SBD Motorsport

December 2018

SBD FUEL INJECTION ASSEMBLY AND SET UP INSTRUCTIONS 2.0L DURATEC HIGH SPECIFICATION TAPER THROTTLE KIT

SBD would like to thank you for choosing the taper throttle injection kit.

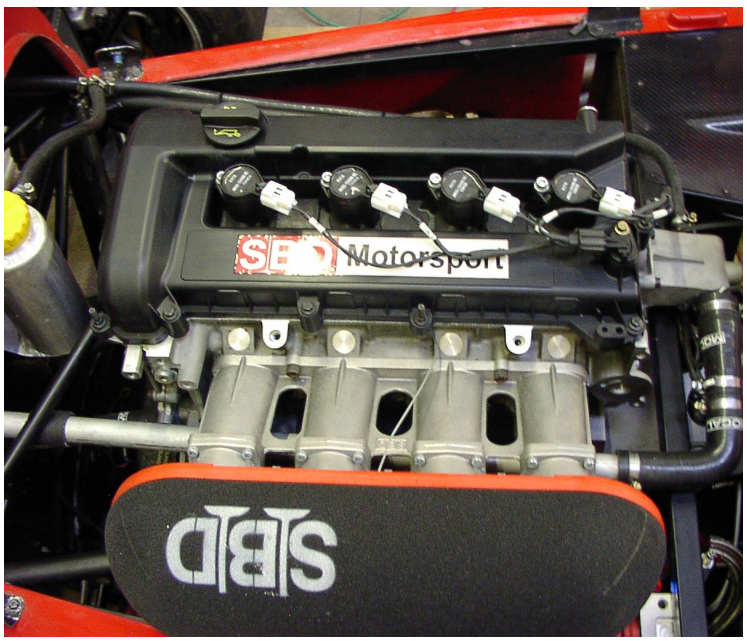
We have developed a larger throttle body design through extensive testing & development of the Duratec engine. Through changing the butterfly & injector position, we have found significant gains in torque, driveability & throttle response. gains in torque, driveability & throttle response. Because the injector is mounted much higher up the inlet track, this allows improved air/fuel mix, which we have found in many tests to give identical improvements to that seen with an 8-injector set up but also allows for reduced complexity.

Although this intake system was originally designed for high specification Duratec engines, we have found so effective that customers have been using it on all level of engine tune. As always a suitable exhaust manifold & system must be used to achieve optimum performance.

This system is a direct replacement for the 2.0L & 2.3L Standard Ford Duratec 16v induction system. It does not use the air mass sensor or air filter box that is fitted to the Standard engine. It fits exactly same as the Standard unit. The fuel rail that is fitted to this kit uses a high pressure coupling system called JIC–6 for use with a braided re-inforced hose. This type of coupling and hose design are much safer to use in motorsport than ordinary push on hose, which are regularly seen on road cars.

The wiring looms have been specially designed to be as neat as possible and to cover as many applications as possible. These wiring looms are kept on the shelf and are available in both front & rear wheel drive applications.

When ordering your kit most of the components should be in stock, which means that we can usually despatch your kit immediately.



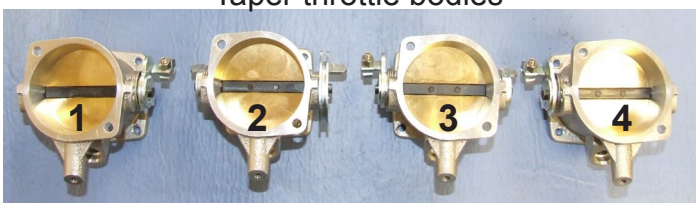
SBD Westfield with 2.0L Duratec with coil-on-plug wiring loom version.

IMPORTANT INFORMATION YOU WILL NEED TO KNOW

There are many references to cylinder numbers in this document. The position of No. 1 cylinder is the cylinder nearest to the timing chain end of the engine and therefore No. 4 position is situated at the flywheel end of the engine.

Taper throttle inlet manifold

Taper throttle bodies



The air temperature sensor should be mounted so it will measure ambient air temperature & not engine bay temperature. If in a kit car then somewhere low in the engine bay. If in an Escort or Manta type car, then through the inner wing or in behind bulkhead.

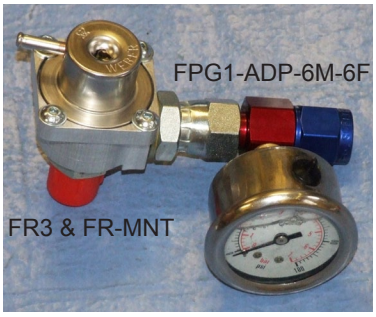
KIT COMPONENTS

Each kit is designed spefically for your requirements, therefore it is not possible to show all the components in your kit (please refer to your invoice for the parts that are included in your kit, however shown below is the minimum parts required to install this kit.

OTHER PARTS YOU WILL NEED TO ASSEMBLE YOUR KIT

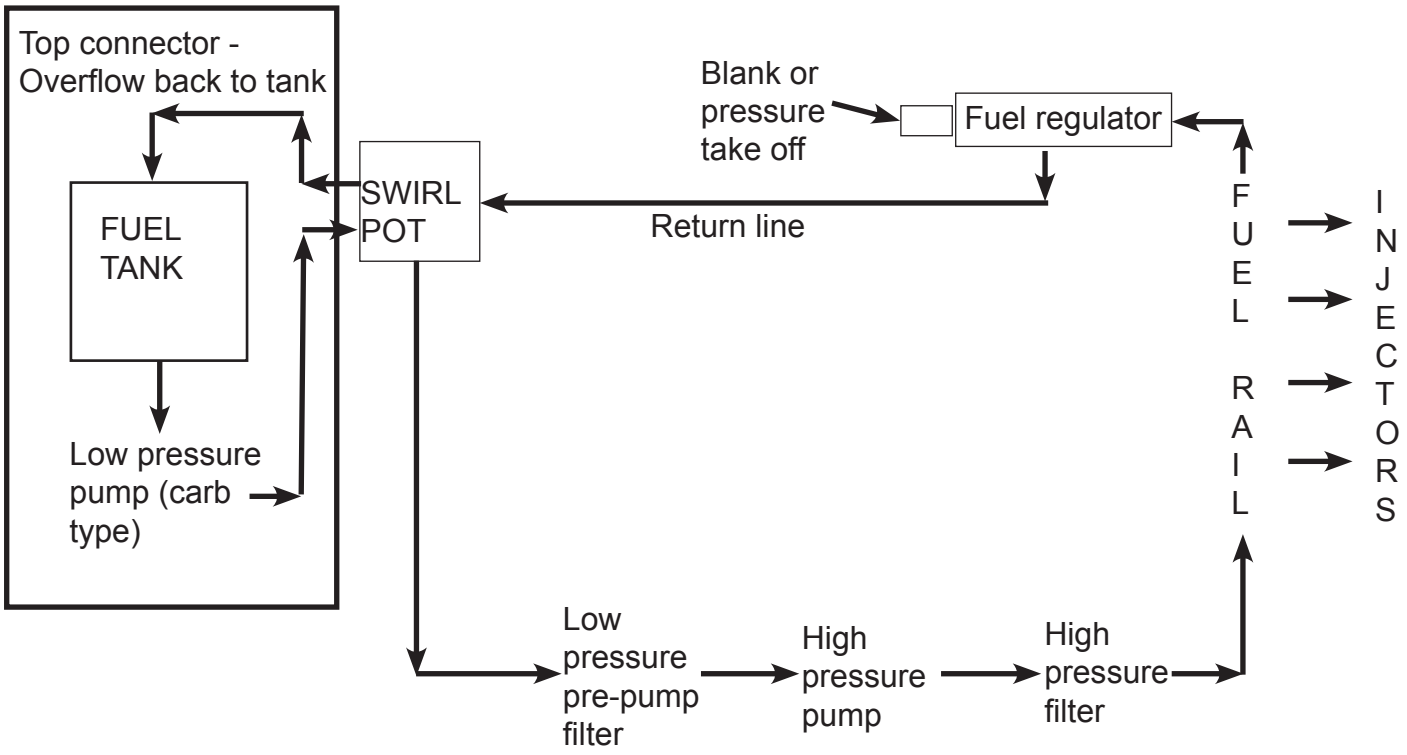
1. Air box / filter and backing plate (recommended).
2. JIC (–6) fuel couplings and braided high-pressure fuel hose.
3. Thread locking compound (Loctite 243, 222 & 648 recommended).

SPECIAL TOOLS YOU WILL NEED TO ASSEMBLE YOUR KIT



Laptop (recommended)
Easimap 6 software, downloaded free from our website (recommended)
SBD Basic CAN mapping kit & adapter (recommended)
If not using any of the above, you will require: Digital voltmeter
Fuel pressure test gauge (recommended so you can confirm your fuel system is working correctly)
Synchrometer (Vacuum gauge), see above right

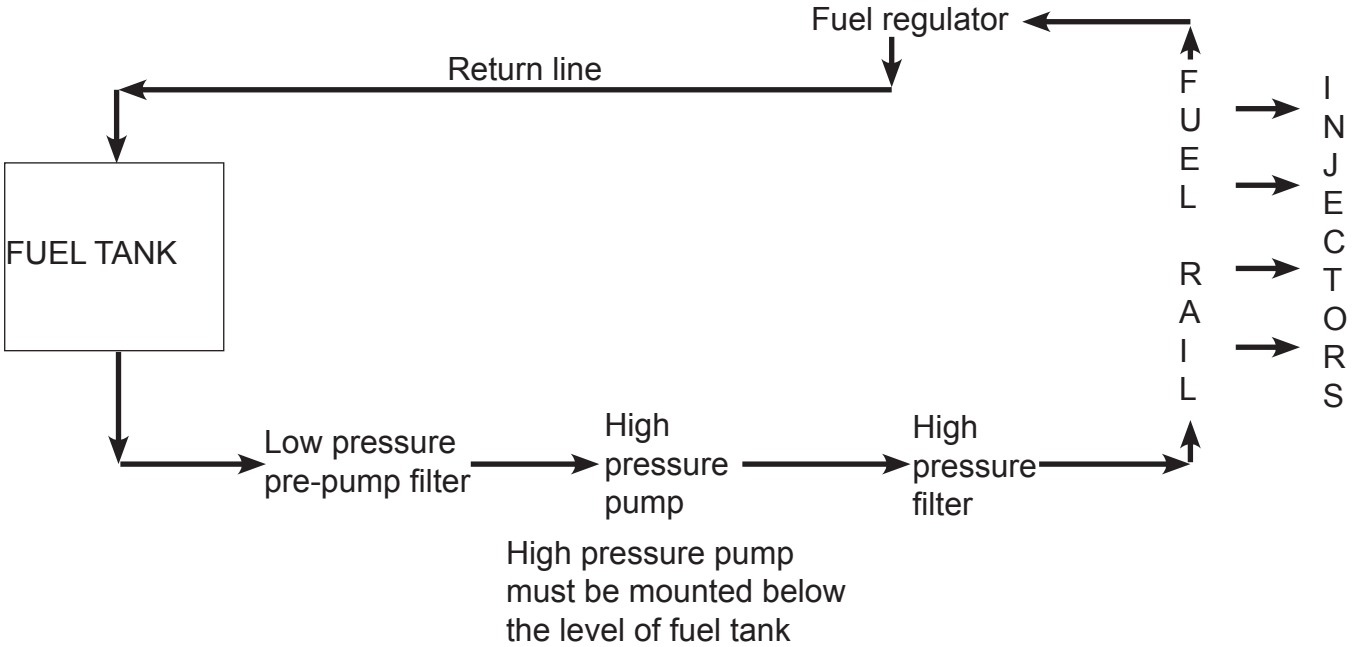
SBD FUEL SYSTEM PLUMBING WITH FUEL SWIRL POT (RECOMMENDED)



Notes

1. Use straight connectors where possible as they are approx. 1/3 of the price of angled ones.
2. High-pressure & Return to swirl pot use JIC –6 couplings.
3. Contact us for all your hose & connector requirements as each installion is different.

SBD FUEL SYSTEM PLUMBING WITHOUT FUEL SWIRL POT



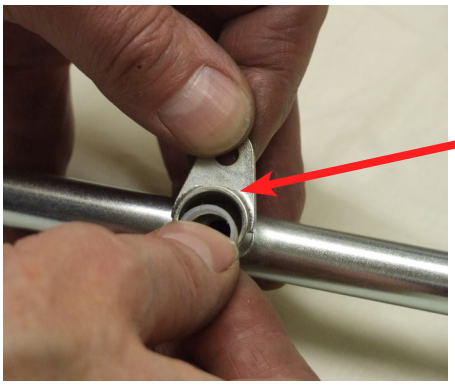
STEP 1

If SBD supply the injectors, they will come in a matched set of 4 and will include a sachet of silicone lubricant to aid assembly.

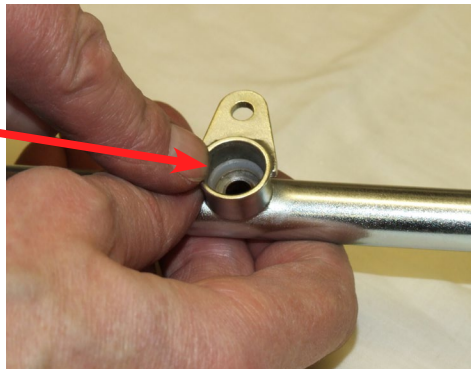
INJ-690P
High flow injector, blue
690cc, 12.5 Ohms

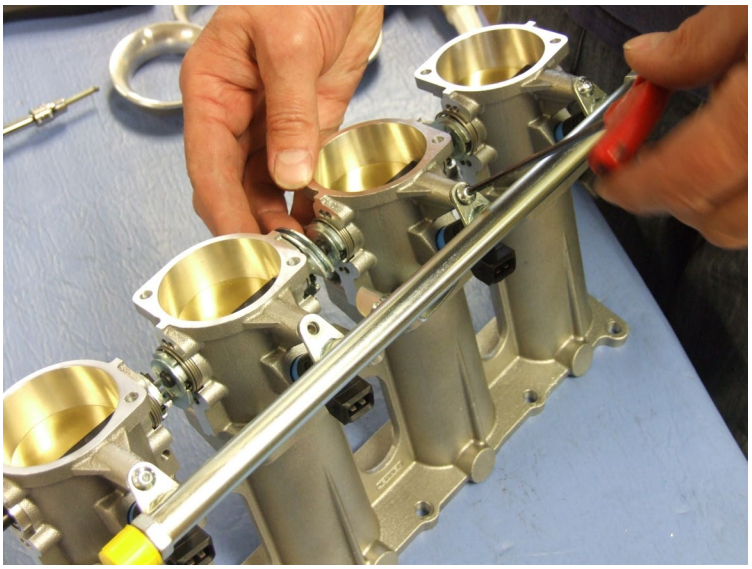
STEP 2

Fit the injectors to the fuel rail by applying a small amount of lubrication to the plastic o-ring spacers, ensuring that the spacer fits squarely into the cup. The spacers are not necessarily on all injector types, please do a trial fit by moving the injector up and down to ensure the o-rings of the injectors remain in full contact with the throttle body bore and fuel rail bore.



Insert the injectors spacers into the fuel rail





STEP 3

Insert the injectors into the fuel rail using a small amount of lubricant (silicone grease, supplied when you purchase injectors from us). The fuel rail with injectors can now be fitted into position (again lubricate the injectors) by locating the bottom of the injectors into the pockets in the inlet manifold and gently pushing on the fuel rail at both ends. The injectors will only press in so far until the mounting arms on the fuel rail rest against the throttle bodies. Tighten the bolts to hold in position.

STEPS 4-6

You will need the throttle potentometer (including brackets & bolts).

Depending on the type of vehicle this system is being fitted to, the throttle potentiometer can be fitted to either No. 1 or No. 4 throttle body. For most kit car and front wheel drive applications the throttle potentiometer will be fitted onto throttle No. 4. This position will be determined by where the connecting socket is fitted on the wiring loom. Refer to your wiring loom drawing for confirmation.

You have two throttle potentiometer options PT1-SS or PT11-SS.

IMPORTANT NOTE

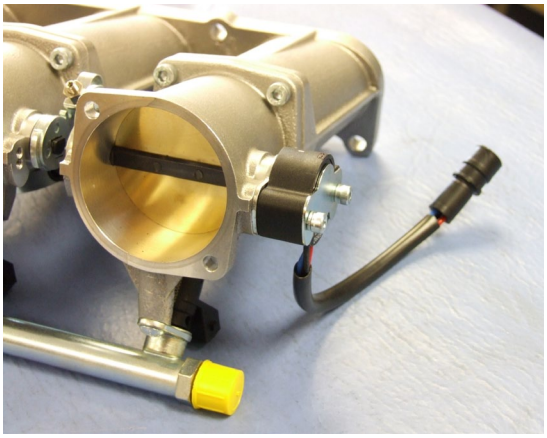
In most cases the voltage for the throttle pot when the engine is at idle is 0.36 Volts, however this is only for an engine that have been programmed by SBD. You will also need to know the units of air when the engine is at idle (this will be in KGs per hour) & the fuel pressure your engine was mapped.

Follow either Step 5 or 6 depending on where the throttle potentiometer is be fitted to.

STEP 5

NOTE
If the throttle potentiometer is being fitted to No. 4 throttle body follow the instructions in this Step.

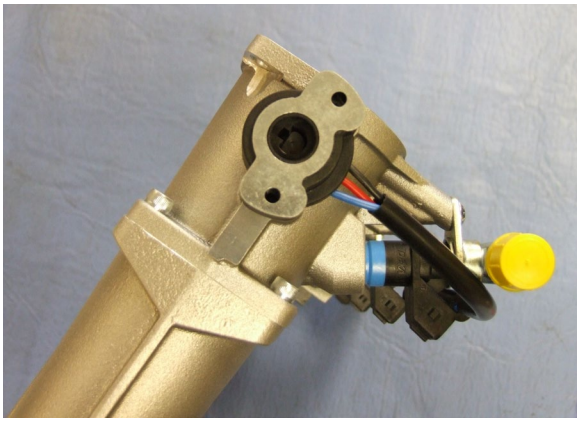
The throttle potentiometer will only operate correctly if fitted the correct way around. For fitting to No.4 throttle body the throttle potentiometer must be mounted with the lip on the side, facing outwards, and the clamping plate will then fit on over the lip.
Note – Do not fit clamping plates, bolts & washers yet.



STEP 6

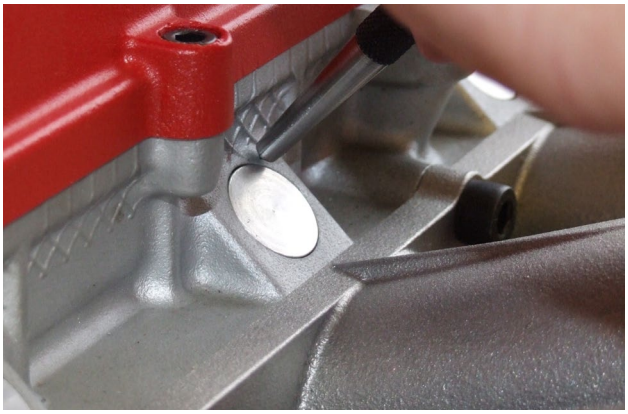
NOTE
Follow the instructions in this step only if your throttle potentiometer is being fitted to No. 1 throttle body.

The throttle potentiometer will only operate correctly if fitted the correct way around. For fitting to No.1 throttle body the throttle potentiometer must be mounted with the lip on the side facing inwards (as shown in Fig 24), and the clamping plate will then fit against the outside of the potentiometer.
Note – Do not fit clamping plates, bolts & washers yet.



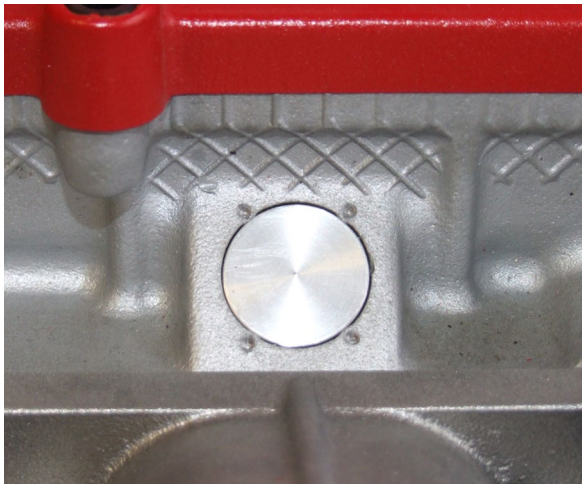
IMPORTANT
Please read the following carefully, as failure to do so may result in damage to your system.

To confirm that the throttle potentiometer is fitted correctly, you will need to gently hold the throttle potentiometer with your hand, and then slowly open the butterflies using the primary operating lever. If the throttle potentiometer is fitted correctly you should be able to achieve full throttle without the throttle potentiometer body moving. If the body does move then fit the throttle potentiometer on the other way around and repeat this step. Fit the clamping plate and then screw bolts & spring washer onto the throttle body until they just begin to tighten.
Do not tighten the bolts & spring washers yet, as the throttle potentiometer will need adjusting later on.



STEP 7

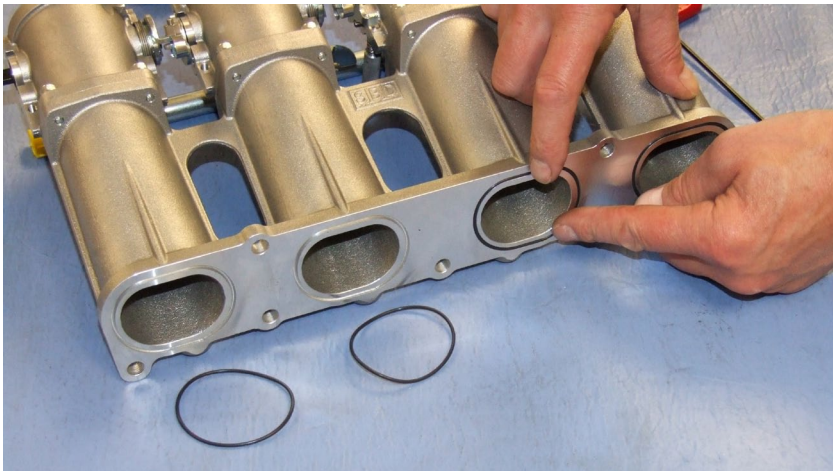
You will need to insert blanks in to the cylinder head where the original injectors are usually placed. Insert the blanks into the head using Loctite 648.

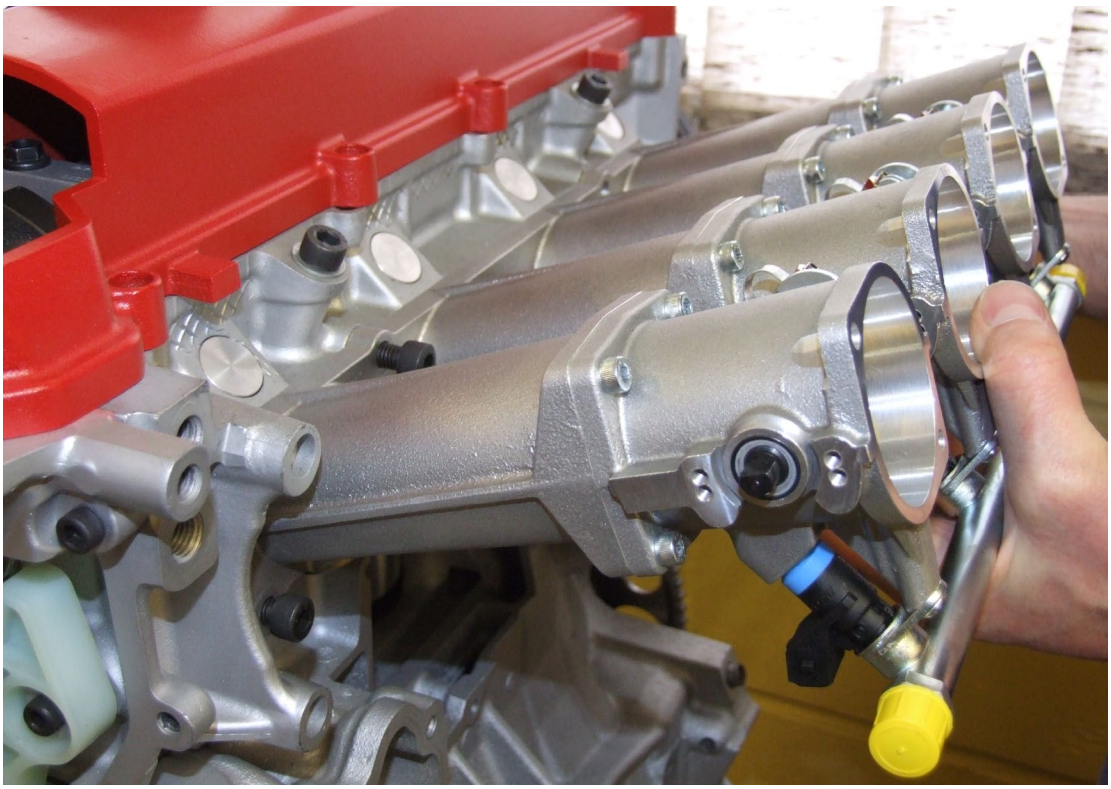


Then using a centre punch & hammer, punch 4 indentation in the cylinder head as shown causing the edge of the injector holes to deform & so retaining the blanks, thereby holding them into place.

STEP 8

Fit the throttle system to the cylinder head, fitting the ‘O’ rings into the grooves on the bottom face of the inlet manifold, stretching the seal slightly helps it locate into the groove. Do not use any kind of sealing compound on this seal. Use the M8 x 20mm bolts provided to fix the inlet manifold to the head.





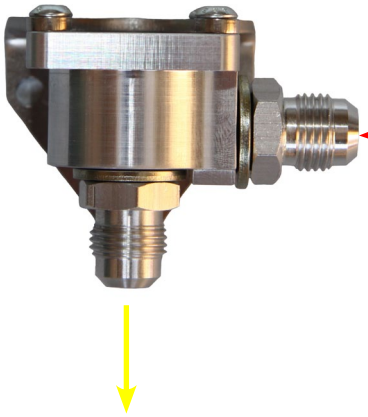
STEP 9

Do not fit the fuel regulator directly on to the fuel rail, because the Duratec produces a resonant frequency, which can make the regulator vibrate & break the fuel rail. Ensure fuel lines fitted to it are not straining.

Unscrew the 4 screws on the regulator mount, lubricate the 2 seals on the regulator (we recommend a silicone grease), then carefully push the regulator into the mount ensuring the seals are damaged. Refit the 4 screws to retain the regulator.

Tighten the inlet & outlet fittings on the regulator mount.

The inlet to the fuel regulator is a female -6 & the outlet is a male -6.

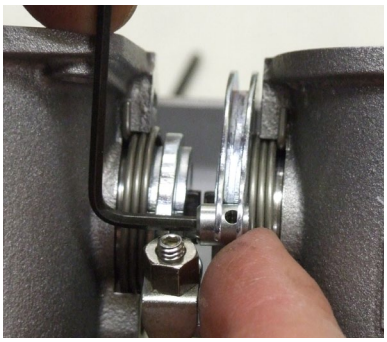


NOTE

The vacuum pipe fitted to the top of the fuel regulator is not used with this kit and can be left vented to atmosphere.

STEP 10

When fitting your throttle cable, you will need to ensure that your cable clamp (or fixed end eye) does not protrude beyond the end of the cam as shown in the picture on the right, otherwise it will jam the throttle system when opening.



If you are using our own throttle cable kit, this comes with a shortened cable clamp as shown in the photo left. Our throttle cable kit, part number TC-K3 also includes an inline adjuster, which you can position anywhere in the throttle cable to make adjustment of the throttle cable. See more information on our website under that part number.

STEP 11

Connect coil on plug loom to the various components as labelled.

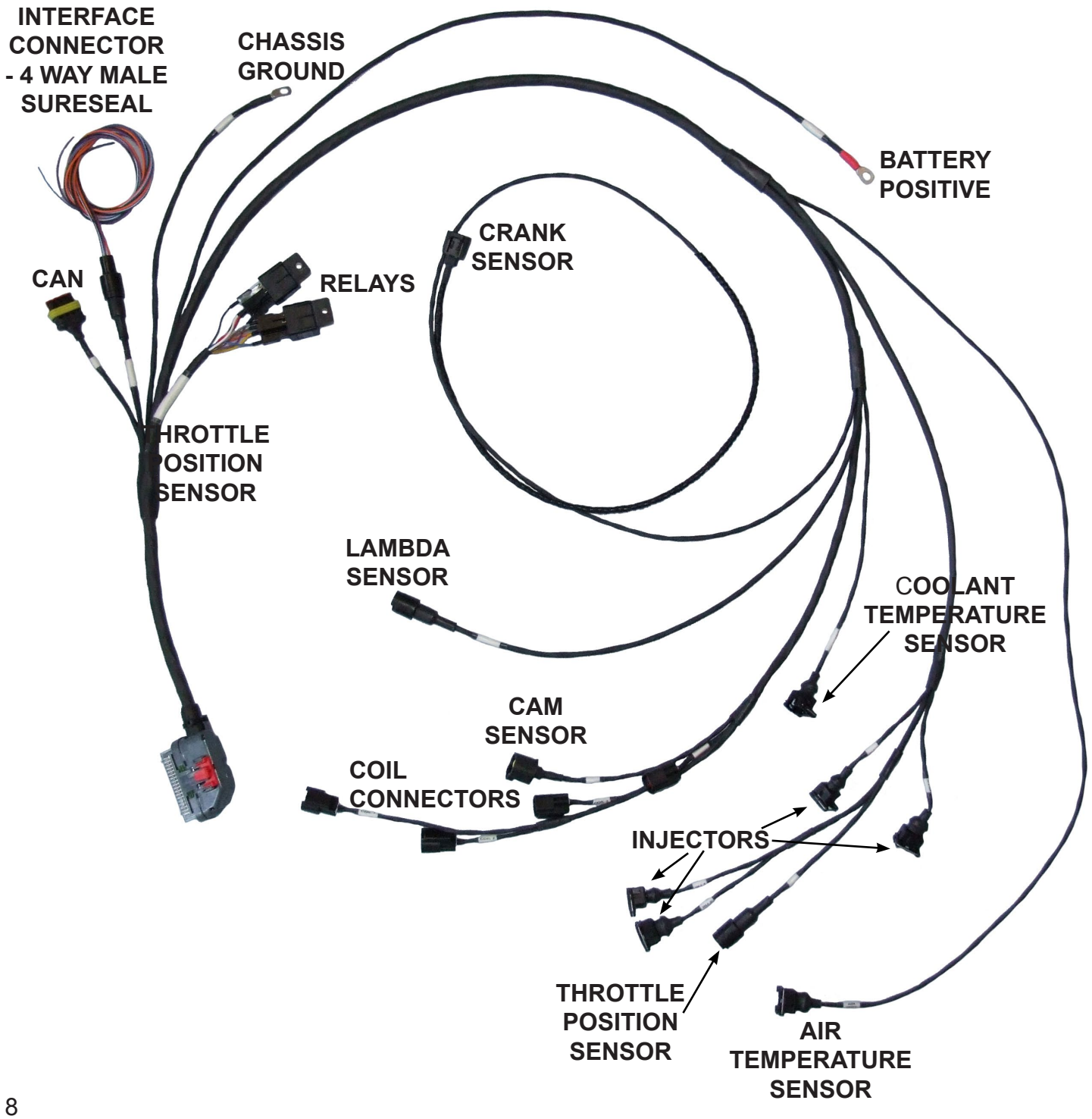
MBE9A4 - The injector plugs labelled with cylinder numbers.

The air temp sensor should measure ambient air temperature so should be mounted away from engine heat.

Connection of interface wires: -

Pin 1	Purple or Red	Switched +12v (Ignition)
Pin 2	Orange	+12v out to fuel pump
Pin 3	Green	Taco signal
Pin 4	Blue/White or White	Gear change light

Connect either way as described in step – 20.



STEP 12

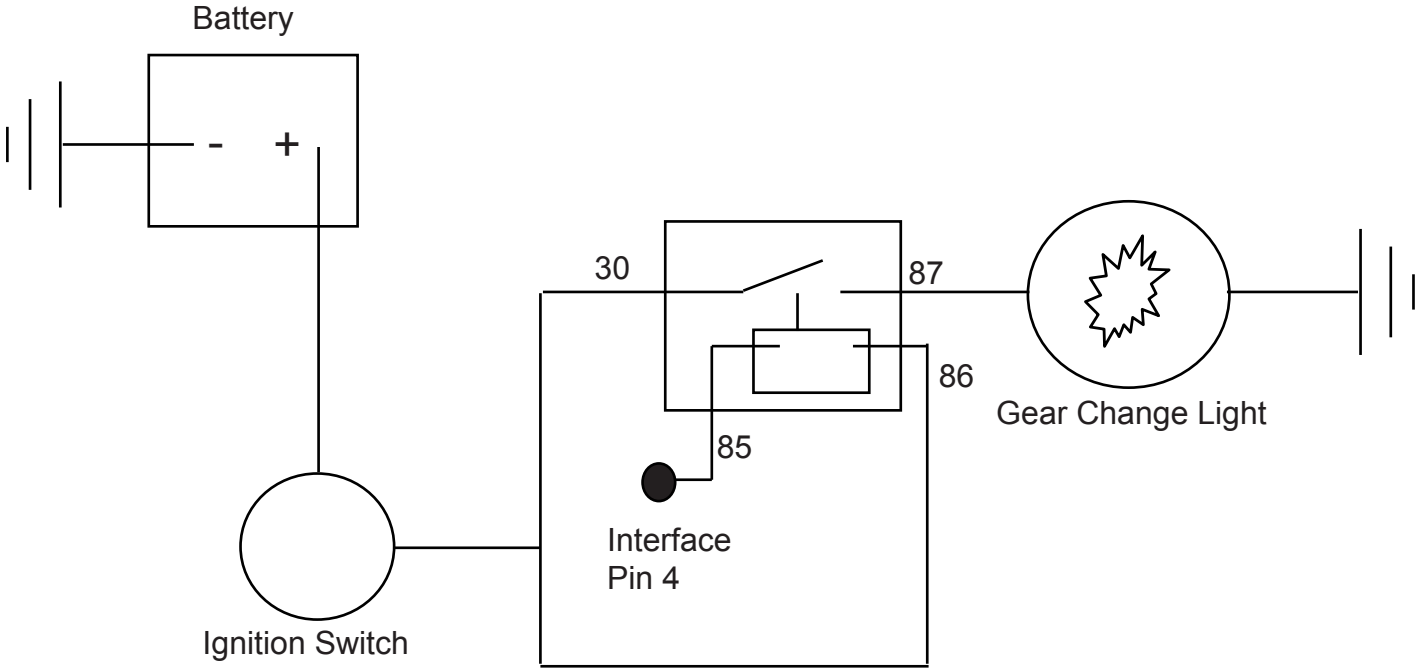
Installation of a gear change lamp

There are a large range of lights & LEDs available on the market, we suggest you use RS Components or a similar supplier. There is a choice of 2 designs for wiring in a shift light, those with a current draw of over 1amp and those which draw less than 1amp. You could also use a bleeper system, which can be fitted into the driver's crash helmet, please check our website for more information

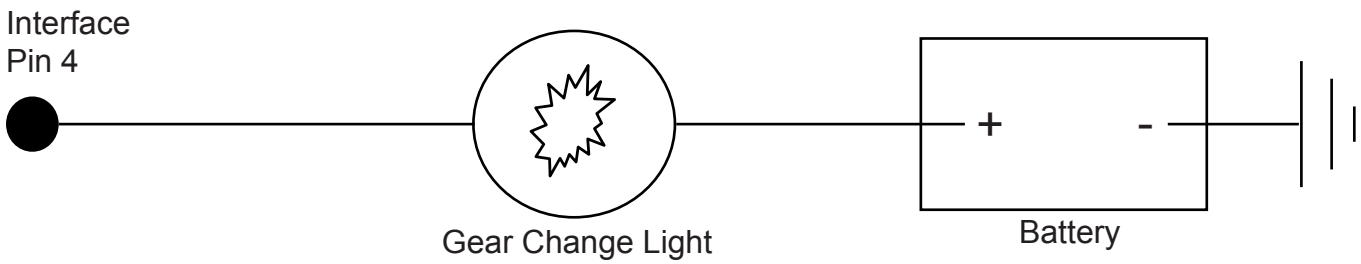
Installation of a large gear change lamp over 1 amp

Relay connections

Pin no. 85 - Connect to interface sure seal pin no. 4
Pin no. 86 - Connect to ignition switched +12V
Pin no. 87 - Connect to gear change lamp
Pin no. 30 - Connect to ignition switched +12V

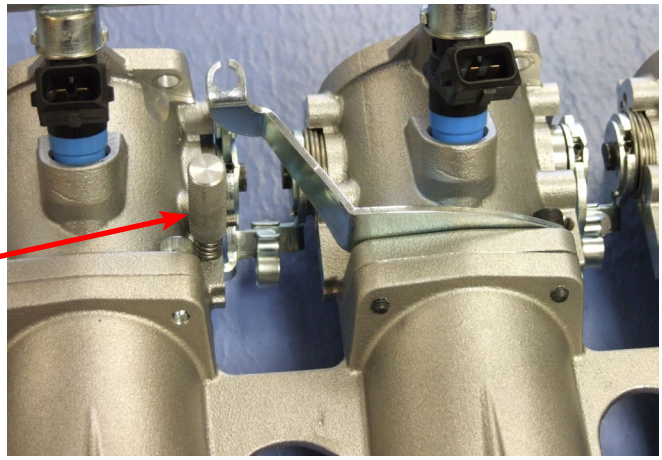


Installation of a small gear change lamp less than 1 amp



SETTING UP PROCEDURE

It is very important to read first and understand the complete set up procedure in order to enable you to set up your throttle system accurately. You should have some assistance for the setting up. All of the steps in the setting up procedure are very critical to ensure correct and efficient running of your kit. Failure to accurately follow any part of these instructions will result in your kit not performing to its optimum.



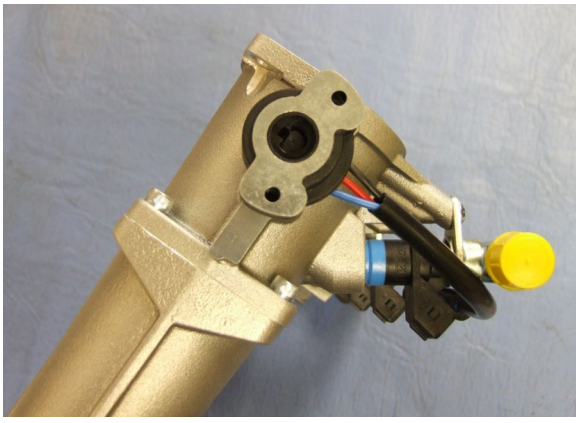
STEP 1

All our throttle bodies are now pre-assembled and set up in the factory before despatch, therefore you should only be required to set the amount of air being drawn through the throttle bodies (Kg/Ph) and the voltage at tickover. The amount of air at idle (kg/ph) varies depending on the kit, this information can be obtained from within the ECU's device info, it would have also been printed out when your ECU was programmed. There is also information within this instruction sheet, but please note that this information does vary so it is always best to look at the information within your ECU.

IF YOUR THROTTLE BODIES HAVE BEEN DISASSEMBLED PLEASE SEE A DIFFERENT INTRUCTION SHEET.

Unscrew throttle stop screw on No.2 so that it is off of the operating arm and the butterfly is fully closed.

STEP 2



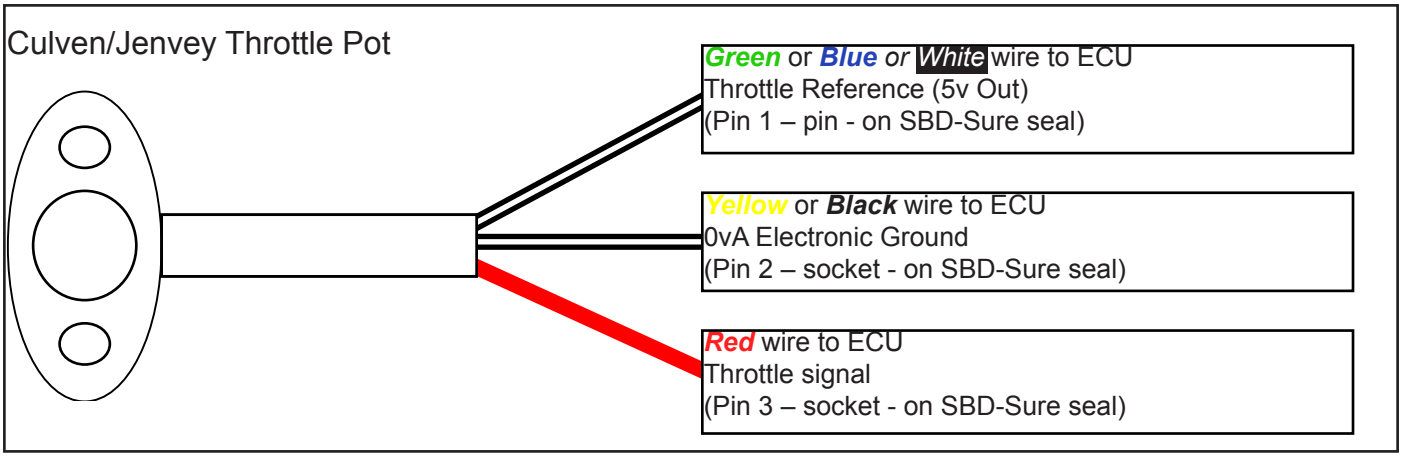
Initial setting for throttle potentiometer
Switch on your ignition only.
Do not attempt to start your engine yet!

Tighten throttle potentiometer clamping screws sufficiently so you are still just about able to move the potentiometer with your fingers. Using either Easimap 6 where the throttle position's voltage is easily displayed on the basic page or a voltmeter (if using a voltmeter, it is suggested to use 2 small bits of wire (straighten out a paperclip), slide the pieces of wire down the side of the sureseal connector on the throttle pot into Pin 3, which will give you the throttle signal and the 0v into Pin 2.

Set voltage to 0.25v, by twisting potentiometer (***This is an initial setting & you must not go back to this reading again. ***).

Leave the voltmeter connected, as you will need this later.

Screw the throttle stop screw clockwise on throttle No.2 until you reach 0.30v on your voltmeter or showing on Easimap 6.



MBE9A4/9A8 ECU Pin out for Throttle sensor

5v Reference	= Pin 22 of ECU
0vA Electronic Ground	= Pin 23 of ECU
Throttle Signal	= Pin 20 of ECU

Do not start your engine yet!

You will first need to set the fuel pressure. Turn ignition on & off to build up pressure as ECU cuts fuel pump when engine is not turning.

TP Kit	Fuel Pressure	Injector Type	ECU Type	Idle RPM/kg/Ph	Cam Profile
TP203 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1150 / 5.0	Standard
TP214 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1150 / 6.5	SBD-CM-DUR01 IN @ 1.67mm, EX @1.35mm
TP245 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1300 / 8.0	SBD-CM-DUR03 IN @ 3.75mm, EX @3.00mm
TP270 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1300 / 8.0	SBD-CM-DUR03 IN @ 3.75mm, EX @3.00mm
TP290 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1370 / 8.0	SBD-CM-DUR03 IN @ 3.75mm, EX @3.00mm
TP307 2.0L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1375 / 8.0	SBD-CM-DUR-300 IN @ 4.16mm SBD-CM-DUR-290 EX @ 3.60mm
TP327 2.4L Duratec	3 Bar (44.1 psi) 300kpa	INJ-690P	MBE9A4	1200 / 9.0	SBD-CM-DUR-300 IN @ 4.16mm SBD-CM-DUR-290 EX @ 3.60mm

Note – When you have completed your fuel system, it is always worth checking with an in-line fuel gauge as shown earlier in the instruction sheet. It is suggested that the pressure is checked not only at idle but also when the engine is revved, this is to ensure that not only do you have the correct pressure, but you also have sufficient fuel flow. If the pressure drops when the engine is revved, we then suggest you check your fuel hoses, fuel filters and fuel pumps to ensure they are all functioning correctly as this could damage your engine when put under load.

STEP 3

Starting engine for the first time
When idle voltage has been initially set and it is suggested that you check the fuel pressure to ensure your fuel system is functioning correctly, you can attempt to start the engine. You may have to hold the throttle to keep engine running. To get the engine to run on its own you can adjust the throttle stop clockwise slightly (Ensuring you do not go above the 0.37v & don't go more than approx 2 units higher or 1 unit lower than the idle Kg/Ph setting for your kit) until engine runs on its own, even if it's not smoothly.

STEP 4

Balancing the throttle bodies to read the same
Engine revs may increase during this stage, unscrew the throttle stop to decrease revs (you can re set pot voltage in next step) to keep it within 2 units above required Kg/Ph setting for your kit.

You now need to balance the butterflies using the synchrometer.

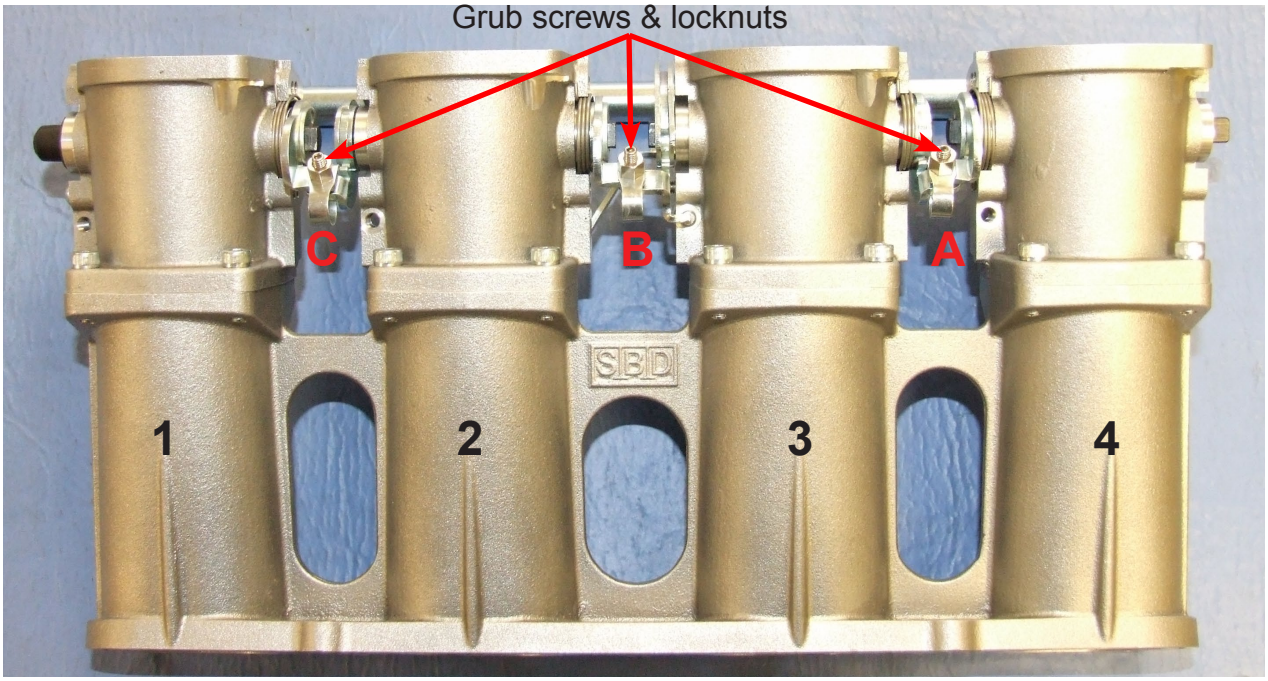
Start by reading airflow through No2 body, then No1 body, use adjuster screw A to adjust the airflow into cylinder No1, once the pair are matched, lock the locknut.

Then measure the airflow through No3 and use adjuster screw B to adjust the airflow into cylinder No3 until it matches cylinder No2 then lock the locknut.

Then measure the airflow through No4 and use adjuster screw C until it matches cylinder No3, then lock the locknut.

When all 4 throttles read the same amount of airflow they are balanced.

Give them a final check to ensure the airflow is the same across all four cylinders.



Using a synchrometer.

STEP 5

Fine tuning airflow & throttle potentiometer
You will have to do this step a few times to get everything right. – It's worthwhile spending extra time & taking care on this stage because if everything is not correct then engine will not idle properly.

With the engine still running, insert the synchrometer on No.2 body & set the correct amount of Kg/Ph airflow for your kit (by adjusting throttle stop screw). Once you have the correct amount of Kg/Ph, reset the throttle potentiometer to read 0.35/0.36v. At this point it is worth checking the vacuum across all the cylinders just to ensure that they are all reading the same.

Keep checking & adjusting until Kg/Ph airflow & throttle potentiometer are correct for your kit. (RPM will be correct when Kg/Ph is set)

Tighten the throttle potentiometer clamp so that it can't move. – DO NOT OVERTIGHTEN AS THIS WILL CAUSE THE POTENTIOMETER TO JAM UP AND STICK AND COULD ALSO DAMAGE THE POTENTIOMETER

Re-check all readings again & re-adjust as necessary.

Once you are finally happy with everything, it is suggested that you use a thread locking agent on the throttle stop screw, we normally use a small amount of Loctite 222. It is not a too stronger Loctite and still allows adjustment but helps to prevent movement of the throttle stop screw from vibration.

IF YOU ARE USING A WASTED SPARK SET UP, SEE WIRING HARNESS CONNECTIONS BELOW:

Connect loom to various components as labelled.

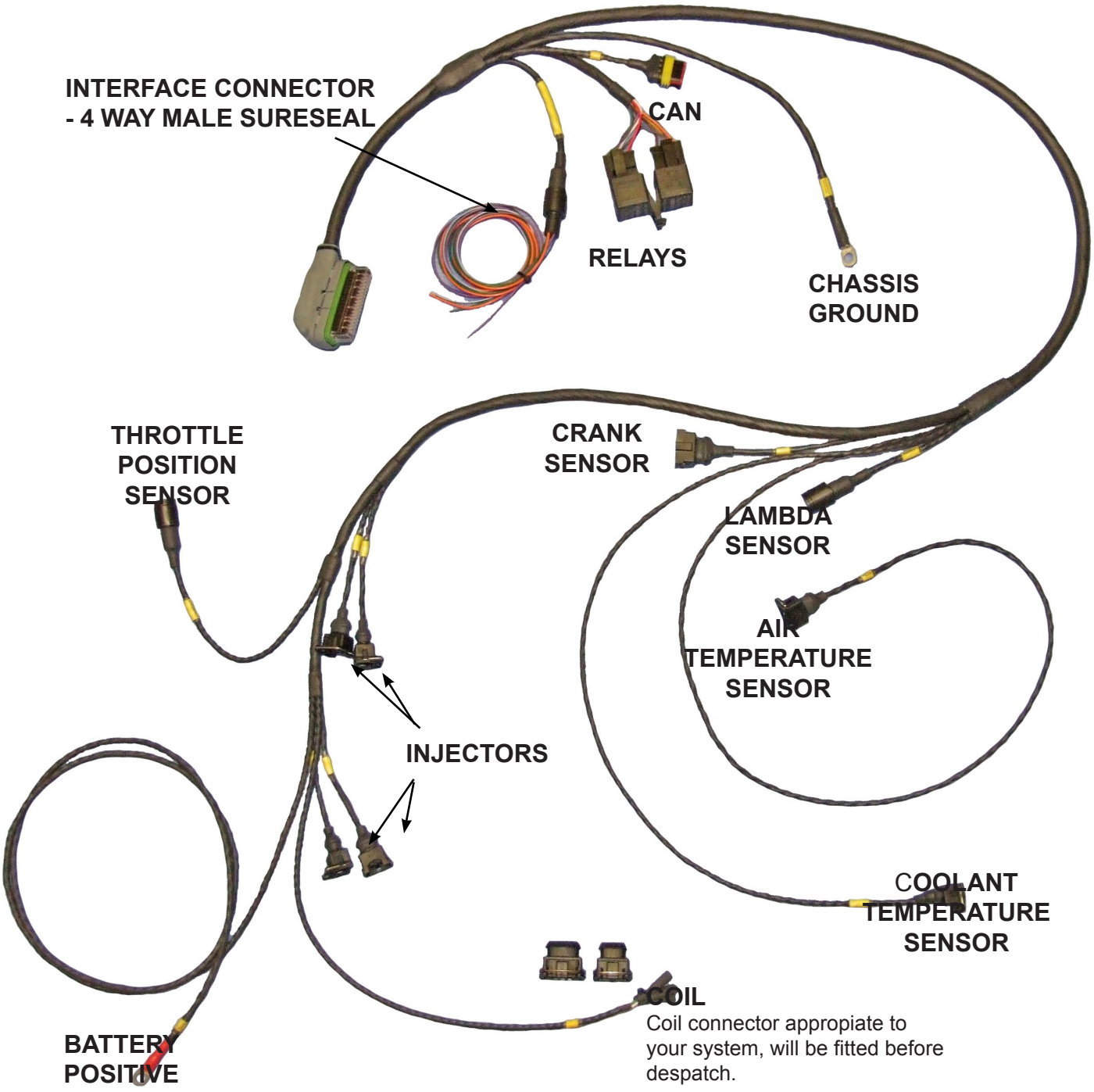
MBE9A4 - The injector plugs labelled with cylinder numbers.

The air temp sensor should measure ambient air temperature so should be mounted away from engine heat.

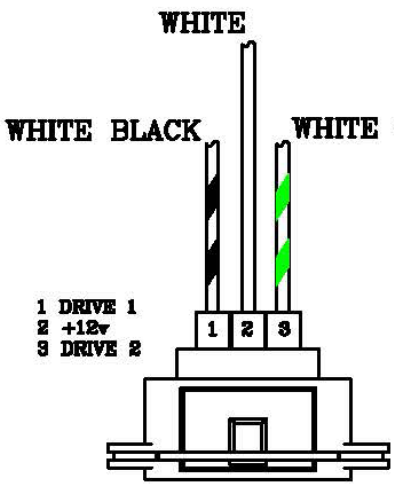
Connection of interface wires: -

Pin 1	Purple or Red	Switched +12v (Ignition)
Pin 2	Orange	+12v out to fuel pump
Pin 3	Green	Taco signal
Pin 4	Blue/White or White	Gear change light

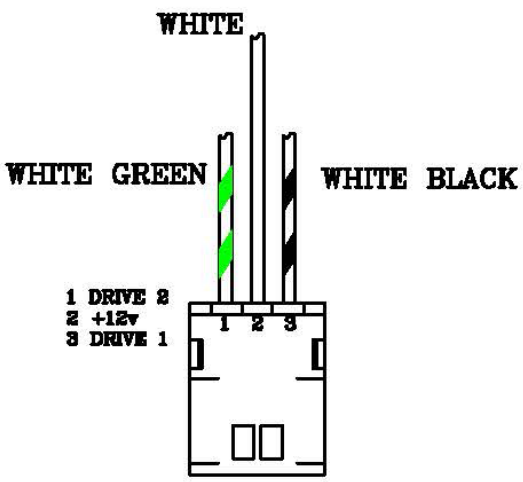
Connect either way as described in step – 20.



COIL CONNECTOR PIN OUTS



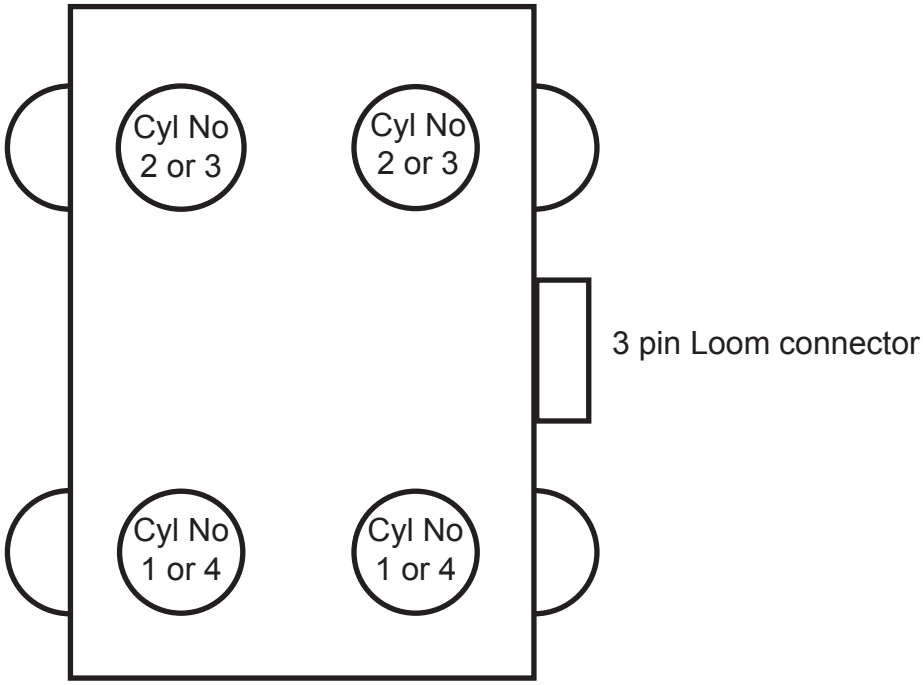
DISTRIBUTOR LESS
FORD COIL



DISTRIBUTOR LESS
LATER FORD COIL

COIL CONNECTION FOR HT LEADS

For use with Ford coils



These coil packs, when used with the MBE ECU, use a wasted spark system.
Both cylinders spark at the same time.
That is why you can install 1 & 4 on either post & the same for 2 & 3.

Please be aware that Technical Support involving our Technicians is chargeable

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