

# TOYOTA TUNDRA 3UR-FE SUPERCHARGER

## Installation Guide



The Harrop TVS2650 Supercharger Tuner kit has been developed for Toyota 3UR-FE V8 engines. Suitable for Stock or TRD Tundras, with the 5.7 Litre V8 engine.

The following part numbers should be referenced when ordering so the correct kit is supplied, as there are subtle differences in the hardware.

### Variants:

Harrop Part Number	Toyota Tundra - 3URFE 5.7L V8
99-KSM51K33	FDI2650 Supercharger kit - Stage 1 (Inc intercooler radiator, fuel pump & regulator upgrade)
99-KSM51K30 (99-KSM52K30 with optional fuel-rails)	FDI2650 Supercharger kit - Stage 2 (Inc intercooler radiator, injectors & fuel pump upgrade, <u>requires custom tuning</u> )
99-KSM51K32 (99-KSM52K32 with optional fuel-rails)	FDI2650 upgrade kit for TRD or aftermarket 1900 Supercharged 3UR-FE engine. <u>Requires custom tuning.</u> <ul style="list-style-type: none"><li>• <u>Does not include</u> Intercooler radiator and pump, Injectors or Fuel pump. These existing components are re-used</li><li>• Does not include air-box intake duct.</li></ul>

Stage 1 kits can be installed without re-calibration. Minimum 98-RON (93-AKI) fuel must be used. Verification of knock control, Air/Fuel ratios and Boost pressure on dyno is recommended. Refer to the document "Toyota\_3UR-FE\_V8\_Tech\_Guide" for information regarding Stage 1.

Where the Harrop kit does not include an air-box intake duct, the aftermarket AFE air-box has been used successfully.

Note that this is a Tuner kit; a full kit will be available once an Executive Order (EO) number from CARB has been obtained. For off-road use only in North America without EO number.

## Preparation

The fuel pump will be replaced during installation. Ensure the fuel tank contains minimal fuel, and that there is a supply of 98-RON (93-AKI) fuel available to add to the tank after installation is complete.

RHS of vehicle is from the driver's perspective when in the driving position.

Allow the engine to cool before starting installation.

Disconnect the battery.

Remove the under tray.

Remove front Grille by unscrewing the 6x screws across the top of the grille. Pull the Grille forward to dislodge the clips that secure each lower corner below the headlights.

**Open access panel and disconnect loom plug underneath**



Drain the radiator by opening the drain cock on the LHS lower corner of the radiator.



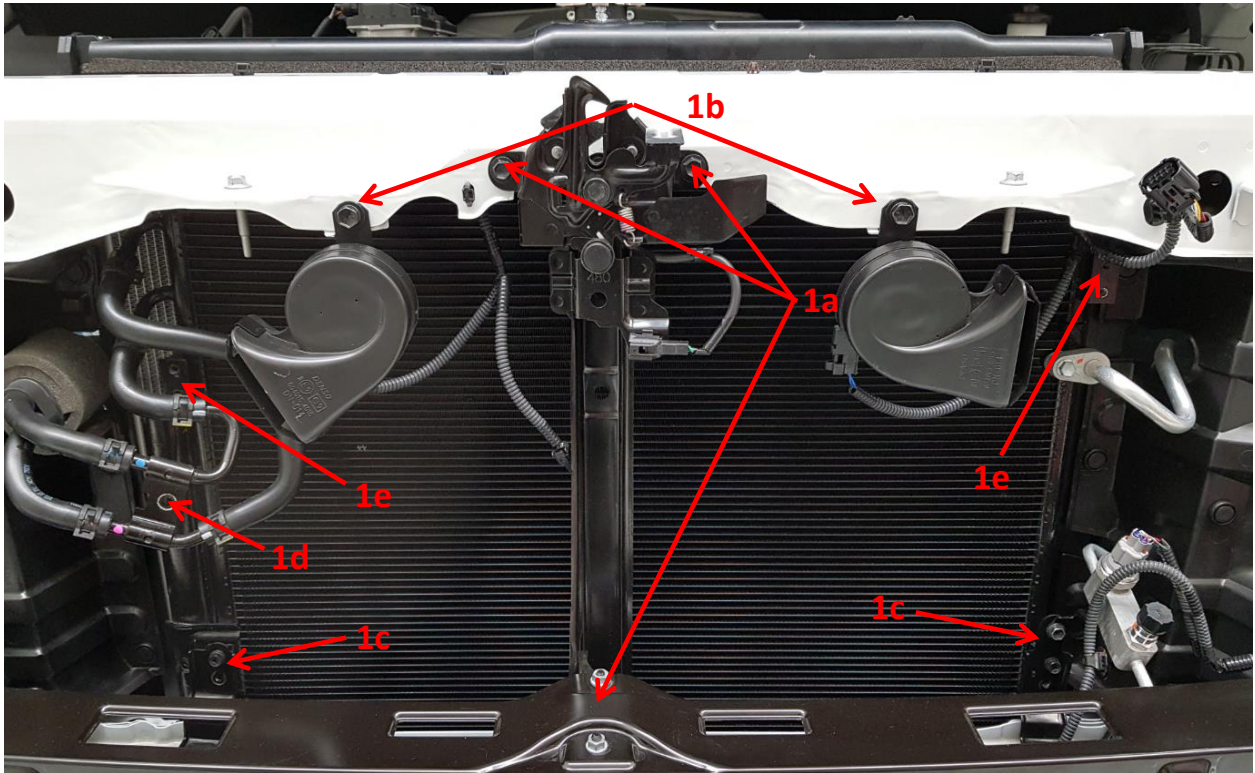


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## 1) Install Harrop intercooler radiator

- Remove hood latch and strut.
- Remove horns.
- Unscrew A/C condenser lower brackets. **It is not necessary to disconnect any AC system hoses or de-gas the AC system.**
- Unscrew hose bracket from RHS of AC condenser.
- Remove A/C condenser upper brackets.

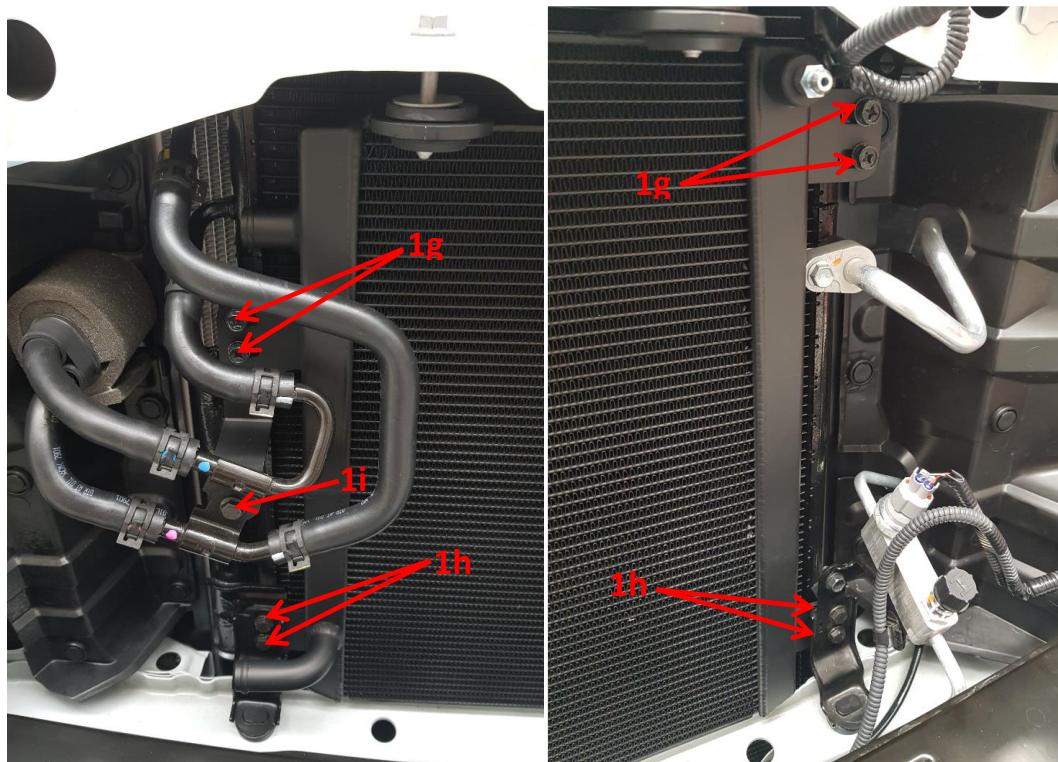


- Swap top A/C condenser bracket rubber bushes to Harrop radiator. Mount the Intercooler radiator onto the original pins on the top cross-member (adjacent to the horns).



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- g) Install top 4x M6 original bolts through intercooler radiator and A/C condenser. Some models will require an additional bracket to be used to mount the intercooler radiator in this step. This bracket will be supplied if required.
- h) The lower radiator brackets sandwich between the A/C condenser and the OE condenser brackets. Install the supplied 4x M6x16 flange head bolts to the lower radiator mounting brackets.
- i) Install hose bracket to RHS of intercooler radiator.



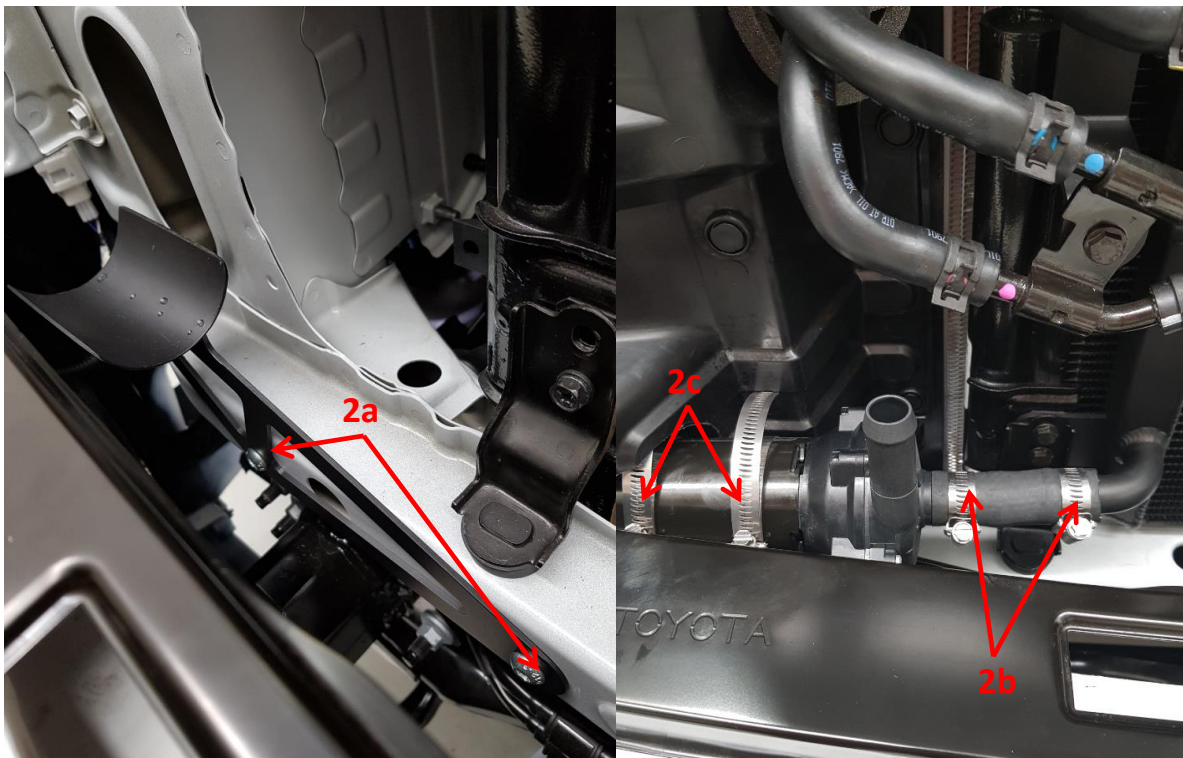
- j) Remove the plastic infill panel from the RHS of the intercooler; it will be modified to allow clearance for the intercooler pump.
  - i) Cut the infill panel as shown in the image below.
  - ii) Re-install the infill panel using the original clips.



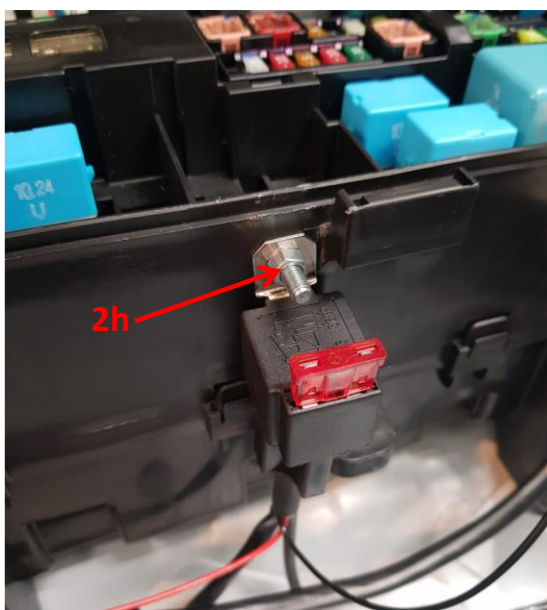
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## 2) Install Intercooler pump and coolant hoses

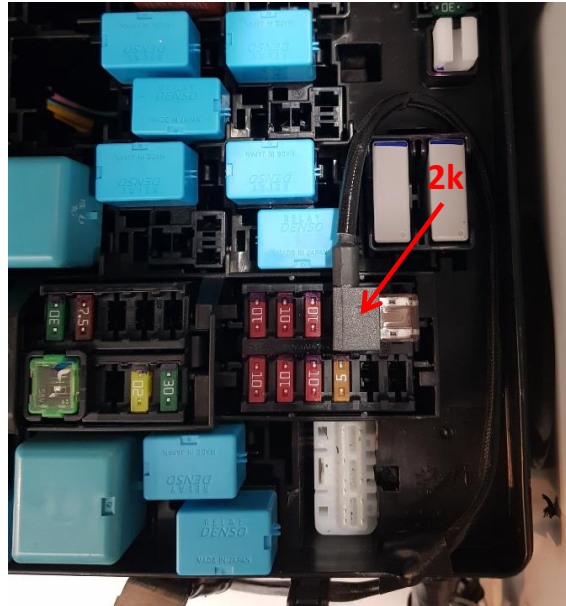
- The intercooler pump bracket mounts to the existing tapped holes in the lateral chassis member immediately below the RHS lower radiator mount bracket. Install the bracket using the supplied M8x25 button head screws through the existing holes as shown.
- Install the supplied  $\frac{3}{4}$ " x 75mm long hose and 2x #10 hose clamps to the intercooler pump and then onto the intercooler radiator outlet as shown below.
- Secure the pump to the bracket, allowing 20mm of space between the pump inlet and radiator outlet, using 2x #32 hose clamps. Orient the pump outlet to point vertically.



- d) Connect the supplied intercooler pump loom to the pump and run the loom along the lateral chassis member and cable tie it as necessary to secure it. Allow some slack in the loom near the pump plug to enable easier disconnection if required.
- e) On the LHS of the intercooler radiator, there is enough space to pass the loom through the LH infill panel without cutting it. Route the loom toward the fuse box, located behind the battery.
- f) Remove the fuse box lid.
- g) The intercooler pump loom relay is mounted on the outside of the fuse box, as shown in the image below. Position the relay and mark the centre of the mounting hole. Drill a  $\varnothing 5.5-6.0\text{mm}$  hole and secure the relay using the supplied M5 x16 Button head screw and nut. Make sure the relay is mounted low enough so the fuse box lid can still close.



- h) Connect the red (positive) wire directly to the positive battery terminal clamp.
- i) Connect the black (negative) wire directly to the negative battery terminal clamp.
- j) Run the fuse break-out lead to the inside of the fuse box directly behind the negative battery terminal, remove the IGN 10A (ignition) fuse and replace with the supplied fuse break-out.
- k) Replace the fuse box lid ensuring the intercooler pump loom is not pinched.
- l) Cable tie the loom to secure it where necessary.



- m) Connect the supplied  $\frac{3}{4}$ " x 1100 long heater hose to the intercooler pump outlet, and run it up into the engine bay through the space at the top RHS of the intercooler radiator.
- n) Connect the supplied  $\frac{3}{4}$ " x 850 long heater hose to the intercooler radiator inlet (top), and run it up into the engine bay through the space at the top RHS of the intercooler radiator. The other end of these hoses will be connected at a later step.



## 3) Removal of Toyota Intake Manifold

- a) Remove plastic engine cover

Dis-connect/unplug the following wiring:

- b) ETC (throttle body)
- c) Coolant temperature sensor (coolant cross-over pipe beside top radiator hose on engine front)
- d) ACIS VSV (LHS of OE manifold, behind the fuel purge valve)



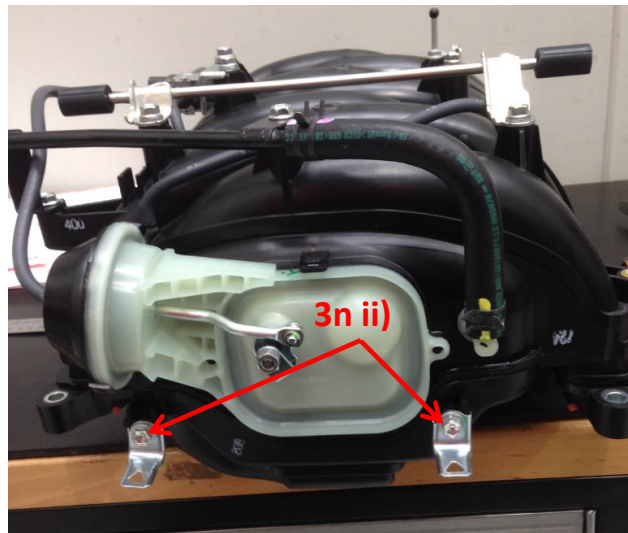
Dis-connect the following components:

- e) Fuel pressure regulator reference and crankcase ventilation tubes from the Throttle intake tube. Remove the Throttle tube with resonance chamber. These are not re-used.
- f) Crankcase ventilation hoses from LH and RH rocker covers. Un-screw the clip and tee-piece from the manifold, and completely remove them from the engine. **Only the T-piece will be re-used.**
- g) Fuel purge valve from the manifold LHS.
- h) Fuel purge valve hose from the throttle end of the manifold.
- i) PCV valve hose from the front of the manifold.
- j) Brake booster hose at the rear LHS of the engine.
- k) Remove the Radiator top hose completely.
- l) Dis-connect the coolant hoses from under the throttle body (not visible in image).
- m) Wiring loom bracket from the RHS rear of the manifold.



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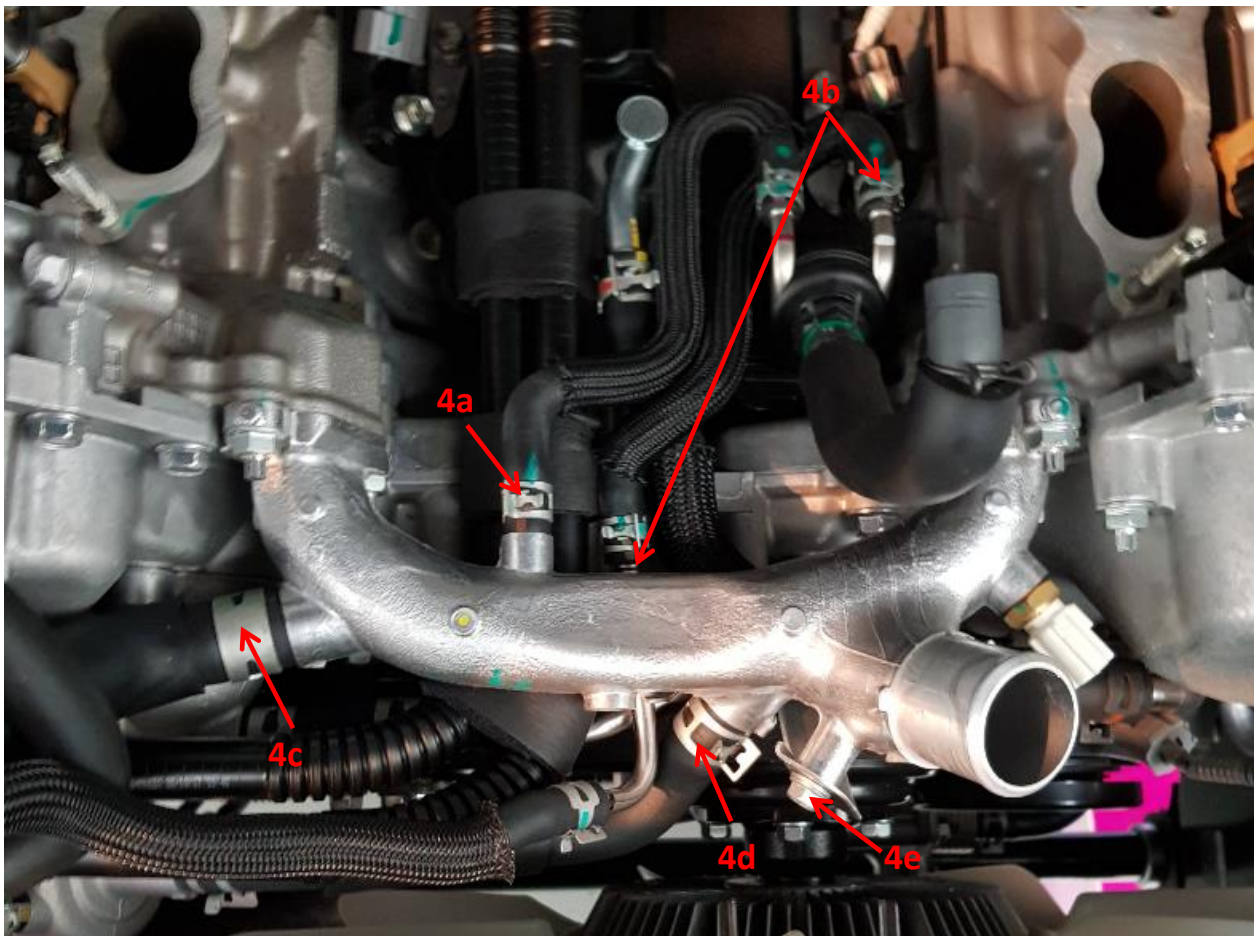
- n) Remove the OE intake manifold, discarding the foam inserts at either side.
  - i) It is necessary to un-clip the wiring loom at the rear of the manifold before it can be removed.
  - ii) Remove the 2x wiring loom clips from the back of the OE manifold. These will be re-used.
  - iii) Apply suitable tape over cylinder head ports to prevent foreign material from entering.
- o) Remove the 2x foam insulation from the engine valley.



## 4) Removal of Toyota Coolant crossover pipe

Dis-connect the following components:

- a) Heated PCV hose to Coolant cross-over pipe.
- b) Heated PCV to throttle body hose. Unscrew the bracket under the crossover pipe and remove completely.
- c) Heater hose to Coolant cross-over pipe.
- d) Thermostat housing to Coolant cross-over pipe.
- e) Oil coolant line bracket adjacent to the radiator hose connection

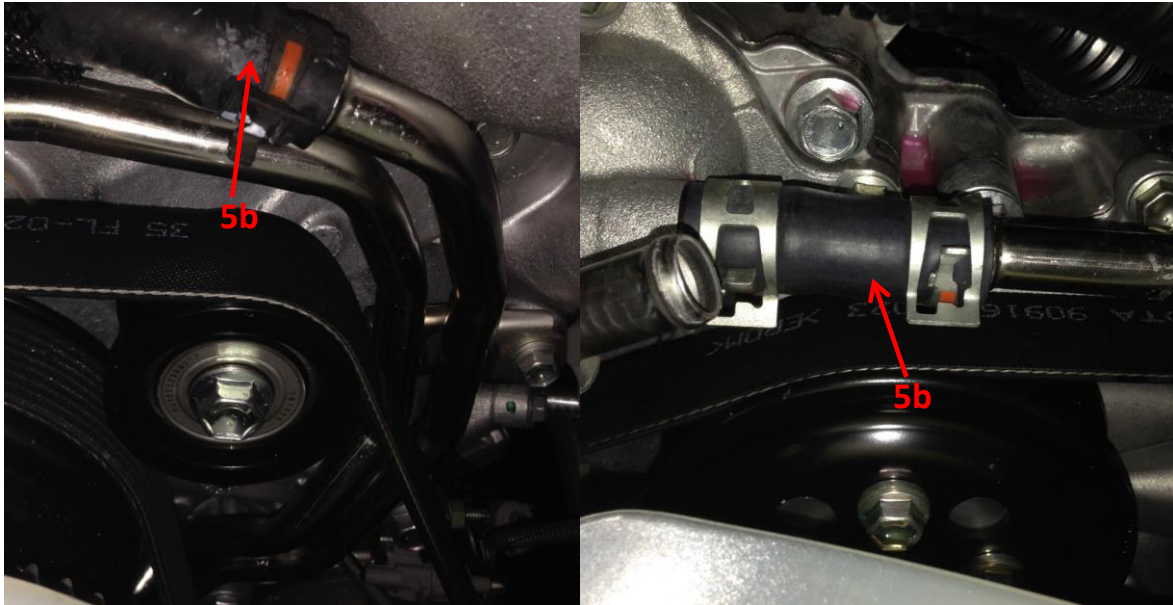


- f) Remove the Toyota Coolant cross-over pipe from the engine. The gaskets and nuts will be re-used.
- g) Remove the coolant temperature sensor from the Toyota Coolant cross-over pipe. This will be re-used.

## 5) Removal of Toyota Oil Coolant lines

Disconnect or remove the following components:

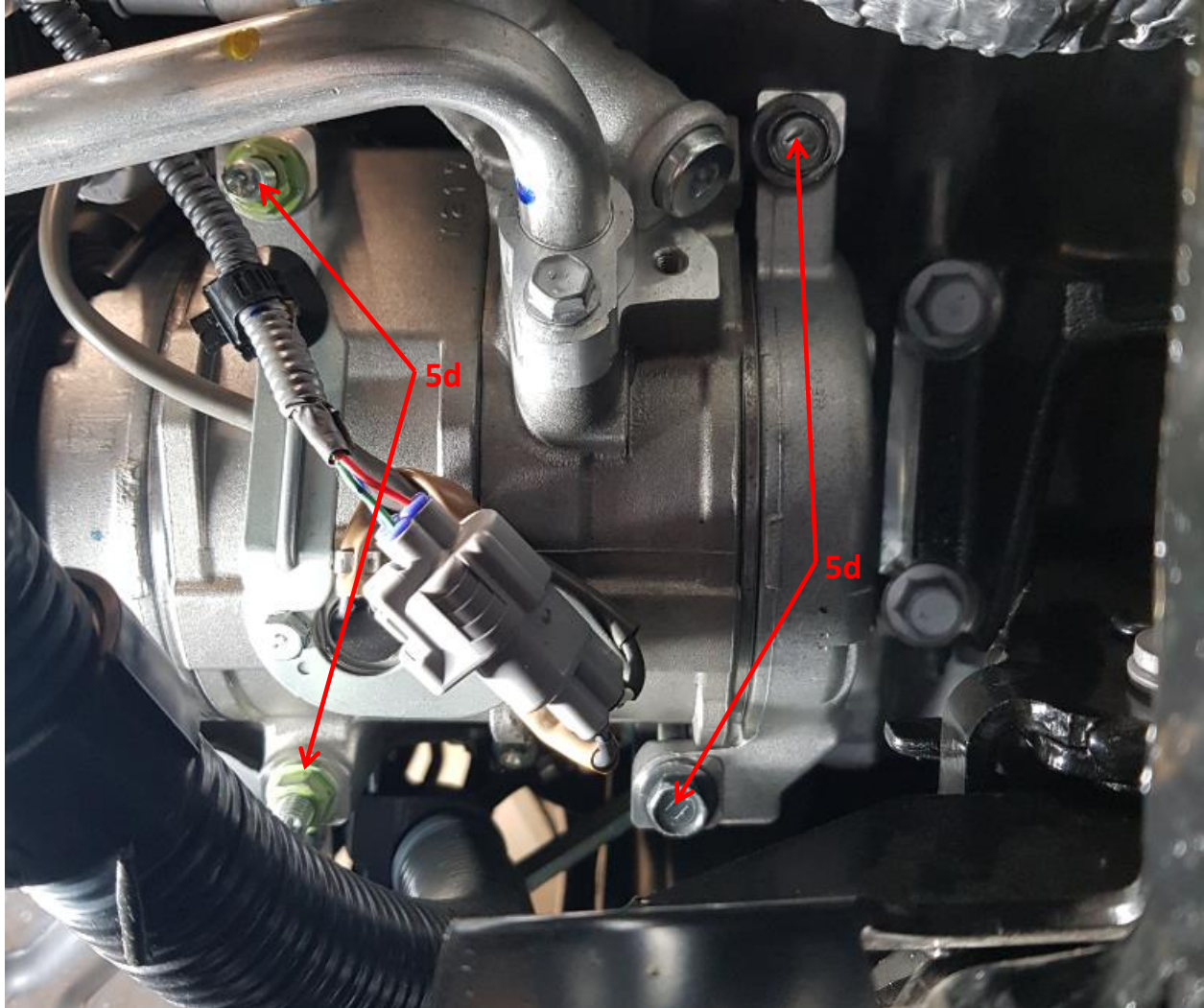
- Toyota FEAD belt. Turn the tensioner anti-clockwise with a 14mm socket until there is enough slack to remove the belt.
- Toyota Oil coolant line hoses from the thermostat housing and valley. Leave the hoses connected to the engine and disconnect the pipe end only.



- Remove the Toyota elbow hoses at the oil cooler under the LH front of the vehicle.



- d) To enable removal of the Toyota Oil Coolant lines, the AC compressor needs to be shifted away from the engine. Remove the 2x bolts and 2x nuts that secure the AC compressor to the engine. These are accessible from inside the LH front wheel arch. Remove the road wheel and flexible covering inside the wheel arch to gain access.



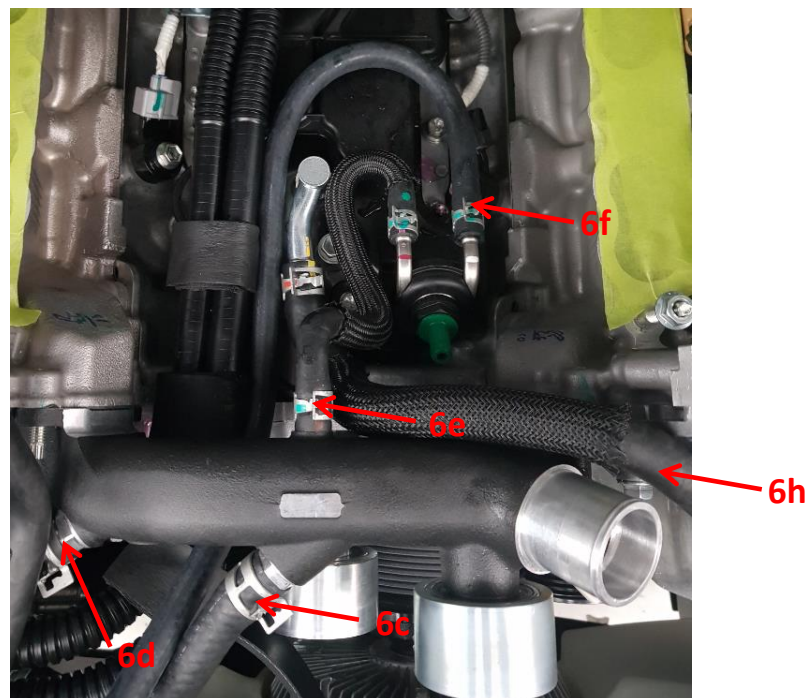
- e) Slide the AC compressor away from the engine approximately 25mm (1.0"). **It is not necessary to remove the AC compressor completely, disconnect any AC system hoses or de-gas the AC system.**
- f) Remove 1x mounting screw on the front LHS Timing cover, and 1x mounting screw on the side of the engine block behind the AC compressor and remove the Toyota Oil Coolant lines.

## 6) Installation of Harrop Engine Coolant cross-over Pipe

- a) Install the Coolant temperature sensor (removed in a previous step) to the Harrop cross-over pipe. Re-use the Copper washer and suitable sealant on the threads of the sensor.



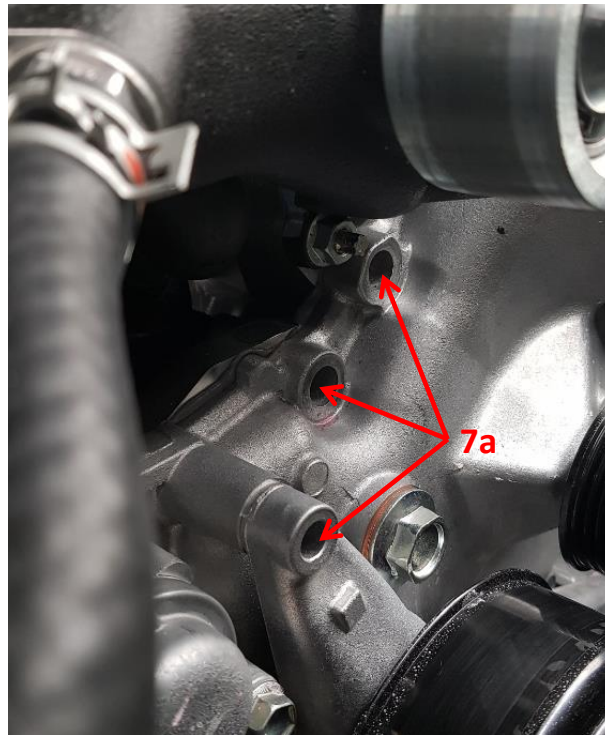
- b) Using a suitable sealant, install the cross-over pipe to the engine re-using the original gaskets and nuts.  
c) Install the supplied 1/2" x 190mm long heater hose between the Ø14mm barb on the crossover pipe and the thermostat housing.  
d) Reconnect the original heater hose to the Ø17mm barb on the RHS of the crossover pipe.  
e) Reconnect the original heated PCV hose to the Ø10mm barb on the rear of the crossover pipe.  
f) Connect one end of the supplied 5/16" x 650mm to the heated PCV valve and route under the crossover pipe toward the RHS of the vehicle.  
g) Secure all connections with original hose clips.  
h) Position the coolant hose from the valley over the coolant crossover pipe. This will be connected later.



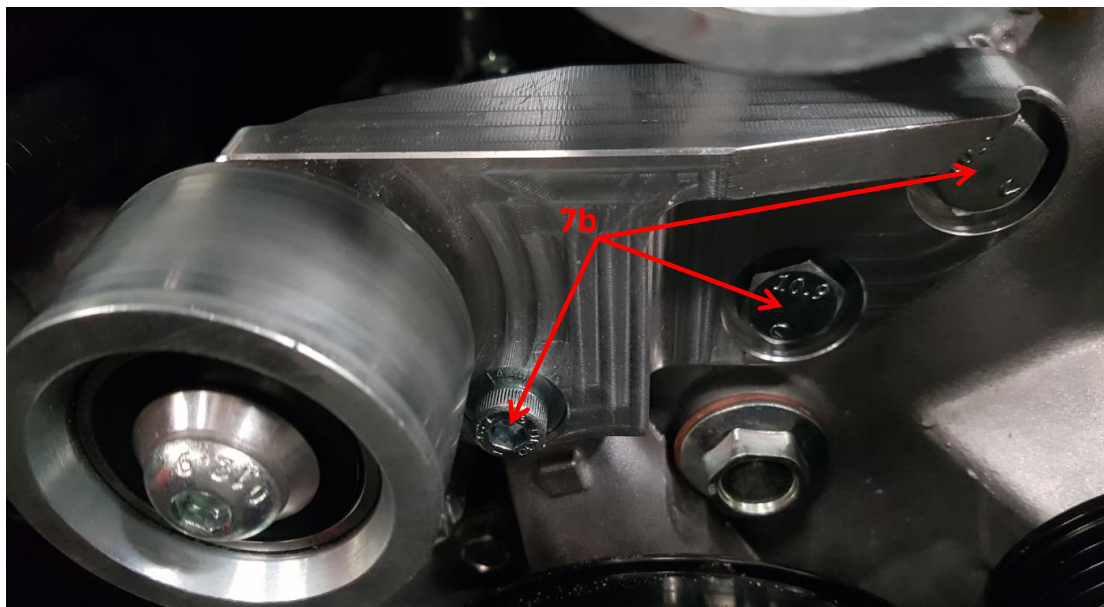
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## 7) Installation of the Supercharger idler bracket

- a) Remove the 3x bolts shown below.



- b) Install the Harrop supercharger idler bracket using the supplied bolts.

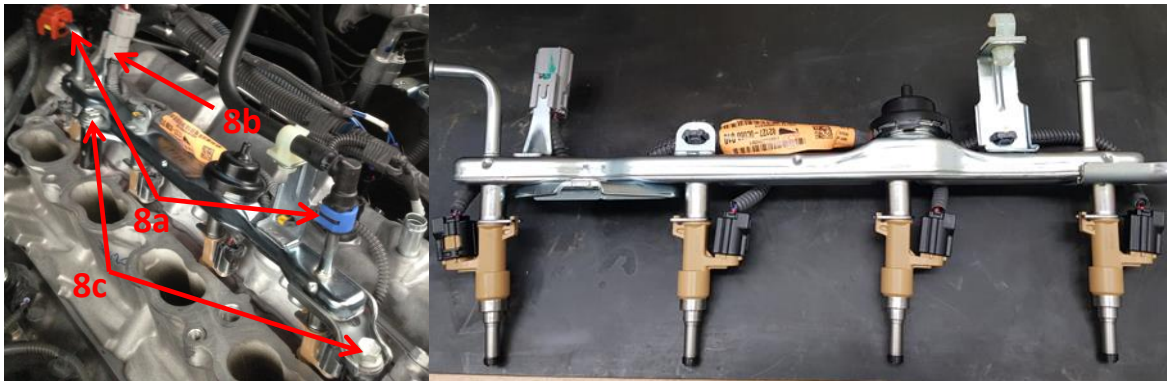




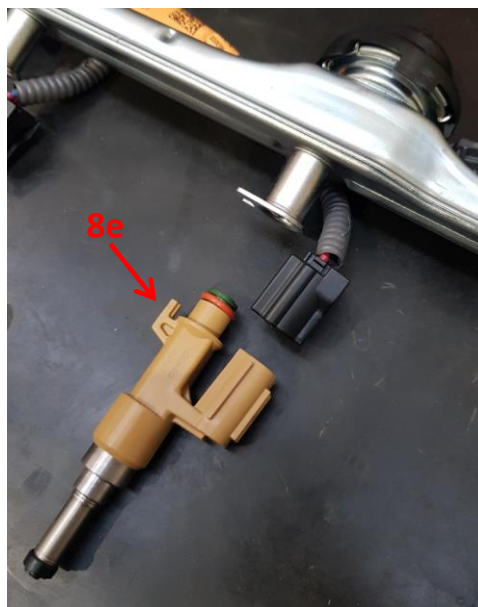
## 8) Installation of High Flow Injectors. Stage 2 only.

This step does not apply to stage 1 kits. Proceed to the next step without installing high flow injectors for stage 1.

- a) Dis-connect the fuel feed line from the rear of the fuel rails. Also dis-connect the fuel return line from the top of each rail. Use caution as there will be residual fuel in the lines and rails
- b) Dis-connect the electrical connector from the rear of the fuel rails
- c) Remove the 2x fuel-rail mounting bolts from each fuel rail. Retain the fuel rail spacers for re-use
- d) Pull up on the fuel rail and remove the rail along with the 4x injectors for each rail
- e) Un-plug each injector from the wiring looms and remove the 4x injectors from each fuel rail.

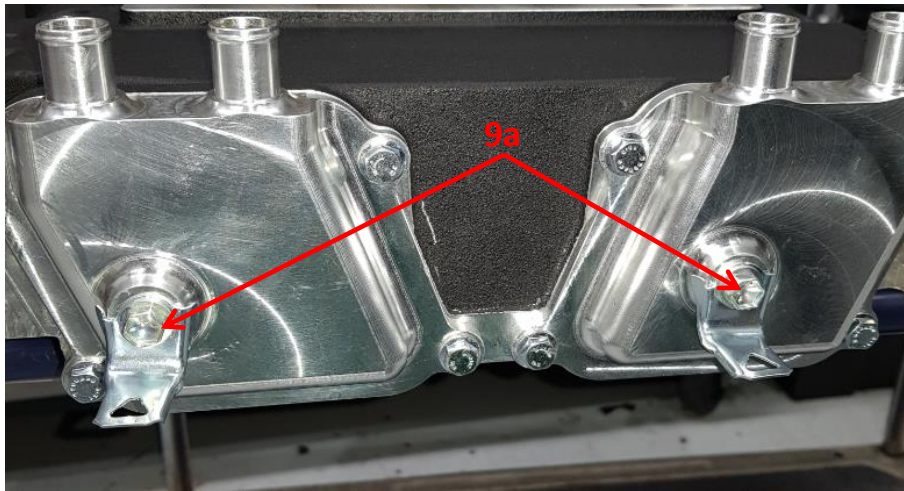


- f) Reverse this procedure to install the supplied Injectors on both LH and RH heads. Refer to the installation instructions provided with the Injector set.
- g) Do not tighten the fuel rail mount bolts yet – leaving them loose will provide space for the supercharger manifold to pass by.

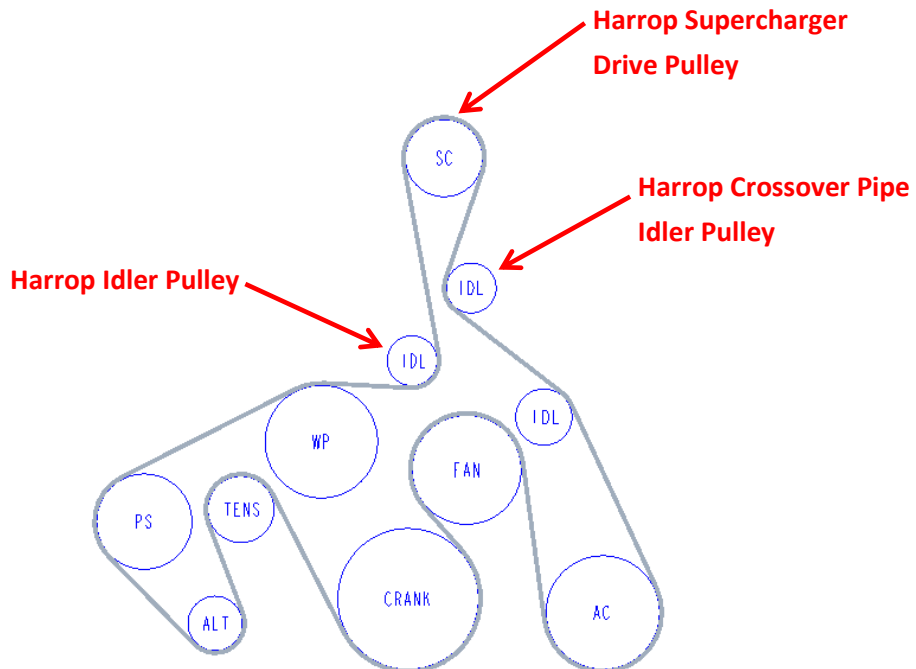


## 9) Installation of the Harrop Supercharger

- a) Install the original harness clips removed in a previous step to the rear of the supercharger manifold.



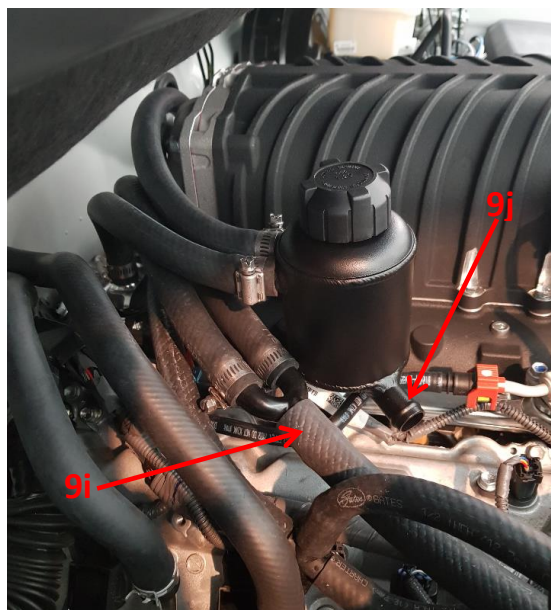
- b) Remove the masking tape from the inlet ports and ensure the head faces are clean, dry and free from foreign material.
- c) Double check that the 8x manifold face O-rings are all in place.
- d) Lower the Supercharger/manifold assembly into position. This is a heavy lift – utilise a suitable hoist.
- e) Tighten down the manifold using the 2x original nuts on the front studs, and the 8x supplied screws.
- f) Install the supplied Supercharger belt to the original FEAD, but route the belt over the supercharger pulley according to the following diagram:



- g) Re-tighten the fuel-rail bolts that were left loose in a previous step.
- h) Install the original throttle to the supercharger inlet using the original screws. The electrical connector should be at the top and horizontal. Ensure the supplied O-ring is in position. Torque screws to 10-12Nm.

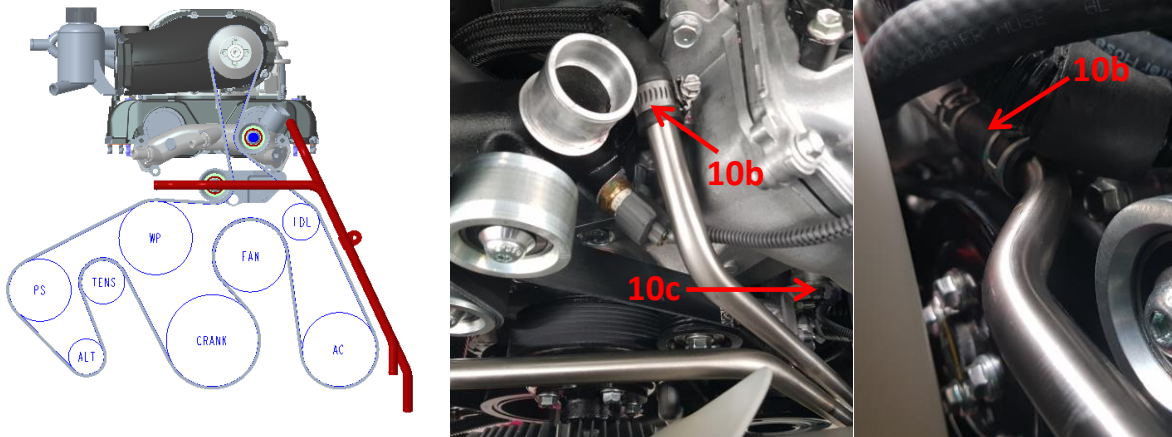


- i) Connect the free end of the 1100 long heater hose that is connected to the intercooler pump outlet to the Y-piece towards the rear RHS of the supercharger manifold. Secure with hose clamp. Refer to step 2m.
- j) Connect the free end of the 850 long heater hose that is connected to the intercooler radiator inlet (top) to the Reservoir outlet on the RHS of the supercharger. Refer to step 2n.

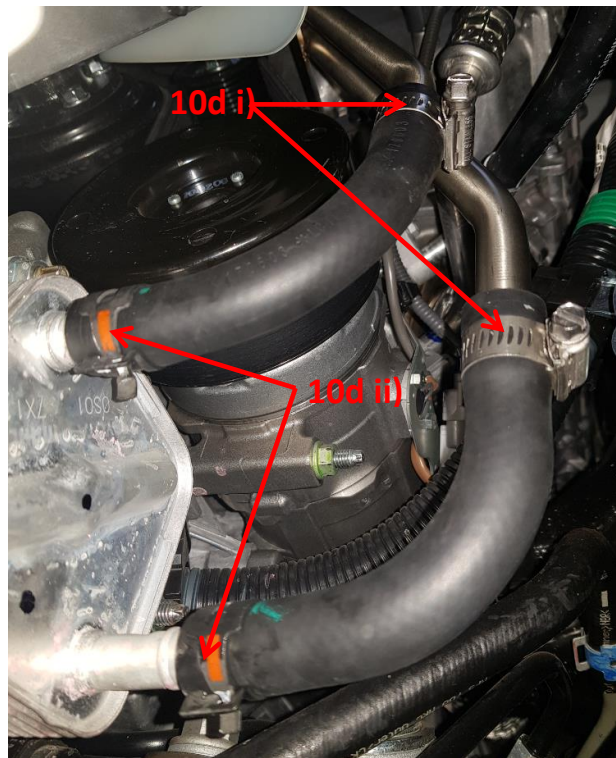


## 10) Install Harrop Oil coolant pipe

- Position the supplied oil cooler pipe between the engine fan and the Harrop idler pulley. Refer to the image below for the correct orientation. The pipes are shown in red.
- Connect the pipe to the original hose above the water-pump pulley, and the original hose that now goes over the engine coolant crossover installed previously.
- Secure the pipe to the front of the LH timing cover with the supplied M6 x 16 screw.

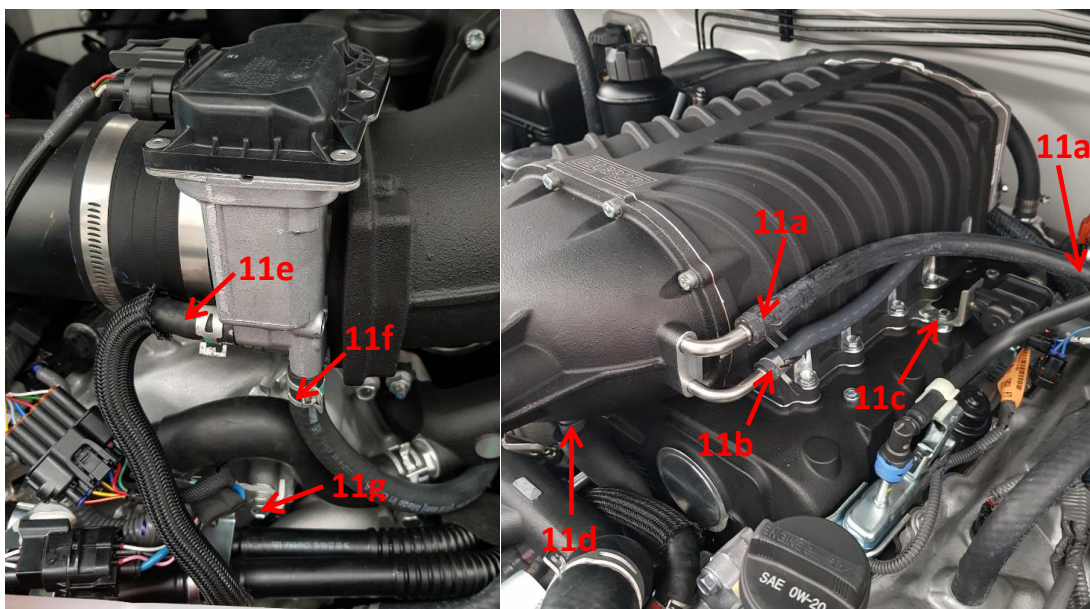


- From underneath the front LHS of the vehicle, install the supplied 90° oil cooler hose bends, noting the orientation
  - The larger  $\varnothing$  end of each bend fits on the Harrop oil cooler pipe. Secure with the supplied hose clamps
  - The smaller  $\varnothing$  end of each bend fits on the Oil cooler. Secure with the original hose clamps.



## 11) Install Ancillary hoses and brackets

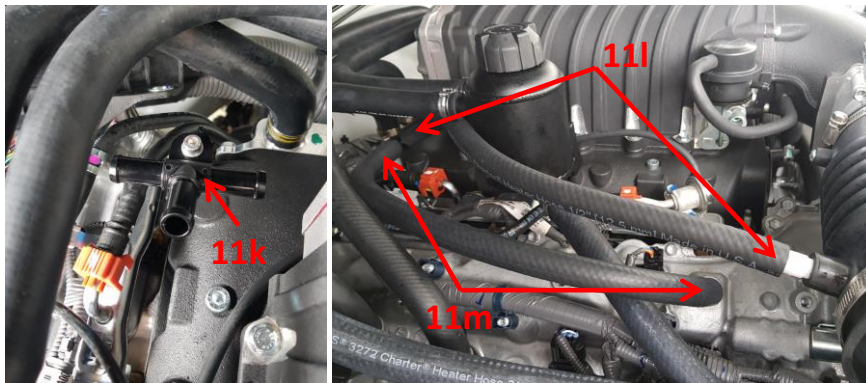
- On the LHS of the supercharger, connect the supplied 11/32" x 600mm long vacuum hose to the top  $\text{\O}9.5$  elbow. Connect the other end of this hose to the brake booster hose barb.
- Connect the fuel purge hose that was disconnected in a previous step to the lower  $\text{\O}8.0\text{mm}$  elbow.
- Using the supplied M6 x 16 screw, mount the fuel purge valve to the tapped hole half way along the manifold using the original mounting bracket.
- Re-connect the PCV hose to the  $\text{\O}10$  hose barb under the supercharger inlet cover.
- Connect the original Throttle body coolant hose to the horizontal hose tail on the Throttle body.
- Connect the supplied 5/16" x 650mm coolant hose (already connected to the heated PVC in the valley) to the vertical hose tail on the Throttle body.
- Use the supplied Air vent pipe bracket to re-position the vent pipes and loom toward the RHS of the vehicle approximately 20.0mm. Use the original screw to secure the supplied bracket to the front of the engine. Use the supplied screw and nut to re-fit the original pipe bracket to the supplied bracket.



- Secure all hose connections with the original clamps.
- Re-connect the top radiator hose in the original orientation and secure with the original clamps.
- Temporarily un-clip the air-box lid and install the Harrop intake boot between the original air-box and the throttle body. Re-use the hose clamps from the Toyota intake boot. The hose barbs should point to the rear of the vehicle, **with the larger one closer to the Air-box**. Re-clip the air-box lid into place.

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- k) Screw the OEM crankcase ventilation T-piece to the rear RHS of the Supercharger manifold, using the spacer and screw provided. Refer to step 3.f.
- l) Attach one end of the supplied 430mm long ½" vacuum hose to the centre branch of the T-piece, and the other end to the Intake boot.
- m) Attach one end of the supplied 480mm long ½" vacuum hose to the RH facing branch of the T-piece, and the other end to the RH Rocker cover.

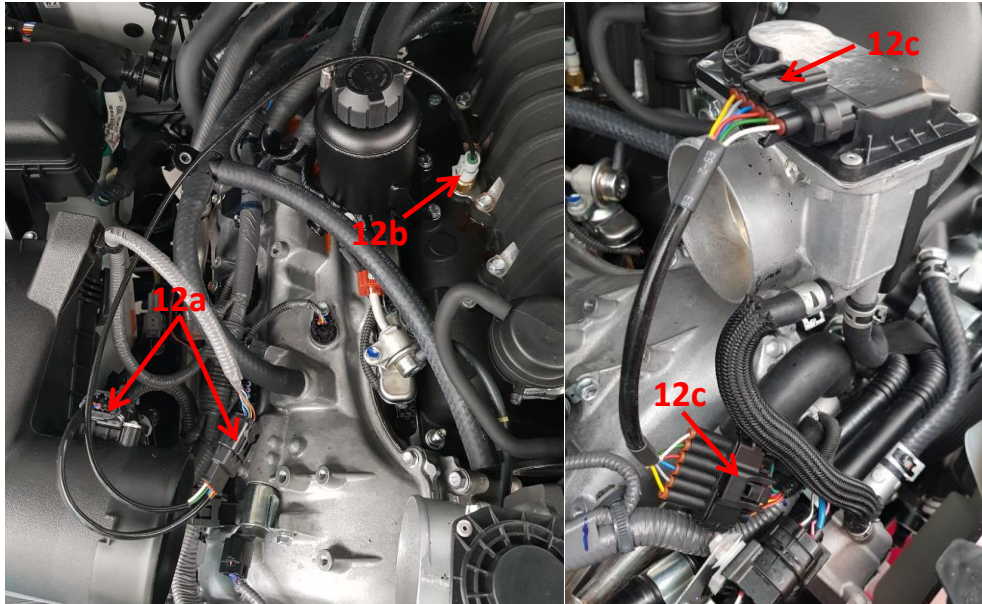


- n) Using the remaining 750mm long ½" vacuum hose, connect between the LH facing branch of the T-piece and the LH Rocker cover.

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## 12) Install wiring patch looms

- Install the supplied MAF – IAT break-out loom. Connect the female MAF sensor plug on the loom to the MAF sensor on the air-box and the male MAF sensor plug to the original female MAF sensor plug.
- Connect the IAT plug to the IAT sensor approximately half way along the RH side of the supercharger manifold. **Note this plug may look different to the image.**
- Connect the supplied throttle extension loom between the original throttle connector and the throttle body.

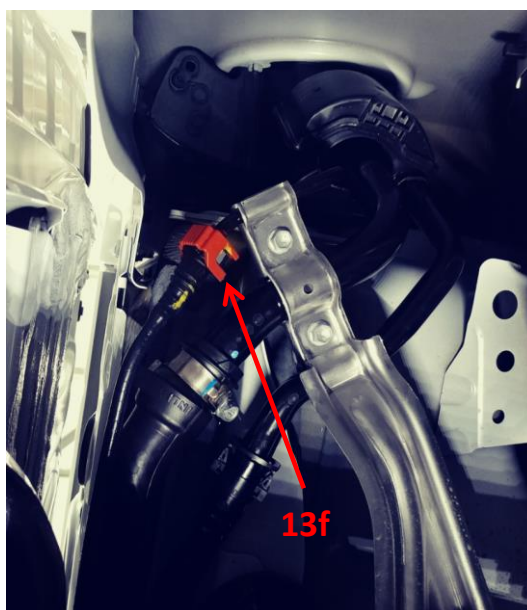


## 13) Install high flow fuel pump

- Ensure the fuel tank is nearly empty before completing the following steps.
- Raise the vehicle on a suitable hoist according to the vehicle owner's manual.
- Dis-connect the fuel delivery and return lines from the front top of the tank.
- Dis-connect the fuel filler tube at the rear top of the fuel tank.
- Dis-connect the fuel purge vent tube from the canister mounted above the fuel tank, and the wiring loom clip from the top of the tank.



- Dis-connect the fuel vent line at the filler neck.



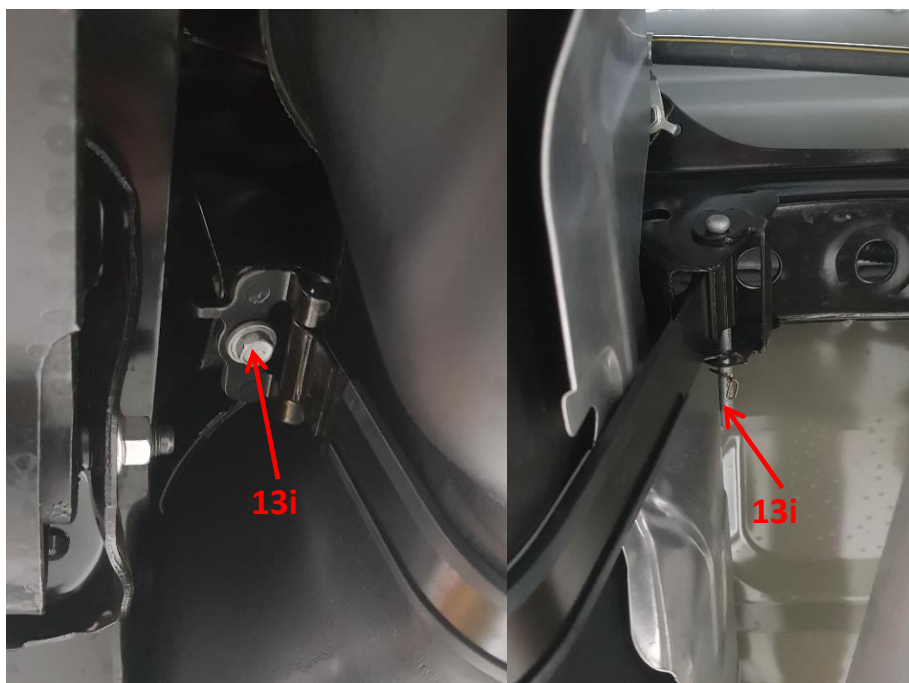
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- g) Un-plug the wiring to the fuel pump at the top of the fuel tank.

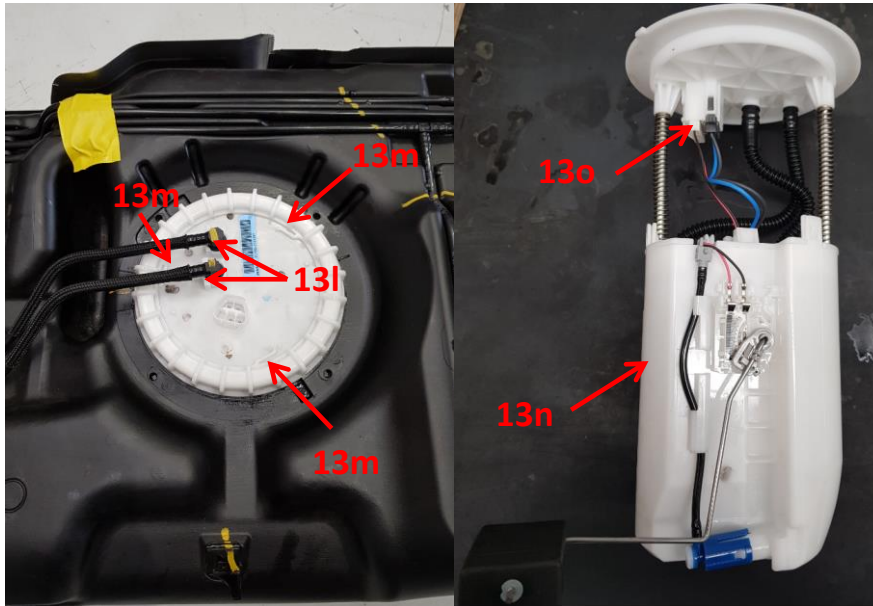


- h) Support the fuel tank with a transmission stand in the centre.  
i) Un-screw 3x M8 bolts (14mm head) and remove 3x pins/wire clips to remove the 3x fuel tank support straps.

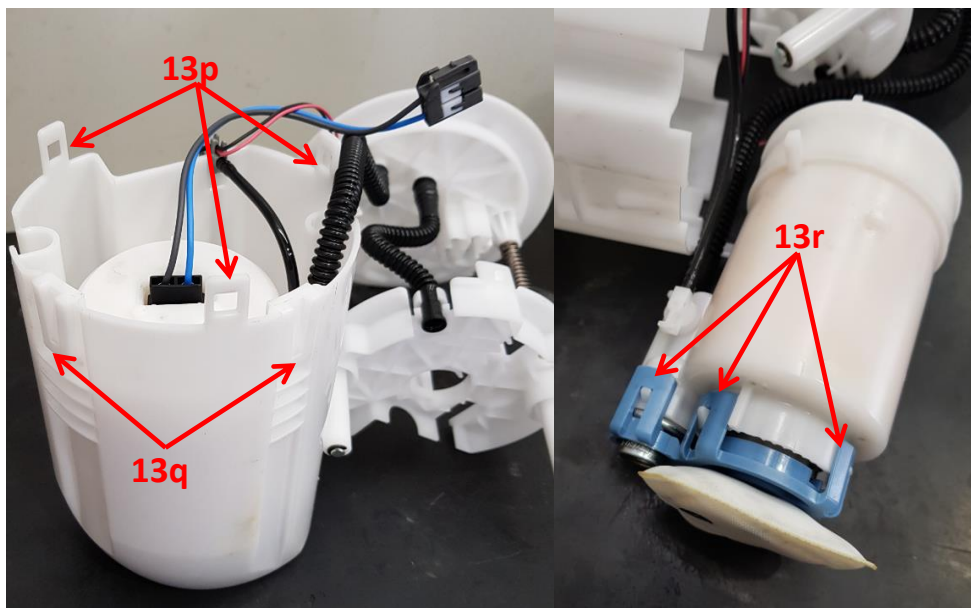


- j) Slowly lower the fuel tank, ensuring that all components are dis-connected and place on a work bench.  
k) Clean the top of the tank, especially around the white fuel pump module.

- l) Remove the 2x retaining clips from the fuel lines on top of the fuel pump module, and withdraw the lines.
- m) Using a suitable tool, us-screw the pump module retaining ring (CCW). It will be necessary to depress the 3x locking barbs one at a time as the ring is rotated.



- n) Remove the fuel pump module from the tank, allowing time for any fuel to drain out in the process.
- o) Dis-connect the two wiring plugs underneath the top of the module. Unplug the pump power loom from the pump and set aside.
- p) Use a sharp pick or small screwdriver to un-clip and separate the two halves of the module.
- q) Un-clip the 2x tabs that hook over the side of the lower half of the module, and remove the pump housing.
- r) Un-clip the 5x pick-up filter tabs and remove the filter, then withdraw the fuel pump.



- s) Remove and discard the old fuel filter and swap the O-ring spacer to the new supplied fuel pump.
- t) Fit the new supplied fuel filter to the new pump.



- u) Inspect the O-ring in the fuel pump housing. Replace with a new supplied O-ring of the same dimensions if it is worn or damaged.



- v) Re-install the new pump/filter to the housing making sure that the pump outlet is firmly seated in the O-ring. Push the 5x clips on the filter all the way home and ensure each clip is secured.
- w) Install the pump housing to the lower module half making sure that the 2x tabs that hook over the side of the lower half of the module are engaged and secure. Refer to step 13q.
- x) Plug in the pump power loom to the pump.
- y) Assemble the two halves of the pump module and engage the 3x retaining clips. Refer to step 13p.
- z) Re-connect the fuel level sender loom to underneath the top of the module.
- aa) Re-install the fuel pump module to the tank, and the tank to the vehicle reversing the steps that were used to remove them.

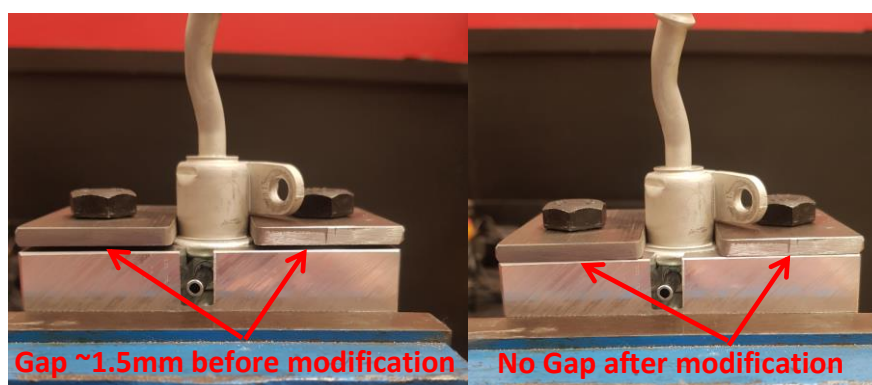
## 14) Fuel pressure regulator modification

These modification steps only apply to Stage 1 kits. Proceed to step 15 for Stage 2 kits.

- The OEM fuel pressure regulator will be modified to increase the system fuel pressure. Locate the pressure regulator on the RHS fuel rail, un-clip the orange lock and remove the quick-connect fitting from the fuel tail of the regulator.
- Remove the short  $\varnothing 4.0\text{mm}$  rubber hose from the vacuum tail of the regulator.

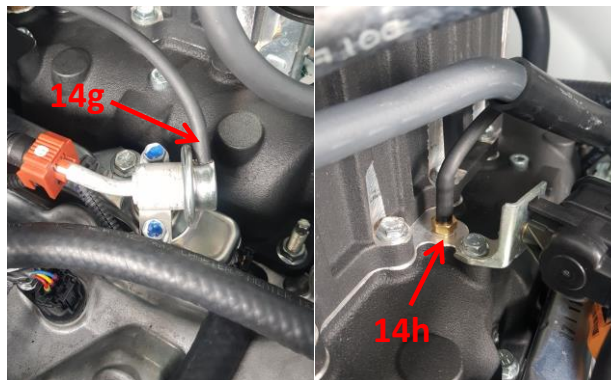


- Un-screw the 2x M6 bolts that secure the regulator to the fuel-rail and remove the regulator.



- Hold the supplied jig in a vice and position the regulator into the pocket as shown.
- Slide the jig plate over the regulator and screw the jig bolts down by hand at first, then tighten them down, alternating between each bolt every  $\frac{1}{2}$  turn until there is no gap.

- f) Remove the regulator from the jig and re-fit to the fuel-rail. Re-connect the fuel tail quick connect and lock
- g) Connect one end of the supplied  $\text{\O}4.0\text{mm}$  x 750mm long hose to the Vacuum tail of the regulator.



- h) Connect the other end of the  $\text{\O}4.0\text{mm}$  hose to the barb fitting on the LHS of the supercharger manifold, adjacent to the fuel purge valve.

## 15) Finalise installation

- a) Re-fill radiator with Genuine Toyota coolant, according to the vehicle owner's manual.
- b) Initial Intercooler system fill. Coolant to be used is either Ford WSS-M97B44-D and/or GMW3420, mixed with distilled or deionised water in a 50% concentrate. **Note filling with a con-compliant coolant will void warranty.** Fill via the intercooler reservoir, allowing time for the coolant to fill down to the front mount radiator. The ideal level is 25mm below the top of the reservoir with the cap removed. Use the bleed screw on the intercooler radiator to allow air to escape during filling.



- c) Re-fit front Grille.
- d) Re-fit under tray.
- e) Re-fuel the vehicle with 98 RON (93 AKI) minimum fuel.
- f) Reconnect battery.
- g) Turn the ignition on without starting the engine. The intercooler pump should be running. Allow 1-2 minutes for coolant to circulate and switch the ignition off. Re-bleed the intercooler radiator and top-up the coolant level.

## 16) Initial engine start and Calibration

Re-calibration is not required with Stage 1 kits as long as this kit is installed completely and without any other modifications. Minimum 98-RON (93-AKI) fuel must be used.

Stage 2 kits and vehicles with other modifications do require re-calibration.

Do not place any load or subject the engine to high speeds until ECU calibration has been performed, if required. It is the installer's responsibility to ensure all coolant connections are leak free, all electrical connections are sound and proper procedures have been followed during installation.

- a) Start the engine and allow to idle only. Check that the supercharger belt is running smoothly and is correctly aligned on all pulleys.
- b) Allow the engine to reach normal operating temperature, then switch off the engine and allow to cool. Re-check the Intercooler reservoir level and the engine radiator level. Check for any leaks.
- c) Calibrate the ECU for the new supercharged induction system for stage 2 kits.