ALTERNATIVE FUEL SYSTEMS

Prins

Installation manual
Dedicated
PART 2/2

DIRECT LIQUI max-2.0 HIGH PRESSURE LIQUID LPG INJECTION

MANUFACTURER	Mazda
TYPE	**3** // 6
ENGINE DISPLACEMENT	1500-**2000** // 2000 // 2500
TYPE	**CX-5**
ENGINE DISPLACEMENT	**2000 //** 2500
NUMBER OF VALVES	16v
ENGINE CODE / NUMBER	PE-VPS (Skyactiv-G)
VEHICLE CATEGORIES	M
TRANSMISSION	AT / MT(6)
VERSION	DLM 2.1
PETROL ECU MANUFACTURER / CODE	Mitsubishi PE1T / PE03
HIGH PRESSURE PETROL POMP	Denso 295100-0294 (Mazda PE01 20 3F0F)
HIGH PRESSURE PETROL INJECTOR	
MODEL YEAR:	2013
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000011 / DLM-LPG 04
LOCATION SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	353/070025/A **//** **353/070011/A** **//** 353/070009/A // 353/35070029/A
ENGINE SET NUMBER	**353/070015/A //** 35070027/A
MANUAL NUMBER	076/1307800
DATE	2017-04-05

Version 2012-11-02 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-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 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 Com port
- 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)

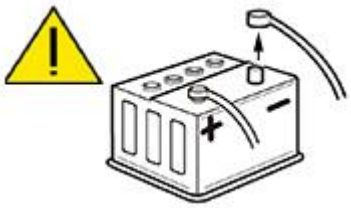
Tightening moments

		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

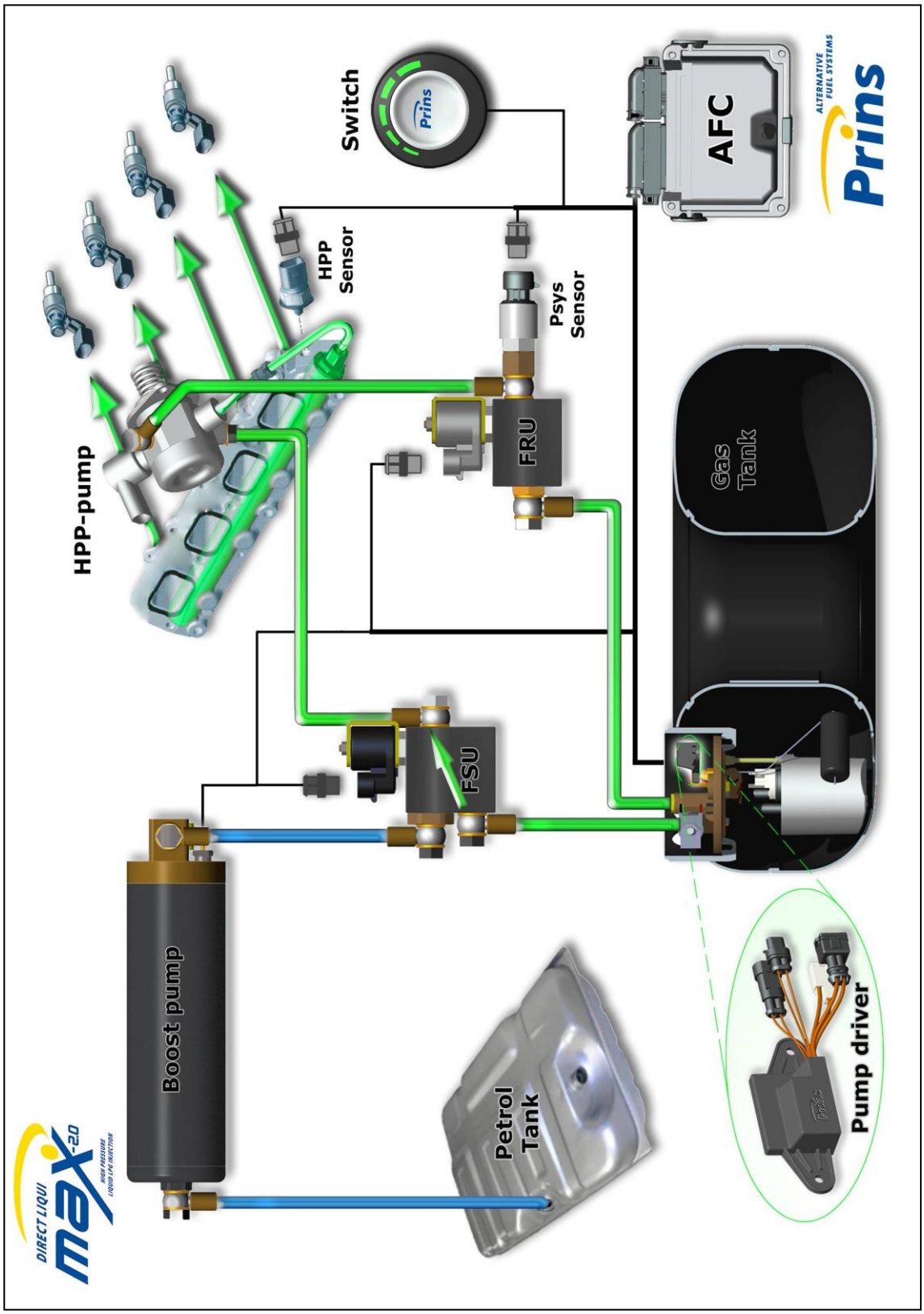
EXPLANATION OF SYMBOLS :


= IMPORTANT, CAUTION

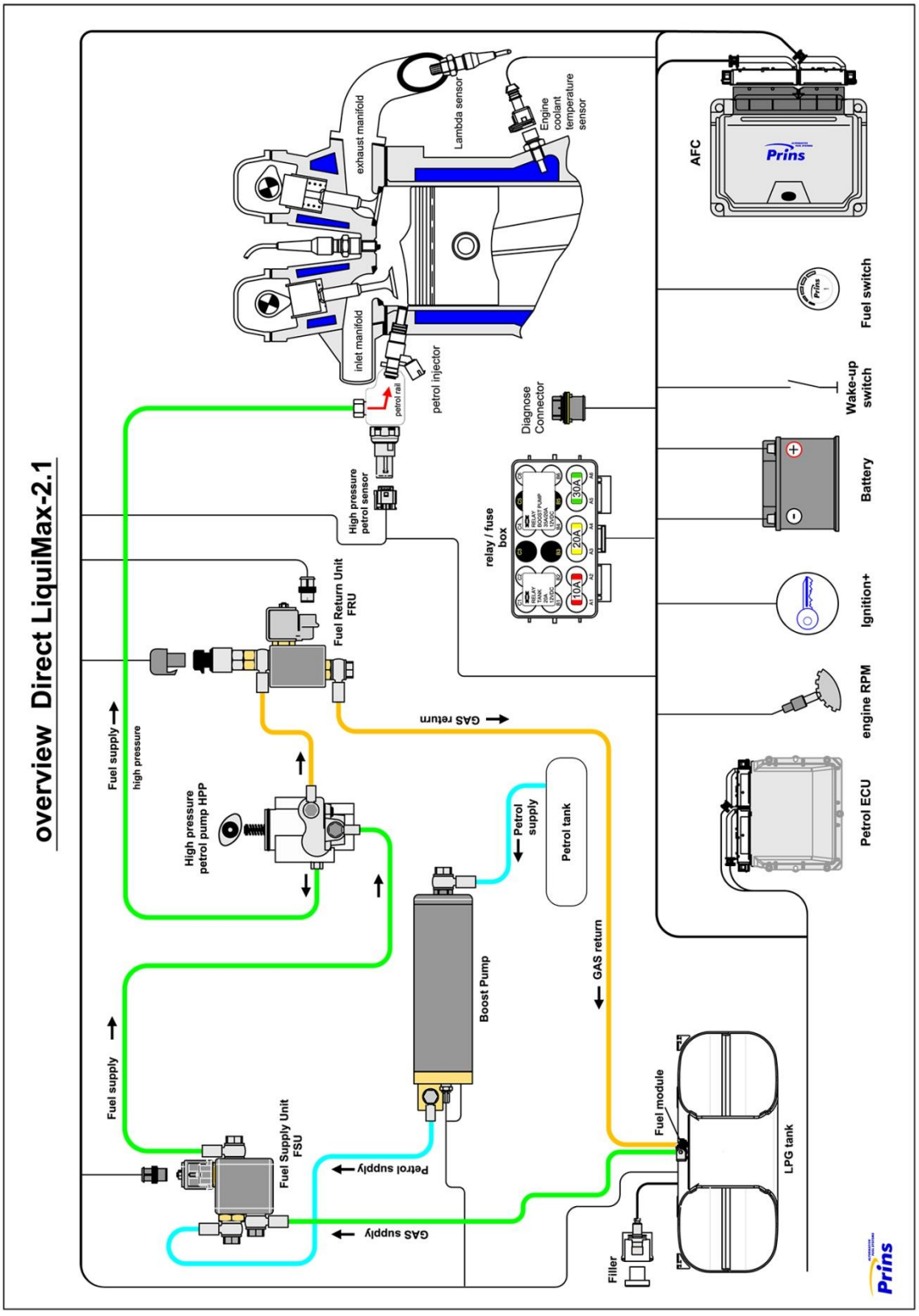

= WEAR SAFETY GOGGLES



Direct LiquiMax



Direct LiquiMax-2.0 diagram, AFC-2.1



Direct LiquiMax parts / approval numbers

1st generation

2nd generation

Fuel Supply Unit : E4-67R-010269

1st generation

2nd generation

Fuel Return Unit : E4-67R-010270
Pressure Sensor : E4-67R-010051

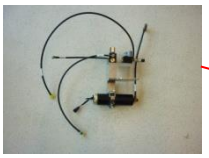
Boost pump

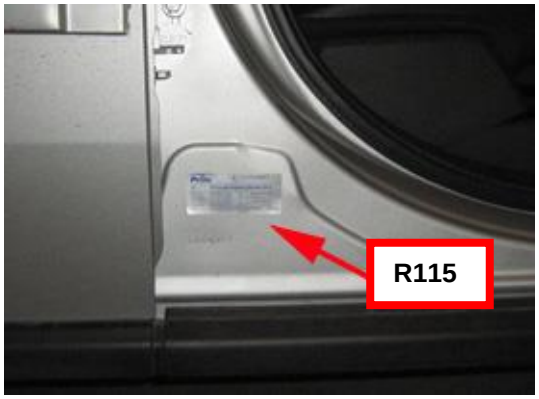
High Pressure Pump : E4-67R-010266
High Pressure Rail : E4-67R-010267
High Pressure Injectors : E4-67R-010309

Prins AFC: E4-67R-010098
E4-10R-030507

Fuel lines series XD : E4-67R-010247 XD3
E4-67R-010247 XD4

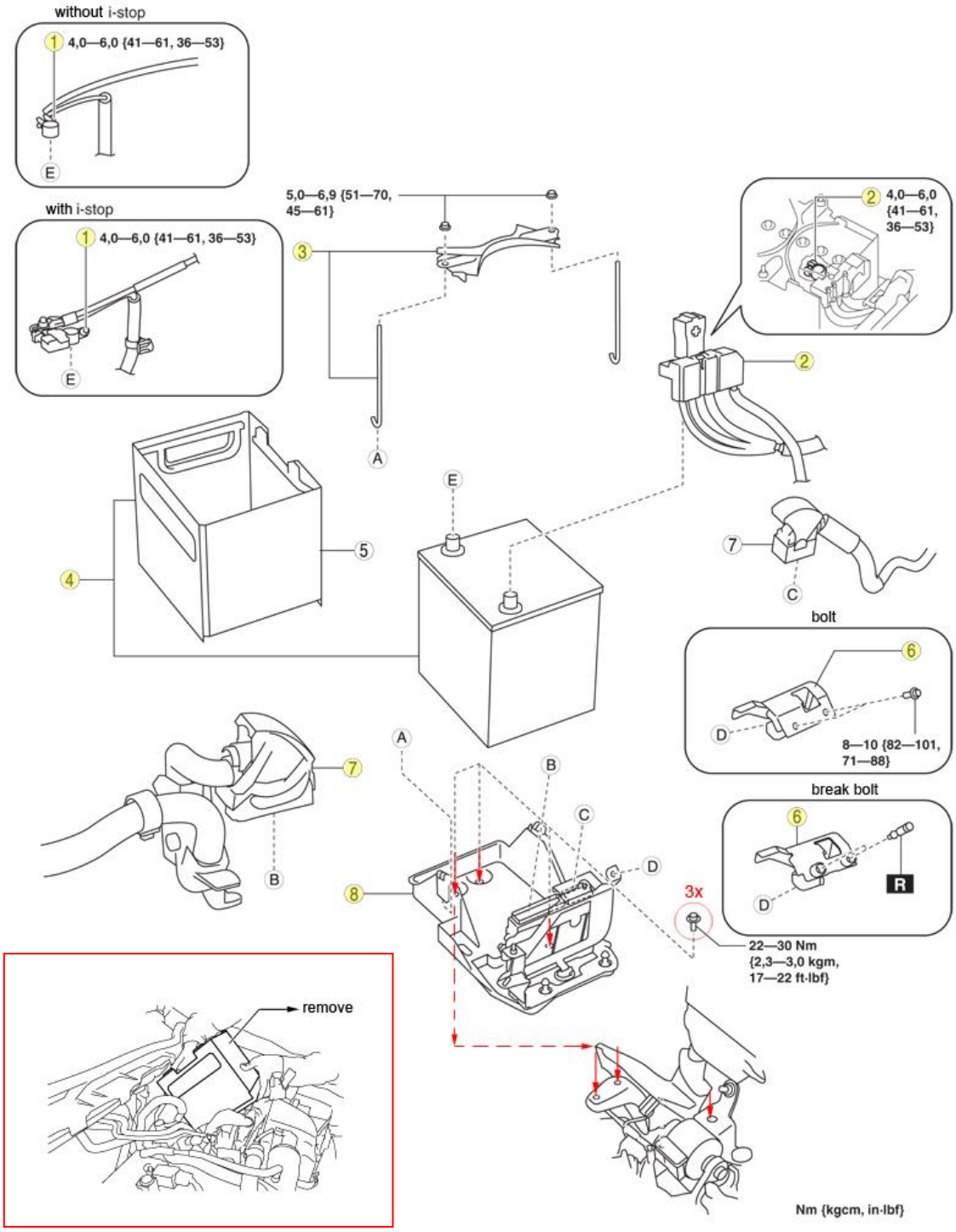
DLM-2.0 component location overview

DLM unit 		**AFC** 
HPP pump 		**Fuse box** 
		Petrol ecu

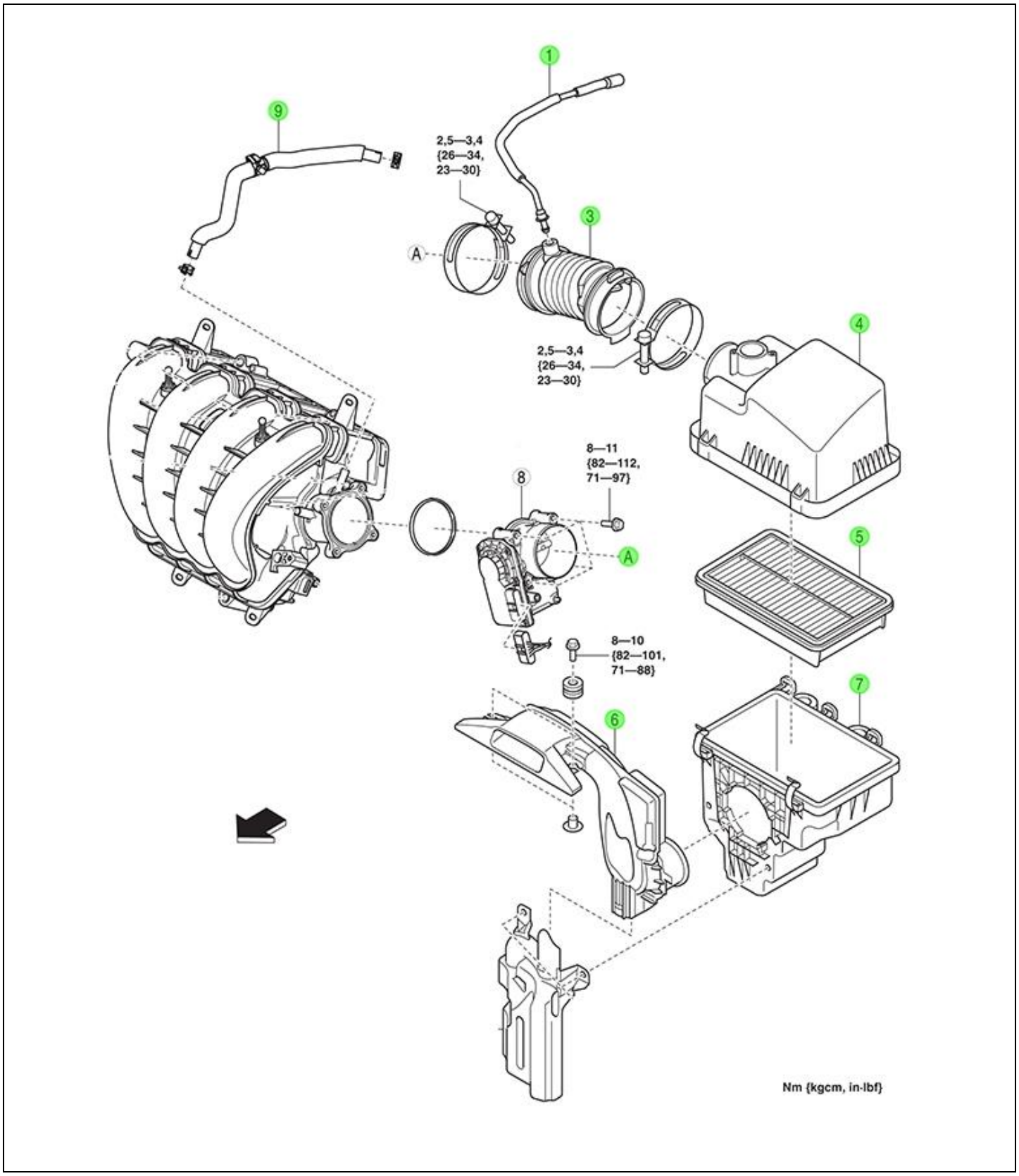


R115 approval sticker :
Right side centre door post

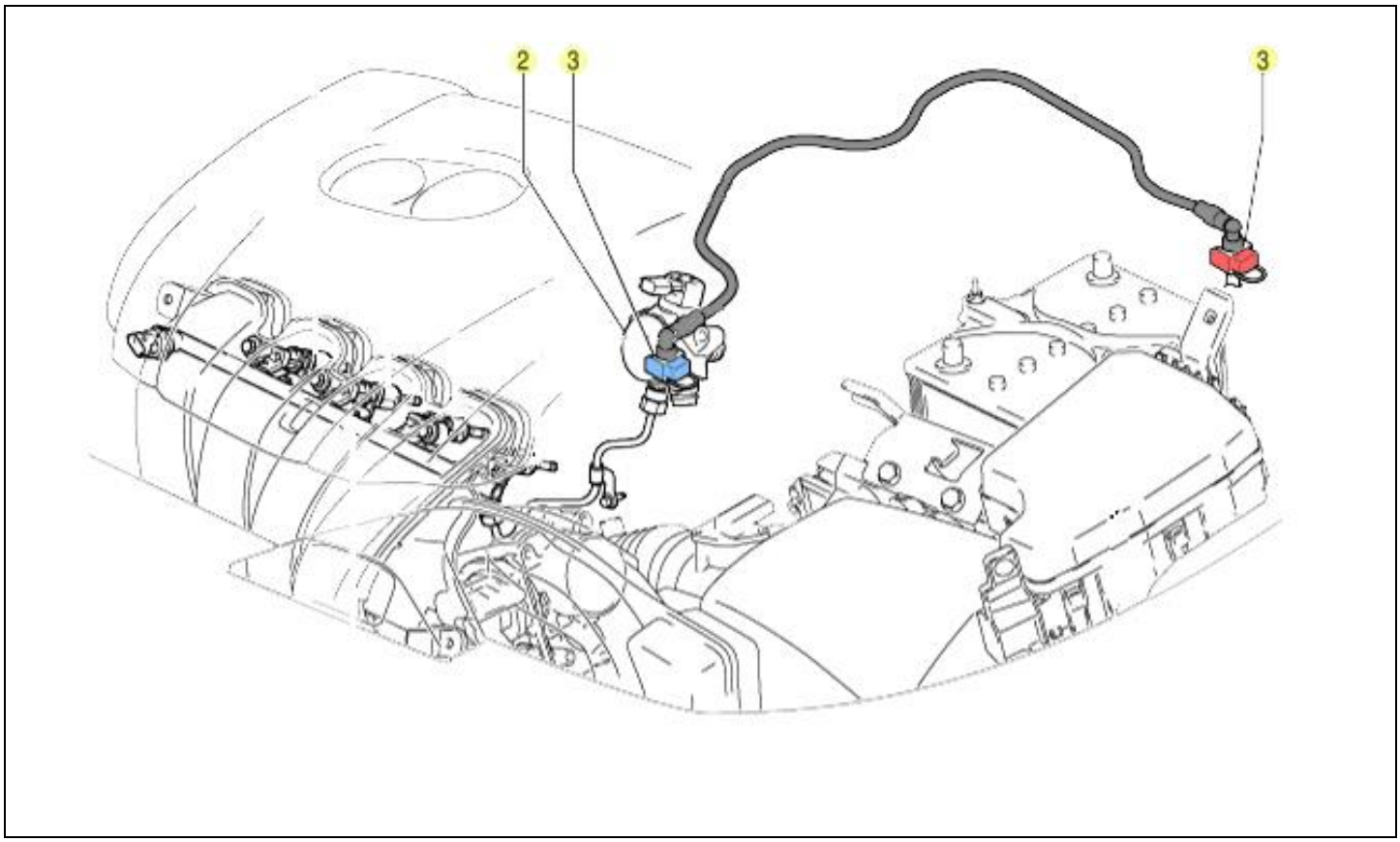
Remove battery



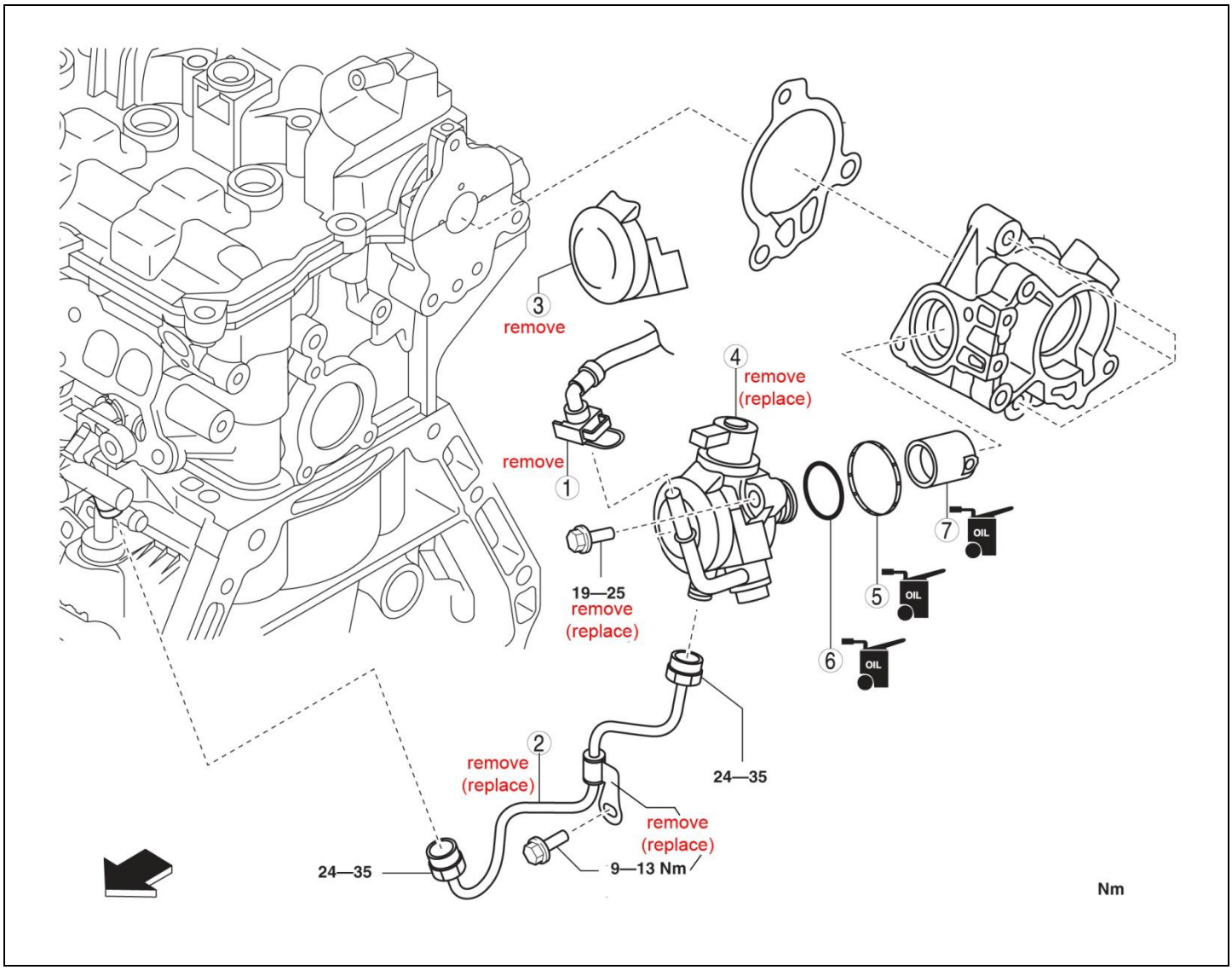
Overview Filter removal



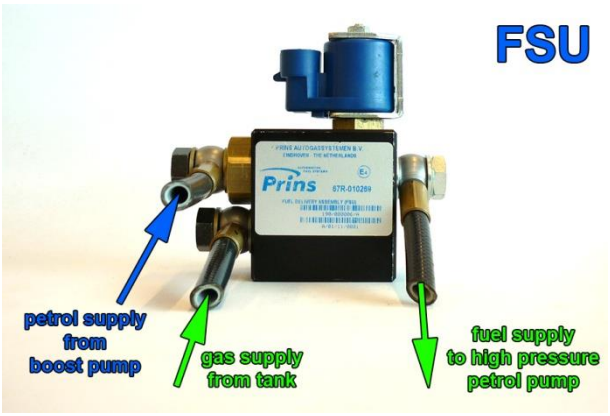
Petrol hose removal

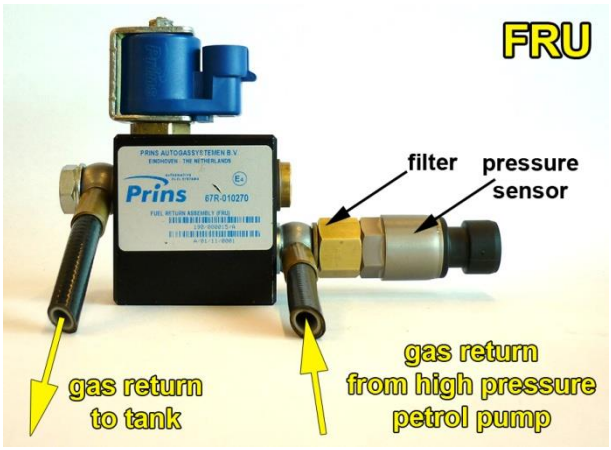


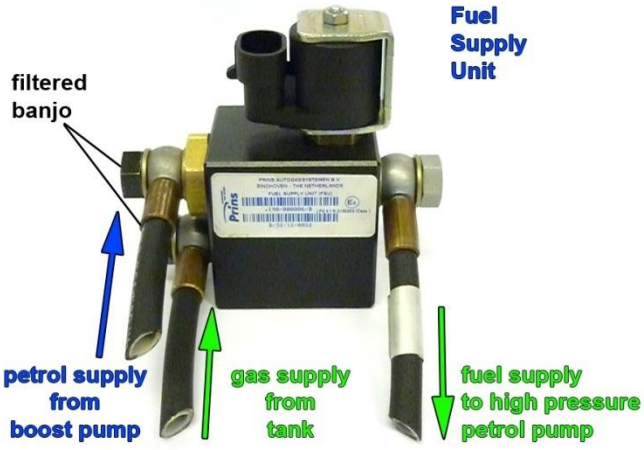
Overview pump removal

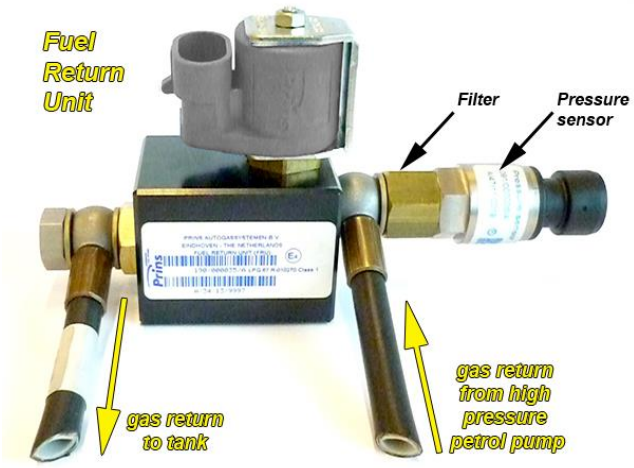


Fuel Supply Unit / Fuel Return Unit





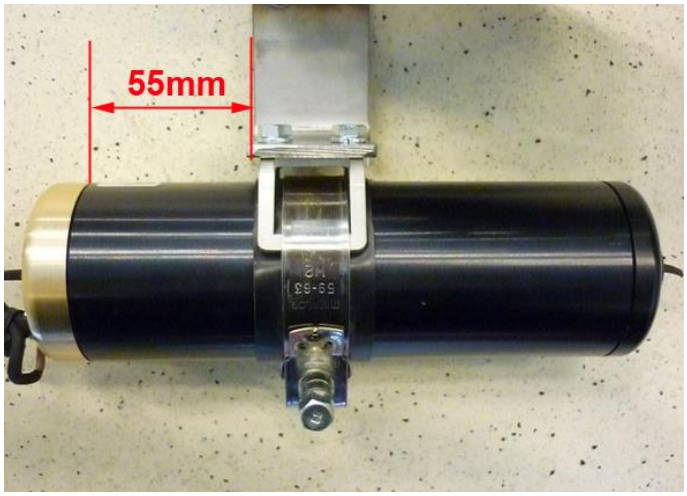




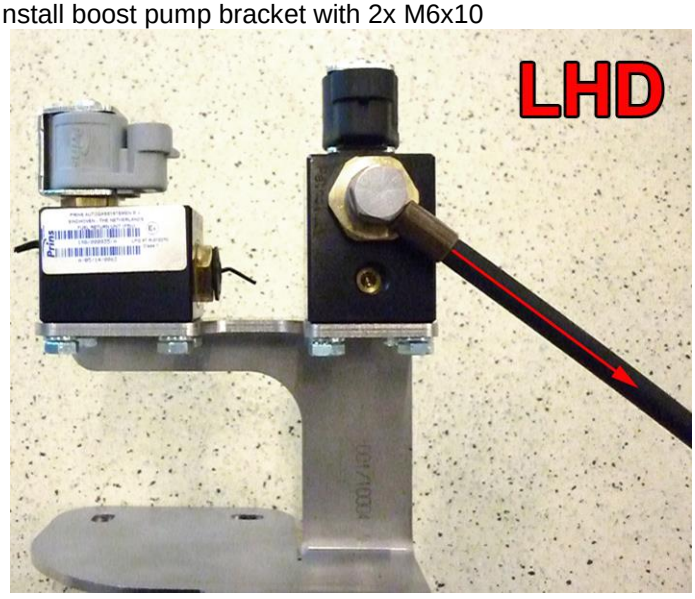
Black filtered banjo will only be used on inlet connections !

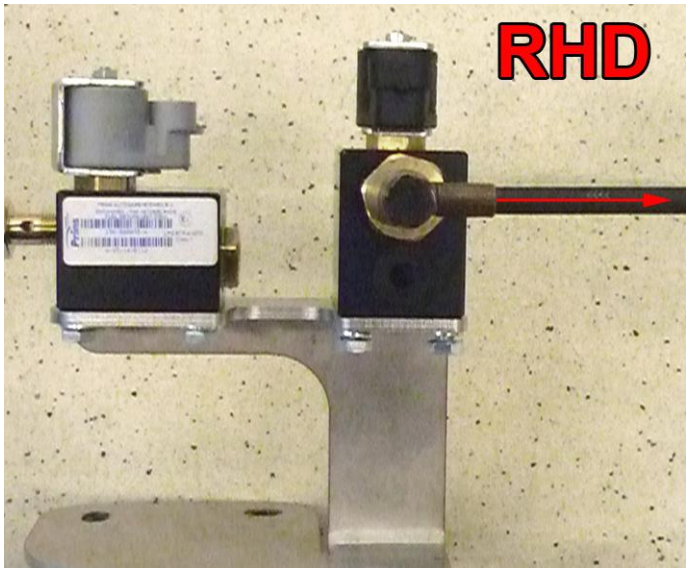
Filter inside sensor banjo

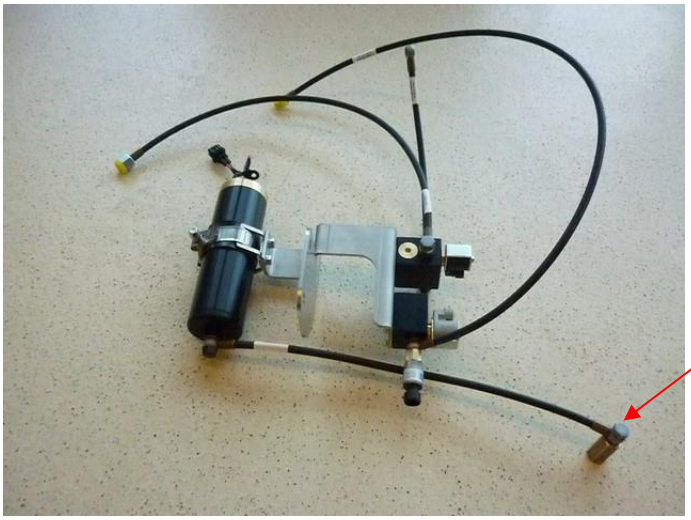
Prepare unit bracket



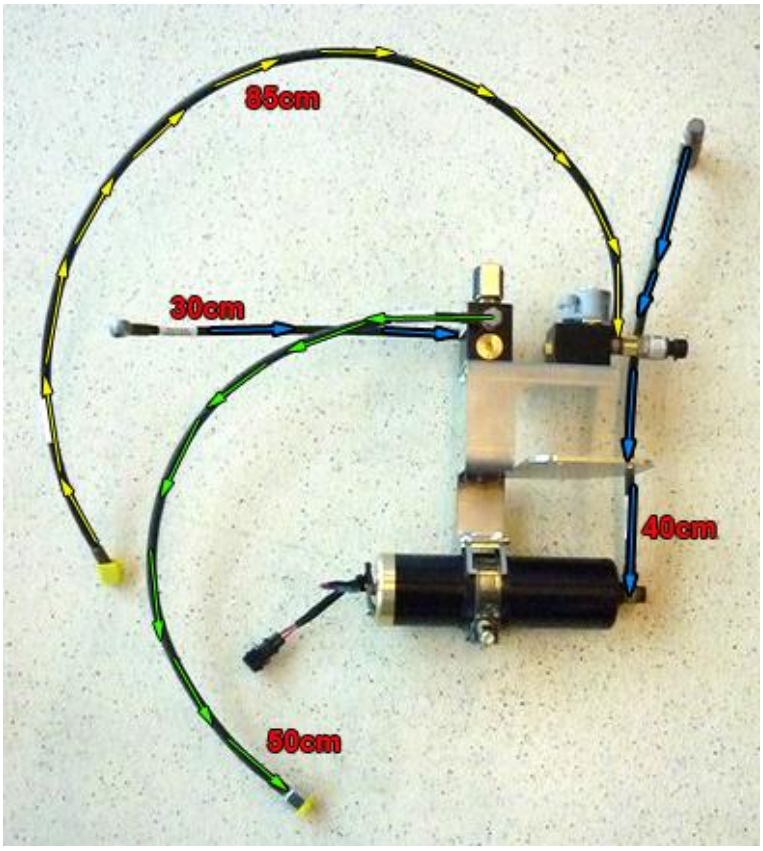
Install boost pump bracket with 2x M6x10

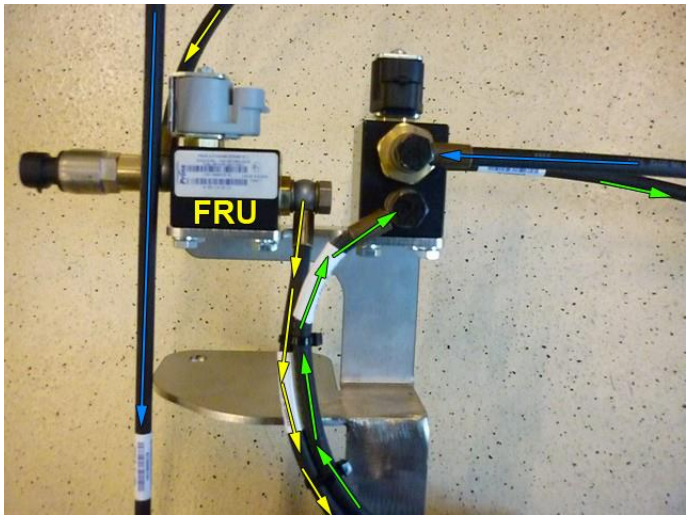


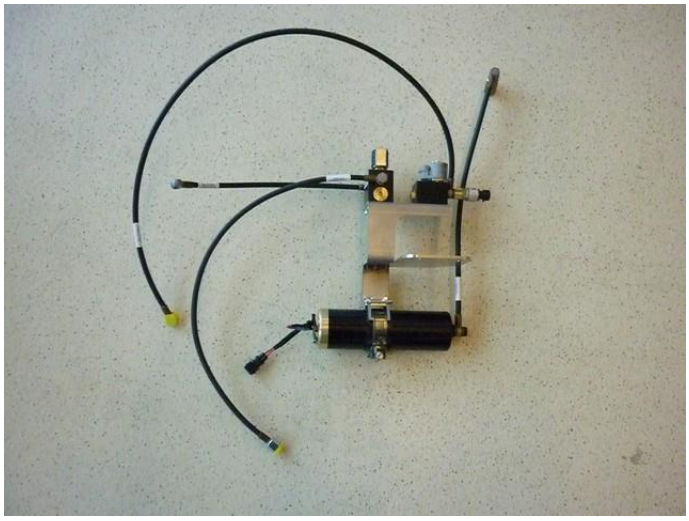




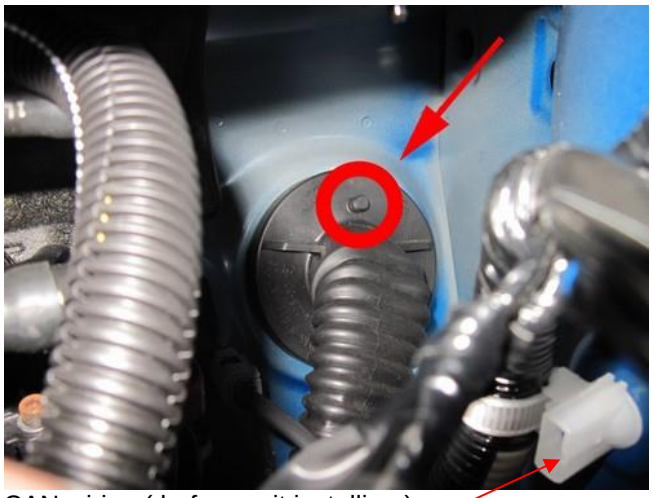
Prepare unit bracket



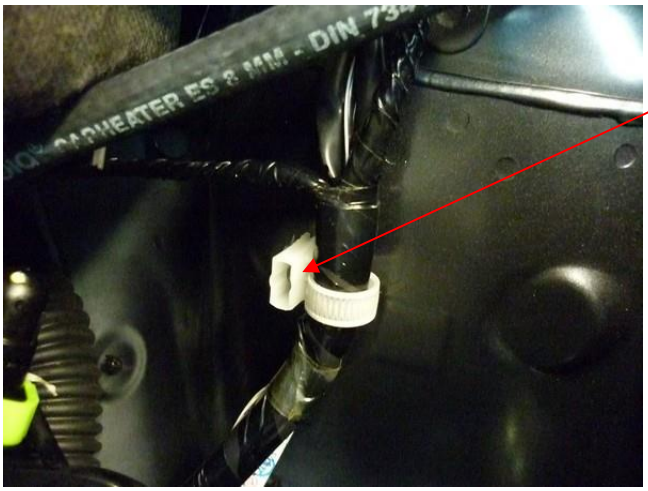




Installation preparation

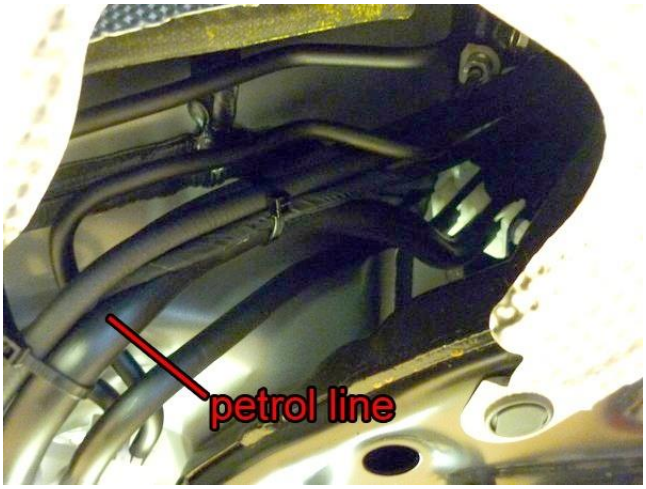



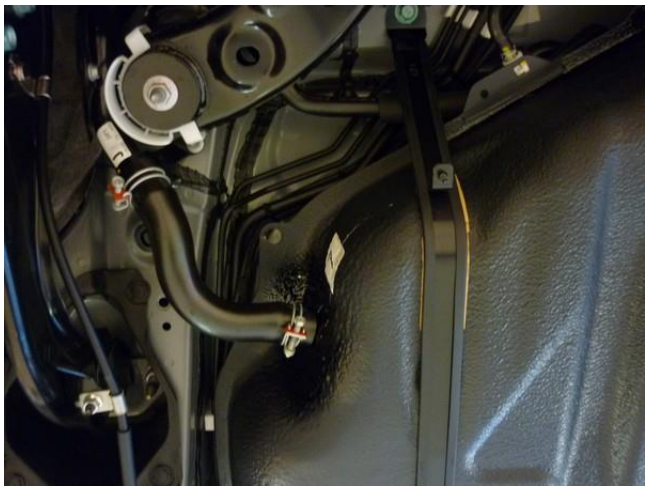
Grommet for transit the Switch and CAN wiring (before unit installing)



Replace white cable clamp, wiring loom moves to front

Hose routing

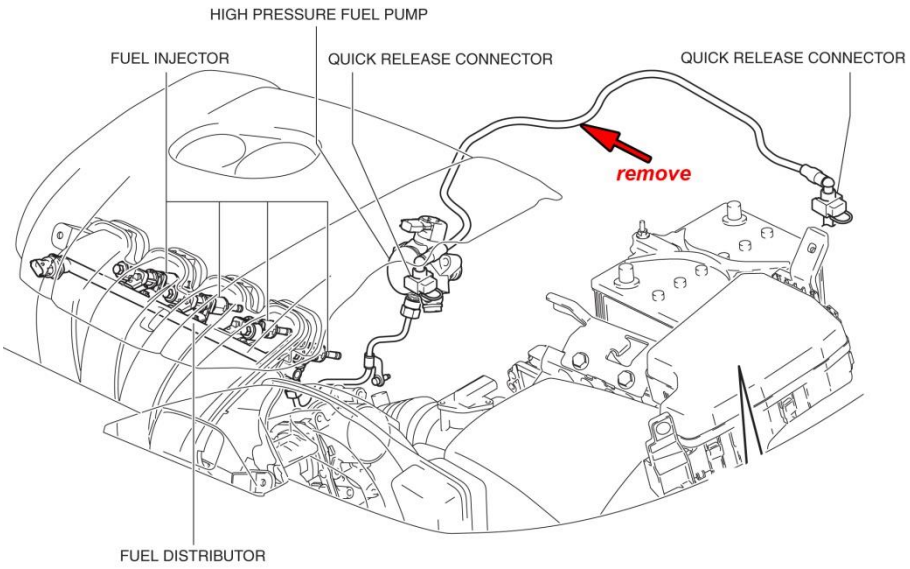




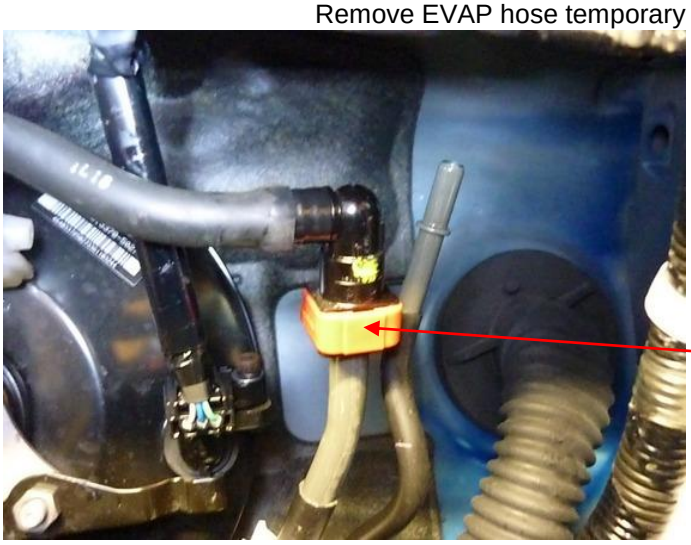
DLM Lines with tie-rap -> only to petrol line !
DLM Lines with clamps and screws -> chassis beam / floor.

Connection of the fuel hose to the boost pump.

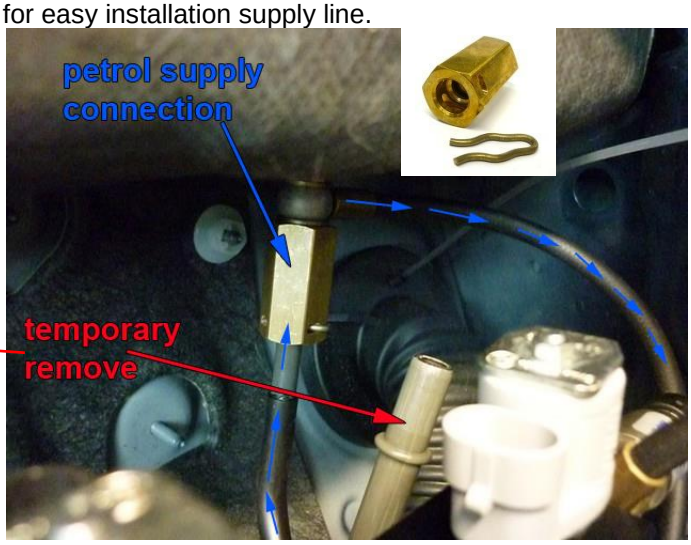
Remove the original petrol supply line.



Remove petrol fuel line (not used anymore)
Remove EVAP hose temporary for easy installation supply line.



LHD



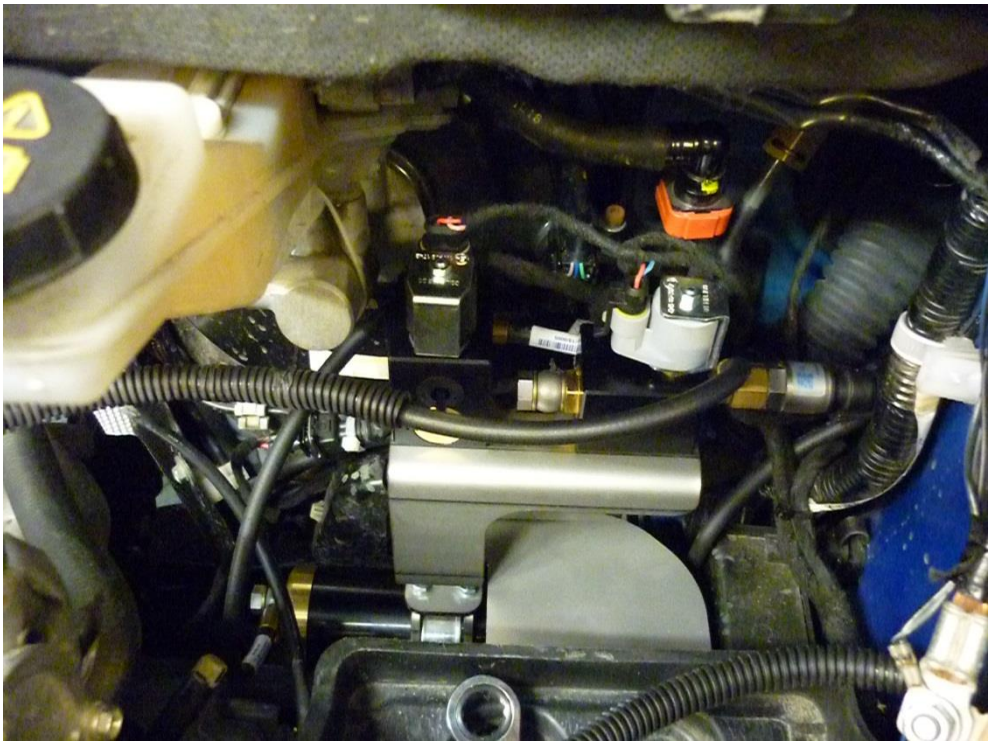
RHD

Connect the petrol supply quick connector (**install lock spring** !) to the fuel pipe.

See next page

Install the unit

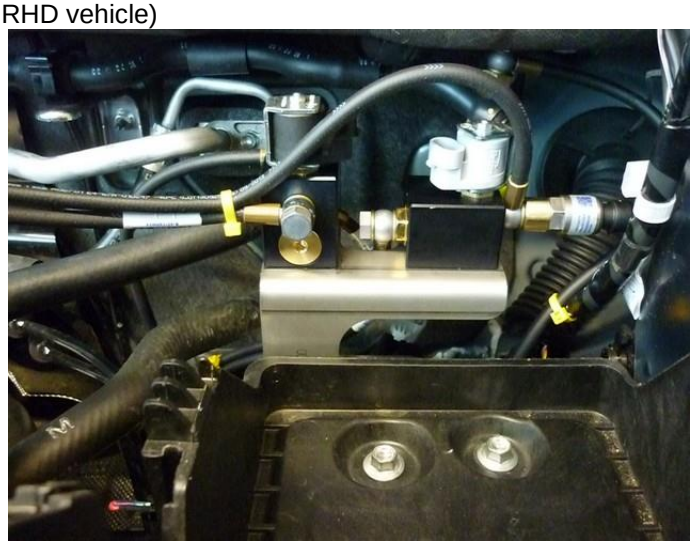
LHD situation:



RHD situation:

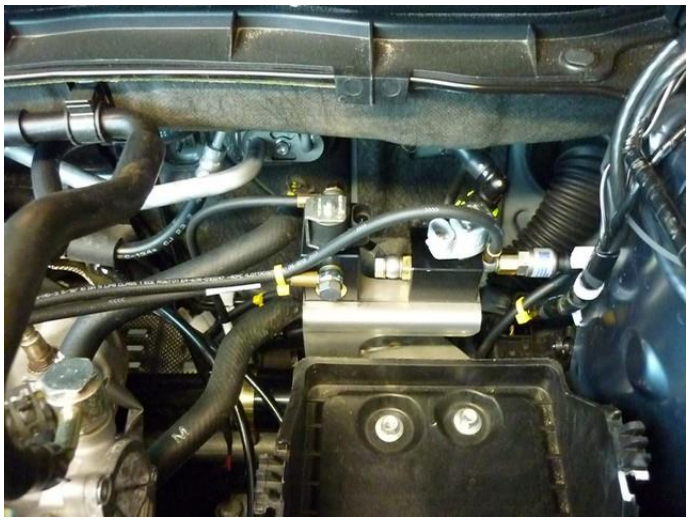
Install the unit

(photos from RHD vehicle)

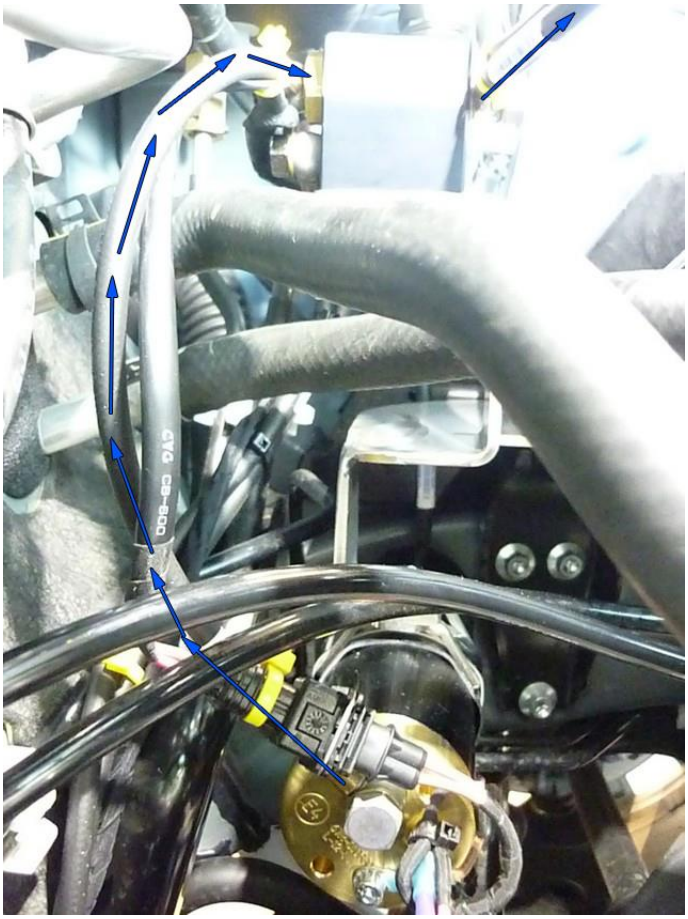



Connect the petrol supply quick connector (**install lock spring** !) to the fuel pipe.
Insert the unit bracket under battery plate and bolt back on the plate.

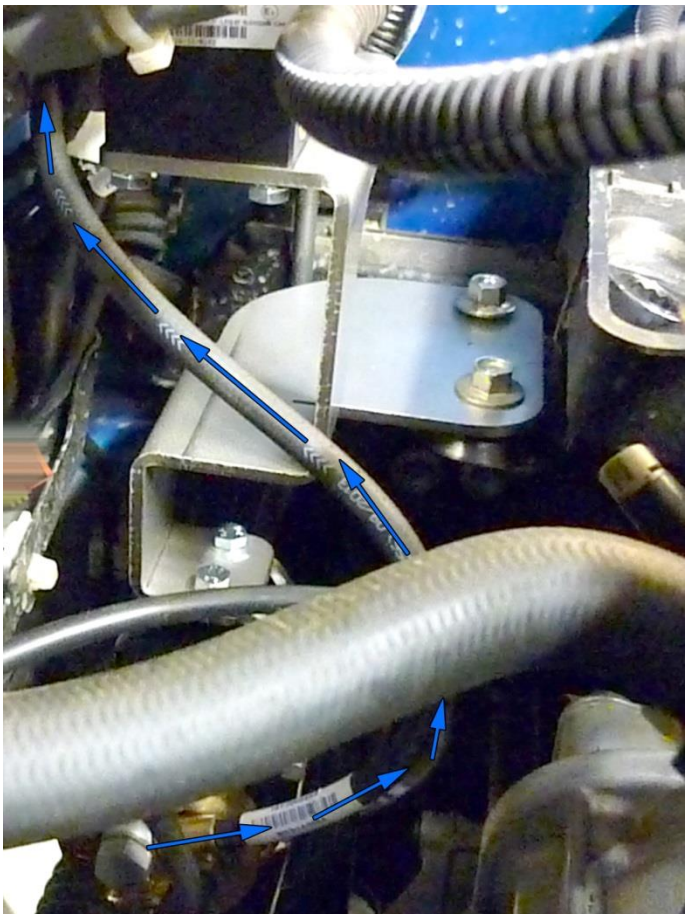


Connect the boost pump

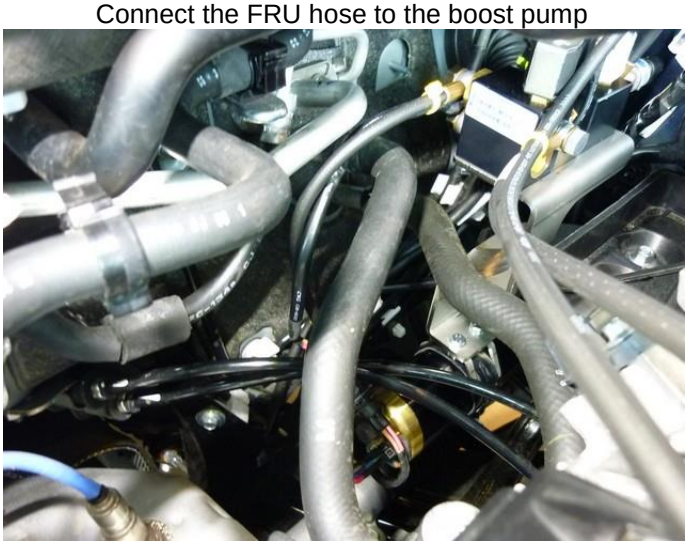


RHD



LHD

Connect the FRU hose to the boost pump

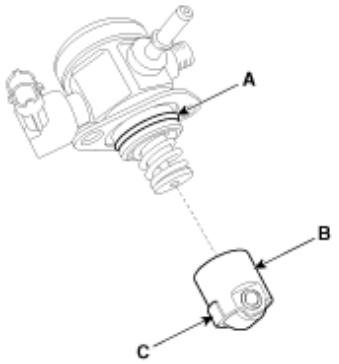


Installation of the Bosch High Pressure Pump

-INSTALLATION-

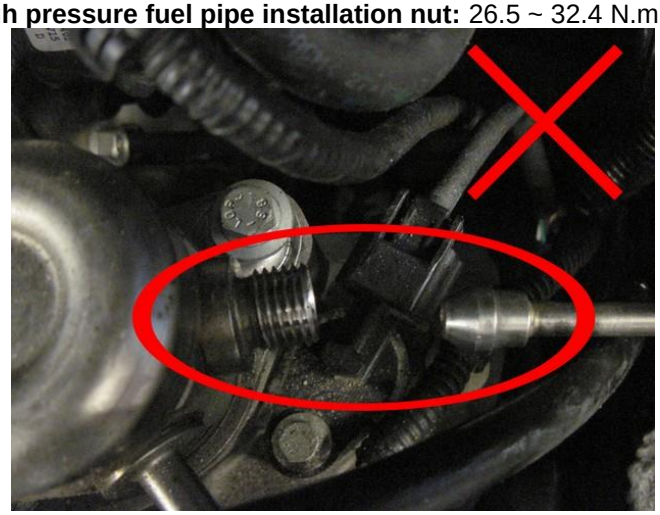
Before installing the high pressure fuel pump, position the roller tappet (**B**&**C**) in the lowest position by rotating the crankshaft. Otherwise the installation bolts may be broken because of tension of the pump spring.

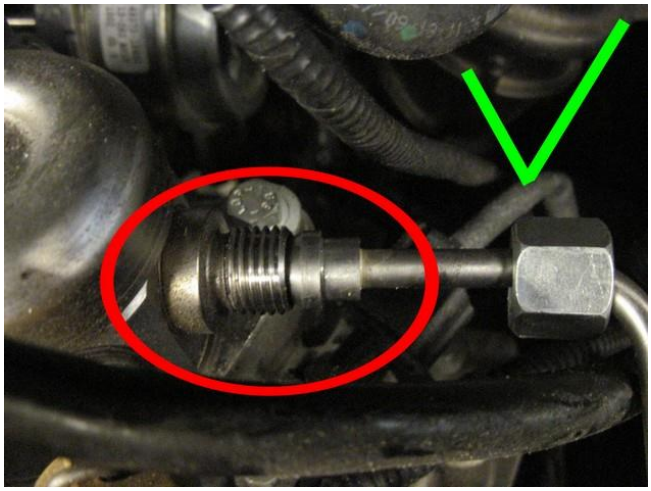
Apply engine oil to the O-ring (**A**) of the high pressure fuel pump, the roller tappet (**B**), and the protrusion (**C**). (roller tappet, only if removed from cylinder head)
Also apply engine oil to the groove on the location where the protrusion (**C**) is installed.



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.





Mount the new fuel line free of tension. If the fuel line does not fit correctly, adapt the fuel line.

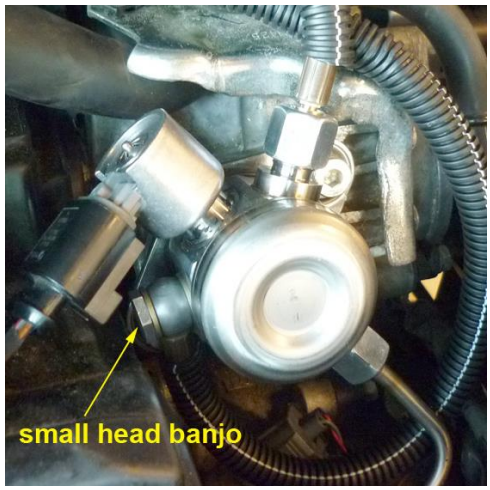
Installation is reverse of removal.

High pressure pump installation

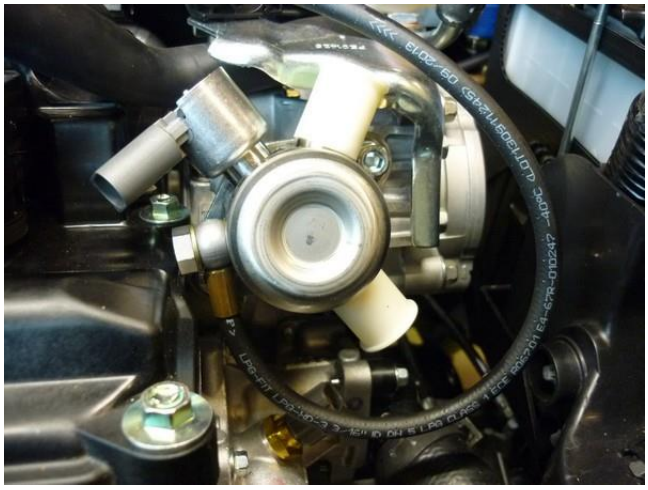
Replace the high pressure pump for the adapted high pressure pump.
(Follow the workshop manual of the car)

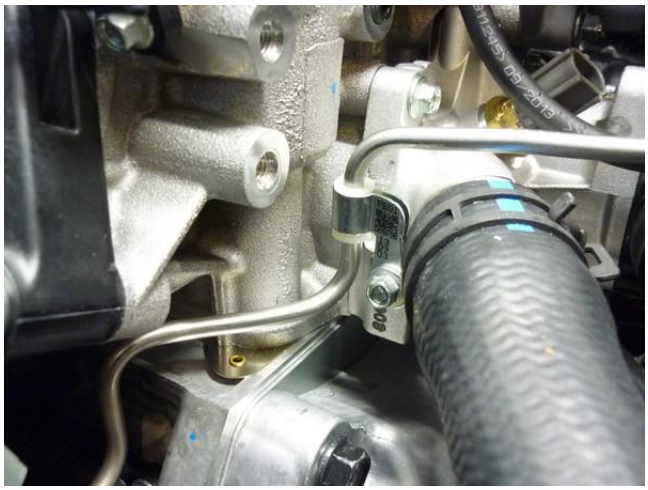

Remove hose from air filter to throttle body. Remove throttle body & brackets/hoses next to the HP pump.

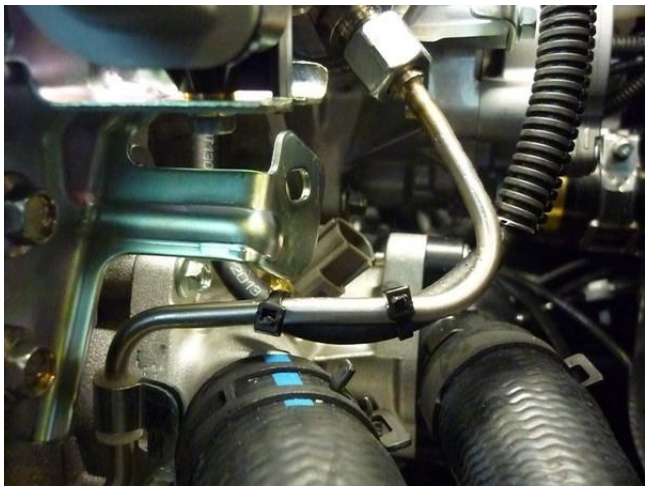

High pressure pump installation 2



Install return hose, hand tight, before mounting pump.
Mount the supplied HP pump with the new Allen bolts & (spring) washers with 25Nm.
After mounting pump, tighten return hose banjo 10Nm, hose facing down.

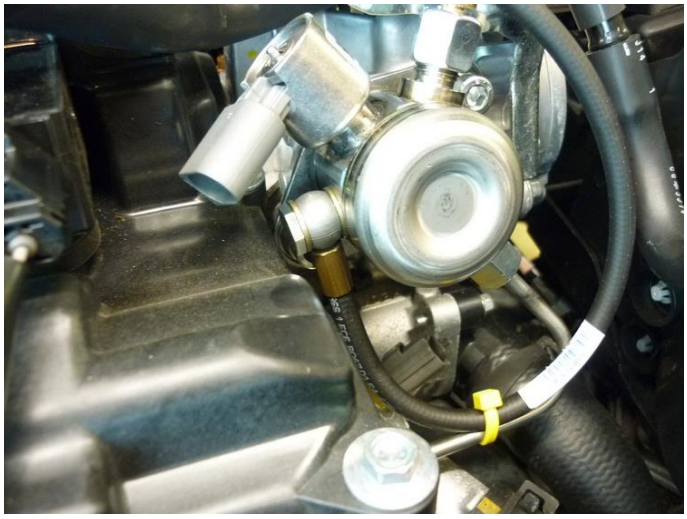






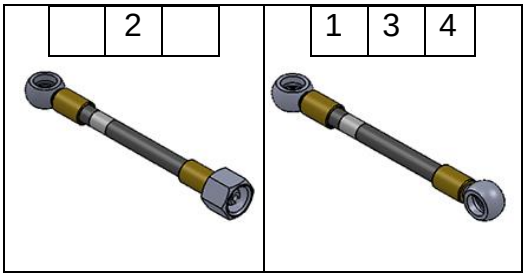
Mount the new fuel line free of tension. If the fuel line does not fit correctly, adapt the fuel line.

Hose routing



Lpg / petrol fuel lines

Hose		from	to	Length (cm)
1	XD-3	Adapter quick connection	Petrol boost pump	40
2	XD-4	Fuel supply unit	High pressure petrol pump	50
3	XD-3	Petrol boost pump	Fuel supply unit	30
4	XD-3	Fuel return unit	High pressure petrol pump	85

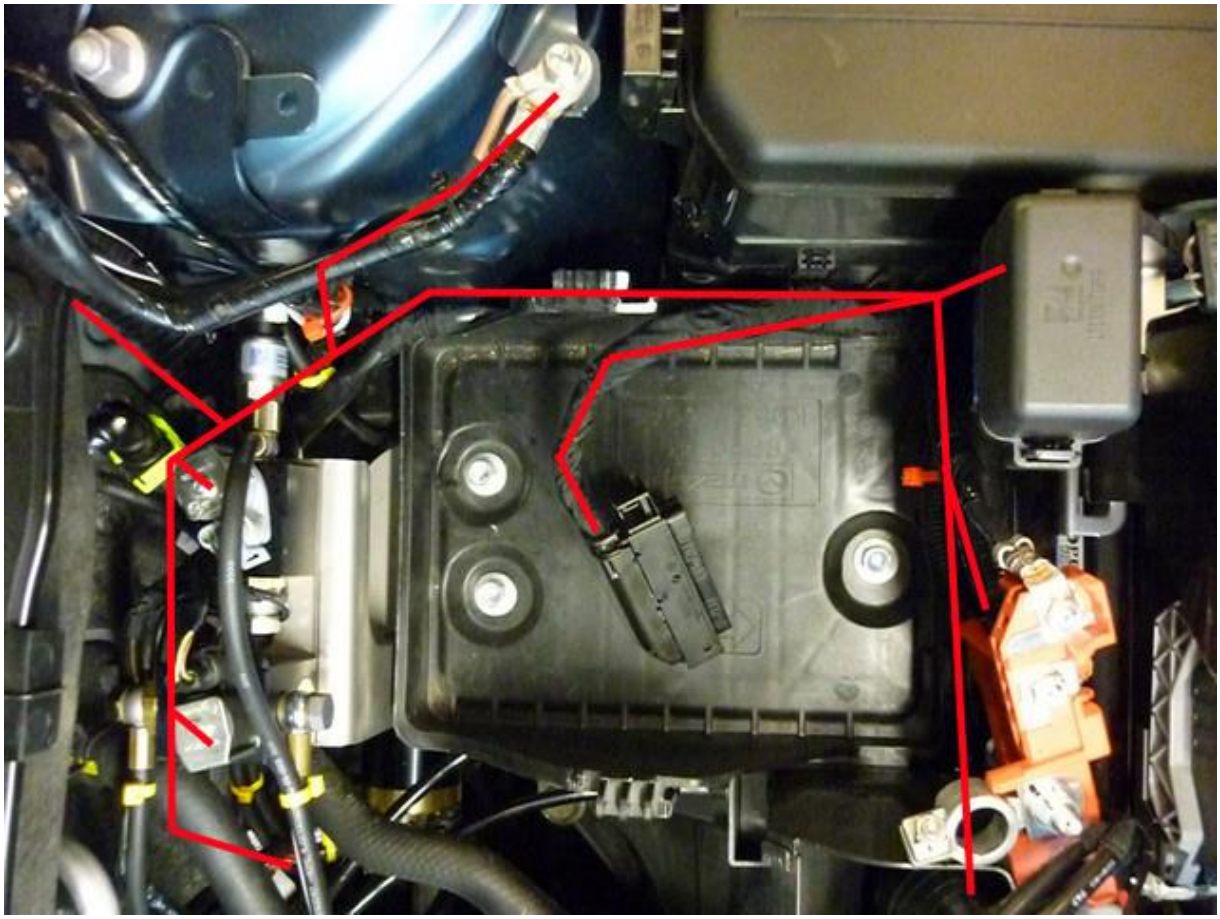


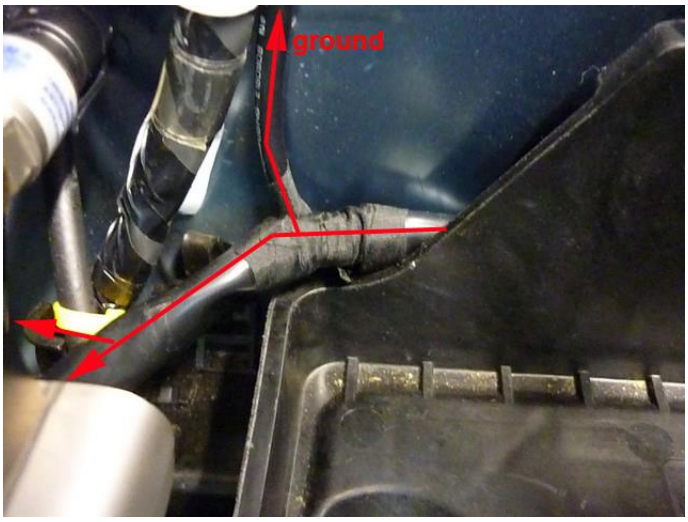
Install the fuel line using two bonded seal washers and banjo bolt;

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

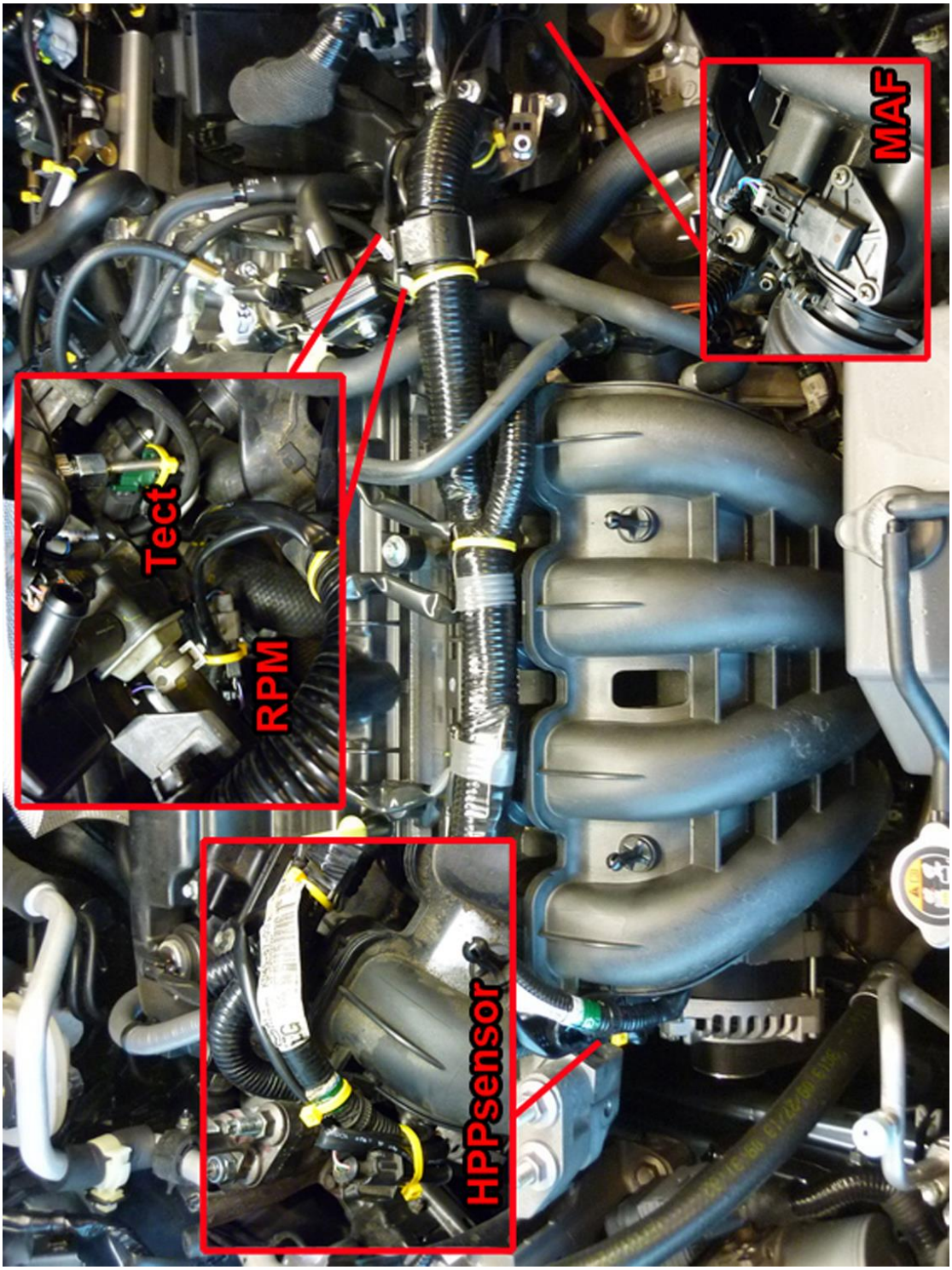
181/300009/A

Wiring

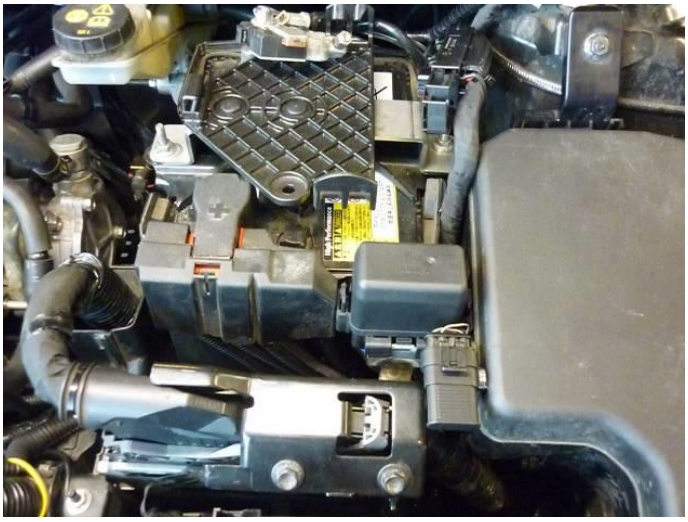


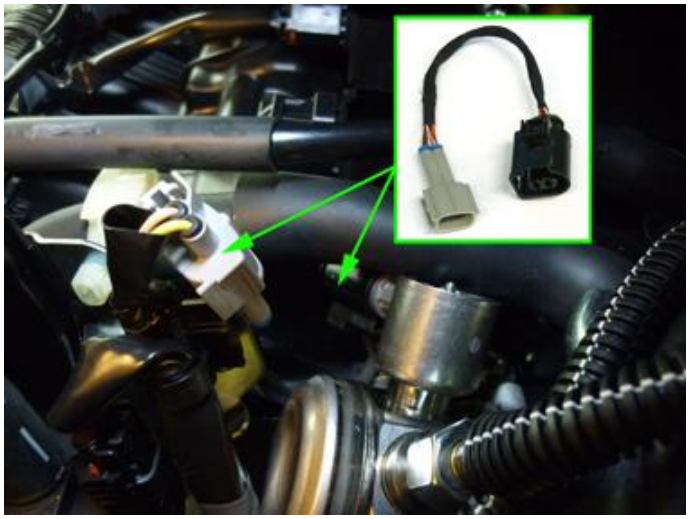


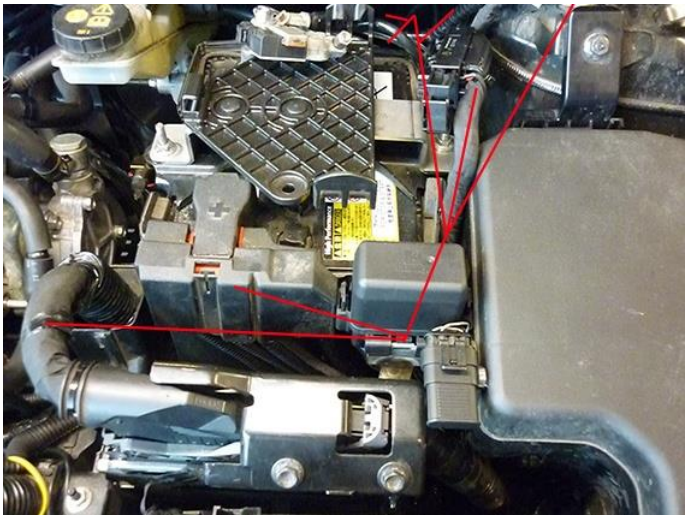
Wiring / Connector location

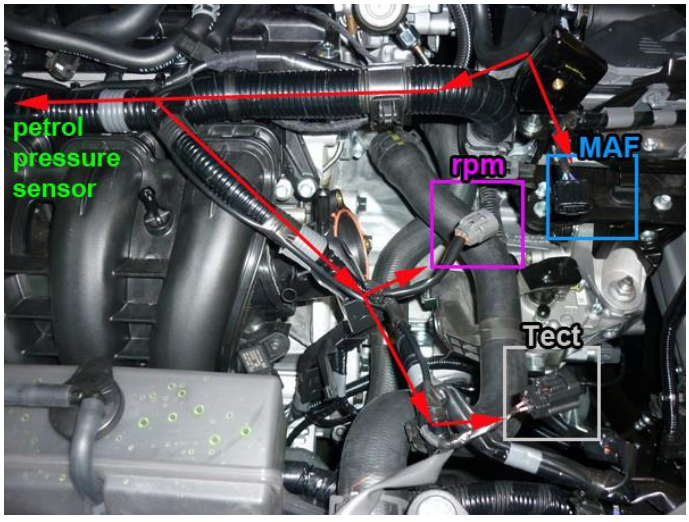


Wiring

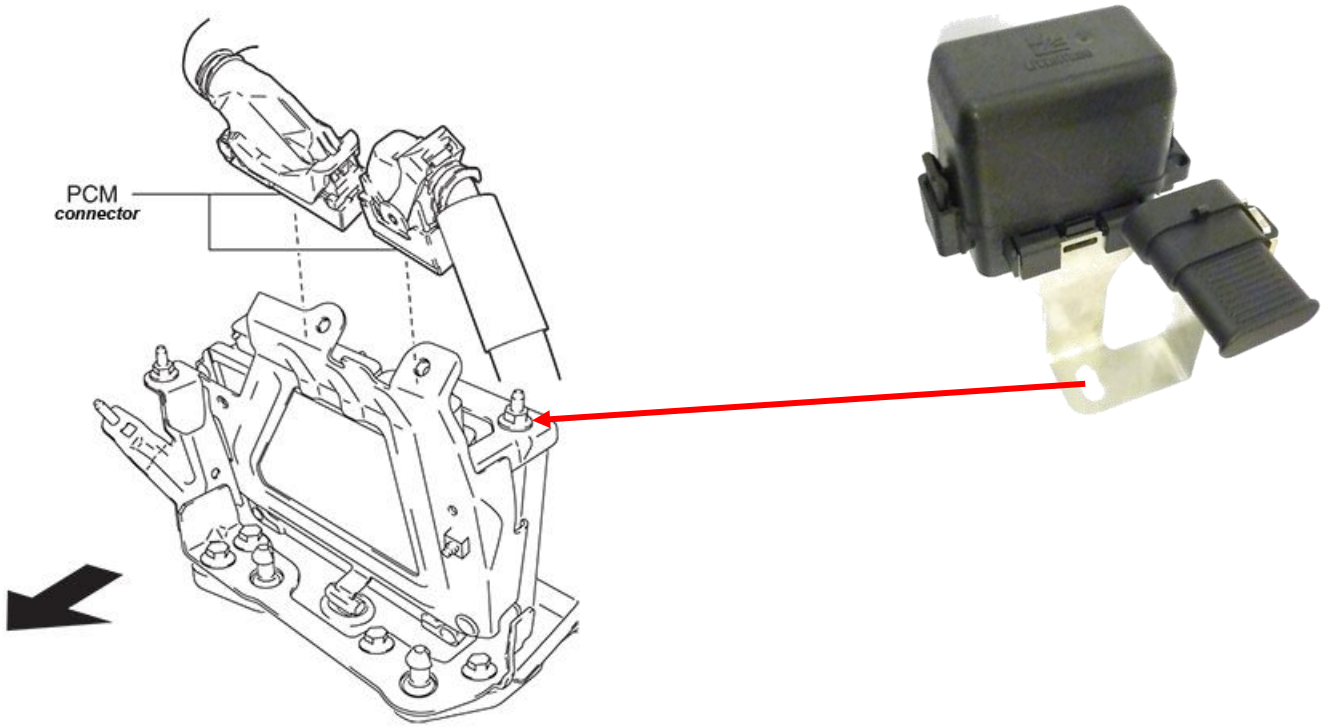


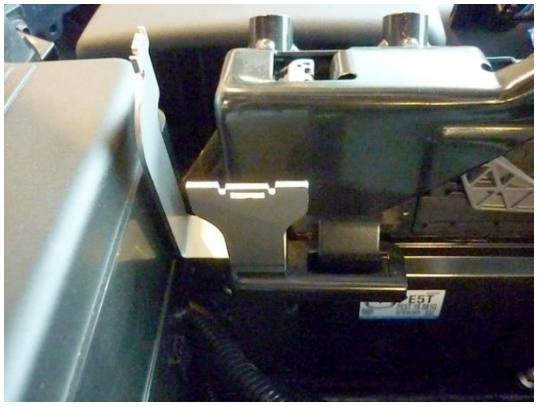


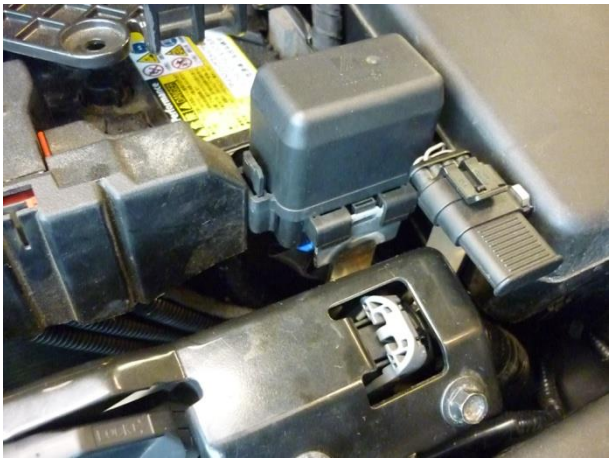




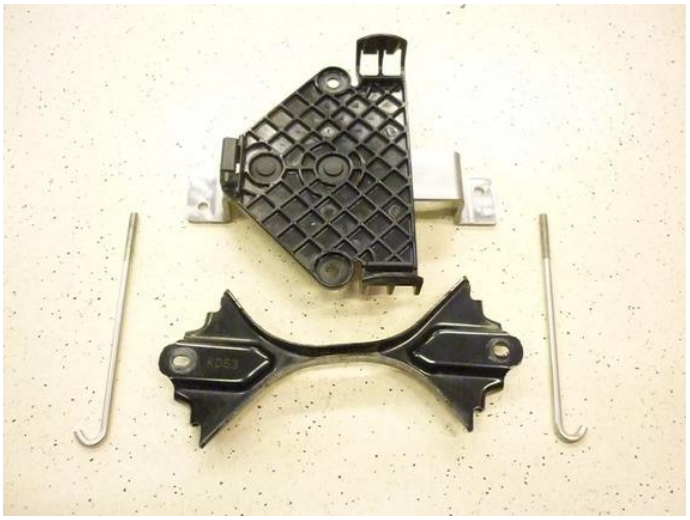
Fuse / relay box location







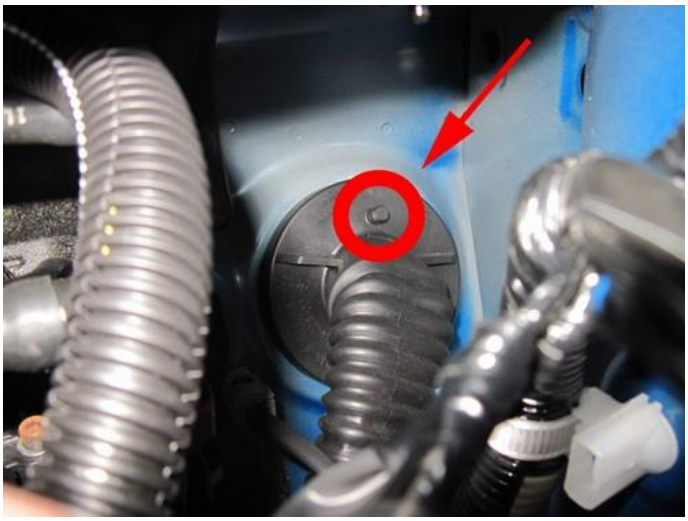
Mounting the AFC



Connect battery ground only when completely finished the installation!

Mounting the fuel selection switch Mazda 3

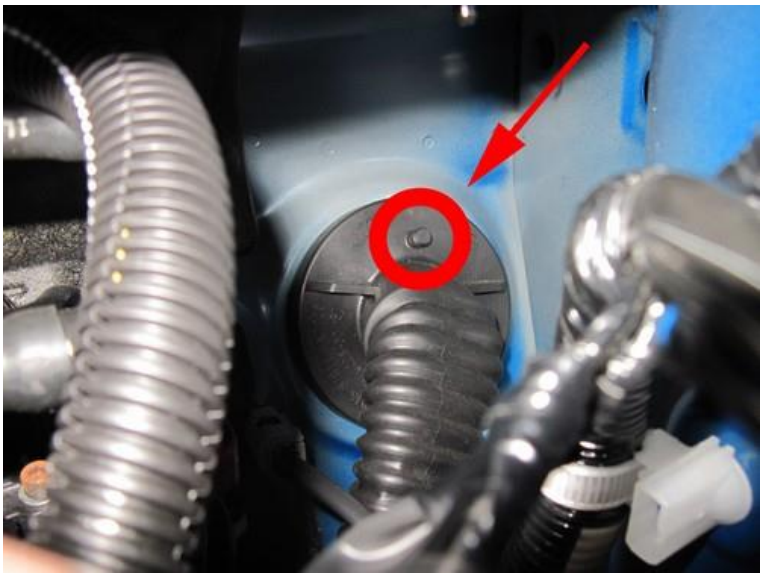
⚠ Mount the switch.



Drill Ø8.3mm

Mounting the fuel selection switch Mazda 6

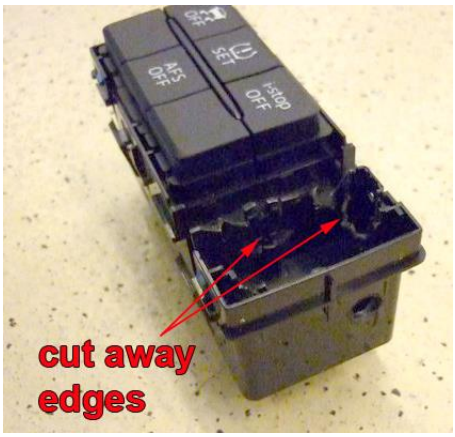
⚠ Mount the switch.

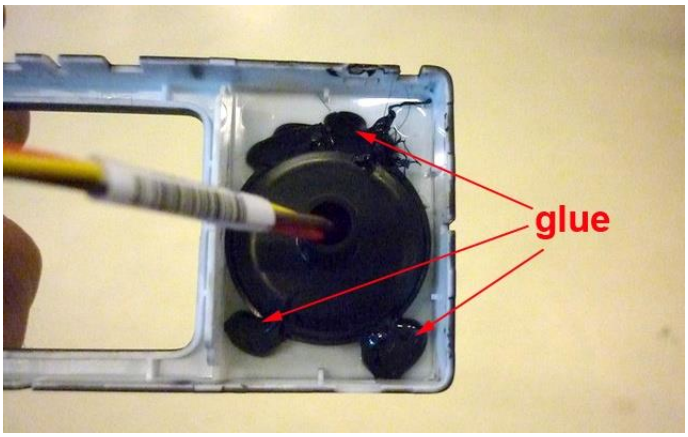


Drill Ø8.3mm

Mounting the fuel selection switch optional Mazda 6

⚠ Mount the switch.





Drill Ø8.3mm

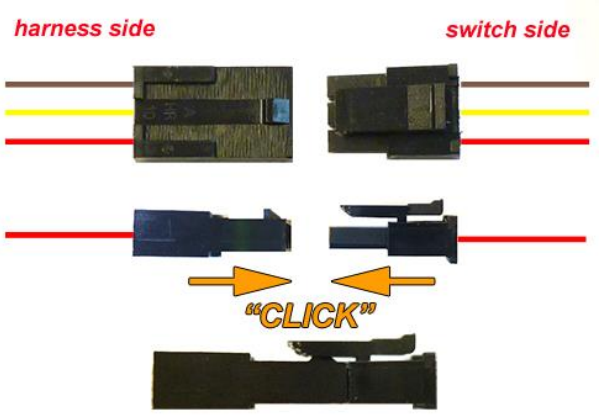
Mounting the fuel selection switch Mazda CX5

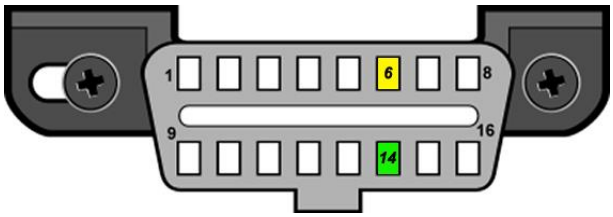
Mount the switch.

Electrical connections

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

Driver room

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

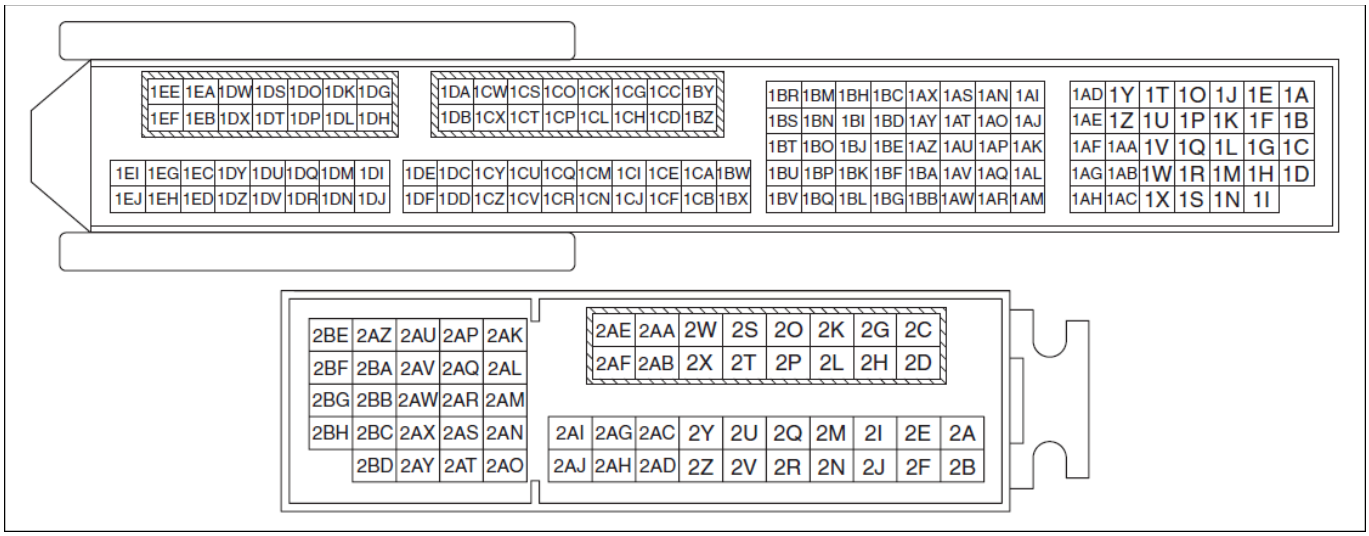
51	CAN-High	Yellow	EOBD connector pin 6
70	CAN-Low	Green	EOBD connector pin 14
			

Electrical connections

1-32 MAIN GND ecu MAIN GROUND SENSE	Brown	*Connect to the '–' of the battery (-31).* Use a ring terminal Ø6mm. Wire location : left suspension strut, original ground.
		

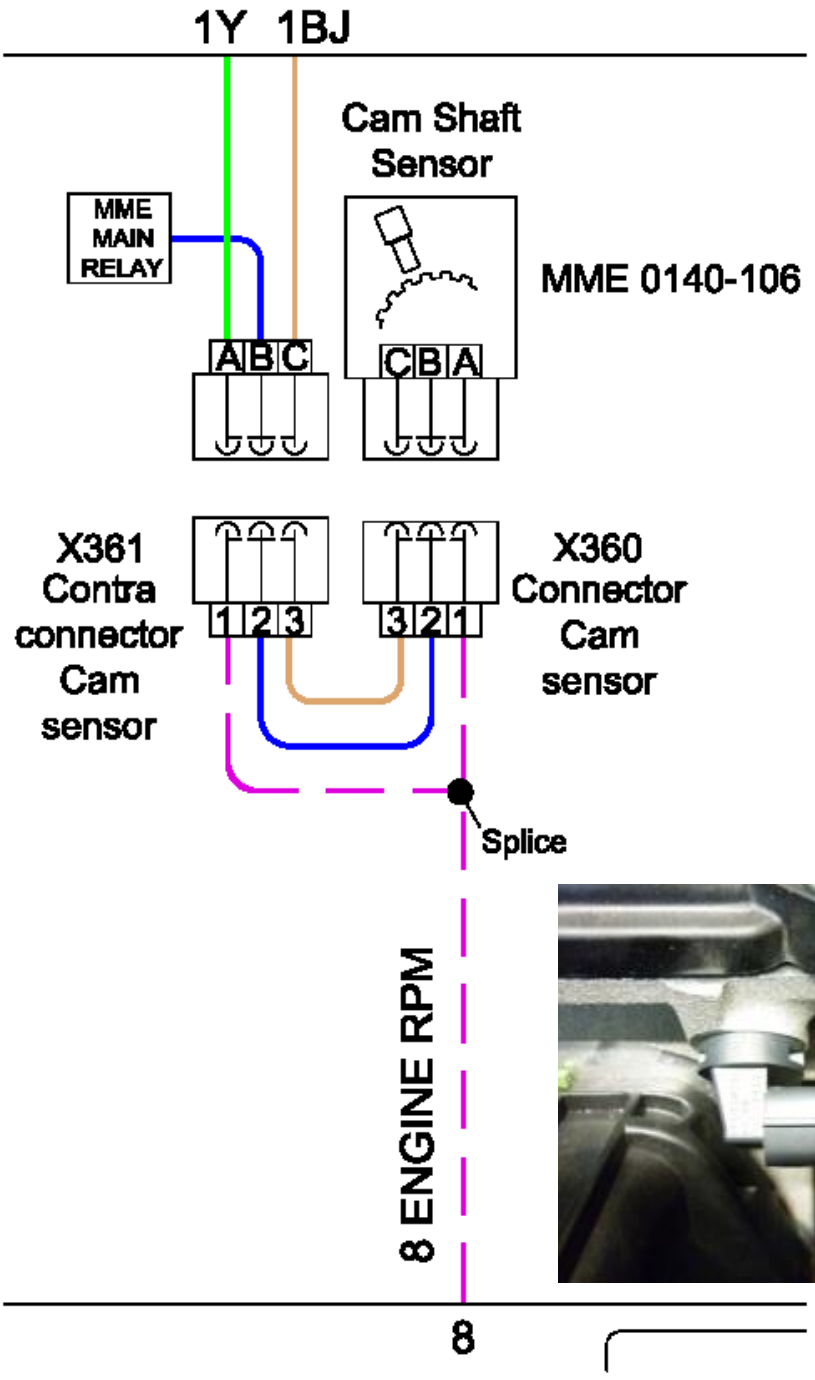
4–13 +12V BATT sense +12V BATT fused +12V BATT boost pump +12V BATT pump driver	Red	*Connect to the '+' of the battery (+30).* Use a ring terminal Ø6mm. Do not place the fuse in the holder before having completed the installation of the LPG system.
		

Petrol ECU connector overview



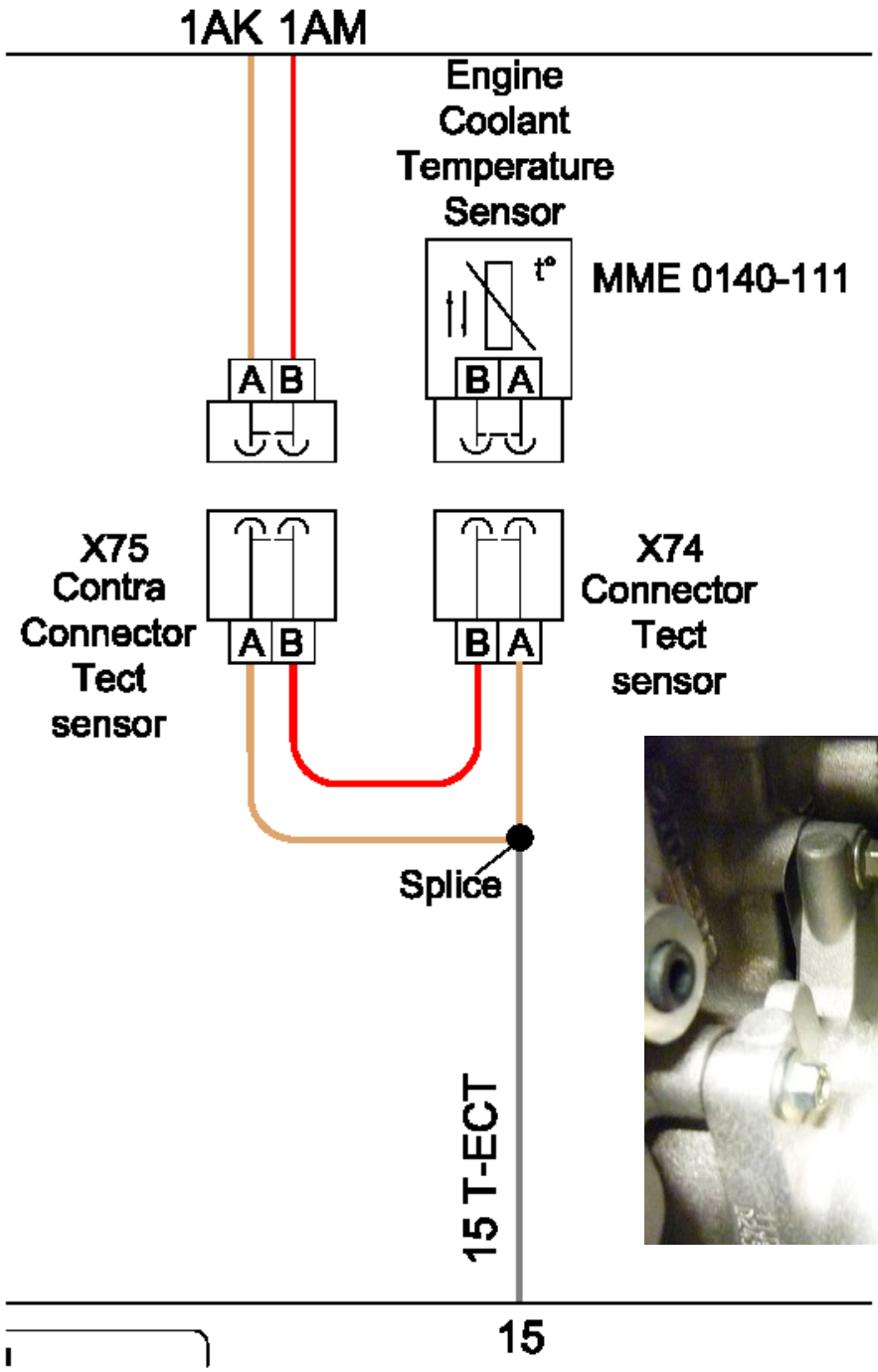
Electrical connections RPM sensor

Wire number / code	Wire colour	Connection
8 RPM engine speed	Purple-white	*For measuring the engine speed signal.* Wire colour: **Green** (petrol ecu **1Y**) Connector location: left front side cylinder head.



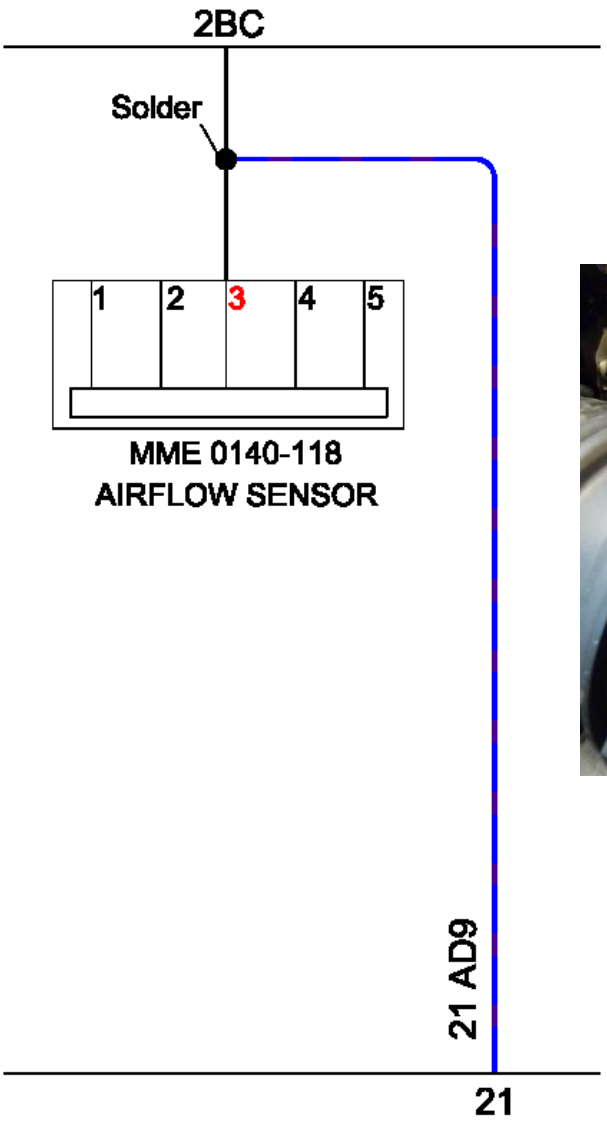
Electrical connections Engine coolant sensor

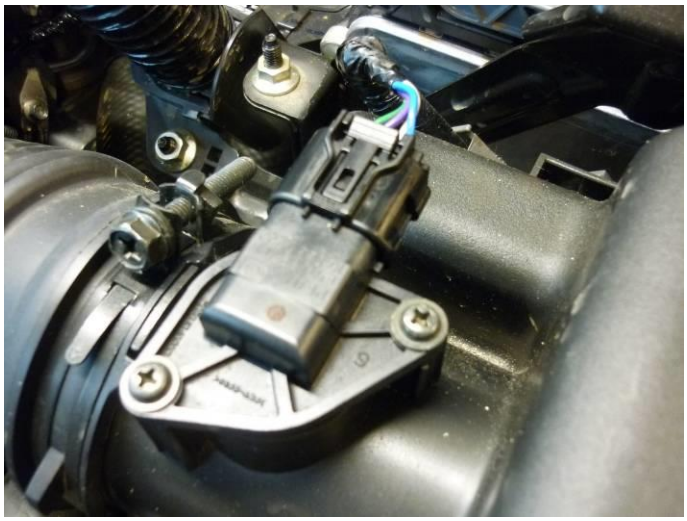
Wire number / code	Wire colour	Connection
15 Tect	Purple-white	*For measuring the engine coolant temperature.* Wire colour : **Brown** (petrol ecu **1AK**) Connector location : left side engine under petrol pressure pump.



Electrical connections MAF sensor

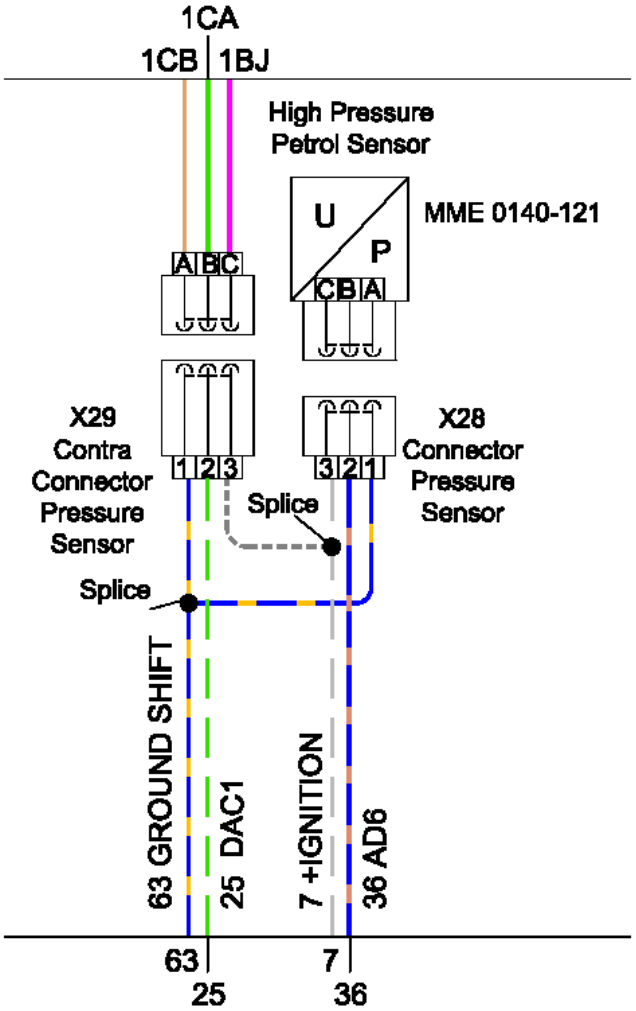
Wire number / code	Wire colour	Connection
21 AD9	Blue-brown	*For measuring the Air Flow signal.* Wire colour : **Black or brown** (petrol ecu **2BC**) Connector location : Air box, 5-pole sensor connector, pin **3**

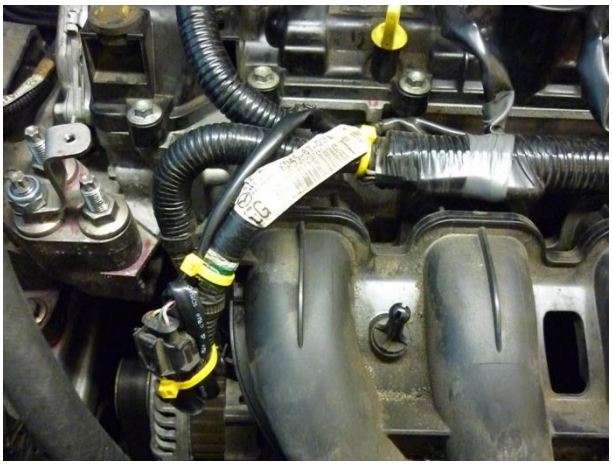




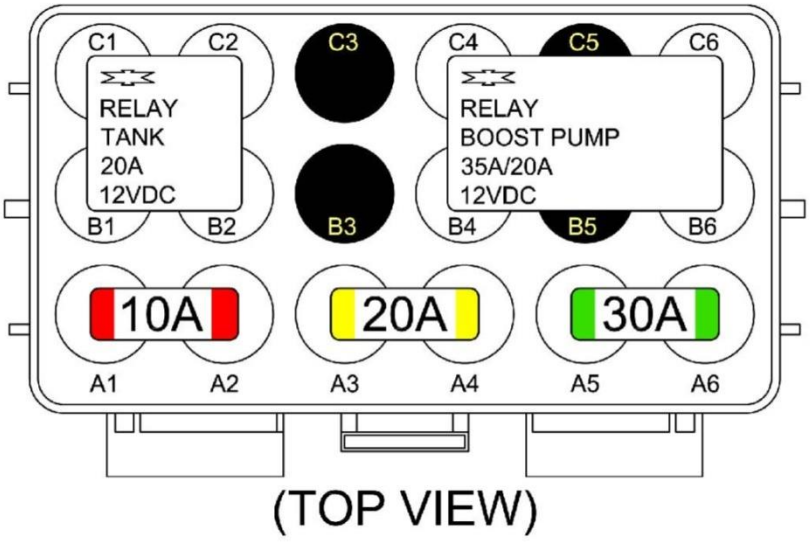
Electrical connections high petrol pressure sensor

25 & 36			*High pressure petrol sensor signal interruption.* Wire colour : **Green**, OEM connector pin **2** (petrol ecu **1CA**) Connector location : 3-pole connector high pressure petrol sensor Right side, under inlet manifold, sensor on end of fuel rail.
25	DAC 1	Green-white	Petrol ecu side, X29, pin 2 (petrol ecu **1CA**)
36	AD 6	Blue-brown	Sensor side, X28, pin 2 (petrol ecu **1CA**)
63	Ground Shift	Blue-orange	*High pressure petrol sensor ground shift.* Wire colour : **Tan** (petrol ecu **1CB**) Connector location: 3-pole connector high pressure petrol sensor, X28 spliced X29, pin **1**
7	+12V IGNITION	Grey-white	*+IGN & WAKE-UP, high pressure petrol sensor.* Wire colour : **Pink** (petrol ecu **1BJ**) Connector location : 3-pole connector high pressure petrol sensor, X28 spliced X29, pin **3**

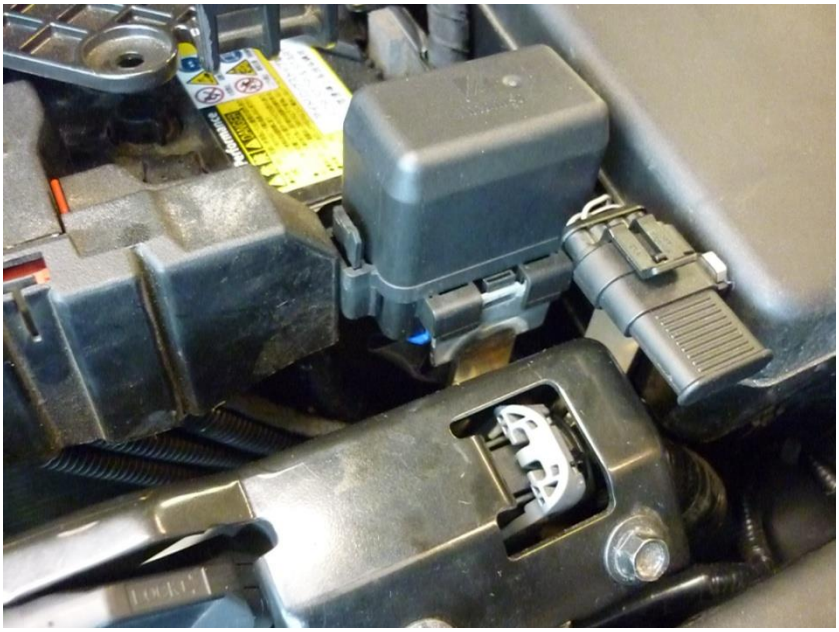




Fuse Box



(TOP VIEW)



Electrical connections

Engine room

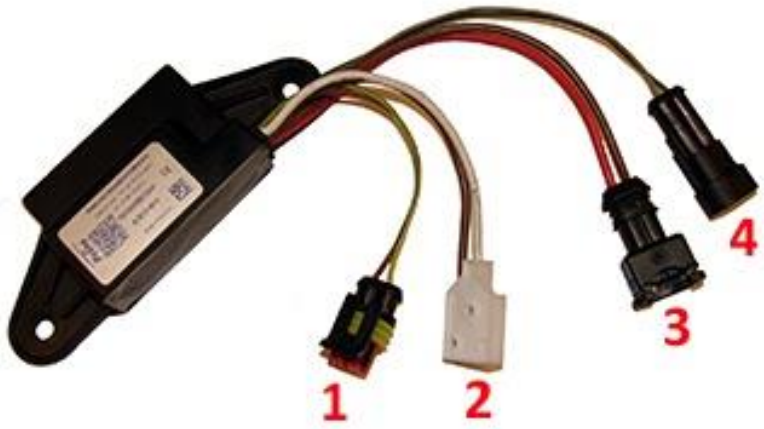
Wire number / code	Wire colour	Connection
3-pole connector		Connect the 3-pole connector to the Psys sensor positioned into the Fuel Return Unit.
35 Ground Psys pin A	Brown	Sensor wire pin A
9 +5V sensor pin B	Red-blue	Sensor wire pin B
16 Psys pin C	Green	Sensor wire pin C
2-pole connector FSU, black		
24 + Lock-off FSU	Yellow-green	Connect the 2-pole connector to the lock-off valve
31 C Ground	Brown-black	of the Fuel Supply Unit
2-pole connector FRU, grey		
43 + Lock-off FRU	Red-white	Connect the 2-pole connector to the lock-off valve
34 C Ground	Brown-black	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-black	Connector pin 4
Boost pump relay		
2 + relay boost pump	Red-white	Pin 86 of the boost pump relay C4
26 Ground BP relay	Purple-blue	Pin 85 of the boost pump relay B6
+12V fused BATT	Red 2.5mm2	Pin 30 of the boost pump relay C6-A5
+12V Boost pump	Red 2.5mm2	Pin 87 of the boost pump relay B4
Wiring tank pump driver relay		
57 + driver relay	Red-white	Pin 86 of the driver relay C1
73 LSS 4 tank relay	Purple-blue	Pin 85 of the driver relay B2
+12V BATT fused	Red 2.5mm2	Pin 30 of the driver relay C2-A4
+12V driver	Red 2.5mm2	Pin 87 of the driver relay B1

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.

ALTERNATIVE FUEL SYSTEMS
Prins