CITROËN

TECHNICAL
TRAINING

BOSCH HDI EDC 15C2 INJECTION SYSTEM AND PARTICLE FILTER

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DEALER QUALITY
DEVELOPMENT DIVISION

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BROCHURE SUMMARY

BOSCH EDC 15C2 HDI SYSTEM (High pressure Diesel Injection) COMBINED WITH A PARTICLE FILTER SYSTEM

The aim of this brochure is to define the composition and operation of a BOSCH EDC 15 C2 HDI diesel engine management system, combined with a particle filter system, in relation to the DW12 Diesel engine.

This device consists of an ECU which analyses the information from the various sensors, and then operates the injectors at the correct moment. It also controls a pressure regulator, the exhaust gas recycling electrovalve and the turbocharging pressure modulating electrovalve.

The following subjects are dealt with in this document:

- General details and system presentation,
- Description and operation of the components of the various functions, or the functions themselves,
- Description of the operating phases:
  - of the injection system,
  - of the particle filter system.
- Notes on maintenance,
- The electrical circuit.

CONTENTS

CHAPTER 1: GENERAL DETAILS: HDI DIRECT INJECTION SYSTEM

I - FOREWORD

II - PRINCIPLE OF HDI

III - PARTICLE FILTRATION PRINCIPLE

IV - SAFETY INSTRUCTIONS

CHAPTER 2: GENERAL LAYOUT: HDI SYSTEM

CHAPTER 3: FUEL SUPPLY FUNCTION

I - DIAGRAM

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

III - SPECIFIC COMPONENTS

IV - ELECTRIC FUEL HEATER (1276)

V - LOW PRESSURE PUMP SUPPLY CUT-OFF

CHAPTER 4: AIR SUPPLY FUNCTION

I - DIAGRAM

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

III - SPECIFIC COMPONENTS

IV - VACUUM RESERVE

V - VARIABLE GEOMETRY TURBOCHARGER

VI - VARIABLE "SWIRL"

VII - SWIRL CONTROL ELECTROVALVE (1264)

VIII - FEATURE: INLET MANIFOLD PRESSURE SENSOR (1312)

CONTENTS

CHAPTER 5: EXHAUST GAS RECYCLING FUNCTION

I - DIAGRAM

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

III - SPECIFIC COMPONENTS

IV - WATER/EXHAUST GAS EXCHANGER (EGR)

V - THROTTLE HOUSING (EGR)

VI - THROTTLE HOUSING CONTROL ELECTROVALVE (EGR) (1263)

CHAPTER 6: HDI SYSTEM

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

II - SPECIFIC COMPONENTS

III - DOUBLE INJECTION RELAY (BSM) - FEATURE

IV - COOLANT TEMPERATURE SENSOR (1220) - FEATURE

V - FUEL TEMPERATURE SENSOR (1221) - FEATURE

VI - BRAKE SWITCH (2100) - FEATURE

VII - CRUISE CONTROL BRAKE PEDAL SWITCH (7308) - FEATURE

VIII - CLUTCH SWITCH (7306) - FEATURE

IX - VEHICLE SPEED SENSOR - FEATURE

X - INJECTION ECU (1320) - FEATURE

CHAPTER 7: PRE-POST HEATING FUNCTION

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

II - PREHEATER PLUGS (1160) - FEATURE

CONTENTS

CHAPTER 8: ENGINE COOLING FUNCTION (FRIC) (INCORPORATED INTO THE INJECTION ECU)

I - DIAGRAM

II - FAN UNIT (1510)

III - COOLANT TEMPERATURE SENSOR (1220)

IV - POSTVENTILATION

V - DOWNGRADED MODE

CHAPTER 9: COOLING REQUIREMENTS FOR THE AIR CONDITIONING (BRAC) (INCORPORATED INTO THE ..... INJECTION ECU)

I - DIAGRAM

II - AIR CONDITIONING PRESSURESTAT (8007)

III - FAN UNIT (1510)

IV - DOWNGRADED MODE

CHAPTER 10: PARTICLE FILTER FUNCTION

I - DIAGRAM

II - PARTICLE FILTER

III - CATALYTIC CONVERTER

IV - EXHAUST GAS TEMPERATURE SENSOR (UPSTREAM OF THE CATALYTIC CONVERTER) (1344)

V - EXHAUST GAS TEMPERATURE SENSOR (DOWNSTREAM OF THE CATALYTIC CONVERTER) (1343)

VI - DIFFERENTIAL PRESSURE SENSOR (1341)

VII - AIR TEMPERATURE SENSOR (1310)

VIII - AIR/WATER HEAT EXCHANGER (HEATING OF THE INLET AIR)

IX - INLET AIR HEATER THROTTLE

X - THROTTLE HOUSING CONTROL ELECTROVALVE (HEATING OF THE INLET AIR) (1285)

XI - THROTTLE HOUSING CONTROL ELECTROVALVE (EGR) (1263)

XII - BUILT-IN SYSTEMS INTERFACE (BSI1)

XIII - INJECTION ECU (1320)

CONTENTS

CHAPTER 11: FUEL ADDITIVE FUNCTION

I - ADDITIVE

II - ADDITIVE TANK

III - ADDITIVE INJECTION PUMP (1283)

III - LOW ADDITIVE LEVEL SENSOR (1283)

IV - SAFETY VALVE

V - ADDITIVE INJECTOR (1284)

VI - FUEL FILLER CAP PRESENCE SENSOR (4320)

VII - FUEL SENDER (1211)

VIII - BUILT-IN SYSTEMS INTERFACE (BSI1)

IX - FUEL ADDITIVE ECU (1282)

CHAPTER 12: OPERATING PHASES: HDI DIRECT INJECTION SYSTEM

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

II - SPECIFIC COMPONENTS

III - TURBOCHARGING PRESSURE REGULATION - FEATURE

IV - EXHAUST GAS RECYCLING REGULATION

V - PRE-POST HEATING

VI - PREHEATING OPERATION

VII - HEATING OF THE PLUGS WHILST CRANKING

VIII - POSTHEATING OPERATION

IX - ADDITIONAL HEATING

X - AIR CONDITIONING COMPRESSOR CUT-OFF

XI - ENGINE IMMOBILISER FUNCTION

XII - DISPLAYING FAULTS: DOWNGRADED MODES OPERATION

XIII - COOLANT TEMPERATURE WARNING LED (V4020) - FEATURE

XIV - CRUISE CONTROL

CONTENTS

CHAPTER 13: OPERATING PHASES: PARTICLE FILTRATION

I - GENERAL PRINCIPLE

II - DIAGRAM

III - PARTICLE FILTER LOAD LEVEL MONITORING FUNCTION

IV - REGENERATION ASSISTANCE MANAGEMENT FUNCTION

V - EFFECTS OF ACTIVATING REGENERATION ASSISTANCE

VI - FUEL ADDITIVE FUNCTION

VII - DISPLAYING FAULTS - DOWNGRADED OPERATING MODES

VIII - DRIVER'S INFORMATION FUNCTION

CHAPTER 14: MAINTENANCE: HDI INJECTION SYSTEM

I - RECOMMENDED FUEL

II - SAFETY INSTRUCTIONS

III - MAINTENANCE

IV - REPLACING PARTS: OPERATIONS TO BE PERFORMED

V - WARRANTY RETURN PROCEDURE

CHAPTER 15: WIRING DIAGRAM

I - LAYOUT DIAGRAM

II - PARTS LIST

GENERAL DETAILS:
HDI DIRECT INJECTION SYSTEM

Note: Some items mentioned in this document are common to the brochure: "HDI injection system" (doc 1.6.159). Reference should be made to this document where necessary.

Note: All values specified in this document are given as guidelines only. Refer to the documentation corresponding to the vehicle.

I - FOREWORD

The HDI system fitted to the new DW12 TED4 engine is based on the system fitted to the DW10 engine and includes the following additional features:

- cylinder head with 16 valves (4 valves/cylinder),
- double complex shape air inlet ducts in the cylinder head (variable swirl),
- variable geometry turbocharger

The HDI system is used to fulfil the requirements of the current standards regarding the following:

- depollution,
- driving pleasure,
- fuel saving,
- mechanical reliability.

In addition to these features, a powerful pollutant particle filtration system has been developed.

A - DEPOLLUTION

Fuel combustion causes the emission of the following pollutants:

- carbon dioxide (CO2),
- carbon monoxide (CO),
- unburned hydrocarbons (HC),
- nitrogen oxide (NOx),
- carbon particles.

Antipollution regulations are being tightened up and lead to the following developments:

- installation of an exhaust gas recycling device (EGR) to reduce nitrogen oxide emissions (NOx) (water cooled),
- installation of a throttle housing (EGR) to improve exhaust gas recycling.

Fitting a catalytic converter reduces the following pollutants:

- carbon monoxide (CO),
- unburned hydrocarbons (HC),
- carbon particles.

Fitting a 16 valve cylinder head reduces the following pollutants:

- nitrogen oxides (NOx),
- carbon particles.

The dual intake air inlet ducts in the cylinder head help to reduce pollutant particles.

The filter system removes black smoke and pollutant particles at full load or during transitory operation, thus helping to protect the environment.

B - MAIN DESIGN OF THE DW12 TED4 ENGINE

Up until now, diesel engines fitted to touring cars have used indirect injection.

In indirect injection, the fuel is injected under a maximum pressure of 300 bar into a combustion prechamber.

In direct injection, the fuel is injected directly onto the top of the piston.

Engine efficiency is improved due to:

- better quality of the air/fuel mixture,
- reduction in heat losses,
- direct combustion in the cylinders.

Features of the new cylinder head design of the DW12 TED4 engine:

- cylinder head with 16 valves,
- specific location of the diesel injectors (central and vertical, optimisation of air/fuel mixture),
- double complex shape air inlet manifolds in the cylinder head (variable swirl),
- no precombustion chamber,
- specific location of the heater plugs (on the rear of the cylinder head).

Modifications used to improve the efficiency of the DW12 TED4 engines:

- variable geometry turbocharger (higher turbocharging pressure at low engine speeds),
- optimisation of the inlet and exhaust manifolds,
- roller valve rockers limiting losses caused by friction,
- weight reduction.

Note: The above modifications also help to reduce pollutant emissions directly.

II - PRINCIPLE OF HDI

The device, developed in collaboration with BOSCH, is used to work out an ideal injection law.

Injection is performed at very high pressure using an injection rail which is common to the electrohydraulic injectors (called common rail).

The common injection rail is maintained at a very high pressure.

The injection pressure may reach 1350 bar at high engine speed.

The injection ECU integrates the following parameters:

- engine speed,
- coolant temperature,
- air temperature,
- fuel temperature,
- fuel pressure,
- pressure in the inlet manifold,
- atmospheric pressure,
- position of the accelerator pedal,
- air flow.

The injection ECU:

- works out the injection time from the fuel pressure,
- controls, if necessary, a pre-injection (to reduce combustion noise) and the main injection,
- controls the fuel flow injected by the electrohydraulic injectors.

Advantages of the electronic management system:

- driving pleasure (50% additional torque at low engine speeds and 25% more power),
- increase in engine efficiency (around 20% fuel saving),
- reduction of pollutant emissions (CO2, CO, HC, and carbon particles).

III - PARTICLE FILTRATION PRINCIPLE

The aim of the filtration system is to reduce emissions of particles released into the atmosphere (black smoke released at full load or during transitory operation).

A particle filter is fitted on the exhaust pipe and traps the particles as the exhaust gas passes through.

The accumulation of particles whilst the engine is operating leads to the progressive clogging up of the particle filter.

To prevent the particle filter from becoming blocked, it must be "regenerated".

A - PARTICLE FILTER REGENERATION PRINCIPLE

Regeneration consists of periodically burning off the particles accumulated in the particle filter essentially consisting of carbon and hydrocarbons. These particles on the particle filter burn in the presence of oxygen at a temperature of 550°C (regeneration limit).

Regeneration of the particle filter is controlled by the injection system.

The injection system triggers an additional injection to increase the initial temperature of the exhaust gases from approximately 150°C (urban driving) to 450°C at the inlet of the catalytic converter.

This increase in temperature occurs in 2 steps:

· a post injection (after Top Dead Centre) creates a post combustion in the cylinder and leads to an increase in temperature of 200 - 250°C,

· an additional post combustion, generated by an oxidation catalytic converter placed upstream of the particle filter, deals with the unburned hydrocarbons (HC) from the post injection. The temperature increases by 100°C which allows the combustion limit of 550°C to be reached.

B - FUEL ADDITIVE FUNCTION

To lower the regeneration limit, Eolys, a cerine based composite, is added to the fuel which lowers the particle combustion temperature from 550°C to 450°C.

Cerine is used in an organic solution stored in an additional tank, located near to the fuel tank

In order to inject an amount of additive proportional to the amount of fuel injected, an additive system has been developed.

The system consists of the following components:

· a suction device with low level detection on the additive tank,

· an additive injection system in the fuel tank,

· a specific ECU controlling the additive function.

IV - SAFETY INSTRUCTIONS

Note: The safety recommendations are given in a document contained in the mechanical file of the vehicle in question.

A - FUEL SUPPLY CIRCUIT

IMPORTANT: Given the very high pressures (1350 bar) in the high pressure fuel circuit, follow these instructions.

Do not smoke near to the high pressure circuit during repairs.

Avoid working near to flames or sparks.

When the engine is running:

· do not work on the high pressure fuel circuit,

· always remain out of the range of a possible jet of fuel which may cause serious injury,

· never put your hand near to a leak on the high pressure fuel circuit.

After switching off the engine, wait for 30 seconds before starting work.

Note: It is necessary to wait for 30 seconds to allow the high pressure fuel circuit to return to atmospheric pressure.

For all repair work, it is recommended that gloves and protective goggles are worn.

B - FUEL ADDITIVE CIRCUIT

Do not smoke near to the fuel additive circuit during repairs.

Avoid working near to flames or sparks.

The additive is a slight skin irritant; it is recommended that gloves and protective goggles are worn.

Environmental protection: used additive and the components used for cleaning the filter must be treated.

C - OPERATIONS ON THE PARTICLE FILTER

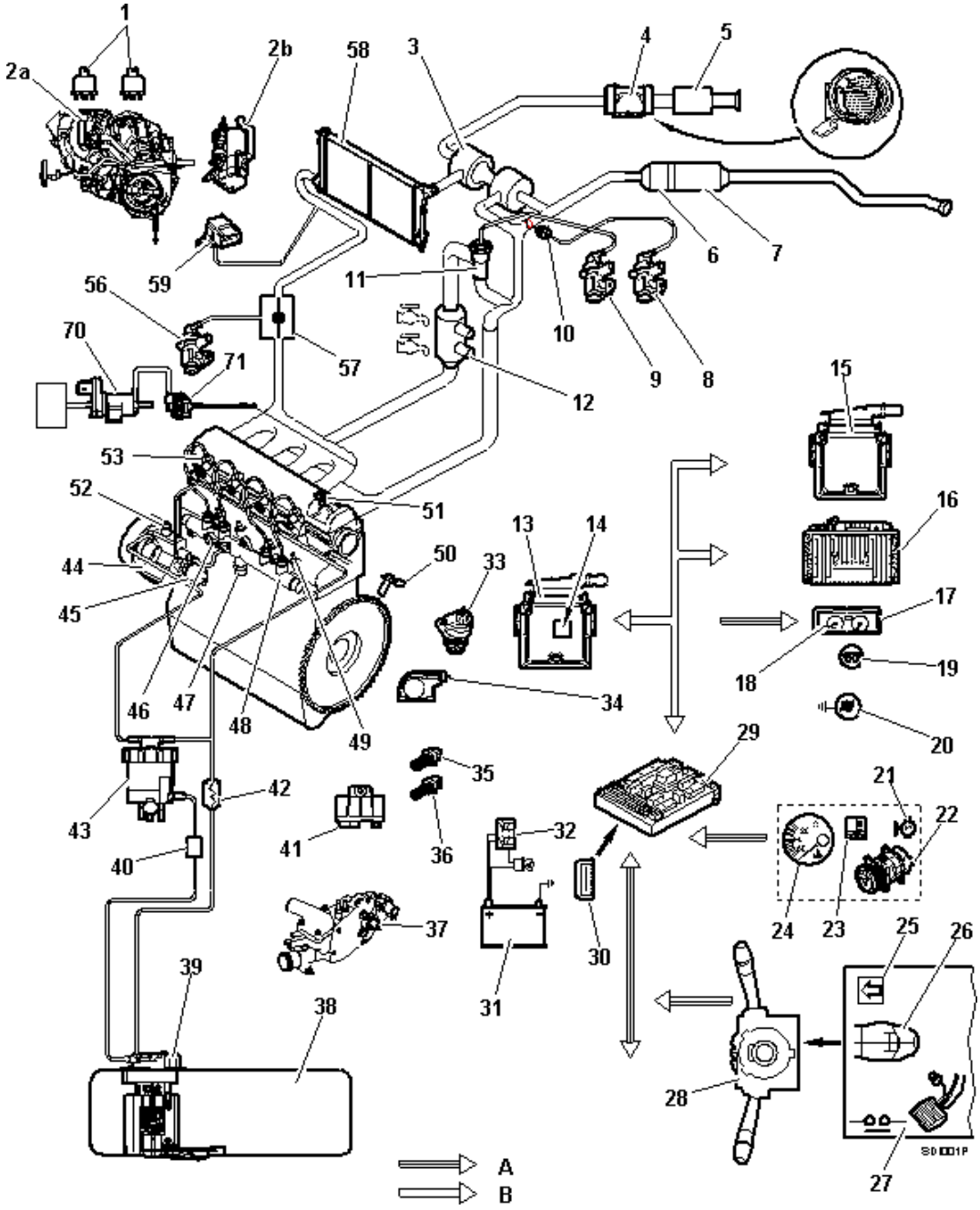
Warning: Forced regeneration leads to a very high exhaust gas temperature (450°C at the exhaust pipe outlet).

Precautions to be taken:

- always keep well away from the exhaust pipe,
- use suitable exhaust gas extraction equipment,
- the work area must be clean and tidy,
- the vehicle chassis must be clean.

It is recommended that a mask and protective goggles are worn when removing and refitting the particle filter (risk of inhaling cerine).

GENERAL LAYOUT:
HDI SYSTEM



Key:

A - VAN network

B - CAN network

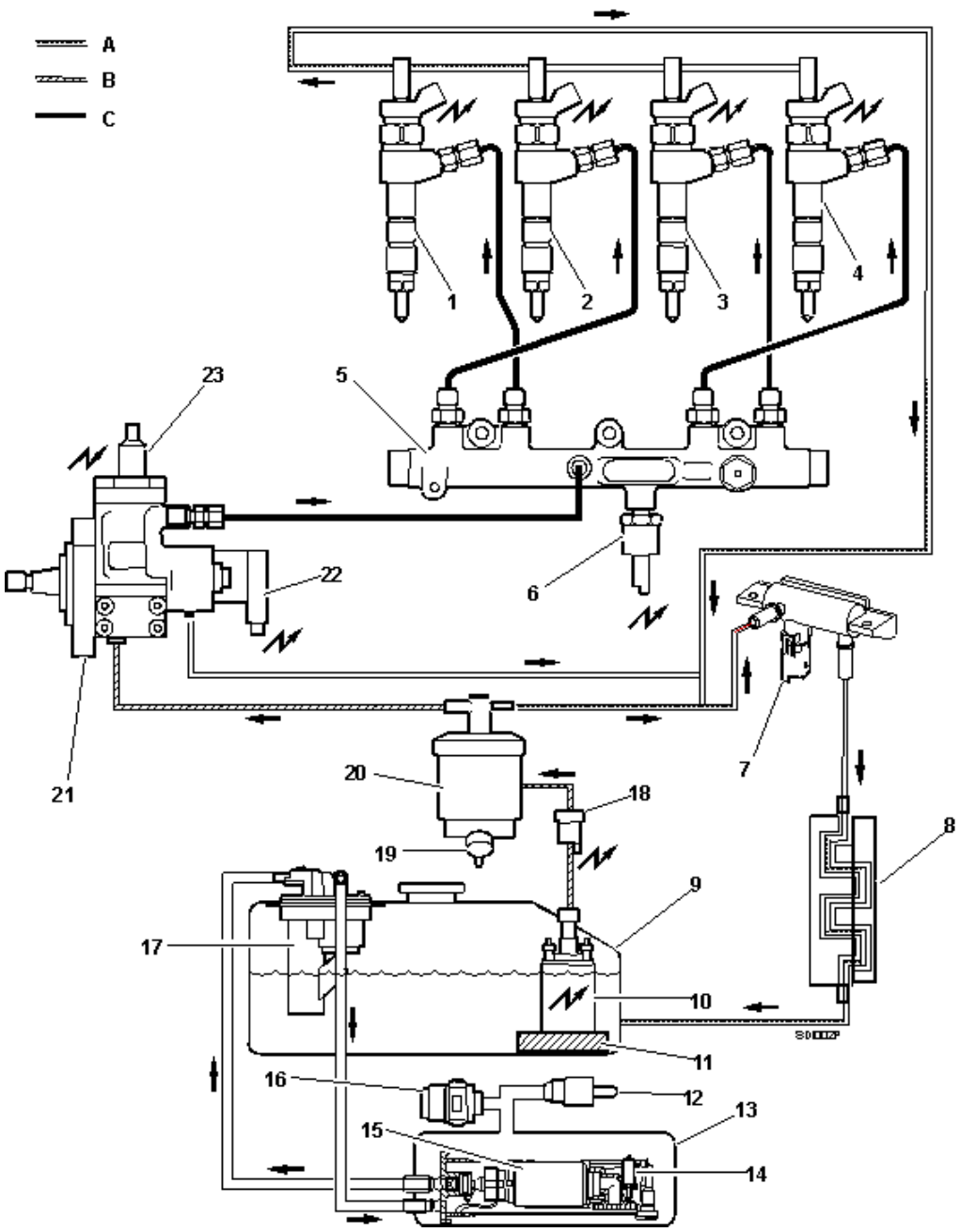
REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
1	Additional heating control relay	BCP3
2	Additional heating (electric resistors (2a) or heater (2b)) (*)	8098 - 1190
3	Variable geometry turbocharger	--
4	Air flowmeter / air temperature sensor	1310
5	Air filter	--
6	Catalytic converter	--
7	Particle filter	--
8	Turbocharging pressure regulation electrovalve	1233
9	Recycling regulation electrovalve (EGR)	1253
10	Variable geometry turbo control diaphragm	--
11	Exhaust gas recycling valve (EGR)	--
12	Exhaust gas / water heat exchanger	--
13	Injection ECU	1320
14	Atmospheric pressure sensor (incorporated into injection ECU)	1320
15	Electronic stability program ECU (*)	7800
16	Automatic gearbox ECU (*)	1360
17	Trip computer (*)	--
18	Electronic rev counter	4210
19	Preheating LED	V1150
20	Diagnostic LED	V1300
21	Fan unit	1510
22	Air conditioning compressor	8020
23	Coolant temperature warning LED	V4020
24	Coolant temperature gauge	4026
25	Cruise control switch	7300
26	Cruise control safety contact	7305
27	Redundant brake switch	7308
28	Switch module at steering wheel (COM 2000)	CV00

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
29	Built-in systems interface (BSI)	BSI1
30	Central diagnostic socket	C001
31	Battery	BB00
32	Double injection relay (engine relay unit)	BSM
33	Vehicle speed sensor	1620
34	Accelerator pedal position sensor	1261
35	Clutch pedal switch	7306
36	Brake pedal switch	2100
37	Coolant temperature sensor	1220
38	Fuel tank	--
39	Low pressure pump	1211
40	Electric fuel heater	1276
41	Pre-post heating unit	1150
42	Fuel cooling	--
43	Fuel filter	--
44	High pressure fuel pump	--
45	High pressure fuel regulator	1322
46	Fuel temperature sensor	1310
47	High pressure fuel sensor	1321
48	High pressure fuel common injection rail	--
49	Preheater plugs	1160
50	Engine speed sensor	1313
51	Camshaft position sensor	1115
52	High pressure fuel pump 3rd piston deactivator	1277
53	Diesel injectors	1331 - 1332 - 1333 - 1334
54	"Swirl" control electrovalve	1264
55	"Swirl" control diaphragm	--
56	Throttle housing control electrovalve (EGR)	1263
57	Throttle housing (EGR)	--
58	Air / air heat exchanger	--
59	Inlet manifold pressure sensor	1312

Note: (*) depending on version.

FUEL SUPPLY FUNCTION

I - DIAGRAM



Key:

A - Return to fuel tank circuit

B - Low pressure fuel circuit

C - High pressure fuel circuit

Parts list

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
1 - 4	Diesel injectors (electrohydraulic)	1131 - 1132 - 1133 - 1134
5	High pressure fuel common injection rail	--
6	High pressure fuel sensor	1321
7	Fuel temperature sensor	1221
8	Fuel cooler	--
9	Fuel tank	--
10	Low pressure pump	1211
11	Fuel pre-filter	--
12	Safety valve (pressure-vacuum)	--
13	Additive tank	--
14	Low additive level sensor	1283
15	Additive injection pump	1283
16	Plug (overflow)	--
17	Additive injector	1284
18	Electric fuel heater	1276
19	Water bleed screw	--
20	Fuel filter + water decanter + low pressure circuit pressure regulator	--
21	High pressure fuel pump	--
22	High pressure fuel regulator on the high pressure fuel pump	1322
23	High pressure fuel pump 3rd piston deactivator	1277

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Common components:

- fuel tank,
- low pressure pump (1211),
- fuel filter (thermostatic element),
- high pressure fuel pump,
- high pressure fuel pump 3rd piston deactivator (1277),
- high pressure fuel regulator (1322),
- high pressure fuel common injection rail,
- diesel injectors (1131, 1132, 1133, 1134),
- fuel cooler.

Note: The filtration housing is fitted with a water in the fuel detector (4050) (major export).

III - SPECIFIC COMPONENTS

Specific features of the DW12 TED4 engine:

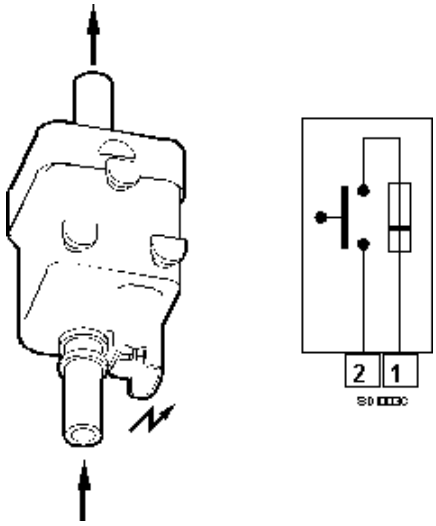
- electric fuel heater (1276),
- high pressure fuel pump with blue supplier's plate.

IV - ELECTRIC FUEL HEATER (1276)

A - ROLE

The fuel heater raises the fuel to its usage temperature.

B - DESCRIPTION



The fuel heater heats the fuel from the fuel tank.

The fuel heater consists of a heating resistor.

The temperature is regulated by a thermostat:

· fuel temperature of -2 (+/-2)°C: fuel heater activated,

· fuel temperature of +3 (+/-2)°C: fuel heater deactivated.

C - ELECTRIC FEATURES

Allocation of connector channels:

· channel 1: 12 volts (+ ignition on),

· channel 2: earth.

Power: 150 W.

D - LOCATION

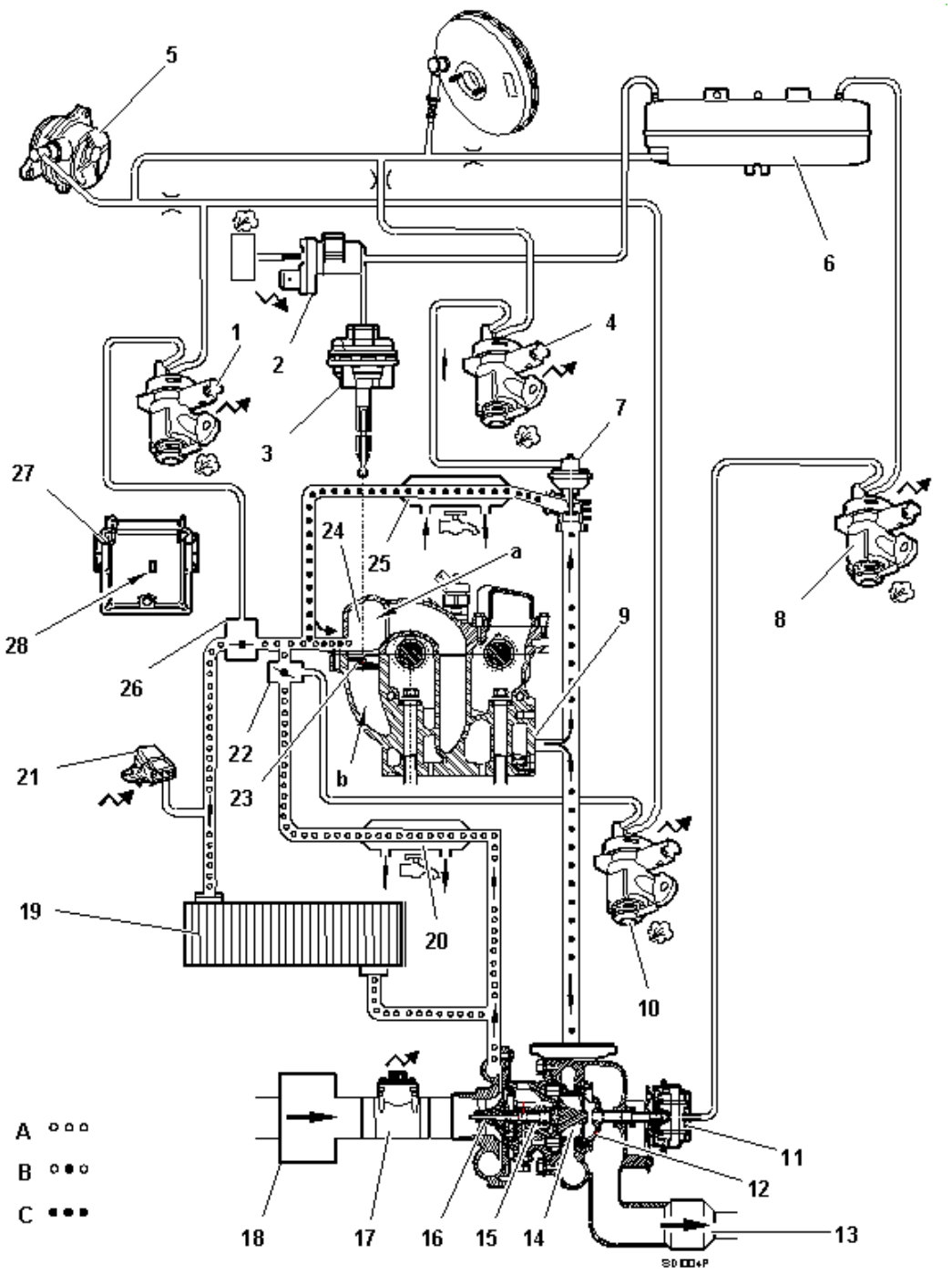
The fuel heater is located on the fuel filter inlet pipe.

V - LOW PRESSURE PUMP SUPPLY CUT-OFF

The airbag ECUs incorporate the low pressure pump cut-off function (inertia switch discontinued).

AIR SUPPLY FUNCTION

I - DIAGRAM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a
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9
22
23
b
21
19
20
10
A
B
C
18
17
16
15
14
11
12
13

Air circulation (following arrows):

A - Exterior air inlet

B - Exhaust gases + air

C - Exhaust gases

a - Short inlet duct (helical shape)

b - Long inlet duct (tangential)

Parts list:

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS	COMMENTS
1	Throttle housing control electrovalve (EGR)	1263	
2	"Swirl" control electrovalve	1264	
3	"Swirl" control diaphragm	--	Vacuum controlled
4	Recycling regulation electrovalve (EGR)	1253	
5	Vacuum pump	--	
6	Vacuum reserve	--	
7	Exhaust gas recycling valve (EGR)	--	Vacuum controlled
8	Turbocharging pressure regulation electrovalve	1233	
9	Exhaust gas manifold	--	
10	Inlet air heater throttle control electrovalve	1285	
11	Variable geometry turbo control diaphragm	--	Vacuum controlled
12	Finned diffuser piston	--	
13	Particle filter + catalytic converter	--	
14	Exhaust turbine	--	
15	Variable geometry turbocharger	--	
16	Inlet air turbine	--	
17	Air flowmeter + air temperature sensor	1310	

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS	COMMENTS
18	Air filter	--	
19	Air/air heat exchanger	--	
20	Air/water heat exchanger (inlet air heater)	--	
21	Inlet manifold pressure sensor	1312	
22	Inlet air heater throttle	--	Vacuum controlled
23	"Swirl" control throttle	--	
24	Inlet air manifold	--	
25	Exhaust gas/coolant exchanger	--	
26	Throttle housing (EGR)	--	Vacuum controlled
27	Injection ECU	1320	
28	Atmospheric pressure sensor (incorporated into injection ECU)	1320	

Note: EGR: exhaust gas recycling.

Turbocharging pressure regulation electrovalve:
White/grey referenced hose opposite white spot on electrovalve

Swirl control electrovalve:
Unmarked hose

EGR regulation electrovalve:
White/blue referenced hose opposite white spot on electrovalve

EGR throttle housing control electrovalve:
White/black referenced hose opposite white spot on electrovalve

Inlet air heater throttle control electrovalve:
White/brown referenced hose opposite white spot on electrovalve

Inlet air heater throttle:
Brown capsule - brown referenced hose

EGR throttle housing:
Black capsule - black referenced hose

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Components common with the document:

- air filter,
- atmospheric pressure sensor (1320),
- air/air heat exchanger,
- inlet manifold pressure sensor (1312),
- vacuum pump,
- turbocharging pressure regulation electrovalve (1233).

III - SPECIFIC COMPONENTS

Specific features of the DW12 TED4 engine:

- vacuum reserve,
- variable geometry turbocharger,
- variable "swirl",
- "Swirl" control electrovalve (1264).

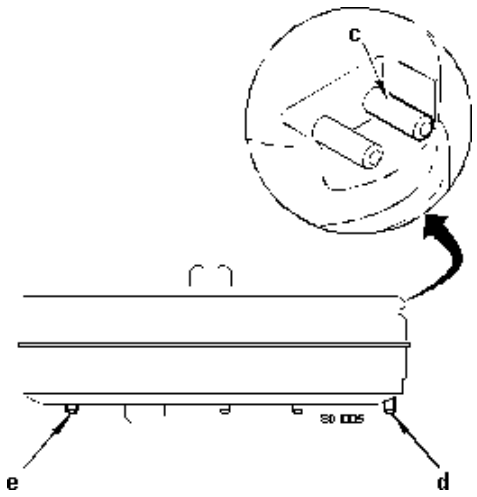
IV - VACUUM RESERVE

A - ROLE

The vacuum reserve allows sufficient braking assistance to be maintained if the following components are controlled simultaneously:

- "Swirl" control butterfly valve,
- inlet air heater butterfly valve,
- variable geometry turbo control diaphragm.

B - DESCRIPTION



c - Vacuum pump vacuum inlet

d - Outlet: "Swirl" control butterfly valve

e - Outlet: variable geometry turbo control diaphragm

Capacity = 0.5 Litre

C - LOCATION

The vacuum reserve is located in the engine compartment, near to the brake servo (depending on vehicle).

Note: The vacuum circuit contains 3 nozzles of 0.55 mm.

V - VARIABLE GEOMETRY TURBOCHARGER

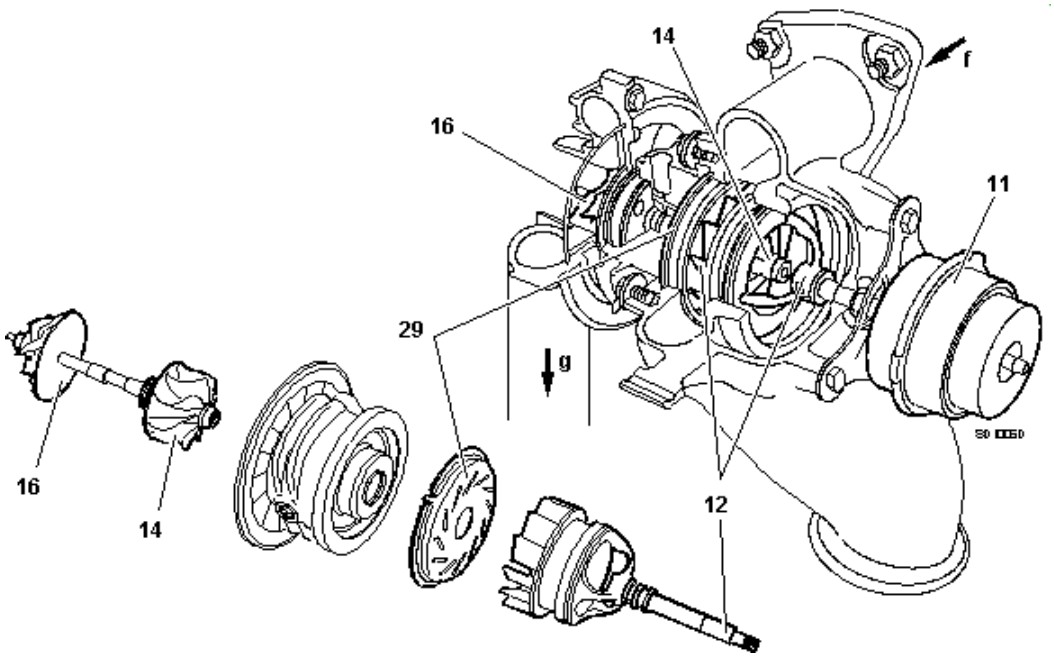
A - ROLE

The turbocharger is used to turbocharge the air entering the engine.

The variable geometry turbocharger is used:

- to increase the speed of the exhaust gases which strike the turbine at low engine speeds,
- to reduce the speed of the exhaust gases which strike the turbine at high engine speeds,
- to adapt the turbine to a variation in exhaust gas flow.

B - DESCRIPTION



11 - Finned diffuser piston control diaphragm: vacuum controlled
12 - Finned diffuser piston
14 - Exhaust turbine
16 - Inlet air turbine
29 - Thermal housing
f - Gases from the exhaust manifold
g - To inlet manifold

The turbocharger has two separate chambers.

The turbocharger consists of the following components:

· a chamber linked to the engine exhaust function,

· a chamber linked to the inlet function,

· a turbine and a compressor, joined together by a shaft.

The turbine, driven by the exhaust gases, drives the compressor which compresses the inlet air.

The movement of the piston (12) allows the inlet cross section of the exhaust turbine to be varied in order to alter the speed of the exhaust gases.

The regulation electrovalve controls the turbocharging pressure regulator piston (12).

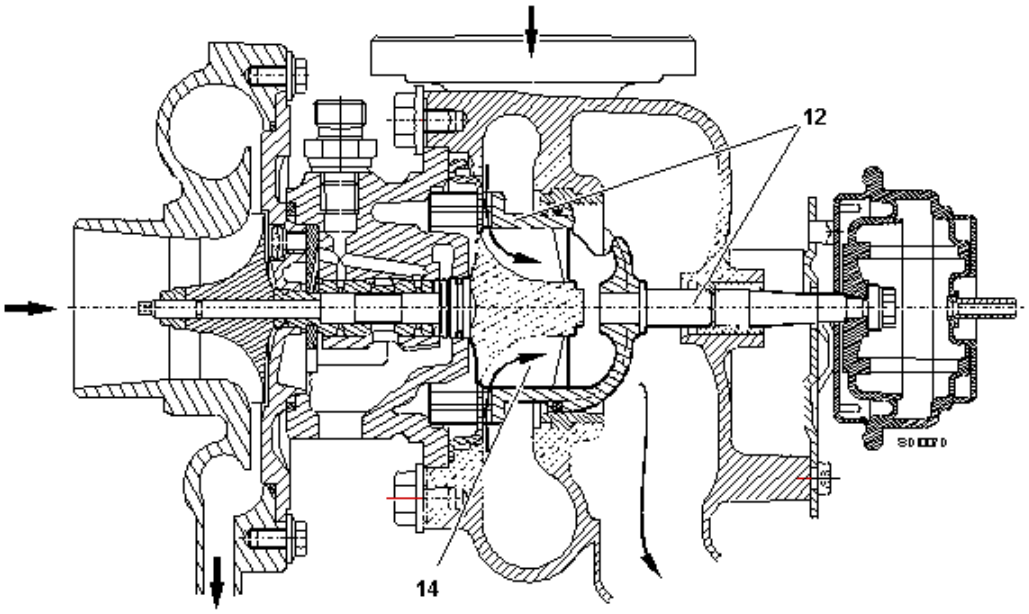
The turbocharging pressure is regulated progressively and is controlled by a cartographic map (injection ECU).

Note: Lubrication of the turbocharger: careful lubrication is required due to the very high speeds of the moving parts and the high temperatures to be dissipated.

The pressurised oil required for this function is taken from the engine's oil circuit.

IMPORTANT: Before switching off the engine, it is essential to let the engine return to idle speed. Failure to comply with this condition will eventually destroy the turbocharger (due to lack of lubrication).

C - OPERATION AT LOW ENGINE SPEED



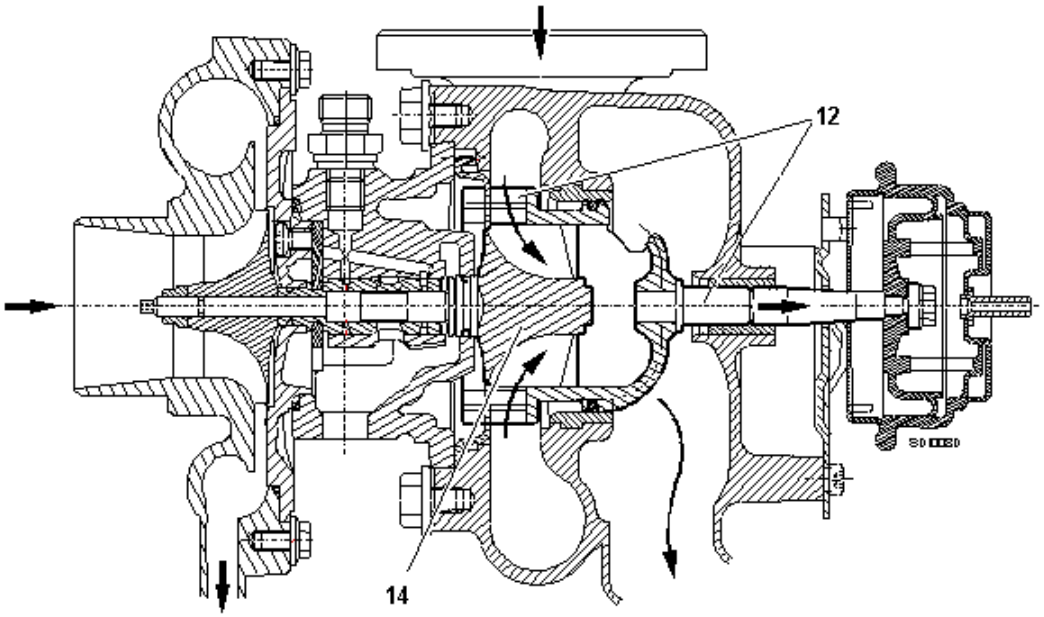
The gas flow passing through the exhaust turbine (14) is low.

To increase the turbocharging pressure, a maximum amount of energy must be converted in the turbine.

The exhaust gases must be made to pass through a small cross section: the finned diffuser piston (12) is closed.

Note: The finned diffuser piston is closed when it is not controlled pneumatically.

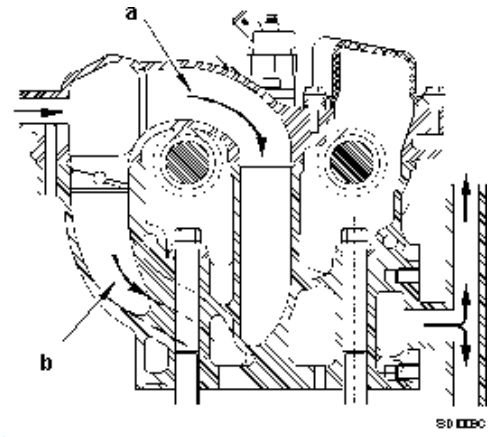
D - OPERATION AT HIGH ENGINE SPEED



Turbocharging pressure regulation: the energy of the exhaust gases is controlled by adjusting the speed at which the gases enter the exhaust turbine by altering the position of the finned diffuser piston.

Contrary to a fixed geometry turbocharger, all of the exhaust gas flow passes through the exhaust turbine (no energy lost).

VI - VARIABLE "SWIRL"



a - Short inlet duct (helical shape)

b - Long inlet duct (tangential)

Using the short inlet duct allows maximum swirl to be obtained (swirl movement).

Air is let into the inlet ducts by opening the "Swirl" control butterfly valve at high engine speeds.

Using 2 inlet ducts allows maximum filling (reduced swirl).

Advantages of the variable "Swirl":

- optimisation of combustion (air/fuel mixture),
- better performance/pollutant emissions compromise.

The variable "Swirl" gives a reduction in carbon particles.

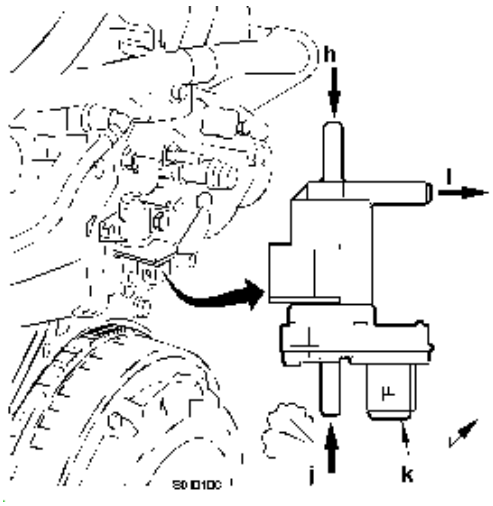
VII - SWIRL CONTROL ELECTROVALVE (1264)

A - ROLE

The Swirl control electrovalve controls the Swirl control diaphragm.

B - DESCRIPTION

The control electrovalve connects the vacuum pump and the Swirl control diaphragm.



h - Vacuum inlet from the vacuum reserve

j - Atmospheric pressure inlet

k - Electrical connector

l - "Usage" outlet

The electrovalve is controlled with an OCR (Open Cycle Ratio) and using a cartographic map (injection ECU).

The electrovalve is subject to the following:

· atmospheric pressure,

· vacuum supplied by the vacuum pump.

The pressure supplied by the electrovalve is between atmospheric pressure and the vacuum from the vacuum pump.

Warning: The "Swirl" control throttle is closed when it is not controlled pneumatically.

Conditions allowing the throttle to open:

· engine speed above 2100 rpm (at 80°C) (2500 rpm at 0°C),

· injected fuel flow greater than 40 mg/stroke.

C - ELECTRICAL FEATURES

Control: injection ECU (earth).

Full supply (maximum OCR) = maximum vacuum.

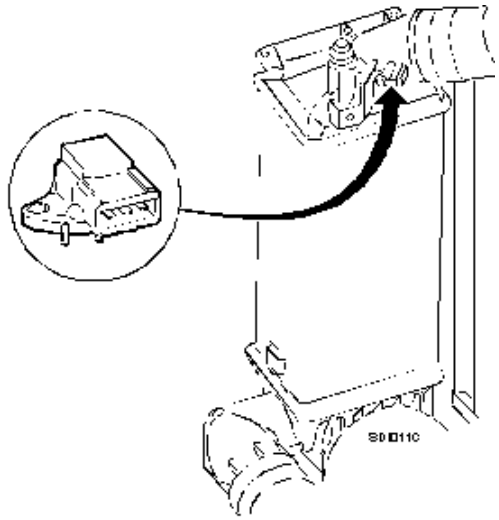
No supply (minimum OCR) = no vacuum (atmospheric pressure).

Resistance at 25 °C = 28 ohms.

D - LOCATION

The Swirl control electrovalve is located on the coolant outlet housing.

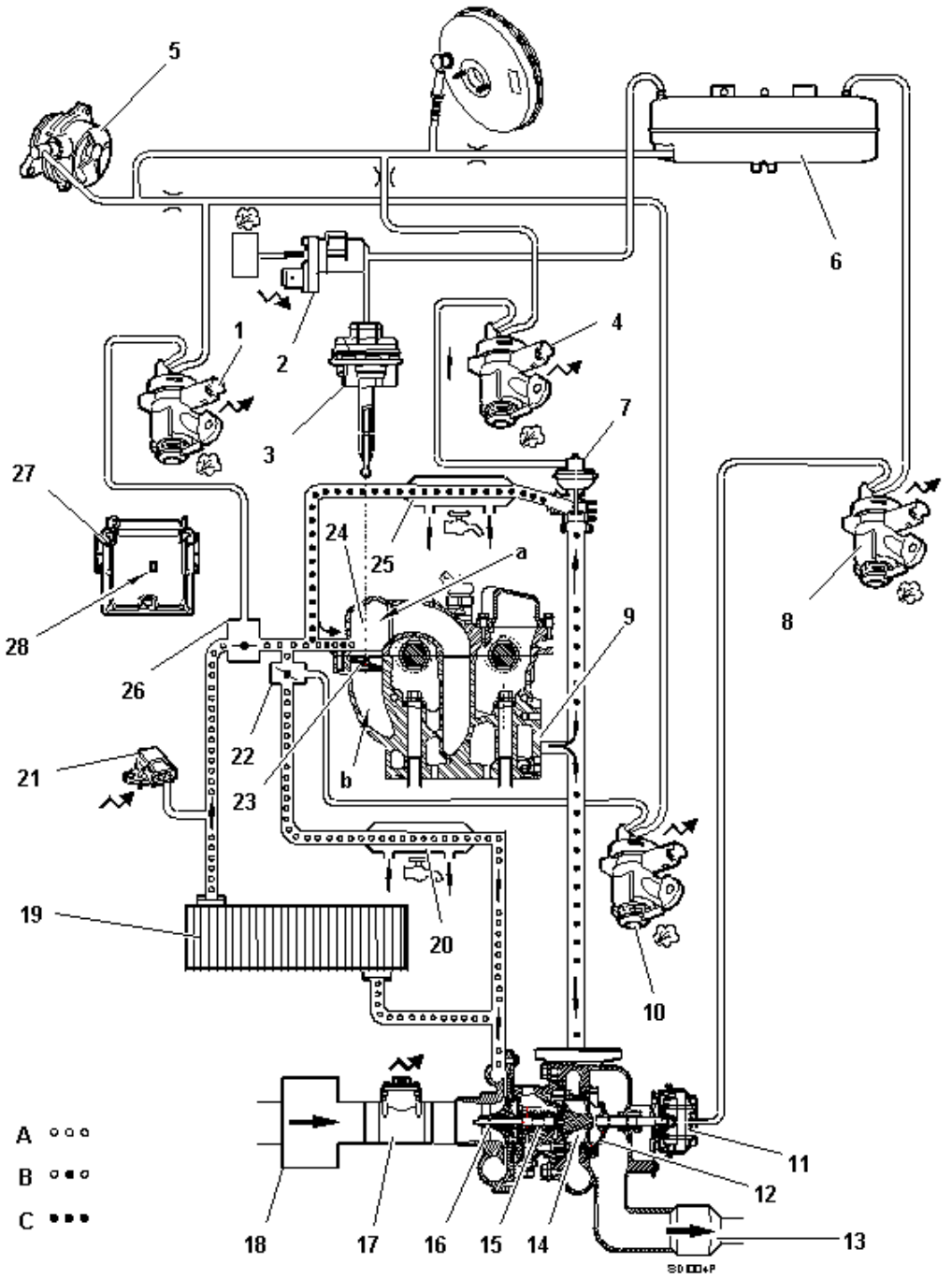
VIII - FEATURE: INLET MANIFOLD PRESSURE SENSOR (1312)



The inlet manifold pressure sensor is located on the outlet of the air/air heat exchanger.

EXHAUST GAS RECYCLING FUNCTION

I - DIAGRAM



Air circulation (following arrows):

A - Exterior air inlet

B - Exhaust gases + air

C - Exhaust gases

a - Short inlet duct (helical shape)

b - Long inlet duct (tangential)

Parts list:

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS	COMMENTS
1	Throttle housing control electrovalve (EGR)	1263	
2	"Swirl" control electrovalve	1264	
3	"Swirl" control diaphragm	--	Vacuum controlled
4	Recycling regulation electrovalve (EGR)	1253	
5	Vacuum pump	--	
6	Vacuum reserve	--	
7	Exhaust gas recycling valve (EGR)	--	Vacuum controlled
8	Turbocharging pressure regulation electrovalve	1233	
9	Exhaust gas manifold	--	
10	Inlet air heater throttle control electrovalve	1285	
11	Variable geometry turbo control diaphragm	--	Vacuum controlled
12	Finned diffuser piston	--	
13	Particle filter + catalytic converter	--	
14	Exhaust turbine	--	
15	Variable geometry turbocharger	--	
16	Inlet air turbine	--	
17	Air flowmeter + air temperature sensor	1310	

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS	COMMENTS
18	Air filter	--	
19	Air/air heat exchanger	--	
20	Air/water heat exchanger (inlet air heater)	--	
21	Inlet manifold pressure sensor	1312	
22	Inlet air heater throttle	--	Vacuum controlled
23	"Swirl" control throttle	--	
24	Inlet air manifold	--	
25	Exhaust gas/coolant exchanger	--	
26	Throttle housing (EGR)	--	Vacuum controlled
27	Injection ECU	1320	
28	Atmospheric pressure sensor (incorporated into injection ECU)	1320	

Note: EGR: exhaust gas recycling.

II - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Components common with the document:

- air flowmeter (1310),
- exhaust gas recycling valve (EGR),
- recycling regulation electrovalve (EGR) (1253).

III - SPECIFIC COMPONENTS

Specific features of the DW12 TED4 engine:

- water/exhaust gas exchanger (EGR),
- recycling regulation electrovalve (EGR) (1253),
- throttle housing (EGR),
- throttle housing control electrovalve (EGR) (1263).

IV - WATER/EXHAUST GAS EXCHANGER (EGR)

A - ROLE

The water/exhaust gas heat exchanger cools the recycled exhaust gases let into the cylinders.

B - LOCATION

Location: on the rear of the cylinder head (bulkhead side).

V - THROTTLE HOUSING (EGR)

A - ROLE

In addition to the EGR valve, the throttle housing, depending on its position, is used to improve exhaust gas recycling. The throttle housing is controlled progressively and using a cartographic map (injection ECU).

Warning: The throttle housing is open when it is not controlled pneumatically.

B - LOCATION

The throttle housing is located at the inlet to the inlet manifold.

VI - THROTTLE HOUSING CONTROL ELECTROVALVE (EGR) (1263)

A - ROLE

The electrovalve controls the closing of the throttle housing.

B - DESCRIPTION

The electrovalve is the same as the following electrovalves:

· turbocharging pressure regulation electrovalve,

· recycling regulation electrovalve (EGR),

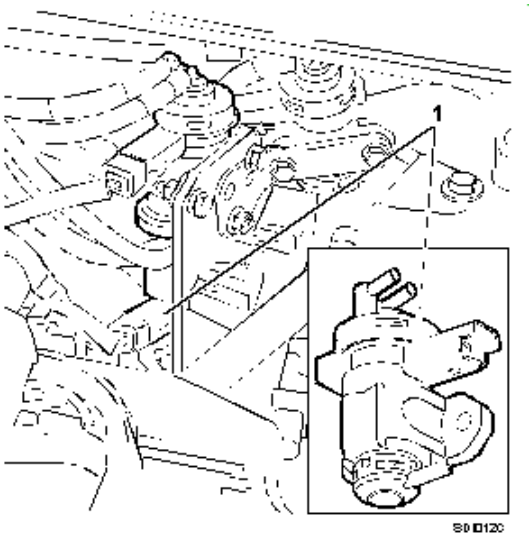
· inlet air heater throttle control electrovalve.

The electrovalve connects the vacuum pump to the throttle housing:

· the greater the vacuum, the more the throttle housing closes,

· the lower the vacuum, the more the throttle housing opens.

C - LOCATION



The electrovalve is located in the engine compartment.

HDI SYSTEM

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Components common with the document:

- high pressure fuel pump,
- high pressure fuel pump 3rd piston deactivator (1277),
- high pressure fuel regulator (1322),
- high pressure fuel common injection rail,
- battery (BB00),
- double injection relay (1304),
- accelerator pedal sensor (1261),
- engine speed sensor (1313),
- camshaft position sensor (1115),
- coolant temperature sensor (1220),
- air temperature sensor (1310),
- fuel temperature sensor (1221),
- high pressure fuel sensor (1321),
- vehicle speed sensor (1620),
- brake switch (2100),
- specific feature of the diesel injector control.

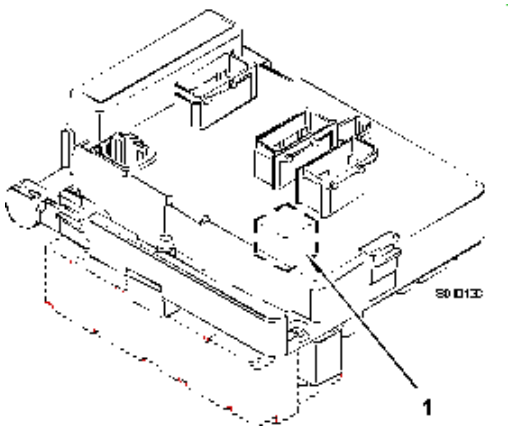
II - SPECIFIC COMPONENTS

Specific features of the DW12 TED4 engine:

- injection ECU (1320),
- diesel injectors (1331, 1332, 1333, 1334).

III - DOUBLE INJECTION RELAY (BSM) - FEATURE

The double relay is incorporated into the engine relay unit (BSM).



1 - Double relay

IV - COOLANT TEMPERATURE SENSOR (1220) - FEATURE

A - ROLE

The coolant temperature sensor informs the ECU of the temperature of the engine coolant.

Role of the injection ECU depending on the information received:

- to adjust the preheating time,
- to adjust the post-heating time,
- to adjusting the starting flow,
- to adjust the idle speed,
- to authorise exhaust gas recycling (EGR),
- to adjust the fuel flow,
- to limit the injected flow if the coolant temperature is critical (anti-boil function),
- to control the operation of the radiator fans,
- to control the coolant temperature gauge on the instrument panel (*),
- to control the warning and pre-warning LEDs (*).

Note: (*) depending on version.

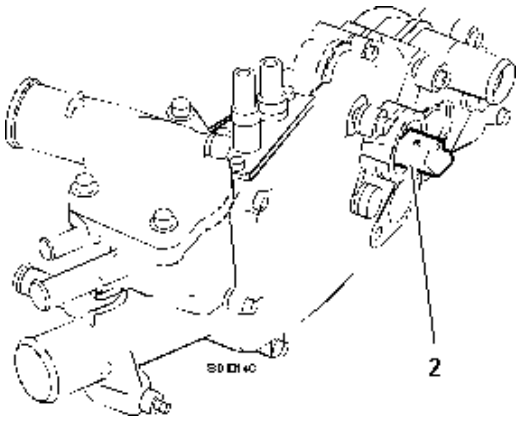
B - DESCRIPTION

Green 2-way sensor.

The sensor consists of a Negative Temperature Coefficient resistor (NTC).

The higher the temperature, the lower its resistance.

C - LOCATION



2 - coolant temperature sensor.

The coolant temperature sensor is located on the coolant housing.

There are 2 types of assembly.

Metal coolant outlet housing.

- the coolant temperature sensor is screwed in,
- it is sealed by a copper seal.

Plastic coolant outlet housing:

- the temperature sensor is secured by a plastic clip,
- it is sealed by an O-ring.

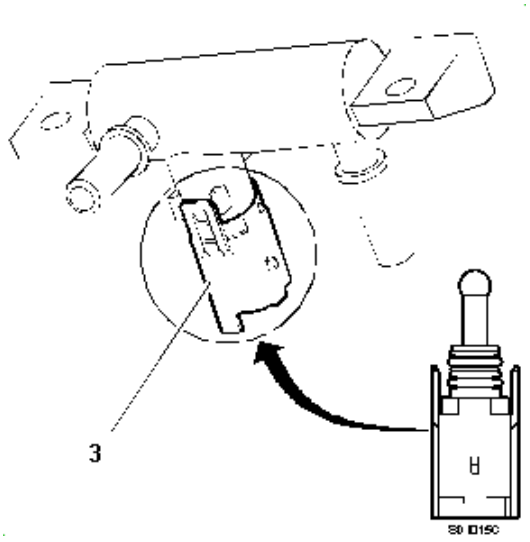
V - FUEL TEMPERATURE SENSOR (1221) - FEATURE

A - ROLE

Role of the injection ECU depending on the information received:

- to adjust the fuel flow,
- to calculate the fuel density.

B - DESCRIPTION



3 - Fuel temperature sensor

The sensor consists of a Negative Temperature Coefficient resistor (NTC).

The higher the temperature, the lower its resistance:

- resistance at 20 °C = 3323 ohms,
- resistance at 80 °C = 287 ohms.

C - LOCATION

The fuel temperature sensor measures the temperature of the fuel directly on the tank return circuit.

VI - BRAKE SWITCH (2100) - FEATURE

A - ROLE

The switch allows the injection ECU to ensure correct driving comfort.

The electrical information supplied by the brake switch is transmitted to the BSI and sent to the injection ECU via the multiplexed network (*).

(*) depending on version.

B - LOCATION

The brake switch is located on the pedal set.

VII - CRUISE CONTROL BRAKE PEDAL SWITCH (7308) - FEATURE

A - ROLE

The switch allows the injection ECU to ensure correct driving comfort.

The information from the brake switches is constantly compared with each other in order to detect any faults.

B - LOCATION

The brake switch is located on the pedal set.

VIII - CLUTCH SWITCH (7306) - FEATURE

A - ROLE

The clutch switch allows the injection ECU to perform the driven idle function.

B - LOCATION

The clutch switch is located on the pedal set.

IX - VEHICLE SPEED SENSOR - FEATURE

The vehicle speed information is transmitted by the ABS ECU on the multiplexed networks.

X - INJECTION ECU (1320) - FEATURE

A - ROLE

The ECU controls all of the injection system.

The ECU software incorporates:

- the functions for controlling injection and depollution,
- the driving pleasure strategies,
- the engine immobiliser function,
- the emergency strategies,
- control of the fan units and warning LEDs (*),
- control of the coolant heating systems for the heater matrix (*),
- diagnostics with fault memorising,
- the cruise control function (*),
- the dialogue with all ECUs of the multiplexed networks.

Note: (*) depending on version.

The ECU electrically operates the following components:

- diesel injectors,
- turbocharging pressure regulation electrovalve,
- high pressure fuel regulator,
- recycling regulation electrovalve,
- pre and post heating unit (post-heating cut-out)
- high pressure fuel pump 3rd piston deactivator.

The ECU supplies the following information:

- engine speed: to the instrument panel dials
- instant consumption: to the trip computer,
- air conditioning cut-off,
- coolant heater operation authorisation (depending on version).

The atmospheric pressure sensor cannot be removed from the injection ECU.

The ECU has a power stage which is capable of providing the very high control current required for the injectors to operate.

The ECU is connected to the injection harness by an 88 track connector.

The injection ECU software is upgraded by downloading (ECU with a flash EPROM).

B - ALLOCATION OF ECU CHANNELS

CHANNEL N°	DESCRIPTION
1	+12 V supply (after double relay) (engine relay unit)
2	Injector n°1 control
3	Injector n°3 control
4	Injector n°4 control
5	Injector n°2 control
6	Injector n°2 control
7	-
8	Diagnostic line for the coils of the fan unit control relays
9	Dialogue line: CAN H network
10	-
11	Input: air temperature sensor (flowmeter)
12	Supply: camshaft position sensor / differential pressure sensor
13	Input: air flow signal (flowmeter)
14	Input: engine speed sensor signal
15	Input: accelerator pedal sensor signal
16	-
17	-
18	Input: camshaft sensor signal
19	-
20	-

CHANNEL N°	DESCRIPTION
21	Input: clutch switch
22	Sensors earth
23	---
24	Output: Swirl control electrovalve
25	Output: fan unit 1 control (high speed)
26	Output: turbocharging pressure regulation electrovalve
27	Earth: differential pressure sensor
28	Output: inlet air heater throttle control electrovalve
29	+12 volts supply (after double relay) (engine relay unit)
30	Injector N° 1 control
31	Injector N° 3 control
32	Injector N° 4 control
33	Earth
34	Sensors earth
35	---
36	Engine immobiliser serial line (*)
37	Dialogue line: CAN L network
38	K diagnostic line
39	Input: fuel temperature sensor
40	Earth: camshaft position sensor
41	Input: engine speed sensor signal
42	Input: differential pressure sensor
43	---
44	Sensors supply (5 volts)
45	Earth: coolant temperature sensor
46	Input: coolant temperature information
47	---
48	Stop lamps contact
49	Earth

CHANNEL N°	DESCRIPTION
50	---
51	Earth
52	Output: recycling electrovalve control (EGR)
53	Earth
54	---
55	Output: throttle housing electrovalve control (EGR)
56	---
57	Output: fan unit control: mid speed (*)
58	Output: additional heating control 1
59	---
60	Output: high pressure fuel regulator
61	---
62	---
63	---
64	---
65	---
66	---
67	Input: preheater unit diagnostic
68	Input: accelerator pedal sensor
69	+ ignition on: engine relay unit (BSM)
70	Input: exhaust gas temperature sensor (upstream of the catalytic converter)
71	Input: inlet manifold air pressure
72	---
73	Input: redundant brake switch
74	Input: fuel pressure
75	Air conditioning pressurestat (26 bar control stage)
76	---
77	---

CHANNEL N°	DESCRIPTION
78	---
79	---
80	Output: high pressure fuel pump 3rd piston deactivator
81	---
82	---
83	Output: fan unit control 2 (low speed)
84	---
85	Output: additional heating control 2
86	Output: double relay control (engine relay unit)
87	Input: inertia switch (earthing)
88	Output: preheating unit control

Note: (*) depending on version.

PRE-POST HEATING FUNCTION

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Components common with the document:

- preheater plugs (1160),
- pre-post heating unit (1150).

II - PREHEATER PLUGS (1160) - FEATURE

The preheater plugs are located on the cylinder head, on the rear of the engine (bulkhead side).

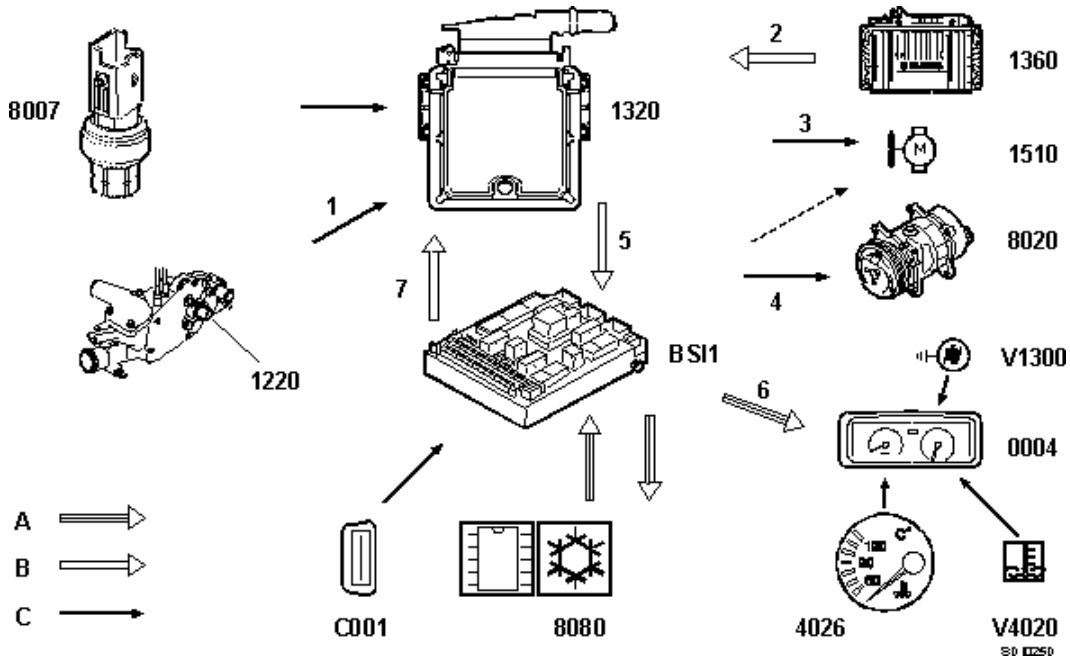
The preheater plugs can be activated during particle filter regeneration assistance.

ENGINE COOLING FUNCTION (FRIC) (INCORPORATED INTO THE INJECTION ECU)

The injection ECU performs the following functions:

- it switches the fan units on and off (engine cooling),
- it controls post ventilation (for 6 minutes maximum),
- it illuminates the coolant temperature warning LED on the instrument panel,
- it controls the coolant temperature gauge on the instrument panel,
- it performs diagnostics for fan unit operation,
- it acquires the engine coolant temperature,
- it manages downgraded modes.

I - DIAGRAM



Key:

A - VAN network

B - CAN network

C - Wire connection

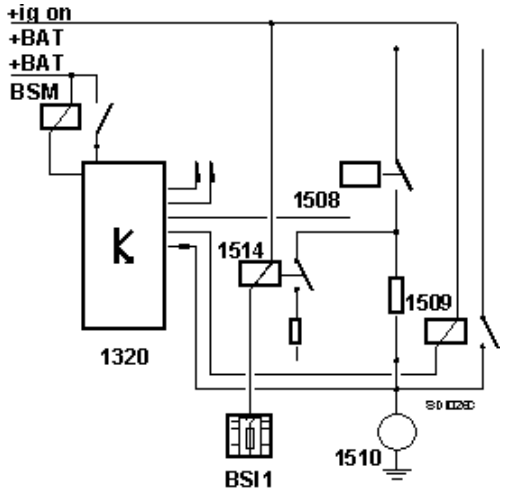
DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
Automatic gearbox ECU (*)	1360
Diagnostic LED	V1300
Fan unit	1510
Air conditioning compressor	8020
Control panel (logometer + warning LED on the control panel	0004
Coolant temperature warning LED	V4020
Coolant temperature logometer	4026
Built-in systems interface	BSI1
Central diagnostic socket	C001
Injection ECU	1320
Air conditioning ECU	8080
Air conditioning pressurestat	8007
Coolant temperature sensor	1220

Note: (*) depending on version.

CONNECTIONS		
CONNECTION N°	**SIGNAL**	**SIGNAL NATURE**
1	Coolant temperature sensor	Frequency
2	Request for automatic gearbox oil temperature cooling (*)	CAN
3	Fan unit relay control: low speed (1508)	All or nothing
	Fan unit relay control: high speed (1509)	All or nothing
4	Air conditioning compressor control	All or nothing
5	Request to illuminate diagnostic LED	CAN
	Request to illuminate coolant temperature logometer	CAN
	Request to illuminate coolant temperature warning LED	CAN
	Authorisation to engage the air conditioning compressor (AC/OUT)	CAN
6	Request to illuminate diagnostic LED	VAN
	Request to illuminate coolant temperature logometer	VAN
	Request to flash coolant temperature warning LED	VAN
7	Request to authorise engaging of the air conditioning compressor (AC/TH)	CAN

Note: (*) depending on vehicle equipment.

II - FAN UNIT (1510)



+BAT = + battery

+ig on = + ignition on

BSM - Double injection relay

1514 - Fan unit relay at mid speed

There is only one type of assembly: three speed fan unit.

Warning: The limits for engaging the fan unit depend on the vehicle: refer to the corresponding documentation.

There are three operating speeds:

- low speed = 97°C,
- mid speed,
- high speed = 105°C.

A - DESCRIPTION

Low speed is obtained by supplying the fan unit through a resistor arranged in series on the supply circuit.

Mid speed is obtained by supplying the fan unit through 2 resistors arranged in parallel in the supply circuit:

- the low speed relay is controlled by the injection ECU,

- the mid speed relay is controlled by the built-in systems interface,

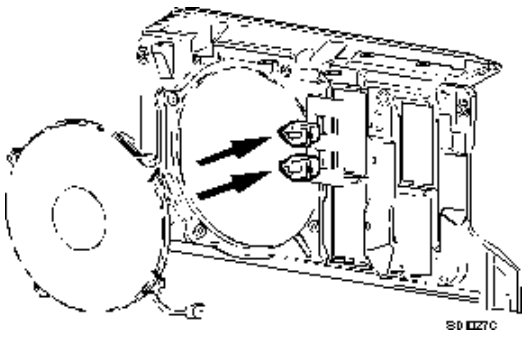
- high speed is obtained by supplying the fan unit directly.

Before switching to high speed, the fan unit is operated at low speed for 3 seconds.

Before switching to mid speed, the fan unit is operated at low speed for 3 seconds (*).

(*) refer to the procedure: cooling requirements for the air conditioning (BRAC).

B - ELECTRICAL RESISTORS



The 2 resistors are located on the front panel, near to the air/air exchanger and the fan unit.

III - COOLANT TEMPERATURE SENSOR (1220)

The coolant temperature sensor informs the ECU of the temperature of the engine coolant.

The coolant temperature sensor is located on the coolant housing.

IV - POST VENTILATION

When the engine is switched off, the ECU controls post ventilation if the coolant temperature exceeds a certain limit (*) (105°C).

(*) depending on vehicle

Post ventilation occurs at low speed and lasts for a maximum of 6 minutes after the engine is switched off.

V - DOWNGRADED MODE

Role of the injection ECU when the coolant temperature sensor is faulty:

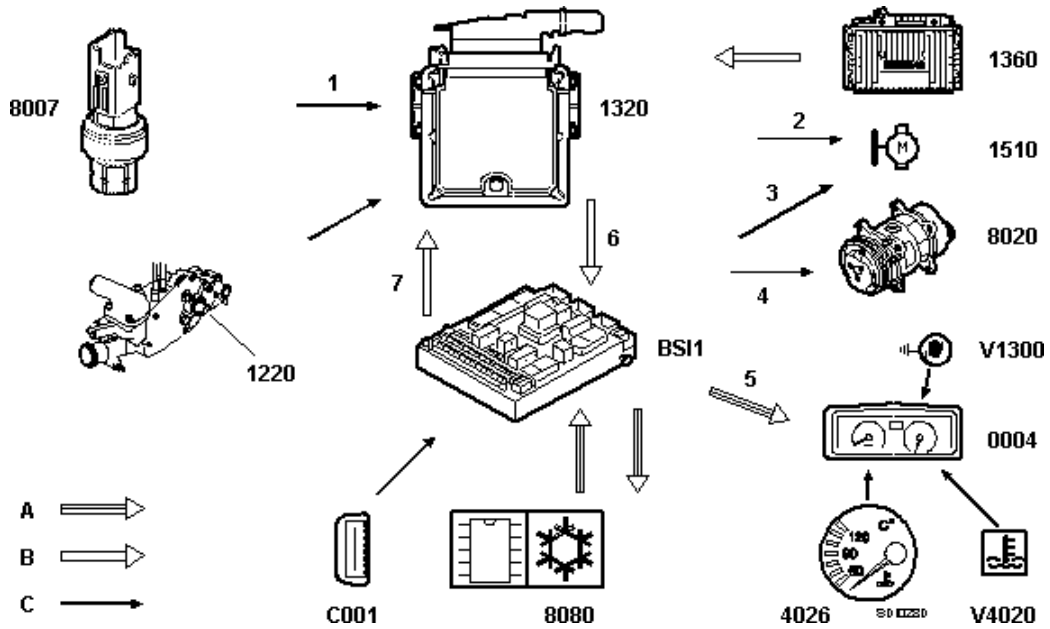
- to control operation of the fan unit at high speed,
- to control the flashing of the coolant temperature warning LED on the control panel (depending on version),
- to prevent the air conditioning compressor from being engaged (AC/OUT).

COOLING REQUIREMENTS FOR THE AIR CONDITIONING (BRAC) (INCORPORATED INTO THE INJECTION ECU)

Functions of the injection ECU:

- to operate the fan units (air conditioning condenser cooling),
- to acquire the pressure of the air conditioning circuit,
- to manage downgraded modes.

I - DIAGRAM



Key:

A - VAN network

B - CAN network

C - Wire connection

DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
Automatic gearbox ECU (*)	1360
Diagnostic LED	V1300
Fan unit	1510
Air conditioning compressor	8020
Instrument panel	0004
Coolant temperature warning LED	V4020
Coolant temperature gauge	4026
Built-in systems interface	BSI1
Central diagnostic socket	C001
Injection ECU	1320
Air conditioning ECU	8080
Air conditioning pressurestat	8007
Coolant temperature sensor	1220

Note: (*) depending on version.

CONNECTIONS		
CONNECTION N°	**SIGNAL**	**SIGNAL NATURE**
1	Air conditioning pressurestat	Analogue
2	Fan unit relay control: low speed (1508)	All or nothing
	Fan unit relay control: high speed (1509)	All or nothing
3	Fan unit relay control: mid speed (1514)	All or nothing
4	Air conditioning compressor control	All or nothing
5	Request to illuminate diagnostic LED	VAN
6	Request to illuminate diagnostic LED	CAN
	Authorisation to engage air conditioning compressor (AC/OUT)	CAN
	Air conditioning pressurestat	CAN
7	Request authorisation to engage air conditioning compressor (AC/TH)	CAN

II - AIR CONDITIONING PRESSURESTAT (8007)

A - ROLE

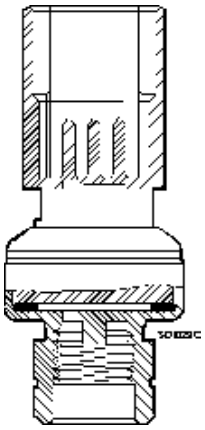
The sensor measures the value of the pressure in the air conditioning circuit.

Role of the injection ECU depending on the information received:

· to authorise operation of the fan unit (air conditioning condenser cooling),

· to authorise engaging of the air conditioning compressor.

B - DESCRIPTION



The sensor is of piezo-electric type.

The sensor consists of strain gauges.

The linear sensor supplies a voltage proportional to the pressure in the air conditioning circuit.

Identification: black connector.

Note: The electrical information provided by the sensor is transmitted by wire to the injection ECU, and sent to the built-in systems interface via the multiplexed network.

C - ELECTRICAL FEATURES

Allocation of connector channels:

- channel 1: 5 volts supply,
- channel 2: pressure information (0 - 5 volts),
- channel 3: earth.

Voltage supplied for a pressure of 1 bar: + 0.5 volt.

Voltage supplied for a pressure of 31 bars: + 4.5 volts.

D - LOCATION

The sensor is located on the air conditioning condenser.

III - FAN UNIT (1510)

The ECU controls operation of the fan unit at low speed if the pressure is greater than 10 bars (off if the pressure is less than 7 bars).

The ECU controls operation of the fan unit at high speed if the pressure is greater than 22 bars (off if the pressure is less than 19 bars).

Note: The BSI controls operation of the fan unit at mid speed if the pressure is greater than 17 bars (off if the pressure is less than 14 bars).

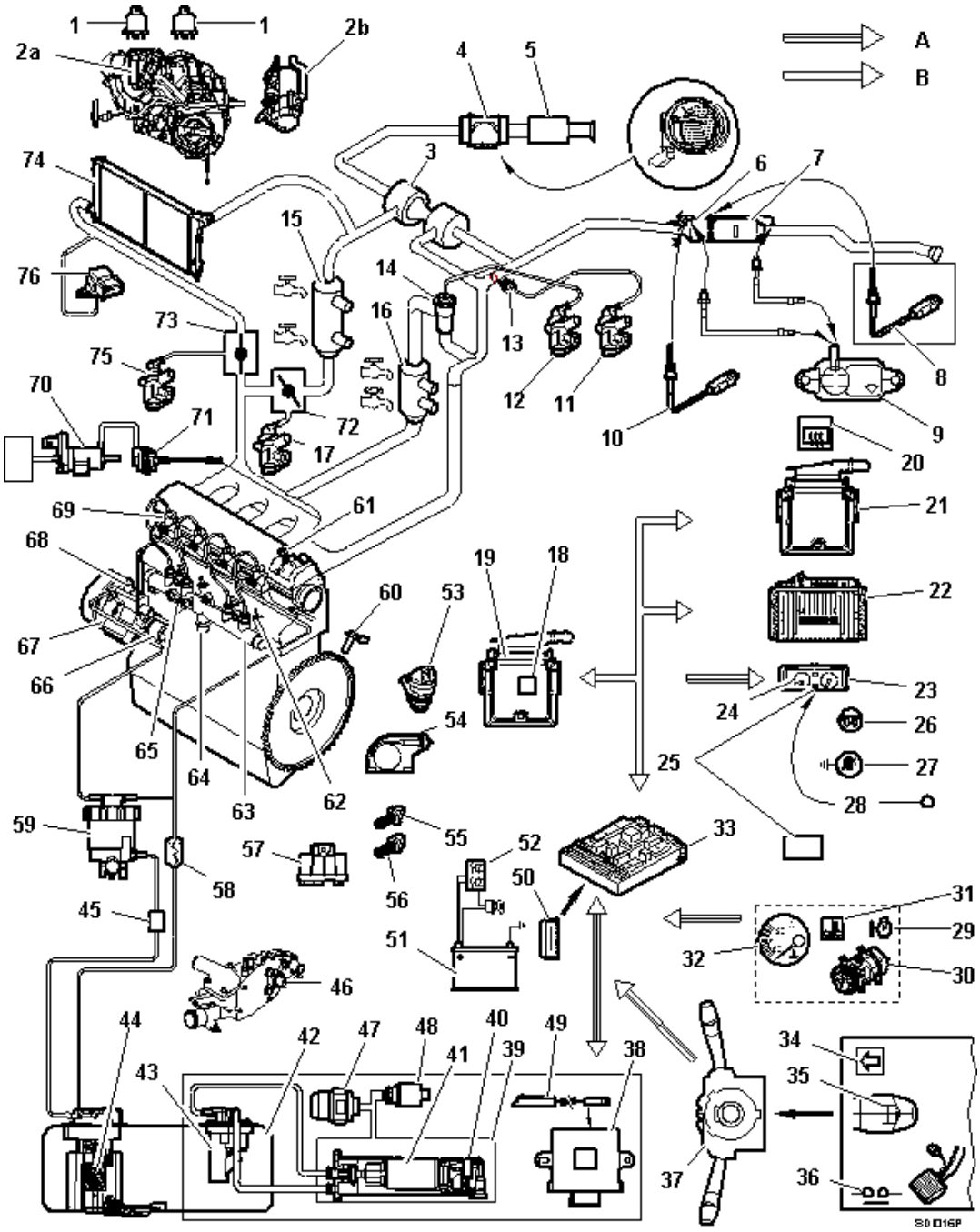
IV - DOWNGRADED MODE

Role of the injection ECU if the pressurestat develops a fault:

- to control the illumination of the diagnostic LED on the control panel,
- to prevent operation of the air conditioning compressor (AC/OUT).

PARTICLE FILTER FUNCTION

I - DIAGRAM



Key:

A - VAN network

B - CAN network

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
1	Additional heating control relay	BCP3
2	Additional heating (electrical resistors (2a) or heater (2b)) (*)	8098 - 1190
3	Variable geometry turbocharger	--
4	Air flowmeter / air temperature sensor	1310
5	Air filter	--
6	Catalytic converter	--
7	Particle filter	--
8	Exhaust gas temperature sensor (downstream of the catalytic converter)	1343
9	Differential pressure sensor	1341
10	Exhaust gas temperature sensor (upstream of the catalytic converter)	1344
11	Turbocharging pressure regulation electrovalve	1233
12	Recycling regulation electrovalve (EGR)	1253
13	Variable geometry turbo control diaphragm	--
14	Exhaust gas recycling valve (EGR)	--
15	Air/water heat exchanger (inlet air heater)	--
16	Coolant/exhaust gas exchanger (EGR)	--
17	Inlet air heater throttle control electrovalve	1285
18	Atmospheric pressure sensor (incorporated into the injection ECU)	1320
19	Injection ECU	1320
20	Heated rear screen	8120
21	Electronic stability program ECU (*)	7800
22	Automatic gearbox ECU (*)	1360
23	Trip computer (*)	--
24	Electronic rev counter	4210
25	Service LED (*)	--
26	Preheater LED	V1150
27	Diagnostic LED	V1300
28	Fuel gauge (*)	--
29	Fan unit	1510

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
30	Air conditioning compressor	8020
31	Coolant temperature warning LED	V4020
32	Coolant temperature gauge	4026
33	Built-in systems interface	BSI1
34	Cruise control switch	7300
35	Cruise control safety contact	7305
36	Redundant brake switch	7308
37	Switch module at the steering wheel (COM2000)	CV00
38	Fuel additive ECU	1282
39	Additive tank	---
40	Low additive level sensor	1283
41	Additive injection pump	1283
42	Fuel tank	--
43	Additive injector	1284
44	Low pressure pump	1211
45	Electric fuel heater	1276
46	Coolant temperature sensor	1220
47	Plug (overflow)	--
48	Safety valve	---
49	Fuel filler cap presence sensor (*)	4320
50	Central diagnostic socket	C001
51	Battery	BB00
52	Double injection relay (engine relay unit)	BSM
53	Vehicle speed sensor	1620
54	Accelerator pedal position sensor	1261
55	Clutch pedal switch	7306
56	Brake pedal switch	2100
57	Pre-post heating unit	1150
58	Fuel cooler	--
59	Fuel filter	--
60	Engine speed sensor	1313
61	Camshaft position sensor	1115
62	Preheater plugs	1160

REF.	DESCRIPTION	PART NUMBER IN THE WIRING DIAGRAMS
63	High pressure fuel common injection rail	--
64	High pressure fuel sensor	1321
65	Fuel temperature sensor	1310
66	High pressure fuel regulator	1322
67	High pressure fuel pump	--
68	High pressure fuel pump 3rd piston deactivator	1277
69	Diesel injectors	1331 - 1332 - 1333 - 1334
70	Swirl control electrovalve	1264
71	Swirl control diaphragm	--
72	Inlet air heater throttle	--
73	Throttle housing (EGR)	--
74	Air/air heat exchanger	--
75	Throttle housing control electrovalve (EGR)	1263
76	Inlet manifold pressure sensor	1312

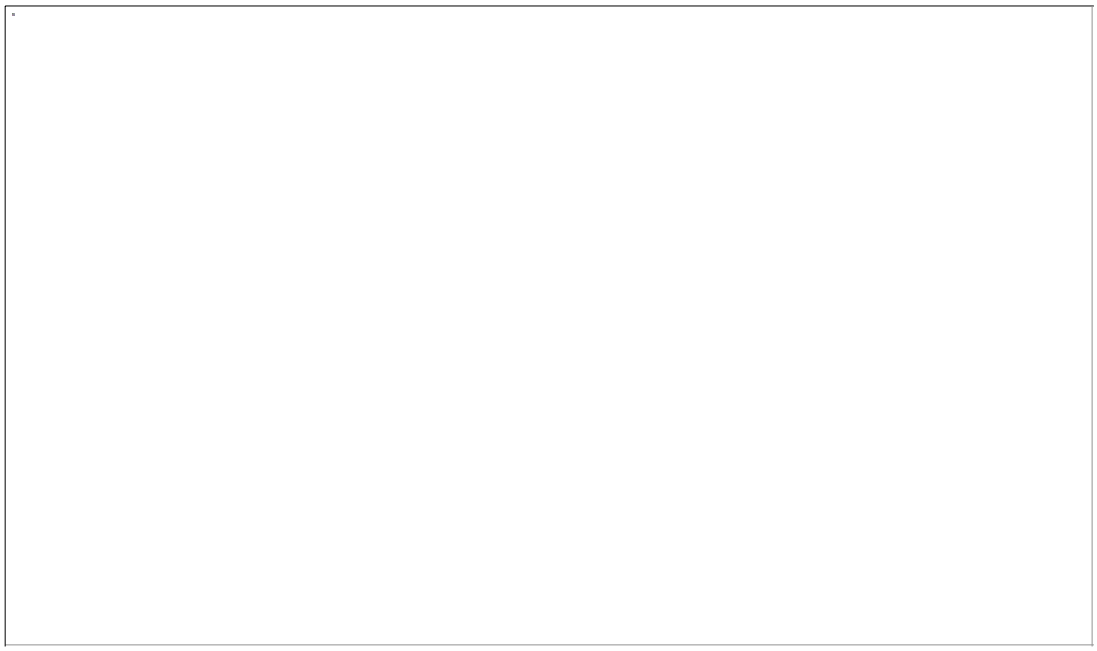
Note: (*) depending on version.

II - PARTICLE FILTER

A - ROLE

The particle filter traps carbon particles as exhaust gases pass through.

B - DESCRIPTION



a - Carbon particles

b - Cerine

c - Filtered exhaust gases

d - Porous ceramic walls

e - Stainless steel casing

f - Thermal insulator

The particle filter is a porous silicon carbide structure containing channels arranged so as to force the exhaust gases to pass through the walls.

Components retained in the particle filter:

· carbon particles,

· cerine,

· deposits from the engine oil and engine wear.

Essentially consisting of carbon and hydrocarbons, these particles attached to the particle filter burn in the presence of oxygen at a temperature of 550°C (natural regeneration or assisted with post-injection).

Cerine is an inorganic material which does not burn and is retained in the particle filter in the form of a solid deposit.

The accumulation of particles during engine operation leads to the progressive clogging up of the particle filter.

Warning: The particle filter must be replaced or cleaned every 80 000 km (in order to remove the particles retained in the filter). Refer to the maintenance section.

C - LOCATION

The particle filter is incorporated into the exhaust pipe (downstream of the catalytic converter).

III - CATALYTIC CONVERTER

A - ROLE

The catalytic converter is used to increase the temperature of the exhaust gases, through post-combustion of the unburned hydrocarbons (HC) resulting from post-injection.

B - DESCRIPTION

Composition of an oxidation catalytic converter:

- a stainless steel envelope,
- a thermal insulator,
- a ceramic honeycombed monolith impregnated with precious metals.

C - LOCATION

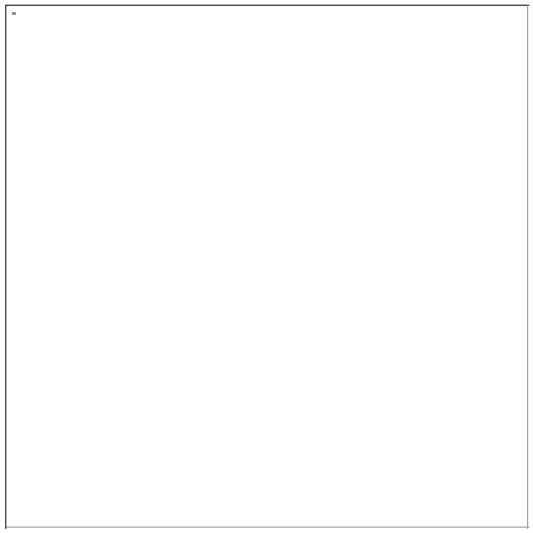
The catalytic converter is located immediately after the particle filter.

IV - EXHAUST GAS TEMPERATURE SENSOR (UPSTREAM OF THE CATALYTIC CONVERTER) (1344)

A - ROLE

The temperature sensor informs the injection ECU of the temperature of the exhaust gases (upstream of the catalytic converter).

B - DESCRIPTION



The sensor consists of a Negative Temperature Coefficient resistor (NTC).

The higher the temperature, the lower its resistance.

C - ELECTRICAL FEATURES

Allocation of connector channels:

- channel 1: 5 volts,
- channel 2: earth.

Resistance at 100°C = 96 000 ohms.

Resistance at 450°C = 762 ohms.

Warning: The electrical information provided by the upstream temperature sensor is transmitted directly to the injection ECU.

D - LOCATION

The temperature sensor is located upstream of the catalytic converter.

The temperature sensor is screwed onto a base.

IMPORTANT: Use the correct tightening torque.

V - EXHAUST GAS TEMPERATURE SENSOR (DOWNSTREAM OF THE CATALYTIC CONVERTER) (1343)

A - ROLE

The temperature sensor informs the injection ECU of the temperature of the exhaust gases (downstream of the catalytic converter).

B - DESCRIPTION

The downstream temperature sensor is identical to the upstream temperature sensor.

C - ELECTRICAL FEATURES

Warning: The electrical information provided by the downstream temperature sensor is transmitted by wire to the additive ECU and sent to the injection ECU via the multiplexed networks.

D - LOCATION

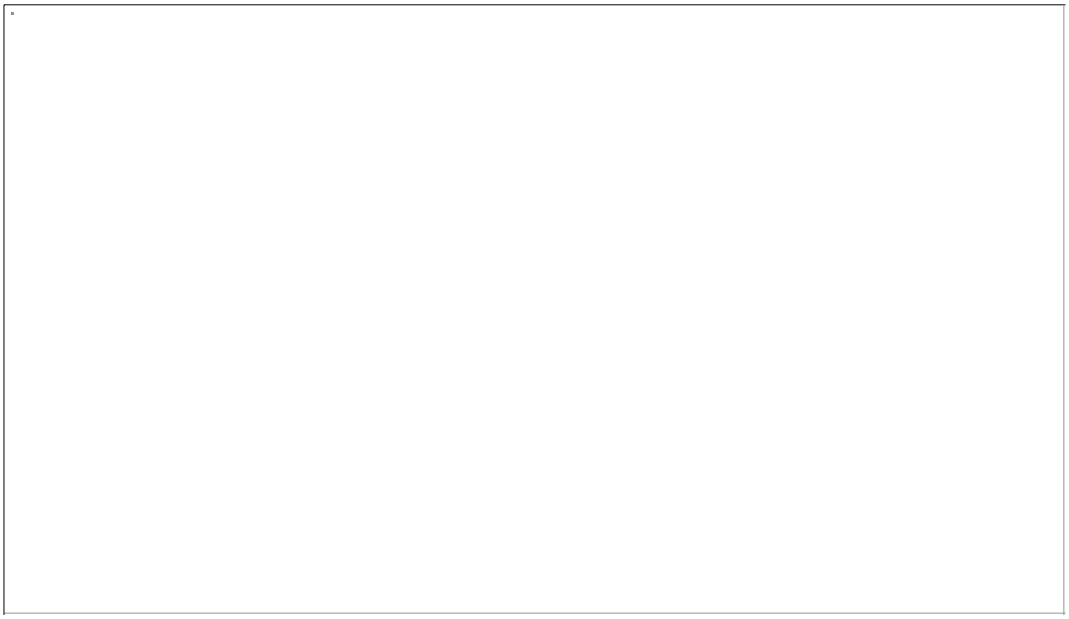
The temperature sensor is located between the catalytic converter and the particle filter.

VI - DIFFERENTIAL PRESSURE SENSOR (1341)

A - ROLE

The sensor permanently measures the pressure difference of the exhaust gases, between the inlet and the outlet of the particle filter, to determine the status of the filter (clogging problems or damage to filter).

B - DESCRIPTION



g - HI: Particle filter upstream information input (diameter 4.32 mm)

h - REF: Particle filter downstream information input (diameter 4.32 mm)

j - White marking

k - Electrical connector

l - Membrane

The sensor comprises the following components:

· electronics for amplifying the signal,

· a sealed membrane.

The membrane is subject to the following pressures:

· the inlet pressure of the particle filter (upstream),

· the outlet pressure of the particle filter (downstream).

The sensor provides a voltage proportional to the pressure differential measured by the membrane (pressure differential = upstream pressure - downstream pressure).

IMPORTANT: Do not invert the upstream and downstream information pipes (malfunction of the filtration system). Management of the particle filter depends on this information.

C - ELECTRICAL FEATURES

Allocation of connector channels:

- channel 1: pressure information (0.5 - 5 volts),
- channel 2: earth,
- channel 3: 5 volts supply

Voltage supplied for a pressure differential of 0 bar: + 0.5 volt (engine off).

Voltage supplied for a pressure differential of 0.9 bar: + 4.1 volts (particle filter clogged).

D - LOCATION

j - white marking

The sensor (9) is located in the centre of the bulkhead at the top (depending on vehicle).

VII - AIR TEMPERATURE SENSOR (1310)

The air temperature sensor informs the ECU of the temperature of the inlet air.

Warning: The air temperature sensor is incorporated into the air flowmeter.

Role of the injection ECU depending on the information received:

- to regulate the temperature of the inlet air by operating the inlet air heater throttle control electrovalve.

Note: When the air temperature sensor (1310) is faulty, the ECU uses a replacement value of 50°C.

Note: The information from the exterior air temperature sensor (6415) located in the door mirror is used by the ECU to perform comparison tests. The exterior air sensor is controlled by the front RH door station (9050).

VIII - AIR/WATER HEAT EXCHANGER (HEATING OF THE INLET AIR)

A - ROLE

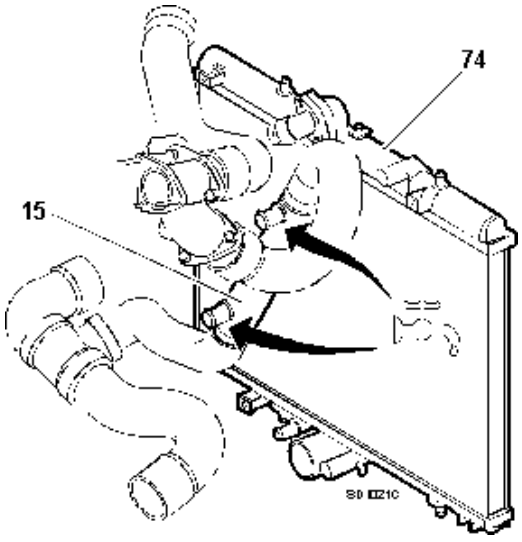
The air/water heat exchanger heats the inlet air in the cylinders (during the particle filter regeneration assistance phase).

The inlet air heater is used to increase the combustion temperature required to regenerate the particle filter.

B - DESCRIPTION

The air/air heat exchanger, which cools the inlet air in the cylinders, is surrounded by an air/water exchanger which heats the inlet air.

C - LOCATION



15 - air/water heat exchanger (inlet air heater)

74 - air/air heat exchanger

The water/air heat exchanger (15) is located near to the front air/air heat exchanger (74).

IX - INLET AIR HEATER THROTTLE

A - DESCRIPTION

Warning: The inlet air heater throttle is closed when it is not controlled pneumatically.

B - LOCATION

The throttle housing is located at the inlet to the inlet manifold.

X - THROTTLE HOUSING CONTROL ELECTROVALVE (HEATING OF THE INLET AIR) (1285)

A - ROLE

The electrovalve controls the opening of the inlet air heater throttle.

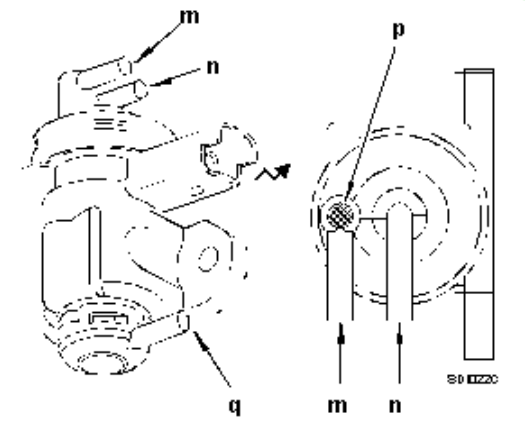
B - DESCRIPTION

The electrovalve is the same as the following electrovalves:

· turbocharging pressure regulation electrovalve,

· exhaust gas recycling electrovalve (EGR),

· throttle housing control electrovalve (EGR).



m - "user" output

n - vacuum pump vacuum inlet

p - white marking

q - atmospheric pressure inlet

The electrovalve is controlled with an OCR (open cycle ratio).

The proportional electrovalve controlled with an OCR voltage is connected to the following:

· atmospheric pressure,

· vacuum supplied by the vacuum pump.

The pressure supplied by the electrovalve is between atmospheric pressure and the vacuum from the vacuum pump.

The electrovalve connects the vacuum pump and the heater throttle.

Operating phases with particle filter regeneration assistance:

· engine at low load and mid load: the inlet air heater throttle is open (controlled),

· engine at full load: the inlet air heater throttle is closed (not controlled) (in moderate ambient temperature).

Note: The inlet air heater throttle can be controlled outside the regeneration assistance operating phase (engine cold, moderate ambient temperature).

C - ELECTRICAL FEATURES

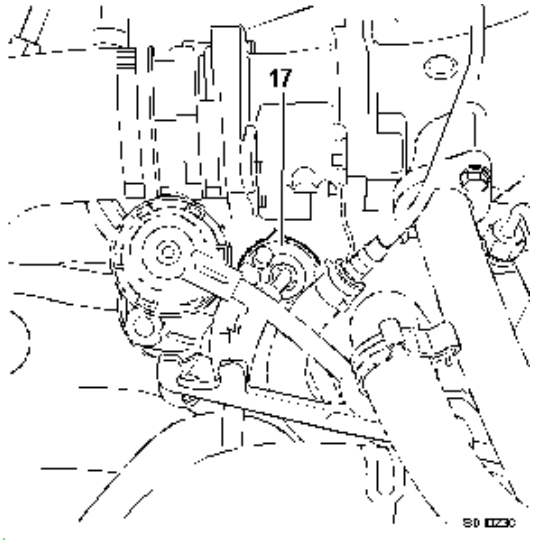
Control: injection ECU (earth).

Variable voltage control (OCR):

· full supply (maximum OCR) = maximum vacuum,

· no supply (minimum OCR) = no vacuum (atmospheric pressure).

D - LOCATION



17 - inlet air heater throttle control electrovalve

The electrovalve is located between the air filter housing and the inlet manifold. It has a 2 way orange connector.

XI - THROTTLE HOUSING CONTROL ELECTROVALVE (EGR) (1263)

A - ROLE

The electrovalve controls the closing of the throttle housing (EGR).

B - DESCRIPTION

Warning: The throttle housing is open when it is not controlled pneumatically.

Operating phases with particle filter regeneration assistance:

· engine at low load: the throttle housing is closed (controlled) (**) (depending on exterior temperature),

· engine at mid load and full load: the throttle housing is open (not controlled).

(**) the engine only lets in heated air.

The electrovalve has a 2 way black connector.

XII - BUILT-IN SYSTEMS INTERFACE (BSI1)

A - ROLE

The BSI performs the following operations:

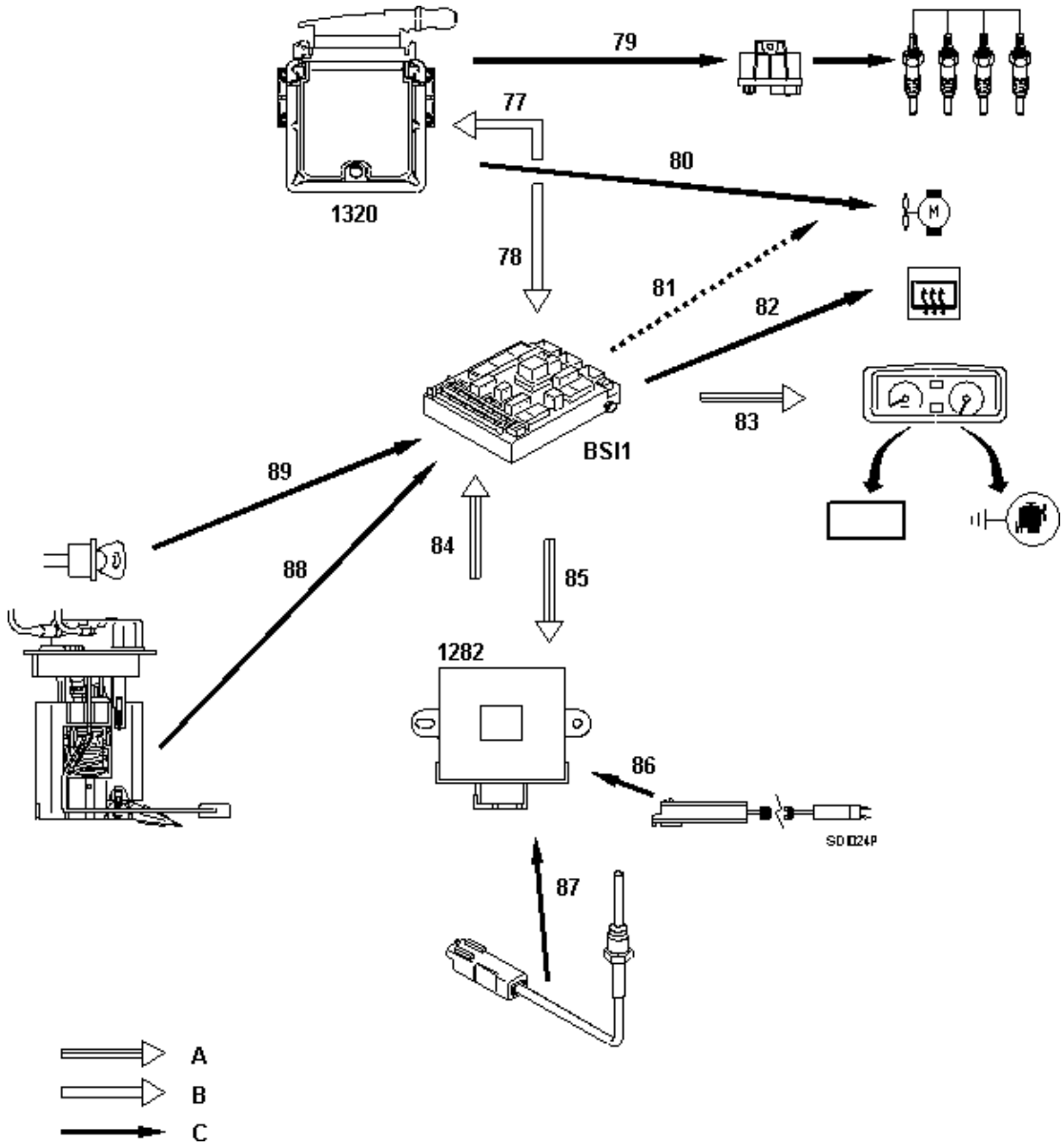
· it transmits information from the fuel additive ECU to the injection ECU,

· it transmits information from the injection ECU to the fuel additive ECU,

· it informs the driver of the status of the pollutant particle filtration system,

· it reinitialises the system after a maintenance operation.

B - DIAGRAM



Key:

A - VAN network

B - CAN network

C - Wire connection

BSI1 - Built-in systems interface

1282 - Fuel additive ECU

1320 - Injection ECU

CONNECTIONS		
CONNECTION N°	**SIGNAL**	**SIGNAL NATURE**
77	Operating status of the additive ECU	CAN
	Low additive level reached warning	CAN
	Total quantity of additive injected since start of particle filter's life	CAN
	Exhaust gas temperature (downstream of the catalytic converter)	CAN
	Request to force fan unit (at low speed)	CAN
	Request to force pre-post heater plugs	CAN
78	Request to illuminate diagnostic LED	VAN
	Particle filter fault	CAN
	Request to activate consumers (alternator saturation)	CAN
	Request to force fan unit (at mid speed)	CAN
	Engine speed sensor signal (engine running information)	CAN
79	Pre-post heating unit / preheater plugs control	All or nothing
80	Fan unit relay control (at low speed)	All or nothing
81	Fan unit relay control (at mid speed)	All or nothing
82	Heated rear screen relay control	All or nothing
83	Request to illuminate diagnostic LED	VAN
	Request to flash service LED on the control panel (*)	VAN
	Request to display a message on the multifunction screen (*)	VAN
84	Operating status of the additive ECU	VAN
	Low additive level reached warning	VAN
	Total quantity of additive injected since start of particle filter's life	VAN
	Status of the fuel filler cap presence sensor	VAN
	Exhaust gas temperature (downstream of the catalytic converter)	VAN

CONNECTIONS		
CONNECTION N°	**SIGNAL**	**SIGNAL NATURE**
85	Engine speed sensor signal (engine running information)	VAN
	Fuel sender information	VAN
	Ignition key position	VAN
	Vehicle speed information	VAN
86	Fuel filler cap presence sensor	All or nothing
87	Exhaust gas temperature (downstream of the catalytic converter)	Analogue
88	Fuel sender	Analogue
89	Ignition key	All or nothing

(*) depending on equipment.

XIII - INJECTION ECU (1320)

A - ROLE

The ECU software performs:

- the functions for controlling injection and depollution,
- the control of particle filter regeneration,
- the driving pleasure strategies,
- the emergency strategies,
- the control of the fan units and warning LEDs (*),
- the diagnostic function with memorising of faults,
- the dialogue with the fuel additive ECU,
- the dialogue with the automatic gearbox ECU (*),
- the dialogue with the electronic stability program ECU (*).

(*) depending on equipment.

B - DESCRIPTION

The ECU is responsible for electrically controlling the following components:

- differential pressure sensor,
- exhaust gas temperature sensor (upstream of the catalytic converter),
- inlet air heater throttle control electrovalve.

FUEL ADDITIVE FUNCTION

I - ADDITIVE

A - ROLE

Role of the additive:

- to lower the particle combustion temperature to 450°C (instead of 550°C),
- to impregnate the particles forming in the combustion chamber,
- to propagate combustion of the particles.

B - DESCRIPTION

EOLYS additive (supplied by RHODIA).

Composition:

- cerine: 4.2% by weight (DP X42),
- catalytic converter: brown in colour,
- solvent product (combustible hydrocarbon).

II - ADDITIVE TANK

A - DESCRIPTION

Specifications:

- capacity: 5 litres,
- range: 80 000 km,
- integrated additive injection pump,
- integrated low additive level sensor,
- 4 orifices.

Orifices:

- additive injection pump outlet (10 mm diameter click-fit connector),
- additive injection pump return (8 mm diameter click-fit connector),
- breather (pressure - vacuum safety valve),
- degassing (overflow).

Filling: refer to the procedure given in the mechanical file of the vehicle in question.

B - LOCATION

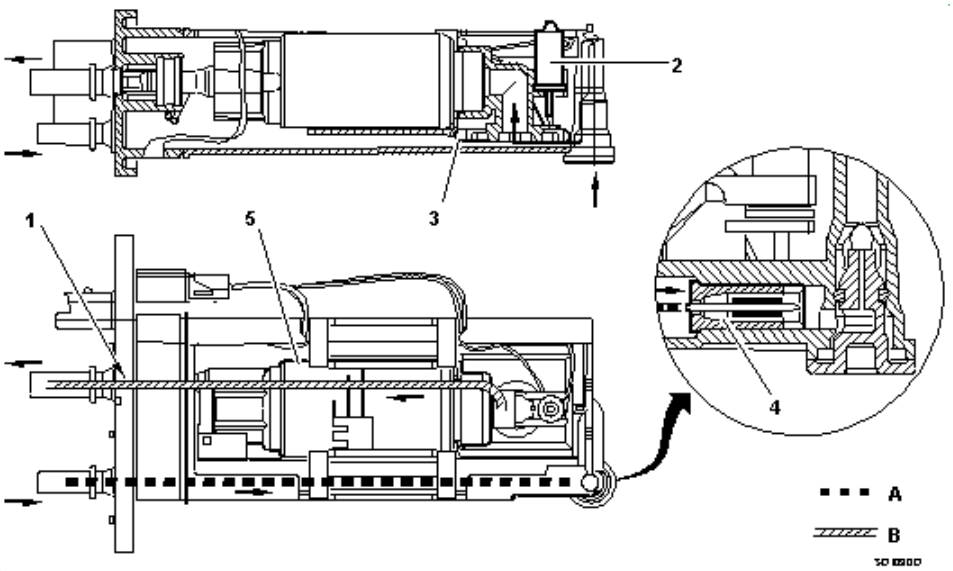
Location: under the fuel tank.

III - ADDITIVE INJECTION PUMP (1283)

A - ROLE

The additive injection pump supplies the pressure and the flow required in the additive circuit.

B - DESCRIPTION



A - Additive return circuit

B - Additive low pressure circuit

Supplier: MARWAL

The additive injection pump comprises the following components:

1 - Non return valve (additive low pressure circuit)

2 - Low additive level sensor

3 - Filter

4 - Non return valve (additive tank return circuit)

5 - Roller displacement pump

The non return valves prevent additive from flowing out when the additive injection pump outlet and return click-fit connectors are opened.

Note: Safety valve rating: 0.2 bar.

Pump flow: 80 l/h.

Normal operating pressure: 3 bars.

The additive pump is supplied with 12 volts by the fuel additive ECU in the following cases:

- for 5 seconds when the ignition is switched on

- during the additive phase

C - ELECTRICAL FEATURES

Controlled by the fuel additive ECU.

Allocation of connector channels:

- channel 1: (-) low additive level sensor,
- channel 2: (+) low additive level sensor,
- channel 3: additive injection pump 12 volt supply,
- channel 4: additive injection pump earth,
- channel 5: spare,
- channel 6: spare.

D - LOCATION

The pump is submerged in the additive tank.

Note: The pump cannot be separated from the additive tank.

III - LOW ADDITIVE LEVEL SENSOR (1283)

A - ROLE

The sensor informs the additive ECU that the low additive level has been reached when there is 0.3 litres remaining in the additive tank.

Depending on the information received, the additive ECU informs the fuel injection ECU.

The injection ECU informs the BSI which requests activation of the following:

- request to flash the service LED on the control panel (*),
- request to display a message on the multifunction screen (*).

Note: 0.3 litres of additive is sufficient to fill up the tank 6 times with 80 litres of fuel (*).

(*) depending on vehicle equipment.

B - DESCRIPTION

The sensor consists of a thermistor.

The information provided varies, depending on whether the thermistor is in the additive or in air (minimum level reached).

C - LOCATION

The sensor is incorporated into the additive injection pump.

IV - SAFETY VALVE

A - ROLE

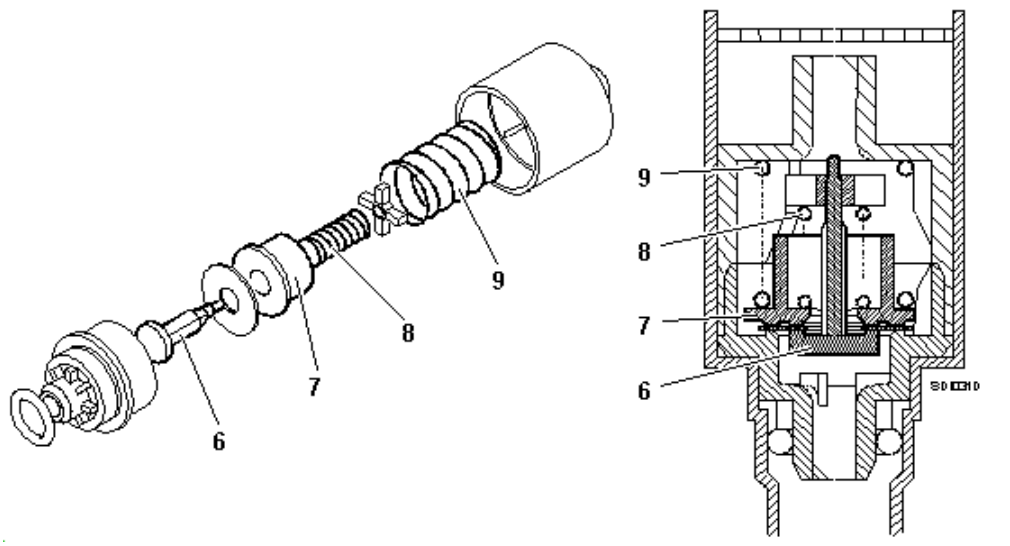
Role of the safety valve:

· sealing function (prevents the solvent from evaporating and the ingress of dust, mud and water),

· overturn safety function,

· breather for the additive tank depending on the additive level.

B - DESCRIPTION



6 - Vacuum valve (0.036 bar)

7 - Pressure relief valve (0.05 +/- 0.01 bar)

8 - Vacuum valve return spring

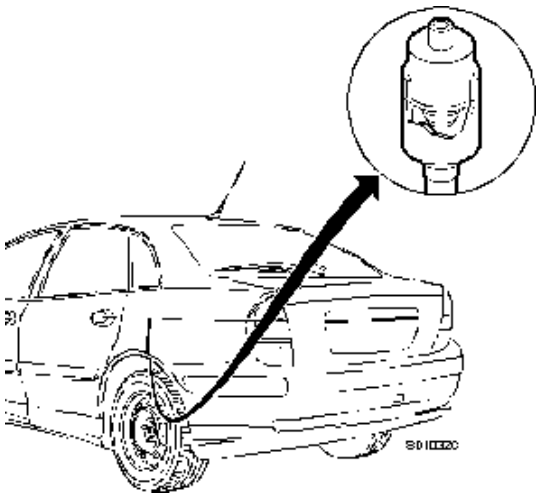
9 - Pressure relief valve return spring

Operation:

· the valve (6) acts as a breather for the additive tank depending on the additive level,

· the valve (8) performs the sealing and overturn safety function.

C - LOCATION



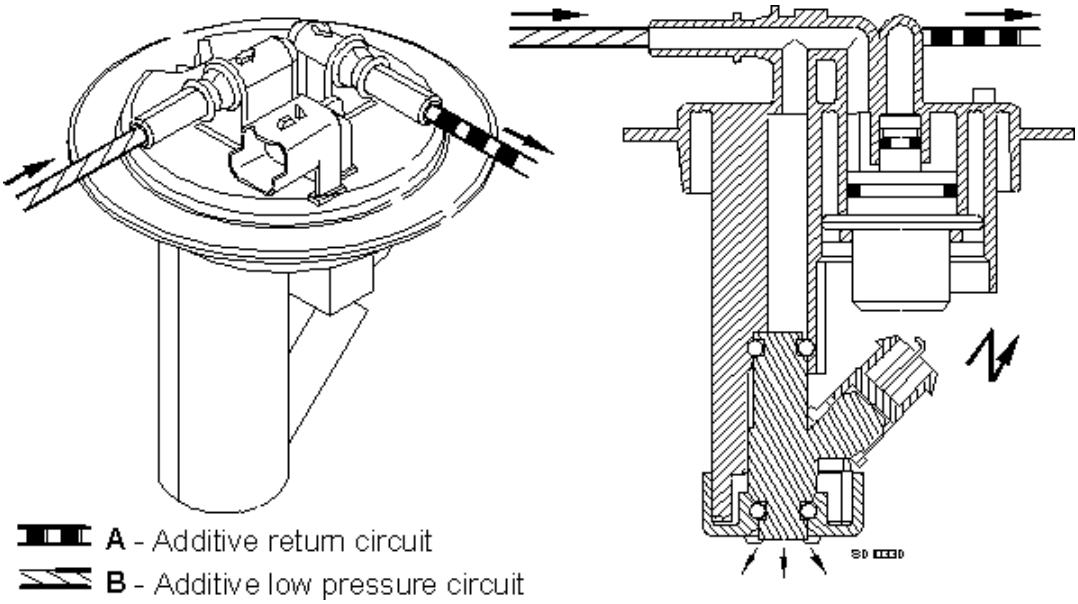
The safety valve is located in the rear left hand wheel arch (behind the mud flap).

V - ADDITIVE INJECTOR (1284)

A - ROLE

The injector is used to inject a set amount of additive into the fuel tank.

B - DESCRIPTION



Type: WEBER IWP 043

Note: Safety valve rating: 3 bars.

C - ELECTRICAL FEATURES

Controlled by the fuel additive ECU.

Allocation of connector channels:

- channel 1: +12 volts supply,
- channel 2: control.

Electrical specifications: resistance at 25 °C = 14.7 ohms.

C - LOCATION

The additive injector is located on the fuel tank.

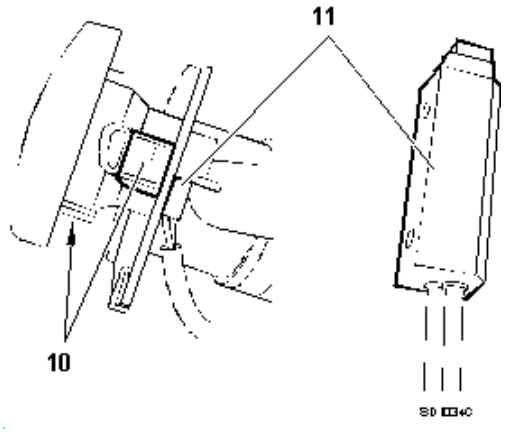
VI - FUEL FILLER CAP PRESENCE SENSOR (4320)

A - ROLE

The fuel filler cap presence sensor informs the additive ECU whether the fuel filler cap is open or closed.

Role of the additive ECU depending on the information received: to detect whether fuel may have been added.

B - DESCRIPTION



10 - Permanent magnet

11 - Contact

The filler cap is fitted with a magnet. When the cap is closed, the magnet is opposite the contact.

C - ELECTRICAL FEATURES

Supply: fuel additive ECU.

Allocation of connector channels:

- channel 1: 5 volt supply,
- channel 2: signal,
- presence of the magnet opposite the contact: resistance = 150 000 ohms,
- absence of the magnet opposite the contact: resistance = 15 ohms.

VII - FUEL SENDER (1211)

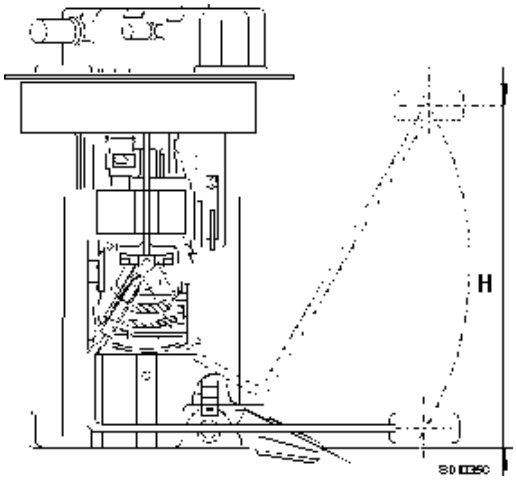
A - ROLE

The fuel sender informs the additive ECU of a variation in fuel level, through the built-in systems interface.

Role of the additive ECU depending on the information received:

- to determine the amount of additive to be injected,
- to control the additive injection pump,
- to control the additive injector.

B - DESCRIPTION



Controlled by the fuel sender.

Supplier VDO:

HEIGHT OF THE FLOAT AXIS IN RELATION TO THE BASE LEVEL	RESISTANCE
14 mm	350 ± 5 ohms
44 mm	300 ± 5 ohms
75 mm	250 ± 5 ohms
110 mm	200 ± 5 ohms
139 mm	150 ± 5 ohms
171 mm	100 ± 5 ohms
202 mm	50 ± 5 ohms

Supplier MARWAL:

HEIGHT OF THE FLOAT AXIS IN RELATION TO THE BASE LEVEL	RESISTANCE
14 mm	350 ± 11 ohms
41 mm	300 ± 10 ohms
72 mm	250 ± 10 ohms
104 mm	200 ± 9 ohms
138 mm	150 ± 9 ohms
171 mm	100 ± 8 ohms
204 mm	50 ± 2 ohms

Note: The fuel sender cannot detect a variation in fuel level of less than 7 litres precisely.

VIII - BUILT-IN SYSTEMS INTERFACE (BSI1)

The BSI sends the additive ECU the following information:

· engine speed sensor signal (engine running information),

· vehicle speed information,

· fuel sender information,

· ignition key position.

IX - FUEL ADDITIVE ECU (1282)

A - ROLE

The ECU controls additive injection.

The ECU software is responsible for:

· controlling the start of additive injection and additive injection time into the fuel tank,

· managing the total amount of additive injected since the beginning of the filter's life,

· the emergency strategies,

· diagnostic with memorising of faults,

· dialogue with the injection ECU.

B - DESCRIPTION

The ECU electrically controls the following components:

· low additive level sensor,

· additive injection pump,

· additive injector,

· fuel filler cap presence contact,

· catalytic converter downstream exhaust gas temperature sensor.

Supplier: MAGNETTI MARELLI.

C - ELECTRICAL FEATURES

Allocation of connector channels:

CHANNEL N°	DESCRIPTION
1	+ 12 volt supply (permanent +BAT)
2	+BAT BSI / + ignition on supply
3	+BODY VAN supply (+12 volts)
4	Input: fuel filler cap presence sensor information
5	Input: low additive level sensor information
6	-
7	-
8	Output: additive injector 12V control
9	Output: additive injection pump 12V control
10	Input: catalytic converter downstream exhaust gas temperature sensor information
11	Input: catalytic converter downstream exhaust gas temperature sensor information
12	Input: fuel filler cap presence sensor information
13	Input: low additive level sensor information
14	VAN Data network
15	VAN Data bar network
16	Earth

D - LOCATION

Location: on the chassis member near to the bottom of the RH centre post (depending on vehicle).

OPERATING PHASES:
HDI DIRECT INJECTION SYSTEM

I - COMPONENTS COMMON WITH DOCUMENT "BOSCH EDC 15C2 HDI INJECTION SYSTEM"

Components common with the document:

- foreword,
- injection diagram,
- role of the main cartographic maps,
- general operation,
- working out the amount of fuel to inject,
- high pressure fuel regulation,
- direct injection,
- working out the injection type,
- turbocharging pressure regulation,
- starting the engine,
- stopping the engine,
- engine operating safety,
- driver's information function.

II - SPECIFIC COMPONENTS

Specific features of the DW12TED4 engine:

- turbocharging pressure regulation,
- exhaust gas recycling regulation,
- pre-post heating,
- additional heating,
- air conditioning compressor cut-off,
- displaying faults,
- downgraded operating modes.

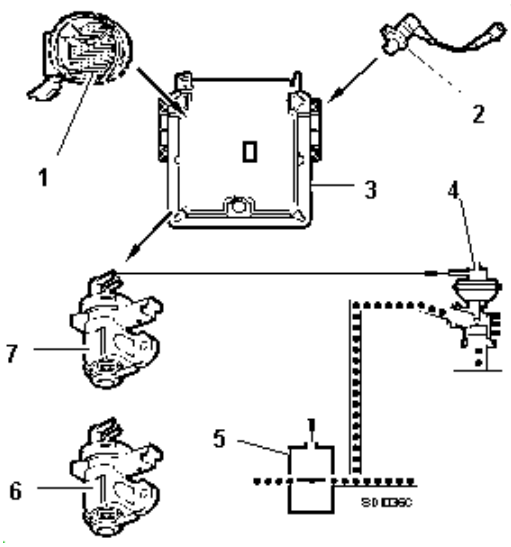
III - TURBOCHARGING PRESSURE REGULATION - FEATURE

The turbocharging pressure is reduced to prevent the turbocharger from being damaged in the following cases:

- when the altitude is above 500 m,
- when the exterior air temperature is above 28°C (at the inlet manifold inlet).

During part of the EGR phase (low engine speed / low load), the turbocharging pressure is controlled in an open loop to prevent any interference on the air loop.

IV - EXHAUST GAS RECYCLING REGULATION



1 - Air flowmeter

2 - Engine speed sensor

3 - Injection ECU

4 - Exhaust gas recycling valve (EGR)

5 - Throttle housing (EGR)

6 - Throttle housing control electrovalve (EGR)

7 - Recycling regulation electrovalve (EGR)

Exhaust gas recycling is of progressive type and is controlled by a cartographic map.

Role of the injection ECU depending on the information received (exhaust gas recycling rate determined in the cartographic map):

- to control the exhaust gas recycling electrovalve with an OCR voltage,
- to determine the exhaust gas recycling rate,
- to correct the OCR applied to the exhaust gas recycling electrovalve so as to obtain the theoretical recycling rate equal to the measured rate.

Note: Exhaust gas recycling rate = difference between the measurement from the air flowmeter and the calculation of the amount of air entering the engine (depending on engine speed and air temperature).

Conditions allowing exhaust gas recycling:

- engine speed greater than 725 rpm,
- low engine load,
- coolant temperature (ECU cartographic map) / air temperature (ECU cartographic map),
- regeneration assistance not active.

Conditions prohibiting exhaust gas recycling:

- full engine load,
- engine speed greater than 2650 rpm,
- altitude above 1500 m,
- coolant temperature above 105°C,
- regeneration assistance active.

Throttle housing (EGR):

- in addition to the recycling valve, the throttle housing, depending on its position, is used to improve exhaust gas recycling,
- the throttle housing is controlled progressively and using a cartographic map (injection ECU).

V - PRE-POST HEATING

The preheating and postheating times are determined by the ECU depending on the coolant temperature.

VI - PREHEATING OPERATION

The preheating time varies as a function of coolant temperature.

COOLANT TEMPERATURE	PREHEATING TIME
- 25°C	15 seconds
- 18°C	10 seconds
- 10°C	0.5 seconds
- 1°C	0.5 seconds

VII - HEATING OF THE PLUGS WHILST CRANKING

During the cranking phase, the plugs are energised in the following cases:

- coolant temperature below 25°C?
- engine speed less than 70 rpm for 0.2 seconds.

Note: After the LED extinguishes, if the starter motor is not operated, the preheater plugs remain energised for a maximum of 10 seconds.

VIII - POSTHEATING OPERATION

Postheating can extend the operation of the plugs after the cranking phase.

COOLANT TEMPERATURE	POSTHEATING TIME
- 25°C	180 seconds
17°C	180 seconds
19°C	400 seconds
25°C	400 seconds
50°C	0 seconds

Parameters which can interrupt postheating:

- coolant temperature above 50°C,
- engine speed above 1500 rpm.

IX - ADDITIONAL HEATING

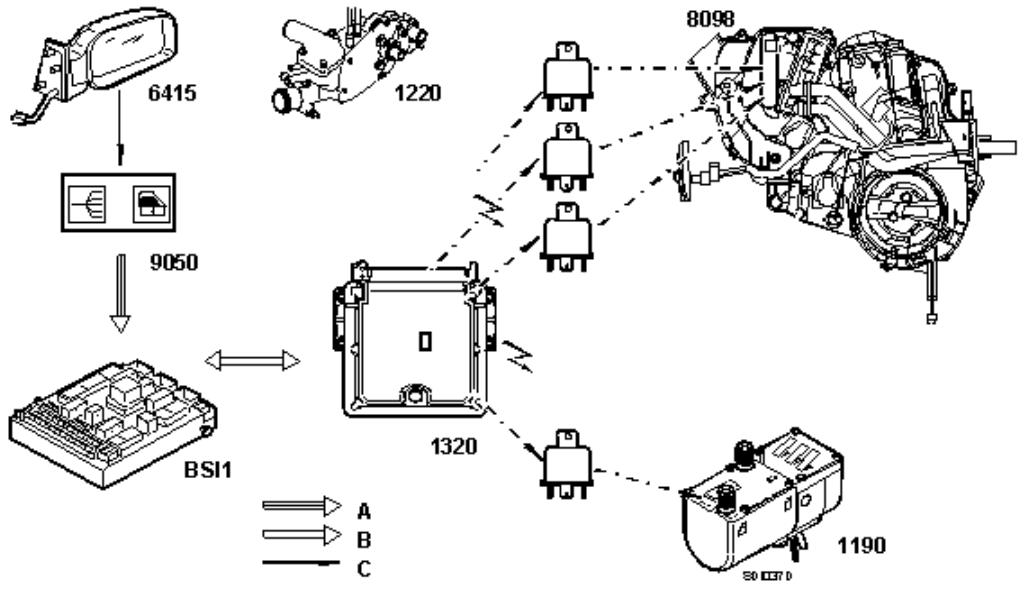
As the engine is highly efficient, a system is required to assist the rise in temperature in the passenger compartment in cold climates.

The passenger compartment temperature rise assistance system is controlled by the built-in systems interface and operated by the injection ECU.

2 devices are used depending on the marketing country:

- several thermoplungers (electrical resistors) located in the coolant circuit of the heater matrix,
- an additional fuel powered heater located in the front left hand wheel arch (for vehicles in very cold countries).

A - DIAGRAM



Key:

A - VAN network

B - CAN network

C - Wire connection

(1220) Coolant temperature sensor.

(1320) Injection ECU.

(6415) Exterior air temperature sensor.

(8098) Electrical resistors.

(1190) Additional heater.

(9050) Front RH door station.

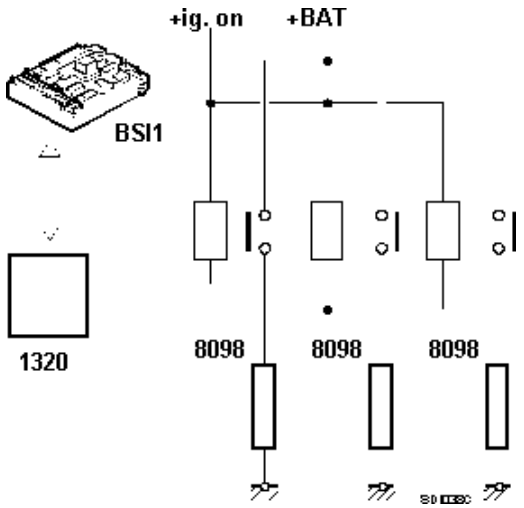
(BSI1) Built-in systems interface.

The built-in systems interface authorises operation of these additional heating systems depending on the following parameters:

- coolant temperature,
- exterior air temperature.

B - PRESENTATION OF THE ADDITIONAL HEATING SYSTEMS

1 - Electrical resistors



Assembly with 3 relays and 3 resistors

1320 - Injection ECU

8098 - Electrical resistors

BSI1 - Built-in systems interface

The resistors can each supply a power of 330 watts.

This assembly allows heating powers of 330, 660 or 990 watts.

2 - Additional heater

The wiring only allows one heating power to be obtained.

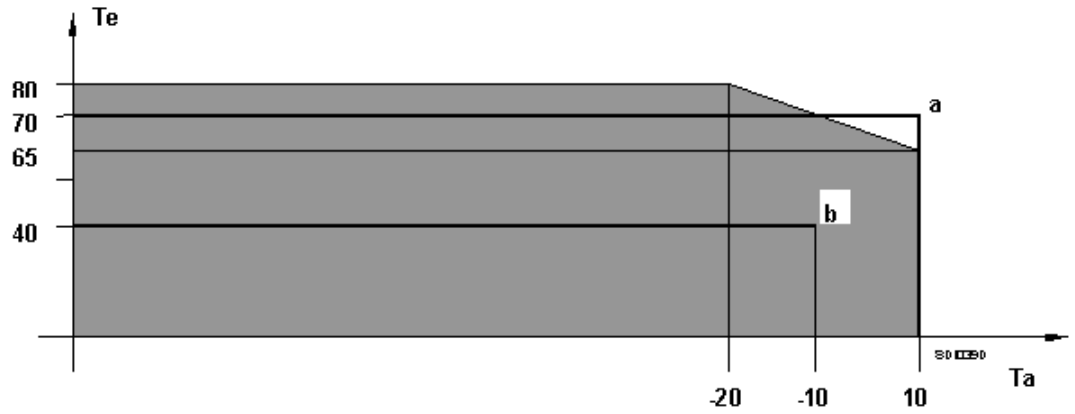
The additional heater is controlled by an integrated ECU.

C - CONTROL OF THE PASSENGER COMPARTMENT HEATING SYSTEMS

The additional heater is switched on in the following cases:

- low passenger compartment temperature (specific curve),
- when the engine operating conditions so allow.

D - WORKING OUT THE ADDITIONAL HEATING REQUIREMENTS



ta - Exterior air temperature

te - Coolant temperature

a - Example 1

b - Example 2

(outside shaded area) heating authorisation zone.

The BSI determines the passenger compartment heating requirement when the engine is started depending on the exterior air temperature and the coolant temperature.

Example 1:

· coolant temperature = 40°C,

· exterior temperature = 10°C,

· the temperature conditions are within the additional heating operating zone.

Example 2:

· coolant temperature = 70°C,

· exterior temperature= 10°C.

· the temperature conditions are outside the additional heating operating zone.

E - OPERATION

The BSI determines the passenger compartment heating requirement when the engine is started depending on the exterior air temperature and the coolant temperature.

The built-in systems interface operates the additional heater in the following conditions:

- engine operating for more than 60 seconds,
- engine speed above 700 rpm,
- battery voltage greater than 12 volts (positive electrical balance),
- coolant temperature above 40°C.

The built-in systems interface controls the heater stages progressively:

- first stage,
- second stage,
- second stage and first stage.

The additional heating is switched off when the temperature conditions so allow (curve).

X - AIR CONDITIONING COMPRESSOR CUT-OFF

The injection ECU is connected to the following components:

- a pressurestat located on the air conditioning circuit,
- the coolant temperature sensor.

The ECU can cut off the supply to the electromagnetic clutch of the air conditioning compressor in the following cases:

- engine speed less than 700 rpm,
- coolant temperature greater than 115°C,
- pressure in the air conditioning circuit less than 2.5 bars (re-authorisation at 3 bars),
- pressure in the air conditioning circuit greater than 30 bars (re-authorisation at 28 bars).

XI - ENGINE IMMOBILISER FUNCTION

The injection ECU prevents the engine from being started by prohibiting injection.

Device operating principle: refer to the corresponding documentation.

Unlocking the system

When the ignition is switched on, the authenticity of the keys is checked by the BSI.

Locking, ignition off

The injection ECU is automatically locked 20 seconds maximum after the ignition is switched off.

Parts replacement procedure

Refer to the repair section.

XII - DISPLAYING FAULTS: DOWNGRADED MODES OPERATION

A - DISPLAYING FAULTS

The appearance of certain faults in the injection system leads to the illumination of the engine diagnostic LED.

The engine diagnostic LED illuminates if a fault occurs on the following components or information:

- capacitor N°1 voltage,
- capacitor N°2 voltage,
- high pressure fuel sensor,
- high pressure fuel monitoring,
- fuel pressure regulator/sensor coherence,
- accelerator pedal sensor N°1,
- accelerator pedal sensor N°2,
- inlet manifold pressure sensor,
- air flowmeter,
- stability of the ECU 5 volt supply,
- exhaust gas recycling function (regulation),
- high pressure fuel regulator,
- diesel injector fault (1 - 4),
- inlet pressure,
- "Swirl" control electrovalve,
- telecoding,
- turbocharging function.

B - DOWNGRADED OPERATING MODES

The injection system manages the following downgraded modes:

- an operating mode with a reduced fuel flow,
- the other mode leads to the engine being stopped immediately.

C - REDUCED FUEL FLOW

This downgraded operating mode limits the fuel flow and the engine speed cannot exceed 2200 rpm (with the injected fuel flow being less than 30 mm^3).

The injection system switches to "reduced flow" mode when a fault is present on one of the following components:

- high pressure fuel sensor,
- fuel pressure regulator/sensor coherence,
- accelerator pedal sensor N°1,
- accelerator pedal sensor N°2,
- inlet manifold pressure sensor,
- air flowmeter,
- exhaust gas recycling function (regulation),
- high pressure fuel regulator,
- stability of the ECU 5 volt supply,
- diesel injector fault (1 - 4),
- inlet pressure,
- turbocharging function.

D - AIR CONDITIONING COMPRESSOR CUT-OFF

The injection ECU cuts off the supply to the air conditioning compressor clutch if a fault is detected on the fan unit control relay coils.

E - HIGH PRESSURE FUEL PUMP 3RD PISTON DEACTIVATOR

When the fuel temperature is above 106°C, the injection ECU deactivates the 3^{rd} piston of the high pressure pump (solenoid energised).

F - STOPPING THE ENGINE

The system stops the engine immediately when a fault is present on one of the following components:

- Eprom in the injection ECU
- engine speed sensor
- capacitor N°1 voltage
- capacitor N°2 voltage
- high pressure fuel monitoring

XIII - COOLANT TEMPERATURE WARNING LED (V4020) - FEATURE

The coolant temperature warning LED can be controlled by one of the following components:

- injection ECU,
- coolant temperature sensor (2 channels).

Normal LED operation:

- the LED illuminates if the temperature exceeds 118°C,
- the LED extinguishes if the temperature falls below 117°C.

XIV - CRUISE CONTROL

The cruise control device is used to maintain the vehicle speed at a value programmed by the driver in the following cases:

- when the accelerator pedal is not pressed,
- regardless of the road profile,
- without pressing the brake pedal.

Possibilities offered by the cruise control device:

- the driver can exceed the programmed speed by pressing the accelerator pedal,
- the driver can cancel cruise control by pressing the brake pedal, the cruise control switch or the on/off button.

Note: The cruise control device can only be used above 40 km/h.

Operation.

When cruise control is on, the injection ECU permanently compares the programmed speed with the vehicle's instantaneous speed.

The speed information is supplied by the speed sensor.

When the programmed speed is greater than the vehicle's current speed, the injection ECU increases the fuel flow: the vehicle accelerates up to the programmed speed.

When the vehicle's current speed is greater than the programmed speed, the injection ECU reduces the fuel flow: the vehicle decelerates down to the programmed speed.

Cruise control is cancelled by pressing:

- the accelerator pedal,
- the clutch pedal,
- the on/off button,
- the brake pedal.

Note: In the above 4 cases, the vehicle decelerates very quickly (accelerator released without declutching).

When cruise control is cancelled by pressing the cruise control button, the vehicle decelerates slowly.

OPERATING PHASES: PARTICLE FILTRATION

I - GENERAL PRINCIPLE

The aim of filtration is to remove the particles retained on the filter walls.

Regeneration consists of periodically burning off the particles accumulated in the particle filter.

Regeneration can be natural if the temperature of the exhaust gases is sufficient.

Regeneration can be caused by the injection ECU if the temperature of the exhaust gases is insufficient and if the particle filter is clogged.

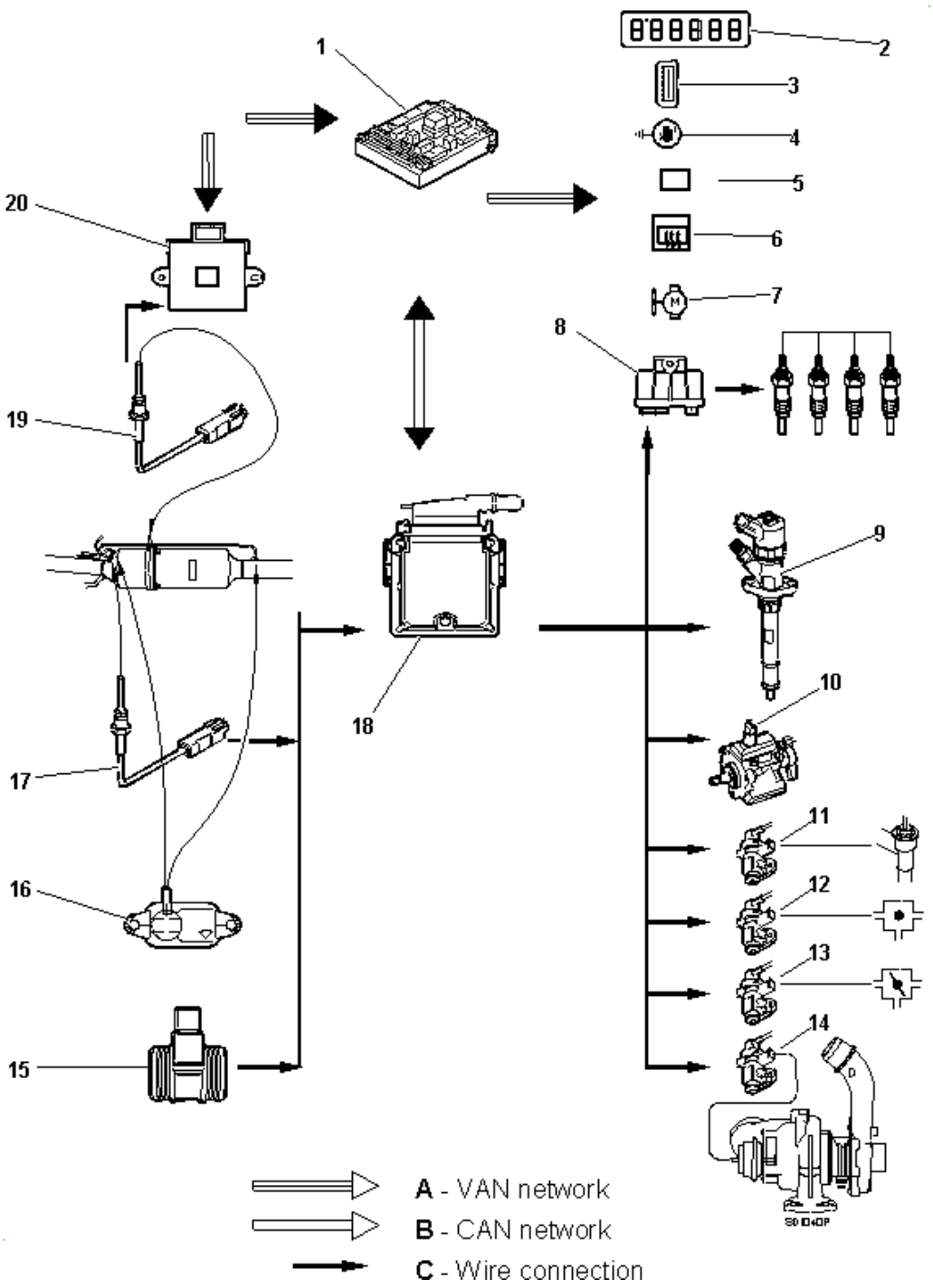
The injection ECU artificially increases the temperature of the exhaust gases using post-injection: this is the "regeneration assistance" phase.

Note: The driving conditions directly affect the temperature of the exhaust gases and consequently the temperature inside the particle filter.

The injection ECU permanently controls the following components:

- the status of the filter using a function which monitors the load level of the particle filter,
- regeneration assistance using a regeneration assistance function.

II - DIAGRAM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A - VAN network
B - CAN network
C - Wire connection

REF.	DESCRIPTION
1	Built-in systems interface
2	Mileage
3	Central diagnostic socket
4	Diagnostic LED
5	Service LED
6	Heated rear screen
7	Fan unit(s)
8	Pre-post heating unit
9	Diesel injectors
10	High pressure fuel pump 3rd piston deactivator
11	Recycling regulation electrovalve (EGR)
12	Throttle housing control electrovalve (EGR)
13	Throttle housing control electrovalve (inlet air heater)
14	Turbocharging pressure regulation electrovalve
15	Air flowmeter
16	Differential pressure sensor
17	Exhaust gas temperature sensor (upstream of the catalytic converter)
18	Injection ECU
19	Exhaust gas temperature sensor (downstream of the catalytic converter)
20	Fuel additive ECU

III - PARTICLE FILTER LOAD LEVEL MONITORING FUNCTION

A - ROLE

- To determine the condition of the particle filter (clogging level)

- To request activation of the regeneration assistance function, when necessary

- To ensure the effectiveness of the regeneration assistance function.

Main information used for monitoring the particle filter:

· pressure differential,

· exhaust gas temperature (downstream of the catalytic converter),

· exhaust gas temperature (upstream of the catalytic converter),

· number of miles travelled,

· inlet air flow.

Note: This information depends on the load level of the particle filter.

B - WORKING OUT THE PARTICLE FILTER LOAD LEVEL

The amount of particles present in the filter varies its load loss (inlet / outlet pressure differential).

This permanently measured value represents the load level of the particle filter.

The cartographic maps of the injection ECU have 6 operating levels determined by curves, from the volume flow of exhaust gases.

The volume flow of exhaust gases is essentially calculated from the following parameters:

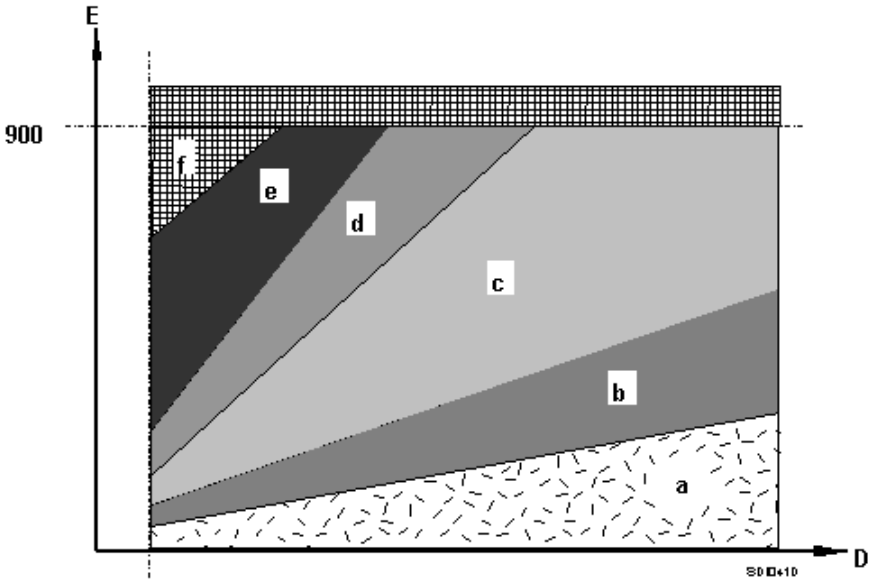
· pressure differential,

· inlet air flow,

· atmospheric pressure,

· exhaust gas temperature (downstream of the catalytic converter).

C - PARTICLE FILTER LOAD LEVELS



D - Exhaust gas volume flow (l/h)

E - Pressure differential (mbar)

a - Filter punctured

b - Filter regenerated

c - Intermediate zone

d - Filter loaded

e - Filter overloaded

f - Filter clogged

Note: These statuses can be read using the diagnostic tool, in parameter measurements.

Zones "a" - "f" represent the possible clogging levels of the particle filter. The aim of the injection ECU is to be permanently in zone "b" or "c" (regardless of vehicle mileage).

When leaving zone "c" to go to zone "d" (at a variable speed depending on driving conditions), the injection ECU requests regeneration assistance to return to zone "b" or possibly "c" (depending on driving conditions).

Note: Zones "a" and "f" are zones where the pressure differential is abnormal.

The injection ECU requests activation of the regeneration function in the following cases:

· load level of the filter passing from zone "c" - "d",

· load level of the filter in zone "e" or "f",

· load level of the filter in zone "c" and driving conditions favourable for regeneration (average speed greater than 70 km/h) (**),

(**) under these conditions regeneration will be quicker (regeneration strategy in economic conditions).

Filter overloaded - zone "e"

The injection ECU switches to the overloaded filter state when regeneration has failed under certain driving conditions.

This is a warning state.

Filter clogged - zone "f"

The pressure differential is permanently greater than 900 mbar (maximum back pressure allowable by the engine) or greater than a limit depending on the volume flow rate.

Possible causes of the fault:

· regeneration assistance ineffective,

· filter clogged with cerine,

· incorrect information from the differential pressure sensor.

The injection ECU suspends all requests for regeneration assistance and signals a fault.

IMPORTANT: If the "filter clogged" fault occurs, it is essential to locate the origin of the clogging or else the filter will be damaged.

Filter punctured - zone "a"

The pressure differential is less than a limit, depending on the volume flow rate.

Possible causes of the fault:

· incorrect information from the differential pressure sensor

· sealing fault of the exhaust pipe, upstream/downstream information pipes

· filter actually punctured

The injection ECU suspends all requests for regeneration assistance and signals a fault.

Note: The "filter punctured" fault may be due to an excess temperature during a regeneration as the amount of burnt particles may be too great.

D - CORRECTION OF THE LOAD LEVELS DEPENDING ON THE AMOUNT OF CERINE

The cerine in the fuel:

· is not burnt with the soot,

· builds up on the walls of the particle filter.

The injection ECU therefore permanently adapts its cartographic maps depending on the amount of cerine accumulated in the particle filter.

E - EFFECT OF DRIVING CONDITIONS ON THE PRESSURE DIFFERENTIAL

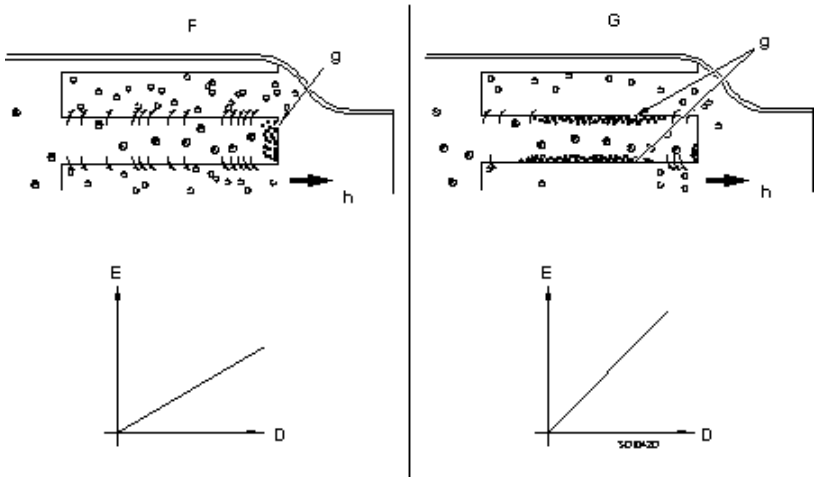
The change in pressure differential also depends on the following parameters:

· fuel consumption (fuel + additive),

· vehicle driving conditions (activation of post-injection),

· exhaust gas temperature,

· exhaust gas speed in the particle filter.



D - Volume flow of exhaust gases (l/h)

E - Pressure differential (mbar)

F - Road or motorway type driving (before regeneration)

G - Urban type driving (before regeneration)

h - Filtered exhaust gases

g - Deposits (cerine, soot, unburned hydrocarbons, oil deposits, etc)

Example F:

· the deposits collect at the bottom of the particle filter,

· the gases pass easily through the channels and the pressure differential is low.

Example G:

· the deposits collect in a stratified layer on the channels,

· the gases have problems passing through the channels and the pressure differential is high.

Warning: For the same amount of cerine and for the same vehicle mileage, the differential pressure may vary.

IV - REGENERATION ASSISTANCE MANAGEMENT FUNCTION

A - ROLE

· To control requests from the monitoring function.

· To activate the functions required for regeneration, depending on the monitoring states.

· To determine the required regeneration assistance level.

· To control the effects of post-injection on engine operation.

Regeneration consists of periodically burning off the particles accumulated on the filter enabling it to remain in zone "b" or "c".

Filter regeneration depends on the temperature of the exhaust gases which must be above the soot combustion limit.

There are 2 techniques for achieving this:

· natural regeneration,

· artificial regeneration (regeneration assistance).

Natural regeneration.

When the exhaust temperature reaches the regeneration limit itself (high engine load), the particles burn off naturally in the particle filter. No external actions are required to assist regeneration.

Artificial regeneration (regeneration assistance).

Regeneration assistance is a set of provisions controlled by the injection ECU, the aim of which is to increase the temperature of the exhaust gases to the regeneration limit.

B - WORKING OUT THE REQUIRED REGENERATION ASSISTANCE LEVEL

There are 2 types of regeneration assistance, depending on the thermal state of the exhaust pipe:

· level 1 regeneration assistance (cartographic maps for cold exhaust pipe and catalytic converter) (catalytic converter pre-heating),

· level 2 regeneration assistance (cartographic maps for warm exhaust pipe).

C - LEVEL 1 REGENERATION ASSISTANCE

When the monitoring function detects a change in operating zone, it requests activation of level 1 regeneration assistance (e.g. changing from zone "c" to "d").

Every time activation is requested, the injection ECU performs the following operations:

· it prevents exhaust gas recycling (EGR),

· it requests activation of electrical consumers (heated rear screen, fan unit, preheater plugs) (*),

· it controls the opening and closing of the inlet air heater throttle (if necessary),

· it activates post-injection (heating of the exhaust gases).

(*) this request is subject to the electrical load shedding strategy of the BSI (depending on equipment).

D - LEVEL 2 REGENERATION ASSISTANCE

The principle is the same as level 1 regeneration assistance but stricter cartographic maps lead to a higher exhaust gas temperature.

The switch from level 1 to level 2 regeneration assistance depends on the following conditions:

· upstream and downstream exhaust temperature,

· for as long as the temperature has not reached a limit.

It is impossible to switch from level 1 to level 2 regeneration assistance if level 1 has not been active for a given time.

E - CASE OF REQUESTING REGENERATION ASSISTANCE IN ECONOMIC CONDITIONS (BY THE MONITORING FUNCTION)

The aim of this request is to activate regeneration assistance under optimum driving conditions, in order to reduce fuel consumption.

The principle is the same as levels 1 and 2 regeneration assistance but with a shorter post-injection time.

Parameters required:

· particle filter in zone "c", "e" or "f",

· sufficient vehicle speed or engine speed/load for a given time

F - CONDITIONS FOR ACTIVATING REGENERATION ASSISTANCE (BY THE MONITORING FUNCTION)

Parameters which can activate regeneration assistance:

· pressure differential,

· distance travelled between each regeneration.

PARAMETERS	REGENERATION ASSISTANCE	
Pressure differential	Activation	Pressure differential (above a limit "E")
	Deactivation	Effective post-injection time (above a limit "K")
Distance	Activation	Distance travelled since last regeneration (above a limit "J")
	Deactivation	Effective post-injection time (above a limit "K")

G - PRESSURE DIFFERENTIAL

The pressure differential parameter is used to activate regeneration assistance independently to the distance information.

When this condition is responsible for determining activation of regeneration assistance, an effective post-injection time must have elapsed before regeneration assistance can be stopped (this allows complete soot combustion, in normal operation).

Monitoring the post-injection time:

· prevents the post-injection time being too long (damage to the engine, expansion of the engine oil),

· limits fuel consumption.

H - DISTANCE

The distance parameter:

· activates regeneration assistance independently to the pressure differential information,

· limits the amount of soot to be burnt off in the filter, should the pressure differential information fail.

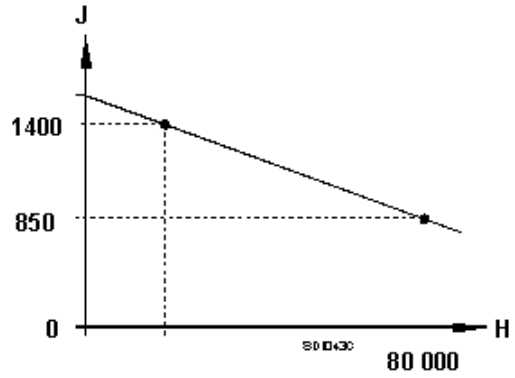
Note: Too many particles to be burned would lead to excessive temperatures which would damage the particle filter.

If the average distance of the last 5 regenerations is less than a limit (350 km), the injection ECU switches to the "distance" strategy.

The distance travelled since the last regeneration is counted by the main injection ECU which activates regeneration assistance when this counter reaches a limit "J".

This limit, or regeneration frequency, depending on the total distance travelled by the particle filter.

The regeneration frequency must be increased to take into account the reduction in capacity of the particle filter (consumption/quantity of accumulated cerine).



H - Distance travelled by the particle filter (km)

J - Regeneration frequency (km)

I - OTHER CONDITIONS

Other conditions authorising activation of regeneration assistance:

· coolant temperature above 60°C,

· sufficient engine speed / load.

V - EFFECTS OF ACTIVATING REGENERATION ASSISTANCE

A - PROHIBITION OF EXHAUST GAS RECYCLING REGULATION (EGR)

Every time regeneration assistance is activated, the injection ECU prohibits exhaust gas recycling regulation:

· exhaust gas recycling valve closed (prevents any hunting phenomena),

· throttle housing open (except if closing is requested to force air to flow into the heater).

B - ACTIVATION OF ELECTRICAL CONSUMERS

1 - Role

Reason for activating electrical consumers:

· to increase the resistant torque of the alternator, thus leading to an increase in engine load,

· to facilitate the rise in temperature of the exhaust gases,

· to quickly place the engine operating point within conditions allowing effective post-injection.

2 - Operation

The injection ECU asks the BSI to activate consumers which absorb a high power (alternator saturation request) (*).

(*) depending on vehicle equipment.

Order in which consumers are activated by the BSI (**):

· heated rear screen control,

· request to force the fan unit at low speed,

· control of the fan unit at mid speed,

· request to force the pre-post heating plugs.

(**) allowed by the load shedding level of the vehicle (provided that the battery voltage is above 12.8 volts).

C - INLET AIR HEATER

The inlet air heater is used:

- to facilitate the rise in temperature of the exhaust gases,
- to quickly place the engine operating point within conditions allowing effective post-injection.

Note: The temperature of the air entering the engine must be between 40°C and 70°C to allow efficient post-combustion.

D - POST-INJECTION

The catalytic converter, located upstream of the particle filter, is an oxidation catalytic converter.

In the presence of unburned hydrocarbons (HC), the heat efficiency of the catalytic converter increases.

The temperature of the exhaust gases increases.

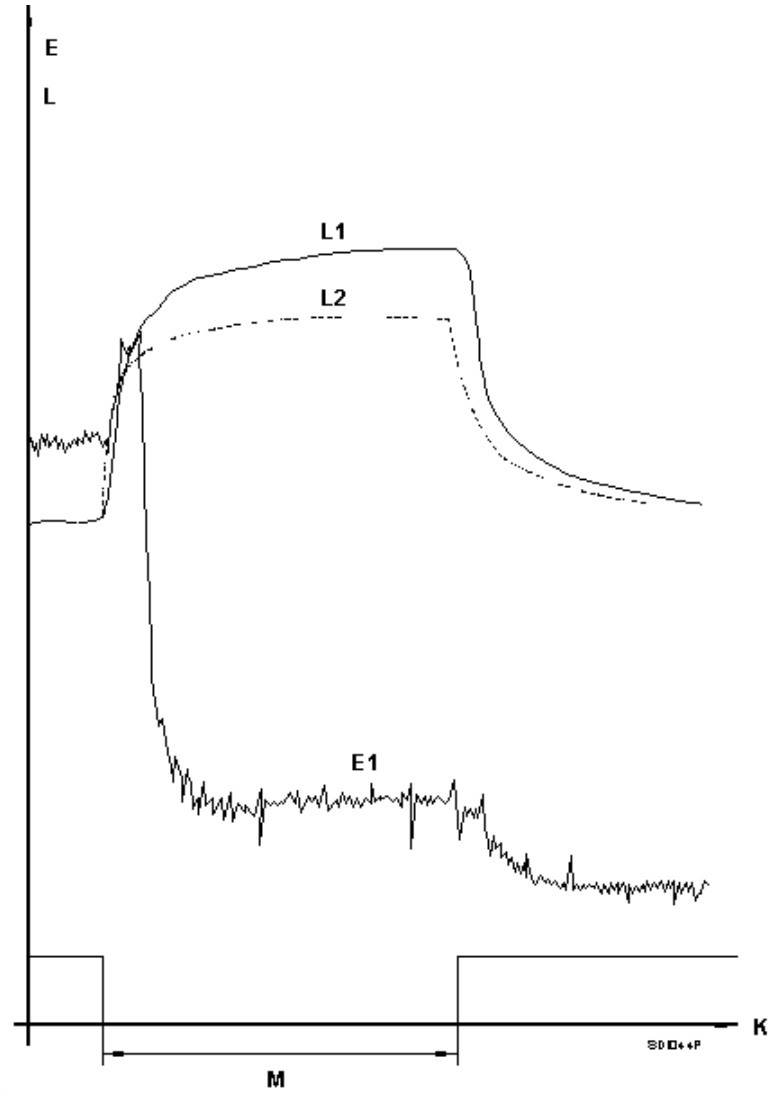
During post-injection:

- the fuel is injected after Top Dead Centre (20 - 120° crankshaft),
- the temperature of the exhaust pipe increases progressively up to the regeneration limit.

Once the regeneration limit has been reached, post-injection is maintained until all of the pollutant particles have been eliminated.

The post-injection flow and time are determined by cartographic maps, taking into account the engine operating conditions.

Operating curve:



E - Pressure differential (mbar)

E1 - Pressure differential curve (mbar)

K - Time (s)

L - Temperature (°C)

L1 - Exhaust gas temperature (downstream of the catalytic converter) (°C)

L2 - Exhaust gas temperature (upstream of the catalytic converter) (°C)

M - Post-injection control

Operation with post-injection: the temperature upstream of the catalytic converter is less than the temperature downstream of the catalytic converter.

Operation without post-injection: the temperature upstream of the catalytic converter is greater than the temperature downstream of the catalytic converter (at steady speed).

E - EFFECTS ON ENGINE OPERATION

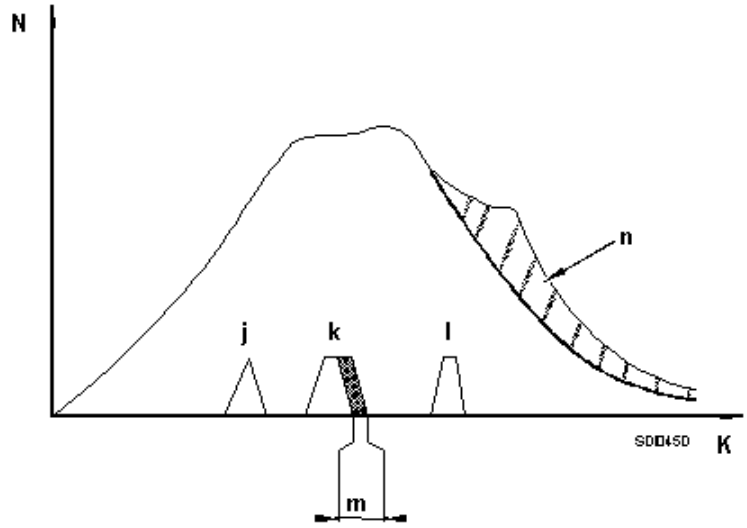
At constant engine load and speed, post-injection leads to an increase in engine torque.

To maintain the same driving pleasure and avoid engine hesitation during post-injection, the injection ECU program incorporates the following strategies:

· reduction of the main injection flow,

· turbocharging pressure regulation.

1 - Reduction of the main injection flow



K - Time (s)

N - Cylinder pressure (bar)

j - Pre-injection

k - Main injection

l - Post-injection

m - Reduction in main injection time

n - Reduction in cylinder pressure

Reducing the main injection flow cancels out the increase in torque due to post-injection.

2 - Turbocharging pressure regulation

To maintain the same engine torque during regeneration assistance, the turbocharging pressure is regulated.

3 - Operation of the high pressure fuel pump 3rd piston deactivator

The high pressure fuel pump operates on 3 pistons during regeneration assistance.

Aim of the system: to provide the flow required by post-injection.

VI - FUEL ADDITIVE FUNCTION

A - OPERATION

To lower the regeneration limit, a cerine based additive (Eolys) is added to the fuel, which lowers the particle combustion temperature from 550°C to 450°C.

Cerine is used in an organic solution stored in an additional tank, located near to the fuel tank.

An additive system has been developed in order to inject an amount of additive proportional to the amount of fuel injected.

The system comprises the following components:

- a suction device with a minimum level detector on the additive tank,
- a system for injecting the additive into the fuel tank,
- a specific ECU for controlling the additive function.

Sender filtering requires a pumping limit equal to 7 litres of fuel.

Operation:

FUEL ADDITIVE FUNCTION: ENGINE STATIONARY	FUEL ADDITIVE FUNCTION: ENGINE RUNNING
Engine off	Non zero vehicle speed
Memorising of the fuel level "n1"	Zero vehicle speed
Opening of the fuel filler cap	Opening of the fuel filler cap
Memorising of the fuel filler cap open	Memorising of the fuel level "n1"
Closing of the fuel filler cap	Closing of the fuel filler cap or non zero vehicle speed
Starting of the engine	Acquisition of the fuel level "n2" - checking of the position of the fuel filler cap
Acquisition of the fuel level "n2" - checking of the position of the fuel filler cap	
Case 1: n2 > n1 and fuel filler cap cycle (*) -> fuel additive function - normal operation	
Case 2: n2 > n1 and fuel filler cap cycle faulty or no cycle -> fuel additive function - fuel filler cap faulty	
Case 3: n2 = n1 and fuel filler cap cycle -> fuel additive equal to pumping limit (7 litres)	
Case 4: n2 = n1 and fuel filler cap cycle faulty or no cycle -> nothing - normal operation	

(*) fuel filler cap cycle:

· opening of the fuel filler cap,

· closing of the fuel filler cap.

The fuel filler cap cycle is effective if the time interval between opening and closing is greater than 5 seconds.

B - TOTAL AMOUNT OF ADDITIVE INJECTED

Every time additive is added, the additive ECU memorises the amount of additive injected.

This value is added to the previously injected values to give a value representing the total amount of additive injected since the beginning of the particle filter's life.

This value is sent to the injection ECU which uses it as the basis for controlling the clogging level of the particle filter with cerine.

VII - DISPLAYING FAULTS - DOWNGRADED OPERATING MODES

A - DISPLAYING FAULTS

The appearance of certain faults in the particle filtration system leads to the illumination of the engine diagnostic LED.

The engine diagnostic LED illuminates when a fault is present on one of the following components or items of information:

- differential pressure sensor,
- exhaust gas temperature sensors (upstream and downstream of the catalytic converter),
- particle filter clogged,
- particle filter punctured.

B - DOWNGRADED OPERATING MODE

The injection system controls the following downgraded mode: an operating mode with reduced fuel flow.

C - REDUCED FUEL FLOW

This downgraded operating mode limits the fuel flow such that the engine speed cannot exceed 2200 rpm under any circumstances (and the injected fuel flow remains less than 30 mm^3).

The injection switches to "reduced flow" mode when one of the following components is faulty:

- particle filter clogged,
- particle filter punctured,
- exhaust gas temperature sensors (upstream and downstream of the catalytic converter) (*),
- differential pressure sensor (*).

(*) 200 km after the fault appears.

D - FUEL ADDITIVE FUNCTION - OPERATION IN DOWNGRADED MODES

3 main strategies are used if the additive system develops a fault.

Fuel filler cap fault:

The additive ECU uses the vehicle speed information in conjunction with the fuel sender information to inject the additive.

Fuel sender fault:

The additive ECU adds an amount of additive equal to that added for a full tank when the fuel filler cap is opened/closed.

Communications fault on the VAN multiplexed network:

The additive ECU adds an amount of additive equal to that added for a full tank when communications are interrupted for more than 10 seconds.

VIII - DRIVER'S INFORMATION FUNCTION

A - DIAGNOSTIC LED (V1300)

Normal LED operation:

· the LED illuminates when the ignition is switched on.

· after the ignition is switched on, the LED extinguishes after a 4 second timer.

Abnormal LED operation:

· the LED illuminates when the ignition is switched on,

· the LED remains illuminated.

B - RISK OF THE PARTICLE FILTER CLOGGING

In the event of prolonged idling, regeneration assistance is ineffective (exhaust gas temperature not sufficient).

The filter clogs up with particles.

The injection ECU informs the BSI.

The BSI requests that a message is displayed on the multifunction screen (risk of particle filter clogging) in the following cases: particle filter fault (particle filter overloaded).

The aim is to encourage the driver to adapt his driving to facilitate particle filter regeneration.

Within 100 kilometres after the message appears, the customer must drive for at least 3 minutes at a speed greater than 50 km/h which should cause the message to disappear.

Failure to comply with this recommendation will lead to the following fault: particle filter clogged.

The injection ECU informs the BSI which:

· requests that the diagnostic LED is illuminated,

· requests that a message is displayed on the multifunction screen (antipollution problem).

C - MINIMUM LEVEL OF ADDITIVE REACHED

The injection ECU informs the BSI which:

· requests that the service LED is flashed on the control panel (for 20 seconds after the ignition is switched on) (*),

· requests that a message is displayed on the multifunction screen (low diesel additive level) (after the ignition is switched on) (*).

(*) depending on vehicle equipment.

MAINTENANCE:
HDI INJECTION SYSTEM

I - RECOMMENDED FUEL

The injection system requires the use of diesel with a low sulphur content (less than 350 ppm, EURO3 standard).

Warning: It is forbidden to add products such as fuel circuit cleaner and regalvanising products.

II - SAFETY INSTRUCTIONS

A - FOREWORD

All operations carried out on the injection system must be performed in accordance with the following provisions and regulations:

· professional healthcare authorities,

· prevention of accidents,

· protection of the environment.

Warning: Operations must be performed by specialist technicians who have been trained in the safety instructions and precautions to be taken.

B - SAFETY INSTRUCTIONS

1 - High pressure fuel circuit

IMPORTANT: Given the very high pressures in the high pressure fuel circuit (1350 bars), comply with the following instructions.

Do not smoke near to the high pressure circuit during repairs.

Avoid working near to flames or sparks.

When the engine is running:

· do not work on the high pressure fuel circuit,

· always remain out of the range of a possible fuel jet which may cause serious injury,

· never put your hand near to a leak on the high pressure fuel circuit.

After switching off the engine, wait for 30 seconds before starting work.

Note: It is necessary to wait for 30 seconds to allow the high pressure fuel circuit to return to atmospheric pressure.

All operations on the fuel circuit are performed in the presence of fuel with additive. It is recommended that gloves and protective goggles are worn as the additive is a slight skin irritant.

2 - Fuel additive circuit

Do not smoke near to the fuel additive circuit during repairs.

Avoid working near to flames or sparks.

The additive is a slight skin irritant; it is recommended that gloves and protective goggles are worn.

Protection of the environment: used additive and items used for cleaning the filter must be recycled.

The additive must be stored under the following conditions:

· away from moisture,

· away from light,

· away from heat,

· in its original sealed, opaque packaging, to prevent the solvent from evaporating.

The contents of any opened containers must not be used and must be recycled.

3 - Operations on the particle filter

Forced regeneration leads to very high exhaust gas temperatures (450°C at the exhaust pipe outlet):

· always keep well away from the exhaust pipe,

· use suitable exhaust gas extraction equipment,

· the working area must be clean and tidy,

· the vehicle chassis must be clean,

· the fuel tank must contain at least 20 litres of fuel to prevent the fuel from overheating,

· the coolant temperature must be above 65°C, before performing a forced regeneration.

It is recommended that a mask and protective goggles are worn when removing and refitting the particle filter (risk of inhaling cerine).

4 - Working area

The working area must be clean and tidy.

Parts being repaired must be stored away from dust.

5 - Preliminary operations

IMPORTANT: The operator must wear clean overalls.

Before starting work on the injection circuit, the connectors of the following sensitive components may have to be cleaned (see corresponding operations):

· fuel filter,

· high pressure fuel pump,

· high pressure fuel common injection rail,

· high pressure fuel lines,

· diesel injector carriers.

IMPORTANT: After removal, blank the connectors of the sensitive components immediately with plugs, to prevent the ingress of dirt.

Use the correct tightening torques for the above components of the high pressure fuel circuit, using a regularly inspected torque wrench:

· diesel injectors,

· high pressure fuel sensor,

· high pressure fuel lines.

The DW12TED4 engine requires particular care to be taken when working on the fuel additive circuit.

Cleanliness of the fuel additive circuit:

· additive tank,

· additive injector supply and return pipes,

· additive injector.

III - MAINTENANCE

A - INJECTION SYSTEM

Bleed water from the fuel filter every 20 000 km.

Replace the fuel filter every 60 000 km.

Warning: The fuel filter is designed to be used on a sophisticated injection system: refer to the procedure given in the mechanical folder of the vehicle in question. It is recommended that gloves and protective goggles are worn when handling fuel.

Note: It is recommended that the cleanliness of the "Swirl" control electrovalve filter is checked periodically.

B - PARTICLE FILTRATION SYSTEM

Replace or clean the particle filter every 80 000 km.

Top up the additive tank every 80 000 km.

Note: Additive is sold by the Replacement Parts Department in 1 litre containers (part number PR 9736.65).

> **IMPORTANT:** Use the recommended additive. All other additives (or products) used will lead to incorrect operation of the particle filtration system.

Dealing with waste:

· additive and components used for cleaning the filter must be recycled,

· the contents of any container which has been opened and not used immediately must be recycled.

C - DIAGNOSTIC TOOLS

Diagnostic tools are used to carry out servicing and diagnostic operations on the particle filtration system:

· reading of fault codes,

· parameter measurements,

· forced regeneration,

· reinitialisation of the total additive quantity.

D - PARAMETER MEASUREMENTS

Particle filter state

This shows the status of the particle filter (regenerated, intermediate zone, loaded, overloaded, clogged or punctured).

Particle filter differential pressure (difference between inlet/outlet pressure).

This parameter corresponds to the pressure difference between the inlet and the outlet of the particle filter.

This value is similar to the "filter state" parameter.

The pressure differential varies depending on the vehicle mileage and driving conditions.

Regeneration assistance state

This parameter states whether regeneration assistance is in progress (active or not active).

Total amount of additive injected

The total amount of additive injected since the additive tank was last refilled.

Average distance of last 5 regenerations - distance travelled since regeneration

Refer to the operating phases - particle filter section.

E - FORCED REGENERATION

Before a particle filter is cleaned, forced regeneration allows any remaining soot to be removed and facilitates cleaning of cerine deposits.

F - REINITIALISING THE TOTAL ADDITIVE QUANTITY

After replacing or cleaning a particle filter, the total amount of additive must be reset in the additive ECU (calculation of the injection ECU cartographic maps).

IV - REPLACING PARTS: OPERATIONS TO BE PERFORMED

A - DIAGNOSTIC BEFORE REPAIR

Warning: Before working on the system, read the memories of all ECUs.

Refer to the fault finding charts:

- fault charts using fault codes,
- fault charts using customer complaints (without fault codes).

B - REPLACING PARTS

Warning: Before adding or replacing parts, ensure that the customer has their confidential card.

COMPONENTS REPLACED	OPERATIONS TO BE PERFORMED	COMMENTS / REQUIRED INFORMATION
Injection ECU	Programming of the injection ECU	Access code
	Checking of telecoded parameters (if necessary, telecoding of the injection ECU)	Description of the vehicle equipment
	Forced regeneration	VIN
Fuel additive ECU	Programming of the total additive quantity parameter	Total additive quantity parameter from the old additive ECU
Particle filter	Reinitialisation of the total additive quantity (reset)	
	Treatment of the old particle filter	
Additive tank	Filling of the additive tank	
	Priming of the additive circuit	
	Treatment of the old additive	
Additive	Filling of the additive tank	
	Priming of the additive circuit	
	Treatment of the old additive	

The following procedures require the use of the diagnostic tools:

- programming of the injection ECU,
- telecoding of the injection ECU,
- programming of the total additive quantity parameter.

C - PROGRAMMING THE INJECTION ECU

Warning: Swapping an injection ECU between two vehicles makes it impossible to start the vehicles.

When fitting a new injection ECU, the engine immobiliser system has to be programmed.

In order to program the engine immobiliser system, you must:

- be in possession of the access code to the built-in systems interface (written on the customer's confidential card),
- be in possession of a new injection ECU,
- use the diagnostic tool,
- carry out an engine ECU programming procedure: "PROGRAMMING THE ENGINE ECU",
- download the injection ECU (if necessary).

D - TELECODING THE INJECTION ECU

This procedure is used to reduce diversity.

Parameters which can be telecoded:

- engine cooling (fan unit),
- air conditioning pressure sensor,
- gearbox,
- diesel injection type,
- additional heating,
- ECUs.

E - REPLACING THE INJECTORS

Original fit.

Diesel injector carriers marked as a function of their injection pipe diameter (diesel flow) (class reference 1, 2 or 3).

The cartographic maps of the injection ECU include the class of injectors fitted on the engine.

Repair.

If an injector is replaced, an injector of the same class must be fitted.

Warning: Fitting an injector of a different class leads to incorrect operation of the particle filtration system.

Note: Fitting 4 injectors of a different class is possible, provided that their new class is telecoded into the injection ECU.

F - DOWNLOADING THE INJECTION ECU

The software of the injection ECU is updated by downloading (ECU with a flash EPROM).

Note: This operation is performed using the diagnostic tools.

G - PROGRAMMING THE TOTAL ADDITIVE QUANTITY PARAMETER

If the additive ECU is replaced, the total additive quantity must be programmed into the new additive ECU.

Warning: Swapping an additive ECU between two vehicles is forbidden.

H - PRIMING THE ADDITIVE CIRCUIT

After opening the additive circuit, it must be reprimed: switch the ignition on then off again 3 times.

V - WARRANTY RETURN PROCEDURE

A - COMPONENTS OF THE INJECTION SYSTEM

Before returning parts to the assessment centre, the following components must be blanked, placed in a plastic bag and packaged in their original packaging:

- diesel injectors,
- high pressure fuel pump,
- high pressure fuel common injection rail,
- high pressure fuel sensor,
- fuel filter.

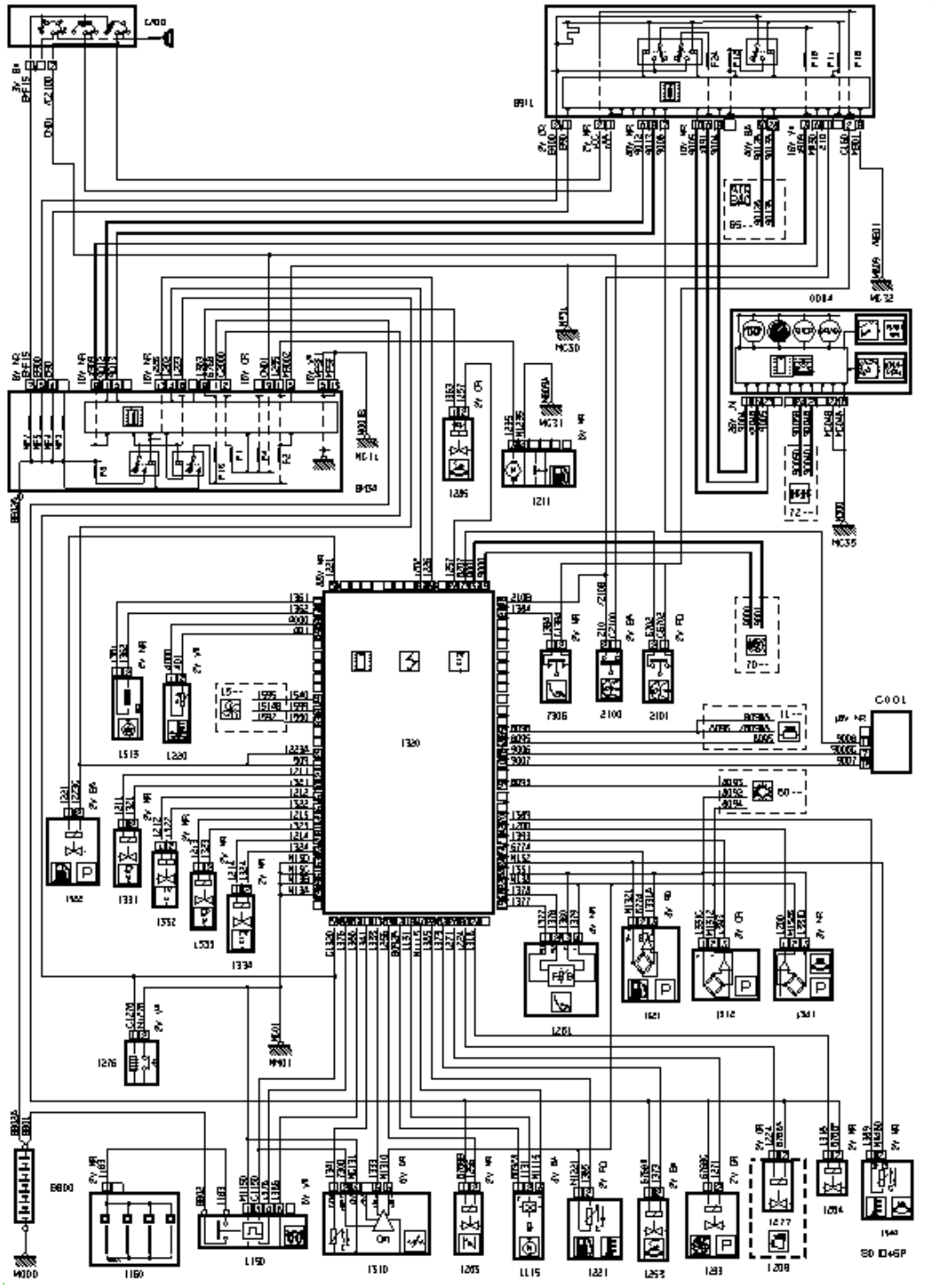
B - INJECTION ECU

The injection ECU will automatically lock if it is disconnected.

> **IMPORTANT:** When returning parts under warranty, return the injection ECU with its access code.

WIRING DIAGRAM

I - LAYOUT DIAGRAM



II - PARTS LIST

BB00 - Battery

BM34 - Engine relay unit with 34 fuses

BSI1 - Built-in systems interface

C001 - Diagnostic connector

CA00 - Ignition switch

MC11 -

MC30 -

MC34 - Earths

MC35 -

MM01 -

0004 - Control panel

1115 - Cylinder reference sensor

1150 - Pre-post heating unit

1160 - Preheater plugs

1208 - High pressure pump 3rd piston deactivator

1211 - Fuel sender pump

1220 - Coolant temperature sensor

1221 - Diesel thermistor

1233 - Turbocharging pressure regulation electrovalve

1253 - All or nothing EGR electrovalve

1261 - Accelerator pedal position sensor

1263 - EGR + throttle electrovalve

1264 - Swirl electrovalve

1276 - Diesel heater

1285 - Inlet air heater electrovalve

1310 - Air flowmeter

1312 - Inlet air pressure sensor

1313 - Engine speed sensor

1320 - Engine management ECU

1321 - High pressure fuel sensor

1322 - High pressure fuel regulator

1331 - Injector - cylinder n° 1

PARTS LIST (continued)

1332 - Injector - cylinder n° 2

1333 - Injector - cylinder n° 3

1334 - Injector - cylinder n° 4

1341 - Particle filter pressure differential sensor

1344 - Upstream exhaust gas temperature sensor

2100 - Stop switch

2101 - Redundant stop switch

7306 - Cruise control safety switch (clutch switch)

11 -- - Preheater ignition function

15 -- - Engine cooling function

70 -- - ABS function

72 -- - Trip computer, clock function

80 -- - Air conditioning, climate control function