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Installation manual Dedicated PART 2/2

MANUFACTURER	CADILLAC
TYPE	CTS
ENGINE DISPLACEMENT	3600
NUMBER OF VALVES	24V
ENGINE CODE / NUMBER	LLT
VEHICLE CATEGORIES	M
TRANSMISSION	AT
VERSION	Direct LiquiMax-2.0
PETROL ECU MANUFACTURER / CODE	BOSCH Motronic 0261.S06.080
HIGH PRESSURE PETROL PUMP	Bosch HDP-5-PE 0261.520.(036)/(114)/(115)
HIGH PRESSURE PETROL INJECTOR	Bosch HDEV-5-1 0261.500.(028)/(056)/(049)/(022)
MODEL YEAR:	2008 -> 2011
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000012 / DLM-LPG 05
LOCATION SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	335/070001/A
MANUAL NUMBER	076/3500400
DATE	2014-04-03



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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 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 (10Nm)
- 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
- Engine coolant

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 :



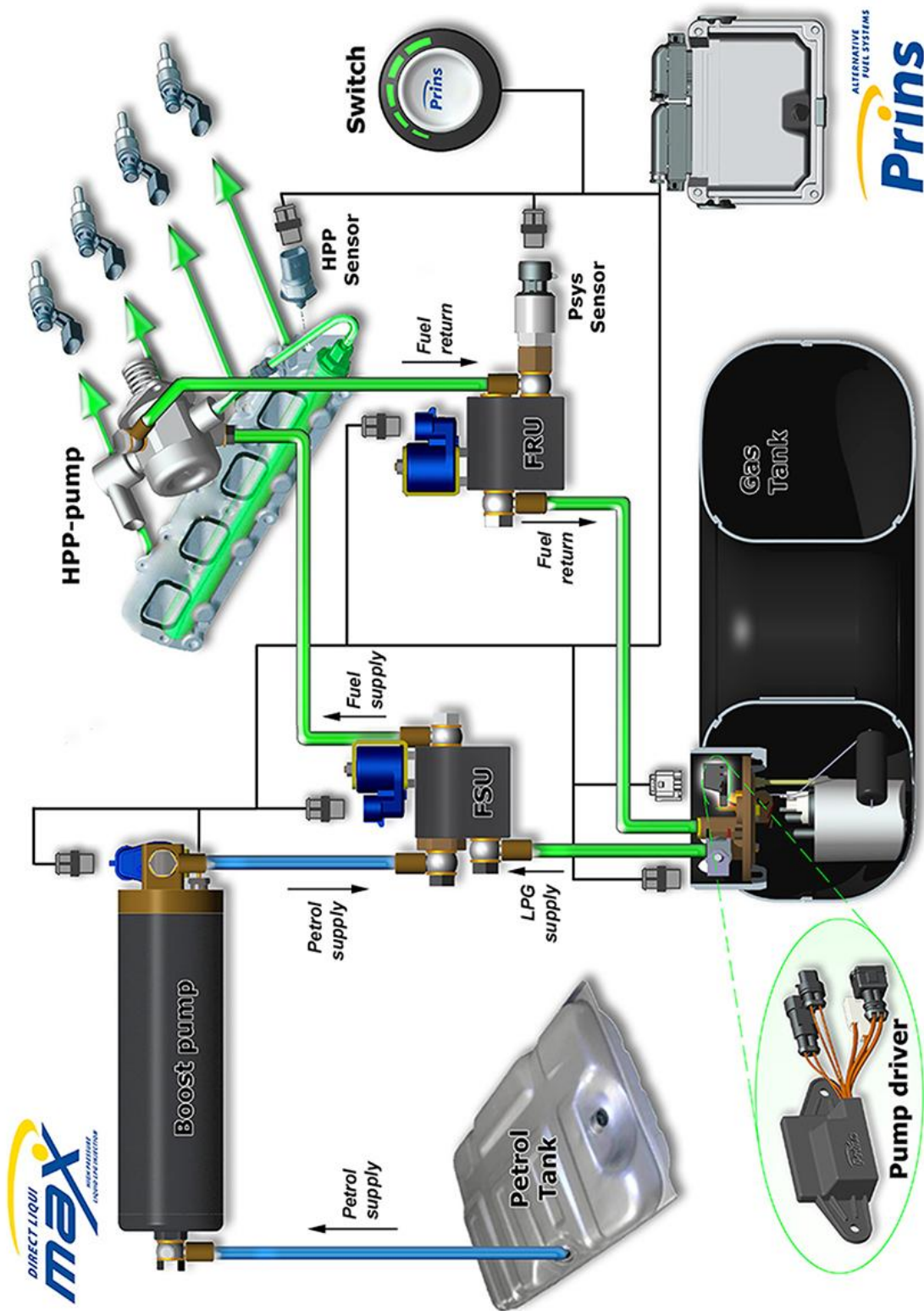
= IMPORTANT,
CAUTION



= WEAR SAFETY GOGGLES

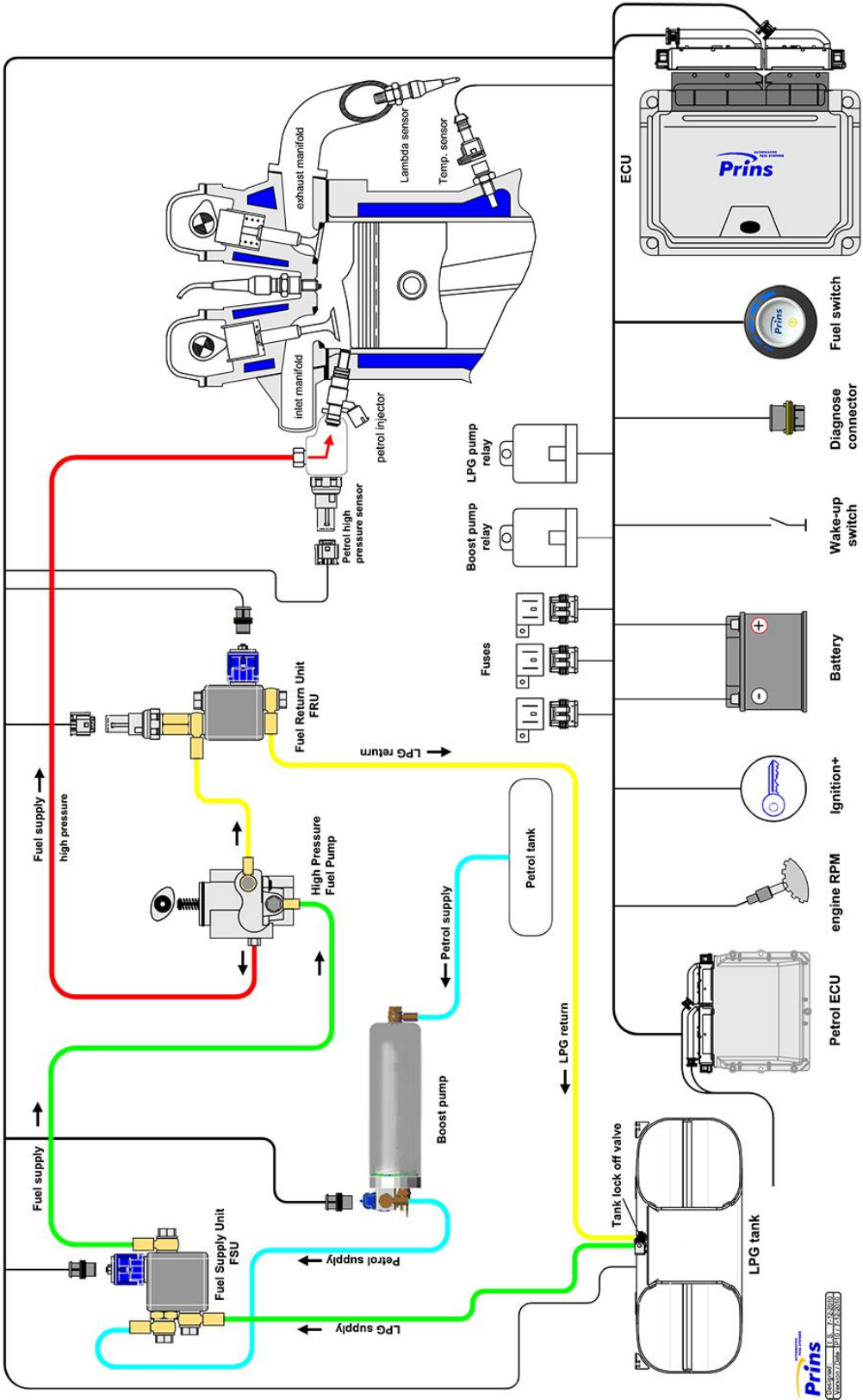


Direct LiquiMax



Overview Direct LiquiMax

overview Direct Liqui Max



Direct LiquiMax parts / approval numbers

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



Mounting and connection points



A : High pressure petrol pump	L : R115 Approval sticker
B : Fuel Supply Unit : FSU	M : Grommet
C : Fuel Return Unit : FRU	N : Gas system fuses
D : Boost pump	P : T-ect
E : AFC	Q : Low pressure petrol sensor signal
F : Boost pump relay	R : MAP, Analog 3
G : Tank relay	S : Digital input 3 pwm
H : Petrol ECU	T : Analog 4
I : Engine speed signal RPM	V : Analog 2
J : "+" ignition	W : Wake-Up
K : High pressure petrol sensor signal	X : Digital input



L:
R115 approval sticker :
Right side centre door post



Removal of the Bosch High Pressure Pump

-REMOVAL-

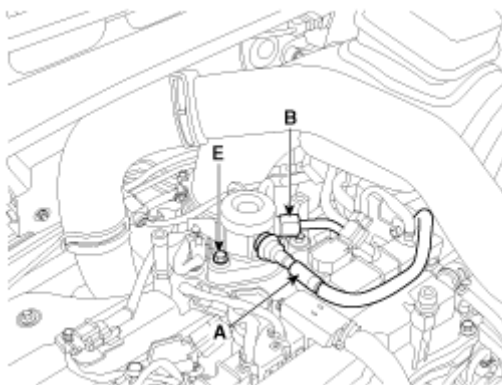
-WARNING-

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.
- 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.

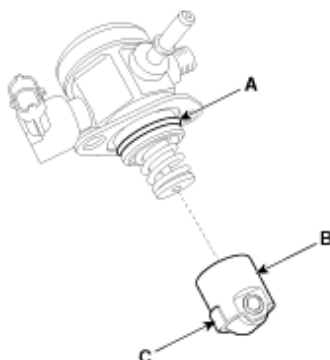


Installation of the Bosch High Pressure Pump

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 petrol pressure pump installation



Replace the high pressure pump for the adapted high pressure pump.

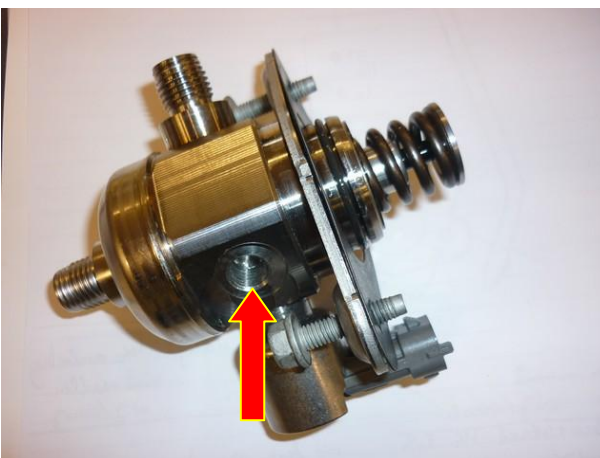
(Follow the workshop manual of the car)

Remove wiper arm, cover, wiper motor.

Remove the upper inlet part with throttle body. ***Make sure nothing can fall into the intake ducts.***



Petrol high pressure pump.



Replace the high pressure pump for the adapted version.

Roller tappet :



Careful : roller tappet can fall out the pump housing !
See chapter : Installation of the Bosch High Pressure Pump !



High petrol pressure pump return

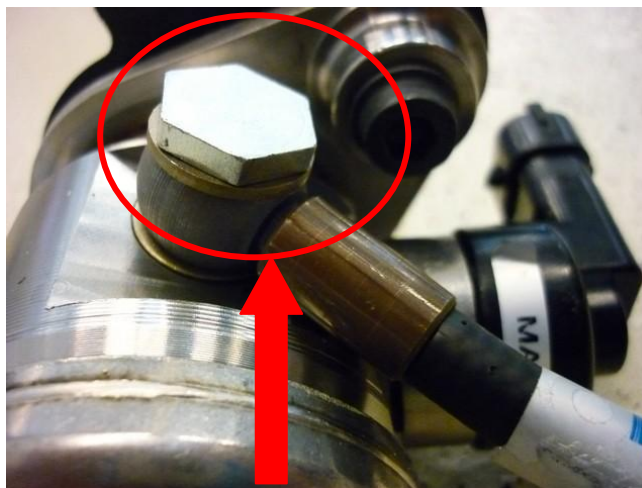
Replace the high pressure pump for the adapted high pressure pump.
(Follow the workshop manual of the car)



Check Roller Tappet before installation HPP pump



Not used anymore

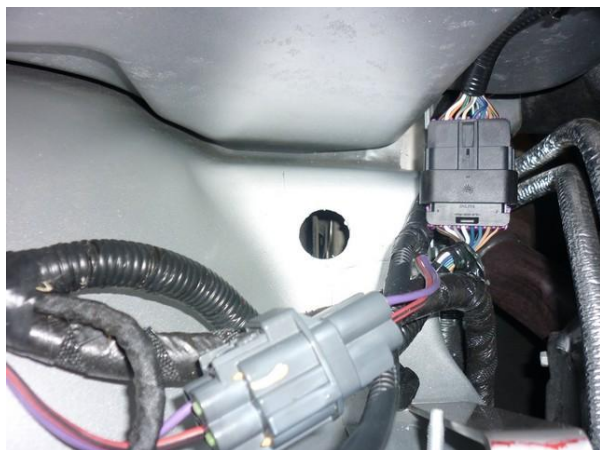


Short head banjo bolt

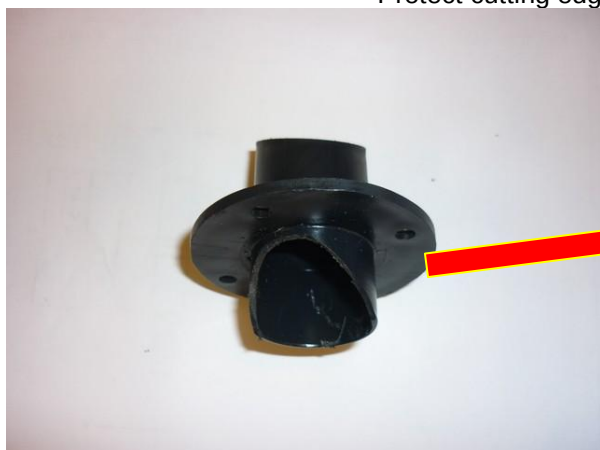
Install / tighten both hoses (see page 4) as shown. After pump installation, tightening is no longer possible
!!!



Mounting the LPG supply and return hose bleeder



Drill a $\varnothing 30\text{mm}$ hole in the right front wheel fender (see photo).
Protect cutting edge against corrosion.



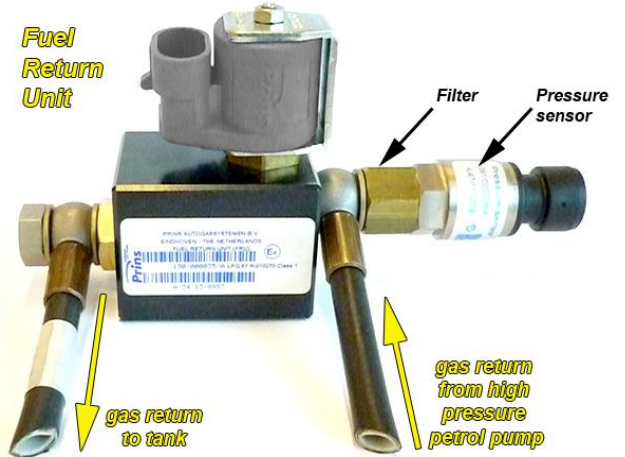
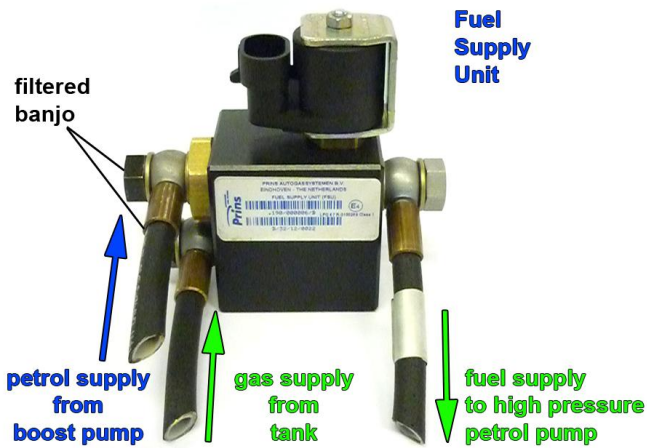
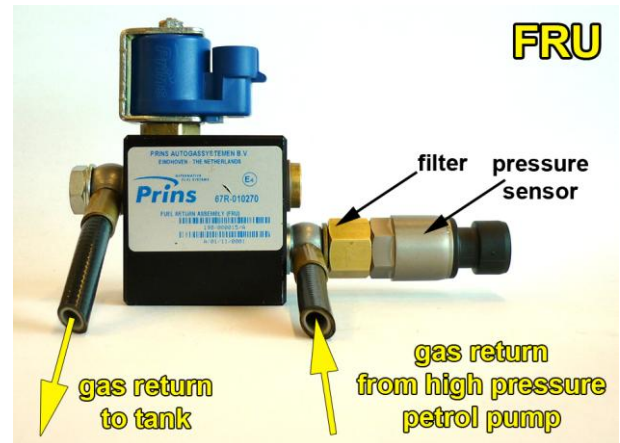
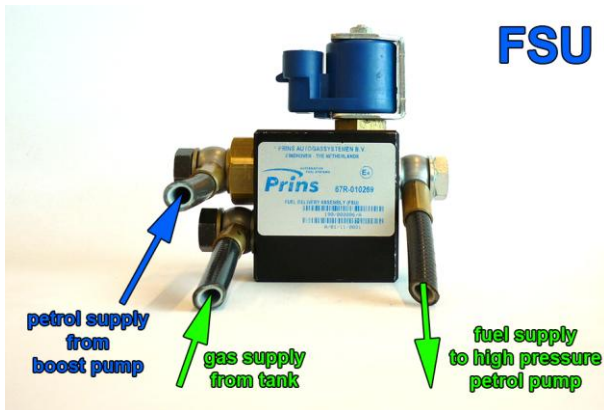
Adapt bleeder and fix with four screws and kit.



-  -Wiring harness to the LPG tank
-  -Return hose
-  -Supply hose



Fuel Supply Unit / Fuel Return Unit



Black filtered banjo will only be used on inlet connections !

Filter inside sensor banjo



Mounting the Fuel Supply and Fuel Return Unit



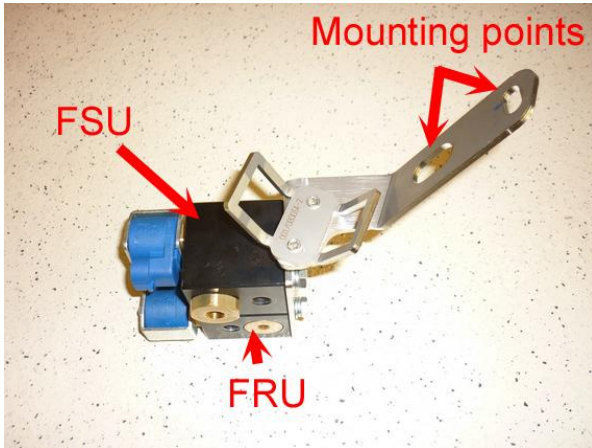
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Install FSU and FRU onto the bracket and mount the bracket on the right suspension strut



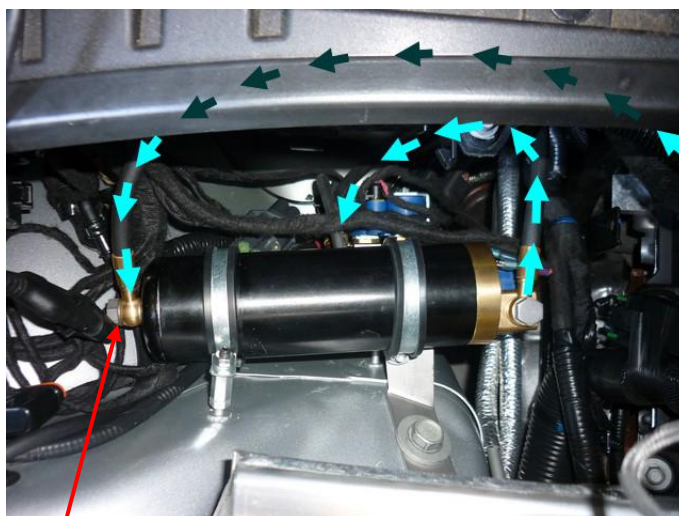
Original mounting point on the right suspension strut.



Boost pump



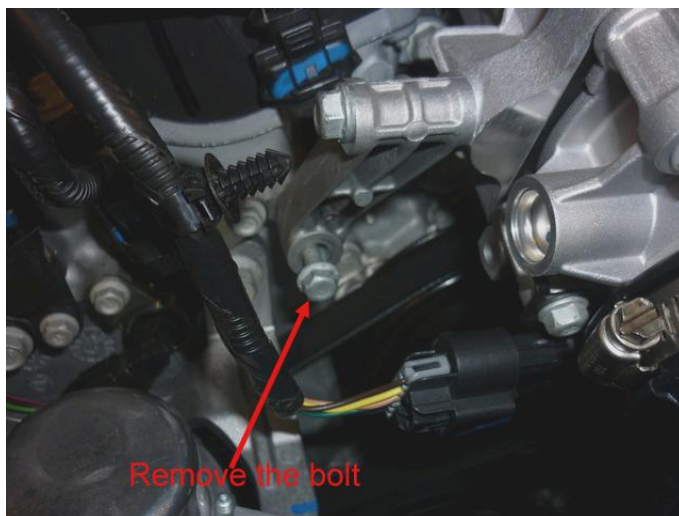
Connection of the fuel hose to the boost pump.



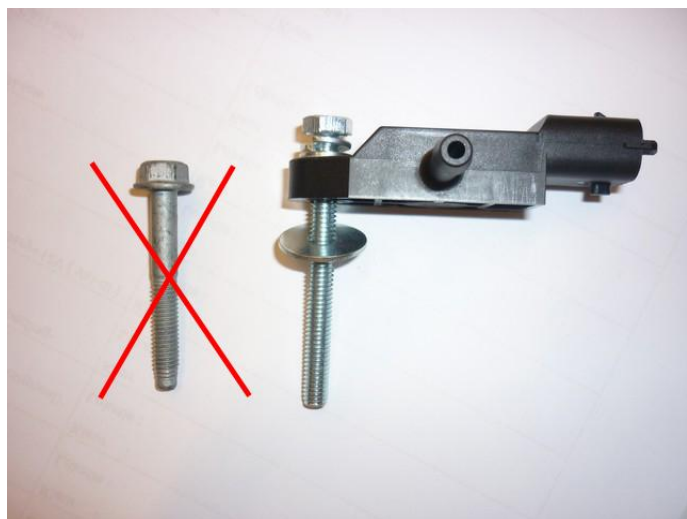
Filtered banjo



MAP sensor



Drill hole Ø5mm and cut thread M6x1. Install the inlet coupling with a locking compound.



Remove the original bolt and use a new longer M6x1 bolt, washer & spring washer for mounting the MAP sensor.
Install a Ø5mm LPG hose between MAP sensor and inlet coupling.

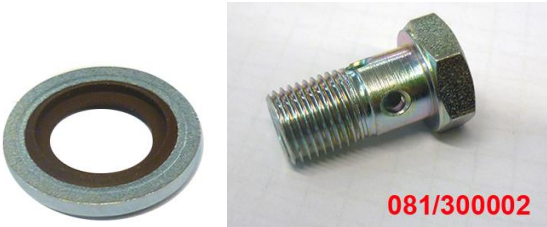


LPG / petrol fuel lines

Hose Ø mm	from	to	Length (cm)
XD 4	Adapter original petrol hose	Petrol boost pump	25 cm
XD 3	Fuel supply unit	High pressure petrol pump	65 cm
XD 4	Petrol boost pump	Fuel supply unit	20 cm
XD 3	Fuel return unit	High pressure petrol pump	75 cm



Install the fuel line using two bonded seal washers and (filtered) banjo bolt for each banjo side:

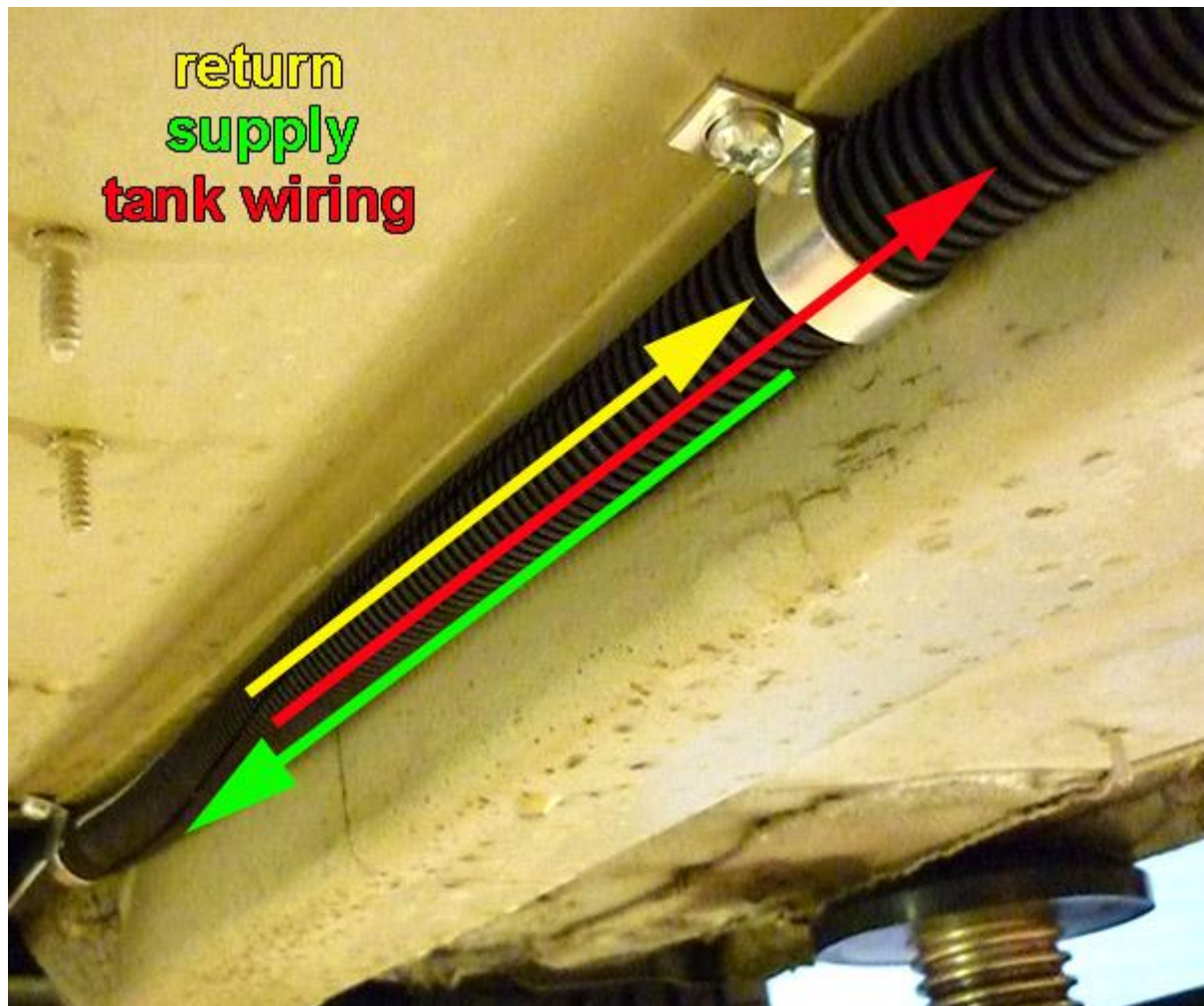


Filtered banjo: (FSU supply inlets / boost pump inlet : black filtered banjo) :



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.



Mounting the AFC

All models



Remove the bolts and remove the clips.
Re-use bolts for the AFC bracket.

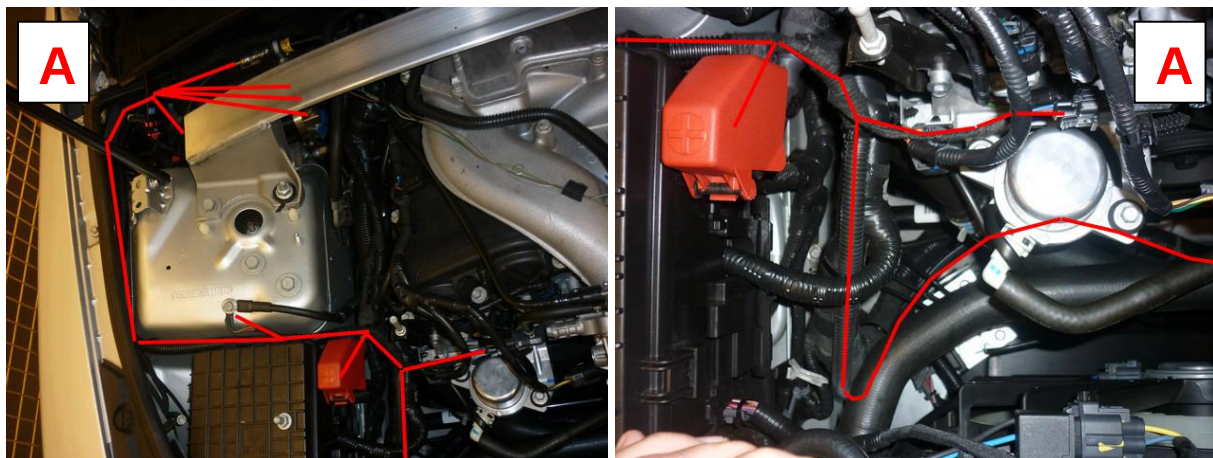


Mount the AFC bracket, with mounted AFC speed clip, with the original bolts.



Wiring AFC / Routing wiring

Routing model 2010 & 2011 petrol ecu left side underneath head light. (Pictures A)



Route the AFC harness, together with the original thick wiring harness (Original harness runs over the sub frame) to the petrol ECU.

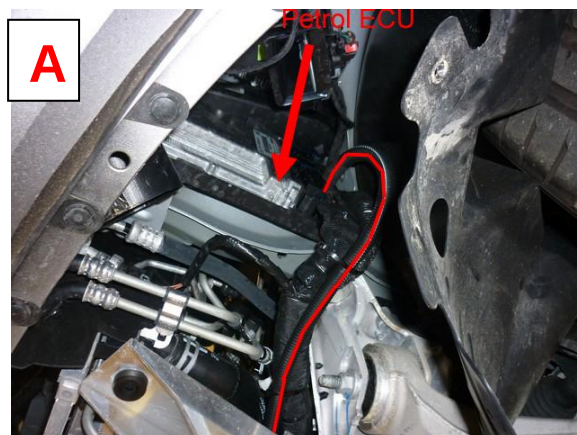
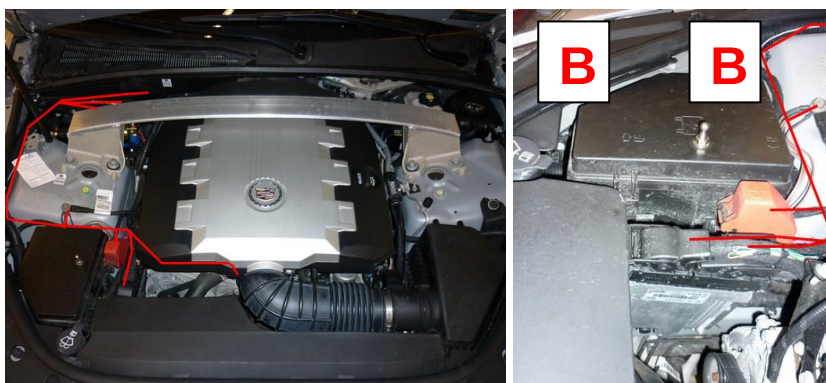


Photo front bottom car.

Routing model 2009 petrol ecu right side engine room (Pictures. B)



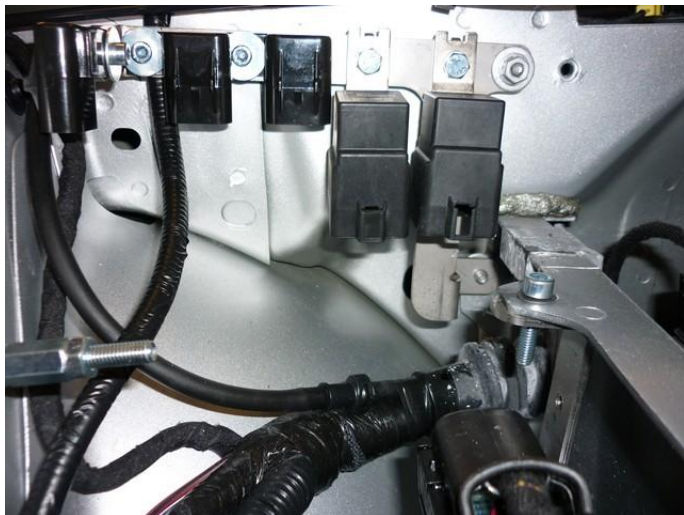
Fuse installation

Model 2008



Remove the bracket (if present)

All models:



Install the fuses and relays onto the bracket



Mounting the fuel selection switch

 **Wiring inside : Switch, EOBD, CAN, Pump driver petrol wiring.**

Grommet cable harness



Transit to passenger compartment : switch, EOBD, CAN, Pump driver petrol wiring.

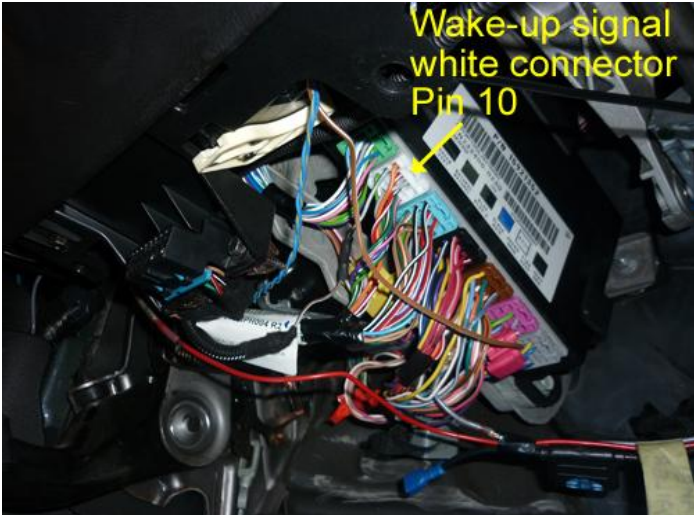
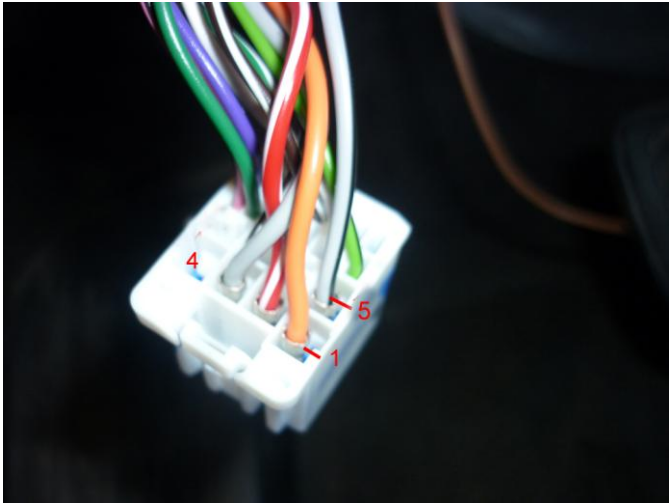


Electrical connections

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

Driver room **Inside**

3-pole micro connector			
66	Ground fuel switch	Brown	Connect the 3-pole connector to the Prins fuel selection switch.
3	+12V fuel switch	Red	
49	LIN fuel switch	yellow	
51	CAN-High	Blue-yellow	EOBD connector pin 6
70	CAN-Low	Blue	EOBD connector pin 14
121	Wake-up	Red-grey	Wire colour : Grey-black Wire location : left-side dashboard Body Control Module locking right of the steering column above the accelerator padel (see picture) white connector pin 5



The module is mounted above the accelerator pedal.



Electrical connections

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

Trunk (petrol pump driver)

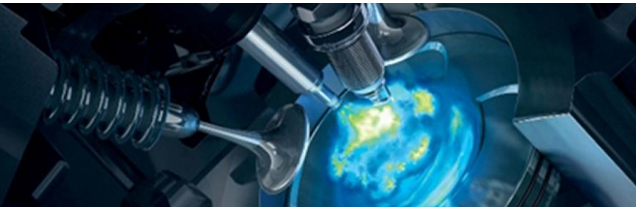
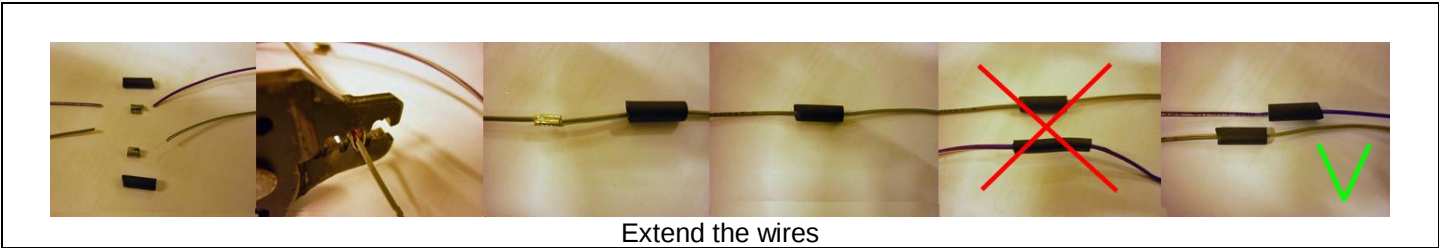
17 Analog 2 10 Simulation 2 Extend wires (see picture)	Blue-black Green-black	Low pressure sensor petrol interruption Sensor side. ECU side. Wire colour :Purple Wire location : on left wheel arch in the trunk. Module Pin 10 Not used model 2009	
115 Digital input 4 Extend wires (see picture)	Yellow-red	Petrol fuel pump driver (PWM in) Fuel pump flow control module. Wire colour :Tan Wire location : on left wheel arch in the trunk. Module Pin 47 Not used model 2009	



Petrol fuel pump driver:

Model: 2009
Not used

Model: 2010, 2011
Behind the left inner panel rear wheel



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
1-32 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. Wire colour :Brown Wire location : Right suspension strut
4 – 13 – 44 +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 fuse in the holder before having completed the installation of the LPG system. Wire location :Fuse box



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 :Yellow Wire location : Petrol ECU under the left headlight insert ECU connector X1, blue connector, pin 36
19 Analog 4	Blue-white	High pressure petrol sensor ground Wire colour :Tan Wire location : Petrol ecu X1, blue connector, pin 42
117 Digital input 3	Yellow-black	High pressure petrol sensor 5Volt supply Wire colour :Grey Wire location : Petrol ecu X1, black connector, pin 38

119 Digital input 2 23 Digital Simulation	Yellow-grey Green-red	Digital Airflow 1 sensor interruption Wire colour :Yellow sensor side Wire colour :Yellow ecu side Wire location : Petrol ecu X2, black connector, pin 13
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 : Yellow Wire location :Petrol ECU under the left headlight insert ECU connector X2, black connector, pin 54



Model 2008,



Model 2011, 2012,(Photo front bottom car left.)



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
27 +5V sensor 37 C ground 20 Analog 3 MAP	Red Brown Blue	For measuring the inlet manifold pressure (MAP). Connect the 3-pole connector to the Prins MAP sensor. Sensor location: Right side behind the throttle body
8 RPM	Purple-white	For measuring the engine speed signal. Wire colour :Yellow Wire location :Petrol ecu X1, blue connector, pin 35
15 T-ect	Grey	For measuring the engine coolant temperature. Wire colour : Yellow Wire location : Petrol ECU under the left headlight insert ECU connector X1, blue connector, pin 82

6 Lambda1 WB	Orange	insulate
42 Lambda2 WB 10KΩ	Orange-white	insulate
113 Digital input 6	Yellow-purple	insulate



Model 2009



Model 2011, 2012 (Photo front bottom car left.)



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

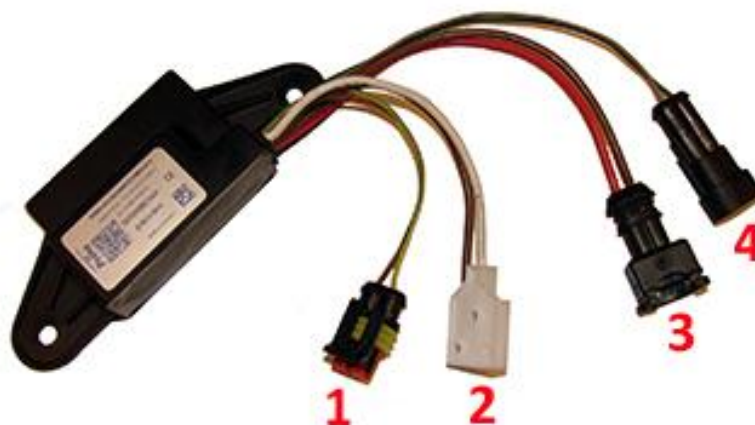


Electrical connections

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. Connector pin 1 Connector pin 2 Connector pin 3
1. 2-pole connector tank lock-off	Green-yellow Brown	Pump driver to lock-off power Pump driver to lock-off ground
2. 3-pole fusite	Red Brown -	1. Pump power 2. Pump ground 3. not used
3. 2-pole connector tank pump	Red 2.5mm ² Brown 2.5mm ²	Pump driver power Pump driver ground
4. 2-pole connector	Grey Green	Pump driver diagnose Pump driver control



Wiring tank relay 2 + tank relay 26 Ground tank relay +12V BATT fused +12V pump driver	Red Green-yellow Red 2.5mm ² Red 2.5mm ²	Pin 86 of the tank relay Pin 85 of the tank relay Pin 30 of the tank relay Pin 87 of the tank relay
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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.

