Page

In order to improve the quality of its racing cars, Renault Sport Technologies asks competitors in the Formula Renault 2.0 championships to follow these procedures.

ENGINE FAILURE

In case of an engine failure, competitors must respect the following points, in order to allow an identification of the incident and its efficient treatment.

If the following points are respected, the engine-builder will be able to lend a new engine or a revised one (with invoicing detailed below), until the causes of the incident are established.

- The external accessories, which are not damaged, can be demounted and kept by the competitor except for:
  - the oil pump, the dry sump, the oil-water exchanger and its brackets, and the oil filter for the Formula Renault 2.0 engine
  - the air filter, the nozzle holder's shim, the admission distributor, the injection ramp with the injectors, the calculator.

- Each engine that will be sent to the engine-builder for rebuilding must always be sent with the following sheet completed.

FR2.0 ENGINE SHEET

IDENTIFICATION		
F4R engine type:	730, 732, 736 or 738	Owner:
Engine N :		Driver(s):
ECU N°:		Championship:

ENGINE HISTORY			
Date of purchase:		Mileage:	
Details of previous work	Dates	Operations	Reasons
Diverse (went off circuit, emergency repairs, ...)			

INCIDENT DETAILS	
Date:	
Session:	Practice / qualification / race / engine test bench / others:
Track:	
Meteorological conditions:	
Dashboard information:	
Lubricant (type and make) sample N°:	
Cooling liquid (type and make):	
Number of incident of the same type occurring on the same vehicle or on the other cars of the team:	
Diverse:	

- The engine must absolutely be sent with the following elements:
  - a sample of 1L of fuel, taken in the presence of technical scrutineers,
  - a sample of 250mL of engine oil, taken in the presence of technical scrutineers,
  - a sample of 250mL of cooling liquid,
  - the calculator (Renault Sport can lend one),
  - the data (AIM/DRACK) registered during the incident (when this occurred during track running); this file should be supplied on a CD or a USB-key.

- The responsibility for the engine failure will be established in a maximum of 2 weeks after receiving the engine, except if complementary analysis in a laboratory is required: In this case, the decision will be made within 5 weeks. After this time, the parts, which are not damaged, will be sent to the competitor. However, the damaged parts will be still kept for one month, and after this, if the competitor makes an express request, he can recover the parts.

- After the analysis of the engine, if the competitor is declared to be at fault, the costs for the rebuilding of the loan engine must be paid, in proportion to the kilometres covered (on the basis of 3050€ every 5000km for the season 2005). The competitor will have to give back the loan engine, and pay the transport to the engine-builder. However, if the engine-builder (or Renault Sport Technologies) is at fault, the competitor will keep the loan engine with nothing to pay for the loan.

Summary of the different responsibilities:

TEAM	ENGINE BUILDER / RENAULT SPORT TECHNOLOGIES
➢ Taking of fuel, oil and cooling liquid, ➢ Demounting engine from the car, ➢ Recuperation of non-essential parts, ➢ Pictures of demounted parts, ➢ «FR2.0 Engine sheet» completed, ➢ Sending the engine with the «engine sheet», the samples of fuel, oil, cooling liquid, the calculator, the data file, ... ➢ Payment of the loan engine's rebuild (if the responsibility of the competitor is declared).	➢ Loan of new engine or revised one, ➢ Demounting and analysis of the faulty engine, ➢ Supplying analysis report, ➢ Determination of the responsibilities (with a Renault Sport Technologies expert), ➢ Determination of cost of rebuilding the loan engine (depending on the kilometres covered), ➢ Payment of the loan engine's rebuild (if the responsibility of Renault Sport is declared).

SENDING ENGINE FOR REBUILDING

In order to improve the control of engines, each competitor must absolutely send an «FR2.0 engine sheet» each time that the competitor sends its engine to the engine-builder for rebuilding, even if the rebuilding does not occur after a problem or a failure.

FAILURE OF OTHER PARTS

For the other parts, apart from the engine, the same type of procedure must be respected (even for the fastening).

The defective component, or the parts of the broken one, must be sent back to Renault Sport Technologies, with the following sheet.

FR 2.0 COMPONENT SHEET

IDENTIFICATION	
Part designation:	Owner:
Reference:	Driver(s):
ECU N°:	Championship:

COMPONENT HISTORY			
Date of purchase:		Mileage:	
Details of previous work	Dates	Operations	Reasons
Diverse (went off circuit, emergency repairs, ...)			

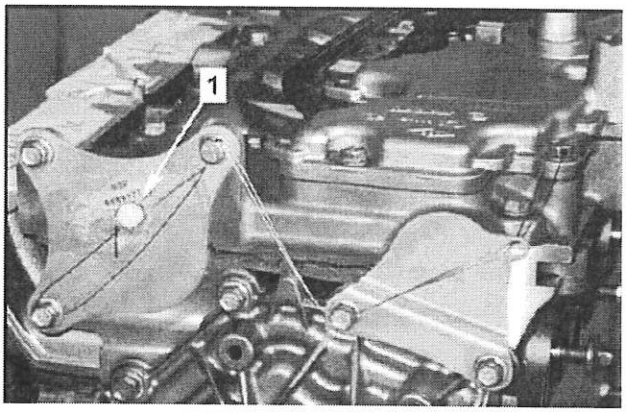
INCIDENT DETAILS	
Date:	
Session:	Practice / qualification / race / engine test bench / others:
Track:	
Meteorological conditions:	
Dashboard Information:	
Lubricant (type and make):	
Number of incident of the same type occurring on the same vehicle or on the other cars of the team:	
Diverse:	

SEALED

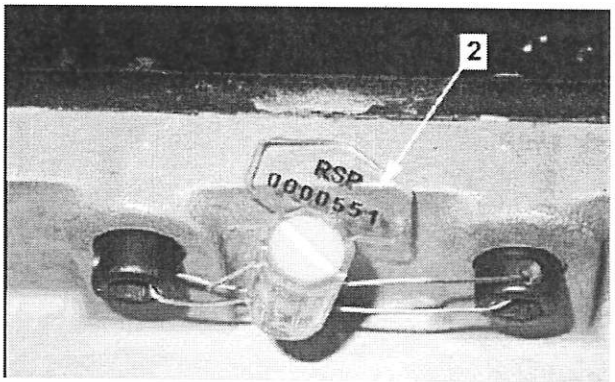
IMPORTANT: The engine is sealed off. It is forbidden to carry out any interventions on the engine. It is compulsory that Renault Sport representatives carry these out.

The following are sealed:

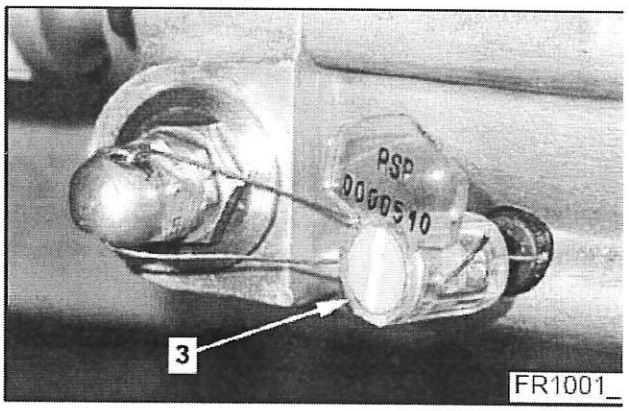
- cylinder head and camshaft plugs (1),



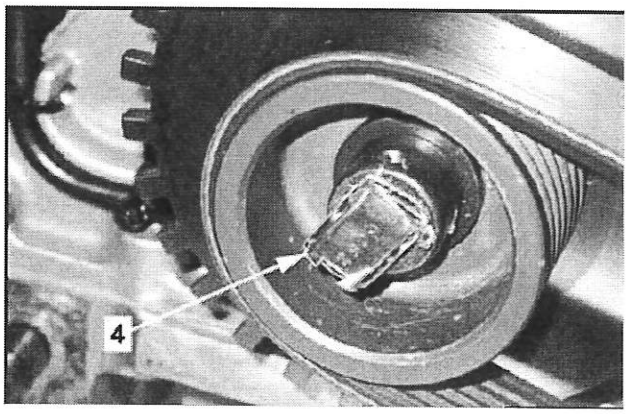
- bottom case (2),



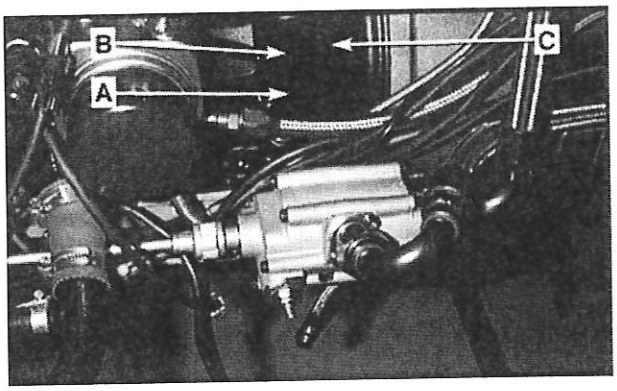
- oil pump (3),



- the distribution pulley and the ignition target (4).



IDENTIFICATION NUMBER



An engraving on the engine-gearbox unit identifies the engine.
It includes the following:
- At A: engine type and certification letter,
- At B: Renault identification and engine index,
- At C: engine production number.

CHARACTERISTICS

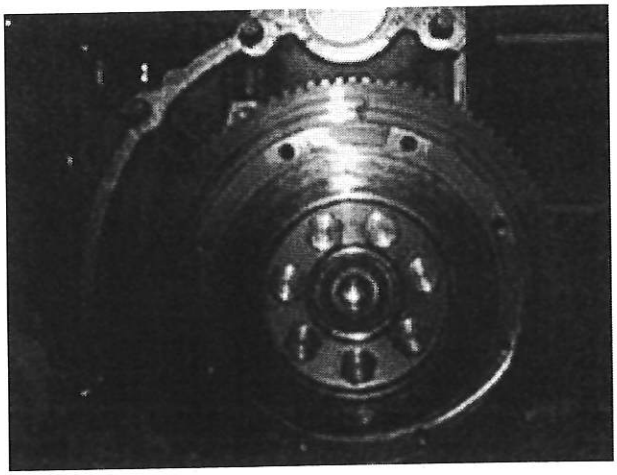
Engine

- Type: F4R.
- Number of cylinders: 4.
- Number of valves: 16.
- Bore: 82,7mm.
- Stroke: 93mm.
- Engine displacement: 1998cm3.
- Compression ratio: 11,2/1.
- Max. Power: 190ch DIN at 7250rpm.
- Max. Torque: 216N.m DIN at 5000rpm.
- Electronic control: MAGNETI MARELLI MF4L competition.
- Type of crankcase: dry (comes from Renault Sport F3 engine).
- Oil type: 15W50. It is mandatory for the engine lubricant used to meet the following criterion: Hot viscosity grade 50.
- Exhaust: catalytic and silencer (complies with FIA standards).

Flywheel

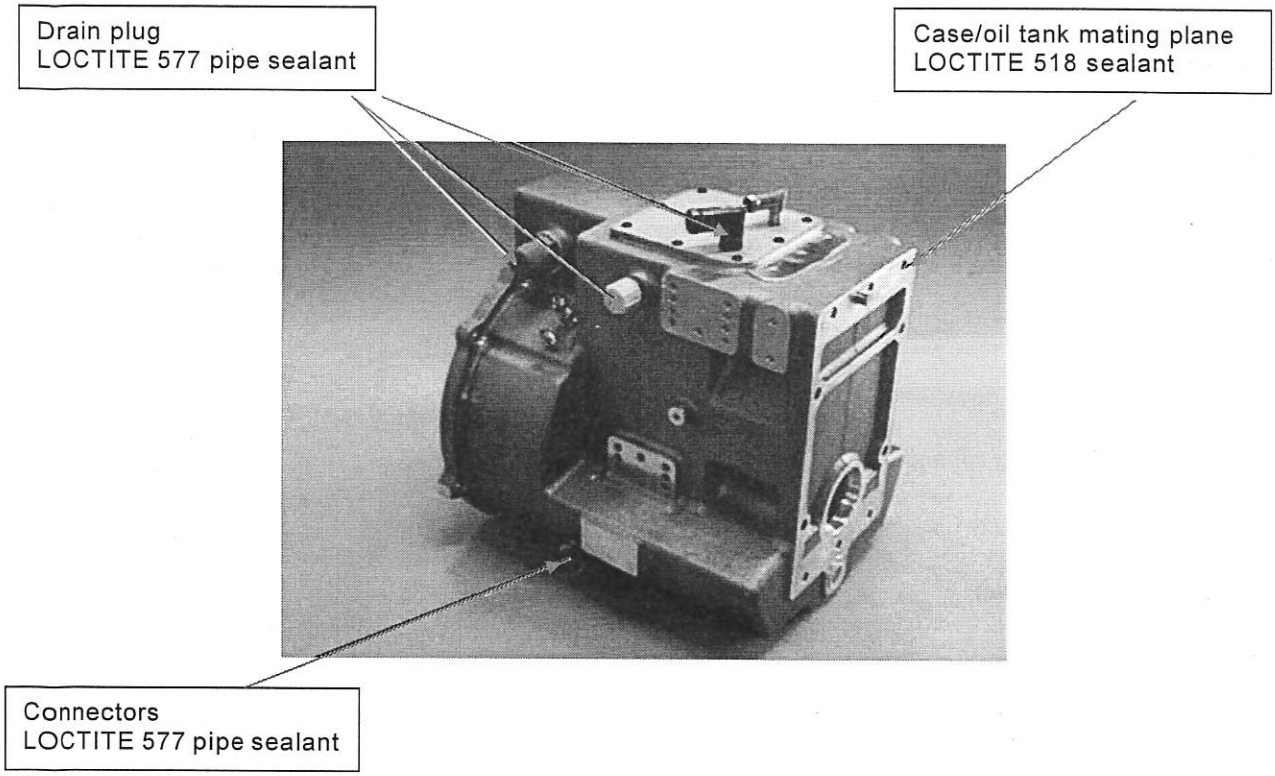
- Diameter: 212mm.
- Weight: 2050g minimum.

IMPORTANT: It is forbidden to change the flywheel.



Oil tank

TYPE	USE
LOCTITE low-strength Screw lock 222	Oil tank fastening screw
LOCTITE 518 sealant	Case/oil tank mating plane



TORQUES

Grade 8.8 fastening is used except:
- Studs and raised head screws and bolts: grade 10.9,
- Screws and bolts with the grade engraved on the head.

The torqueses are indicated in N.m.

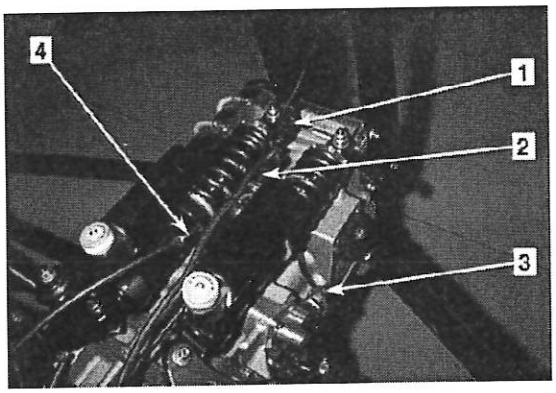
SCREW	GRADE		
	8,8	10,9	12,9
M4	2,8	3,9	4,7
M5	5,5	7,7	9,2
M6	9,4	13,2	15,9
M8	22,7	32,0	38,4
M10	44,9	63,1	75,7

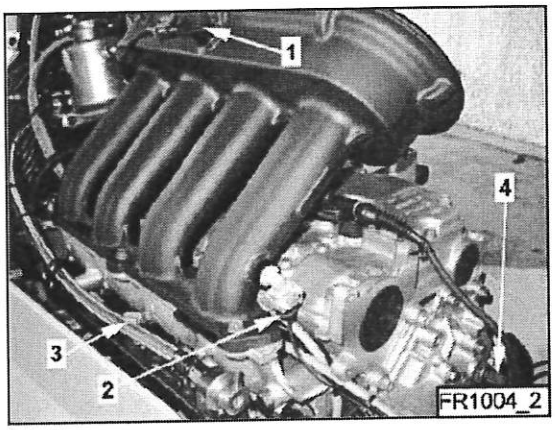
SCREW	UNF
¼	13,5
5/16	26,5
3/8	46

ENGINE-GEARBOX UNIT

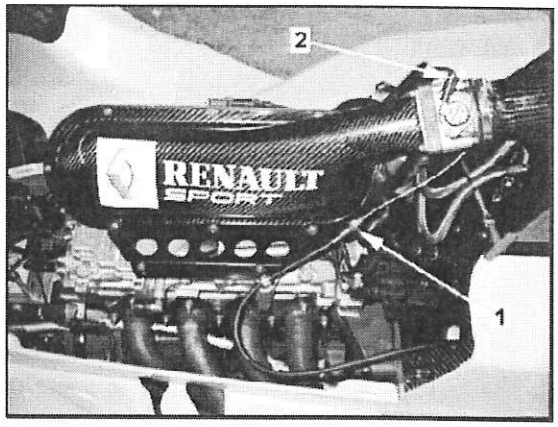
Removal

- Disconnect battery.
- Remove left and right bridges, engine bonnet, and floorboard.
- Disconnect the following connectors:
  - rain light (1),
  - gearbox potentiometer (2),
  - cut-off switch 3),
  - gearbox release cable (4).
- Remove wing.
- Disconnect the following:
  - intake air pressure sending unit (1),
  - intake air temperature sending unit (2),
  - injectors (3),
  - intake water temperature sending unit (4).

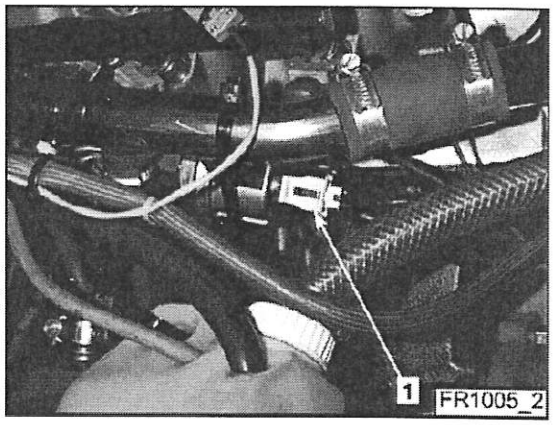




- accelerator control cable (1),
- butterfly valve position sending unit (2),

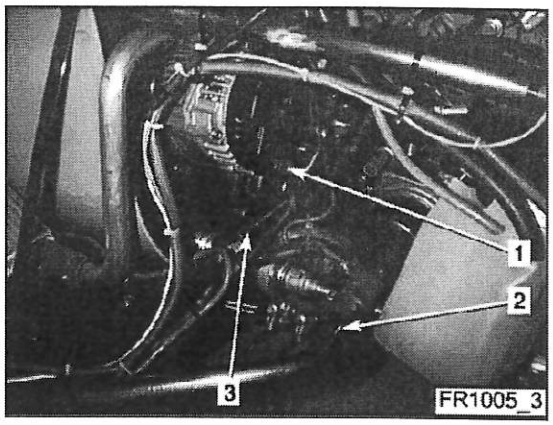


- oil pressure sending unit (1),

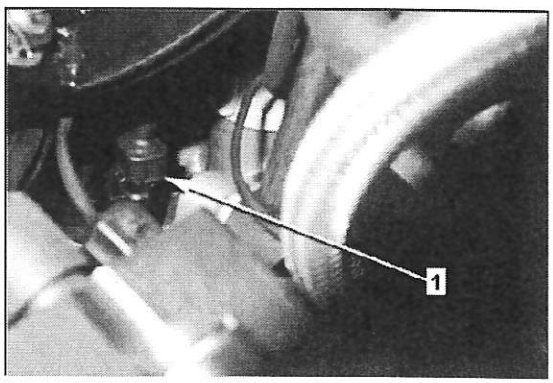


- TDC sensor connector (3),
- alternator wiring (1),
- water pump cooling system lines (2).

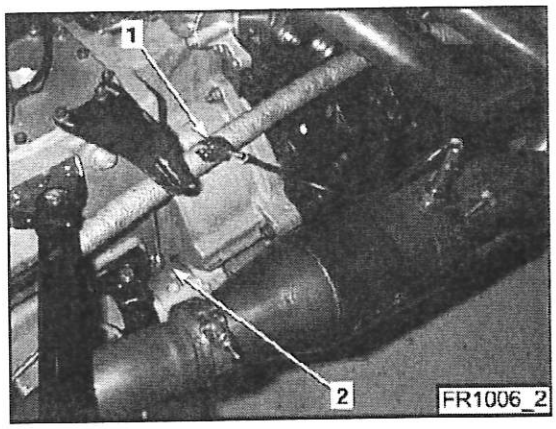
NOTA: *Provide for coolant flow.*



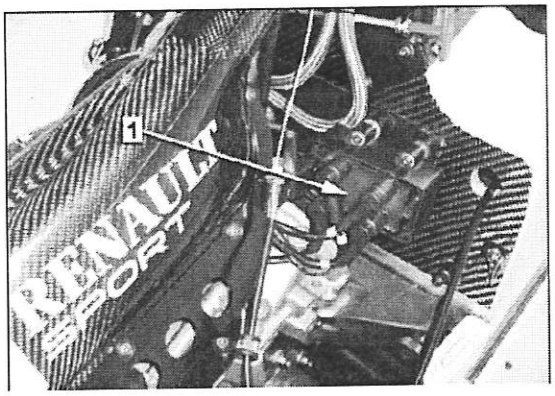
- camshaft phase shift solenoid valve (1),



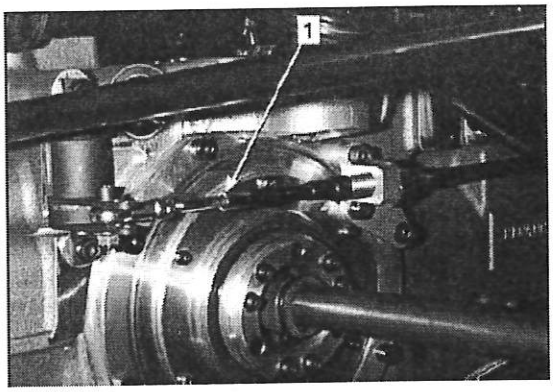
- oxygen probe connector (1),
- starter wiring (2).



- Disconnect coil (1).

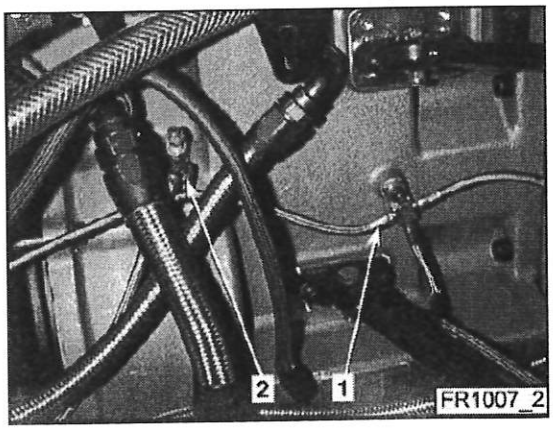


- Disconnect push-pull cable.

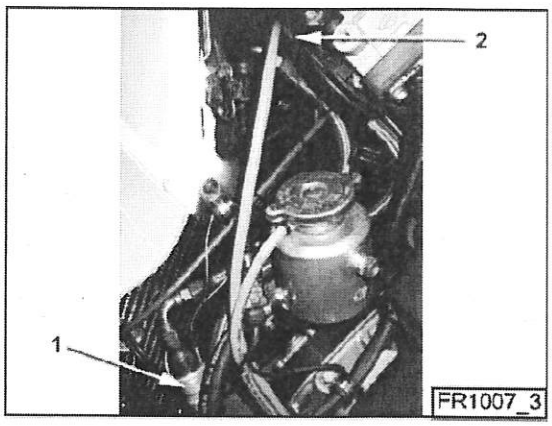


- Disconnect hydraulic system lines:
  - clutch (2),
  - rear brakes on tee (1).

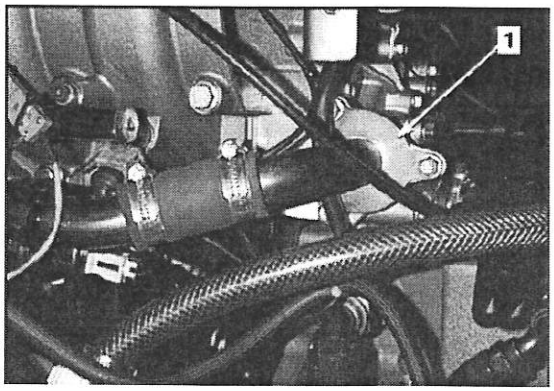
NOTA: *Provide for coolant flow*



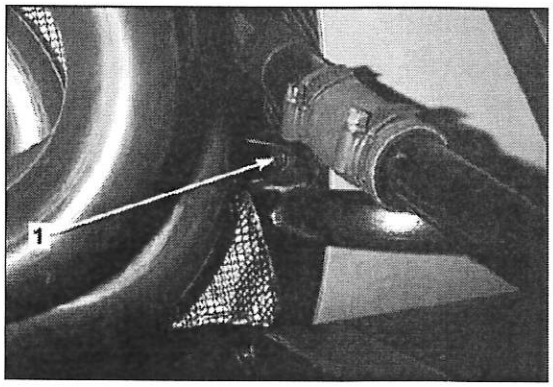
- Disconnect the following:
  - fuel supply coupler (1),
  - fuel returns connector to tank (2).



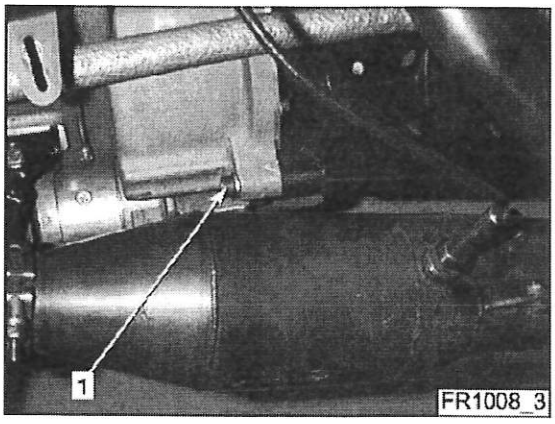
- Remove the three bolts fastening the water line clamp (1) to the thermostat casing.



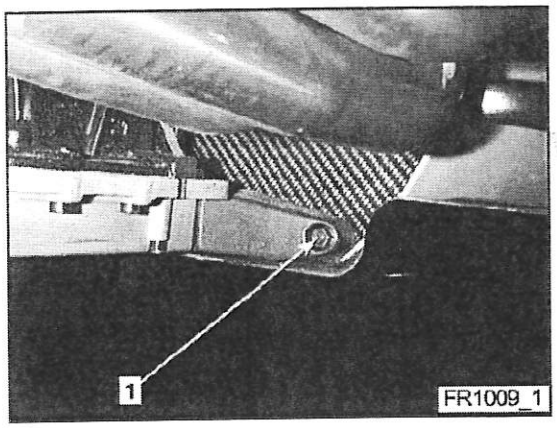
- Install shell on stand and prop up engine with a lifting device (see section covering this).
- Loosen bolt (1) fastening through-bolt to shell.



- Remove bolt (1) fastening through-bolt to clutch case.

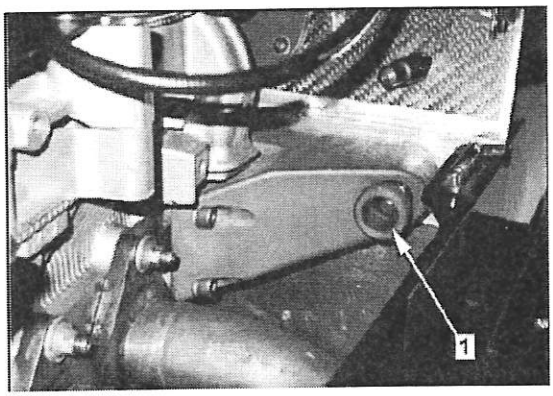


- Remove the two nuts (1) fastening the bottom mounting to the shell.



- Remove the two nuts (1) fastening the top mounting to the shell.
- Disengage gearbox-engine unit.

NOTA: *Two top-mounting references are available: the ref. 77 11 154 676 is a reinforced one.*

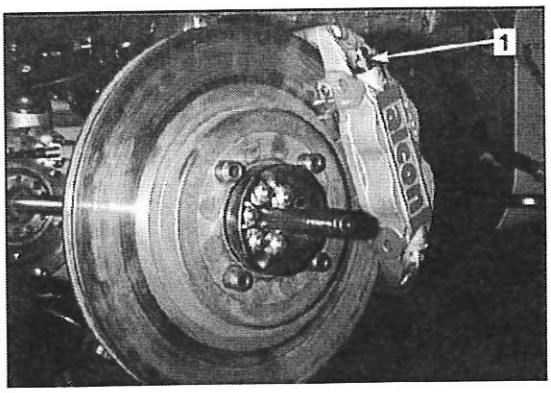


Installation

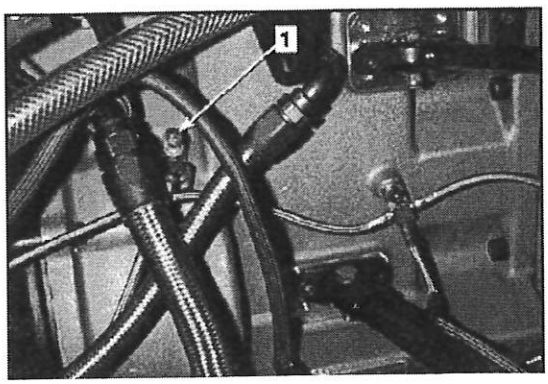
- Carry out the above steps in the reverse order.
- Observe torques.

IMPORTANT: **When attaching the pull-rod to the shell, adjust using washers so that the tightening of the screw does not entail strain in the pull-rod.**

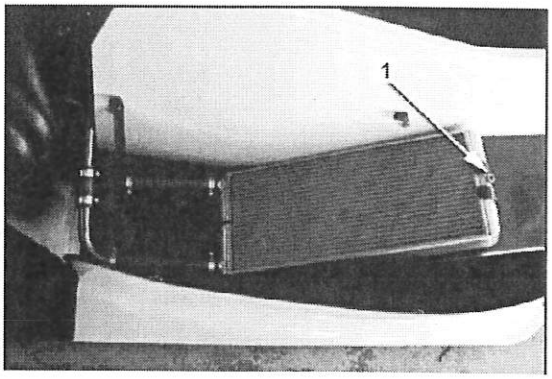
- Bleed the following :
  - brakes (1),



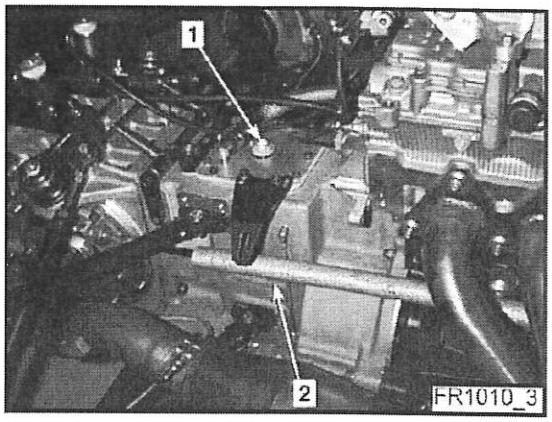
  - clutch (1),



- radiators (1).

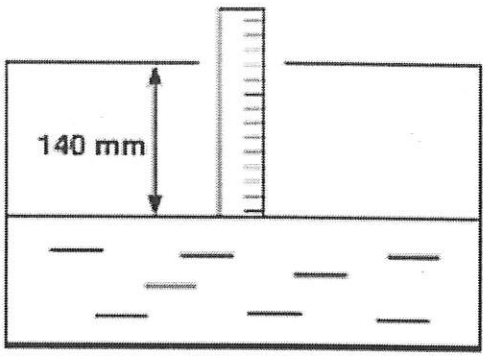


- Adjust the levels of the following:
  - engine oil [filler cap (1) and level gauge (2)],

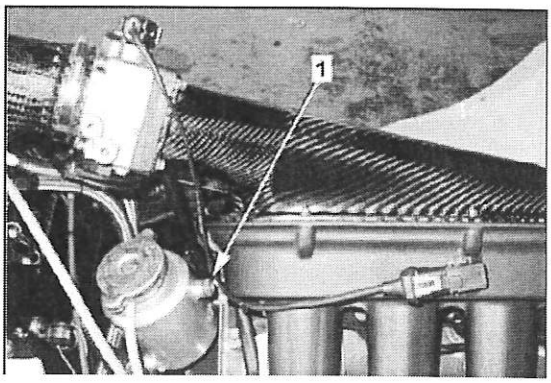


NOTA: *The oil level is adjusted following the following steps:*

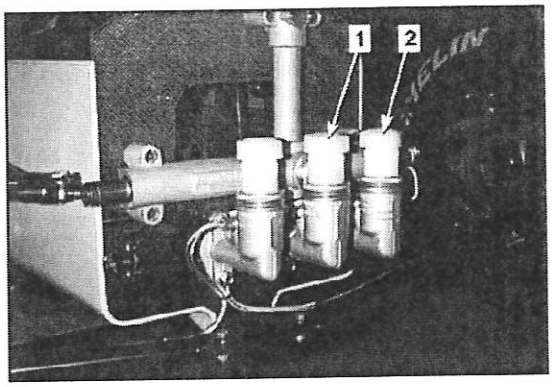
- Run the engine for 2 or 3min.
- Use a rule plunged into the oil tank to check that the level between the surface of the oil and the filler hole is 140mm.



- cooling system (1),

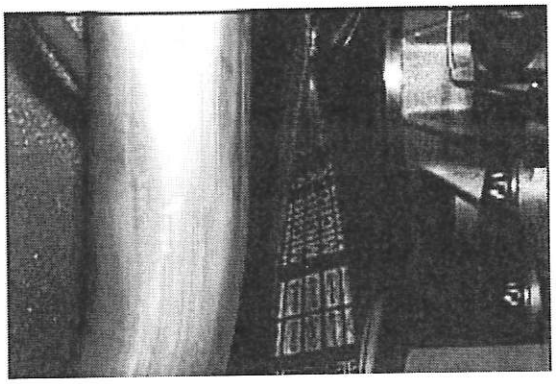


- clutch system (2),
- rear brake fluid (1),



ALTERNATOR BELT AND OIL PUMP
Adjustment of the tension

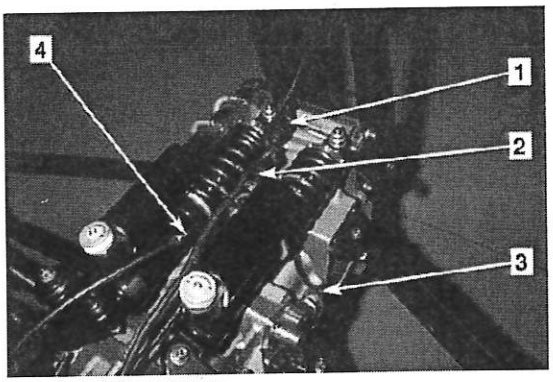
Check it regularly when the engine is hot.
It is correct when it is possible to turn of quarter turn (90°) the belt strand located between the alternator pulley and the oil pump pulley.

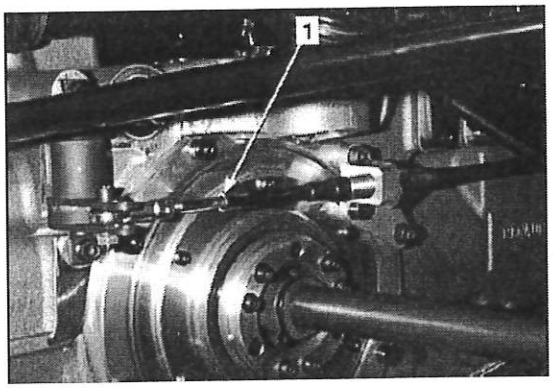


OIL TANK / GEARBOX ASSEMBLY

Removal

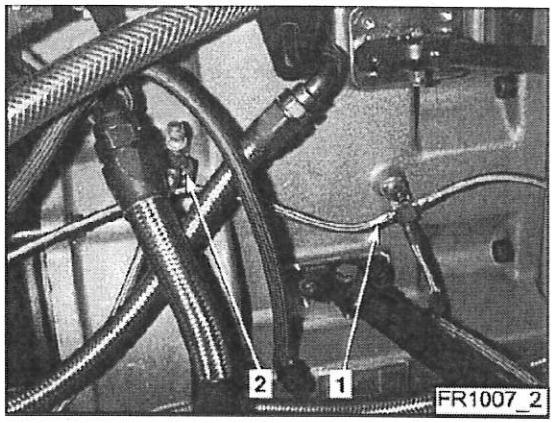
- Disconnect battery.
- Remove left and right bridges, engine bonnet, and floorboard.
- Disconnect the following connectors:
  - rain light (1),
  - gearbox potentiometer (2),
  - cut-off switch (3),
  - gearbox release cable (4).
- Remove wing.
- Remove starter.
- Disconnect push-pull cable (1).



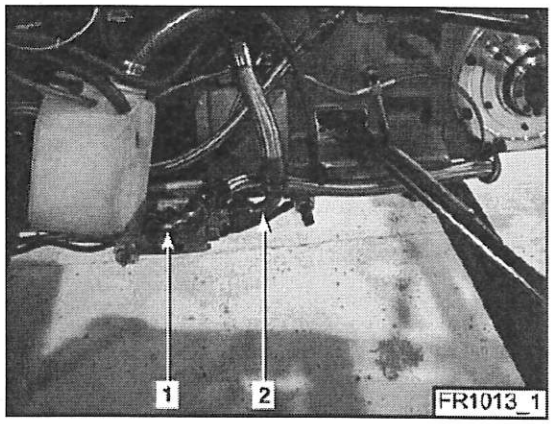


- Disconnect hydraulic system lines :
  - clutch lines (2),
  - rear brakes on T (1).

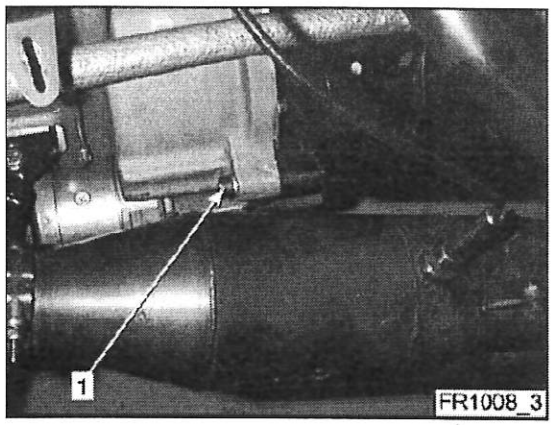
NOTA: *Provide for hydraulic fluid flow.*



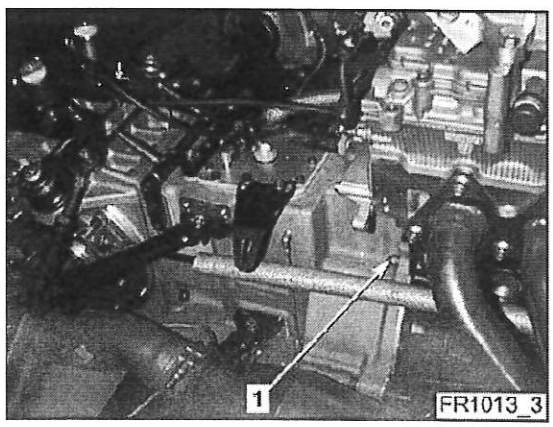
- Disconnect oil lines (1) and (2) on the oil pump.
- Remove the muffler.
- Place engine/shell assembly on stand and prop up oil tank/gearbox assembly with a lifting device.



- Remove bolt (1) fastening engine strut to clutch housing.

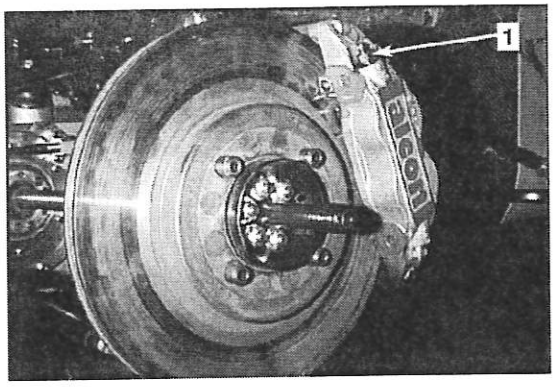


- Remove nuts (1) fastening clutch housing to engine.
- Disengage oil tank/gearbox assembly.

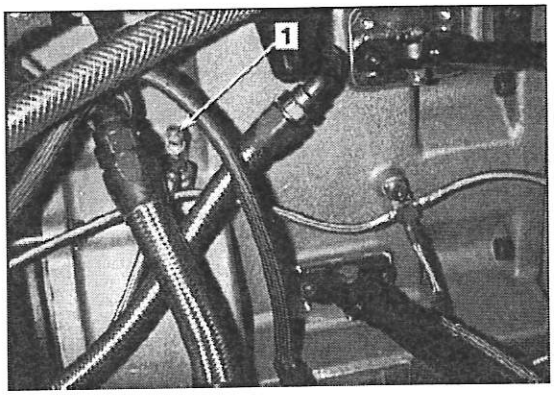


Installation

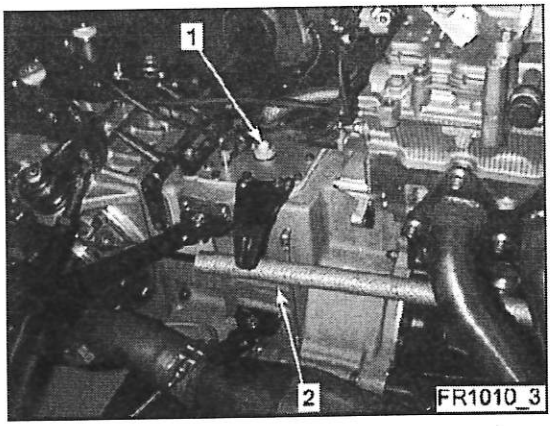
- Carry out the above steps in the reverse order.
- Observe torques.
- Bleed the following :
  - brakes (1),



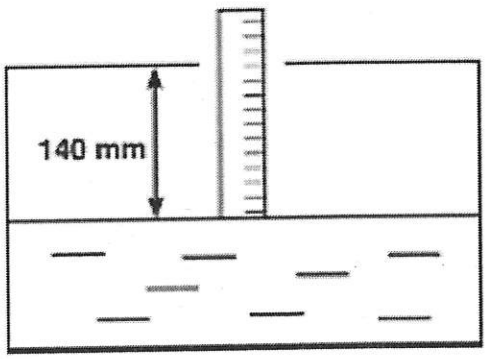
  - clutch (1),



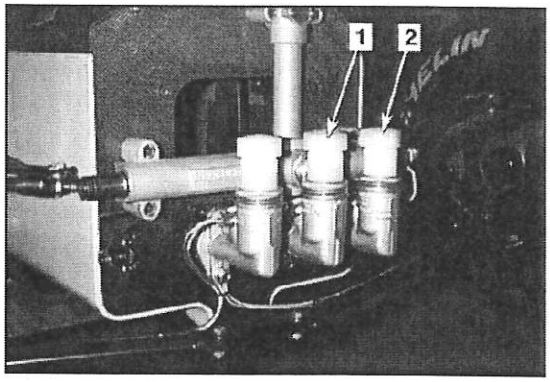
- Adjust the levels of the following:
  - engine oil [filler cap (1) and level gauge (2)],



NOTA: *The oil level is adjusted following the following steps: Run the engine for 2 or 3min. Then use a rule plunged into the oil tank to check that the level between the surface of the oil and the filler hole is 140mm.*



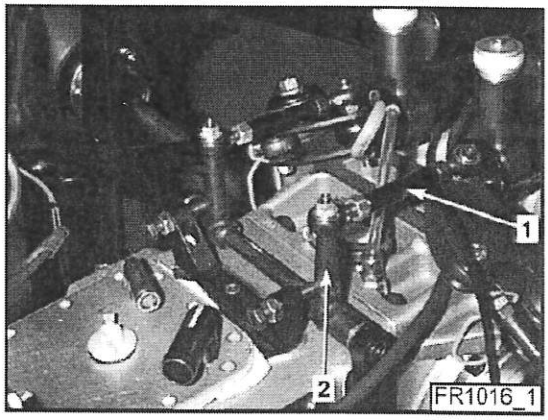
- clutch system (2),
- rear brake fluid (1).



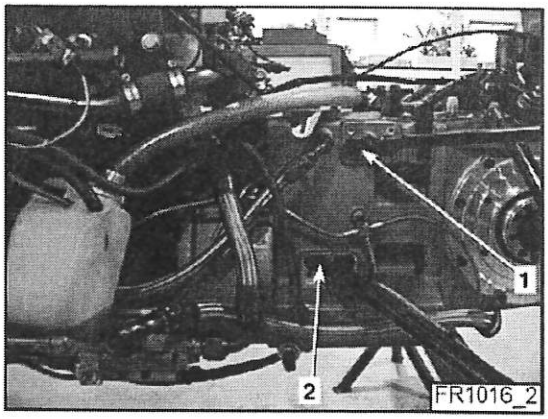
OIL TANK

Removal

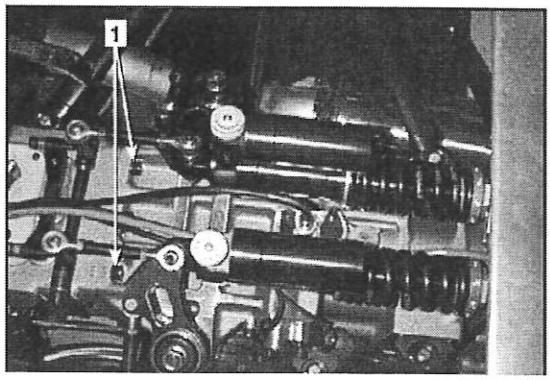
- Remove oil tank/gearbox assembly (see above).
- Uncouple antiroll rods (2) from antiroll bar (1).



- Remove bolts fastening bottom (2) and top (1) suspension wishbones to the oil tank.

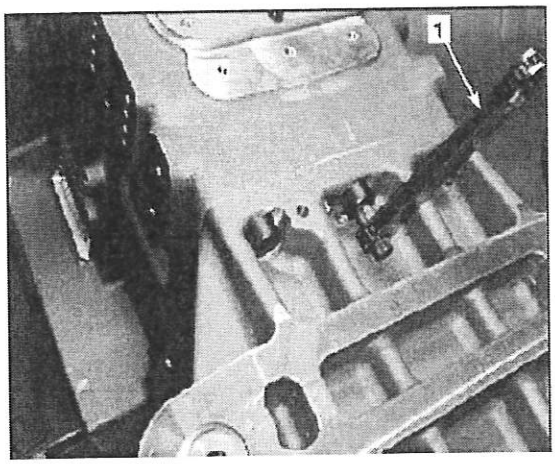


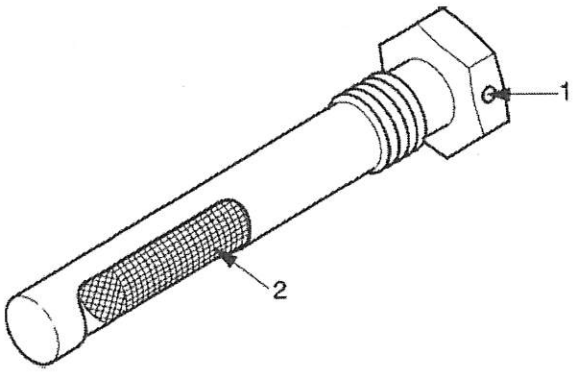
- Remove bolts (1) fastening oil tank to gearbox.
- Remove oil tank.



Installation

- Use an M10x150 tap to clean oil tank tapings, and then remove grease from tapings, screws and bolts, and mating planes of both oil tank and gearbox.
- Coat gearbox-mating plane with LOCTITE 518 sealant and fit oil tank on gearbox.
- Put a few drops of LOCTITE low-strength Screw lock 222 on the seven mounting bolts.
- Insert using a Facom P/N 68B 6x8 (1) type ratchet ring wrench to tighten.
- Torque bolts to 55N.m.
- Carry out the above steps in the reverse order.
- Observe torques.
- Install the oil tank/gearbox assembly (see above).
- Since the oil tank intake connector is equipped with a strainer (2), when changing the connector, make sure that the indexing hole (1) is turned downwards on completion of tightening.





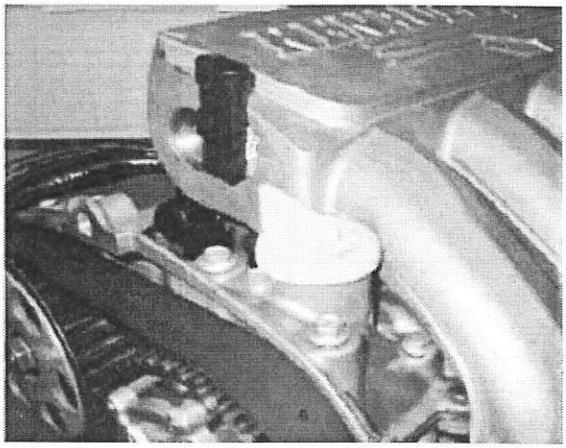
To improve the mounting of the air box support (P/N: 77 11 154 847) on F4R 738 engines, a specific support is from now on available.

This part is sold under the P/N 77 11 154 882 in the Renault Sport Spare Parts Department (ALPINE, Dieppe). The use of the new support (P/N: 77 11 154 882) is compulsory on F4R 738 engines since the season 2005.

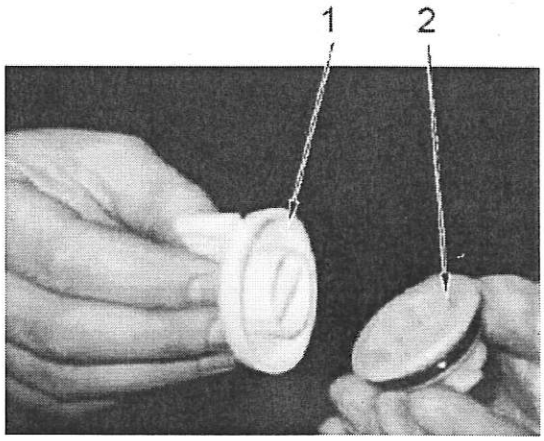
The use of the intake manifold launched in 2004 entails a compulsory modification of the oil filler cap for the Formula Renault 2.0 F4R engines, as described below.

MODIFICATION OF THE CAP

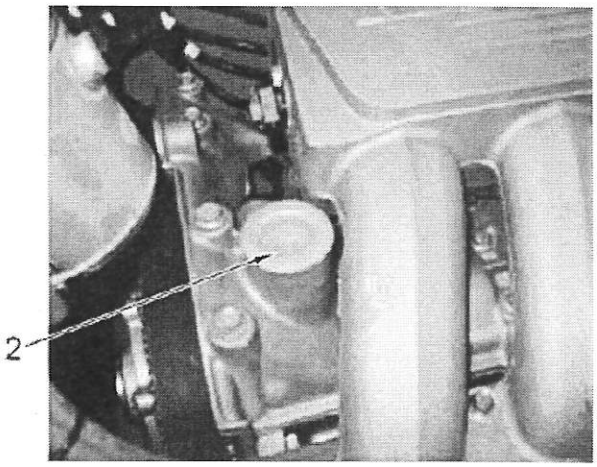
- Remove the cap.



- Separate both parts of the cap.



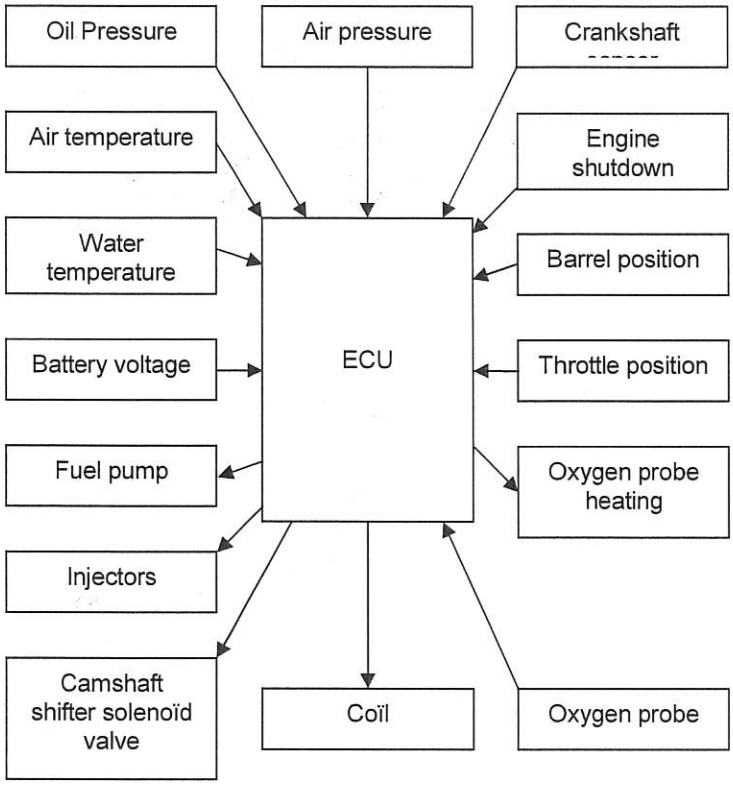
- Install the part that insures the sealing and the fastening of the cap.



MAIN COMPONENT PARTS OF THE FUEL INJECTION SYSTEM

DESIGNATION	MANUFACTER	REFERENCE
ECU	MAGNETI MARELLI	77 11 154 130
Air temperature sensor	MAGNETI MARELLI	77 11 155 393
Water temperature sensor		77 11 155 372
Air pressure sensor	DELCO	77 11 155 392
Oxygen probe	BOSCH	77 11 155 391
Catalyser	ORBISOUD	77 11 154 183
Air filter	JR	01 03 20 007
Ignition coil	SAGEM	77 11 155 389
Ignition plugs	NGK	77 11 155 292
Fuel pump	WALBRO	77 11 154 287
Electromagnetic injectors	MAGNETI PICO	77 11 155 388
Throttle valve	MAGNETI MARELLI	77 11 154 256
Magnetic sensor (Engine TDC and RPM)	SIEMENS	77 11 126 782

INJECTION SYSTEM COMPONENT PARTS



FUEL SYSTEM	INJECTION SYSTEM	POWER
➢ Fuel pump. ➢ Fuel filter. ➢ Fuel pressure regulator.	➢ ECU. ➢ Water temperature sensor. ➢ Air temperature sensor. ➢ Intake air pressure sensor. ➢ Engine speed and TDC sensor. ➢ Camshaft shifter. ➢ Oxygen probe. ➢ Engine shutdown switch. ➢ Barrel position potentiometer. ➢ Throttle valve position potentiometer.	➢ Ignition coïl. ➢ Electromagnetic injectors.

FUEL TANK

IMPORTANT: FIA recommendations reminder: «Rubber bladders must bear a code showing the name of the manufacturer, the specifications under which the tank was made and the date of manufacture. No rubber bladder must be used more than five years after the manufacture date, unless it has been re-certified by the manufacturer for a maximum extension period of two years».

As far as the first Formula Renault 2.0 were built in 1999, it is asked to the competitors to verify the date of fabrication of the fuel tank equipping their car.

For all tanks made more than 5 years ago, we ask the competitors to contact ATL (phone: + (0)3 20 99 75 00).

FUEL PUMP AND FILTER

IMPORTANT: Special tools required: Mot. 1311-01 Fuel pump test case and 2000mL test tube.

Description

Nominal flow rate: 80L/h on no-load

The fuel pump is electric. It is installed in a pumpwell immersed in the fuel tank.

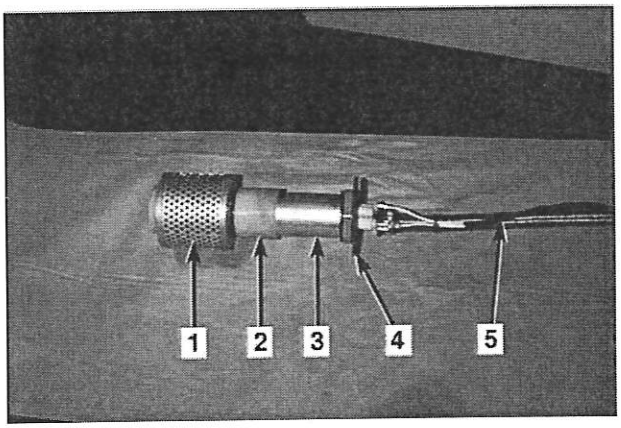
The fuel pump assembly contains the following:

- electric pump (3) which houses the engine fuel supply line (5),
- pump mounting (4),

NOTA: It should be installed at the top end of the pump.

- filter mounting (2),
- fuel filter (1).

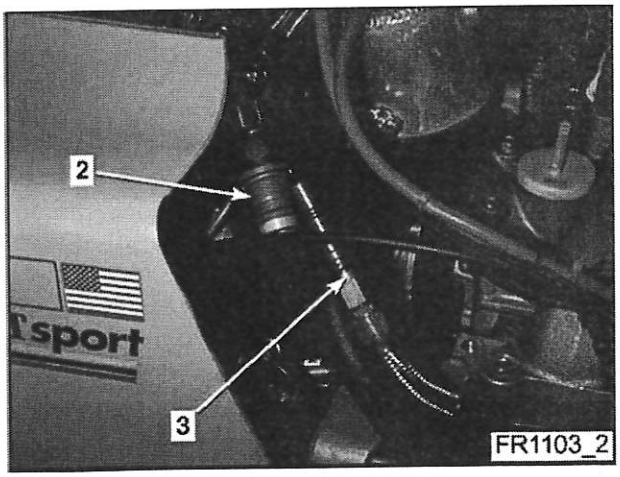
The pump is driven by the computer upon ignition switch on and while the engine is running. If the engine does not start 3 sec after ignition switch-on, the petrol pump stops.



Testing pump flow-rate

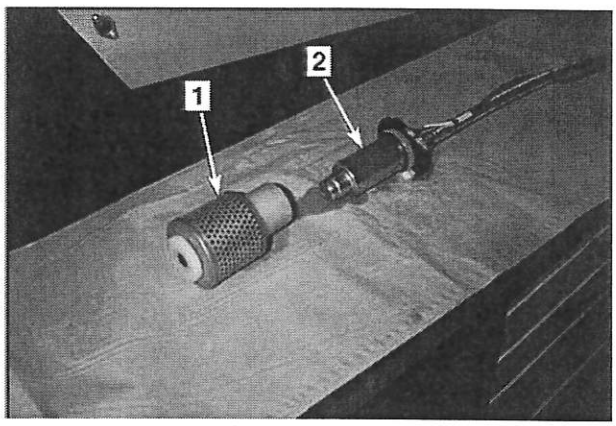
IMPORTANT: Do not smoke and do not place any incandescent object close to the working area.

- Disconnect the coupler (1).
- Connect the test case hose to the link (2) and insert the other end into the test tube.
- Switch on ignition.
- Check flow rate to be at least 60L/h min.
- If the flow rate is low, check pump power supply voltage (flow rate loss of about 10% per voltage drop of 1V).

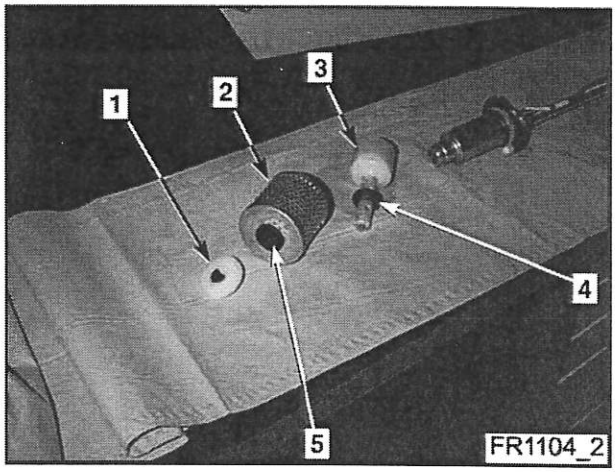


Petrol filter exchange

- Separate the filter/mounting assembly (1) from the pump (2).



- Remove bolt (1) and washer.
- Remove filter (2) from its mounting (3).
- On installation, make sure that the seals and gaskets (4) and (5) are correctly position on the filer (2).



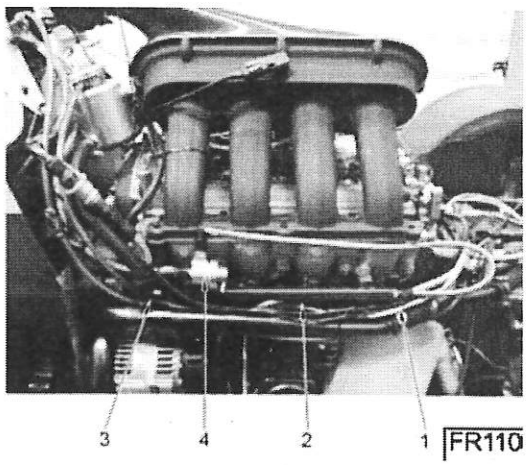
INJECTION MANIFOLD

Description

The injection system is composed of an injection manifold (2) fitted with 4 injectors secured by a clip. Each injector is connected to the ECU by a connector.

The manifold includes:

- a petrol return end-piece (1),
- a petrol inlet end-piece (3),
- a pressure regulator (4) that maintains the fuel pressure at 3.5±0.06bar with a pump capacity of 80±2L/h.

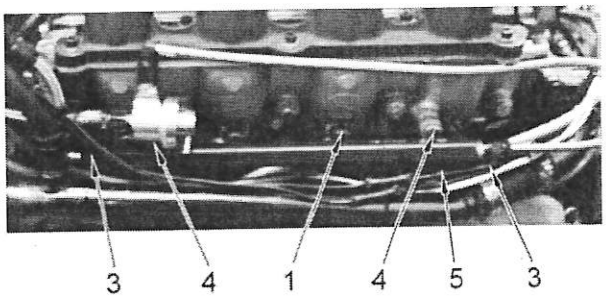


Tightening torque values

Intake manifold screw: 11N.m±2N.m.
Injection manifold screw: 10N.m.

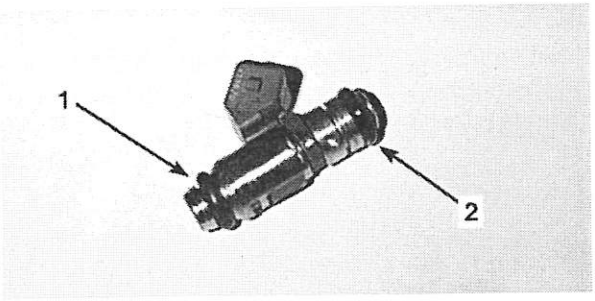
Removal of ramp

- Disconnect:
  - injectors (1),
  - fuel inlet pipe (2) and return pipe (3).
- Remove manifold attaching screws (4).
- Remove manifold (5).



Installation

- Replace injector foot O-rings (2).
- If the injector has been removed, replace injector head seal (1).
- Correctly connect petrol inlet and return unions.
- Proceed to installation steps in the reverse order of removal.
- Comply with tightening torques.



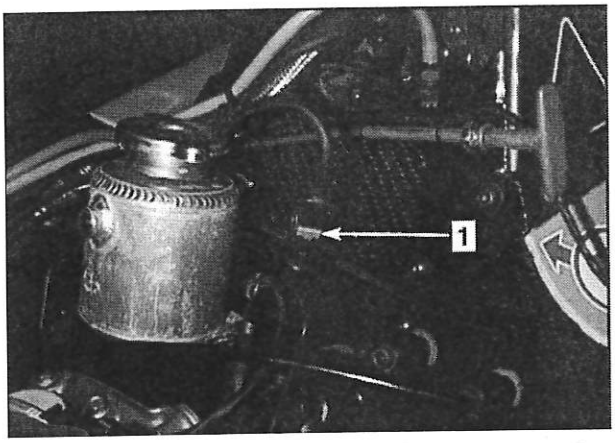
Testing fuel supply pressure

- Connect pressure gauge to coupler.
- Check pressure to be 3.5±0.06bar with a pump capacity of 80±2L/h and engine full loaded.

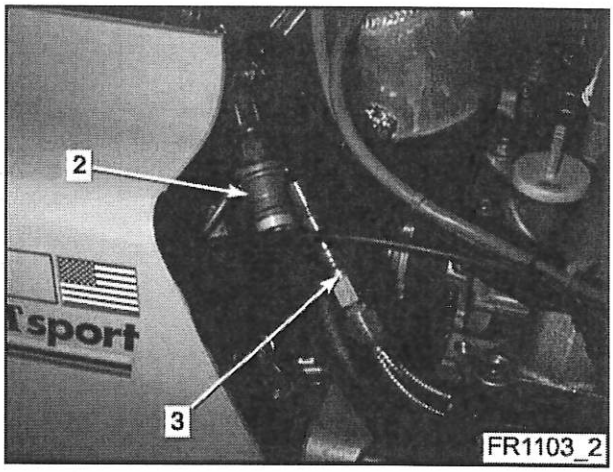
FUEL TANK

Draining the fuel tank

- Disconnect supply connector from pump (1).



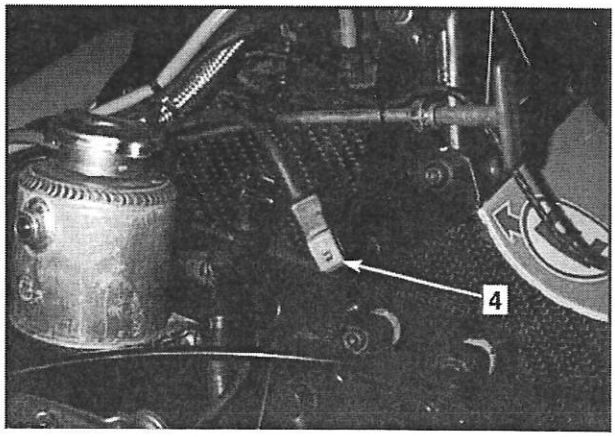
- Disconnect pump coupler (3). Connect drain end-piece onto connector (2).
- Plunge other end of drain end-piece into a recipient of a sufficient capacity.
- Supply power to petrol pump by means of a battery connected to connector (4).



To respect the article 16 of the technical regulations, the fuel system draining procedure described below must be followed.

At the beginning of every meeting:

- Empty the tank and the fuel system.
- Put 2 L fuel delivered on the circuit.
- Run the engine for a couple of minutes.
- Empty the tank and the fuel system.
- Run the free practice session with fuel delivered on the circuit.
- Empty the fuel tank and fuel system.
- Put 2 litres of fuel delivered on the circuit.
- Empty the tank and the fuel system.
- The fuel contained in the tank is now in accordance with the one distributed on the circuit.



MAIN UNITS

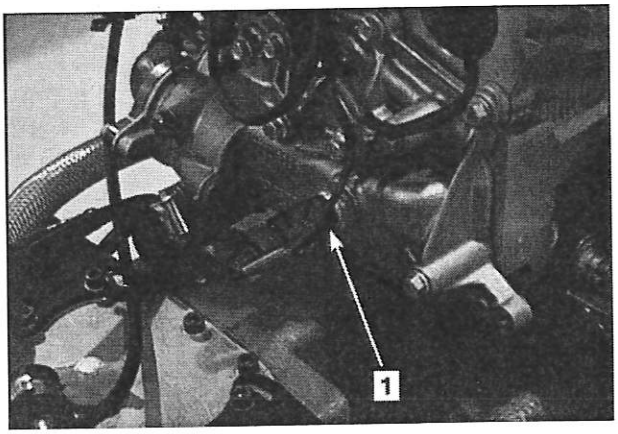
ECU

The Engine Control Unit (1) is mounted on a digital technology PCB mainly driven by a microprocessor.
The injection is the multipoint, half-sequential type.

Water temperature sensor

The water temperature sensor (1) is installed on the water outlet unit.
It is a NTC (negative temperature coefficient) type thermistor that sends to the ECU the electric image of the water temperature.
The ECU uses this information to:
- Manage the injection system.
- Display the temperature on the dashboard.

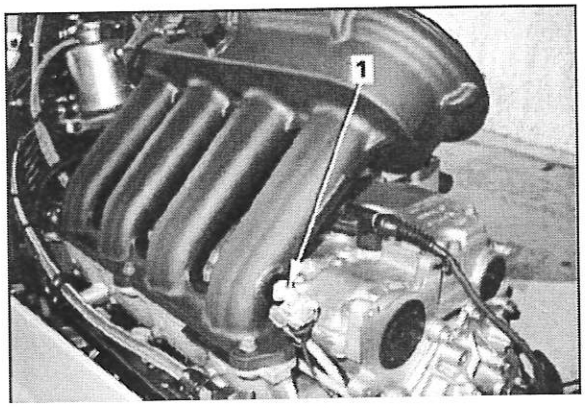
NOTA: *When replacing, make sure the sensor is of the correct type.*



Air temperature sensor

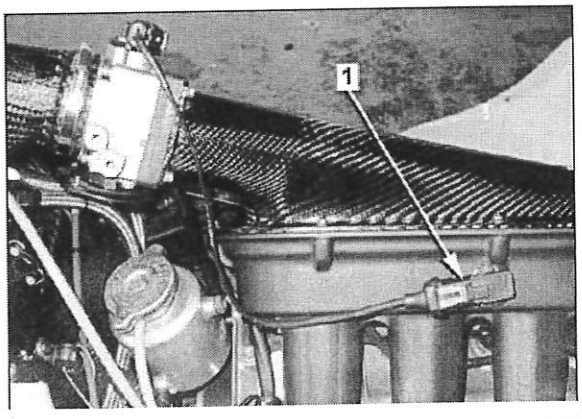
Air temperature sensor (1) is fitted to the intake manifold. It consists of a NTF type (negative temperature factor) thermistor feeding the ECU with the electrical translation of air temperature.
Thus, the ECU receives data on intake air specific gravity. When the air temperature decreases, its specific gravity increases and the ECU increases the petrol quantity injected to restore the expected air/petrol ratio

NOTA: *During a replacement, make sure that the sensor type is compliant. If this is questionable, check temperature reading on the dashboard under cold engine condition.*



Intake air pressure sensor

This sensor (1) is fitted to the intake manifold.
It provides the ECU with intake manifold air pressure electrical translation data.
This signal is one of the primary parameters for computing injection time.

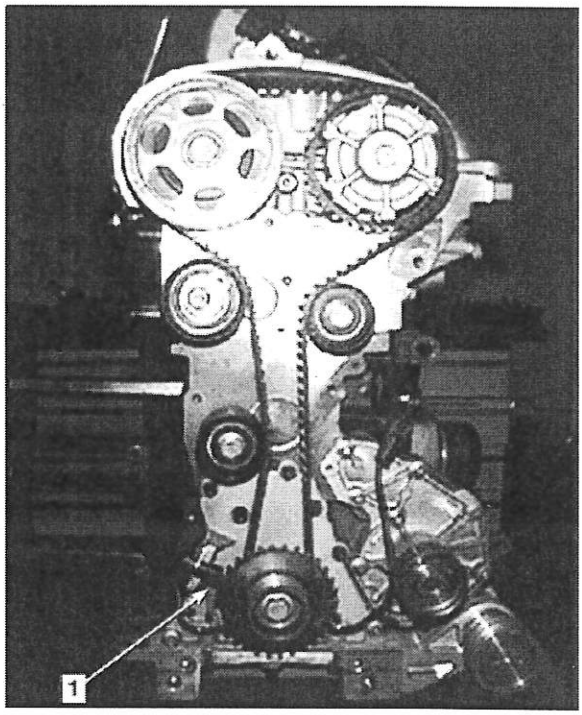


Engine speed and TDC sensor

This sensor (1) is installed in the top section of the target, fastened between the pulley and the crankshaft gear. The target has 28 teeth (-2 teeth).

This toothless gap enables the sensor to provide the ECU with :

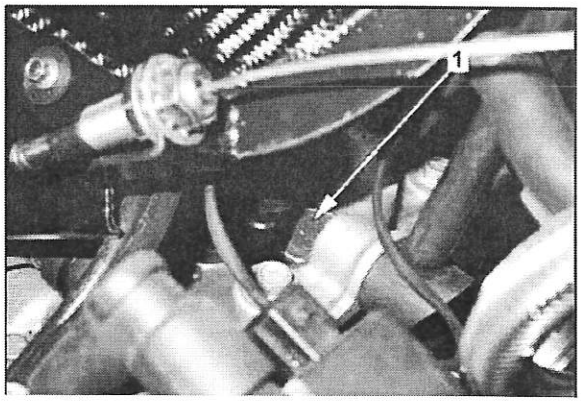
- TDC and BDC position data.
- Engine rotation speed data.



Camshaft shifter solenoid valve

The camshaft shifter is designed for modifying the timing pattern. It is "go/no go" operated by a solenoïd valve (1) fitted to cylinder head cover and driven by the computer.

The solenoïd valve is open when engine rating ranges from 1500 to 6500rpm.

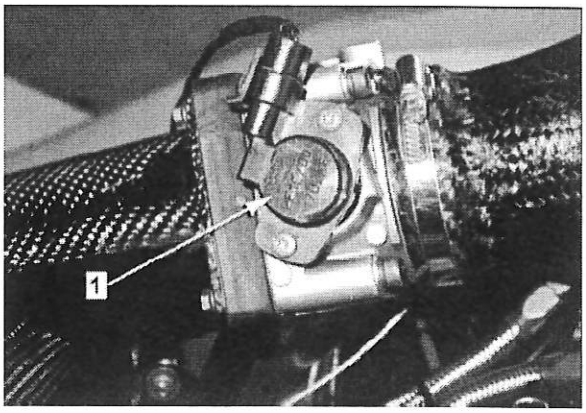


Throttle valve potentiometer

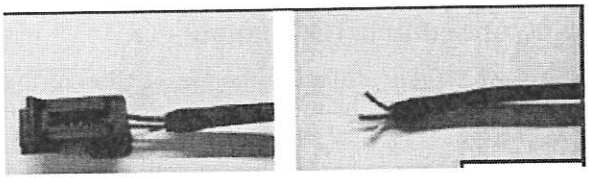
This potentiometer (1) provides to the ECU with an accurate item of information on throttle valve position throughout its operating range.

Valve: Ø 60mm.

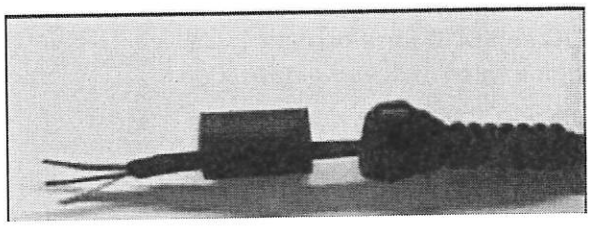
For cars older than 2004, the modification of the intake manifold requires the use of a loom extension (P/N: 77 11 154 855, available from the Renault Sport Spare Parts department) and the modification of the original plug. This has to be made the following way:



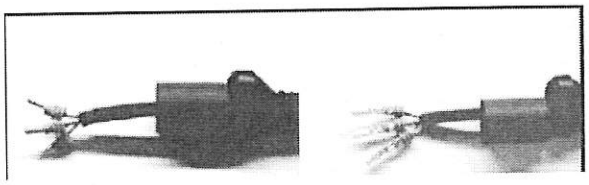
- Cut the original connector.



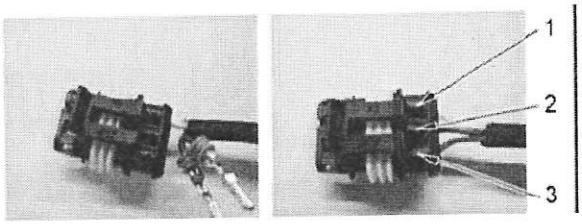
- Insert the thermo-retractable rubber sleeve.



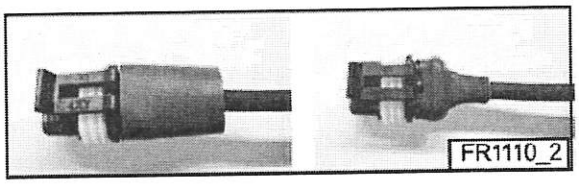
- Insert the grommets in any cable and crimp the pin on the grommets.



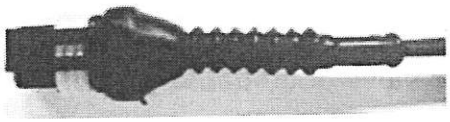
- Insert the pins in the connector.



- Fit the thermo-retractable sleeve on place and heat till the all shrink tightly.



- Re-position the rubber cover.



- Connect the loom extension (P/N: 77 11 154 855) to the new plug on one side, and to the throttle potentiometer on the other side.

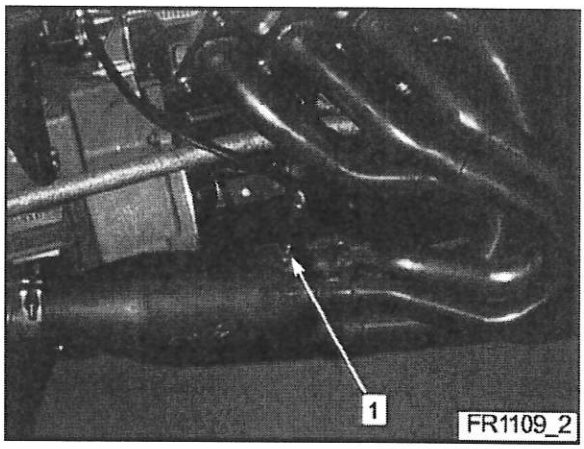
Oxygen probe

Oxygen probe (1) determines the oxygen ratio contained in exhaust gases the value of which varies as a function of mixture richness. A probe specific feature is that any carburetted mixture composition variation causes the output voltage to vary accordingly.

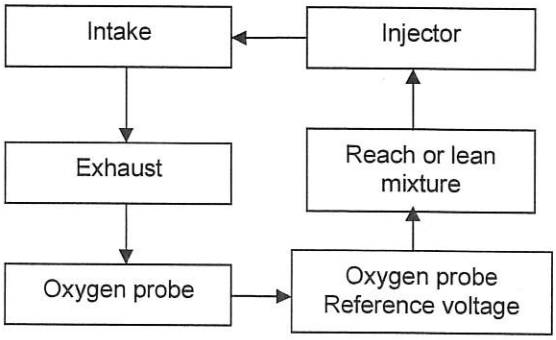
The ECU corrects the air/petrol mixing ratio so that the carburetted mixture be always as close as possible to the stoïchiometric ratio (Lambda = 1), which jointly makes it possible to use catalyst to thoroughly decontaminate exhaust gases.

Richness control is active when water temperature is greater than 75°C.

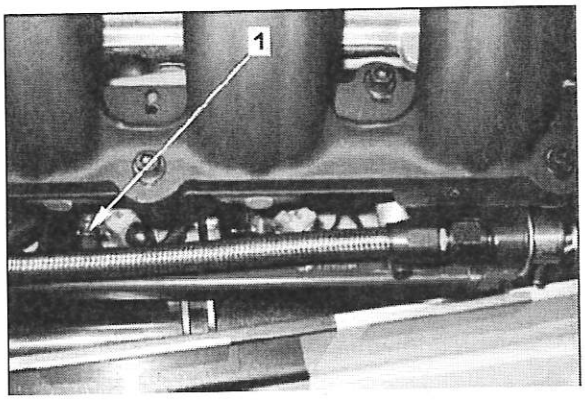
The oxygen probe is fitted with a heating resistor which makes it possible to prime the probe more quickly when starting up the engine



Regulation principle using an oxygen probe



POWER



Electromagnetic injectors

An electromagnetic injector is mainly composed of an injector body and a needle carrying a magnetic core. This assembly is spring-loaded to the tight injector body seat.

The injector body includes:

- At the rear, a ECU-driven magnetic winding.
- At the front, an injector needle guide.

When the magnetic winding is energised, the magnetic core is attracted and the needle moves off the seat, allowing the pressurised fuel to flow through. When the magnetic winding is de-energised, the spring pushes back the needle to its seat and the circuit is closed.

Each cylinder features an injector (1) mounted in the intake pipe which sprays petrol upstream of the intake valve.

Injection is said to be the half-sequential, phase-controlled type except during start-up where a special procedure is used in order to produce the best start-up possible.

Start

During cold starts, a small proportion of the injected fuel is sprayed and plays a part in combustion. This critical air/fuel metering step is called "side-wall wetting". When the computer detects a starting phase by measuring engine rating, it will carry out asynchronous injections the duration of which will be dependent on water temperature (the four injectors are simultaneously operated for each target tooth). When the engine exceeds 300rpm, the computer considers that it is normally running and selects the normal procedure by returning to a synchronous operating mode (half-sequential injection).

Start-up is facilitated if the circuit-breaker is used to switch on the system. In such a case, the computer carries out a "cold start" by operating the petrol pump then, upon starter motor signal, triggers sidewall wetting injections.

Using the "IGNITION" push-button in ignition function holds the computer power on. The computer then carries out a "hot start". This procedure, which makes it possible to avoid flooding the engine, is to be used during mechanical repairs or multiple starts close together.

Deceleration cut-off

The injection is cut off during deceleration phases. When the throttle valve is fully closed for an engine rating greater than 4000rpm, the injectors are no longer controlled. Injection is restored in either of the following two cases:

- Throttle valve opening upper than 3%.
- Engine rating lower than 4000rpm.

Battery voltage correction

The battery delivers a 12V rated voltage. According to operating conditions, this voltage may vary from 8 to 16V and affect injector mechanical opening time. This so-called "dead time" increases when the battery voltage decreases. In order to compensate for the opening time, the injection time actually applied to the injectors is corrected as a function of battery voltage.

Down-graded mode of operation

This function allows the injection computer to carry out a self-diagnostic based on input parameters, to alert the driver about an abnormal measurement through a dashboard-warning device and to store intermittent failures for further look-up using a display tool. The alarm will remain activated on the dashboard as long as the fault is present. The stored alarms are maintained if the engine is shut down using the "IGNITION" push-button. They will be lost if the system is cut off using the main circuit breaker or if the battery or the computer is disconnected. If it remains powered, the latter holds a diagnostic code in storage, to be further used for trouble-shooting.

Should there be an abnormal parameter, the computer runs in the downgraded mode applying a default value for the defective input. These default values are:

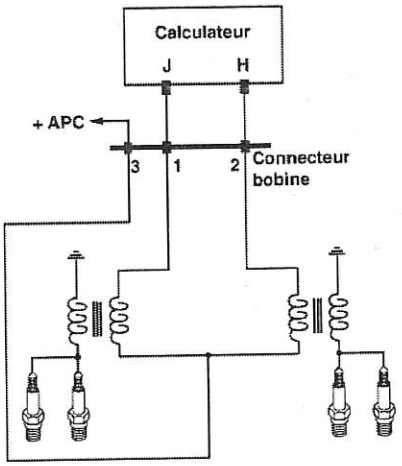
- Air temperature: 28°C.
- Water temperature: 80°C.
- Throttle valve potentiometer: 98%.
- Intake pressure: reconstituted from a throttle valve rating indexed mapping.

GENERAL

The static ignition system has been designed for increasing the power quantity applied to ignition plugs by suppressing any intermediate device between plugs and coils.

The system includes:

- a computer including the ignition power stage,
- a module composed of two dual output coils,
- 4 ignition plugs.



ECU

Depending on the data received from the various sensors, but mainly as a function of engine rating and load, the ECU (1) determines:

- the number of lead angle degrees to apply and consequently the ignition point,
- the cylinders at TDC and consequently the coil to be controlled.

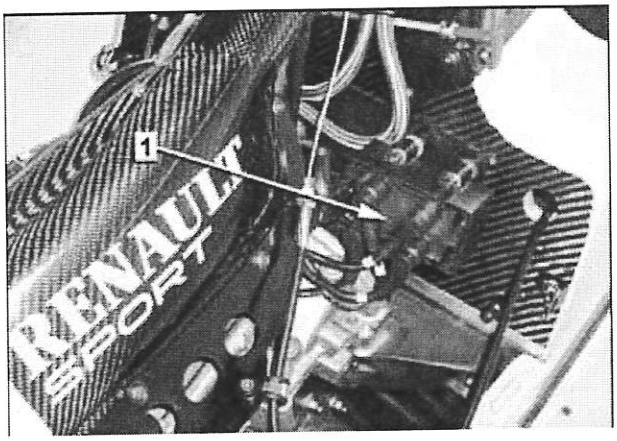
It triggers the spark to the 2 cylinders at TDC by cutting off the relevant coil earth path.

COIL

Fitted to the intake manifold, both ignition coils (1) make up a single module. They cannot be separated.

Individually controlled by the computer, each coil simultaneously delivers two sparks.

- The coil of cylinders 1 and 4 is controlled from ECU channel J.
- The coil of cylinders 2 and 3 is controlled from ECU channel H.



IGNITION PLUGS

Tightening torque values

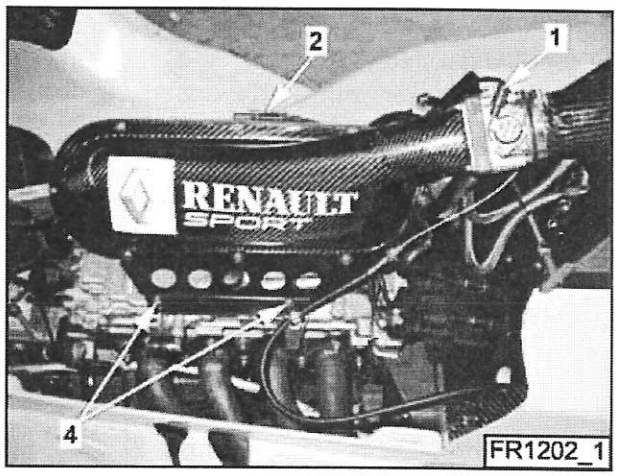
Ignition plugs : 25 to 30N.m
Intake manifold screw: 11N.m±2N.m

Characteristics

For the engine to operate smoothly, it is compulsory to use the type of ignition plug prescribed.
Flat socket with Resistive type seal
Manufacturer: NGK
Type : PFR6E-10
P/N : 77 11 155 292

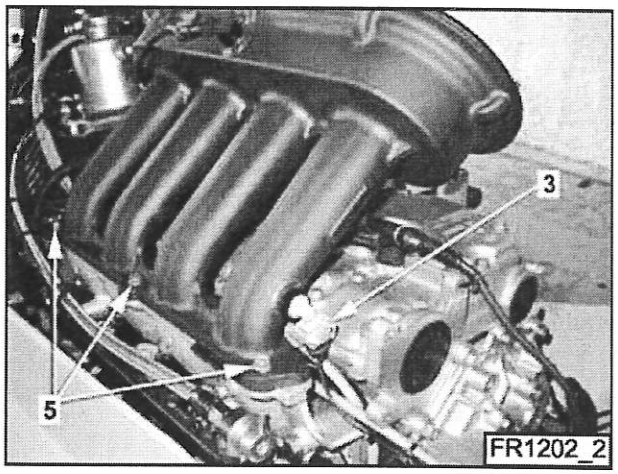
Removal

- Disconnect:
  - the throttle valve potentiometer (1),
  - the intake air pressure sensor (2),
  - the intake air temperature sensor (3),
- Remove:
  - fastening screws of the support (4),
  - fastening screws of the intake manifold (5),
- Release the admission unit on the exhaust side.
- Disconnect and remove ignition plugs

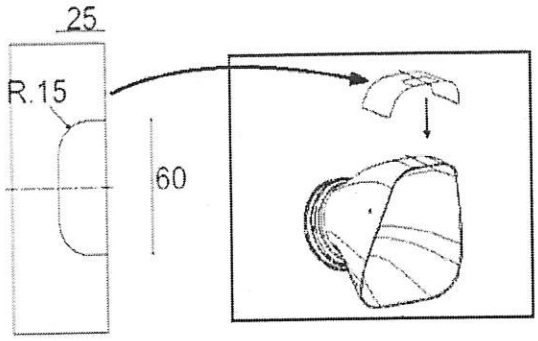


Installation

- Proceed in the reverse order of removal.
- Install the intake manifold fitted with new seals.
- Tighten the screws to the prescribed torque starting from the two upper screws.



AIR INLET

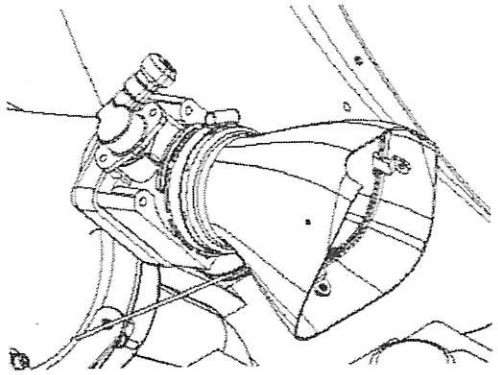


To make easier the installation of the belts of extraction, the air inlet must be modified, as presented below.

The teams will make this modification. Therefore, we ask them to respect scrupulously the various orders below.

IMPORTANT: The part to be modified being in carbone/epoxy, we ask to the teams to make these modifications in a well-ventilated area, and with appropriate tools: blade in carbidetungsten, high speed of rotation.

- Draw on a piece of adhesive tape the profile presented below by respecting scrupulously coasts; then put the adhesive tape on the air inlet, by centring it suitably.
- Cut then the bailer with an appropriate tool, by following the strip (profile) drawn on the end of adhesive tape.
- Result:

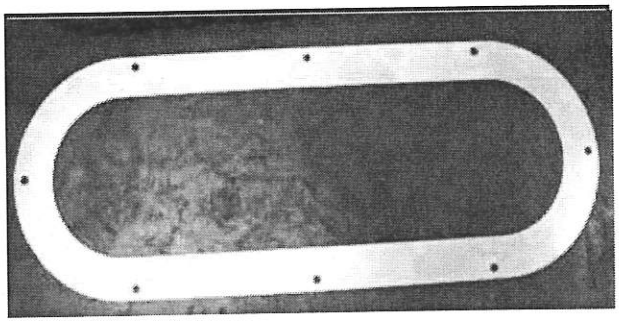


AIRBOX

In order to increase the tightness between the air filter and the air box, we ask all competitors to modify the Formula Renault 2.0 air box as explained hereafter.

Required stuff:

- The «tightness air box plate», P/N: 77 11 154 340, has to be used. From now, it is available at the Renault Sport Spare Parts department in Dieppe
- The use of universal joint « Kent Sili Gasket 2 » or similar is compulsory.



Assembly procedure

- Dismantle the air box and the air filter from the intake manifold.
- Degrease and defrost the air box tightness plane.
- Apply a silicone strip on the air box tightness plane.
- Mount the tightness plate on the air box.
- Fix the air box + plate block on the intake manifold, without the air filter, and tighten the 8 assembling nuts.
- Let the joint dry 8 hours minimum.
- Dismantle the intake system and cut the joint in excess.
- Assemble the intake elements with the air filter.