

ALTERNATIVE
FUEL SYSTEMS

Prins

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



installation manual Engine Kit part 2/2



MANUFACTURER	Ford
TYPE	Mondeo
ENGINE DISPLACEMENT	1596
NUMBER OF VALVES	16
ENGINE CODE / NUMBER	JTBB
VEHICLE CATEGORIES	M1
TRANSMISSION	MT
VERSION	AFC-2.1
PETROL ECU MANUFACTURER / CODE	Bosch MED
HIGH PRESSURE PETROL PUMP	Bosch HDP-5-PE BM5G 0261.520.140
HIGH PRESSURE PETROL INJECTOR	Bosch HDEV-5-1
MODEL YEAR:	2011
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000009 / DLM-LPG 02
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	347/070031/A
MANUAL NUMBER	076/0705100
DATE	2014-07-14



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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-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 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
- 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
High pressure petrol fuel line	24-35	17

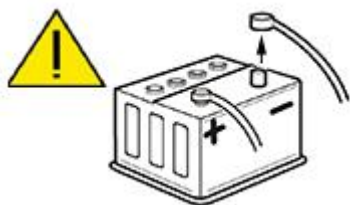
EXPLANATION OF SYMBOLS :



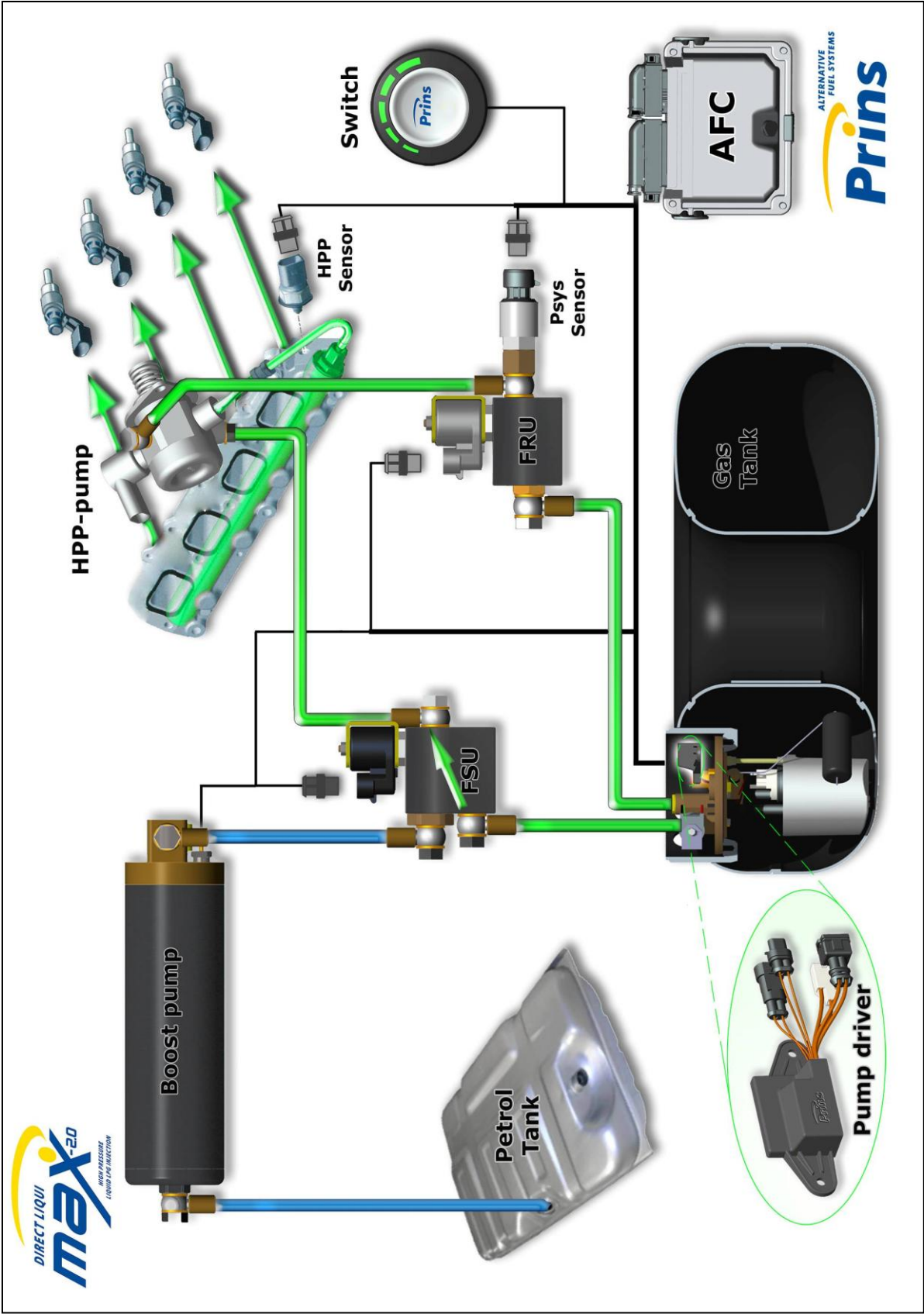
= IMPORTANT, CAUTION



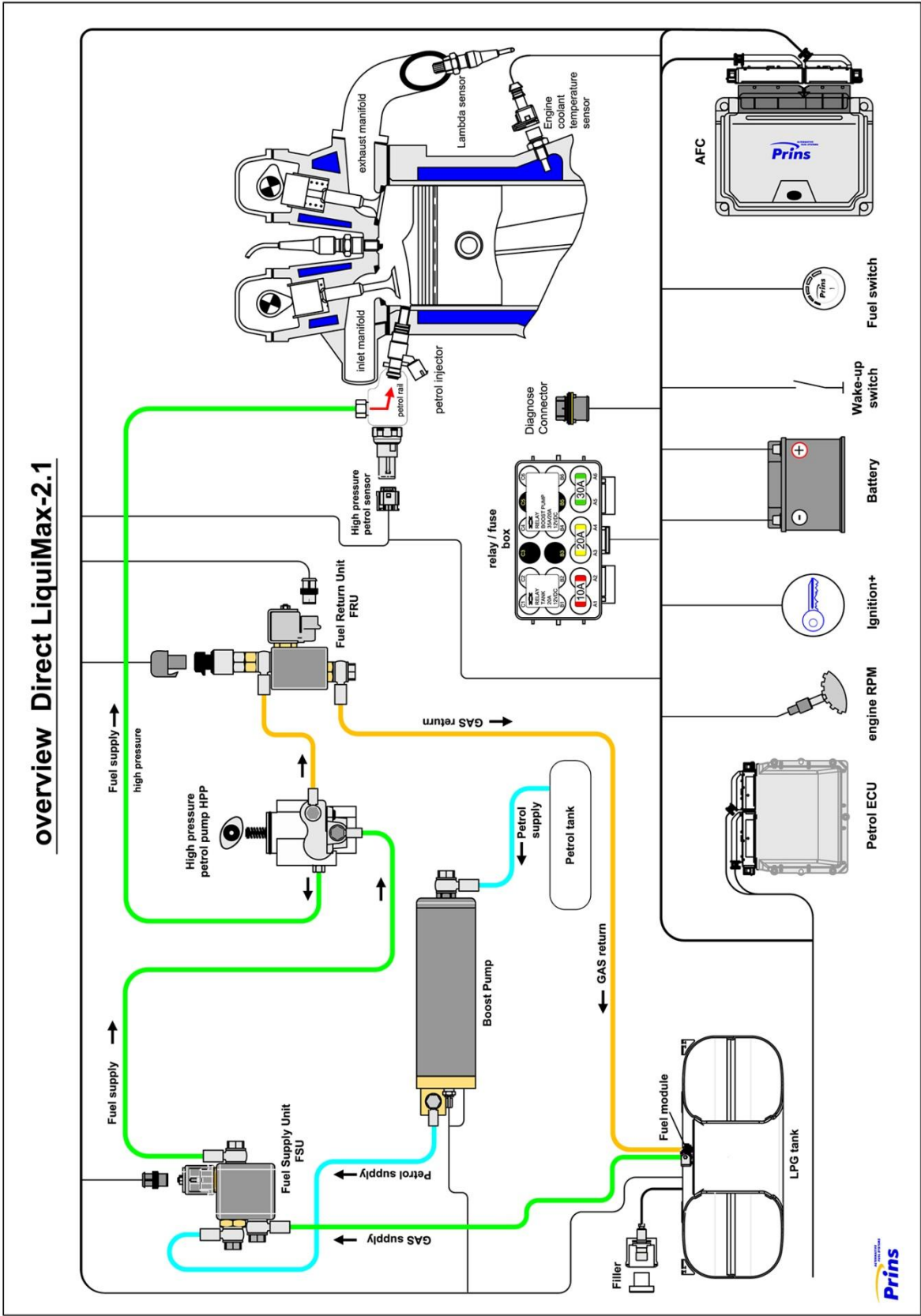
= WEAR SAFETY GOGGLES



Direct LiquiMax-2.0, AFC-2.1








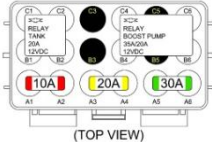

Direct LiquiMax-2.0 diagram, AFC-2.1




Direct LiquiMax parts / approval numbers

 <p>1st generation</p>  <p>2nd generation</p>	 <p>1st generation</p>  <p>2nd generation</p>
<p>Fuel Supply Unit : E4-67R-010269</p>	<p>Fuel Return Unit : E4-67R-010270 Pressure Sensor : E4-67R-010051</p>
	
<p>Boost pump</p>	<p>High Pressure Pump : E4-67R-010266 High Pressure Rail : E4-67R-010267 High Pressure Injectors : E4-67R-010309</p>
	 <p>XD-3 LPG</p>  <p>XD-4 LPG</p>
<p>Prins AFC: E4-67R-010098 E4-10R-030507</p>	<p>Fuel lines series XD : E4-67R-010247 XD3 E4-67R-010247 XD4</p>

DLM component location overview

<p>HPP pump</p> 		<p>Petrol ECU</p>
<p>FSU</p> 		<p>AFC</p> 
<p>FRU</p> 		<p>Fuse / relay box</p> 
<p>Boost pump</p> 		

	<p>R115 approval sticker : Right side centre door post</p>
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Removal of the Bosch High Pressure Petrol Pump

REMOVAL

WARNING

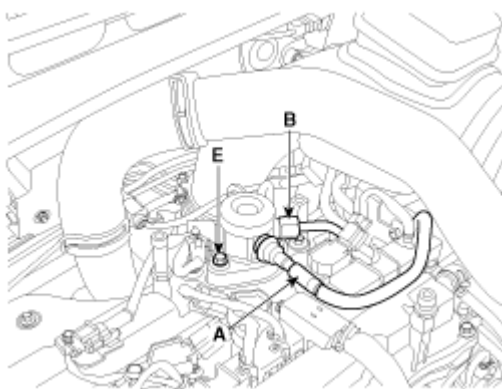
In case of removing the high pressure fuel pump, high pressure fuel pipe, delivery pipe, there may be injury caused by leakage of the high pressure fuel.

Don't do any repair work right after engine stops (HOT engine).

- Turn the ignition switch OFF and disconnect the battery negative (-) cable.
- Wear 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.

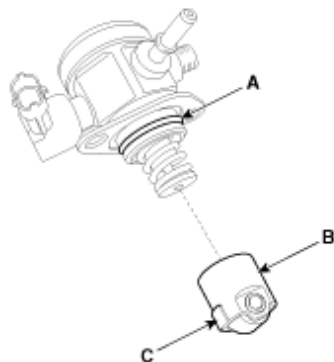
Installation of the Bosch High Pressure Petrol Pump

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 petrol pump installation bolt: 12.8 ~ 14.7 N.m

Petrol 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 petrol pipe installation nut: 26.5 ~ 32.4 N.m

Installation is reverse of removal.

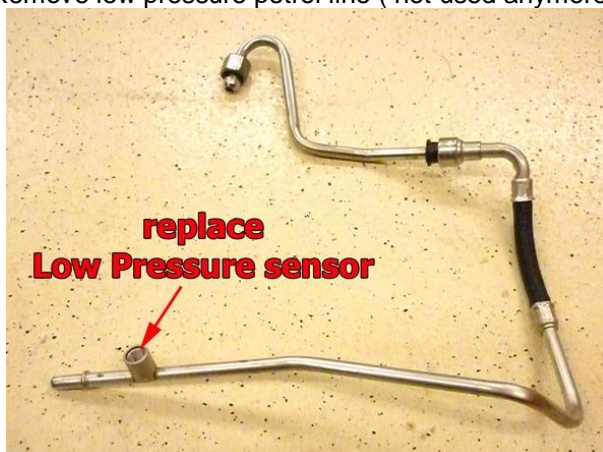
High pressure petrol pump installation



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



Remove low pressure petrol line (not used anymore)



See chapter : Connection of the fuel hose to the boost pump.



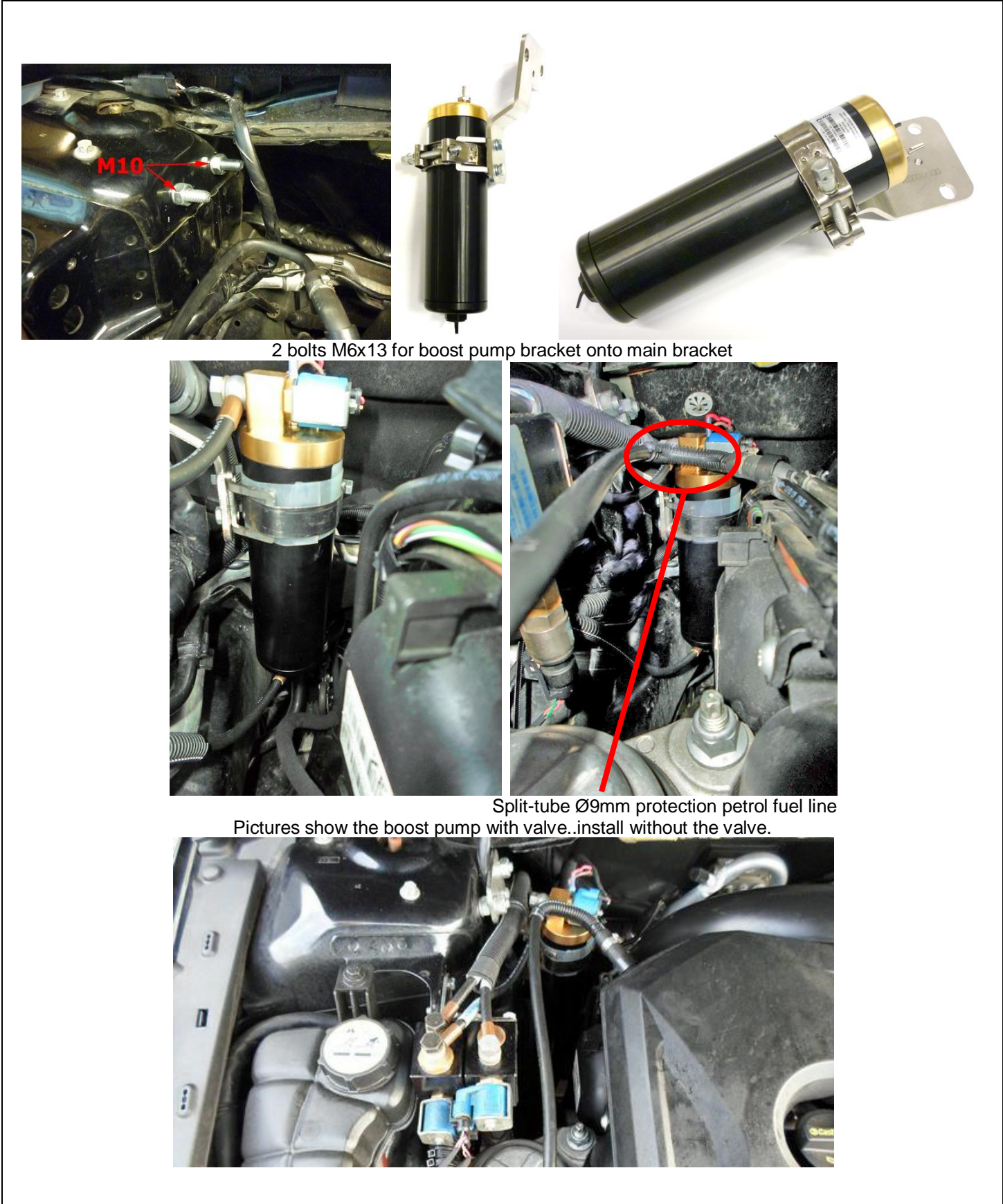
Install a new (shorter) M6x25 bolt.

High pressure petrol pump LPG supply / return

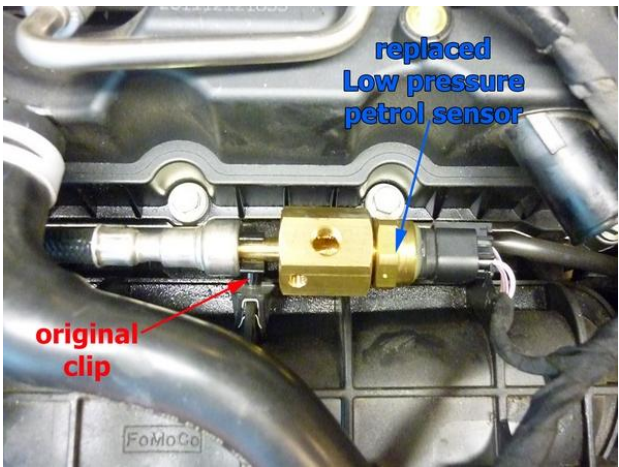
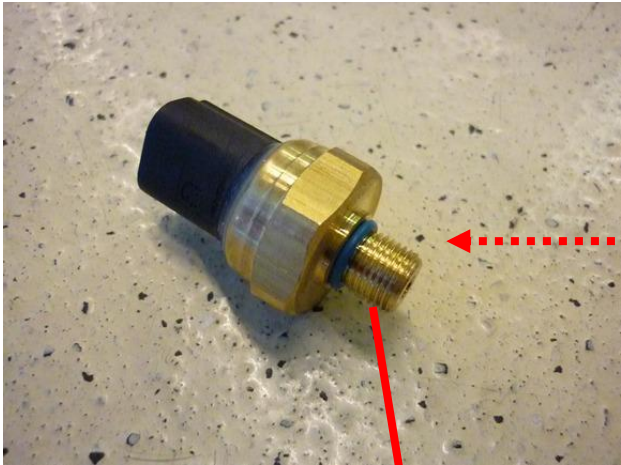


Adapt cover. Remove bolt (cut away)

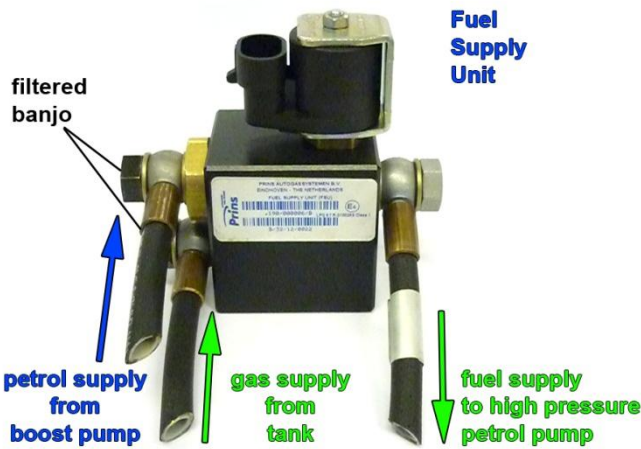
Boost pump



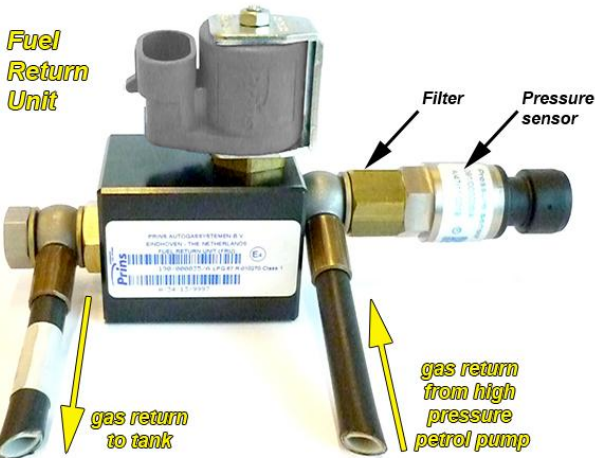
Connection of the petrol fuel hose to the boost pump.



Fuel Supply Unit / Fuel Return Unit



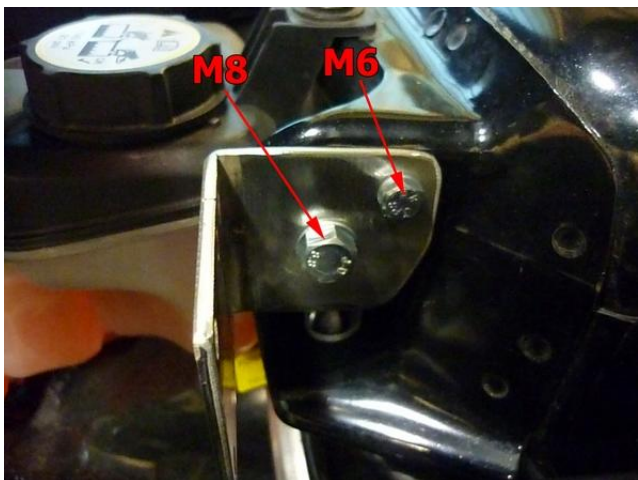
Black filtered banjo will only be used on inlet connections !



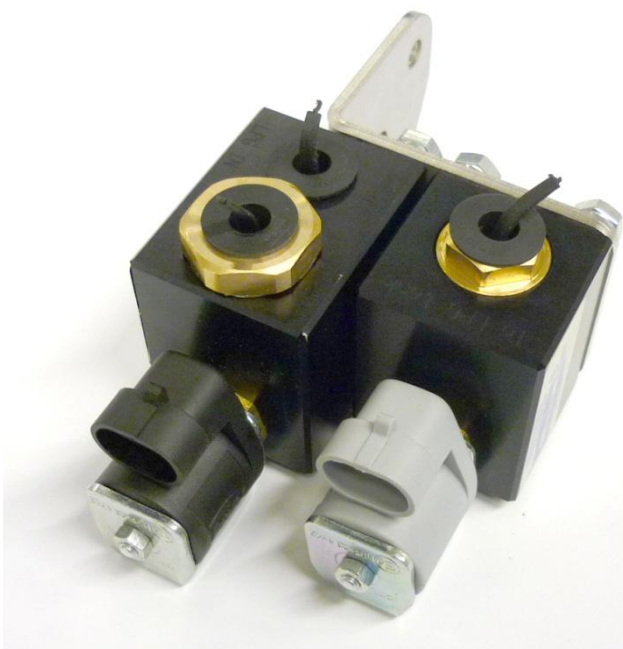
Filter inside sensor banjo



Mounting the Fuel Units

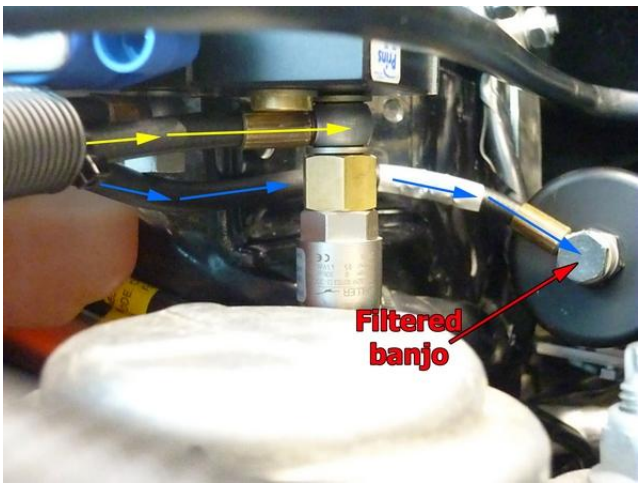
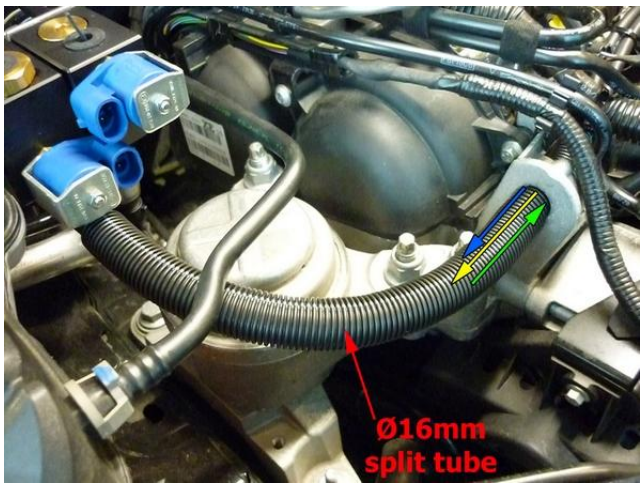
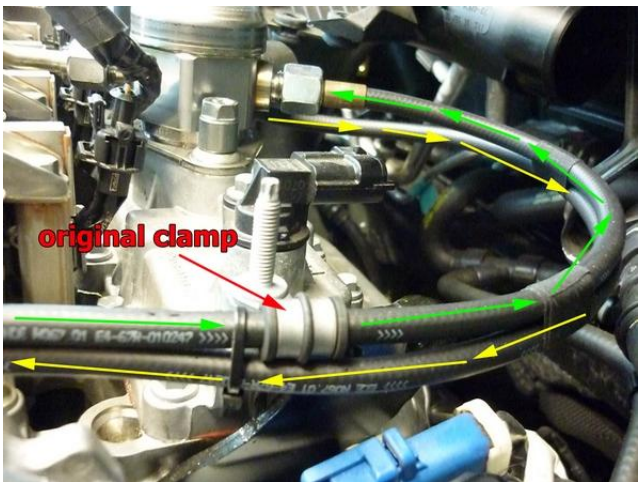


(1st gen. units on pictures, install 2nd gen. units)



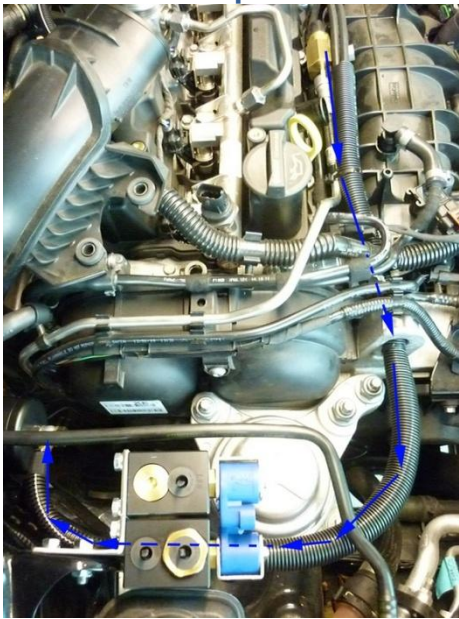
Connection of the fuel hose to the boost pump.

Connect the fuel hoses to the boost pump.

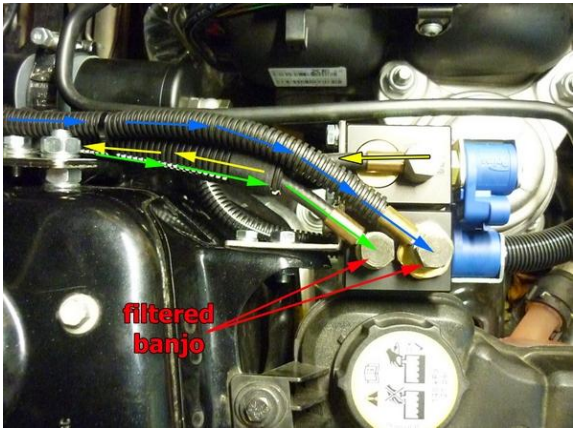


Connection of the petrol fuel hose to the boost pump.

Blue : petrol

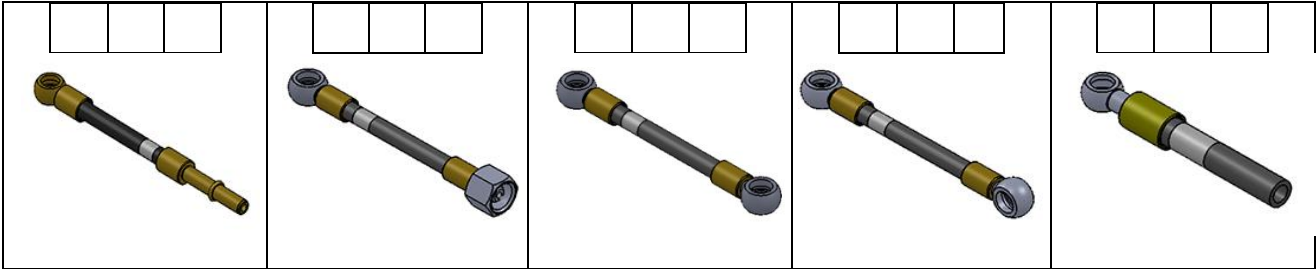


Filter banjo bolt

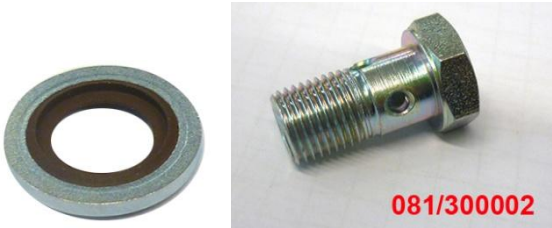


LPG / petrol fuel lines

	Hose	from	to	Length (cm)
1	XD	Adapter original petrol hose	Petrol boost pump	90cm
2	XD	Fuel supply unit	High pressure petrol pump	115cm
3	XD	Petrol boost pump	Fuel supply unit	25cm
4	XD	Fuel return unit	High pressure petrol pump	125cm



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

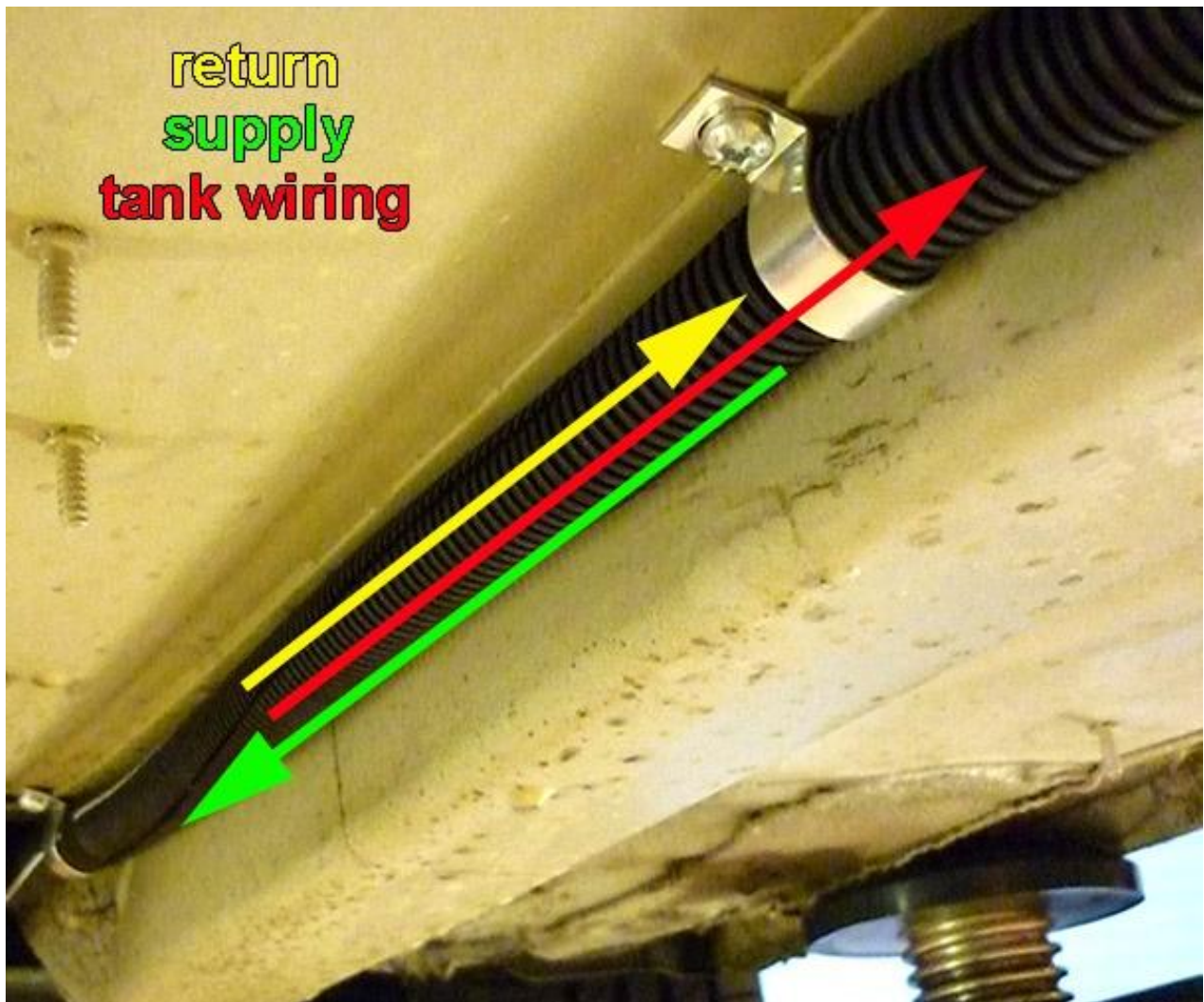


Filtered banjo: (FSU supply inlets / boost pump inlet / HPP pump inlet : black filtered banjo) :



Supply hose – Return hose – Tank wiring

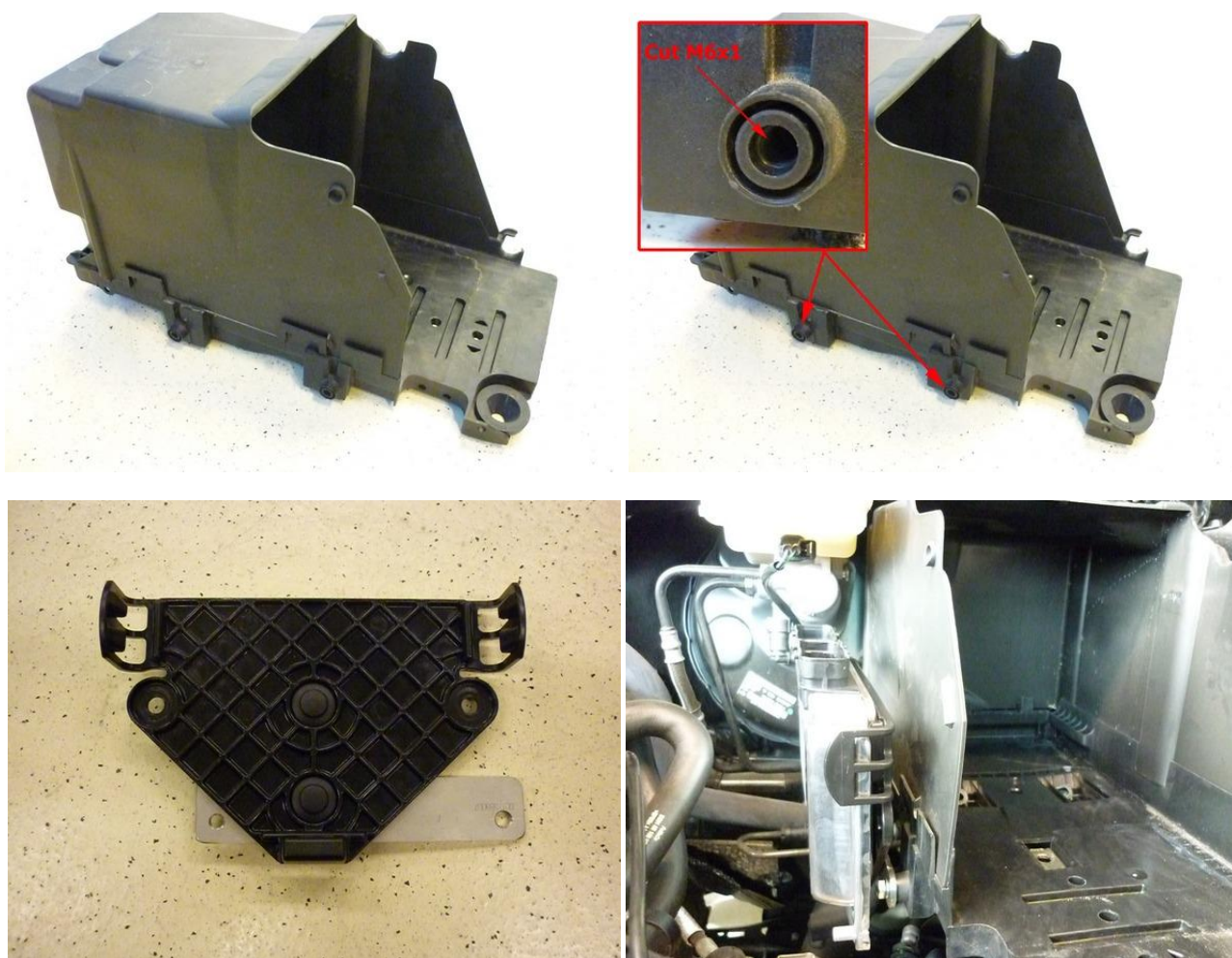
Protect the supply- and return hose together with tank-wiring using the Ø16 split tube. Mount the “hose assembly “ with clamps, with a maximum distance of 40cm.



Demo photo

Mounting the AFC-2.1

Remove battery box

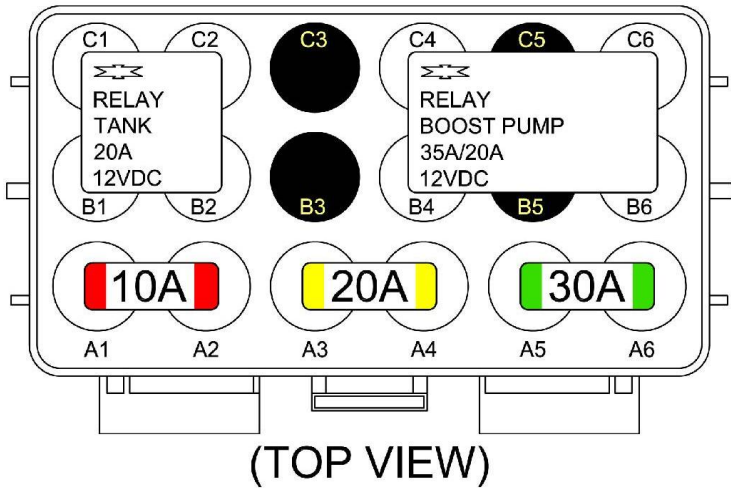


Bolt on the bracket with M6x20 and spring washers

Mounting the fuse / relay box



Install fuse box near the battery with brackets



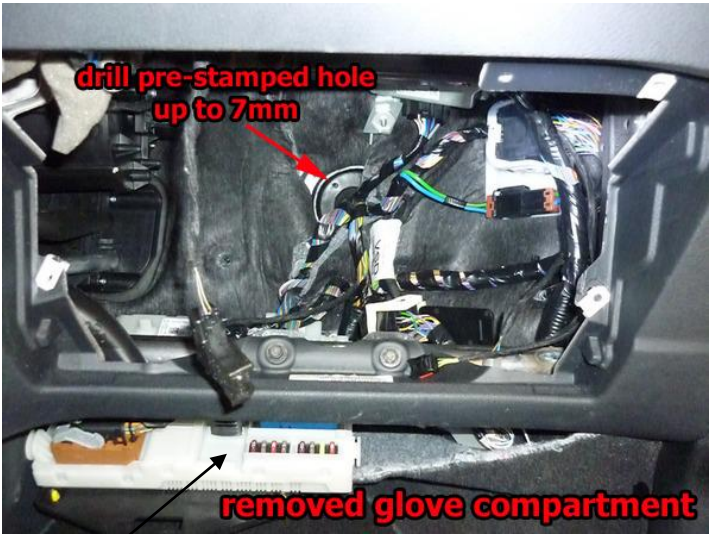
Wiring AFC



Wiring inside



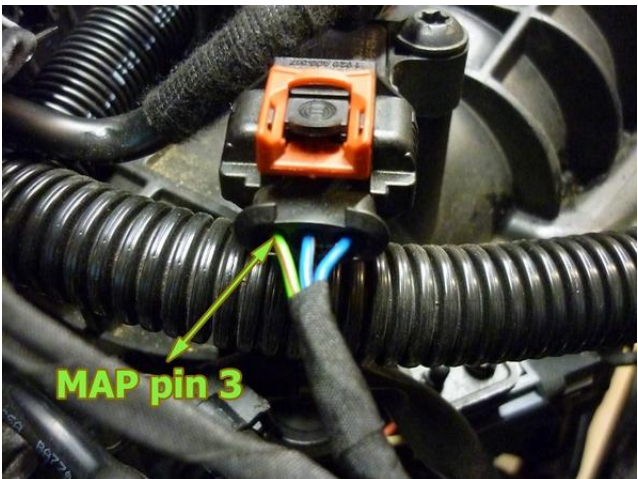
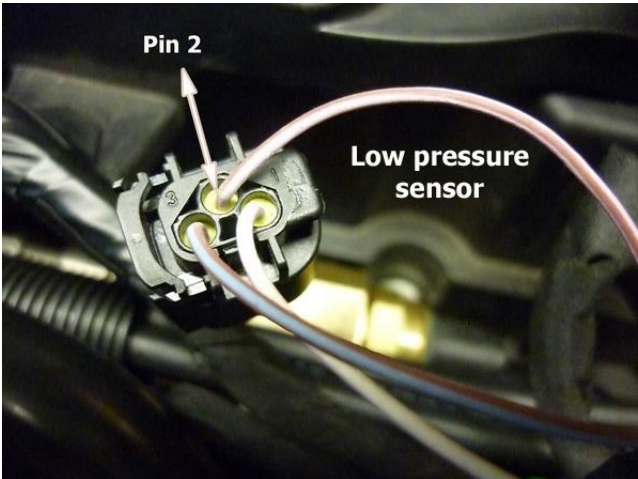
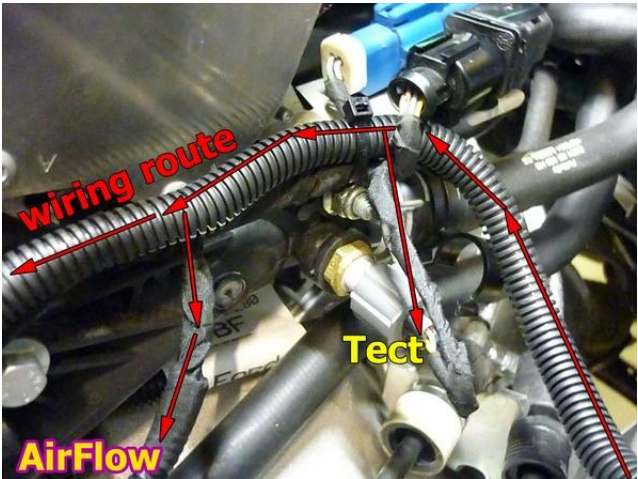
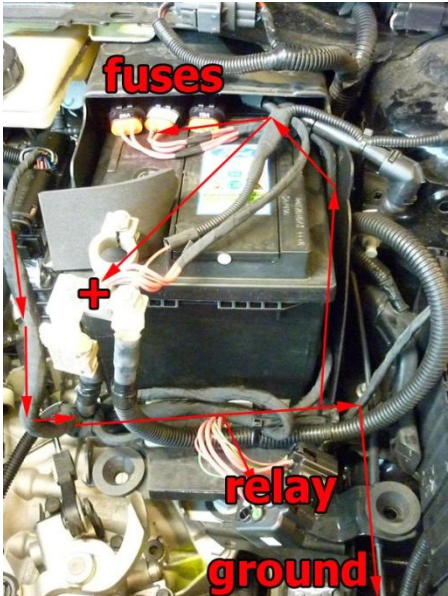
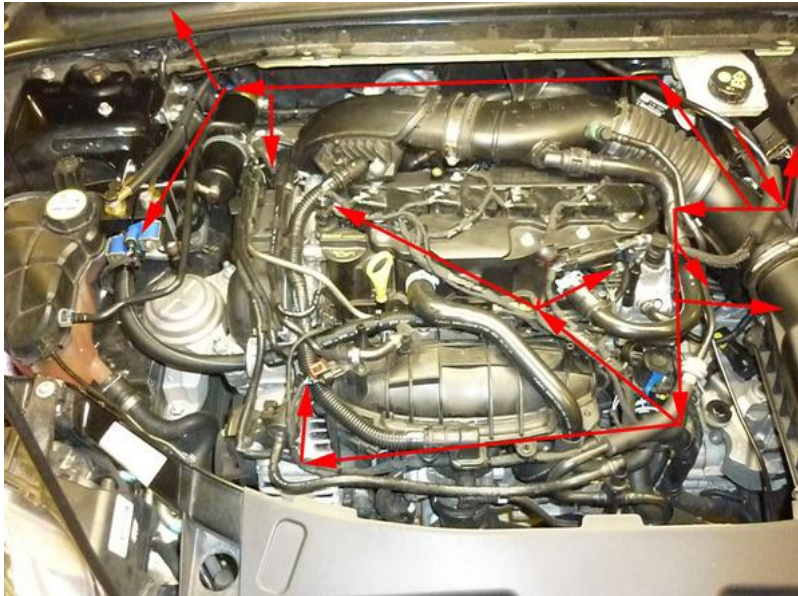
Switch / CAN / 56 Digital input 2 PWM / 40 wake-up



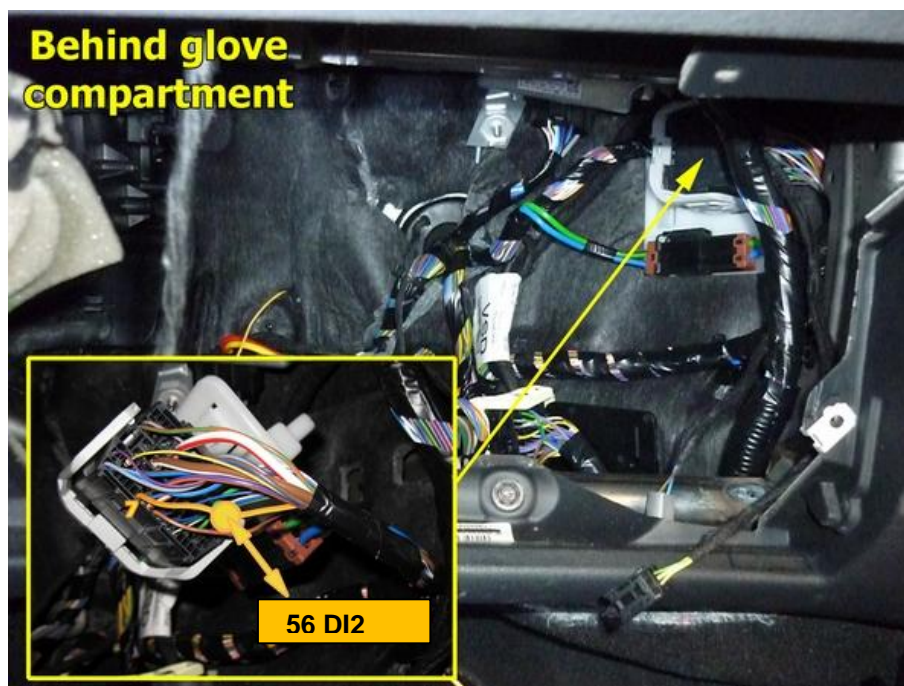
BCM



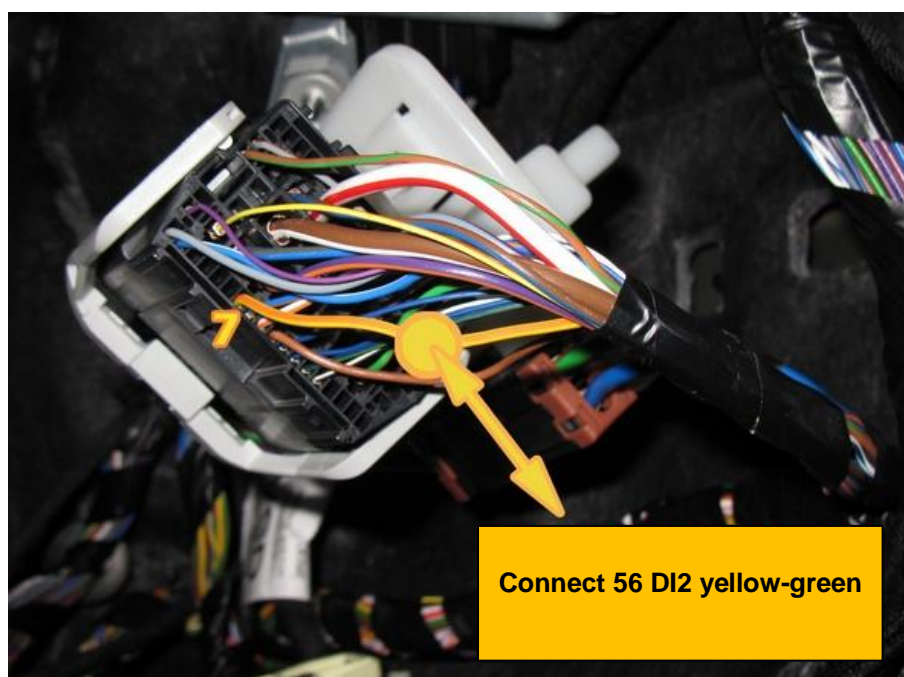
Wiring routing



PWM petrol tank connection



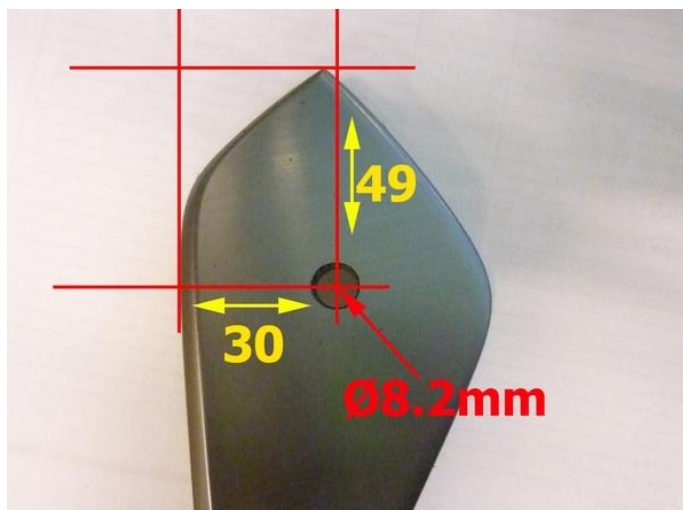
Pin 7, PWM wire





Mount the switch, drill Ø8,2mm.

Mounting the fuel selection switch



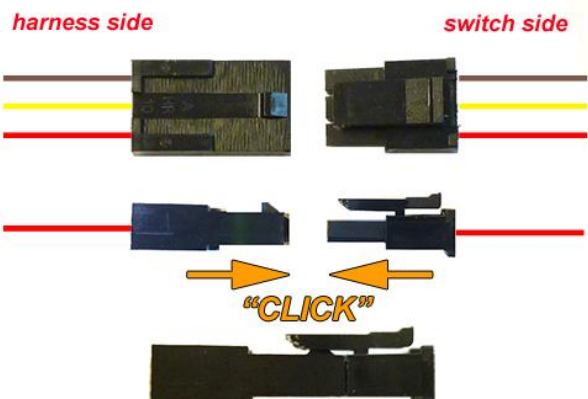
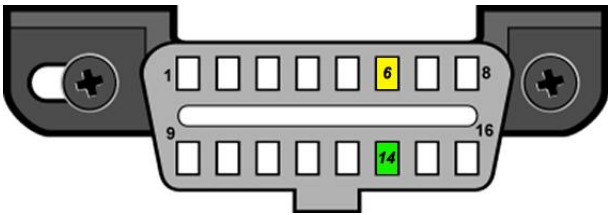

Not used wires
Insulate:

Wire number / code	Wire colour	Connection
22 LSS 1	Purple-white	
42 Digital out pull up 2	Red-purple	
58 +12V switched	Red-white	
20 AD 3	Blue-pink	
19 AD 4	Blue	
21 AD 9	Blue-purple	
74 DAC 3	Green-pink	

Electrical connections

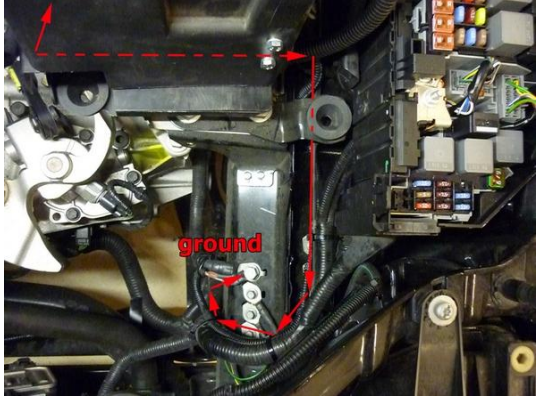

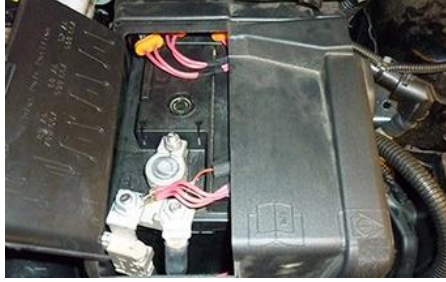
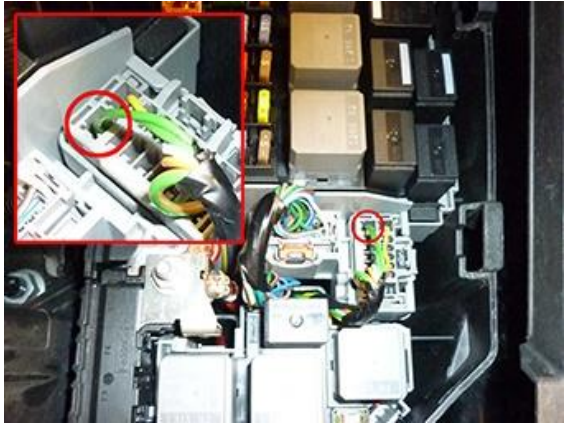
WIRING INSIDE

Driver room

Wire number / code		Wire colour	Connection
3-pole micro connector			
66	Ground fuel switch	Brown-black	Connect the 3-pole connector to the Prins fuel selection switch.
3	+12V fuel switch	Red-white	
49	LIN fuel switch	Yellow	
			
51	CAN-High	Yellow	EOBD connector pin 6
70	CAN-Low	Green	EOBD connector pin 14
			
40	Wake-up	Grey-red	<p>High pressure petrol sensor 5Volt supply / car wake-up</p> <p>Wire colour : blue-grey</p> <p>Wire location : under glove compartment, blue connector.</p> 
56	DI 2	Yellow-green	<p>Digital Input 2, OEM petrol pump driver, PWM IN</p> <p>Wire colour : yellow-orange, pin 7</p> <p>Wire location : see chapter: PWM petrol tank connection</p>

Electrical connections

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

<p>1-32 MAIN GND ecu MAIN GROUND SENSE</p>	<p>Brown</p>	<p>Connect to the '-' of the battery (-31) ; use a ring terminal.</p>  
<p>4 – 13 +12V BATT sense +12V BATT fused +12V BATT boost pump +12V BATT pump driver</p>	<p>Red</p>	<p>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.</p> 
<p>7 +12V IGNITION</p>	<p>Grey - white</p>	<p>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 : double green wires Wire location : fuse box</p> 

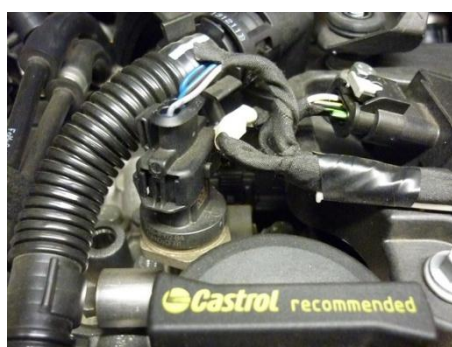
Electrical connections

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

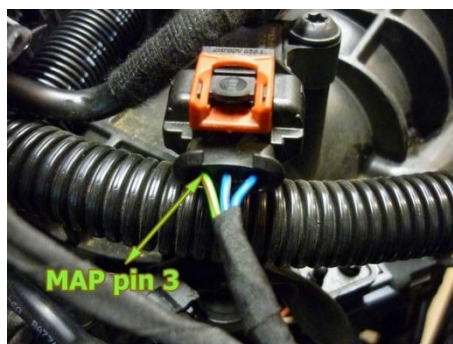
Wire number / code	Wire colour	Connection
36&25		High pressure petrol sensor signal interruption Wire colour :blue-brown, pin 2 Wire location : 3-pole connector, petrol pressure sensor. right side rail
36 AD 6	Blue-brown	Sensor side
25 DAC 1	Green-white	Petrol ecu side

63 Ground Shift	Blue-orange	High pressure petrol sensor ground Wire colour :green-purple, pin 1 Wire location : 3-pole connector, petrol pressure sensor. right side rail
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61 DI 4	Yellow-blue	Digital Input 4, 5Volt High pressure petrol sensor signal Wire colour : grey, pin 3 Wire location : 3-pole connector, petrol pressure sensor. right side rail
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18 AD 1	Blue-white	Analog in (sensor side) MAP sensor in Wire colour : yellow, pin 3 Wire location : intake manifold, MAP sensor
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Electrical connections

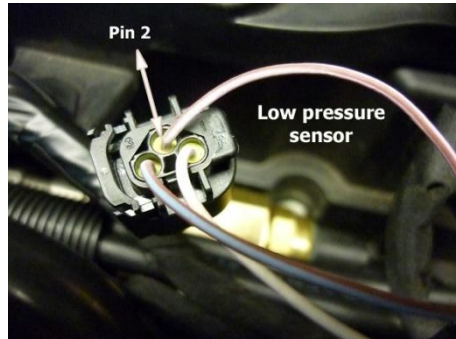
Check and measure the wiring in case of changes in the cars wiring colours.

Wire number / code	Wire colour	Connection
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15 T-ect	Grey	For measuring the engine coolant temperature. Wire colour : yellow Wire location : coolant sensor, left side cylinder head.
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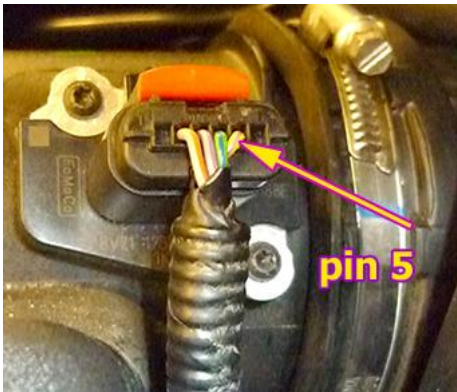


17&10		<i>Low pressure petrol sensor signal interruption</i> Wire colour : Pink-brown, pin 2 Wire location : Low petrol pressure sensor in Prins adaptor.
17 AD 2	Blue-green	<i>Analog in (sensor side, LOW pressure in / Boost in)</i> Sensor side
10 DAC 2	Green	<i>Simulation, analog out (ecu side, LOW pressure out / Boost out)</i> ECU side



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

23 & 60			Interrupt the MAF, Airflow, sensor signal wire. Wire colour :blue-green, pin 5 Wire location : Air filter box, MAF, airflow sensor.
23	LSS2	Purple-green	ECU side
60	Digital input 3	Yellow-pink	Sensor side



8	RPM engine speed	Purple-white	For measuring the engine speed signal. Wire colour :brown-blue Wire location : cam sensor, left side engine, pin 2
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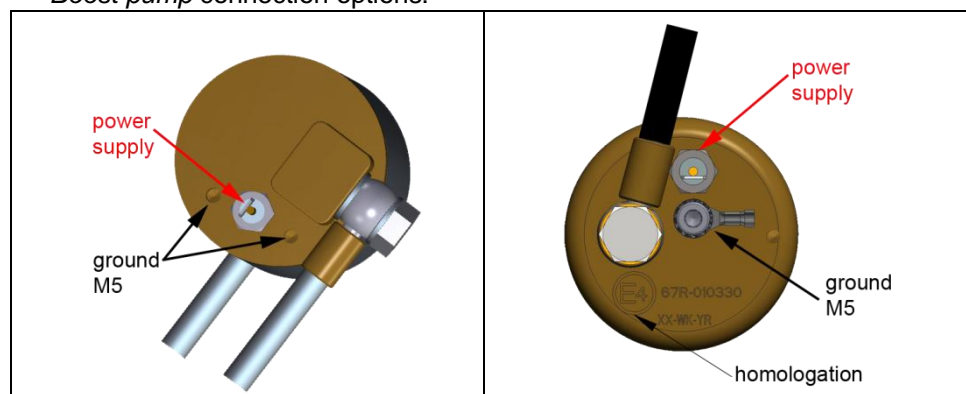
Electrical connections

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

Engine room

Wire number / code	Wire colour	Connection
<i>3-pole connector</i>		
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
<i>2-pole connector FSU, black</i>		
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
<i>2-pole connector FRU, grey</i>		
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
<i>4-pole diagnose connector</i>		
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
<i>Boost pump relay</i>		
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
<i>Wiring tank pump driver relay</i>		
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:

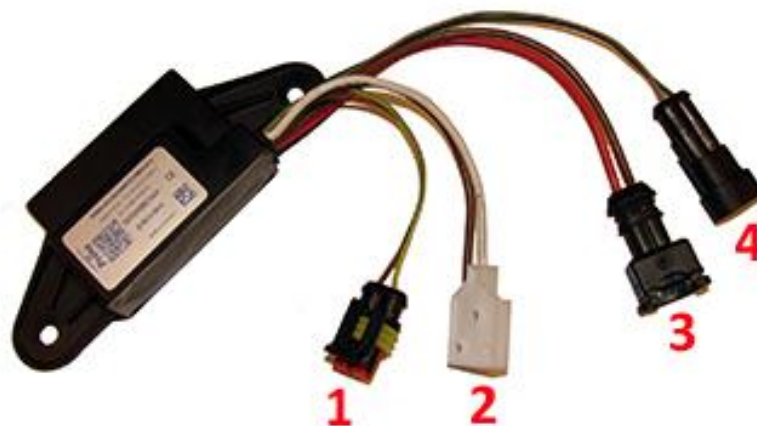


Electrical connections

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.