ALTERNATIVE FUEL SYSTEMS

Prins

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

Installation manual Dedicated PART 2/2

VSI LPG

MAKE OF AUTOMOBILE:	Dodge
TYPE:	Ram
PISTON DISPLACEMENT:	5700cc
NUMBER OF VALVES:	16
ENGINE NUMBER:	5.7V8 Hemi 290kW
TRANSMISSION TYPE (MT / AT)	AT
VEHICLE CATEGORIES M or N	M
TYPE VSI INJECTOR (COLOUR)	Yellow
VERSION (LPG / CNG)	LPG
INJECTION SYSTEM:	MOTOROLA MULTI-POINT INJECTION
MODEL YEAR:	2010
SYSTEM APPROVAL NUMBER (R115)	R115-*****
LOCATION SYSTEM STICKER	If applicable : right side, centre door post
ENGINE SET NUMBER	337/2000800

NUMBER : 076/3211700
DATE : 2010-01-17
VERSION NR : 2009-07-07 B

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

EXPLANATION OF SYMBOLS :

= IMPORTANT, CAUTION

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 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.
- 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 a 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 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 gas 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.

Please fill in the warranty card completely and return it within 8 days after installation.

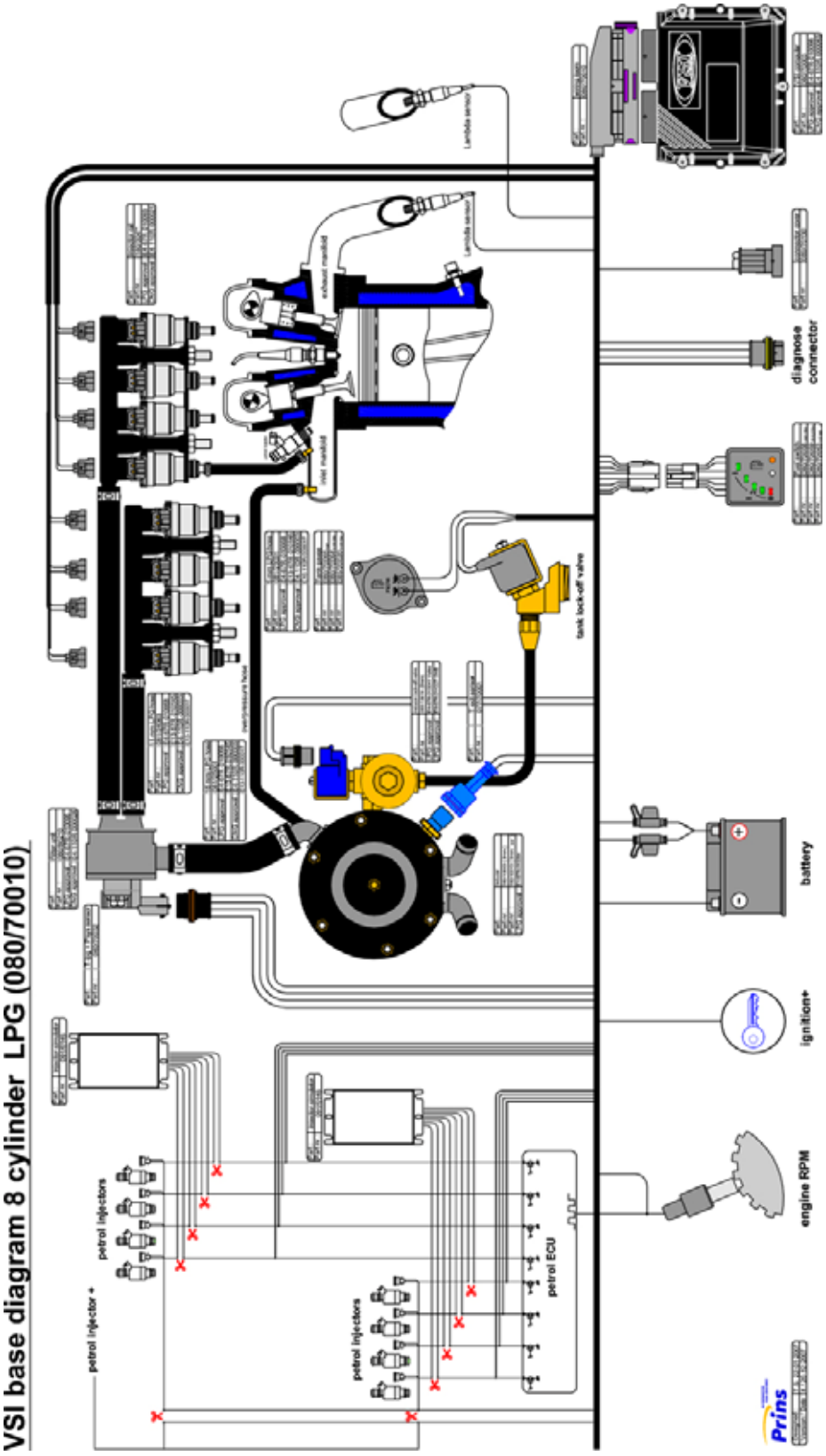
Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer : operating on Windows 98,W2000 or XP.
  Internal memory : 16 Mb or more
  Memory HD space : 5MB
  Screen : 256 colours, advise colours 16 bits or more
  Com port : 1 free COM port 1 or COM port 2 with a 9 or 25 pins connector
- Vehicle fuel system scan tool or OBD scan tool Prins (part nr. 099/99928)
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins VSI diagnostic software
- Prins VSI serial interface
- Prins VSI break out box (part nr. 080/70090)
- Torque wrench (10Nm)
- Portable light
- Assortment drill bits 4 to 12 mm
- Assortment cutters (ø 20, 30, 50, 70 mm)
- Punching tool ø 70 mm
- Round file
- Portable drill or pneumatic drill
- Threading device (male M6x1, M8x1, M10x1)
- Pipe-flaring tool (for 6 and 8 mm copper pipe)
- Air gun
- Vacuum cleaner
- Hot air gun
- Allan spanner for inlet couplings 3,5mm (part nr. 099//9970)
- Reducer adjustment tool (part nr. 099/9960)
- 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

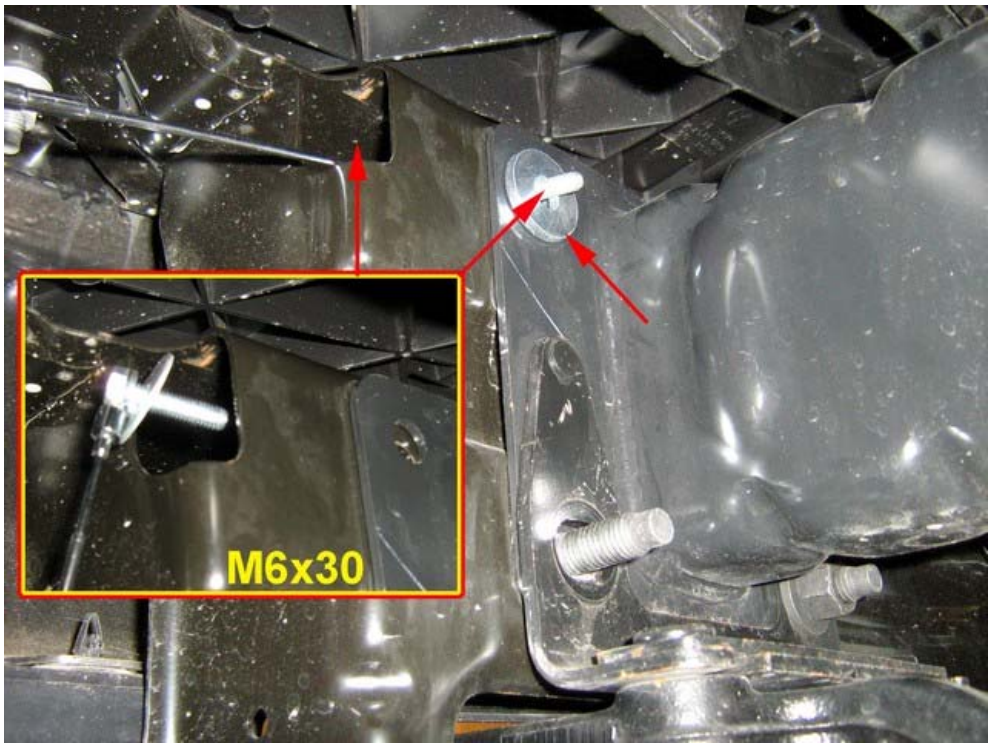
	
Reducer VSI LPG Prins : E4-67R-010054 Lock-off valve OMB : E8-67R-014327 Lock-off valve Valtek : E4-67R-010041	Injector rail Prins : LPG E4-67R-010093 CNG E4-110R-000021
	
Filter unit T1 / T2 Prins : LPG E4-67R-010096 CNG E4-110R-000028 Filter unit Keihin : LPG E4-67R-010177 CNG E4-110R-000091	Injector Keihin :LPG E4-67R-010092 CNG E4-110R-000020
	
Computer VSI- 4 / 8 / 10 Prins: LPG E4-67R-010098 CNG E4-110R-000083	LPG hoses Tubithor : LPG E13-67R-010145 CNG E13-110R-000017 Rubia : LPG E4-67R-010068 CNG E4-110R-000003

Mounting and connection points

A : Reducers	H : Engine speed signal RPM (40)
B : Filter unit	I : Lambda signal (45 + 46)
C : Injector rail	J : “-“ interruption petrol injector
D : VSI Computer	K : Overpressure coupling
E : Injection module	L : R115 Approval sticker
F : Water connections	M : grommet
G : “+” ignition (13)	N : “+“ interruption petrol injector

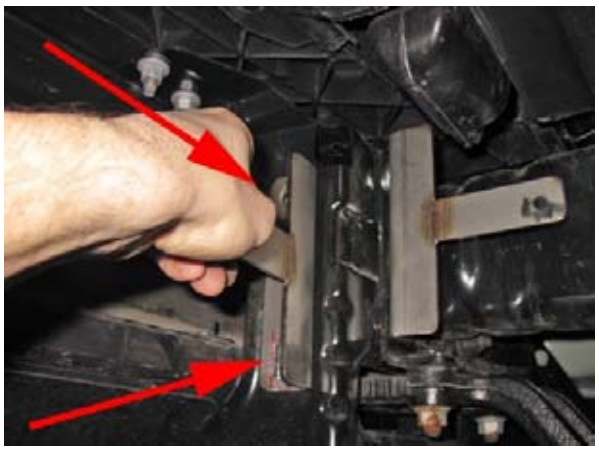
R115 approval sticker :
Right side centre door post

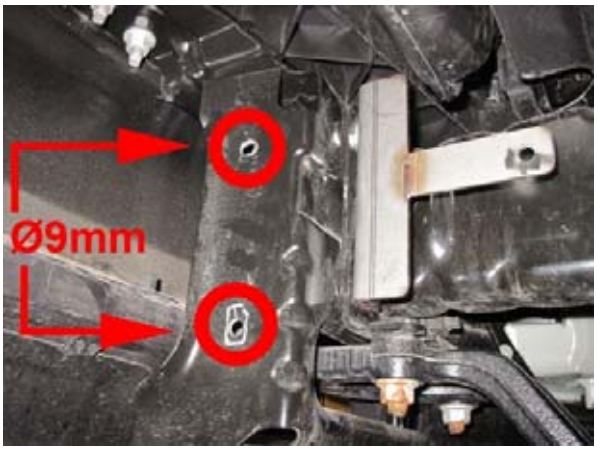
Mounting the reducer brackets 1



Secure with original nut (bottom) and M6x30 bolt, washers and nuts (top).

Mounting the reducer brackets 2



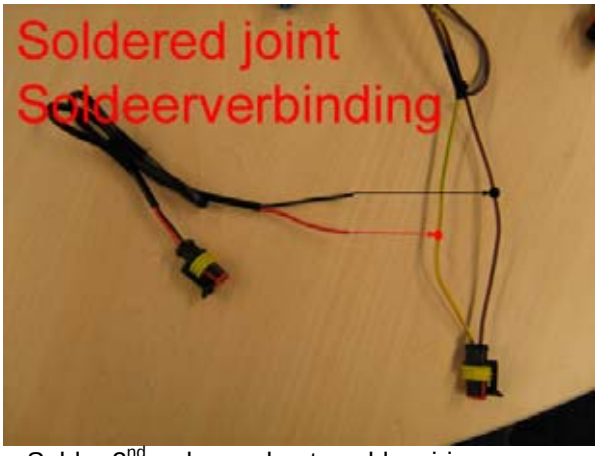


Hold bracket to bumper support and mark holes. Drill holes Ø9mm.

Mount 2nd reducer bracket with M8x25 bolts, (spring)washers and nuts.

Mounting the reducers

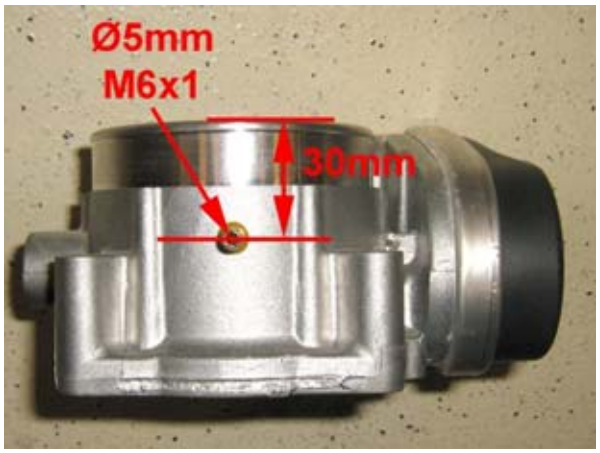
Mount Ø5mm overpressure hose to reducers.
Mount the reducers on the brackets with M8 nuts and springwashers.



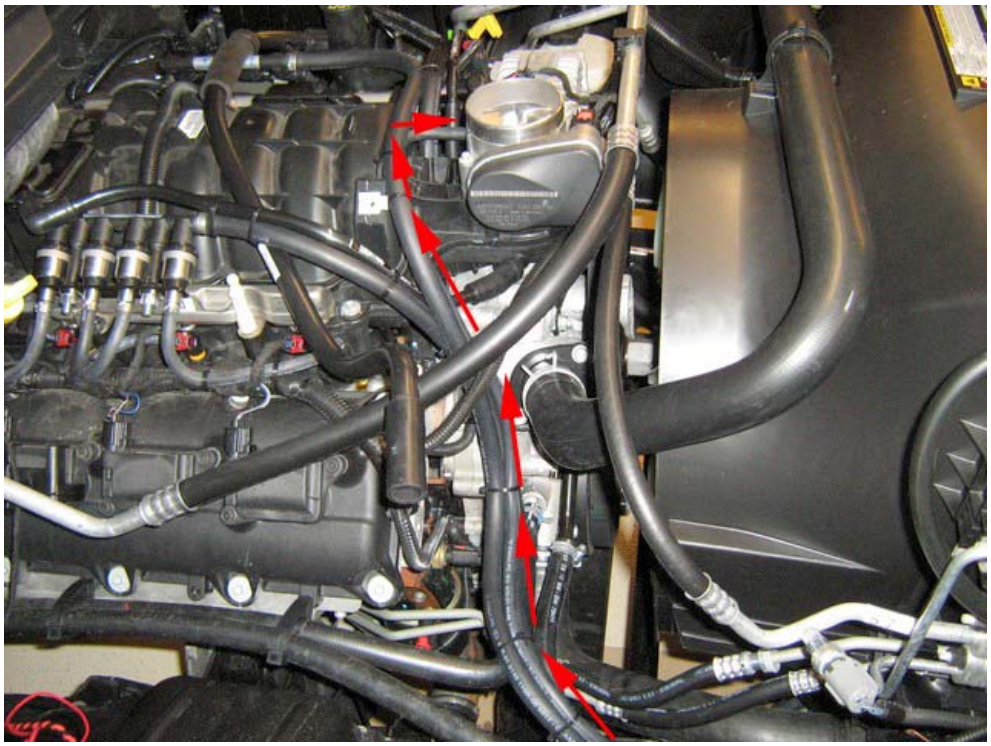
Mount LPG-piping with T-piece to reducers. Solder 2nd reducer plug to cable-wiring.

Water connections

Overpressure connection

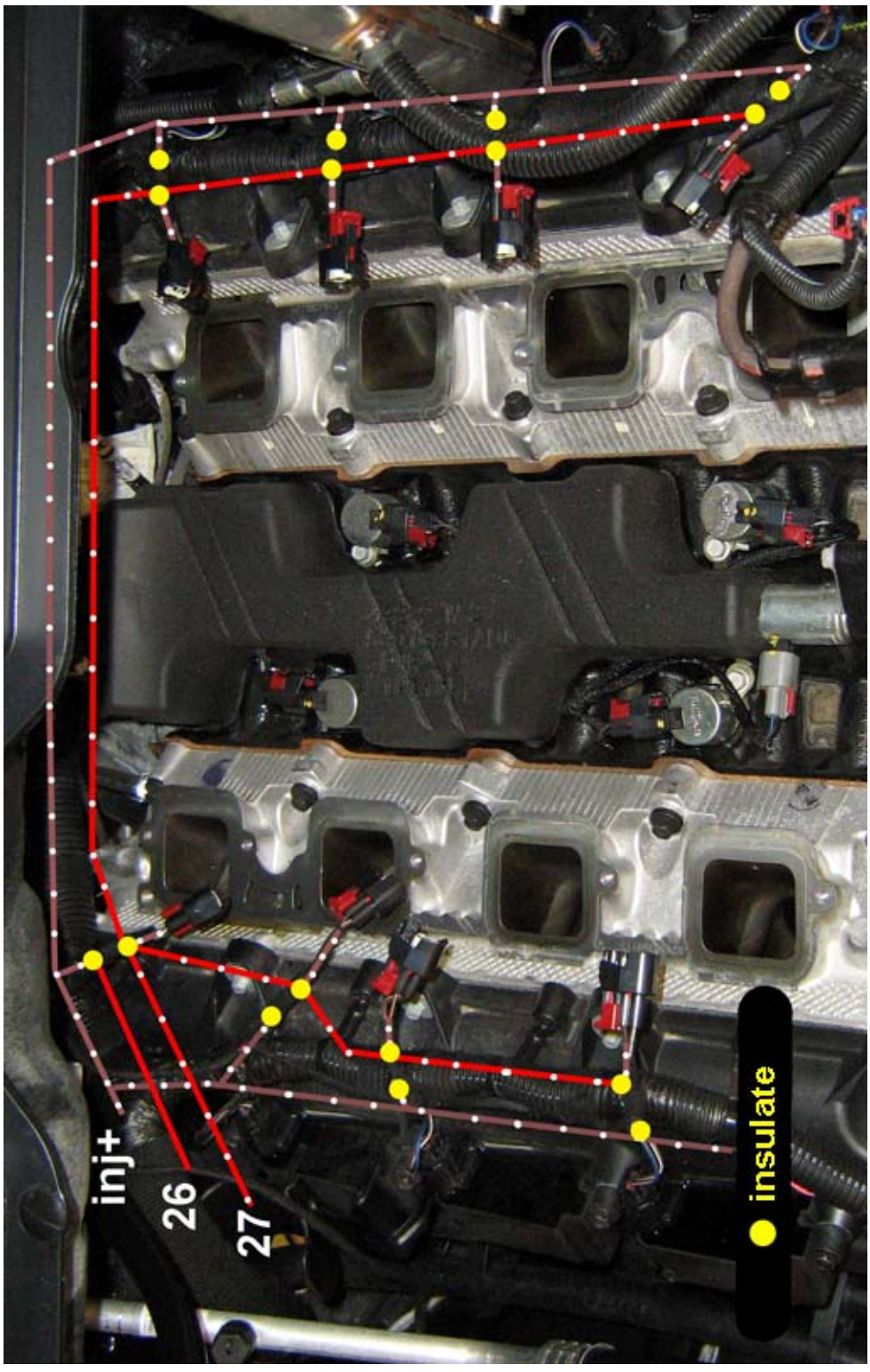


Mount overpressure coupling to throttle body (see picture).
Mount T-piece for overpressure hoses near reducers and connect to overpressure coupling.



Petrol injector power supply interruption

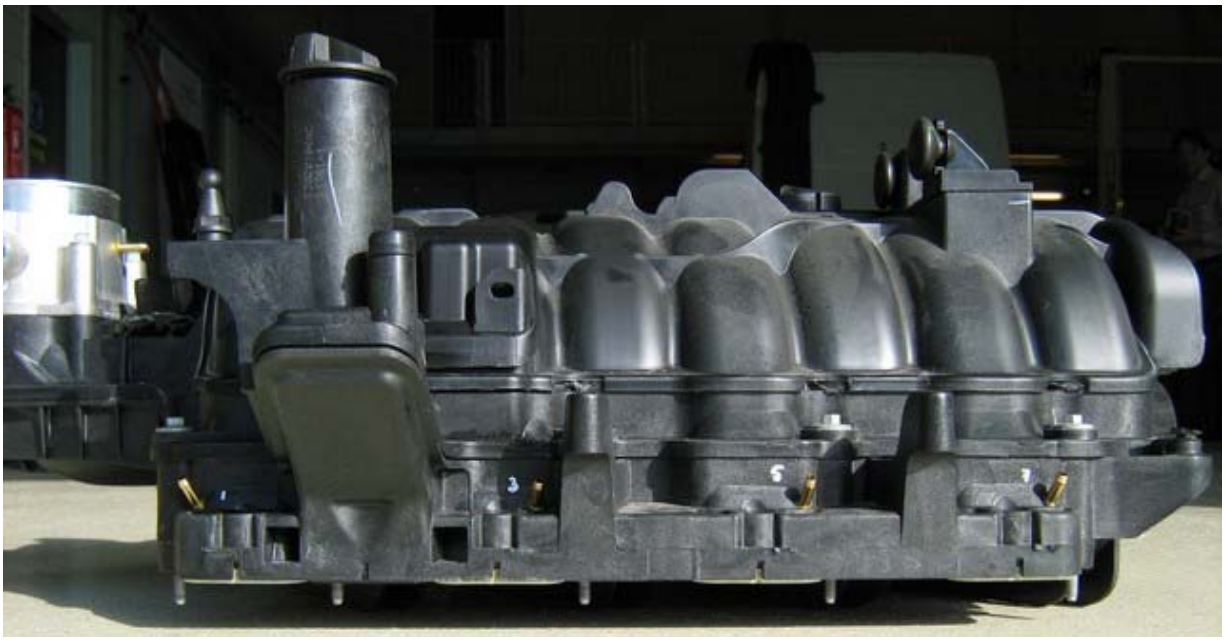
Remove the inlet manifold.
Connect VSI wires 26 & 27. Interrupt the petrol injector power supply (+).



Overview inlet manifold couplings Bank 1

Mounting the inlet manifold couplings Bank 1

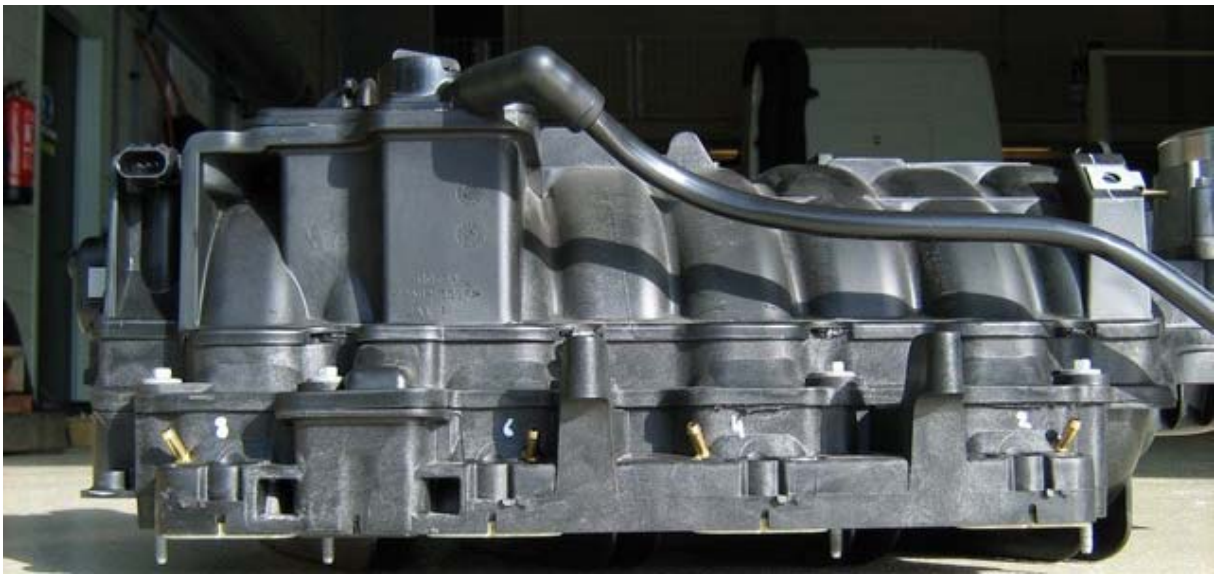
Remove the inlet manifold. Use a petrol injector to determine were to drill the holes.
Drill **8** holes of 5 mm in the inlet manifold.
Cut M6x1 thread in these holes.
Place the VSI couplings with a lock compound in the inlet manifold.
Watch out that the lock compound doesn't come inside the VSI couplings.
Connect VSI wires 26 & 27. Interrupt the petrol injector power supply (+).
Mount the hoses on the VSI couplings and place the inlet manifold back on the engine.



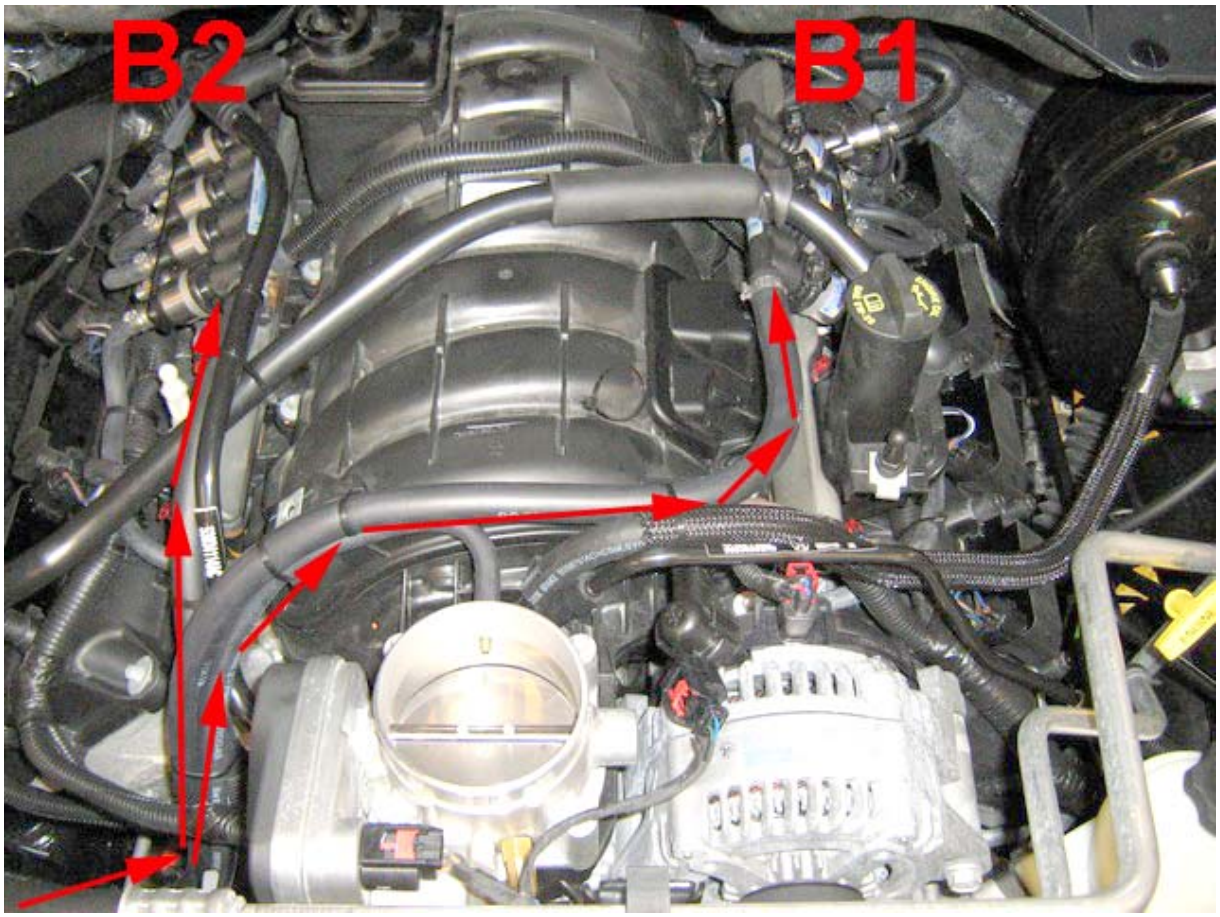
Overview inlet manifold couplings Bank 2

Mounting the inlet manifold couplings Bank 2

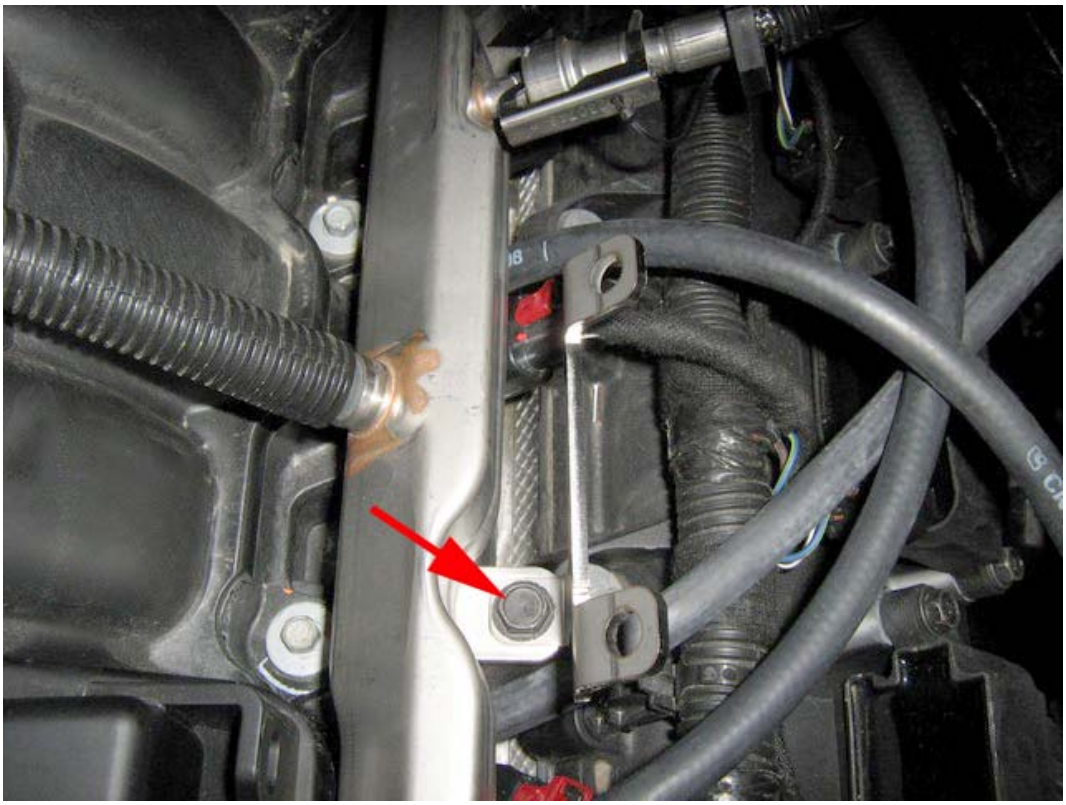
Remove the inlet manifold. Use a petrol injector to determine were to drill the holes.
Drill **8** holes of 5 mm in the inlet manifold.
Cut M6x1 thread in these holes.
Place the VSI couplings with a lock compound in the inlet manifold.
Watch out that the lock compound doesn't come inside the VSI couplings.
Connect VSI wires 26 & 27. Interrupt the petrol injector power supply (+).
Mount the hoses on the VSI couplings and place the inlet manifold back on the engine.



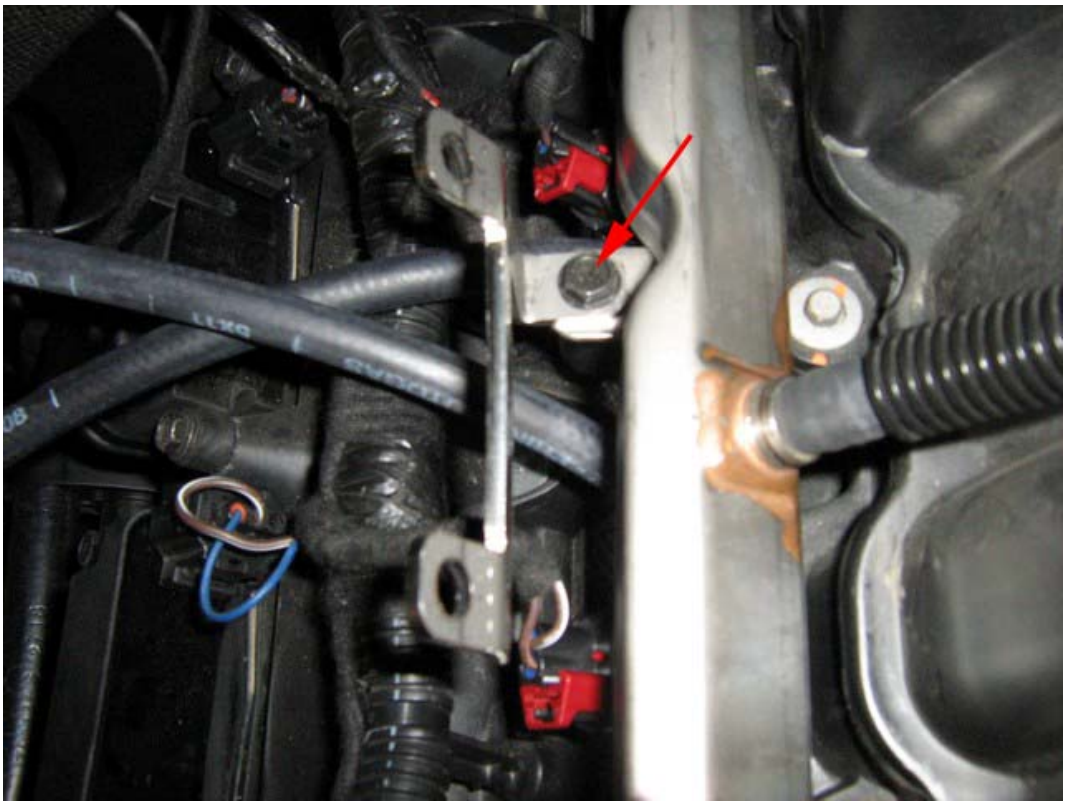
VSI injector rail overview

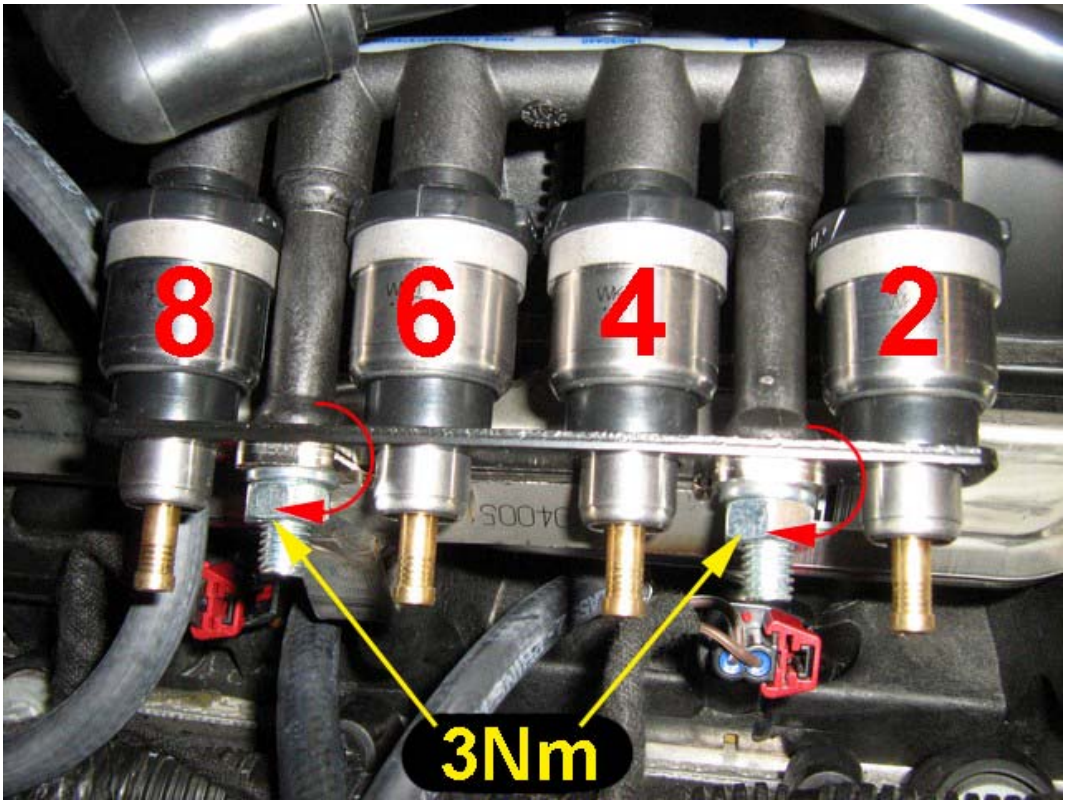


Mounting the VSI injector rail Bank 1



Mounting the VSI injector rail Bank 2





Mounting the filter units

Filter replacement must be recorded in the service book supplied

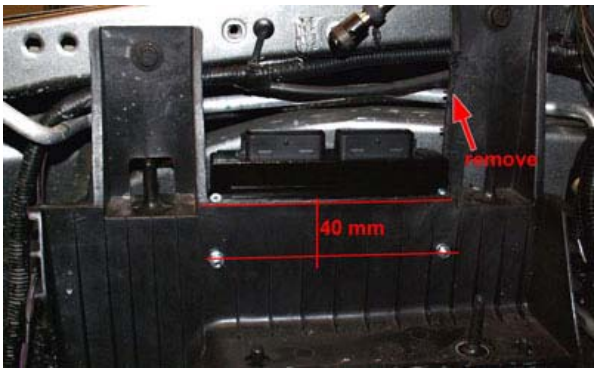
LPG hoses

Length of hose,	ø 16 mm	reducer	-> filter unit *Prins*	= ± 8	cm (2x)
Length of hose,	ø 5 mm	reducer	-> **Y** piece -> inlet manifold	= ± 140	cm
Length of hose,	ø 11 mm	filter unit *Prins*	-> filter unit *Prins*	= ± 20	cm
Length of hose,	ø 11 mm	filter unit *Prins*	-> rail B2	= ± 142	cm
Length of hose,	ø 11 mm	filter unit *Prins*	-> rail B1	= ± 115	cm
Length of hose,	ø 5 mm	VSI injector 1	-> manifold coupling	= ± 29	cm
Length of hose,	ø 5 mm	VSI injector 2	-> manifold coupling	= ± 24	cm
Length of hose,	ø 5 mm	VSI injector 3	-> manifold coupling	= ± 17	cm
Length of hose,	ø 5 mm	VSI injector 4	-> manifold coupling	= ± 20	cm
Length of hose,	ø 5 mm	VSI injector 5	-> manifold coupling	= ± 23	cm
Length of hose,	ø 5 mm	VSI injector 6	-> manifold coupling	= ± 20	cm
Length of hose,	ø 5 mm	VSI injector 7	-> manifold coupling	= ± 28	cm
Length of hose,	ø 5 mm	VSI injector 8	-> manifold coupling	= ± 29	cm

Cut the hoses on length.
Please observe that there is no damage or fouling to the hoses.

Mounting the VSI computer

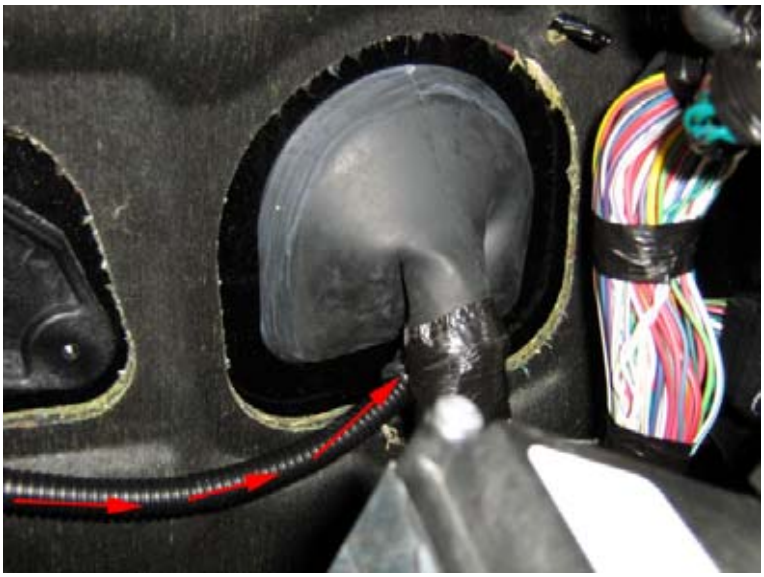
Never mount the computer upside down or near a heat source



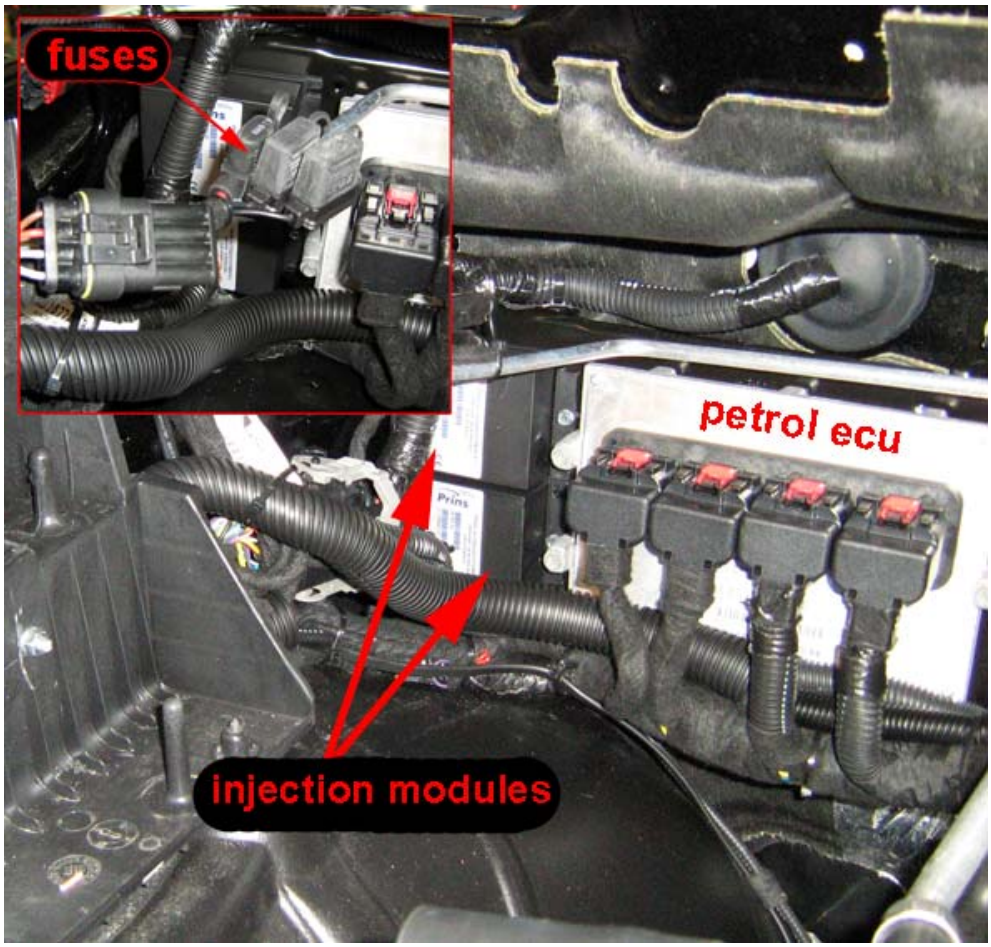
Mounting the fuel selection switch

Mount the switch.

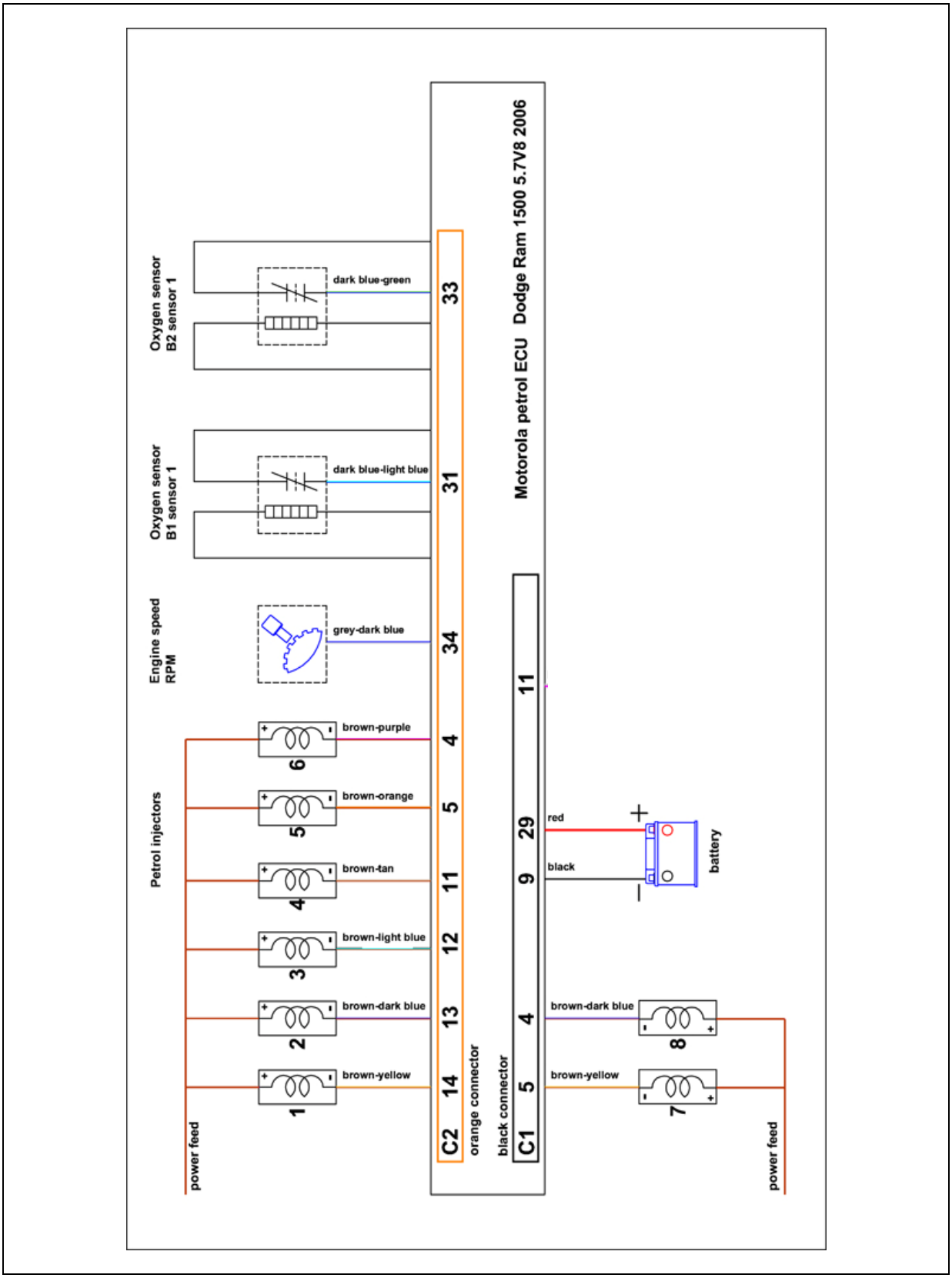
When mounting the switch, only push on its sides.
Pushing the switch in the centre may result in damage to the switch.
See general manual for programming the selection switch



ECU location



ECU pin outs

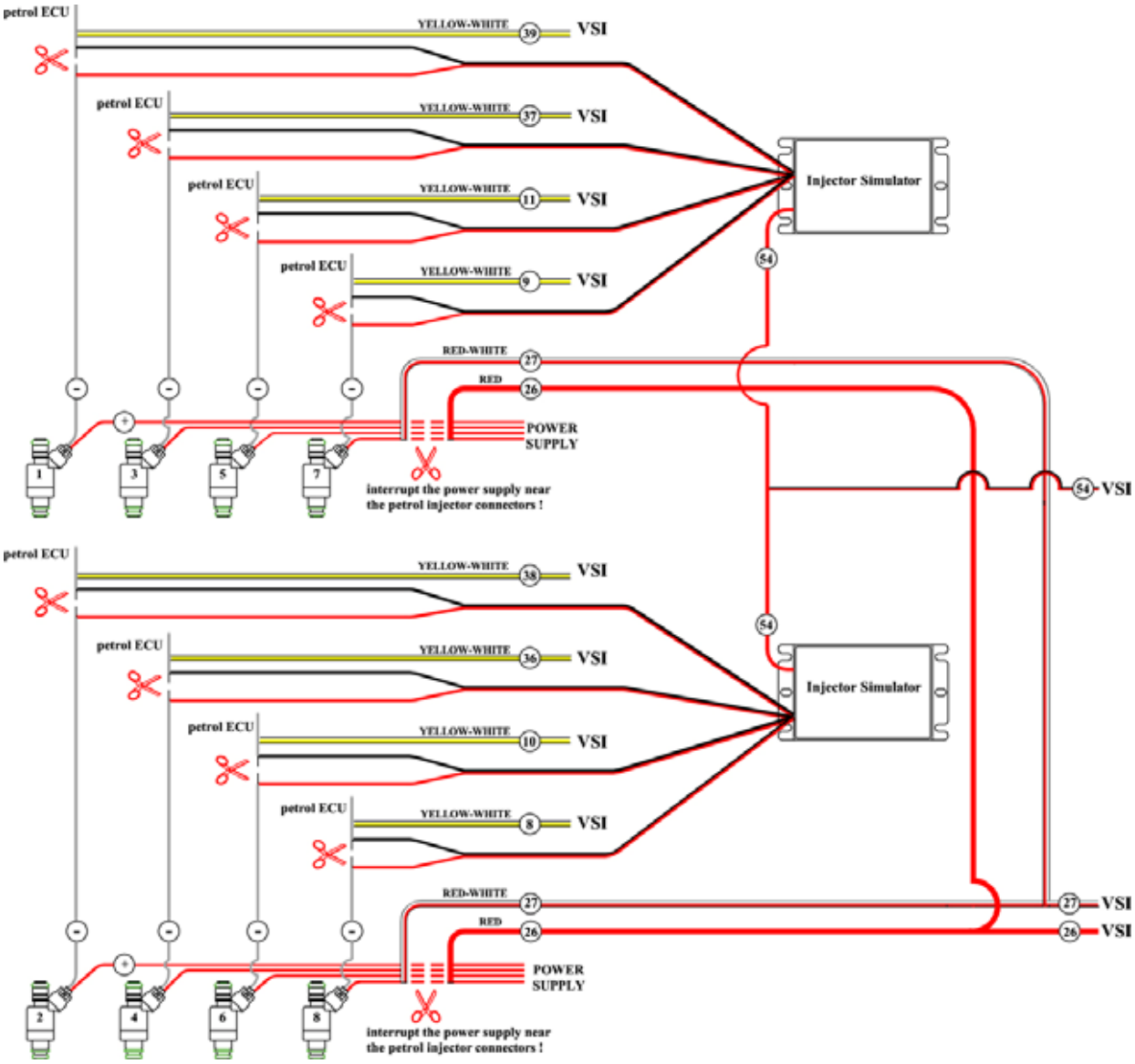


Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.
Mount filter unit plug to 1 of the 2 filters / Mount ECT plug to 1 of the 2 reducers.

Wire number / code	Wire colour	Connection
50 MAIN GND	brown	Wire colour: **BLACK** Wire location: ECU, black connector **C1**, pos 9.
25-51 +12V BAT	red	Wire colour: **RED** Wire location: ECU, black connector **C1**, pos 29. Do not place the fuse in the holder before having completed the installation of the LPG system.
33 33G INJ OUT **1** 34 34 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **1**.
32 32G INJ OUT **2** 34 34 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **2**.
31 31G INJ OUT **3** 34 34 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **3**.
30 30G INJ OUT **4** 34 34 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **4**.
5 5G INJ OUT **5** 6 6 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **5**.
4 4G INJ OUT **6** 6 6 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **6**.
3 3G INJ OUT **7** 6 6 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **7**.
2 2G INJ OUT **8** 6 6 G INJ A PLUS	**Green - white** red	Connector VSI-injector to cylinder **8**.
13 IGNITION +	Grey-white	Make a connection to + petrol injector, in parallel with the vsi wire 26. Wire colour : **RED** Wire location : VSI wiring loom, nr.26, petrol injector power supply interruption. ***Or :*** Wire colour : **BROWN-WHITE,** +petrol injector. Wire location : near connector petrol injector.
46 LAMBDA 1-L	orange	For the measurement of the lambda signal of cylinder bank 1. Connect the wire in parallel to the lambda sensor. Wire colour : **light BLUE-dark BLUE** Wire location : ECU, orange connector **C2**, pos 31
45 LAMBDA 2-R	orange-white	For the measurement of the lambda signal of cylinder bank 2. Connect the wire in parallel to the lambda sensor. Wire colour : **BLUE-GREEN** Wire location : ECU, orange connector **C2**, pos 33
40 RPM	Purple-white	For measuring the engine speed. Wire color :**GREY-BLUE** Wire location : ECU, orange connector **C2**, pos 34

Injection module connections



Electrical connections

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

VSI wire: 54 INJ module	red - black	Power supply for the simulation of the injector(s). **Connect the red - black cable (54) to the loose red cable of the injector simulator(s).** For the connection of the injector simulator the control cables of the petrol injectors must be interrupted. Connect the red cables of the module to the **injector side** and the black cables of the module to the **computer side (with corresponding yellow-white wire)**. Do not interchange the red and the black cables, but connect those as a pair to each of the injectors (refer to the injector diagram). Module location: right side petrol ecu.

Electrical connections

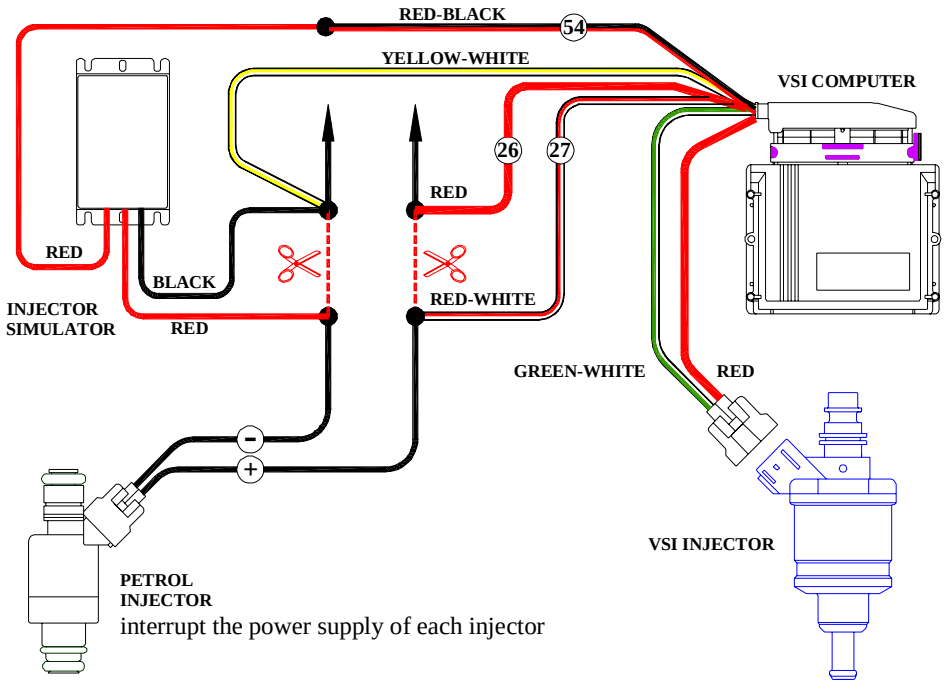
Check and measure the wiring in case of changes in the cars wiring colours.

For measuring the petrol injectors.

Connect each yellow / white measuring cable to the position at which the control cables of the petrol injectors have been interrupted (refer to the injector diagram).

Attention:
Each yellow / white measuring cable corresponds to a specific LPG injector and cylinder number. Do not interchange the cables. Refer to the page 'mounting the injector rail' for the correct cylinder numbers.

VSI measure wire nr. :	Full colored / Bicolored	To interrupt petrol injector wire color / location
VSI wire nr. 39 Petrol injector / cyl. 1	Yellow-white	Color :brown-yellow Location : ECU, orange connector **C2**, pos 14
VSI wire nr. 38 Petrol injector / cyl. 2	Yellow-white	Color : brown-blue Location : ECU, orange connector **C2**, pos 13
VSI wire nr. 37 Petrol injector / cyl. 3	Yellow-white	Color : brown-light blue Location : ECU, orange connector **C2**, pos 12
VSI wire nr. 36 Petrol injector / cyl. 4	Yellow-white	Color : brown-tan Location : ECU, orange connector **C2**, pos 11
VSI wire nr. 11 Petrol injector / cyl. 5	Yellow-white	Color :brown-orange Location : ECU, orange connector **C2**, pos 5
VSI wire nr. 10 Petrol injector / cyl. 6	Yellow-white	Color : brown-purple Location : ECU, orange connector **C2**, pos 4
VSI wire nr. 9 Petrol injector / cyl. 7	Yellow-white	Color : brown-yellow Location : ECU, black connector **C1**, pos 5
VSI wire nr. 8 Petrol injector / cyl. 8	Yellow-white	Color : brown-blue Location : ECU, black connector **C1**, pos 4



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 reducer heats up.
   Check the engine signals, petrol injection time, RPM, ECT, lambda
   Let the engine run idle on LPG.
   Adjust the reducer pressure. Refer to the parameter list (or F2 : ID box) 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 to high.
   Seal the reducer 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.

Trouble code chart

Trouble code	Definition	Check / solution
100	Lambda to long to rich.	Check when operating on petrol and LPG that there is good lambda signal movement.
101	Lambda to long to lean.	Check when operating on petrol and LPG that there is good lambda signal movement.
102	Lambda to long to lean during open loop.	Check when operating on petrol and LPG that there is good lambda signal movement.
110	T-ECT>= 171°C	Check if the ECT sensor (blue) in the reducer is connector is connected to ground.
111	T-ECT>= -40°C	Check if the ECT sensor (blue) in the reducer has a power connection.
120	T-LPG>= 171°C	Check the ground connection of the Pressure/temperature sensor in the filter unit.
121	T-LPG>= -40°C	Check the power connection of the Pressure/temperature sensor in the filter unit.
150	Psys<= Low_Level	Based on a pressure drop in the system, this can be caused by an empty LPG tank, incorrect solenoid valve, polluted filter or incorrectly adjusted pressure.
160	ECM-VSI not activated	Activate the LPG computer with the diagnostic program, using the F11 function key.
180	T-Board >= 90°C	LPG computer circuit board to hot, replace the VSI computer in a cooler area.
181	Battery voltage to high	Check board voltage / alternator output and condition of the battery.
210-220-230-240-250-260-270-280	VSI injector overload	Injector current to high, check for short circuiting
211-221-231-241-251-261-271-281	VSI injector noload	Injector current to low, check for bad connections.
310	Adjusted pressure on idle out of range	Adjust the idle pressure to the value shown by parameter " Idle Level "
311	Programm error during flahing the memory	Check parameter settings, contact Prins Autogassystemen.
320	Psys voltage to low	Check the ground connection of the Pressure/temperature sensor in the filter unit.
321	Psys voltage to high	Check the power connection of the Pressure/temperature sensor in the filter unit.
322	Psys > 3,5 Bar	Check the coolant temperature (T-ect) and the reducer for leakage of the first stage.
330	unexpected parameter change	Contact Prins Autogassystemen.
340	reducer warms up to slow	Check the water connections / circuit.
341	Gas leakage, system pressure is less then 1.25 bar after 4 hours when the engine is not running	Check the system for gasleakage.
-	System switches to LPG but engine stalls immediately.	LPG tank empty ? Lock-off valves open ?
-	No injection timing on LPG (0 Msec.)	Check the injection module.
-	The LPG system switches constantly between LPG and Petrol	- Check coolant system for air. - T-ect sensor in the reducer malfunction.
-	Engine hesitates on high revs, and not running on all cylinders. Engine runs good on idle.	Check for kinked or jammed LPG hoses (between VSI injector and couplings). Check for blocked inlet couplings.
-	Switch LED's don't lit up	Check the main fuse of the VSI system Check ignition+ (VSI wire 13)
-	Fault codes when turning the ignition off (key out the ignition)	Caused by different switch off times between ignition+ and injector power. Connect VSI wire 13 to the petrol injector feed instead of ignition+.
-	The orange LED on the switch flashes	Activate the LPG computer with the diagnostic program, using the F11 function key.
-	The LPG system switches to LPG but engine stalls immediately	LPG tank empty?
-	Not running on all cylinders on lpg	Check parameter 10, number of cylinders.
-	No injection times on lpg	Check the connections of the injection module.
-	Injection time "falls" to 0 mSec on LPG	Check the injection module.
-	Check engine while running on LPG, injector circuit malfunction, no lambda control (limb home)	Replace injection module
-	Not starting / running on petrol	Check the connections of the injection module.