ALTERNATIVE FUEL SYSTEMS

Prins

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

Installation manual
Dedicated
PART 2/2

DIRECT LIQUI max-2.0 HIGH PRESSURE LIQUID LPG INJECTION

MANUFACTURER	Subaru
TYPE	Forester
ENGINE DISPLACEMENT	2000
NUMBER OF VALVES	16
ENGINE CODE / NUMBER	FA20 DIT
VEHICLE CATEGORIES	M
TRANSMISSION	AT
VERSION	Direct LiquiMax-2.1
PETROL ECU MANUFACTURER / CODE	Hitachi
HIGH PRESSURE PETROL POMP	AC Delco
HIGH PRESSURE PETROL INJECTOR	-
MODEL YEAR:	2014-
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000016 / DLM-LPG 09
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	362/070001/A
MANUAL NUMBER	076/2200200D
DATE	2015-4-13

Version 2013-09-28 D

TABLE OF CONTENTS

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-2.0 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 / servicing** 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 the 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 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)
- 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)

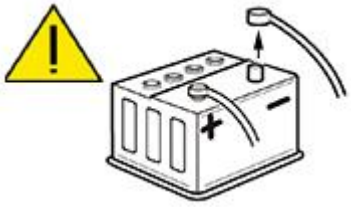
Tightening moments

		Nm	Spanner mm
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
Boost pump clamp		7	10

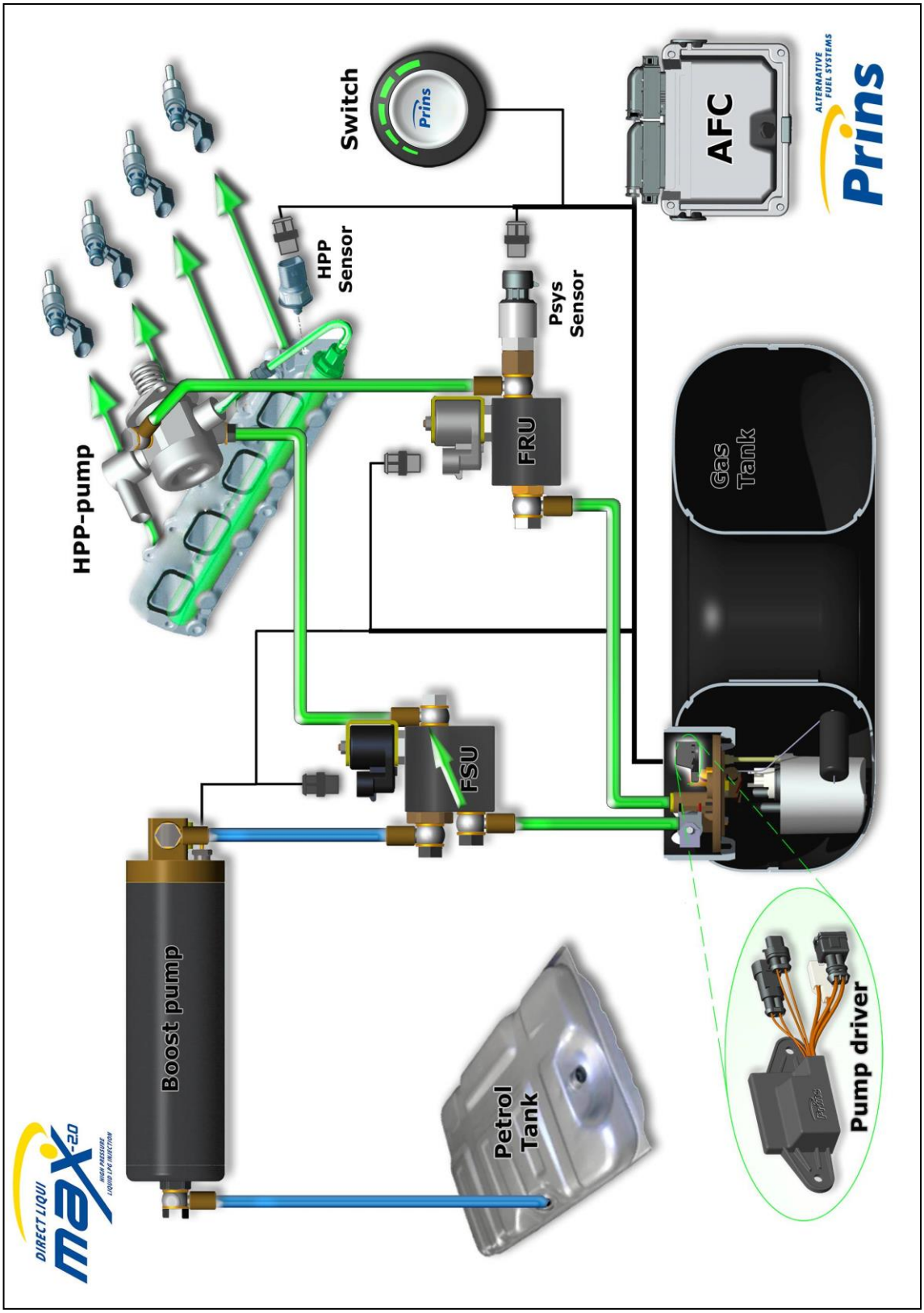
EXPLANATION OF SYMBOLS :

= IMPORTANT, CAUTION

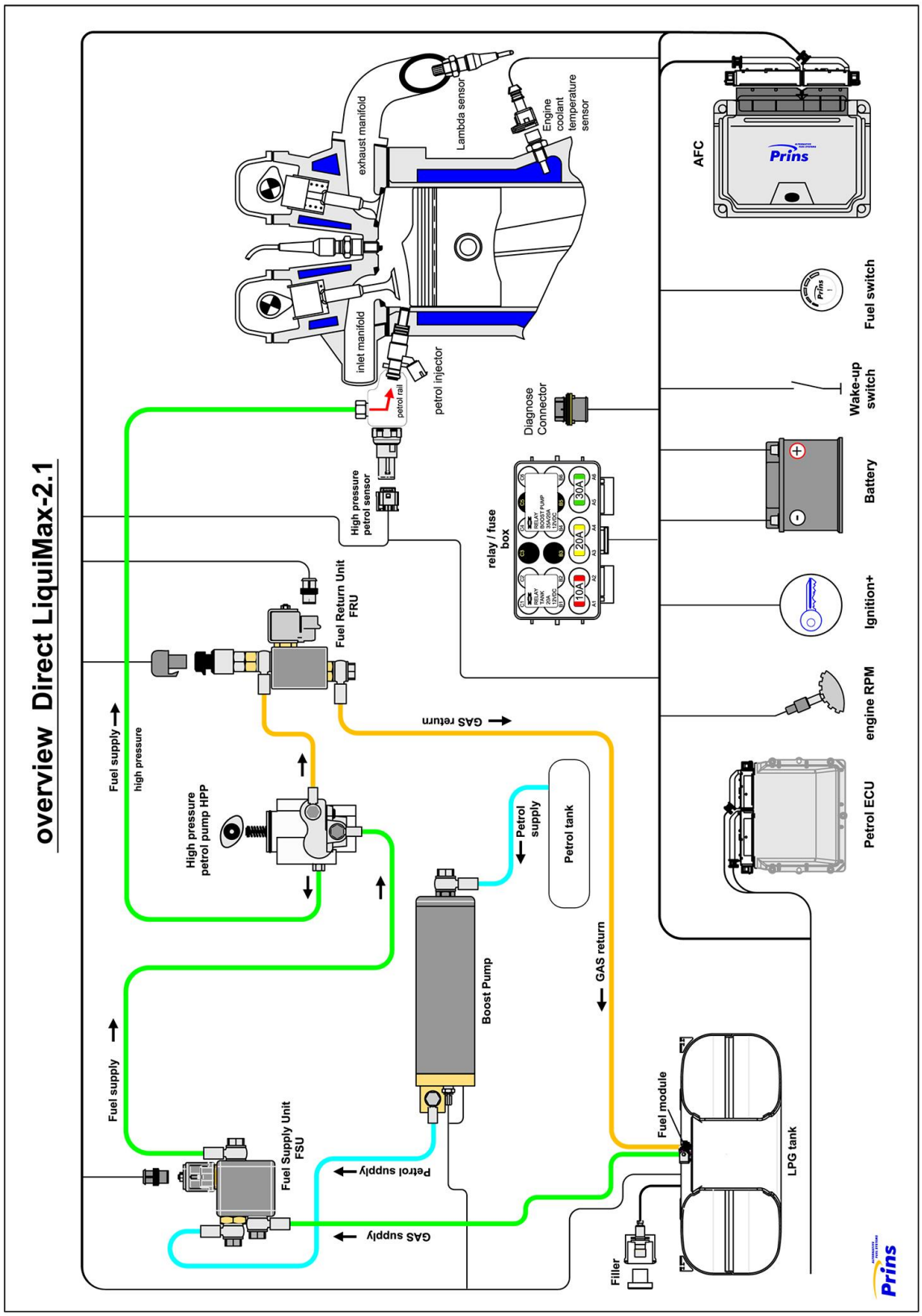
= WEAR SAFETY GOGGLES



Direct LiquiMax-2.1



Direct LiquiMax-2.1diagram



Direct LiquiMax parts / approval numbers

<table>
<tr>
<td>  1st generation
  2nd generation</td>
<td>  1st generation
  2nd generation</td>
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<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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<td>  </td>
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<tr>
<td>Prins AFC: E4-67R-010098
E4-10R-030507</td>
<td>Fuel lines series XD : E4-67R-010247 XD3</td>
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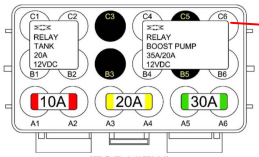
DLM-2.1 component location overview

Petrol ECU

Fuse / relay box



(TOP VIEW)

AFC

Boost pump

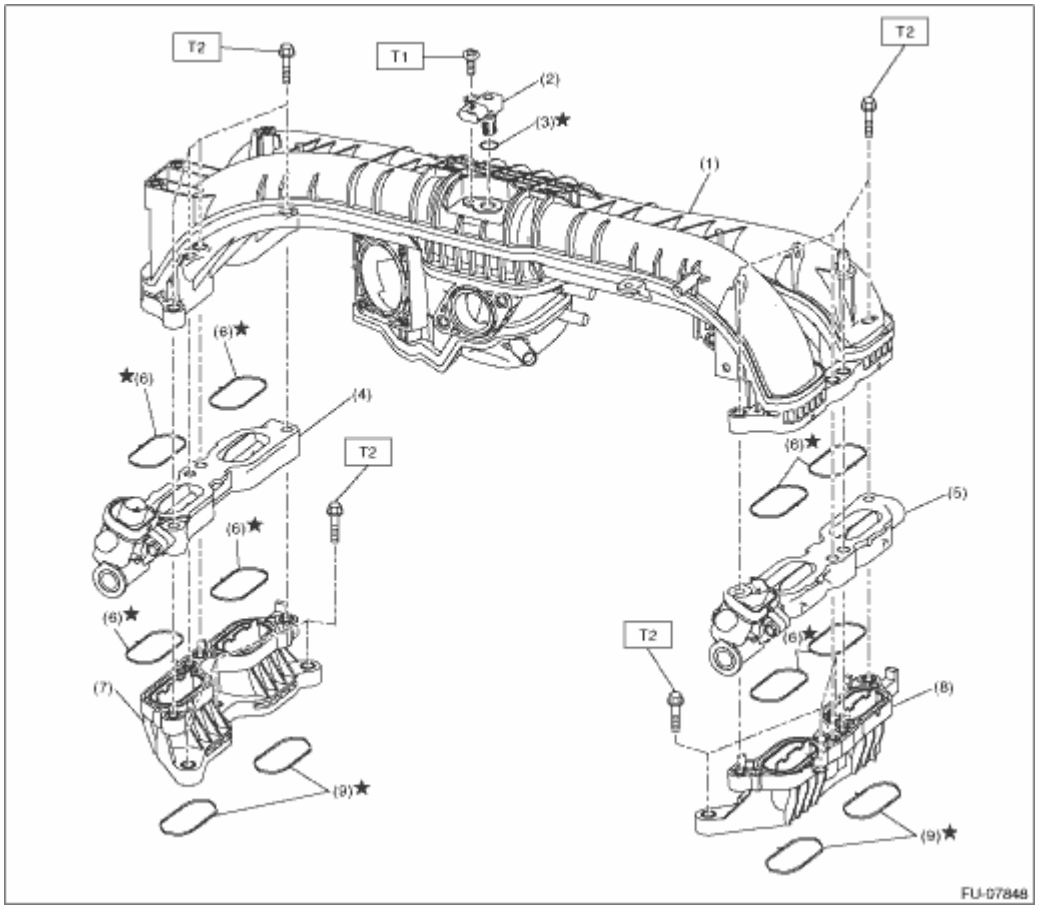
FSU

FRU

HPP pump

R115 approval sticker :
Right side centre door post

Lift inlet manifold



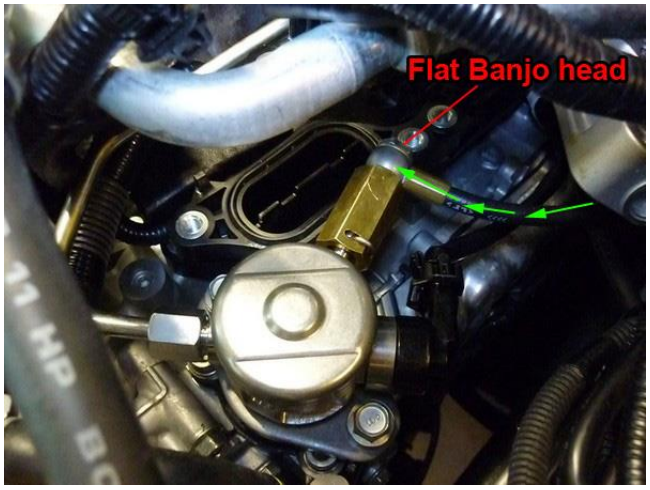
Remove valve housing, left side (4) for removing the high petrol pressure pump

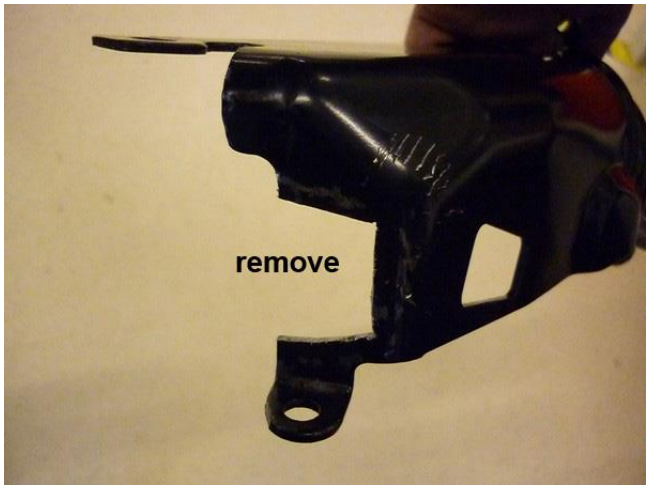
Adapt valve housing

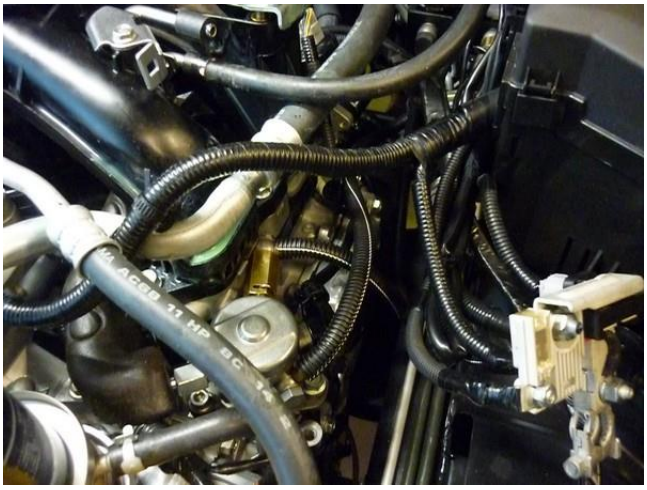
Carefully grind away, flatten the surface of the housing for (tight) fitting of the quick release.
See picture

Install the high pressure pump

Install pump before re-installing the valve housing

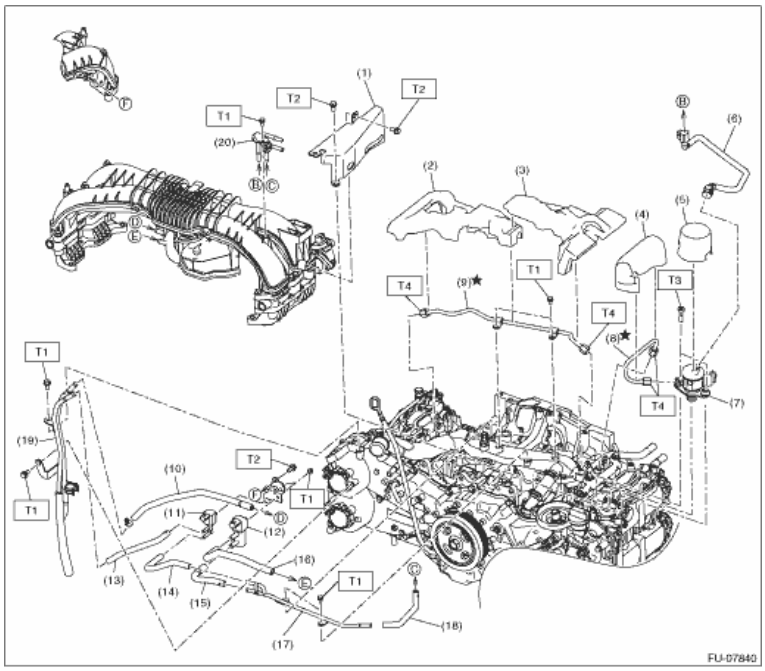




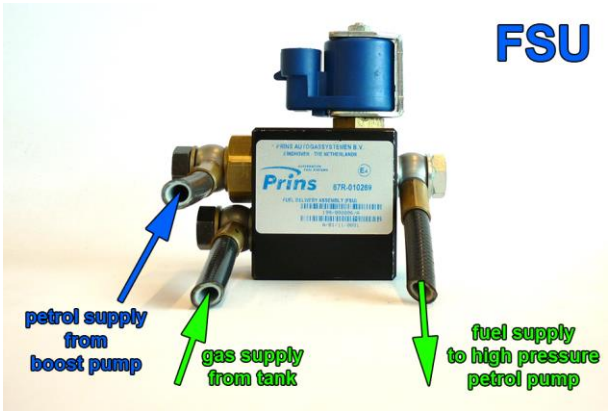


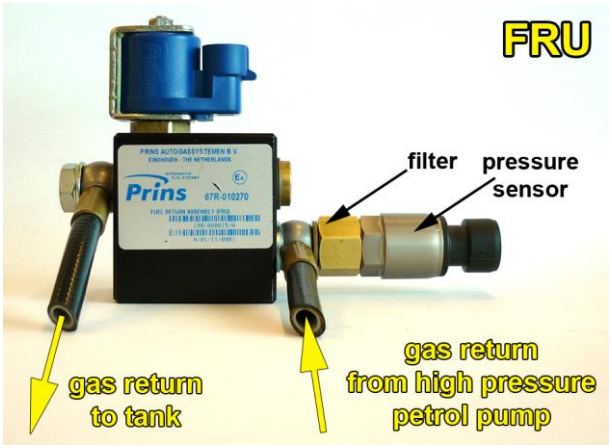
Connection of the fuel hose to the boost pump.

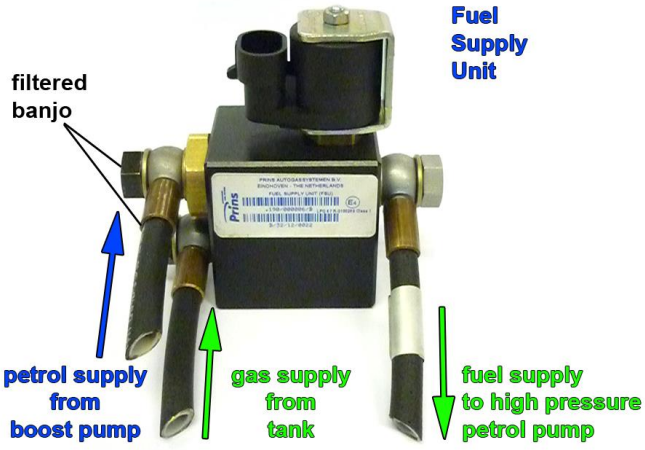
Remove the original petrol hose nr 6 and main supply hose.

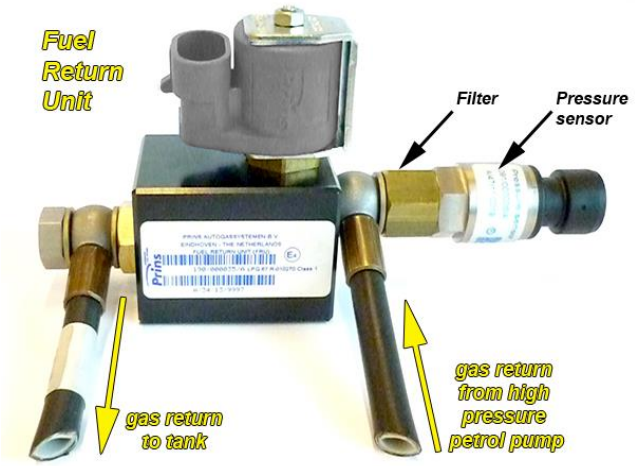


Fuel Supply Unit / Fuel Return Unit





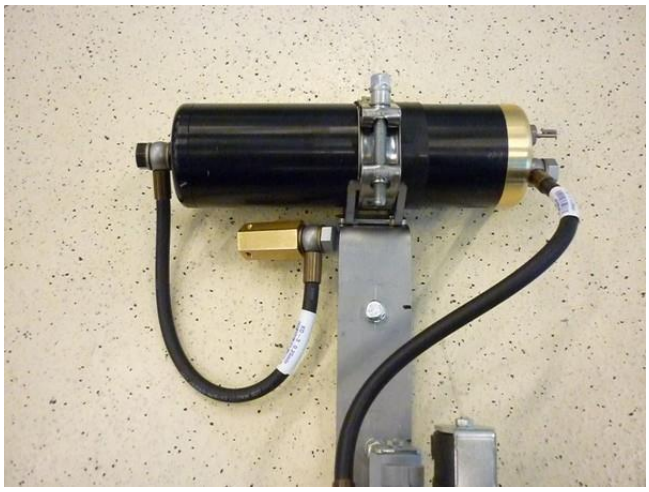




Black filtered banjo will only be used on inlet connections !

Filter inside sensor banjo

System bracket






Installation System bracket






Lpg / petrol fuel lines

Hose		from	to	Length (cm)
1	XD-3	Adapter original petrol hose	Petrol boost pump	25
2	XD-3	Fuel supply unit	High pressure petrol pump	50
3	XD-3	Petrol boost pump	Fuel supply unit	25
4	XD-3	Fuel return unit	High pressure petrol pump	50

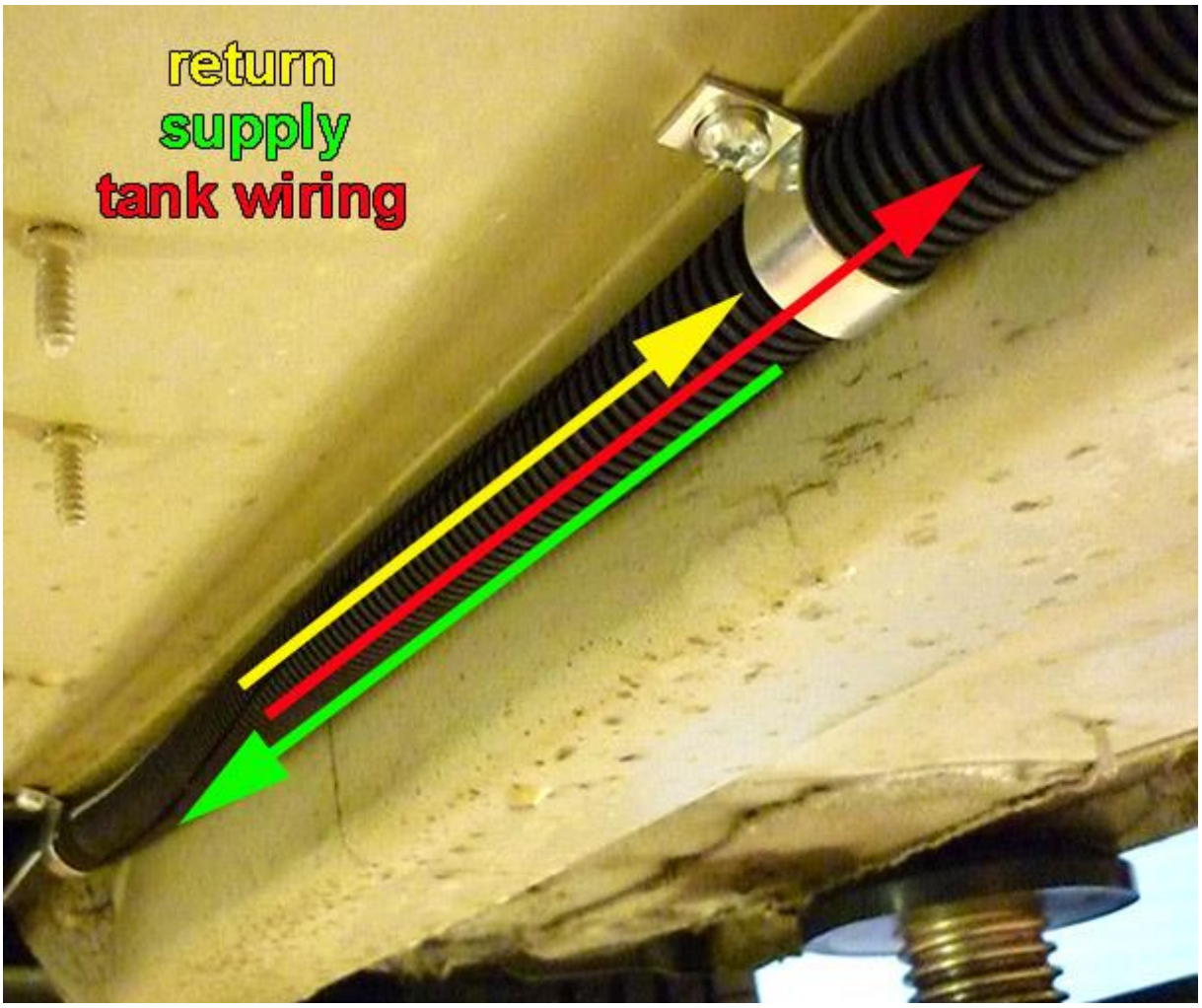
Install the fuel line using two bonded seal washers and banjo bolt :

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

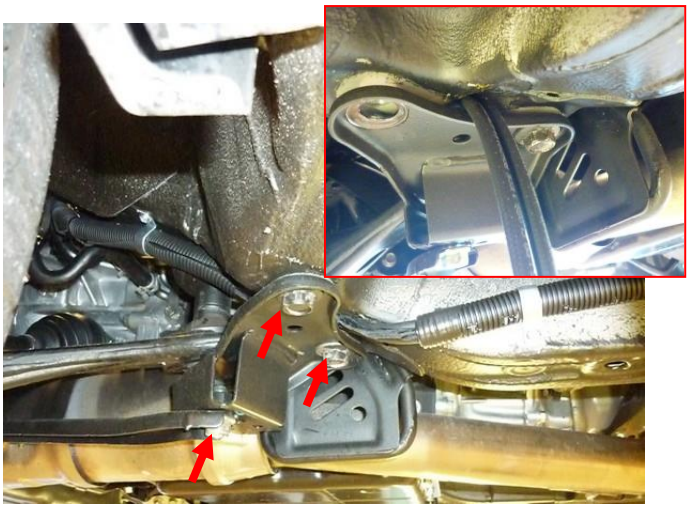
181/300009/A

Supply hose – Return hose – Tank wiring

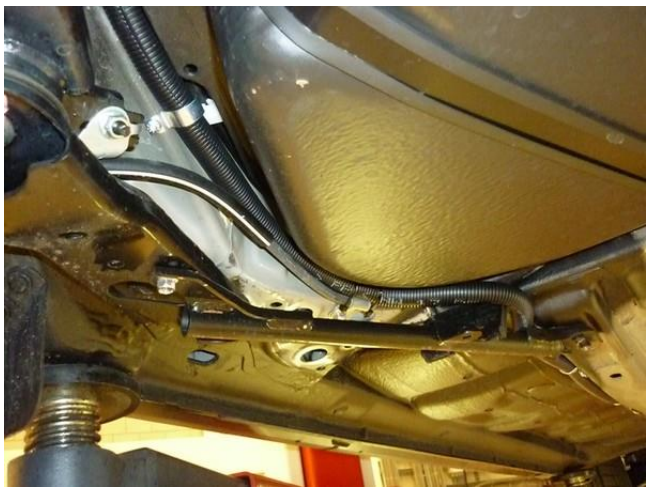
Protect the supply- and return hose together with tank-wiring using the Ø16 split tube.
Mount the “hose assembly “ with clamps, with a maximum distance of 40cm.



Hose routing



Temporary loosen bolts/nut for fuel lines and wiring

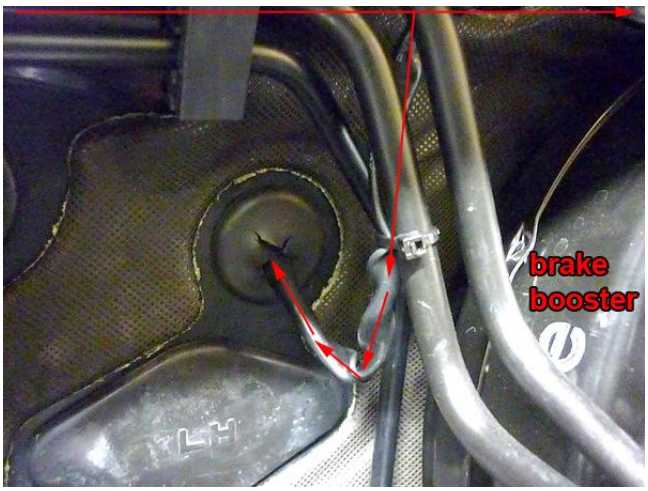


Mounting the AFC and fuse / relay box bracket

Wiring routing

Mounting the fuel selection switch

Mount the switch.



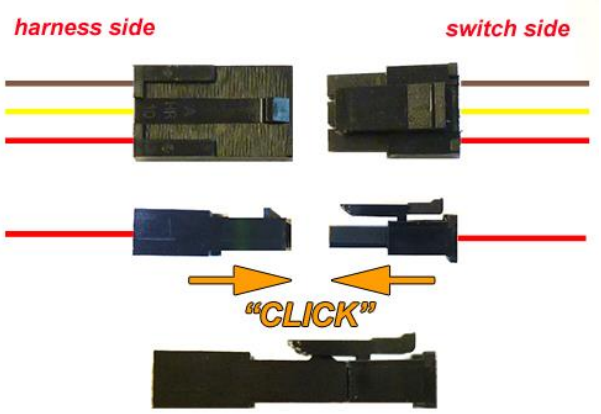
Grommet

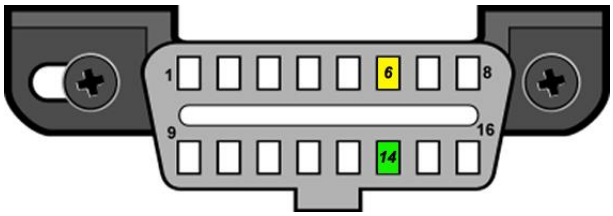
EOBD connector

Electrical connections

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

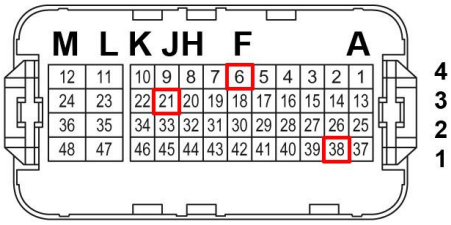
Driver room

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

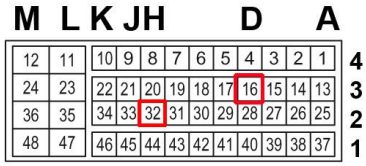
51	CAN-High	Yellow	EOBD connector pin 6
70	CAN-Low	Green	EOBD connector pin 14
			

Electrical connections petrol ECU

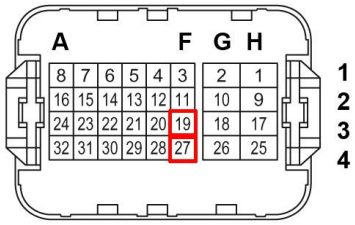
TOP VIEW



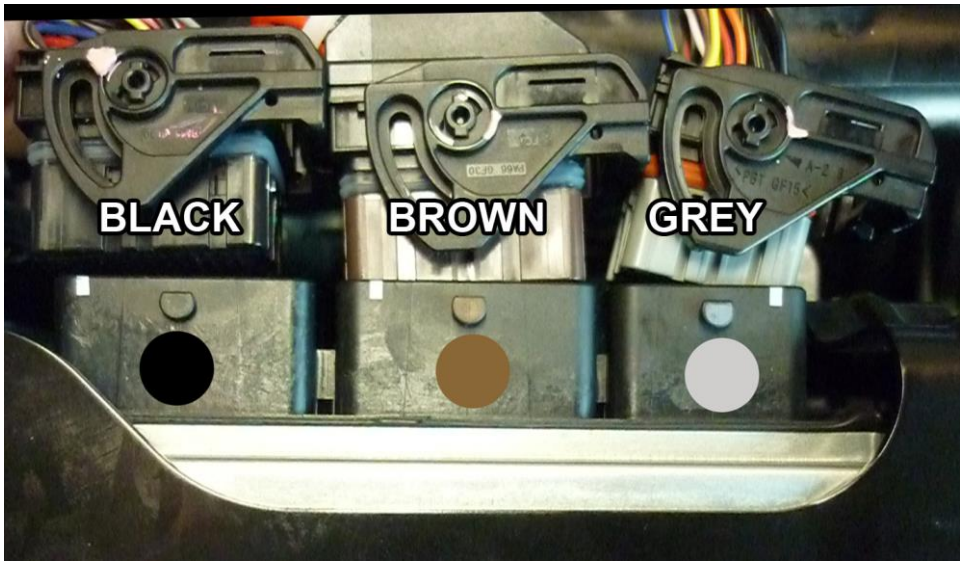
B : E158, Black

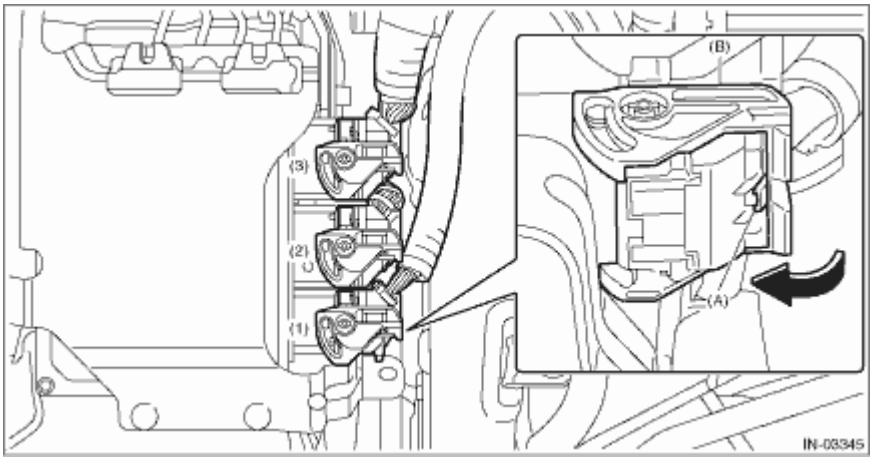


A : B134, Brown



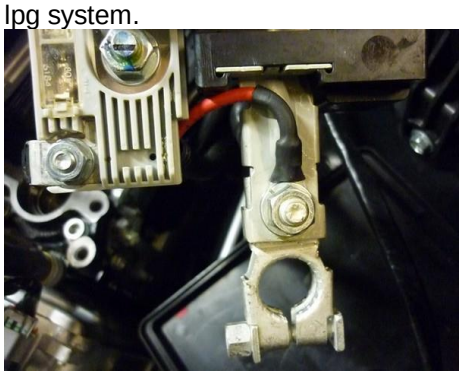
C : E159, Grey

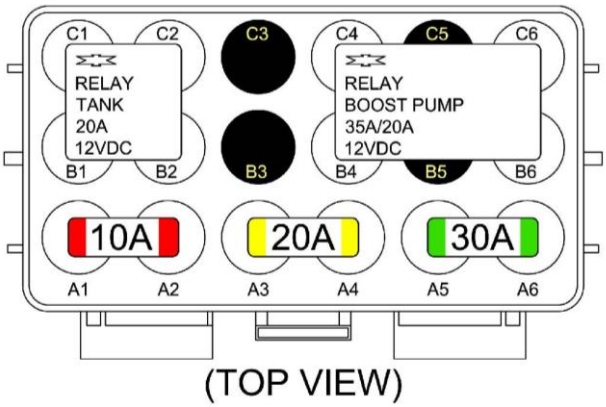




Electrical connections

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

1-32 MAIN GND ecu MAIN GROUND SENSE	Brown	Connect to the '–' of the battery (-31) ; use a ring terminal. 
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. **Do not place the fuses** before having completed the installation of the lpg system. 



(TOP VIEW)

Electrical connections

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

Wire number / code	***Wire colour***	***Connection***
36&25		*High pressure petrol sensor signal interruption* Wire colour :blue-white Wire location : Petrol ecu, **black** connector, pin 6, F4
36 AD 6	Blue-brown	Sensor side
25 DAC 1	Green-white	Petrol ecu side

8 RPM engine speed	Purple-white	For measuring the engine speed signal. Wire colour : green-red Wire location : Petrol ecu, **black** connector, pin 21, J3

15 T-ect	Grey	For measuring the engine coolant temperature. Wire colour : grey Wire location : Petrol ecu, **black** connector, pin 38, B1

7 +12V IGNITION	Grey - white	Make a connection to +ignition / contact+ (+15). **Do not place the fuses** in the holder before having completed the installation of the lpg system. Wire colour : red-black or yellow-green Wire location : Petrol ecu, **brown** connector, pin 32, H2

21 AD 9	Blue-purple	*Analog in (sensor side, MAF in)* Wire colour : white Wire location : Petrol ecu, **brown** connector, pin 16, D3

63 Ground Shift	Blue-orange	*High pressure petrol sensor ground* Wire colour : yellow-black Wire location : Petrol ecu, **grey** connector, pin 27, F4

40 Wake-up	Grey-red	*High pressure petrol sensor 5Volt supply / car wake-up* Wire colour : black-blue Wire location : Petrol ecu, **grey** connector, pin 19, F3

Electrical connections

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

Insulate not used wires.

17	AD 2	Blue-green	
10	DAC 2	Green	
18	AD 1	Blue-white	
22	LSS 1	Purple-white	
23	LSS 2	Purple-green	
42	Digital out pull up 2	Red-purple	
58	+12V switched	Red-white	
56	DI 2	Yellow-green	
60	DI 3	Yellow-grey	
61	DI 4	Yellow-blue	
20	AD 3	Blue-pink	
19	AD 4	Blue	
74	DAC 3	Green-pink	

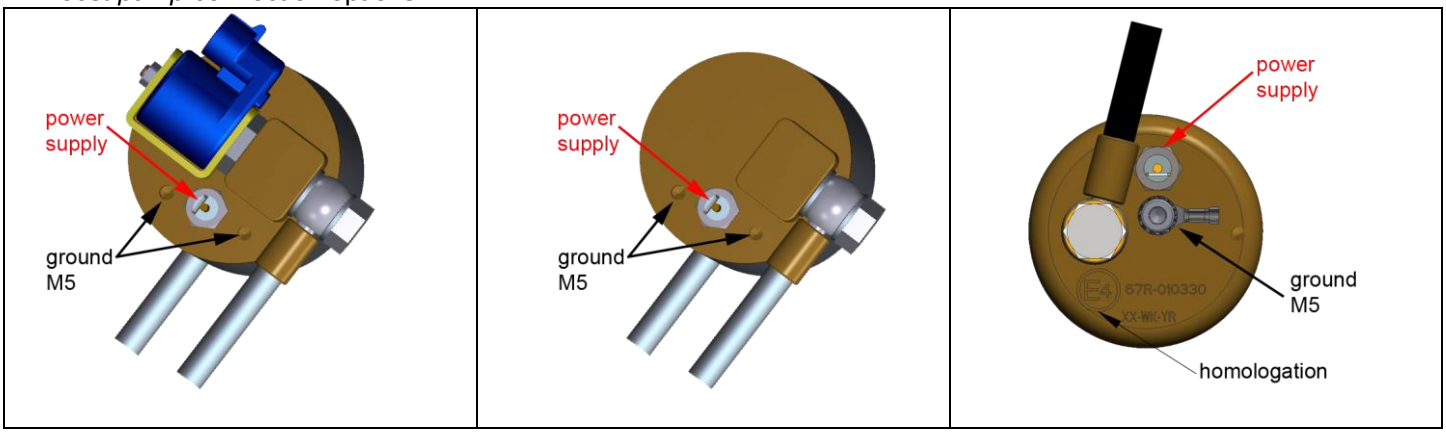
Electrical connections

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 Ground Psys pin A 9 +5V sensor pin B 16 Psys pin C	 Brown Red-blue 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
2-pole connector FSU, black 24 + Lock-off FSU 31 C Ground	 Yellow-green Brown-black	 Connect the 2-pole connector to the lock-off valve of the Fuel Supply Unit
2-pole connector FRU, grey 43 + Lock-off FRU 34 C Ground	 Red-white Brown-black	 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-black	Diagnose connector for service / diagnosis Connector pin 1 Connector pin 2 Connector pin 4
Boost pump relay 2 + relay boost pump 26 Ground BP relay +12V fused BATT +12V Boost pump	 Red-white Purple-blue Red 2.5mm2 Red 2.5mm2	 Pin 86 of the boost pump relay C4 Pin 85 of the boost pump relay B6 Pin 30 of the boost pump relay C6-A5 Pin 87 of the boost pump relay B4
Wiring tank pump driver relay 57 + driver relay 73 LSS 4 tank relay +12V BATT fused +12V driver	 Red-white Purple-blue Red 2.5mm2 Red 2.5mm2	 Pin 86 of the driver relay C1 Pin 85 of the driver relay B2 Pin 30 of the driver relay C2-A4 Pin 87 of the driver relay B1

Boost pump connection options:

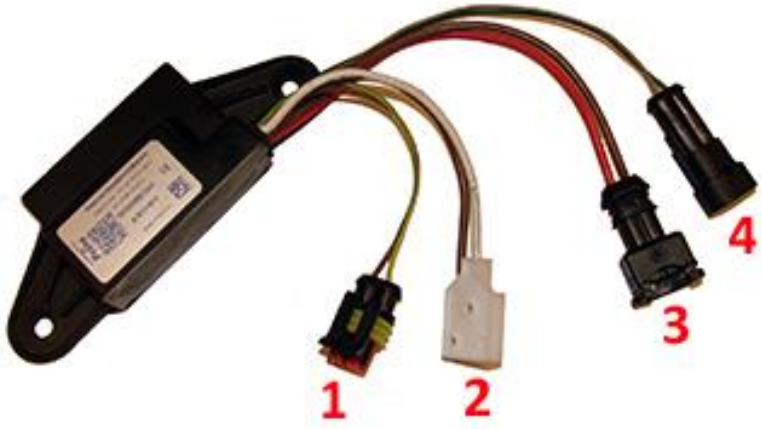


Electrical connections

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 33 Ground tank gauge 12 Tank level in 11 + tank level supply	Brown-black Blue Red-blue	Connect the 3-pole connector to the tank level sensor.
2-pole driver connector 71 LSS 3 PWM driver 64 AD 5 driver diagnose	Purple-pink Blue-grey	Connect the 2-pole connector to the pump driver (4).
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 power 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 71 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.