Installation manual

PART 2/2

We strongly recommend ValveCare-DI on this engine

MANUFACTURER	Hyundai / Kia
TYPE	Based on Sportage
ENGINE DISPLACEMENT	1591cc
NUMBER OF VALVES	16
ENGINE CODE / NUMBER - OUTPUT	G4FD - 97 kW
FIRING ORDER	1-3-4-2
VEHICLE CATEGORIES	M
TRANSMISSION	MT
VERSION	AFC-2.1 DI-LPG eVP
TYPE VSI INJECTOR	KN9 - 52cc
TYPE INJECTION MODULE	Gen2 Type 4
PETROL ECU MANUFACTURER / CODE	***Kefico 39110-2BRN0 / CPEGD 2.20.3***
MODEL YEAR:	2018-
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000031 / VSI-LPG 45
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	349/129004/A
MANUAL NUMBER	076/2892000
DATE	2019-11-27

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FOR EXPLANATION AND CIRCUIT DIAGRAMS SEE : INSTALLATION MANUAL GENERAL PART 1 / 2

General instructions

- The installation of the system shall be done in accordance with the installation manual provided by Prins Autogassystemen.
- This manual is based on Dutch regulations; always install the system in accordance to the local regulations.
- Always download the “general manual 1/2“ from our website for basic instructions and diagrams.
- Always disconnect the battery when installing the LPG system. Make sure the ignition key is outside the car. Be aware of central door locking, radio / telephone memory code and alarm system.
- Do not place the main fuse into the fuse holder before having completed the installation of the VSI system.
- The VSI computer has to be activated by means of the diagnosis software.
- In the unlikely event the AFC fails, it will automatically switch over to petrol.
  Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the VSI wiring harness, ensure that it does not run near any of the ignition components.
- Solder and insulate all electrical connections.
  The wires in the loom are provided with numbers and text.
  The text on the wire explains the function of the wire.
  The wire harness is not model specific, therefore it may be necessary to adjust the length of the wires.
  Ensure maximum care is taken when connecting the wiring.
  Make professional joints using solder and shrink sleeve. Do not stretch the wiring harness.
- No component of the LPG-system shall be located within 100mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- Remove any internal burrs after having shortened the LPG pipe.
  (This guarantees the maximum flow through the pipe without pollution.)
- If holes have to be drilled (wear safety glasses) for installing brackets, etc., the drilled holes must always be treated with an anti-corrosion agent after the chips have been removed (especially when mounting an exterior filler into the body work).
- After having completed the installation, check the whole system for gas leakage; use a gas leak detection device. Also check for any leak of engine coolant, petrol and air.
- Fitting and maintenance is only allowed by Prins Autogassystemen selected LPG engineers.
- Failure to follow the instructions in this manual can result in a poor or non-working LPG-installation or a dangerous situation.
- For maintenance instructions and filter registration see owner’s manual.
- Prins Autogassystemen is not responsible for any damages to people or objects as a result of changes to Prins products.
- Check our website regularly for diagrams, certificates, updates, info-bulletins and product information.

Please fill in the warranty portal completely within 14 days after installation.
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Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer
- Vehicle fuel system scan tool or OBD scan tool Prins (part no. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins Diagnostic Tool
- Torque wrench (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits Ø4 to 12 mm
- Assortment cutters (Ø20, 30, 50, 70 mm)
- Portable drill or pneumatic drill
- Thread cutting device (male M6x1, M8x1, M10x1)
- Air gun
- Vacuum cleaner
- Safety goggles
- Hot air gun
- Soldering iron, soldering tin
- Wire-stripping pliers
- Adhesive tape
- Adhesive sealant
- Thread locking compound
- Anti-corrosion agent / black body coating
- Gas leak detection device or foam leak spray
- Shrink sleeves

Vehicle check

- Check the vehicle drivability on petrol
- Check the fuel system for error codes (scan tool)
- Check if the catalytic converter is in good condition (exhaust gas analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)

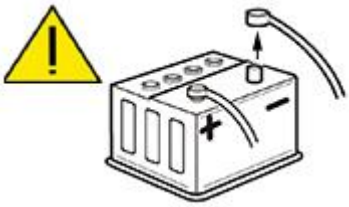
Tightening moments

		Nm	Spanner mm
M5 x 0,8		6.5	8
M6 x 1,0		11.3	10
M8 x 1,25		27.3	13
M10 x 1		52	15-16-17
M10 x 1,5		54	15-16-17

LPG manifold nipple		1	3.5 Allen
Reducer nut - bracket		10	13
Lock-off nut		15	16
Fuel line nut – lock-off		20	13
Fuel line tank – lock-off		20	16
Filling hose connections		50	22

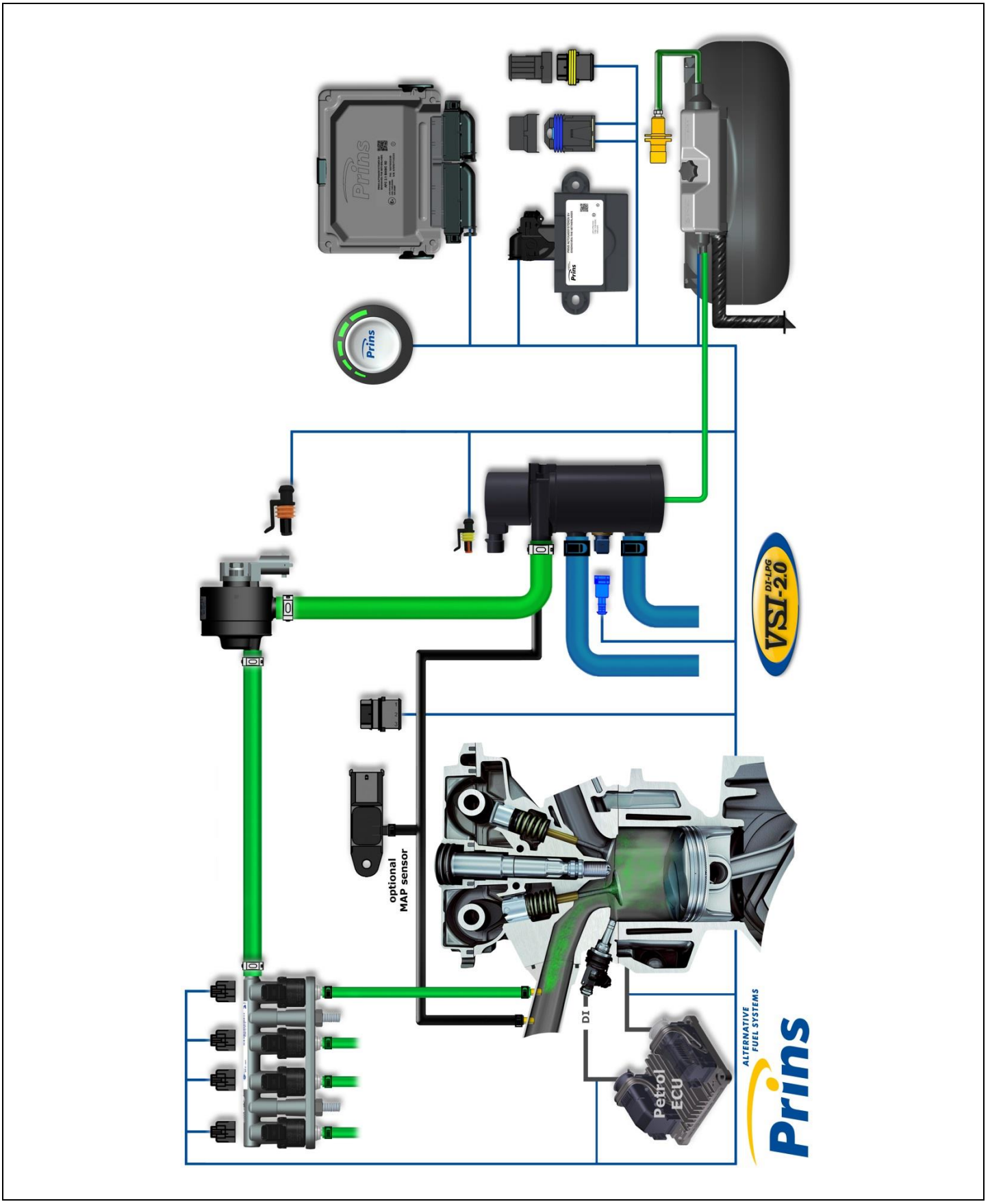
EXPLANATION OF SYMBOLS:

= IMPORTANT, CAUTION



= WEAR SAFETY GOGGLES

Basic System Overview



VSI approval numbers

Prins eVP-500 LPG: E4-67R-010358

Injector rail Prins : LPG E4-67R-010093
CNG E4-110R-000021

Filter unit Prins : LPG E4-67R-010096
CNG E4-110R-000028

Injector Keihin KN9 : LPG E4-67R-010310
CNG E4-110R-000295

Prins AFC : E4-67R-010098
E4-10R-030507

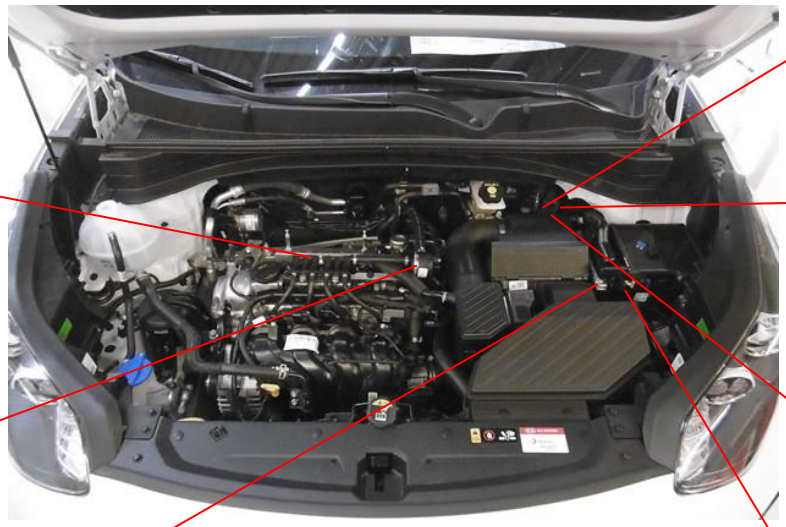
Tubithor : LPG E13-67R-010145
CNG E13-110R-000017

Rubia : LPG E4-67R-010068
CNG E4-110R-000003

WinLas : LPG E37-67R-010140
CNG E37-110R-000012

Thunderflex LPG E24-67R-010018
CNG E24-110R-000040

VSI component location overview (Sportage)



eVP-500

Rail

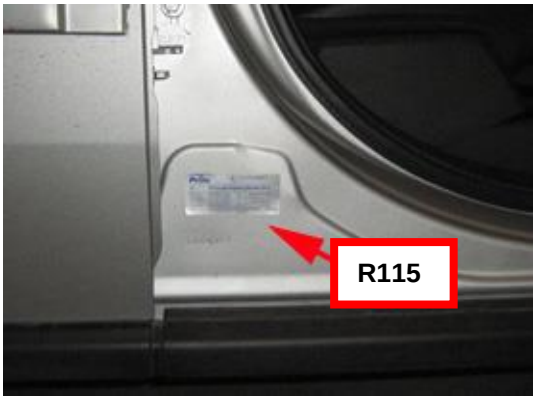
AFC

Filter

Injection module

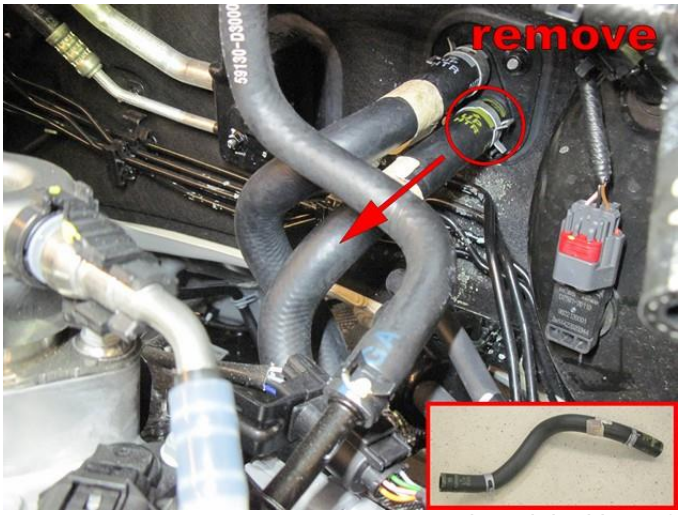
Petrol ECU

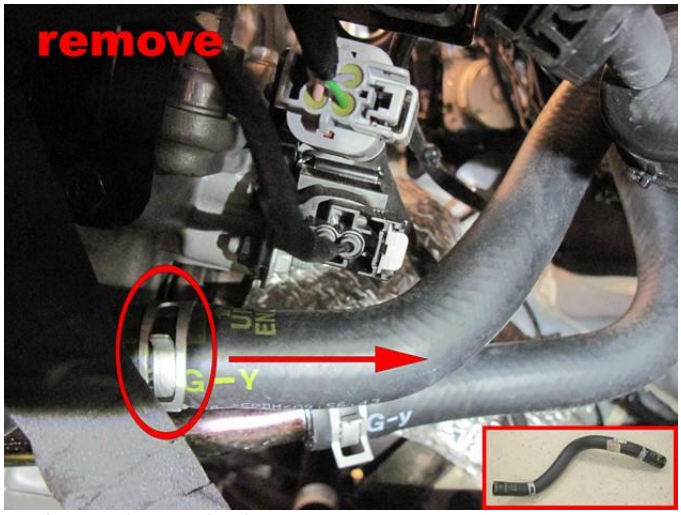
Fuse box



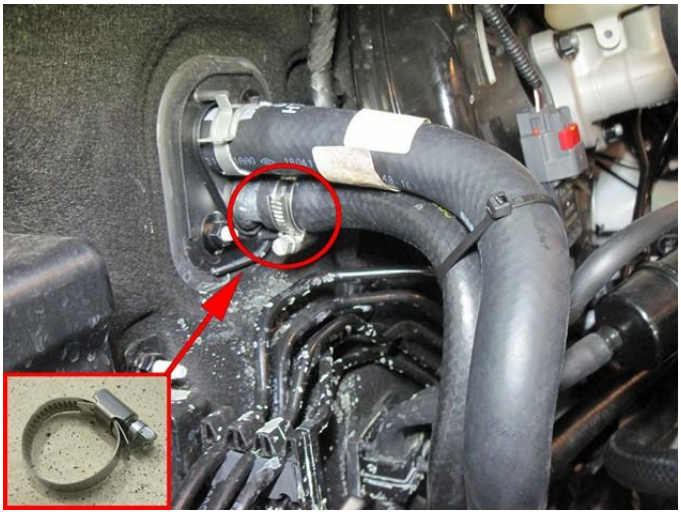
If applicable, R115 approval sticker :
Right side centre door post

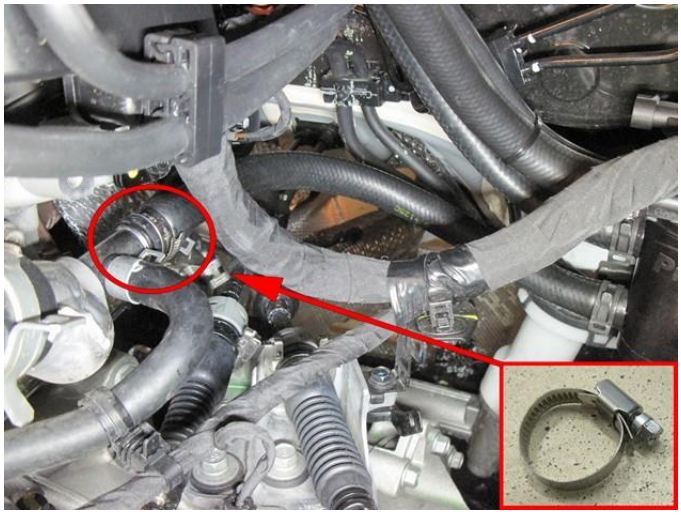
Water connections



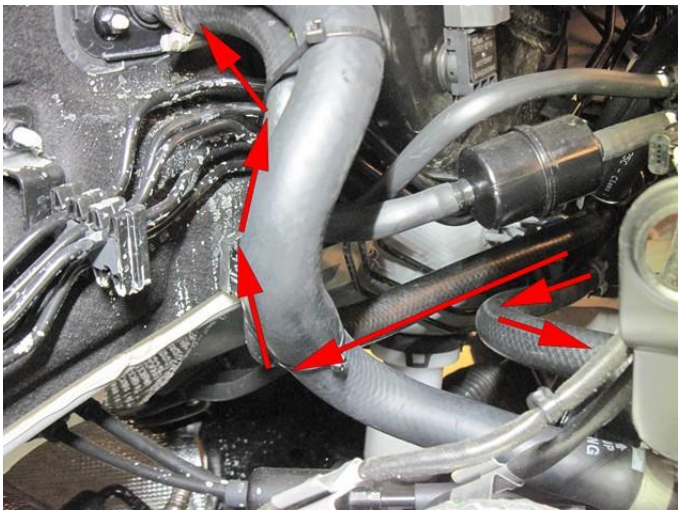


Remove the original hose from the engine to the heater.





Cut the water hoses on length and with a little lubrication mount them to the original water connections.

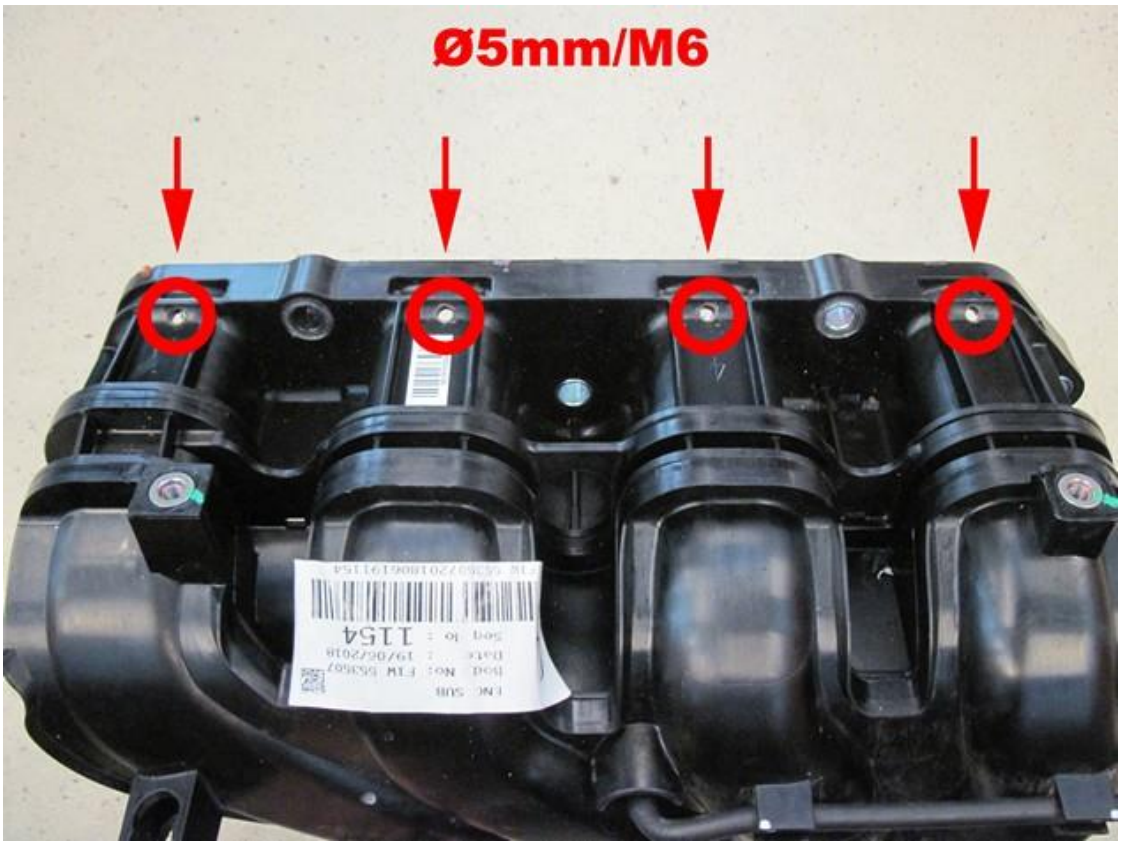


Cut the water hoses on length and mount them with a little lubrication to the original water connections.
Fixate with pull-straps.

Mounting the inlet manifold couplings 1

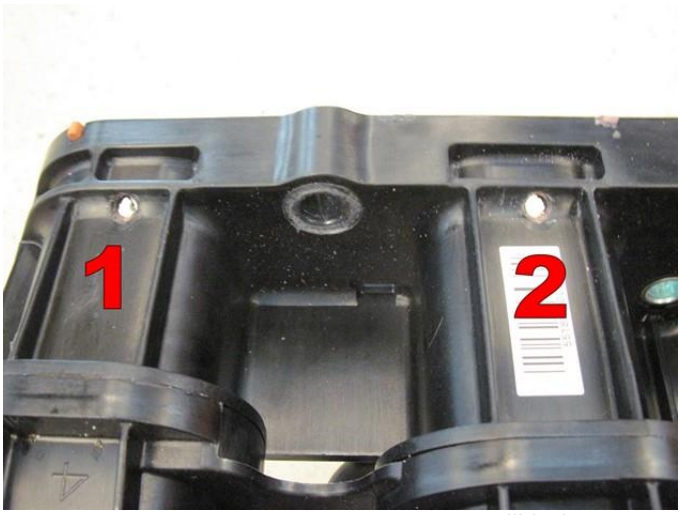
Remove the inlet manifold.
Drill **5** holes of **5mm** in the inlet manifold. Cut **M6x1** thread in these holes.
Place the VSI couplings with a locking compound in the inlet manifold. Watch out that the locking compound doesn't come inside the VSI couplings. Place the inlet manifold back on the engine.

Remove the inlet manifold

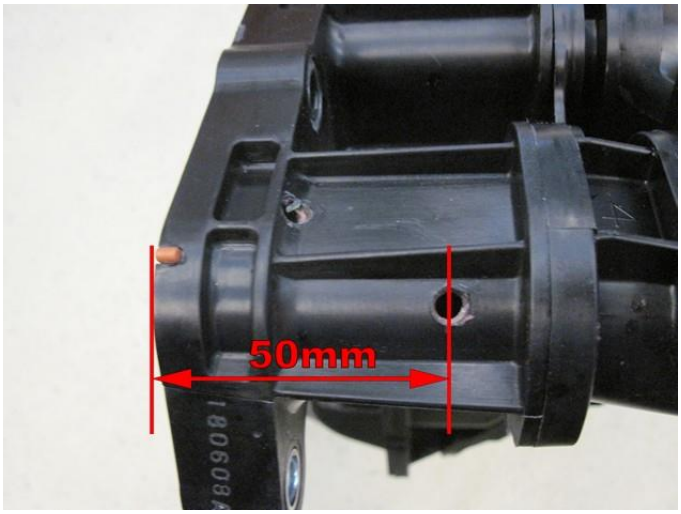


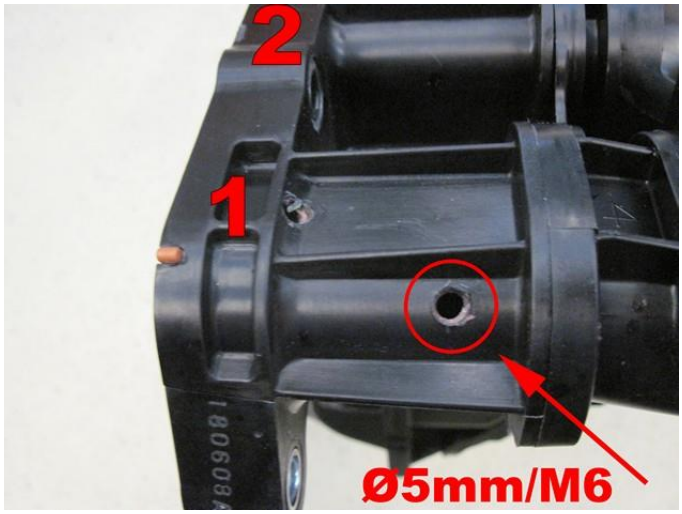
Drill holes 5mm and cut thread M6.

Mounting the inlet manifold couplings 2

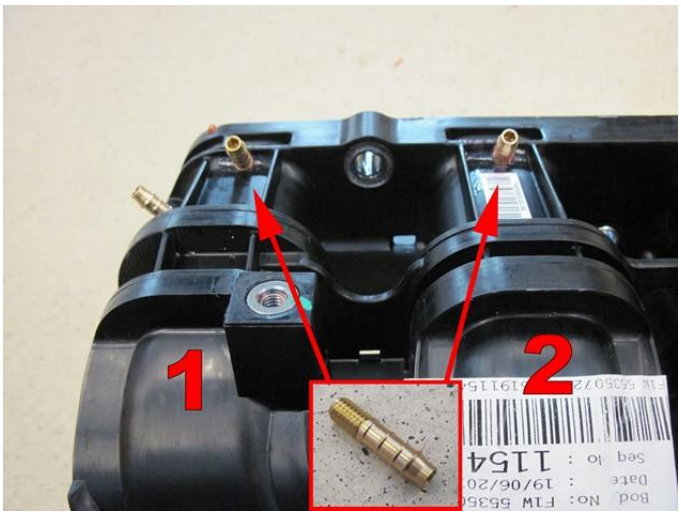


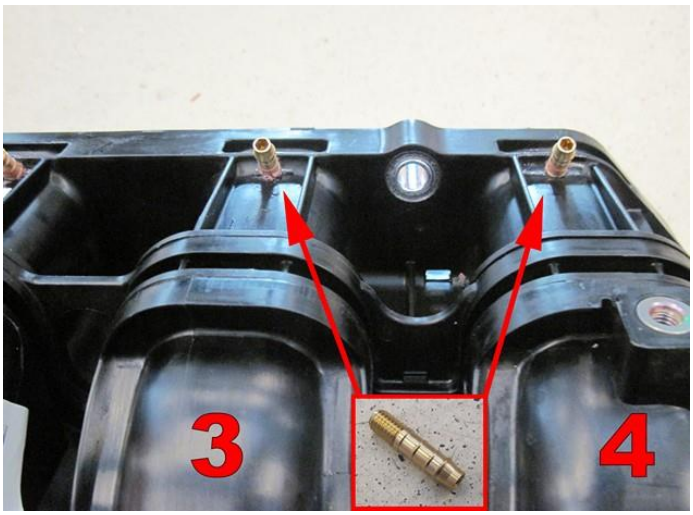
Drill holes 5mm and cut thread M6.





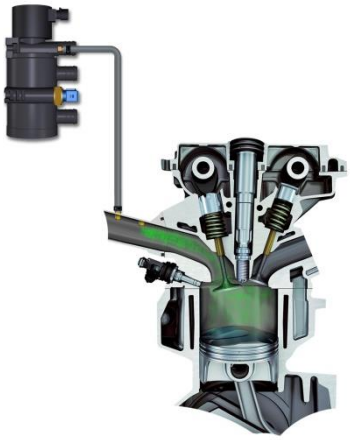
Drill holes 5mm and cut thread M6.





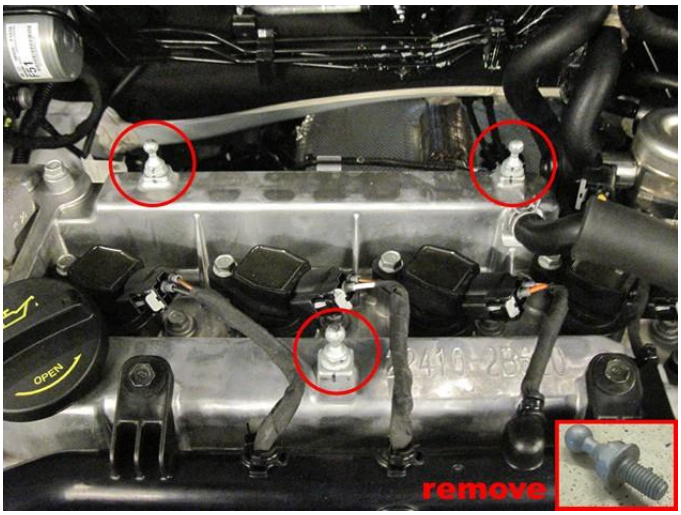
Mount the VSI couplings with a locking compound.

Overpressure connection

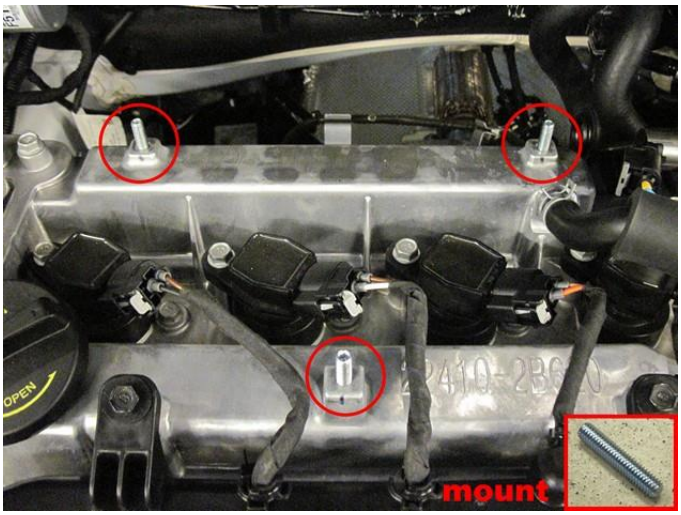


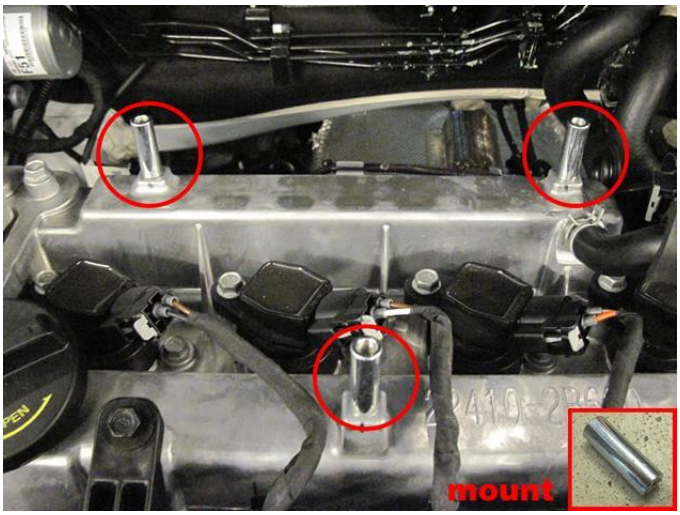
Mount the VSI coupling with a locking compound.

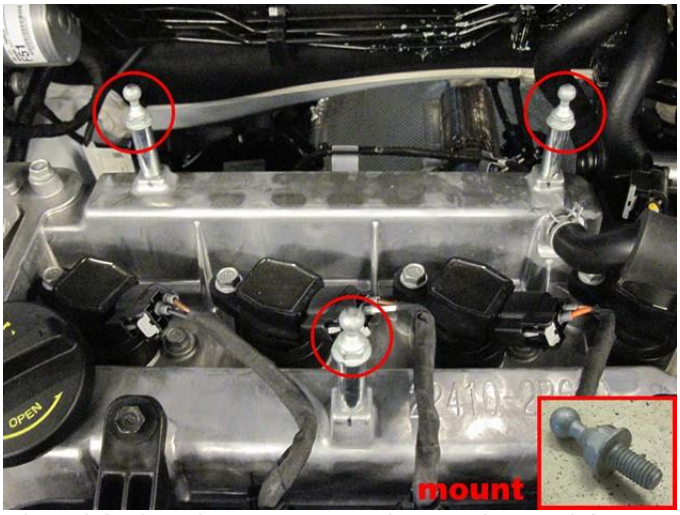
Extending the engine cover mountings



Remove the original engine cover mountings and extend them as shown.

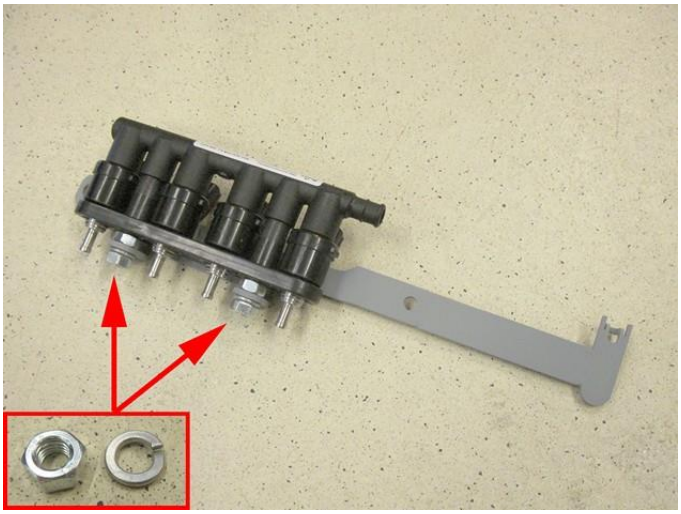




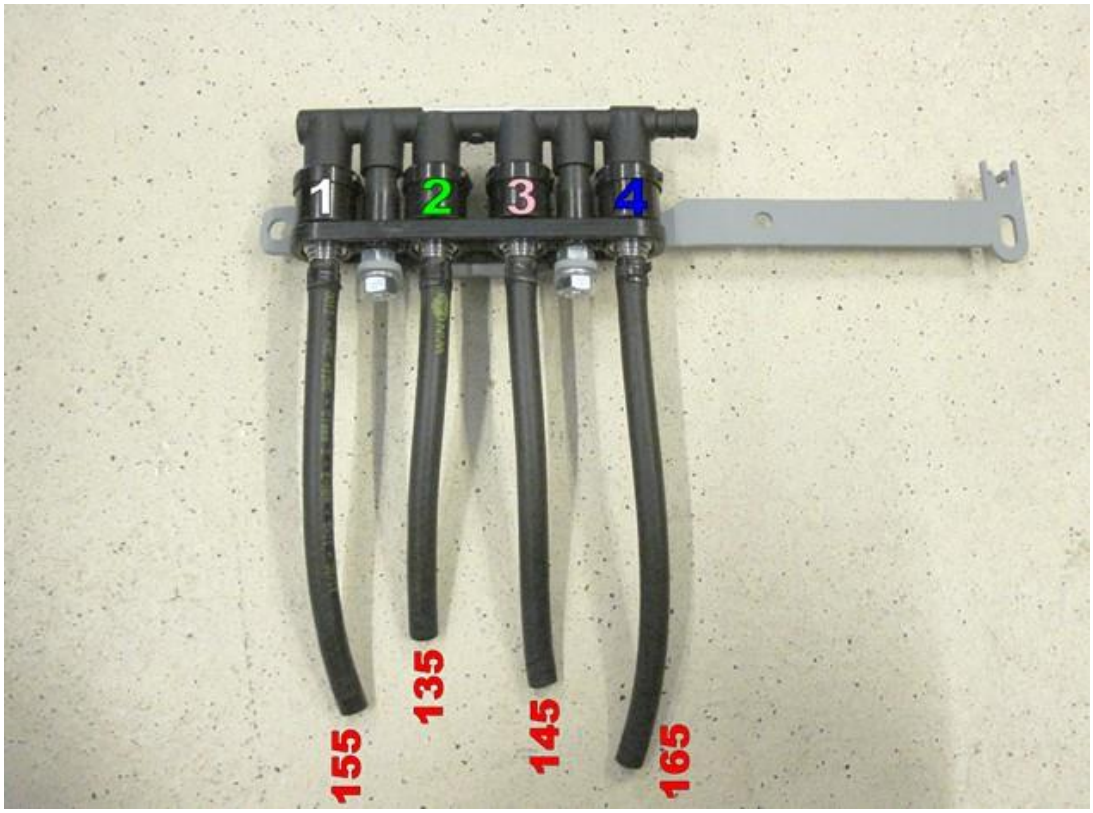


Remove the original engine cover mountings and extend them as shown.

Mounting the Injector Rail 1



Mount the injector rails to the bracket

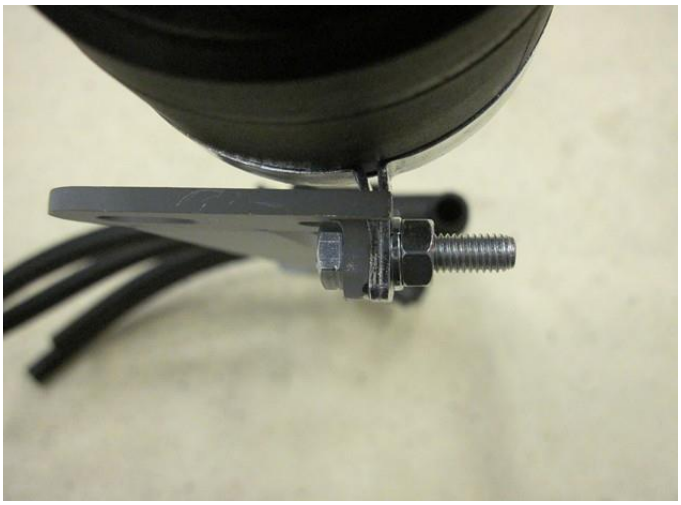


Mount the 5mm LPG hoses with the correct length to the injector rail.

Mounting the Injector Rail 2 / Prins Filter Unit 1

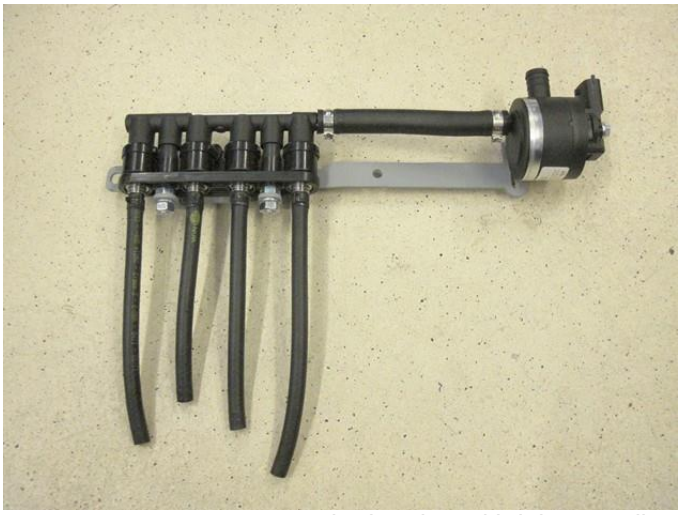
Mount the 5mm hoses to the rail. Mount the clamps for the VSI couplings to the hoses (preparation).

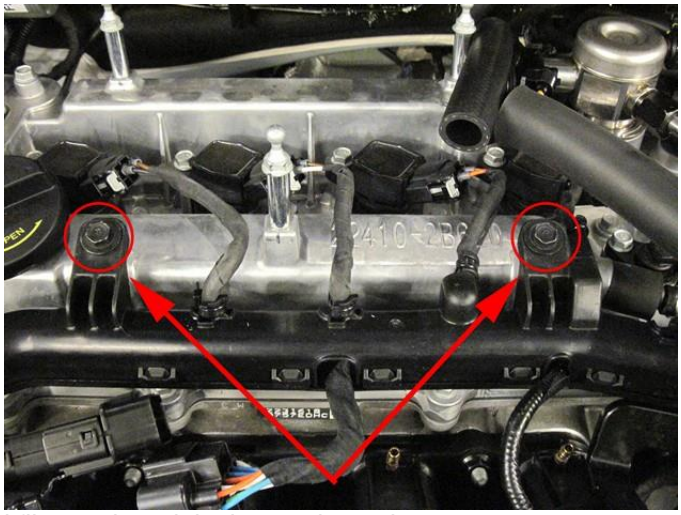
Mount the filter with the clamp to the bracket as shown,



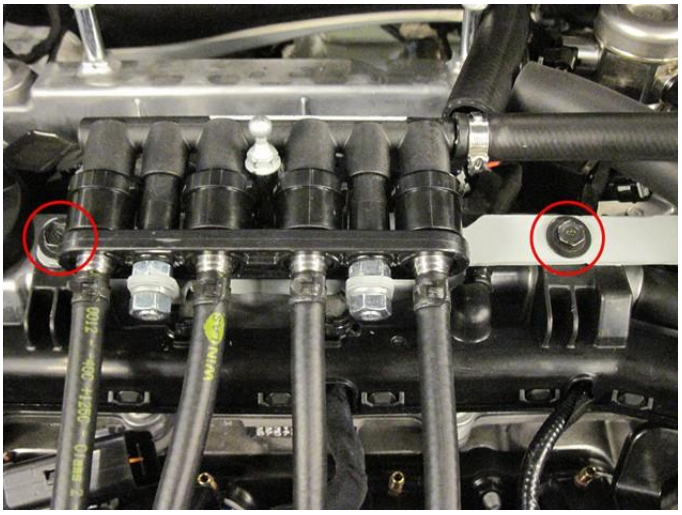
Mount the 11mm LPG hose between the Prins filter and the injector rail.

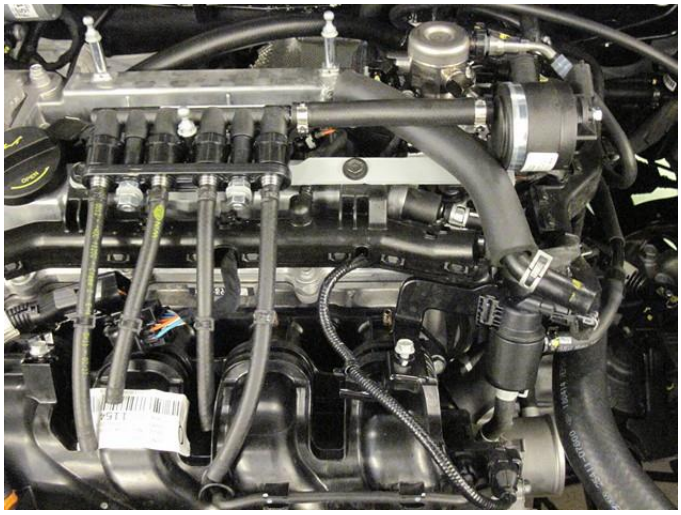
Mounting the Injector Rail 3 / Prins Filter Unit 2





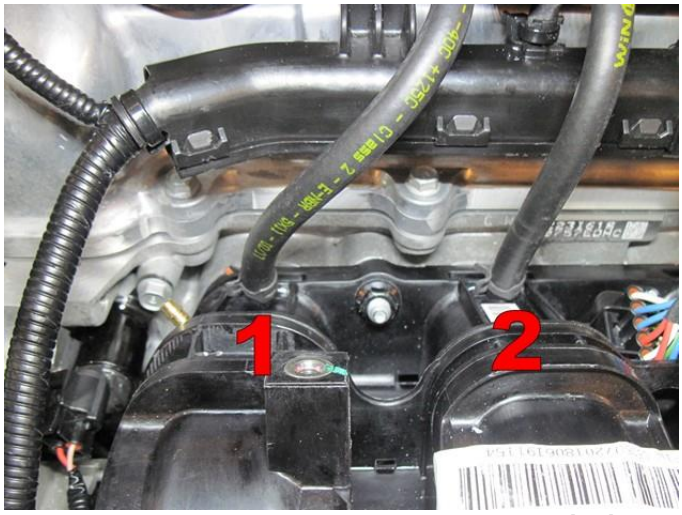
Mount the bracket with injector rail and filter to the original mounting points.

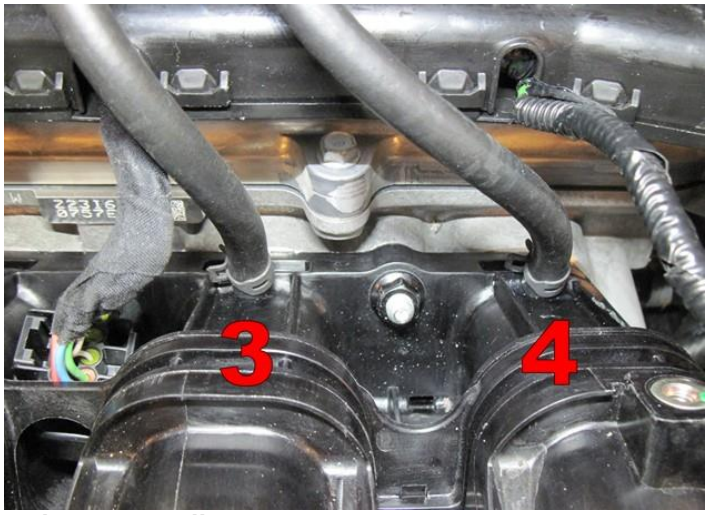




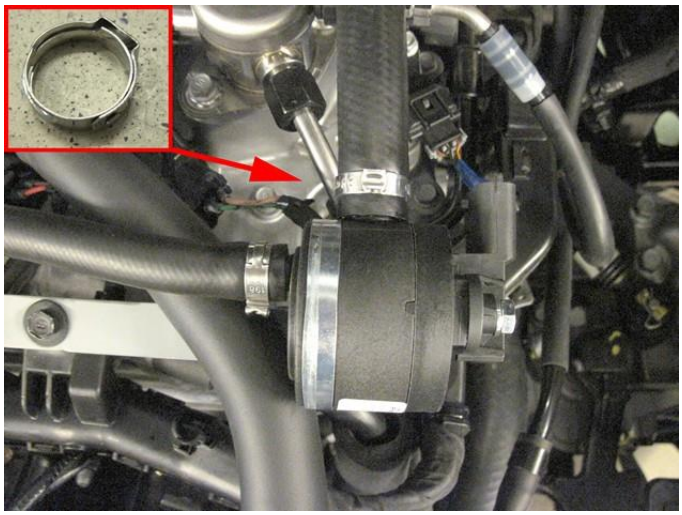
Connect the hoses to the VSI couplings.

Mounting the Injector Rail 4 / Prins Filter Unit 3 / Overpressure

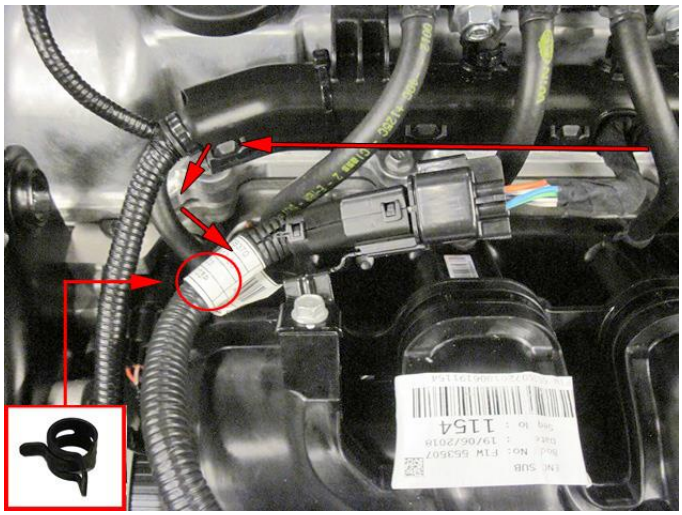




Connect the hoses to the VSI couplings.



Mount the 16mm LPG hose from the eVP-500 to the Prins filter.



Mount the 5mm overpressure hose from the eVP-500 to the overpressure coupling.
For the routing, follow the 16mm LPG hose around the filter, via the wiring to the overpressure coupling.

LPG hoses

Hose (Ø in mm)	*From component*	*To component*	*Hose length (cm) +/-*
16	eVP-500	Prins filter unit	70
11	Prins filter unit	VSI injector rail	14
5	eVP-500 overpressure	Inlet manifold coupling	130
5	VSI injector 1	Inlet manifold coupling cyl.1	15,5
5	VSI injector 2	Inlet manifold coupling cyl.2	13,5
5	VSI injector 3	Inlet manifold coupling cyl.3	14,5
5	VSI injector 4	Inlet manifold coupling cyl.4	16,5

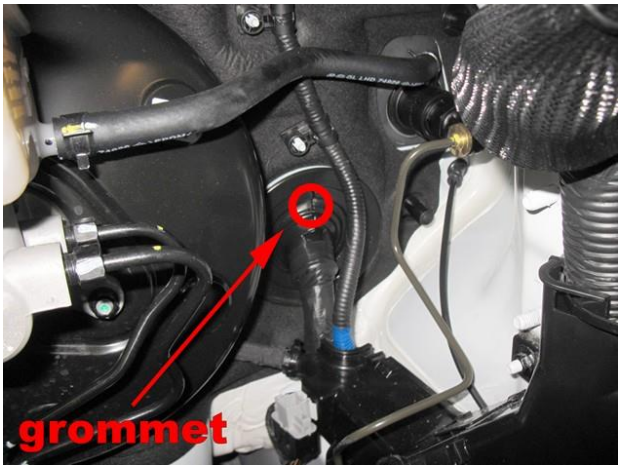
General info.

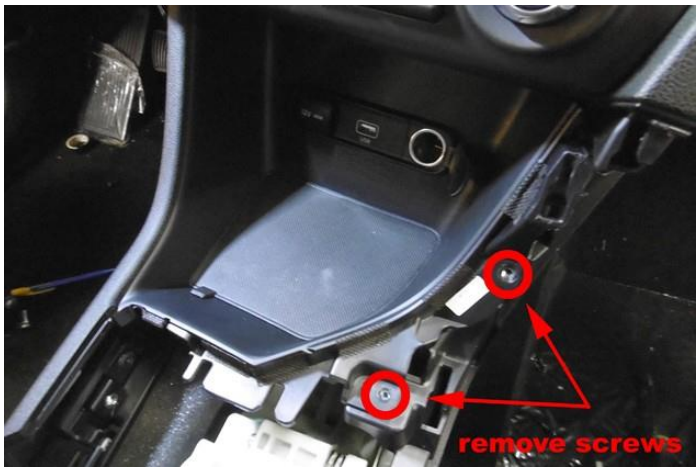
Cut the LPG hoses on length.
Please observe that there is no damage or fouling to the hoses.

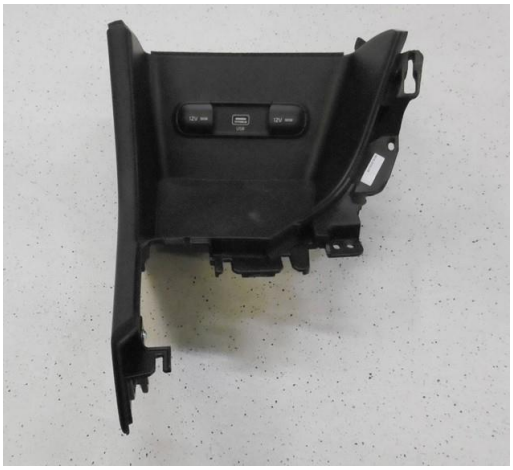
Mounting the fuel selection switch (Sportage)

When mounting the switch, only push on its sides.
Pushing the switch hard in the centre may result in damage to the switch.

Remove parts as shown.

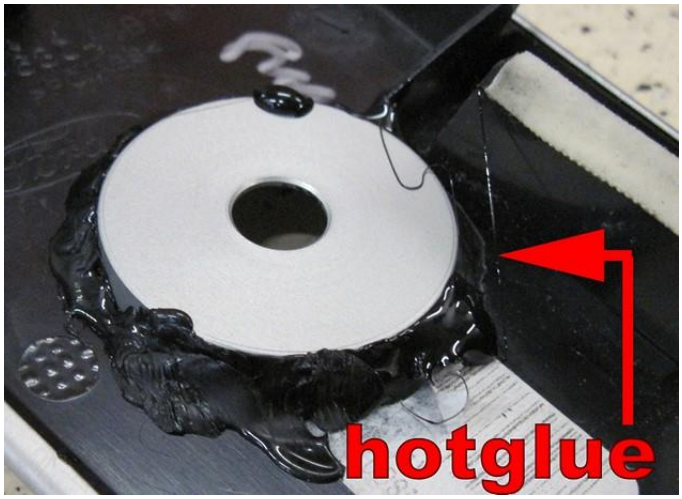






Mounting the fuel selection switch (Sportage)

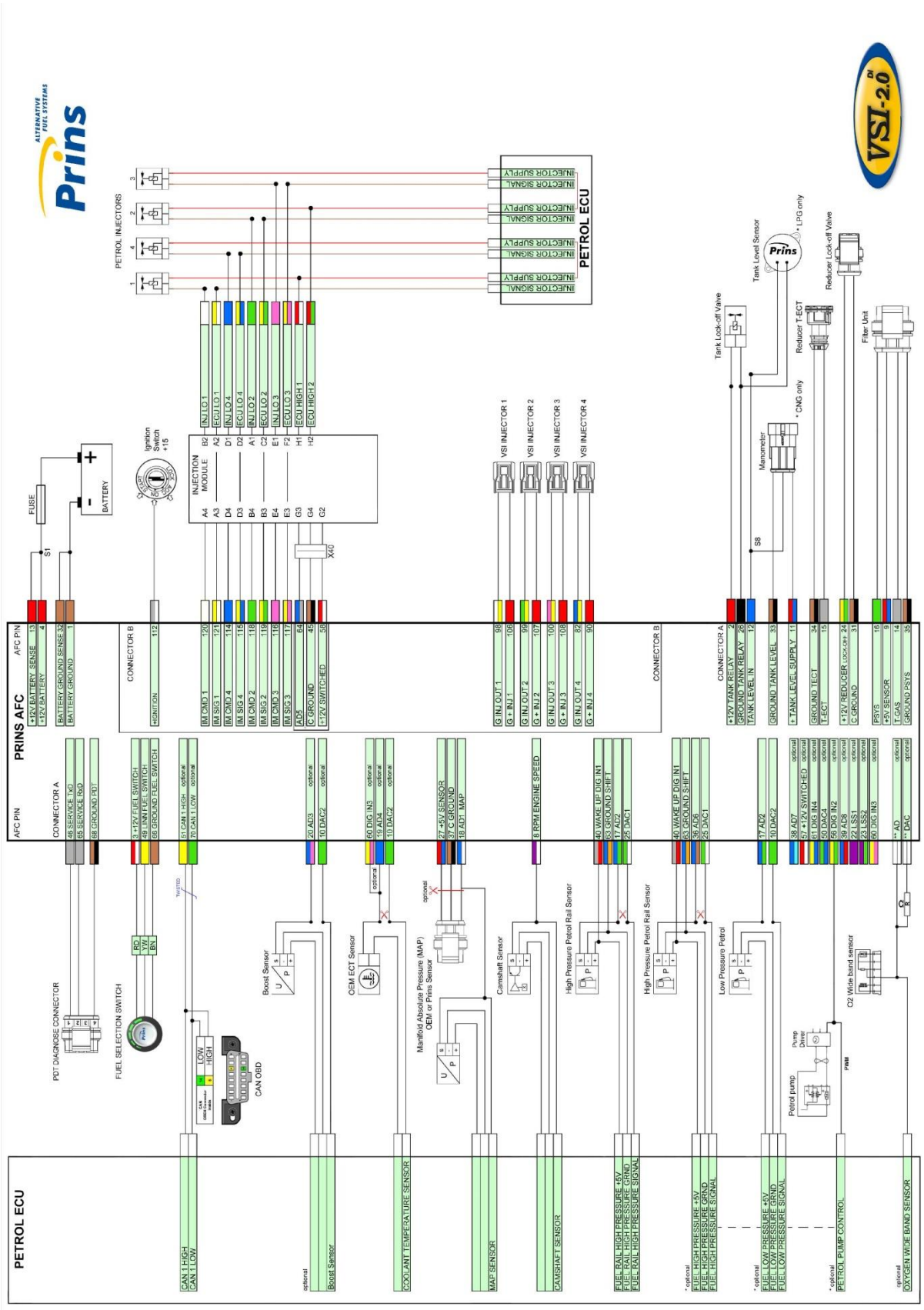
Drill a hole Ø32mm for mounting the switch. Mount the switch with the ring and fixate with some hot glue.



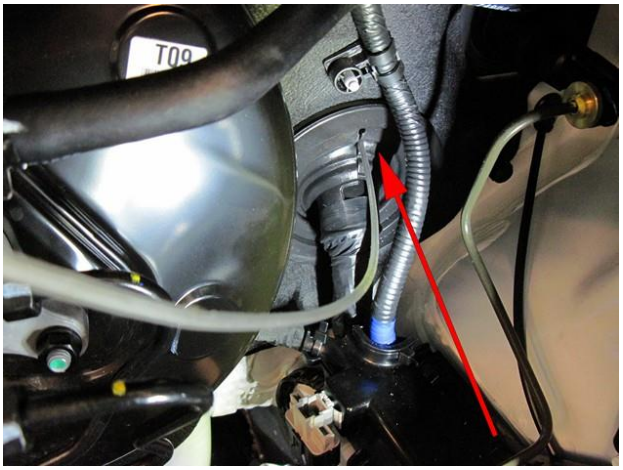
Mount the switch with the ring and fixate with some hot glue. Mount everything back.

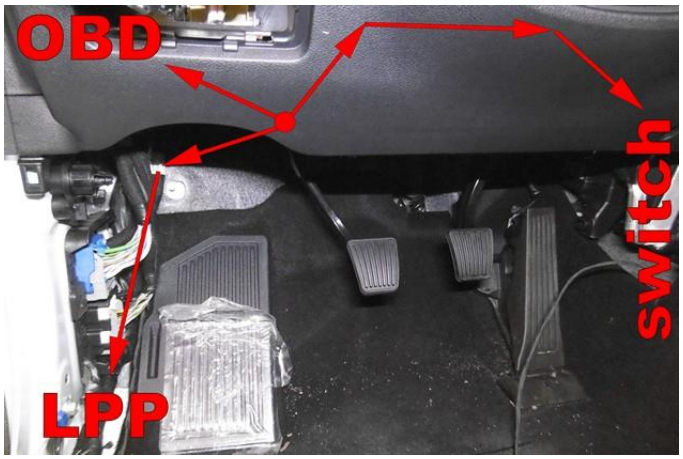
Basic Wiring Diagram

(for diagnostic purposes)



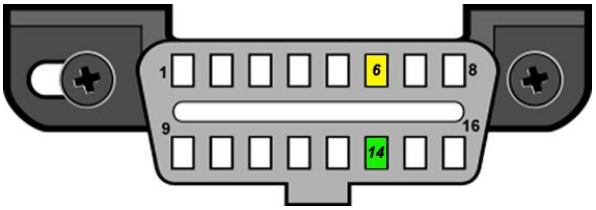
Electrical connections - Driver Room



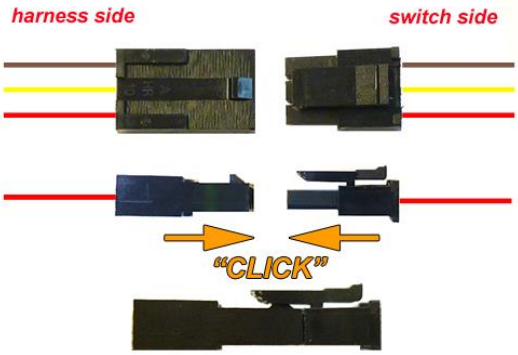


Put the wires from the switch, CAN/OBD & Low Pressure Sensor (17&10) through the (prepared) grommet.
The wiring for the low pressure sensor are connected underneath the back seat.

				Connect to EOBD diagnose connector.
51	CAN1 High		Yellow	Pin : 6
70	CAN1 Low		Green	Pin : 14

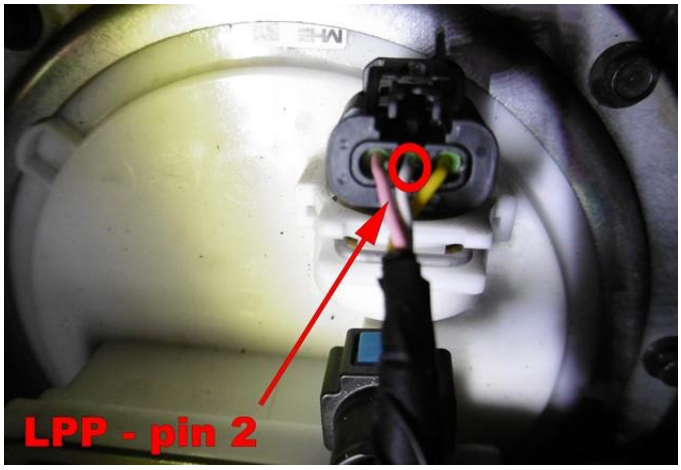


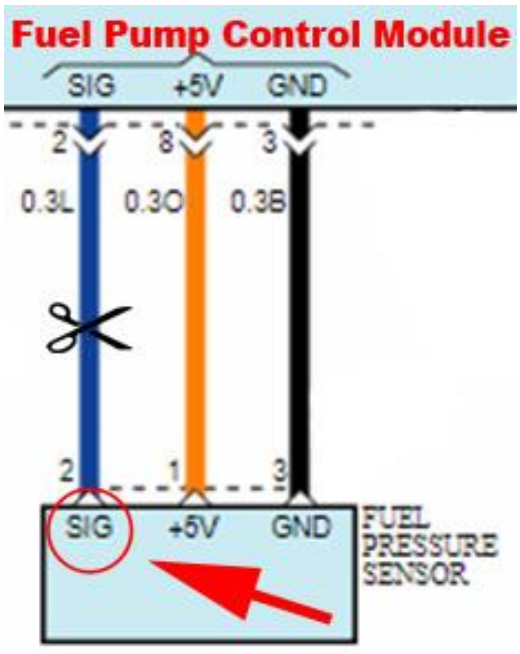
3-pole micro connector				*Connect to the Prins fuel selection switch.*
66	Ground fuel switch		Brown-black	
3	+12V fuel switch		Red-white	
49	LIN fuel switch		Yellow	



Electrical connections - Driver Room

17 & 10			*Low pressure petrol sensor signal interruption.* *UNDER THE BACK SEAT, INSIDE THE VEHICLE* Wire colour: **blue** or **white** Wire location: **under** cover **back seat**, pin **2**
17 AD 2		Blue-green	Sensor side
10 DAC 2		Green	Pump Driver side

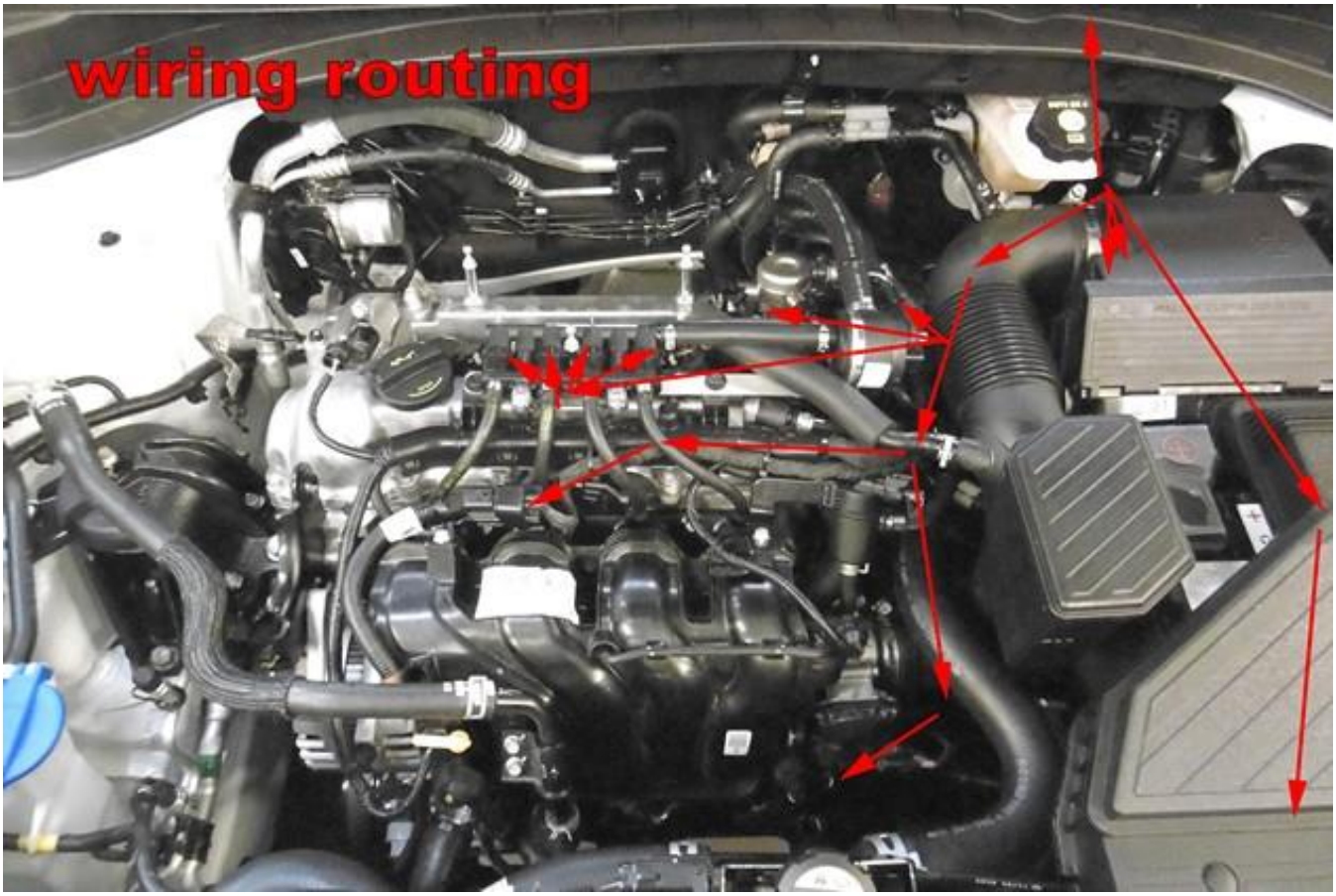


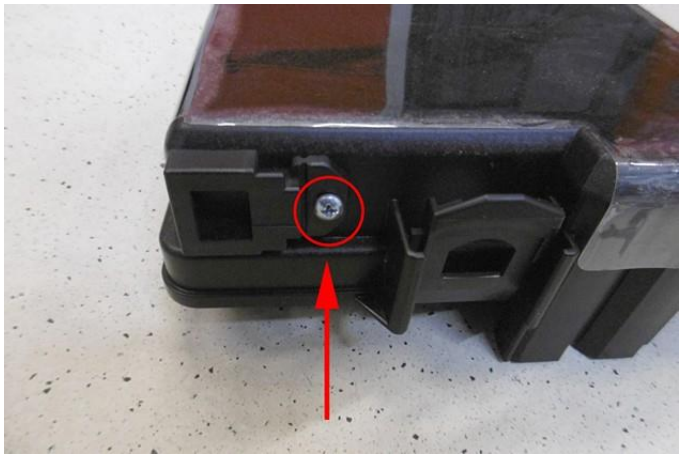


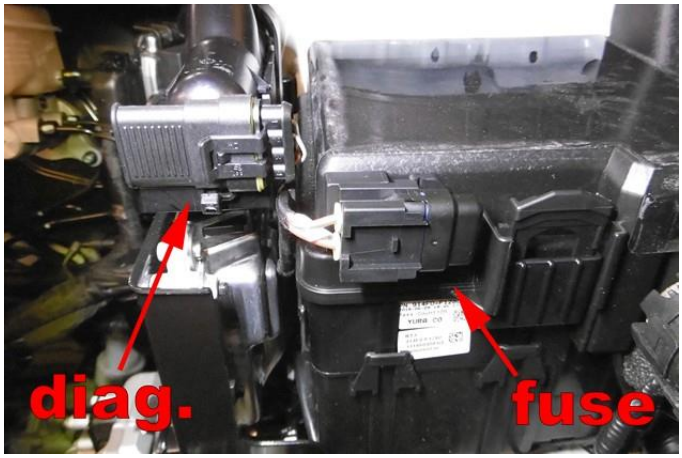
Connect wires 17 & 10 to the low pressure petrol sensor signal on the petrol tank.

Wiring routing & fuse

Do not place the fuse in the holder before having completed the installation of the LPG system





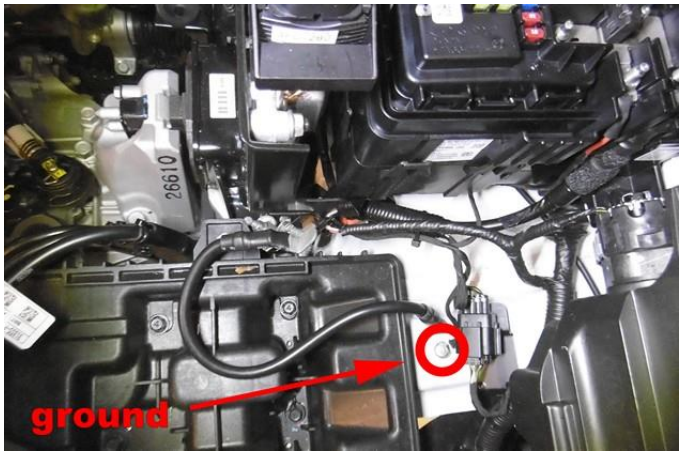


Electrical connections

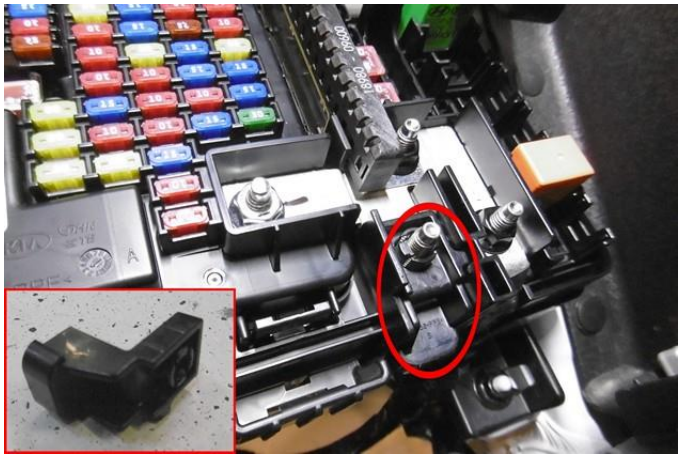
Check and measure the wiring in case of changes in the cars wiring colours

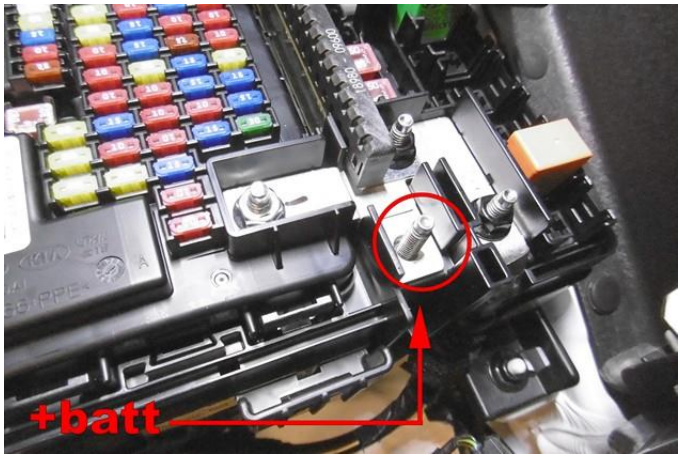
Do not place the fuse in the holder before having completed the installation of the LPG system.

1 Ground battery 32 Ground sense		Brown	*Connect to the '–' of the battery; use a ring terminal:* Wire colour: **Black** Wire location: Original battery ground location



4 +12V Battery		Red	*Connect to the '+' of the battery; use a ring terminal or solder:* Wire colour: **Red** Wire location: Original +12V batt connection in the fuse-box





Electrical connections

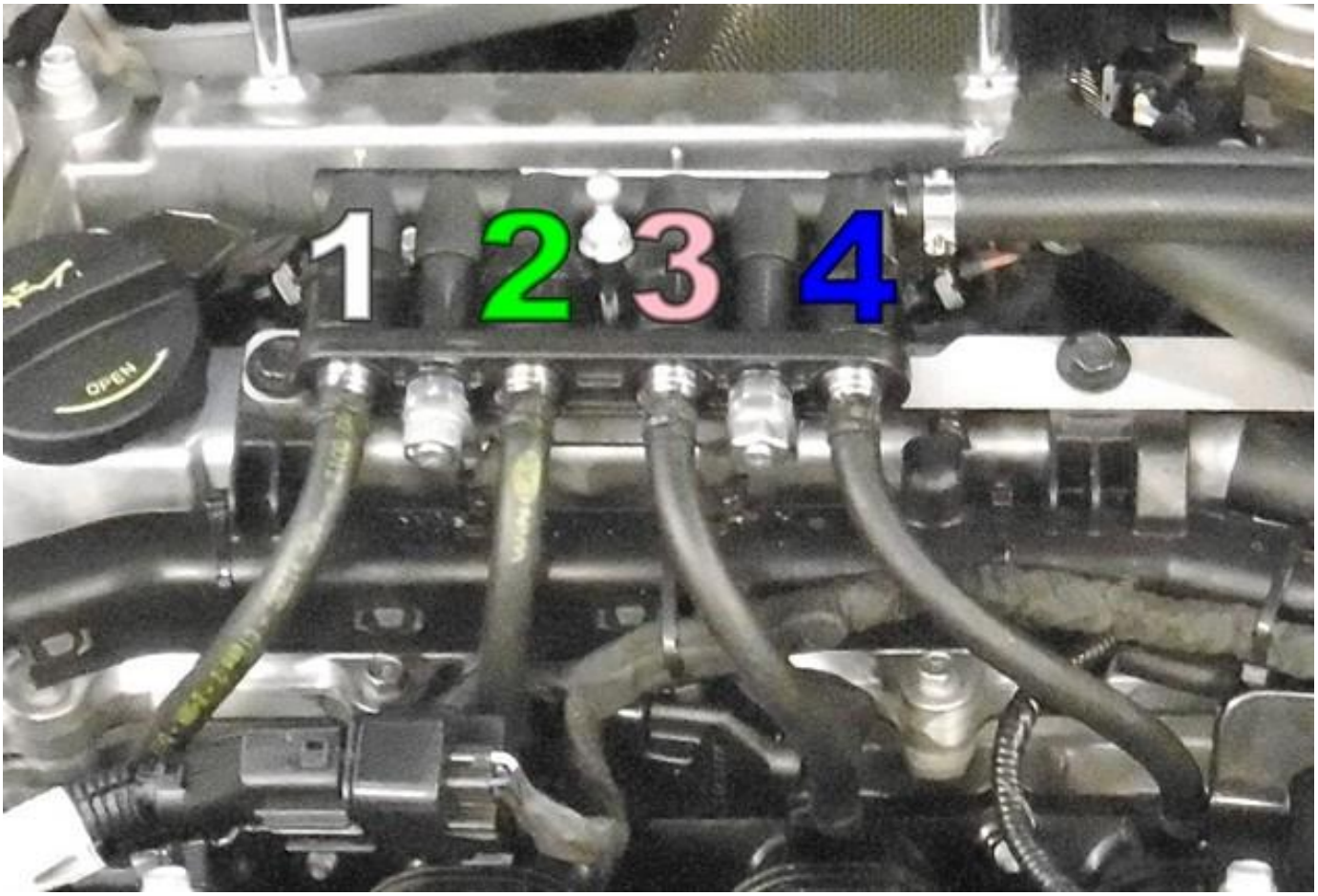
Mount all connectors from the Prins wiring loom to the right connector & fixate with pull-straps

98 98 G INJ OUT **1**	**White-yellow**	Connector VSI-injector to cylinder **1**. Timing belt/chain side
106 106 G + INJ 1	**red**	

99 99 G INJ OUT **2**	**Green-yellow**	Connector VSI-injector to cylinder **2**.
107 107 G + INJ 2	**red**	

100 100 G INJ OUT **3**	**Pink-yellow**	Connector VSI-injector to cylinder **3**.
108 108 G + INJ 3	**red**	

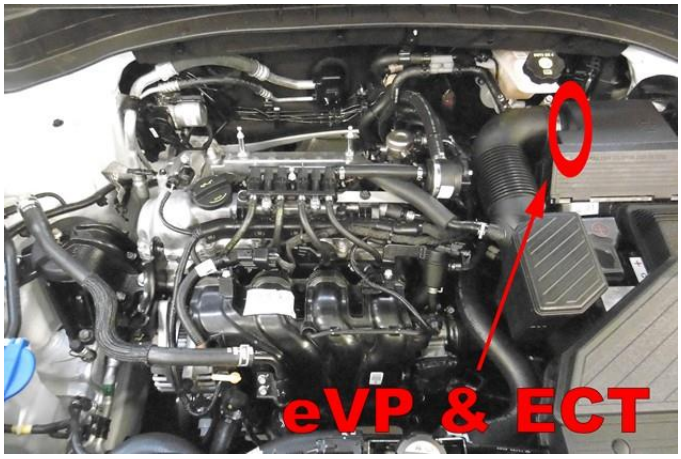
82 82 G INJ OUT **4**	**Blue-yellow**	Connector VSI-injector to cylinder **4**.
90 90 G + INJ 4	**red**	

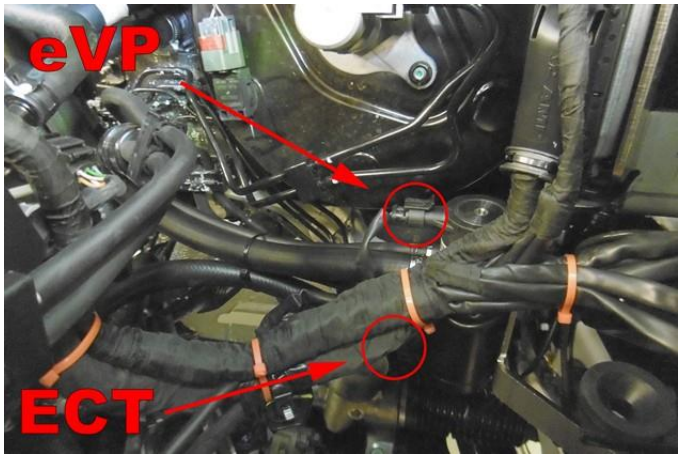


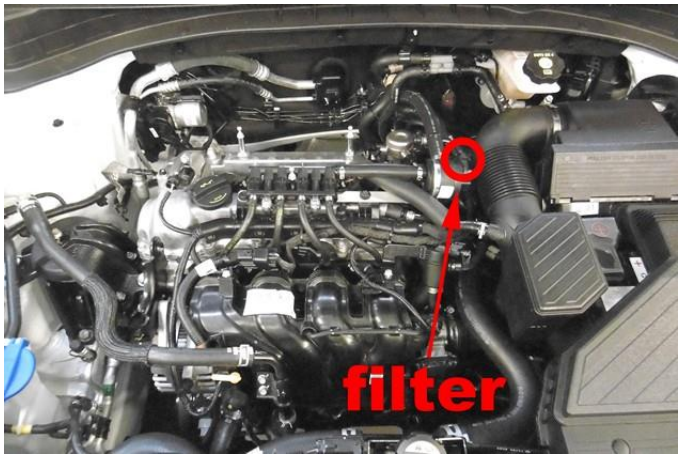
Mount het connectors from the wiring loom to the injectors.

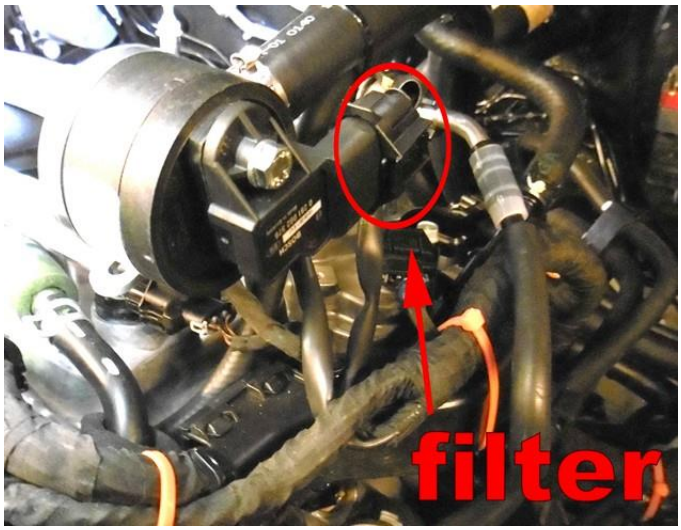
Electrical connections – Dedicated wiring loom

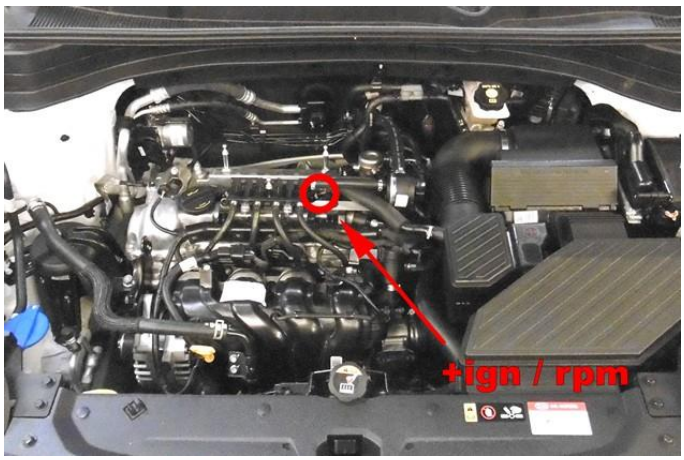
Mount all connectors from the Prins wiring loom to the right connector & fixate with pull-straps

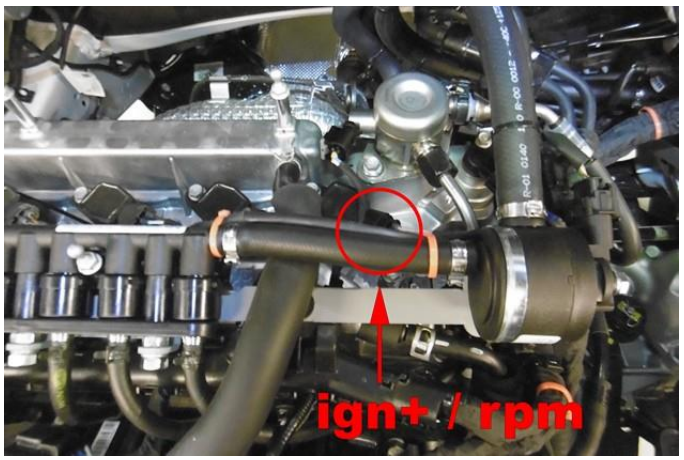






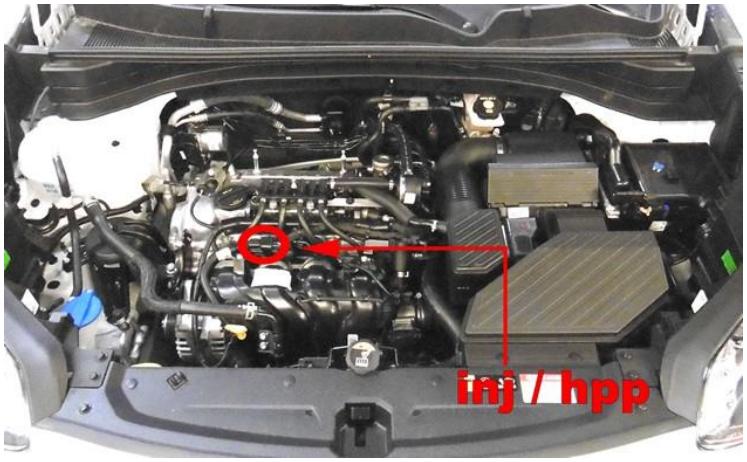


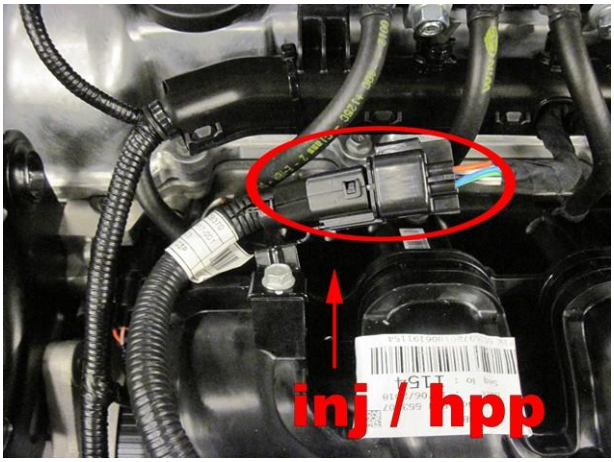


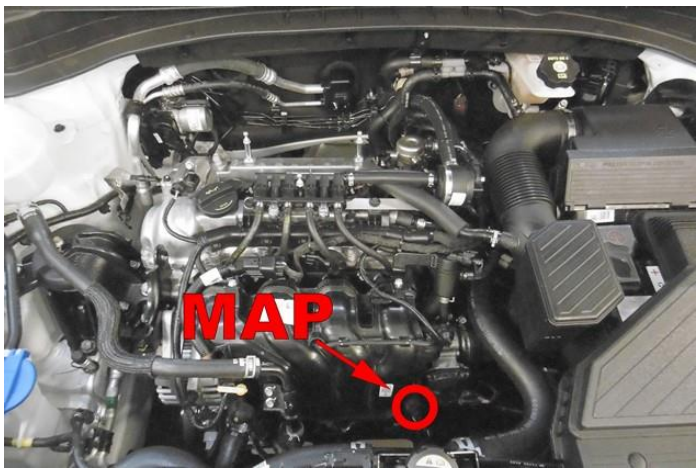


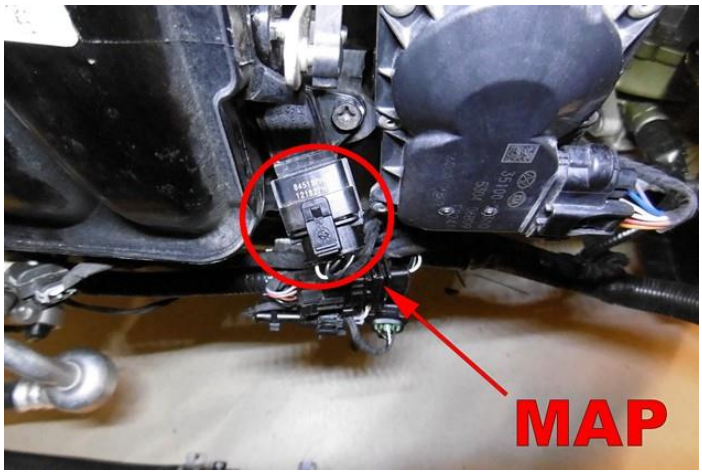
Electrical connections – Dedicated wiring loom

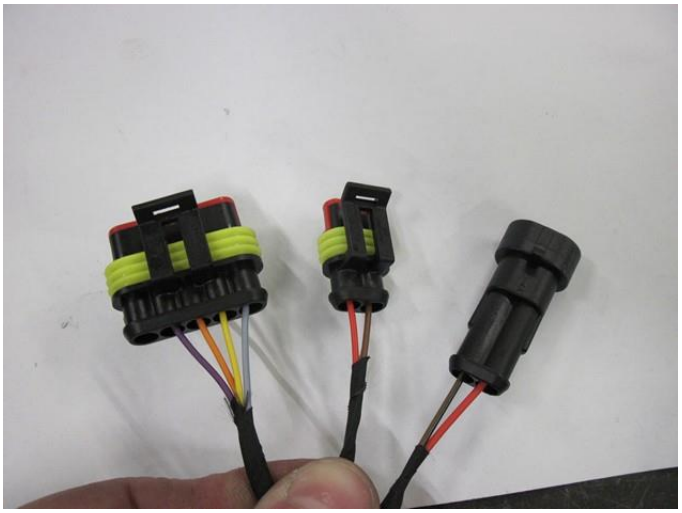
Mount all connectors from the Prins wiring loom to the right connector & fixate with pull-straps

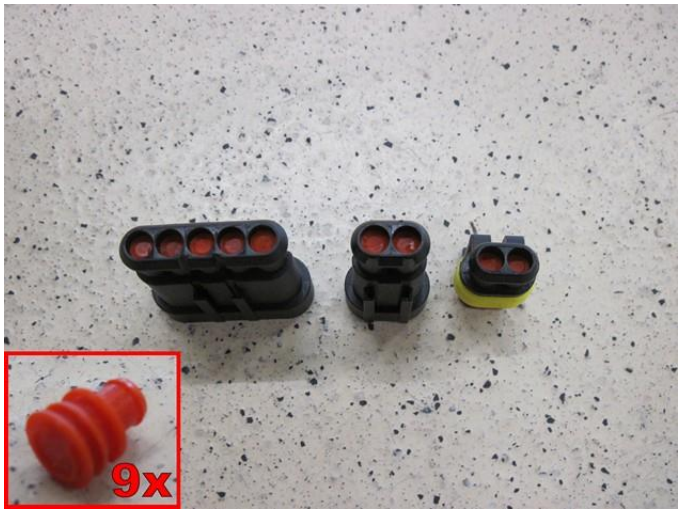








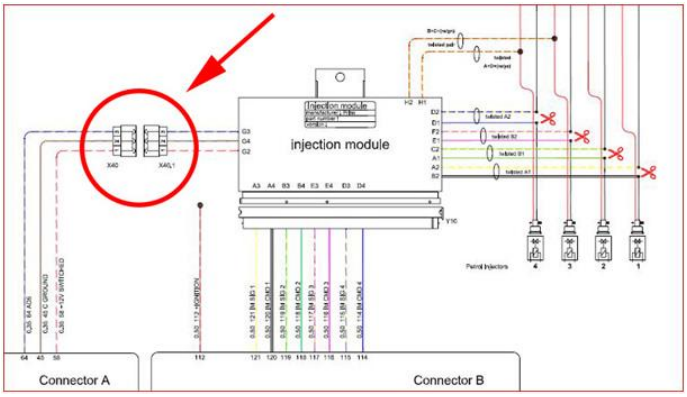




You have some extra wiring with connectors that lead to nothing; tie away with some pull straps.
Be sure to put the covers with the plugs onto those connectors against water penetration from the wiring loom.
Those connectors are normally used for the strongly recommended ValveCare-DI system.

Electrical connections

Connectors in wiring loom

2-pole blue connector 15 T-ECT 34 Ground T-ECT	 Grey Brown-black	*For measuring the engine coolant temperature (Tect).* Connect the connector to the reducer temperature sensor.
4-pole connector 35 Ground Psys 14 T-Gas 9 +5 Volt sensor 16 Psys	 Brown-black Grey Red-blue Green	*For measuring gas pressure and temperature.* Connect the connector to the filter unit sensor.
2-pole connector 24 +12V reducer lock-off 31 C Ground	 Yellow-green Brown-black	Connect the connector to the reducer / eVP-500 lock-off valve.
4-pole connector 46 Service TxD 65 Service RxD 68 Ground PDT	 Grey Grey Brown-black	Diagnose connector.
Tank wiring loom 2 +12V Tank relay 12 Tank level IN 26 Ground tank relay	 red blue black	 Connect to the tank lock-off. Connect the tank level gauge. Connect to the tank lock-off.
Wiring loom link 45 C ground 58 +12V switched 64 AD5	 Brown–black Red–white Blue-grey	*Only without a dedicated wiring loom:* Connection from AFC connector A to connector B. 

Finishing

Checklist after installation

1. Connect the Prins Diagnostic Tool and run the VSI diagnostic program.
   Install the VSI fuse, turn the ignition key in the accessory position.
   When working on the car, beware of moving and rotating parts in the engine compartment.

2. When commissioning the LPG system, you must activate the AFC with the diagnostic software.
   When the AFC has not been activated, the switch will keep blinking.
   To activate the AFC, select function *activate ECM* in the diagnostic software.

3. Check whether the program in the AFC matches with the car (dedicated engine set):
   Refer the car description in the diagnostic software (Basic → Identification) and compare these with the set number.

4. The system will switch over to LPG as soon as the temperature of the coolant becomes higher than parameter 70 - Switch over ECT.

5. Check all components and connections for any gas leakage (use a LPG leak detector device or a fluid detection like soap). Caution for moving and rotating parts in the engine compartment!

6. Let the engine run warm on petrol >80°C.
   Check if the reducer heats up.
   Check the engine signals, petrol injection time, RPM, ECT, lambda, MAP signal and petrol pressure signal.
   Let the engine run idle on LPG.
   Adjust the reducer pressure.
   Refer to *Basic → System* in the diagnostic software for the idle level value set.
   Adjust the reducer pressure in such a way that the pressure measured (P-sys) equals the idle level value.
   Turn the socket-head screw at the front of the reducer to adjust the pressure.
   An error code will be generated whenever the pressure variation is too high.

7. Use the diagnostic software to check again all input and output signals.

8. Check the system for error codes and solve these, if required.
   Check the petrol ECM for EOBD error codes.
   Place the protection connector on the VSI communication connector.

9. Take a test drive and check the drivability on LPG and petrol.

ALTERNATIVE FUEL SYSTEMS
Prins