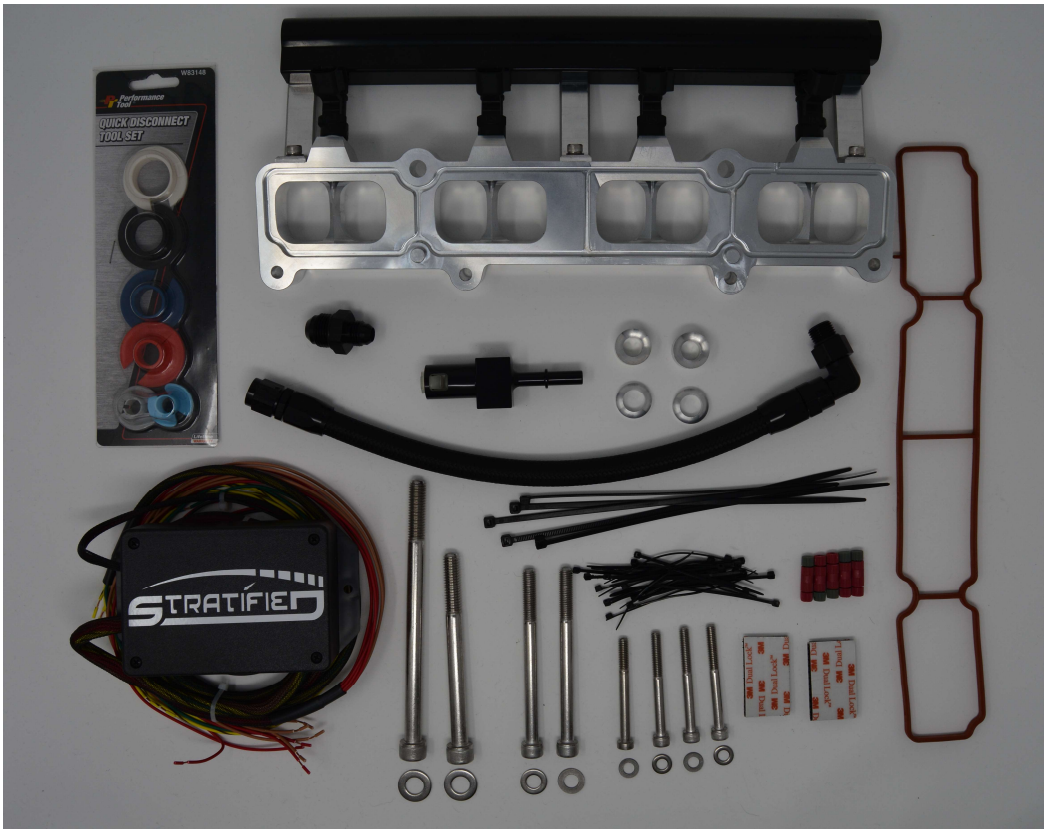
STRATIFIED
AUX FIESTA ST

4-Port Aux Fuel Injection System

Installation and User Guide



Thank you and congratulations on the purchase of your new Stratified 4-Port Auxiliary Fuel System. Follow this document to ensure safe and proper installation and operation of your new device.

WARNINGS AND WARRANTY – PLEASE READ CAREFULLY

ALL parts are sold for OFF ROAD/RACE-ONLY ground vehicle use only.
Aftermarket systems interacting with engine functions are not for use on pollution controlled vehicles. Alteration of emission related components constitutes tampering under most local emission regulation guidelines and can lead to fines and penalties.

*** DISCONNECT THE NEGATIVE BATTERY TERMINAL BEFORE PERFORMING ANY ELECTRICAL WORK ON YOUR VEHICLE. IF YOU DO NOT FEEL COMFORTABLE MAKING THESE MODIFICATIONS, HAVE THEM PERFORMED BY A PROFESSIONAL. ***

Limited Warranty

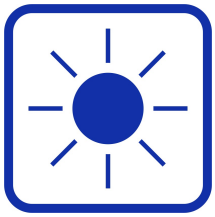
This Stratified product is warranted against defects in materials and workmanship for ninety (90) days from date of purchase. During the warranty period, Stratified will repair, or at its option replace at no charge, components that prove to be defective. The product must be returned - shipping prepaid - to a Stratified facility. This limited warranty does not apply if the product is damaged by accident or misuse. The foregoing warranty is in lieu of all other warranties expressed or implied including, but not limited to, any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. Stratified Automotive Controls Ltd. is not responsible for any fines, injuries, or damages incurred as a result of the installation or use or misuse of our products. It is the complete responsibility of the purchaser of such products to ensure that they are used in a legal, safe, and appropriate manner.

Table of Contents

1. Features and Benefits

Protects your Engine from Fuel Starvation:
To make more power you need two main components. Air and Fuel. With more boost and bigger turbochargers or superchargers, your OEM direct injection components can't supply the fuel needed for safe high power operation. This auxiliary port injection system is a proven method for keeping your motor safely fueled under the most demanding conditions.

Provides The Fuel you Need for More Boost and Power:
Direct injection cars use expensive and complex components. When upgrading your vehicle to produce more power than stock, more fuel is needed. Direct injection injectors and fuel pumps are often not upgradeable. This fuel system augments your fueling under high power levels with proven components allowing you to achieve you power goals.



Cleaner Valves, Efficient Motor:
The direct injection (DI) system is very efficient and has cooling benefits. Keeping it in the car and working as intended is ideal. This is why a port injection system works so well. You keep the efficient DI fueling and augment it with port injection only under high power. This also has the benefit of keeping your intake valves cleaner.

Easy Installation:
We have worked very hard to make our systems as plug and play as possible. The kit you purchased is built and tested for your vehicle. This means everything fits right and works as it should from the get-go making it a painless and effective installation process.

Tested, Proven, Safe Solution:
We don't build and sell anything that we don't thoroughly test. The fuel system is a proven, safe solution for increasing fueling on your vehicle and we stand behind its performance, capabilities, and reliability.

E85 Safe, Simple Adjustments:
All kit components are E85 safe. The controller that calculates the fuel delivery as well as all components are purpose built and safe. We make adjusting the fueling as simple as possible to make sure you get to your results quickly whether we tune the system or someone else does.

Split Port Directional Injection with Angled Port Matching:
Features injectors oriented towards the cylinder head that spray with a split stream pattern to ensure even fuel distribution to each intake valve. The ports on the spacer are also matched to the angle at the mating surface between the intake manifold and cylinder head to ensure that the transition of airflow towards the engine remains smooth.

2. Introduction and Precautions

***IMPORTANT*: When installing and working with the Auxiliary Fuel System, you are working with flammable fluids. Take all safety precautions necessary during installation and operation of the fuel kit to prevent any fires or injuries. This means ensuring you are installing the system in a well-ventilated area away from any spark or flame source. After the installation and periodically thereafter, check that the system continues to be leak free.**

The Aux Fuel System Electronic Controller should be mounted within the vehicle's engine bay, but it is **NOT water proof**. The controller should not be mounted directly on the engine. Do not spray or pressure wash the controller with water or any other liquids. Mount the controller in an area that is not in contact with the engine - preferably close to other vehicle electronics such as the fuse box.

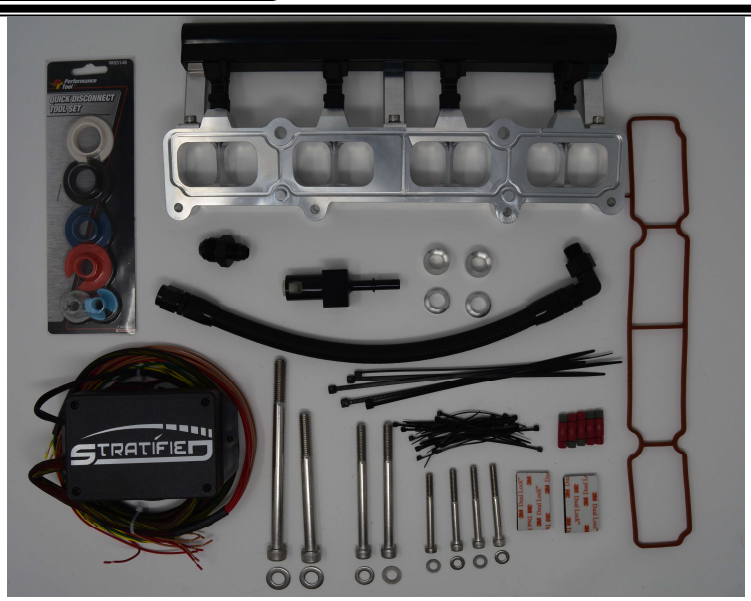
The direct injection (DI) system in your vehicle is designed to supply enough fuel to run the OEM vehicle with OEM components. Most manufacturers build some headroom into their fueling systems but at some point, your quest for power requires more fuel. On a direct injected car this means that you need to upgrade at least the fuel injectors or high pressure fuel pump or often both. These upgrades are expensive and often not available.

The Stratified 4-Port Auxiliary Fuel System is designed to work in conjunction with your DI fuel system and offer additional fuel when needed under high boost or high power demands. This means that your car remains efficient and driveable while having the fueling capacity to reach higher power goals.

3. Parts Included

Verify that all these components are included with your fuel system kit:

Item	Specifics
X[4]tra Fuel Kit Injection Assembly	• **1x** – Intake Spacer • **1x** – (-8 AN) ORB Plug • **3x** – Fuel Rail Legs • **1x** – Fuel Rail • **4x** – Fuel Injector • **6x** – M5 Bolts/Washers
Fuel Line (1 ft.) w/ Fittings	• **1x** – (-8 AN) 90 Deg. Fitting • **1x** – (-6 AN) Straight Fitting • **1x** – (-6 AN) Male – (-8AN) Male Adapter w/ O-Ring
Fuel System Controller Box	• **1x** – 4-Port Controller w/ Strat Sticker • **1x** – Add-a-fuse • **1x** – 5A Fuse • **1x** – Ring terminal • **1x** – Tuning Required Sticker • **4x** – Injector Connector
Hardware Bag	• **1x** – Stratified Fuel Line Tap • **1x** – FoMoCo Intake Manifold Gasket • **5x** – Posi-Taps • **1x** – M6 Low-Profile Socket Head Cap Screw (SHCS) • **3x** – M6 SHCS • **2x** – M8 SHCS • **1x** – M10 x 110mm SHCS • **1x** – M10 x 150mm SHCS • **4x** – M6 Washers • **2x** – M8 Washers • **2x** – M10 Washer • **15x** – Zip Ties – Small • **2x** – 3M Dual Lock Strips • **5x** – Zip Ties - 8" Large
1x – Fuel Disconnect Set	N/A
1x – Stratified Tuned Decal	N/A
1x – Business Card	N/A
1x – ½" Wire Loom (2.5 ft.)	N/A
OPTIONAL	**1x** – USB Tuning Cable



4. Tools Required

- T30 Bit
- 17mm wrench, long handle
- 15mm 3/8” deep socket
- 3/8” Drive Ratchet
- Long nose pliers
- 13mm socket
- 7mm socket ¼” Drive
- ¼” drive ratchet
- E10 bit (Reverse Torx)
- 8mm socket
- 4, 5, 6mm Hex

5. Install Diagram

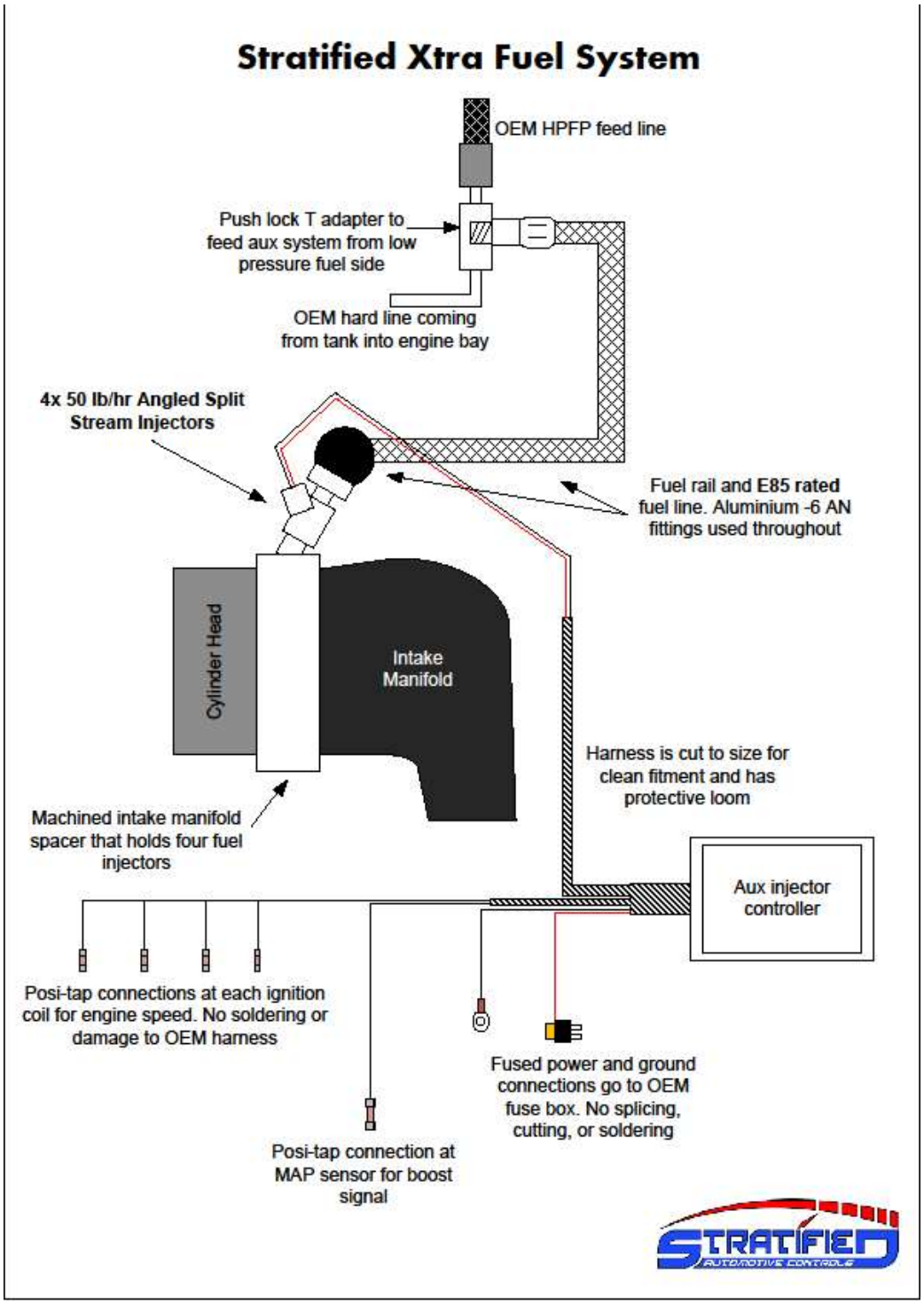


Figure 1 - General Layout of Stratified Aux Fuel Kit

6. Installation Instructions

***IMPORTANT*: When installing and working with the Auxiliary Fuel System, you are working with flammable fluids. Take all safety precautions necessary during installation and operation of the fuel kit to prevent any fires or injuries. This means ensuring you are installing the system in a well-ventilated area away from any spark or flame source. After the installation and periodically thereafter, check that the system continues to be leak free.**

WARNING: Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

WARNING: Do not smoke, carry lit tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

WARNING: Clean all fuel residue from the engine compartment. If not removed, fuel residue may ignite when the engine is returned to operation. Failure to follow this instruction may result in serious personal injury.

WARNING: Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

WARNING: Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

WARNING: When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

WARNING: Avoid contact with fuel during a visual inspection for fuel leaks with the engine running. Do not work on the fuel system until the pressure has been released and the engine has cooled. Fuel in the high-pressure fuel system is hot and under very high pressure. High-pressure fuel may cause cuts and contact with hot fuel may cause burns. Failure to follow these instructions may result in serious personal injury

1. You must first relieve the fuel pressure in the OEM fuel system. This is done by pulling fuse R13 from the body control fuse module which is in the passenger foot well underneath the glove box.
2. Remove the panel insulator.
3. Remove Fuse R13 from the body control module.

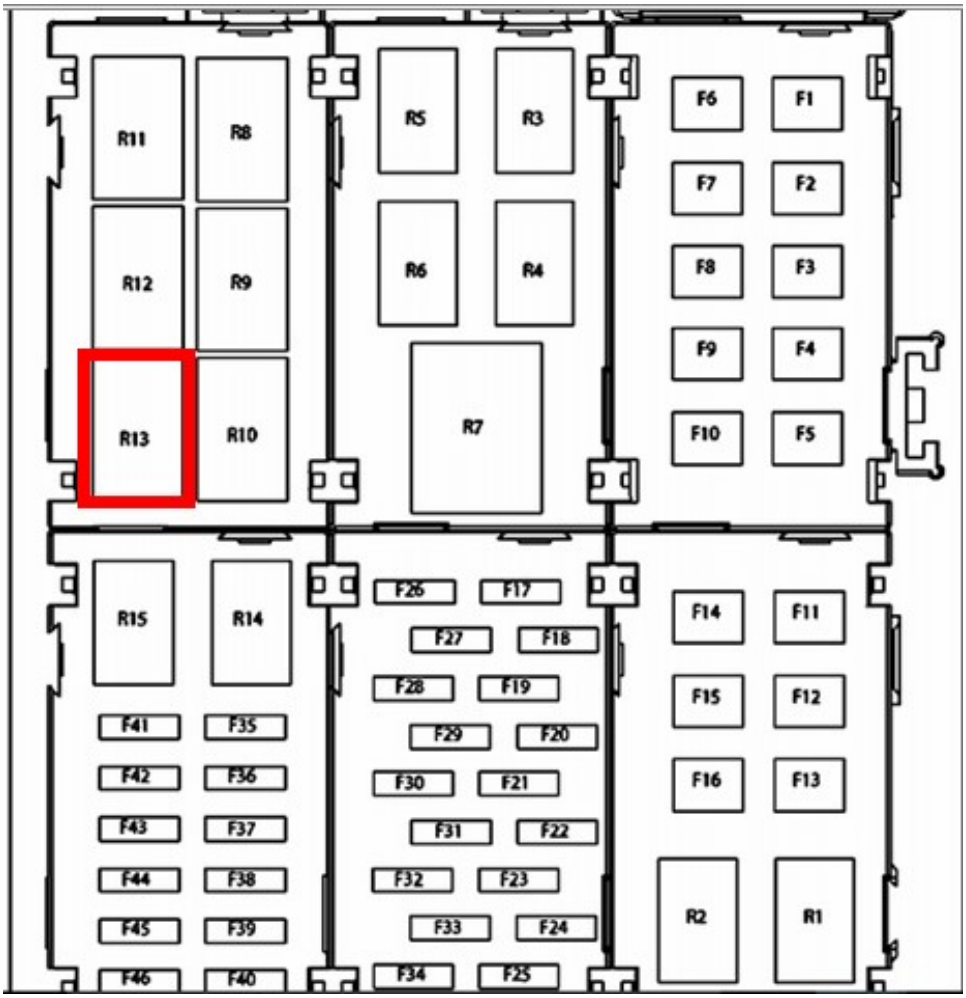


Figure 2 - Fuse to remove to relieve Fuel Pressure.

4. Now start the car and wait for the engine to stall. Once it has stalled, crank for another 20 seconds to ensure fuel pressure is relieved.
5. Turn the key to the OFF position and keep the fuse out of the panel until the fuel kit installation is complete. This might trigger some engine codes. Clear these after the installation.
6. Remove the negative battery cable.

7. The intake spacer, rail, and injectors should be installed next. This also gives you the opportunity to inspect your intake valves. They will look cleaner after you run the aux fuel system!
8. Jack up the front of the vehicle and secure it.
9. Use a T30 bit, remove the accessory belt cover located on passenger side of motor.

Figure 3 - Remove accessory belt cover

10. Use a 17mm long handle wrench to push accessory tension forward (relieving tension) and slip the belt off crank pulley.

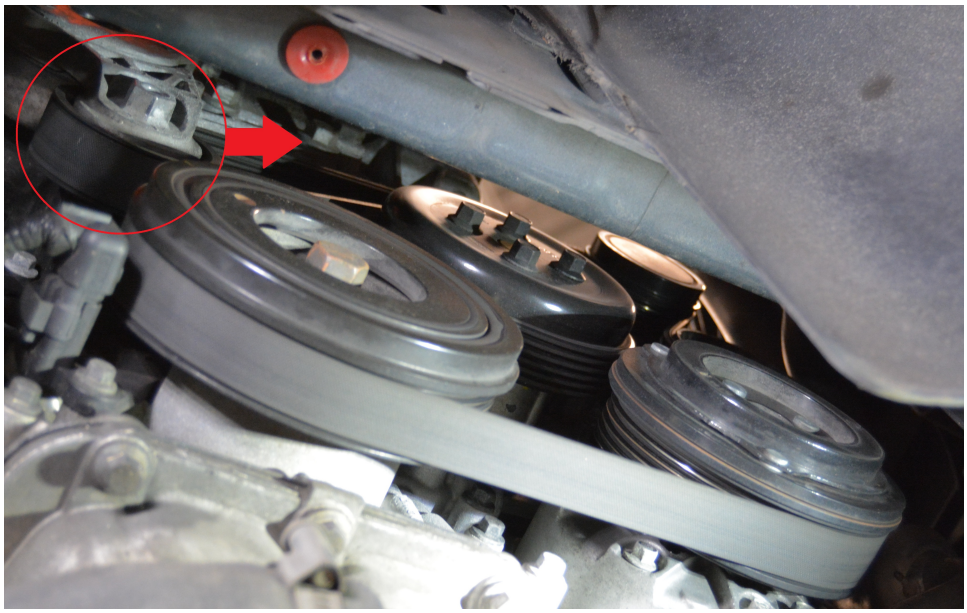


Figure 4 - Accessory belt tensioner.

11. To disconnect the charge pipe follow steps these instructions:
    a. Loosen the hose clamp securing the charge pipe to the throttle body
    b. Remove the nut holding the charge pipe to the transmission
    c. Loosen the second charge pipe clamp

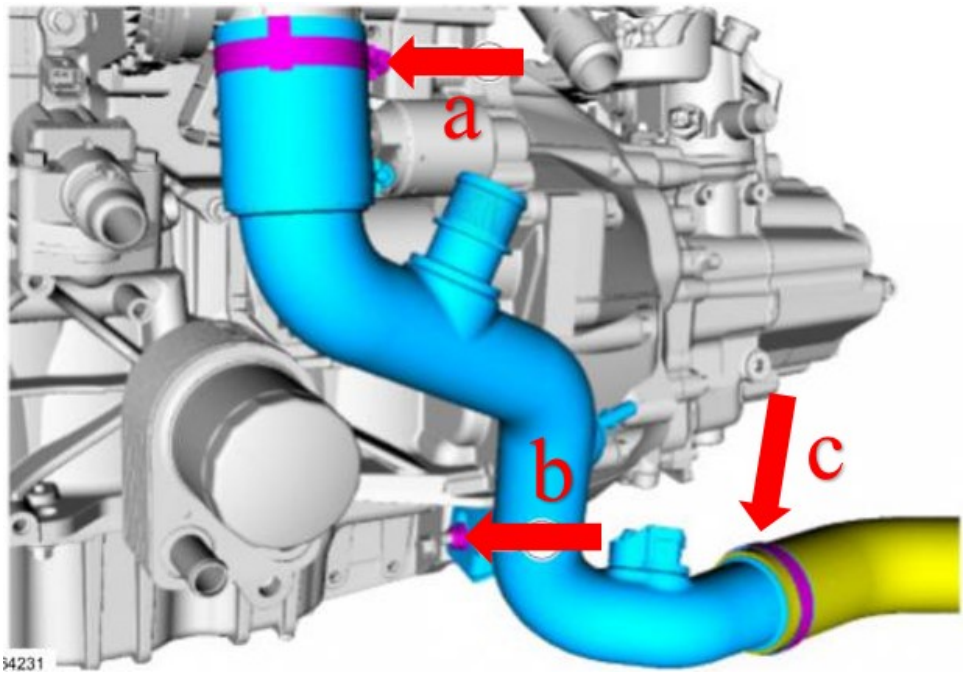


Figure 5 - Charge Pipe Removal

    d. Disconnect the vacuum line
    e. Disconnect the IAT sensor

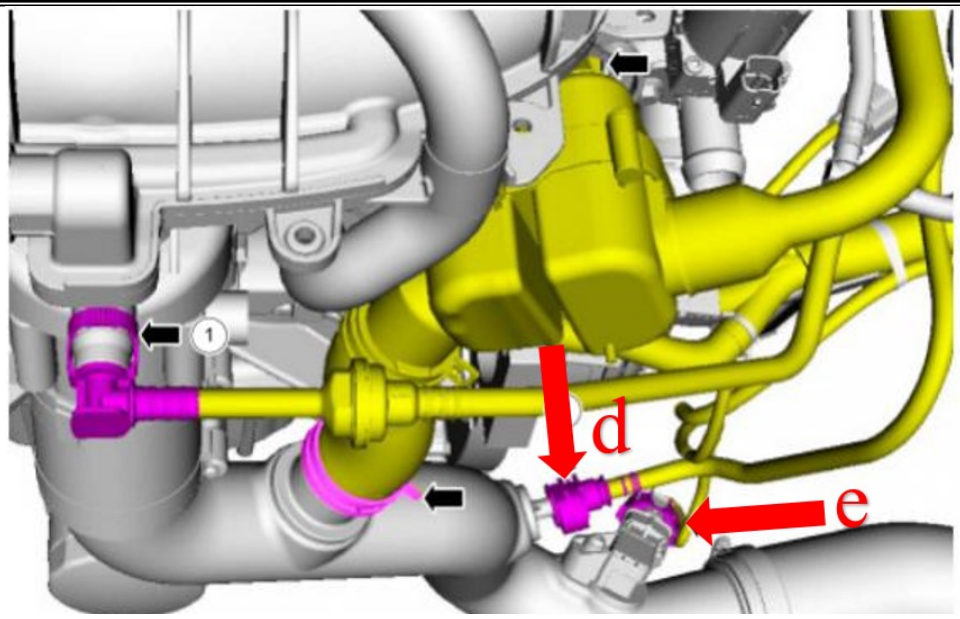
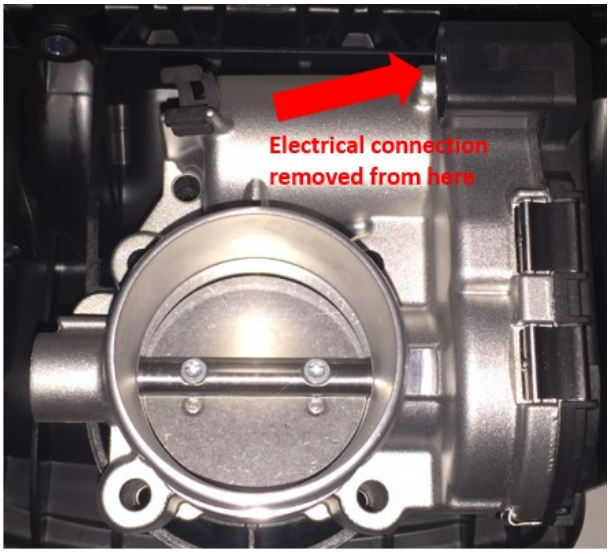


Figure 6 - Removing connections from charge pipe

12. Remove the throttle body
13. Disconnect the electrical connection from the throttle body as shown below:



14. If car is raised on hoist, lower it now.
15. Loosen alternator and move it to the side. There is one 15 mm bolt at the bottom, one 15mm bolt at the top and one 15mm nut at the top.
16. Remove the alternator stud using a torx bit. Disconnect the alternator signal wire and move the alternator to the side.

17. Disconnect the vacuum and electrical connections from the manifold and throttle body:

- PCV hose from front of IM manifold
- PCV hose from PCV box on top of engine
- MAP sensor connector
- Remove PCV hose attaching to intake from VC
- Plastic clips holding electrical harness across Intake Manifold (four), Knock sensor connector (two) and set aside harness so it is not in the way of Intake Manifold removal
- Remove clip holding PCV hose in, set PCV hose completely aside
- Remove EVAP line from front of Throttle Body
- Release Sound Symposer from Intake Manifold

NOTE: The throttle body electrical connector is tricky to disconnect. It is necessary to loosen the intake manifold to give yourself more clearance.

NOTE: Be careful with the quick connect vacuum hoses and lines. The clips can be fragile if not handled carefully.

Figure 7 - Fiesta ST Intake Manifold ready to be removed

18. You will now have to modify the valve cover to ensure proper fitment of the assembly. To clear the injector you must remove the driver's side tab on the front of the valve cover as circled below.

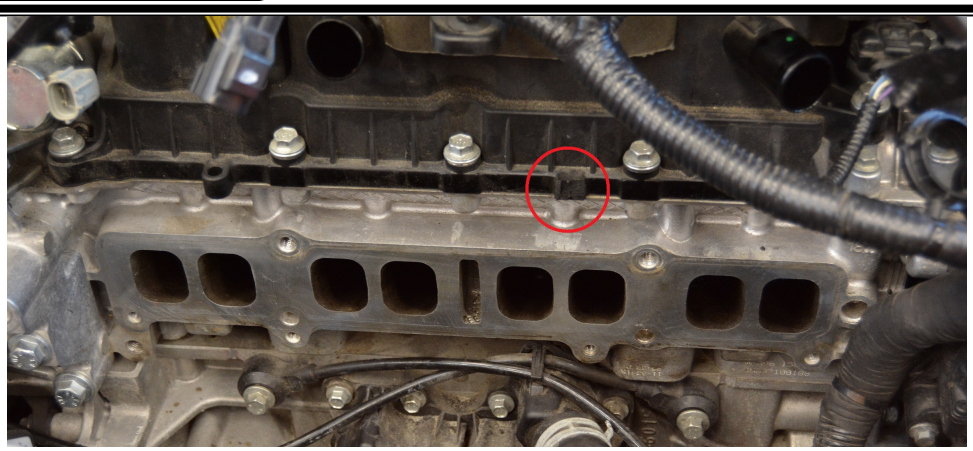


Figure 8 - Valve cover tab cut off

Figure 9 - Injector clearing the cut tab

19. You will also have to modify the Intake manifold slightly to clear the PCV hose connecting to the block. All is needed is to slightly shave the ear of the bolt location (bottom, second from drivers side) in order to clear the PCV hose as show in the photos below.

Figure 10 - Intake Manifold modified for clearance

Figure 11 - Intake Manifold clearing the PCV Hose

20. Place the included FoMoCo OEM manifold gasket into the grooves of the Intake Spacer, it may help to use some grease (such as Sil-Glyde) to hold the gasket in place.

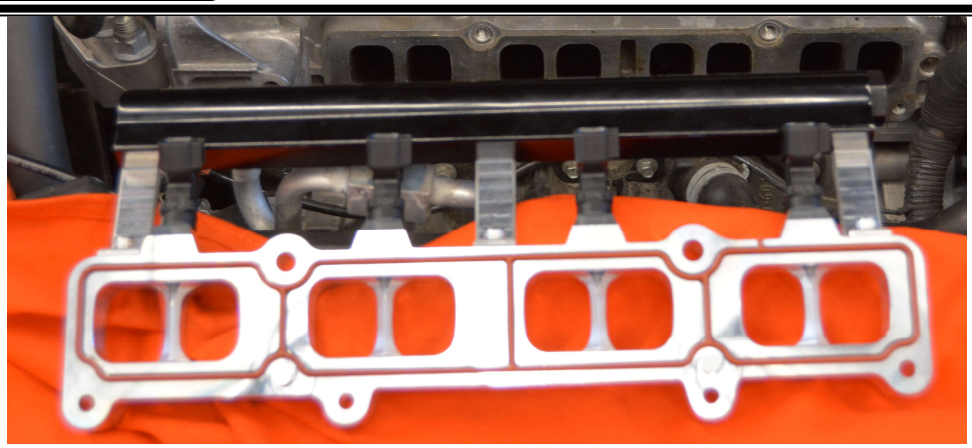


Figure 12 - Gasket Installed

21. Align the spacer and Intake Manifold to the head using the four M6 Washers and M6 bolts provided as well as the two M8 Washers and bolts.
    a. NOTE: One of the four M6 bolts has a 'Super Low Clearance Head' this one should be installed on the bottom passenger side corner, nearest to the alternator.
    b. The two upper holes are for the M8 bolts, the four lower holes are for the M6 bolts.

Figure 13 – Aux Fuel kit installed

22. The installation of the intake spacer will offset the throttle body towards the front of the car. Massaging the couplers on the cold pipe will allow fitment.
    a. If you have a thicker aftermarket radiator, ensure that the fan shroud and charge piping have ample room and keep in mind that the engine will rock back and forth during acceleration and deceleration.
23. Install the Stratified Aux Fuel Flexible line -8AN male to -6AN male fitting onto the fuel rail then connect fuel line to -6AN male end. Neither connection requires any sealants or tape, doing so will cause sealing issues.

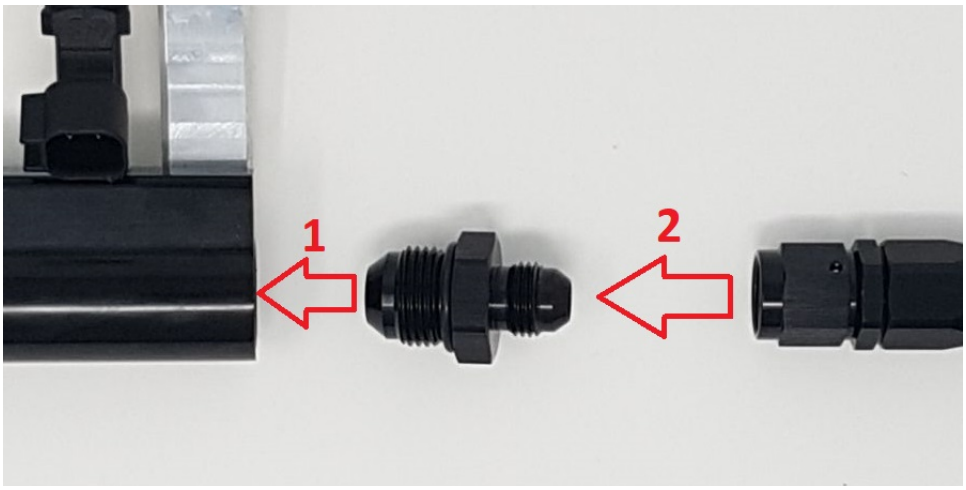


Figure 14 - Installing the fuel line to the fuel rail

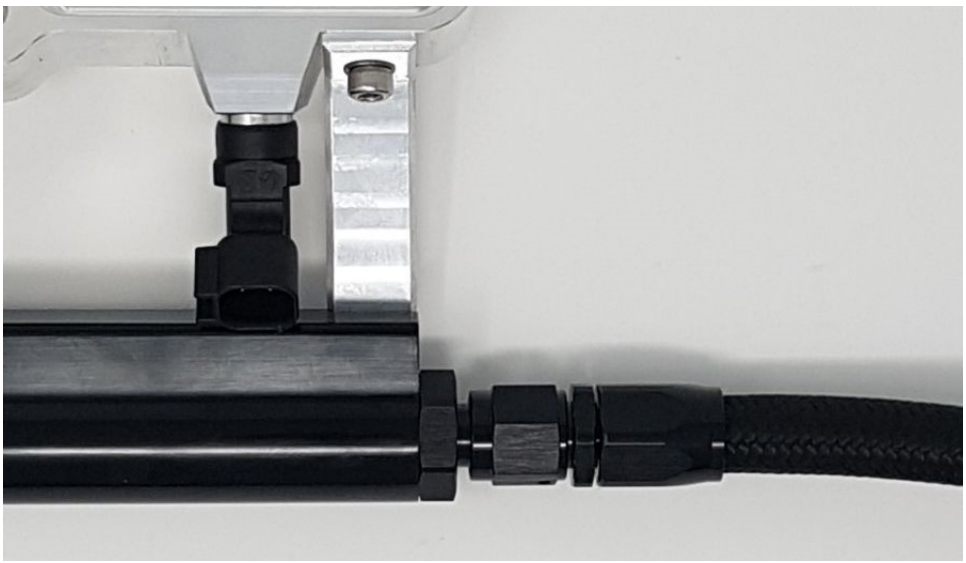


Figure 15 - Fuel Line Installed to Fuel Rail

24. Run the fuel line underneath the air intake tube and towards the rear of the motor making sure that it does not come into contact with any abrasive surfaces.
25. Thread the Stratified Aux Fuel Flexible line -6AN male fitting into the provided fuel line tap. This fitting uses an O-Ring for sealing and does not require any sealing tape or liquid.

Figure 16 - Fuel Line connected to Fuel Tap

26. Disconnect the high pressure fuel pump (HPFP) feed line from behind the HPFP. It is marked by a red arrow below. This rubber flexible feed line connects to a supply hard line coming from the tank. The line is 5/16” and the best tool to use for disconnecting it is the one supplied in the kit. Select the 5/16” collar from the kit.

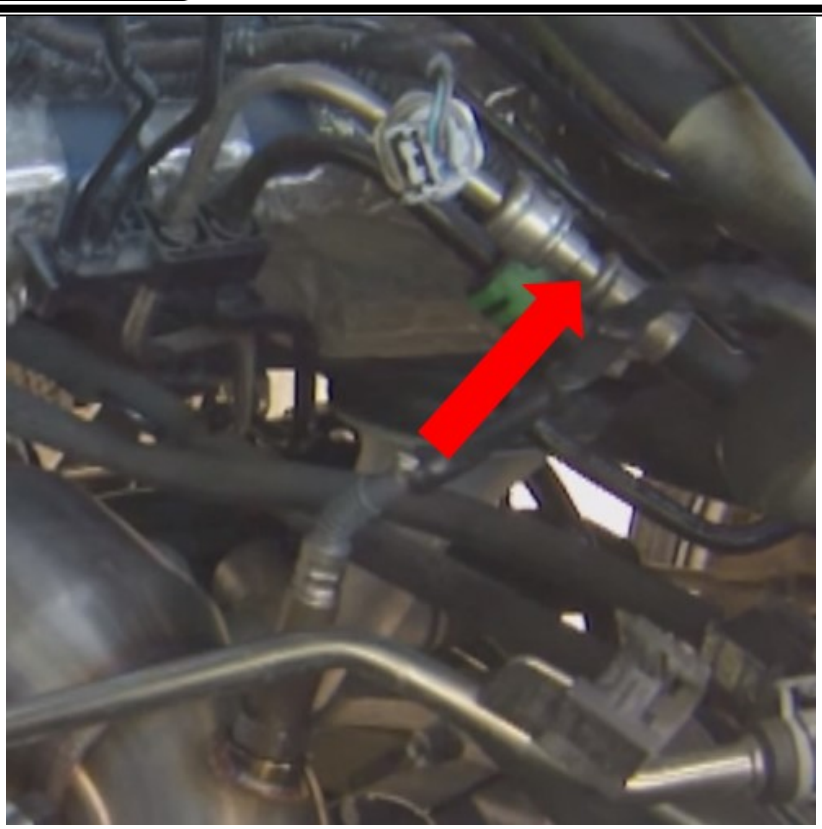


Figure 17 - OEM LPFP Connection

27. Place the 5/16” collar on the hard line where the arrow is pointing with the flat section away from the fuel line connector and push it between the connector and hard line. The connector should pop off without much force.

    ***WARNING:* Watch for fuel spray and leaking when disconnecting the fuel line.**

28. Place the fuel line tap on the 5/16” hard fuel supply line and re-attach the HPFP feed line (soft line) to the top of the tap. Make sure all fuel connections click into place.

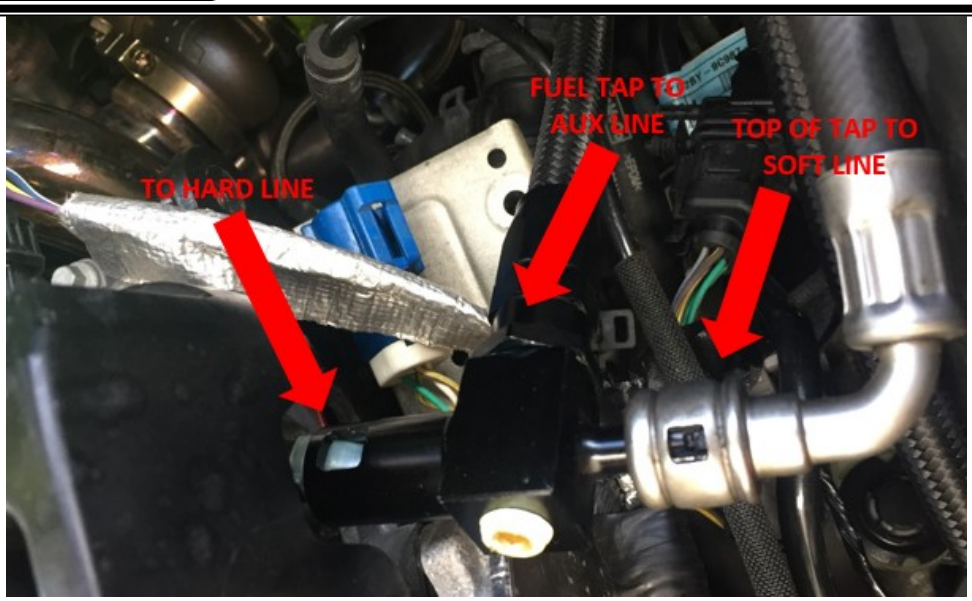


Figure 18 - Fuel Line and Tap Installed

29. Secure the fuel line using the large Zip ties to prevent rubbing or abrasion.
30. Re-install the alternator.
    a. Install the OEM bottom bolt and keep it loose.
    b. Using the provided M10 hardware and spherical washers space the top of the alternator to allow for the necessary clearance to the manifold. The washers go between the alternator and block as shown.
    c. The longer bolt should be installed in the driver's side bolt location replacing the stud. This step can be a little troublesome and will require some patience. We recommend installing the passenger side bolt first followed by the longer driver's side stud.
    d. Tighten all 3 bolts securing the alternator.
    e. Reconnect the alternator signal wire.

Figure 19 - Alternator Re-Install

31. Follow steps 9 and 10 in reverse order to re-install the accessory belt and accessory belt cover.
32. Now it is time to install the controller. Below is the controller and the wiring connections.

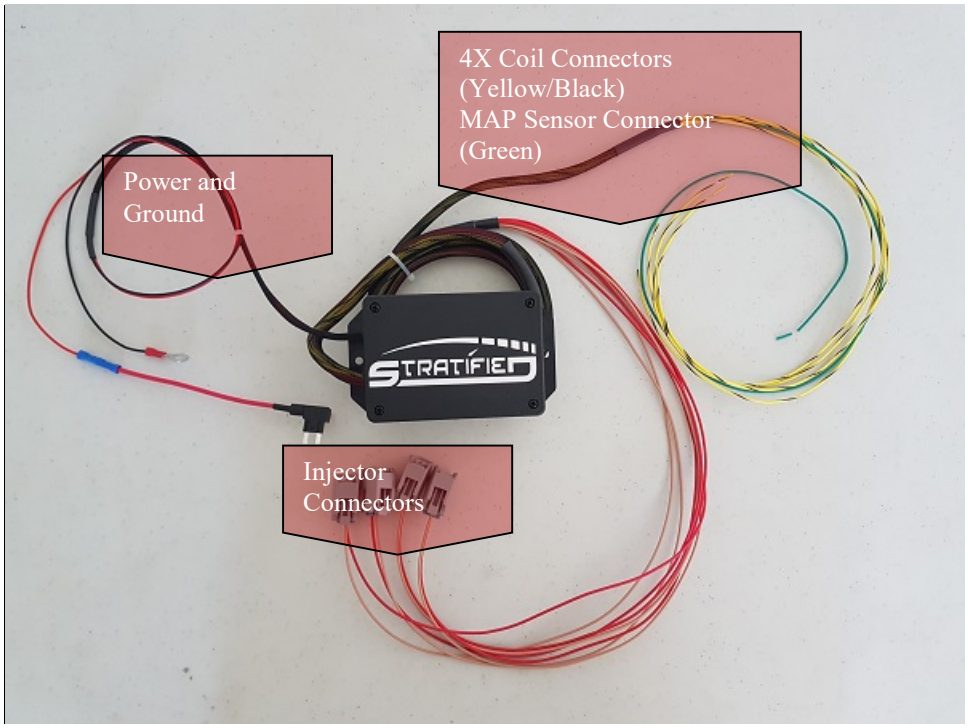


Figure 20 - Stratified Aux Fuel Controller and Electrical Harness

33. Start by removing the air filter box assembly from the engine bay.
34. Secure the Stratified Aux Fuel Controller to the top of the fuse box using the 3M dual lock provided.

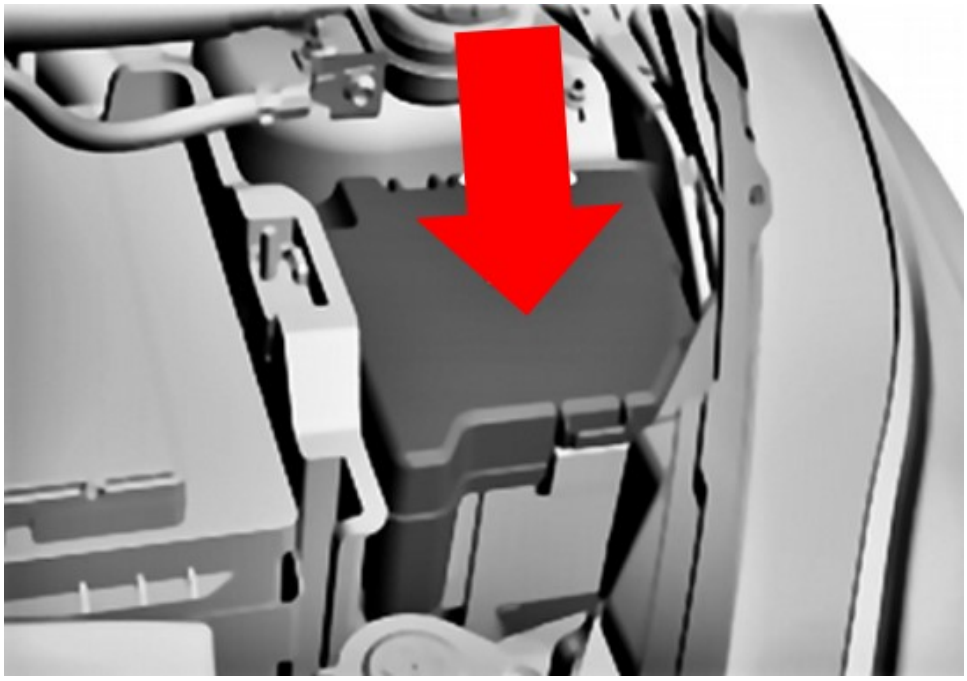
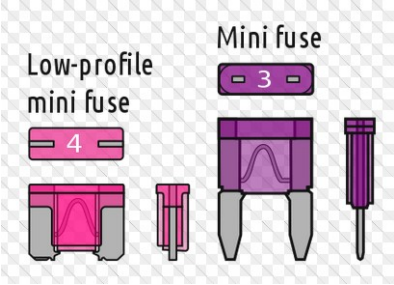


Figure 21 - Install Location for Aux Fuel Controller

35. Open the fuse box and install the Add-A-Fuse supplied to one of the switched fuse locations in the fuse box by the battery. If the location you use has an existing fuse, make sure that fuse is rated for at least 10A and is switched with ignition. Place the removed fuse in the second position of the Add-A-Fuse holder or that circuit will no longer work.
    a. Make sure that the add-a-fuse is designed for your fuse box. Depending on year, the Fiesta can use mini or low-profile mini fuses as shown below. The kit should be ordered with the correct fuse type for your vehicle.



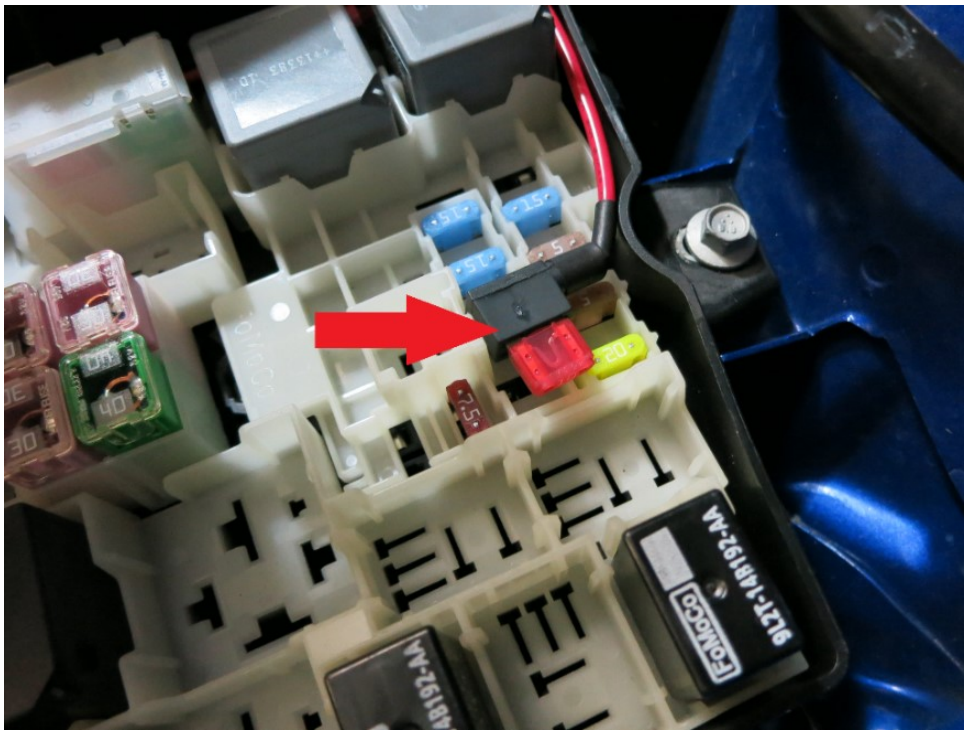


Figure 22 - Aux Fuel Controller Fuse Location

36. Locate the ground wire to the ground terminal of the battery and bolt down the ring terminal from the Stratified Aux Fuel Controller harness.

Figure 23 - Ground Terminal Location

37. Run the four injector connectors and wires underneath the intake tube and connect them to the four auxiliary injectors.

Figure 24 - Injector Connectors

38. Now it is time to get your tach signal connected. To do this you need to tap into the **leftmost** wire for **each** of the 4 coil packs. Each tapped coil pack connects to one of the 4 **yellow/black** wires of the Aux Fuel Controller.

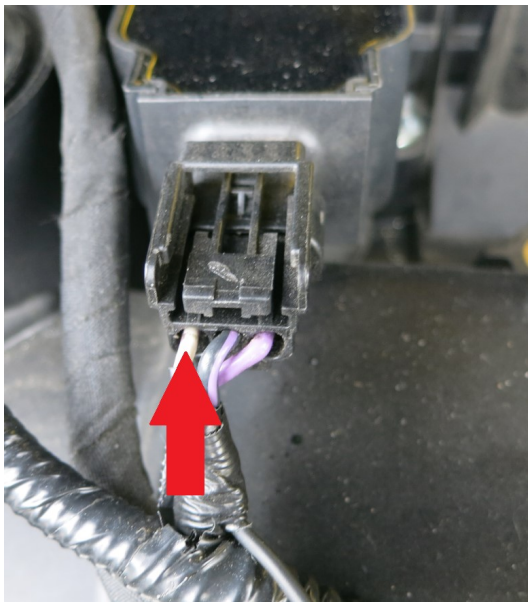


Figure 25 - Ignition Signal Pickup Location (same for all 4 coils)

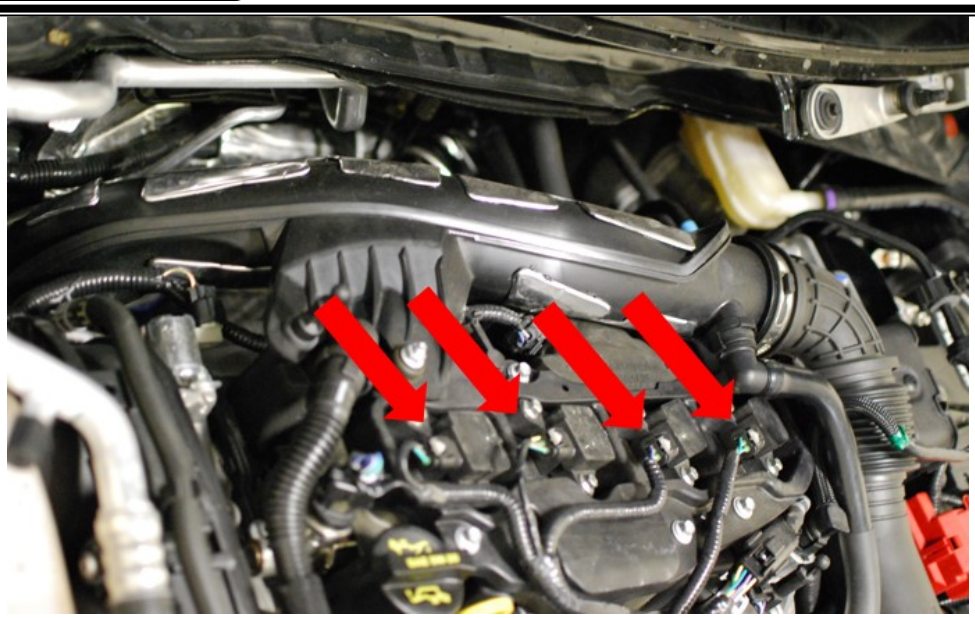


Figure 26 - Ignition Coil Location

39. 4 Posi-Tap connectors are provided for this task. Installing these is simple as shown below and does not damage the wires. The order in which you connect each coil pack to the yellow/black wires does not matter. Ensure that the wires are routed well and securely connected.

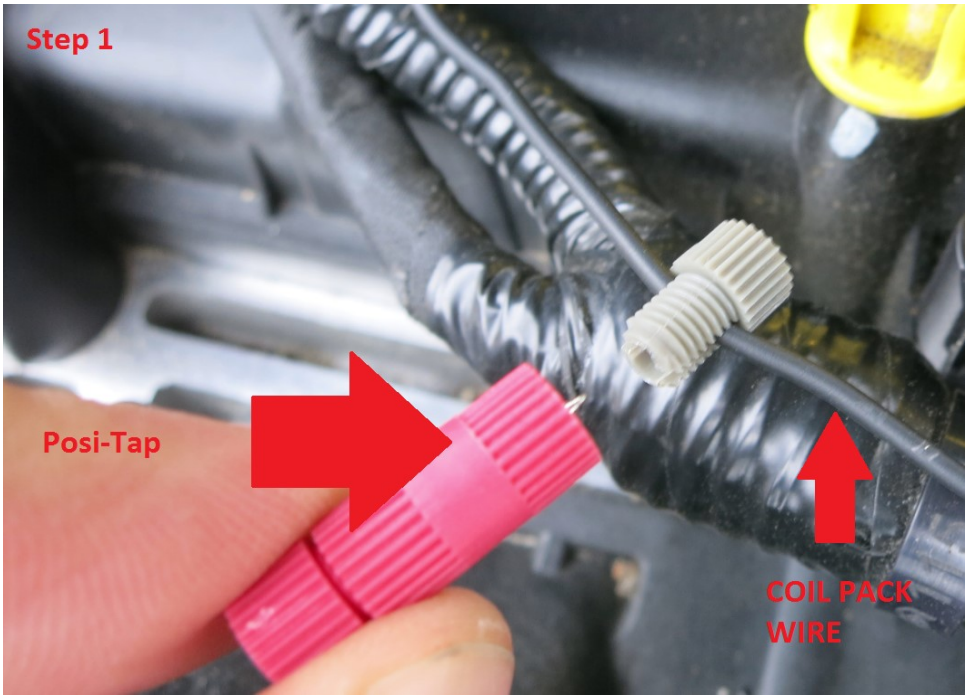


Figure 27 - Posi-Tap Instal Step 1

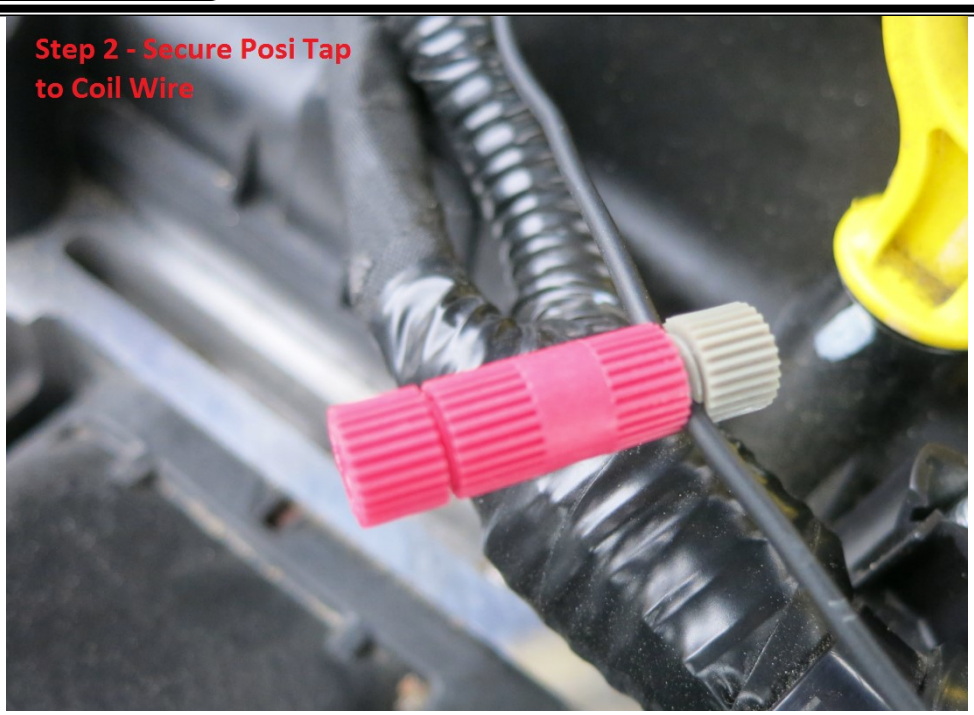


Figure 28 - Posi-Tap Instal Step 2

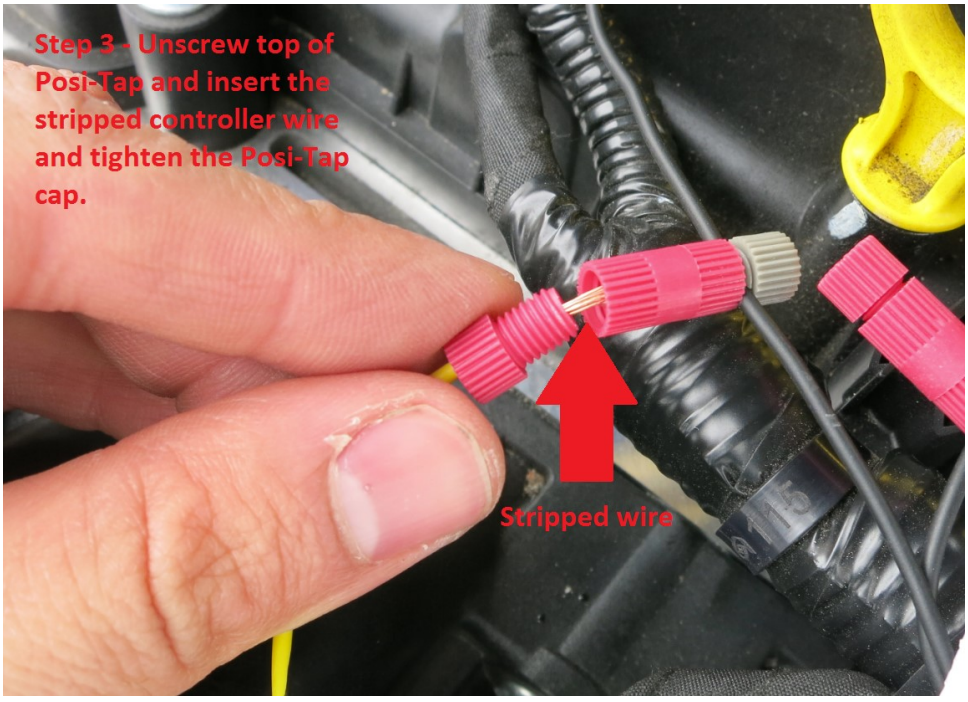


Figure 29 - Posi-Tap Instal Step 3

40. Now it's time to connect to the MAP sensor wire. This wire can be found right at the MAP sensor (**leftmost** wire) on the manifold or a little higher up the engine

harness for a cleaner install. Use a Posi-Tap connector to connect this MAP sensor wire to the **green** wire on the Aux Fuel Controller.

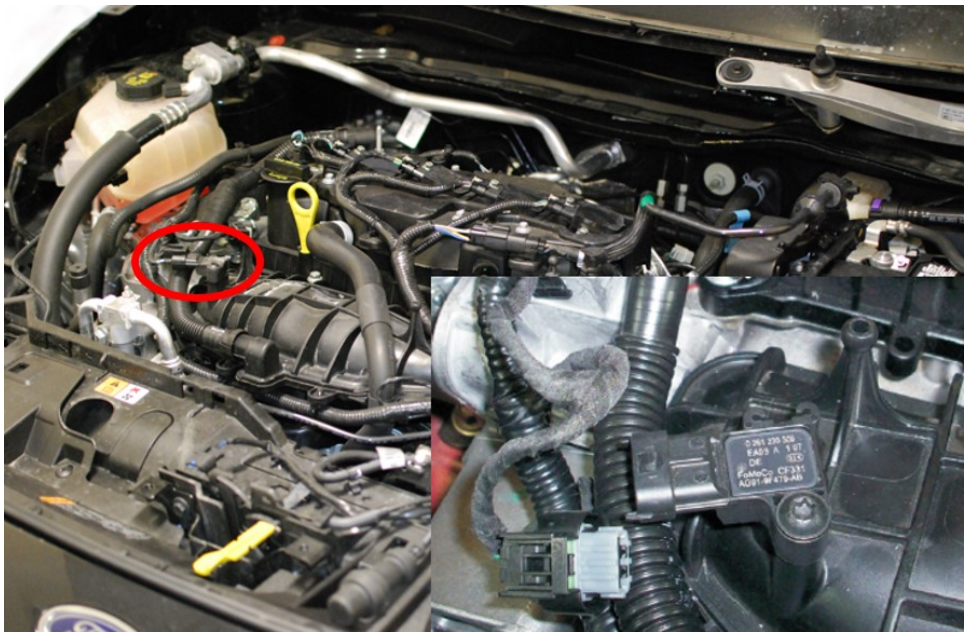


Figure 30 - Map Sensor Connection Step 1

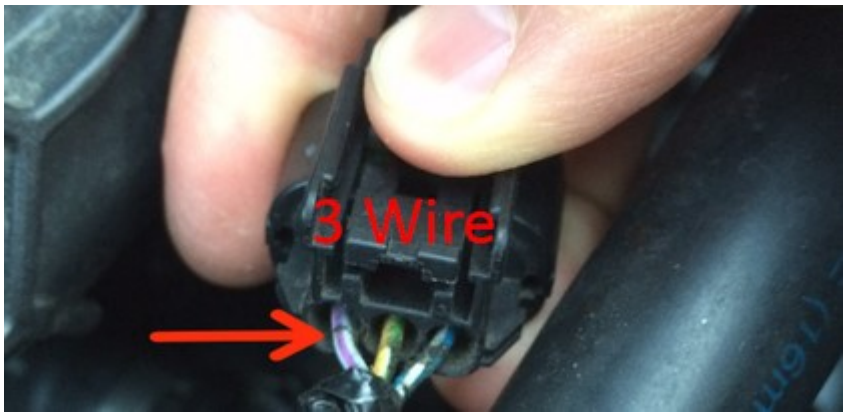


Figure 31 - Map Sensor Connection Step 2

41. Use the included loom to bundle the wiring behind the rail and strapping it down.
42. Using the small Zip Ties, bundle and secure the wiring loom so that it is not going to rub or become damaged over time.
43. Now that everything is in place, reinstall the air filter box and check all your electrical, vacuum, and fuel connections.
44. Get your tuning laptop ready and make sure it has the Split Second R4 tuning software installed that was supplied with the Aux Fuel Controller.
45. Replace fuse F56 in the passenger footwell body control module.

46. Reconnect the battery.
47. Turn the key to the ON position to prime the fuel system but do not start the car. Go to the engine bay and ensure there are no fuel leaks of any kind.
48. Remove the 4 Phillips screws that hold the lid on the Stratified Aux Fuel Controller.
49. Using a serial cable or Serial-USB converter connect the controller to your laptop computer.

Figure 32 - Connecting to R4 Controller

50. Open the R4 software on your computer. Click on File → New Customer and create a new profile.

    NOTE: *This step is not necessary if you have purchased a Stratified Tune with your fuel kit. If you have purchased a tune with the kit, you need to jump to step 51 and select the R4 map sent to you by your tuner.*

51. Select Open Customer: File → Open Customer. If you have been sent a Stratified Aux Fuel Tune, select and open the file you were sent.

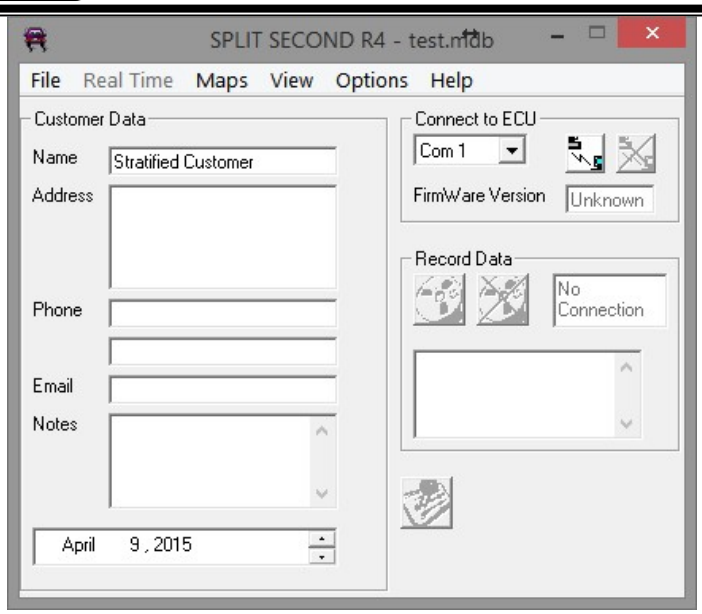


Figure 33 - Setting Up R4 Software

52. Go to Options → System Settings and ensure everything is set as shown below:

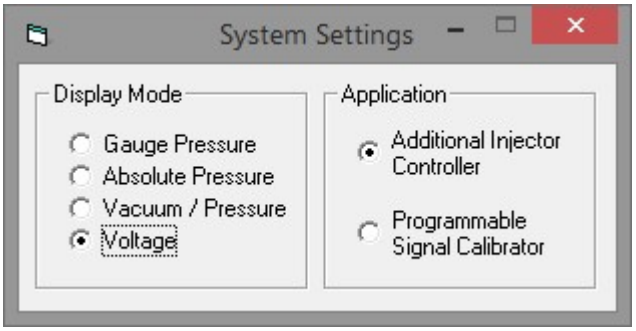


Figure 34 - Setting Up R4 Software

53. Go to Options → Engine Settings and ensure everything is set as shown below:

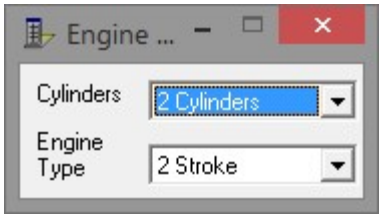


Figure 35 - Setting Up R4 Software

54. Now that your controller is setup, you have to set how much and when to inject the additional fuel. This is contained in the Maps → Fuel Maps. If a map was pre-made for you, you will see some values populated in this table, not just 0s and all you need to do is flash the map.

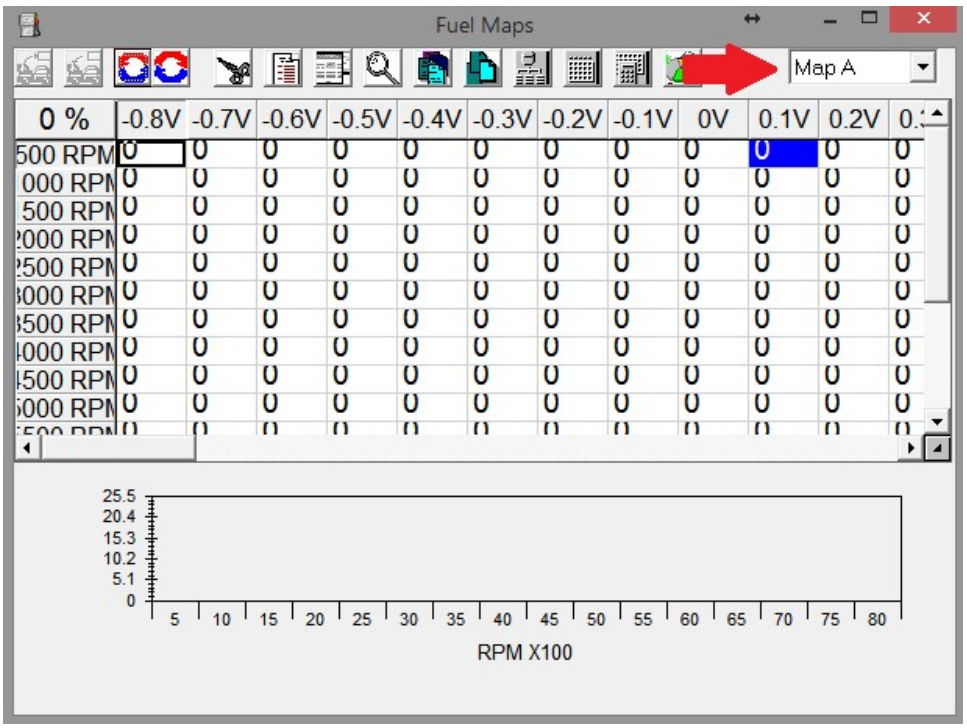


Figure 36 – Looking at the fuel map

55. To flash a map you must have the ignition key in the ON position (Aux system is powered).

56. Close the fuel map you were just looking at (but not the main R4 software window).

57. In the main R4 software window select the correct COM port in the R4 software to connect to your USB-Serial converter and computer. Then click the Connect to ECU button.

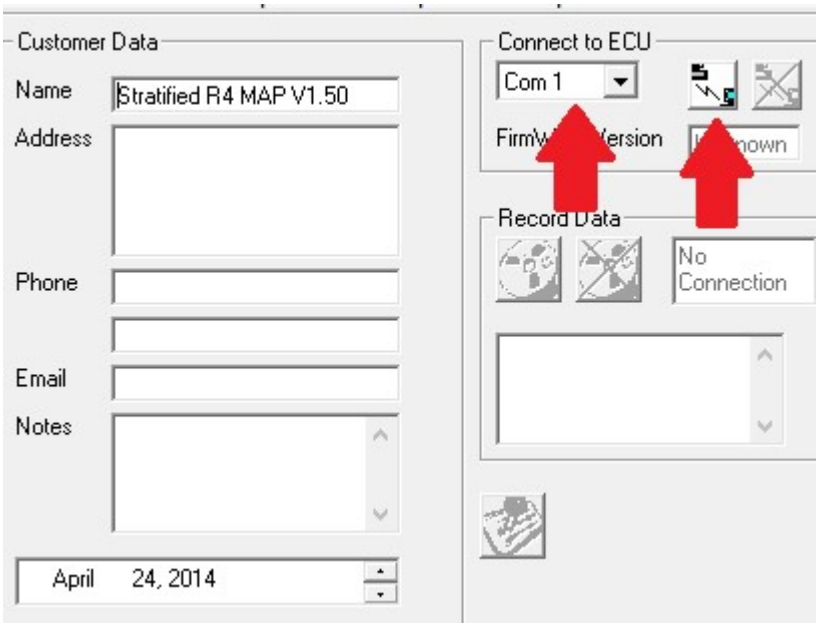


Figure 37 – Connecting to R4 controller

58. If the controller is powered and the computer is communicating with it, you will see the Record Data button become active (not grayed out)

59. At this point you can flash a tune to the Aux Fuel System Controller. To do this you must re-open the Fuel Maps window and click the Flash to Controller button (**which is not grayed out when you are connected to the controller and it is powered**).

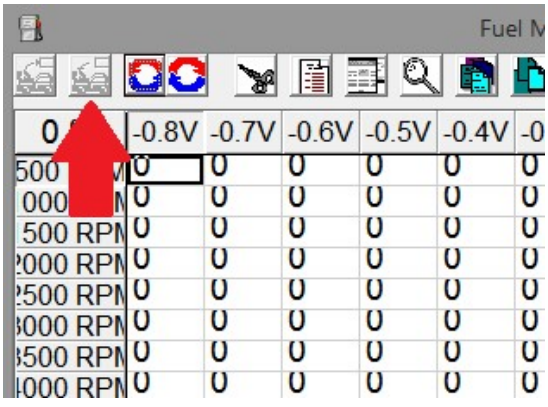


Figure 38 – Flashing the tune

60. You will see a progress bar and once it has completed the Aux Fuel System Controller has been flashed.

61. To check the operation of the Controller, go to **Real Time** and open up the **All** option. **With the Key ON and engine OFF you should see the Volts box show approximately 1.6V with the OEM 3 bar MAP sensor.** RPM will read 0.

62. Turn the engine on and hold your foot on the throttle to hold the engine speed above 2000 RPM and below 3000 RPM. **You should see the RPM match your tachometer in your dash. The Voltage should read below 1.0V.**

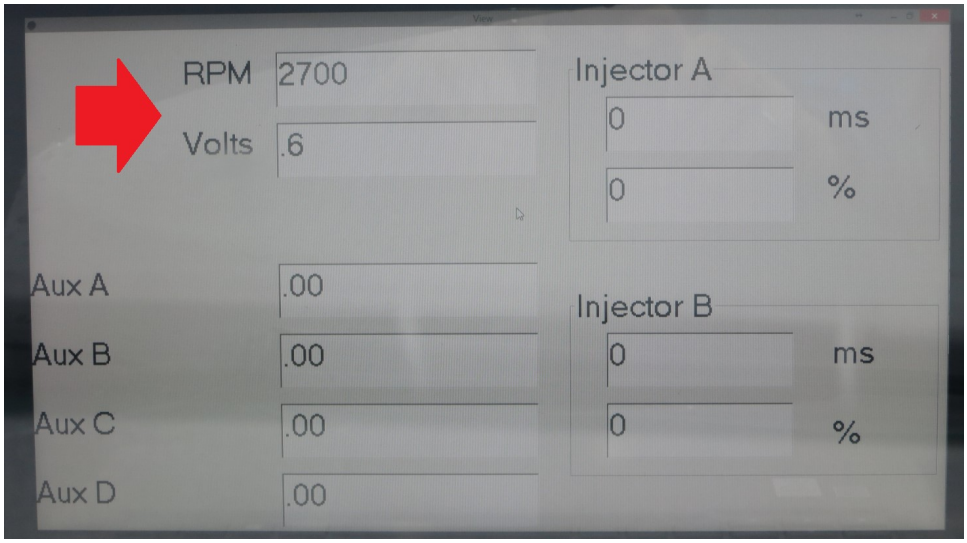


Figure 39 – Testing the R4 software

NOTE: Below 1500 RPM you will see that the RPM on the Aux Fuel Controller will not match the actual engine speed. **This is normal** and only happens at very low engine speeds (below 1500 RPM) where additional fueling is not needed.

63. Congratulations, your fuel system is now setup. Time to tune it and enjoy the added fueling and performance!

**Some illustrations taken from the 2014 Ford Fiesta Workshop Manual