January 2020

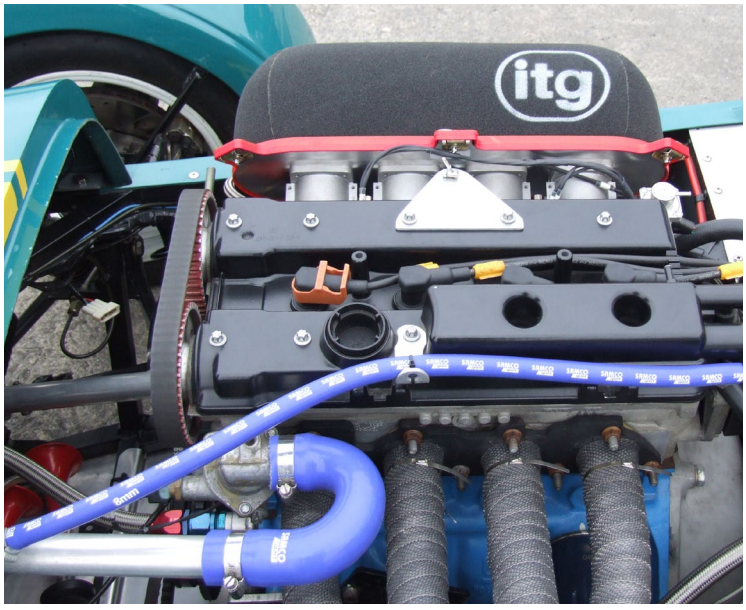
SBD FUEL INJECTION ASSEMBLY AND SET UP INSTRUCTIONS TAPER THROTTLE KIT 1.4L & 1.6L 16V with MBE9A4

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

The kit was originally developed by Steve at SBD in 1994 for a customer running a privately funded Touring Car, being very pleased with the result obtained from the 2.0L kit, in 1996 Steve designed a kit for the 1.4L & 1.6L 16v engines. A Russian rally team approached Steve part of the way through the development; this engine was a good test bench for the new throttle kit. The taper throttle kit is the basis for most of the performance engines and kits produced by SBD. The kits are extremely efficient and as a direct replacement of the standard induction system, give up to an incredible 49% increase in power (provided a suitable exhaust system is used) and an almost road car like driving characteristic, very smooth and progressive.

This system is a direct replacement for the Standard GM 1.6L 16V induction system. It does not use the air mass sensor or air filter box that is fitted to the standard engine. The fuel rail that is fitted to this kit uses a high pressure coupling system called JIC–6. These couplings are specifically designed for use with a high-pressure braided fuel hose, which is by far safer to use than a standard rubber fuel hose and has a greater tolerance to damage.

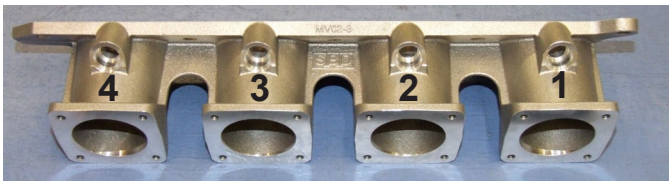
The wiring looms have been specially designed to be as neat as possible and to cover as many applications as possible.



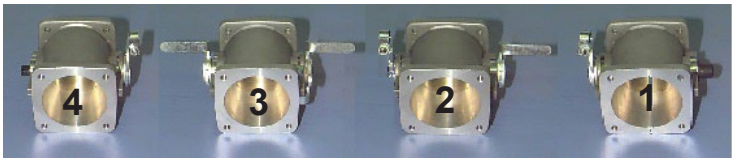
IMPORTANT INFORMATION YOU WILL NEED TO KNOW

There are many references to cylinder numbers in this document. The position of No. 1 cylinder is the cylinder nearest to the camshaft belt 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/Manta/Astra/Nova type car, then through the inner wing or in behind bulkhead.

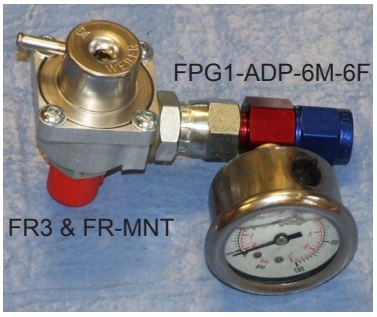
KIT COMPONENTS

OTHER PARTS YOU WILL NEED TO ASSEMBLE YOUR KIT

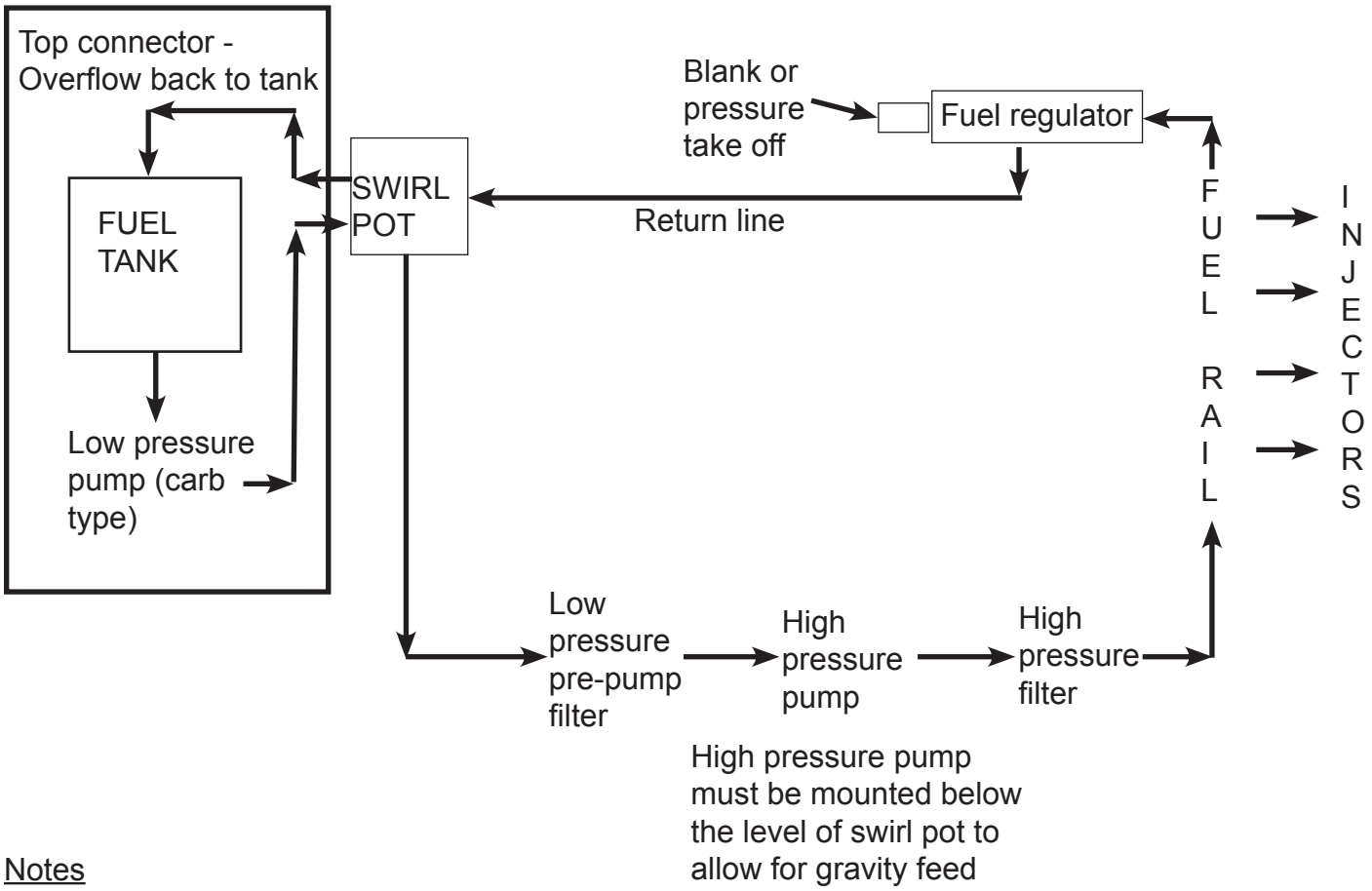
1. Inlet manifold gasket.
2. Injectors (x4). Refer to Step 23 to confirm which injectors you should use.
3. Air box / filter and backing plate.
4. JIC –6 fuel couplings & braided fuel pipes.
5. Thread locking compound (Loctite 242 recommended).
6. Silicone grease

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



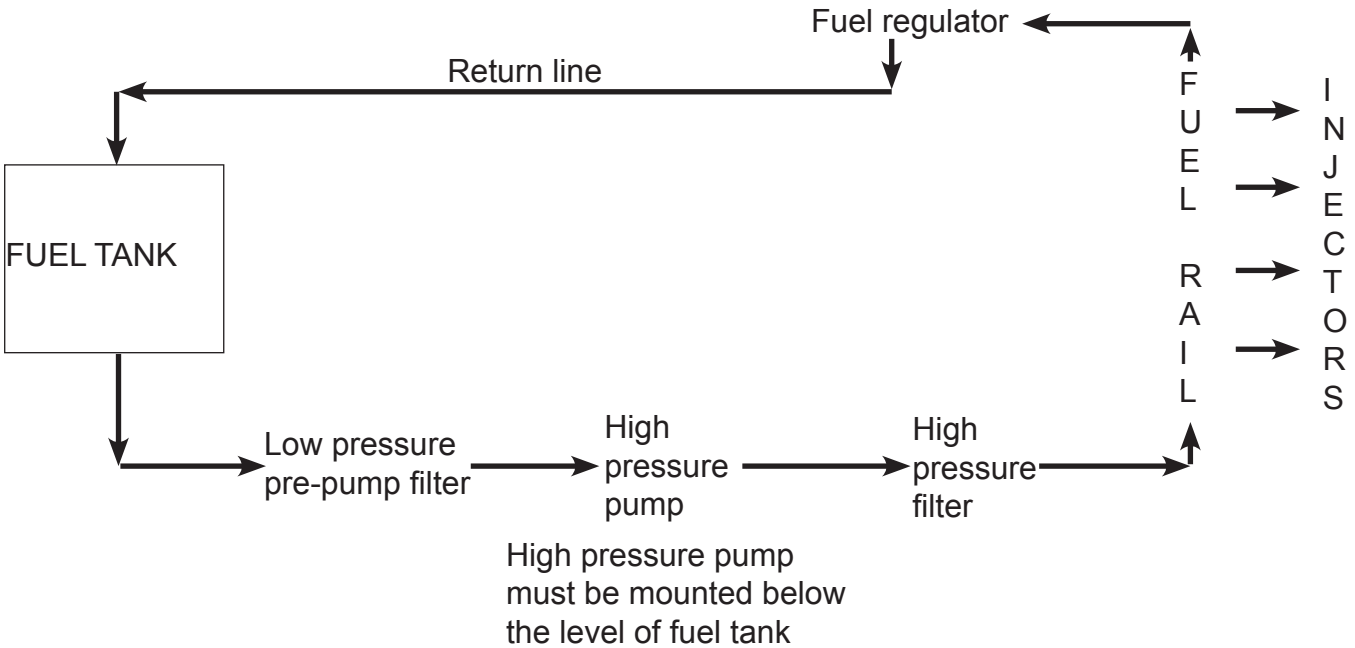
SBD FUEL SYSTEM PLUMBING WITH FUEL SWIRL POT (RECOMMENDED)



Notes

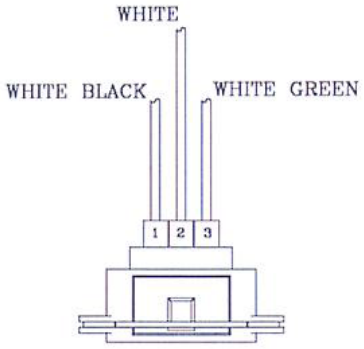
1. Use straight connectors where possible as they are approx. 1/3 of the price of angled ones.
2. High-pressure & Return to swirl pot use JIC –6 couplings.

SBD FUEL SYSTEM PLUMBING WITHOUT FUEL SWIRL POT

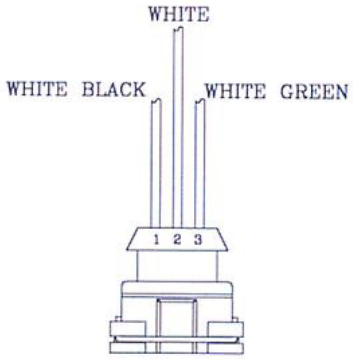


COIL CONNECTOR PIN OUTS

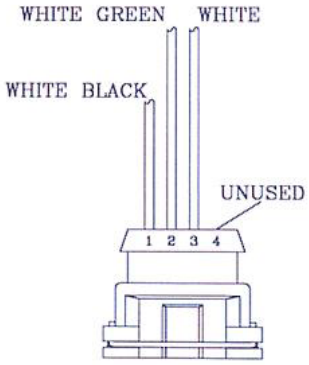
WHITE/BLACK - IGN/DRIVE 1
WHITE - +12V
WHITE/GREEN - IGN/DRIVE 2



DISTRIBUTOR LESS
FORD COIL



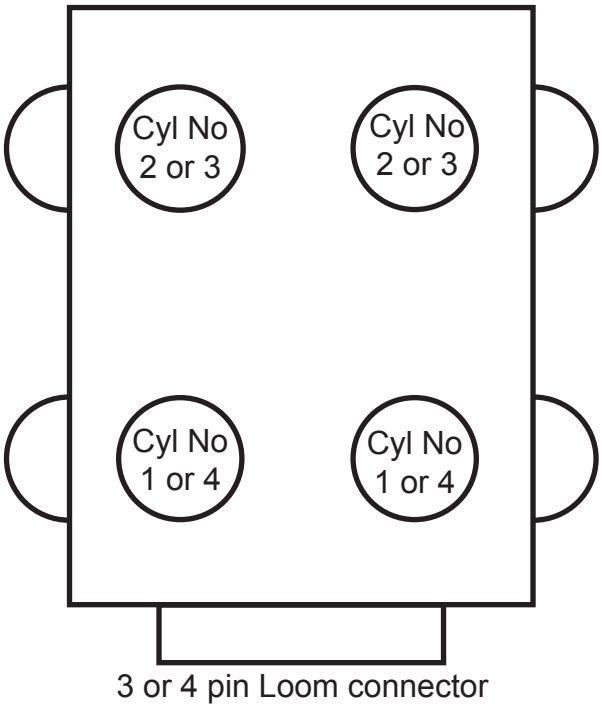
DISTRIBUTOR LESS
BOSCH COIL



DISTRIBUTOR LESS
SAGEM/VALEO/SIEMENS/LUCAS COIL
PLUS SOME PEUGEOT COIL ON PLUG SYSTEMS

COIL CONNECTION FOR HT LEADS

For use with: -Sagem/Valeo/Bosch/Siemans/Lucas 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.

GM 1.6 16V ENGINE
INSTALLATION INFORMATION

The photographic instruction sheet supplied with your kit covers most of the assembly procedure required on all types of car. The details below are designed to aid your installation when fitting the system to a Vauxhall/Opel Corsa.

RIGHT HAND DRIVE CARS

When fitting the taper throttle system to the Corsa, in right hand drive form you will need to have the shorter 40mm ram pipes (as opposed to the 90mm supplied as standard) and modify the bulkhead around the brake servo, to allow sufficient clearance to fit an air filter.

LEFT HAND DRIVE CARS

When installation is carried out on left hand drive cars, it is a much easier conversion, due to the fact that the servo is obviously mounted on the opposite side of the car and aligns with the gearbox, which means that it is not necessary to modify the bulkhead.

MOVING THE ALTERNATOR

The alternator is also required to be lowered on all left and right hand drive cars. This is to allow sufficient clearance above the alternator for the new throttle system. This is best carried out by making yourself a small plate, approximately 8mm thick, with 4 holes drilled in it. Both sets of holes are drilled at the same distance apart as the holes on the alternator bracket, but with the second set of holes, moved sufficiently downwards to allow you to fit a nut and bolt arrangement underneath the existing lugs that hold the alternator onto the block (approximately 50mm apart).

BRAKE SERVO

Due to the fact that you are now fitting 4 individual butterflies, the inlet manifold has been specially designed to spread the vacuum for the servo across two cylinder ports (2 & 3). The manifolds are standard, as you will see from your photographic instruction sheet, will arrive undrilled (unless we carry out this modification prior to despatch). We can supply 2 threaded tubes to insert into the flat sections of the manifold, which you will then join together by means of plastic and rubber pipes. You will then attach these two pipes by the means of a ‘T’ or ‘Y’ to your original non-return valve system on your servo (we have found on some of the Corsa’s some of the installation is quite tight on the cooling system pipes and have quite often used some beautifully made plastic 90 degree bends which are fitted to the Mk III Astra).

THROTTLE CABLE CONNECTION

The kit comes complete with what we call a ‘see-saw’ linkage. This allows you to either push or pull the cable from the under side of the throttles or on top. We find the most suitable way on the Corsa, is to manufacture a small bracket which allows you to mount your original throttle cable neatly off the edge of the cam cover and then by means of a little pivot which is supplied in the kit, to clamp the original inner cable to this pivot and discard the standard cup as would normally be used on the standard car.

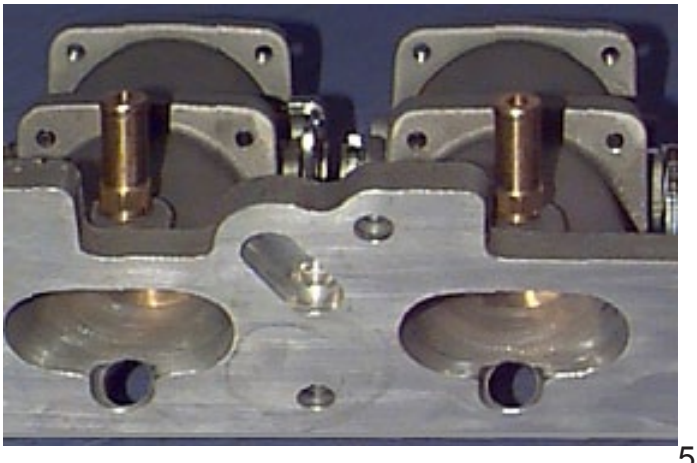
INLET MANIFOLD PORTING

To get the maximum out of your kit it is recommended that you have your inlet manifold matched to the inlet mouths of your cylinder head, this will help the airflow into the cylinder head. Alternatively you can tidy the ports by using an emery cloth flap wheel or a similar tool. This is sometimes necessary due to variations in the cylinder head castings. ***If you intend to do any porting on the manifold, it must be done now!***

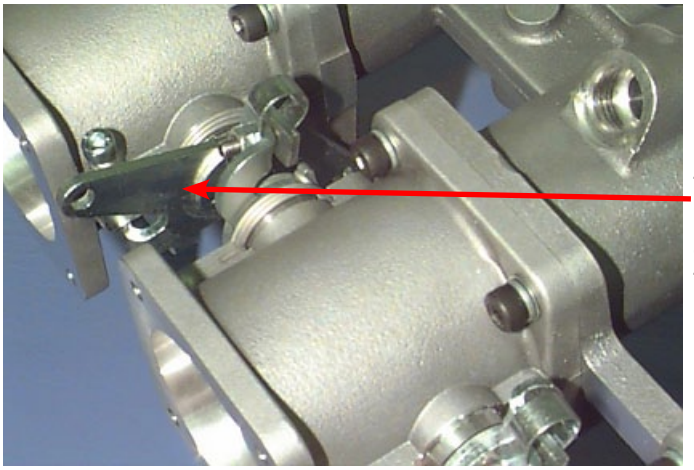
BRAKE SERVO MODIFICATIONS

If you are using a brake servo on your vehicle you will need to carry out this modification to fit servo couplings to enable you to connect a servo vacuum pipe to your inlet manifold.

If you are using a brake servo this modification must be carried out before assembly!

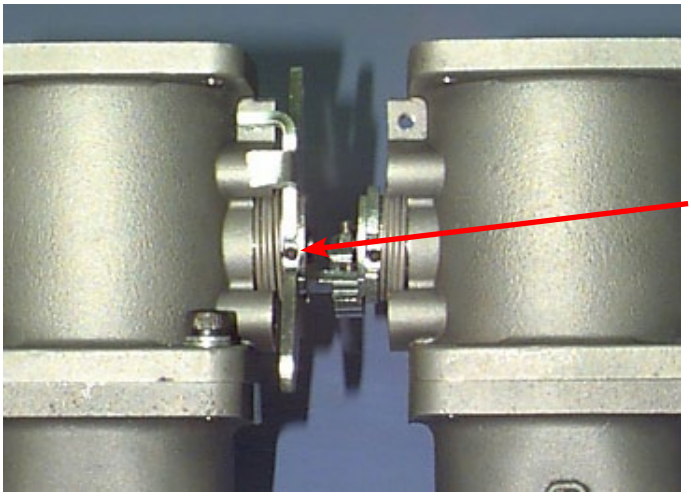


ASSEMBLY PROCEDURE



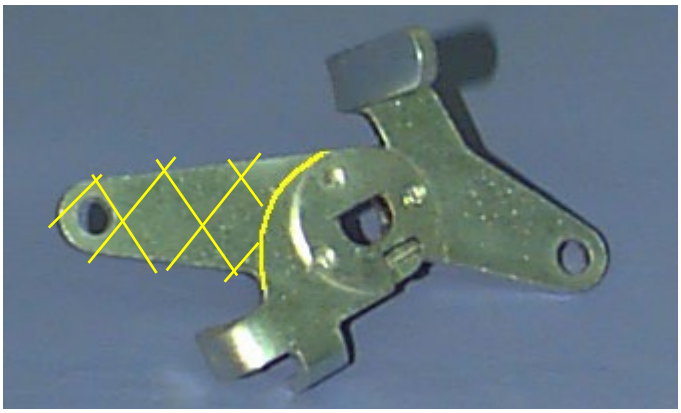
STEP 1

Note one of the levers on throttle No. 3 has 2 extensions; these are for the throttle cable to attach to (this is the primary operating lever). Check which extension is going away from the inlet manifold (shown in 4) as this will have to be cut off to prevent it fouling the airbox/filter backplate.



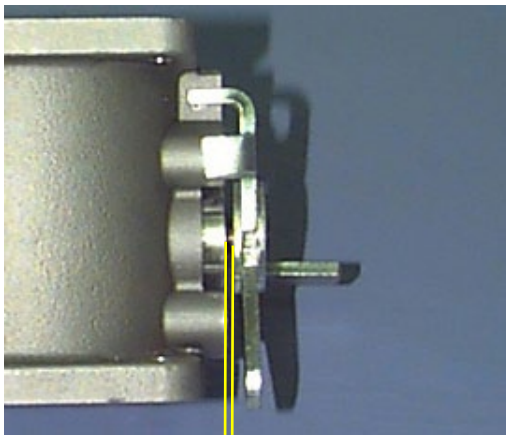
STEP 2

It is very important that before removing the lever you carefully note the position of the return spring, in order to ensure correct refitment later on.
To remove the lever you need to undo the small grub screw (shown in Fig left) at the bottom of the lever and gently pull the lever outwards from the throttle body. Be careful not to loose the screw or the nut that the screw goes into once they are removed. Sometimes the levers are difficult to remove so be careful not to bend the lever, this may result in problems later on in use.



STEP 3

Mark the lever with a scribe or a pen (shown left), then hold the lever in a vice and carefully cut along the mark with a hacksaw. Once the lever is cut, tidy the cut edge with a fine file and remove any burrs.
Be very careful when you cut down the lever to make sure that you cut off the correct bit as both extensions look very similar.



STEP 4

First clean and then refit the lever ensuring the spring is fitted in exactly the same position as noted earlier. When the lever is pushed on you need to have about .020” or 0.50mm gap between the inside of the lever and the throttle housing (shown left). Refit and tighten the grub screw being careful not to over tighten.

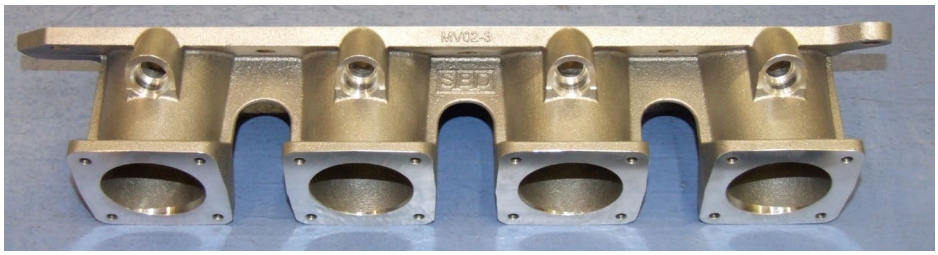
Note – Picture left shows the throttle lever refitted without the spring in position. This is only done to show where you should measure the clearance from when refitting the lever onto the throttle.

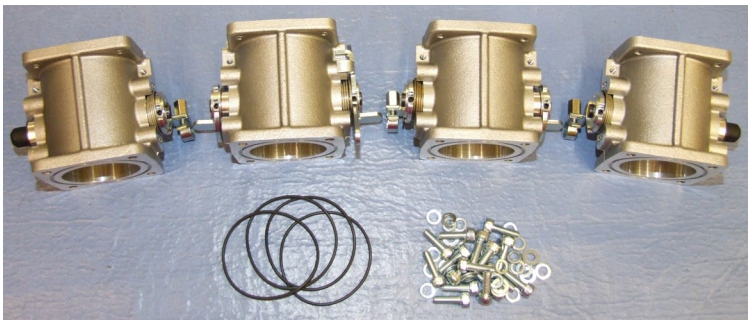
STEP 5

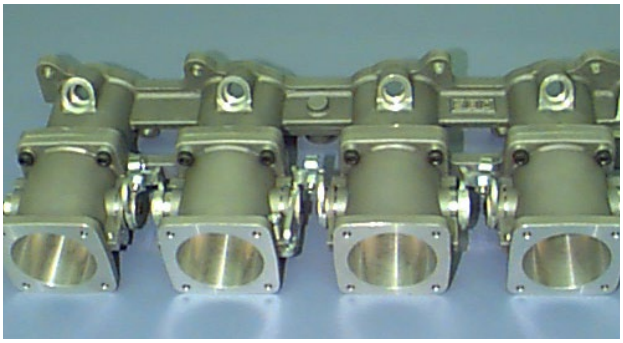
You will need the inlet manifold, throttle bodies & associated o-rings, bolts & washers.

Now you are ready to assemble your throttle system
First you must make sure that all of the components you are assembling are thoroughly cleaned.
Starting with No. 3 throttle body, fit the ‘O’ ring into the groove on the bottom face of the body, stretching the seal slightly helps it locate into the groove. Do not use any kind of sealing compound on this seal. Now place the throttle on the inlet manifold in the No. 3 position ensuring the levers are at the top as before, and the ‘O’ ring stays in place. Fix the throttle into place using the bolts & washers and tighten evenly.

You can check that the O-ring has remained in position by opening the butterfly using the butterfly using the operating lever & looking into the throttle, you should not be able to see any part of the seal.





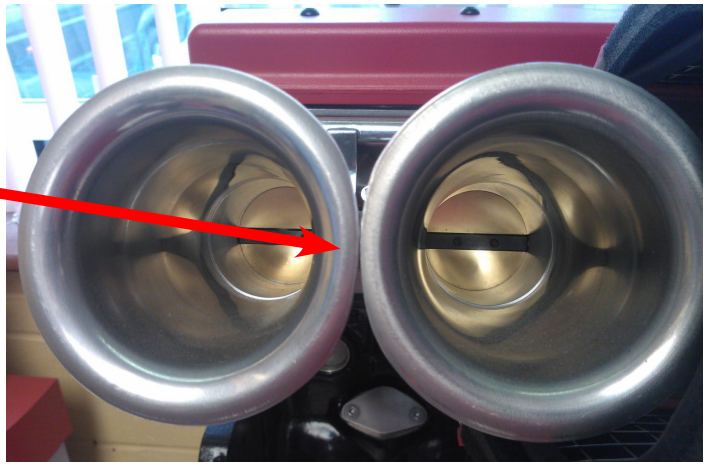


STEP 6

Now fit throttle No. 2 onto the inlet manifold in position No. 2, following the same instructions as for fitting No. 1 throttle. When No. 2 throttle is fitted, ensure that the operating lever from No. 2 body fits in between the balancing screw and the throttle lever spring (shown in 2), and again ensure the ‘O’ ring is fitted correctly by looking down the throttle.
Fit throttles No. 3 & 4 into position being careful to ensure correct positioning of the ‘O’ ring and lever arms as before.

STEP 7

When fitting the air horns you will need to trim them slightly along the adjoining edges to enable them to fit.



STEPS 8 - 10

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

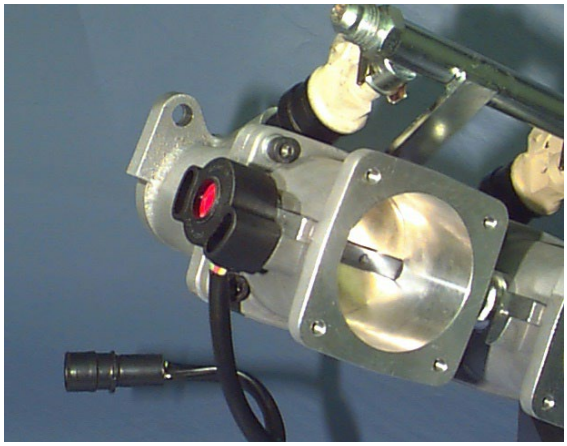
In most cases the voltage for the throttle pot when the engine is at idle is 0.35/0.36 Volts this is however only for engine that have been programmed by SBD. You will also need to know the units of air when the engine is at idle (this will be in KGs per hour) & the fuel pressure your engine was mapped.

Follow either Step 17 or 18 depending on where the throttle potentiometer is be fitted to.

STEP 9

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

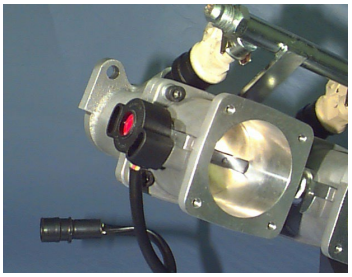
The throttle potentiometer will only operate correctly if fitted the correct way around. For fitting to No.4 throttle body the throttle potentiometer must be mounted with the lip on the side, facing outwards, and the clamping plate will then fit on over the lip.
Note – Do not fit clamping plates, bolts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



STEP 10

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.

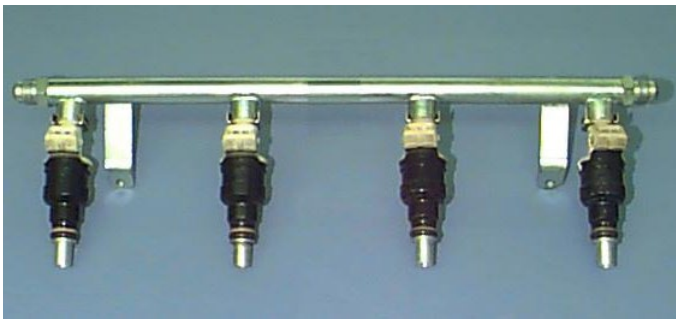
To confirm that the throttle potentiometer is fitted correctly, you will need to gently hold the throttle potentiometer with your hand, and then slowly open the butterflies using the primary operating lever. If the throttle potentiometer is fitted correctly you should be able to achieve full throttle 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 11

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.
You will need first to confirm the type of injector you should use for your kit. Refer to table on page 15.

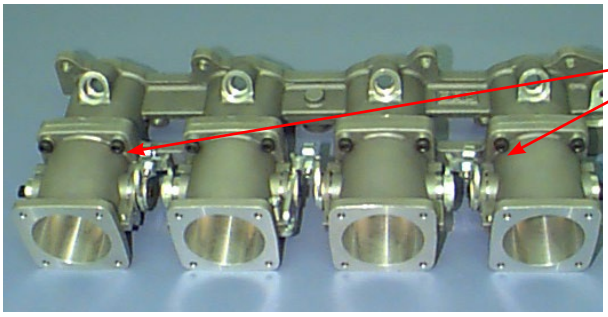
INJ-330-P
Small Peco injector, brown 330cc

INJ-690-P
Small peco injector, blue 690cc



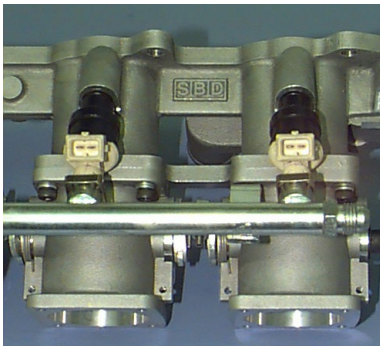
STEP 12

Fit the injectors to the fuel rail by applying a small amount of silicone lubricant to the rubber 'O' rings, ensuring that the 'O' ring fits squarely into the cup. Once the injector is fitted, fit the injector clip onto the top of the injector making sure that the lip on the injector cup locates into the cut out on the injector clip, also making sure the injector clip locates into the top groove on the top of the injector.



STEP 13

To fit the fuel rail and injectors, which were assembled in the Steps 12 & 13, first you must remove the top right throttle body fixing screw on No4 throttle and also the top left throttle body fixing screw on No1 throttle.



STEP 14

The fuel rail with injectors can now be fitted into position (use silicone lubricant) 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. Refit the fixing screws removed in Step 14 and tighten evenly.

STEP 15

You should now be ready to fit your throttle system to the cylinder head of your engine.
Using a new inlet manifold gasket and new copper nuts fit the throttle system to the cylinder head. Do not use any sealing compound. It is recommended that you remove the stud shown in Fig 29 and replace it with a M8x20 cap head bolt as the shoulder of a copper nut will foul on the inlet manifold, not allowing it to be tightened., Apply a small amount of thread locking compound to the bolt when fitting (Loctite 242 recommended).

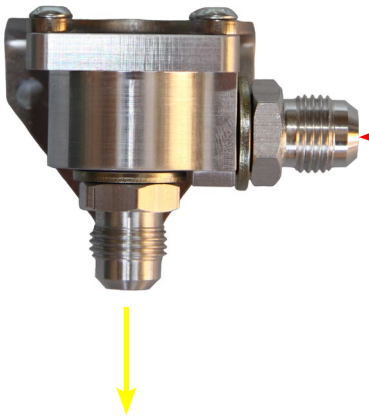
STEP 16

Do not fit the fuel regulator directly on to the fuel rail, because certain engines can produce 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.



From fuel rail

Return to fuel tank

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 17

Connect loom to various components as labelled.

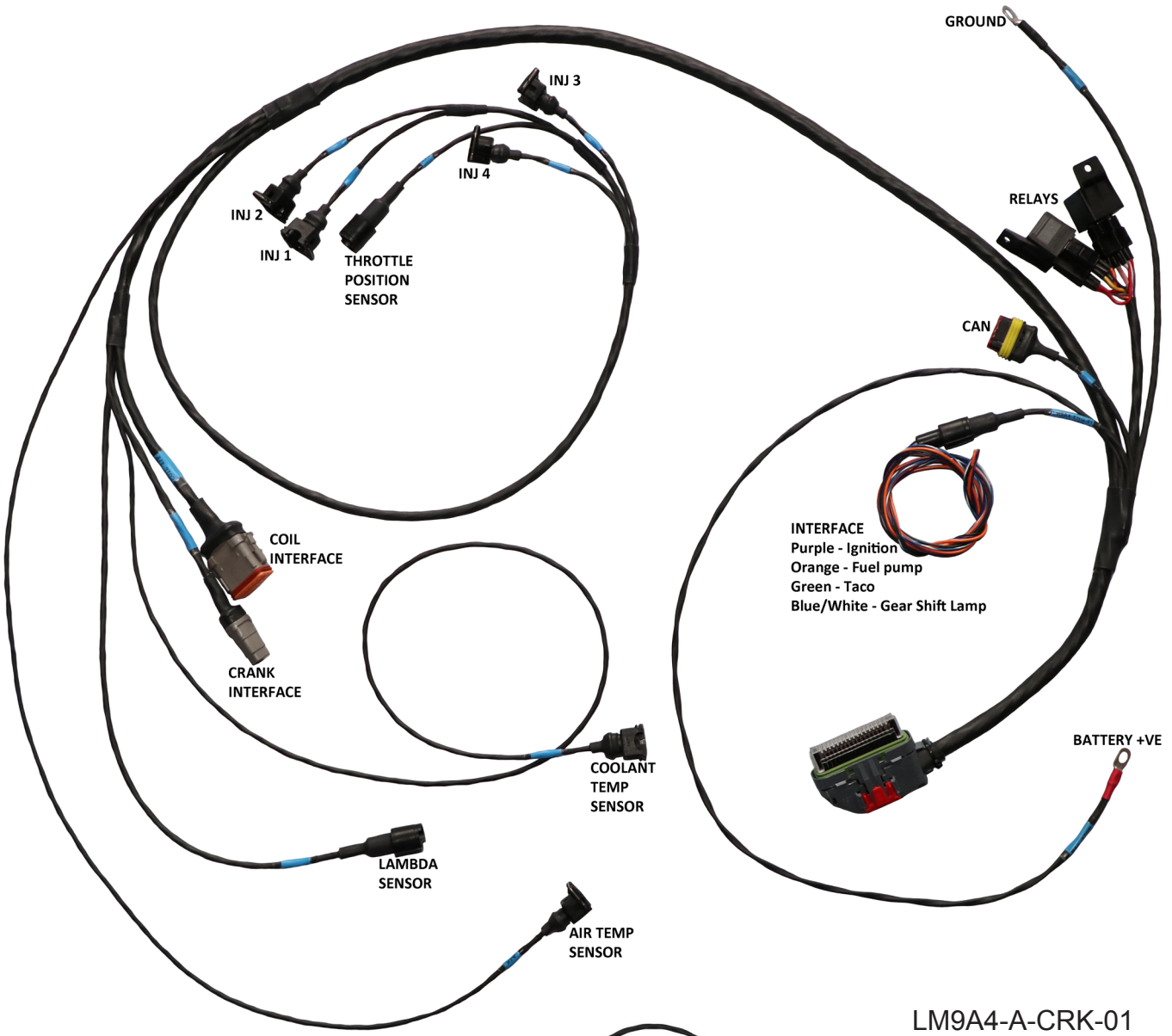
MBE9A4 - The injector plugs labelled with cylinder numbers.

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.



LM9A4-A-CRK-01

LM9A4-A-COIL-01

STEP 18

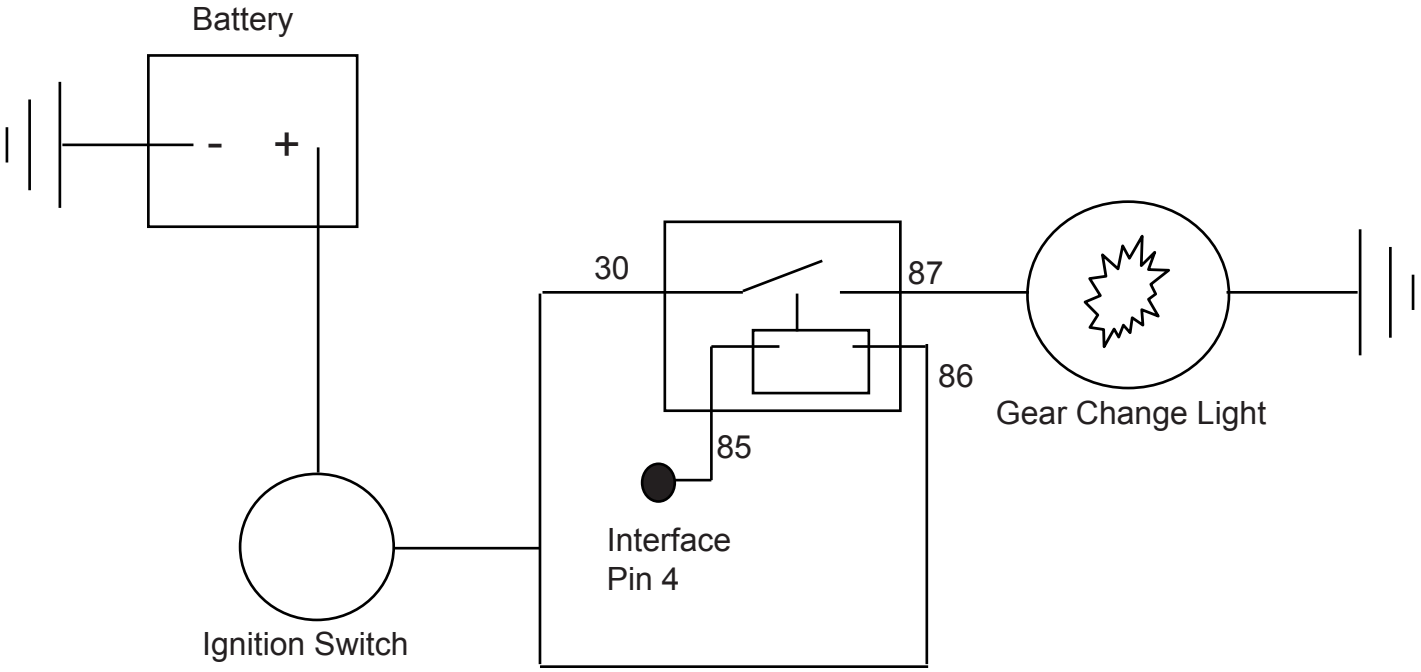
Installation of a gear change lamp

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

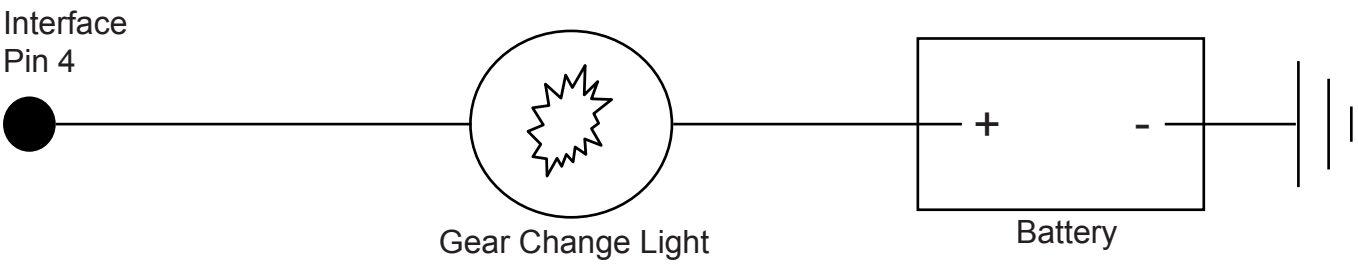
Installation of a large gear change lamp over 1 amp

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



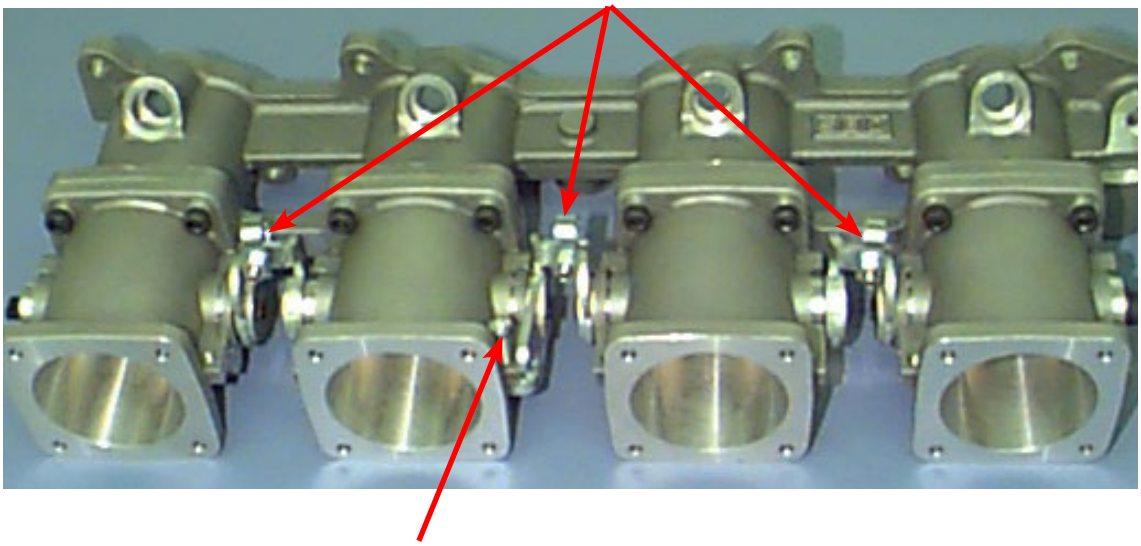
Installation of a small gear change lamp less than 1 amp



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.

Grub screws & locknuts



Throttle Stop Screw

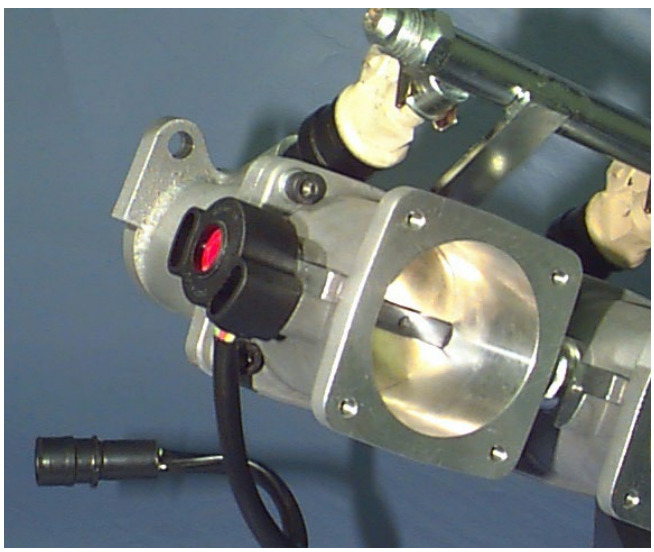
STEP 1

Visual alignment of butterflies
Unscrew throttle stop screw on no. 3 so that it is off of the operating arm and the butterfly is fully closed.
Visually adjust remaining butterflies to fully closed by loosening locknut in-between bodies & adjusting grub screw. Do not lock the screws yet, as you will have to adjust them again after starting the engine.

STEP 2

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

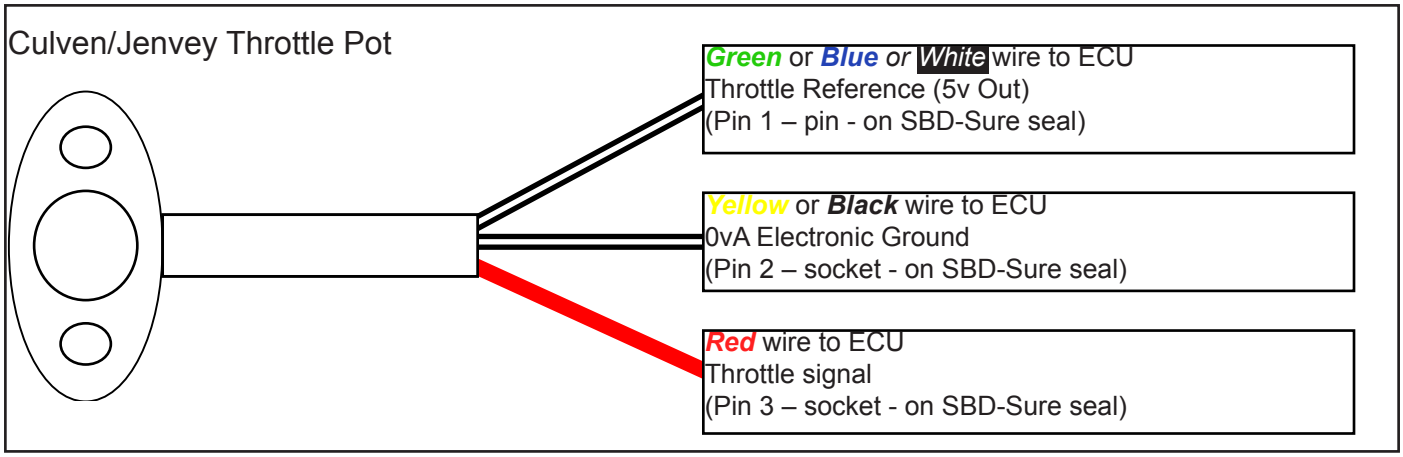
Tighten throttle potentiometer clamping screws sufficiently so you are still just about able to move the potentiometer with your fingers. Using either Easimap 6 where the throttle position's voltage is easily displayed on the basic page or a voltmeter (if using a voltmeter, it is suggested to use 2 small 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.3 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
TP127-137 1.4L 16v XE	3 Bar (44psi)	INJ-330P	MBE9A4	980 / 4.0	Standard
TP 150-164 1.6L 16v XE	3 Bar (44psi)	INJ-330P	MBE9A4	980 / 4.0	Standard

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.

Injector Types

INJ-330-P INJ-690-P

STEP 3

Starting engine for the first time

When idle voltage & fuel pressure have been set, 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 screw the throttle stop clockwise slightly (Ensuring you do not go above the 0.36v & 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 No3 body, then No4 body, use adjuster screw A to adjust the airflow into cylinder No4, once the pair are matched, lock the locknut.

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

Then measure the airflow through No1 and use adjuster screw C until it matches cylinder No2, 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, butterflies balanced insert the synchrometer on No.3 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, re set the throttle potentiometer to read 0.35/0.36v.

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.

Please be aware that Technical Support involving our Technicians is chargeable

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