Installation manual

PART 2/2

MANUFACTURER	BMW (based on F30 320i ED)
ENGINE DISPLACEMENT	1598cc
NUMBER OF VALVES	16v
ENGINE CODE / NUMBER - OUTPUT	N13B16A – 75 / 100 / 125 / 130kW
FIRING ORDER	1-3-4-2
VEHICLE CATEGORIES	M
TRANSMISSION	AT
VERSION	AFC-2.1 DI-LPG
TYPE VSI INJECTOR	KN9 - 63cc
TYPE INJECTION MODULE	Type 1
PETROL ECU MANUFACTURER / CODE	Bosch 0.261.S11.037 (810)
MODEL YEAR:	2011 - 2015
SYSTEM APPROVAL NUMBER (R115)	**(Only 130kW)** E4-115R-000045 / VSI-LPG 51
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	343/121001/A
MANUAL NUMBER	076/0302000
DATE	2018-03-15

TABLE OF CONTENTS

General instructions 2
Required equipment / tools / materials for installing a complete system 3
Vehicle check 3
Tightening moments 4
Basic System Overview 4
VSI approval numbers 6
VSI component location overview 7
Example mounting (based on F30 320i ED) 8
Overpressure / MAP connection 9
Mounting the inlet manifold couplings 10
Mounting the VSI injector rail 11
Mounting the VSI injector rail 12
Basic Wiring Diagram 13
Electrical connections 14
Electrical connections – Insulate 15
Electrical connections 16
Petrol ECM connector overview 16
Electrical connections 17
Electrical connections 18
Electrical connections 19
Electrical connections 20
Electrical connections 21
Checklist after installation 22

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.
- 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 and alarm system.
- Do not place the main fuse into the fuse holder before having completed the installation of the VSI system.
- The VSI computer has to be activated by means of the diagnosis software.
- In the unlikely event the AFC fails, it will automatically switch over to petrol.
  Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the VSI 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 the 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.
- Remove any internal burrs after having shortened the LPG pipe.
  (This guarantees the maximum flow through the pipe without pollution.)
- 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 an exterior filler into the body work).
- After having completed the installation, check the whole system for gas leakage; use a gas leak detection device. Also check for any 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’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.

Please fill in the warranty portal completely 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 Diagnostic Tool
- Torque wrench (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits Ø4 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)

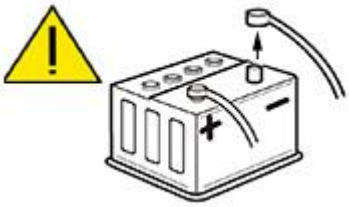
Tightening moments

		Nm	Spanner mm
M5 x 0,8		6.5	8
M6 x 1,0		11.3	10
M8 x 1,25		27.3	13
M10 x 1		52	15-16-17
M10 x 1,5		54	15-16-17

LPG manifold nipple		1	3.5 Allen
Reducer nut - bracket		10	13
Lock-off nut		15	16
Fuel line nut – lock-off		20	13
Fuel line tank – lock-off		20	16
Filling hose connections		50	22

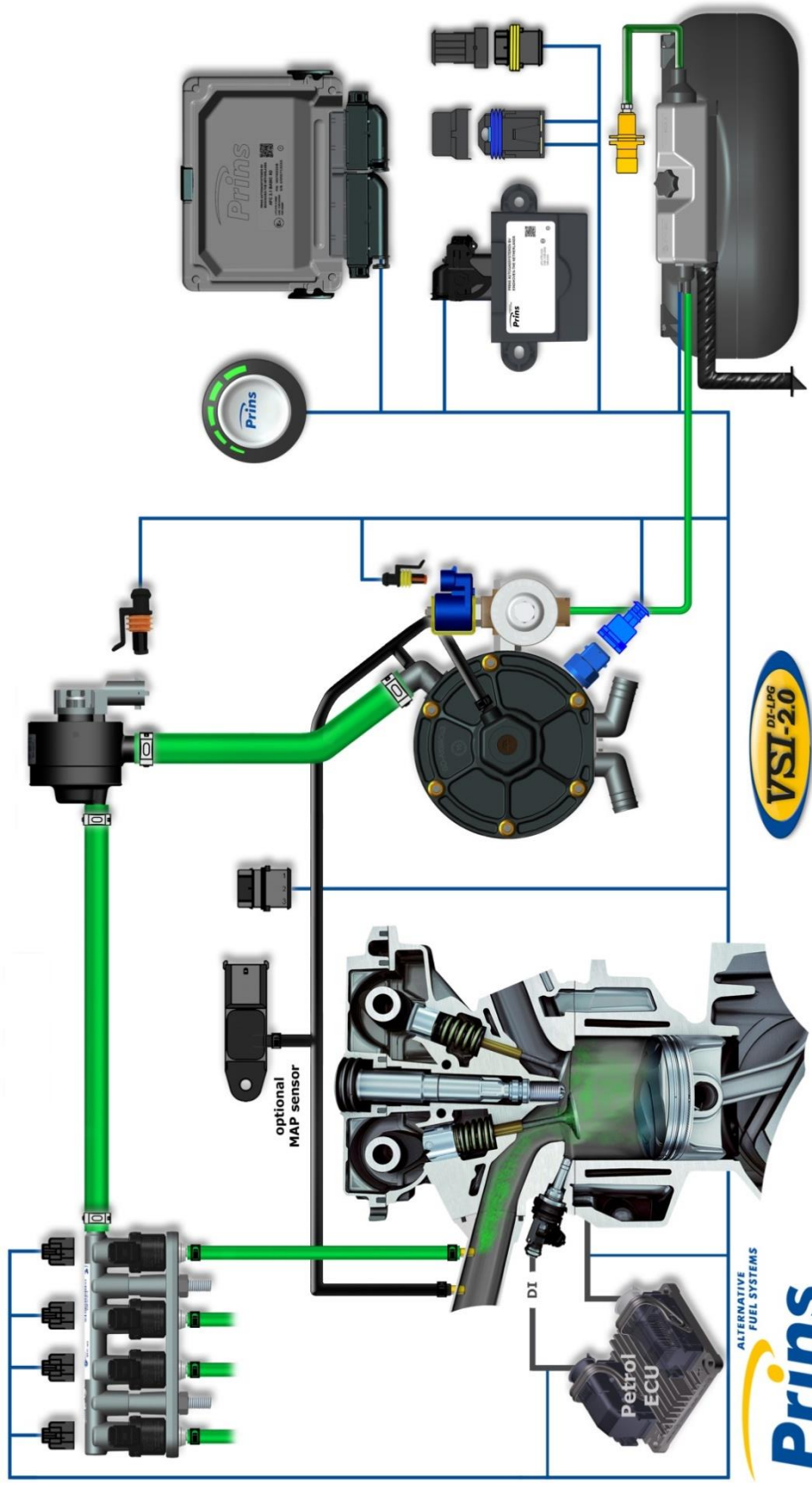
EXPLANATION OF SYMBOLS:

= IMPORTANT, CAUTION



= WEAR SAFETY GOGGLES

Basic System Overview



VSI approval numbers

Reducer VSI LPG Prins : E4-67R-010054
Lock-off valve OMB : E8-67R-014327
Lock-off valve Valtek : E4-67R-010041

Injector rail Prins : LPG E4-67R-010093
CNG E4-110R-000021

Filter unit T1 / T2 Prins : LPG E4-67R-010096
CNG E4-110R-000028

Injector Keihin KN9 : LPG E4-67R-010310
CNG E4-110R-000295

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

Tubithor : LPG E13-67R-010145
CNG E13-110R-000017
Rubia : LPG E4-67R-010068
CNG E4-110R-000003
WinLas : LPG E37-67R-010140
CNG E37-110R-000012
Thunderflex LPG E24-67R-010018
CNG E24-110R-000040

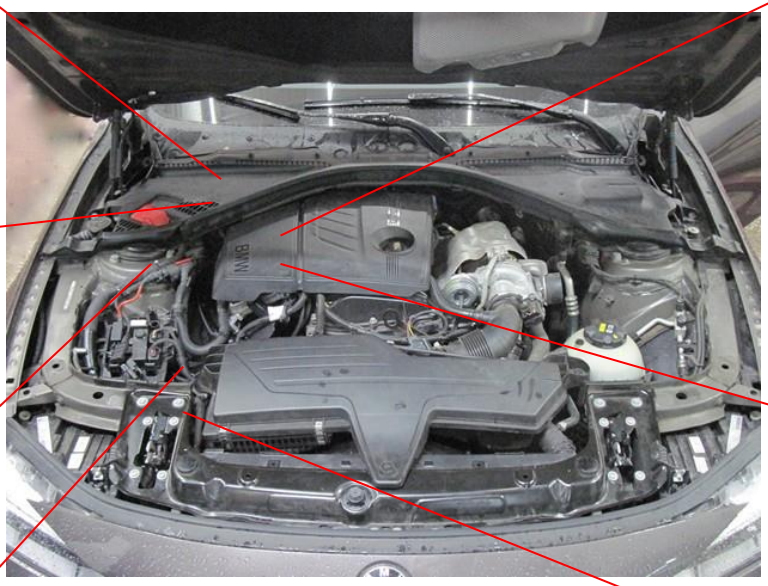
VSI component location overview

AFC

Injection module

Fuse box

Filter



Petrol ECU

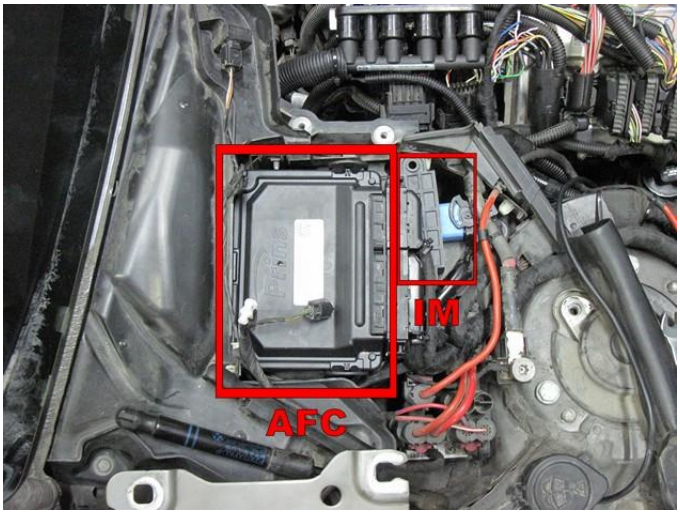
Rail(s)

Reducer

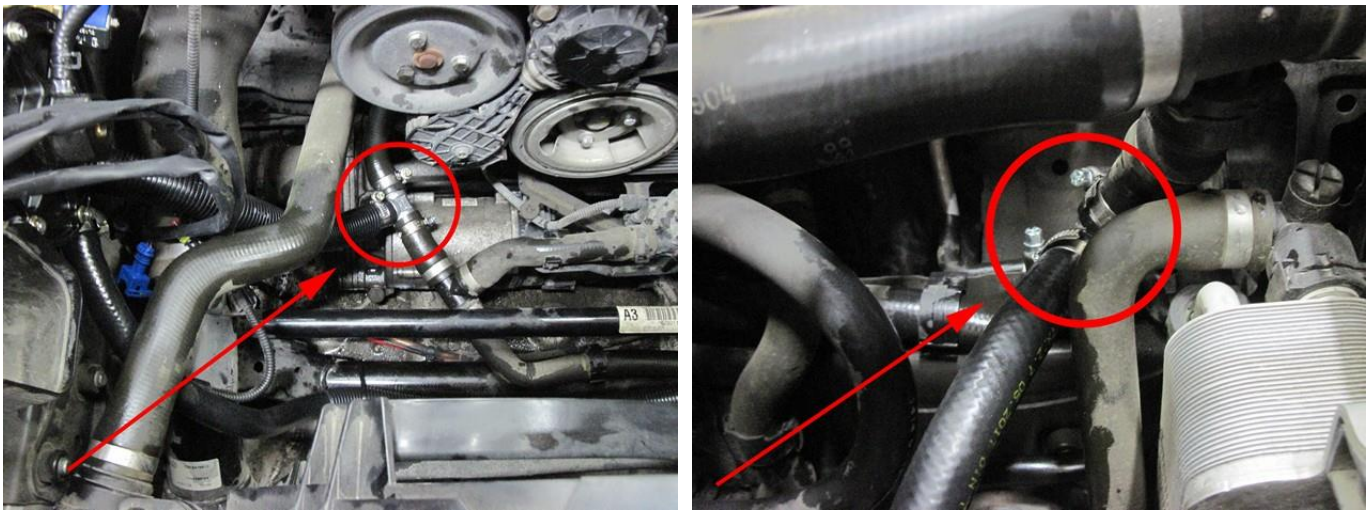
If applicable, R115 approval sticker :
Right side centre door post

Example mounting (based on F30 320i ED)

Reducer & filter



AFC & injection module



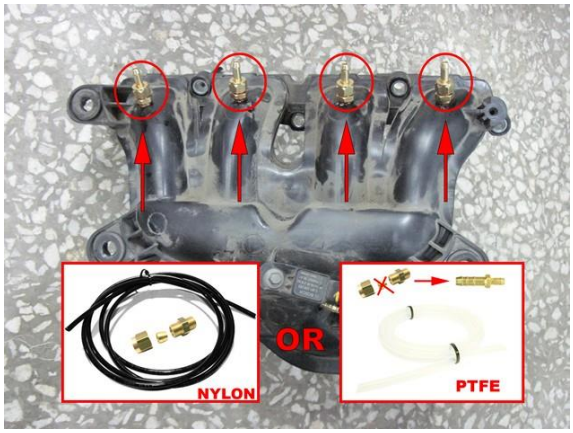
T-pieces

Overpressure / MAP connection

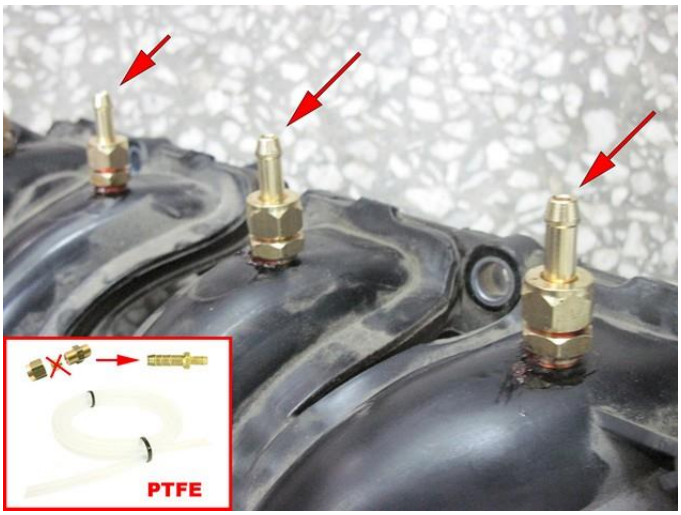
Remove manifold, drill hole Ø5mm and cut thread M6x1. Mount the coupling with a locking compound.

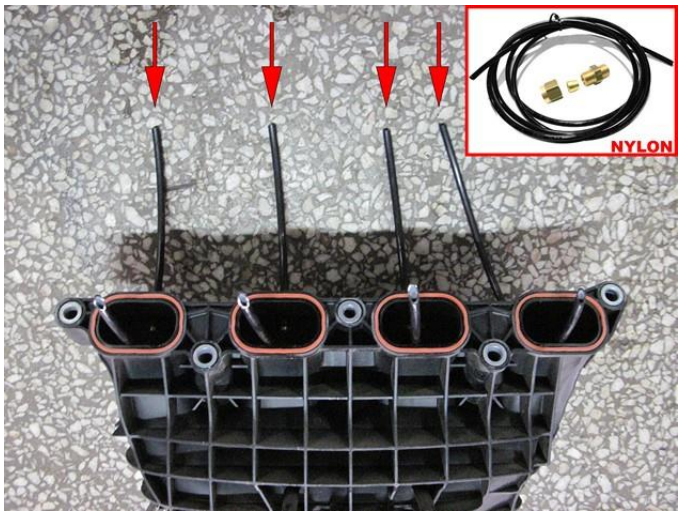
Mounting the inlet manifold couplings

Remove the inlet manifold. Drill 4**x** holes of **8,5mm** in the inlet manifold.
Cut **M10x1** thread in these holes. Place the VSI couplings with a lock compound in the inlet manifold.
Watch out that the lock compound doesn't come inside the VSI couplings.
Place the inlet manifold back on the engine.

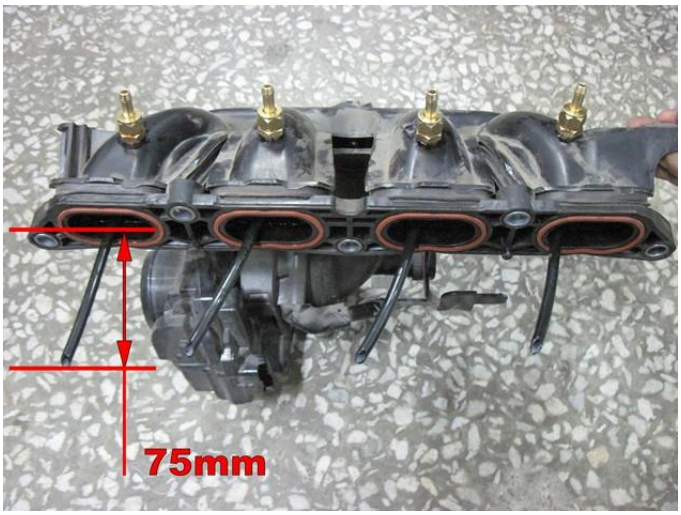


2 options for the injector hoses. Nylon (black) or PTFE (white). Use the supplied hose & couplings.



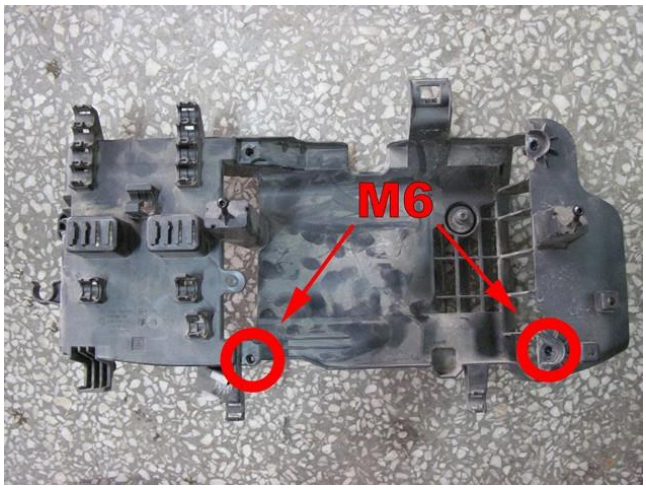


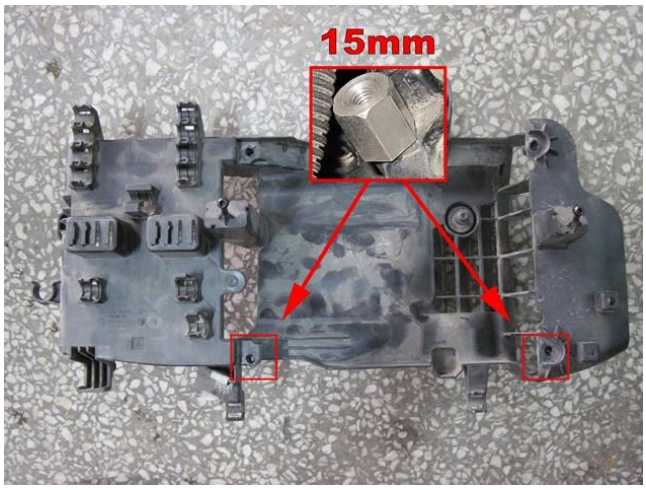
If the nylon hose is used, be sure the hose is long enough to reach the VSI-injector.



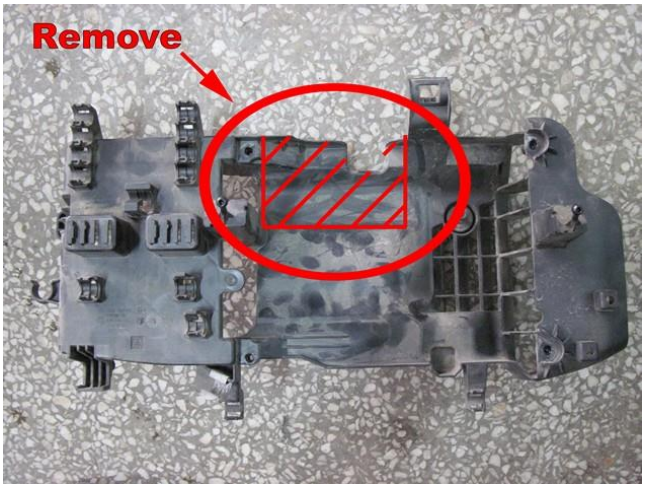
Inside the manifold, cut-off the hoses with a lenght of 75mm. Mount the manifold back to the engine.

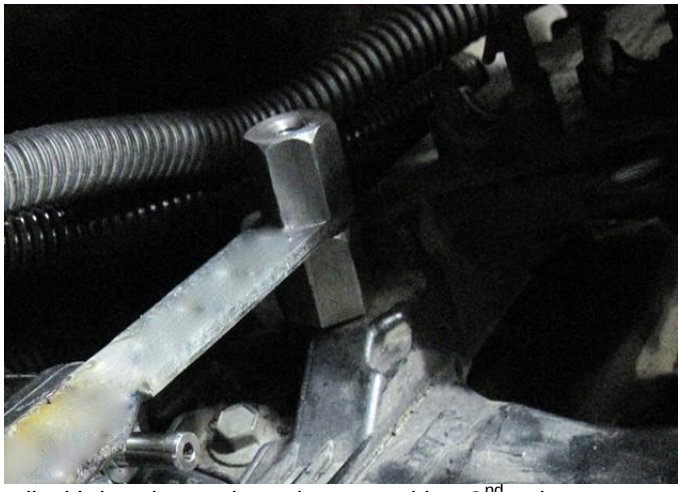
Mounting the VSI injector rail





Cut thread M6 in the lower petrol ECU fixation from the plastic petrol ECM engine mount.
Mount a M6 colonette (+/-15mm, not supplied) in the just adjusted fixations.



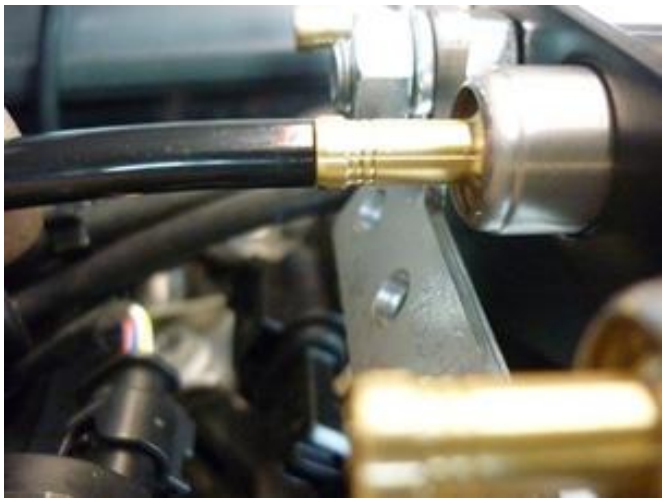


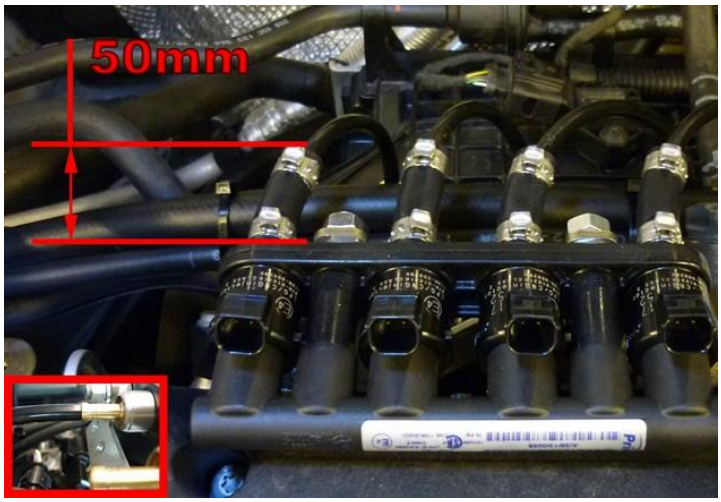
Remove the indicated part of the plastic. Mount the rail with bracket to the colonette, with a 2nd colonette.

Mount the injector rail with the bracket to the plastic petrol ECM engine mount.

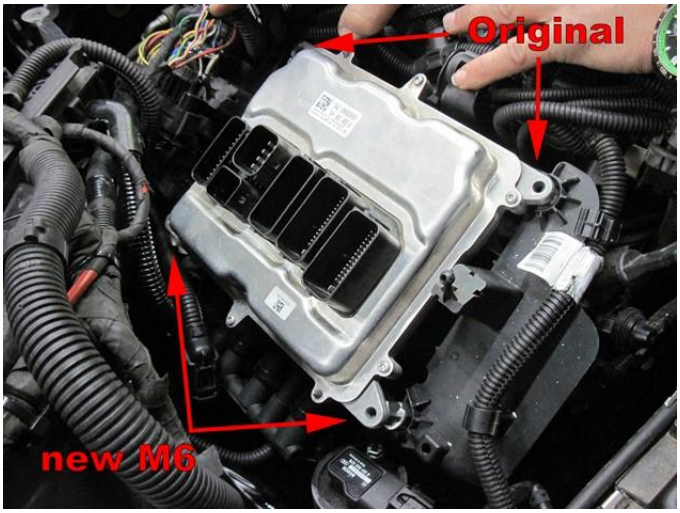
Mounting the VSI injector rail

With PTFE, mount the 5mm LPG hose from injector to the manifold coupling.



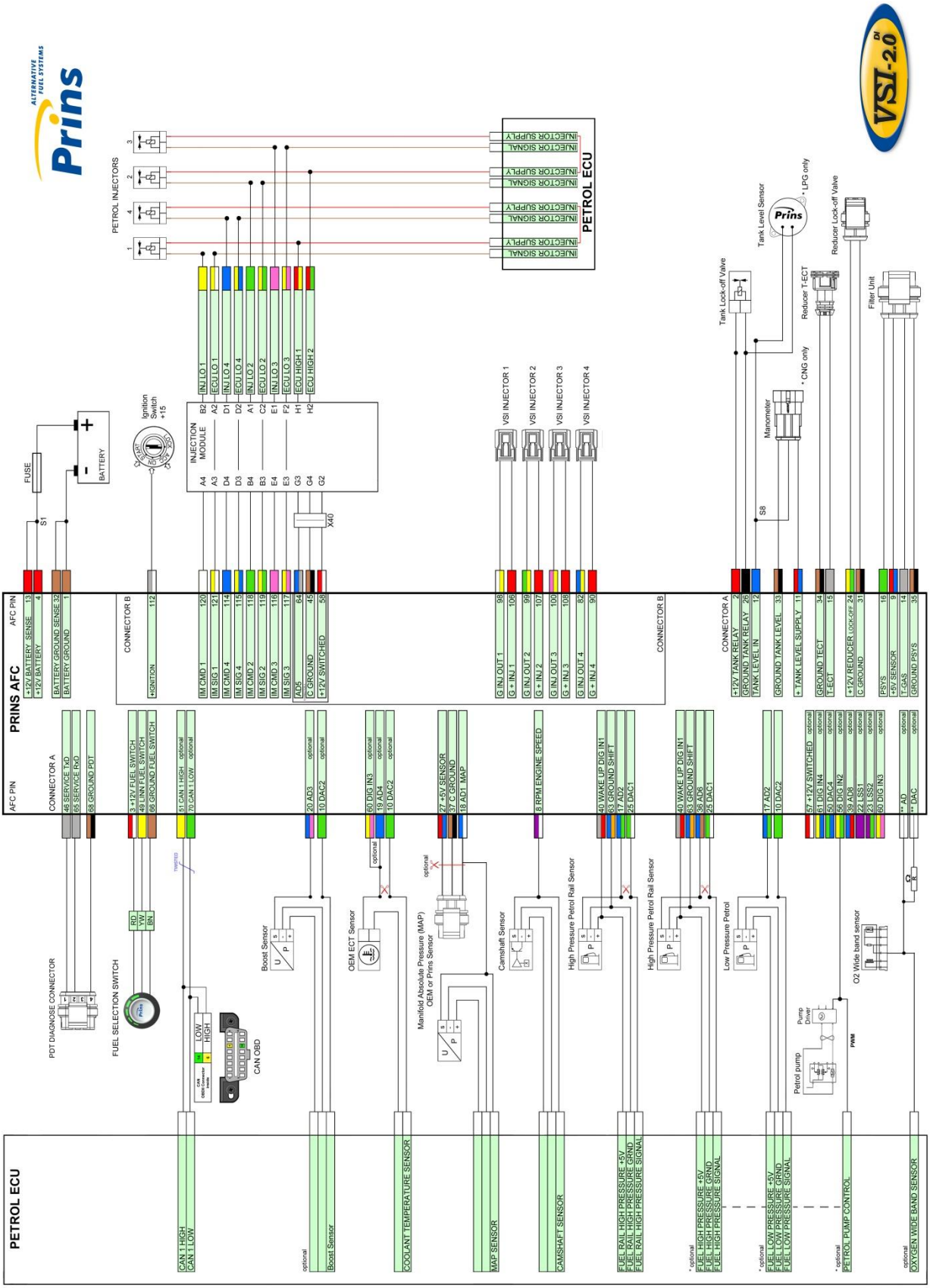


With nylons, mount the nylons hose with the 6mm LPG hose to the injector.
Use the same hose routing for PTFE & nylons.



Mount the petrol ECM. On top the original screws, below M6 bolts or screws.

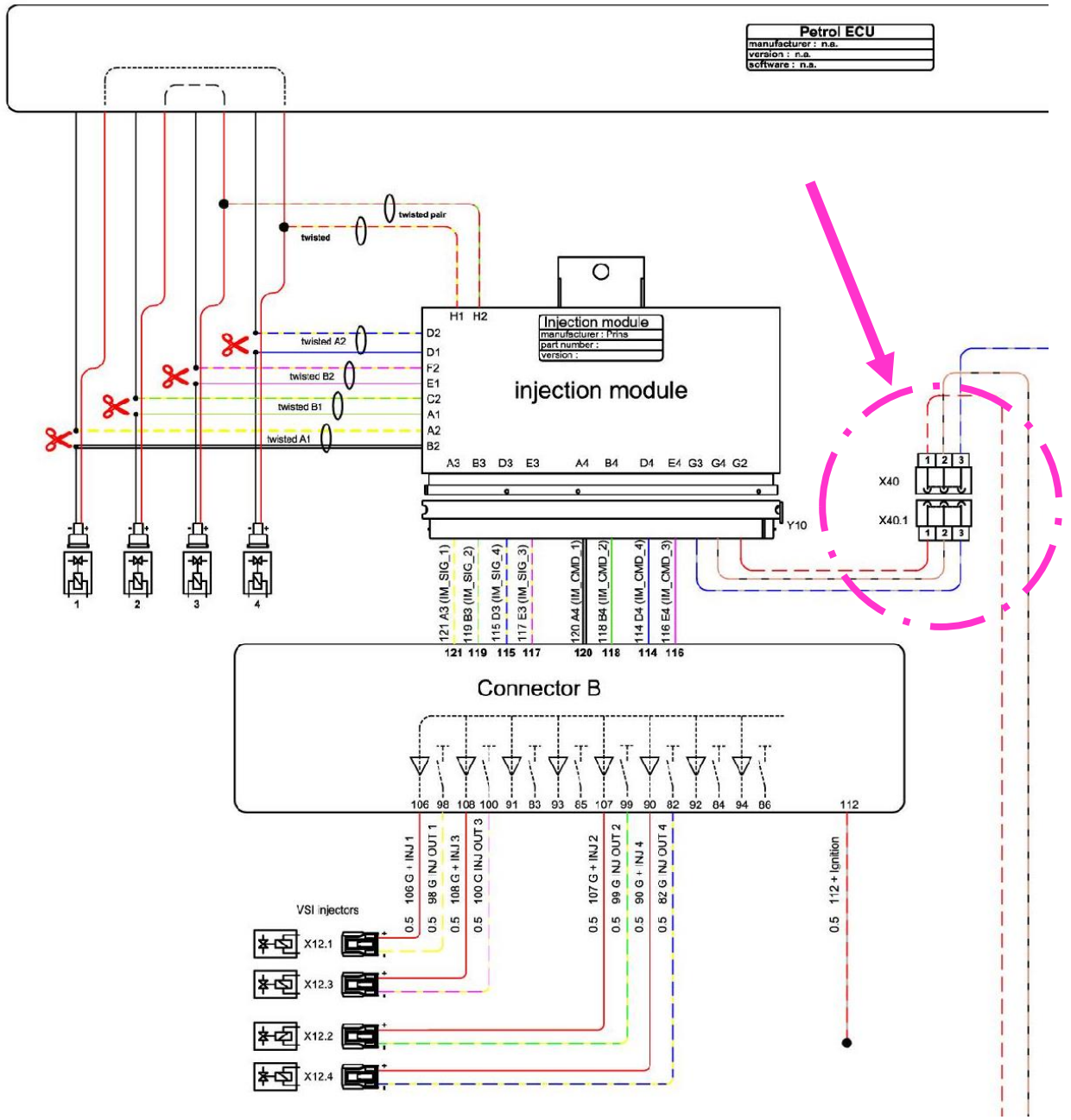
Basic Wiring Diagram



Electrical connections

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

Connector Injection Module



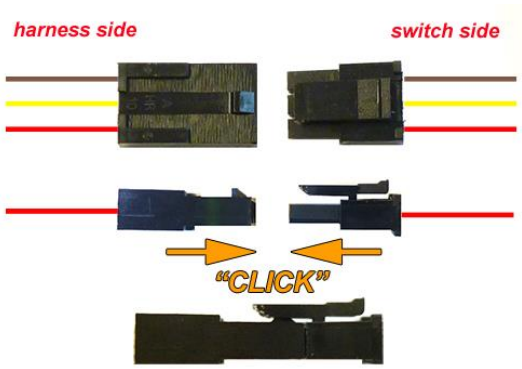
Electrical connections – Insulate

10	DAC 2		Green	***Insulate***
19	AD4		Blue	***Insulate***
20	AD3		Blue-pink	***Insulate***
22	LSS1		Purple	***Insulate***
23	LSS2		Purple-green	***Insulate***
36	AD 6		Blue-brown	***Insulate***
38	AD7		Blue-light Blue	***Insulate***
39	AD8		Blue-red	***Insulate***
43	+12 Valve 2		Red-white	***Insulate***
50	DAC4		Green-blue	***Insulate***
56	DI2		Yellow-green	***Insulate***
60	DIG IN3		Yellow-pink	***Insulate***
61	DIG IN4		Yellow-blue	***Insulate***
62	C Ground		Brown-black	***Insulate***
74	DAC3		Green-pink	***Insulate***
Insulate all extra not used wires.				

Electrical connections

Driver room

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

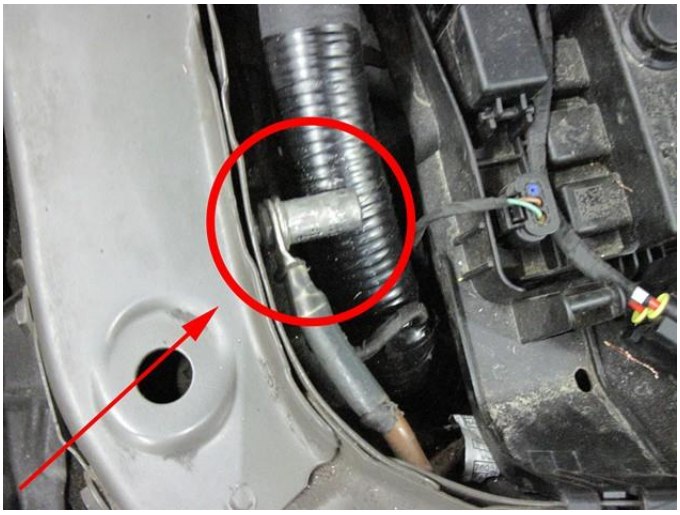


Petrol ECM connector overview

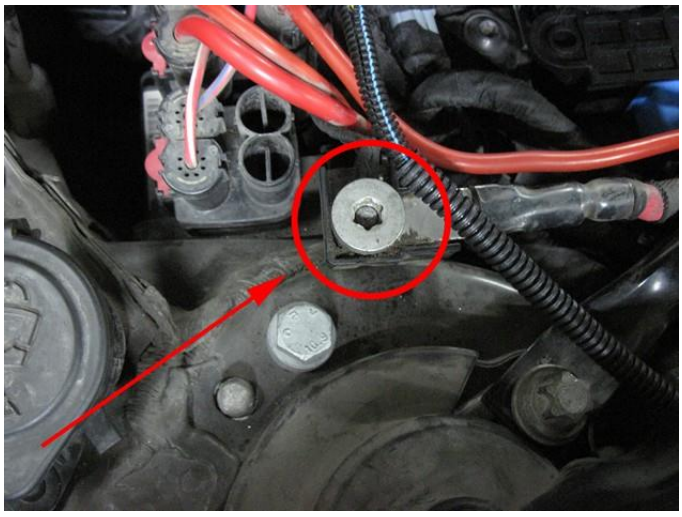
Electrical connections

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

32 Ground sense1 Ground battery		Brown	*Connect to the '–' of the battery; use a ring terminal or solder:* Wire colour: **Black** Wire location: **On ground point , right front in engine room.**



4 +12V Battery		Red	*Connect to the '+' of the battery; use a ring terminal or solder:* Wire colour: **Red** Wire location: **On +Batt point at right suspension strut.**



Do not place the fuse in the holder before having completed the installation of the LPG system.

Electrical connections

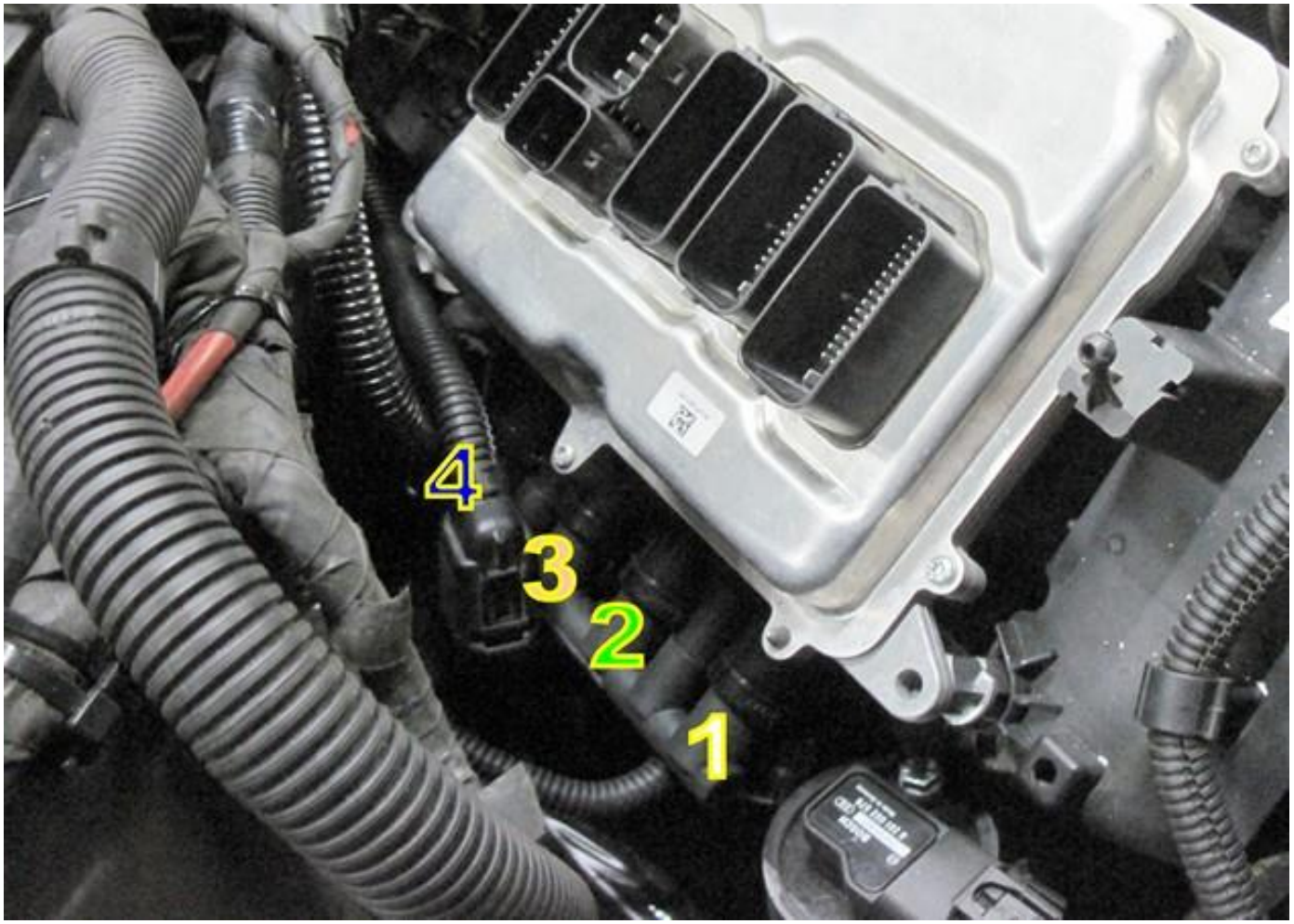
Check and measure the wiring in case of changes in the cars wiring colours.

98 98 G INJ OUT **1**	**White-yellow**	Connector VSI-injector to cylinder **1**. Timing belt/chain side
106 106 G + INJ 1	**red**	

99 99 G INJ OUT **2**	**Green-yellow**	Connector VSI-injector to cylinder **2**.
107 107 G + INJ 2	**red**	

100 100 G INJ OUT **3**	**Pink-yellow**	Connector VSI-injector to cylinder **3**.
108 108 G + INJ 3	**red**	

82 82 G INJ OUT **4**	**Blue-yellow**	Connector VSI-injector to cylinder **4**.
90 90 G + INJ 4	**red**	



Electrical connections

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

⚠ For measuring the petrol injectors :

Interrupt each petrol injector control wire (injector min)
Each VSI wire has a petrol injector / cylinder number printed on the wire, connect this wire to the corresponding petrol injector / cylinder.
Connect the **bicoloured** VSI measuring wire to the **ecu side** (wire code: ecu-lo).
Connect the **corresponding full coloured** VSI wire to the **petrol injector side** (wire code: inj-lo).
See diagrams: Installation manual general part 1 / 2.

Attention:
Each bicoloured measuring wire corresponds to a specific LPG injector and petrol injector / cylinder number.
Do not interchange the wires.

Petrol injector **cyl. 1**		
INJ LO 1	White	Injector side
ECU LO 1	**White-yellow**	ECU side
(IM pos. B2 / A2)		Colour: **White-green** Location: Petrol ECU, connector **6**, pin **8**

Petrol injector **cyl. 4**		
INJ LO 4	Blue	Injector side
ECU LO 4	**Blue-yellow**	ECU side
(IM pos. D1 / D2)		Colour: **White-green** Location: Petrol ECU, connector **6**, pin **24**

(cyl. 1-4)		
ECU HIGH **A**	**Red-yellow**	Injector side
(IM pos. H1)		Colour: **White** Location: Petrol ECU, connector **6**, pin **9**

Petrol injector **cyl. 2**		
INJ LO 2	Green	Injector side
ECU LO 2	**Green-yellow**	ECU side
(IM pos. A1 / C2)		Colour: **White-black** Location: Petrol ECU, connector **6**, pin **23**

Petrol injector **cyl. 3**		
INJ LO 3	Pink	Injector side
ECU LO 3	**Pink-yellow**	ECU side
(IM pos. E1 / F2)		Colour: **White-brown** Location: Petrol ECU, connector **6**, pin **22**

(cyl. 2-3)		
ECU HIGH **B**	**Red-green**	Injector side
(IM pos. H2)		Colour: **White** Location: Petrol ECU, connector **6**, pin **12**

Electrical connections

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

			CAN 1 High. Wire colour: **Blue-red** Wire location: Petrol ECU connector **1** pin **28**
51	CAN1 High	Yellow	

			CAN 1 Low. Wire colour: **Red** Wire location: Petrol ECU connector **1** pin **13**
70	CAN1 Low	Green	

3-pole connector 27 +5V Sensor 37 C ground 18 AD1 ***Cut off connector***		***Red-blue*** ***Brown-black*** Blue-white	*For measuring the inlet manifold pressure (MAP).* ***Cut off & insulate*** ***Cut off & insulate*** Wire colour: **Blue-yellow** Wire location: Petrol ECU connector **2** pin **11**
18	AD 1	Blue-white	

17 & 25			*High pressure petrol sensor signal interruption.* Wire colour: **Yellow-red** Wire location: Petrol ECU connector **2** pin **53**
17	AD 2	Blue-green	Sensor side
25	DAC 1	Green-white	Petrol ecu side

			High pressure petrol sensor ground. Wire colour: **Black-green** Wire location: Petrol ECU connector **2** pin **38**
63	Ground Shift	Blue-orange	

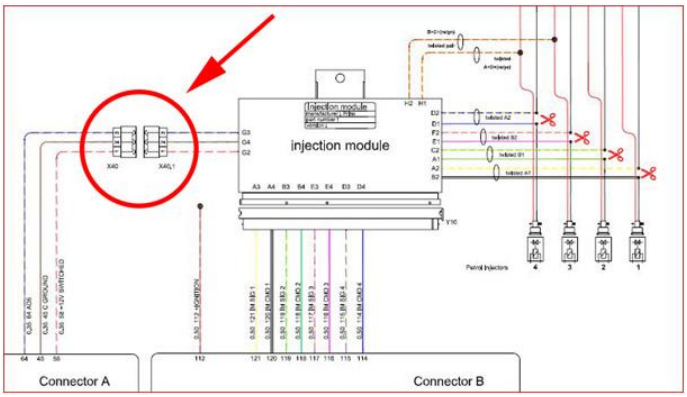
			High pressure petrol sensor supply 5V Wire colour: **Blue** Wire location: Petrol ECU connector **2** pin **3**
40	Wake-up	Grey-red	

			For measuring the engine speed signal. Wire colour: **Yellow** Wire location: Petrol ECU connector **3** pin **16**
8	RPM	Purple-white	

112			*Connect to +ignition / contact+ (+15).* *Do not place the fuses in the holder before having completed the installation of the LPG system.* Wire colour: **Red-green** Wire location: Petrol ECU connector **5** pin **6**
112	+ Ignition	Red-grey	

Electrical connections

Connectors in wiring loom

2-pole blue connector 15 T-ECT 34 Ground T-ECT	 Grey Brown-black	*For measuring the engine coolant temperature (Tect).* Connect the connector to the reducer temperature sensor.
4-pole connector 35 Ground Psys 14 T-Gas 9 +5 Volt sensor 16 Psys	 Brown-black Grey Red-blue Green	*For measuring gas pressure and temperature.* Connect the connector to the filter unit sensor.
2-pole connector 24 +12V reducer lock-off 31 C Ground	 Yellow-green Brown-black	Connect the connector to the reducer lock-off valve.
4-pole connector 46 Service TxD 65 Service RxD 68 Ground PDT	 Grey Grey Brown-black	Diagnose connector.
Tank wiring loom 2 +12V Tank relay 12 Tank level IN 26 Ground tank relay	 red blue black	Connect to the tank lock-off. Connect the tank level gauge. Connect to the tank lock-off.
Wiring loom link 45 C ground 58 +12V switched 64 AD5	 Brown–black Red–white Blue-grey	Connection from AFC connector A to connector B. 

Optional:

3-pole connector 11 + manometer 12 tank level in 33 ground manometer	 red blue brown	***Cut off connector and insulate wires***

Checklist after installation

1. Connect the Prins Diagnostic Tool and run the VSI diagnostic program.
   Install the VSI fuse, turn the ignition key in the accessory position.
   When working on the car, beware of moving and rotating parts in the engine compartment.

2. When commissioning the LPG system, you must activate the AFC with the diagnostic software.
   When the AFC has not been activated, the switch will keep blinking.
   To activate the AFC, select function *activate ECM* in the diagnostic software.

3. Check whether the program in the AFC matches with the car (dedicated engine set):
   Refer the car description in the diagnostic software (Basic → Identification) and compare these with the set number.

4. The system will switch over to LPG as soon as the temperature of the coolant becomes higher than parameter 70 - Switch over ECT.

5. Check all components and connections for any gas leakage (use a LPG leak detector device or a fluid detection like soap). Caution for moving and rotating parts in the engine compartment!

6. Let the engine run warm on petrol >80°C.
   Check if the reducer heats up.
   Check the engine signals, petrol injection time, RPM, ECT, lambda, MAP signal and petrol pressure signal.
   Let the engine run idle on LPG.
   Adjust the reducer pressure.
   Refer to *Basic → System* in the diagnostic software for the idle level value set.
   Adjust the reducer pressure in such a way that the pressure measured (P-sys) equals the idle level value.
   Turn the socket-head screw at the front of the reducer to adjust the pressure.
   An error code will be generated whenever the pressure variation is too high.

7. Use the diagnostic software to check again all input and output signals.

8. Check the system for error codes and solve these, if required.
   Check the petrol ECM for EOBD error codes.
   Place the protection connector on the VSI communication connector.

9. Take a test drive and check the drivability on LPG and petrol.

ALTERNATIVE FUEL SYSTEMS
Prins