ALTERNATIVE FUEL SYSTEMS

Prins

Installation manual

PART 2/2

VSI DI-LPG 2.0

MANUFACTURER	GM
TYPE	Based on Silverado / Sierra
ENGINE DISPLACEMENT	4301cc
NUMBER OF VALVES:	12v
ENGINE CODE / NUMBER:	GM V6 – EcoTec3 – LV1 / LV3
ENGINE OUTPUT	213kW / 285hp
FIRING ORDER	1-6-5-4-3-2
TRANSMISSION TYPE (MT / AT)	AT
VEHICLE CATEGORIES M or N	M
TYPE VSI INJECTOR	KN9 - 82CC
TYPE INJECTION MODULE	Gen2 Type 2 - 6 Cylinder + ADD-ON Module EcoTec
VERSION	AFC-2.1 DI LPG
MODEL YEAR	2019 →
PETROL ECU MANUFACTURER / CODE	serv# 12692986
SYSTEM APPROVAL NUMBER (R115)	E4- #115R-000028 / VSI-LPG 48
LOCATION SYSTEM STICKER	If applicable : right side, centre door post
ENGINE SET NUMBER	338/120024/A
MANUAL NUMBER	076/3302800-1
DATE	2020-04-16

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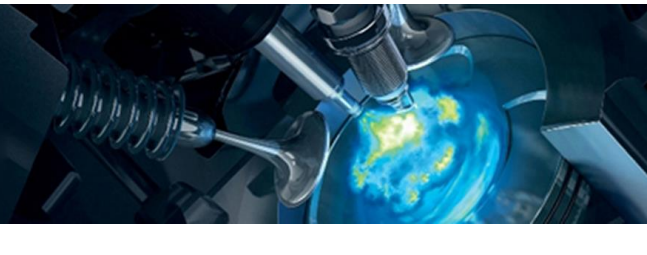

Manual updates / revision

Rev. nr	Rev. Date	Subject update
-	2019-10-02	First release
1	2020-04-16	Update, extra mounting example injector rails

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, 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 VSI computer fails, it will automatically switch over to petrol. Never disconnect the VSI computer 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 100 mm 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 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.
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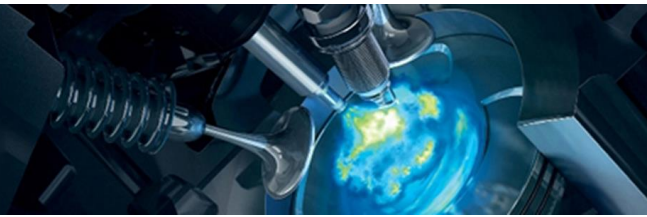


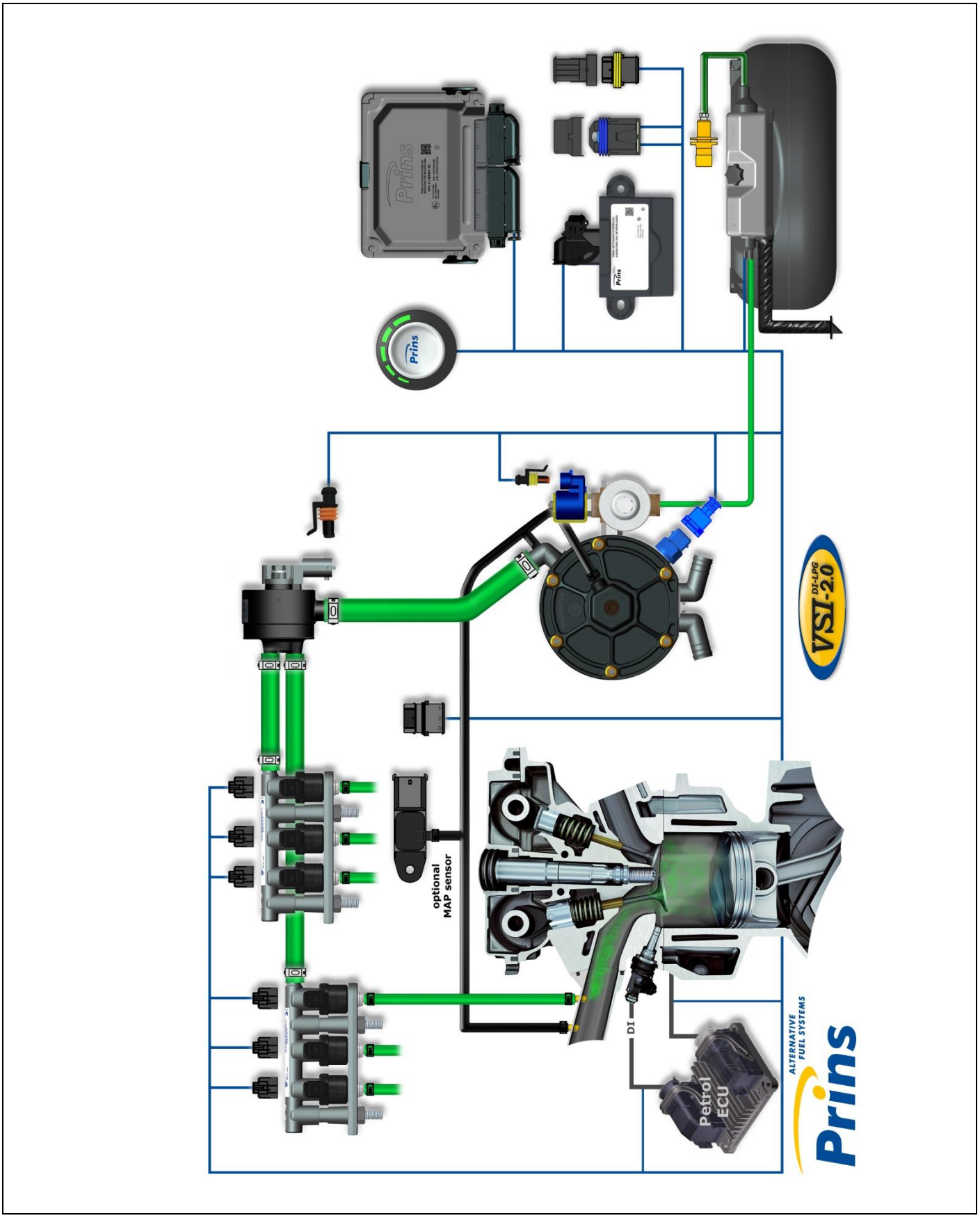
Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer
- Vehicle fuel system scan tool or OBD scan tool Prins (part nr. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins VSI diagnostic software
- Prins VSI serial interface
- Prins VSI break out box (part nr. 080/70090)
- Torque wrench (25Nm)
- Portable light
- Assortment drill bits 4 to 12 mm
- Assortment cutters (ø 20, 30, 50, 70 mm)
- Punching tool ø 70 mm
- Threading device M10x1 / M6x1
- Round file
- Portable drill or pneumatic drill
- Air gun
- Vacuum cleaner
- Hot air gun
- Allan spanner for inlet couplings 3,5mm (part nr. 099//9970)
- Molex extraction tool for VSI switch connector (part nr. 090/9929)
- Soldering iron, soldering tin
- Wire-stripping pliers
- Adhesive tape
- Adhesive sealant
- Thread locking compound
- Anti-corrosion agent / black body coating
- Gas leak detection device or foam leak spray
- Shrink sleeves
- Engine coolant

Vehicle check

- Check the vehicle drivability on petrol
- Check the fuel system for error codes (scan tool)
- Check if the catalytic converter is in good condition (exhaust gas analyzer)
- Check the condition of the ignition system (spark plugs, cables, coil)

Base diagram

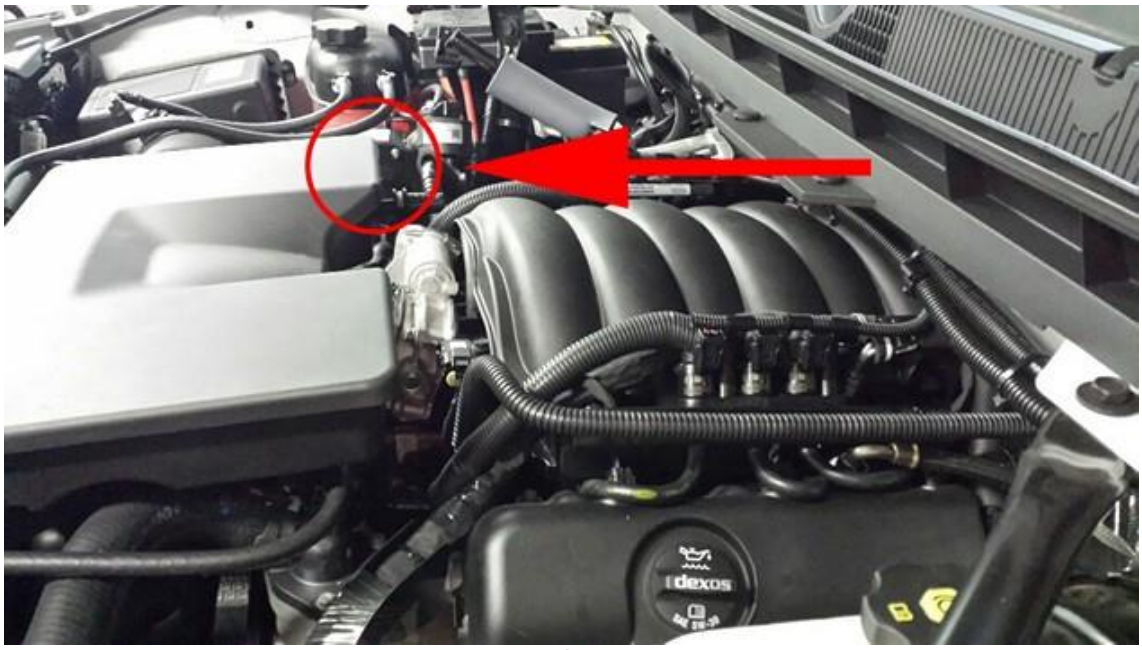


VSI approval numbers

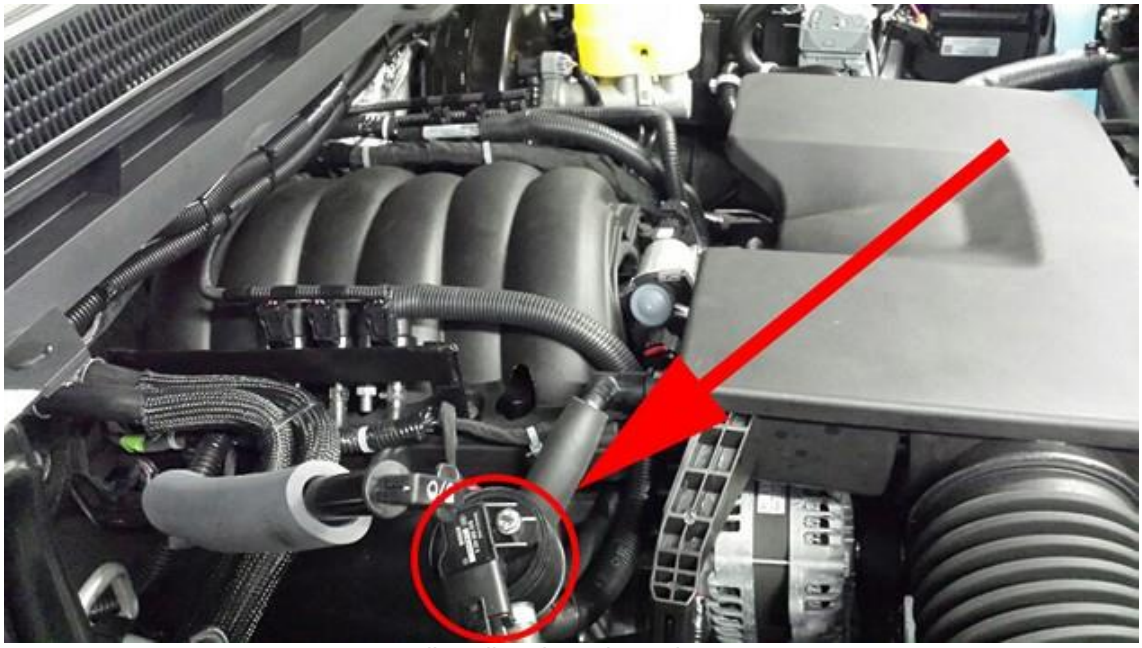
	
Reducer VSI LPG Prins : E4-67R-010054 Lock-off valve OMB : E8-67R-014327 Lock-off valve Valtek : E4-67R-010041	Injector rail Prins : LPG E4-67R-010093 CNG E4-110R-000021
	
Filter unit T1 / T2 Prins : LPG E4-67R-010096 CNG E4-110R-000028	Injector Keihin KN9 :LPG E4-67R-010310 CNG E4-110R-000295
	
Prins AFC : E4-67R-010098 E4-10R-030507	LPG hoses Tubithor : LPG E13-67R-010145 CNG E13-110R-000017 Rubia : LPG E4-67R-010068 CNG E4-110R-000003

Mounting the reducer & filter (example)

Later on this will be updated.



Reducer

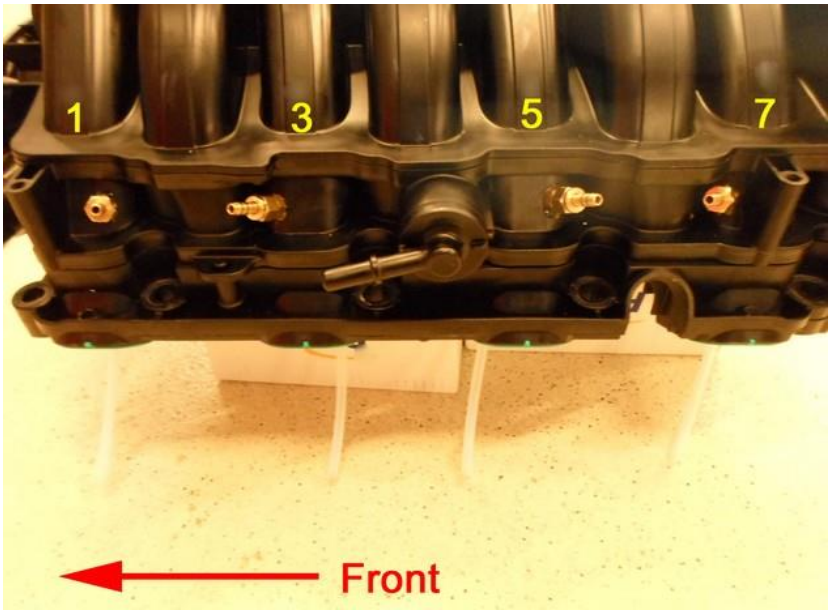


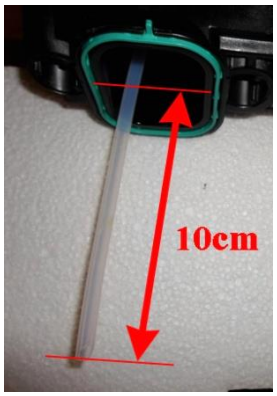
Filter directly to the reducer

Installation of the inlet couplings cylinder 1-3-5

This is an example from the 5.3/6.2 V8, mount the couplings likewise. Later on this will be updated.

Remove the complete inlet manifold.
Drill **3** holes of **9**mm into the inlet manifold. Cut **M10x1** thread in these holes.
Mount the inlet couplings with a locking compound.
Watch out that the lock compound doesn't come inside the inlet couplings.



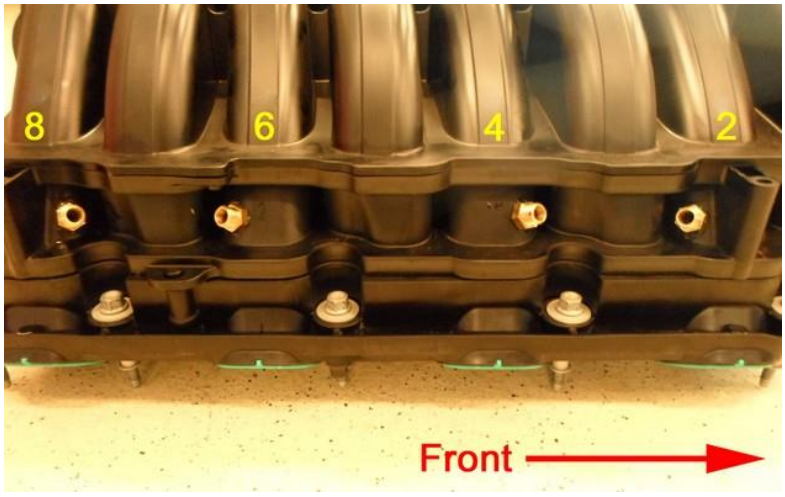


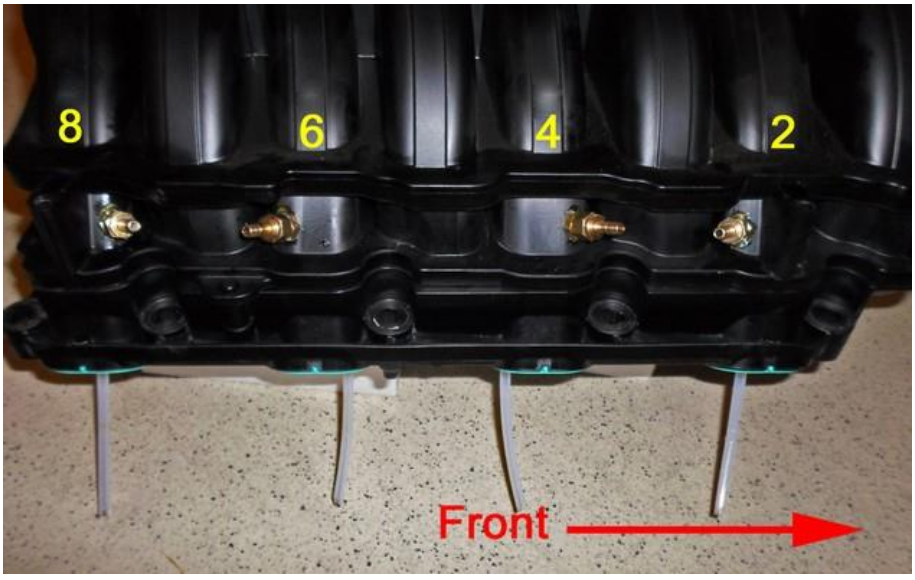
PTFE hoses, cut on length when mounted. **The 10cm for the PTFE hose will also be used for the 4.3 V6.**

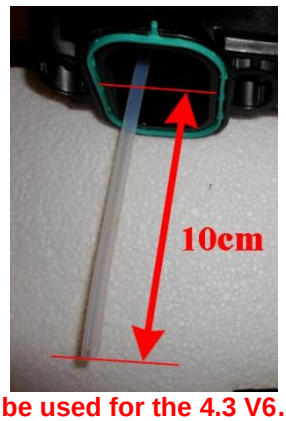
Installation of the inlet couplings cylinder 2-4-6

This is an example from the 5.3/6.2 V8, mount the couplings likewise. Later on this will be updated.

Remove the complete inlet manifold.
Drill **3** holes of **9**mm into the inlet manifold. Cut **M10x1** thread in these holes.
Mount the inlet couplings with a locking compound.
Watch out that the lock compound doesn't come inside the inlet couplings.



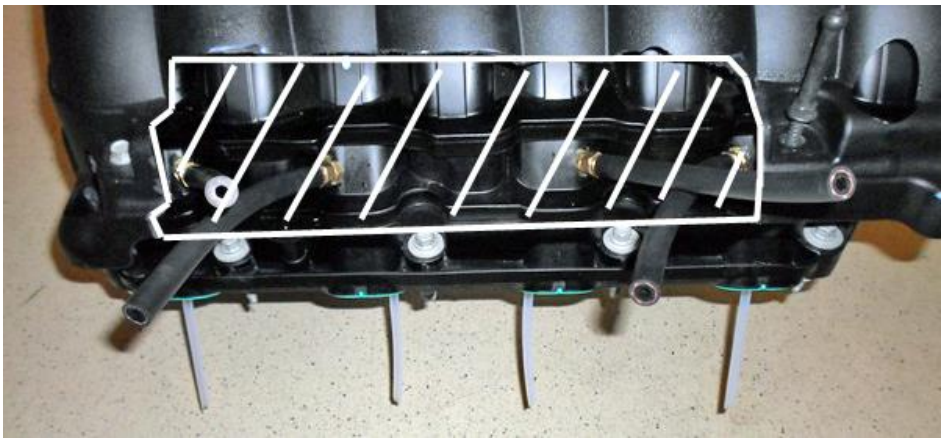


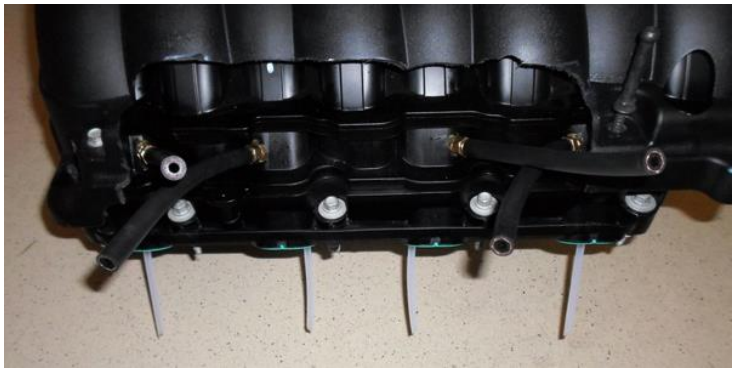


PTFE hoses, cut on length when mounted. **The 10cm for the PTFE hose will also be used for the 4.3 V6.**

Modify intake manifold cover

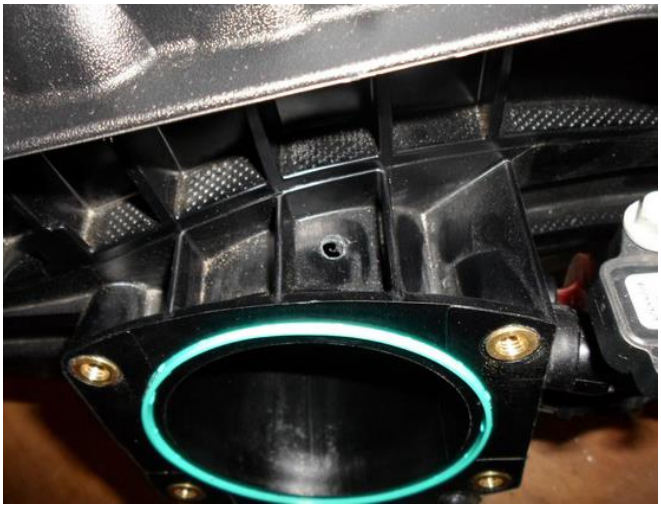
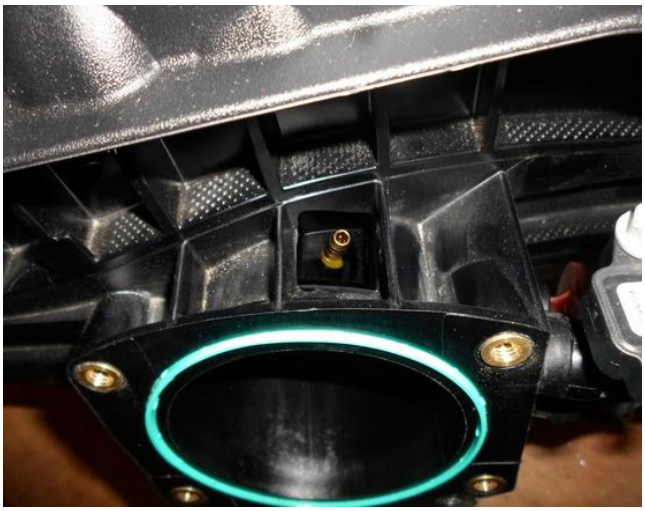
This is an example from the 5.3/6.2 V8, mount the couplings likewise. Later on this will be updated.





Vacuum / overpressure coupling

Drill **1** hole of **5**mm into the inlet manifold. Cut **M6** thread in this hole.
Mount the inlet coupling with a locking compound.
Watch out that the lock compound doesn't come inside the inlet coupling.

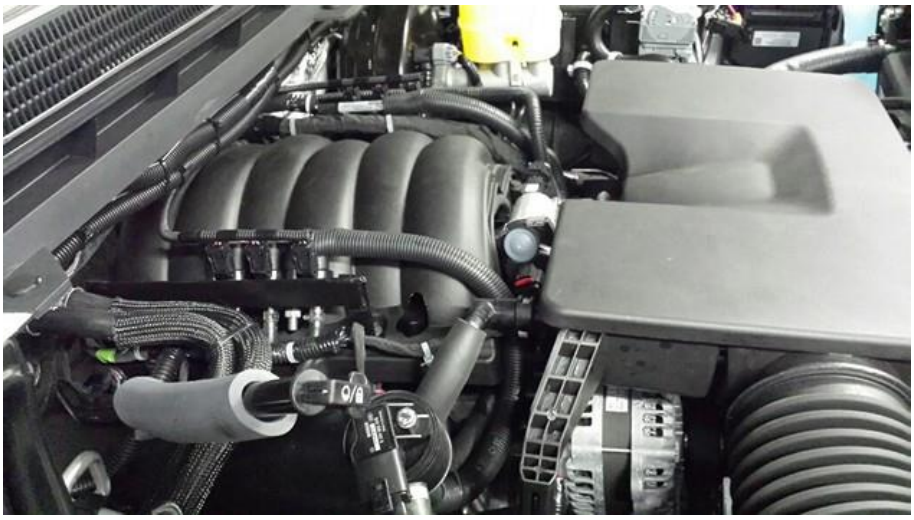
Drill **1** hole of **5**mm into the inlet manifold. Cut **M6** thread in this hole

Mount the coupling with a locking compound.

Mounting the injector rails – Example 1

Later on this will be updated, this is from the Pick-up V8.

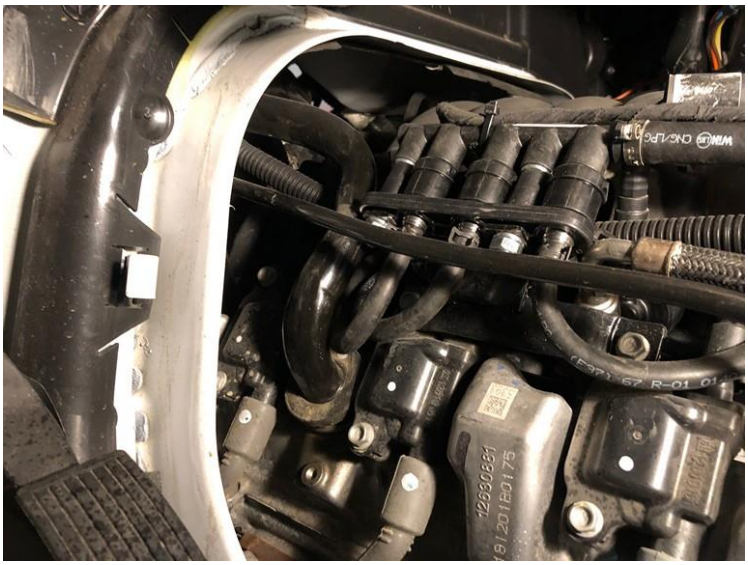
Rail left side



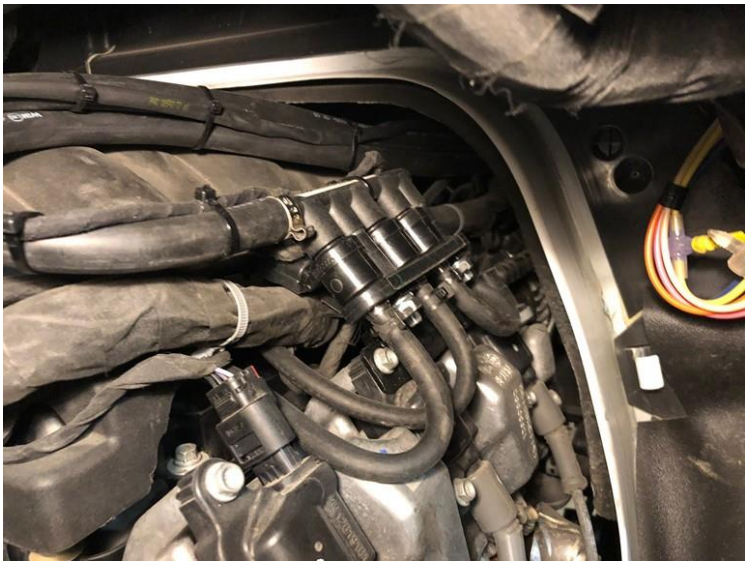
Rail right side

Mounting the injector rails – Example 2

Example from a GMC Savanna.

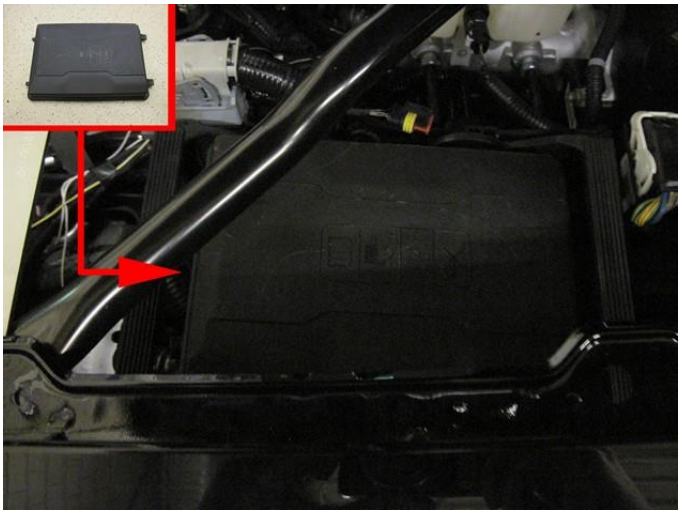


Left side

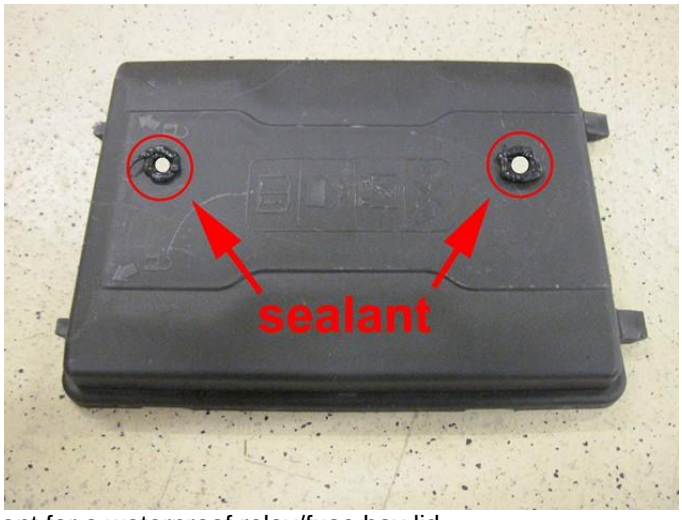


Right side

Mounting the AFC – option 1 (example)



The AFC will be mounted on top of the relay/fuse box on the left side behind the regulators.

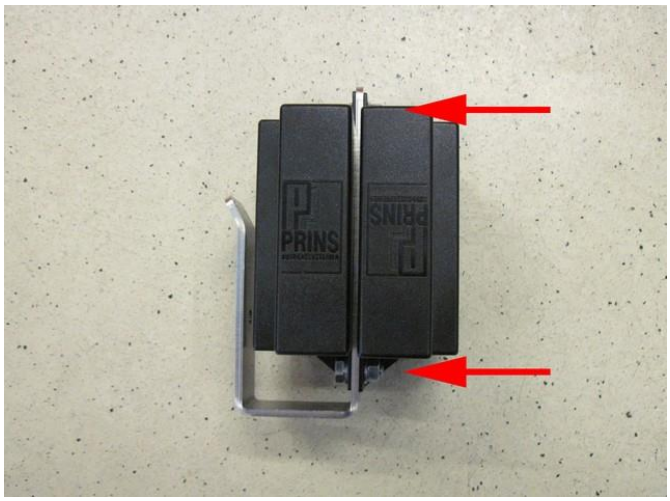


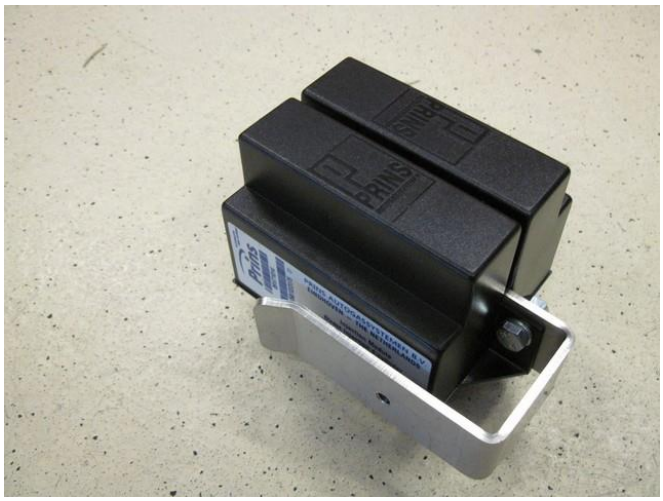
When mounting the AFC-clip, use sealant for a waterproof relay/fuse box lid.

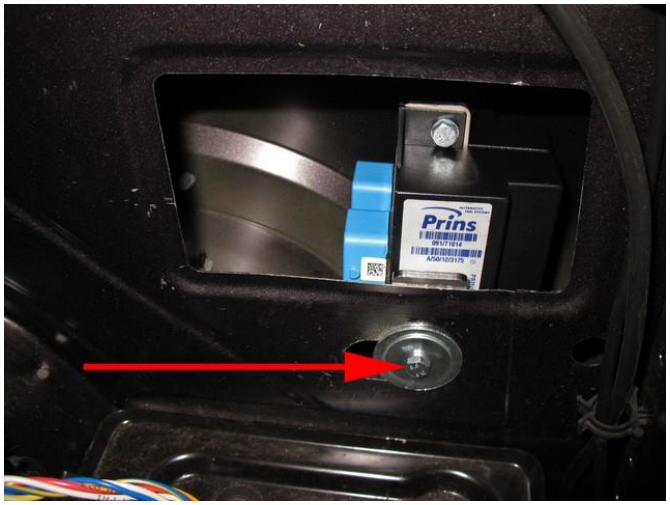
Mounting the AFC – option 2 (example)

Mounting the DI injection module

This is an example from the 5.3/6.2 V8, mount the single module likewise. Later on this will be updated.





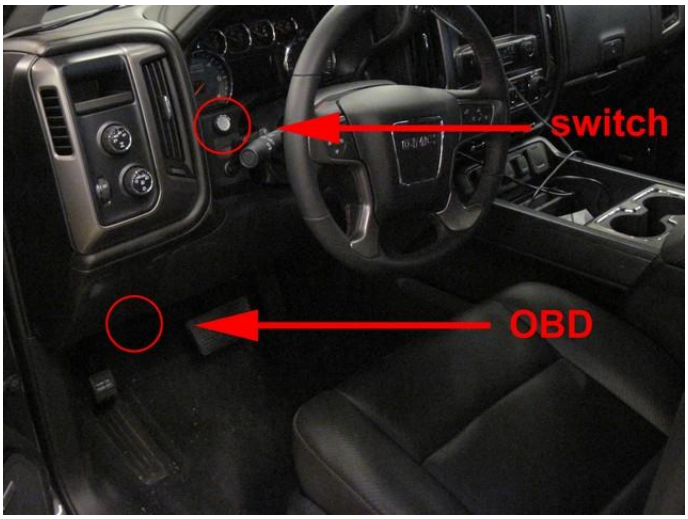


Mount both DI injection modules to the bracket and mount to vehicle with M6x12 bolt.

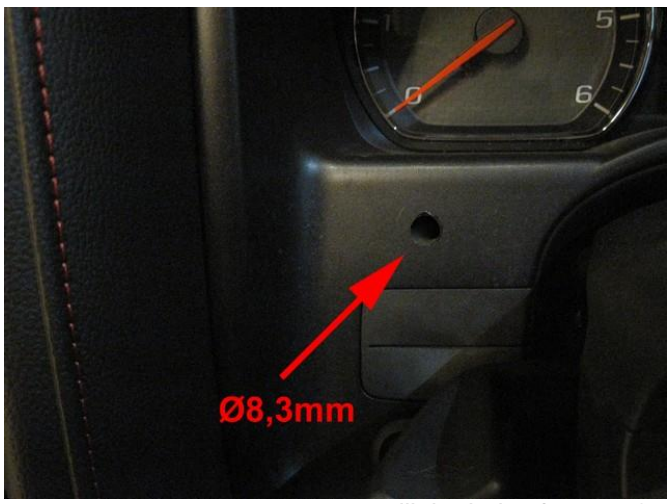
Fuel selection switch (example) / EOBD CAN wiring

When mounting the switch, only push on its sides.
Pushing the switch in the centre may result in damage to the switch.

use big harness rubber , move fuse panel under the dash board to have access

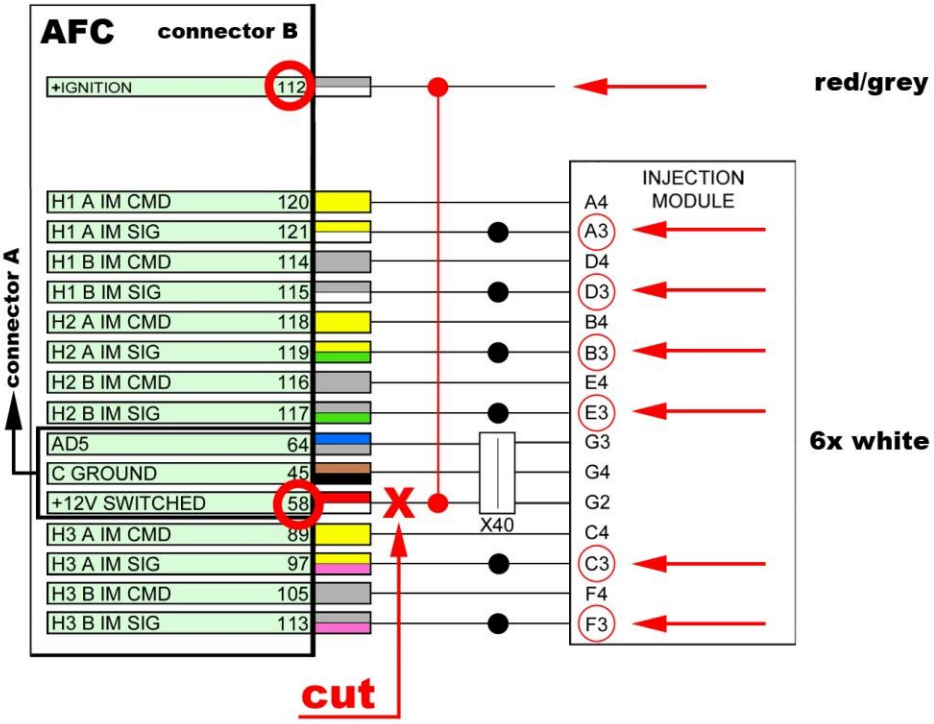


Switch & OBD location.



Drill the hole Ø8,3mm for the switch. Mount switch.

Electrical connections - Ecotec Add-on Module

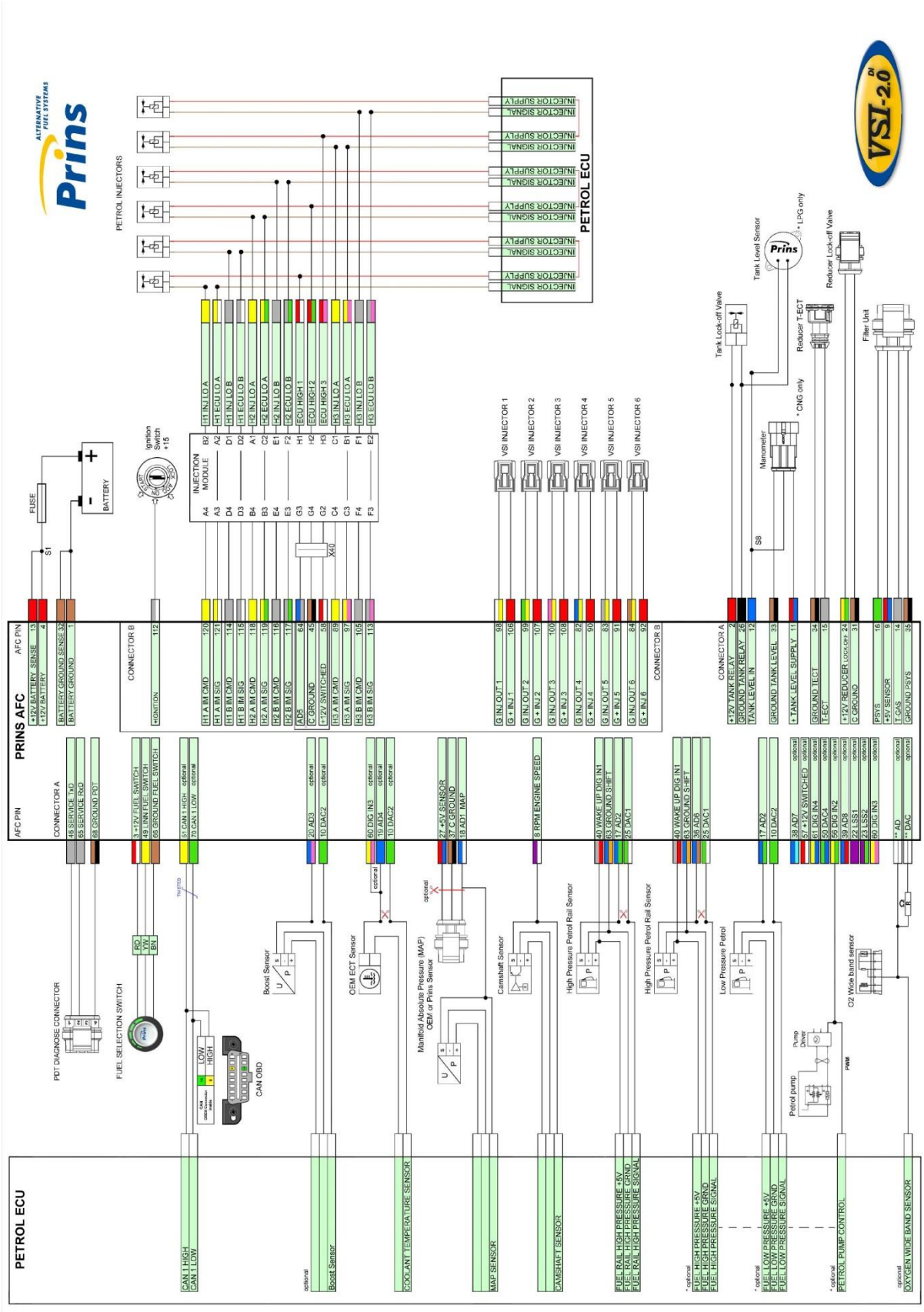


Solder/connect 6 of the 8 **white** wires to the **IM SIG** wires and the **red/grey** wire to the **+ignition** (112).
It is not important which white wire connects to what IM SIG wire. Insulate the 2 remaining white wires.
Be sure to insulate in a proper way.

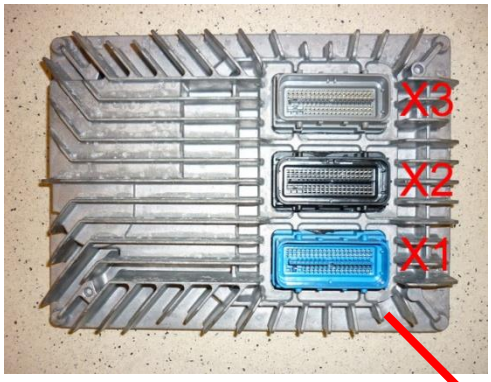
Also cut **wire 58** near the AFC and insulate the wire to the AFC side. Connect the other side of wire 58 (from the injection modules) to +ignition (112) to supply the injection modules.

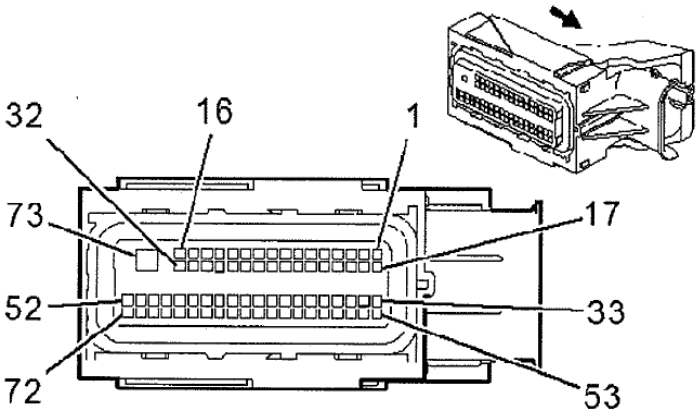
Mount the Add-on module near the Injection modules.

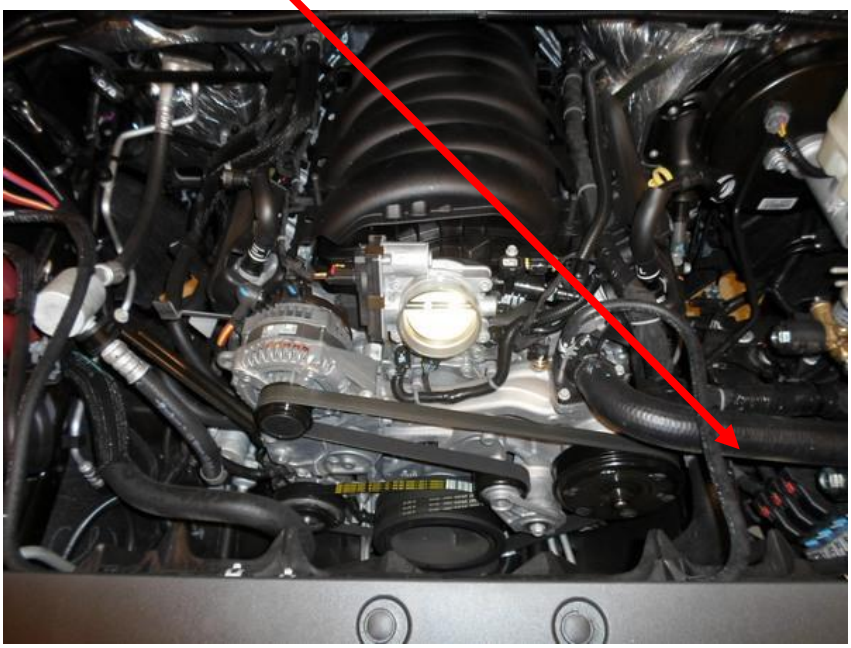
Basic Wiring Diagram



Petrol ECU location / connectors







Electrical Connections (remarks)

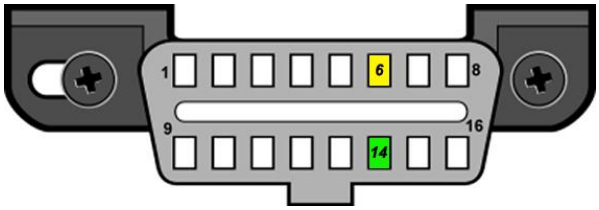
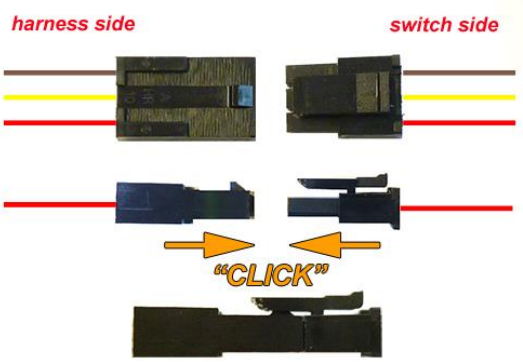
- **Before mounting the wiring to the AFC and/or the vehicle, mount the 2 extra wiring modules to pin 29 and pin 71 from the AFC connector.**

- **Extend wire 56 DI2 with the supplied 3-core wiring. Use only 1 core.**

- **Also remove the MAP connector and add the wiring from the MAP connector to the rest of the wiring connected to the ECU.**

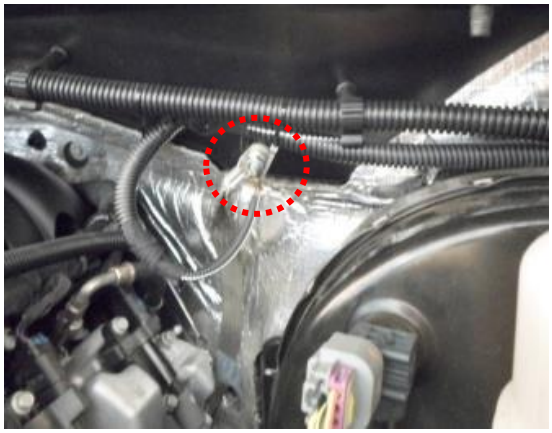
Electrical connections

Driver room

51 CAN1 High 70 CAN1 Low	Yellow Green	Connect to EOBD diagnose connector Pin : 6 Pin : 14
		
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
		

Electrical connections

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

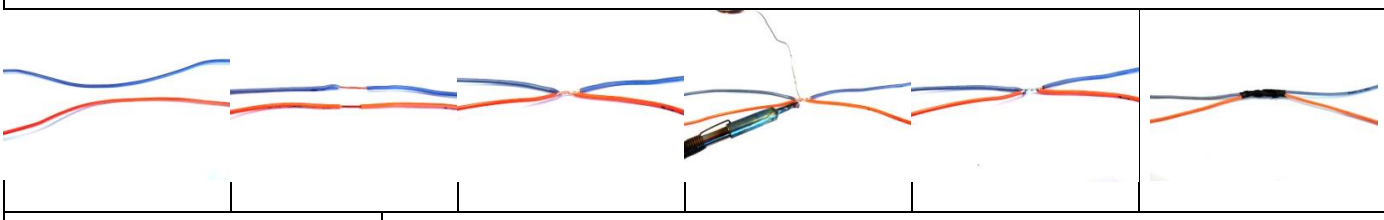
Wire number / code	Wire colour	Connection
32 Ground sense 1 Ground battery	Brown Brown	Connect to the '–' of the battery; use a ring terminal or solder: Wire colour : **Black** Wire location : **original ground point** 

4 +12V Battery 13 +12V battery sense	Red	Do not place the fuse in the holder before having completed the installation of the LPG system. Wire colour : **Red** Wire location : **+ Battery**

Electrical connections

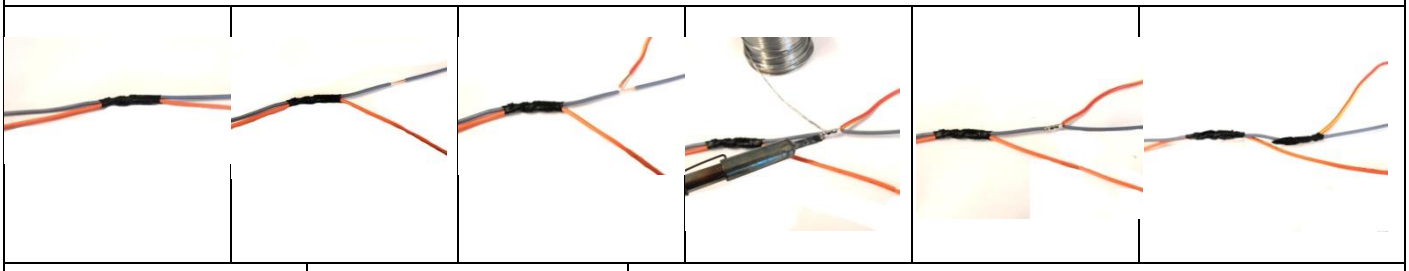
When mismatching colours : Pin numbers/positions are leading !

⚠ Join the injector supply connections of the petrol injector groups

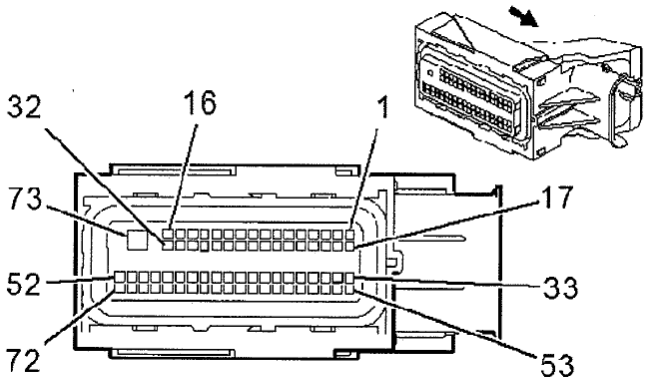


Join +inj.1 and +inj. 4	Grey Connector **X3** - pin **72** with pin **69**
Join +inj.3 and +inj. 6	Grey Connector **X3** - pin **68** with pin **71**
Join +inj.2 and +inj. 5	Grey Connector **X3** - pin **67** with pin **70**

Connect AFC wiring to ECU_High_1, 2 & 3 (H1, H2 & H3) to just joint wires



Petrol inj. High 1 H1 (ECU_HIGH_1)	Red-White	Colour: **Brown-white** Location: Petrol ECU, grey connector **X3**, inj. 1 - pin **72**
Petrol inj. High 2 H2 (ECU_HIGH_2)	Red-Green	Colour: **Green-grey** Location: Petrol ECU, grey connector **X3**, inj. 3 - pin **68**
Petrol inj. High 3 H3 (ECU_HIGH_3)	Red-Pink	Colour: **Blue-green** Location: Petrol ECU, grey connector **X3**, inj. 2 - pin **67**



Electrical connections

When mismatching colours : Pin numbers/positions are leading !

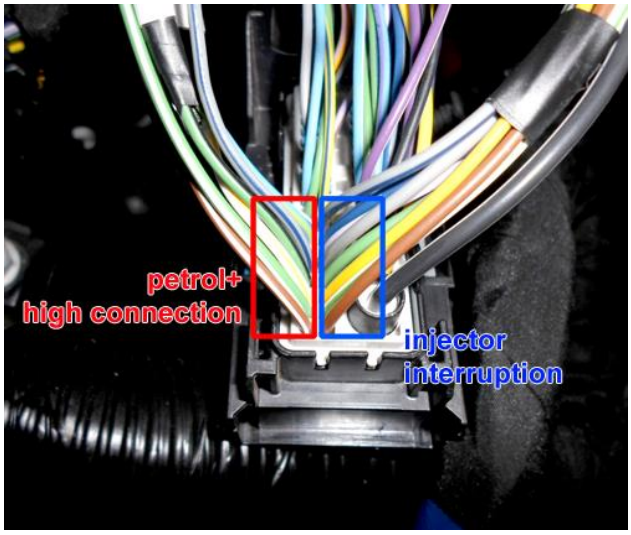
⚠ For measuring the petrol injectors :

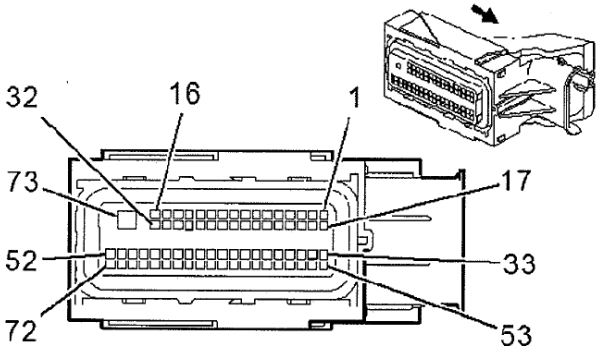
Interrupt each petrol injector control wire (injector min/ground).

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.

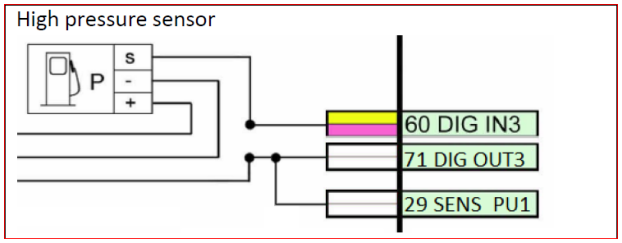
Attention:
Each bicoloured measuring wire corresponds to a specific LPG injector and petrol injector / cylinder number.
Do not interchange the wires.

VSI measure wire nr.	Full coloured / Bicoloured Module position	Interrupt petrol injector wire
H1 (INJ LO A) / **H1** (ECU LO A) *Petrol injector cyl.* ***1***	Yellow / Yellow-White B2 / A2	Colour : **Brown** Location : Petrol ECU, **X3** , pin **52**
H1 (INJ LO B) / **H1** (ECU LO B) *Petrol injector cyl.* ***4***	Grey / Grey-White D1 / D2	Colour : **Grey-blue** Location : Petrol ECU, **X3** , pin **49**
H2 (INJ LO A) / **H2** (ECU LO A) *Petrol injector cyl.* ***3***	Yellow / Yellow-Green A1 / C2	Colour : **Green** Location : Petrol ECU, **X3** , pin **48**
H2 (INJ LO B) / **H2** (ECU LO B) *Petrol injector cyl.* ***6***	Grey / Grey-Green E1 / F2	Colour : **Violet-green** Location : Petrol ECU, **X3** , pin **51**
H3 (INJ LO A) / **H3** (ECU LO A) *Petrol injector cyl.* ***2***	Yellow / Yellow-Pink B2 / A2	Colour : **Blue** Location : Petrol ECU, **X3** , pin **47**
H3 (INJ LO B) / **H3** (ECU LO B) *Petrol injector cyl.* ***5***	Grey / Grey-Pink D1 / D2	Colour : **White-green** Location : Petrol ECU, **X3** , pin **50**





Electrical connections – Petrol ECM

60, 71 & 29		*Fuel rail pressure sensor signal interruption* Wire colour : **Dark blue-White** Wire location : Petrol ECU, **X3**, pin **63** ***Add wiring module for pin 29 & pin 71***
60 DIG IN3	Yellow-pink	Sensor side
71 **Wiring module**	**White**	ECU side
29 **Wiring module**	**White**	Connect wire **29** to wire **71**, see picture below
		

17 & 10		*Fuel line pressure sensor signal interruption* Wire Colour: **Blue-White** Wire location: Petrol ECU, blue connector, **X3**, pin **60**
17 AD2	Blue-Green	Sensor side
10 DAC2	Green	ECU side

3-pole black connector 27 +5V Sensor 37 C ground 18 AD1	Red – blue (not used) Brown - black (not used) Blue - white	*For measuring the inlet manifold pressure (MAP).* *Cut off connector and insulate not used wires.* Wire colour : **Green-white** Wire location : Petrol ECU, **X3,** pin **58**
63 Ground shift	Blue – orange	*Make a connection to high pressure petrol sensor ground* Wire colour : **Black-light green** Wire location : Petrol ECU, **X3,** pin **37**
8 RPM engine speed	Purple - white	*For measuring the engine speed.* Wire colour : **Yellow-Purple** Wire location : Petrol ECU, **X3,** pin **8**

40 Wake-up	Grey - red	*High pressure petrol sensor 5Volt supply / car wake-up* Wire colour : **White-Red** Wire location : Petrol ECU, **X2,** pin **39**
20 AD3	Blue – pink	*Make a connection to Lambda sensor bank 1* Wire colour : **Purple-Grey** Wire location : Petrol ECU, **X2,** pin **10**
19 AD4	Blue	*Make a connection to Lambda sensor bank 2* Wire colour : **Purple-White** Wire location : Petrol ECU, **X2,** pin **26**

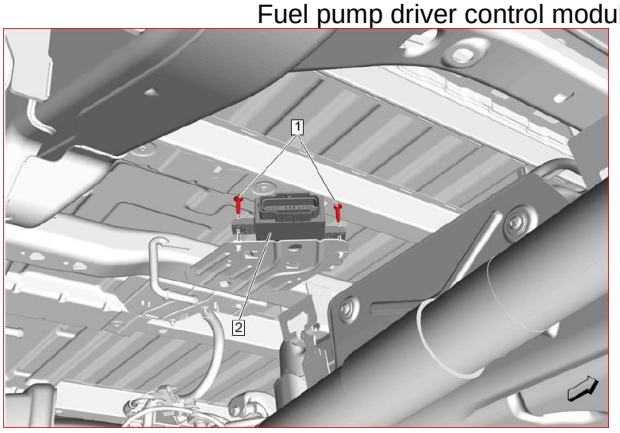
112 + Ignition	Red - grey	*Make a connection to ignition + / contact +.* Do not place the fuse in the holder before having completed the installation of the LPG system. Wire colour : **Purple-Blue** Wire location : Petrol ECU, **X1,** pin **49**

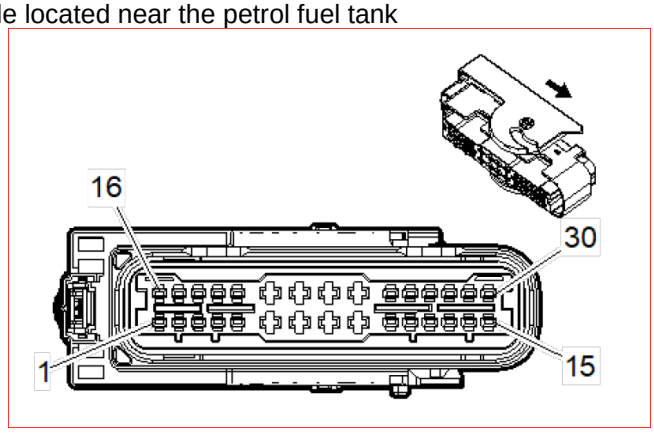
Electrical connections – Chassis Control Module

Extend wire 56 DI2 with the supplied 3-core wiring. Use only 1 core.

56 DI2 *Extend the wire with the supplied extension wire.*	Yellow-green	*Fuel pump supply voltage PWM.* Wire colour: **Grey** Wire location : Fuel pump driver control module **Pin 8** ***Fuel pump module next to the petrol fuel tank***

Fuel pump driver control module located near the petrol fuel tank





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 1 of the 2 the reducer temperature sensors.
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 The wiring loom link is a grey connector on both sides, one is caped other one is loose , connect each other.

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 serial interface wire and run the VSI diagnosis program.
   Install the VSI fuse, and program the switch.
   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 VSI computer with the diagnosis software.
   When the VSI computer has not been activated, it will keep generating error code 160. To activate the VSI computer, select function F11 (activate ECM).

3. Check whether the program in the VSI computer matches with the car (dedicated engine set):
   Refer with F2 to the box number and car description in the diagnosis software and compare these with the set number.

4. The system will switch over to LPG as soon as the temperature of the coolant (T-ect)
   becomes higher than the parameter T-min set and when the TSO-cold time is expired.

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 evaporator heats up.
   Check the engine signals, petrol injection time, RPM, ECT, lambda, MAP signal, petrol pressure signal.
   Let the engine run idle on LPG.
   Adjust the evaporator pressure. Refer to the parameter list (or F2 : ID box) for the idle level value set.
   Adjust the evaporator 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 evaporator to adjust the pressure.
   An error code will be generated whenever the pressure variation is to high.
   Seal the evaporator with the sticker included in the delivery after having adjusted the pressure.

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

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

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

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