Installation manual for Stage 1

(A Supplementary section is provided for Intercooled versions)

Congratulations on your purchase of a performance enhancing Raptor supercharger kit or kit parts for your Subaru Impreza MY 98 – MY 09 both 2.0 and 2.5 liter.

The following will assist you with installing the components you have purchased. Always wear personal protection equipment whilst working, work safely and observe all environmental/safety requirements when draining engine fluids which are toxic.

Disclaimer:

You should not expressly rely on this information without making your own enquiry.

RAPTOR HELPLINE: 0409 897 081 7:00am - 8:30pm Mon – Friday (Australian time)

Email: info@raptorsc.com.au

Example of installed supercharger system

GC8 2.0 fitted with Stage 1 Supercharger system. Shown with type 2 bracket to suit integral P/S pump and reservoir that is common to this model.

Fitment of Raptor Supercharger system (Stage 1)

Subaru GC – GDB (body examples below)

EJ2.0 and 2.5 SOHC (AUS, UK, SPAIN some USA)

MAP SENSED ECU SYSTEM with 3 PLUG ECU

GC 98 – 99

GDA – GDB (Bugeye and later)

SAFETY INFORMATION

- REMOVE THE KEY FROM THE IGNITION OF THE CAR – THE CAR MUST BE COMPLETELY OFF – NOT EVEN THE CAR RADIO ON.
- DO NOT SMOKE NEAR THE CAR.
- NO NAKED FLAMES OR OTHER IGNITION SOURCES.
- PRE-READ ALL INSTRUCTIONS BEFORE STARTING.
- ALLOW 5 HOURS ON AVERAGE FOR FULL KIT INSTALL – IT'S NOT A RACE. ACCURACY/ATTENTION TO DETAIL IS MORE IMPORTANT THAN SPEED!!

ECU installation Step 1.

It is important to determine above all else that the ECU will plug in and work without adversely affecting your cars everyday driving performance, you must pass this step with flying colours before proceeding to install any hardware onto the engine.

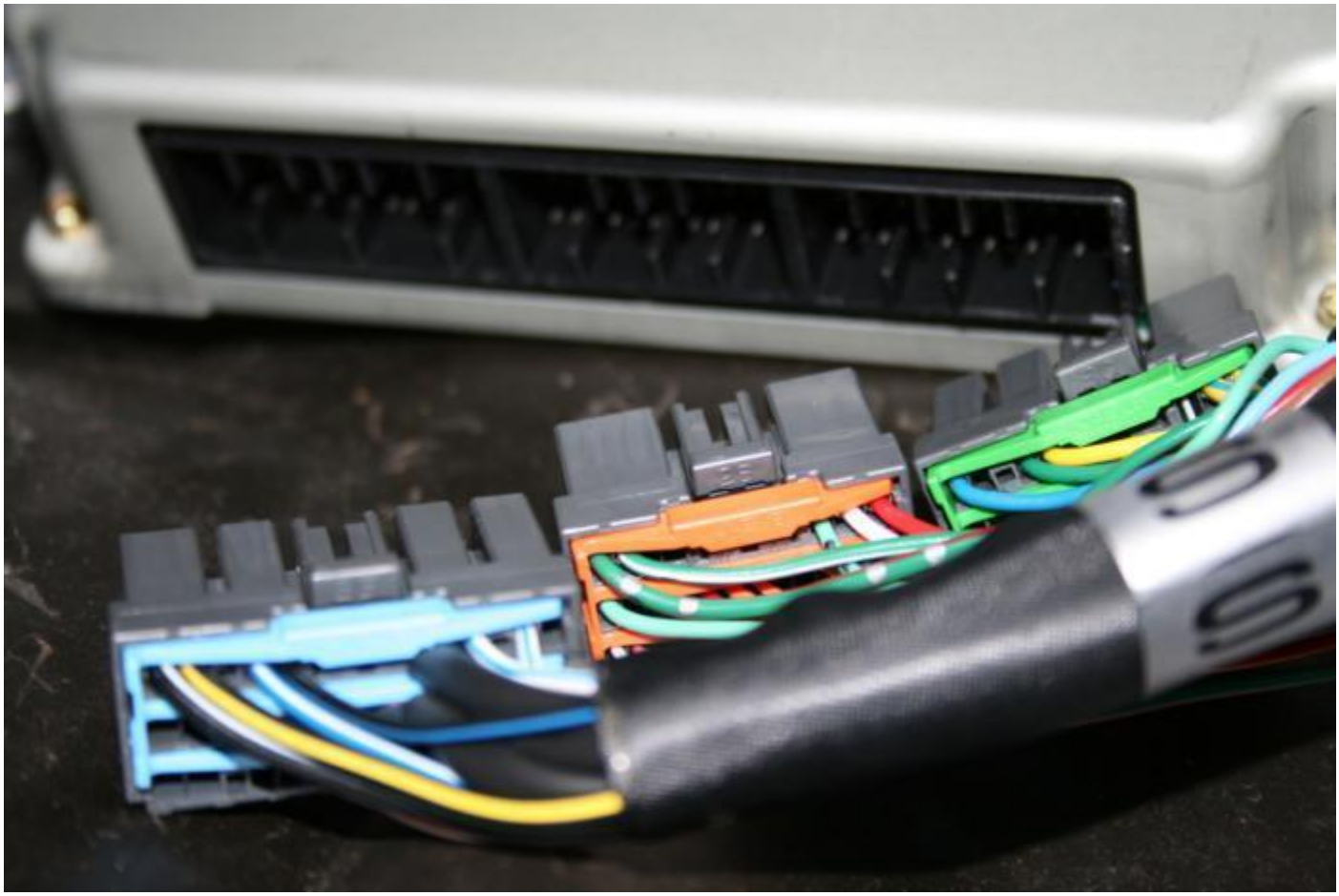
Locate the ProSequential computer in your kit, you can see it with the blue writing on it in the right side of this image, it is shown prewired to the plug and play loom insert.

Step 2.

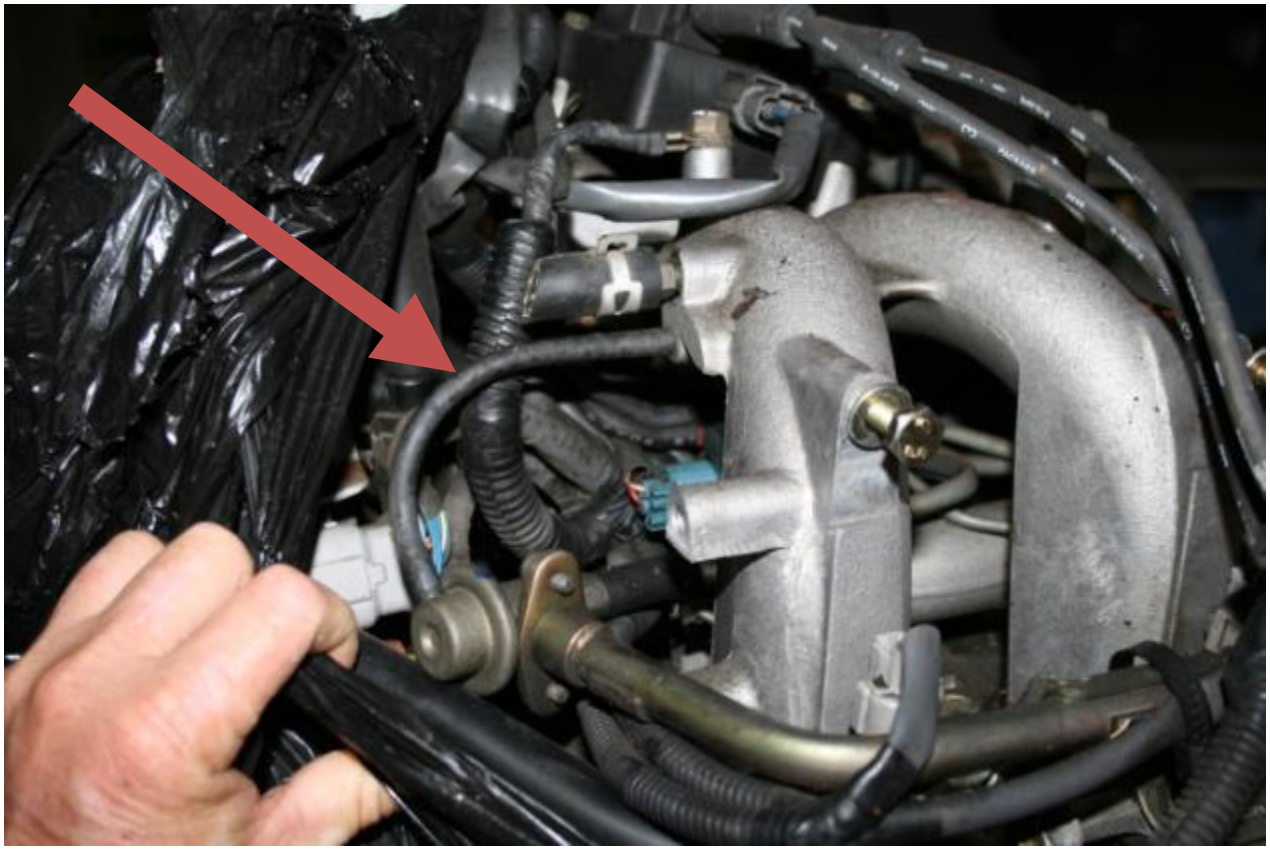
Locate the ECU of your Subaru, typically you will find it under the feet of the passenger this will be the left hand side for Australian vehicles and right side for USA and so on. Carefully pull up the carpet, there is often a plastic retaining screw or 2 to remove but often nothing else. Peel back the carpet until the alloy cover of ECU is fully exposed, then take a 10mm socket and remove the bolts and one nut, lift cover away.

With engine switch off and key removed from ignition remove the 3 plugs from the ECU, there is a small push down clip on each of the three ECU plugs you must depress by finger before the plugs will come away from the ECU. Then plug those three plugs into the female plugs of the ECU loom (supplied) and then plug loom male plugs back into ECU. Tidy the wiring and make certain none of the ProSequential wires are rubbing against sharp edges or crushed under the ECU alloy lid. Locate the ProSequential to where ever you feel it suits your liking.

Most important is the connect the MAP sensor vacuum line to the push on 4mm hose connection (opposite end of plug connections) on the Prosequential ECU. Connect this vacuum line to the short vacuum line which goes between manifold runner and fuel pressure regulator



Shown is left hand side of engine when viewed from front: Vacuum source line for ProSequential and for CBV (compressor bypass valve). Simply cut hose with scissors or side cutters and install the plastic 4mm Tee and connect the supplied vacuum line, cut line to length. Subaru conveniently have more than one rubber access hole in the firewall of their vehicles, choose one which suits your liking and punch a hole in plug then thread hose through hole followed by reinstallation of the plug for a air tight seal at the firewall.



Step 3

Upon reconnecting all the plugs as described above and the vacuum line then attempt to restart the engine, if everything is correct engine should start readily and settle into a smooth idle as normal. If you can confirm this to be correct are now ready to move onto the hardware installation.

Hardware installation Step 1:

Remove all original plastic air intake components from engine, this is the cold air intake, the transfer pipe and engine airbox. There are some small plastic screws/clips and some 10/12mm nuts retaining the parts. See image for parts to remove.

Remove all items with a red arrow pointing to them. GDB shown , but same or similar for GC8.

Step 2:

Remove the engine drive belt shields and then loosen the alternator mount bolt (shown with spanner on it) and adjuster bolt , then remove engine belt for the alt, PS and crank pulley. The plastic shield can simply be hinged away to one side as shown.

Step 2.1

You need to source sparkplugs 2 heat ranges colder than stock, if you have these at hand now is the time to install the spark plugs.

If you have difficulties with installing sparkplugs then proceed no further with installation of this supercharger kit and have a mechanic do it for you.

The suggested spark plug for supercharged operation

NGK BKR7EIX - 11

Step 3

Next step is to undo the screws (2) at the top of the radiator cooling fan which is on your left (usually the fan nearest the radiator cap). Then lift radiator fan up a little so it comes free from lower mounts, then move it back 1.5" (40mm) and you will find you can lower the radiator down quite a distance which will give you more room to work on the power steering pump bolts later. No need to disconnect any wires for this but take care and make sure no wires are damaged. In picture below you will see that fan is still in there but low enough to allow tools to easily engage PS pump bolts. GC8 shown.

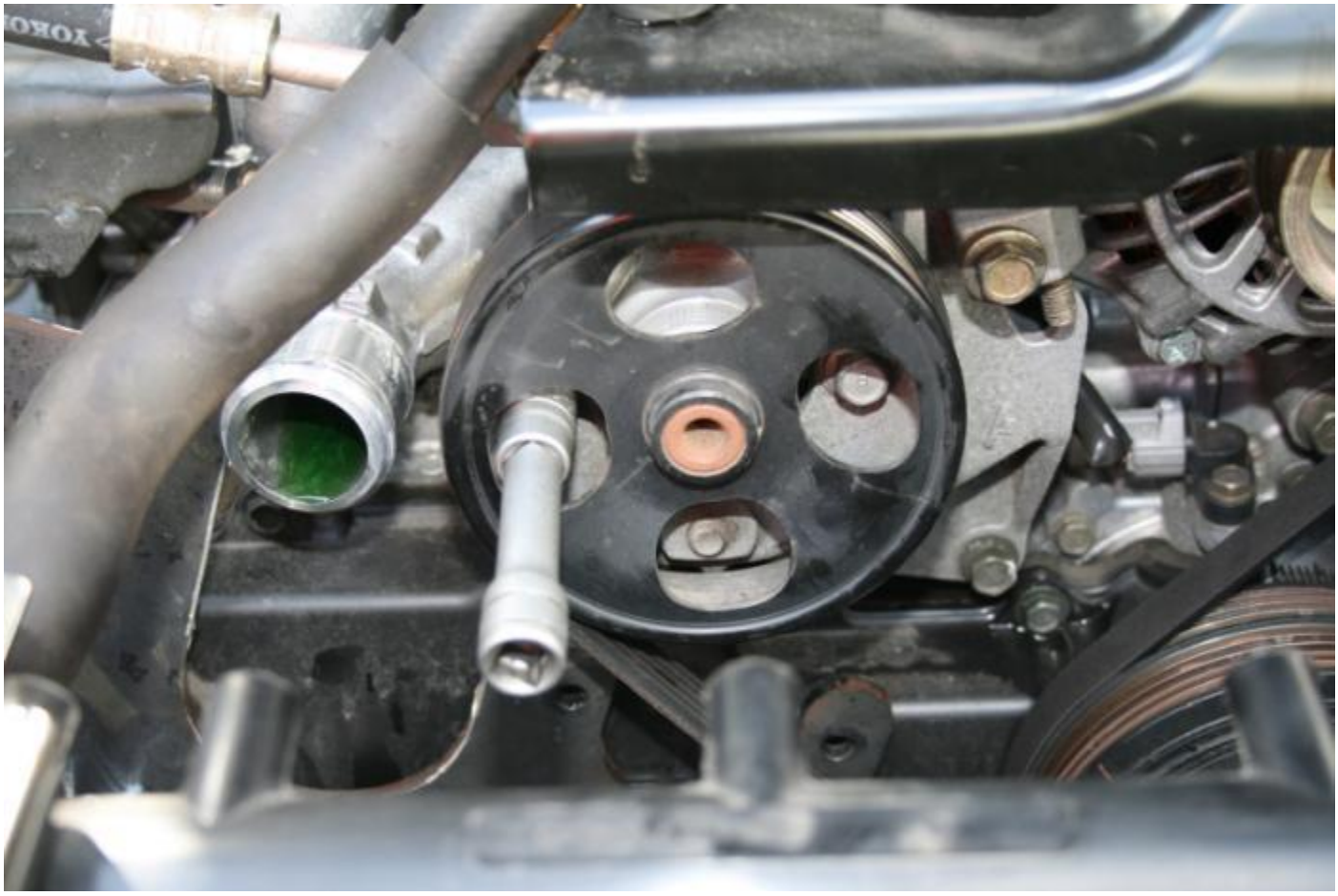
Step 4

Temporarily remove of some guards and shields on the left side of engine (viewed from front). Remove all mounts, guards and shields that mount to the 2 bolts which the red arrows point to, this bolts are critical for installation of the supercharger bracket alloy brace. You will need to also unclip the spark plug lead holder etc and then reinstall the leads after SC alloy bracket is in place. There will be up to 10 bolts to remove in some instances, some very tight.

Step 5

Removal of the power steering pump bolts (2)

Since you already have the belt removed and belt cover simply engage the PS pump bolts as shown and remove 2 bolts (horizontally apart), these are 12mm head.



Step 6

No longer applicable

Step 7

Now proceed to slide the Supercharger mounting bracket into place as shown, for GC series you will slide the bracket into place from the left side (facing front of vehicle) and for GD series slide the bracket in from the right side, lower the bracket down below the P/S pulley and then raise the bracket up behind P/S.

Now insert the 2 original PS pump retaining bolts, first through the pulley, then through the SC mounting bracket and finally into the threads of the power steering pump itself. Screw the bolts in but DO NOT TIGHTEN them fully, bracket must still be able to be moved around a bit.

7.1

If you have not already removed the fuel injector/rail guard then do so. This is the item being pointed out in the following image, there are several 12mm head bolts holding this on and some will be VERY tight to undo.

Step 7.2

Stay Brackets

In the image there are 2 types shown, the top one is the GC series bracket and the lower item is the GD series stay bracket. In your kit there will only be the correct item for your installation. Both items mount to the engine and the bracket in the same manner, the shape differences are to accommodate different styles of power steering pressure line that Subaru has applied to the GC/GD models. **IF YOUR SUBARU HAS ANOTHER INCARNATION OF THEIR MANIFOLD YOU WILL HAVE TO MODIFY THE ALLOY BRACKET YOU HAVE BEEN SUPPLIED BY DRILLING/CUTTING ETC**

The stay bracket mounts to the manifold as pictured below

In the next image you will see how the stay bracket bolts to the SC bracket; which you have already installed behind the power steering pump. You will find (usually loosely screwed into end of bracket) 2 very short button headed

screws (as shown with tool engaged) to fasten SC mount bracket to the stay bracket. Align the holes by moving the SC mount bracket around until both button headed screws can be started into the threads in the end of the stay bracket.

Now tighten the 2 bolts at the power steering pump which are retaining the SC bracket, tighten to normal Subaru tension specifications.

Next tighten the 2 button headed screws as shown in the following image, tighten as much as possible with a tool as shown. There is no need for locking compound on these screws.

Step 8 (GC series only) GD owners go to step 9

In the following image you will see 2 small vacuum lines, these normally connect to the charcoal canister for Australian Model GC and possible European GC, we do not supply the rubber hose in the kits.

Before mounting the supercharger to the bracket disconnect the 2 rubber lines and then PUSH THE METAL LINES down to the engine cylinder head, this allow the supercharger to fit the bracket and then the hoses can pass around the supercharger unit.

You need to go to parts store and purchase some 4mm and 6mm hose about 500mm in length which you can then cut to length and reconnect to canister as per original specification.

Step 9

This is where you first begin to see you are going to be SUPERCHARGED!

Take the supercharger and carefully slide the supercharger pulley through the hole in the bracket, this is NOT EASY as many items around the mount are very close but we like to assure you that the charger will fit through the hole eventually!! Now position the supercharger so the top of the compressor housing (snail) is approximately horizontal .

Then take the 8 stainless steel screws with countersunk head and fasten supercharger to the bracket, tighten screws moderately, if you notice that the hex in the end of the screws is deforming from your Allen key tool then tighten the screws a bit less. Just nice and firm is all that is needed, these screws have NO tendency to come loose normally.

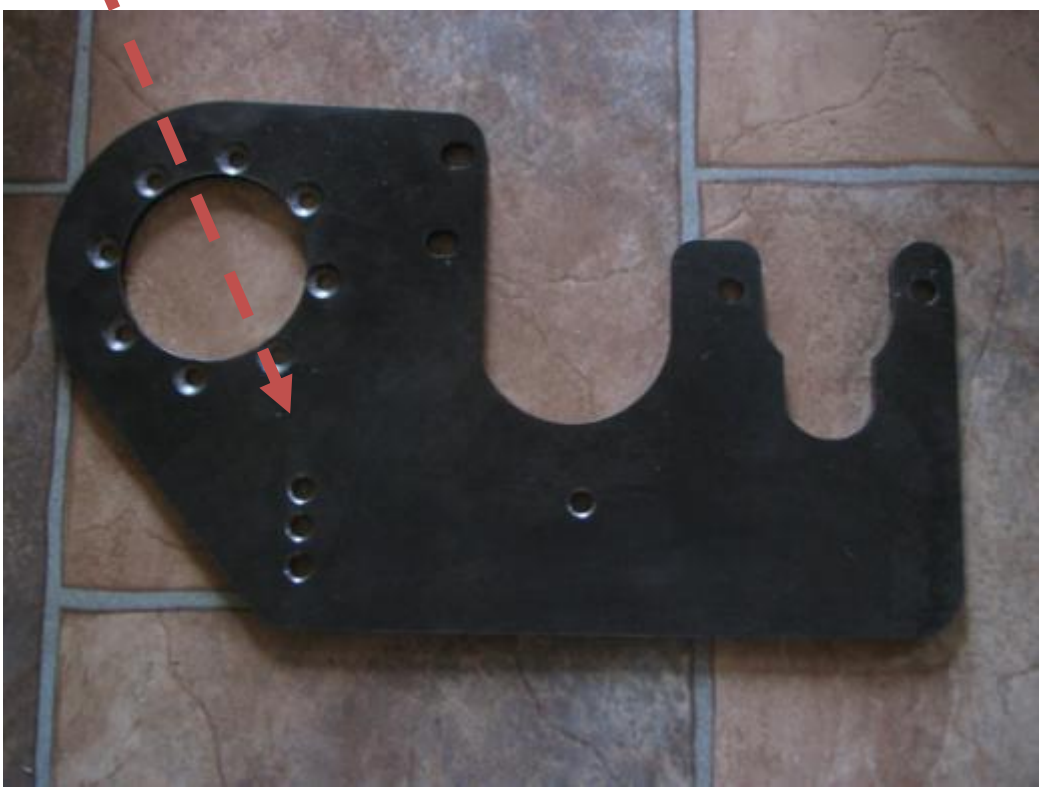
Now tighten the 2 bolts which fasten the stay bracket to the engine manifold. Remember over tightening of bolts into Aluminium may result in the thread being pulled out = VERY BAD and ☹

Your installation should be looking a lot like the image below, the supercharger mounting bracket in place,stay bracket in place, the supercharger screwed into position and all the relevant bolts/screwed fully tightened.

Yes, check again you have tightened all the screws/bolts, this will assist your reliability!

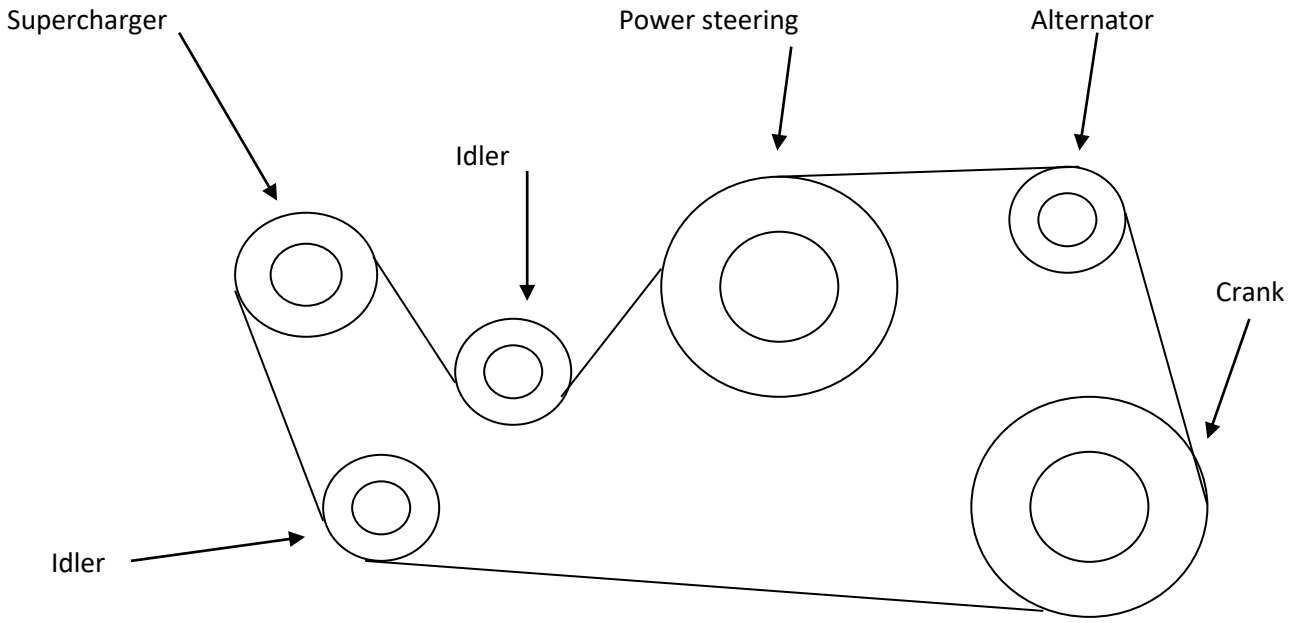
Step 10

Positioning of the lower (grooved Idler) idler pulley. You will note your bracket has 3 possible holes, fit the grooved idler into the top hole. It is extremely likely the pulleys have been pre-mounted onto your bracket and ready for use, check the tension of the bolts retaining the idlers, these must be very tight. As your belt stretches you can move the idler down to the next hole and retension.



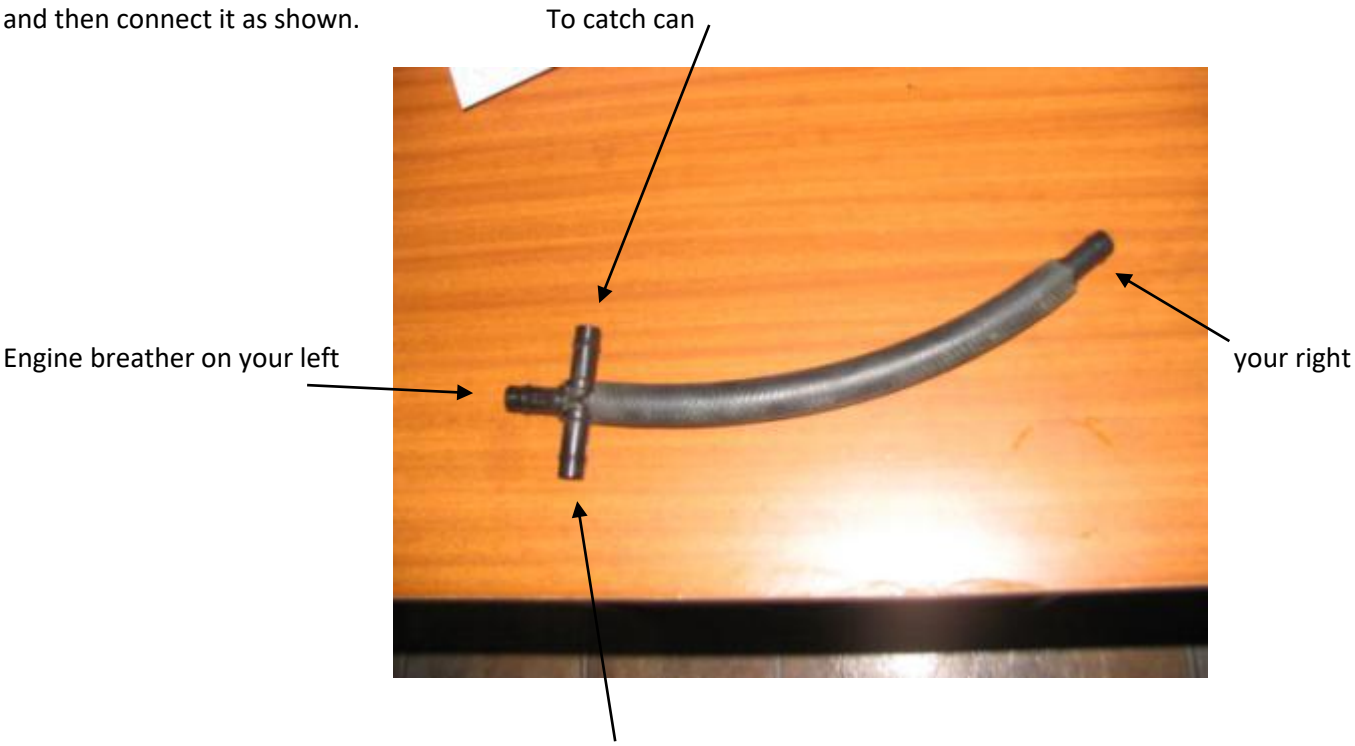
Step 11

Fitting the drive belt. You have been supplied a 5PK1495 belt with your Subaru kit, mount it around the pulleys as shown in the following diagram, then tension belt via the screw tension to same belt tension as original Subaru P/S belt. Excessive tension on the belt is not desired and can cause damage to supercharger, this supercharger system is properly engineered and does not experience belt slip at normal belt tension. Now tighten all alternator mounting bolts, reinstall belt guards etc. Reinstall the RADIATOR FAN ASSEMBLY and if you disconnected any wires then reconnect the plugs also.



STEP 12

Now is the ideal time to install your crankcase ventilation line connections. In your kit will find the following item, and then connect it as shown.



Engine crankcase breather

As you reach over the front of vehicle hold the modified breather assembly in the same orientation as in the image and starting on your right hand simply plug the male fitting directly into the hose coming up from camshaft cover on that same side.

Then connect the center male connection to the original rubber hose coming from the engine crankcase and then connect your left side cam cover breather hose to the the male connection on left side.

You now have one male fitting at centre of the cross piece facing toward engine bay firewall with no hose connected, this male connector now connects to your breather oil catch can hose. See next step for catch can and hose instructions.

Step 13

Install your breather oil catch can as shown, you may have to make a very minor modification to the mounting bracket for your specific model but otherwise the fitment is easy. In some instances the breather filter can be installed in center top hole or on side like shown in this GD series installation. Simply route hose back to the breather crosspiece, cut to length and connect.

Step 14

It is now time to connect the pressure side of the supercharger to the engine, you have been provided 1 aluminium pipe with BOSCH valve and 2 pieces of 90 degree bend silicone hose. Install as shown in picture below.

WARNING------ IT IS VERY DIFFICULT TO INSTALL THE SILICONE HOSE TO THROTTLE BODY AS IT WILL SEEM THROTTLE BODY SLIGHTLY TO LARGE, THIS WILL TAKE SOME TIME AND EFFORT BUT WE ASSURE YOU THE BEND CAN ALWAYS FIT THE THROTTLE BODY. One slightly larger hose clamp is provided for the throttle body connection.

Connect the black BOSCH VALVE hose line to the same vacuum line that you connected the Prosequential computer MAP sensor line using another 4mm Tee section connector as supplied.

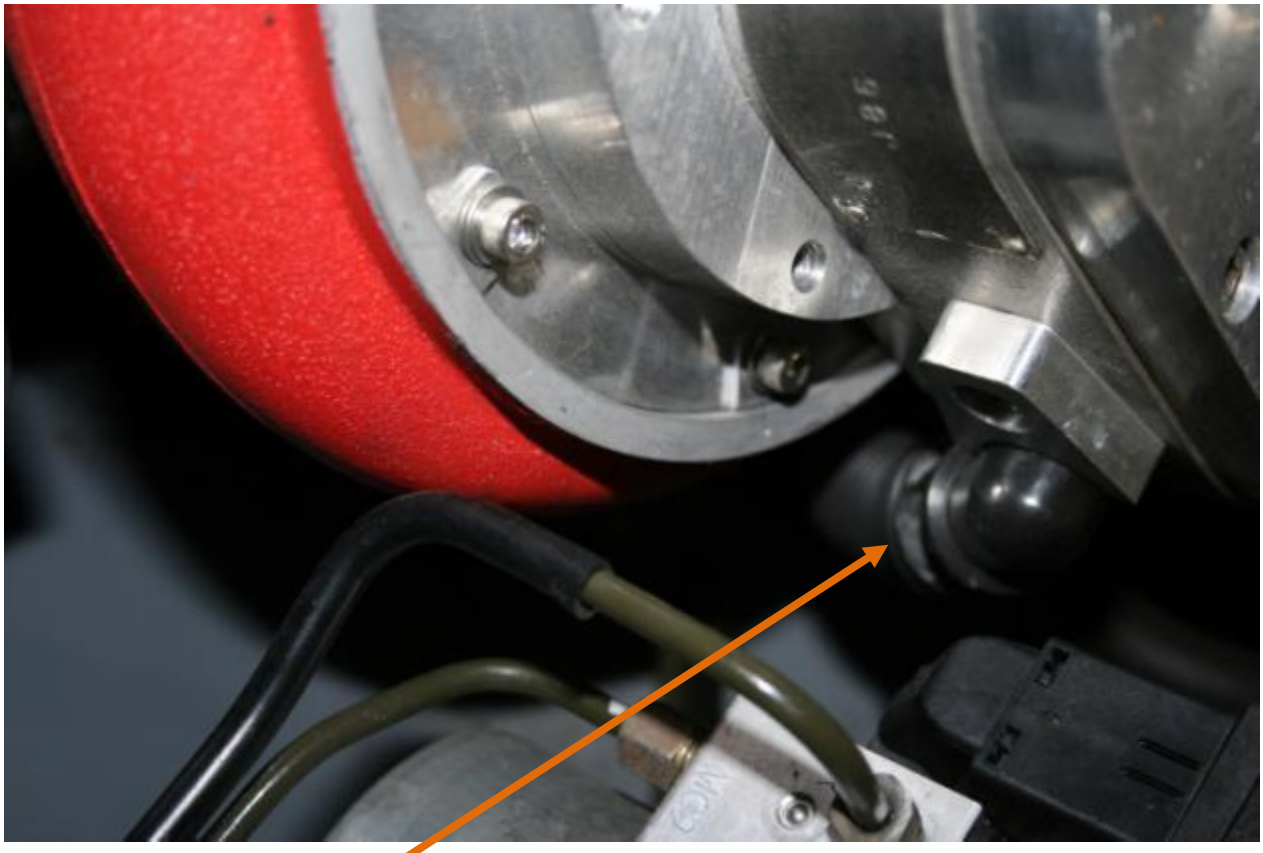
Step 15

Now it is time to install the supercharger air filter, adaptor ring and silicone bend. Simply fit the large 75mm silicone bend to the supercharger intake (some effort required to stretch this on)making sure hose clamp is loosely on hose, then insert stainless adaptor ring partially inside of other end of silicone bend, then fit hose clamp and tighten to retain the adaptor ring. Be sure you leave enough of the adaptor ring exposed so air filter can be mounted onto the adaptor. Then tighten air filter hose clamps – all intake clamps. Position the filter so it doesn't touch or rub against side of the car, some times filter will point slightly back wards rather than directly 90 degrees to side.

Step 16

The supercharger cooling system, it consists of a little black fan unit, some 19mm hose and some wiring.

The hose simply pushes onto ONE outlet on the supercharger transmission body, leave the other trans fitting unconnected so air can escape the supercharger transmission.



Hose pushed onto fitting

The basic components of the supercharger cooling system. The hose can be cut to length with a pair of scissors.

Where to mount the cooling fan unit (for GC and GD).

These holes in the body are right near the supercharger intake, you can use the large zip tie provided to secure the cooler unit on the behind this panel. You will have to partially remove the liner from the around the front right hand wheel of the car so you can slip the cooler unit up inside and use the zip tie to secure it. It is best to connect the wiring to the unit and insert the hose into side of fan body (simply push in 20mm of hose) before securing the unit with zip tie.

Then reinstall the wheel arch liner and secure with original fasteners.

Cooling fan electricity supply.

We are not going to supply a wiring diagram for this step, we are supplying this kit to global market and wiring is different for each country

The cooling fan power needs is 35 AMPS, any key switched power supply is sufficient to trigger a relay. For Impreza sedans/wagons the best place to find 12 V power supply is under the dash in cabin, there is no key switched 12 V in engine bay area. WE STRONGLY SUGGEST THAT IF YOU ARE NOT FAMILIAR WITH ELECTRICITY THEN BUY THE SERVICES OF A SPECIALIST AUTOMOTIVE ELECTRICIAN, FOR A SMALL FEE IT WILL BE GOOD INSURANCE THAT THE JOB IS DONE CORRECTLY.

Fan unit must always run when ignition switch is in ON position.

STEP 18 (GC series only)

The shortening of the top radiator hose (required) so that hose is moved toward radiator so the hose does not rub on SC mounting bracket.

Loosen hose clamps at both ends of upper radiator hose and cut approx 25mm of hose from off the radiator end of the hose, now slide hose forward about 20mm on the thermostat housing and retighten clamp making sure hose is still properly connected, now reattach hose to radiator and clamp securely. Check that hose is not touching the SC bracket at all. Adjust hose as necessary to create clearance.

Failure to implement this step may lead your car to have a coolant loss at some point in the future ruining your engine.

Be sure to top up the coolant again after correcting the hose length

Step 19

Remove the rubber seals along edge of bonnet, slightly different types of rubbers for GC and GD but remove them to facilitate better engine bay cooling

In the image below the rubbers have been removed

STEP 20

If you have complete all the above steps and are fully confident that your car is safe to start then you may be ready to do so.

Prestart check list

Check coolant level

Check you have retighted every bolt that was loosened

Check that drive belt for supercharger is not excessively tight and that all bolts around alternator brackets have been retightened.

Check the Supercharger cooling fan is operating when ignition is in ON position

Check the supercharger air intake filter is not touching the body

Check that you have 95 octane or higher fuel in the fuel tank of car

Check you have adequate amount of engine oil of correct grade

Post start checklist

Engine must be running for this test

Check that air is being discharged from the BOSCH valve when engine is idling, this means correct operation.

Supercharger WILL BE PRODUCING VERY LOUD WHISTLE/WHINE SOUND, this will diminish over the coming 1000km of driving

Drive car at no more than 4000 rpm for first 150km of driving, then you can use full RPM range but ONLY AFTER DYNO TEST TO CONFIRM SAFE OPERATION OF ENGINE AT FULL POWER.

The ECU has been supplied complete with installed tune, take this as being a “startup tune” until you prove it is safe with a dyno test report. Raptor IS NOT LIABLE if you damage your engine while using this start up tune without confirmation of safe operation. It is your responsibility to make sure it is correct

DET3 DIGITAL ECU TUNER

Specifications

Digital ECU Tuner 3 is one of the most popular "piggy back" devices on the European market today. Built in 400Kpa MAP sensor

TECHNICAL DETAILS

- four 16x16 size tables (fuel map,two PWM tables, ignition table),
- 8 Correction tables 16x1,
- 2 independent switchable map sets ,
- possibility modification of one analogue signal,
- 4 analogue inputs,
- inbuilt Data Flash - possibility of logging without PC
- battery voltage monitoring,
- support of frequency output air flow meter (possibility of signal modification) 17Hz-4kHz,
- support VR and Hall effect crank sensors together with ignition modules pulse. Device supports both single ended and differential signals,
- supports a lot of crank trigger patterns: 60-2, 36-2, 36-1, Multitooth, Ignition Modules and more,
- support of waste gate valve,
- output for 4 saturated injectors ("full group"),
- ON/OFF parametric output,
- automatic conversion of MAP to MAF with the use of the learning algorithm,
- launch control,
- road dyno,
- individual calibration of each analogue sensors - device displayed values with correct units,
- free firmware update - new crank trigger patterns and new functionality,
- fuel Implant mode - possibility to drive injectors in standalone mode (batch fire),
- USB communication no additional interface needed,
- 24 months warranty.

PC REQUIREMENTS

To properly work with the DET3 device following minimum is required.

- Windows 2000, XP, Vista, Wimndows 7, 8,10
- Screen resolution of at least 1024x768 16bit

- CPU with a clock of at least 600MHz
- USB port

WHAT'S IN THE BOX

- Digital Ecu Tuner 3 device
- USB AA lead
- connector
- set of terminals
- set of resistors and diode which may be useful during installation

Software download for Black Chrono version HERE

For normal silver version see DOWNLOAD section
(There are NO feature differences between Chrono and Standard)

Costs typically AUD$395

Maintenance and operation suggestions

Use very high grade engine oil (Castrol Edge Synthetic 5/30) and service engine each 5000km of use.

Use suggested sparkplugs

Always wait until engine is at normal operating temperature before applying full power

We suggest you always use a knock sensor with a LED on your dash so you know if engine is operating unsafely

Always operate GD series vehicles with not less than half full of fuel, this does not apply to GC

Fitment of kits and systems

No liability whatsoever (including liability in negligence) is accepted by Raptor Superchargers for the fitment of incorrect tuning or incorrect fitment of kits and systems. The onus is clearly with the fitter to ensure the kit supplied is correct for the particular system. Any damage to parts or consequential damage or cost resulting from the fitment of the incorrect parts or incorrect fitment of parts is totally the responsibility of the fitter

Fuel systems

All Raptor Supercharger systems are fashioned to give adequate fuel enrichment on unmodified vehicles. If vehicle engine is modified ie extractors, air filter pod, fuel pumps, manifolds, etc) most kits will require additional enrichment not provided with kit/s. Raptor superchargers is in no way liable for engine damage arising due to incorrect tuning, un-maintained fuel systems and the like.

Insurance

Take care to inform your vehicle insurer of changes you are making/have made so that you retain your policy, also enquire with your state transport department regarding engineering certificates/mod plates that they may require for lawful motor vehicle operation.

Lawful operation

It is your responsibility to make certain that your vehicle complies with the rules, regulations of your particular country, state or town.