ALTERNATIVE FUEL SYSTEMS

Prins

Quality, innovation and customer care, it's in our nature

Installation manual
Dedicated
PART 2/2

MANUFACTURER	OPEL
TYPE	INSIGNIA
ENGINE DISPLACEMENT	2000
NUMBER OF VALVES	16V
ENGINE CODE / NUMBER	A20NHT
VEHICLE CATEGORIES	M
TRANSMISSION	AT
VERSION	Direct LiquiMax-2.0
PETROL ECU MANUFACTURER / CODE	Bosch
HIGH PRESSURE PETROL POMP	BOSCH 261.520.-037 / 038 / 071 / 072
HIGH PRESSURE PETROL INJECTOR	Bosch
MODEL YEAR:	2009
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000012 DLM-LPG 05
LOCATION SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	357/070001/A
MANUAL NUMBER	076/1707900
DATE	2013-05-29

Version 2012-11-02 D

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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.
- For an optimal functioning of the Direct LiquiMax system, maintain a clean and organized work environment during installation and maintenance to prevent pollution of the LPG components.
- 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, alarm system.
- Wear safety goggles when working on petrol filled system / connections (pressurized petrol)
- Do not place the main fuse into the fuse holder before having completed the installation of the system.
- The AFC has to be activated by means of the Prins diagnosis software.
- Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the 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 is it may be necessary to adjust the length of the wires.
  Ensure maximum care is taken when connecting 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 100 mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- 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 a exterior filler into body work).
- After having completed the installation, check the whole system for lpg leakage; use a lpg leak detection device. Also check for 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 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.

Register (warranty card) the system on the Prins warranty portal .

Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer : operating on Windows 98,W2000 or XP.
  Internal memory : 16 Mb or more
  Memory HD space : 5MB
  Screen : 256 colours, advise colours 16 bits or more
  Com port : 1 free COM port 1 or COM port 2 with a 9 or 25 pins connector
- Vehicle fuel system scan tool or OBD scan tool Prins (part nr. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins serial interface
- Torque wrench (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits 4 to 12 mm
- Assortment cutters (ø 20, 30, 50, 70 mm)
- Portable drill or pneumatic drill
- Thread cutting device (male M6x1, M8x1, M10x1)
- Socket 46mm
- 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 analyzer)
- Check the condition of the ignition system (spark plugs, cables, coil)

Tightening moments

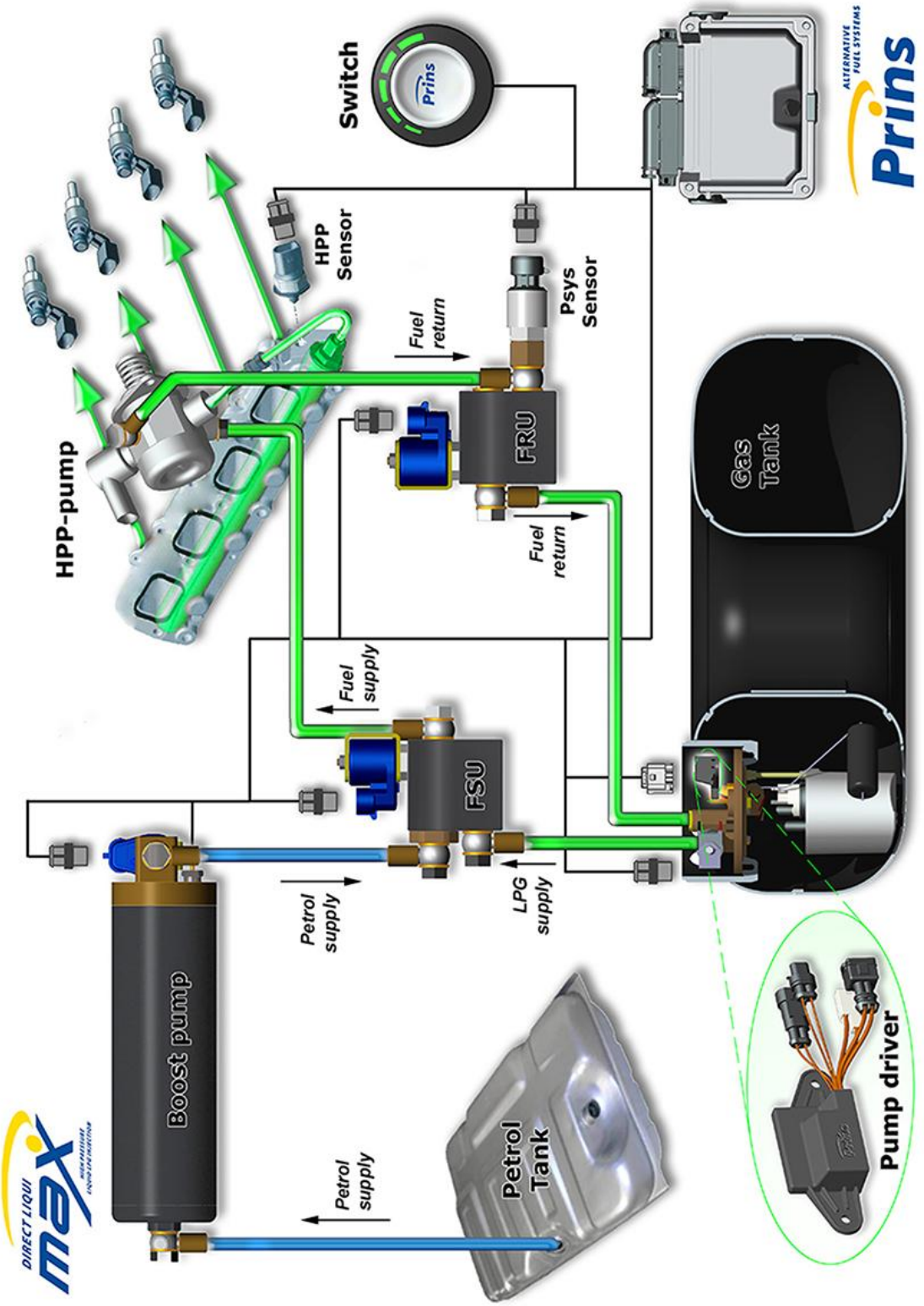
		Nm	SW
M 4 x 0,7		3.3	7
M 5 x 0,8		6.5	8
M 6 x 1,0		11.3	10
M 7 x 1,0		14.5	11
M 8 x 1		24.5	13
M 8 x 1,25		27.3	13
M 10 x 1		52	15-16-17
M 10 x 1,5		54	15-16-17
(filtered)Banjo bolt		10	14
Supply line connection		15	13
Fuel module Allen bolts		20	7
Filler hose connection		50	22

EXPLANATION OF SYMBOLS :

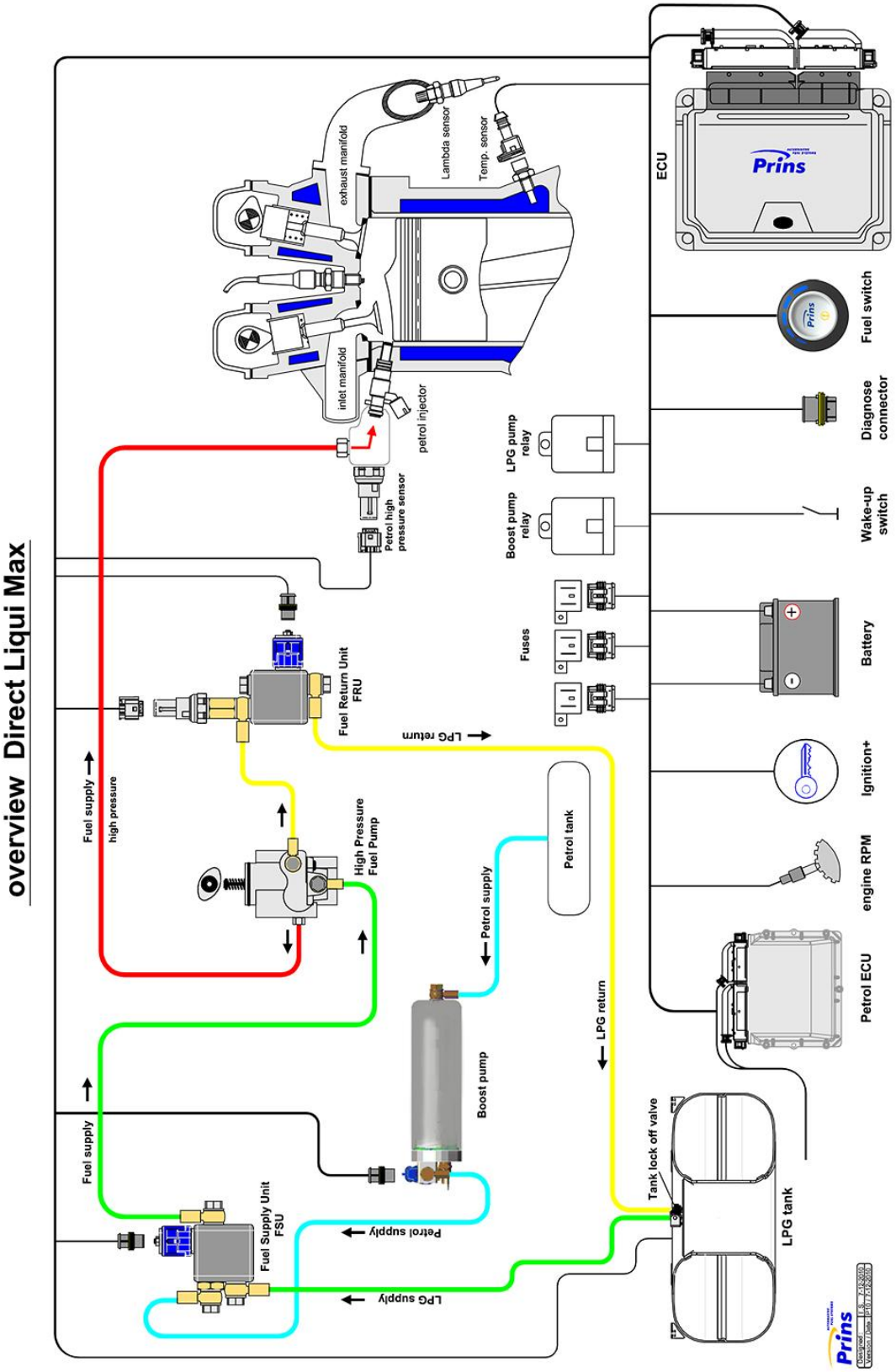
= IMPORTANT, CAUTION

= WEAR SAFETY GOGGLES

Direct LiquiMax



Overview Direct LiquiMax



Direct LiquiMax parts / approval numbers

<table>
<tr>
<td>  1st generation
  2nd generation</td>
<td>  1st generation
  2nd generation</td>
</tr>
<tr>
<td>Fuel Supply Unit : E4-67R-010269</td>
<td>Fuel Return Unit : E4-67R-010270
Pressure Sensor : E4-67R-010051</td>
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<tr>
<td>  </td>
<td>  </td>
</tr>
<tr>
<td>Boost pump</td>
<td>High Pressure Pump : E4-67R-010266
High Pressure Rail : E4-67R-010267
High Pressure Injectors : E4-67R-010309</td>
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<tr>
<td>  </td>
<td>   </td>
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<tr>
<td>Prins ECU : E4-67R-010098
E4-10R-030507</td>
<td>Fuel lines series XD : E4-67R-010247 XD3
E4-67R-010247 XD4</td>
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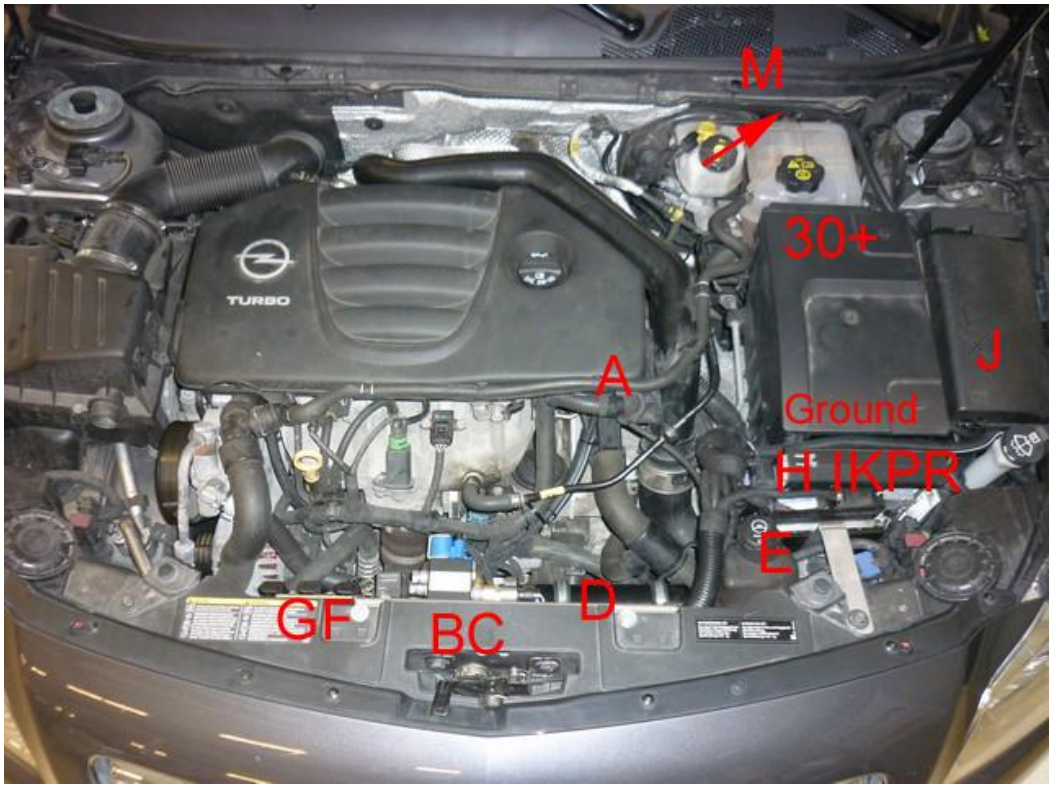
Mounting and connection points



A	: High pressure petrol pump	K	: High pressure signal
B	: Fuel Supply Unit : FSU	L	: R115 Approval sticker
C	: Fuel Return Unit : FRU	M	: Grommet
D	: Boost pump	N	: Gas system fuses
E	: Lpg computer	P	: T-ect
F	: Boost pump relay	Q	: pump driver **(right tail light)**
G	: Tank relay	R	: MAP, Analog 1
H	: Petrol ECU	W	: Wake-Up
I	: Engine speed signal RPM		
J	: “+” ignition		

R115 approval sticker :
Right side centre door post

Removal of the Bosch High Pressure Pump

-REMOVAL-

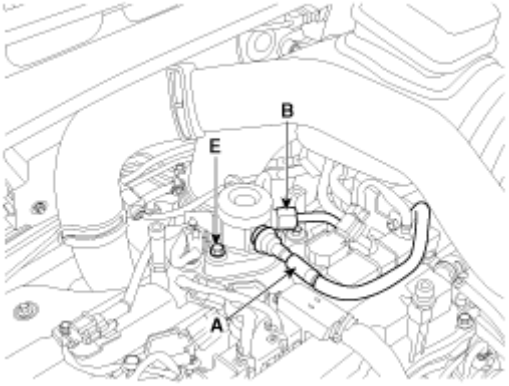
-WARNING-

In case of removing the high pressure fuel pump, high pressure fuel pipe, delivery pipe, there may be injury caused by leakage of the high pressure fuel.
Don't do any repair work right after engine stops (HOT engine).

- Turn the ignition switch OFF and disconnect the battery negative (-) cable.
- Ware safety goggles.
- Disconnect the fuel pressure regulator valve connector
- Disconnect the High Pressure fuel feed pipe (B)
- Remove the Low Pressure fuel pipe / hose (A).
- Remove the installation bolts (E), and then remove the high pressure fuel pump from the cylinder head assembly.

  CAUTION:

  Unscrew in turn the two bolts in small steps (0.5 turns). In case of fully unscrewing one of the two bolts with the other bolt installed, the housing surface of the cylinder head may break because of tension of the pump spring.



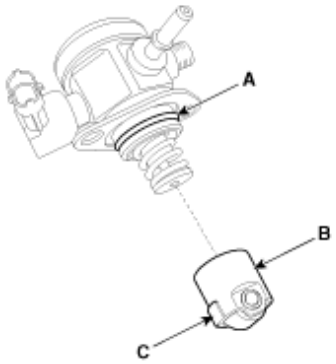
CAREFULLY store the removed petrol pump. Make sure no pollution can come into the pump.

Installation of the Bosch High Pressure Pump

-INSTALLATION-

Before installing the high pressure fuel pump, position the roller tappet (**B**&**C**) in the lowest position by rotating the crankshaft. Otherwise the installation bolts may be broken because of tension of the pump spring.

Apply engine oil to the O-ring (**A**) of the high pressure fuel pump, the roller tappet (**B**), and the protrusion (**C**). (roller tappet, only if removed from cylinder head)
Also apply engine oil to the groove on the location where the protrusion (**C**) is installed.



Installation bolts:
When tightening the installation bolts of the high pressure fuel pump, tighten and turn the bolts in small step (0.5 turns) after tightening them with hand-screwed torque.
High pressure fuel pump installation bolt: 12.8 ~ 14.7 N.m

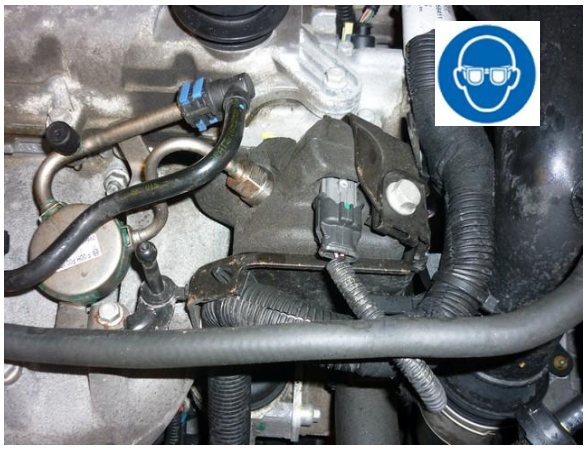
Fuel pipe:
First hand-tighten the nut(s) fully until they are not fastened any more in order to have them inserted in place and then completely tighten to the specified torque using a torque wrench.
If not tightening the bolts or nuts in a straight line with the mating bolt holes or fittings, it may cause a fuel leak due to broken threads.
High pressure fuel pipe installation nut: 26.5 ~ 32.4 N.m

Installation is reverse of removal.

High pressure pump supply

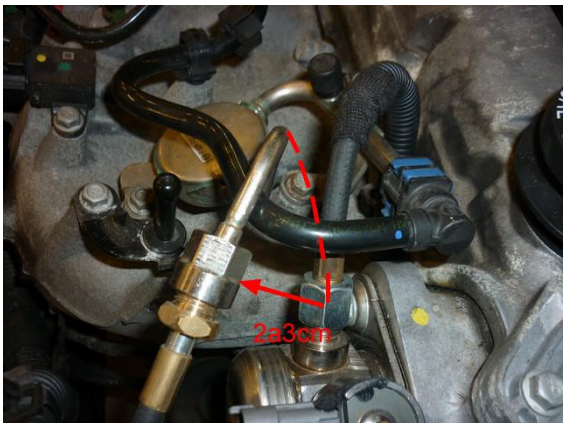
Replace the high pressure pump for the adapted high pressure pump.
(Follow the workshop manual of the car)

Be aware that the roller tappet stays inside housing.



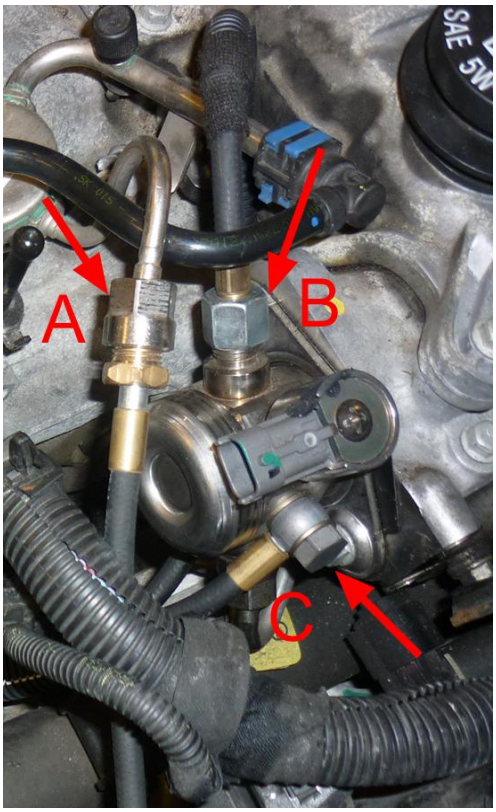

High pressure pump return

Replace the high pressure pump for the adapted high pressure pump.
(Follow the workshop manual of the car)



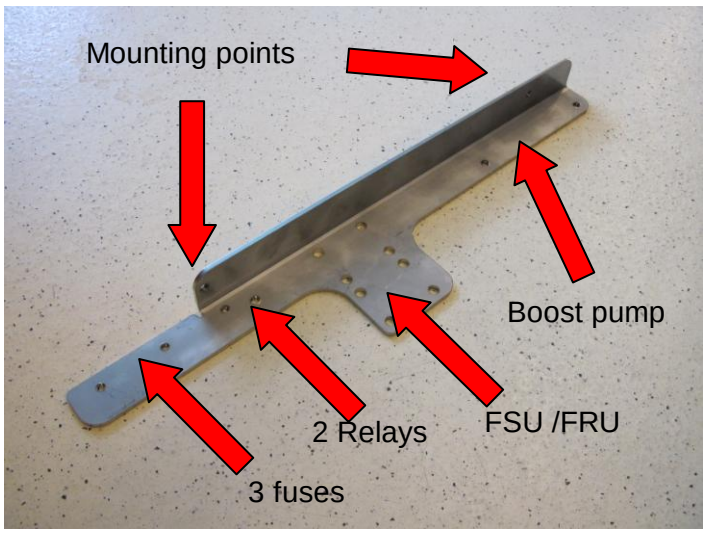
Bend the petrol pipe to the front 2 a 3cm.

Fuel line A = to boost pump
Fuel line B = to FSU
Fuel line C = to FRU



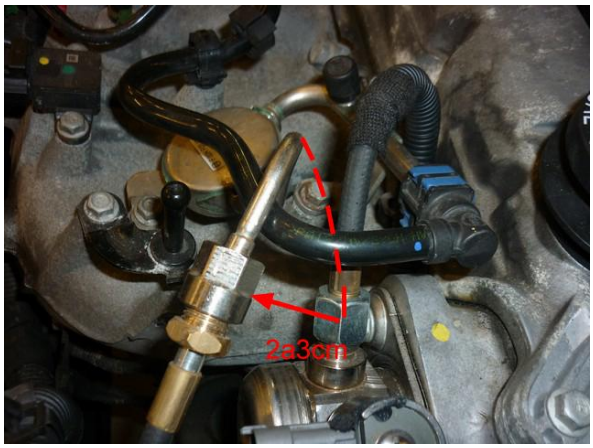
Boost pump

The Boost Pump be installed with 2 round brackets on the combined support.



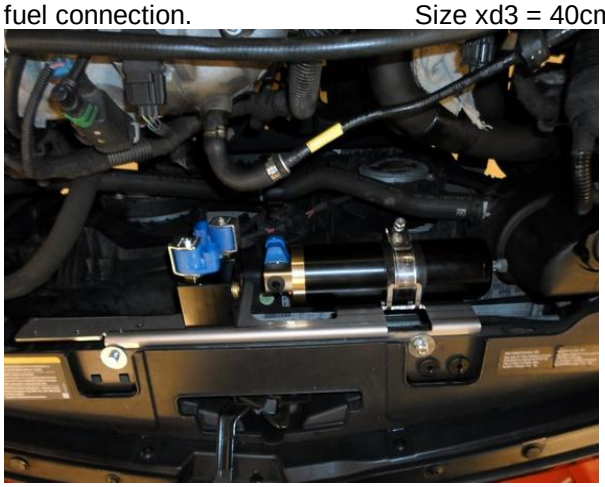
Connection of the fuel hose to the boost pump.

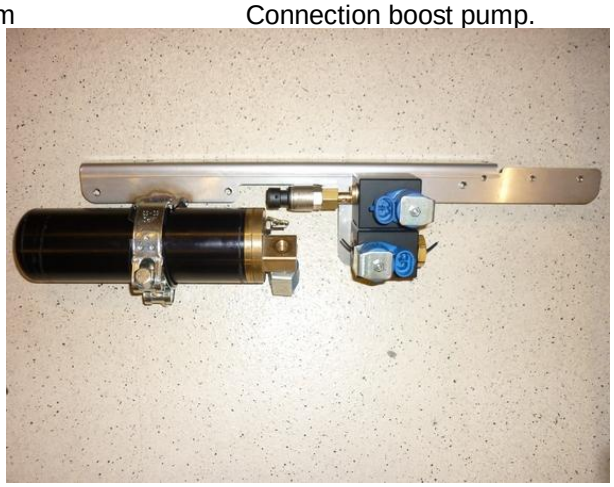
Connect the fuel hoses with an adapter to the boost pump.



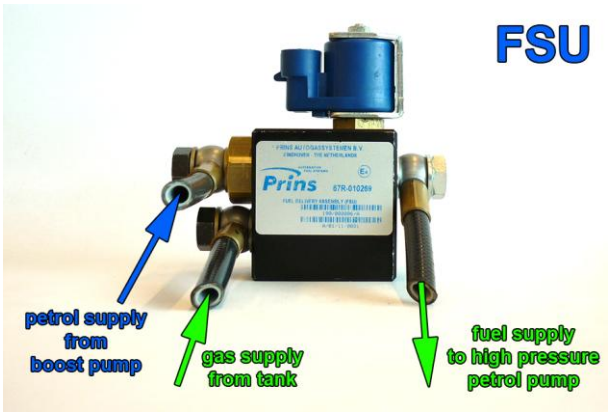
Special connection

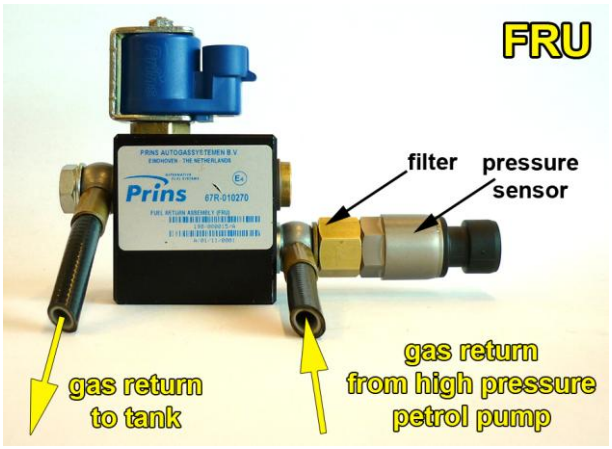
Original fuel connection. Size xd3 = 40cm Connection boost pump.

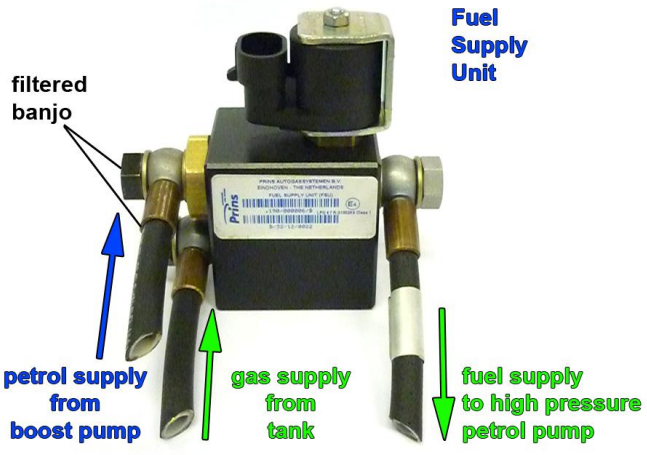


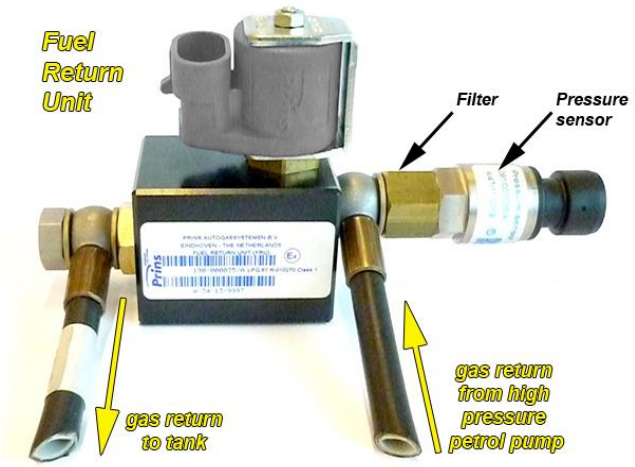


Fuel Supply Unit / Fuel Return Unit







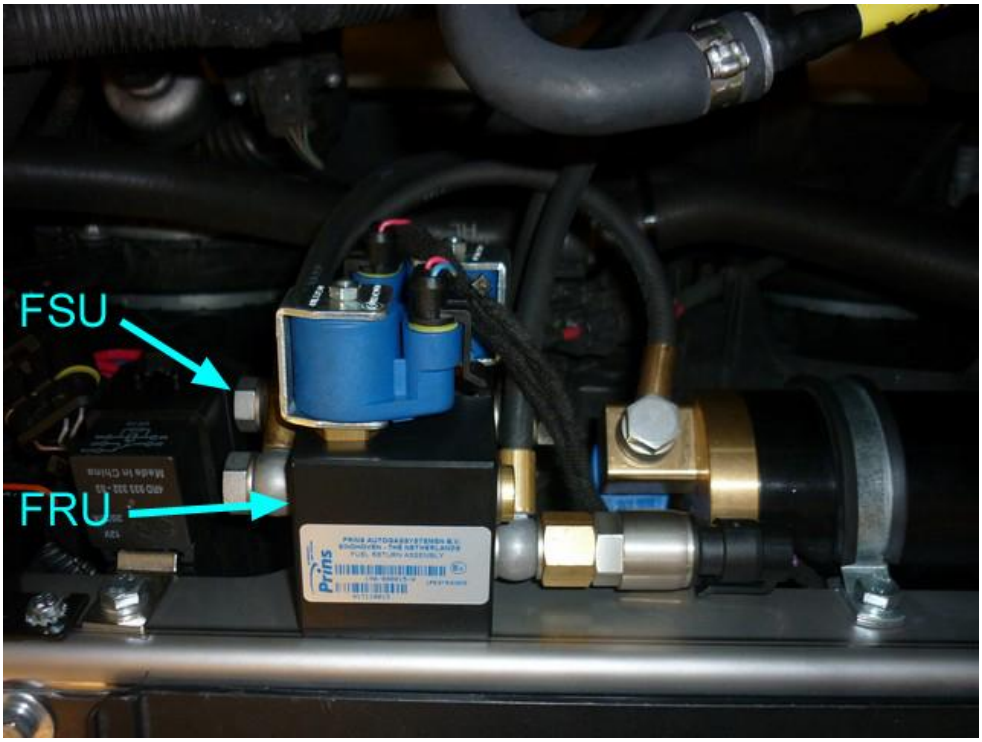


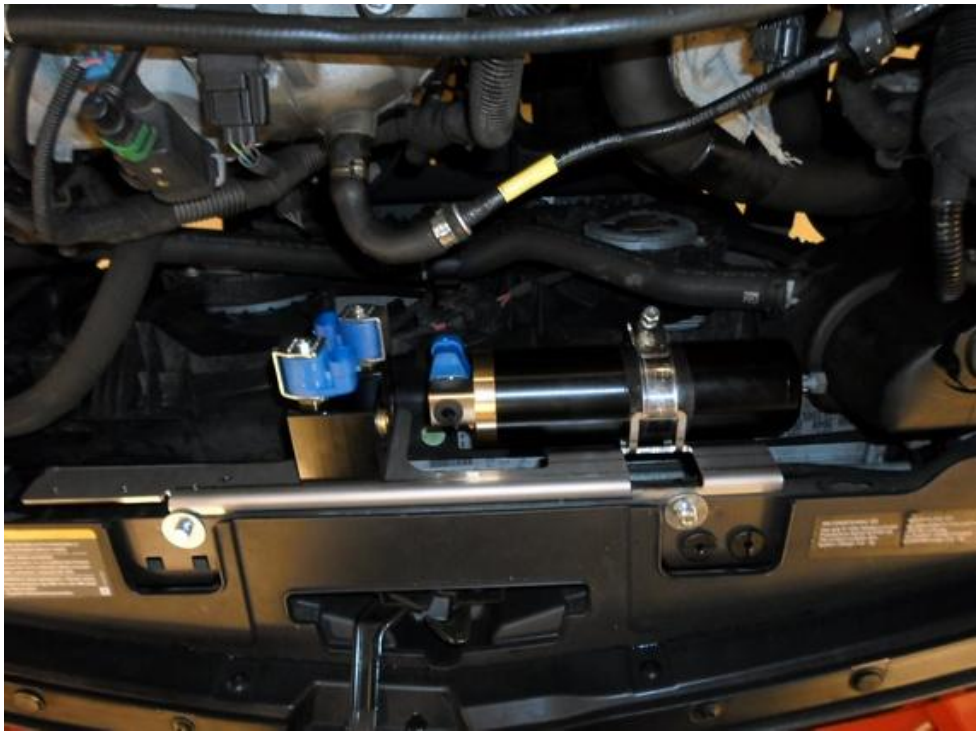
Black filtered banjo will only be used on inlet connections !

Filter inside sensor banjo

Mounting the Fuel Supply Unit and the Fuel return unit

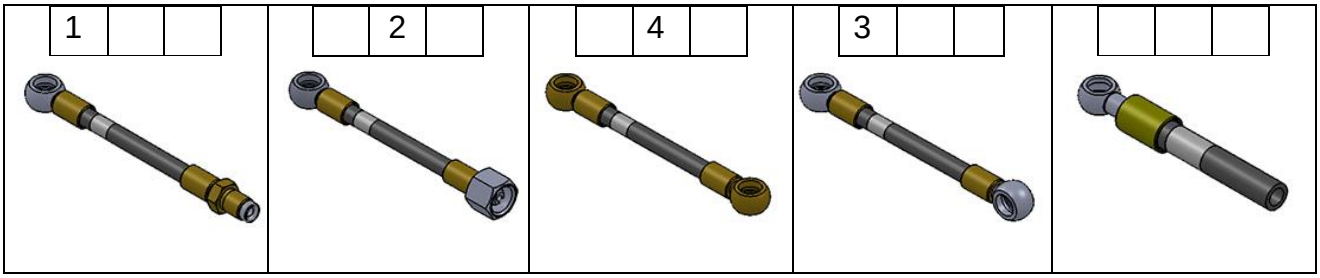
The FSU and FRU will be mounted on the combined support.



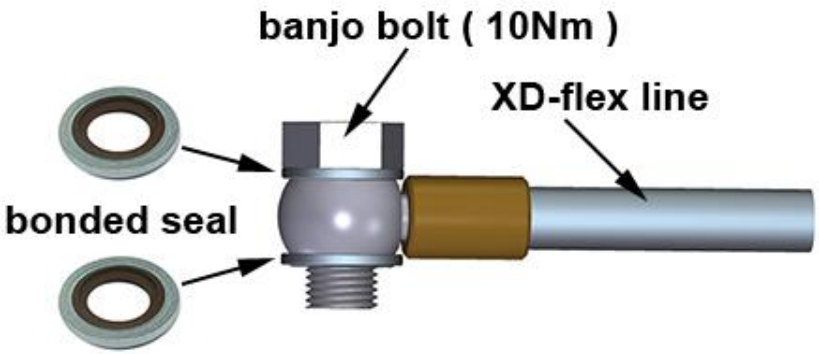


Lpg / petrol fuel lines

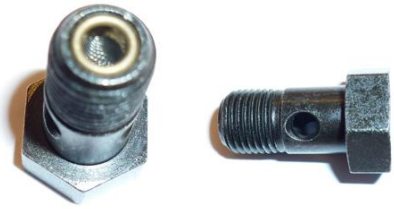
Hose		from	to	Length (cm)
1	XD-4	Adapter original petrol hose	Petrol boost pump	40cm
2	XD-3	Fuel supply unit	High pressure petrol pump	65cm
3	XD-3	Petrol boost pump	Fuel supply unit	25cm
4	XD-3	Fuel return unit	High pressure petrol pump	45cm



Install the fuel line using two bonded seal washers and banjo bolt :



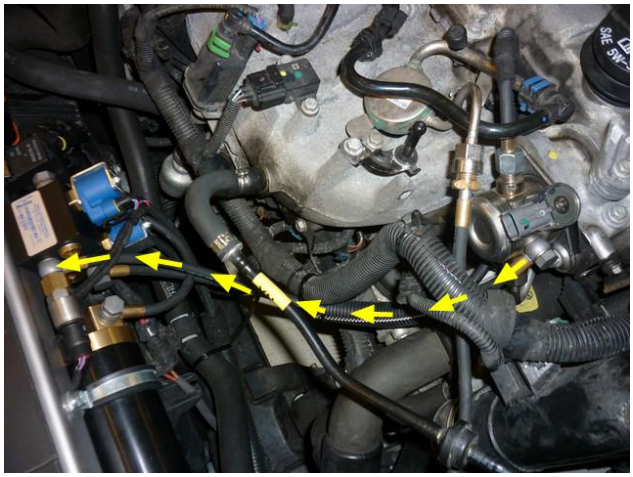
<u>Filtered banjo:</u> (FSU supply inlets / boost pump inlet : black filtered banjo) :



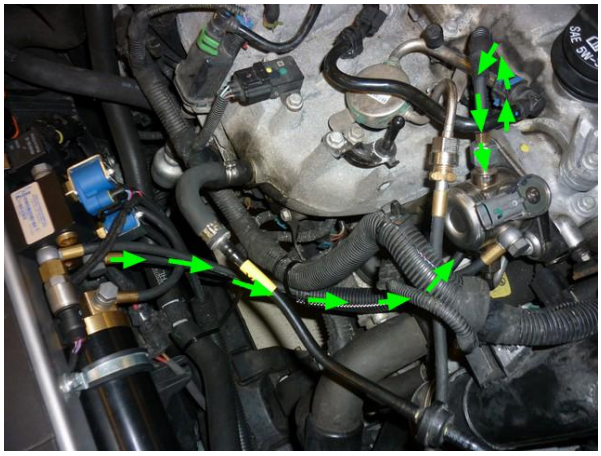
181/300009/A

Hose routing 1

Fuel line to the boost pump and boost pump to the FSU.



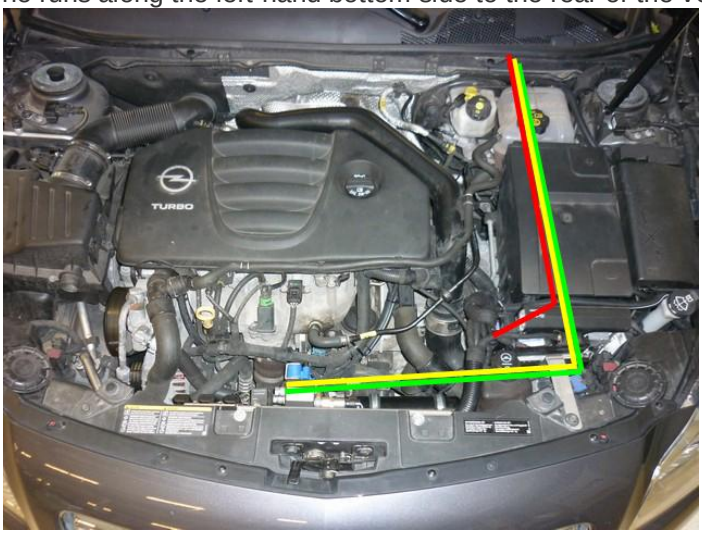
HPP to the FRU

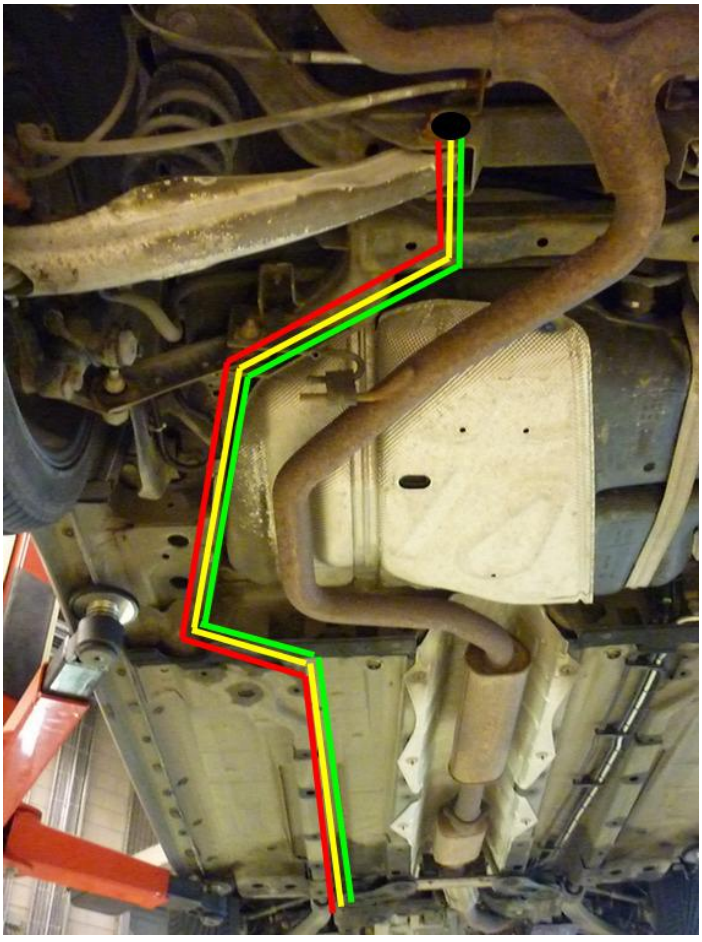


FSU to the HPP

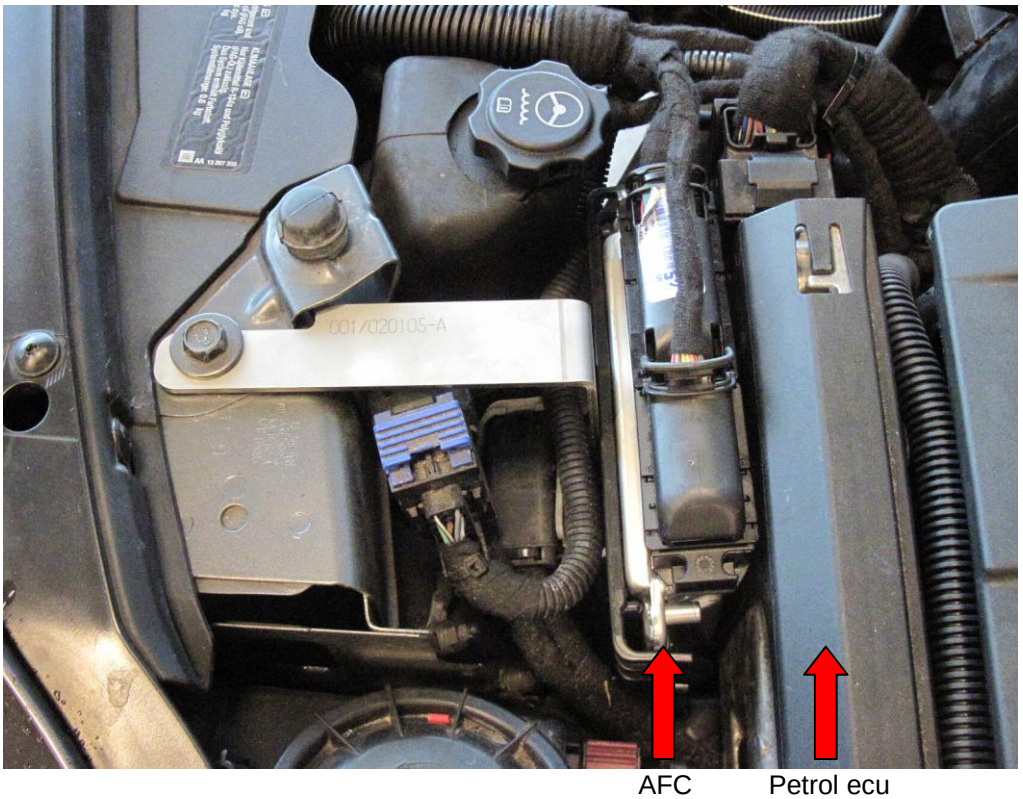
Hose routing 2

Fuel-line runs along the left-hand bottom side to the rear of the vehicle.





Mounting the LPG computer

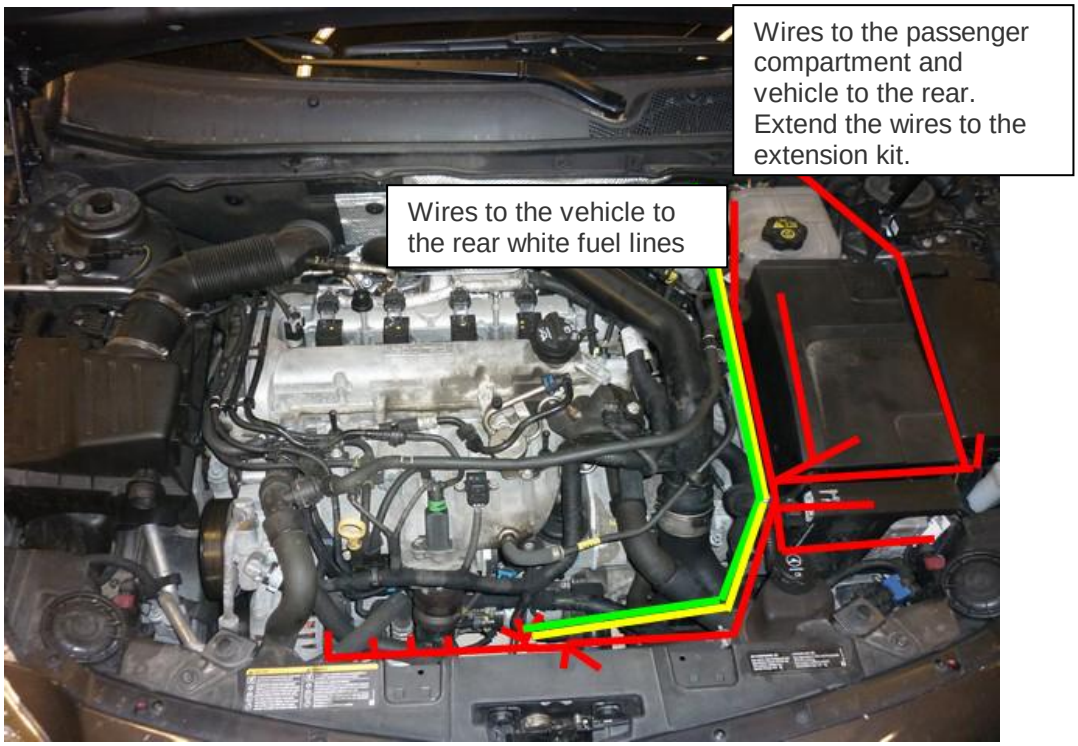


AFC Petrol ecu

Wiring LPG computer

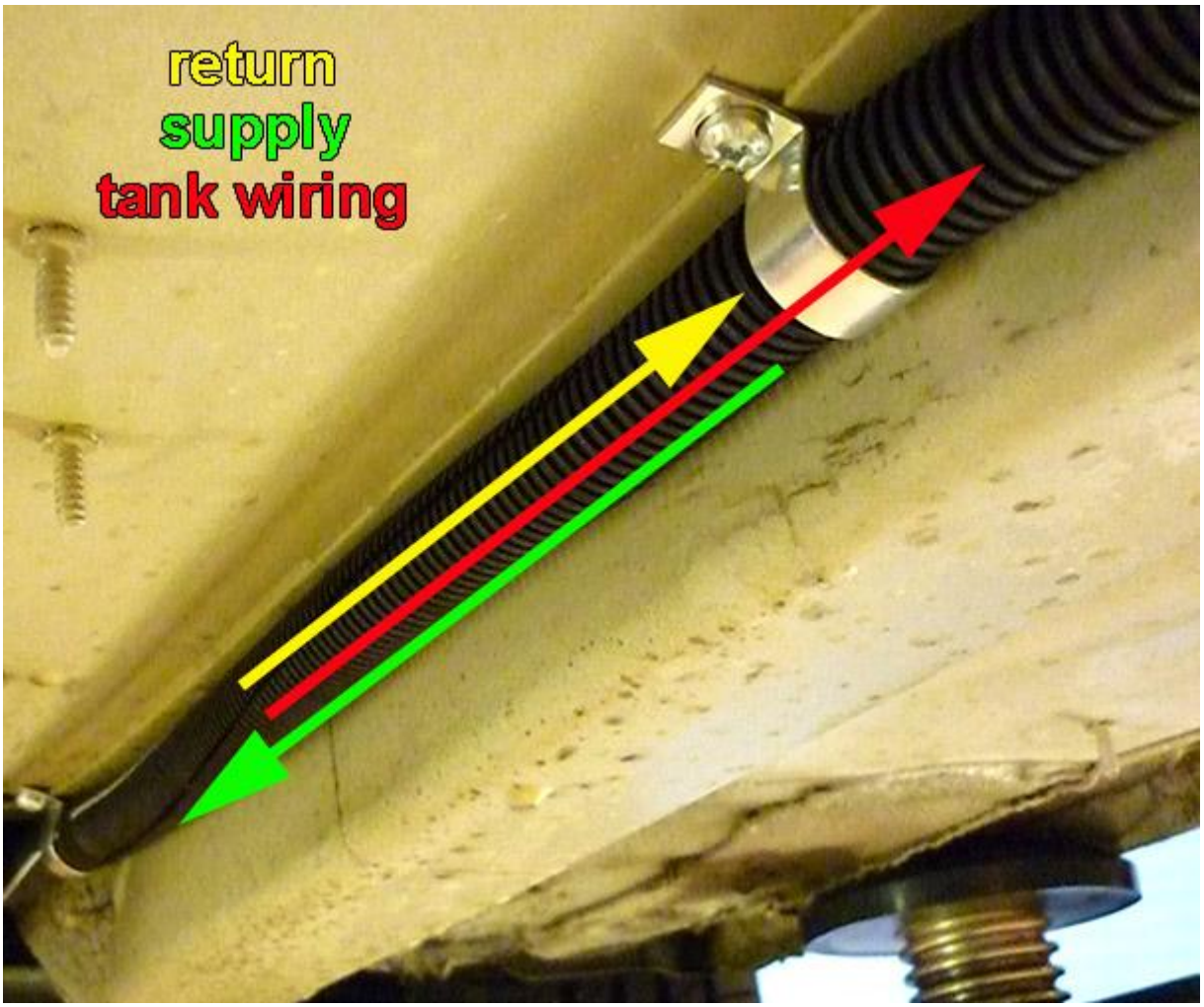
Attention!!!

The wires of the petrol pump driver, join with the switch wiring



Supply hose – Return hose – Tank wiring

Protect the supply- and return hose together with tank-wiring using the Ø16 split tube.
Mount the “hose assembly “ with clamps, with a maximum distance of 40cm.



Mounting the fuel selection switch

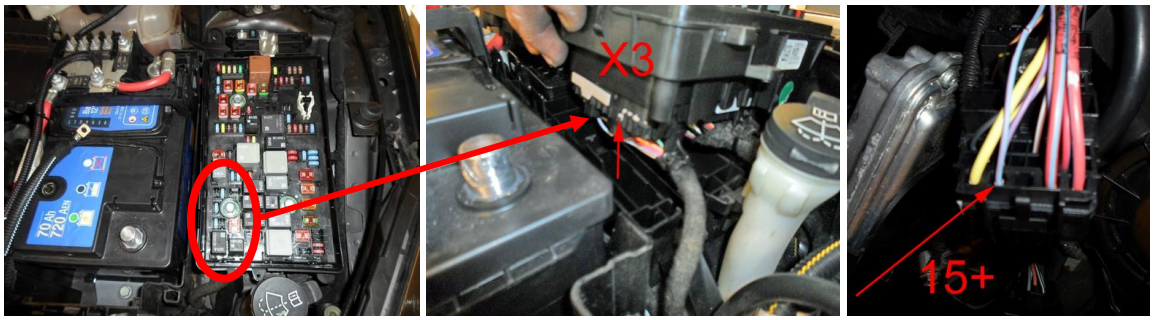
Mount the switch.

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Engine room

Wire number / code	*Wire colour*	*Connection*
1-32-40 MAIN GND ecu MAIN GROUND SENSE MAIN GND pump driver MAIN GND boost pump	brown	Connect to the '–' of the battery (-31) ; use a ring terminal M8. Wire location : Battery ground (-31)
4 – 13 +12V BATT sense +12V BATT fused +12V BATT boost pump +12V BATT pump driver	red	Connect to the '+' of the battery (+30); use a ring terminal M8. Do not place the fuse in the holder before having completed the installation of the lpg system. Wire location : Battery (+30)
7 +12V IGNITION	grey - white	Make a connection to ignition + / contact + (+15). Do not place the fuse in the holder before having completed the installation of the lpg system. Wire colour : Purple-blue Wire location : underside Fuse box, engine room, X3 pin 4



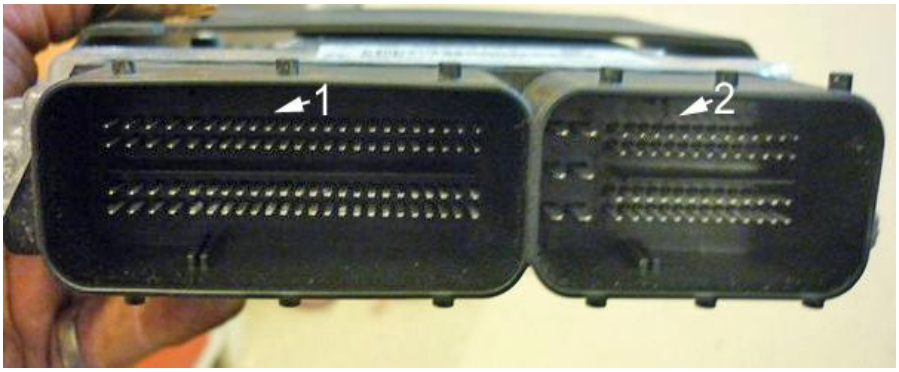
See page 27 for petrol pump driver wiring connections

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Engine room

Wire number / code	***Wire colour***	***Connection***
18 Analog 1 25 Simulation 1	Blue-red Green-grey	*High pressure petrol sensor signal interruption* Sensor side. ECU side. Wire colour :blue-white Wire location : Petrol ecu X1 pin 36
19 Analog 4	Blue-white	*High pressure sensor ground* Wire colour : black-dark green Wire location : Petrol ecu X1 pin 42
23 Digital Simulation	Green-red	***Insulate]***
8 RPM	Purple-white	For measuring the engine speed signal. Wire colour : green Wire location : Petrol ecu X1 pin 35
15 T-ect	Grey	For measuring the engine coolant temperature. Wire colour : blue Wire location : Petrol ecu X1 pin 82
When original sensor is used: cut off connector: Only use blue signal wire 20 Analog 3 MAP*	Red:insulate Brown:insulate Blue	For measuring the inlet manifold pressure from the engine MAP sensor. Wire colour : green-white Wire location : Petrol ecu X1 pin 37
119 Digital input 2	Yellow-grey	Digital airflow 2 Wire colour : green-white Wire location : Petrol ecu X2 pin 13
121 Wake-up switch	Red-grey	5 volt engine MAP sensor supply. Wire colour : Brown / black Wire location : Petrol ecu X1 pin 95



Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

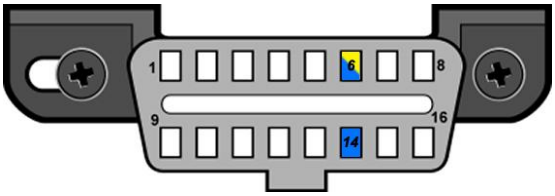
Engine room

Wire number / code	Wire colour	Connection
4-pole connector 35 C Ground pin 1 14 T-LPG pin 2 9 +5V sensor pin 3 16 Psys pin 4	 Brown Grey Red Green	Connect the 4-pole connector to the Psys / T-lpg sensor positioned into the Fuel Return Unit. Sensor wire pin 1 : black Sensor wire pin 2 : purple-green Sensor wire pin 3 : red-white Sensor wire pin 4 : purple-yellow
2-pole connector Boost Pump 106 + Lock-off Boost Pump 98 Ground lock-off	Red White-yellow	Connect the 2-pole connector to the lock-off valve on the Boost Pump.
2-pole connector FSU 108 + Lock-off FSU 100 Ground lock off	Red Pink-yellow	Connect the 2-pole connector to the lock-off valve on the Fuel Supply Unit
2-pole connector FRU 90 + Lock-off FRU 82 Ground lock off	Red Blue-yellow	Connect the 2-pole connector to the lock-off valve on the Fuel Return Unit
4-pole diagnose connector 46 Service TxD 65 Service RxD 68 C ground	 Grey Grey Brown	Diagnose connector for service / diagnosis Connector pin 1 Connector pin 2 Connector pin 4
Boost pump relay 91 + relay boost pump 83 GND relay boost pump +12V fused BATT +12V Boost pump	 Red Grey-yellow Red Red	 Pin 86 of the boost pump relay Pin 85 of the boost pump relay Pin 30 of the boost pump relay Pin 87 of the boost pump relay

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Driver / Luggage compartment.

3-pole micro connector 66 Ground fuel switch 3 +12V fuel switch 49 LIN fuel switch	Brown Red yellow	Connect the 3-pole connector to the Prins fuel selection switch.
51 CAN-High	Blue-yellow	EOBD connector pin 6
70 CAN-Low	Blue	EOBD connector pin 14 
115 Digital input 4	Yellow-red	On the fuel pump and fuel level sensor unit connect the wire in parallel to the grey wire. Wire colour :Grey Wire location : fuel pump control module K27 pin 47 fuel pump control module is located right before the rear light.
17 Analog 2 10 Simulation 2	Blue-black Green-black	Interrupt the wire of the low pressure fuel sensor.  Sensor side. ECU side. Wire colour : blue- white Wire location : fuel pump control module K27 pin 10 fuel pump control module is located right before the rear light.

STATION CAR

SEDAN

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Engine room

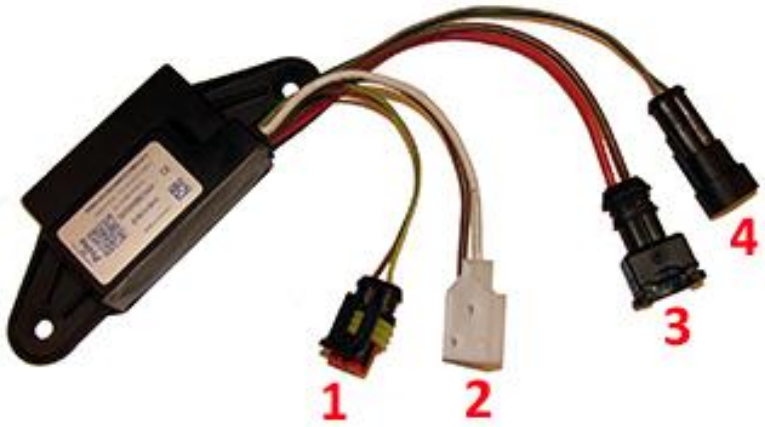
Wire number / code	Wire colour	Connection
3-pole connector 35 C Ground pin A 9 +5V sensor pin B 16 Psys pin C	 Brown Red Green	Connect the 3-pole connector to the Psys sensor positioned into the Fuel Return Unit. Sensor wire pin A Sensor wire pin B Sensor wire pin C
14 T-LPG	Grey	Not used, insulate.
2-pole connector Boost Pump 106 + Lock-off Boost Pump 98 Ground lock-off	Red White-yellow	Connect the 2-pole connector to the lock-off valve of the Boost Pump.
2-pole connector FSU 108 + Lock-off FSU 100 Ground lock off	Red Pink-yellow	Connect the 2-pole connector to the lock-off valve of the Fuel Supply Unit
2-pole connector FRU 90 + Lock-off FRU 82 Ground lock off	Red Blue-yellow	Connect the 2-pole connector to the lock-off valve of the Fuel Return Unit
4-pole diagnose connector 46 Service TxD 65 Service RxD 68 C ground	 Grey Grey Brown	Diagnose connector for service / diagnosis Connector pin 1 Connector pin 2 Connector pin 4
Boost pump relay 107 + relay boost pump 99 GND relay boost pump +12V fused BATT +12V Boost pump	 Red Green-yellow Red Red	 Pin 86 of the boost pump relay Pin 85 of the boost pump relay Pin 30 of the boost pump relay Pin 87 of the boost pump relay
Wiring tank pump driver relay *2 + driver relay* *26 Ground driver relay* *+12V BATT fused* *+12V driver*	 Red Green-yellow Red 2.5mm2 Red 2.5mm2	 Pin 86 of the driver relay Pin 85 of the driver relay Pin 30 of the driver relay Pin 87 of the driver relay

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Lpg tank housing

Wire number / code	***Wire colour***	***Connection***
3-pole tank level connector *40 Ground tank gauge* *12 Tank level in* *11 + tank level supply*	 Brown Blue Red	Connect the 3-pole connector to the tank level sensor.
1. *2-pole connector tank lock-off*	Green-yellow Brown	From tank pump driver From tank pump driver
2. *3-pole connector tank pump*	Red 2.5mm^2 Brown 2.5mm^2	From tank pump driver From tank pump driver
3. *2-pole connector driver*	Red 2.5mm^2 Brown 2.5mm^2	From tank pump relay 87 From main ground
4. *2-pole connector driver*	Green Grey	From AFC pin 22 pwm From AFC pin 64 diagnose



Checklist after installation

1. Install the system fuses.
   Turn on ignition.
   Connect the Prins interface wire and run the Prins diagnosis program.
   When working on the car, beware of moving and rotating parts in the engine compartment
   (even when the engine is not running !!).

2. When commissioning the LPG system, you must activate the AFC with the diagnosis software.

3. Check whether the program in the AFC matches with the car (dedicated engine set):
   See “Identification” in the diagnosis program.

4. Check all components and connections for any LPG leakage, use a LPG leak detector device or
   a fluid detection like soap. Also check for petrol leakage. Make sure the solenoid valves are in open position.
   No evidence of leakage is permitted.
   Caution for moving and rotating parts in the engine compartment !

5. Use the diagnosis software to check again all input and output signals.

6. Check the system for error codes and solve these, if required.
   Check the petrol MMS for EOBD error codes.
   Place the protection connector back on the diagnose connector.

7. Make a test drive and check the cars drivability on LPG and petrol.