2013 USER MANUAL

C. ENGINE

C ENGINE

CONTENTS

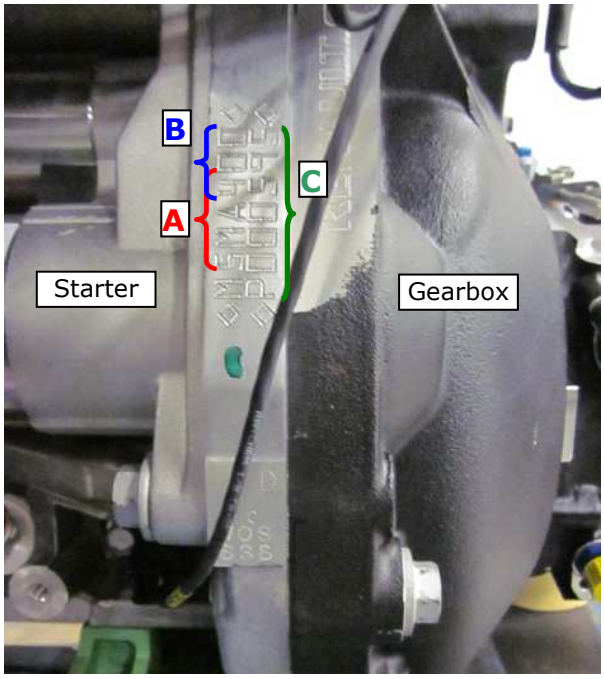
C.1 ENGINE

C.1.1 IDENTIFICATION

The engine is identified by an engraving made on the engine block. It is located on the intake side, on the vertical face of the starter fitting

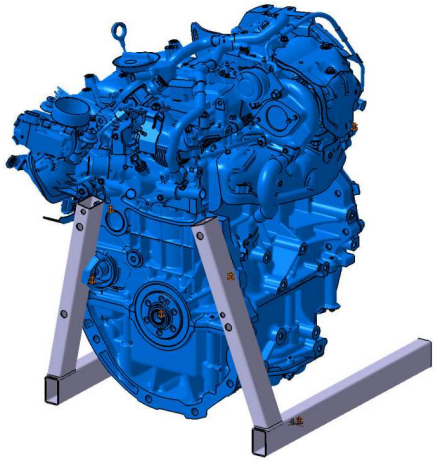
It includes:

Area **A**: the engine type and homologation : M5MA
Area **B**: the engine index : 400
Area **C**: the engine manufacturing number
Here "P000xxx"
A reminder of the engine manufacturing number is also engraved on the head cylinder behind the engine mounting



➔ These 2 numbers must be the same, if it's not the case, it will be considered as a **technical non conformity**

⚠ Any procedure carried out on the engine not included in this manual must be performed by a Renault Sport accredited engine partner.



C.1.2 TRANSPORT

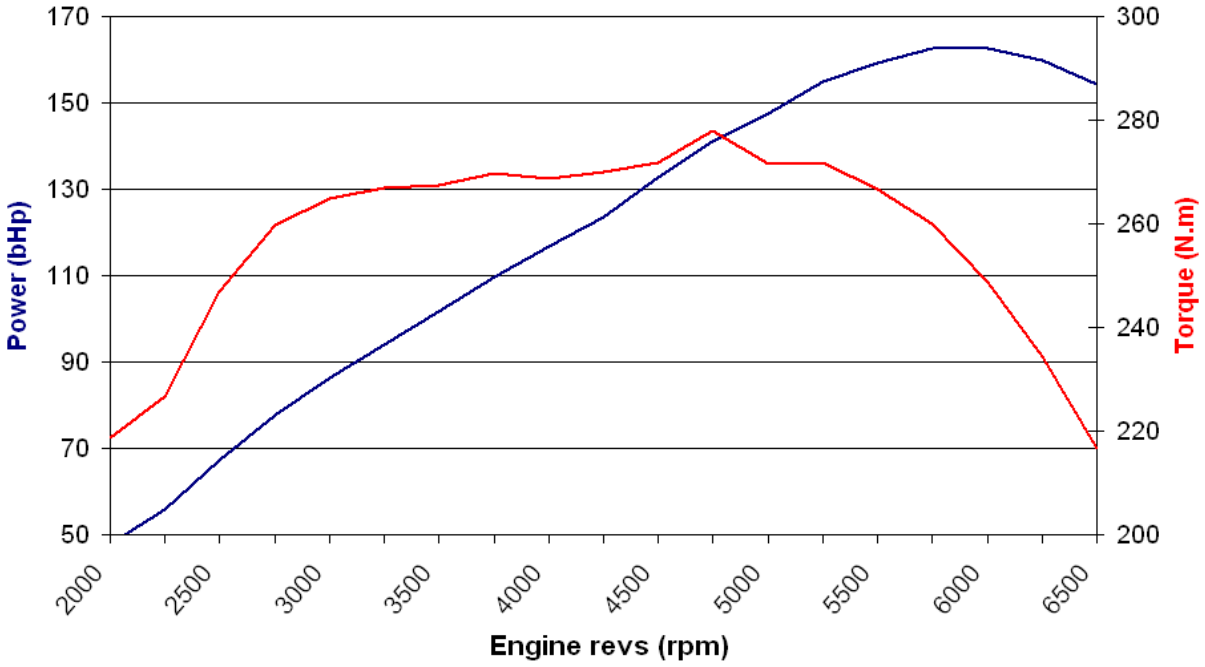
To facilitate the engine transportation, a specific kit has been developed.

This kit is available from Renault Sport spare parts department under the following reference:
8201 400 360

NOTE : This kit is mandatory in case of engine shipment to ORECA Magny Cours or to RENAULT SPORT

C.1.3 CHARACTERISTICS

- Type: M5MA 400
- Number of cylinders: 4 in-line
- Number of valves: 16
- Capacity: 1618 cm3
  - Bore : 79.7mm
  - Stroke : 81.1mm
- Injection type : direct injection (HP fuel pump)
- Turbo charged (waste gate and pop-off electro valve)
- Max. power: 162 kW (220bhp) at 6,000rpm
- Max. torque: 280Nm at 4.750rpm (average 270N.m between 2500 and 6000rpm)
- Max. engine speed: 6,500rpm

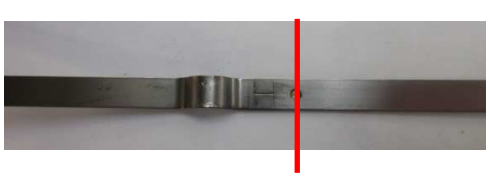


C.1.4 LUBRICATION

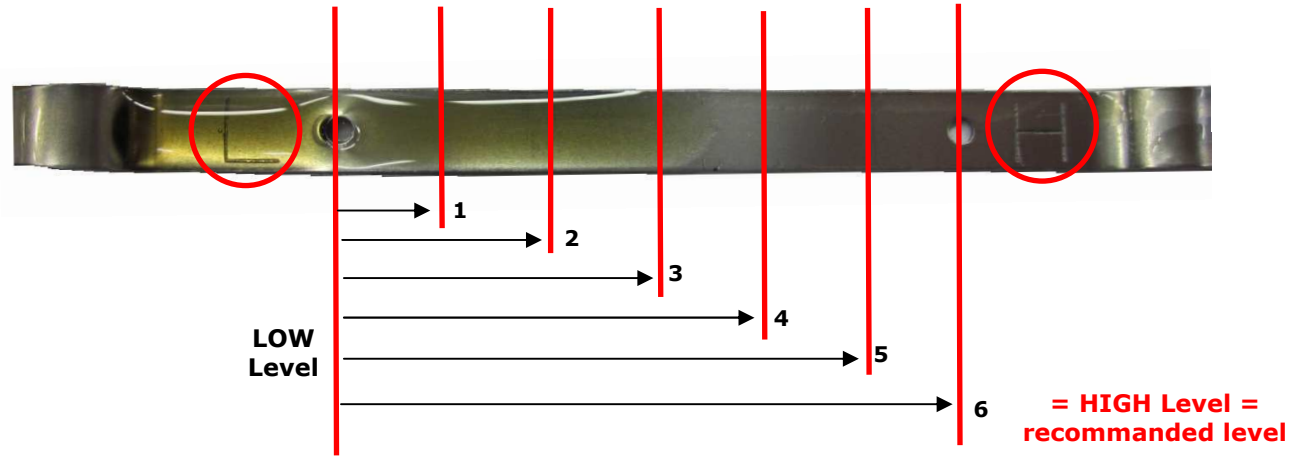
⚠ To prevent any oil surge, it is essential to drive with a minimum of 4.5 Liters

First oil change	Oil change rate	Lubricant
After 500km	Every 1,000km	**Elf Excellium NF 5W40 MANDATORY**

The recommended oil level is the maximum position on the dipstick (H) which corresponds to 4.2L (oil filter included)



OIL LEVEL position (<u>oil filter filled</u>)



Level	Position (mm)	Oil quantity (L)
0 : Low level	0	2.5
1	7	2.8
2	15.7	3.2
3	21.8	3.5
4	27.5	3.8
5	32.5	4.0
6 : high level	**38**	**4.2**

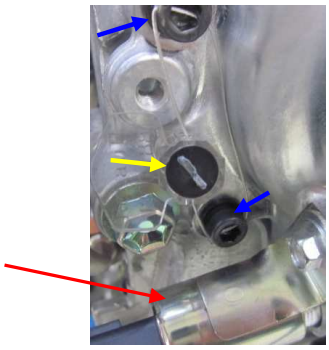
C.1.5 SEALED PARTS

⚠ The engine has sealed parts. The presence of these sealed parts is mandatory. No procedure may be carried out on the engine without a representatives of Renault Sport (Scrutinneers, technical responsible and official engine Tuner ORECA MAGNY COURS)

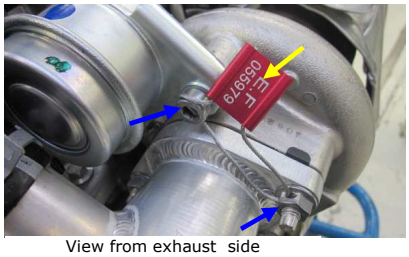
TOTAL = 9 Seals

- **Timing cover**
- 2 drilled screws
- 1 plastic seal

Exhaust camshaft actuator
<u>(Not plugged!!)</u>



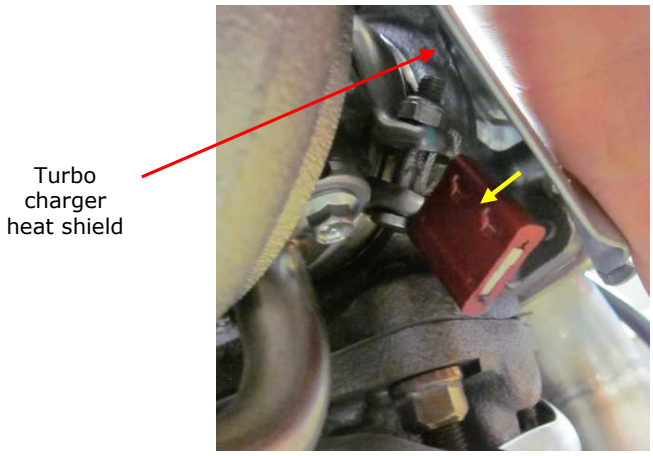
- **Turbo upstream pipe and Waste gate lung screw**
- 1 drilled waste gate screw
- 1 drilled Turbo upstream pipe screw
- 1 steel seal



View from exhaust side

- **Turbo charger clamp**

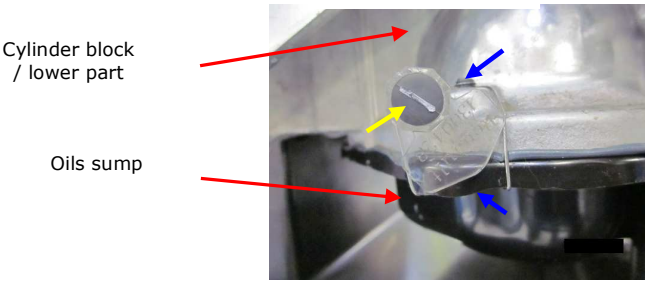
- 1 drilled clamp
- 1 steel seal



View from exhaust side

- **Oil sump**

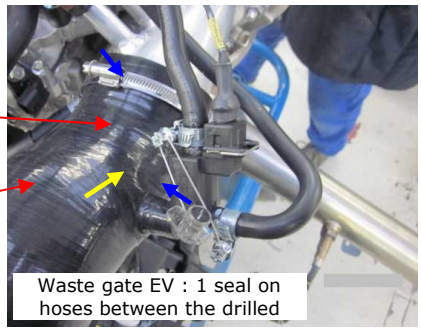
- 1 drilled screw (head and last threads)
- 1 plastic seal

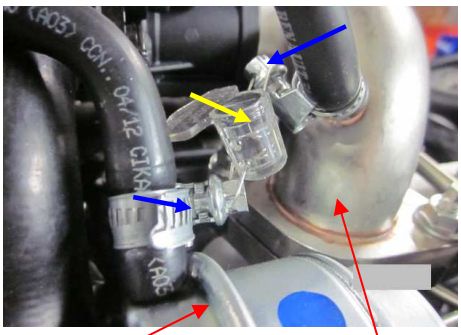


View from intake side

- **Waste gate hoses**

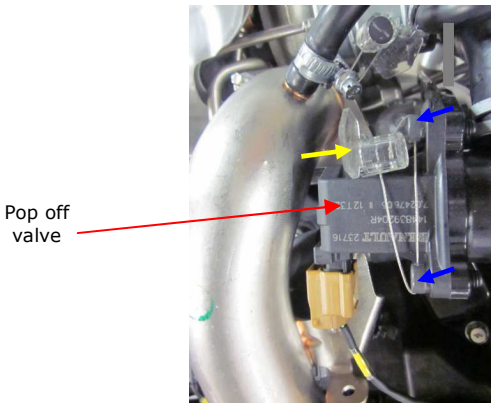
- 2 x 2 drilled clamp
- 2 plastic seals





- **Pop off valve**

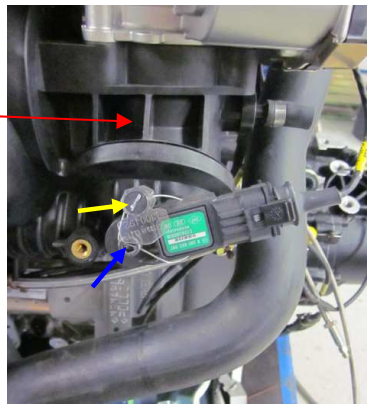
- 2 drilled screws
- 1 plastic seal



- **Manifold Pressure sensor (downstream of the motorised throttle)**

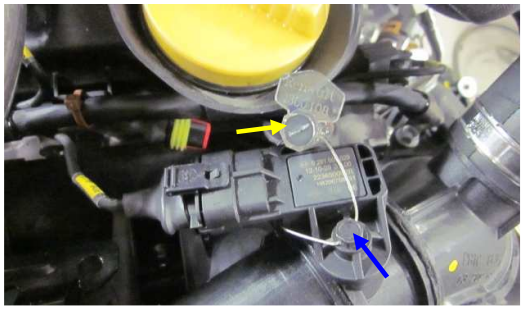
- 1 drilled screw
- 1 plastic seal

Motorised throttle body



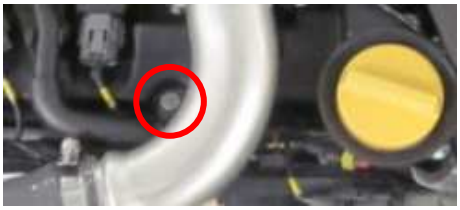
- **Air temp + boost pressure sensor**

- 1 drilled screw
- 1 plastic seal

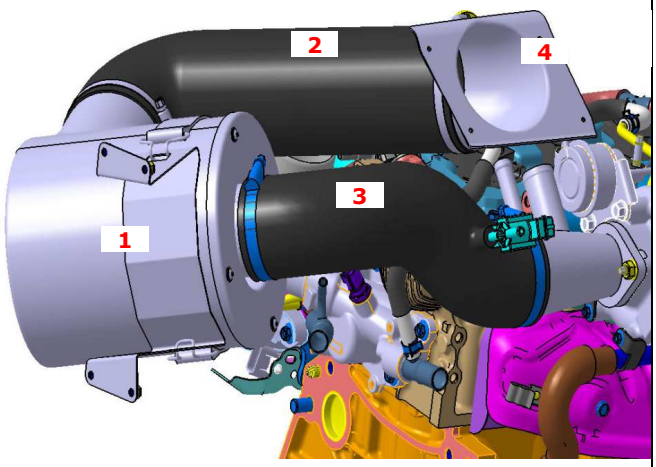
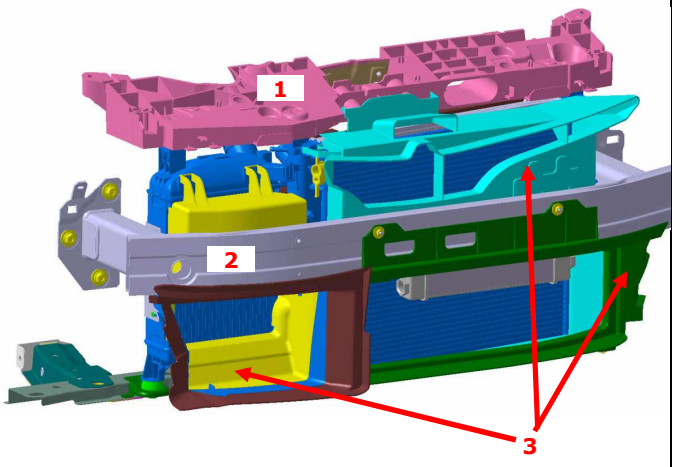


- **ORECA Electronic TAG**

Fitted on a head cylinder cover scew



C.1.6 REMOVAL OF THE POWERTRAIN

Operations	Pictures
1 - Disconnect the battery	
2 - Remove the 2 driveshafts nuts	
3 - Remove the air intake circuit : - Air box and its support (1) - Upstream hose (2) - dowstream hose (3)	
4 - Raise the vehicle.	
5 - Remove the front bumper and headlights	
6 - Remove the gearbox cooling circuit : 2 hoses to the cooler	
7 - Remove the upper plastic crossbeam (1) Attach the coolers to the engine, using plastic clips or straps.	
8 - Remove the front crossbeam (2) (gearbox cooler remains fitted) and the 3 front air ducts (3)	

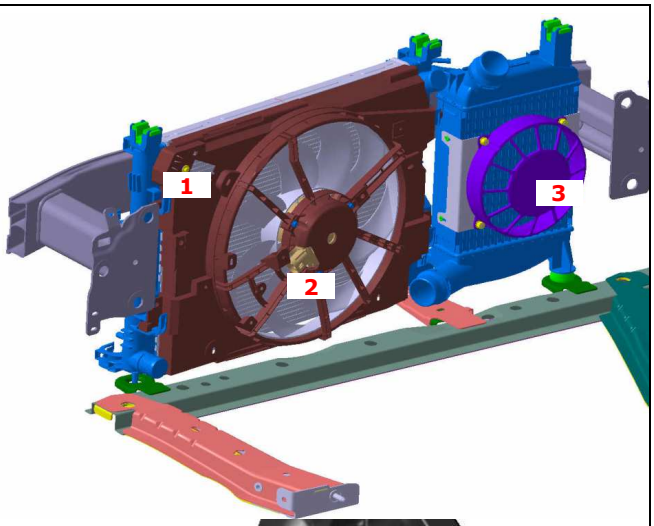
9-

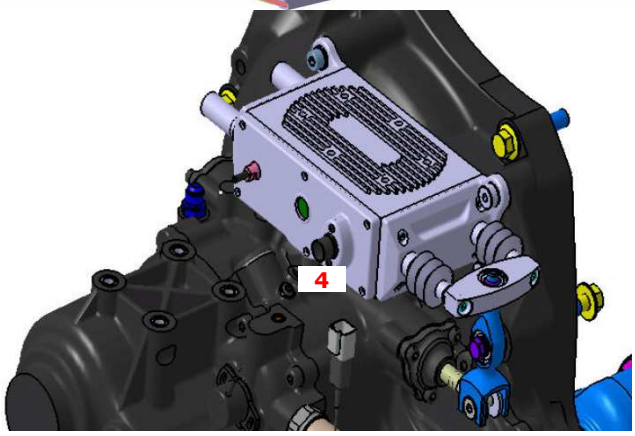
Disconnect the following front loom connectors:

- Engine cooler Fan :
  2 connectors on the relay (1)
  1 connector on the Fan engine (2)
- Turbo air cooler
  1 connector (3)
- XAP Gearbox actuator (4) if fitted on gearbox (+12v supply and red connector)

Bring all connectors back to the chassis

NOTE : the front loom remains fitted on the chassis





10-

Removing the coolers :

- Drain the engine water by removing the cooler lower hose and remove the cooler after disconnecting the 2 hoses (fan remains fitted on it)
- Disconnect the 2 hoses and remove the turbo cooler (fan remains fitted on it)

11-

Disconnect the engine loom connector situated on engine bulkhead left hand side (facing the engine) (5)

Bring the connector back to the engine.

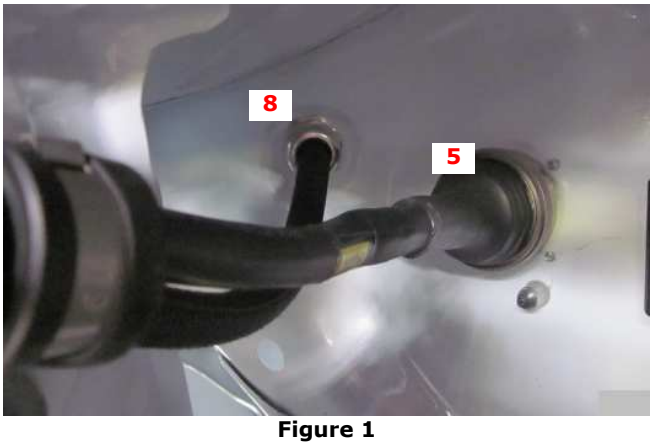
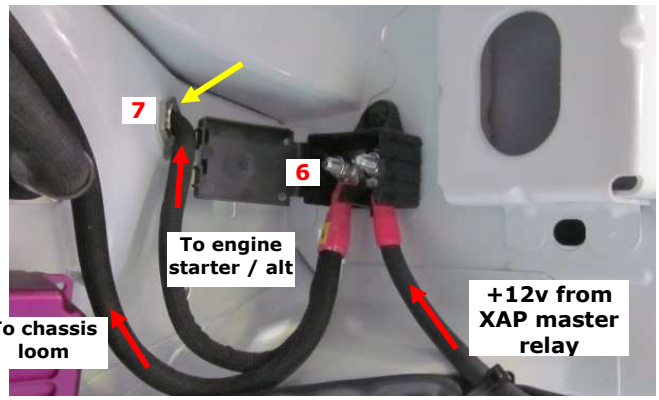


Figure 1

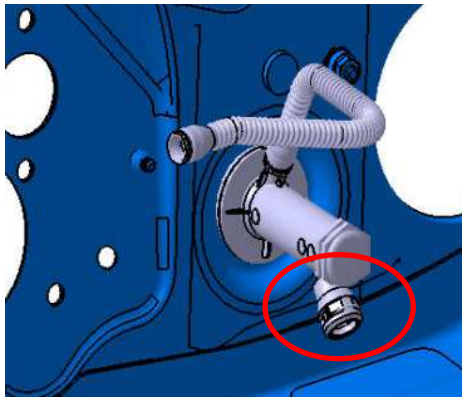
12- Disconnect the starter/alternator power loom :

- 1 nut on the breakout box (situated in driver's compartment, on the right hand side of the ECU) (6)
- Unscrew the bulkhead connector (7)
- Pull the power loom from engine side and bring the connector back to the engine (8), see figure 1 on previous page

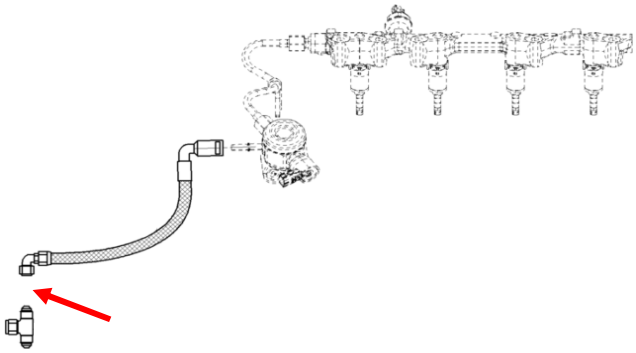


13- Remove the clutch slave cylinder feeding adapter on the master cylinder

Note: *Watch out for fluid discharge.*

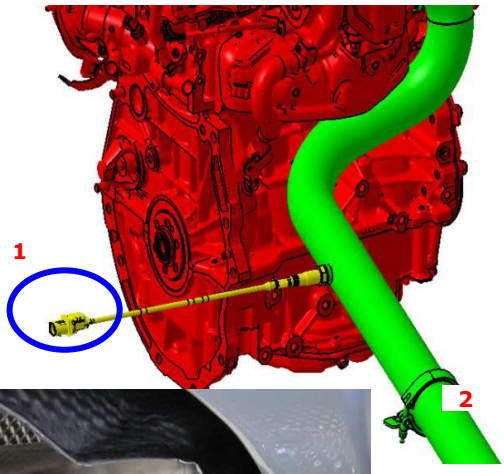


14- Unscrew the fuel pipe union, at the "T" on the bulkhead side and fit a cap on both sides to protect the fuel hose from dirtiness



15- Disconnect the lambda sensor (1) and bring the corresponding chassis connector back to driver's compartment

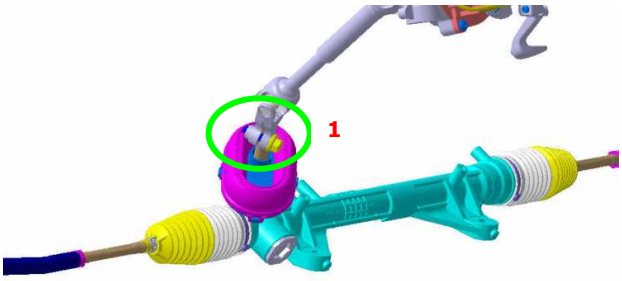
Remove the exhaust line clamp before the intermediate line (2)



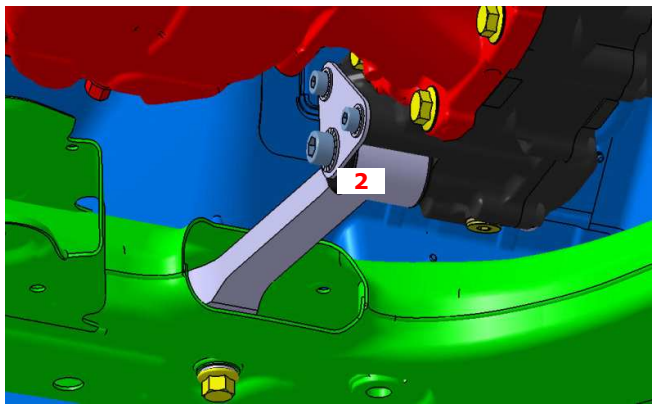
16-

Subframe
Remove :

- The 2 anti roll bar rods (let them fitted on the damper strut)
- The steering ball joint from the uprights
- The lower wishbones ball joints on the uprights (let the wishbones fitted on the subframe)
- The steering intermediary shaft (access in driver's compartment behind the pedal box) (1)



Disconnect the connecting torque rod yoke from the gearbox by removing the screw (2)



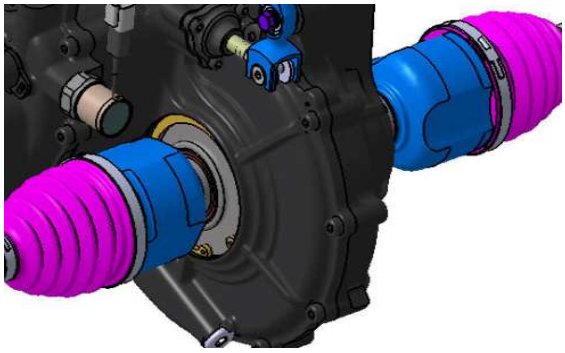
- Remove the square if necessary (2 more screws)

➔ Then Remove the complete subframe (See chapter *D : Front axle/Removing the subframe*)

17-

Remove the 2 driveshafts:

- Extract the driveshaft on the gearbox side.
- Extract the driveshaft on the wheel side.

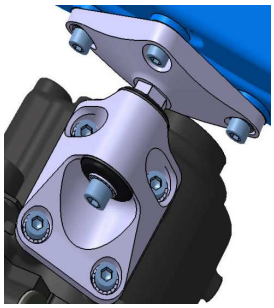


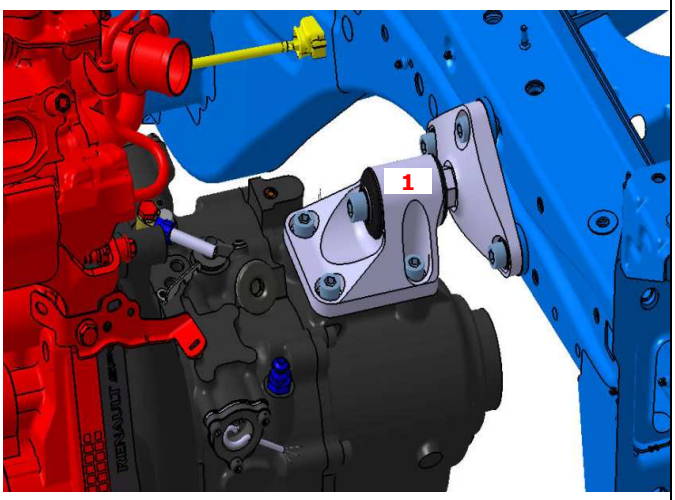
18- Place the powertrain on a hydraulic plate and lift it slightly using wood spacers

19-

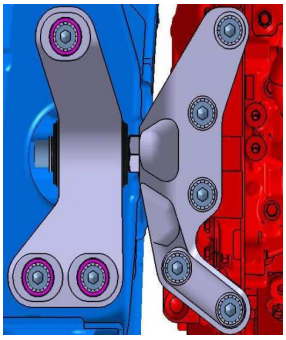
Separate the gearbox mounting by removing the screw **(1)**

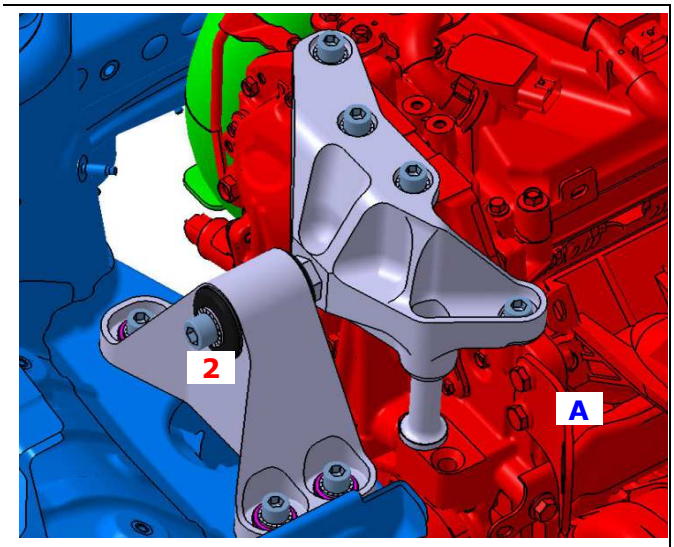
If necessary , remove the support on the gearbox (4 screws)





19- Separate the engine mounting when removing the screw **(2)**

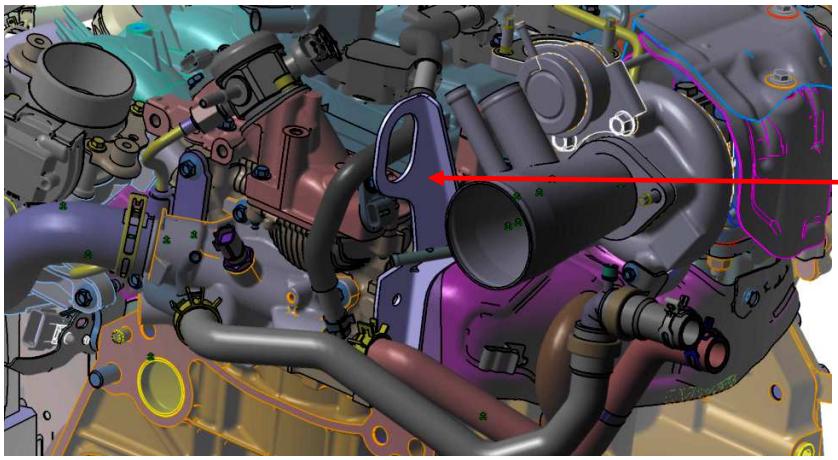


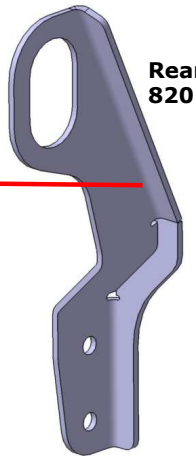


20- Take out the powertrain lowering the hydraulic plate.

NOTE : to lift the power train, fit the adapted engine lift brackets

- 1 front bracket on head cylinder near the engine mounting **(A)**
- 1 specific rear bracket between upstream turbo pipe and engine, fitted on head cylinder





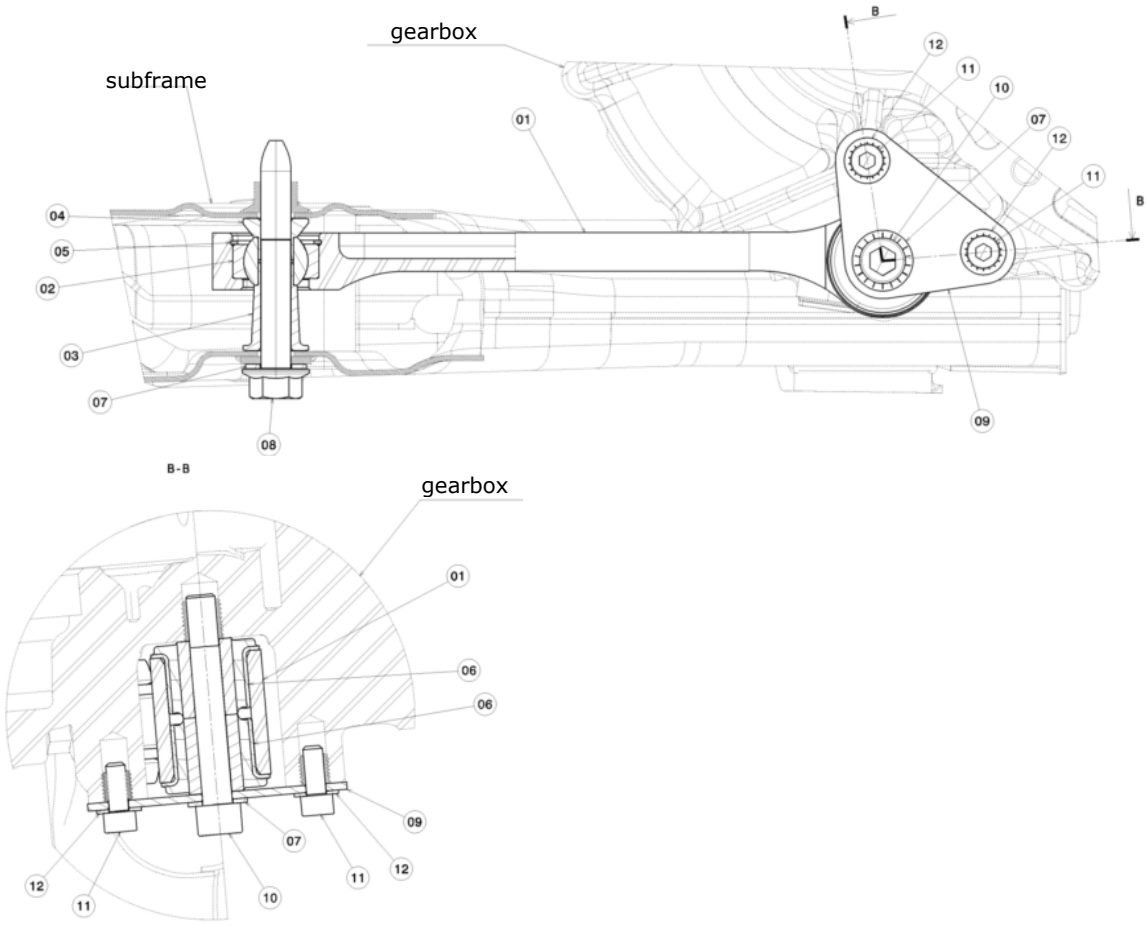
Rear bracket :
8201 428 360

C.1.7 REFITTING OF THE POWERTRAIN

Carry out the previous operations in reverse order.

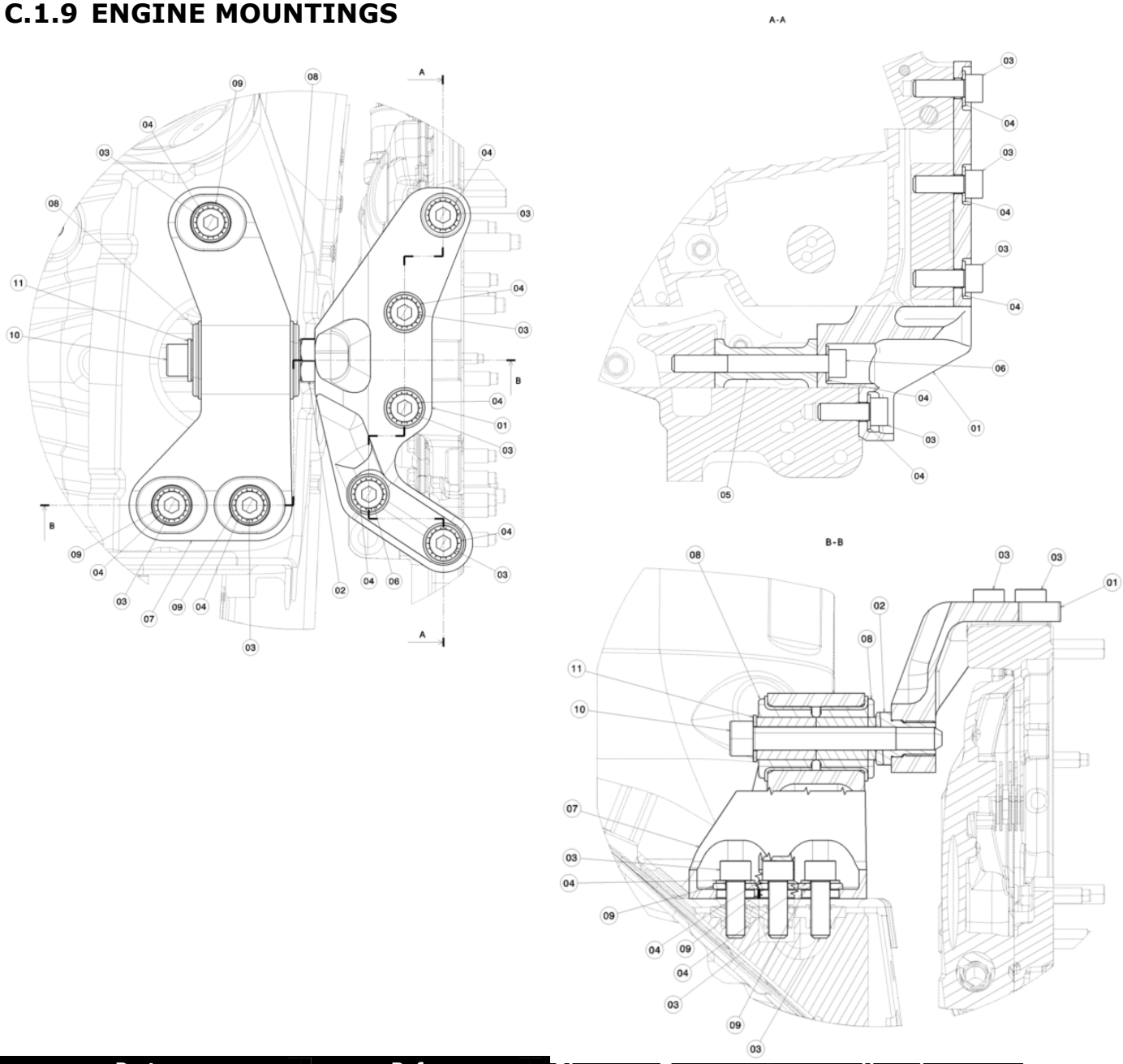
When refitting the powertrain, it is important to comply with the following positioning procedure for the powertrain in order to guarantee the operational clearances required for the driveshafts.

C.1.8 CONNECTING TORQUE ROD YOKE



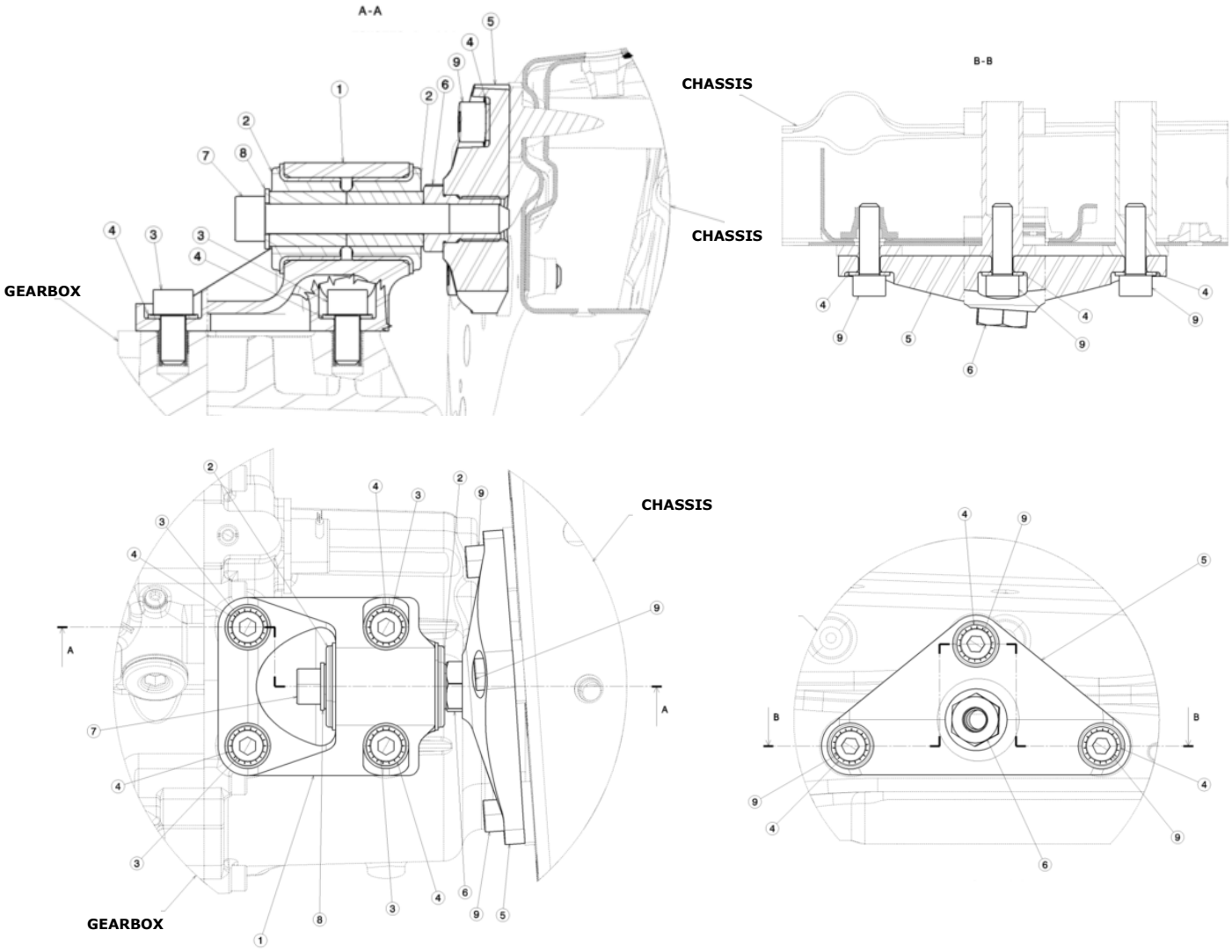
N°	Part	Ref	Qty	Torque	thread
1	Torque rod yoke	8201354335	1		
2	Ball joint	7711160476	1		
3	Lower spacer	8201354569	1		
4	Upper spacer	8201354558	1		
5	Snap ring	7711160477	1		
6	Silent block	7711160043	2		
7	Washer M12	7711156931	2		
8	Screw M12-90	7703602201	1	105 N.m	Cooper grease
9	Triangle bracket	8201368206	1		
10	Screw M12-85	8201368275	1	105 N.m	Cooper grease
11	Screw M8-20	7711128280	2	30 N.m	LOCT 243 (blue)
12	Washer M8	7711156945	2		

C.1.9 ENGINE MOUNTINGS



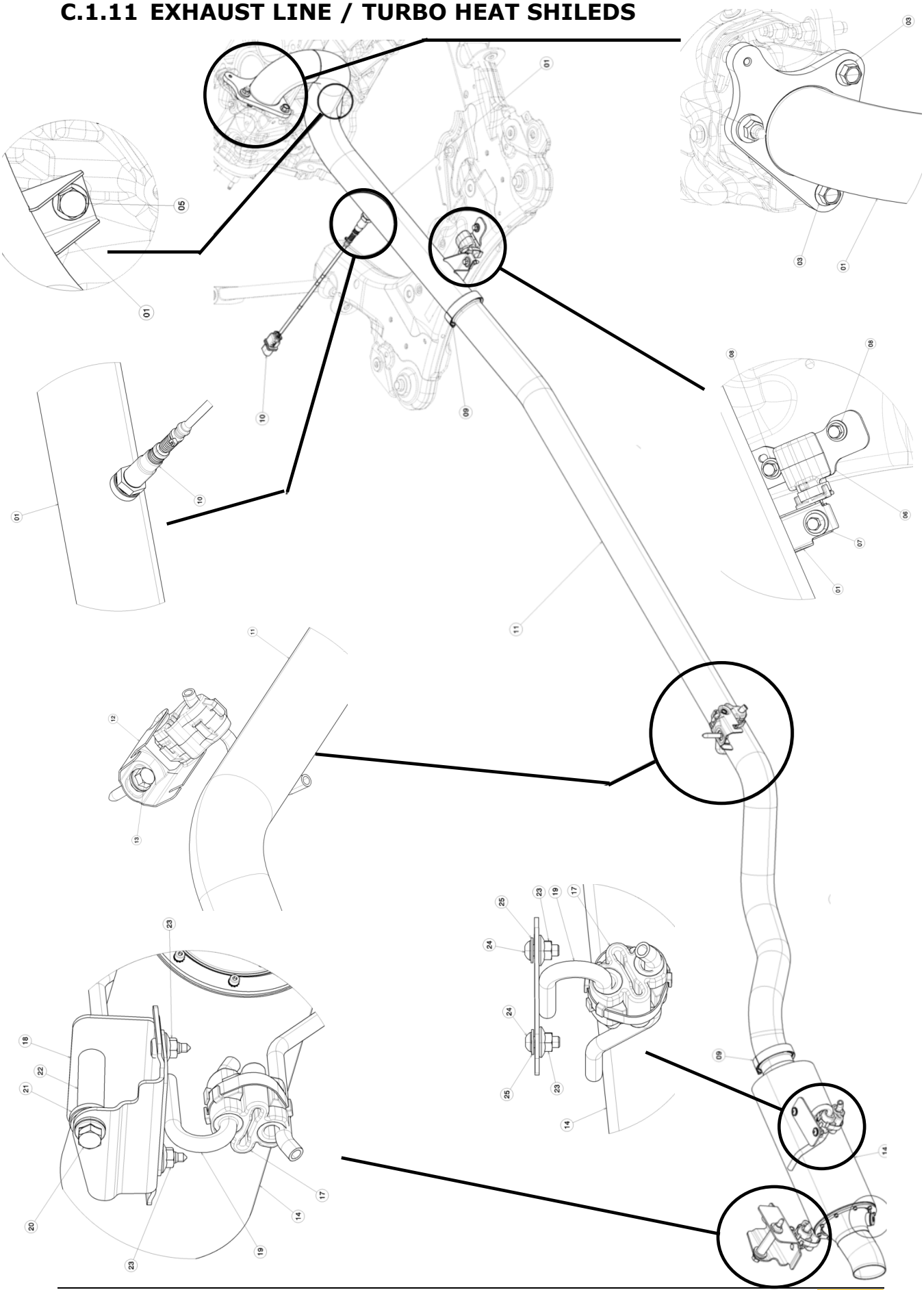
N°	Part	Ref	Qty	Torque	thread
1	Engine/engine mounting	8201355219	1		
2	Engine mountings interface	7711167027	1	100 N.m	LOCTITE 243 (blue)
3	Screw M10-30	7711156933	7	62 N.m	LOCTITE 243 (blue)
4	Contact washer Ø10	7711156944	8		
5	Engine/engine mounting shim	8201362862	1		
6	Screw M10-90	7711127847	1	62 N.m	LOCTITE 243 (blue)
7	Engine/chassis mounting	8201354703	1		
8	Silent bloc	7711160043	2		
9	Washer Ø10	7703053341	3		
10	Screw M12 - 98	7711167029	1	105 N.m	Cooper grease
11	Washer Ø12	7711156931	1		

C.1.10 GEARBOX MOUNTINGS



N°	Part	Ref	Qty	Torque	thread
1	Gearbox/gearbox mounting	8201371034	1		
2	Silent bloc	7711160043	2		
3	Screw M10-20	7711128989	4	70 N.m	LOCTITE 243 (blue)
4	Contact washer Ø10	7711156944	7		
5	Gearbox/chassis mounting	8201360377	1		
6	Gearbox mountings interface	7711167027	1	100 N.m	LOCTITE 243 (blue)
7	Screw M12 - 98	7711167029	1	105 N.m	Cooper grease
8	Washer Ø12	7711156931	1		
9	Screw M10 -35	7711051273	3	62 N.m	LOCTITE 243 (blue)

C.1.11 EXHAUST LINE / TURBO HEAT SHILEDS

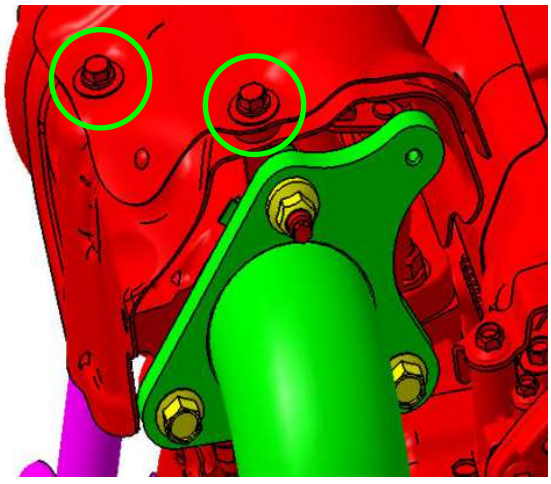


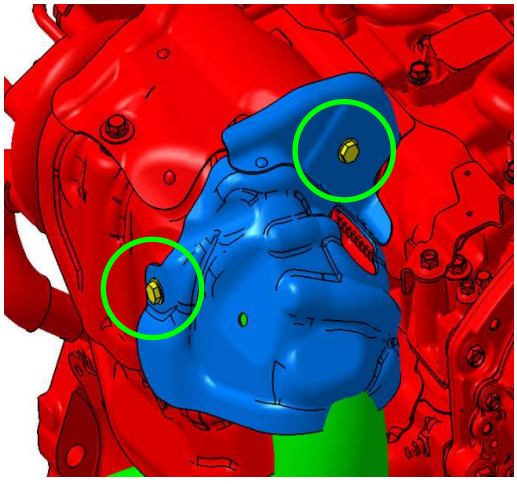
N°	Part	Ref	Qty	Torque	Thread treatment
1	Turbo exit line	82 01 368 925	1		
2	Locknut M10	14094 4P100	1	63 N.m	Without
3	Screw M10-26.5	14069 1KC0A	2	63 N.m	Without
4	Turbo / turbo exit line seal	14445 1KC0A	1		
5	Screw M10-20	77 03 002 854	1	50 N.m	LOCTITE 222 (purple)
6	Silent bloc F1	82 01 142 258	1		
7	Screw M8-30	77 03 002 794	1	24 N.m	Without
8	Screw M6-20	77 03 602 282	2	10 N.m	Without
9	Clamping Ø83	82 01 369 110	2		
10	Lambda sensor	82 00 420 670	1		
11	Intermedary line	82 01 403 325	1		
12	Silent bloc F4	206 51 63 64 R	1		
13	Screw M10-50	77 03 602 189	1	62 N.m	Without
14	Muffler: silencer+ catalysor	82 01 409 008	1		
15	Cap M18	77 03 075 076	1		
16	Cooper seal Ø18	77 11 166 083	1		
17	Silent bloc F7	82 00 444 058	2		
18	Left support	20793 2514R	1		
19	Muffler support	82 01 403 488	2		
20	Screw M10-110	77 03 602 190	1	62 N.m	Without
21	Sealing spacer	82 00 564 670	1		
22	Left spacer	82 00 564 668	1		
23	Nut M8	77 03 034 131	4	24 N.m	Without
24	Screw M8-20	82 01 419 296	2		
25	Contact washer M8	77 11 156 945	2		

Turbo heat shields

These heat shields are fitted using inox screws

Screw M6x20 ref 8201 431 561 x3
Screw M6x15 ref 8201 431 558 x2
Washer M6 77 11 158 358 x5



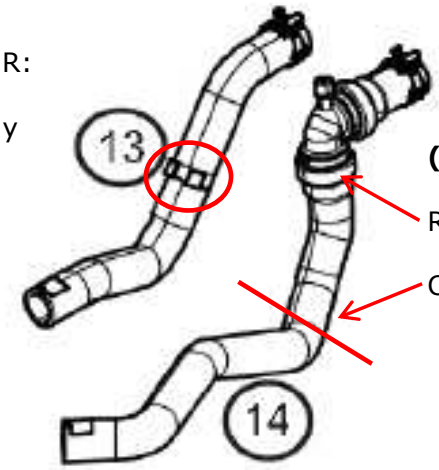


C.1.12 WATER CIRCUIT BUCKLE ON WATER BOX

This buckle is not directly sold as a spare part. It is built from 2 genuine references:

(13) 92 40 035 21R:

Cut the hose to only keep the nozzle



(14) 92 41 014 55 R :

Remove the clamp

Cut the hose

Turn the hose (14) to obtain the right orientation and fit the nozzle as indicated below:

Nozzle from (13)

C.2 POWERTRAIN MANAGEMENT

C.2.1 OPERATING PRINCIPLE

COMPONENTS COMPRISING THE ENGINE AND GEARBOX MANAGEMENT SYSTEM

- Fuel circuit
  - Low pressure fuel pump (in fuel tank) with integrated regulator (5bars)
  - High pressure pump (on exhaust camshaft extremity)
  - Fuel pressure sensors :
    - Low pressure sensor (exit of the fuel tank behind the chassis cover)
    - High pressure sensor (on the high pressure rail under intake manifold)
  - 4 Injectors

- Electronics
  - ECU (SQ7 Di)
  - XAP electronic fusebox (CBNT)
  - Dashboard (ICD Lite)
  - Switch panel on facia
  - Steering wheel switch panel (buttons and paddle shift kit)
  - XAP Master Relay

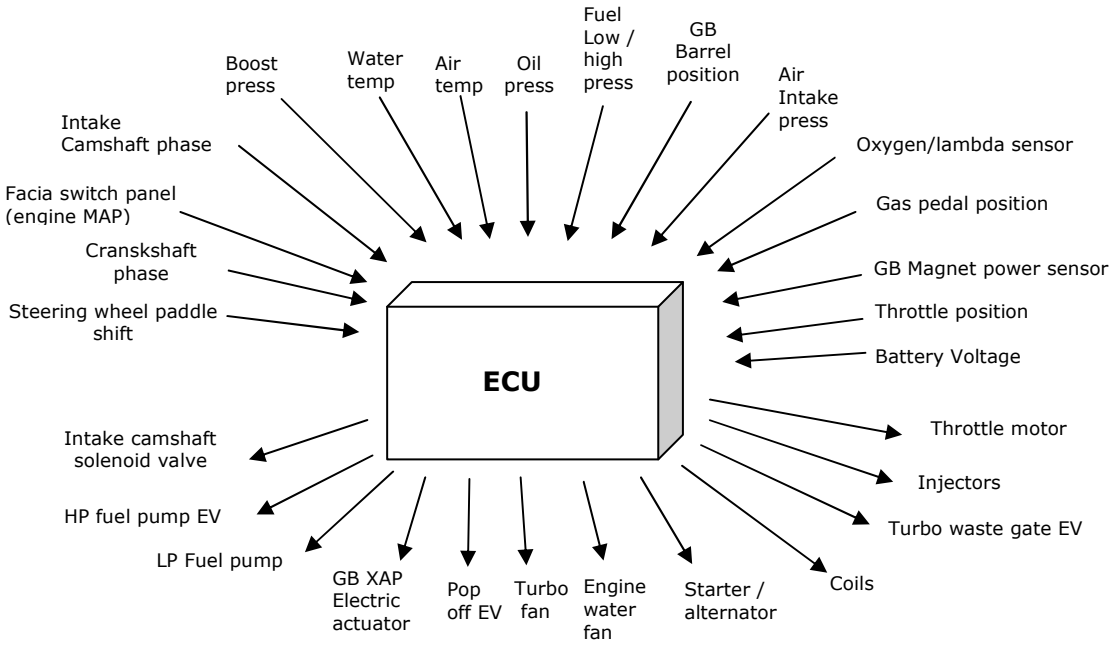
- Engine sensors / actuators
  - Air temperature + boost pressure sensor
  - Intake manifold sensor
  - Crankshaft phase sensor
  - Intake camshaft phase sensor (**exhaust not used**)
  - Intake camshaft dephaser solenoid valve (**exhaust not used**)
  - Oxygen/lambda sensor
  - Motorised throttle + integrated throttle position sensor (TPS)
  - Gas pedal position sensor (PPS)
  - Oil pressure sensor
  - Water temperature sensor
  - High pressure fuel pump electro valve
  - Pop-off electro valve
  - Turbo waste gate electro valve

- Gearbox sensors / actuators (*see chapter D Transmission / shifting*)
  - XAP Electric Actuator (semi-automatic shifting kit)
  - Barrel position sensor
  - Magnet power shift sensor
  - Barrel unlocking solenoid

- Power
  - 4 Coils
  - Starter
  - Alternator

- Cooling
  - Engine water cooler + fan (2 speeds)
  - Turbo air-air cooler + fan (1 speed)

Schematic diagram



C.2.2 STARTING

2 possibilities to start the engine :

1) "hot start" or after an engine stalling

2) "cold start" just after putting general power supply ON

Starting is made easier if a "cold start" is performed. To make it, turn the power supply OFF and then ON (button **(1)** on the facia switch panel) ➔ the ECU will perform a "cold start" :

- The reference position of the Motorised Throttle is higher than if the engine was stalled before, without general power supply cut between 2 consecutive starts
- The fuel pump is controlled then, after the engine start command, it performs wall wetting injections.

To start the engine correctly when it is cold (WaterT<50°), we stronlgy advise you to press the "START" button (button **(3)** of the facia switch panel) with "IGNITION" switched OFF (button **(2)** of the switch panel) during a few seconds to **rise progressively the oil pressure (oilP)**. You can check the "oilP" value on the dashboard in engine diagnostic page (see chapter *B-presentation*)
As soon as the oilP starts growing to 0.8b, you can then flick the "IGNITION" ON and then press "START" to start the engine.

Also, if cold starting fails, it is advisable to turn OFF the general power supply and repeat the engine start procedure.

C.2.3 DECELERATION CUT-OFF

When the Gas pedal is fully released and the engine speed is greater than 3500rpm, the injectors are no longer controlled. Injection is re-instated in one of the following two cases :

- Gas Pedal position > 2%,
- Engine revs < 2500rpm

C.2.4 SHIFTING STRATEGIES

Differents strategies are applied depending on gearbox shifting mode (semi-auto or manual). Please refer to chapter D.2.9 (Gearbox shifting modes)

C.2.5 BATTERY VOLTAGE

The ECU requires a voltage with the starter activated greater than 9 volts. Below this threshold, the battery must be charged or replaced.

⚠ In order to avoid damage to the ECU, it is not advisable to use a battery ”booster”.

C.2.6 ENGINE / GEARBOX MAP

The switch “MAP” situated on the Facia switch panel, offer the possibility to switch between 2 mappings : DRY or WET. The differences are on the following parameters :

- Gas Pedal / throttle position law : “softer” law on WET conditions
- Shifting managemement : Blip more important during downshift on WET position

C.2.7 COOLING FANS

Turbo Air Exchanger fan

turns on if the Air Temperature is > 50°C
turns off when the Air Temperature is <48°C

Engine Water Fan

	Low speed	High speed
Turns ON	Water Temperature > 87°c	Water Temperature > 90°c
Turns OFF	Water Temperature < 86°c	Water Temperature < 88°c

C.2.8 COLD START

To avoid engine damages during this phase and encourage to make a correct cold start, the following securities have been implemented :

Boost Pressure

- No Boost Pressure when water Temperature < 30°c
  ➔ the pop-off valve is fully open (pop-off : 100%)
- Partial Boost Pressure between 30°C < water Temp < 50°c (pop off : 0%)
- Maximal Boost Pressure allowed when water temp > 50°c.

VVT

- No VVT when water temperature < 55° : VVT1_pos : 100 / VVT1_tg : 0
- When Water Temperature >55°C : VVT1_pos follows strictly the VVT1_tg

RPM

Engine RPM is limited to 4500 rpm when Water Temperature < 50°c.
Engine RPM is limited to 6500 rpm when Water Temperature > 60°c.

C.2.9 OPERATION IN DOWNGRADED MODE

The ECU performs a self-diagnostic from input parameters and warns the driver of an abnormal measurement by means of an alarm on the Dashboard. The alarm is activated on the Dashboard as soon as the fault is present. Each alarm is registered in the form of a diagnostic code in the data acquisitions and in the bottom left position of the dashboard (refer to chapter *B-presentation*).
In the event of an abnormal parameter, the ECU works in downgraded mode with a default value for the faulty input. These values are:

- Air temperature: 0°C (Richness grows to reduce performances)
- Water temperature: 80°C.
- Throttle potentiometer: 13deg
- Gas pedal potentiometer : 0%
- Intake pressure: 950 mbars (performances are degraded is the sensor sis absent or defective)

C.2.10 ENGINE PROTECTION

Boost Pressure
- When Water temperature (waterT) > 100°c Boost Pressure decrease progressively
- When WaterT >120°c, Boost Pressure stops (pop-off valve fully open 100%)
- When Air Temperature (airT) = 60°c, the Boost Pressure Target is reduced of 6%. This percentage progressively increase to reach :
  15% when AirT = 90°
  21% when AirT = 110°c

Engine Revs limiter
When Water > 100°c, the engine maximum RPM (6500 rpm) starts to decrease linearly to reach 3500 rpm at 120°c
When WaterT > 120°c, the limiter is still 3500rpm

Igntion advance:
When Air Temperature >70°c, the ignition advance drops of 3° to progressively reach -5° at 100°c

Fuel injection:
When Air Temperature > 60°c, the fuel injection increase from 1% to 3% (depending on Manifold Pressure)
This percentage progressively increase to reach 2% to 8% when Air Temperature > 90°c, still depending on Manifold pressure

C.2.11 ELECTRONICS AND ELECTRIC DEVICES

C.2.11.1 Electronics Control Unit : COSWORTH SQ7DiRST 01E-501070-RST

The ECU controls engine and gearbox operations. It is fitted under the facia, passenger side

⚠ It is strictly forbidden to open the ECU. The Cosworth security labels **must be present**. If these labels are missing, this can be considered a technical non compliance.

⚠ Only one sticker allowed corresponding to the lastest software / Map update

C.2.11.2 Dashboard : COSWORTH ICD 01D-032954-RST

This dash is fitted on the steering column (3 possible vertical positions)

It displays on 8 screens all the necessary information for driver and for diagnostics

It also incorporates the datas acquisition system

All alarms displayed are classified in 2 categories (refer to chapter *B – presentation*)

⚠ Only one sticker allowed corresponding to the lastest software update

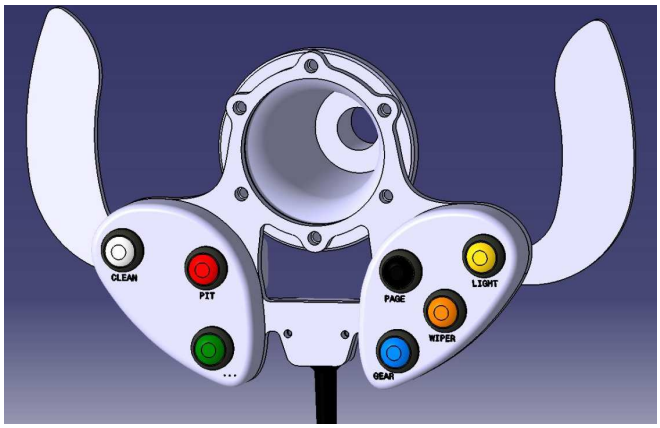
C.2.11.3 Electronic Fuse Box : XAP_CBNT98

This fuse box manages the power supply of all +12v consumers of the car

- ECU
- Starter excitation
- VVT actuator
- Wheel speed sensors
- …etc

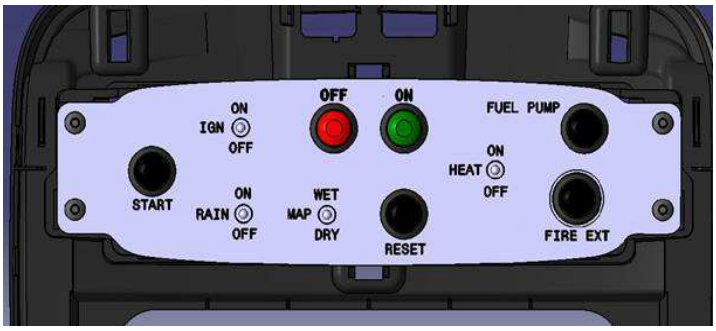
PINOUT indicated in chapter F - Wiring and electrical equipment)

C.2.11.4 Steering wheel switch panel : XAP_STER98



This switch panel is fitted between steering wheel and steering wheel Hub.
It allows the activation of :
- pit limiter
- lights
- windscreen washer
- Gb barrel unlocking
- Page change
- Wiper
- Free button
- Gearbox shifting (paddles)

C.2.11.5 Facia switch panel : XAP_SWT98



This second switch panel is fitted directly in the central area of the facia
It allow the activation of :
- Masterswitch (ON/OFF)
- Ignition
- Starter excitation
- Manual fuel pump
- Engine map (DRY/WET)
- …etc

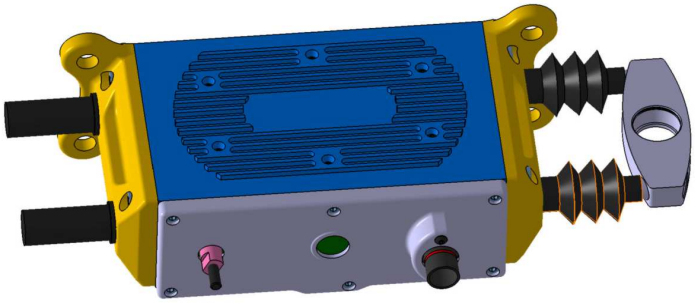
C.2.11.6 Master relay : XAP_Relay

This relay is fitted near the battery.

It allows the supply of :
- the chassis loom (CBNT Supply)
- starter / alternator / XAP gearbox actuator

C.2.11.7 GEARBOX SHIFTING ACTUATOR: XAP_ESHIFT98

This actuator is fitted on the gearbox clutch casing ant is articulated with the manual selection axis.

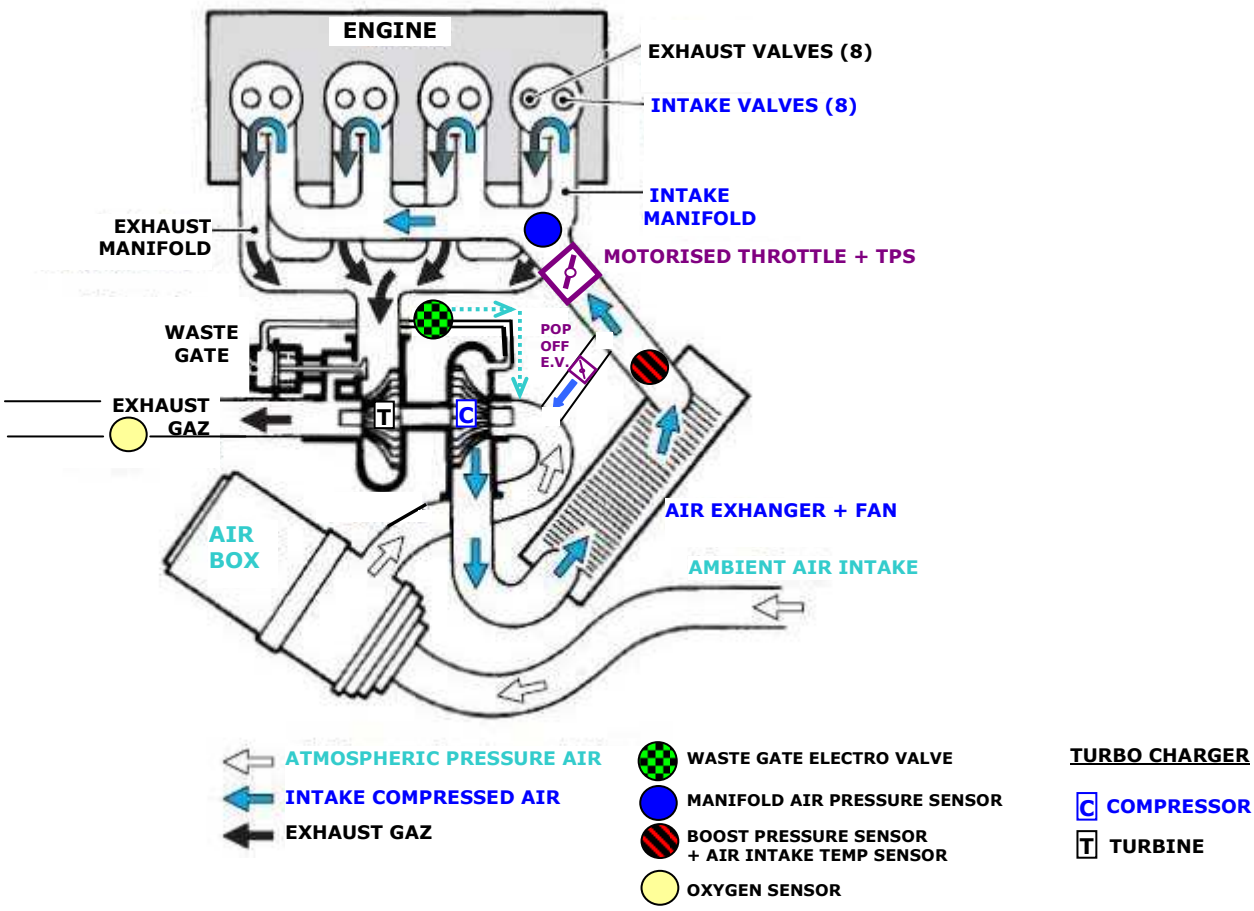


It allows the semi-automatic shifting mode in parallel with the manual shifting mode.

See
chapter *C-Transmission / shifting*

C.2.12 AIR INTAKE / EXHAUST

C.2.12.1 Principle



C.2.12.2 Air sensors and actuators

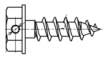
- Air intake temperature sensor + boost pressure sensor = 1 Sensor

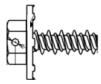
These 2 functionalities are **<u>included in 1 sensor</u>** fitted on the plastic upstream hose to the throttle body

This information allows the ECU to control:

- The injection system.
- The air temperature and boost pressure on the display.
- The Turbo air exchanger fan when the temperature reaches 50°C
- The Waste gate Electro valve
- The pop off electro valve

NOTE :
This sensor is sealed

- To fit it, the original screw (drilled on the head) is a 8201 415 686 

- In case of damage of the thread it's possible to fit the new reference 8201 431 863 

- Air intake pressure sensor (Intake pressure)

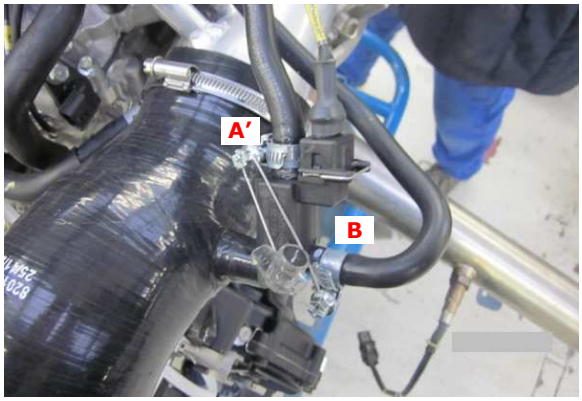
Located downstream to the throttle hose

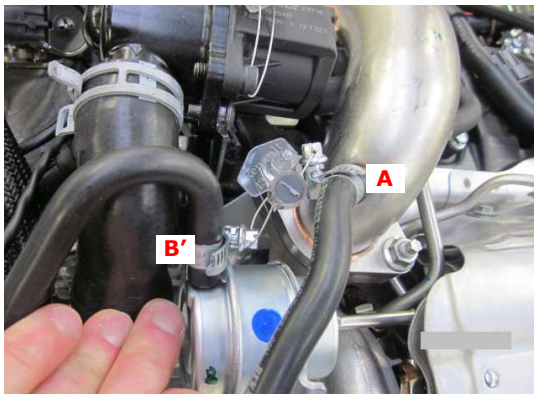
This information allows the ECU to control:
- The injection system.
- To display the intake pressure on the dash.

NOTE :
This sensor is sealed

- Waste gate electro valve

The Waste gate electro valve is situated on the upstream compressor hose.





Supply : 1 hose coming from the compressor exit to the EV (A > A')
Exit : 1 hose going to the lung to manage the waste gate valve (B > B')

NOTE : the 2 hoses are sealed (A, A', B and B')

The Waste gate electro valve allows the ECU to regulate the boost pressure (compressor side by opening the waste gate valve situated on the Turbine side.

POP OFF Electro valve (overpressure valve)

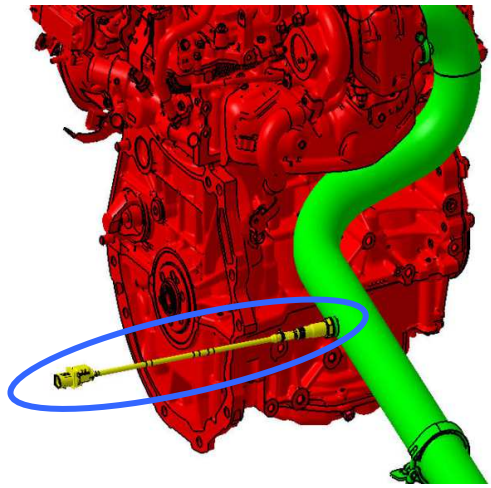
Located on the top of the engine

The pop off valve, under ECU control, allows the pressure discharge upstream of the throttle body when the Boost pressure is at its maximum value when the motorised throttle suddenly closes.

This valve has only 2 positions:
- Close (0%)
- Open (100%)

- Oxygen sensor (Lambda sensor)

Located on the turbo exhaust exit



This information allows the ECU to control the injection system by monitoring the lambda value.

The Oxygen sensor is proportional and must always be plugged

C.2.13 FLY BY WIRE

The link between the Gas pedal and the throttle is 100% electric (Fly By Wire)

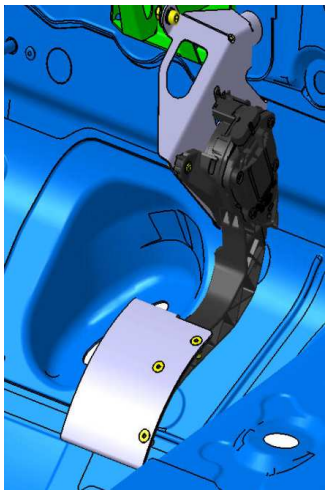
C.2.13.1 Motorised Throttle / Throttle position sensor (TPS)

Located on the intake side, the Motorised Throttle include a Throttle Position Sensor (TPS)

The Motorised Throttle is managed by the ECU depending on the Gas pedal potentiometer position

The Throttle position sensor allows the ECU :
- To control the injection system.
- To control the VVT
- To display the throttle position on the dashboard
- To make the throttle / gas pedal calibration

C.2.13.2 Gas Pedal potentiometer sensor (PPS)



The Gas pedal and its potentiometer are indissociable and directly plugged to the chassis loom.

The Gas Pedal potentiometer allows the ECU to:
- To control the Motorised Throttle
- To display the Gas Pedal on the dashboard
- To make the gas pedal / throttle calibration

C.2.13.3 Gas pedal / Throttle potentiometer learning

As ECU manage the motorised Throttle (TPS) depending on the Gas pedal position (PPS), it's regularly necessary to make a calibration between these 2 sensors to learn the min/max position and the corresponding voltages. (***Autocal*** procedure)

To make the Autocal :

1) Ensure the **GB is in Neutral** and that the master switch is off ("OFF" red Button on Facia switch panel)
2) Press the Gas pedal (complete stroke)
3) Stay pressed on the Gas pedal while pressing the master switch on ("ON" green button on the facia switch panel)
4) Just after the dashboard has started and is initialised, the following screen appears

NOTE : it means that the Autocal procedure has started (FBW learn activated)

➔ As soon as the message appears, release the gas pedal

5) Then the following screen appears :

➔ Follow the instructions: pump Gas pedal twice (full stroke) then release it.

6) The calibration procedure is being performed when the following screen appears:

2 possible results: "success " **OR** "failed"

If the FBW learn failed, check:

- The Motorised Throttle
- The Gas Pedal potentiometer
- The chassis and/or engine loom

Despite of this, if the Autocal is still NOK, contact your Renault Sport Technical interlocutor.

C.2.14 FUEL INJECTION

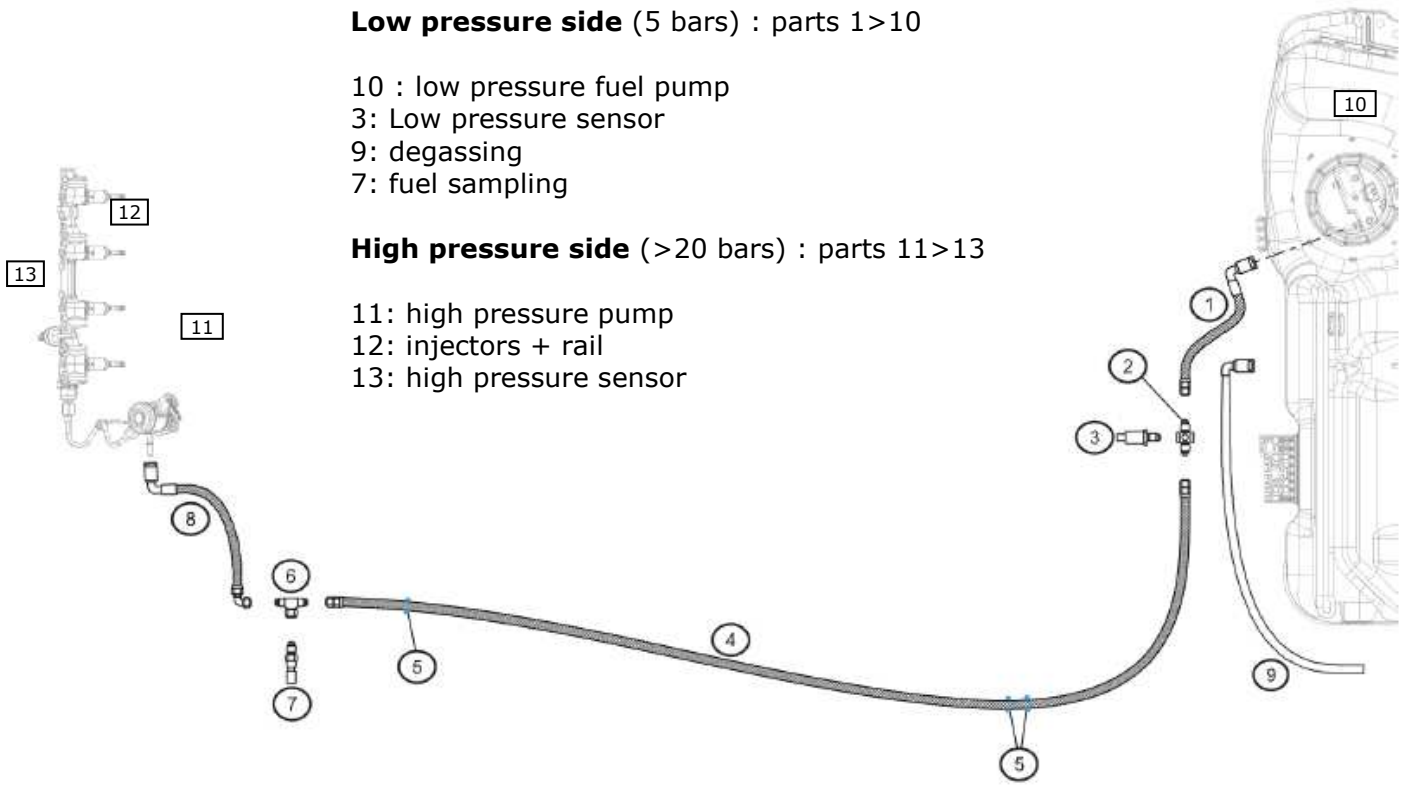
C.2.14.1 Principle

Low pressure side (5 bars) : parts 1>10

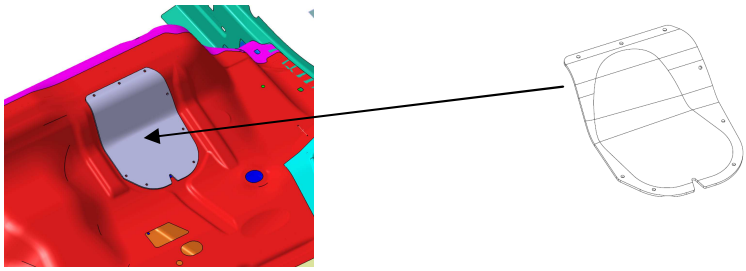
10 : low pressure fuel pump
3: Low pressure sensor
9: degassing
7: fuel sampling

High pressure side (>20 bars) : parts 11>13

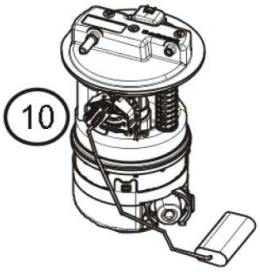
11: high pressure pump
12: injectors + rail
13: high pressure sensor



C.2.14.2 Access Hatch



C.2.14.3 Fuel tower



The fuel tower is situated directly in the fuel tank. It contains:
- A low pressure fuel filter
- A low pressure pump
- A fuel pressure regulator

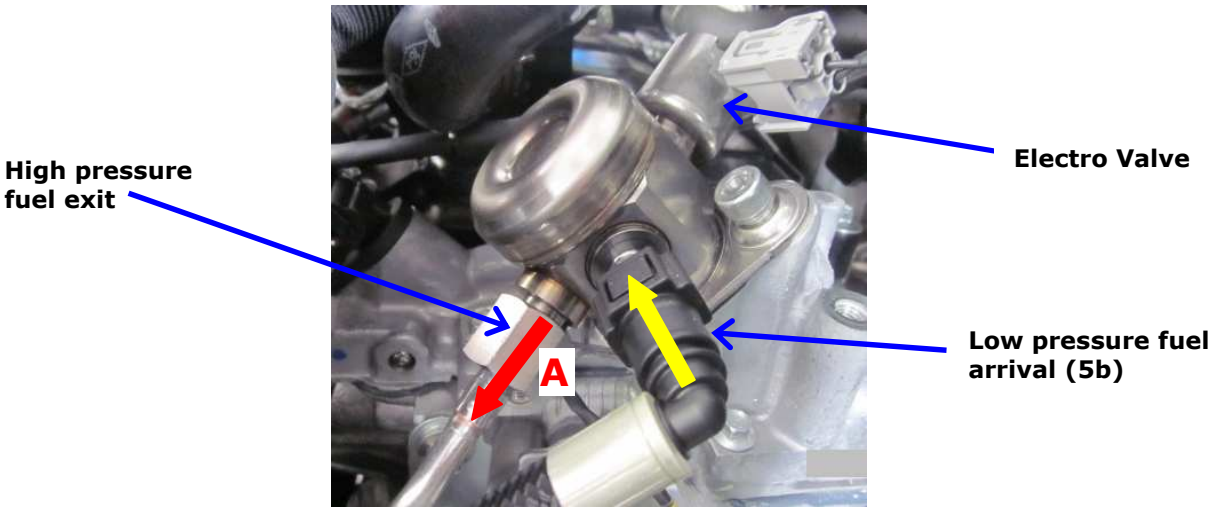
The fuel pump is managed by the ECU and is regulated by the regulator at **5 bars***

C.2.14.4 Low pressure fuel sensor (3)

This sensor is situated on a "T" union just after the fuel tower exit and allows displaying the fuel pressure on the dashboard.

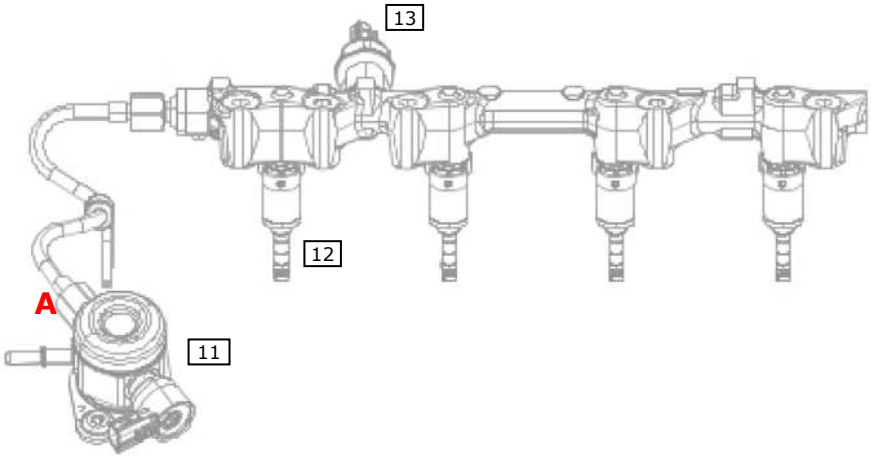
C.2.14.5 High Pressure (HP) pump electro valve (11)

Located on the gearbox side of the cylinder head, the high pressure pump is driven by the exhaust camshaft. The electro valve is situated above the HP pump.



This electro valve allows, under ECU control, to maintain and permanently regulate the high fuel pressure inside of the fuel rail.

C.2.14.6 Injection rail



C.2.14.7 High pressure fuel sensor (13)

This sensor is situated directly on the HP rail and allows:

- the ECU to regulate (through the Electro valve) the fuel pressure
- to display the fuel HP value on the dashboard

NOTE : STARTING THE ENGINE AFTER A REFFITTING

After an engine refitting, it's necessary to bleed the air inside the rail if the HP fuel pressure doesn't exceed 10 bars during the starting phase (The engine will not start in this case). To do so:

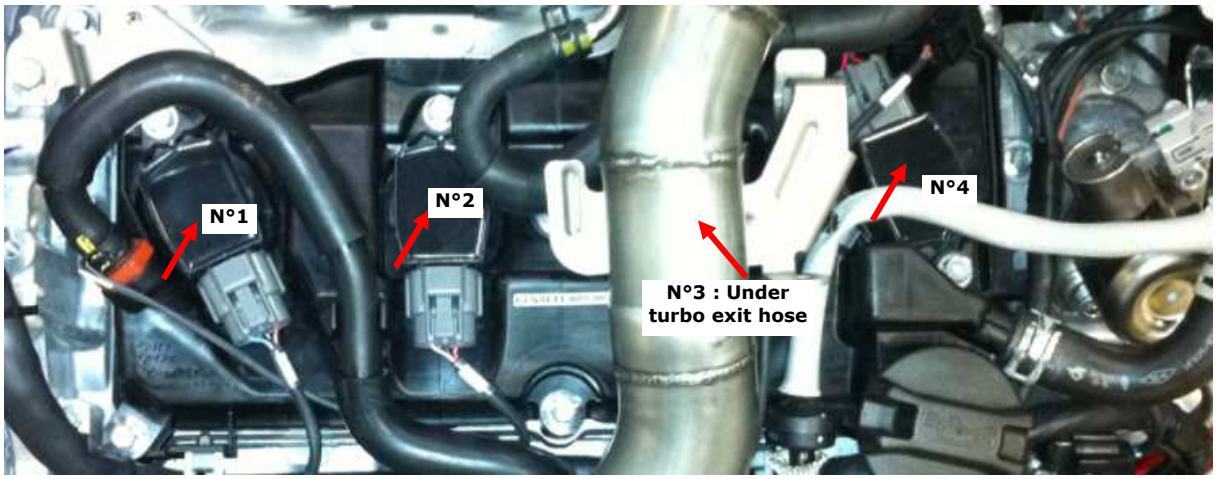
- Activate manually the fuel pump on the facia switch panel (5b on low pressure side)
- Unscrew the adapter "A" to allow the air inside of the rail escaping

➔ It may be necessary to repeat this operation 2 or 3 times to start the engine

C.2.15 IGNITION

The system includes:

- The ECU which incorporates the ignition power stage.
- 4 coils
- 4 spark plugs.



Each Coil (Pin 1) is managed directly by an ECU ignition output.

Renault Sport strongly recommend you to check regularly (after each race meeting) the state of :

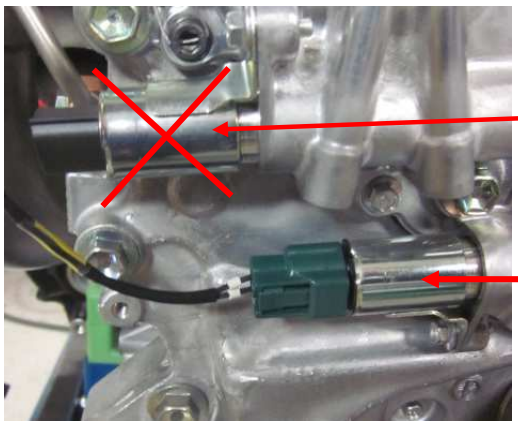
- The coil stem
- The spark plug electrode

C.2.16 VARIABLE VALVE TIMING (VVT)

Only the intake camshaft if managed

C.2.16.1 Intake camshaft solenoid valve

Located on the timing side of the engine, directly on the timing cover



This actuator allows, under the ECU Control, the variable valve timing of the intake camshaft

Exhaust camshaft solenoid valve must not be used

⚠ CAUTION

Only the **intake** camshaft solenoid valve is used (only one connector on the engine loom for it).
The exhaust camshaft solenoid valve situated above is still fitted but must not be plugged instead of the intake one.

This parameter corresponds in the acquisition table to VVT1_tg (Target sent by the ECU)
If water temp<55°C, the VVT is not driven (VVT1_tg=0)

C.2.16.2 Intake camshaft phase sensor

This sensor is located on the gearbox side of the cylinder head, near the oil cap.

This information allows the ECU
- To specify the position of the intake camshaft.
- To control the intake camshaft solenoid valve

⚠ CAUTION

Only the **intake** camshaft phase sensor is used (only one connector on the engine loom for it).
The exhaust camshaft phase sensor situated behind the HP pump must not be plugged instead of the intake one.

C.2.17 OTHER ENGINE SENSORS

C.2.17.1 Water temperature sensor

Fitted to the water outlet unit.

This information allows the ECU:
- To control the injection system.
- To control the engine cooling fan activation when the temperature reaches 87°C first speed) and 90°C (second speed)
- To display the water temperature on the dashboard

⚠ NOTE :
The engine water temperature sensor is particularly important during engine cold start because it restricts the VVT, the Boost Pressure and the RPM limiter. Please refer to page C-18 and respect the engine warm-up procedure rigorously.

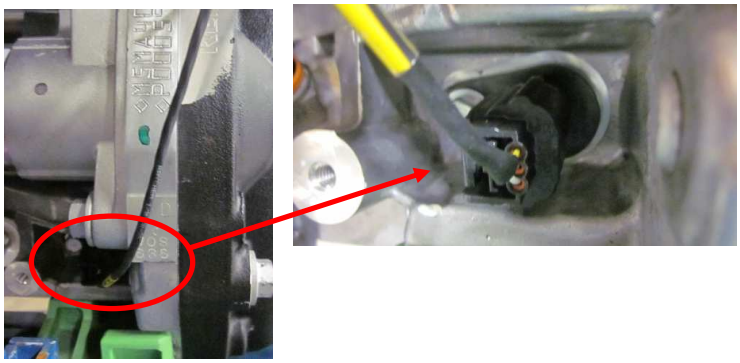
C.2.17.2 Oil pressure sensor

This sensor is not plugged directly on the cylinder block but is connected to the engine through an hydraulic pipe. The sensor is situated under the Motorised Throttle.

This information allows the ECU to display the oil pressure on the dashboard.

C.2.17.3 Crankshaft phase sensor (TDC or S mot)

Located on the cylinder block (under the starter motor). The trigger wheel is fitted to the crankshaft



This information allows the ECU to specify:

- The Top Dead Centre (TDC) position.
- The engine speed on the dashboard