RENAULT

Technical Note 3175A

Fault finding
Cooling circuit

Vehicles concerned: see list on the following page

Subsections concerned: 19A

Fault finding procedures for various faults affecting the cooling system and water pumps

77 11 293 182 **Edition 3 - OCTOBER 2005** **EDITION ANGLAISE**

"The repair procedures given by the Manufacturer in this document are based on the technical specifications current when it was prepared.

The procedures may be modified as a result of changes introduced by the manufacturer in the production of the various component units and accessories from which his vehicles are constructed."

Vehicle	Type
Twingo	X06X
Renault 4	
Renault 5	X40X
Express	F40X
Kangoo	XCXX
Kangoo phase II	XCXX
Clio I	X57X
Clio II	XBXX
Clio II phase II	XBXX
Clio V6	CB1A
Clio V6 phase II	CB1A
Clio Internationale	XB1R
Clio III	XRXX
Renault 19	X53X
Renault 21	X48X
Modus	XPXX
Logan	LS0X
Mégane	XAXX
Mégane II	XMXX
Scénic	JAXX
Scénic II	JM0X
Laguna	X56X
Laguna II	XGXX
Laguna II phase II	XGXX
Renault 25	X29X
Safrane	X54X
Vel Satis	XJXX
Vel Satis phase II	XJXX
Avantime	DE0X
Espace	J11X
Espace II	J63X
Espace III	JE0X
Espace IV	JK0X
Espace IV phase II	JK0X
Trafic	T/PVXX
Trafic II	XL0X
Master propulsion	XHXX
Master propulsion phase II	XHXX
Master	FB/FC
Master	Q/Rxxx
Master II	XDXX
Master II phase II	XDXX
Spider	EF0H
AIpine	D50X

Contents

All combustion engines in operation produce energy which is divided up as follows:
– part of this energy is mechanical and drives the engine,
– part is heat energy in the form of exhaust gas which is removed in the form of heated coolant which is partly used to heat the passenger compartment. But the heat from the coolant must be removed to maintain the correct operating temperature of the engine.

This is achieved by using a liquid cooling system.

Coolant circulates in (or around) the components to be cooled. This liquid, which has been heated following contact with the hot engine components, is transferred quickly by a pump into a radiator where it cools down and returns to the engine.

The cooling circuit, which must be completely sealed for it to operate properly, is principally composed of:
– an engine block and cylinder head,
– a radiator and engine cooling fan,
– temperature sensors (thermostat, temperature switch),
– a coolant pump,
– an expansion bottle,
– hoses,
– a bleed screw (if fitted to the vehicle),
– a heater matrix,
– coolant,
– and various other components depending on the vehicle model.

A centralised coolant temperature management system has been developed following the development of engine computers. This system uses information provided by a single temperature sensor located on the engine block. This sensor operates the fan unit either at high or low speed via an injection computer. It also operates the coolant temperature warning light located on the instrument panel. When dealing with a vehicle displaying a fault, it is advisable to establish whether the vehicle is fitted with this system or not. This is established by checking whether the temperature switch is at the bottom of the radiator. If a temperature switch is found, there is no centralised coolant temperature management system.

The cooling circuit is fitted with a valve which protects the system from overpressure. The colour of this valve indicates its rating (in bars):

Note:
Reminder of the ratings for the expansion bottle valve:

Expansion bottle valve with:

– a brown spot	1.2 bars
– a blue spot	1.4 bars
– a yellow hand	1.4 bars
– a white hand	1.6 bars
– a grey hand	1.8 bars

Operating diagram: See MR for the vehicle concerned.

Water pump - Description

The water pump's function is to create sufficient flow to dissipate some of the heat generated by combustion, exhaust gases and friction.
Its operating principle involves the conversion of mechanical energy generated by the engine into hydraulic energy to circulate the coolant.
The pump operates as a generator. The flow rate depends on the pressure differential created by the pump and the ease with which water can pass through the cooling system.

General description of a water pump

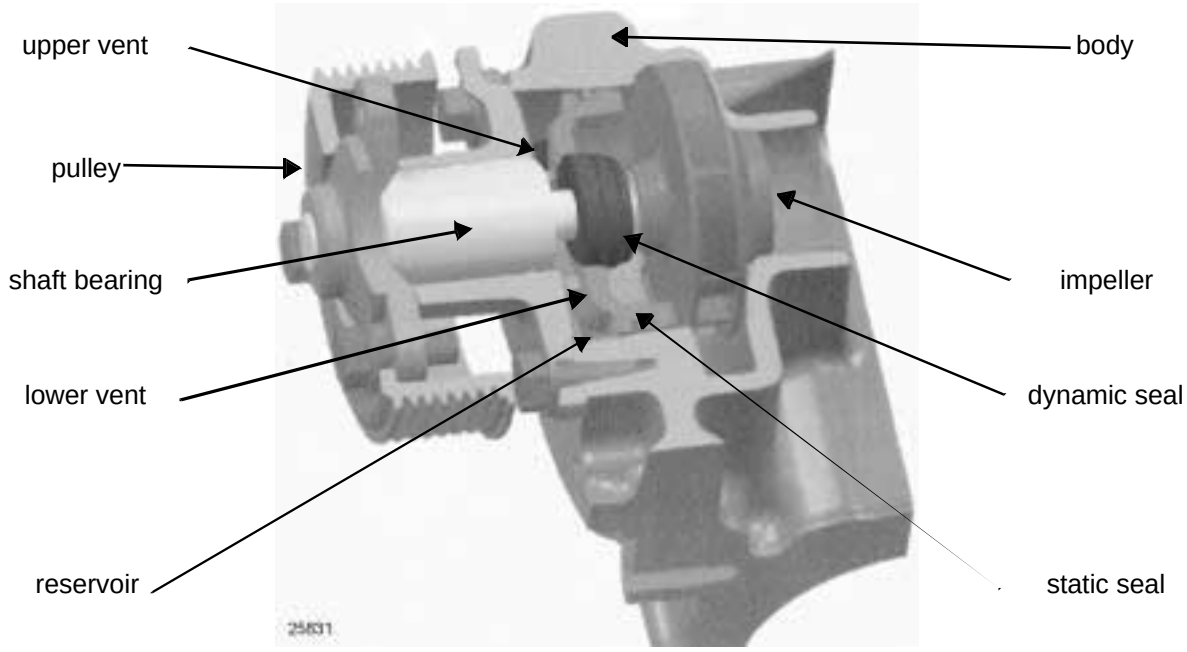
The operating principle of a centrifugal pump consists of converting mechanical energy into hydraulic energy.

The conversion takes place in two stages:
- the first consists of the conversion of mechanical energy into kinetic energy by the vanes of the impeller;
- the second step is the conversion of the kinetic energy into pressure energy by the spiral form of the pump body (shell + impeller).

The mechanical energy required to rotate the impeller is provided by the pulley via the bearing spindle. By reaction, the vanes of the impeller transfer a certain amount of motion to the fluid. The fluid is then thrown out by the impeller and collected by an arrangement called a volute. The junction between the volute and the cylinder block water inlet also affects the pump performance.

The role of the dynamic seal is to provide a seal between the ambient air under the bonnet and the cooling system during engine operation or when the engine is stopped.

To avoid damage in operation, there is a film of coolant between sealing ring and counterface. The purpose of this film is to provide lubrication and cooling of these two components. However, a very small amount of liquid can work its way to the outside of the pump. This liquid is discharged via the lower vent hole and is known as a "cosmetic leak". This leakage is normal and necessary for correct operation of the dynamic seal.


upper vent
body
pulley
shaft bearing
impeller
lower vent
dynamic seal
reservoir
static seal
25631

IMPORTANT
– Be aware of high temperatures when dealing with circuits that have been designed to be under pressure (risk of severe burns).
– Never remove the expansion bottle valve when the engine is hot.
– When working under the bonnet, be aware that the radiator ventilation fan(s) may operate unexpectedly.
– Do not undo the bleed screw(s) with the engine running.

Preliminary test:

When a vehicle displaying a fault arrives, before carrying out fault finding, check:

– the coolant fluid level in the tank (marked by a line) and colour,

– the condition and tension of the coolant pump drive belt,

– that the engine cooling fan, radiator and radiator grille are not blocked by any object that could disrupt air movement,

– that there is no signs of coolant leakage in the engine compartment.

Special tooling required	
Mot. 1700	Cooling circuit diagnostic and filling tool

Equipment required
Cylinder head testing tool

- **TRACES OF LIQUID**
  - ON THE GROUND — ALP 1
  - IN THE ENGINE COMPARTMENT — ALP 1
  - IN THE PASSENGER COMPARTMENT — ALP 2
- **SMOKE EMISSION**
  - FROM THE EXHAUST (WHITE SMOKE FROM WARM ENGINE) — ALP 3
  - IN THE ENGINE COMPARTMENT — ALP 1
  - IN THE PASSENGER COMPARTMENT — ALP 2
- **TEMPERATURE OR WARNING INDICATOR**
  - TEMPERATURE WARNING LIGHT:
    - WARNING LIGHT LIT WHEN DRIVING — ALP 4
    - THE WARNING LIGHT LIGHTS UP INTERMITTENTLY WHEN THE VEHICLE IS IN MOTION — ALP 5
  - WATER TEMPERATURE NEEDLE:
    - THE NEEDLE MOVES UP INTO THE RED AREA WHEN DRIVING — ALP 4
    - THE NEEDLE INDICATES OVERHEATING JUST AFTER STARTING OFF — ALP 5
    - THE NEEDLE POSITION FLUCTUATES WHEN DRIVING — ALP 5

OTHERS:

THERE IS A BUBBLING NOISE UNDER THE DASHBOARD	ALP 6
FLUID LEVEL IN THE TANK DECREASES	ALP 1
LIQUID IN THE TANK HAS CHANGED COLOUR	Technical Note 2675 A
THERE IS NO HEATING IN THE VEHICLE	ALP 7
HEAVY CONDENSATION ON THE WINDSCREEN (INTERIOR)	ALP 2
WATER PUMP CHECK	ALP 8

ALP 1	**– Traces of liquid on the ground** **– Traces of liquid in the engine compartment** **– Smoke emission in the engine compartment** **– Fluid level in the tank decreases**

NOTES	– Check that it is definitely coolant. – Ask the customer if they have topped up the coolant fluid level before contacting the RENAULT network.

Cold engine.
Check the coolant fluid level in the tank.

Are there any signs of fluid leaks?

yes

Locate the leak. Repair the leak or replace the defective part.

no

Leak-test the reservoir and its cap using tool Mot. 1700.

yes

Pressurise the system to its rated pressure with tool Mot. 1700.

Does the pressure drop?

yes

Are there any signs of fluid leaks?

yes

Locate the leak. Repair the leak or replace the defective part.

no

no

Smoke is most likely to be caused by the release of coolant. This can be the result of:
– a blocked fan unit:
  ● run the fan unit command on vehicles fitted with centralised coolant temperature management,
  ● if the vehicle is not fitted with centralised coolant temperature management, short circuit the temperature switch to force the fan unit to start.
  If the fan unit does not start, replace the fan unit motor.
– faulty temperature control. Apply the T2 test procedure.
– a faulty coolant pump. Check that it is operating correctly (ALP 8).

ALP 2	**– Traces of liquid in the passenger compartment** **– Smoke emission in the passenger compartment** **– Heavy condensation on the windscreen (interior)**

NOTES	– Check that it is definitely coolant. – Ask the customer if they have topped up the coolant fluid level before contacting the RENAULT network.

Check the coolant fluid level in the tank.
Check that the heating in the passenger compartment is not switched on. Run a warm engine at idle speed for **1 minute**.
Turn the heating on in the passenger compartment.

Is there an odour in the passenger compartment?

yes → Replace the heater matrix because it is leaking.

no → Check that the cooling system is not leaking in the engine compartment using tool Mot. 1700.

Are there any signs of fluid leaking in the engine compartment?

yes → Locate the leak.
Repair the leak or replace the defective part.

no → Replace the heater matrix.

ALP 3	– Smoke emission from the exhaust (white smoke, warm engine)

NOTES	Ask the customer if they have topped up the coolant fluid level before contacting the RENAULT network.

Cold engine.
Check the coolant fluid level in the tank.
Pressurise the system to its rated pressure with tool Mot. 1700.

Does the pressure drop?

yes

The cooling circuit is not sealed. Look for a leak in the passenger compartment (ALP 2), or a leak in the engine compartment (ALP 1) or an internal engine leak (T1 test).

no

Start the engine.
Depress the accelerator pedal quickly a few times until the fan unit has started.
The warning light must remain off.

Does the fan unit start and the warning light remain off?

yes

Remove the cylinder head
Check the level of the cylinder head. Test the cylinder head.

Is the cylinder head sealed?

no

Replace the cylinder head.

yes

The smoke fault may be the result of an internal engine leak.

no

There is a temperature control fault.
Apply the T2 test procedure.

ALP 4	**– The warning light remains lit when driving** **– The needle moves up into the red area when driving**

NOTES	Ask the customer about the conditions when the fault appears.

Start the engine when it is cold.
Maintain an idling speed.

What is the temperature of the heater and radiator hoses?

Cold heater matrix input hose,
Cold radiator input hose.

Check the circuit coolant level.
There is no engine coolant circulation.
Check that the coolant pump is operating correctly (ALP 8) and check the belt drive.

Hot heater matrix input hose,
Cold radiator input hose.

The temperature of the heater input hose and radiator input hose must increase. If this does not occur, check that the coolant pump and thermostat are operating correctly (ALP 8) and check the coolant fluid level in the reservoir.

Is the temperature warning light on?

yes

Apply the T2 test procedure.
If the test is not successful, the fault is not due to the actual cooling circuit itself:
– perform fault finding on the centralised coolant temperature management (depending on version),
– check the warning light wiring.

no

Accelerate to start the fan unit.

Has the fan unit started?

yes

Does the warning light come on?

no

Depress the accelerator pedal quickly a few times and check that the warning light does not light up.

yes

B

no

A

ALP 4 CONTINUED	

A

- For vehicles not fitted with centralised coolant temperature management:
  – Disconnect the temperature switch and short circuit it to activate the two fan unit speeds (high and low).
- For vehicles fitted with centralised coolant temperature management:
  – Run the command mode of the two speeds (high and low) of the fan unit using the diagnostic tool.

In both cases, the two speeds of the fan unit must be activated.
If this is does not occur:
– check the fan unit wiring if one of the two speeds is not obtained,
– replace the fan unit if it does not operate correctly.

the fan unit operates normally.

- For vehicles not fitted with centralised coolant temperature management:
  – replace the temperature switch.
- For vehicles fitted with centralised coolant temperature management:
  – check the temperature sensor,
  – perform fault finding on the injection computer.

B

- For vehicles not fitted with centralised coolant temperature management:
  – Disconnect the temperature switch and short circuit it to trigger fan unit high-speed operation.
- For vehicles fitted with centralised coolant temperature management:
  – Activate the high-speed command mode using a diagnostic tool.

In both cases, the fan unit high-speed operation must be activated.
If this does not occur, check that the radiator, engine cooling fan and radiator grille are not blocked by an object which could disrupt air movement. Check the fan unit wiring.
If the wiring is correct, carry out a temperature control test.

If the test is successful, the coolant temperature warning light fault is not due to the cooling system.
– Check the instrument panel wiring.
– Perform a centralised coolant temperature management test.

ALP 5	**– The warning light lights up intermittently when the vehicle is in motion** **– The needle indicates overheating just after starting** **– The needle position fluctuates when driving**

Carry out a preliminary check on the cooling system using tool Mot. 1700.

Is the cooling circuit functioning?

yes

The fault is not due to the cooling circuit.
Check by:
– running the coolant temperature warning light command (depending on version),
– carrying out fault finding on the instrument panel.

no

Replace the parts necessary for the circuit to function properly.

If the source of the fault is the water pump, follow the procedure on ALP 8.

ALP 6	There is a bubbling noise under the dashboard.

NOTES	Ask the customer if they have topped up the coolant fluid level before contacting the RENAULT network.

Cold engine.
Check the coolant fluid level.

Is the coolant fluid at maximum level?

no → Add some coolant and bleed the circuit using Mot. 1700.

yes → Bleed the coolant circuit using Mot. 1700.

Start the engine and depress the accelerator pedal quickly a few times.

Is there still a bubbling noise?

yes

What has happened to the coolant fluid level?

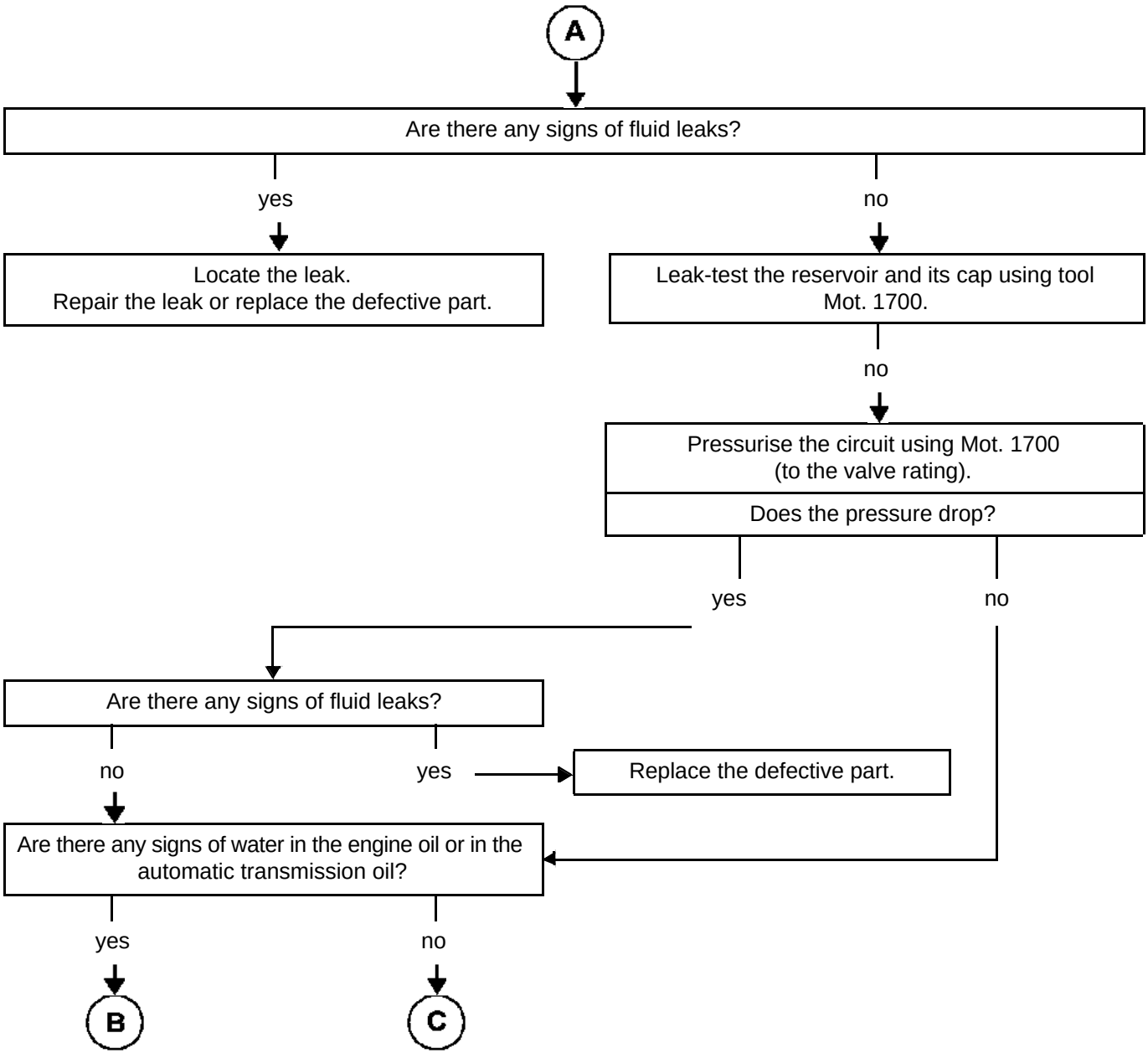
It has risen

It has not moved → C

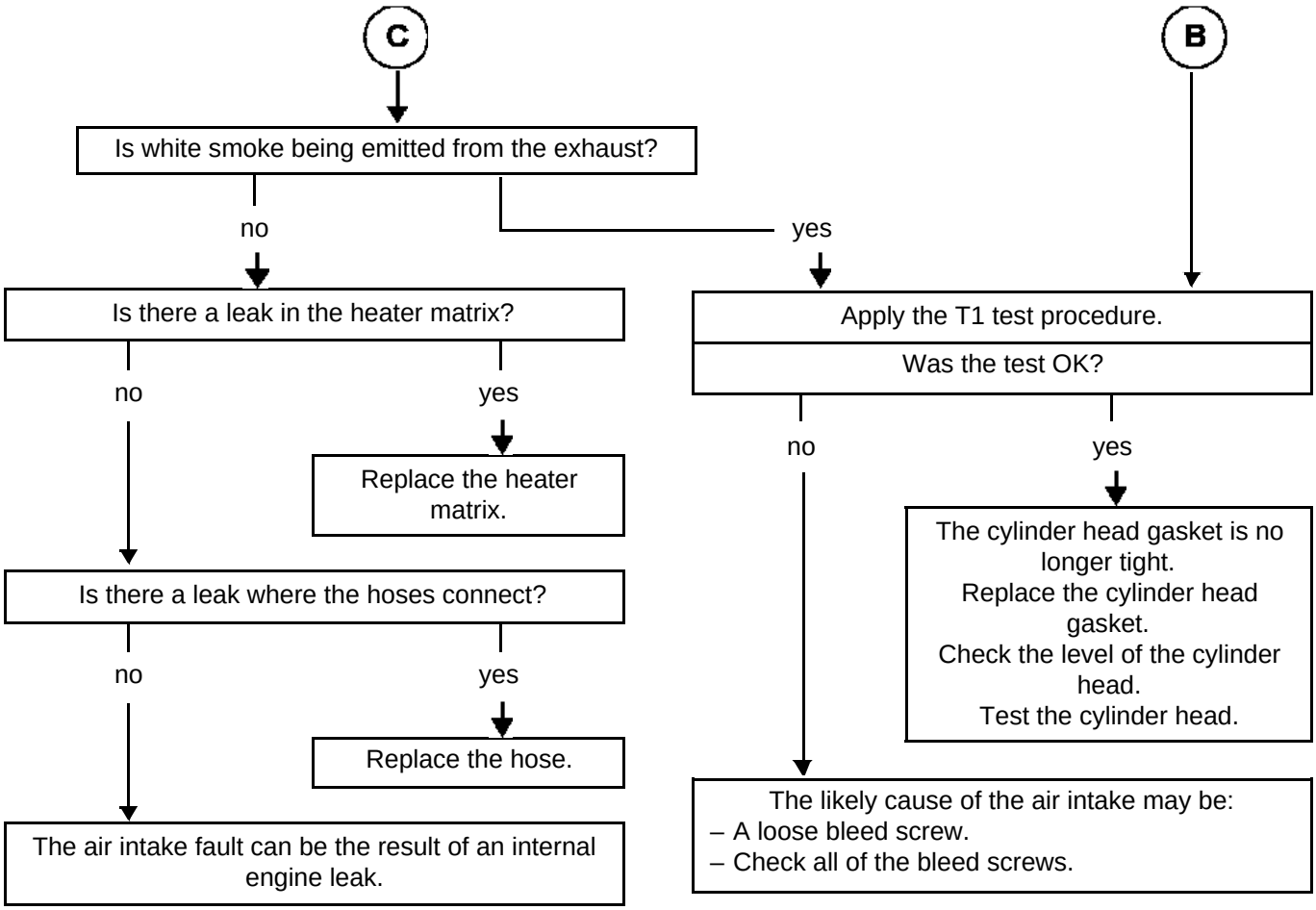
It has dropped → A

For vehicles fitted with a hot tank, fit a **Ø 3** nozzle in the radiator tank output hose towards the expansion bottle (secure it near the output unit with a clip). If the fault is still present or for vehicles fitted with a cold tank, check the thermostat and replace the parts necessary for it to operate properly.

ALP 6 CONTINUED 1	



ALP 6
CONTINUED 2



ALP 7	There is no heating in the vehicle

NOTES	Ask the customer if they have topped up the coolant fluid level before contacting the RENAULT network. Check the operation of the fan unit heating and air flow circuit.

Check the coolant fluid level in the tank.
Start the engine.

Is the coolant pump driven correctly by the engine?

yes

Cold engine. Maintain an idling speed.

The heater matrix input hose must be hot and the radiator input hose must be cold. Is this correct?

yes

Clean the cooling circuit and replace the coolant using Mot. 1700.

no

The two hoses are hot: replace the thermostat.
The two hoses are cold: replace the coolant pump.

no

Check the condition of the belt and replace it if necessary.
Check that the belt has the correct tension.

ALP 8	Water pump check

NOTES	● Never start the engine without the timing cover. ● Always disconnect tool Mot. 1700 before removing any cooling system component.

● When the engine is cold, top up the coolant in the expansion bottle to the maximum level.
● Carry out fault finding on the cooling system using tool Mot. 1700 (see Technical Note 3857A, page 19A-5).

Wait 3 minutes. Does the pressure in the cooling system drop?

no → A

yes → Carry out a visual inspection of the cylinder block below the water pump.

Are there signs of leakage, drips, seepage or beads of moisture?

no → The fault is not caused by the water pump. Locate the leak (ALP 1). Repair the leak or replace the defective part.

yes → If the water pump is driven by the timing belt, remove the timing cover.

Is the leak coming from the seal between the water pump and the cylinder block?

no → The leak is coming from the water pump. Change the water pump.

yes → Change the seal and repeat the test from the beginning.

ALP 8

CONTINUED

A

- Disconnect tool Mot. 1700 and refit the cap on the expansion bottle.
- Start the engine and hold the engine speed at 2500 rpm.
- Accelerate several times with no load, every 2 or 3 minutes, until the fan switches on.
- Switch off the ignition.
  - If the water pump is driven by the timing belt, wait 15 minutes before removing the timing cover.
- Carry out a visual inspection of the water pump.

Is there leakage from the water pump, drips, seepage or beads of moisture?

no

It is normal to find a build-up of crystalline material at the dynamic seal of the water pump.

Is there an abnormal amount* of play in the water pump pulley when you try to move it?

no

The fault is not caused by the water pump. Locate the leak (ALP 1). Repair the leak or replace the defective part.

yes

Change the water pump.

yes

Change the water pump.

** The repairer will be allowed to make his own judgement on this point*

TEST 1	Test to detect CO_2 in the cooling circuit

NOTES	Engine stopped for at least 5 hours.

Examine the radiator input hose.

Is the hose hard?

yes

This is an indication that CO_2 may be present. Replace the hose.

no

Take a sample of coolant and test it with a CO_2 liquid reagent.

Does the reagent change colour?

no

The test for the presence of CO_2 is negative. There is no internal engine leak.

yes

The test for the presence of CO_2 is positive. Exhaust gas is leaking into the cooling circuit.

TEST 2	Temperature control test

Cold engine. Start the engine.
Idling speed for **5 minutes**, with short bursts of acceleration.

What is the temperature of the heater hoses and radiator hoses?

Cold heater matrix input hose,
Cold radiator output hose.

There is no engine coolant circulation. Check that the coolant pump is operating correctly (ALP 8) and check the belt drive. Check the circuit coolant level.

Hot heater matrix input hose,
Cold radiator output hose.

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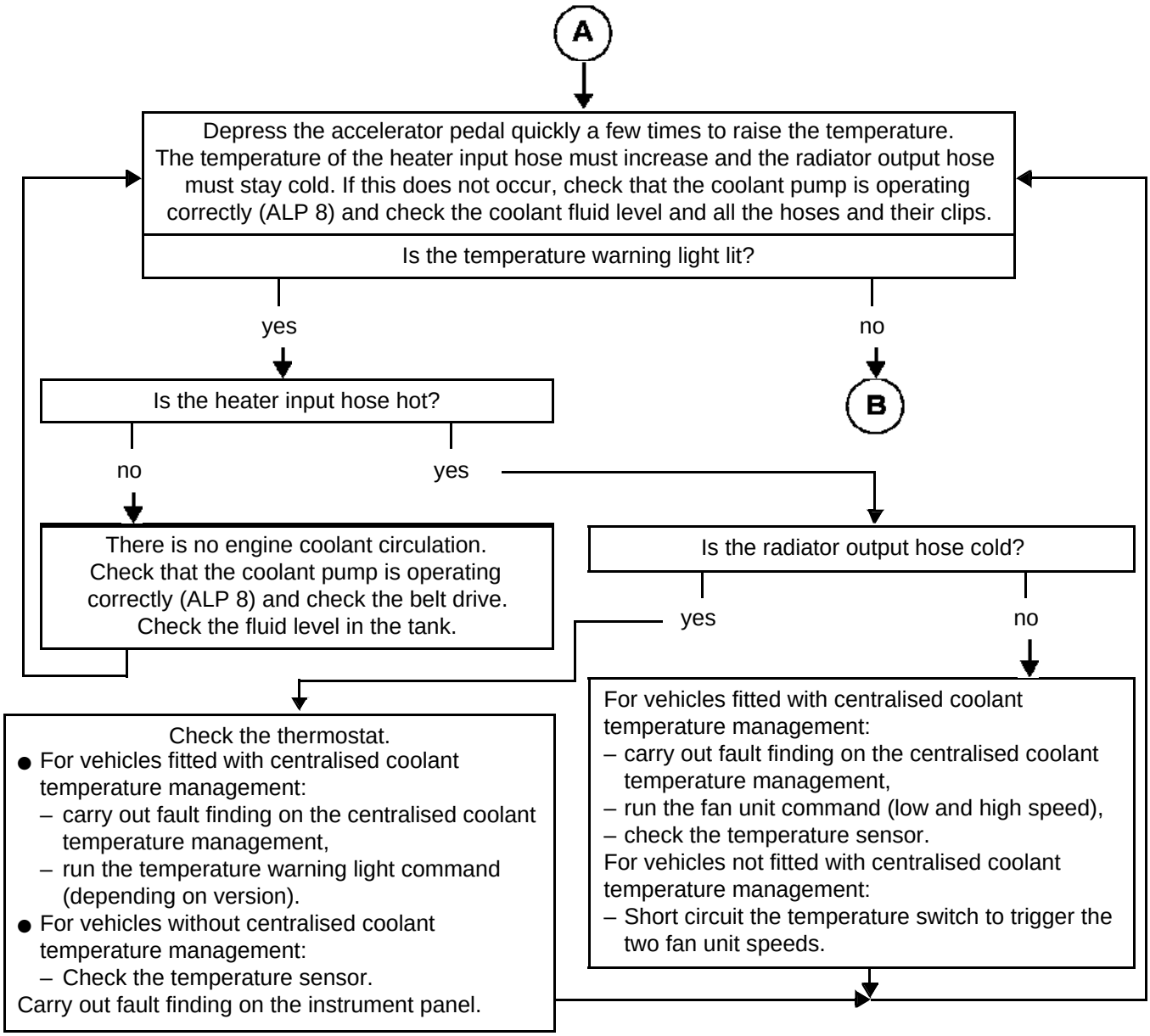
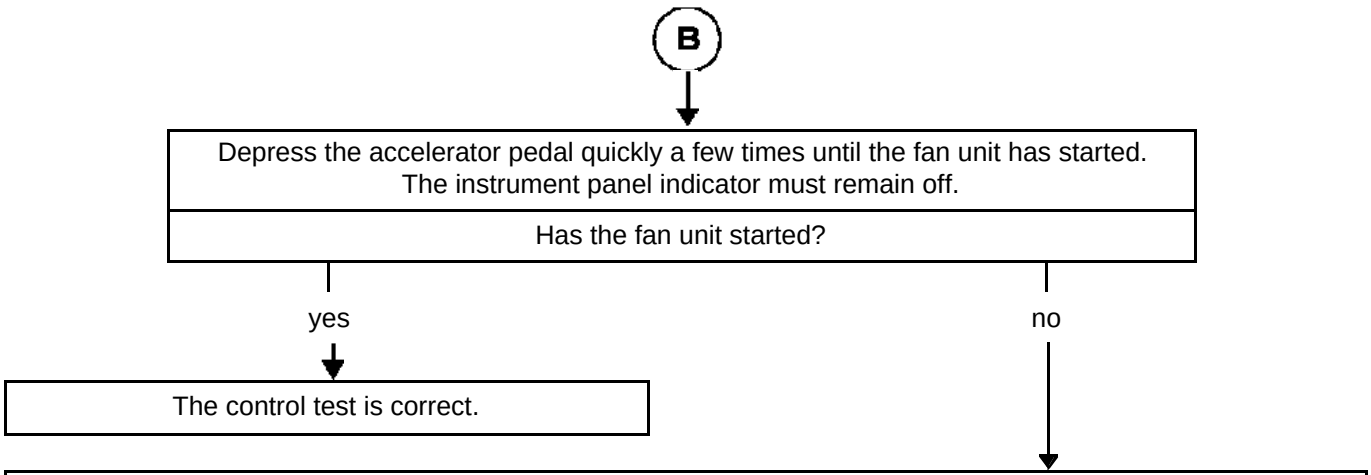
Warm heater matrix input hose,
Warm radiator output hose.

The thermostat is not sealed. Replace the thermostat.

TEST 2
CONTINUED 1



TEST 2 CONTINUED 2	



- For vehicles without centralised coolant temperature management:
  – Disconnect the temperature switch and short circuit it to activate the two fan unit speeds (high and low).
- For vehicles fitted with centralised coolant temperature management:
  – Run the command mode of the two speeds (high and low) of the fan unit using the diagnostic tool.

In both cases, the two speeds of the fan unit must be activated.
If this is does not occur:
– check the fan unit wiring if one of the two speeds is not obtained,
– replace the fan unit if it does not operate correctly.