



Installation Guide

TVS 1900 1GR-FE Dual VVT-i

Toyota FJ Cruiser 4.0L 1GR-FE 2009-2017



Important Information

Installing the supercharger indicates your acceptance of the responsibility and liability associated with the fitment and use of this product. Please ensure the owner and drivers of the supercharged vehicle are aware of their responsibilities and liabilities as indicated below.

Thank you for purchasing this supercharger which has been designed and made with pride. The owner and drivers of the enhanced vehicle must be aware that fitment of a supercharger may affect:

- The vehicle's factory warranty.
- Insurance cover and associated liabilities.
- Compatibility with emission and roadworthy certification.
- The validity of a driver's license for a supercharged vehicle.
- The handling & braking capability of the vehicle due to increased engine power & torque characteristics.
- The longevity of the engine.
- The vehicle will need to use premium unleaded fuel only (98 RON).

It is the owner's/driver's responsibility to accept any consequences and liabilities of using the supercharger and any subsequent effect it may have. Harrop Engineering shall not be liable and shall be 'Held Harmless' for any direct and/or indirect/consequential losses, costs, damages, expenses, injuries or liabilities whatsoever incurred by the owner/driver of the vehicle or other parties arising from this supercharger, its installation and/or its operation. It is recommended that vehicles have completed 1,500 km and have been driven, serviced and maintained in accordance with the vehicle manufacturer's handbook before fitting a supercharger. An engine should be deemed reliable and have delivered all reasonable expectations in line with the vehicle manufacturer's specifications prior to fitting a supercharger.

Warranty

This supercharger is covered by a limited warranty on components and workmanship for a period of 36 months from the date of purchase, subject to the following:

- Installation must be completed by a qualified motor mechanic or technician who has undertaken appropriate training in fitting Harrop superchargers.
- The supercharger has not been modified or "overdriven" by fitting alternative drive pulleys.
- The supercharged vehicle has been tuned by an appropriately qualified and experienced technician.
- The supercharged vehicle has been driven in accordance with the conditions specified by the vehicle manufacturer's normal use of operation, driving care and vehicle service program.
- The supercharged vehicle has not been used for competitive racing.

No warranty shall apply where Harrop have determined improper fitment or handling, misuse in operation, neglect, or accident damage. Engine modifications made prior to or in conjunction with the supercharger fitment may invalidate the Harrop limited warranty. Any warranty claims must be made immediately & directly in writing to Harrop Engineering so that a determination can be made promptly. Involvement of a third party or an attempt to repair a perceived/actual fault may invalidate the warranty. To the extent of the law, the determination on any warranty claim & associated costs will be at the sole discretion of Harrop Engineering.

By installing the supercharger, you acknowledge that all conditions pertaining to this supercharger and its operation have been read, understood and accepted

For 65 years Harrop Engineering has been at the forefront of designing, developing and manufacturing precision performance components. Today our innovative and logical approach is applied to low volume automotive OEMs and the performance aftermarket through a dedicated team of 65 staff. Core performance products include Superchargers, Engine Components, Brakes, Differentials and we are also the exclusive Australian Distributor for Forgeline Motorsport Wheels.

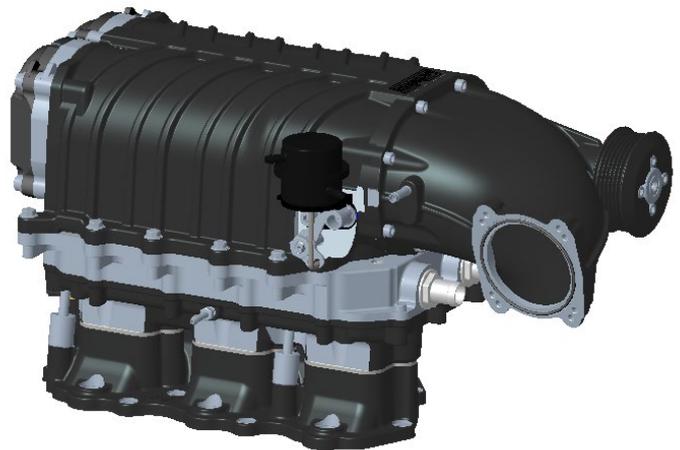
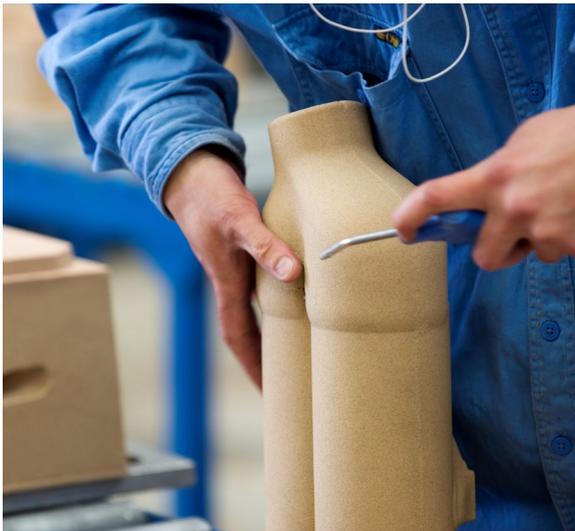
Harrop are also the preferred supplier of Eaton Supercharger and Traction Control technology including dual branded product designed and manufactured in-house. There are currently over 4,000 components in our portfolio and this is growing daily as we continually develop more Harrop Performance Products. Our high-profile car manufacturing customers have included Holden, HSV, FPV, Ford, Roush, Toyota, TRD and Lotus.

We also supply to race teams from categories including F1, NASCAR and V8 Supercars and an extensive range of drag, circuit and off-road competitors. Just as importantly, a large portion of our customers are performance enthusiasts and weekend warriors who are highly passionate about their ride.

Please take a moment to review the following pages and learn why Harrop is the first choice in Superchargers.

Thank you for choosing Harrop and enjoy your Harrop Enhanced ride.

- Team **HARROP**



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References to left and right in the instructions are made to the vehicles side and NOT the installer

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Removal Of Existing Inlet Manifold

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

Allow the engine to cool before starting installation.

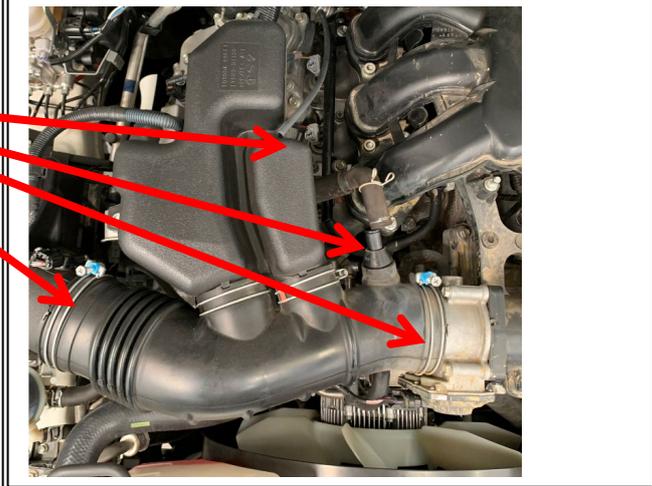
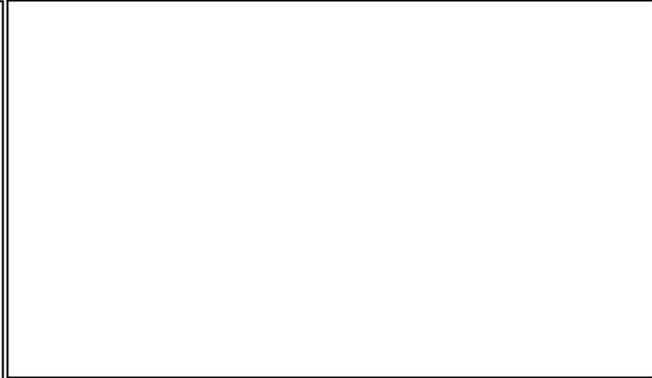
Disconnect the battery.

Remove the under tray and the engine cover.

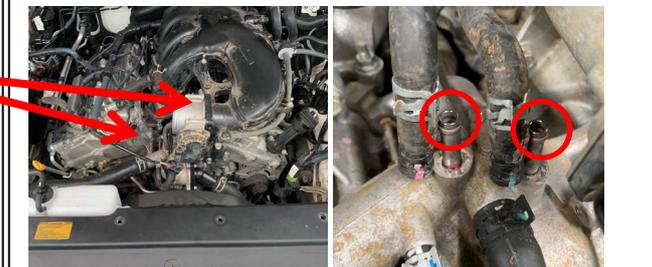
Remove the front Grille.

Dis-connect the PCV vent hose, fuel pressure reference and each end of the OE intake tube.

The intake tube is not re-used.



Dis-connect the throttle loom and vacuum connection from the front of the manifold.



Dis-connect the coolant lines from under the throttle body.

Un-screw the fuel purge solenoid from the LHS of the OE inlet manifold and set aside for re-attachment later.



Un-clip the heater hoses from the rear of the inlet manifold in 2 places.



Remove the manifold support bracket from the LHS rear.



Dis-connect the PCV vacuum hose from under the LHS of the inlet manifold, and remove this hose completely by also disconnecting from the PVC valve at the rear LHS valve cover.

Remove the steel manifold support bracket at the front of the engine.



Vacuum out the areas around the inlet manifold bolts to ensure no loose material can fall into the engine.

Unscrew 4x bolts and 2x nuts that secure the inlet manifold. Remove the intake manifold from the engine.

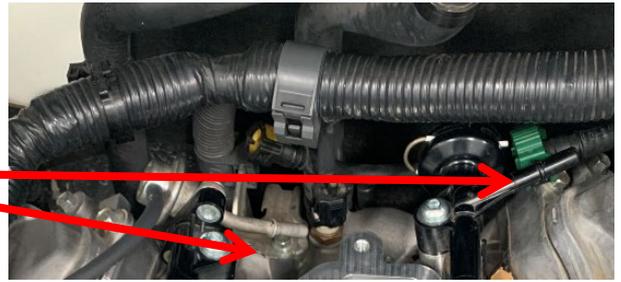


Un-clip 6x injector plugs.

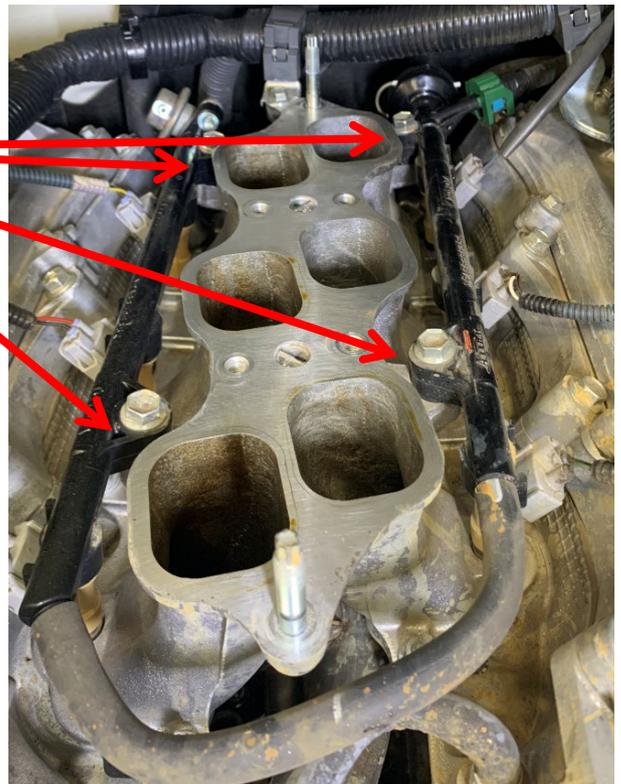
The orange gasket may have stuck in the OE inlet manifold, this is not re-used.



At the rear of the fuel-rails, dis-connect the fuel delivery pipe and the fuel return pipe. Use a rag to wrap the connection before it is separated to prevent residual fuel from spraying out.



Remove the 4x fuel-rail securing bolts and remove the fuel-rail complete with injectors. Make sure to collect the 6x rubber injector seals from the manifold.



Remove 6x bolts and 4x nuts that secure the Toyota lower manifold to the engine. These will be re-used.

Ensure that no debris, dirt or loose bolts/nuts/washers etc fall into the intake ports. Remove the 2x inlet gaskets and set aside for re-use later.

Clean the cylinder head surfaces and tape them over to prevent anything falling in.

The Supercharger is packaged as an assembled unit, but must be partially dis-assembled to enable installation.

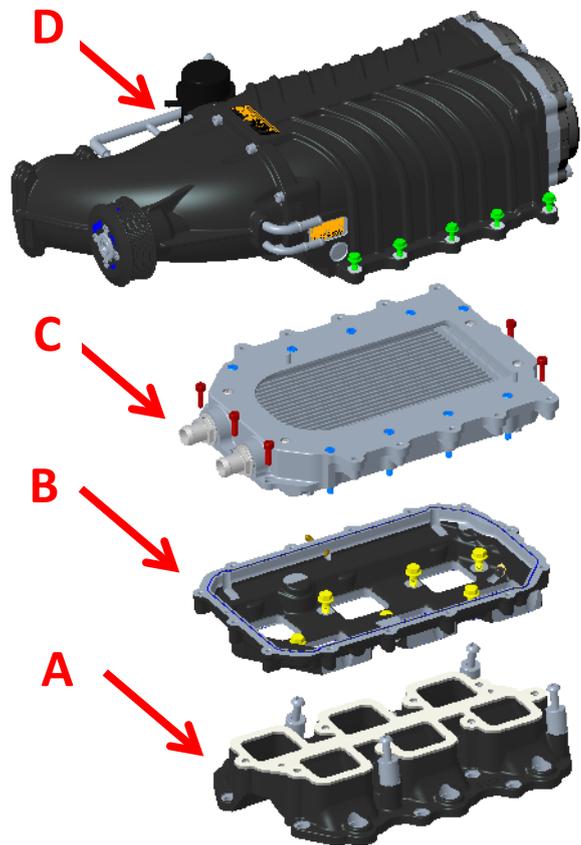
The assembly can be separated into 4 main parts.

Remove the 10x M6x25 flange head bolts from the supercharger (shown in Green) and lift off the supercharger unit 'D'.

Remove the 9x M6x45 (shown in Blue) and 5x M6x20 (shown in Red) screws to remove the upper intercooled manifold 'C'. It is not necessary to dis-assemble the upper intercooler manifold further.

Remove the 8x M8x25 Flanged head screws (shown in Yellow) that secure the lower manifold to the base manifold 'B'.

These sub-assemblies are installed in order starting with A, B, C, and D.



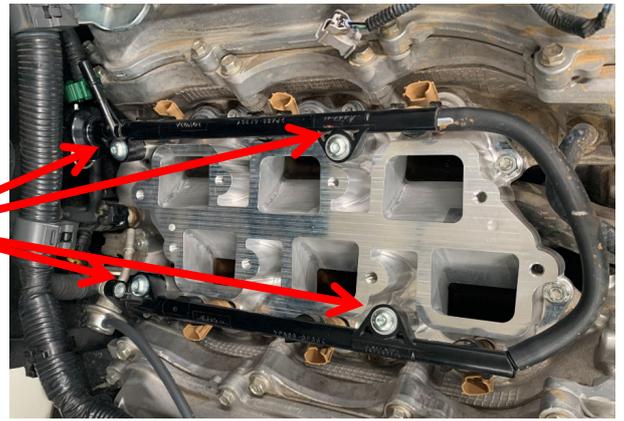
Installation of Supercharger

Transfer 6x injector seals to the new Harrop lower manifold.



Remove the protective tape and clean the head faces and original intake gaskets, and install the Harrop lower manifold to the engine using the original fasteners. Torque to 22-24Nm.

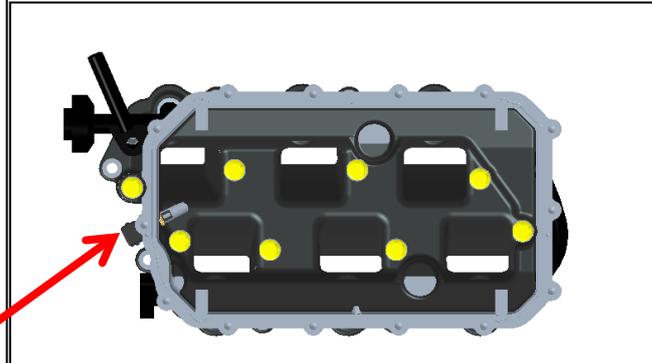
Install the fuel-rails with injectors to the Harrop lower manifold, using the 4x fuel-rail spacers and fasteners supplied. Torque to 22-24Nm.



-4x M8x60 Button head.

Re-connect the fuel inlet and return lines at the back of the manifold. Plug in all 6x fuel injectors.

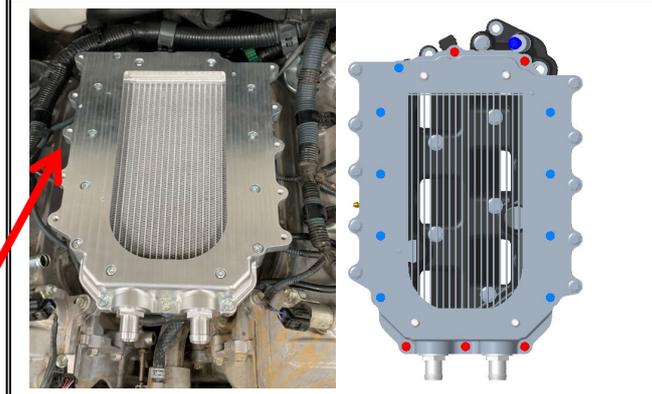
Install the supplied Teflon spacer #15217 and manifold #15211 to the engine using the supplied fasteners. Ensure all o-rings and 2x locating dowels are in place and that there is clearance to all fuel injectors and rails before tightening down. Torque screws to 22-24Nm.



-8x M8x25 Flanged head shown in Yellow.

Connect the IAT plug on the supplied loom #15372 to the sensor at the rear of the manifold. Lay the rest of the loom towards the Air-box for connection later.

Install the Intercooler manifold to the engine, ensuring the o-ring cord is in place. Tighten all 14 screws to 15-16Nm.



-9x M6x45 shown in Blue.

-5x M6x20 shown in Red.

Connect the fuel pressure regulator vacuum hose to the hose barb on the RHS of the manifold.

Install the Supercharger unit to the engine. Ensure the o-ring and 2x dowels are in the base of the supercharger, and all surfaces are clean.

- 10x M6x25 flange head screws shown in Green.

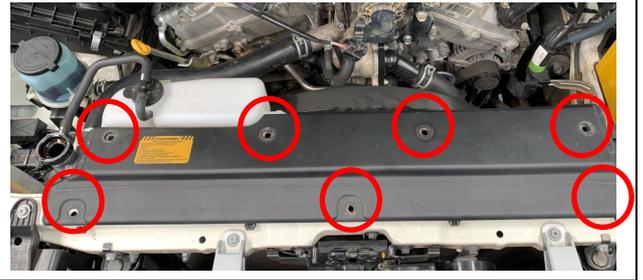
Tighten to 15-16Nm.



Installation of Supercharger Drive

The engine Fan and shroud need to be removed together to gain access to the front of the engine.

Remove the 7x plastic trim clips and remove the radiator top trim piece.



Un bolt the engine coolant reservoir, disconnect the overflow hose and remove the coolant reservoir.



Remove the lower radiator hose and trim 50mm from the radiator end. This will be re-installed later.



Remove the Fan shroud securing bolts, 1x LHS Top and 1x RHS Top. Remove any wiring or hose clips that are attached to the fan shroud.



Remove 4x flange nuts that secure the Engine Fan.

Hold the Fan and Shroud together and carefully remove from the vehicle, avoiding damage to the Radiator. Temporarily replace the nuts to hold the pulley in place.

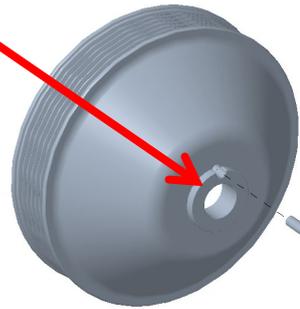
Cut a piece of cardboard and secure it to the radiator to protect it from damage.



Remove the Crank Pulley Bolt (CCW) using an Impact Gun.

Install the Harrop drive pulley #15245 to the crank pulley. Make sure the locating dowel $\varnothing 5 \times 12$ is in place, and oriented in the keyway slot.

Tighten the Crank Bolt to 270-280Nm.



Rotate the OE belt tensioner CCW and remove the belt from the power steering pulley only. This is to remove tension from the belt temporarily. This belt will be re-installed.

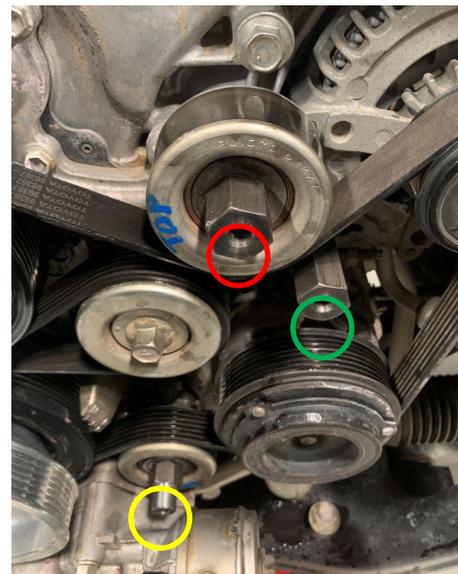
Replace the Top Pulley bolt with the supplied stud #15243 – red circle

Replace the Inner Alternator Bolt with supplied stud #15242 – Green circle

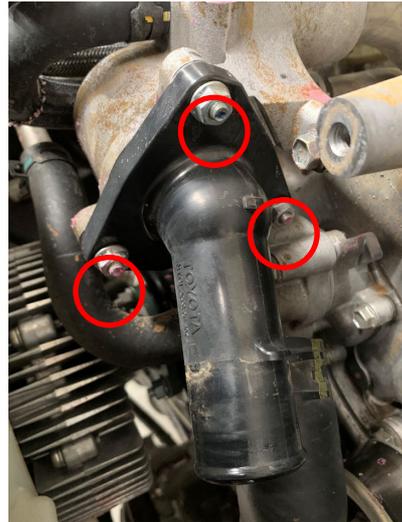
Replace the lower Pulley bolt with the supplied Stud #15244 – Yellow circle. Temporarily screw the M10 nut and washer all the way down the stud before installing. This will allow the stud to clear the oil cooler body. After tightening the lower stud, back off the M10 nut and washer to allow the idler bracket to slot over the stud.

Tighten all three studs to 22-24Nm.

Rotate the OE belt tensioner CCW and Re-install the belt over the power steering pulley, and slowly release the belt tensioner. Check that the belt is properly installed on all of the pulleys. Refer to the OE belt route.



Remove the plastic thermostat housing from the front of the engine. Keep the gasket, nuts and thermostat for re-installation later.



Install the supplied idler bracket #A15218 in the position shown, secure with:

1x M6x80 shown in Red with spacer behind bracket (remove the OE screw first)

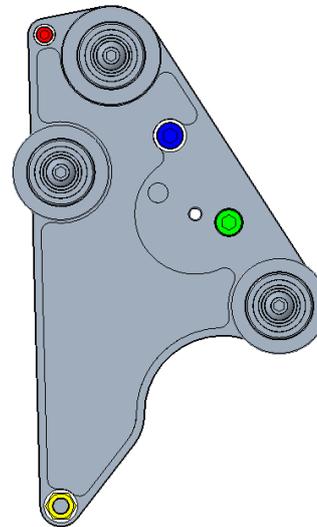
1x M10x25 shown in Blue

1x M10x30 shown in Green

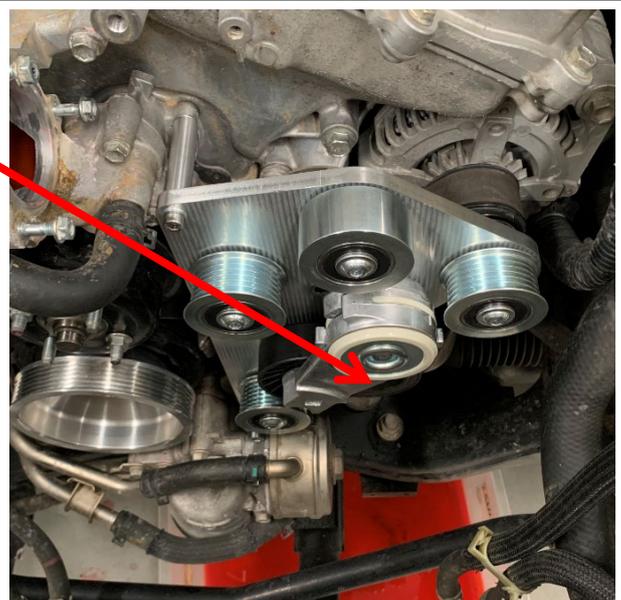
1x M10 nut shown in Yellow. The bracket is slotted to allow the nut to remain in place while installing

Torque M6 to 15-16Nm

Torque M10 to 22-24Nm



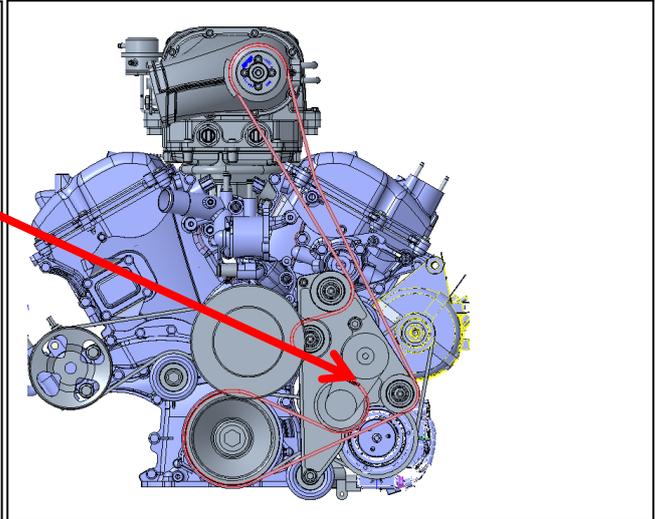
Install the Tensioner to the idler bracket loosely. This is to allow install the supercharger belt to be routed correctly.



Route the supplied 6PK2010 belt as shown without looping over the supercharger at first.

Align the tensioner locating pin in the idler bracket and tighten the tensioner mount bolt to 22-24Nm.

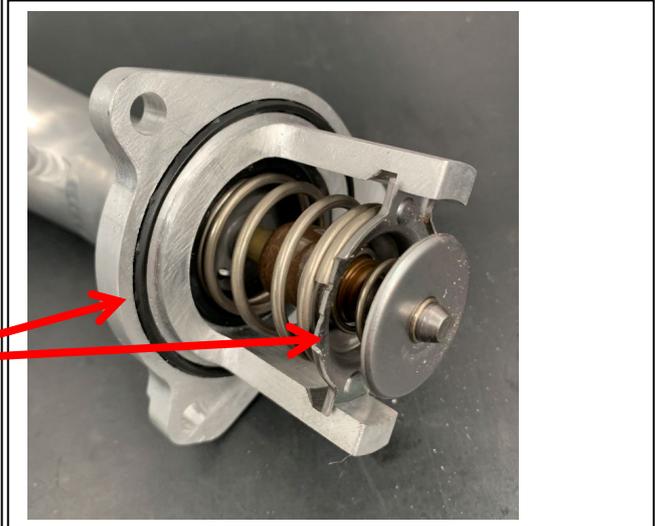
Using a 3/8" drive bar, rotate the tensioner CW to allow the belt to be slipped over the supercharger top pulley. Slowly release the tensioner until it tightens against the belt.



Remove the thermostat from the OE plastic housing removed earlier by pressing against the spring pressure and turning until the locating tabs are free.

Carefully pry out the circular seal.

Install these components into the Harrop Thermostat housing #15224 in the same manner as the original.



Install the Thermostat assembly to the engine using the 3x original flange nuts.

Remove the cardboard protecting the radiator and Re-install these components:

Engine Fan and shroud.

Lower radiator hose. The end that was shortened connects to the radiator.

Coolant reservoir.

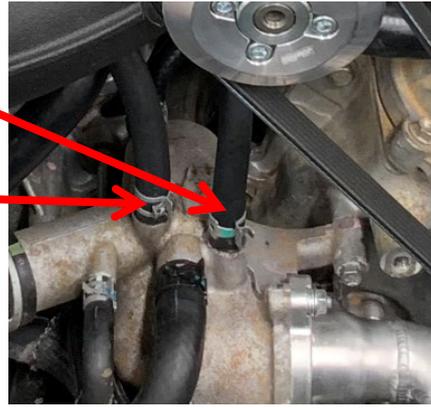
Radiator top trim.



Connect the supplied 5/16" x 380 long coolant hose to the LH hose fitting on the top of the OE water manifold.

Connect the supplied 5/16" x 320 long coolant hose to the RH fitting on the top of the OE water manifold.

Secure both with the original clamps removed earlier.



Install the original throttle to the supercharger inlet with the electrical connector towards the front. Ensure the O-ring is in place in the supercharger inlet. Re-use the 4x original throttle body screws.

Re-connect the throttle loom to the throttle.



Connect the free end of the 5/16" x 320 long coolant hose to the rear facing barb on the throttle.

Connect the free end of the 5/16" x 380 long coolant hose to the RH facing barb on the throttle.

Secure both with the original hose clamps removed earlier.



Connect the Air-box to the throttle using the supplied inlet boot #14680. The smaller end goes onto the throttle. Orient the boot so the Ø12.7 hole is at the back.

Secure with the supplied hose clamps.

Un-plug the MAF connector at the airbox and connect to the supplied loom #A15372. Plug the remaining connector of A15372 to the original vehicle MAF sensor connector.

Connect the PCV vent hose on the RH valve cover to the inlet boot using the supplied 5/8" connector.

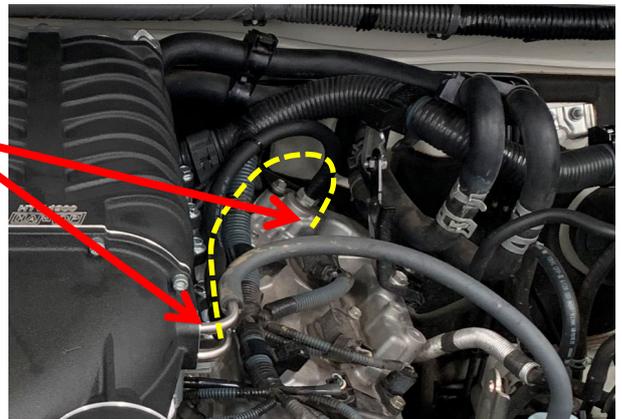


Connect the vacuum hose end to the top elbow on the Supercharger LHS

Attach the fuel-purge solenoid to the existing bracket on the LH valve cover behind the oil fill neck. Use the original screw to secure as shown.



Attach one end of the supplied 3/8" x 500mm long Vacuum hose to the lower elbow on the supercharger LHS and connect the other end to the PCV valve at the back of the LH valve cover.



Installation of Intercooler System

Un-clip the plastic cover from the hood latch to reveal the mounting bolts.



Temporarily remove the hood latch and un-clip the Ambient air temp sensor from the centre strut.

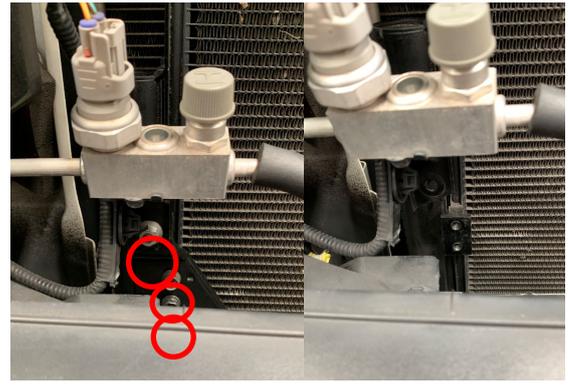


Unbolt the centre strut from the bumper bar and lower crossmember to remove the strut. This will be replaced by the supplied centre strut bracket.

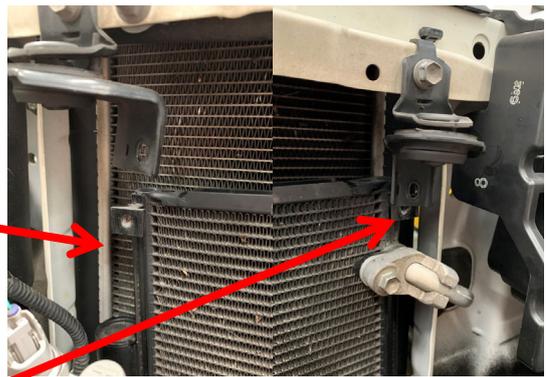


Remove 2x M6 screws and 1x M6 nut from the mount bracket of the lower RHS of the A/C condenser.

Also remove 2x M6 screws from the LHS lower bracket.



At the Top RHS of the A/C condenser, remove 1x M6 screw. Support the condenser to prevent damage.



At the Top LHS of the A/C condenser, remove 1x M6 screw. Support the condenser to prevent damage.

Remove 2x rubbers from the lower condenser brackets. These will be re-used.



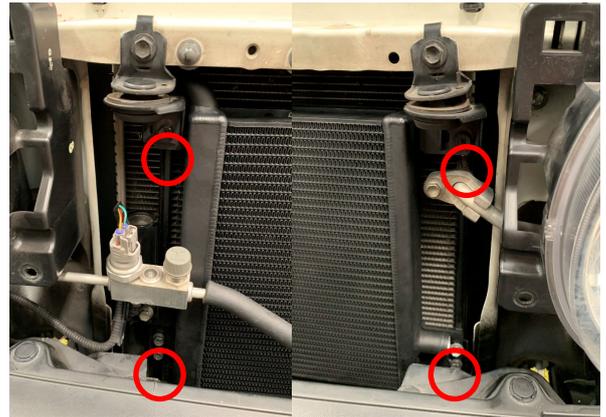
Insert these rubbers into the Harrop Intercooler Radiator #15240 lower brackets.



Install the Intercooler Radiator in front of the A/C condenser. Ensure the rubbers on the lower brackets fit over the lip on the lower crossmember.

Align the A/C condenser with the mounting holes on the new Intercooler Radiator.

Install M6 screws to all 4 upper and lower brackets. Re-secure the A/C manifold block with an M6 screw to the Intercooler Radiator.



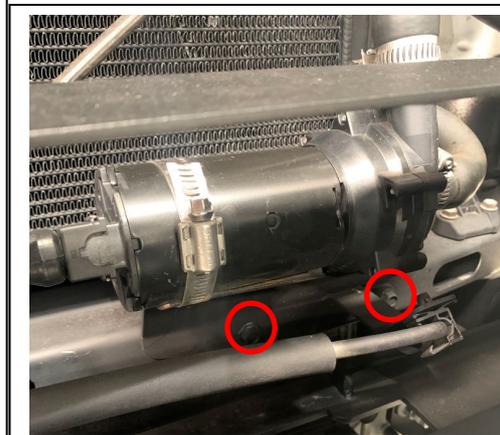
Install the supplied centre strut #A15190 to the vehicle in the same fashion as the OE strut. Use the original fasteners.

Re-install the Hood latch and plastic cover using original fasteners.

Clip the Ambient air temp sensor to the hole provided.



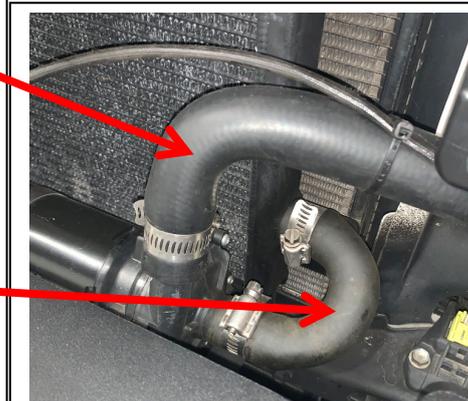
Install the intercooler pump bracket #15308 to the lower cross-member near the LHS of the Intercooler radiator. Screw the bracket to the crossmember using the supplied M6 screws and existing tapped holes. Using the supplied hose clamps, secure the intercooler pump to the bracket with the pump outlet oriented vertically.



Find supplied hose #15309 and determine the end which has the smaller bend. Connect this end of the hose to the pump outlet and secure with a supplied hose clamp.

Connect the supplied U-shaped hose #9201 between the Intercooler Radiator and the Pump inlet as shown.

Secure with the supplied hose clamps.



Temporarily remove the LHS headlight to gain access behind it. Run pump outlet hose #15309 towards the LHS and through the small hole behind the indicator.



Plug-in the intercooler pump loom #A13128 to the pump and cable tie to secure it along the hose. Run the loom up behind the battery for connection later.



Route the pump outlet hose around the battery, behind the oil filler and across to the LHS intercooler fitting on the front of the supercharger manifold.

Secure each end using the supplied hose clamps.

Re-install the LH headlight.



Temporarily remove the plastic trim from the top of the RHS engine bay by removing 5x trim clips and the pulling upwards firmly.

Locate these two mounting holes and secure the supplied intercooler reservoir #A15310 with 2x M6 screws.

Re-install the plastic trim and clips.



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Connect the supplied 5/8" intercooler hoses shown in blue to the reservoir and the supplied Y-piece #11409 as shown, secure with 4x hose clamps.



Connect the remaining branch of the Y-piece to the front of the supercharger manifold using the supplied 3/4" x 280mm long intercooler hose shown in red. Secure with 2x hose clamps.

Connect the supplied 3/4" x 500 long hose between the reservoir outlet (bottom) and the radiator top RHS inlet. Route the hose behind the radiator cap and through to the Intercooler. The Intercooler mount bracket can be removed temporarily for access.



Secure with 2x hose clamps.

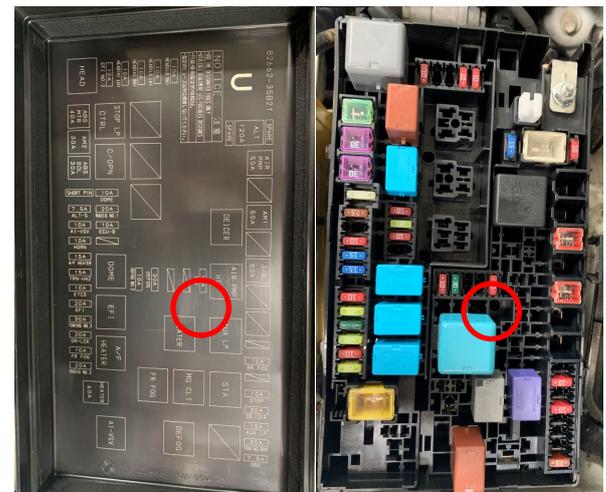
Remove the fuse box lid and continue to install the Intercooler pump loom #13128.

Attach the relay to the inner guard as shown with a pop rivet or small self-tapping screw.

Attach the Earth (black) eyelet to the existing earth on the inner guard

Find the 10A INJ fuse and replace it with the fuse breakout from the intercooler pump loom.

Run the positive (red) wire behind the fuse box and the up to the existing stud on the RHS.



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Use cable ties to secure the loom to the pump outlet hose.
Replace the fuse-box lid ensuring the intercooler pump
loom passes through the space shown.



Finalise Installation

Ensure all coolant hoses are connected and have a clamp at each end.

Re-fill the Engine radiator and reservoir with coolant as specified in the vehicle's service manual.

Fill the intercooler system with GM6277M, mixed with distilled or deionised water in a 50% concentrate. Note: Filling with a noncompliant coolant will void warranty. Fill until the level covers the upper fitting, allow some time for the coolant to completely fill the intercooler radiator.

Make sure any components that were removed to aid installation have been re-fitted where necessary.

Re-connect the Battery and switch the ignition on without starting the engine.

Check that the intercooler pump is running. The coolant should be visibly flowing through the reservoir. Let the pump run for a minute and then switch off and re-fill the reservoir. Repeat until the coolant level is constant.

Check that all hoses and wiring looms are secured and cannot come into contact with any pulley, fan or belt.

Start the engine and allow to idle only. Not place and load, or rev the engine until re-calibration has been performed.

Check that the supercharger belt is running correctly and that the belt tensioner is approximately half way along its total travel.

Check for coolant and vacuum leaks.

The ECU requires calibration to ensure high performance and safe operation.