ALTERNATIVE FUEL SYSTEMS

Prins

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

Installation manual
Dedicated
PART 2/2

MANUFACTURER	Mazda
TYPE	3
ENGINE DISPLACEMENT	2000
NUMBER OF VALVES	16
ENGINE CODE / NUMBER	LF-VD (MZR DISI)
VEHICLE CATEGORIES	M
TRANSMISSION	MT
VERSION	Direct LiquiMax-2.0
PETROL ECU MANUFACTURER / CODE	Mitsubishi LFBL 18 881J
HIGH PRESSURE PETROL POMP	Hitachi Gen-1
HIGH PRESSURE PETROL INJECTOR	x
MODEL YEAR:	2011
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000011 / DLM-LPG 04
LOCATION SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	353/070005/A

NUMBER :	076/1307300
DATE :	2012-11-06
VERSION NR :	2012-05-21 D

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FOR EXPLANATION AND CIRCUIT DIAGRAMS SEE : INSTALLATION MANUAL GENERAL PART 1 / 2

General instructions

- The installation of the system shall be done in accordance with the installation manual provided by Prins Autogassystemen.
- This manual is based on Dutch regulations, always install the system in accordance to the local regulations.
- For an optimal functioning of the Direct LiquiMax system, maintain a clean and organized work environment during installation and maintenance to prevent pollution of the LPG components.
- Always download the “general manual 1/2 “ from our website for basic instructions and diagrams.
- Always disconnect the battery when installing the lpg system. Make sure the ignition key is outside the car. Be aware of central door locking, radio / telephone memory code, alarm system.
- Wear safety goggles when working on petrol filled system / connections (pressurized petrol)
- Do not place the main fuse into the fuse holder before having completed the installation of the system.
- The AFC has to be activated by means of the Prins diagnosis software.
- Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the wiring harness, ensure that it does not run near any of the ignition components.

  Solder and insulate all electrical connections.
  The wires in the loom are provided with numbers and text. The text on the wire explains the function of the wire. The wire harness is not model specific, therefore is it may be necessary to adjust the length of the wires. Ensure maximum care is taken when connecting wiring.
  Make professional joints using solder and shrink sleeve. Do not stretch the wiring harness.

- No component of the LPG-system shall be located within 100 mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- If holes have to be drilled (wear safety glasses) for installing brackets, etc., the drilled holes must always be treated with an anti-corrosion agent, after the chips have been removed (especially when mounting a exterior filler into body work).
- After having completed the installation, check the whole system for lpg leakage; use a lpg leak detection device. Also check for leak of engine coolant, petrol and air.
- Fitting and maintenance is only allowed by Prins Autogassystemen selected LPG engineers.
- Failure to follow the instructions in this manual can result in a poor or non-working lpg installation or a dangerous situation.
- For maintenance instructions and filter registration see owner manual.
- Prins Autogassystemen is not responsible for any damages to people or objects as a result of changes to Prins products.
- Check our website regularly for diagrams, certificates, updates, info-bulletins and product information.

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

Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer : operating on Windows 98,W2000 or XP.
  Internal memory : 16 Mb or more
  Memory HD space : 5MB
  Screen : 256 colours, advise colours 16 bits or more
  Com port : 1 free COM port 1 or COM port 2 with a 9 or 25 pins connector
- Vehicle fuel system scan tool or OBD scan tool Prins (part nr. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins serial interface
- Torque wrench (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

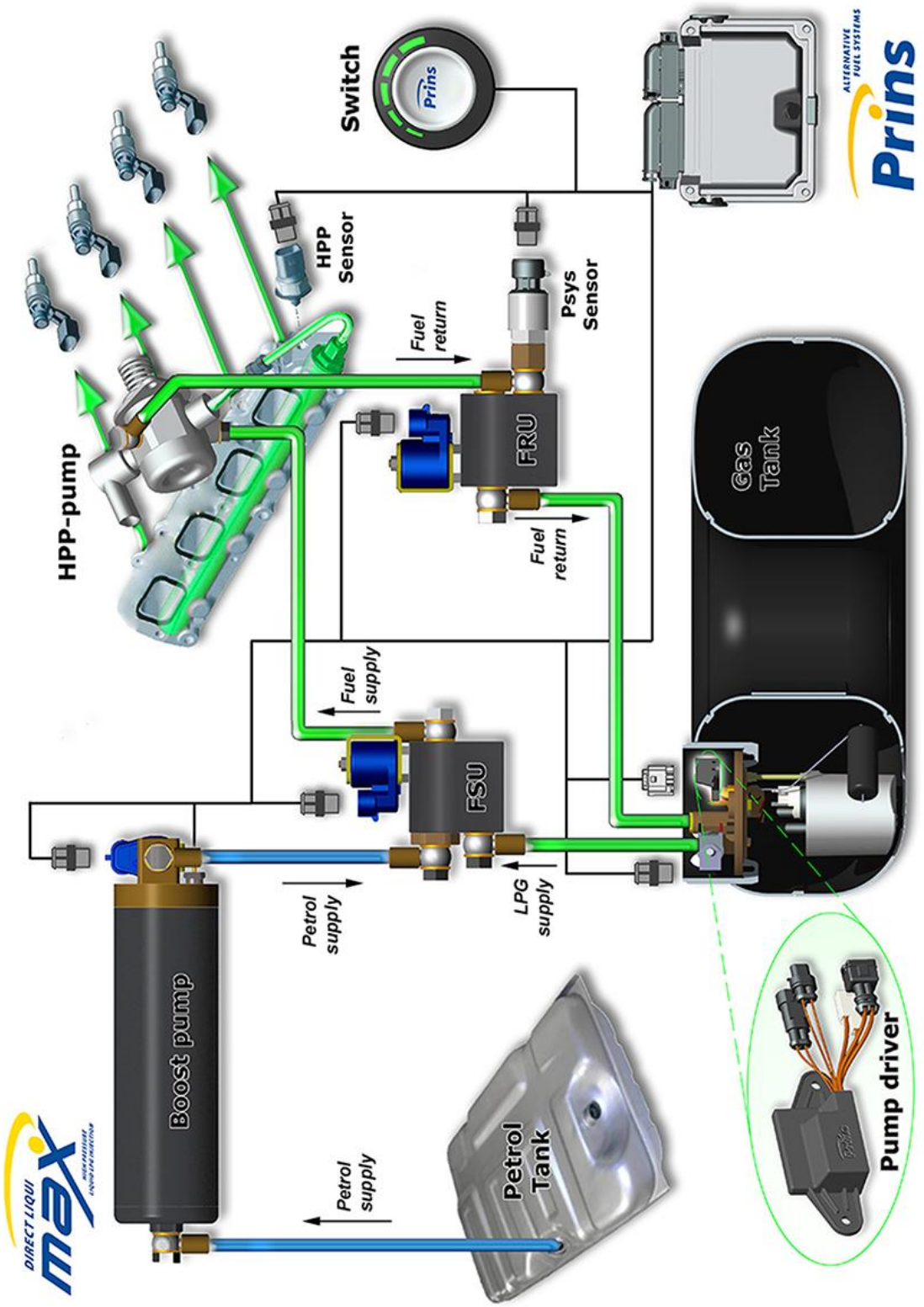
		Nm	SW
M 4 x 0,7		3,3	7
M 5 x 0,8		6,5	8
M 6 x 1,0		11,3	10
M 7 x 1,0		14,5	11
M 8 x 1		24,5	13
M 8 x 1,25		27,3	13
M 10 x 1		52	15-16-17
M 10 x 1,5		54	15-16-17
(filtered)Banjo bolt		10	14
Supply line connection		15	13
Fuel module Allen bolts		20	7
Filler hose connection		50	22

EXPLANATION OF SYMBOLS :

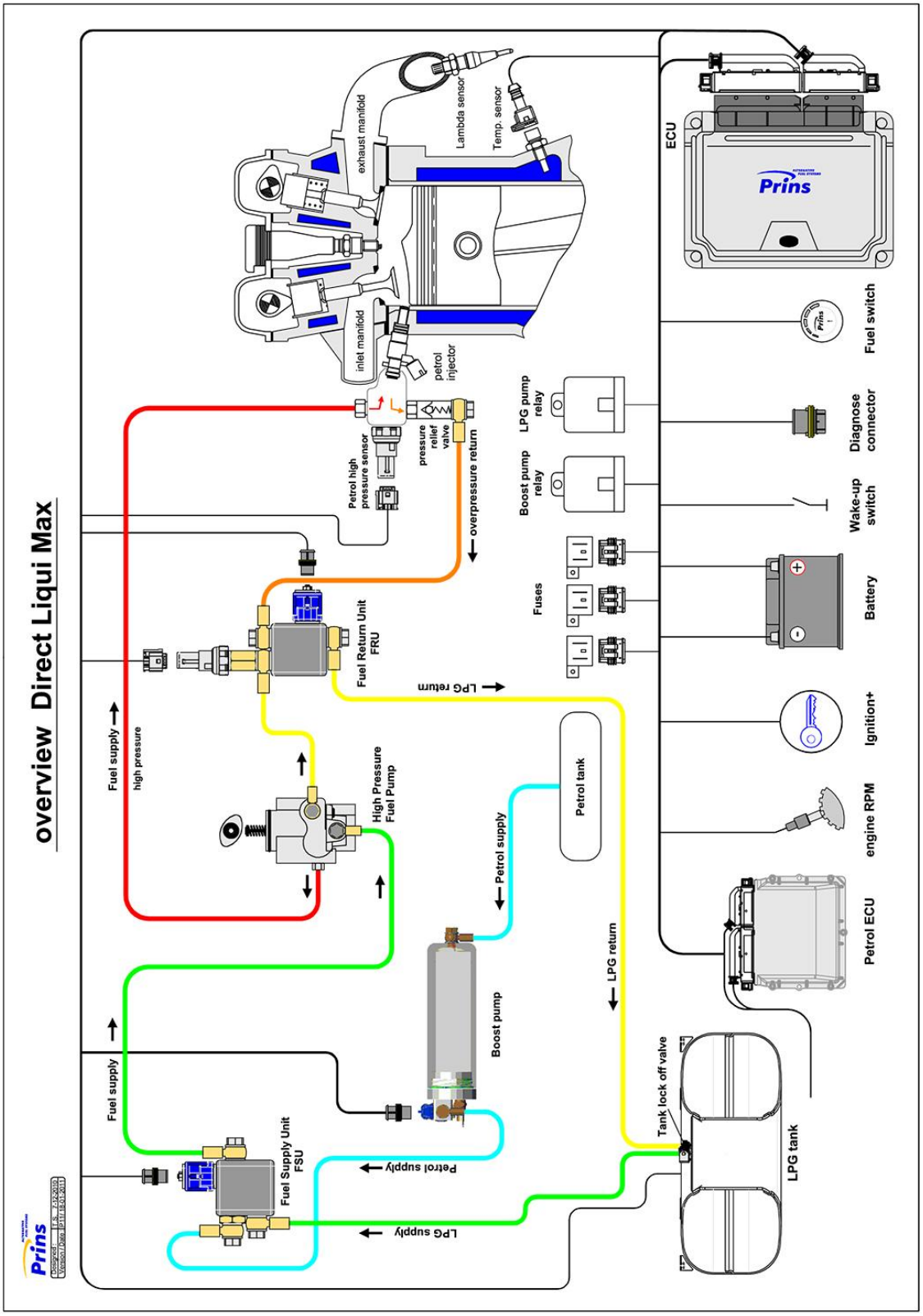
= IMPORTANT, CAUTION

= WEAR SAFETY GOGGLES

Direct LiquiMax



Overview Direct LiquiMax



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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<td>  </td>
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<tr>
<td>Boost pump</td>
<td>High Pressure Pump : E4-67R-010266
High Pressure Rail : E4-67R-010267
High Pressure Injectors : E4-67R-010309</td>
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<tr>
<td>  </td>
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<tr>
<td>Prins ECU : E4-67R-010098
E4-10R-030507</td>
<td>Fuel lines series XD : E4-67R-010247 XD3
E4-67R-010247 XD4</td>
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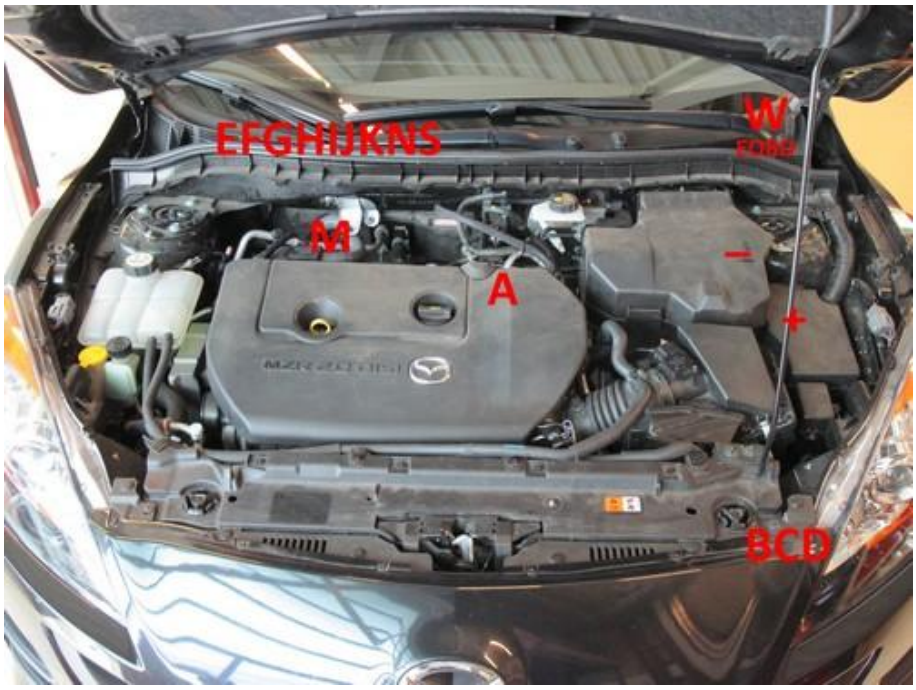
Mounting and connection points



A	: High pressure petrol pump	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	: Analog 2
H	: Petrol ECU	T	: Analog 4
I	: Engine speed signal RPM	V	: Digital input 3
J	: “+” ignition	W	: Wake-Up
K	: High pressure petrol sensor signal	X	: Digital input

L:
R115 approval sticker :
Right side centre door post

High pressure pump installation

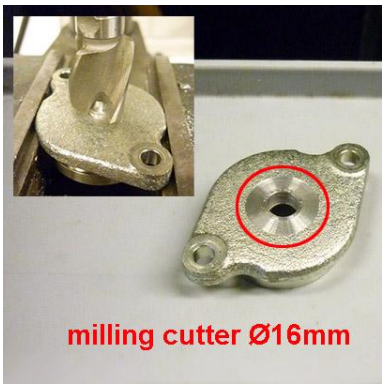
Replace the high pressure pump for the adapted high pressure pump.
(Follow the workshop manual of the car)

Remove original inlet and install the special inlet with a o-ring

Use the original bolts or M5x16

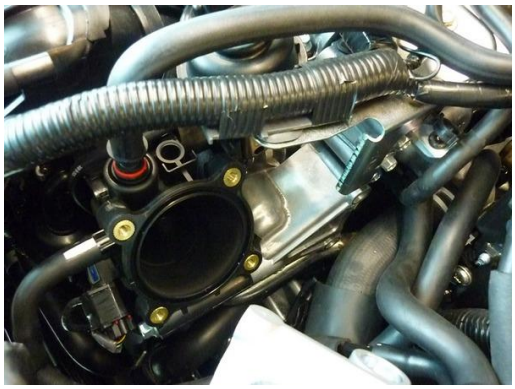
High pressure pump return

Remove the high pressure pump, careful : petrol !!
(Follow the workshop manual of the car) Carefully remove cover and adapt as shown:

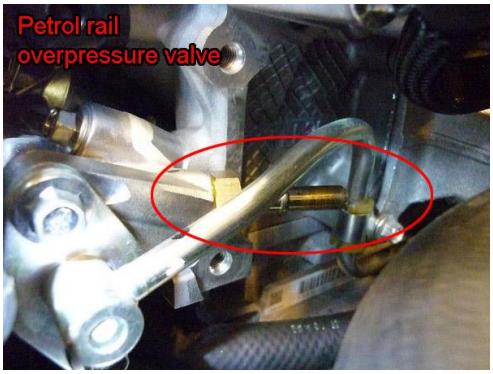


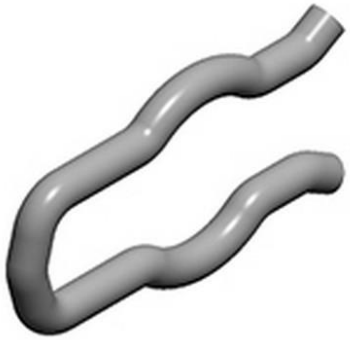
Replace adapted cover

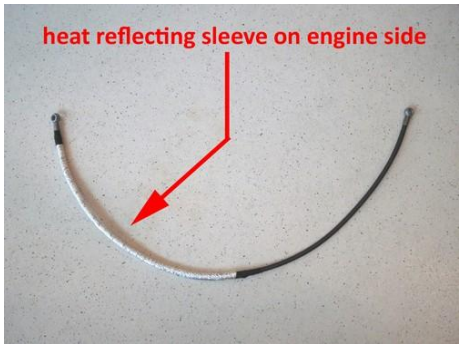
Petrol rail overpressure return

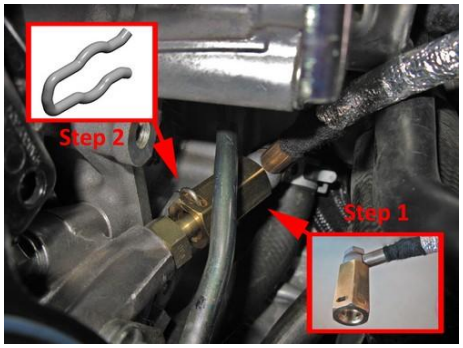


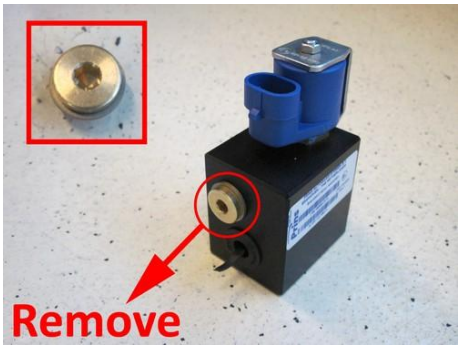

Remove rail-cover





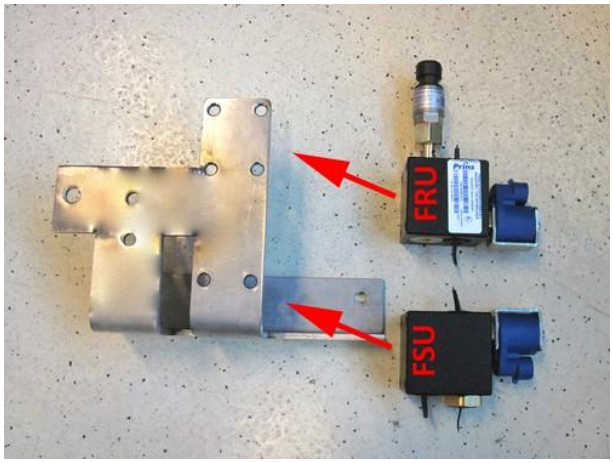


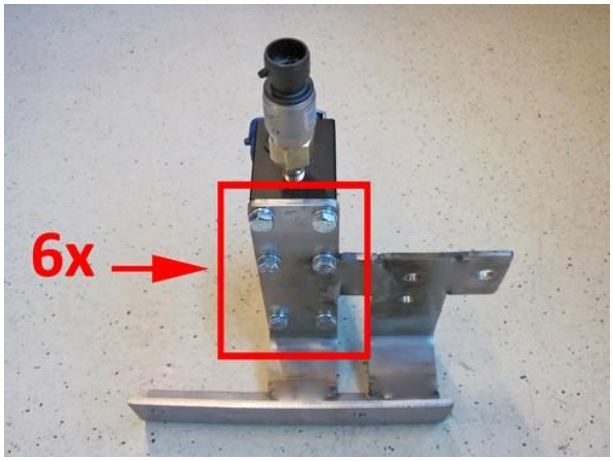




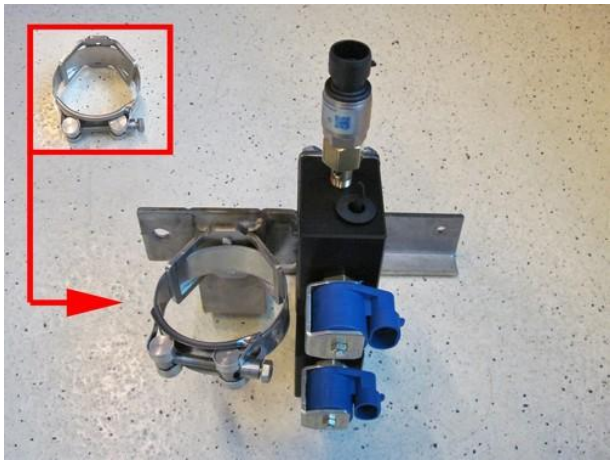
Mount heat reflecting sleeve on engine side of the flex hose, then mount hose on quick connection and connect to the petrol overpressure valve. Don't forget to mount the locking clip.
Connect the flex hose from quick connection to the FRU (remove Allan bolt next to pressure sensor)

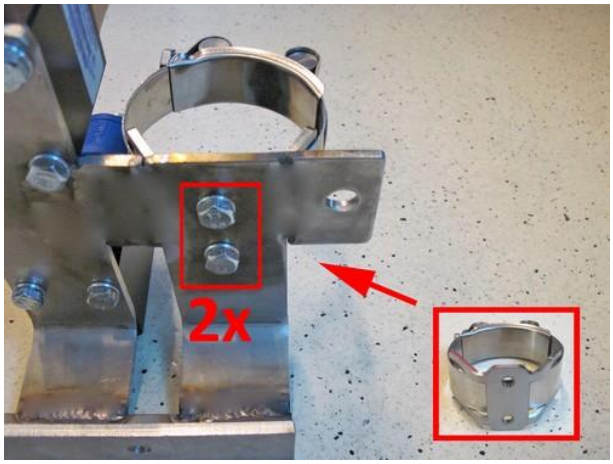
Preparation FSU / FRU / Boost pump





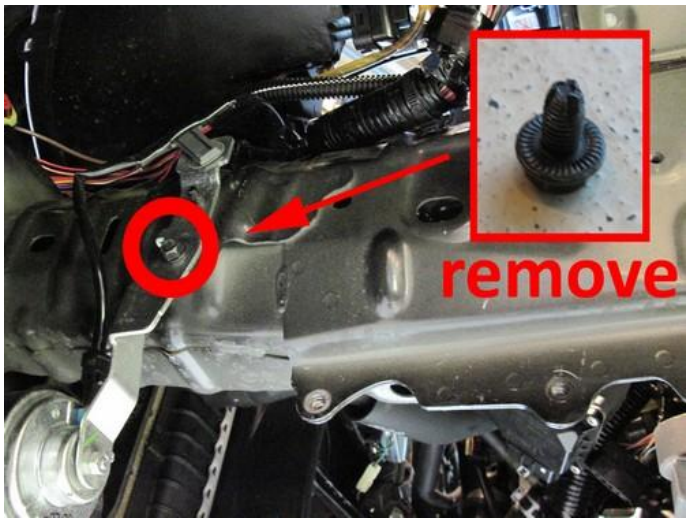
Mount FSU and FRU to bracket with 6 M6 bolts and spring washers.

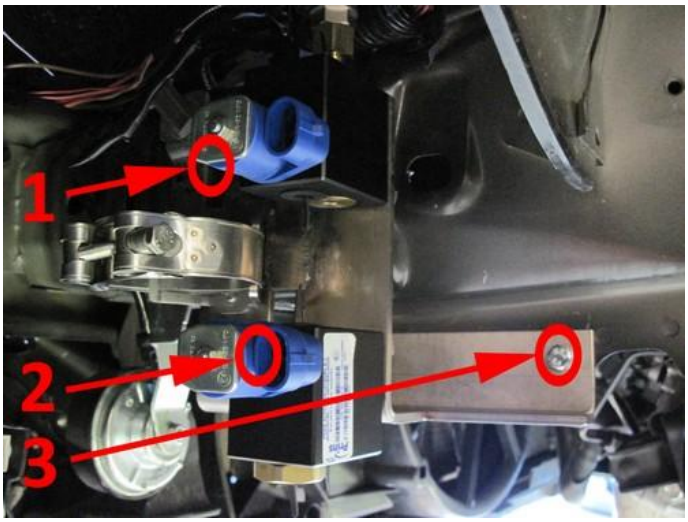




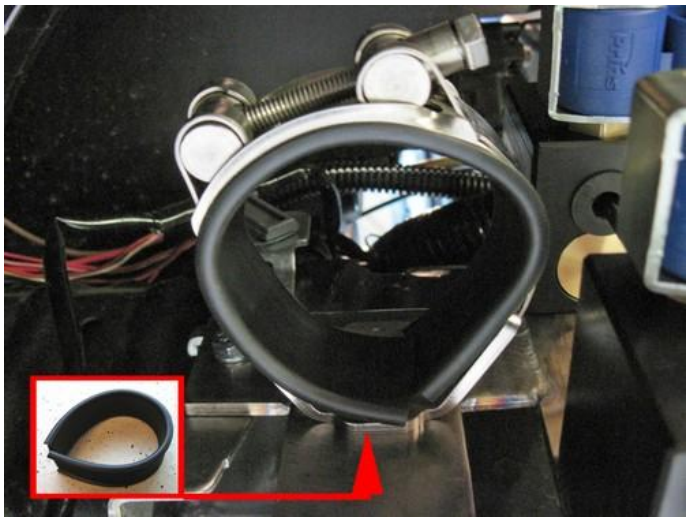
Mount boost pump clamp on extra boost pump bracket and mount on big bracket with 2x M6 bolts with spring washers.

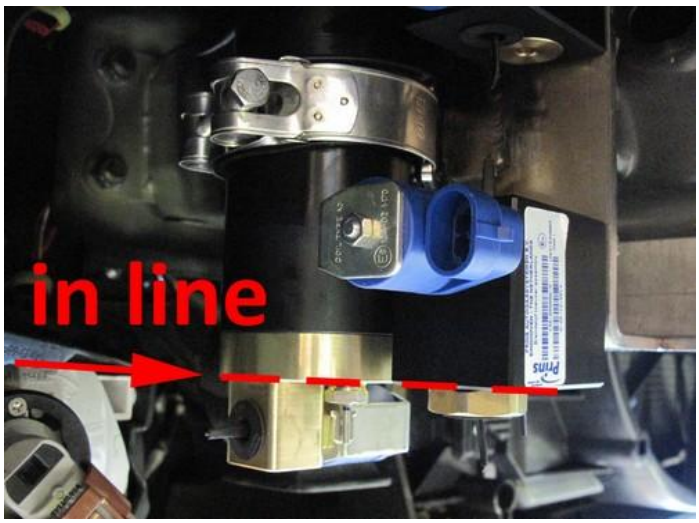
Mounting the FSU / FRU / boost pump bracket





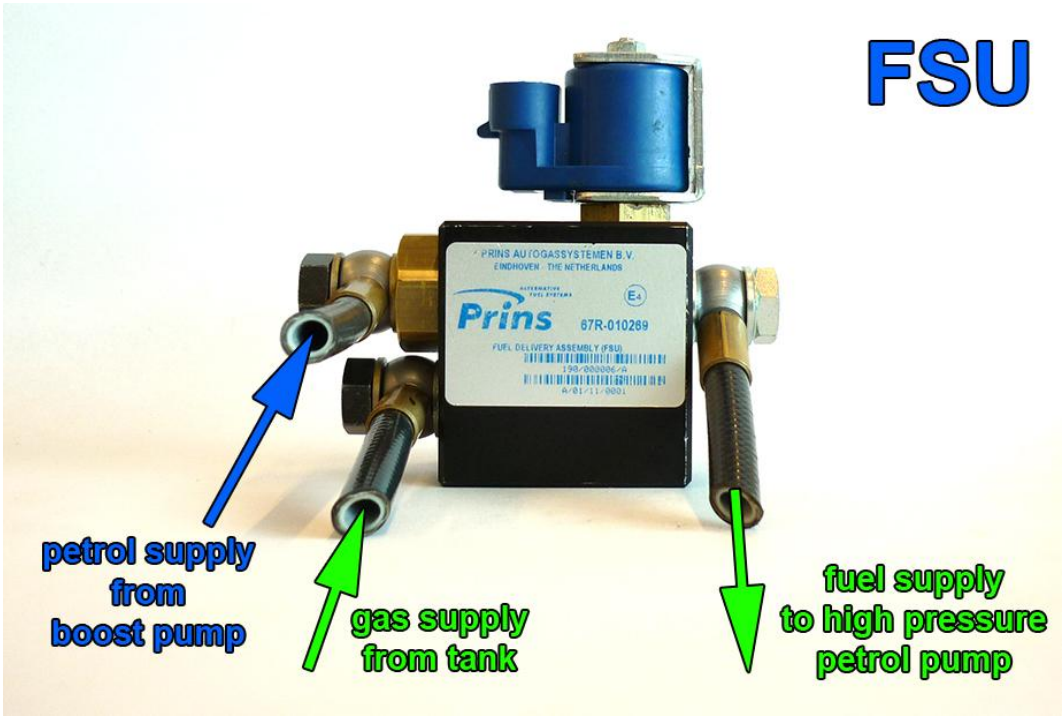
Remove original bolt from horn on left chassis beam.
Mount FSU / FRU / boost pump bracket with 3 M6 bolts with spring washers.



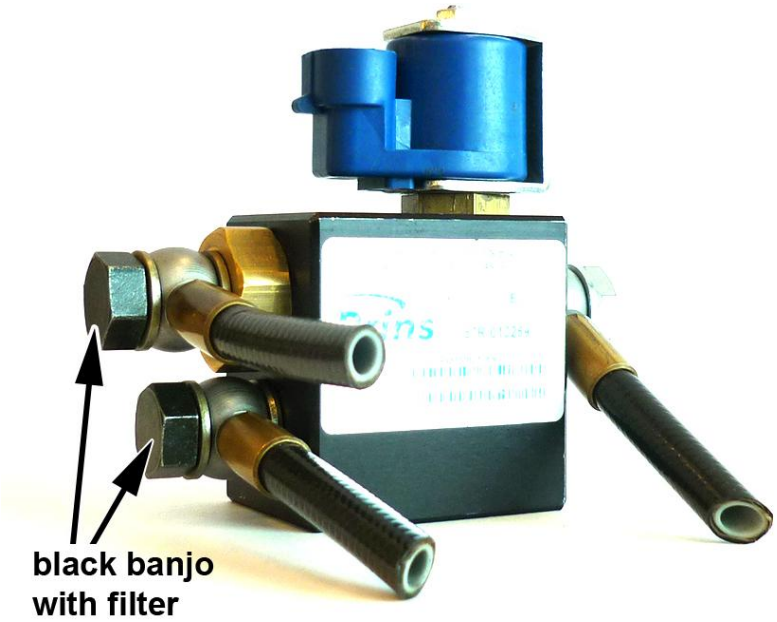


Mount rubber into boost pump bracket. Mount boost pump into bracket. Keep in line with FSU (see picture).

Fuel Supply Unit

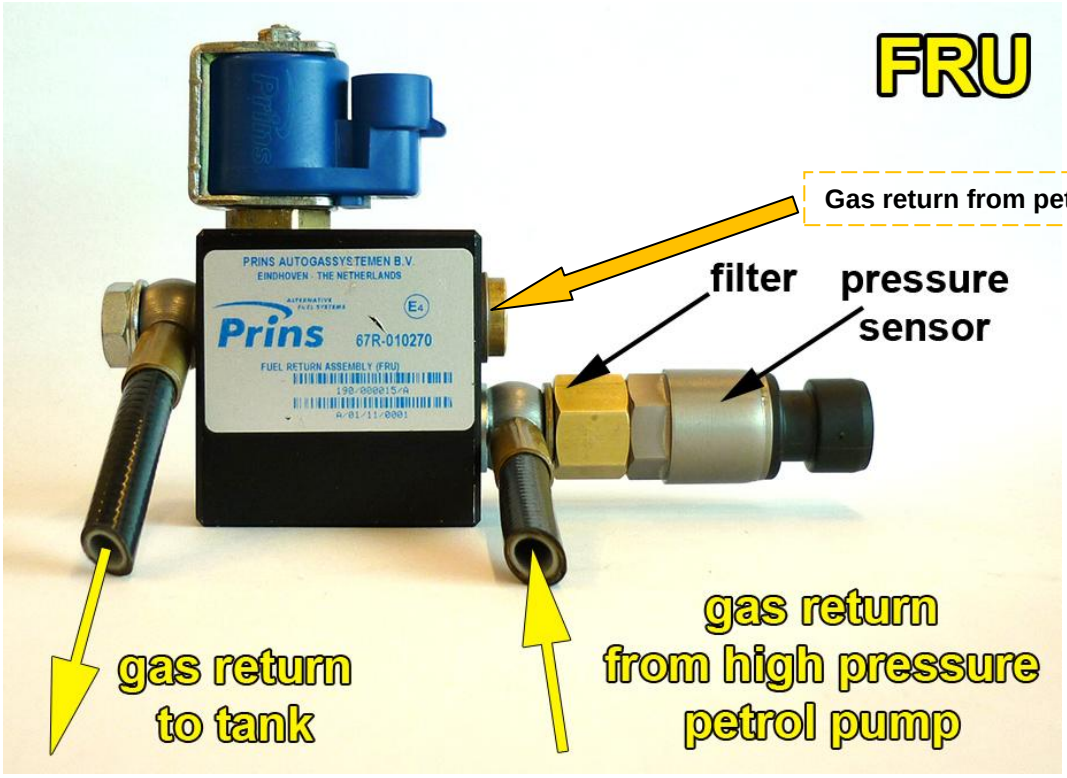


181/300009/A



Black filtered banjo will only be used on inlet connections !

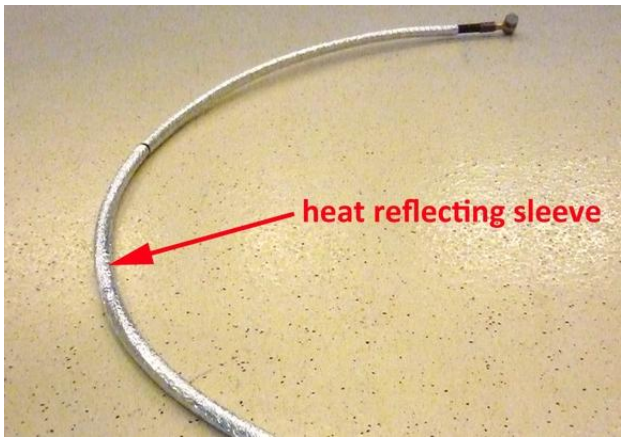
Fuel Return Unit



Filter inside sensor banjo

Lpg / petrol fuel lines

Hose	from	to	Length (cm)
XD-4	Adapter original petrol hose	Petrol boost pump	95 with heat sleeve
XD-3	Fuel supply unit	High pressure petrol pump	125 with heat sleeve
XD-3	Petrol boost pump	Fuel supply unit	25
XD-3	Fuel return unit	High pressure petrol pump	110 with heat sleeve
XD-3	Fuel return unit	Petrol rail return	85

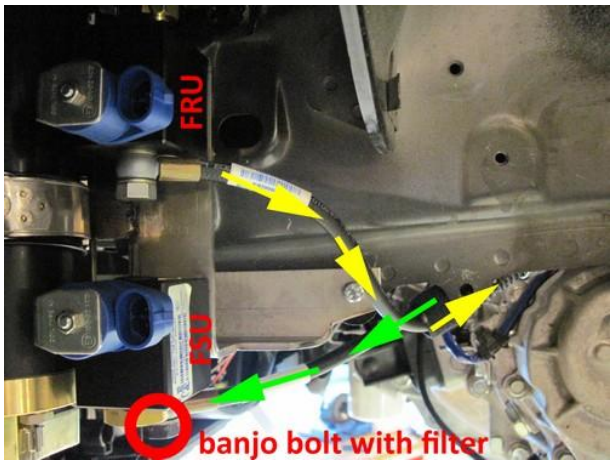


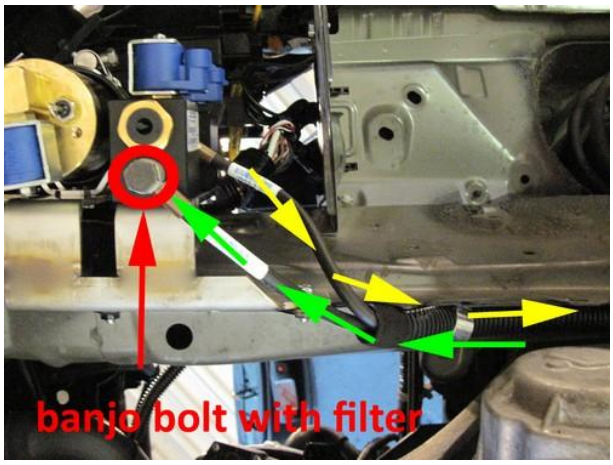
Install the fuel line using two bonded seal washers and banjo bolt :

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

181/300009/A

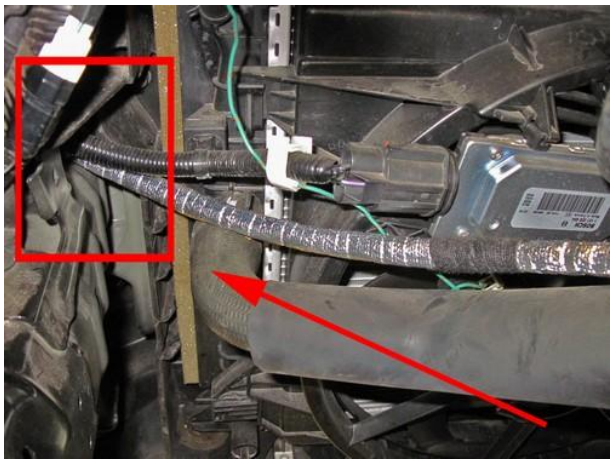
Mounting the fuel lines 1





Mount the fuel hoses (to tank) to the FSU and FRU. All inlets are using a banjo bolt with filter.

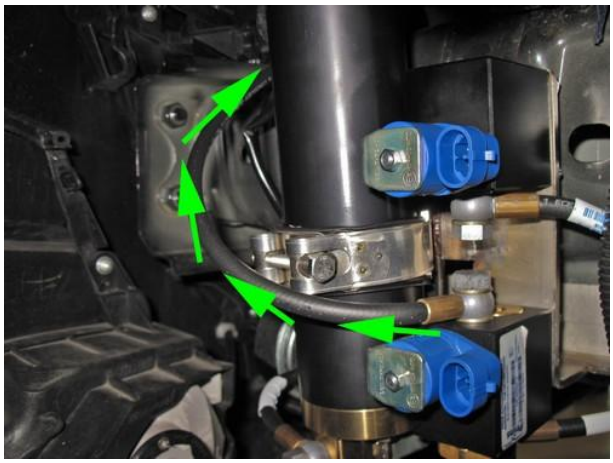
Mount flex hose from boost pump to fuel supply unit.

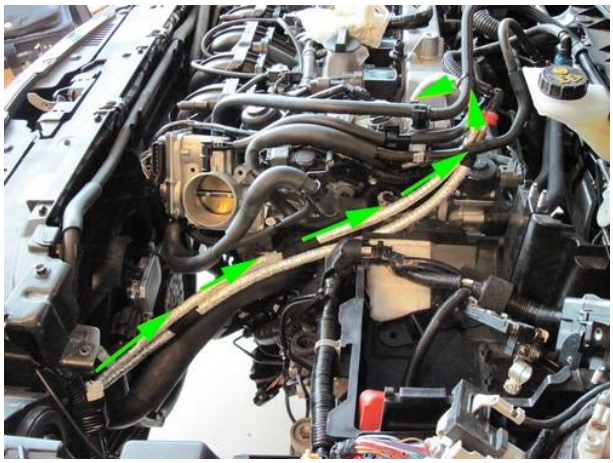


Passing space for fuel lines.

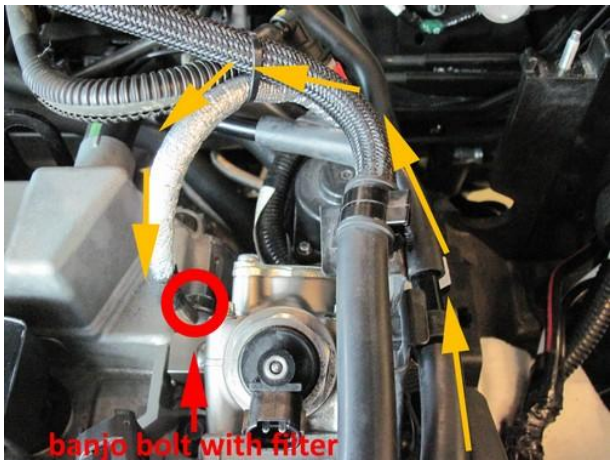
Mount flex hose from original petrol supply connection to boost pump.

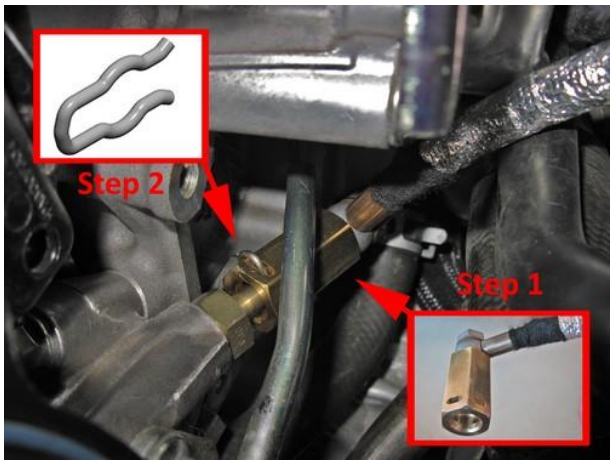
Mounting the fuel lines 2

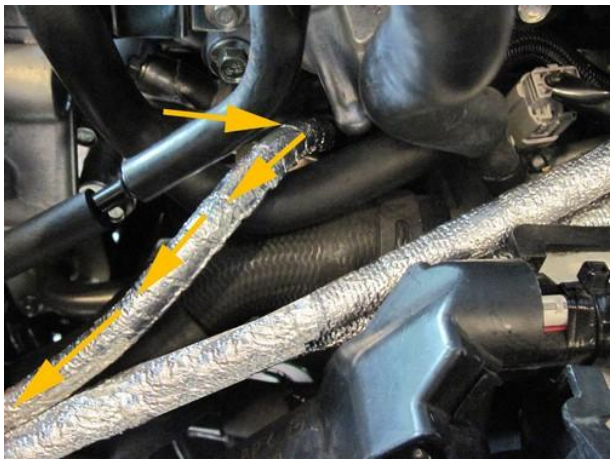


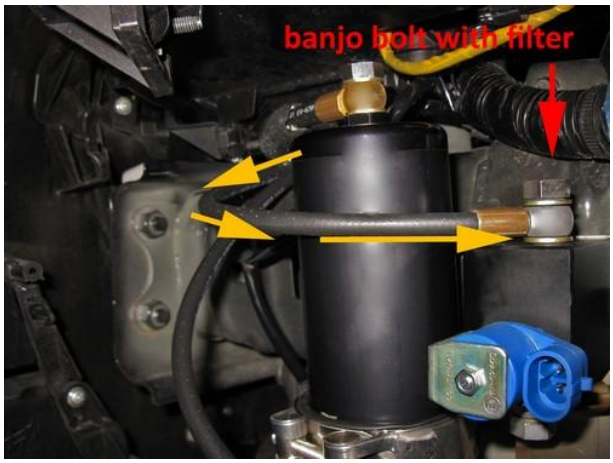


Mount flex hose from FSU to high pressure petrol pump. Use bajo bolt with filter on HP petrol pump.





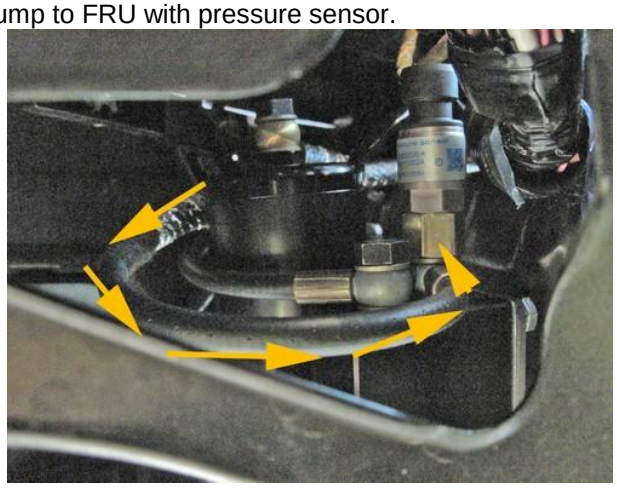




Mount flex hose from petrol rail return to FRU. Use banjo bolt with filter on FRU.

Mounting the fuel lines 3

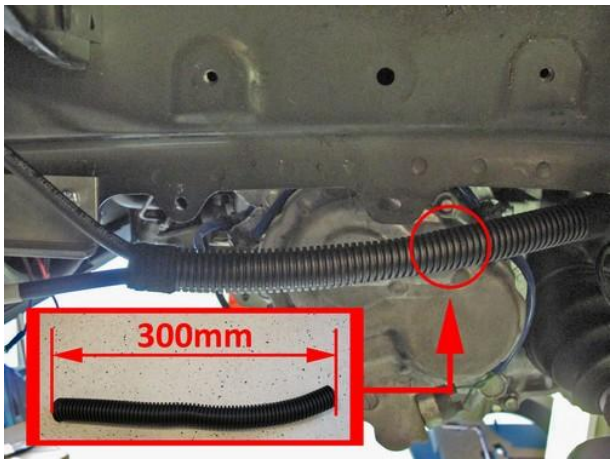

Mount flex hose from HP petrol pump to FRU with pressure sensor.

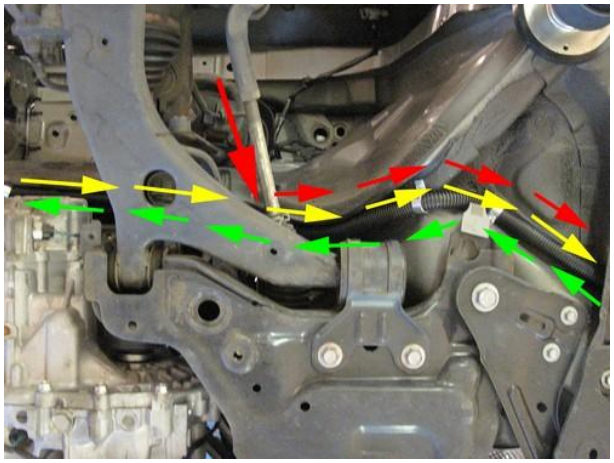



Mount flex hose from HP petrol pump to FRU with pressure sensor.

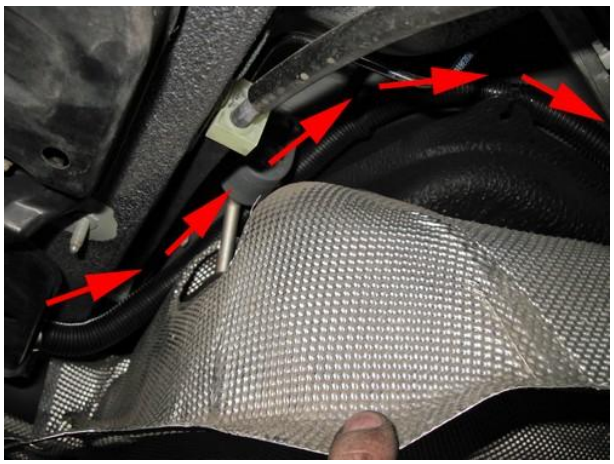
Fuel lines to tank

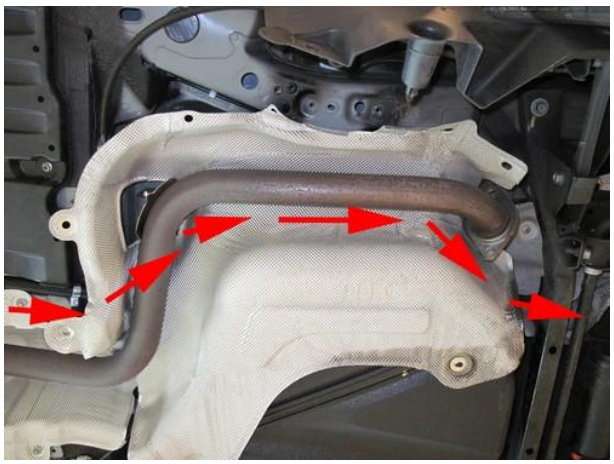
Remove plastic bottom plates.

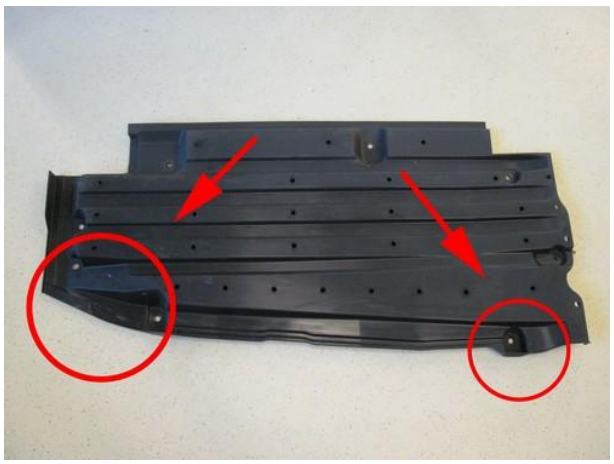




Mount split tube around first section of fuel hoses. The green and yellow arrows are the fuel lines, the red are the wiring. They come together in this corner. Mount split tube around hoses & wiring together.



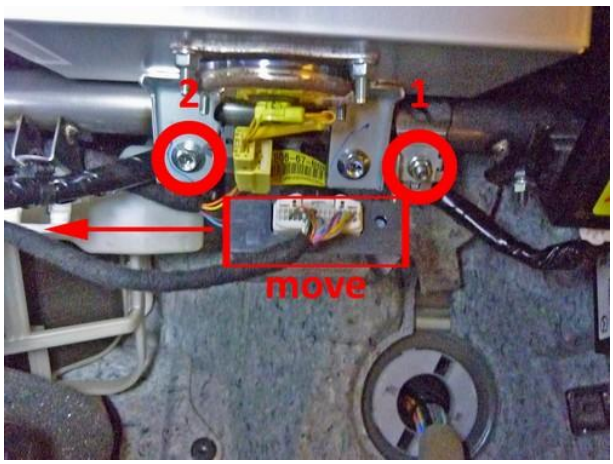




Adapt plastic bottom plates for transit fuel lines & wiring.

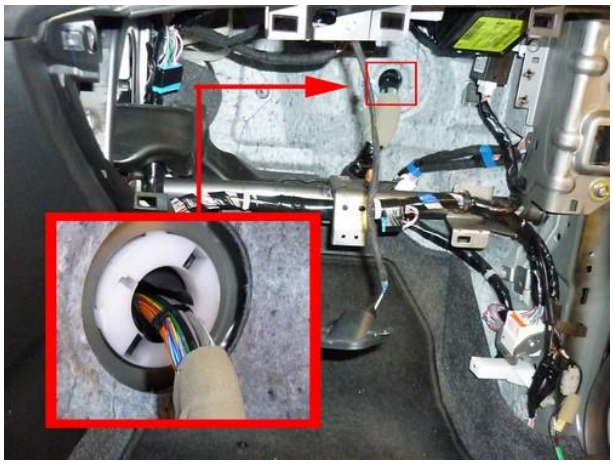
Mounting the AFC / Relays

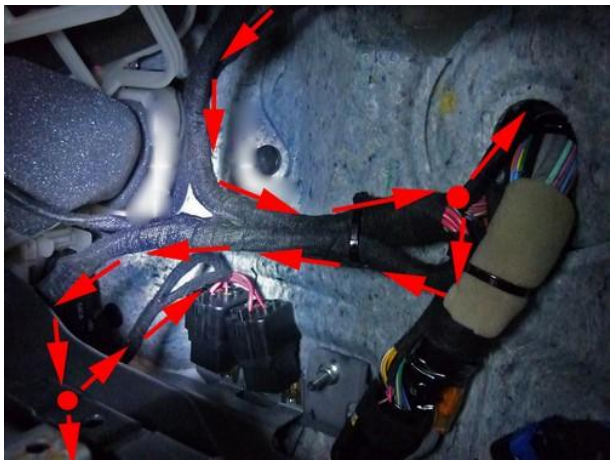
Remove plastic cover, carpet & steel plate (cover of petrol ECU) below glove box.



Relocate electronic unit from nut 1 to bolt 2. Mount AFC clip on bracket.

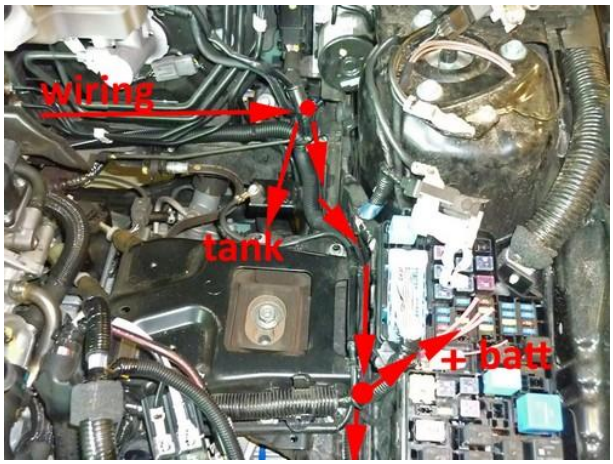
Mount bracket to nut 1. Connect wiring to AFC and mount both relays with M6 nuts & spring washers.



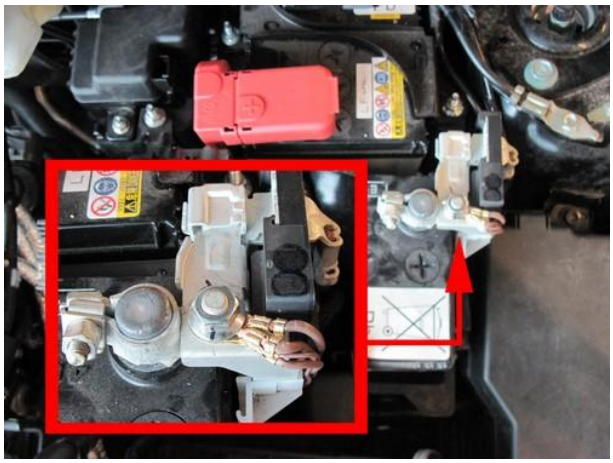


Wiring transit for: boostpump / FSU / FRU / tank wiring / + batt & ground.
After all connections (incl petrol ECU) have been made, adapt plastic cover for fitting underneath glovebox.

Wiring routing



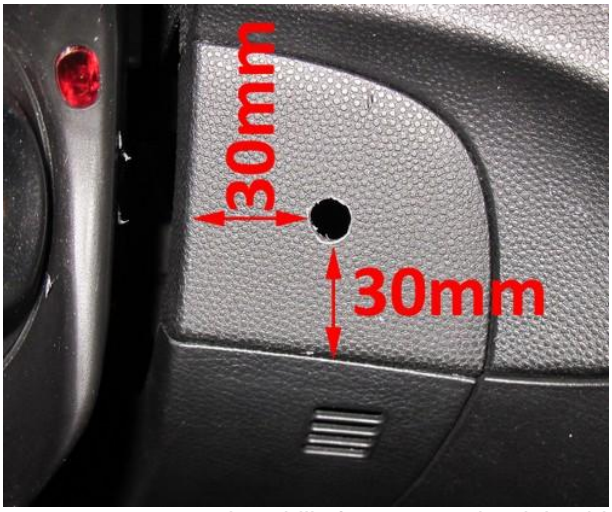
+Batt connection



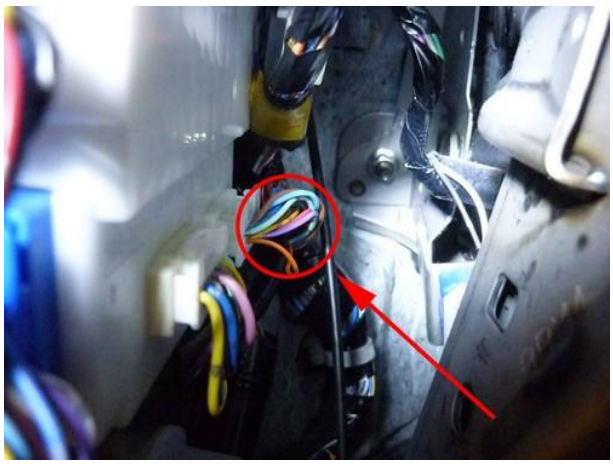
Ground connection on battery.

Mounting the fuel selection switch / Wake-up connection

Wiring inside : switch wiring / CAN wiring / Wake-up connection / Petrol ECU connections



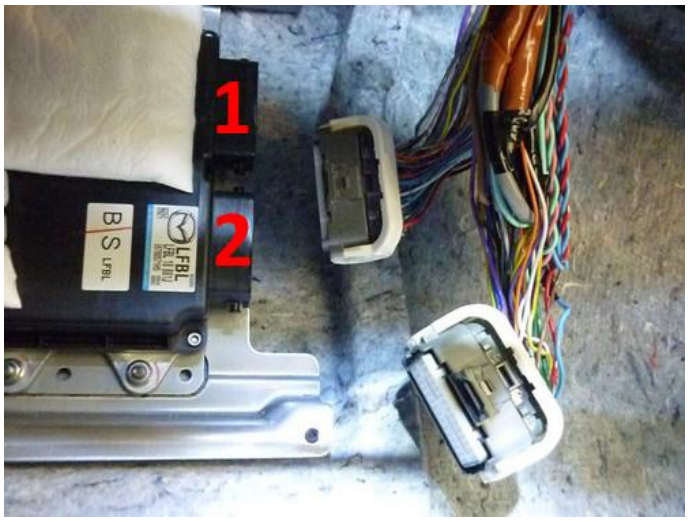
Mark & drill Ø8,3mm on the right side of the steering column. Mount fuel switch.



Remove cover on left side of steering column. Wake-up connection.

Petrol ECU pin out and location / Fuses

Petrol ECU located beneath glove box under steel cover.



Connector 2

2BE	2BA	2AW	2AS	2AQ	2AK	2AG	2AC	2Y	2U	2Q	2M	2I	2E	2A
2BF	2BB	2AX	2AT	2AP	2AL	2AH	2AD	2Z	2V	2R	2N	2J	2F	2B
2BG	2BC	2AY	2AU	2AQ	2AM	2AI	2AE	2AA	2W	2S	2O	2K	2G	2C
2BH	2BD	2AZ	2AV	2AR	2AN	2AJ	2AF	2AB	2X	2T	2P	2L	2H	2D

Connector 1

1BE	1BA	1AW	1AS	1AO	1AK	1AG	1AC	1Y	1U	1Q	1M	1I	1E	1A
1BF	1BB	1AX	1AT	1AP	1AL	1AH	1AD	1Z	1V	1R	1N	1J	1F	1B
1BG	1BC	1AY	1AU	1AQ	1AM	1AI	1AE	1AA	1W	1S	1O	1K	1G	1C
1BH	1BD	1AZ	1AV	1AR	1AN	1AJ	1AF	1AB	1X	1T	1P	1L	1H	1D

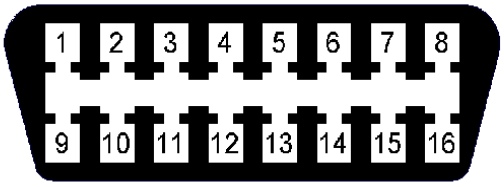
Fuses when finished.

Electrical connections

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

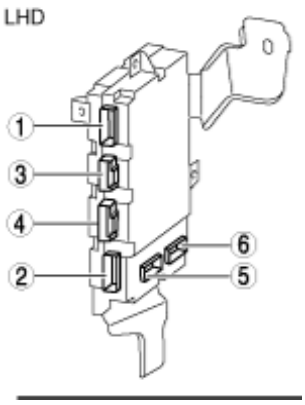
Driver room

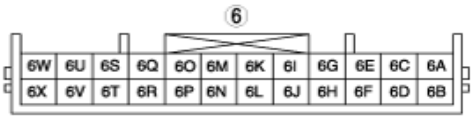
3-pole micro connector 66 Ground fuel switch 3 +12V fuel switch 49 LIN fuel switch	Brown Red yellow	Connect the 3-pole connector to the Prins fuel selection switch.
51 CAN-High	Blue-yellow	EOBD connector pin 6 **White** (clamp connection, not solder)
70 CAN-Low	Blue	EOBD connector pin 14 **Red** (clamp connection, not solder)



This is EOBD connector is located left under the steering column.

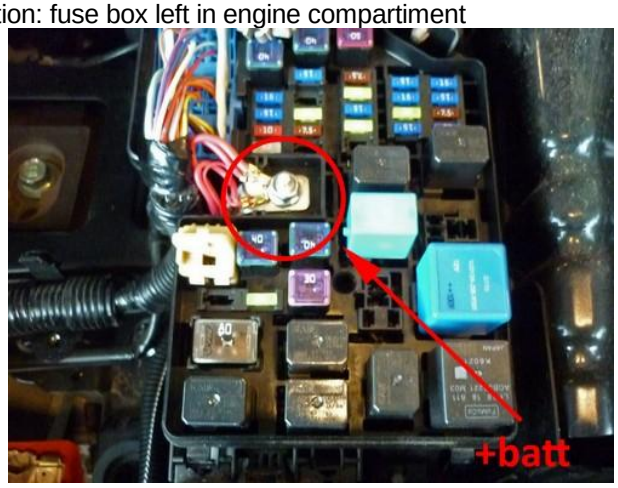
121 Wake-up	Red-grey	Wire colour : **Orange** Wire location : **Left IN car (see picture page 23), conn 6, pin 6T** (clamp connection, not solder)





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 location : On battery ground clamp. 
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 left in engine compartiment 

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***
18 Analog 1 25 Simulation 1	Blue-red Green-grey	*High pressure petrol sensor signal interruption* Sensor side. ECU side. Wire colour : **Green** Wire location : **ECU Connector 2, pin 2R**
117 Digital input 3	Yellow-black	*High pressure petrol sensor 5Volt supply* Wire colour : **Grey** Wire location : **ECU Connector 2, pin 2K**
19 Analog 4	Blue-white	*High pressure petrol sensor ground* Wire colour : **Orange** Wire location : **ECU Connector 2, pin 2T**

17 Analog 2	Blue-black	*Airflow* Wire colour : **grey-black** Wire location : **ECU Connector 2, pin 2M**
7 +12V IGNITION	grey - white	*Make a connection to ignition + / contact + (+15).* *Do not place the fuse in the holder before having completed the installation of the lpg system.* Wire colour : **Purple-Grey** Wire location : **ECU Connector 1, pin 1AY**
27 +5V sensor 37 C ground 20 Analog 3 MAP* * Cut off connector: Only use blue signal wire 20	Red, insulate Brown, insulate Blue	*For measuring the inlet manifold pressure from the engine MAP sensor.* Wire colour: **Yellow** Wire location: **Connector 2, pin 2AG**
8 RPM	Purple-white	*For measuring the engine speed signal.* Wire colour : **Yellow** Wire location : **ECU Connector 2, pin 2S**
15 T-ect	Grey	*For measuring the engine coolant temperature.* Wire colour : **Grey** Wire location : **Connector 2, pin 2AH**

23	Digital Simulation	Green-red	Insulate
115	Digital input 4	Yellow-red	Insulate
119	Digital input 2	Yellow-grey	Insulate
6	Lambda1 WB	Orange	Insulate
42	Lambda2 WB 10KΩ	Orange-white	Insulate
10	Simulation 2	Green-black	Insulate
97	Digital input 5	Yellow-orange	Insulate
113	Digital input 6	Yellow-purple	Insulate

Electrical connections

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

Engine room

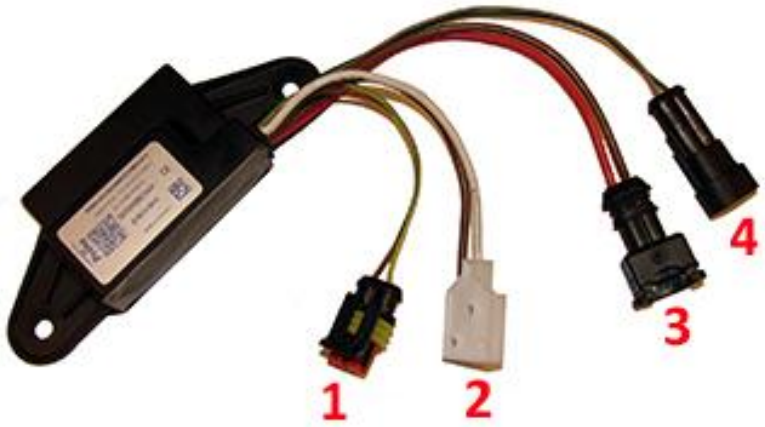
Wire number / code	Wire colour	Connection
3-pole connector		Connect the 3-pole connector to the Psys sensor positioned into the Fuel Return Unit.
35 C Ground pin A	Brown	Sensor wire pin A
9 +5V sensor pin B	Red	Sensor wire pin B
16 Psys pin C	Green	Sensor wire pin C
14 T-LPG	Grey	Not used, insulate.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

Electrical connections

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

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

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.