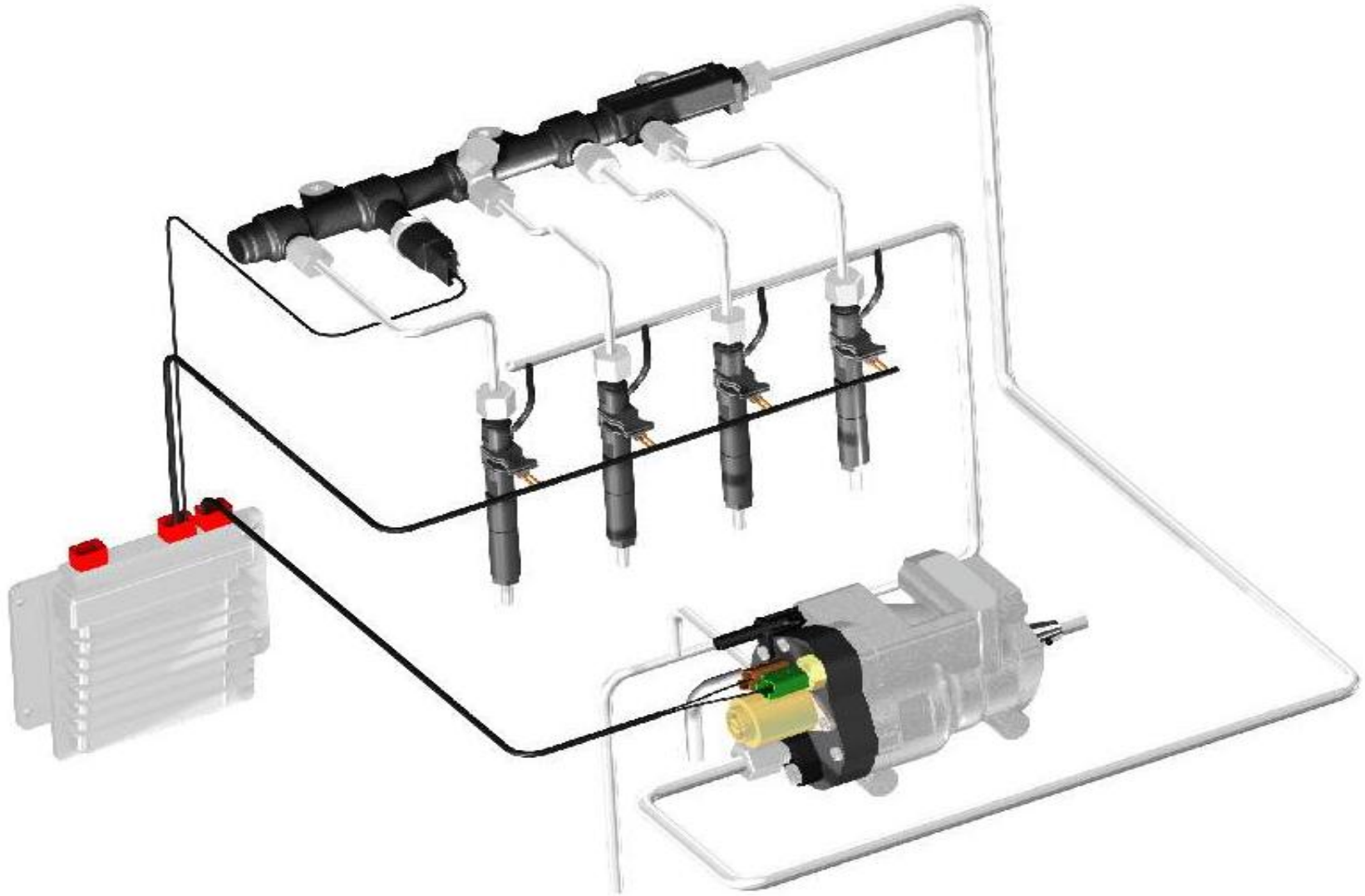


COMMON RAIL (Delphi)

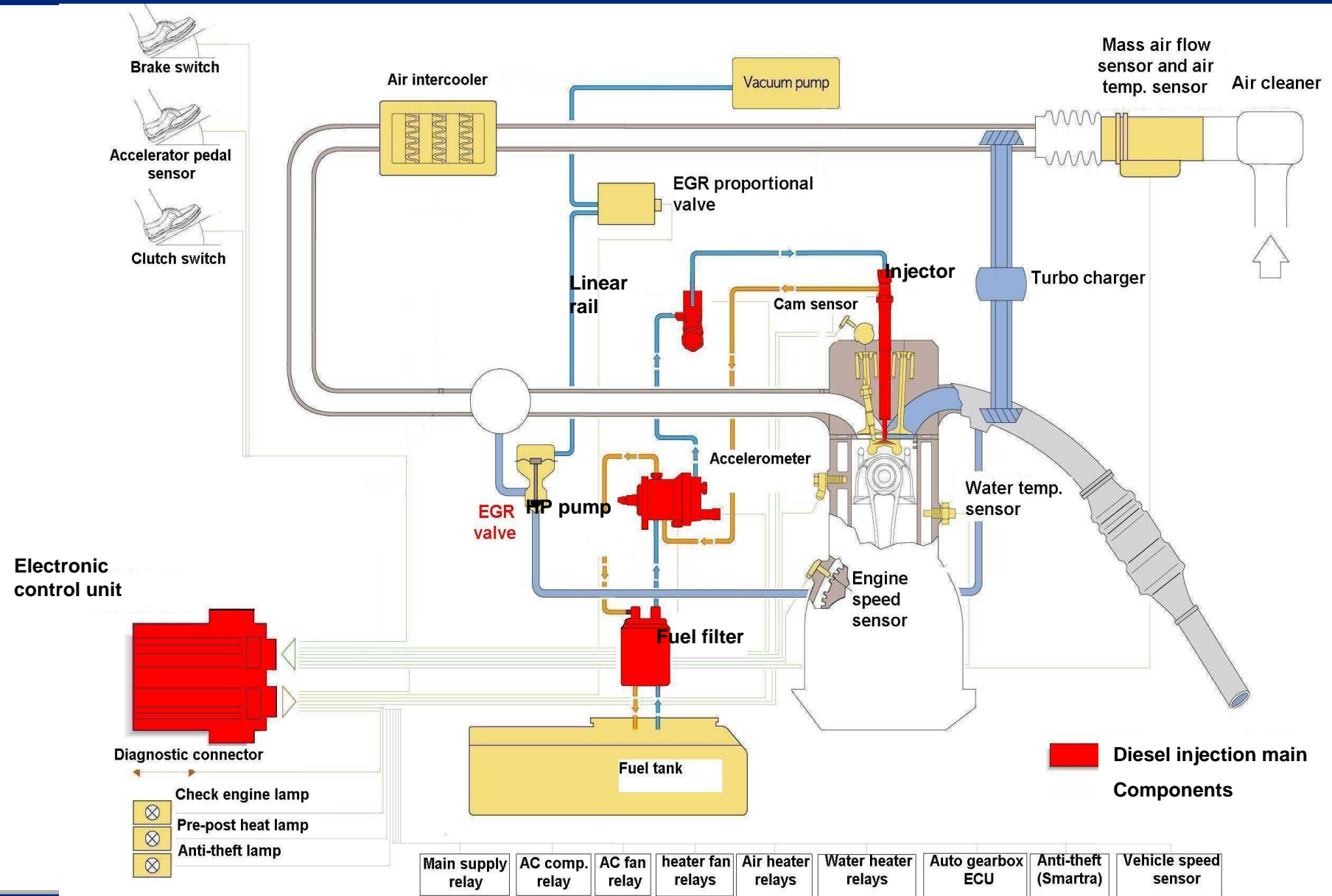
Chonan Technical Service Training Center

Fuel System

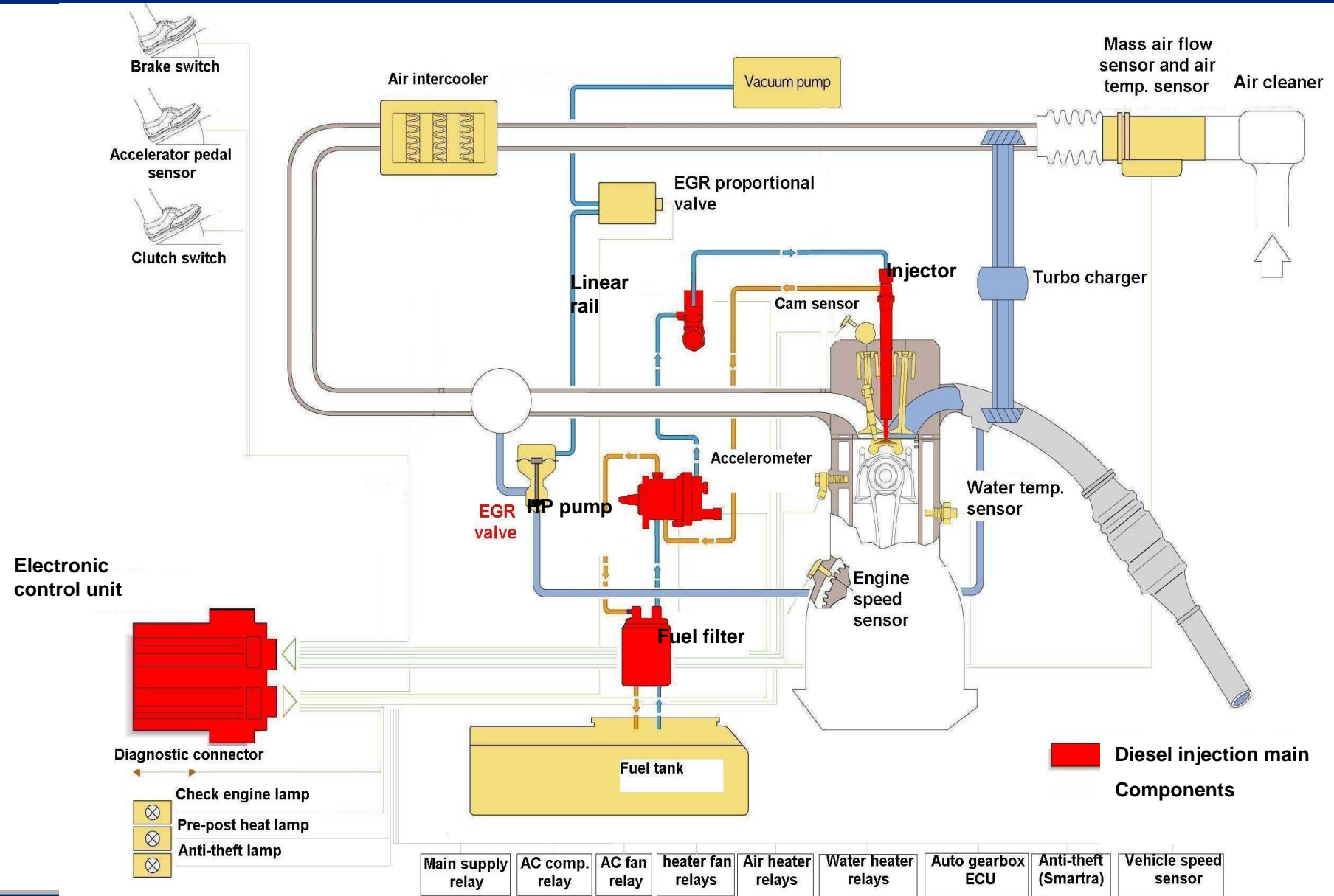
Common Rail System



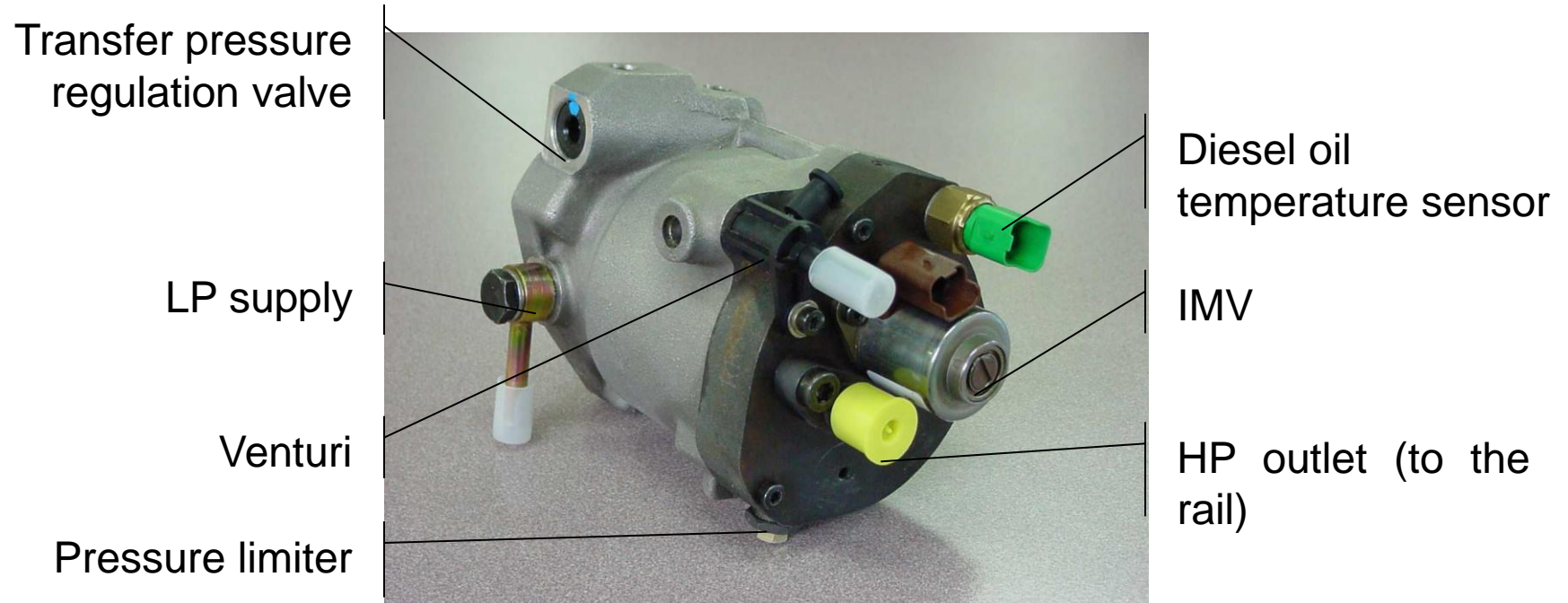
Common Rail System



Common Rail System



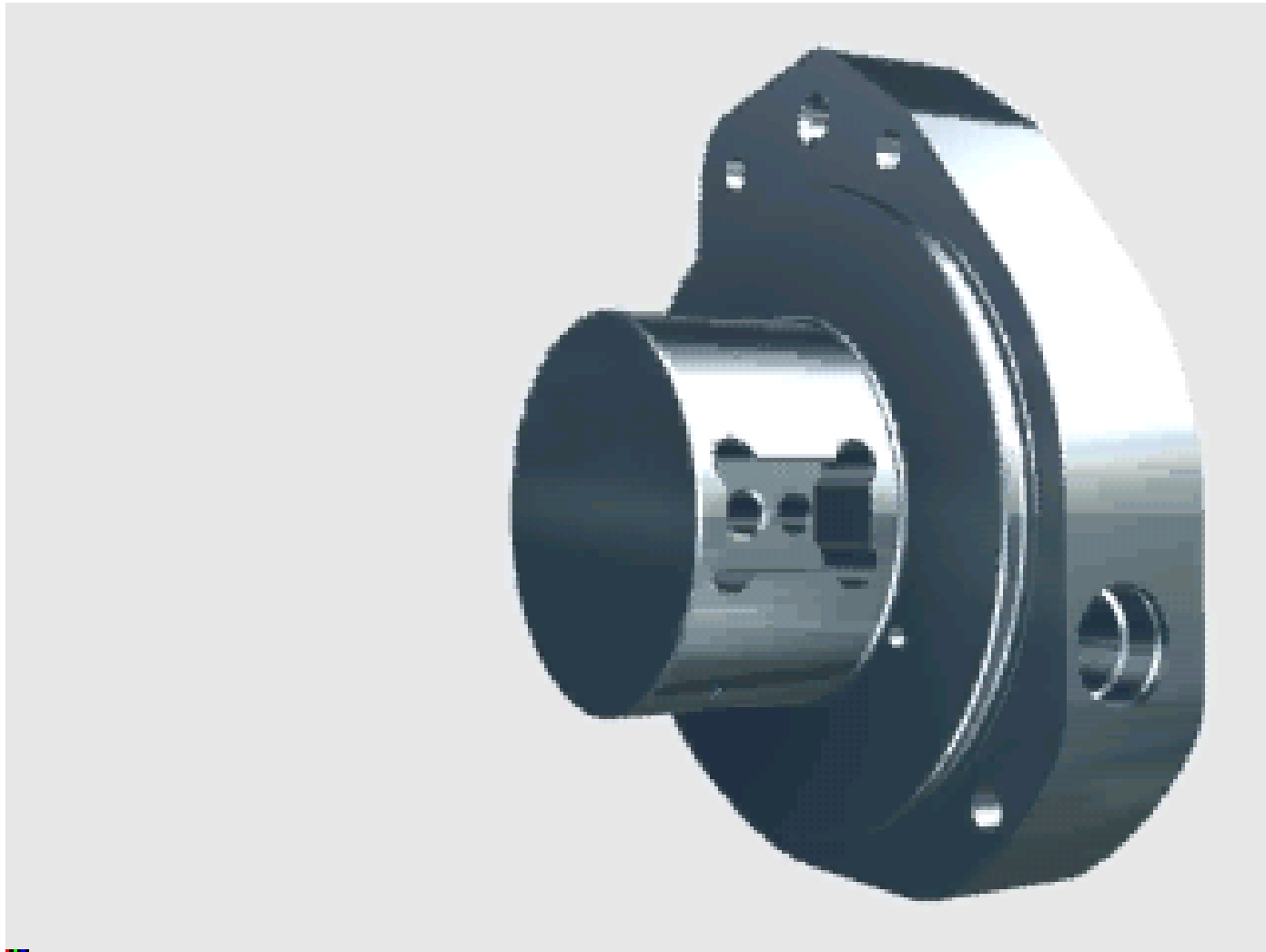
High Pressure Pump



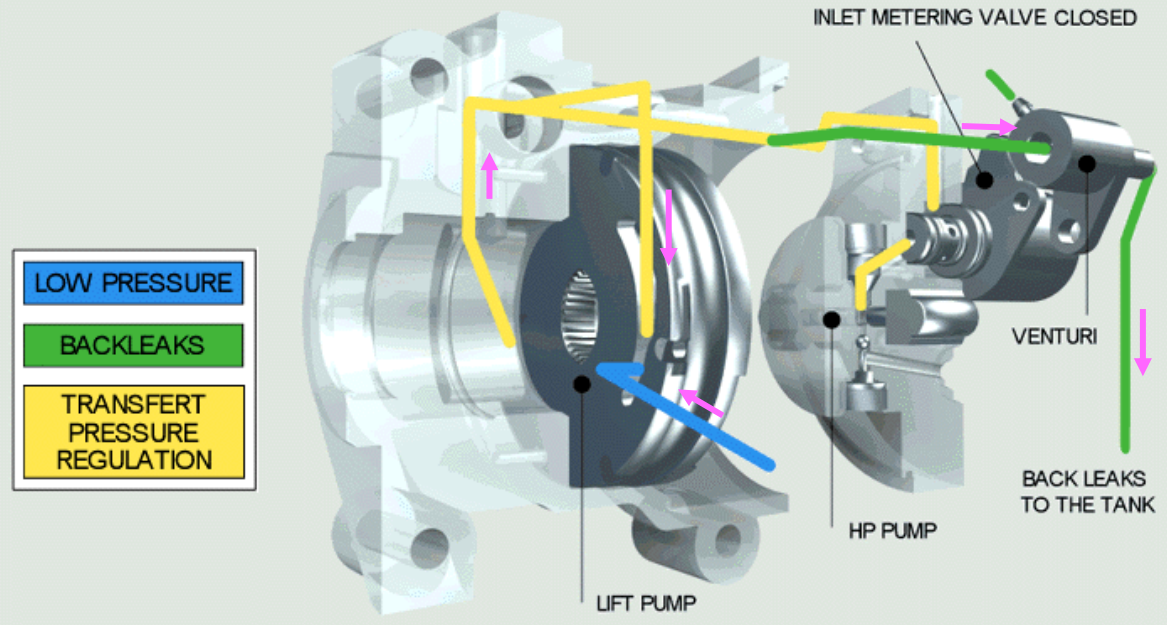
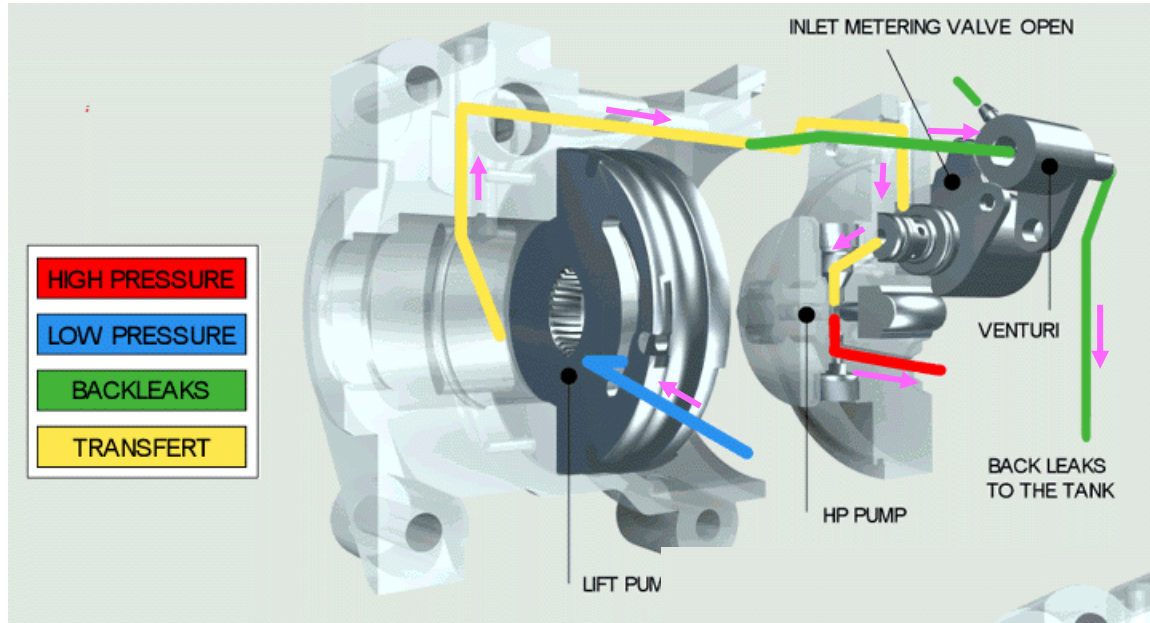
A detailed technical cross-section drawing of a mechanical assembly. The drawing shows various components, including a central shaft with gears or pulleys, a housing with internal features, and a complex assembly on the right side. The components are labeled with circled numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11. The drawing uses standard engineering conventions for cross-sections, with hatching indicating different materials or sections.



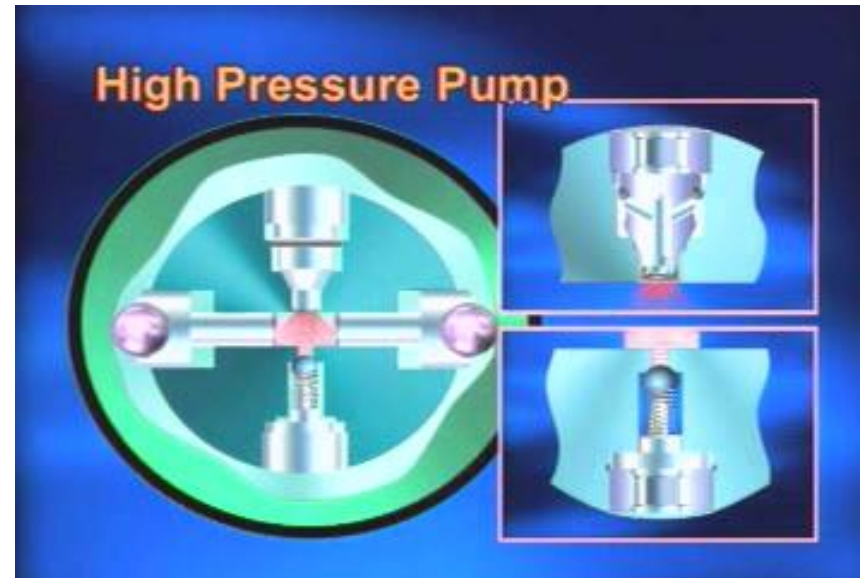
High Pressure Pump



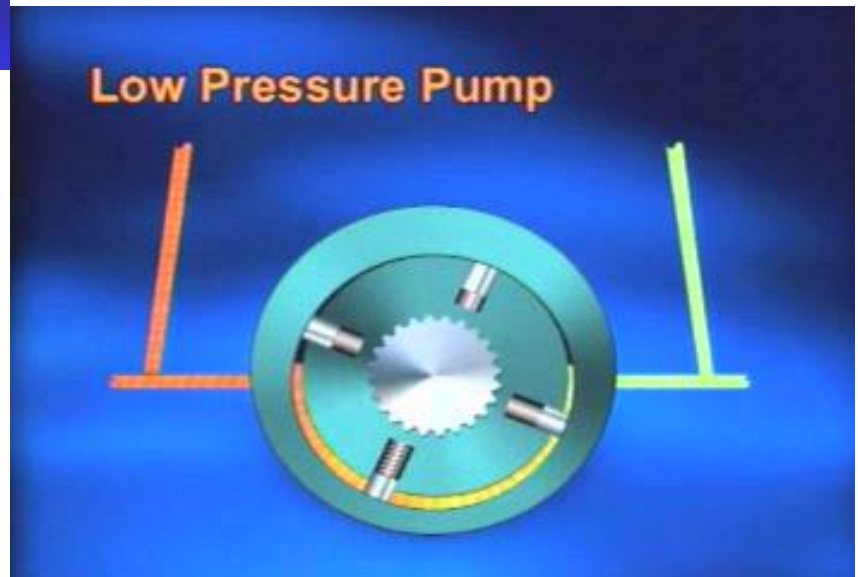
High Pressure Pump



High Pressure Pump



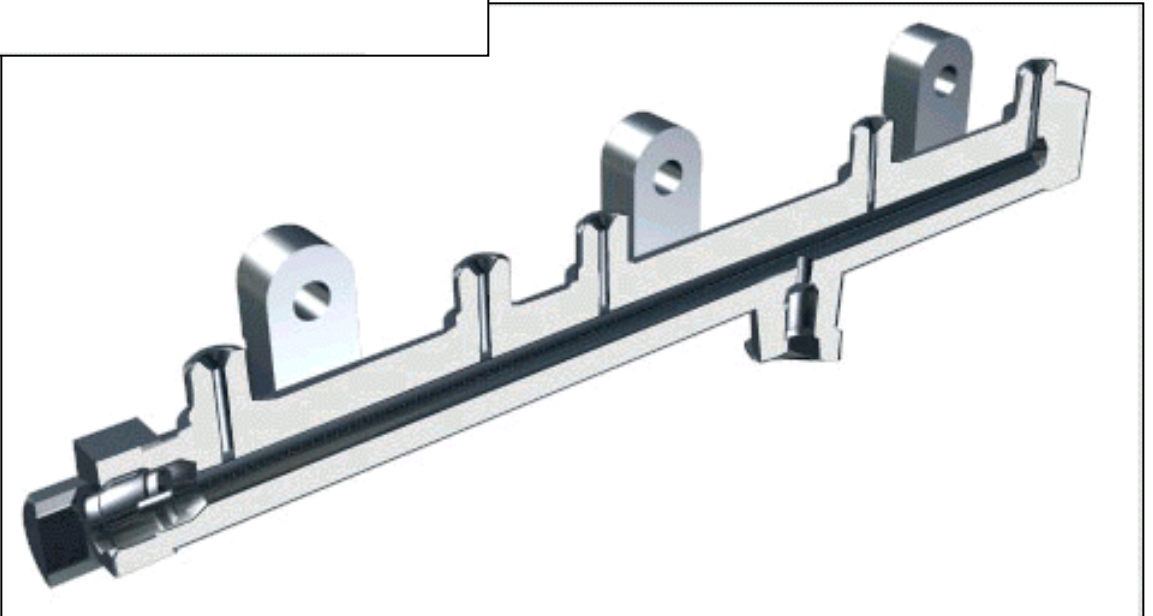
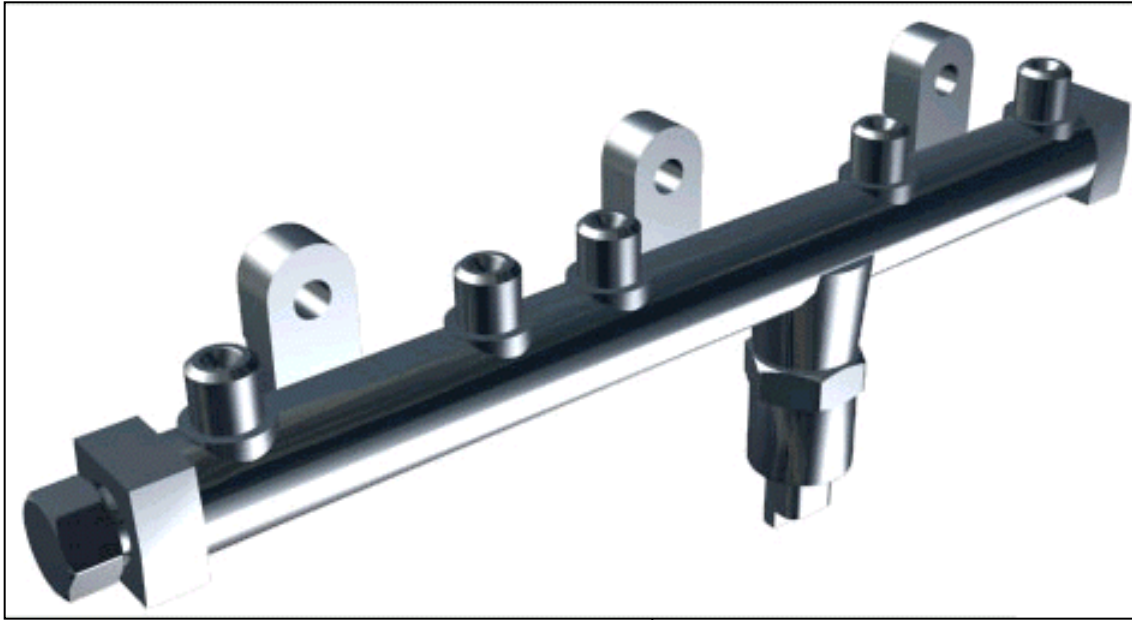
Low Pressure(Feed) Pump of High Pressure Pump



Common Rail (Linear Rail)



Common Rail (Linear Rail)



High Pressure Pipes

1. 4 HP pipes rail / injector
2. 1 HP pipe pump / rail

If the Injector or main rail feed pipes are removed they MUST BE REPLACED WITH NEW



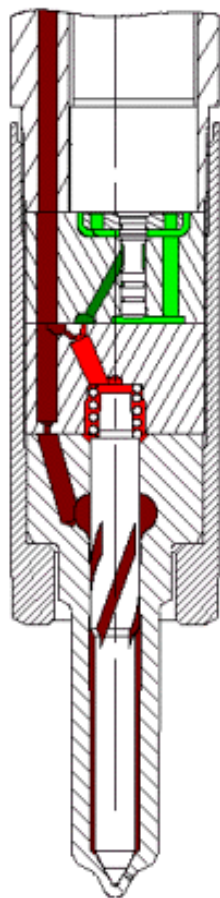
Injector



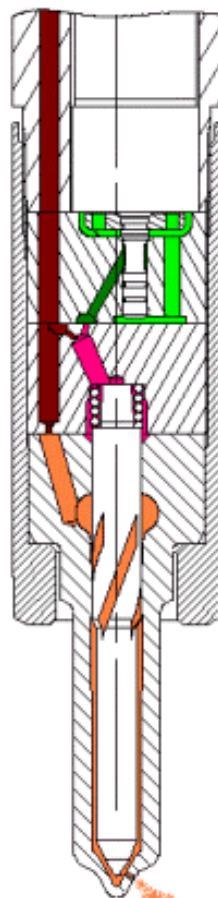
Injector Operation



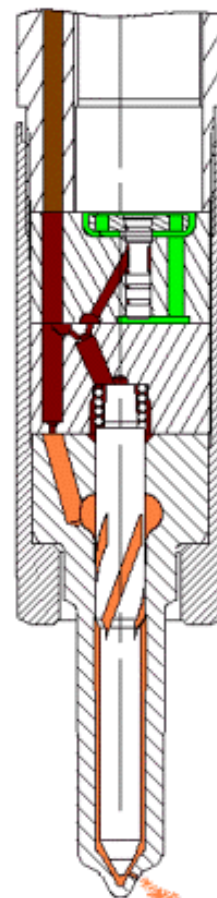
VALVE CLOSED
NOZZLE CLOSED
NO INJECTION



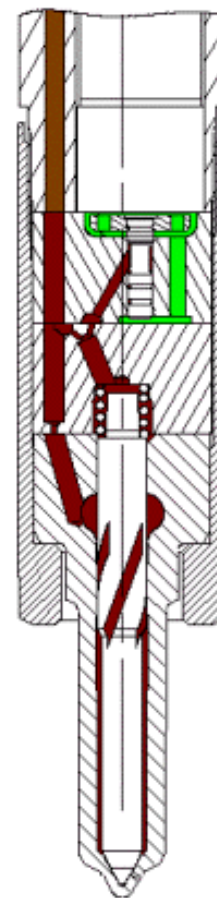
VALVE OPEN
NOZZLE CLOSED
FUEL DISCHARGE



VALVE OPEN
NOZZLE OPEN

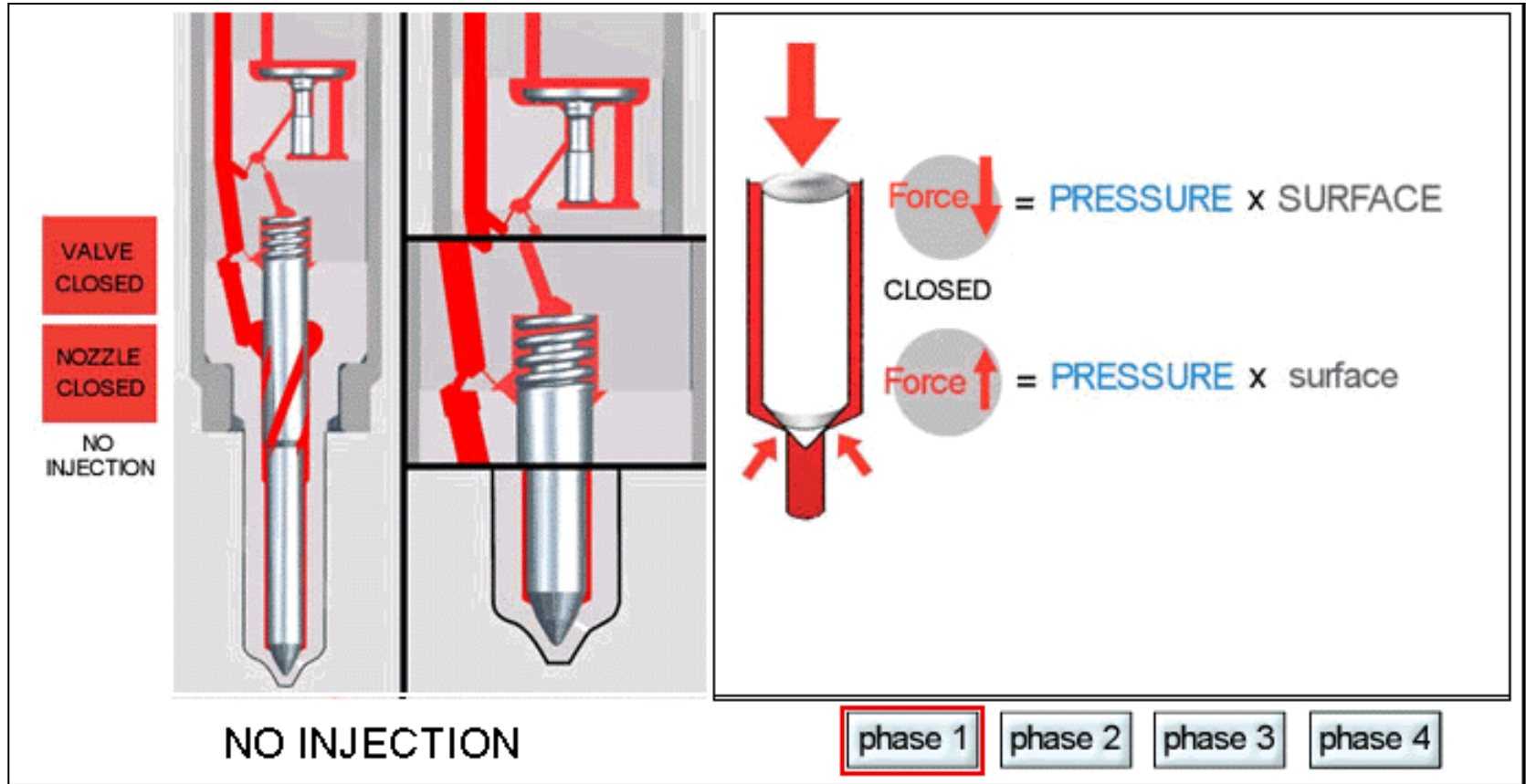


VALVE CLOSED
NOZZLE CLOSING

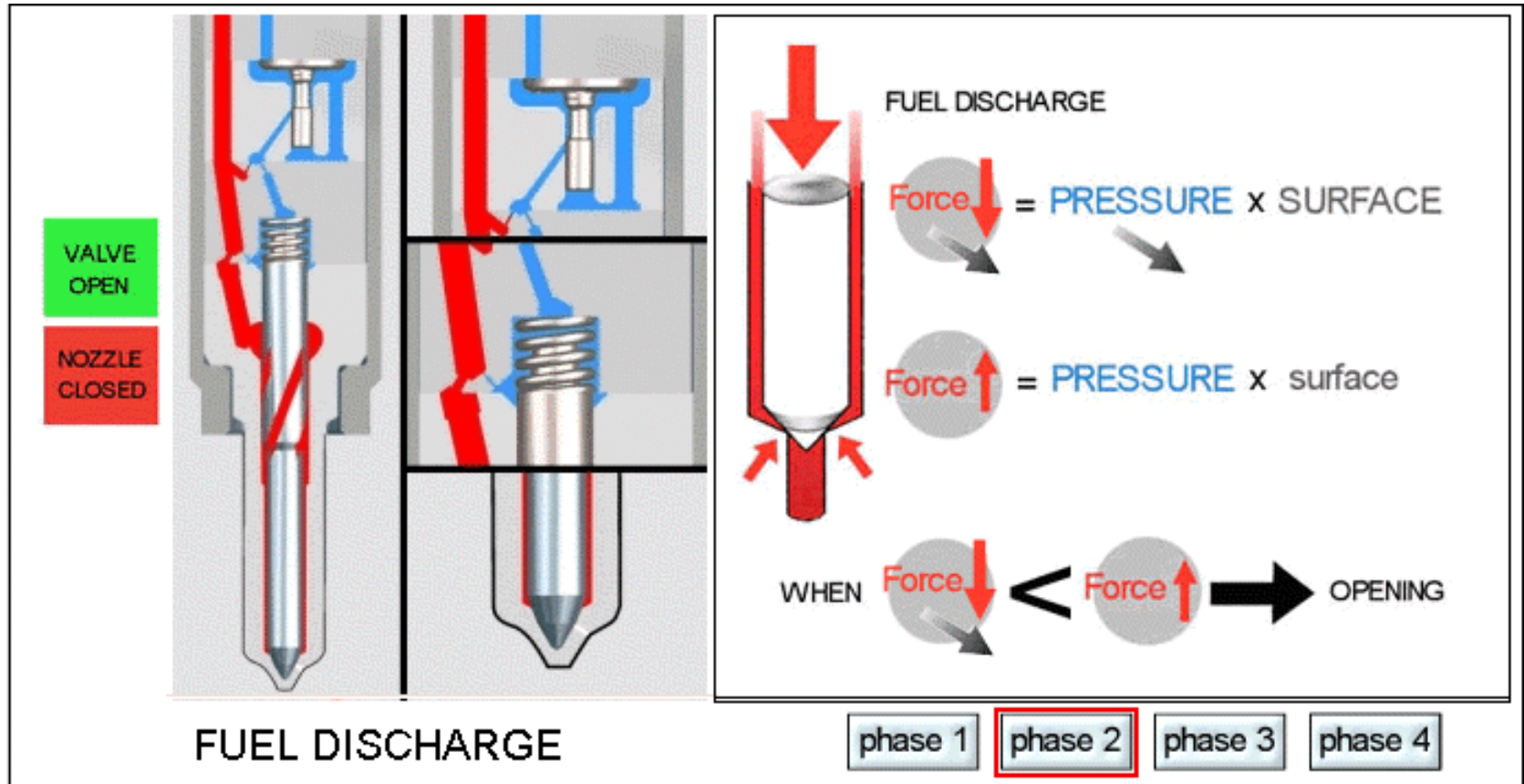


VALVE CLOSED
NOZZLE CLOSED
NO INJECTION

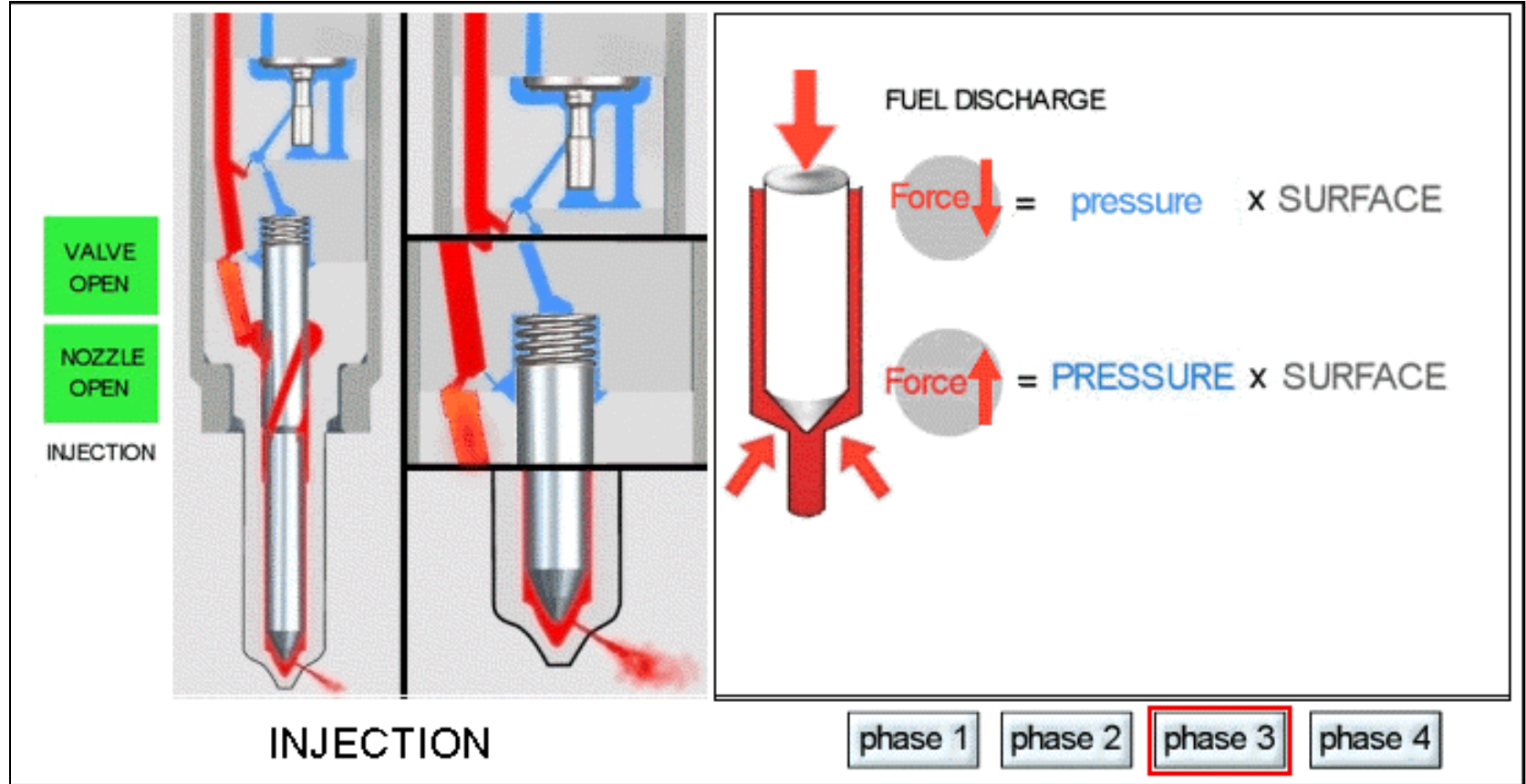
Injector Operation (Phase 1)



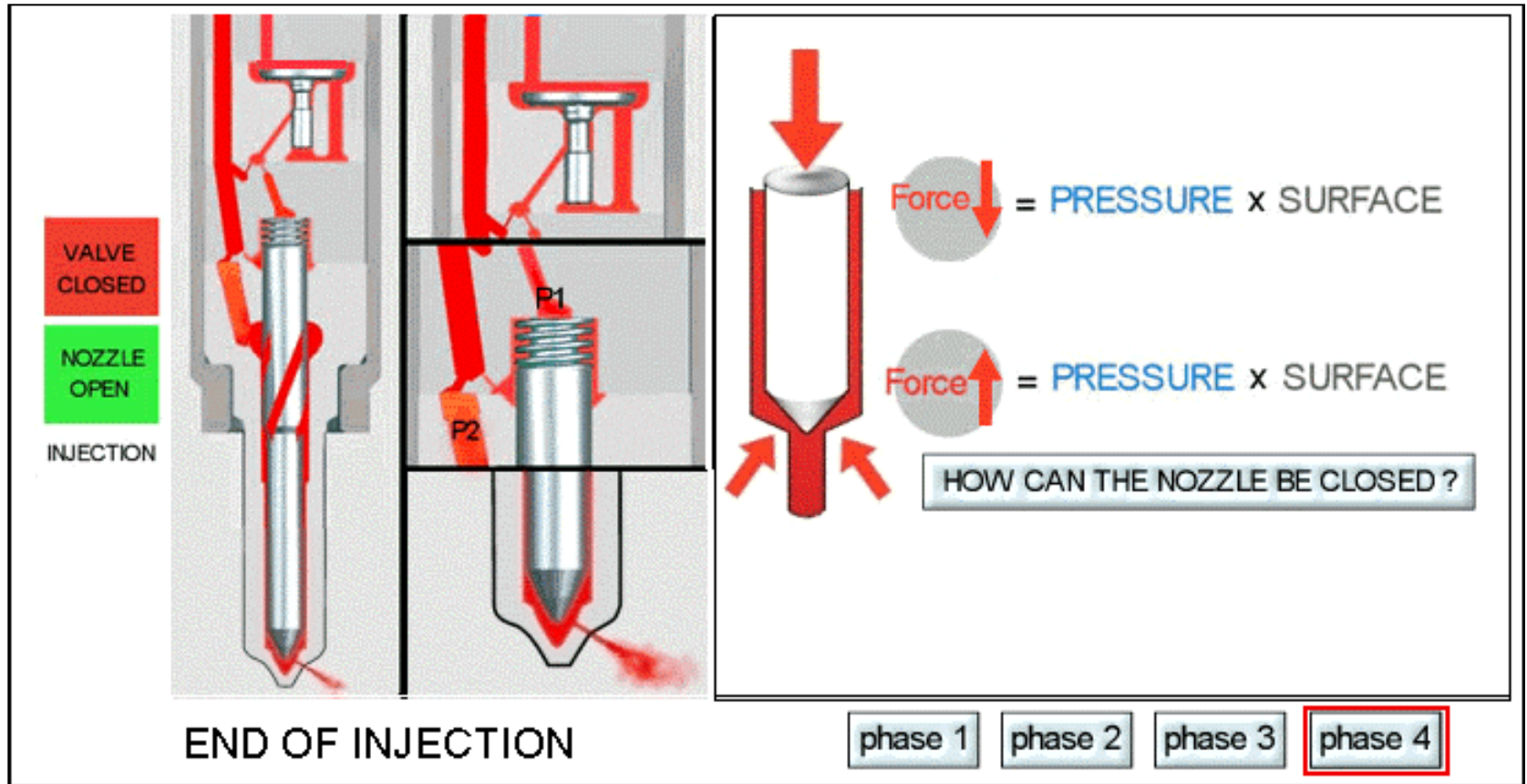
Injector Operation (Phase 2)



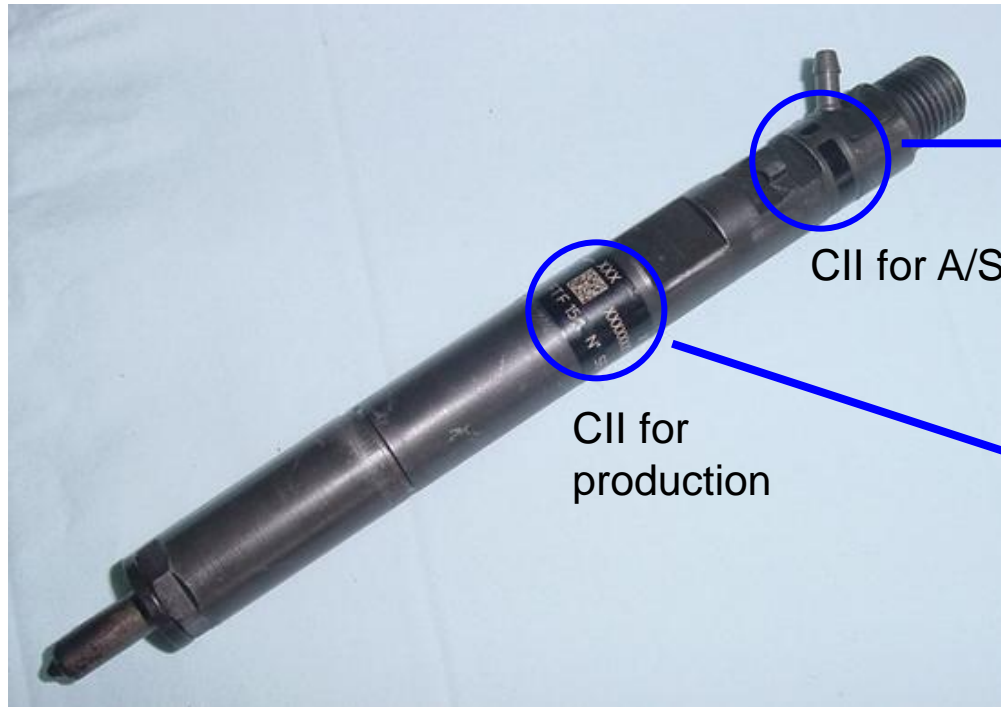
Injector Operation (Phase 3)



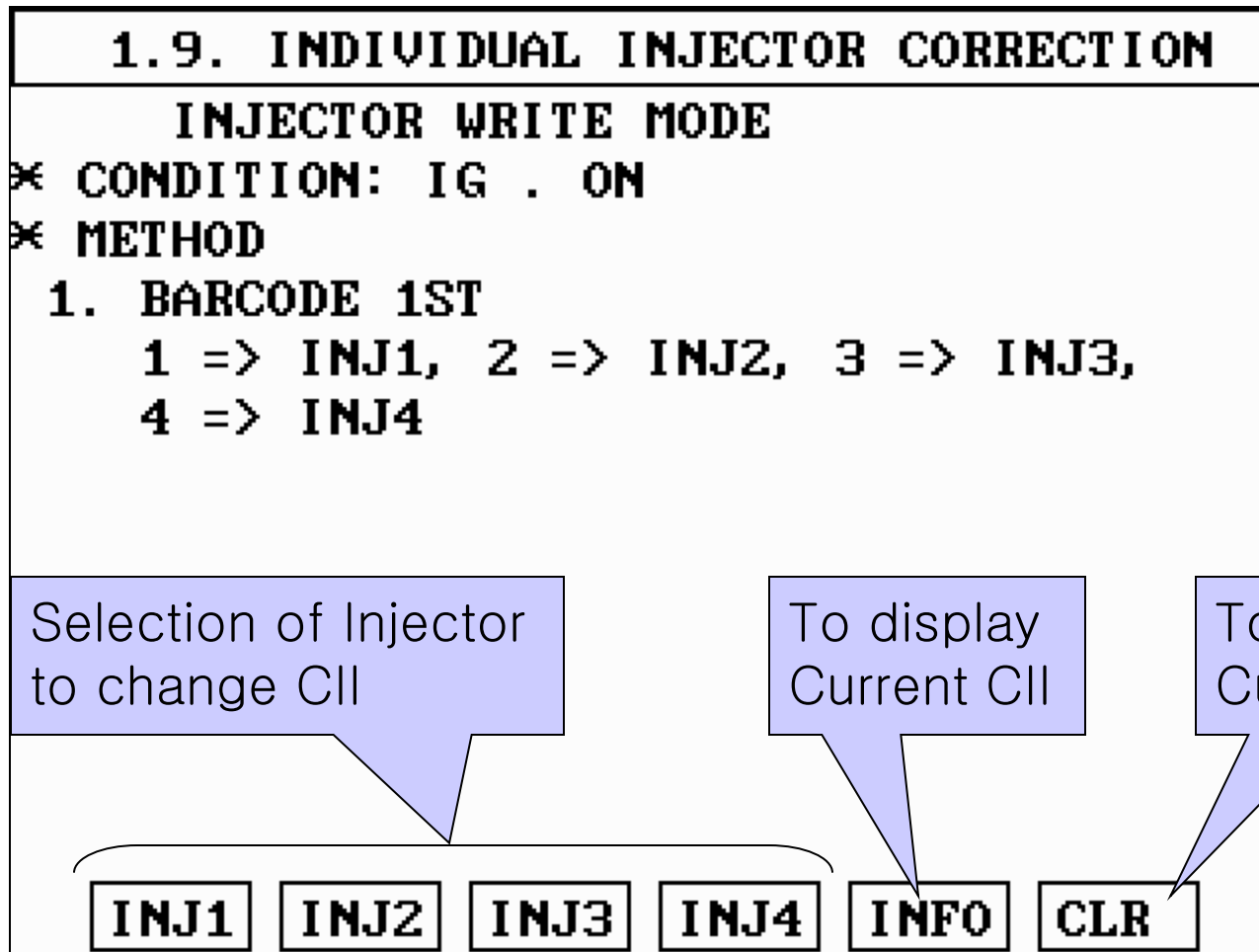
Injector Operation (Phase 4)



Calibration Individual Injector



Individual Injector Correction



* CII : Calibration Individual Injector

1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 1	A8	39	D3	DA	B5	AD	6E	AC
INJECTOR 2	4C	3E	24	60	3E	09	F1	8E
INJECTOR 3	84	39	DD	60	41	D2	30	30
INJECTOR 4	7C	3D	A3	DF	BE	25	D2	0E

Cleared(Default Value)

1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 1	30	42	04	20	42	02	10	10
INJECTOR 2	30	42	04	20	42	02	10	10
INJECTOR 3	30	42	04	20	42	02	10	10
INJECTOR 4	30	42	04	20	42	02	10	10

If CII is cleared from ECM

- DTC(P1300 INJECTOR CORRECTION DATA)is set
- Failsafe mode and fixed 1250rpm
- No acceleration
- Check engine lamp “on”

1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 1

READ ECU DATA

<<<< A8 39 D3 DA B5 AD 6E AC >>>>

2. BARCODE DATA 2ND ~ 17TH INPUT
, AND [ENTER] KEY

A

B

C

D

E

F



1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 2

READ ECU DATA

<<<< 4C 3E 24 60 3E 09 F1 8E >>>>

2. BARCODE DATA 2ND ~ 17TH INPUT
, AND [ENTER] KEY

A

B

C

D

E

F



1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 3

READ ECU DATA

<<<< 84 39 DD 60 41 D2 30 30 >>>>

2. BARCODE DATA 2ND ~ 17TH INPUT
 , AND [ENTER] KEY

A

B

C

D

E

F



1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 4

READ ECU DATA

<<<< 7C 3D A3 DF BE 25 D2 0E >>>>

2. BARCODE DATA 2ND ~ 17TH INPUT
, AND [ENTER] KEY

A

B

C

D

E

F



1.9. INDIVIDUAL INJECTOR CORRECTION

INJECTOR 4

READ ECU DATA

<<<< 30 42 04 20 42 02 10 10 >>>>

2. BARCODE DATA 2ND ~ 17TH INPUT
, AND [ENTER] KEY

7C3DA3DFBE

A	B	C	D	E	F
---	---	---	---	---	---

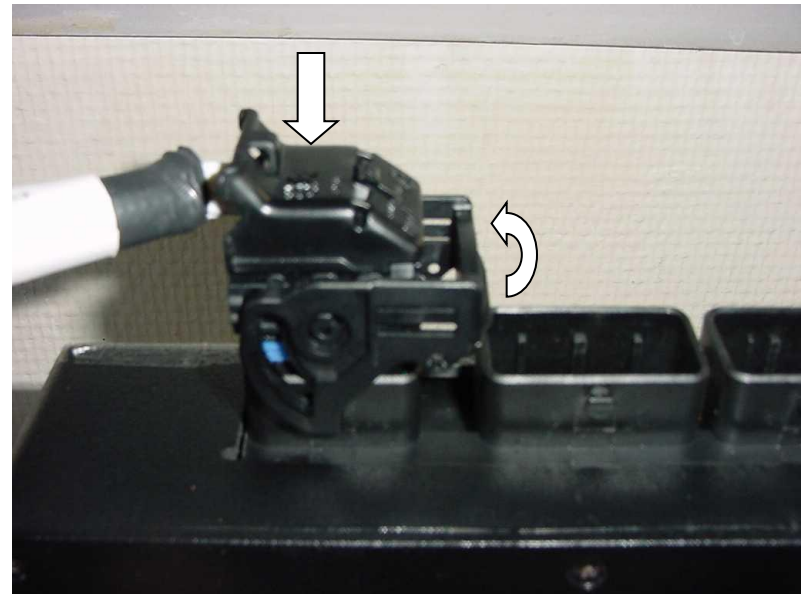
Ignition ON, Engine Stop

The correction is impossible on Engine Running Condition

ECM



Connection



Input / Output

AFS

Accelerator pedal sensor

CMP sensor

CKP sensor

Rail Pressure sensor

Knock sensor(Accelerometer)

Fuel Temperature sensor

ECT sensor

IAT sensor

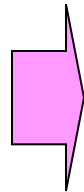
Vehicle Speed sensor

Brake switch

Clutch switch(M/T)

A/C switch

A/C Pressure sensor



ECM



Main Relay

Injector

Cooling Fan control

Air Heater

EGR Valve

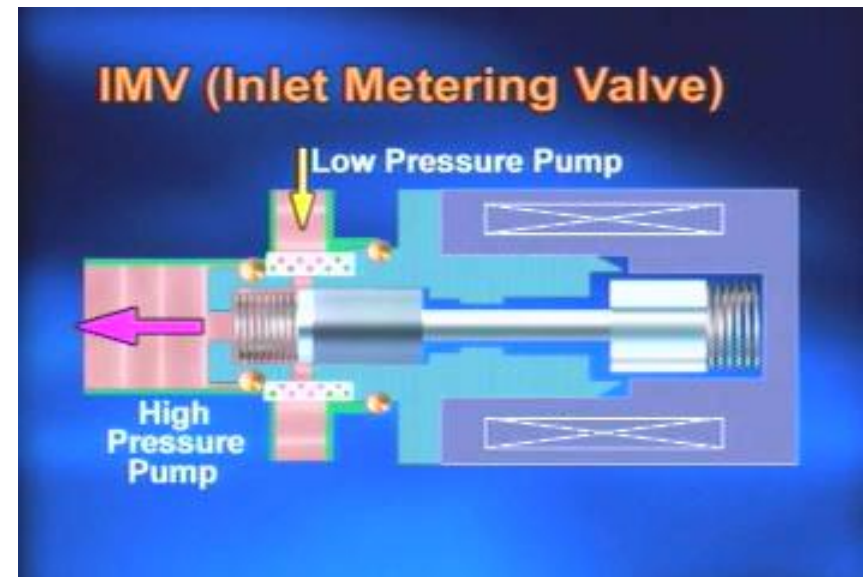
MIL lamp

Inlet Metering Valve

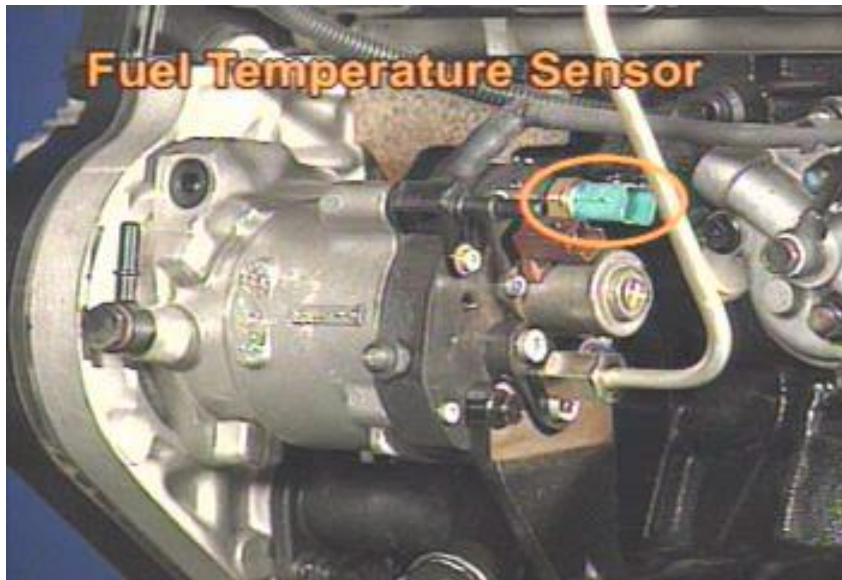
IMV (Inlet Metering Valve)



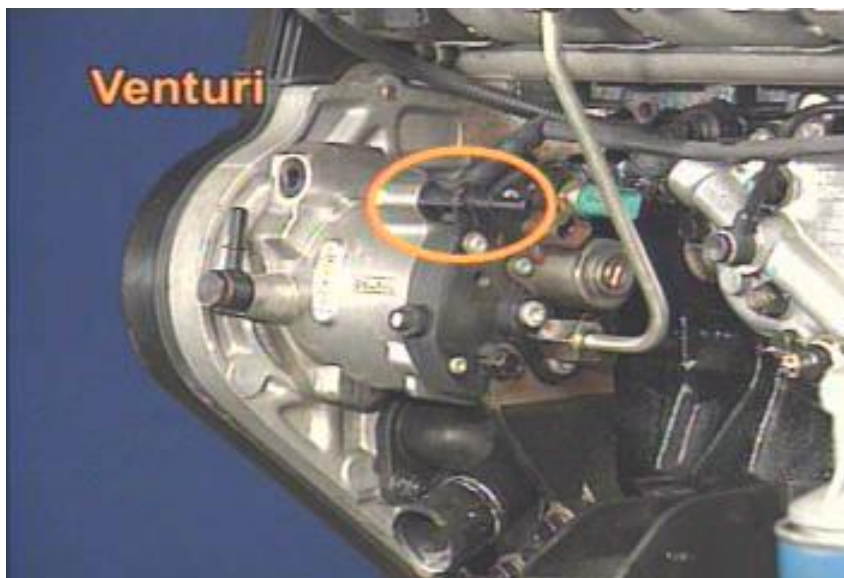
IMV (Inlet Metering Valve)



Fuel Temperature Sensor

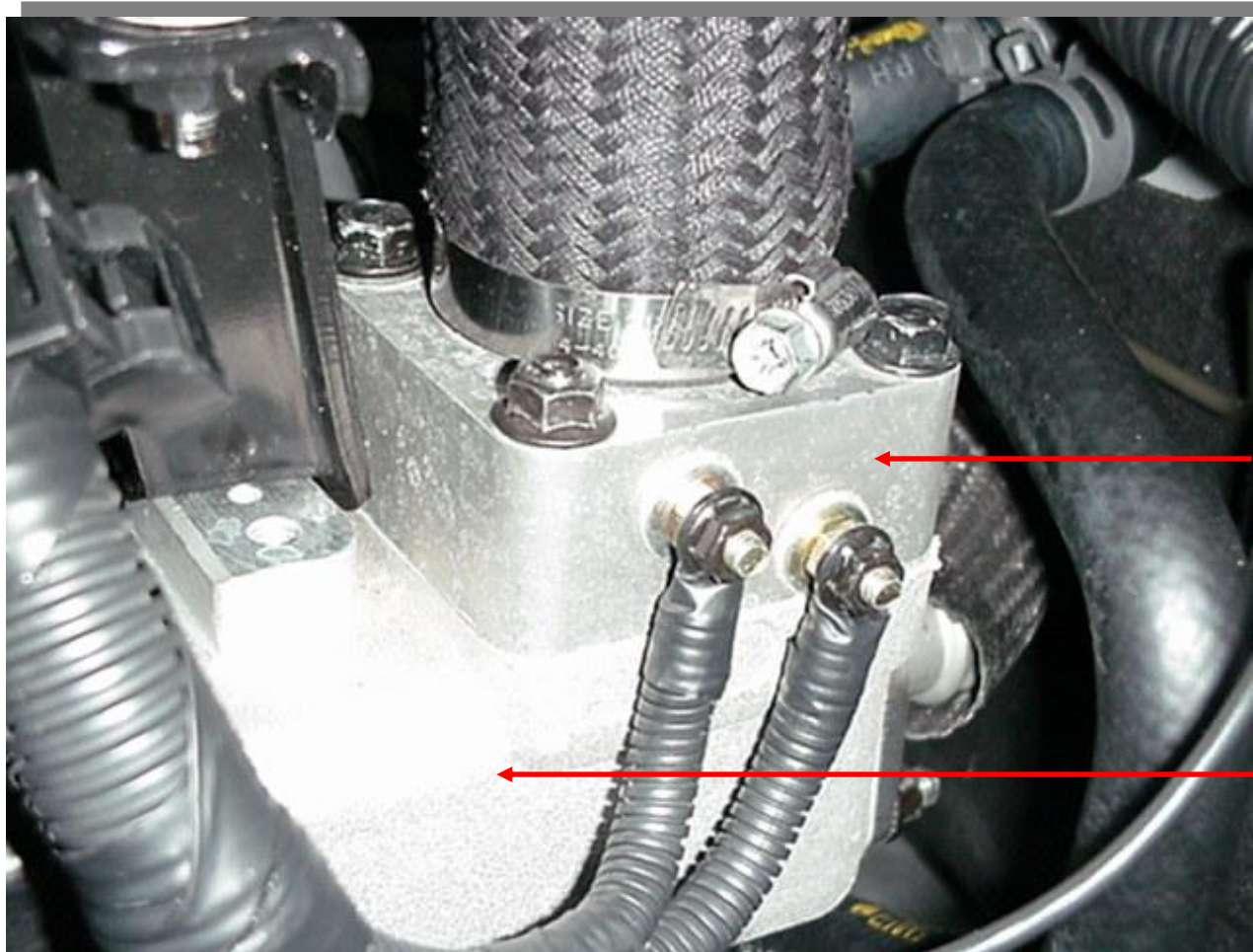


Venturi



Auxiliary

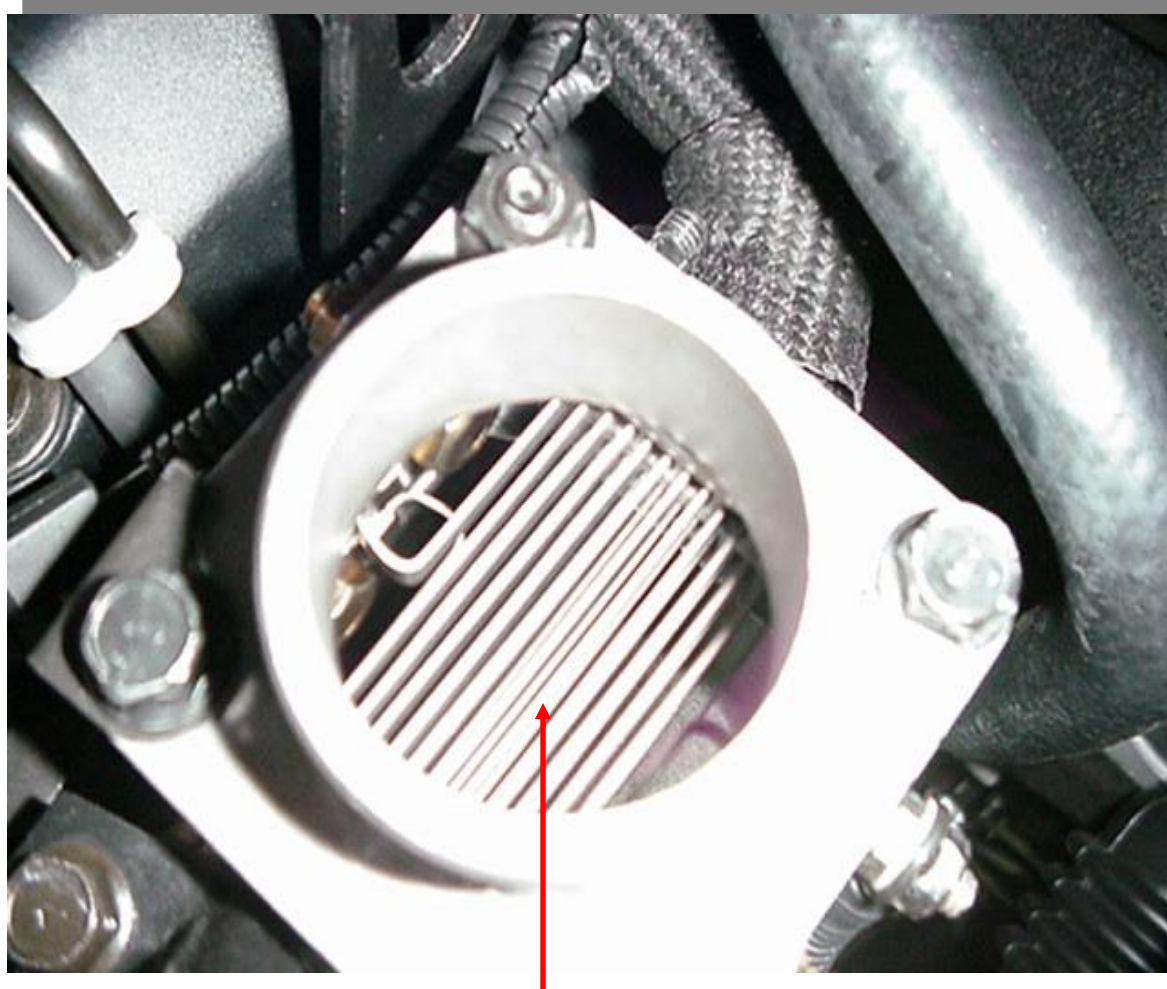
Air Intake Heater



Air Intake heater

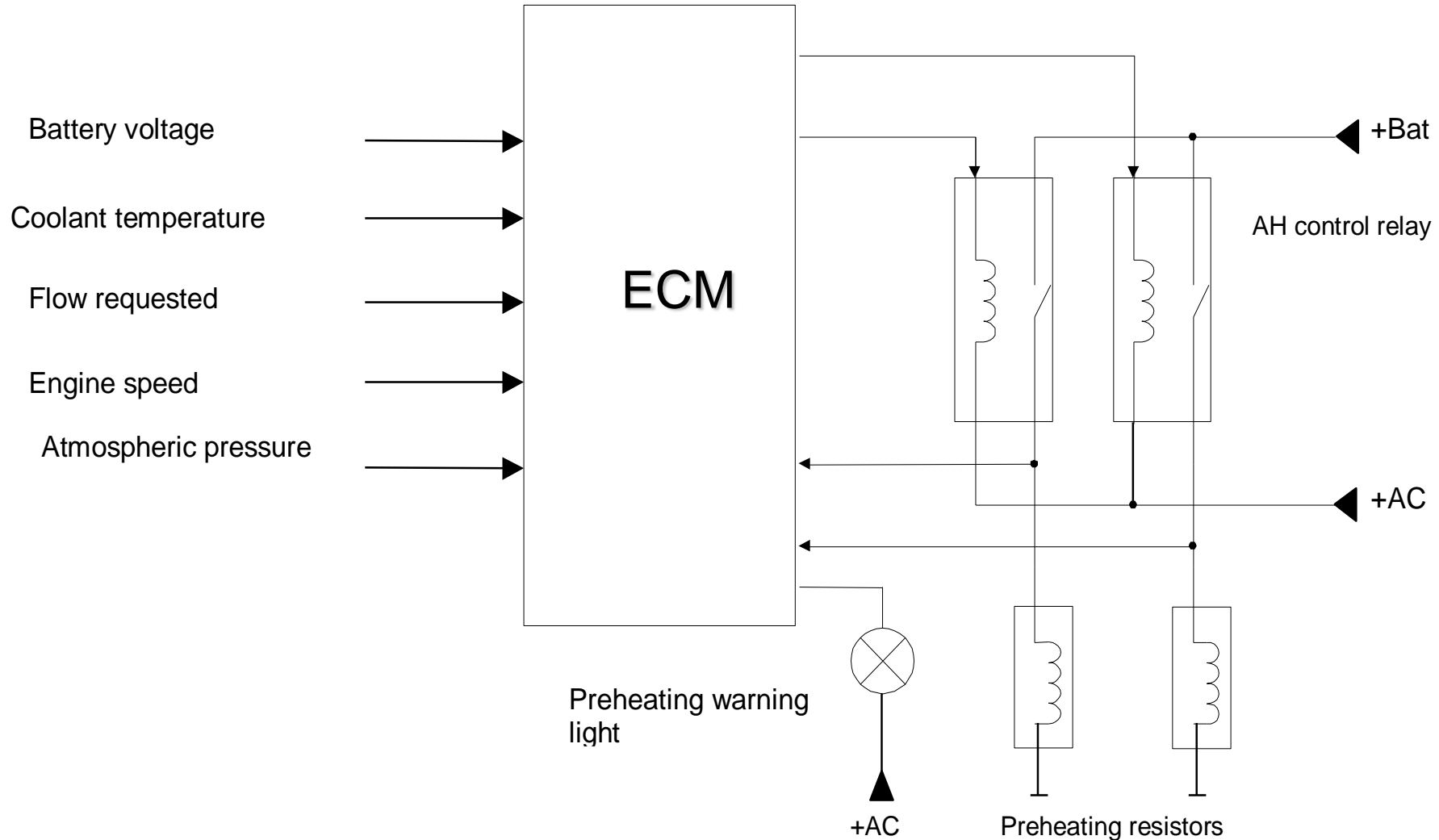
Air Intake manifold

Air Intake Heater



Heater element

Air Intake Heater



Air Intake Heater

Pre-heating

Variable preheating

Engine coolant temperature (°C)	-30	-25	-20	-15	-10	-5	0	20
Illumination (s)	28	25	15	10	5	3	2	0

Fixed preheating

This begins when the preheating warning light extinguishes. During this second phase, the preheating resistors remain supplied for 5 seconds.

Post-heating

Coolant temperature (°C)	-20	-10	0	20	80
Duration of post-heating (s)	100	50	25	10	10

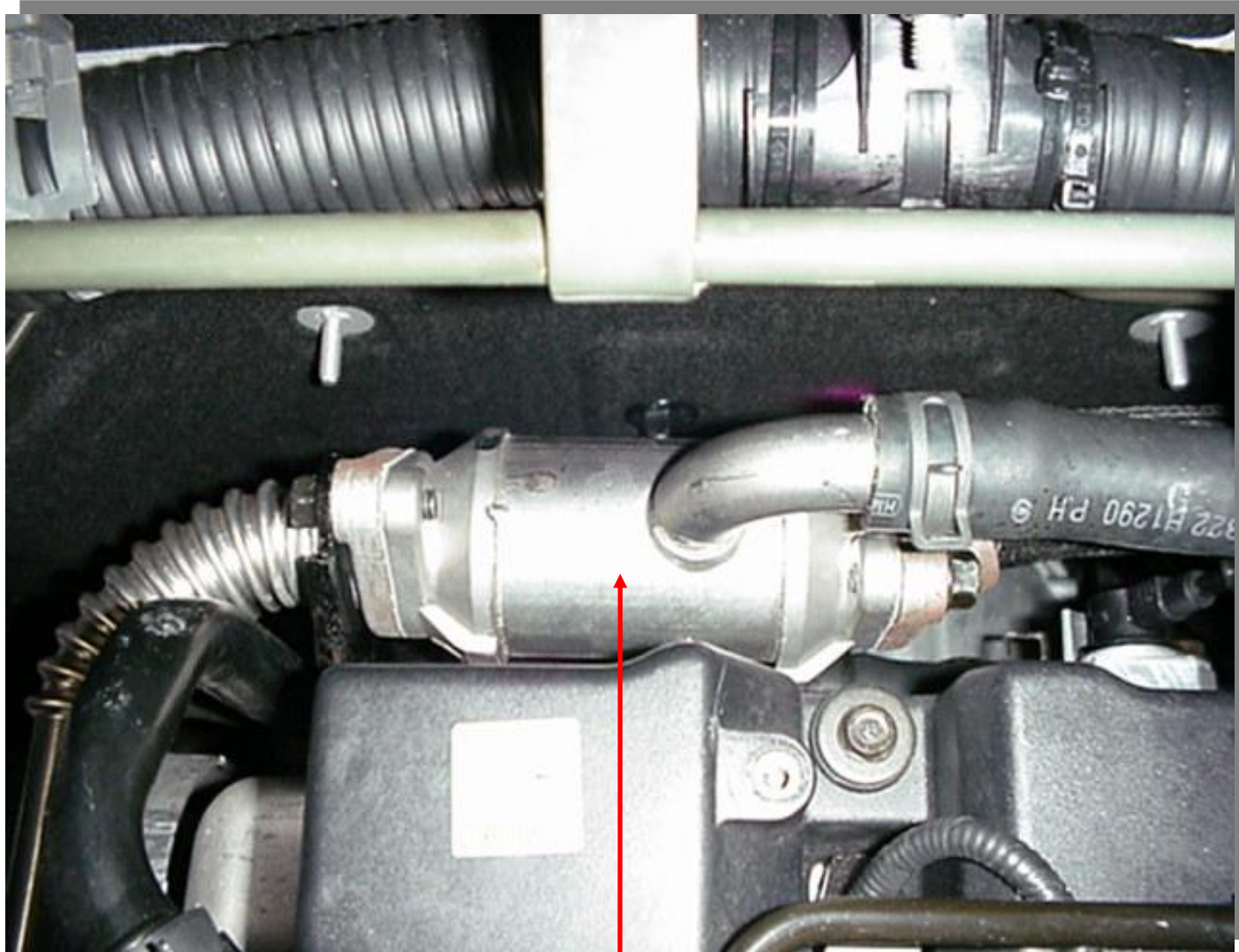
Exhaust Gas Return (EGR)

EGR Valve

Solenoid Valve



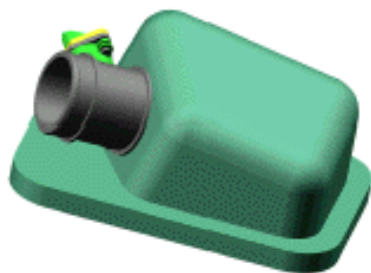
EGR Cooler (Heat Exchanger)



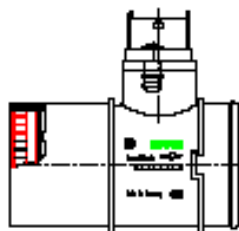
Heat exchanger

Mass Air Flow Sensor

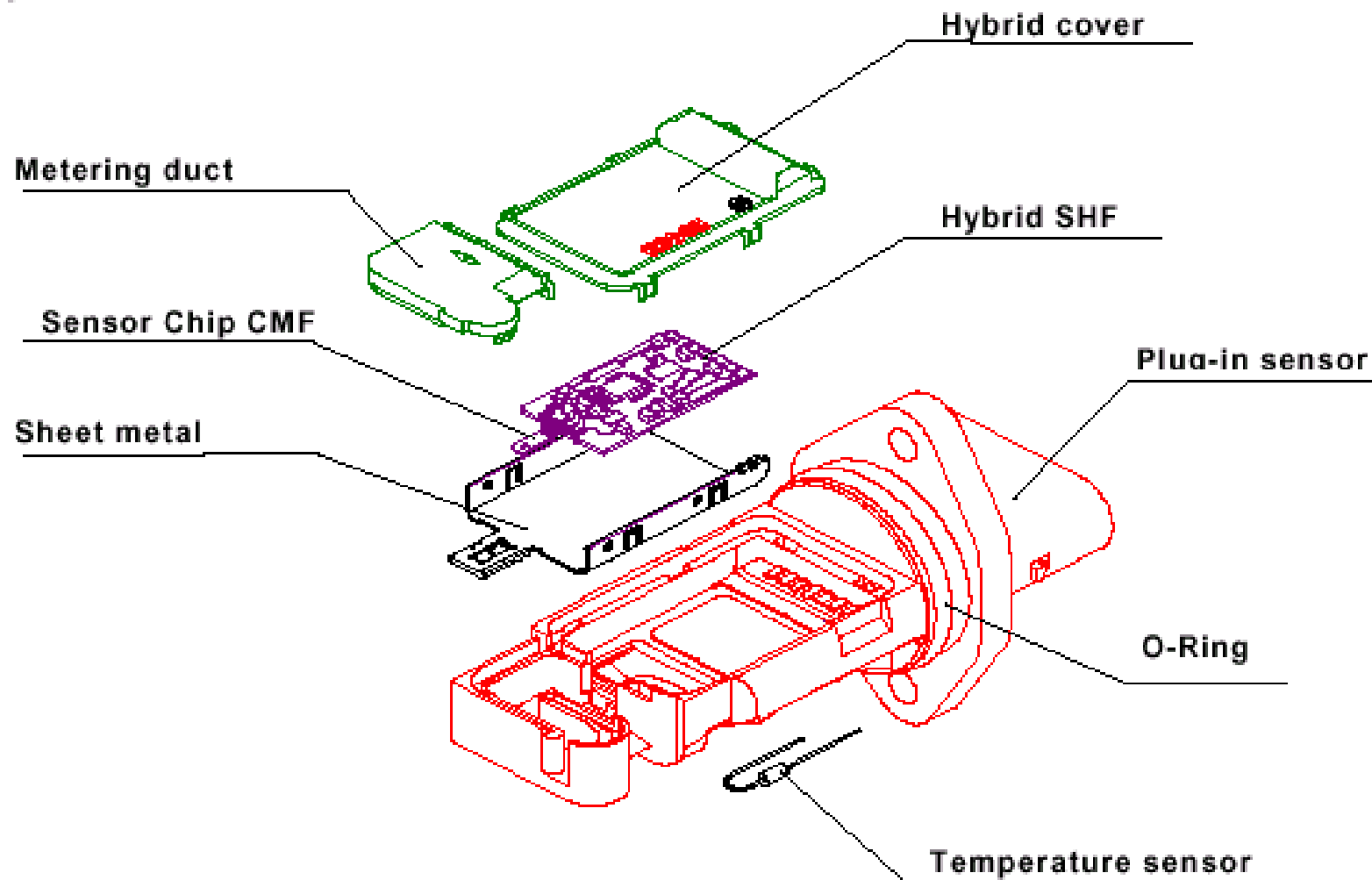
**Direct installation at the air cleaner housing
without additional intake duct**



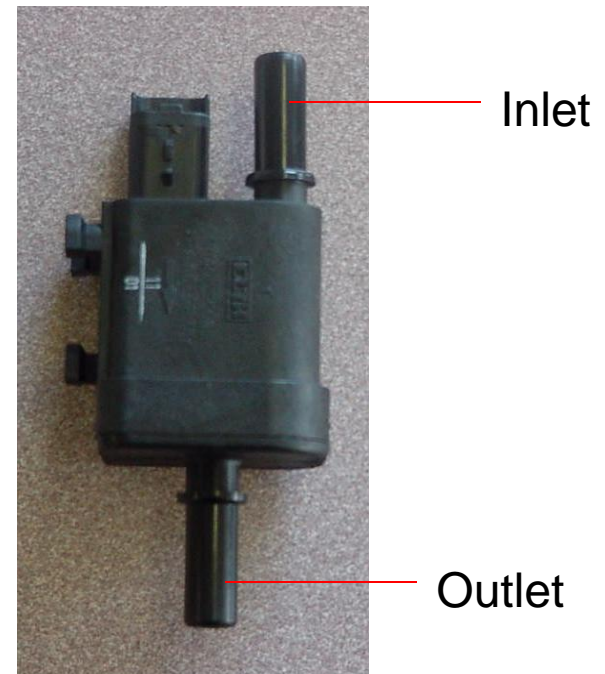
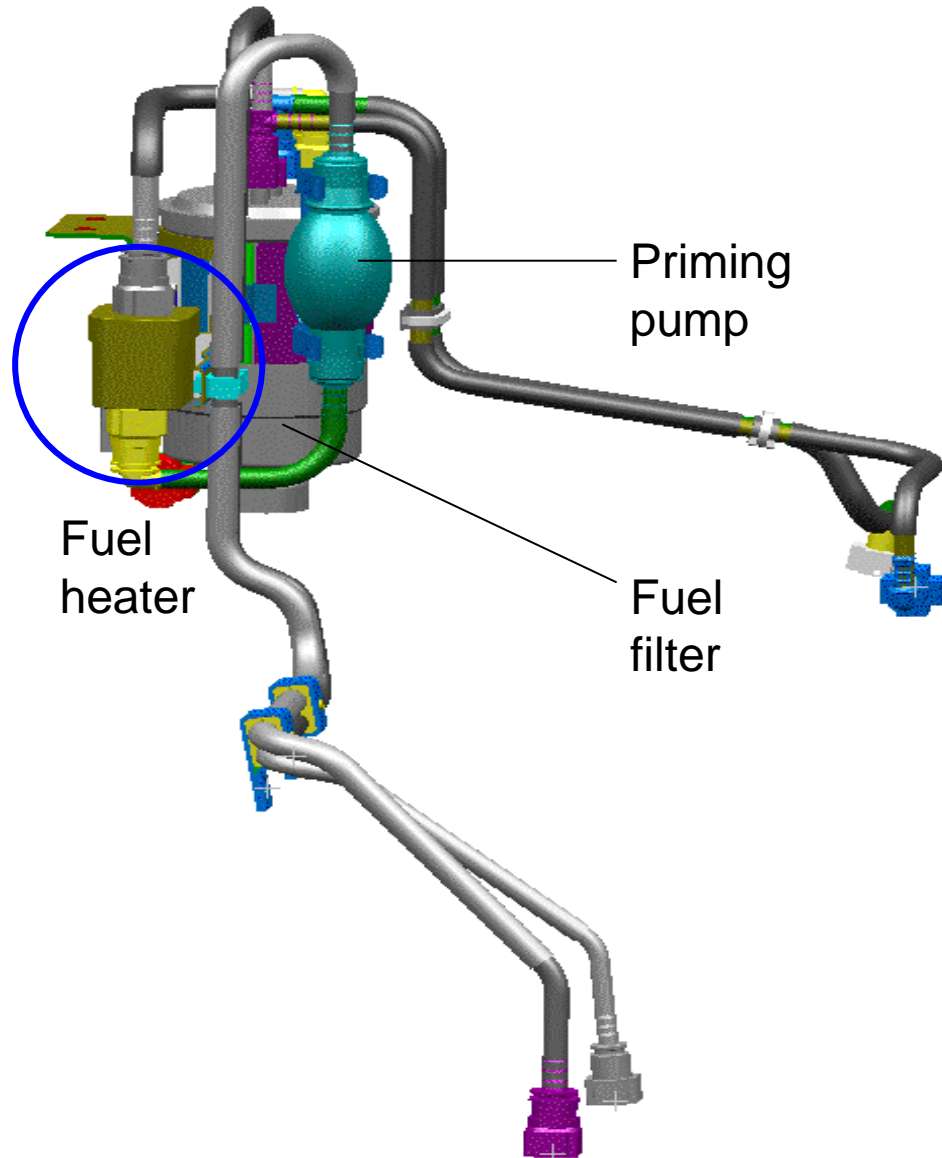
- * Space saving installation
- * Little sensitivity to disturbed flow by using a combined flow straightener
- * High precision (plug-in module is trimmed in the metering tube)
- * Cost optimized design (minimum number of parts)



Mass Air Flow Sensor



Fuel Heater



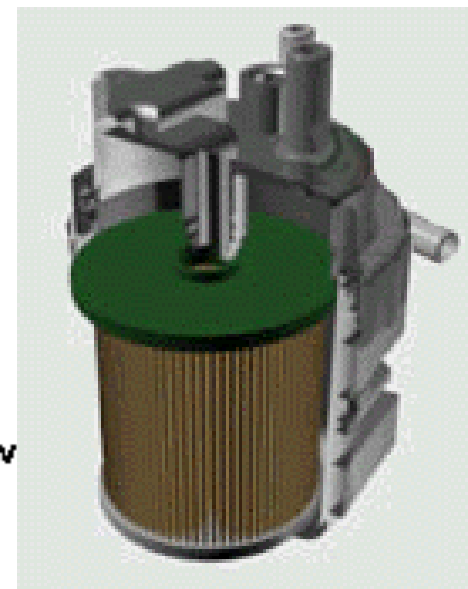
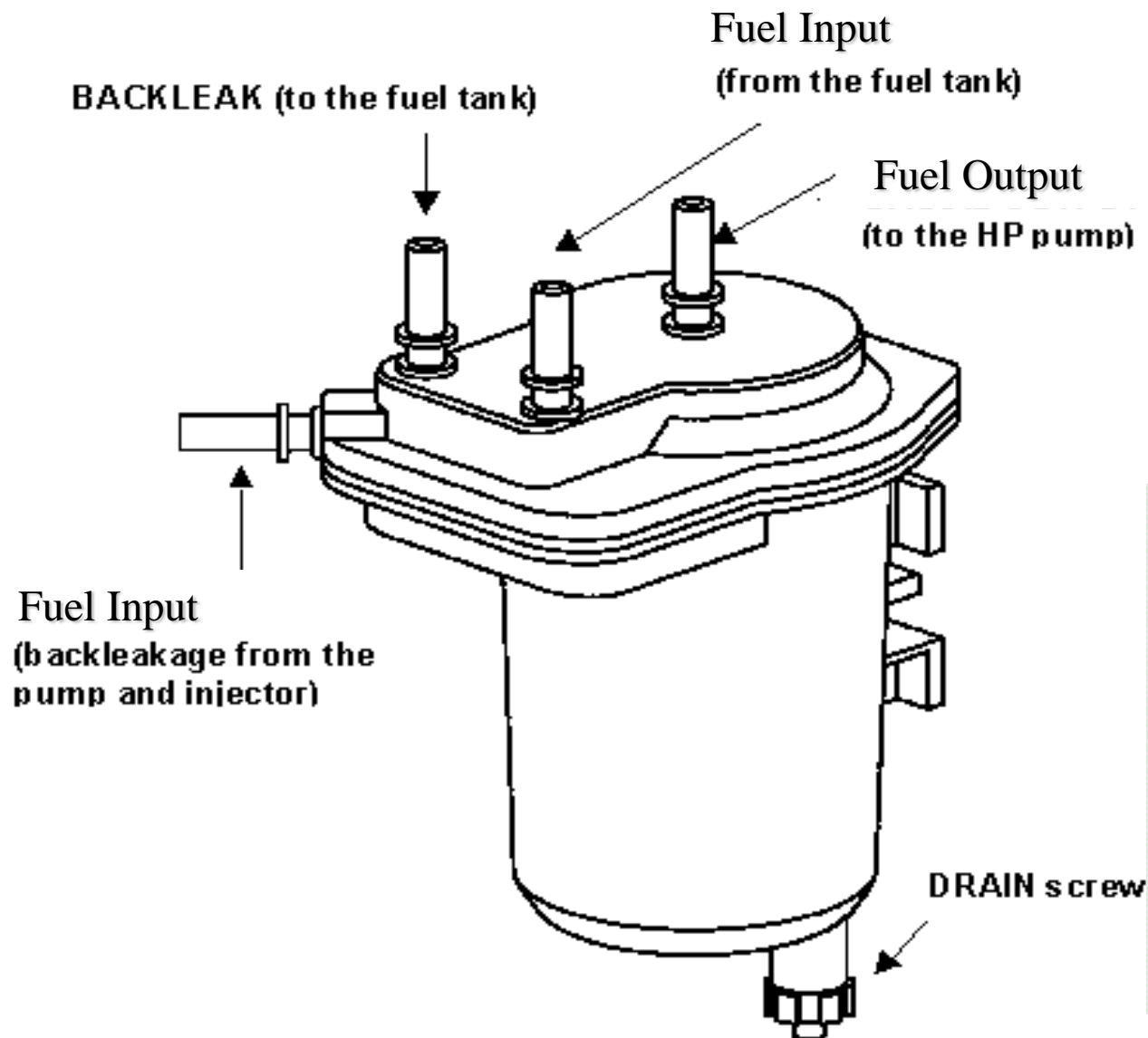
Priming Pump



Accelerator Pedal Position Sensor

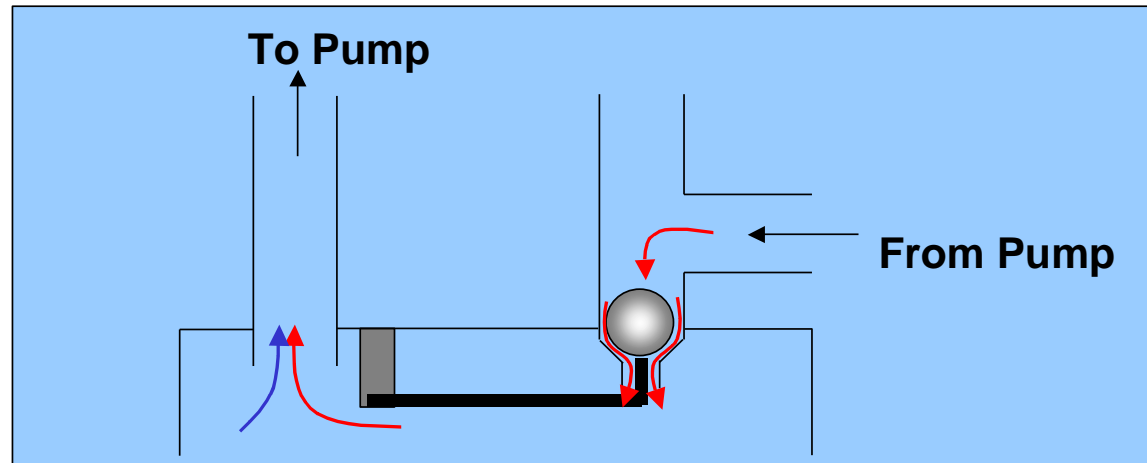


Fuel Filter

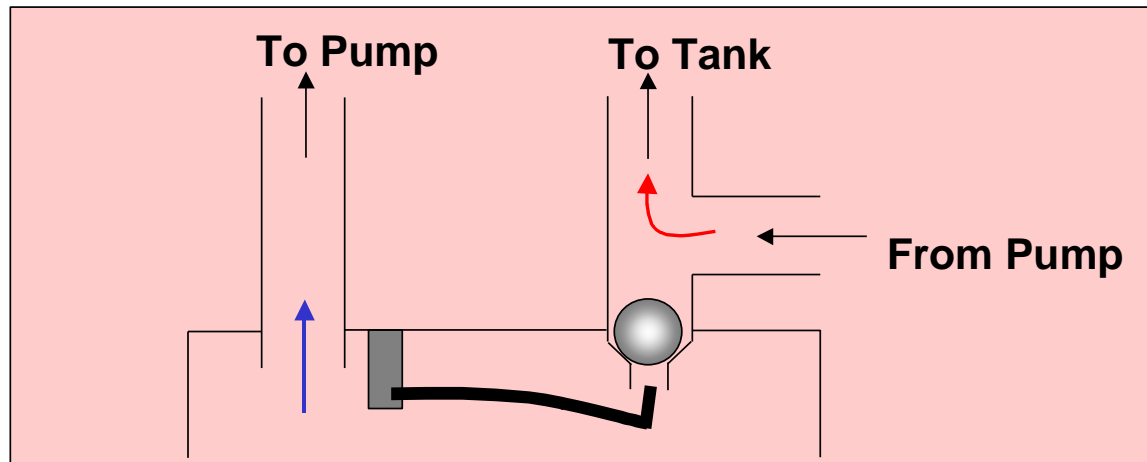


Fuel Filter (Recirculation)

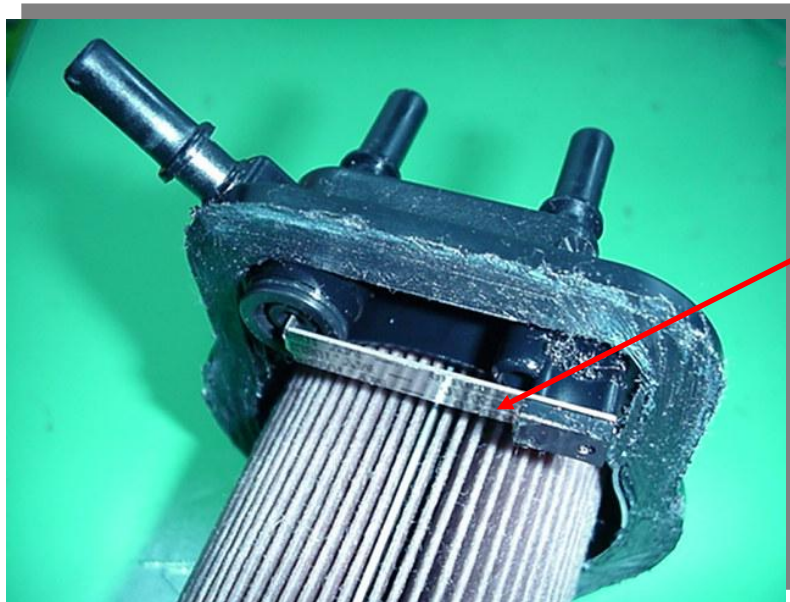
Cold



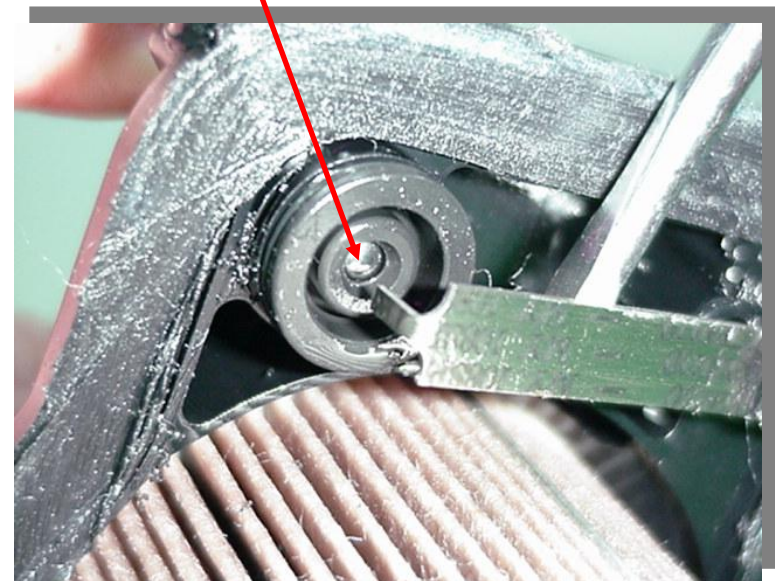
Hot



Fuel Filter



Bi-metal strip



Steel ball

Handling

Safety Instructions

It is strictly prohibited to smoke or to eat while working on the Common Rail injection system.

It is essential to disconnect the battery before any work is done on the Common Rail injection system.

It is strictly forbidden to work on the Common Rail injection system with the engine running.

It is necessary to read the value of the rail pressure and of the diesel oil temperature with the engine running.

It is necessary to read the value of the rail pressure and of the diesel oil temperature with the aid of the diagnostic tool before any work is done on the fuel circuit. The opening of the circuit can only begin if the diesel oil temperature is less than 50°C (122 ° F) and the rail pressure is close to 0 bar. If it is not possible to communicate with the computer, wait for 5 minutes after the engine has stopped before starting any work on the fuel circuit.

Safety Instructions

It is strictly prohibited to supply an actuator directly off an external power supply.

The injector must not be dismantled.

The HP sensor must not be removed from the rail. If the HP sensor fails, It is essential to replace the complete rail.

The IMV, the diesel temperature sensor and the venturi must not be removed from the pump. If one of these components is faulty, the whole pump must be replaced.

The HP pipes are not reusable : a removed pipe must be replaced.

Decarbonizing the injector in an ultrasonic bath is strictly prohibited.

The computer's metal casing must never be used as an earth.

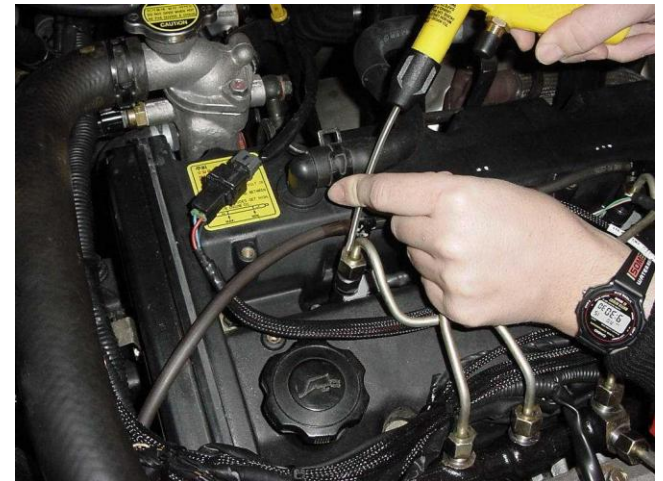
The packaging of the spare parts should be opened just before they are used. Moreover, the sealing plugs must not be removed until the final connection is made. The plugs and the sealed pouches must be discarded after use.

Removal a rail/injector pipe(rail/HP pump)

1. Clean the nuts of the HP unions with a solvent (CARCLEAN type) applied with a clean brush.



2. Vacuum the particles with the aid of a 'BLOVAC BV11' type suction device(Figure4).



Removal a rail/injector pipe(rail/HP pump)

3. Disconnect the injector with the aid of pliers, applying pressure to the locking clips on the side of the connector.



Removal a rail/injector pipe (rail/HP pump)

4.. Slacken the nut screwed onto the injector using a 17 mm(0.67 in) open wrench(Figure4)



5. Slacken the nut screwed onto the rail using a 17 mm(0.67 in) open wrench(Figure 5).



* Notice

It is important to position the wrench level with the solid end of the nut, in order to apply the stresses to the strongest part of the nut. If the torque is applied to the open end of the nut, there is a risk of distortion of the nut when it is tightened. Or use a pipe-wrench with cloth.

Removal a rail/injector pipe (rail/HP pump)

6. Move the nut along the pipe, keeping the olive in contact with the injector cone(Figure 6) and vacuum the particles in the contact area between the olive and the cone, using a pneumatic suction device.
7. Carry out the same operation on the rail side.
8. Remove the pipe and vacuum the particles inside the injector cone with the aid of the pneumatic suction device (Figure 7).



Removal a rail/injector pipe (rail/HP pump)

9. Carry out the same operation on the rail side.
10. Immediately seal the HP outlets with the aid of the recommended plugs (Figure 8).



Plugs

Assembly a rail/injector pipe (rail/HP pump)

1. Take the new pipe out of its packing just before fitting it.

*** WARNING**

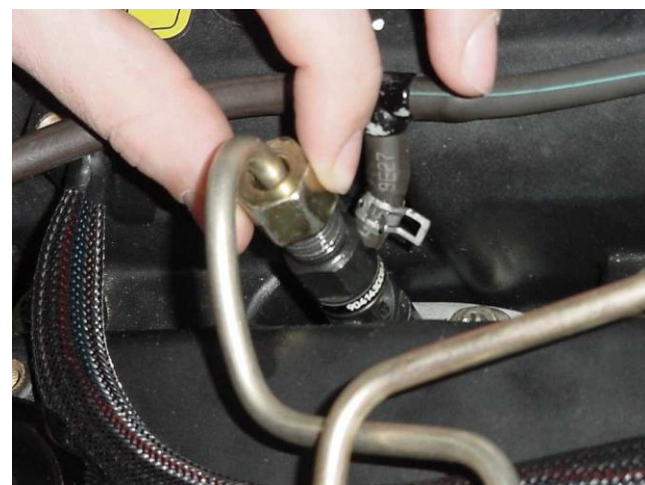
IT IS FORBIDDEN TO RE-USE AN OLD PIPE.

2. Remove the plug inserted at each end of pipe.
3. Lubricate the threads of the nuts with the lubricant supplied in the kit before fitting the pipe (Figure 9)
4. Remove the protective plugs from the HP outlets of the rail and the injector.

*** WARNING**

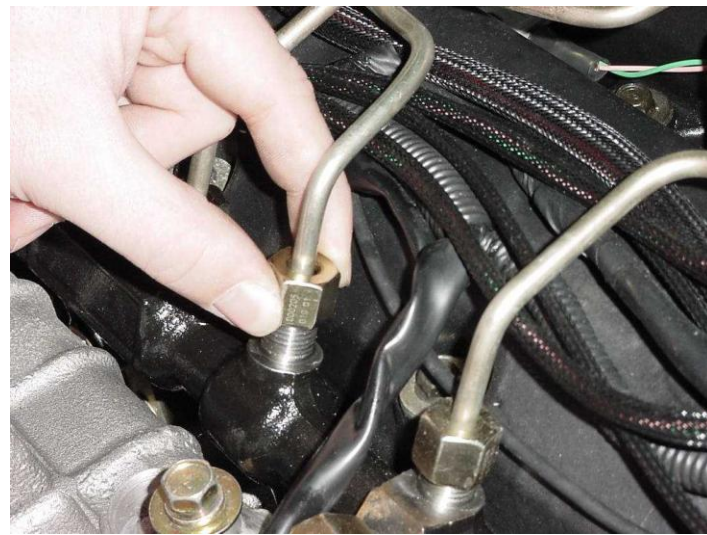
THE PLUGS MUST BE DISCARDED AFTER USE

5. Fit the pipe olive into the injector cone and the rail cone. Tighten the nut by hand (Figure 10).

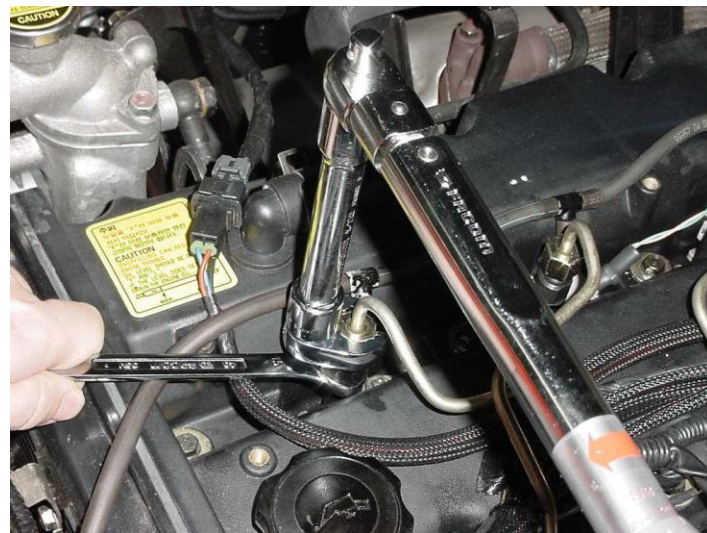


Assembly a rail/injector pipe (rail/HP pump)

6 Fit the pipe olive into the rail cone and tighten the nut by hand



7. Tighten the nut on the injector side to 40 Nm(29.5 lb-ft), applying reverse torque with the support tool for the injector holder (Figure 12).



Assembly a rail/injector pipe (rail/HP pump)

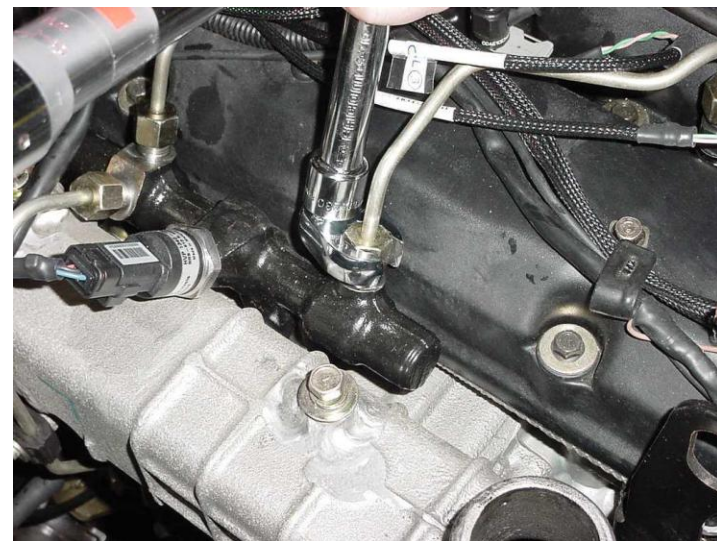
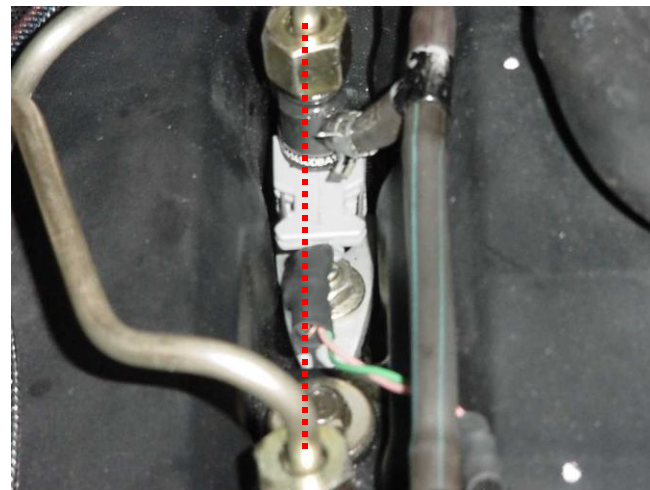
* Notice

When tightening the nut, ensure that the connector remains aligned with the injector row axis (Figure 13).

7. Tighten the nut on the rail side to a torque of 40 Nm(29.5 lb-ft)

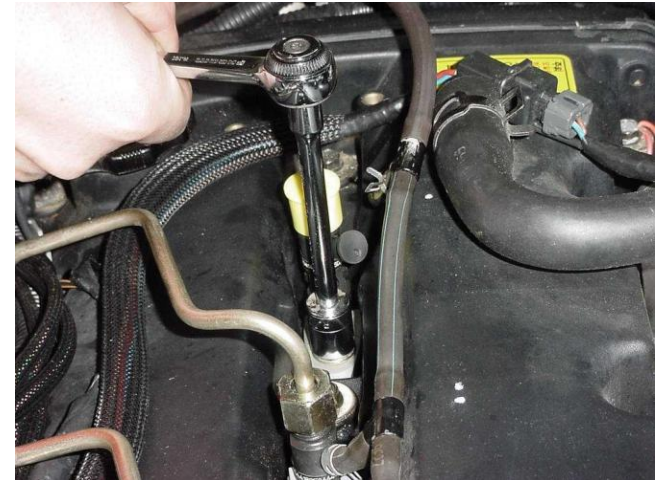
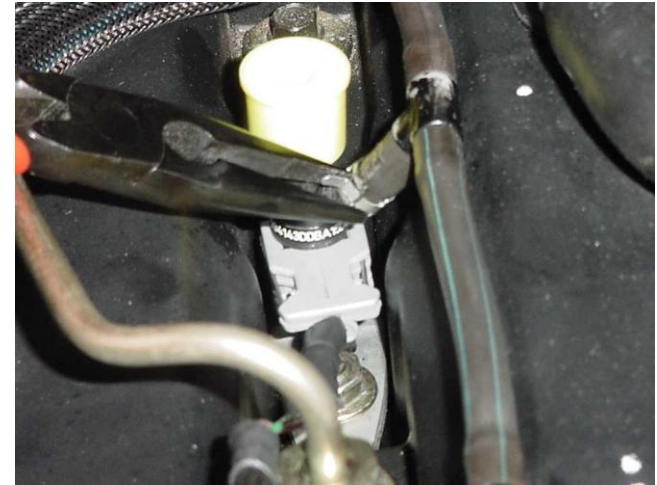
ESSENTIAL

To validate the repair, start the engine and check the tightness of the HP connection.



Injector holder-removal

1. Remove the HP pipe of the injector being removed (following the method indicated in refer to page).
2. Disconnect the injector connector
3. Disconnect the injector leakage return hose(Figure2).
4. Slacken off the flange of the injector holder(Figure3).
5. Remove the injector with the flange and its bolts.
Use a special tool if the injector is stuck.



Assembly of injector holder

1. Clean the socket of the injector holder and vacuum the particles using the pneumatic suction device(Figure 5).

2. Clean the flange of the injector holder with solvent (CARCLEAN type) using a clean brush.

3. Place a new heat protection washer on the seat of the injector holder.

*** WARNING**

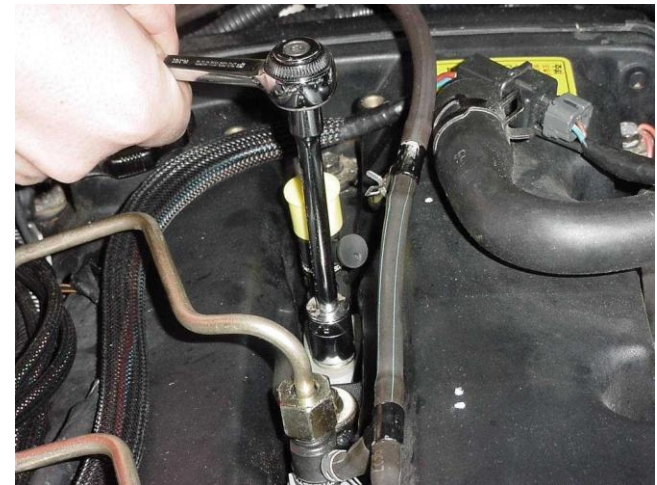
IT IS PROHIBITED TO RE-USE AN OLD HEAT PROTECTION WASHER!

4. Fit the injector holder with its flange.

5. Tighten the injector holder flange bolt to a torque of 19 Nm(14.01 lb-ft)(Figure 6).

6. Reconnect the return hose of the injector holder. Reconnect the injector connector.

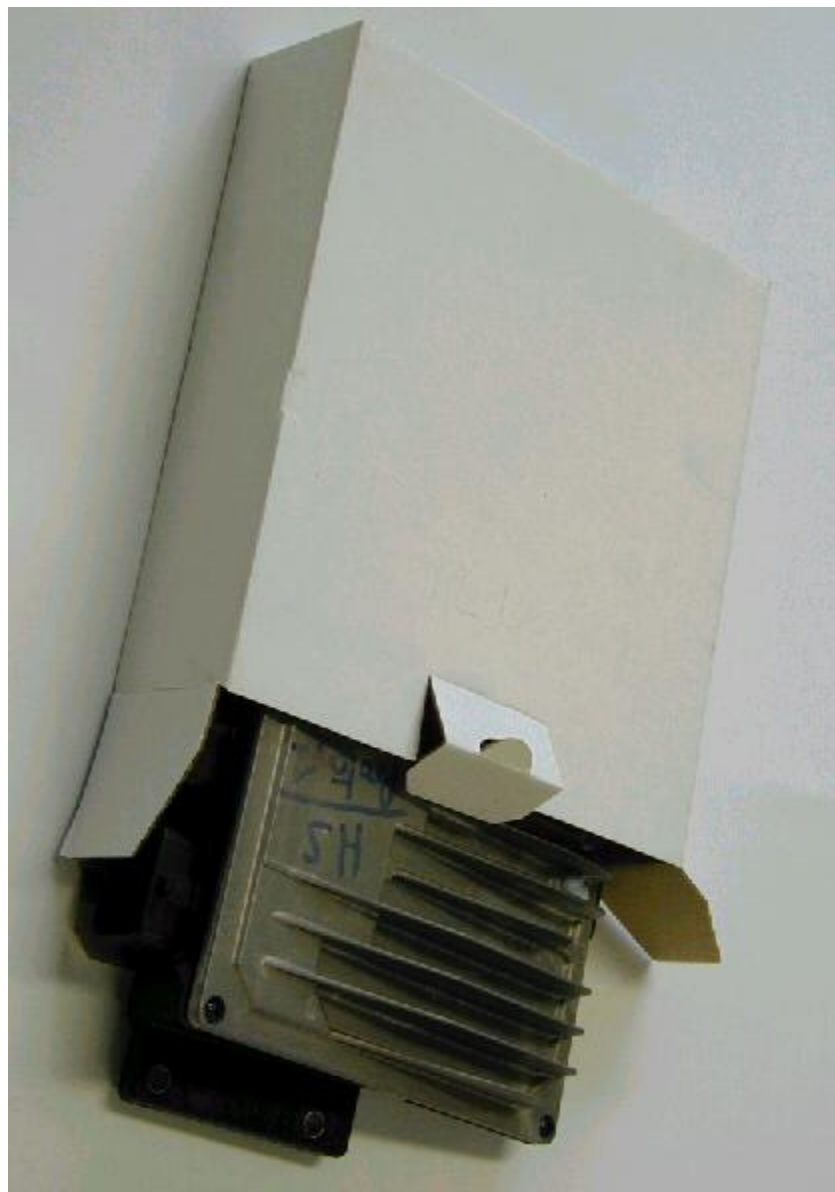
7. Reassembly the HP pipe, referring to the method described in page.



Delphi Common Rail Cap Kit



Delphi Common Rail Cap Kit



Delphi Common Rail Cap Kit



Delphi Common Rail Cap Kit

