

ALTERNATIVE
FUEL SYSTEMS

Prins



installation manual
Engine Kit
part 2/2

MANUFACTURER

Mazda

TYPES

3 // 6

ENGINE DISPLACEMENT

1500-2000 // 2000-2500

TYPES

CX-3 // CX-5

ENGINE DISPLACEMENT

2000 // 2000-2500

NUMBER OF VALVES

16v

ENGINE CODES / NUMBERS

P5-VPS 86kW / PE-VPS 88-121kW / PY-VPS 141kW (Skyactiv-G)

VEHICLE CATEGORIES

M

TRANSMISSION

AT / MT(6)

VERSION

DLM Gen3

PETROL ECU MANUFACTURER / CODES

Mitsubishi PE1T- / PE03- / PSKJ- 18881

HIGH PRESSURE PETROL PUMP

Denso 295100-0294 (Mazda PE01 20 3F0F)

HIGH PRESSURE PETROL INJECTOR

Denso

MODEL YEAR:

2013-

SYSTEM APPROVAL NUMBER (R115)

E4-115R-000011 / DLM-LPG 04 (NOT 2.5 PY-VPS)

LOCATION SYSTEM STICKER

right side, centre door post

ENGINE SET NUMBER Mazda 3 // 6

353/070315001/A / 353/070620001/A

ENGINE SET NUMBER Mazda CX-5

353/070520001/A (->2016) // 353/070520005/A (2017->)

ENGINE SET NUMBER Mazda CX-3

353/071320001/A

MANUAL NUMBER

076/1308000-1

DATE

2019-02-28

DIRECT LIQUI
max
GEN3 HIGH PRESSURE LIQUID LPG INJECTION



TABLE OF CONTENTS

General instructions	3
Required equipment / tools / materials for installing a complete system	4
Vehicle check	4
Tightening moments.....	5
Direct LiquiMax parts / approval numbers	5
Overview DLM Direct Injection	7
Fuel Management Unit connections.....	8
Fuel Management Unit.....	9
Boost pump	10
DLM component location overview Skyactive Mazda 3-6-CX-5	11
DLM component location overview Skyactive Mazda CX-3	12
Remove battery.....	13
Overview Filter removal	14
Petrol hose removal	15
Overview pump removal	16
Installation preparation.....	17
EXTEND WIRING : Option Fuel Reset (only 2WD CX-5 2017 →)	17
Hose routing	18
Connection of the fuel hose to the boost pump.	19
Connection of the fuel hose to the boost pump. (CX-3).....	20
Install the unit (3-6-CX-5)	21
Install the unit (CX-3)	22
Install the support bracket (CX-3)	23
Install unit bracket onto the support bracket (CX-3).....	24
Installation of the Bosch High Pressure Petrol Pump	25
High pressure pump installation.....	26
High pressure pump installation connection (3-6-CX-5)	27
Hose routing (3-6-CX-5)	28
LPG / petrol fuel lines (3-6-CX-5).....	29
High pressure pump installation connection (CX-3).....	30
Hose routing (CX-3)	31
LPG / petrol fuel lines (CX-3)	32
Mounting the AFC	33
Fuse / relay box location (3-6-CX-5)	34
Wiring routing (3-6-CX-5)	35
Fuse / relay box location (CX-3).....	36
Wiring (CX-3).....	37
Mounting the fuel selection switch Mazda 6	38
Mounting the fuel selection switch optional Mazda 6.....	39
Mounting the fuel selection switch Mazda 3	40
Mounting the fuel selection switch Mazda CX-5	41
Mounting the fuel selection switch Mazda CX-3	42



Basic DLM Gen3 wiring diagram.....	43
Main Connector AFC	44
Electrical connections driver room	45
Option Fuel Reset (only 2WD CX-3/5 2017 →) driver room	45
Option Fuel Reset (only 2WD CX-3/5 2017 →)	46
Option Fuel Reset (only 2WD CX-3/5 2017 →)	47
Option Fuel Reset (only 2WD CX-5 2017 →)	48
Petrol ECU connector overview BIG connector	49
Petrol ECU connector overview SMALL connector	50
Electrical connections Wake-up & MAF sensor, SMALL connector	51
Electrical connections Camshaft sensor, Big connector	52
Electrical connections Engine Coolant sensor, Big connector.....	53
Electrical connections High Petrol Pressure sensor, Big connector	54
Electrical connections	55
Fuse Box	56
Electrical connections	57
Electrical connections	58
Prins safety stickers	59
Checklist after installation	60

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 the 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 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 100mm 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.

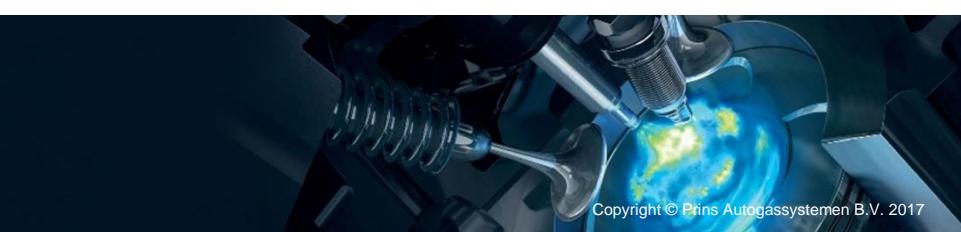


Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer
- Vehicle fuel system scan tool or OBD scan tool Prins (part no. 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 (Ø20, 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 analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)



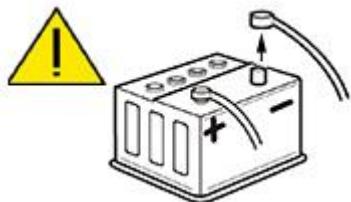
Tightening moments

	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



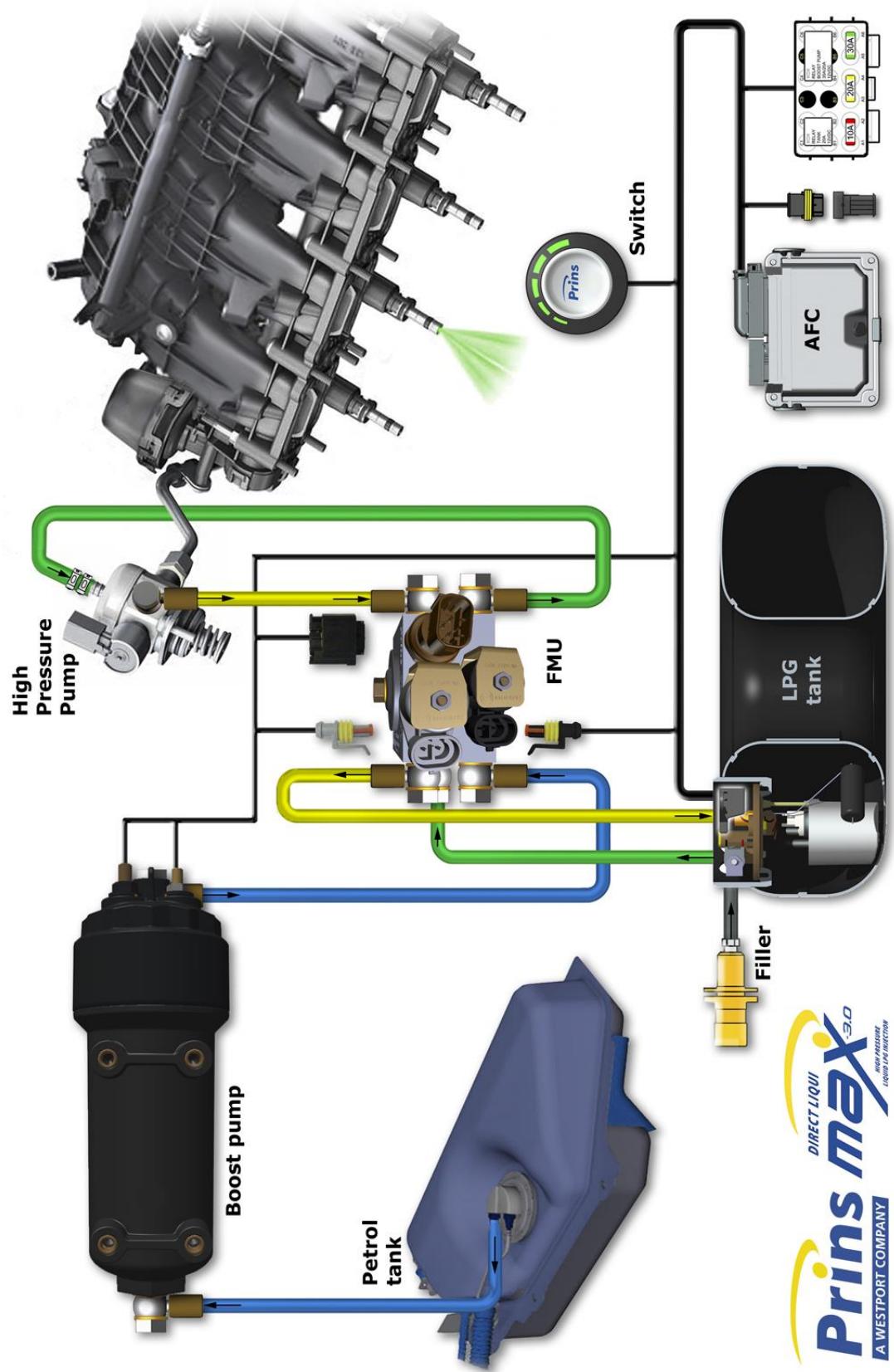
= WEAR SAFETY GOGGLES



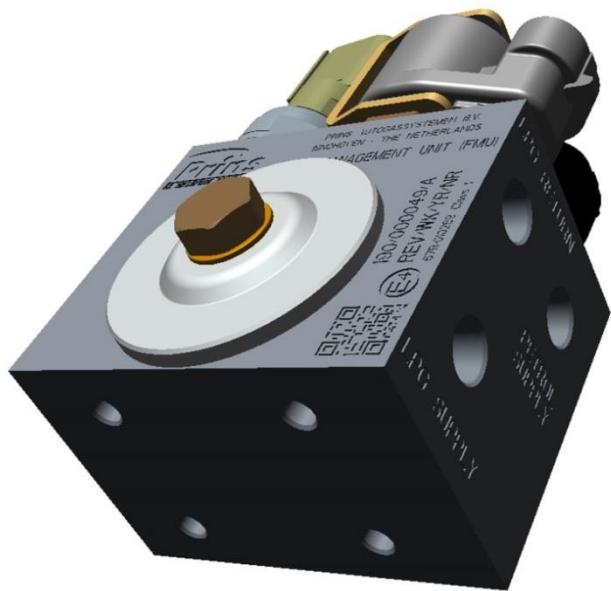
Direct LiquiMax parts / approval numbers

	
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



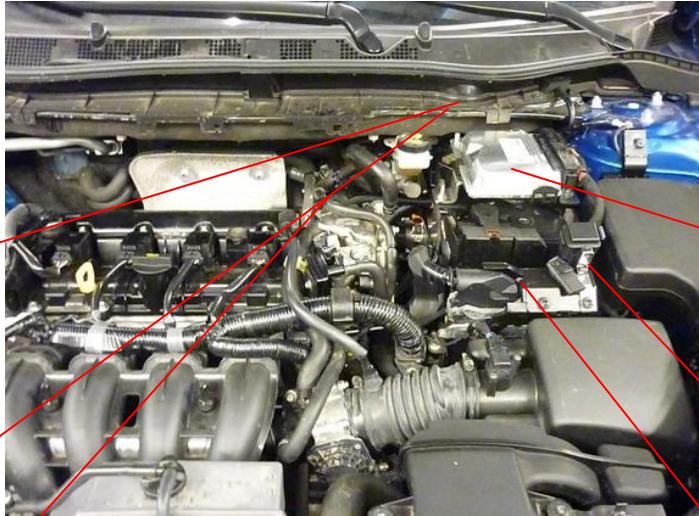
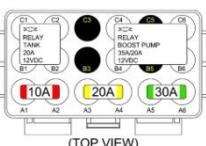
Fuel Management Unit connections



Fuel Management Unit

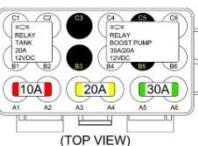
Boost pump

DLM component location overview Skyactive Mazda 3-6-CX-5

		
FMU 		AFC 
Boost pump 		Fuse / relay box  (TOP VIEW)
HPP pump 		Petrol ECU

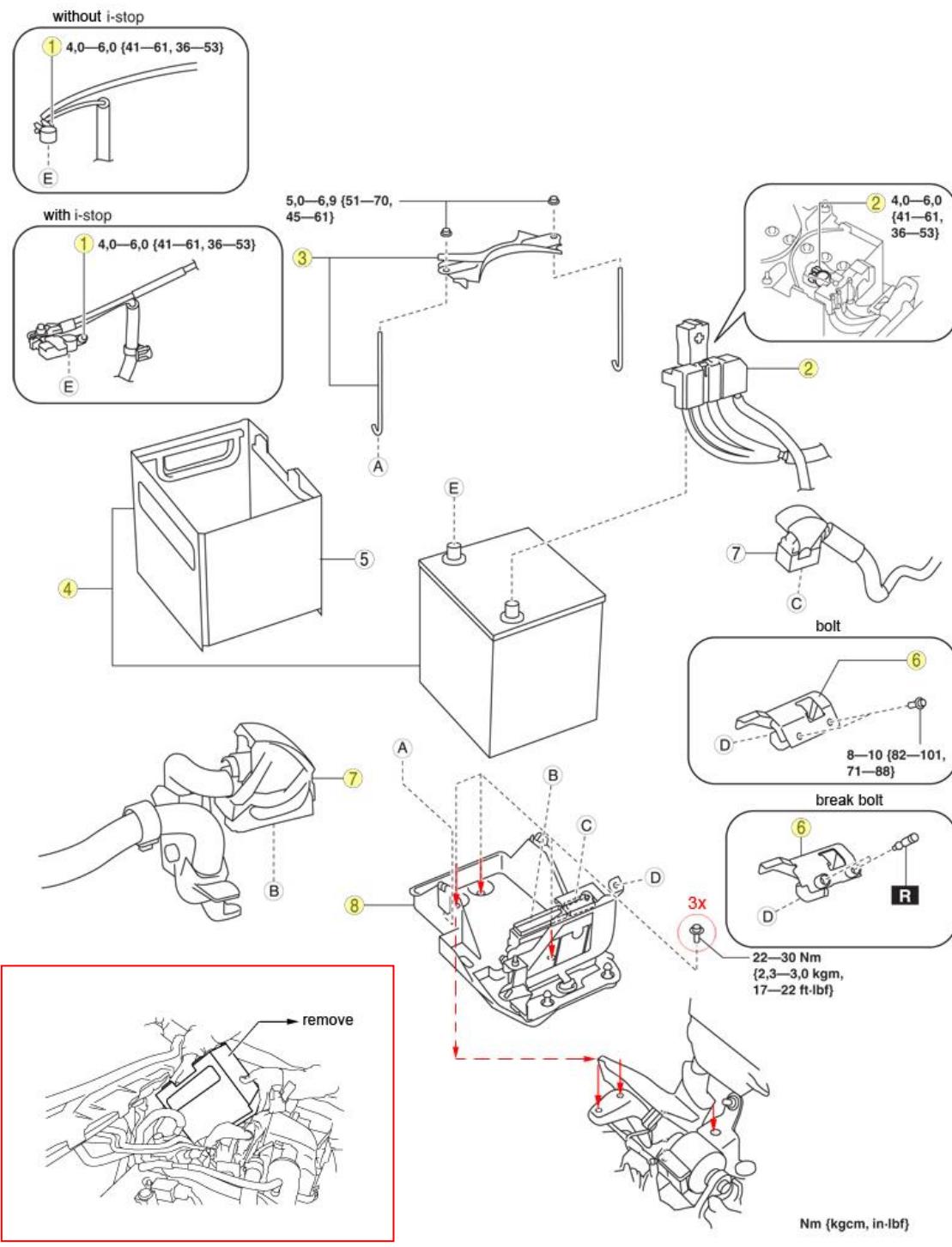
	i.a. R115 approval sticker : Right side centre door post
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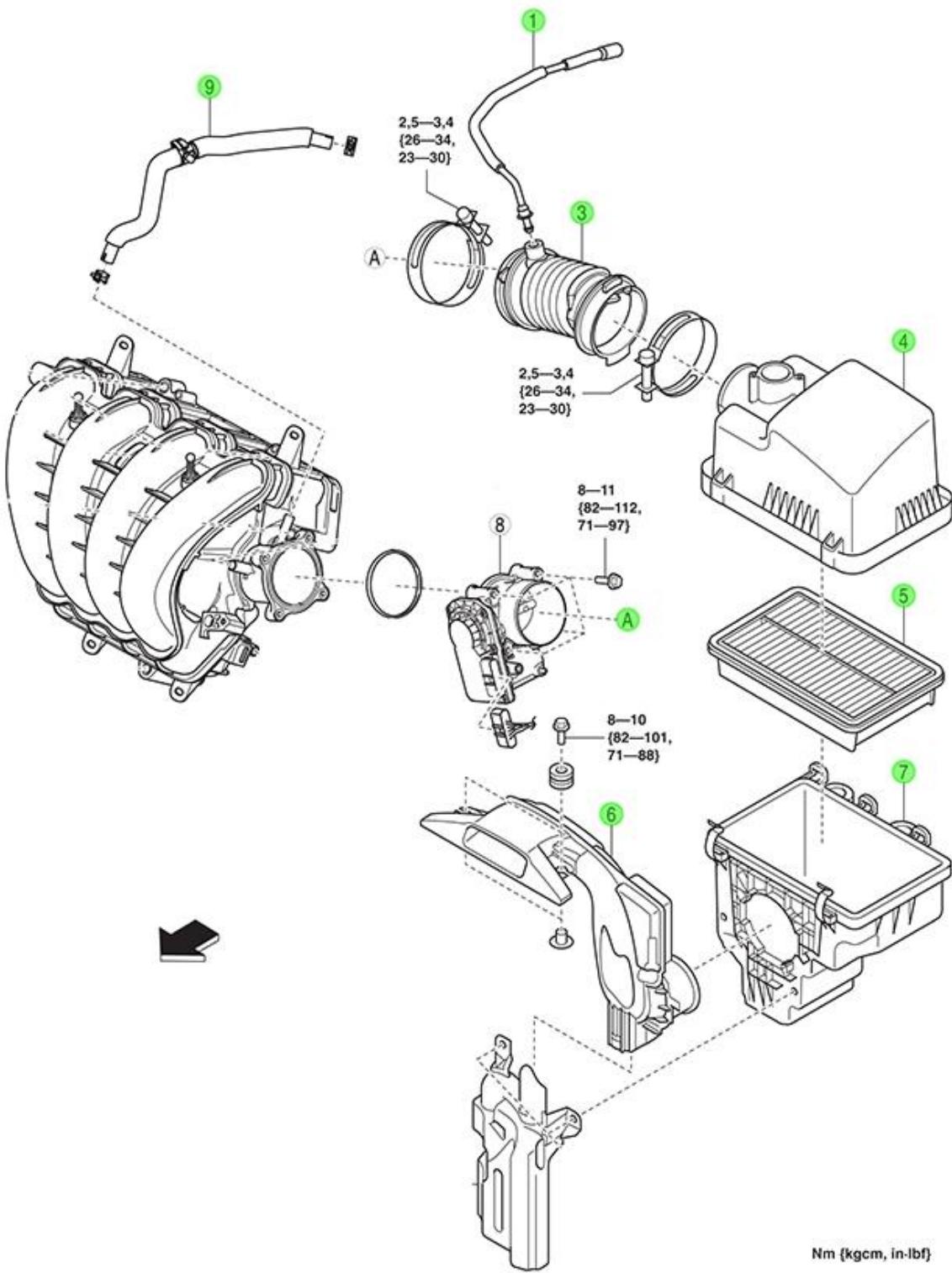
DLM component location overview Skyactive Mazda CX-3

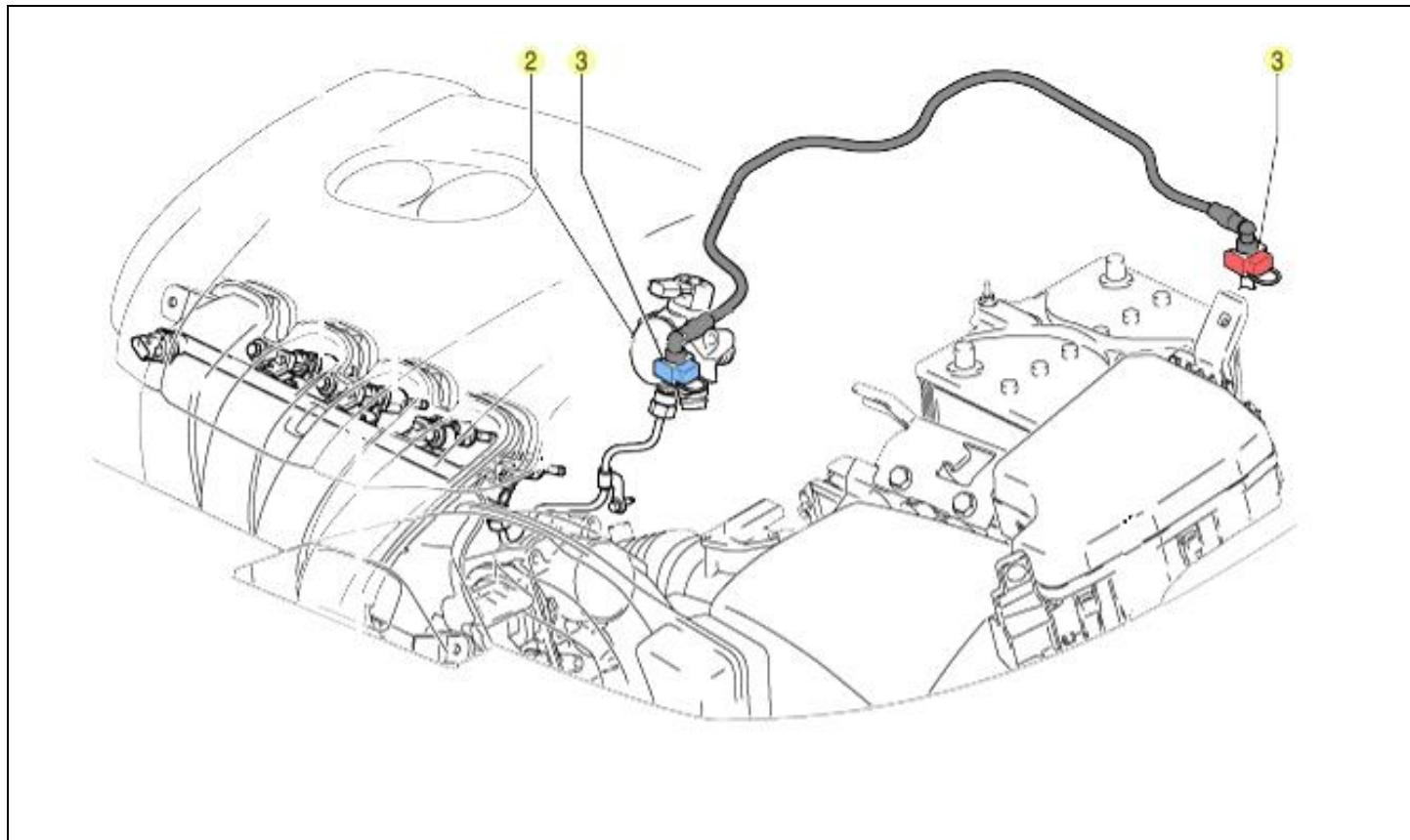
Petrol ECU		AFC
HPP pump		FMU
		
		Boost pump
		
		Fuse / relay box 

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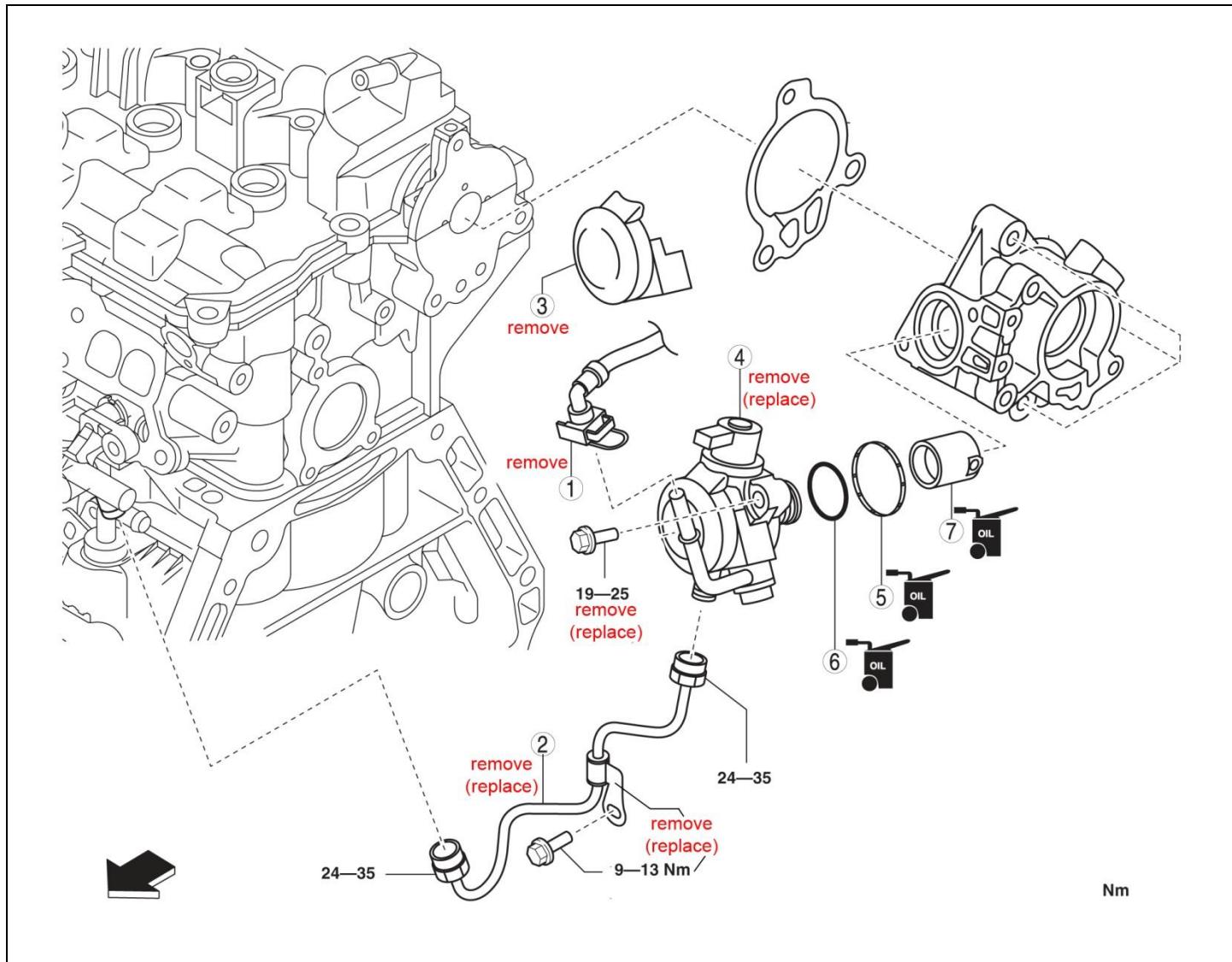
Remove battery



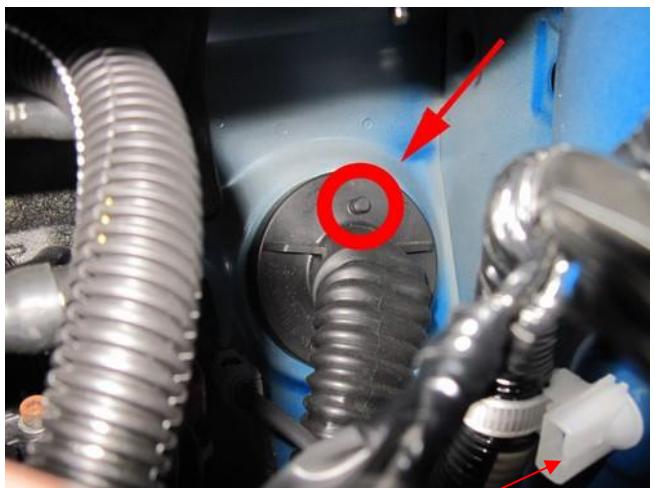
Overview Filter removal

Petrol hose removal

Overview pump removal



Installation preparation



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

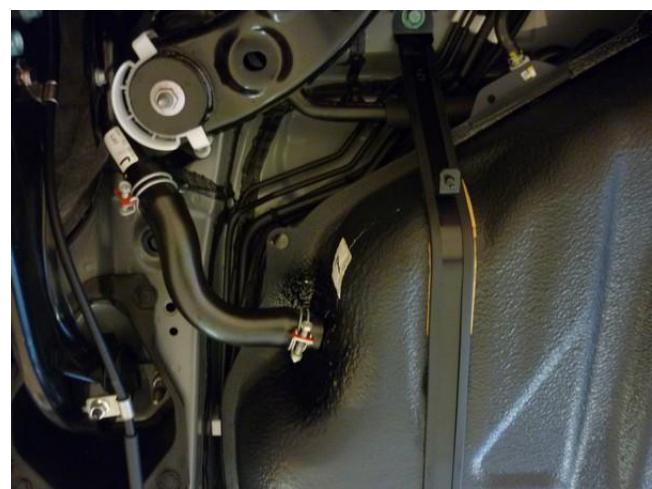
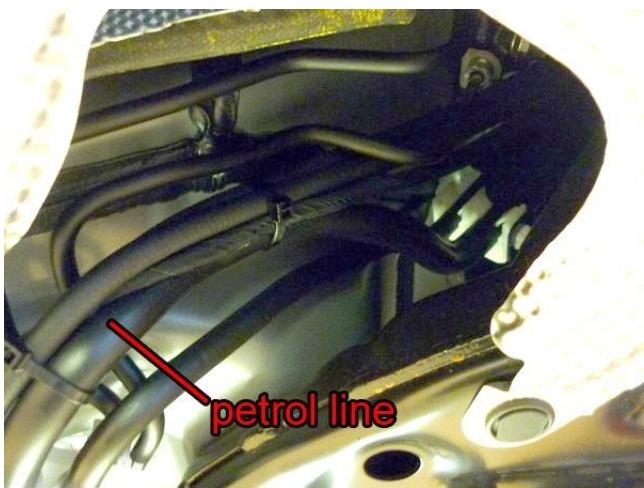


Replace white cable clamp, wiring loom moves to front (only Mazda 3/6/CX-5).

EXTEND WIRING : Option Fuel Reset (only 2WD CX-5 2017 →)

		Model 2017+ New nose	
22	LSS1	Purple	Extend wire to the tank under back seat
4	+Batt	Red	Extend wire to the tank under back seat

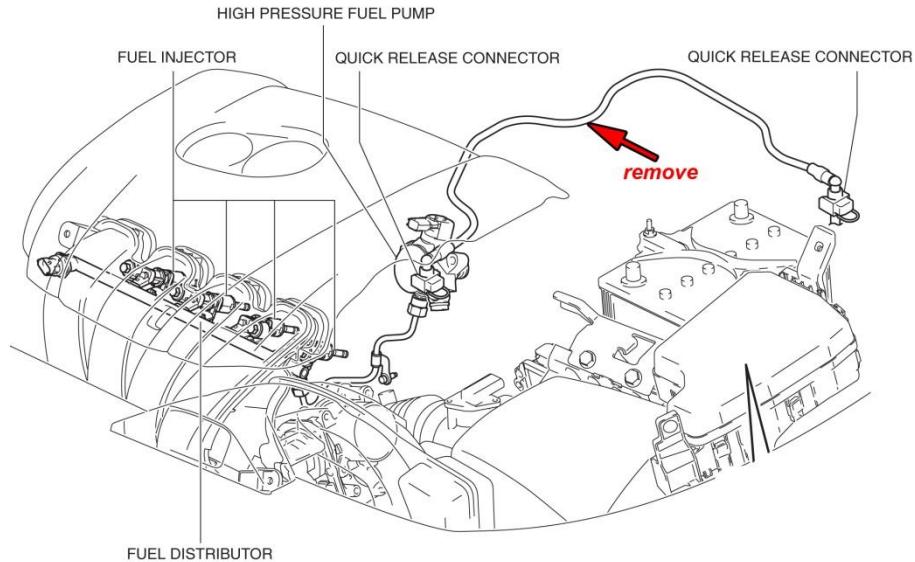
Hose routing



**Mount the DLM Lines with tie-raps & only to the petrol fuel 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.

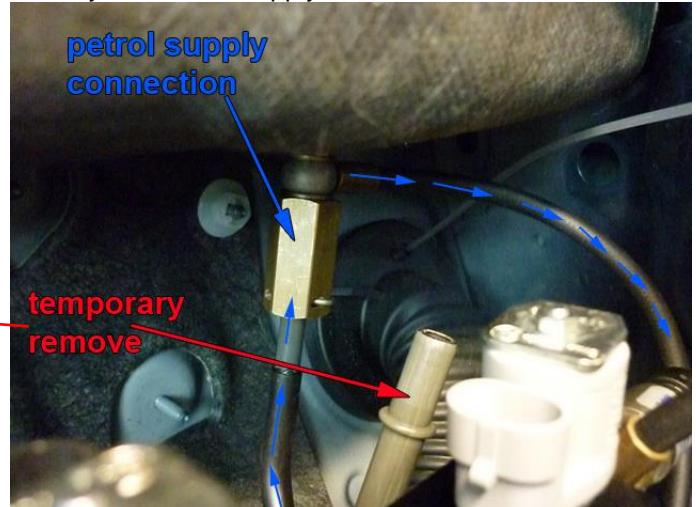


Remove the petrol fuel line (not used anymore).

Remove EVAP hose temporary for easy installation supply line.



LHD



RHD

Connect the petrol supply quick connector to the fuel pipe.



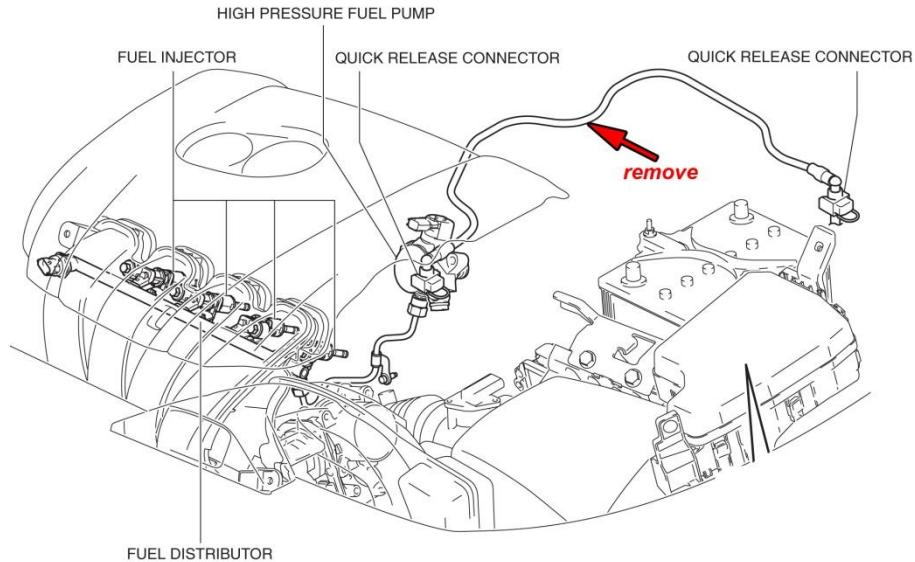
New type quick connector: Tighten with 20Nm.



Wiring transit.

Connection of the fuel hose to the boost pump. (CX-3)

Remove the original petrol supply line.



Remove the petrol fuel line (not used anymore).

Remove EVAP hose temporary for easy installation supply line.



Connect the petrol supply quick connector to the fuel pipe.



New type quick connector: Tighten with 20Nm.



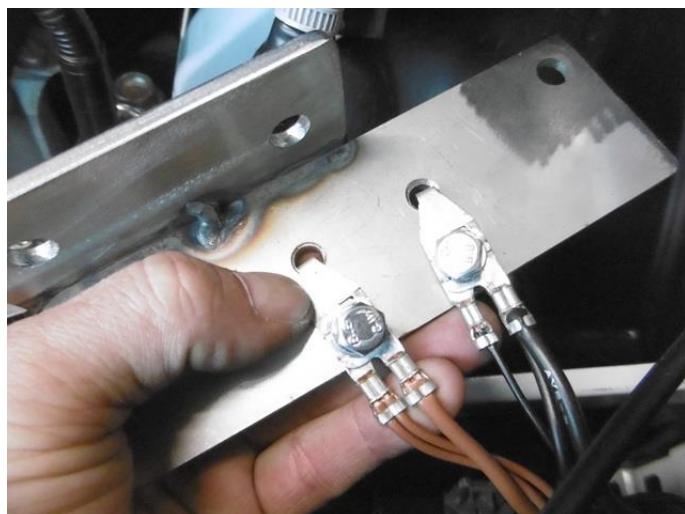
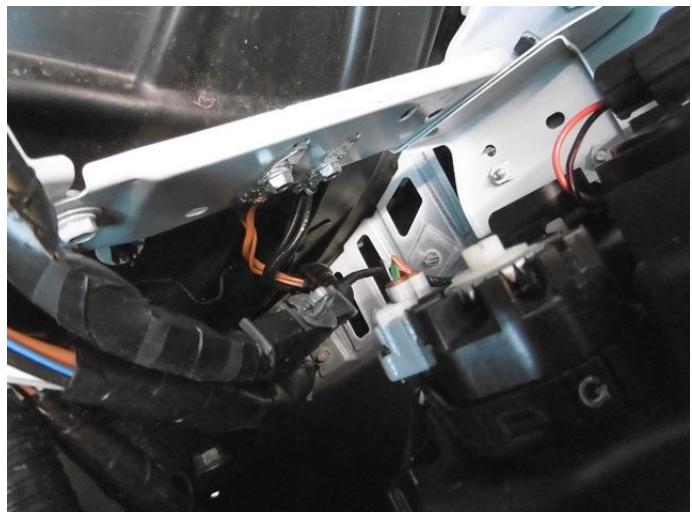
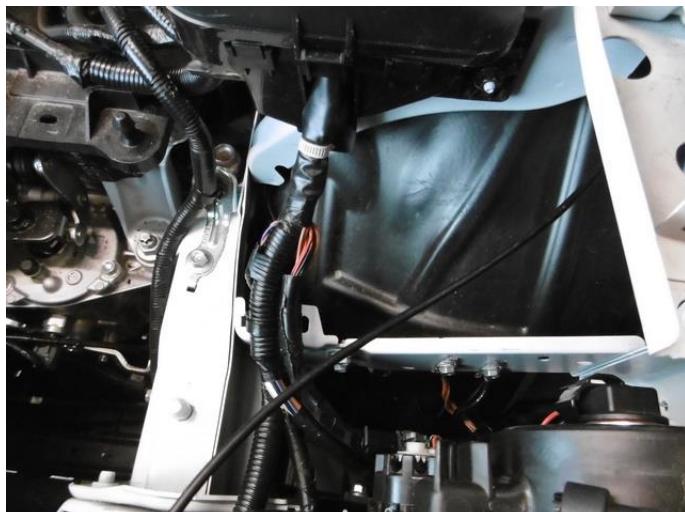
Wiring transit.

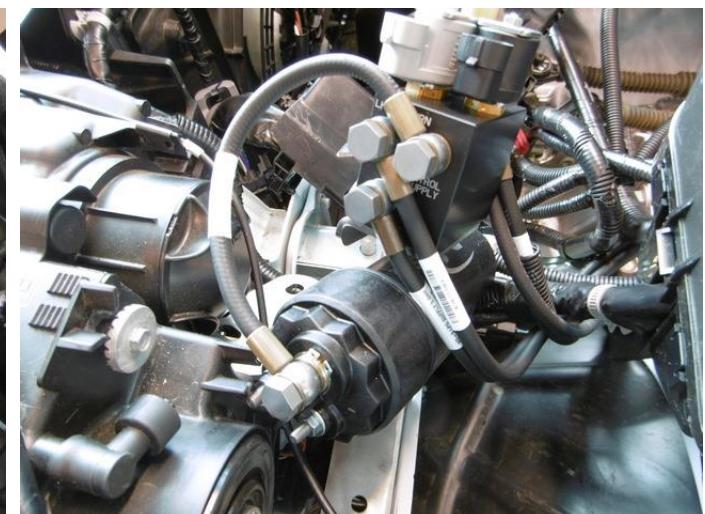
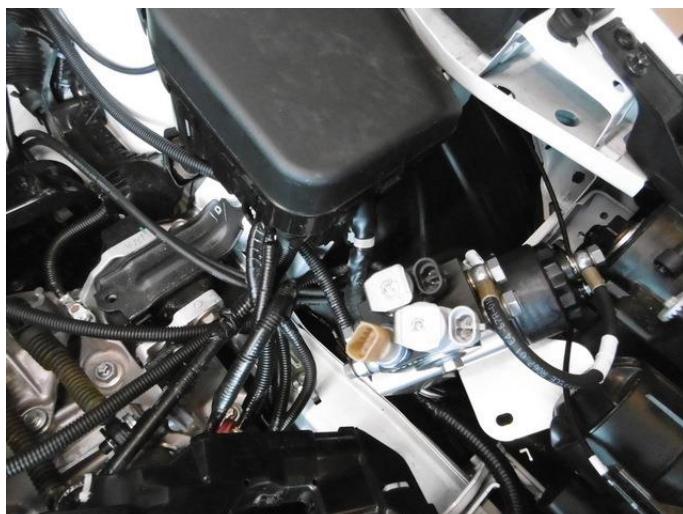
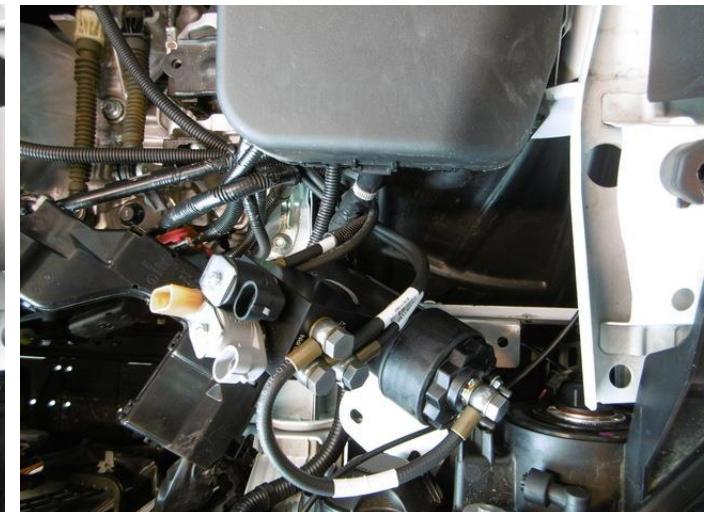
Install the unit (3-6-CX-5)

Connect hoses to the boost pump and FMU.



Install the unit (CX-3)

Install the support bracket (CX-3)

Install unit bracket onto the support bracket (CX-3)

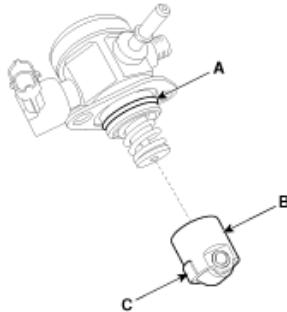
Installation of the Bosch High Pressure Petrol Pump

-INSTALLATION-

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

Apply engine oil to the O-ring (**A**) of the high pressure fuel pump, the roller tappet (**B**), and the protrusion (**C**). (roller tappet, only if removed from cylinder head).

Also apply engine oil to the groove on the location where the protrusion (**C**) is installed.



Installation bolts:

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

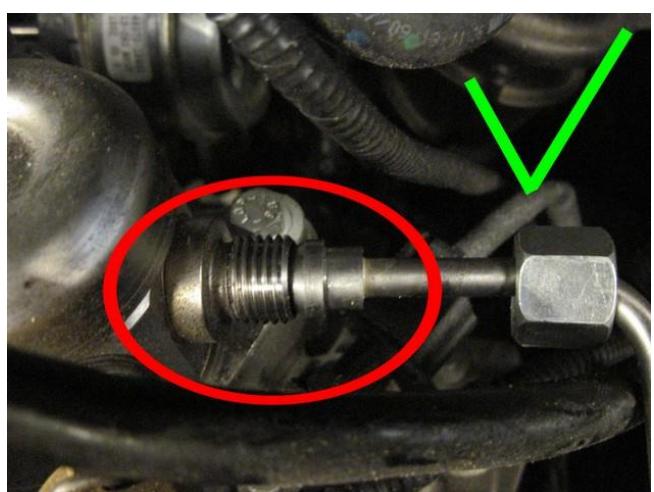
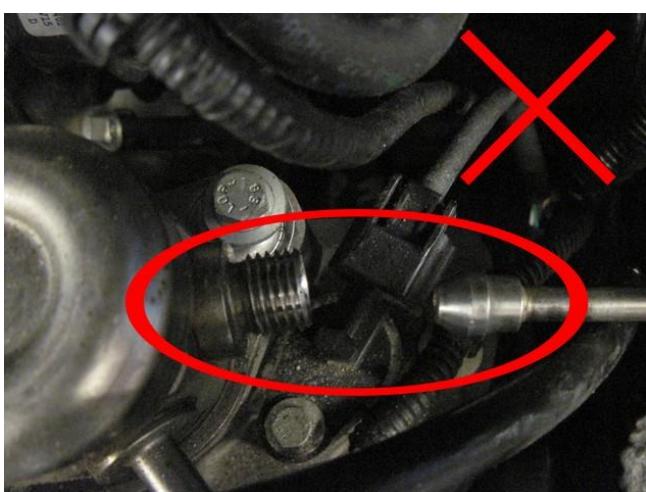
High pressure petrol pump installation bolt: 12.8 ~ 14.7 N.m.

Petrol pipe:

First hand-tighten the nut(s) fully until they are not fastened any more in order to have them inserted in place and then completely tighten to the specified torque using a torque wrench.

If not tightening the bolts or nuts in a straight line with the mating bolt holes or fittings, it may cause a fuel leak due to broken threads.

High pressure petrol pipe installation nut: 26.5 ~ 32.4 N.m.



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.

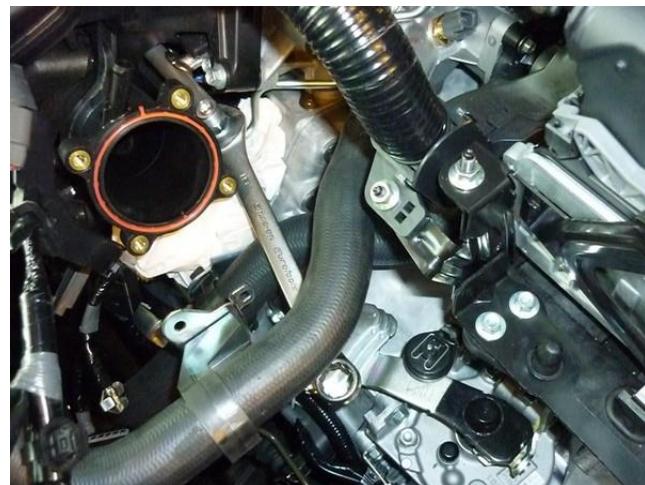
High pressure pump installation



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.



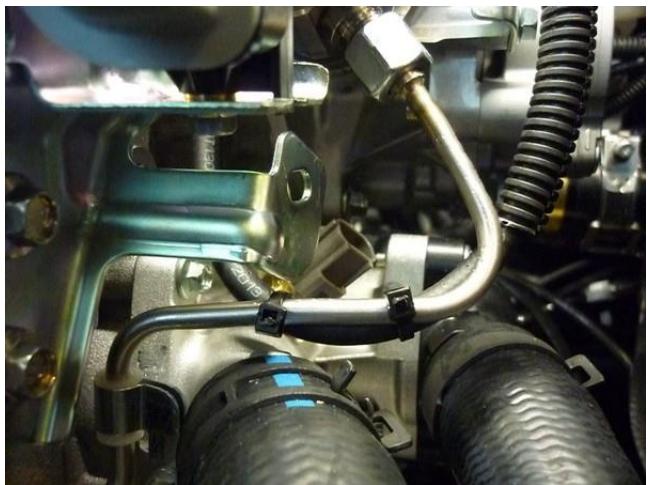
High pressure pump installation connection (3-6-CX-5)



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.

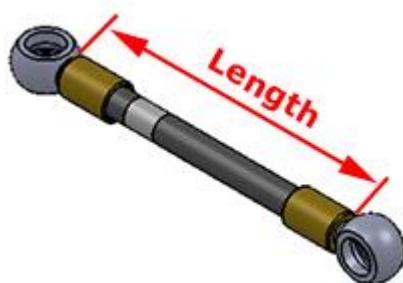
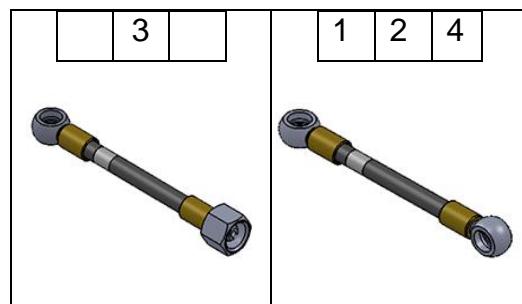
Re-use the original fuel line bracket.

Hose routing (3-6-CX-5)



LPG / petrol fuel lines (3-6-CX-5)

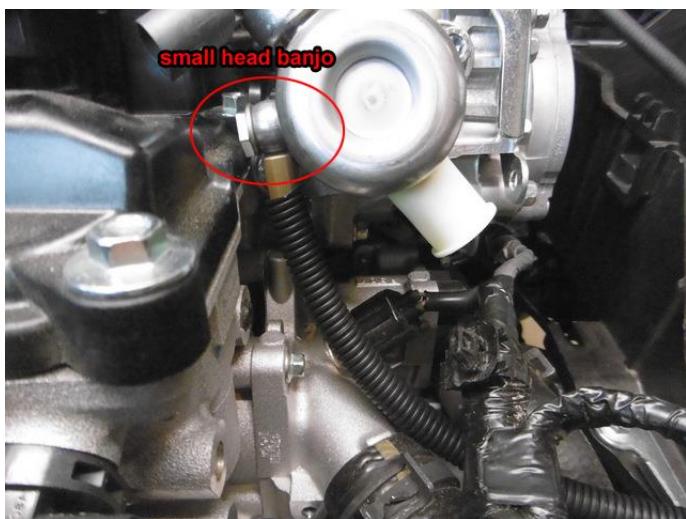
Hose	from	to	Length (cm)
1 XD-3	Adapter original petrol hose	Boost pump in	40
2 XD-3	Boost pump out	FMU petrol supply	30
3 XD-4	FMU HPP supply	High pressure pump	50
4 XD-3	High pressure pump	FMU HPP return	85
5 XD fuel supply line	FMU LPG supply	Tank	
6 XD fuel return line	FMU LPG return	Tank	



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



High pressure pump installation connection (CX-3)



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.

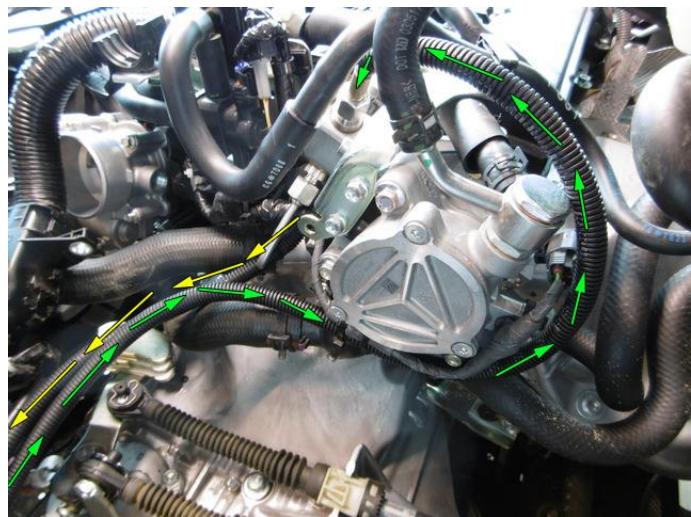
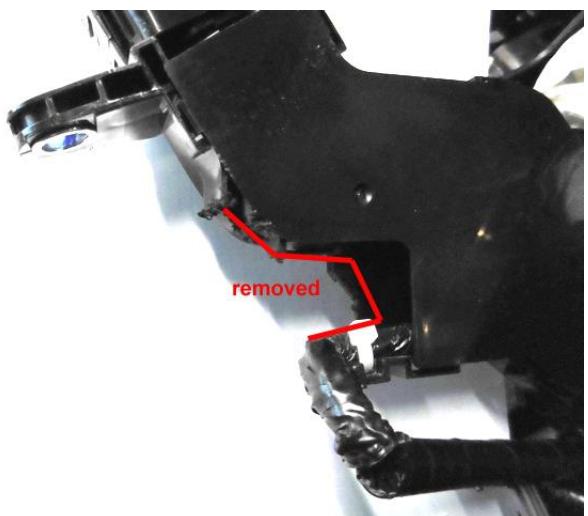
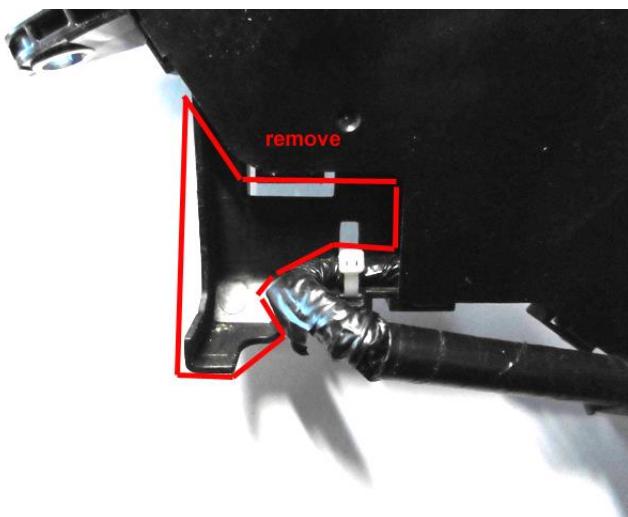


Mount the new fuel line free of tension. If the fuel line does not fit correctly, adapt the fuel line.

Re-use the original fuel line bracket.

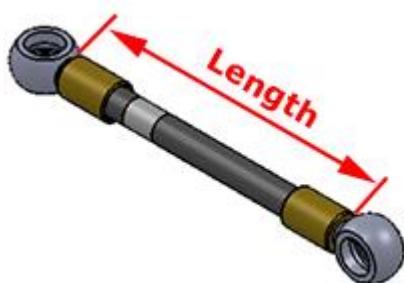
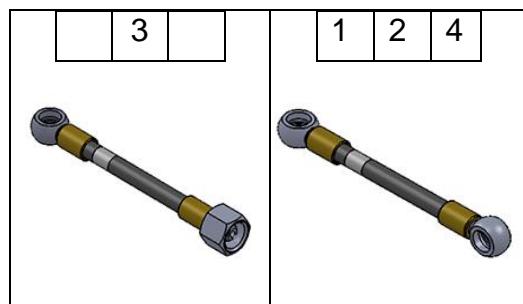


Hose routing (CX-3)



LPG / petrol fuel lines (CX-3)

Hose	from	to	Length (cm)
1 XD-3	Adapter original petrol hose	Boost pump in	60
2 XD-3	Boost pump out	FMU petrol supply	20
3 XD-4	FMU HPP supply	High pressure pump	100
4 XD-3	High pressure pump	FMU HPP return	70
5 XD fuel supply line	FMU LPG supply	Tank	
6 XD fuel return line	FMU LPG return	Tank	



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

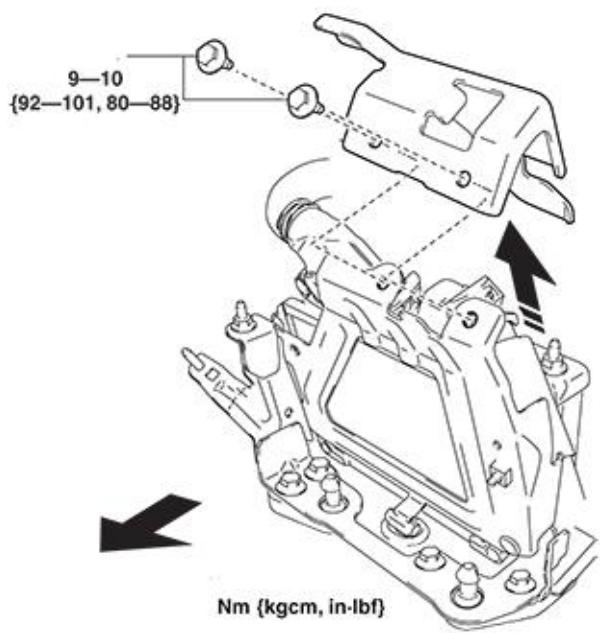
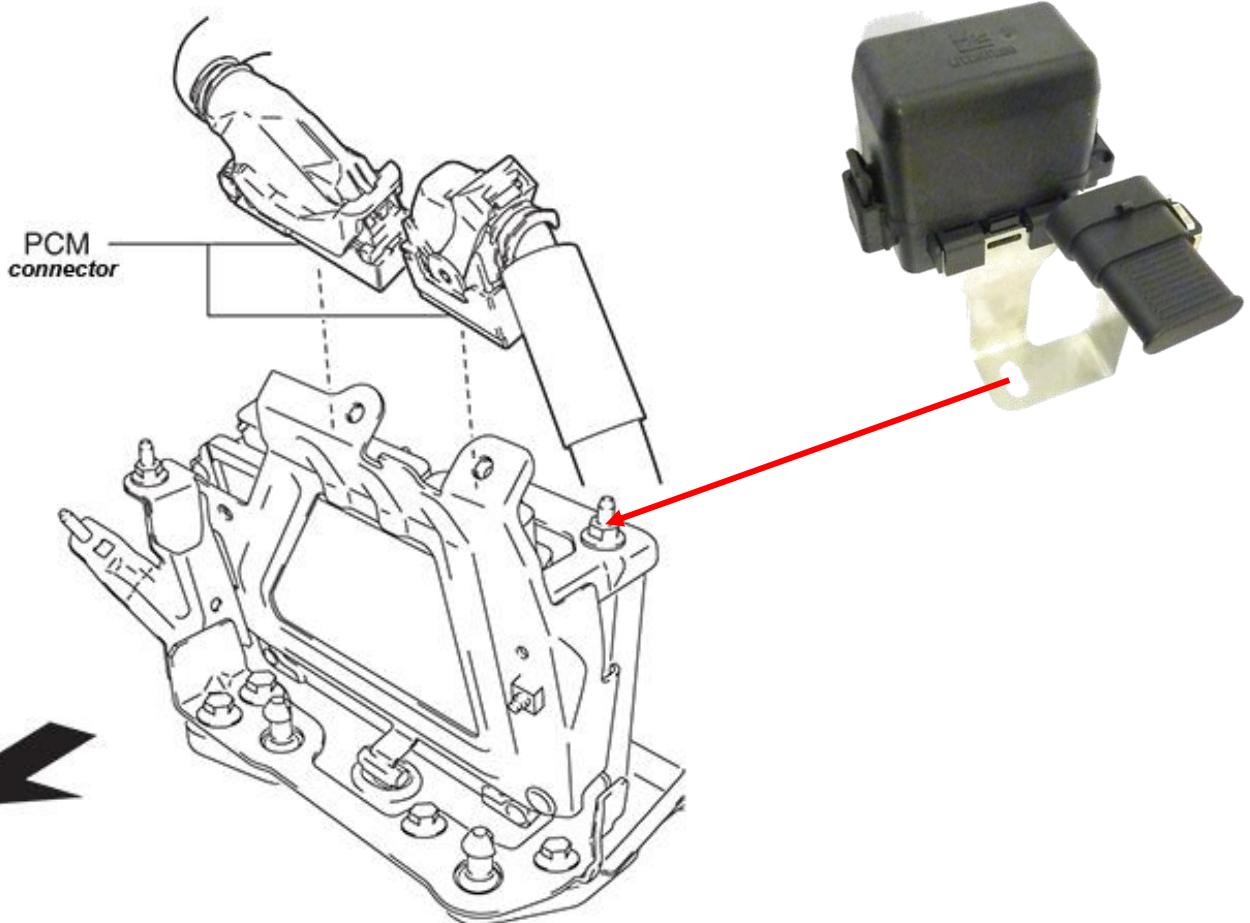


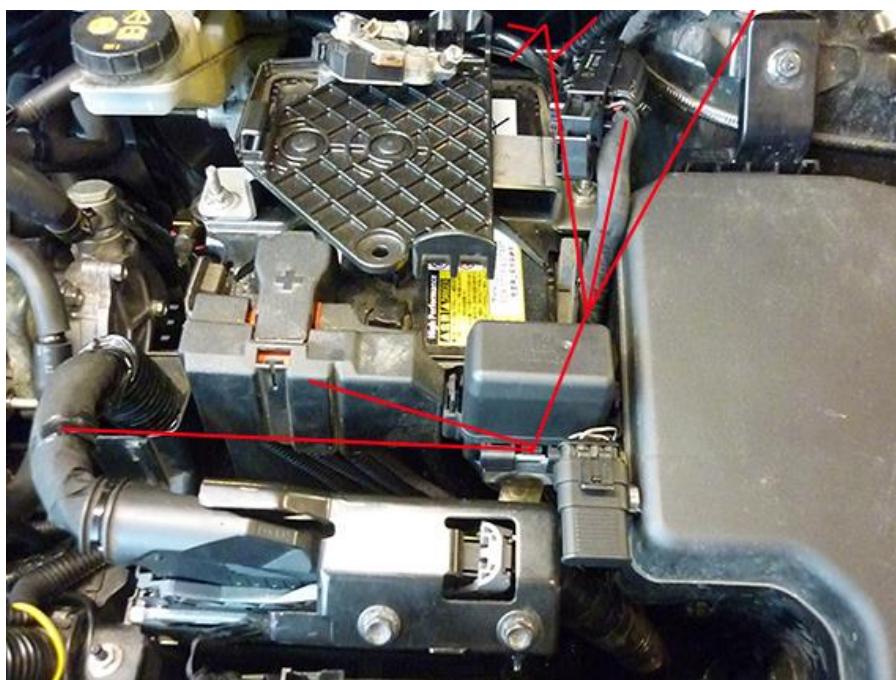
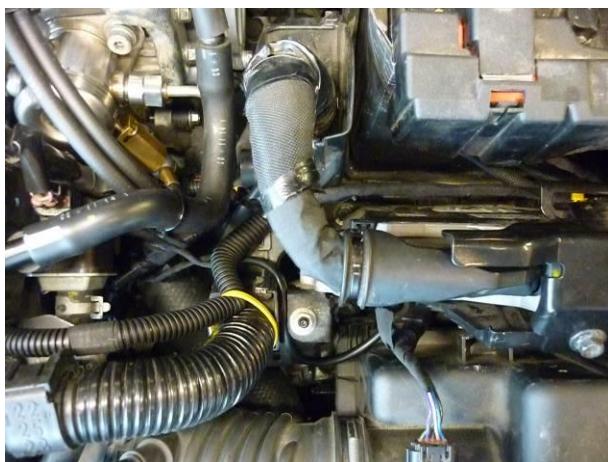
Mounting the AFC

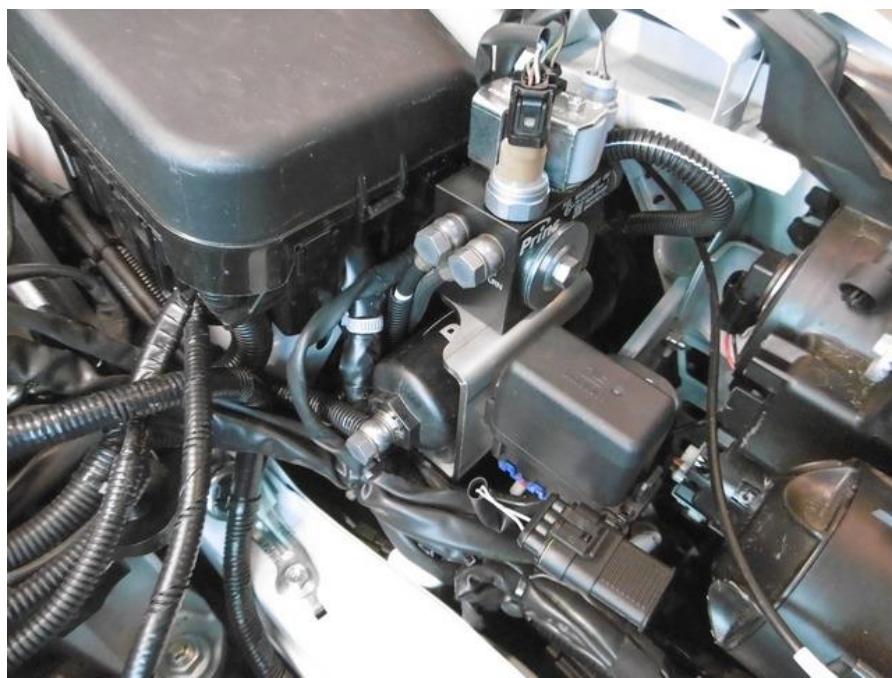
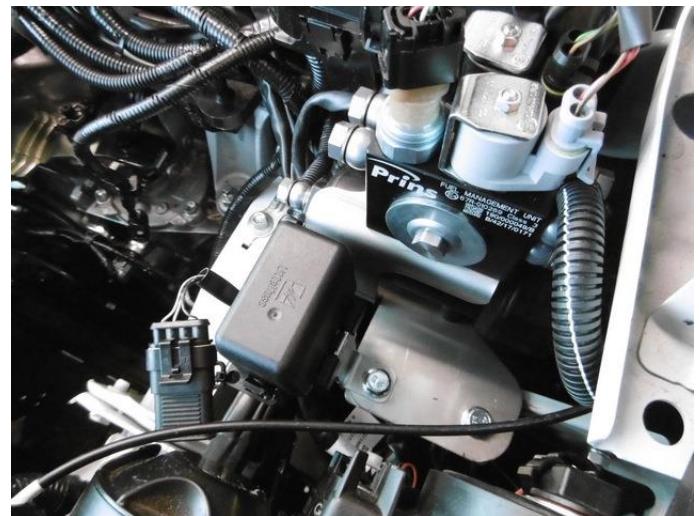
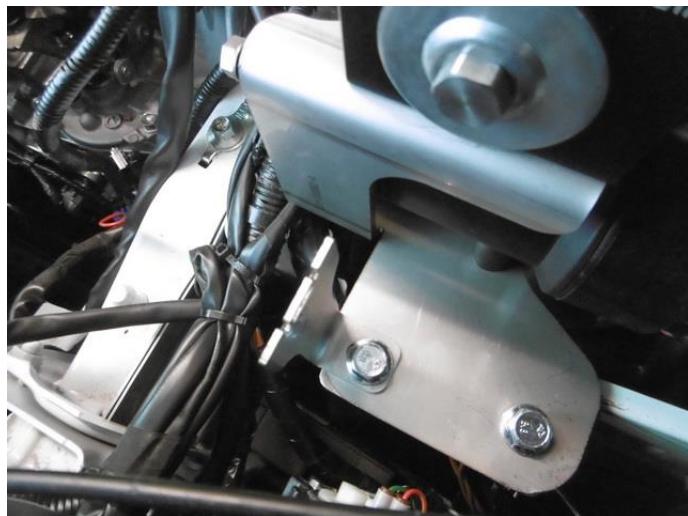


Connect battery ground only when completely finished the installation!

For CX-3, remove battery and support for connecting wiring.

Fuse / relay box location (3-6-CX-5)

Wiring routing (3-6-CX-5)

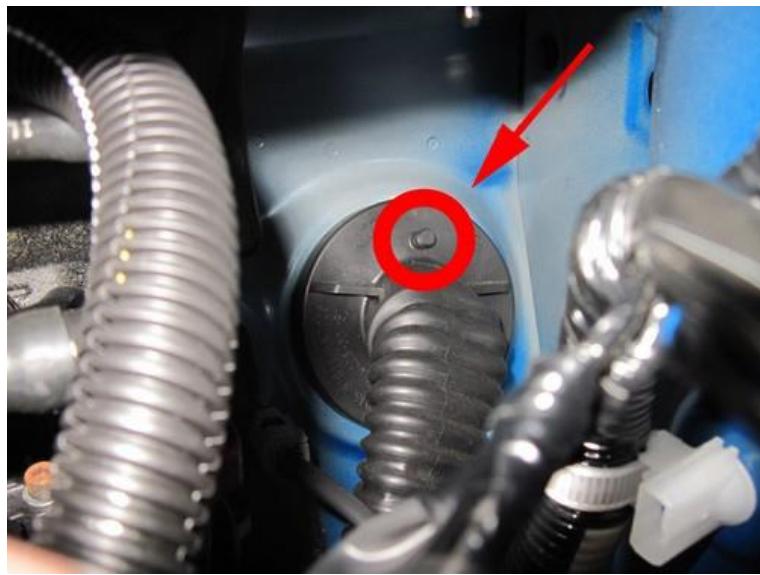
Fuse / relay box location (CX-3)

Wiring (CX-3)



Mount the switch.

Mounting the fuel selection switch Mazda 6

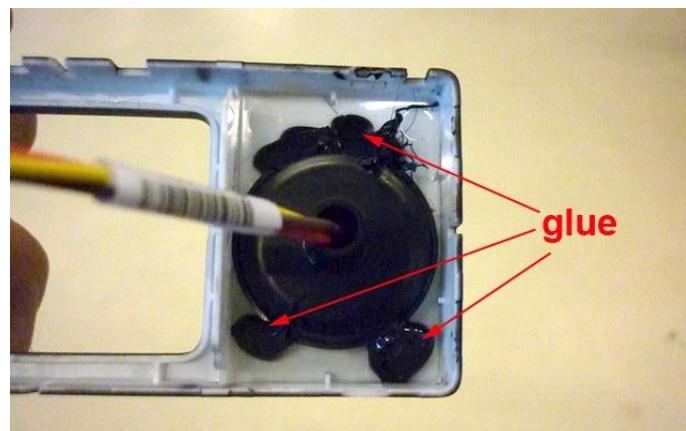
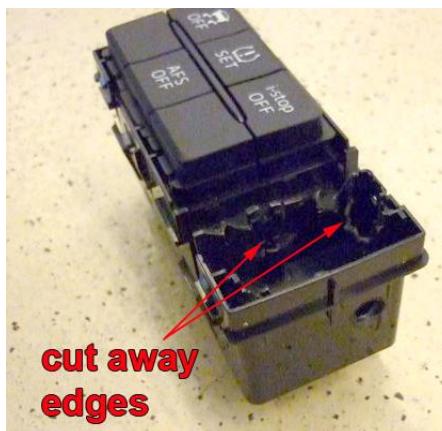


Drill Ø8.3mm

Mounting the fuel selection switch optional Mazda 6



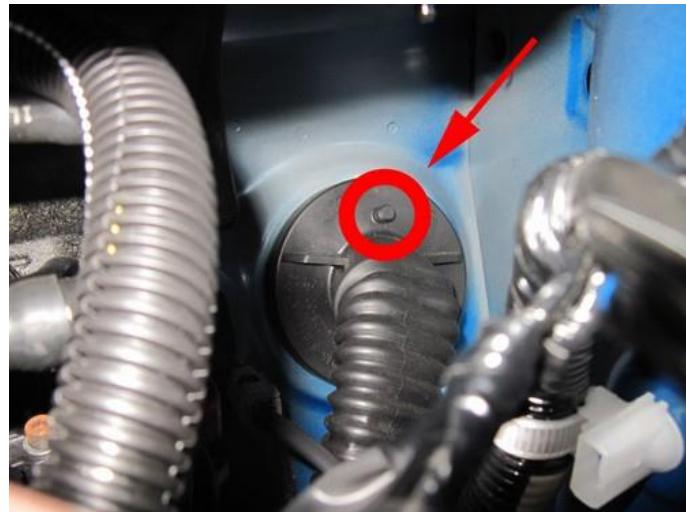
Mount the switch.



Mounting the fuel selection switch Mazda 3



Mount the switch.



Drill Ø8.3mm

Mounting the fuel selection switch Mazda CX-5

 Mount the switch.



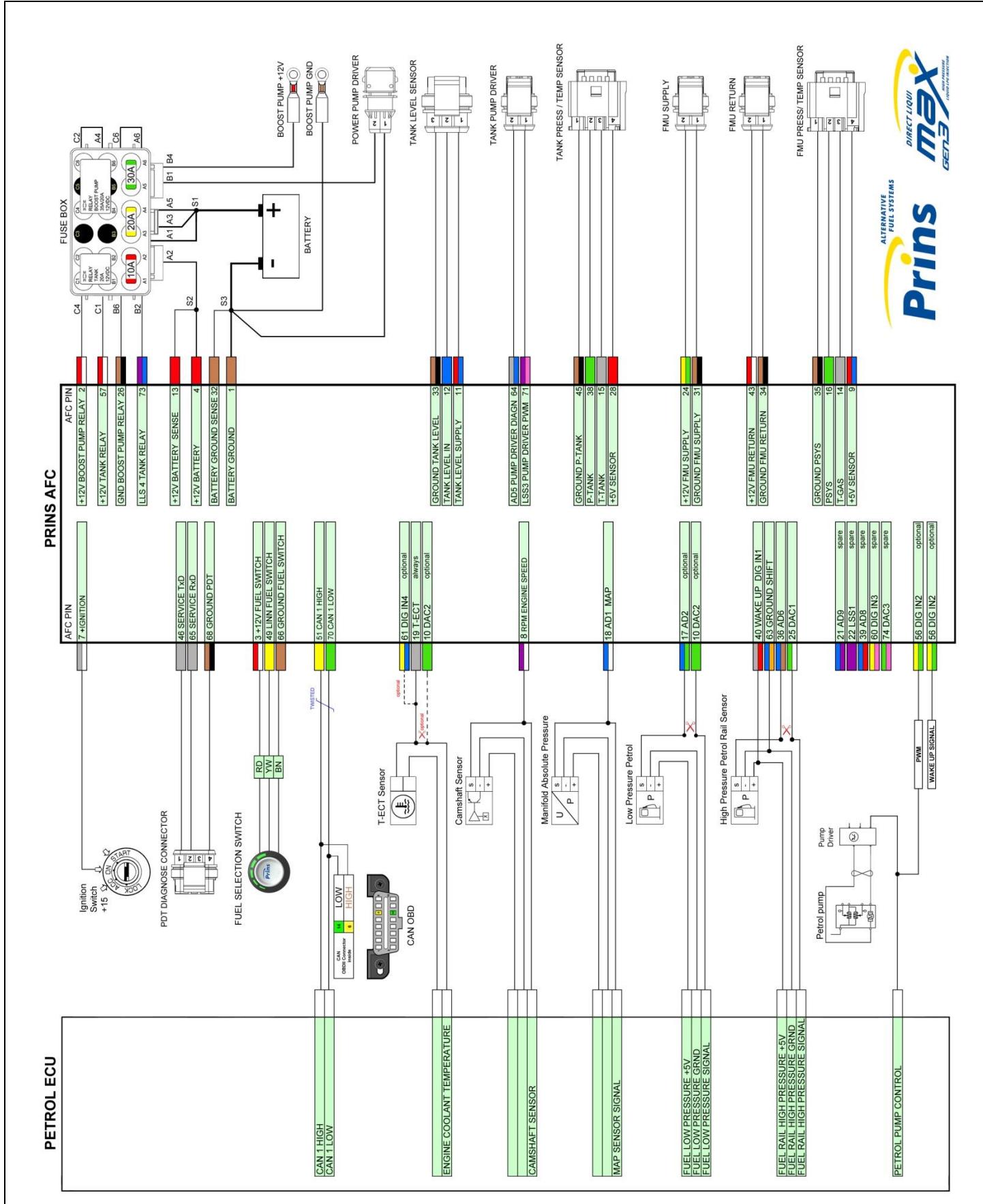
Mounting the fuel selection switch Mazda CX-3



Mount the switch.



Basic DLM Gen3 wiring diagram



Main Connector AFC

Prins
A WESTPORT COMPANY

Electrical connections driver room

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

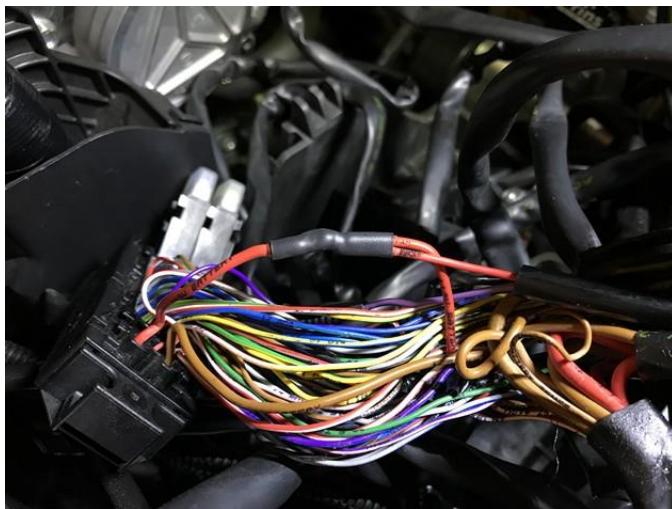
Driver room

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.

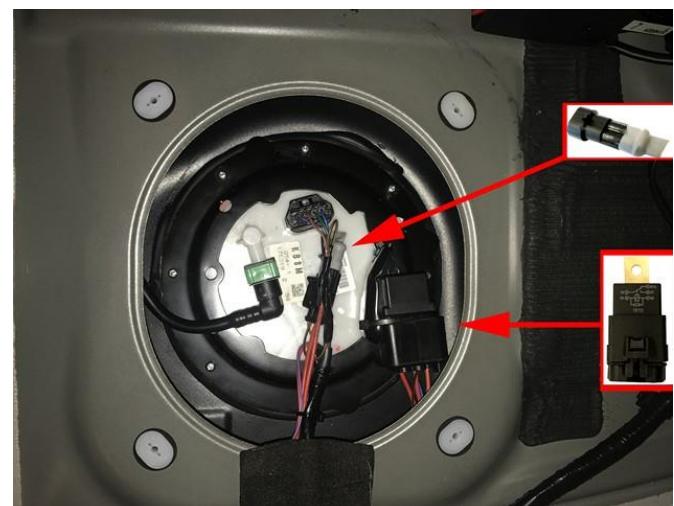
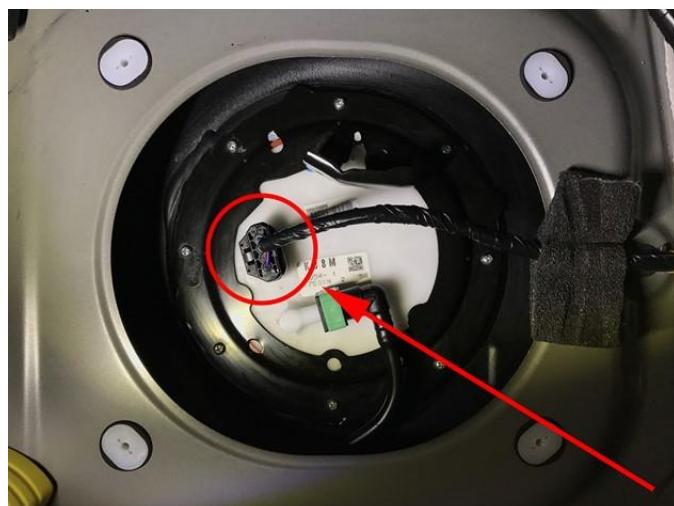
51 CAN-High		Yellow	EOBD connector pin 6
70 CAN-Low		Green	EOBD connector pin 14

Option Fuel Reset (only 2WD CX-3/5 2017 →) driver room

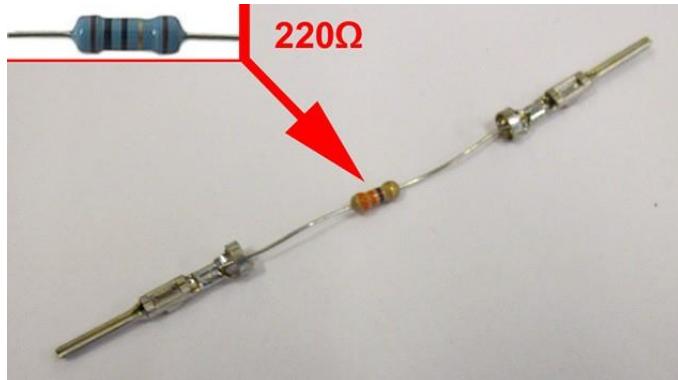
		Model 2017+ New nose	
22 LSS1		Purple	Extend wire to the tank under back seat (see next pages)
4 +Batt		Red	Extend wire to the tank under back seat (see next pages)

Option Fuel Reset (only 2WD CX-3/5 2017 →)

Connect/extend LSS1 (22) & +Batt (4) to/from the AFC connector with the supplied wiring to the tank fuel level gauge underneath the back seat.



Connect the relay with the resistor to the wiring from the tank fuel level gauge (see next pages).

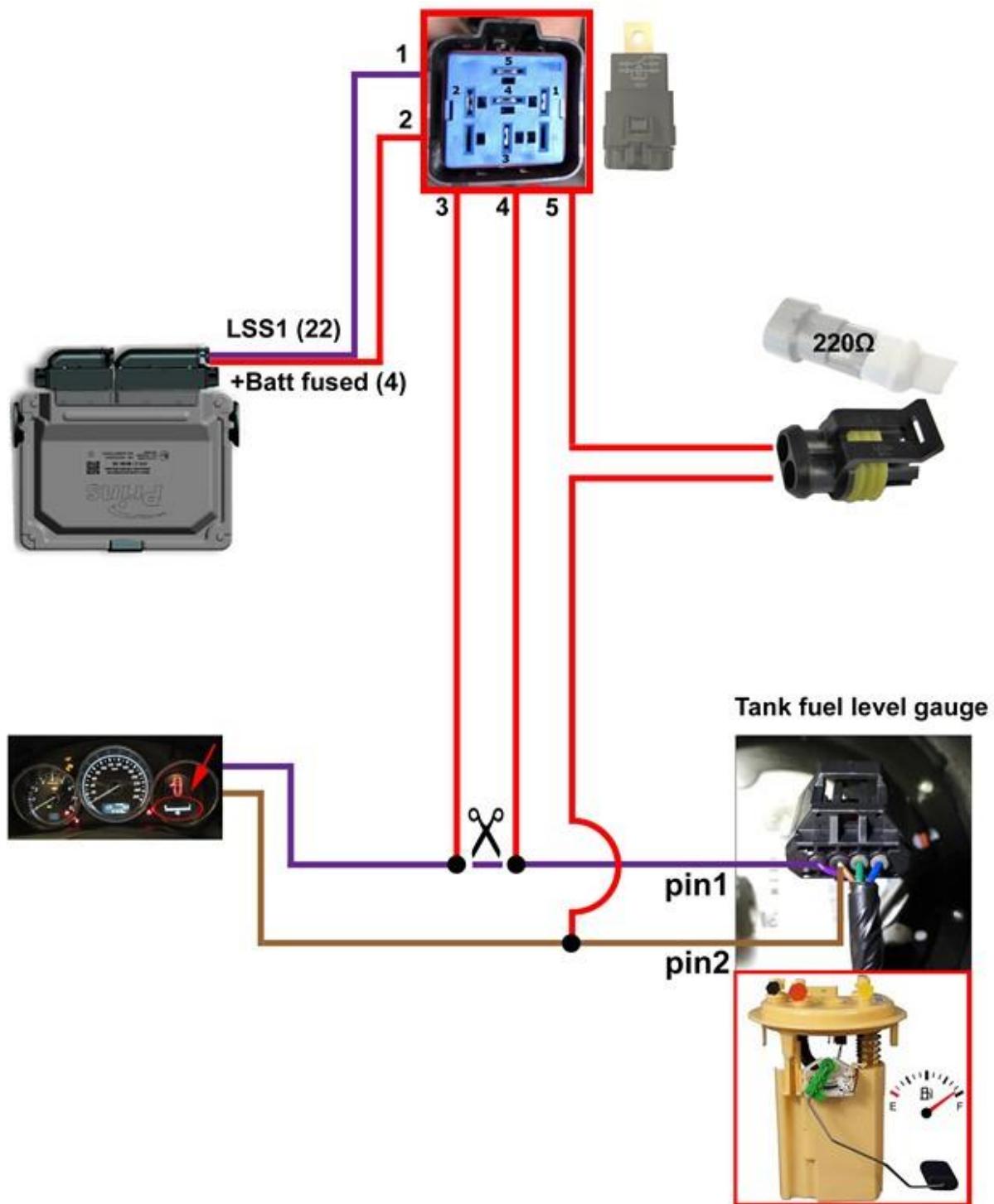
Option Fuel Reset (only 2WD CX-3/5 2017 →)

Mount (& solder) the resistor to the terminals & mount to the connector.



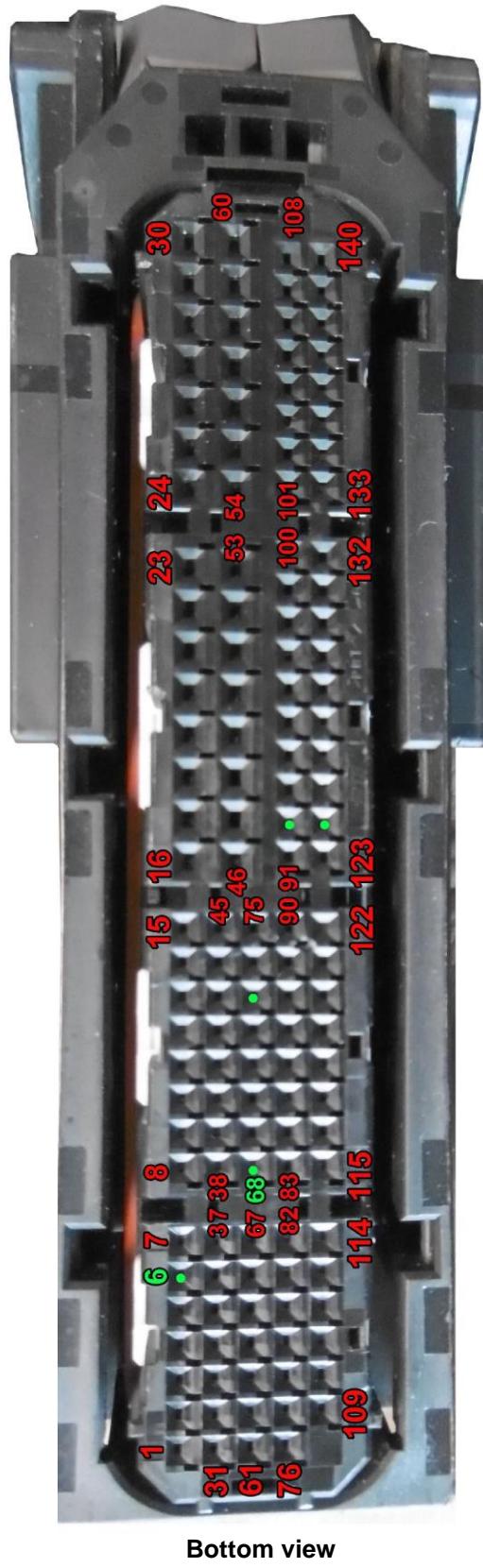
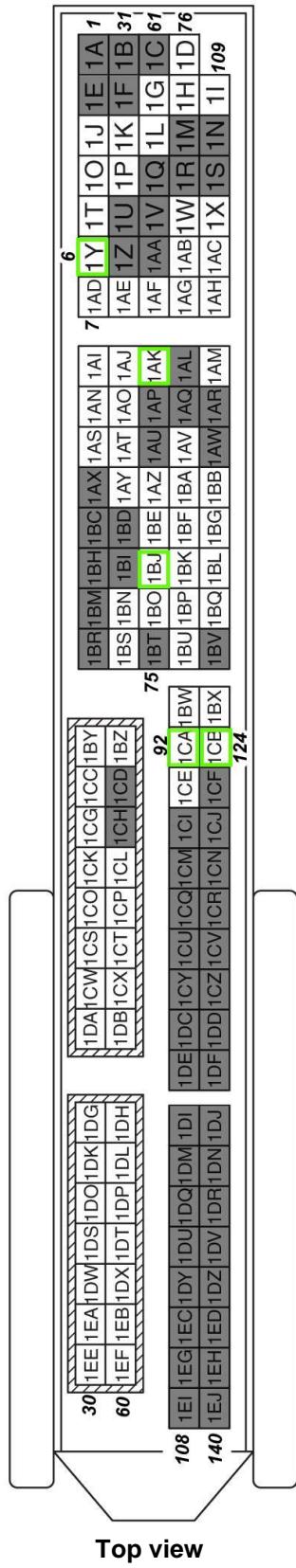
Mount the resistor to the connector. Use shrink sleeve with glue to protect the connector against weather influences.

Option Fuel Reset (only 2WD CX-5 2017 →)



Relay pin 1	Brown-black	Connect to LSS1 (22) from AFC (extended wire)
Relay pin 2	Blue	Connect to +BATT (4) from AFC (extended wire)
Relay pin 3	Red	Cut wire from the tank level fuel gauge pin 1 and connect to the front
Relay pin 4	Red	Cut wire from the tank level fuel gauge pin 1 and connect to the sensor
Relay pin 5	Red	Connect to pin 2 from the tank level fuel gauge via the resistor connector

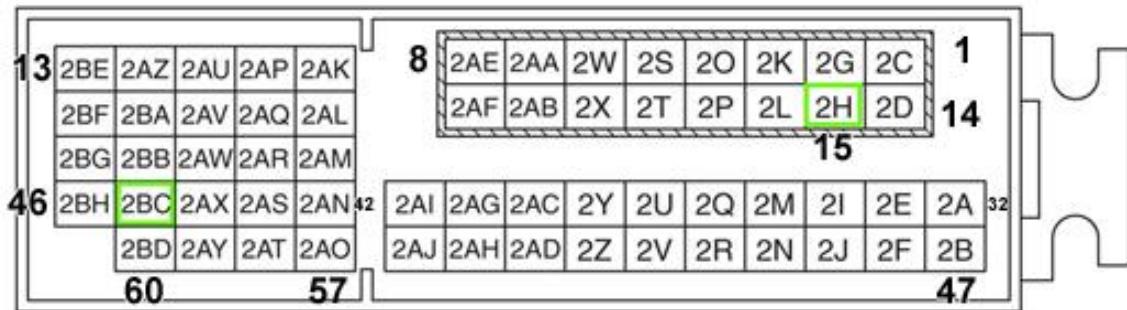
Petrol ECU connector overview BIG connector



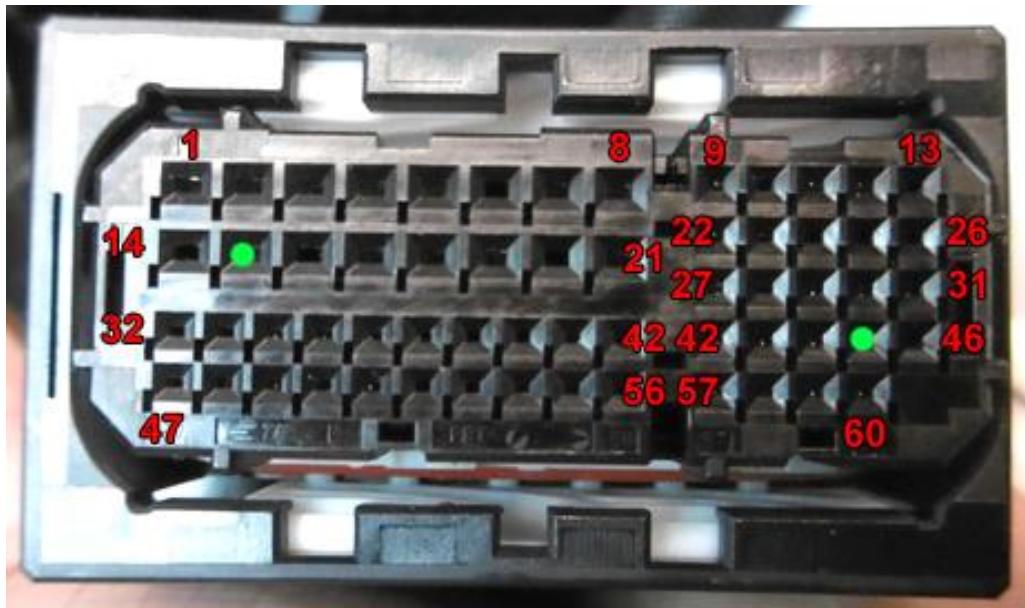
Position leading !

Petrol ECU connector overview SMALL connector

Top view



Bottom view



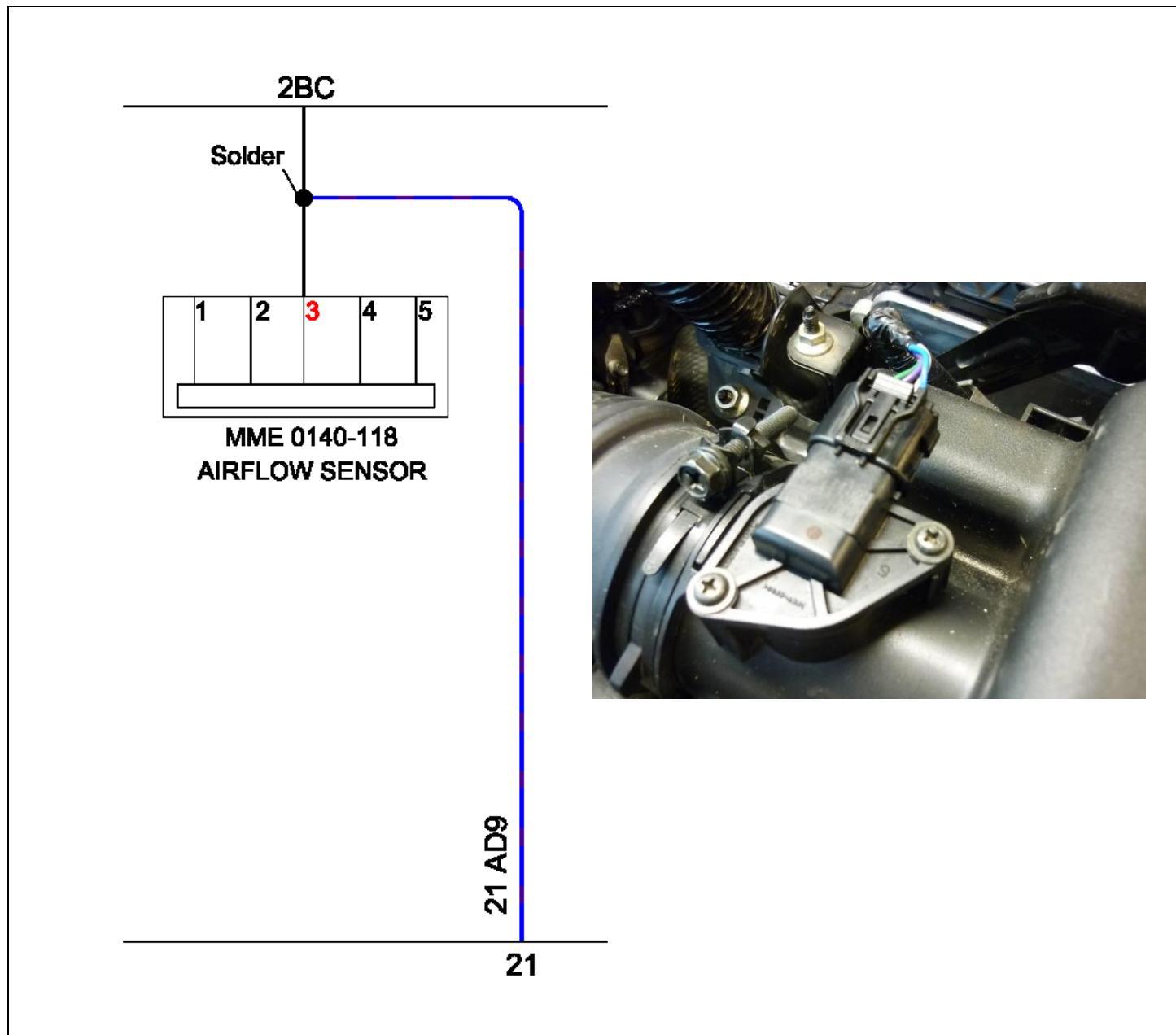
Position leading !



Electrical connections Wake-up & MAF sensor, SMALL connector

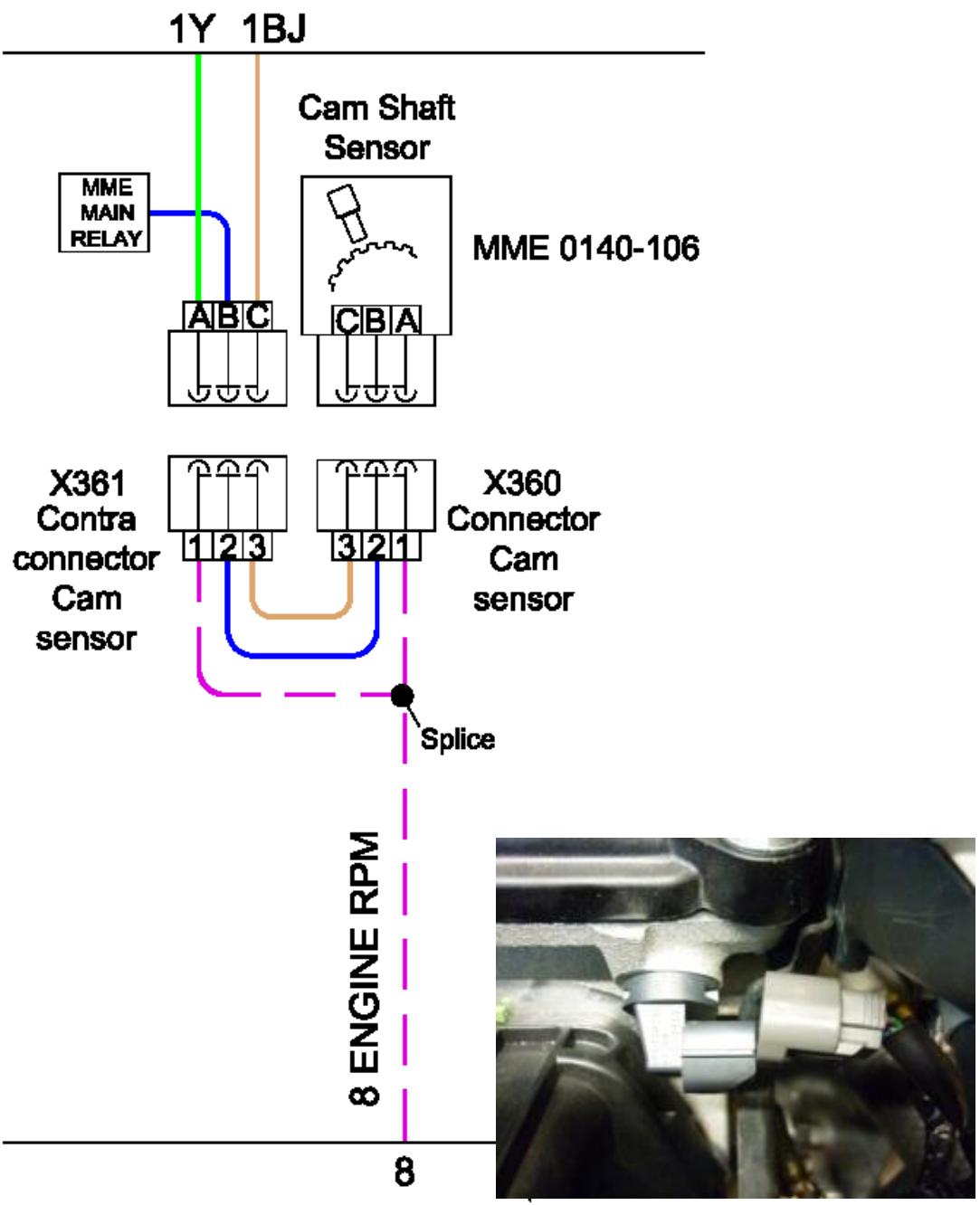
Wire number / code	Wire colour	Connection
		<i>Car wake-up.</i> Wire colour : White-grey Wire location : petrol ecu 2H, pin 15
40 Wake-up	Grey-red	

Wire number / code	Wire colour	Connection
21 AD 9		<i>For measuring the Air Flow signal.</i> Wire colour : Black or brown petrol ecu 2BC, pin 45 or Air box, 5-pole sensor connector, pin 3
21 AD 9	Blue-purple	



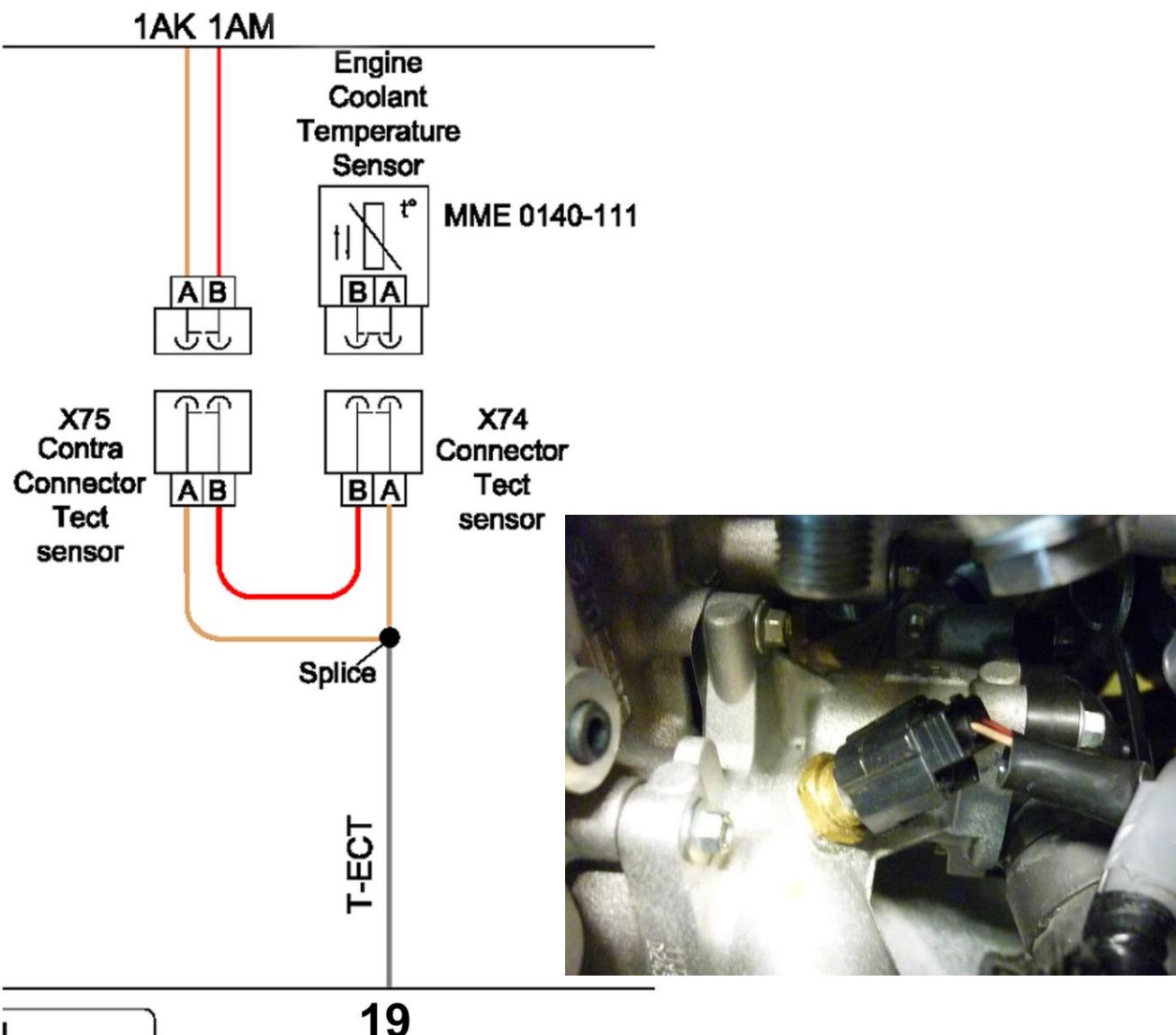
Electrical connections Camshaft sensor, Big connector

Wire number / code	Wire colour	Connection
8 RPM engine speed		For measuring the engine speed signal. Wire colour :Green petrol ecu 1Y, Pin 6 or left front side cylinder head.
8 RPM	Purple-white	



Electrical connections Engine Coolant sensor, Big connector

Wire number / code	Wire colour	Connection
19 Tect		For measuring the engine coolant temperature. Wire colour : Brown petrol ecu 1AK , pin 68 or left side engine under petrol pressure pump, pin A
19 T-ect	Grey	

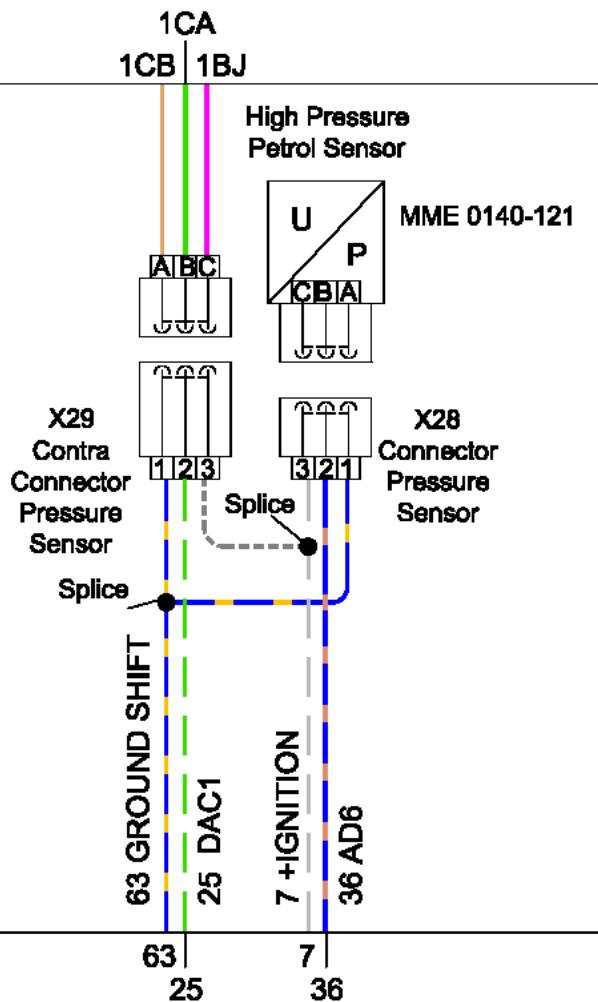


Electrical connections High Petrol Pressure sensor, Big connector

36 & 25			<i>High pressure petrol sensor signal interruption.</i> Wire colour : Green petrol ecu 1CA, pin 92 or 3-pole connector high pressure petrol sensor connector pin 2 Right side on engine, under inlet manifold, sensor on end of the fuel rail.
36	AD 6		Blue-brown Sensor side X28, pin 2 (petrol ecu 1CA)
25	DAC 1		Green-white Petrol ecu side X29, pin 2 (petrol ecu 1CA)

63 Ground Shift			<i>High pressure petrol sensor ground shift.</i> Wire colour : Tan petrol ecu 1CB, pin 124 or 3-pole connector high pressure petrol sensor X28 spliced X29, pin 1
63	Ground Shift		Blue-orange

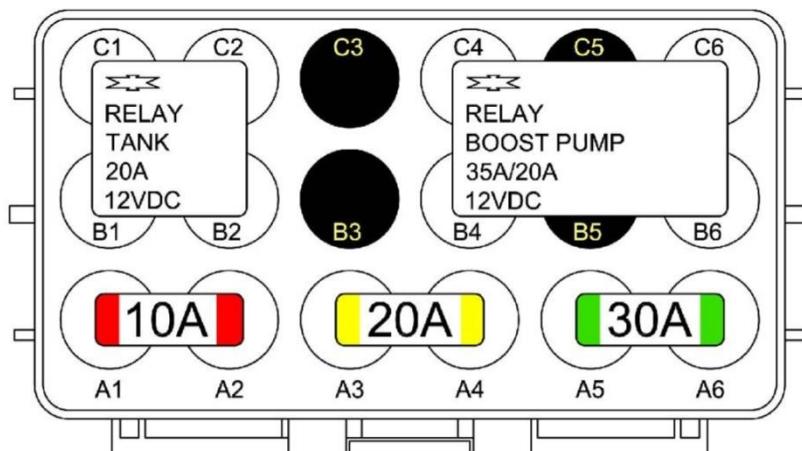
7 + IGNITION			<i>+IGNITION - High pressure petrol sensor +.</i> Wire colour : Pink petrol ecu 1BJ, pin 73 or 3-pole connector high pressure petrol sensor X28 spliced X29, pin 3
7	+IGNITION		Grey-white



Electrical connections

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

4 +12V BATTERY			<p>Connect to the '+' of the battery (+30); use a ring terminal.</p> <p>Do not place the fuses before having completed the installation of the LPG system.</p> 
4 +12V BATTERY		Red	

Fuse Box

(TOP VIEW)

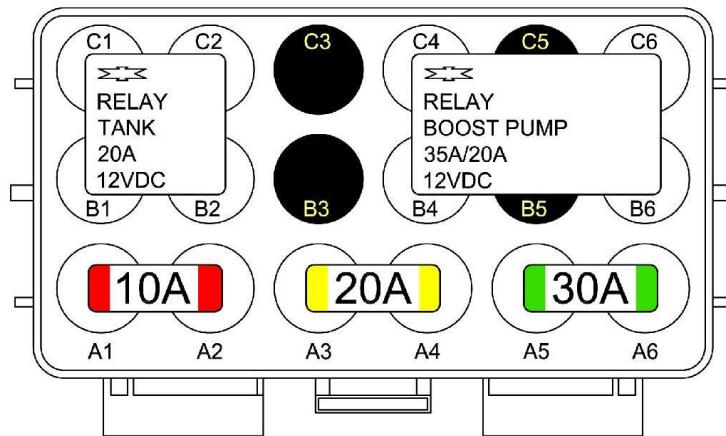


Electrical connections

**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>4-pole FMU P/T sensor</i> 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.
<i>2-pole black connector FMU</i> 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
<i>2-pole grey connector FMU</i> 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
<i>4-pole diagnose connector</i> 46 Service TxD 65 Service RxD 68 Ground PDT	Grey Grey Brown-black	<i>Diagnose connector for service / diagnosis.</i> Connector pin 1 Connector pin 2 Connector pin 4
<i>Boost pump relay</i> 2 +12V boost pump relay 26 Ground BP relay +12V fused BATT +12V Boost pump	Red-white Brown-black Red Red	Pin 86 of the boost pump relay C4 Pin 85 of the boost pump relay B6 Pin 30 of the boost pump relay C6-A5 Pin 87 of the boost pump relay B4
<i>Wiring tank pump driver relay</i> 57 +12V tank relay 73 LSS 4 tank relay +12V BATT fused +12V driver	Red-white Purple-blue Red Red	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)

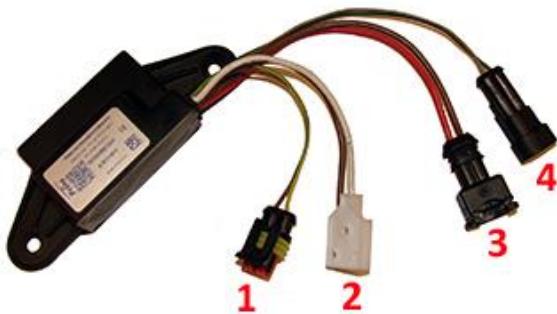
Electrical connections

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

LPG tank housing

Wire number / code	Wire colour	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 Red	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 Brown	From tank pump driver From tank pump driver	
3. 2-pole connector driver	Brown Red	From main ground From tank pump relay	Ground pump driver +12V pump driver
4. 2-pole connector driver	Green 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 ECU 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.

