ALTERNATIVE FUEL SYSTEMS

Prins

installation manual
Engine Kit
part 2/2

MANUFACTURER	FORD
TYPE	FOCUS / Transit Connect II
ENGINE DISPLACEMENT	999cc
NUMBER OF VALVES	12
ENGINE CODE / NUMBER	M1DA-D - 92kW // **M2DA-D - 74kW** // M2GA - 92kW
VEHICLE CATEGORIES	M1
TRANSMISSION	MT
AFC VERSION	**AFC-2.1**
PETROL ECU MANUFACTURER / CODE	Bosch FoMoCo xxxx-12A650-xx / xxxx-12B684-xxx
HIGH PRESSURE PETROL PUMP	Bosch HDP-5-PE BM5G 0261.520.(094)(095) Type 12
HIGH PRESSURE PETROL INJECTOR	Bosch HDEV-5-1LE 0261.500.
MODEL YEAR:	10-2014
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000009 DLM-LPG 02
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	347/070210001/A // **347/070210011/A** // 347/070310011/A
MANUAL NUMBER	076/0706900
DATE	18-4-2017
	Version 27-5-2015 D

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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 Gen3 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.
- When working on the car, beware of moving and rotating parts in the engine compartment (even when the engine is not running !!).
- 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 debris has been removed (especially when mounting an exterior filler into body work).
- After having completed the installation, check the whole system for LPG leakage; use a gas 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’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.

Register the system (with warranty card) on the Prins warranty portal within 14 days after installation.

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)
- Portable light
- Assortment drill bits 4 to 12 mm
- Forstner Ø32 drill
- Assortment cutters Portable drill or pneumatic drill
- 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

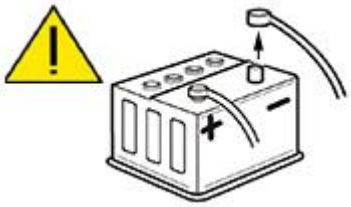
- Check the vehicle drivability on petrol
- Check the fuel system for error codes (scan tool)
- Check if the catalytic converter is in good condition (exhaust gas analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)

Tightening moments

		Nm	Spanner mm
M 5 x 0,8		6.5	8
M 6 x 1,0		11.3	10
M 8 x 1,25		27.3	13
M 10 x 1,5		54	15-16-17
Banjo bolt		10	14
Supply line connection tank		15	13
Fuel module Allen bolts tank		20	7
Filler hose connection tank		50	22
Boost pump M6 mounting bolts		10	10
FMU M6 mounting bolts		10	10
High pressure petrol fuel line		24-35	17
Quick release		20	19

EXPLANATION OF SYMBOLS :

= IMPORTANT, CAUTION

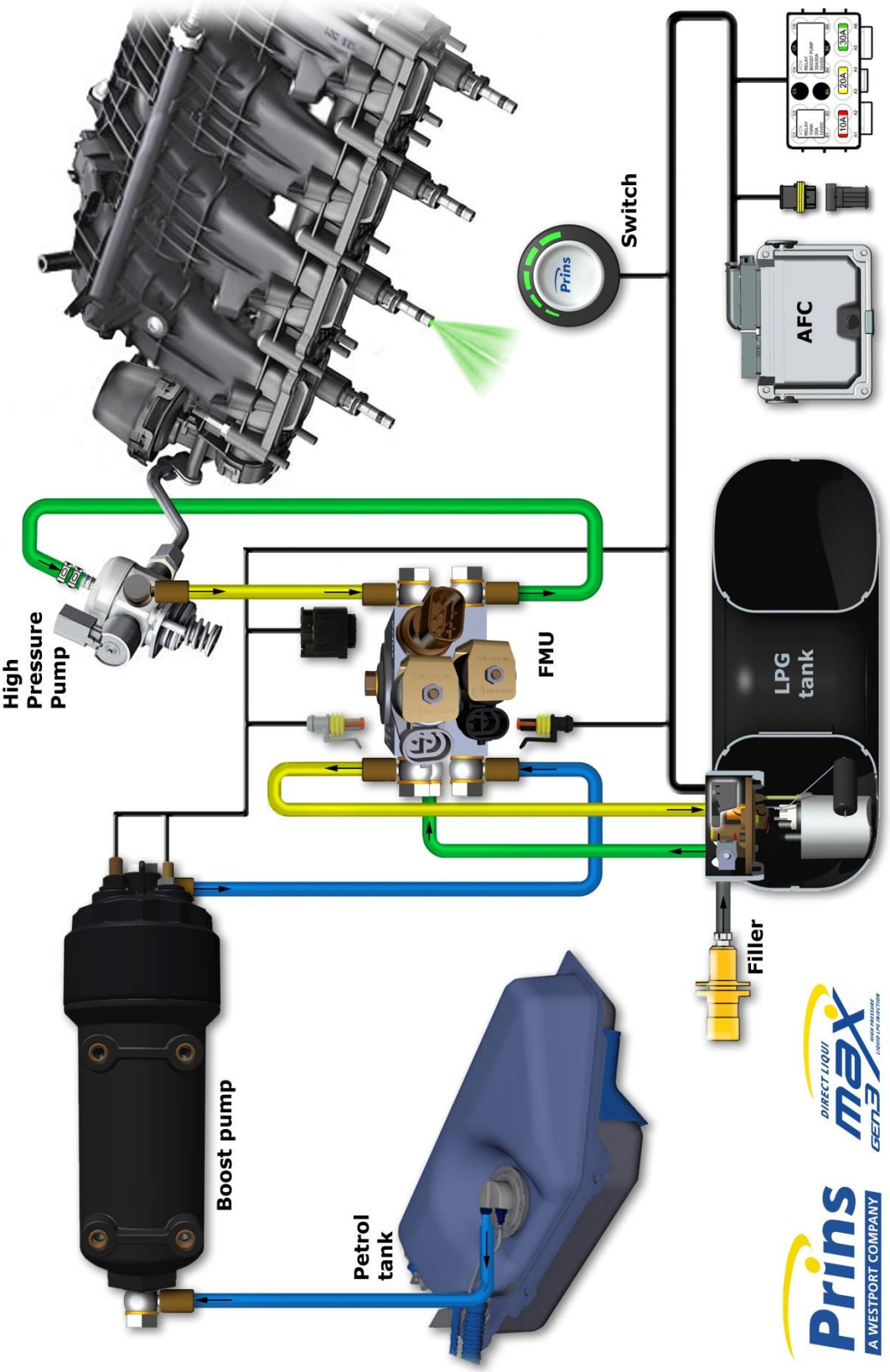


= WEAR SAFETY GOGGLES

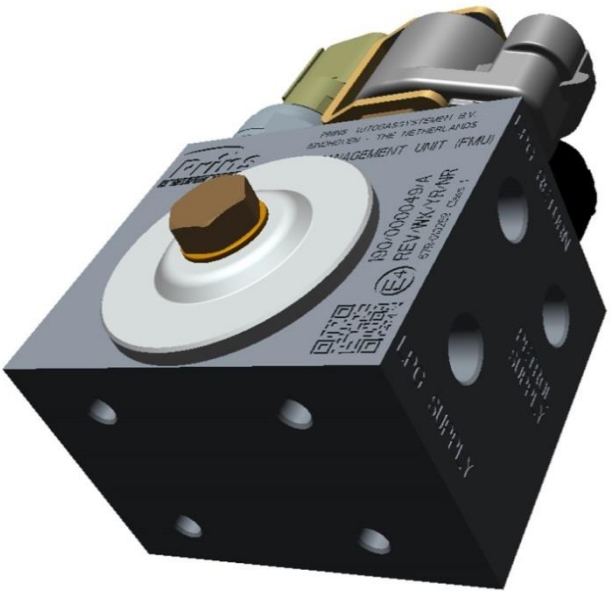
Direct LiquiMax parts / approval numbers

	
Fuel Management Unit : E4-67R-010269	Boost pump
	
Prins AFC: E4-67R-010098 E4-10R-030507	High Pressure Pump : E4-67R-010266 High Pressure Rail : E4-67R-010267 High Pressure Injectors : E4-67R-010309
	
	Fuel lines XD- series : E4-67R-010247

Overview DLM Direct Injection



Fuel Management Unit connections



Fuel Management Unit

Boost pump

DLM component location overview

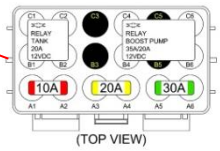
AFC

FMU

Boost pump

HPP pump

Fuse / relay box



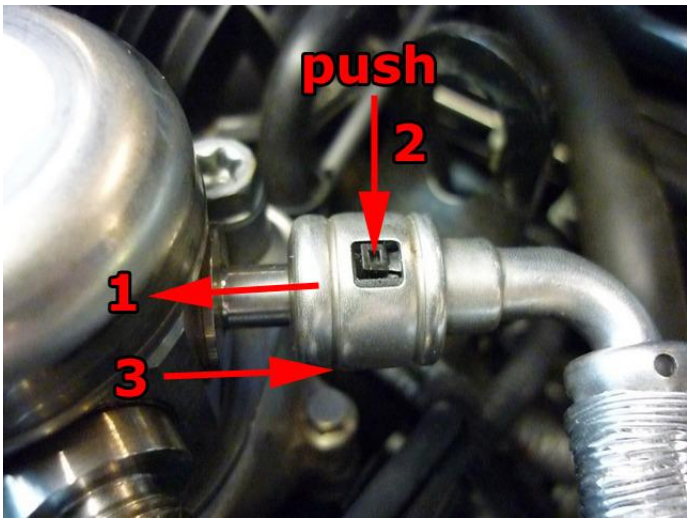
i.a. R115 approval sticker :
Right side centre door post

Preparation

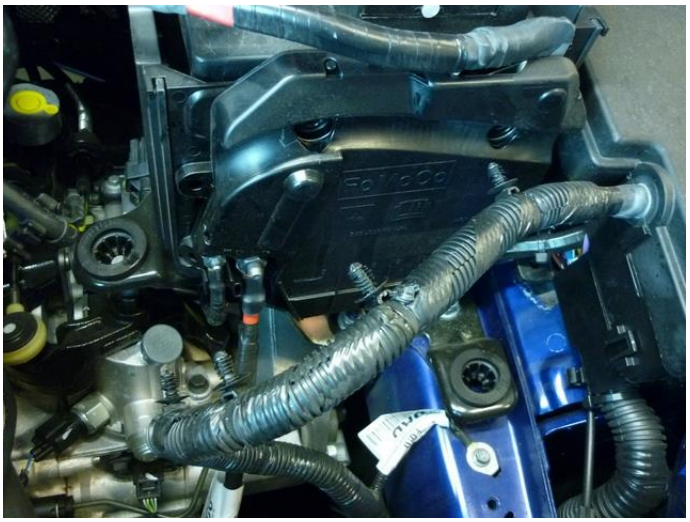
Remove air box with pipe / remove wipers and wiper box.

Preparation, remove wiper box

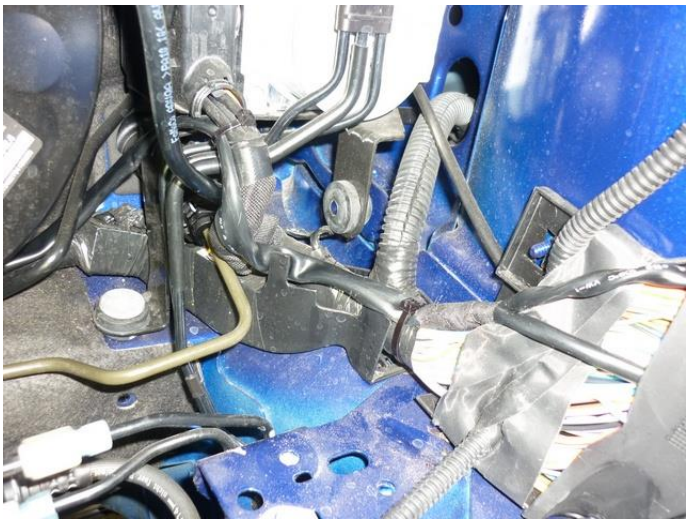
Fuel supply disconnection



Preparation



Remove battery and battery box.



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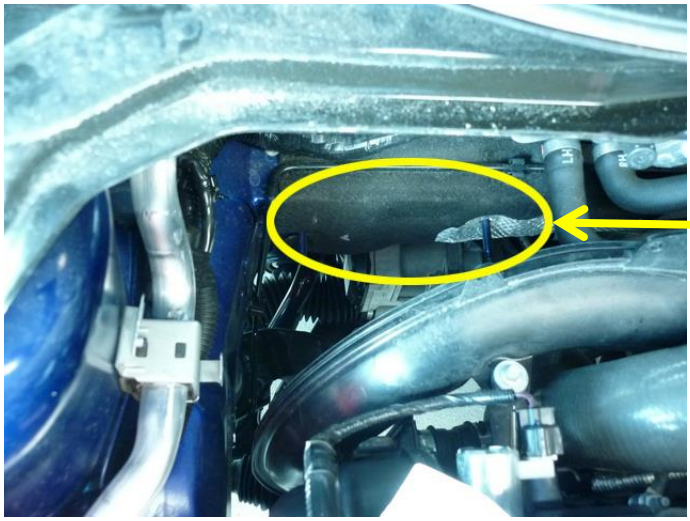
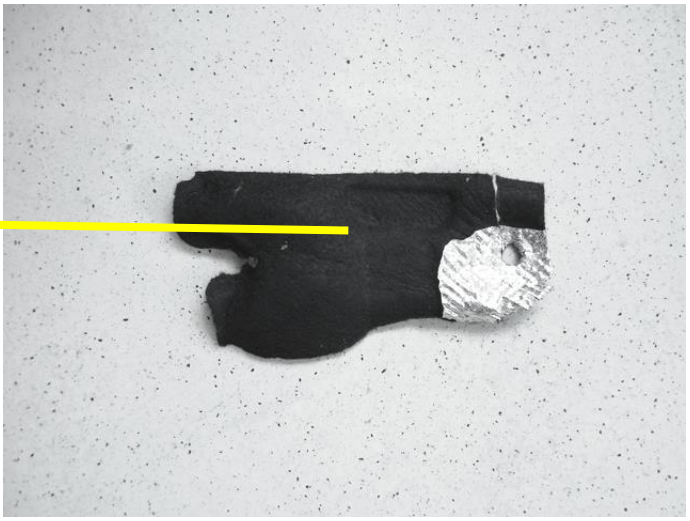
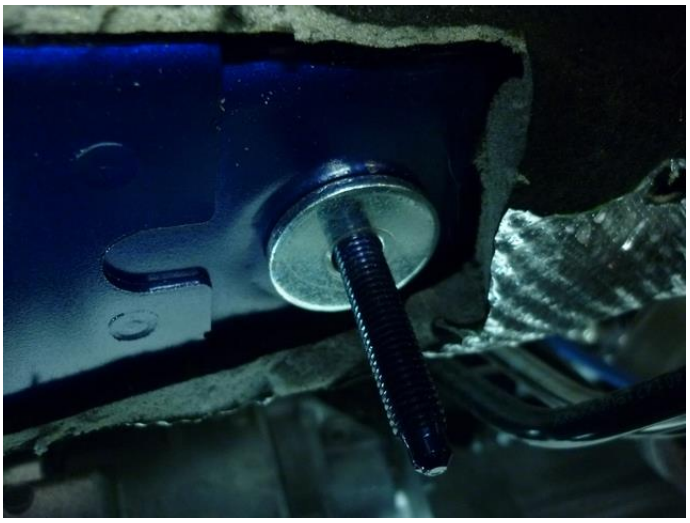


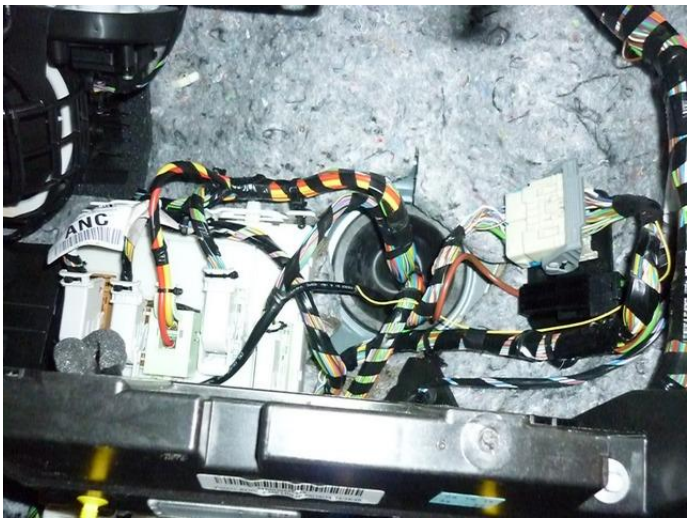


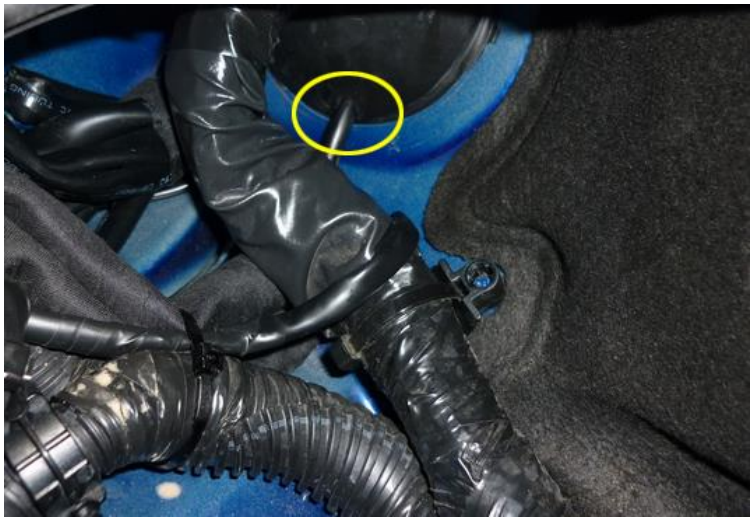
Cut away fabric.



Preparation

Remove glove compartment





Removal of the High Pressure Petrol Pump

-REMOVAL-

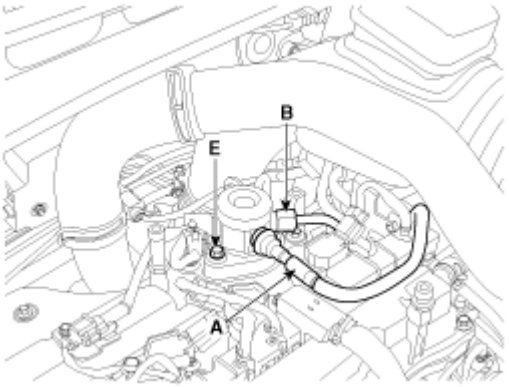
-WARNING-

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.
- 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.



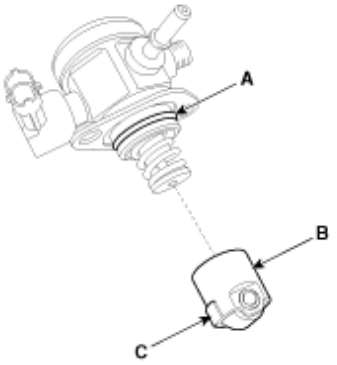
CAREFULLY store the removed petrol pump. Make sure no pollution can come into the pump.

Installation of the 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.

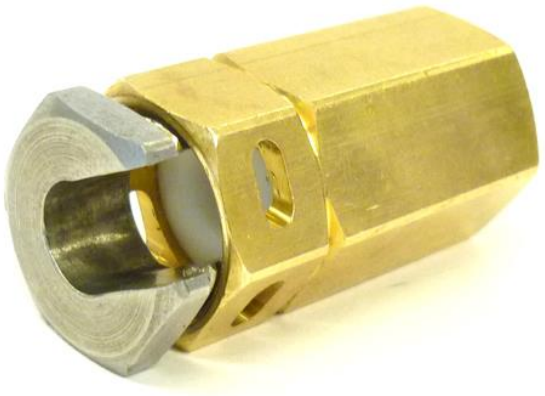


Installation bolts:
When tightening the installation bolts of the high pressure fuel pump, tighten and turn the bolts in small step (0.5 turns) after tightening them with hand-screwed torque.

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 Nm

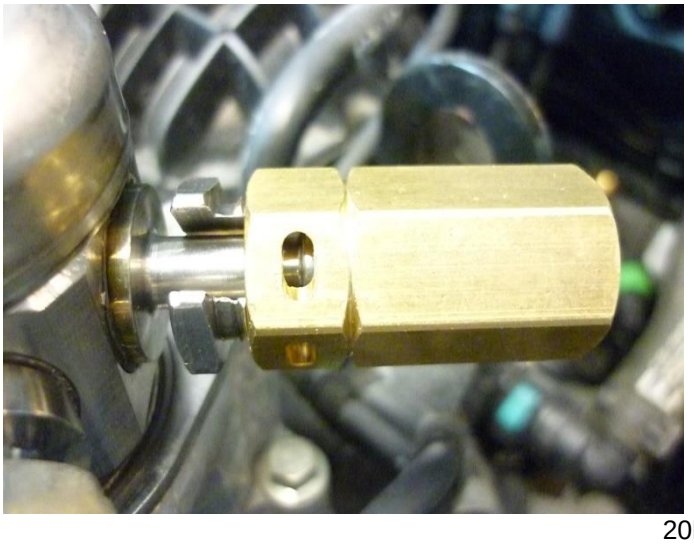
Installation is reverse of removal.

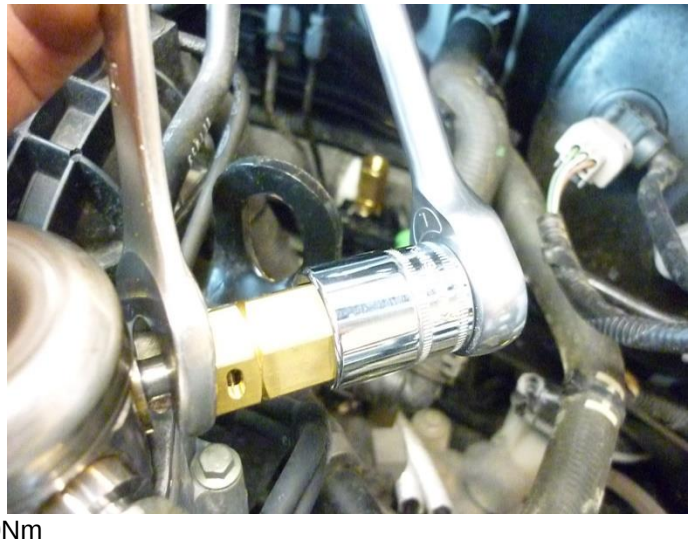
High pressure petrol pump Supply



No locking clip needed.

(example)

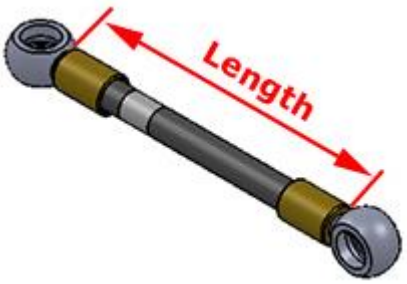




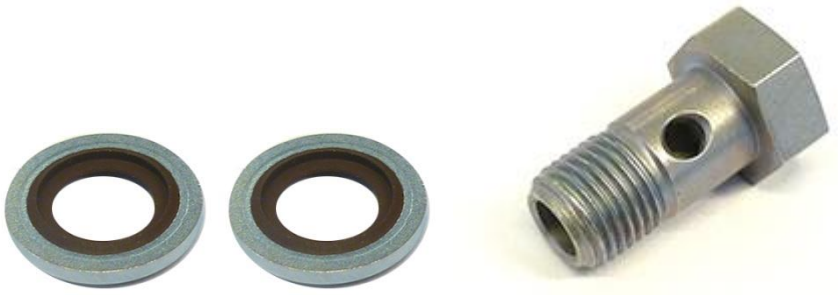
20Nm

LPG / petrol fuel lines

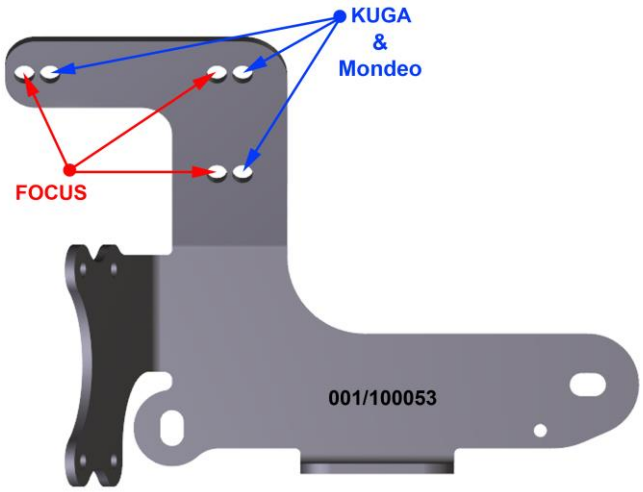
Hose		from	to	Length (cm)
1	XD-4 quick release	Adapter original petrol hose	Boost pump in	45
2	XD-3	Boost pump out	FMU petrol supply	20
3	XD-3	FMU HPP supply	High pressure pump	80
4	XD-3	FMU HPP return	High pressure pump	85
5	XD fuel supply line	FMU LPG supply	Tank	450
6	XD fuel return line	FMU LPG return	Tank	450

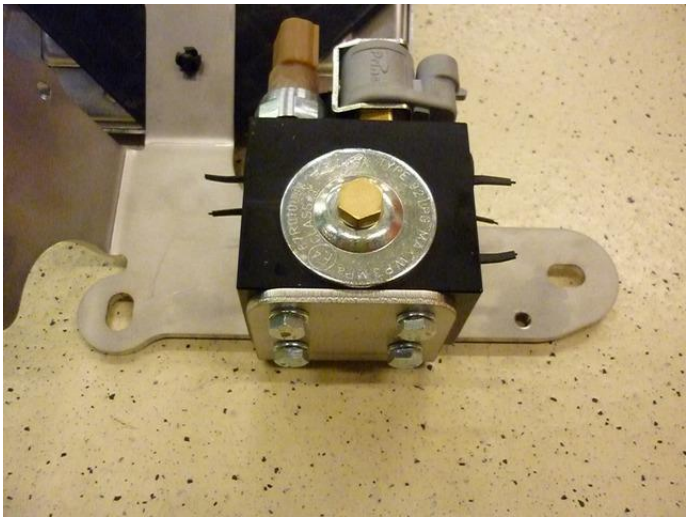


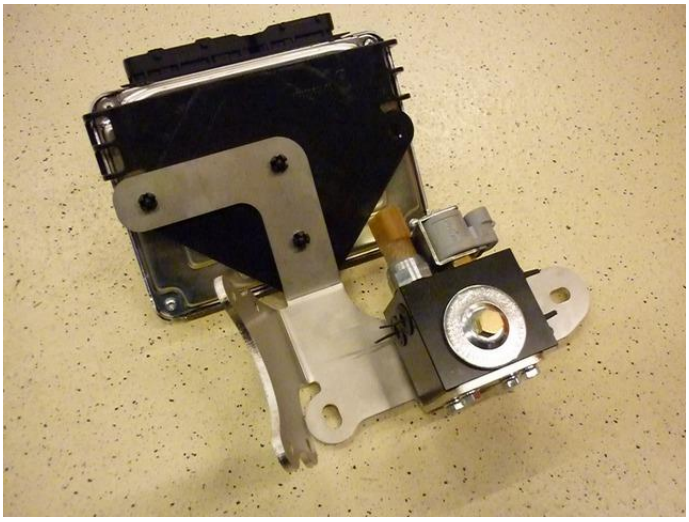
Install the fuel line using two bonded seal washers and banjo bolt :

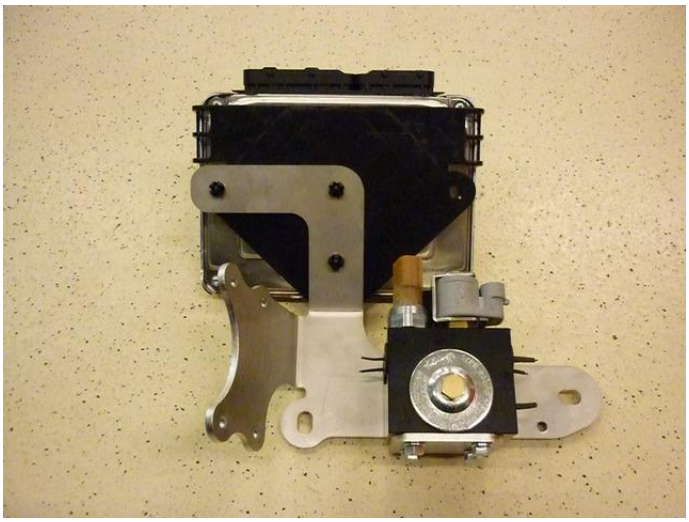


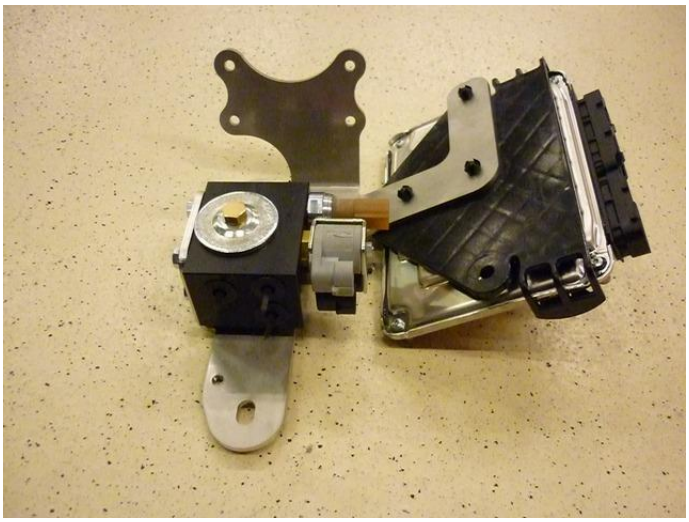
FMU / AFC assy



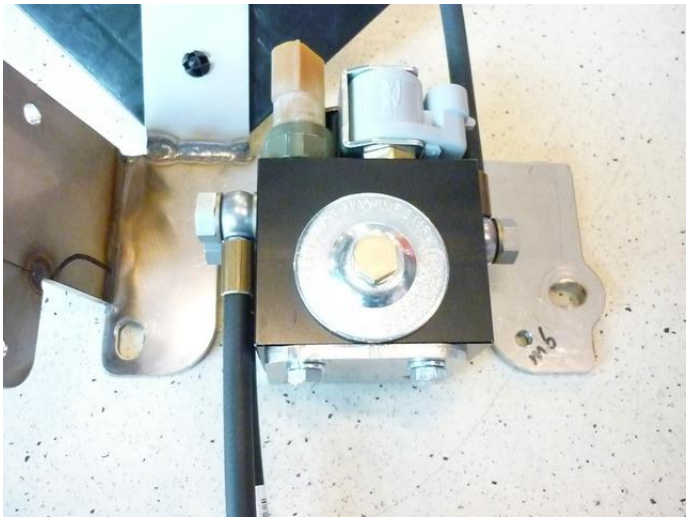




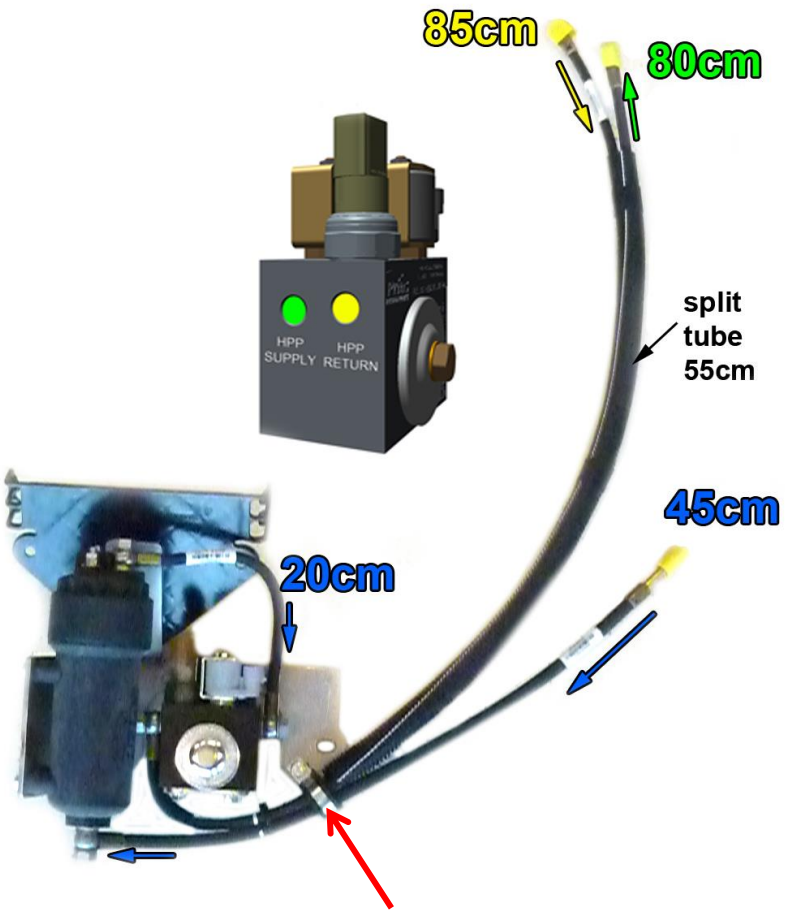




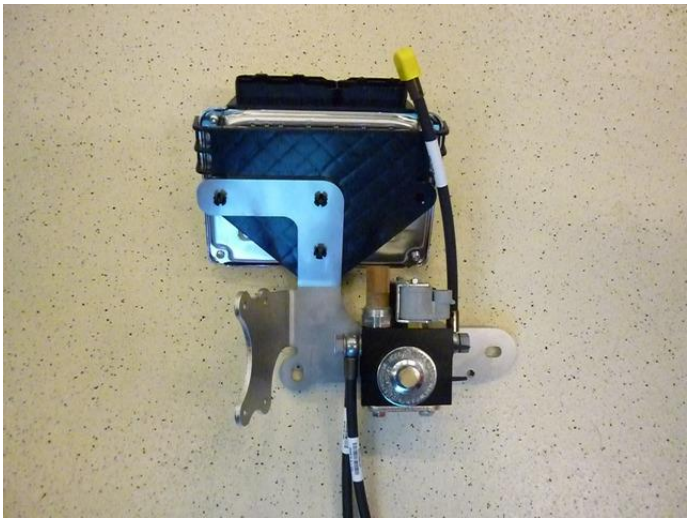
Assembly with boost pump



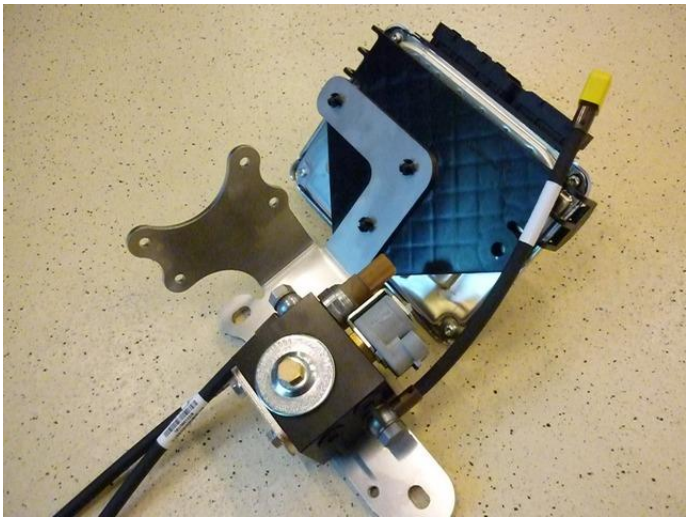
Assembly with boost pump

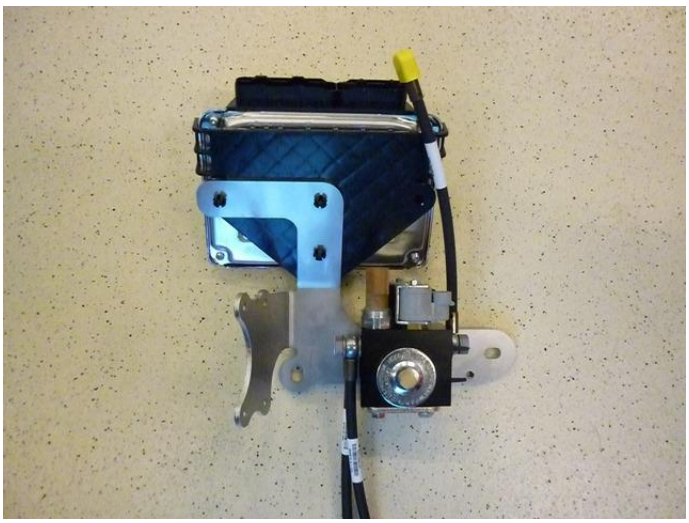


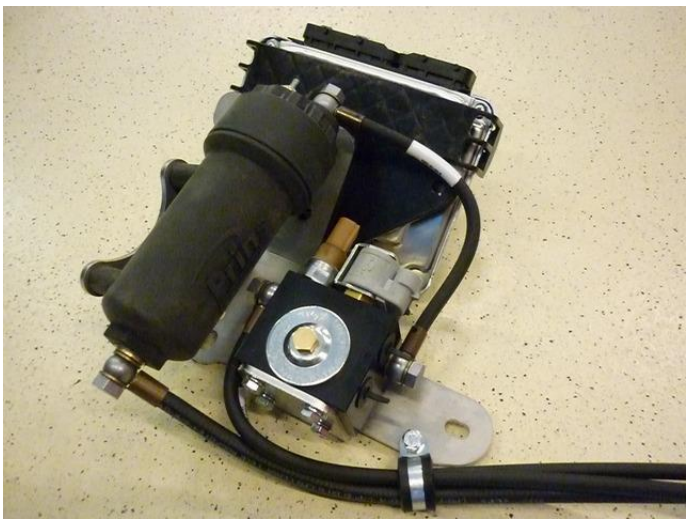
DO NOT USE THE CLAMP ON ECOBOOST 1.0 ASSEMBLY



Assembly with boost pump

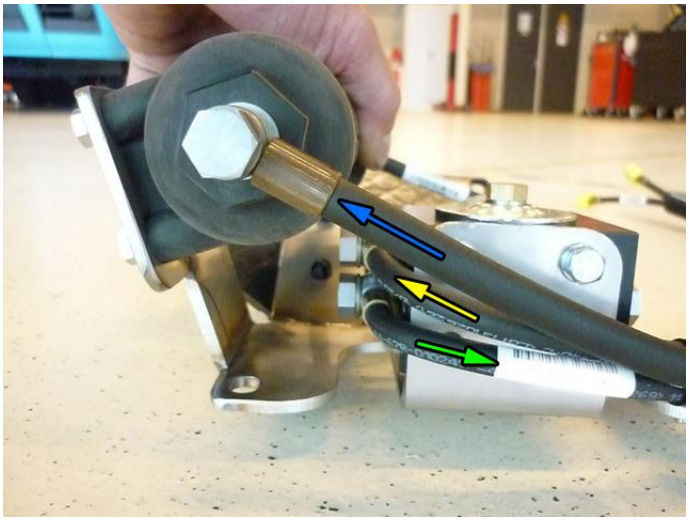






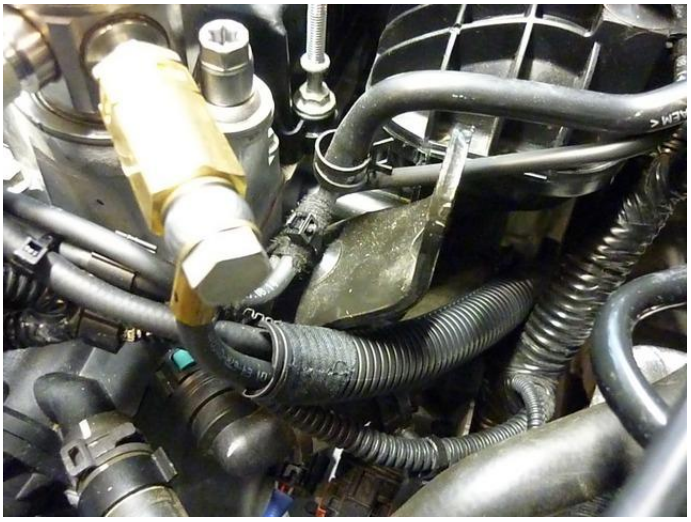
DO NOT USE THE CLAMP ON ECOBOOST 1.0 ASSEMBLY

Hose assembly with boost pump

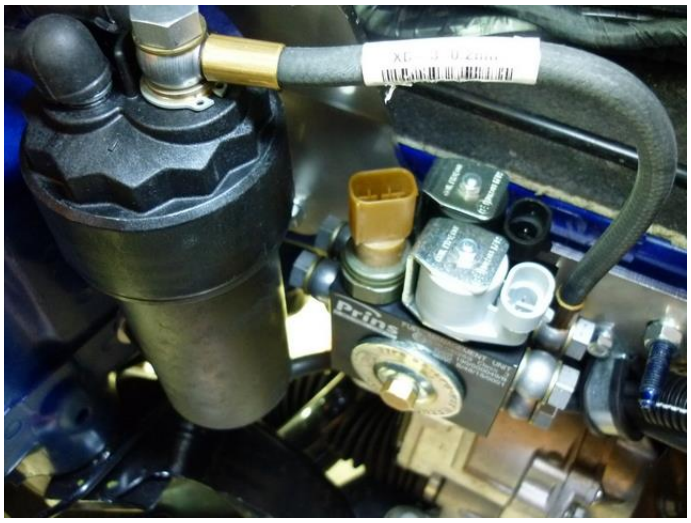


Assembly installation

Remove under engine cover.
Installation assembly from underneath the vehicle.

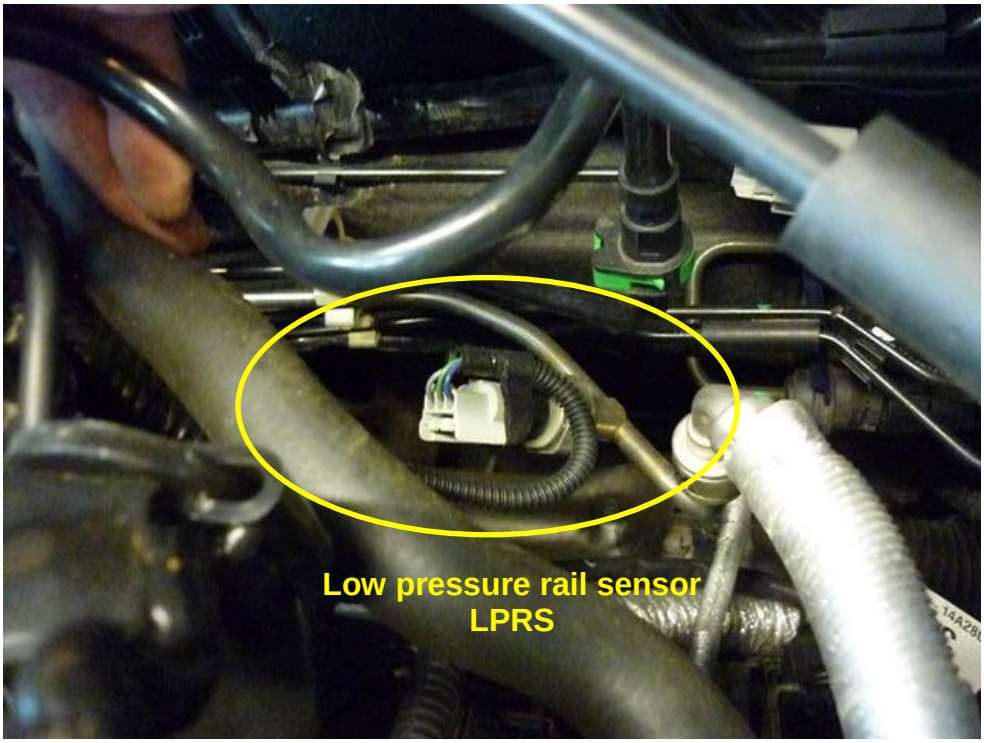


Assembly installation



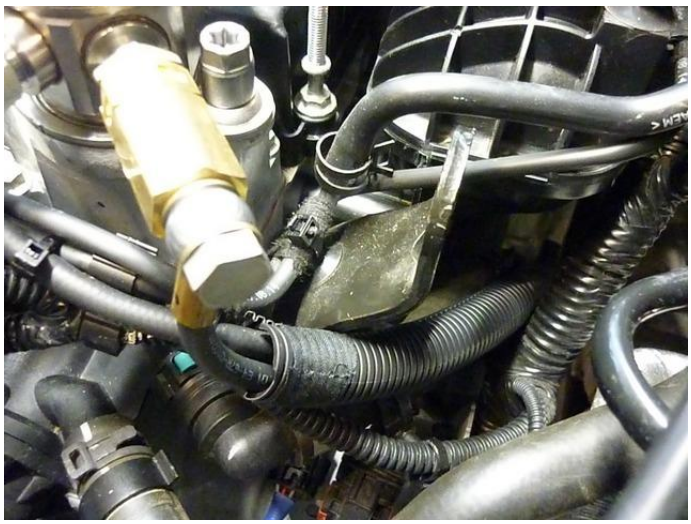
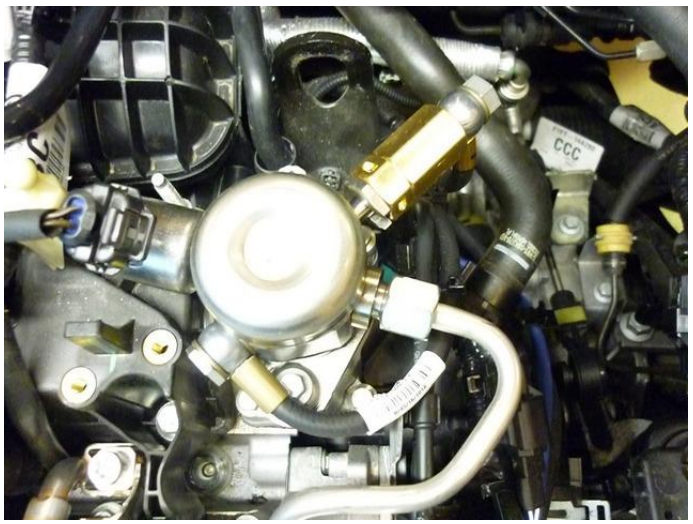
Original fuel line re-route

Connect to the XD-4 quick connection to boost pump



High pressure petrol pump installation Supply hose – Return hose – HPP Pump

Replace the original high pressure petrol pump for the adapted high pressure petrol pump

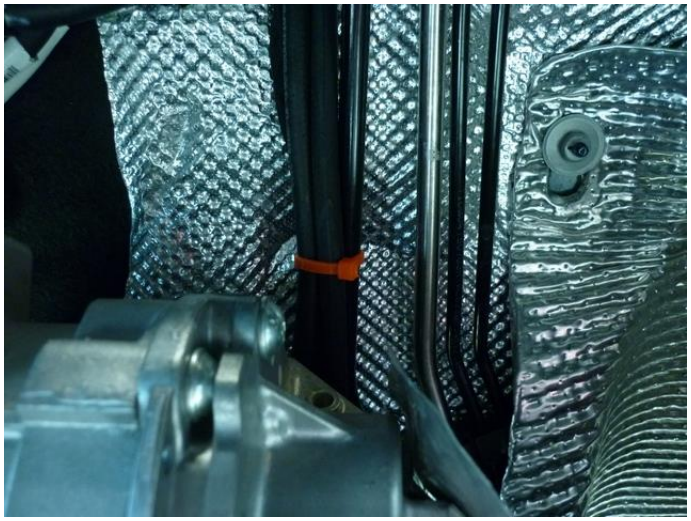



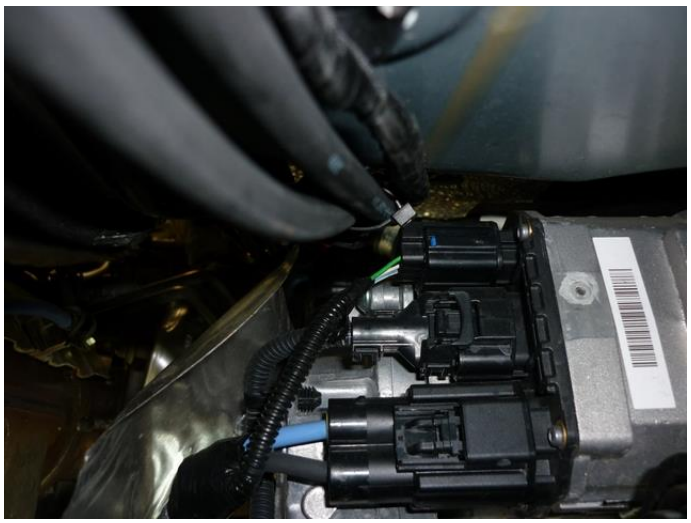


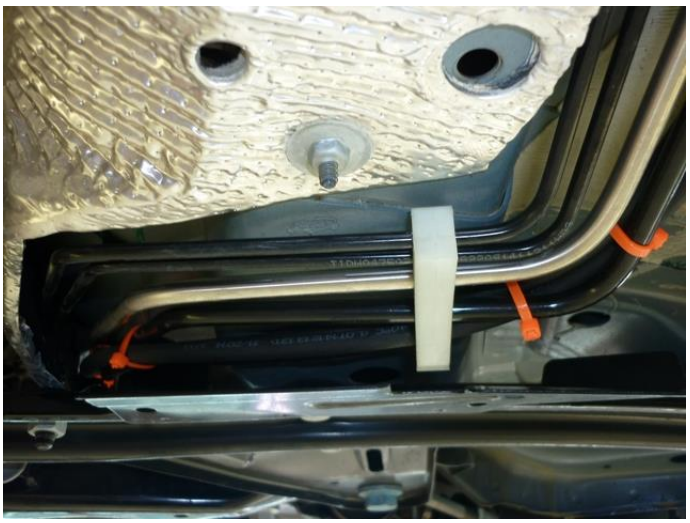
Mounting the fuse / relay box bracket

Tank fuel lines and wiring

Tank fuel lines and wiring

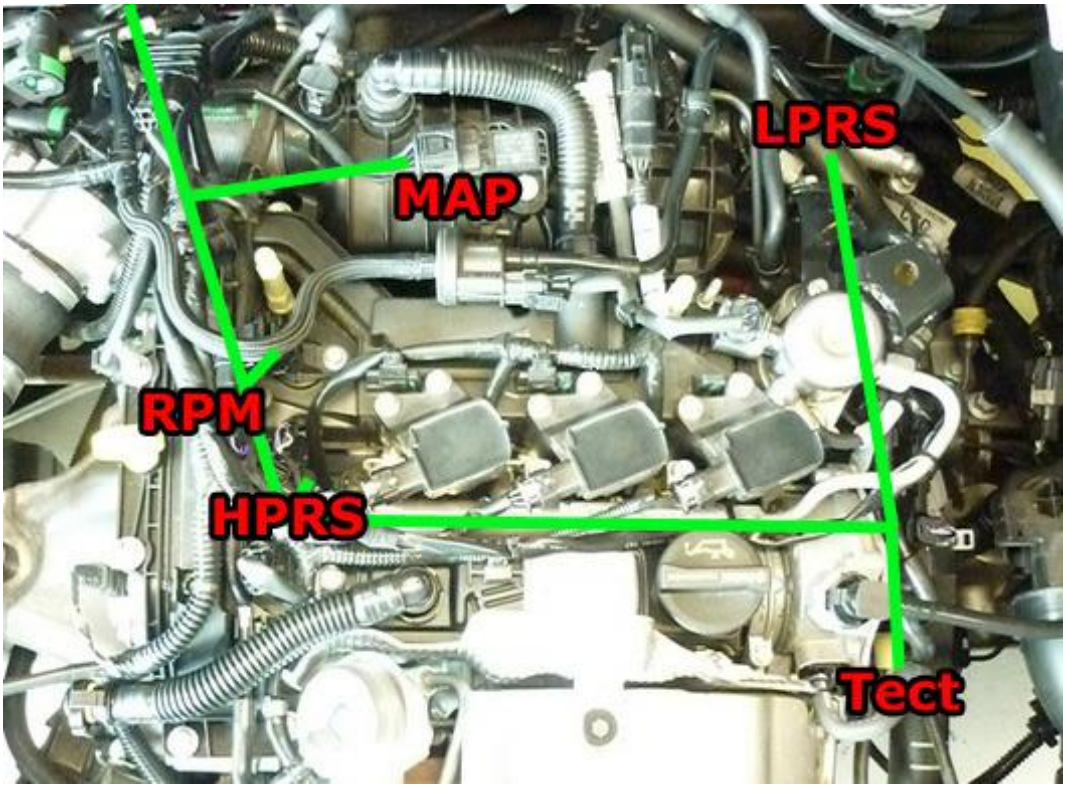






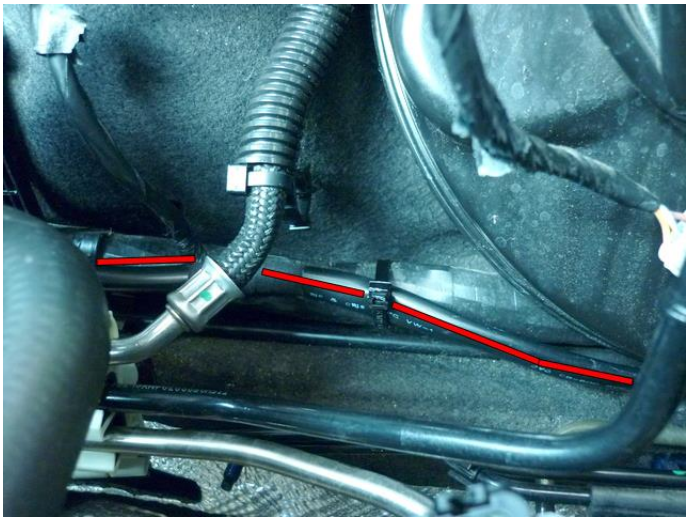
Tank fuel lines and wiring

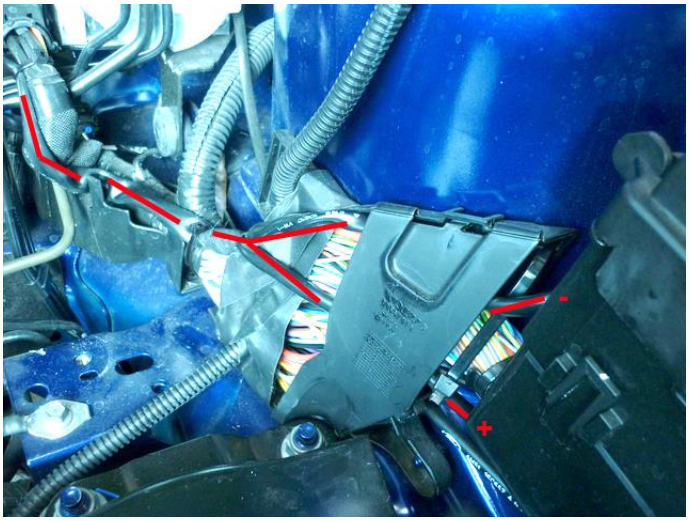
Wiring AFC

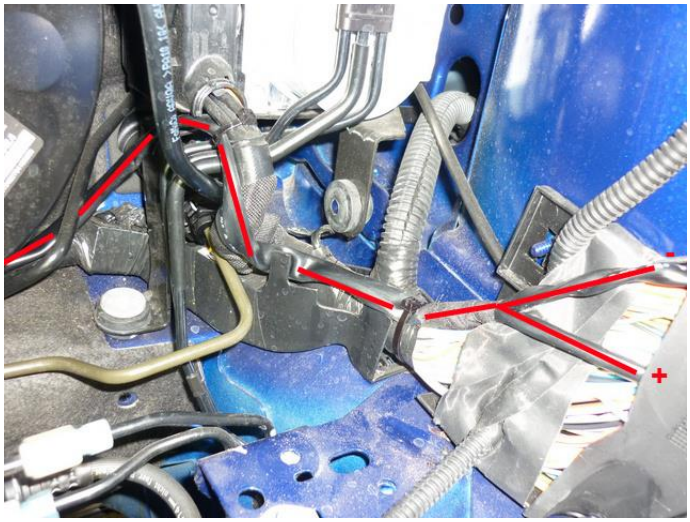


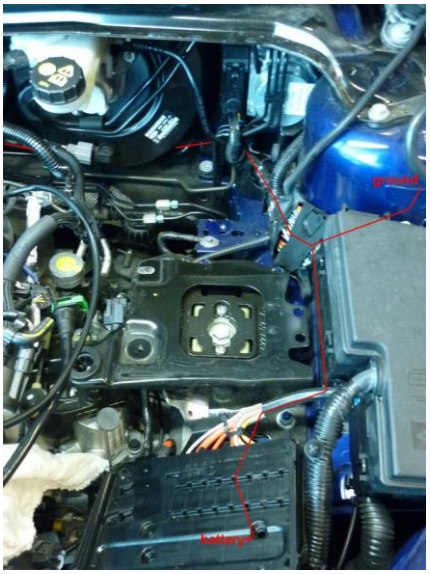
Wiring Boost pump / FMU

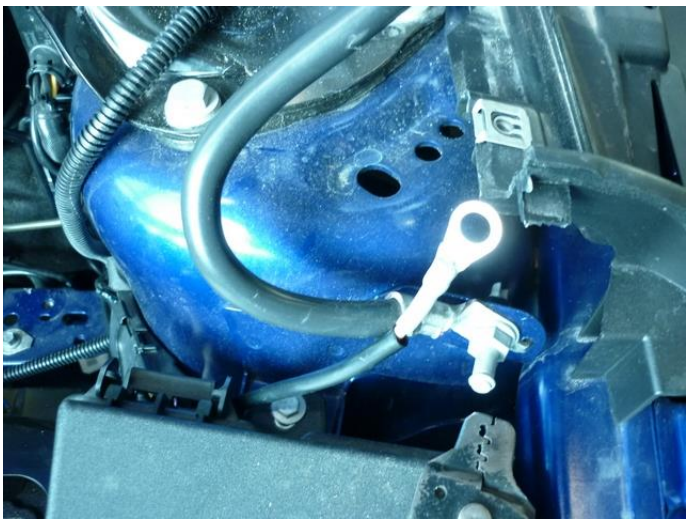
Wiring +12V Supply / Ground



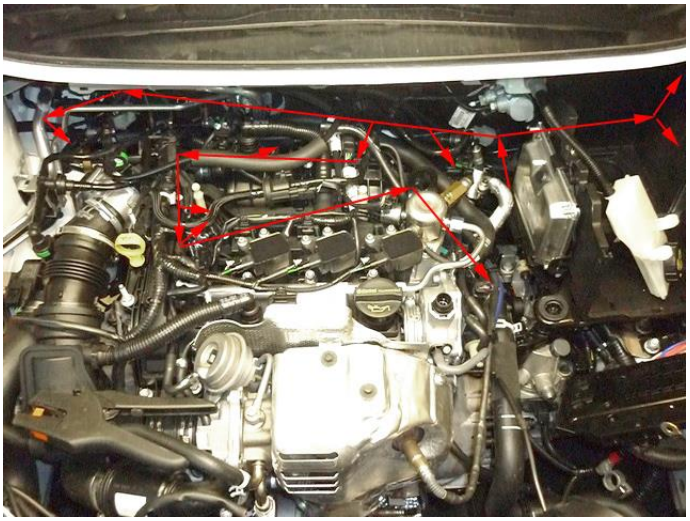


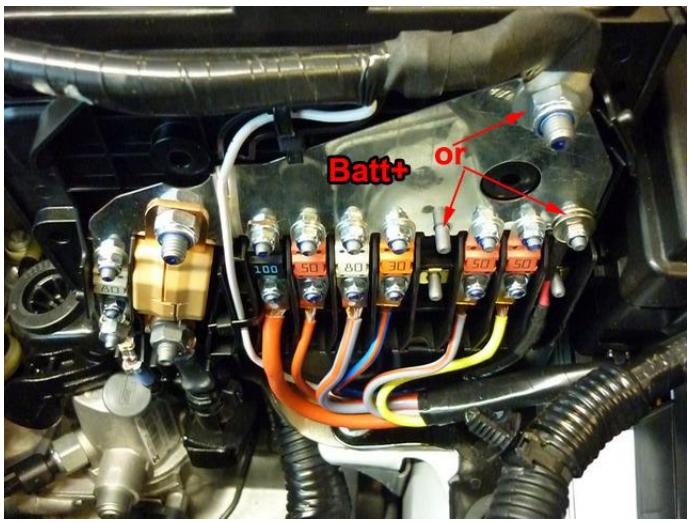


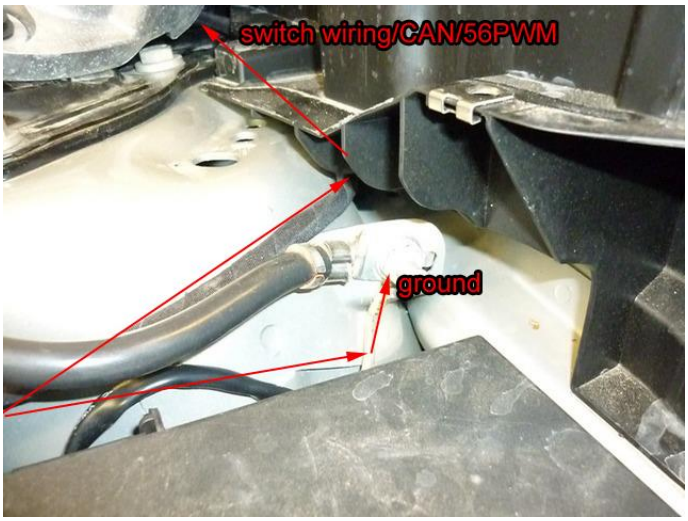




Wiring AFC-2.1 Transit Connect

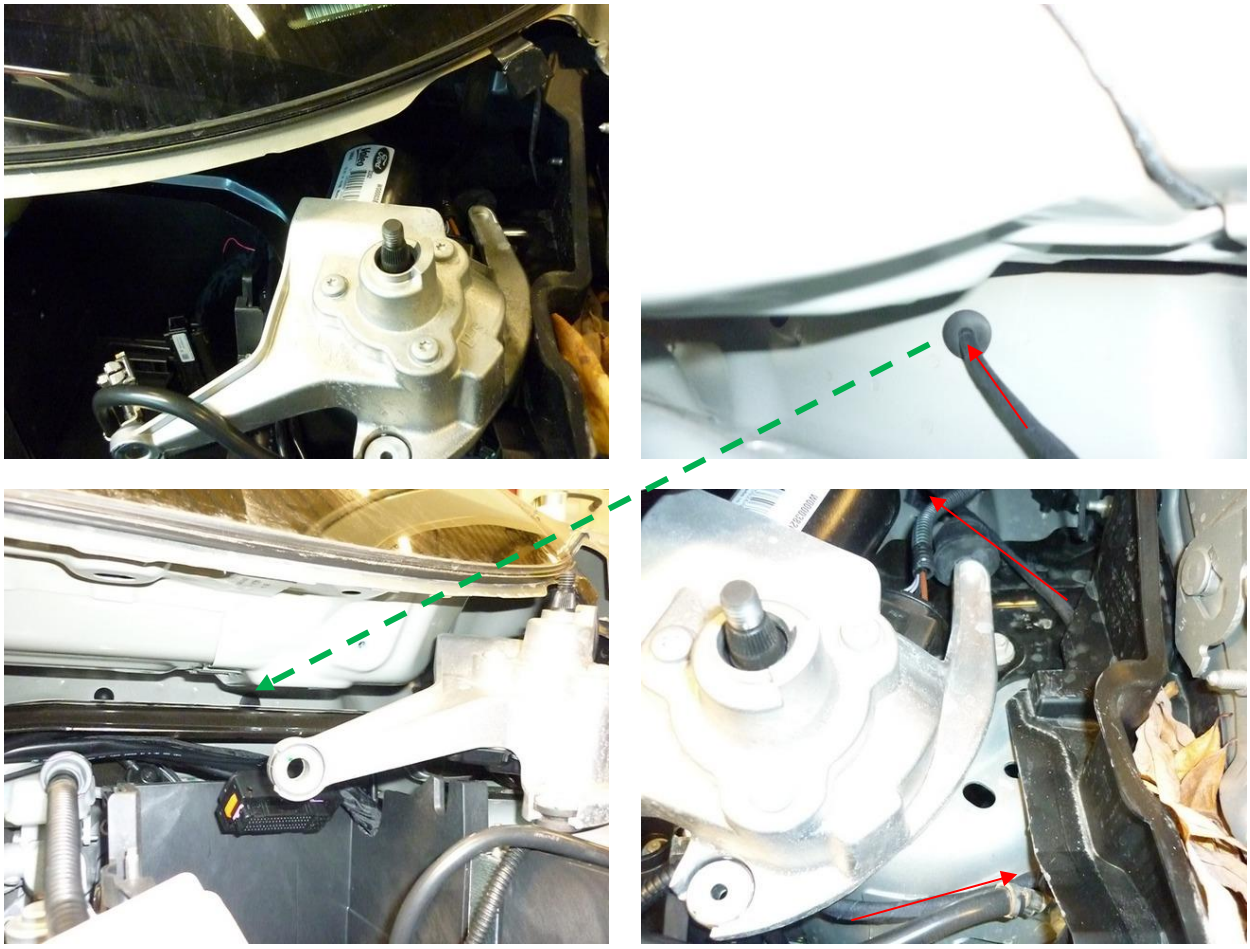






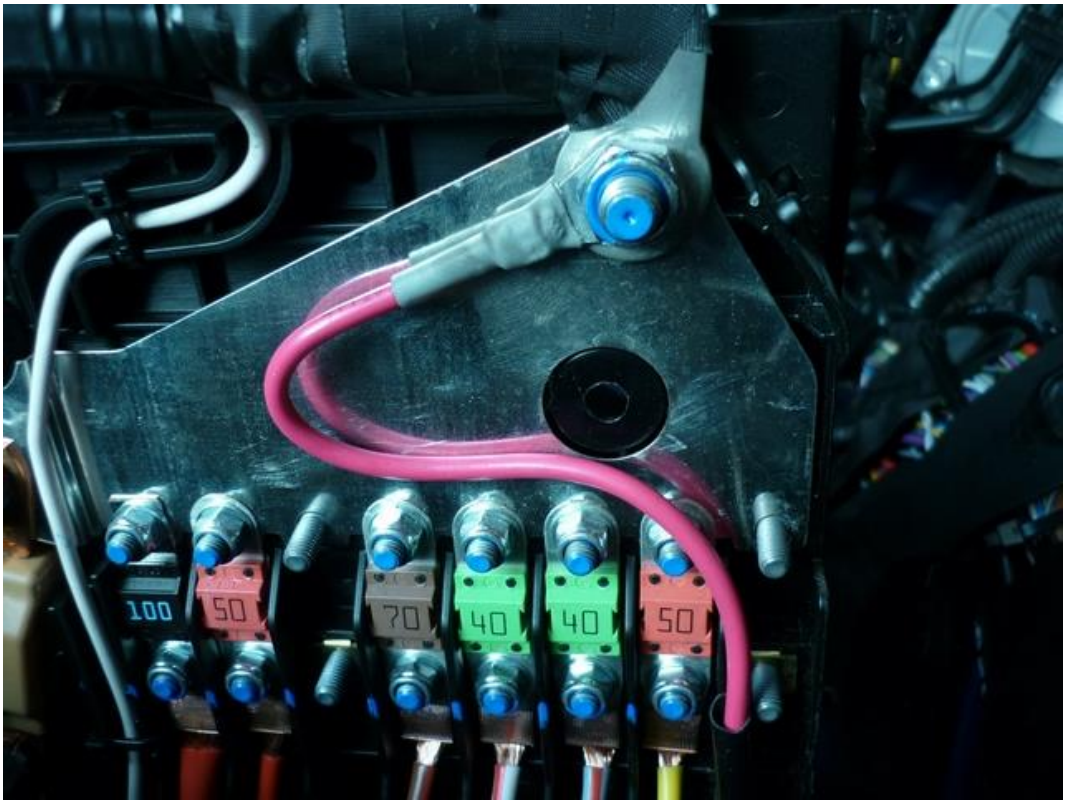
Switch wiring Transit Connect

Remove left wiper motor.
Drill a hole and pull wiring through using a grommet.
ALSO wire 56, DI2, yellow-green, PWM signal

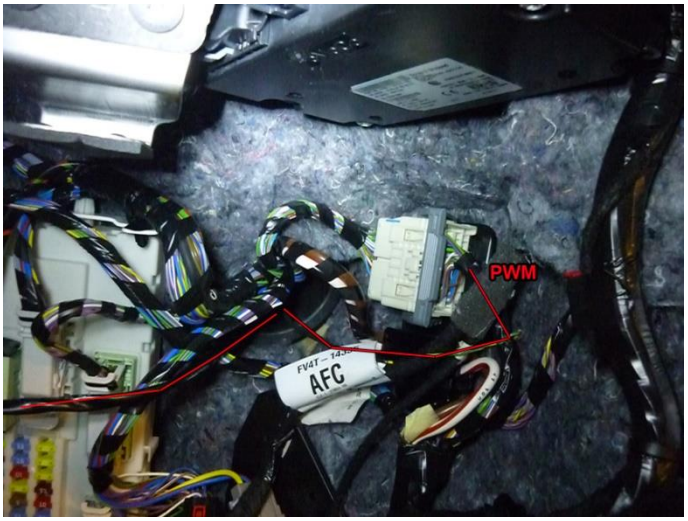


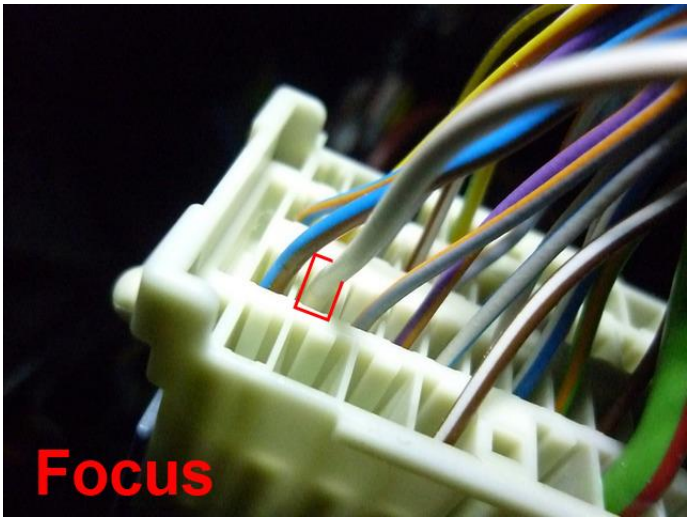
wiring inside, behind isolation

Wiring +12V Battery



Wiring inside – DIG IN2 – PWM Focus

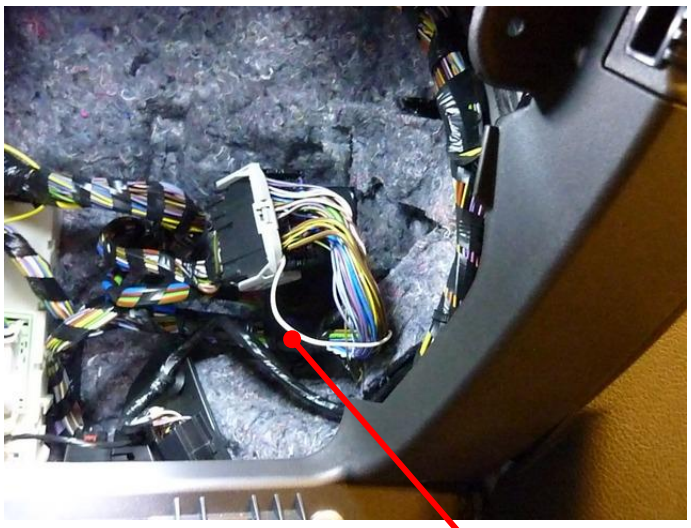




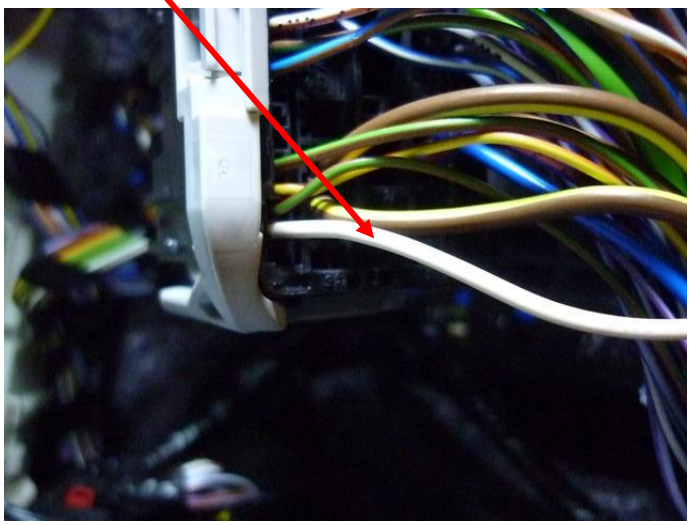
			Digital Input 2, OEM petrol pump driver, PWM IN Wire colour / position : see picture Wire location : behind / under glove compartment
56 DIG IN2		Yellow-green	

Wiring inside – DIG IN2 – PWM Transit Connect

Remove glove compartment.



Extend the yellow-green wire to connect to the WHITE wire:



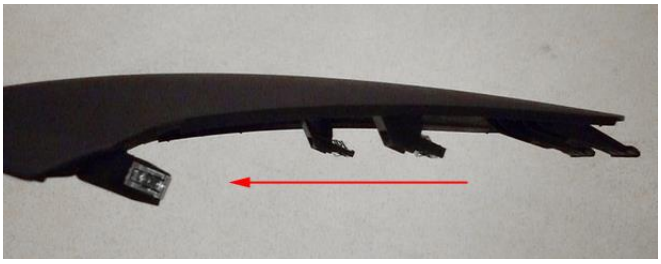
56 DI 2	Yellow-green	*Digital Input 2, OEM petrol pump driver, PWM IN* Wire colour : white Wire location : behind glove compartment

Mounting the fuel selection switch - Focus

Mount the switch, drill hole Ø8,3mm.

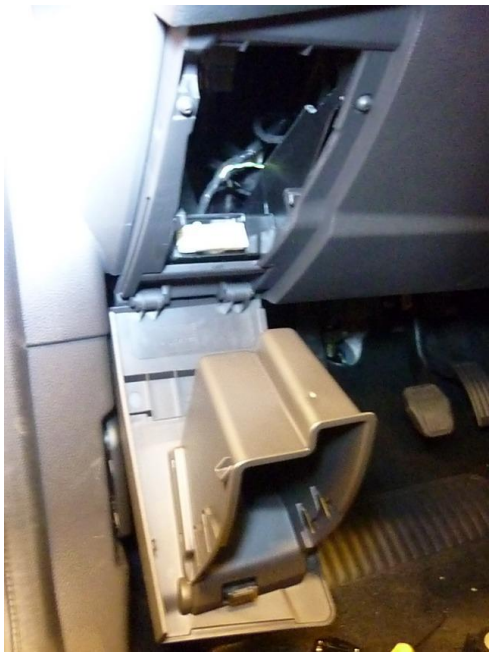
With cup:

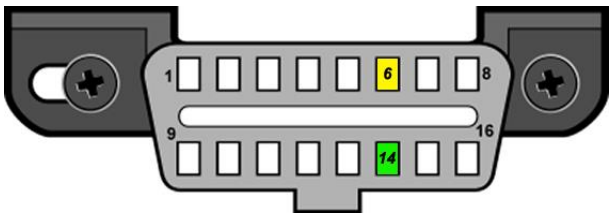
Mounting the fuel selection switch – Transit Connect



EOBD

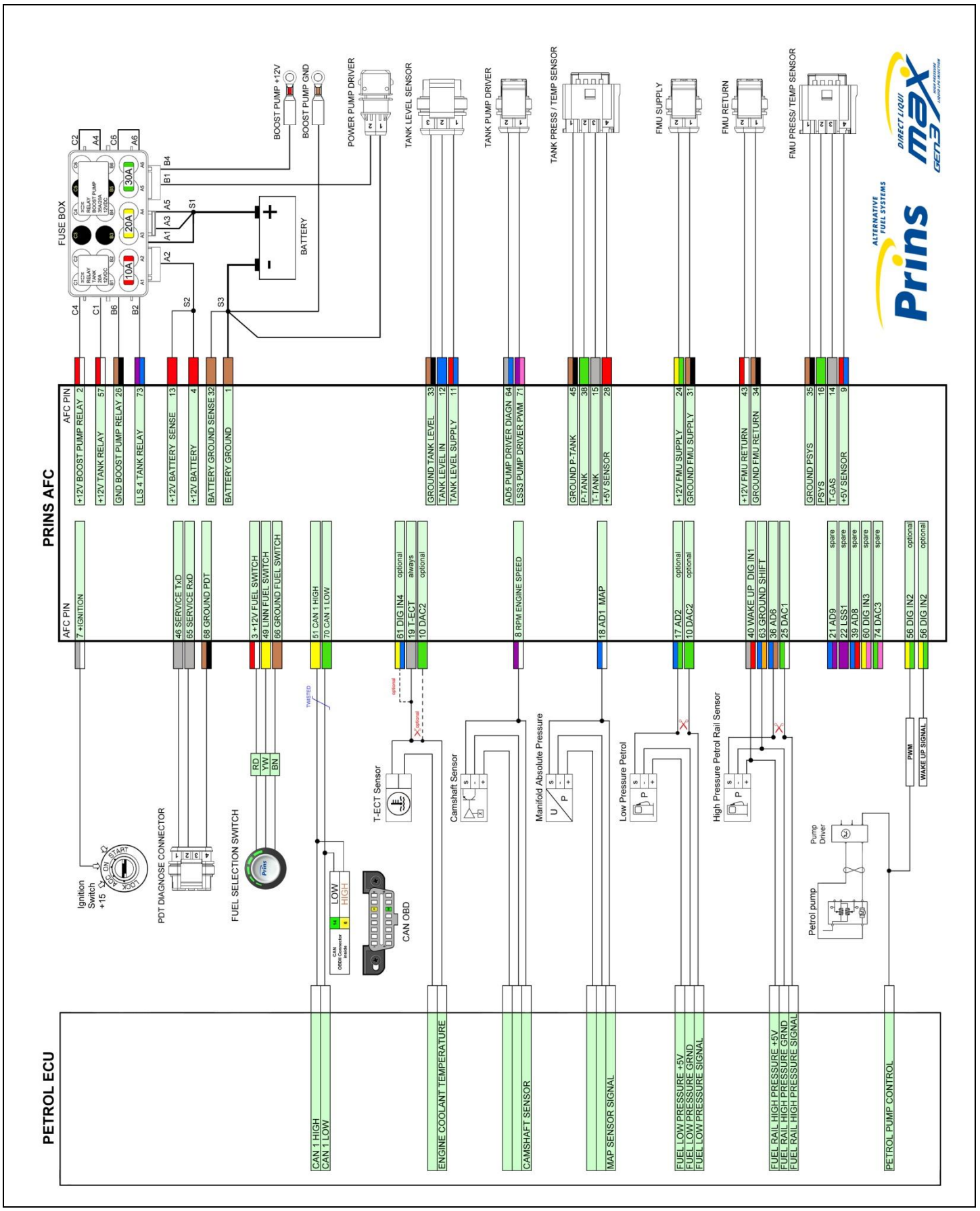
Focus :



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

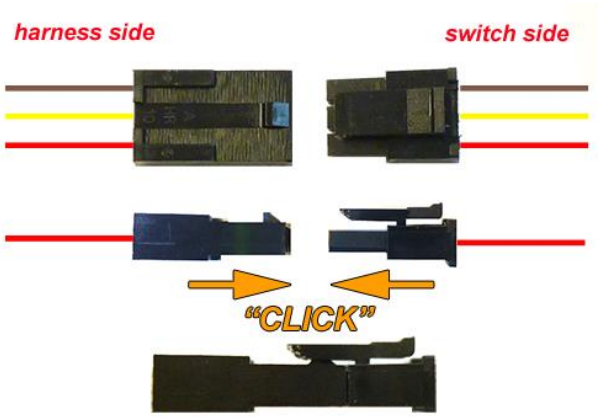
Main Connector

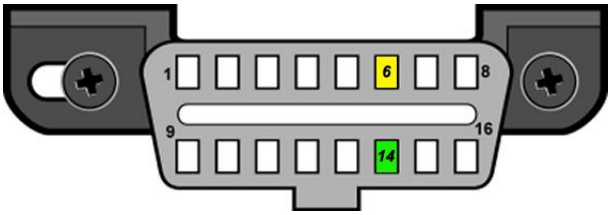
Basic DLM Gen3 wiring diagram



Electrical connections- inside driver room

Wire number / code	Wire colour	Connection
		Digital Input 2, OEM petrol pump driver, PWM IN Wire location : behind / under glove compartment
56 DIG IN2	Yellow-green	See pages: Wiring Inside – DIG IN2 This depends on the vehicle.

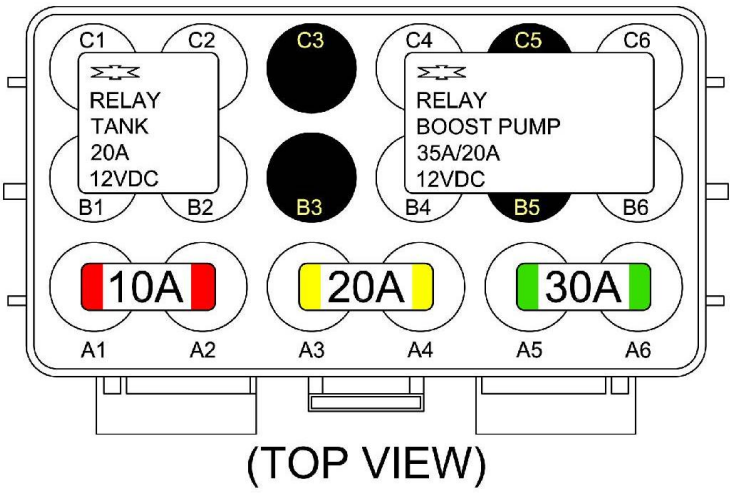
3-pole micro connector 66 Ground fuel switch 3 +12V fuel switch 49 LIN fuel switch	Brown-black Red-white Yellow	Connect the 3-pole connector to the Prins fuel selection switch.
		

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

Electrical connections Ground / Battery+

Wire text	clr	Wire colour	Connection
1			Connect to the '–' of the battery (-31) ; use a ring terminal. 
1 BATTERY GROUND		Brown	

4			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. 
4 +12V BATTERY		Red	

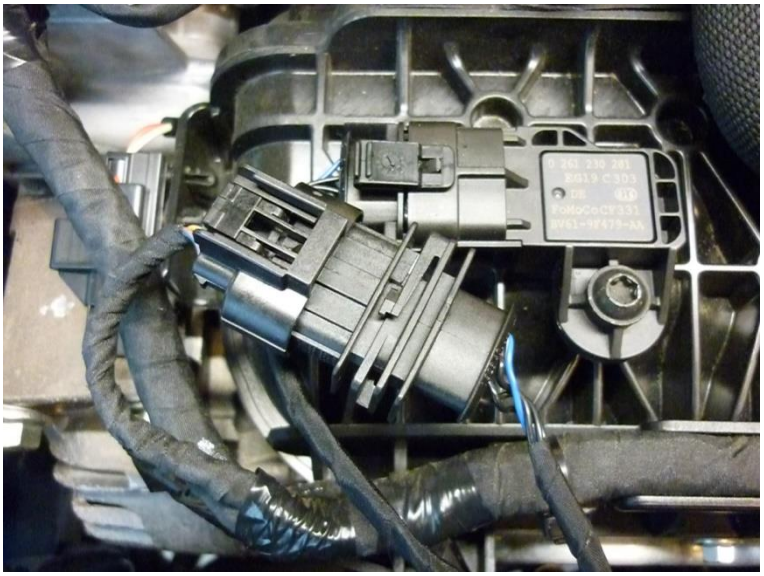


(TOP VIEW)

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

Electrical connections Map Sensor

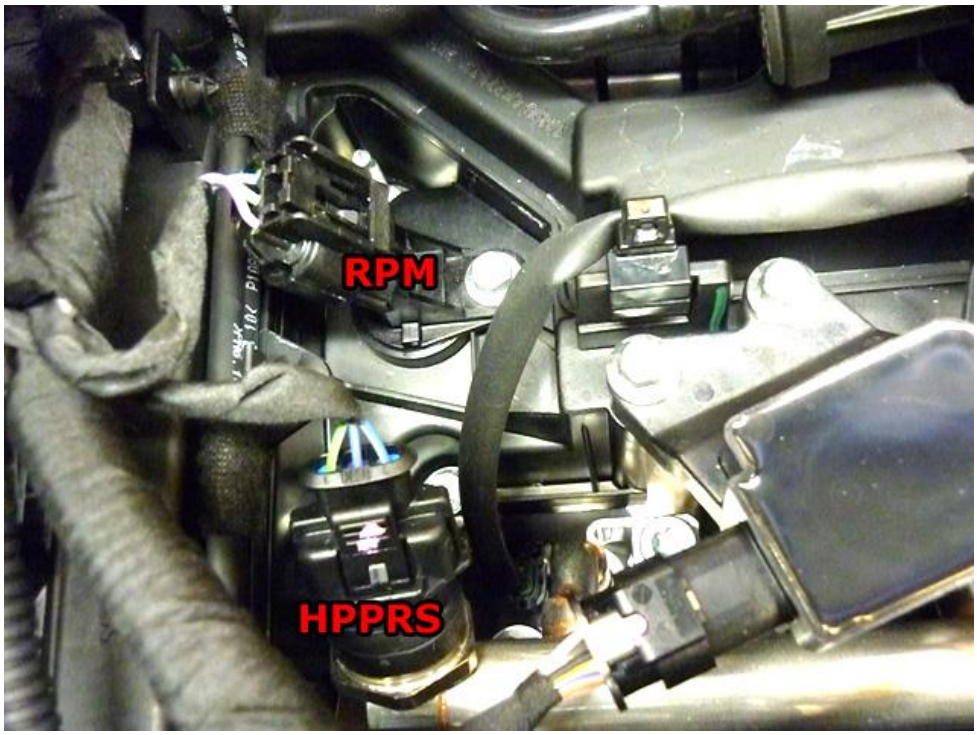
Wire text	*clr*	*Wire clr*	*Connection*
Focus			*Analog in (sensor side) MAP sensor signal.*
18 AD 1		Blue-white	Wire location : pin **4**



Transit			*Analog in (sensor side) MAP sensor signal.*
18 AD 1		Blue-white	Wire location : pin **3**

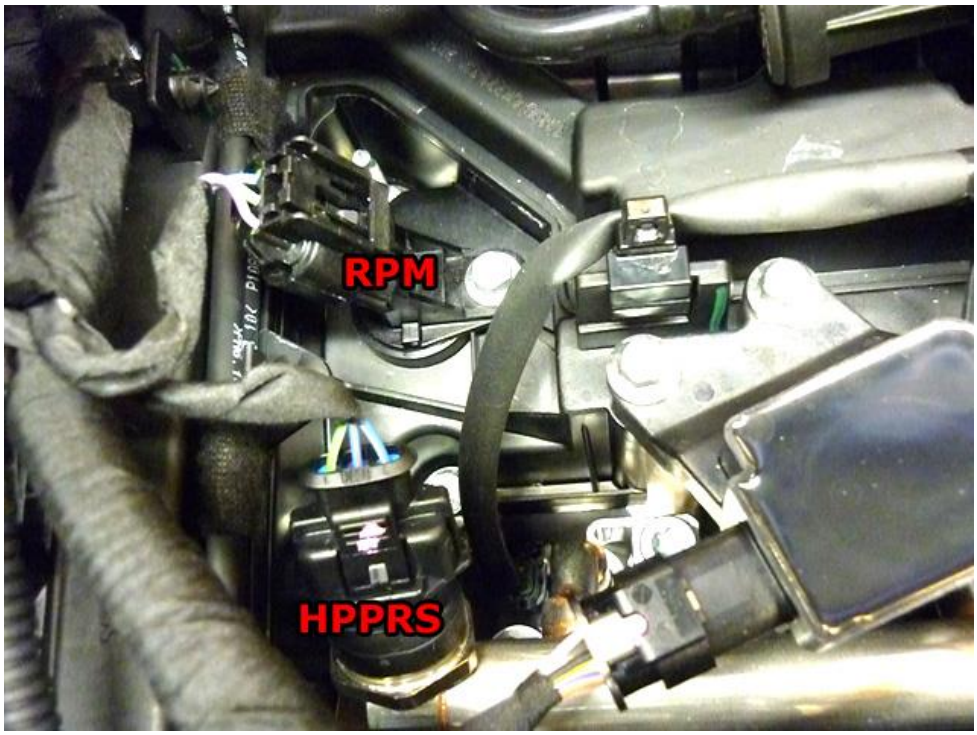
Electrical connections Engine RPM

Wire text	*clr*	*Wire clr*	*Connection*
			For measuring the engine speed signal.
8 RPM		Purple-white	Wire location : cam sensor, pin **2**



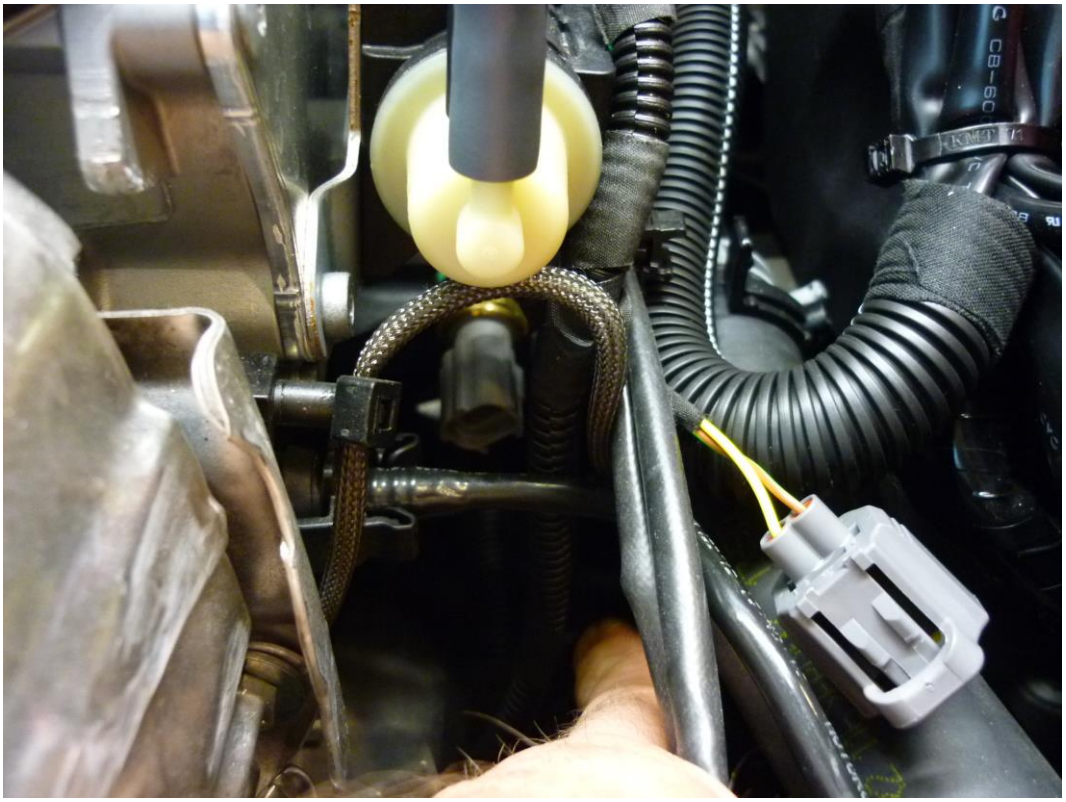
Electrical connections high pressure petrol sensor signal

Wire text	*clr*	*Wire clr*	*Connection*
			High pressure petrol sensor signal interruption (HPPRS)
36 AD 6		Blue-brown	Sensor side, Wire location : pin **2**
25 DAC 1		Green-white	Petrol ecu side, Wire location : pin **2**
			High pressure petrol sensor ground (petrol rail)
63 Ground Shift		Blue-orange	Wire location : pin **1**
			High pressure petrol sensor supply (HPPRS) **Do not place the fuses** in the holder before having completed the installation of the LPG system.
7 +IGNITION		Grey-white	Wire location : pin **3**



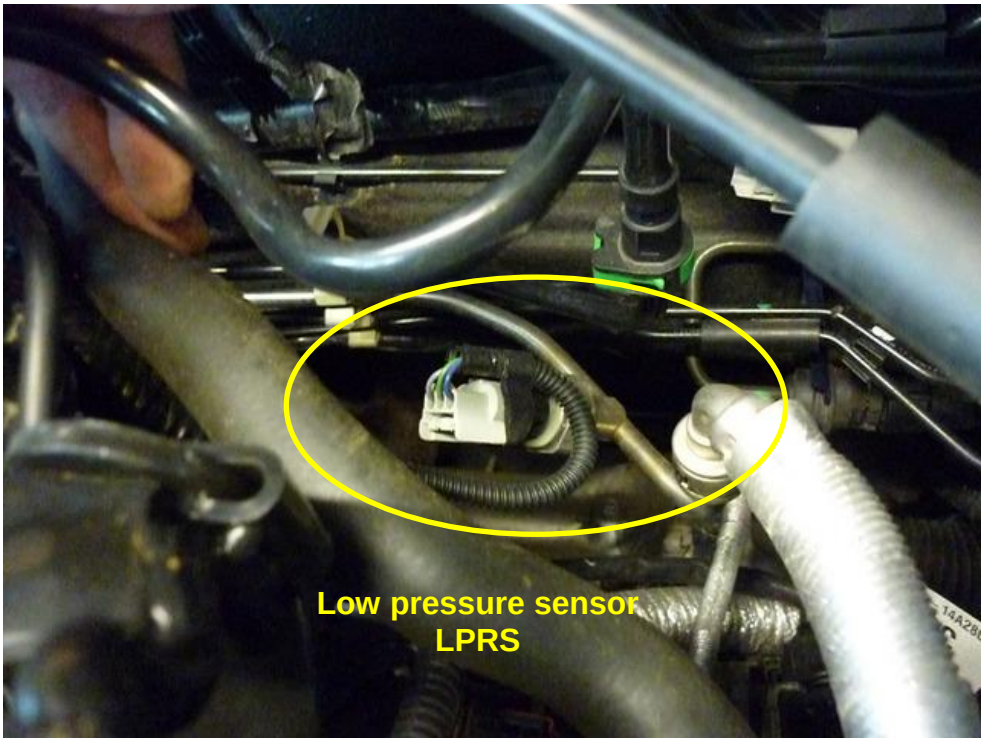
Electrical connections Engine coolant sensor

Wire text	*clr*	*Wire clr*	*Connection*
			For measuring the engine coolant temperature.
19 T-ect		Grey	Wire location : pin **1**, **yellow**



Electrical connections Low pressure petrol sensor signal

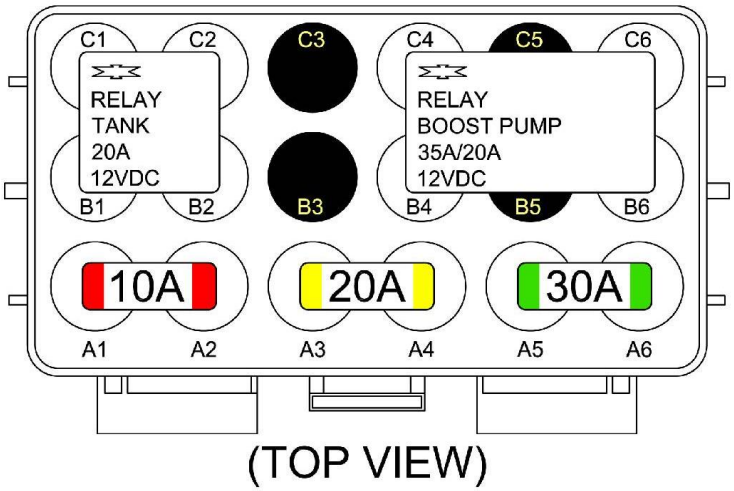
Wire text	*clr*	*Wire clr*	*Connection*
			Low pressure petrol sensor signal interruption
17 AD 2		Blue-green	Sensor side, Wire location : pin **1**
10 DAC 2		Green	Petrol ecu side, Wire location : pin **1**



Electrical connections

Engine room

Wire number / code	Wire colour	Connection
4-pole FMU P/T sensor 1. 35 Ground P-Sys 2. 16 P-Sys 3. 14 T-Sys 4. 9 +5V sensor	 Brown-black Green Grey Red-blue	Connect the 4-pole connector to the P/T sensor.
2-pole black connector FMU 24 +12V FMU supply 31 Ground FMU supply	 Yellow-green Brown-black	Connect the 2-pole connector to the black lock-off valve of the Fuel Management Unit
2-pole grey connector FMU 43 +12V FMU return 34 Ground FMU return	 Red-white Brown-black	Connect the 2-pole connector to the grey lock-off valve of the Fuel Management Unit
4-pole diagnose connector 46 Service TxD 65 Service RxD 68 Ground PDT	 Grey Grey Brown-black	Diagnose connector for service / diagnosis Connector pin 1 Connector pin 2 Connector pin 4
Boost pump relay 2 +12V boost pump relay 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 +12V tank 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



(TOP VIEW)

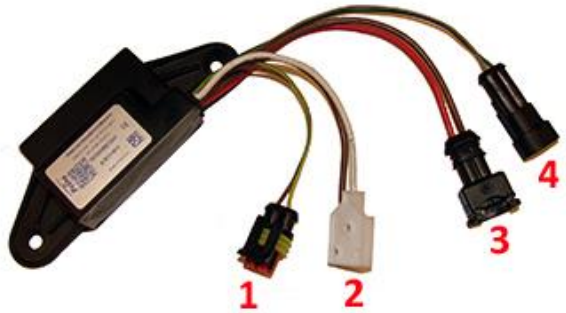
Electrical connections

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

Lpg tank housing

Wire number / code	***Wire colour AFC***	***Connection***
3-pole tank level connector 1. 33 Ground tank level 2. 12 Tank level in 3. 11 + tank level supply	 Brown-white Blue Red-blue	Connect the 3-pole connector to the tank level sensor.
4-pole Tank P/T sensor 1. 45 Ground P-Tank 2. 38 P-Tank 3. 15 T-Tank 4. 28 +5V sensor	 Brown-black Green Grey Red	Connect the 4-pole connector to the P/T sensor.
2-pole Steering Diagnose connector 1. Ground pump driver 2. +12V pump driver	 Brown 2.5mm^2 Red 2.5mm^2	Connect the 2-pole connector to the driver, connector 3.
2-pole Steering Diagnose connector 1. 71 LSS3 Pump driver PWM 2. 64 Pump driver diagnose	 Purple-pink Blue-grey	Connect the 2-pole connector to the driver, connector 4.

Pump Driver			
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*	1. Brown 2.5mm^2 2. Red 2.5mm^2	From main ground From tank pump relay	Ground pump driver +12V pump driver
4. *2-pole connector driver*	1. Green 2. Grey	From AFC pin 71 From AFC pin 64	LSS3 Pump driver PWM Pump driver diagnose



Prins safety stickers

Apply the sticker on an eye catching location.

Checklist after installation

1. Install the system fuses.
   Turn on ignition.
   Connect the Prins Diagnostic Tool and run the Prins Diagnostic 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 gas leak detector device or a fluid detection like soap. Also check for petrol leakage.
   Check all made connections and XD-hose crimps for petrol / LPG 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.

ALTERNATIVE FUEL SYSTEMS

Prins