

# GROUP 07

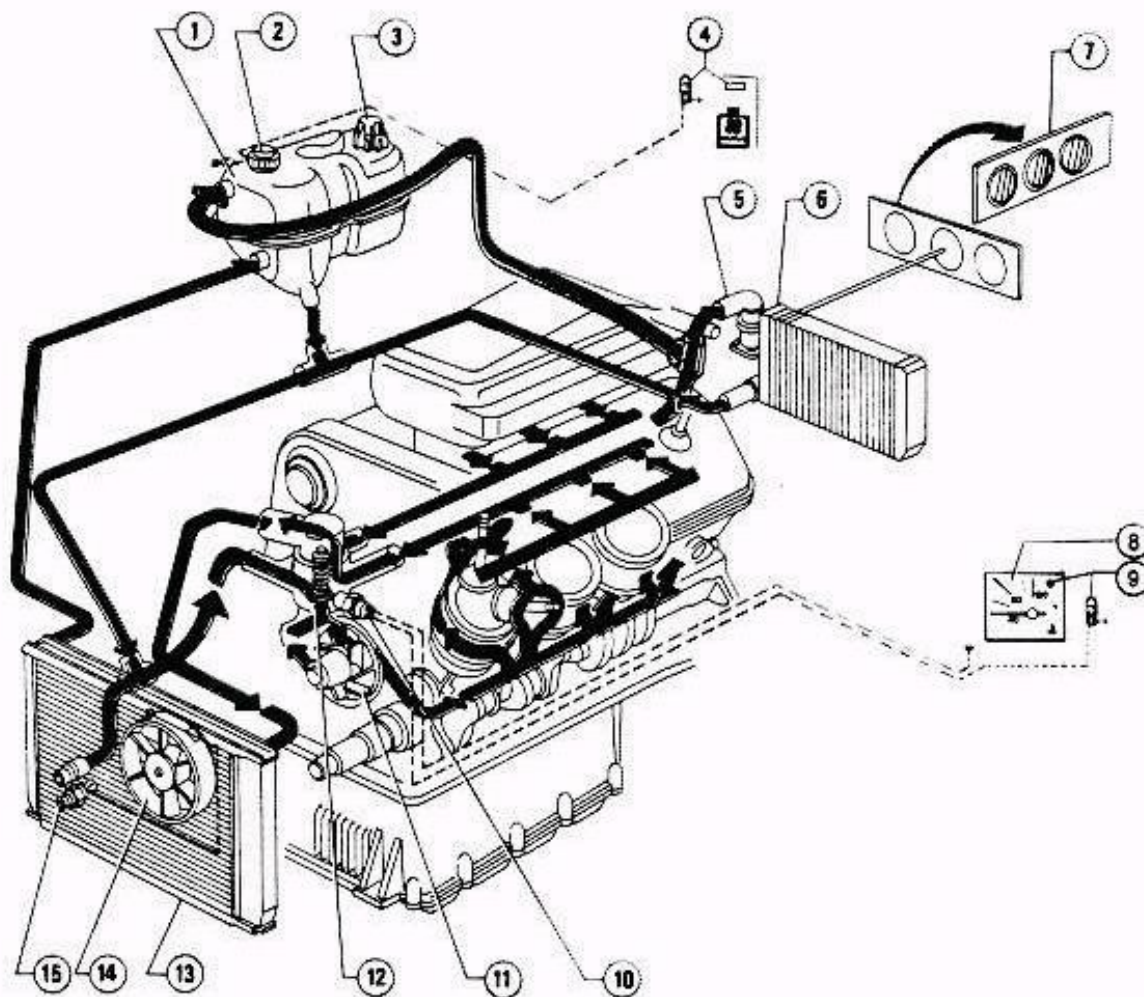
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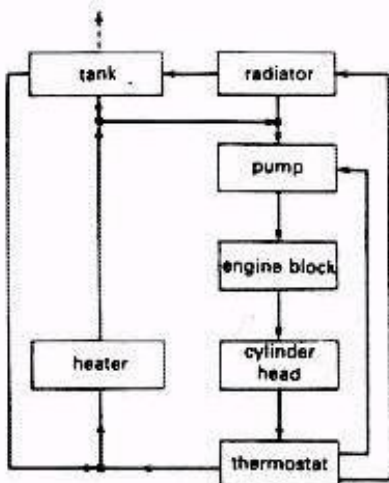
**07**

# COOLING SYSTEM

## GENERAL DESCRIPTION



- 1 Header tank
- 2 Coolant level sensor
- 3 Pressure relief valve
- 4 Min coolant level warning lamp (ALFA ROMEO Control)
- 5 Heater cock
- 6 Heater
- 7 Heater control
- 8 Coolant temperature indicator
- 9 Max coolant temperature warning lamp
- 10 Bulb for coolant temperature indicator and max water temp. warning lamp
- 11 Water pump
- 12 Thermostat
- 13 Radiator
- 14 Electric fan
- 15 Electric fan control thermal switch



The cooling system is of the sealed type, with forced circulation by centrifugal pump belt - driven by crankshaft.

A thermostat permits the engine to be brought quickly to the normal running temperature and kept at the optimal values; thermostat opens when coolant reaches 80° C (176° F) approx.

In addition to the air ram effect, the radiator is also cooled by an electric fan controlled by a thermal switch located on radiator.

The system is fitted with a coolant temperature sensor which supplies the max temperature indicator and warning lamp on cluster.

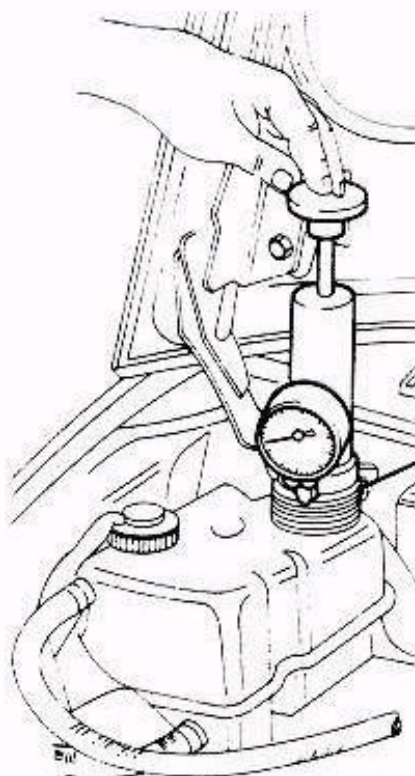
The warning lamp illuminates when coolant temperature exceeds 105° C (221° F).

A sensor, on header tank, provides an indication (through "ALFA ROMEO Control") whenever coolant level in the tank goes below the min value.

## HYDRAULIC SYSTEM TIGHTNESS TEST

1. Unscrew the header tank pressure relief valve.
2. Screw tester on header tank union.
3. Pressurize the system and check on tester, that pressure remains within the specified value.

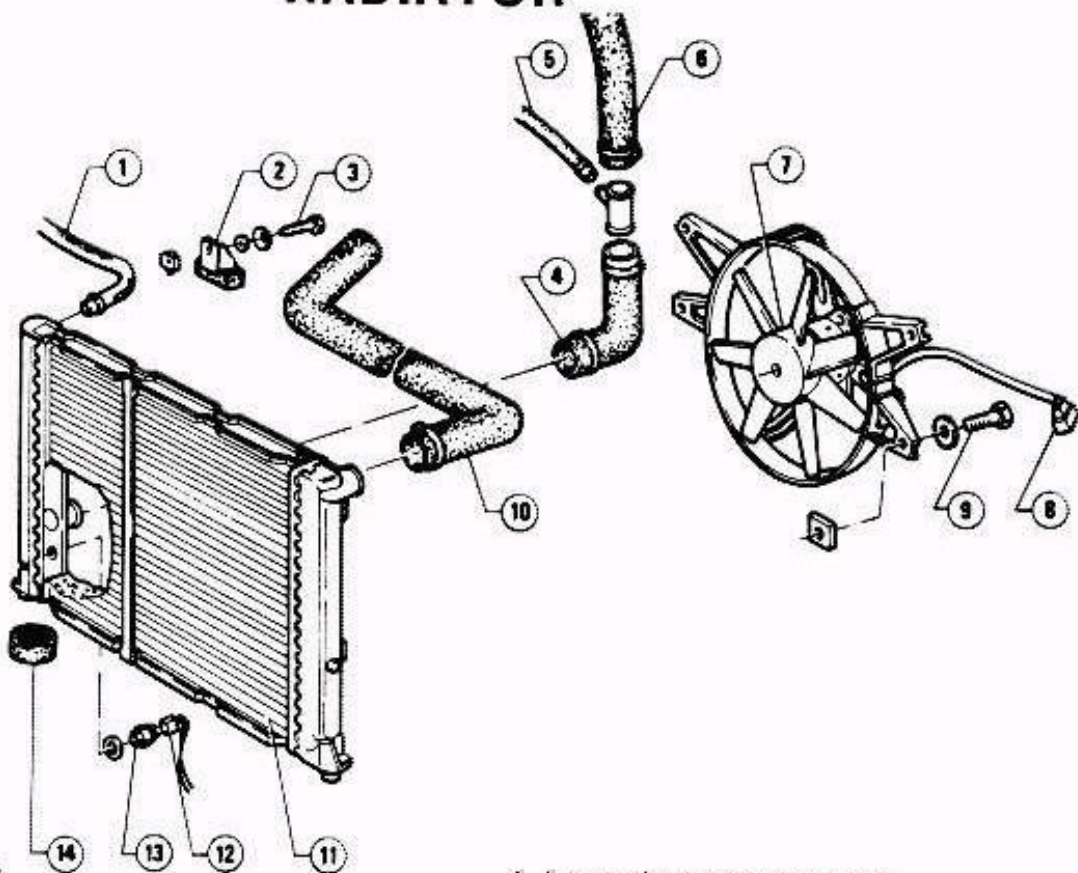
Cooling system check pressure  
 107.9 KPa (1.08 bar; 1.1 Kg/cm<sup>2</sup>; 15.64 psi)



Adapter

Manufacturer	Part #
Napa	200-1308
Mac	TA-1B
Stant	TA-1B
SAB	8393217

# RADIATOR



- 1 Radiator breather hose
- 2 Bracket
- 3 Screw securing radiator to body
- 4 Coolant outlet sleeve from radiator
- 5 Return hose to heater
- 6 Coolant-to pump delivery sleeve
- 7 Electric fan

- 8 Connector for electric fan supply cable
- 9 Screw securing electric fan to radiator
- 10 Coolant-to radiator delivery sleeve
- 11 Radiator
- 12 Connector for electric fan control cables
- 13 Electric fan control thermal switch
- 14 Rubber pad

## REMOVAL AND INSTALLATION

1. Disconnect battery.
2. Disconnect sleeve (8) from radiator; drain and recover coolant.

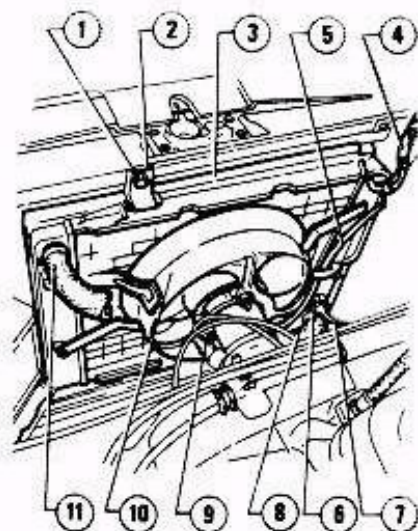
### WARNING:

Take the utmost care when draining coolant with engine hot, to avoid being burned.

3. Detach sleeve (11) and hose (4) from radiator.
4. Detach connector (5) of electric fan supply cables, and connector (7) from thermal switch (6).

5. Unscrew screw (1) which secures radiator to body; remove radiator from engine compartment, and withdraw rubber pads.
6. If required, unscrew screws (9) and remove electric fan (10).

- 1 Radiator securing screw
- 2 Bracket
- 3 Radiator
- 4 Breather hose
- 5 Electric fan supply cables connector
- 6 Thermal switch
- 7 Connector
- 8 Sleeve
- 9 Electric fan securing screw
- 10 Electric fan
- 11 Sleeve



7. Carry out installation by reversing the order of removal; then carry out re-filling, as follows.

- a. Remove header tank cap, and refill cooling system with the specified liquid.

**Cooling system refill**

Min. external temperature	°C (°F)	-20 (-4)	-35 (-31)
Concentrated antifreeze std. No. 3681-69956	l (Gals)	3.6 (0.95)	5 (1.32)
Dilution distilled water	l (Gals)	6.4 (1.69)	5 (1.32)
Antifreeze ready to use Std. No. 3681-69958	l (Gals)	10 (2.64)	-

To increase antifreeze protection at temperatures below  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) without draining the system completely, replace 1.5 l (0.4 gals) of the mixture with the same amount of concentrated antifreeze. For temperatures below  $-45^{\circ}\text{C}$  ( $-49^{\circ}\text{F}$ ) replace 3.3 l (0.87 gals) of the mixture.

**CAUTION:**

Products harmful to paint. Avoid contact with painted surfaces.

- b. Start the engine, run it to the normal running temperature so as to allow coolant to flow in the system, and operate on heater control, in order to open the cock of radiator core liquid.
- c. With engine cold top up the system to the max level marked on header tank.

**TIGHTNESS TEST**

1. Remove radiator from vehicle as described in "Removal and Installation".
2. Close the radiator liquid inlet/outlet union.
3. Immerge radiator in a tank previously filled with water, and identify any leaks by blowing compressed air from radiator breather hose, until reaching 107.9 kPa pressure (1.08 bar; 1.1 Kg/cm<sup>2</sup>; 15.64 psi).
4. If leaks are present, replace radiator as described in: "Removal and Installation".

**ELECTRIC FAN CONTROL THERMAL SWITCH**

**REPLACEMENT**

1. Drain and recover coolant.
2. Detach connectors from thermal switch on radiator.
3. Unscrew thermal switch and remove it from radiator.
4. Lubricate thermal switch threading with **Anti-seize R. GORI: Never Seez.**

then screw it on radiator taking care to position a new gasket in between; then tighten it to the specified torque.

**T**: Tightening torque  
Thermal switch for electric fan control on radiator

20 to 25 N·m  
(14.5 to 18.1 ft·lb)  
(2 to 2.5 Kg·m)

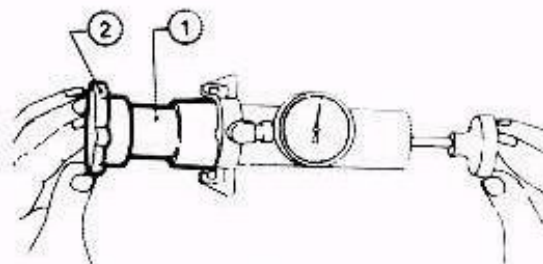
5. Restore liquid level in the cooling system.
6. Start the engine and warm it up until coolant reaches a temperature within  $84$  to  $88^{\circ}\text{C}$  ( $183.2$  to  $190.4^{\circ}\text{F}$ ).
7. Check that, at this temperature, thermal switch enables electric fan.

**PRESSURE RELIEF VALVE**

**SEAL TEST**

1. Fasten connector ① to tester and insert in pressure relief valve ②.
2. Apply pressure and check on tester that upon reaching the specified pressure setting the relief valve cracks off.

Pressure relief valve setting pressure  
88.3 to 107.9 kPa  
(0.88 to 1.08 bar;  
0.9 to 1.1 Kg/cm<sup>2</sup>;  
12.8 to 15.64 psi)



1 Connector  
2 Valve setting

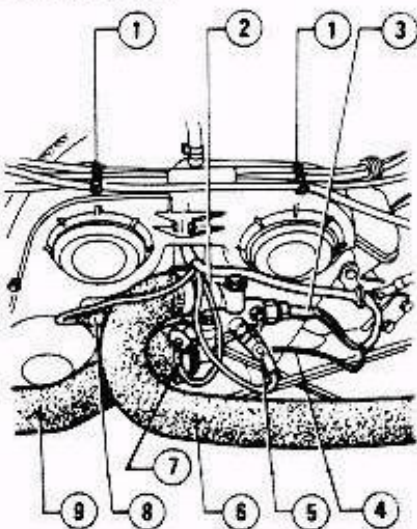
# WATER PUMP

## REMOVAL

1. Detach the negative battery terminal.
2. Detach connectors ③, ⑤ and ⑧ from thermostat unit ②, then disconnect ground cable ④.
3. Detach cable from coolant temperature sender ⑦.
4. Disconnect sleeve ⑨ from radiator and drain coolant; disconnect sleeves ⑥ and ⑨ from thermostat unit.

### Recover coolant

5. Release the spark plug supply cables from fasteners ① on timing belt case covers.



- 1 Fasteners
- 2 Thermostat unit
- 3 Connectors for indicator and coolant temperature warning lamp (for cluster)
- 4 Ground cable
- 5 Connector for coolant temperature sender cable (for ECU)
- 6 Outlet sleeve from thermostat unit
- 7 Coolant temperature sender for ignition advance ECU
- 8 Connector for cold start thermal switch
- 9 Inlet sleeve to thermostat unit

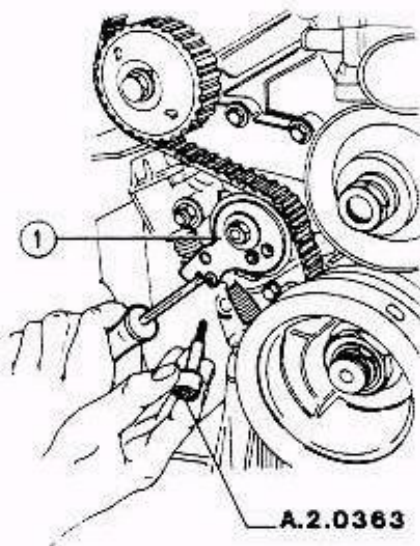
- 6 Loosen and remove the drive belts of the following components:
  - air conditioner compressor (if present)
  - power steering pump
  - water/alternator pump

7. Remove distributor covers and disconnect the related cap; remove the covers on timing belt case.
8. Engage the 5th speed, move vehicle forward so as to rotate crankshaft in the running direction, until notch P (marked on engine pulley) is aligned with the reference pin (piston of first cylinder in the expansion stroke).

If engine is timed, the notches on camshaft pulleys are aligned with the references on timing belt cases. In addition, the middle of distributor rotor arm must be towards the first cylinder.

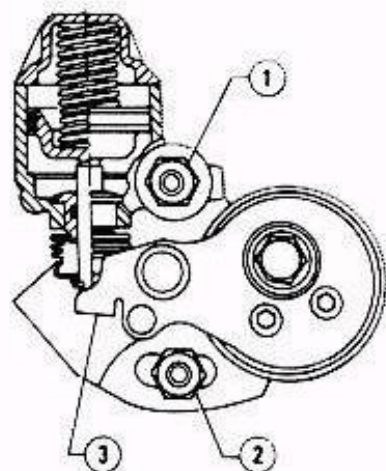
9. Unscrew the screws which secure timing belt cases; separate the cases and remove them by releasing the fuel return hose and ECU cables from brackets.

10. Lift belt tightener arm ① and insert pin A.2.0363 into the arm hose, so as to keep arm itself lifted.



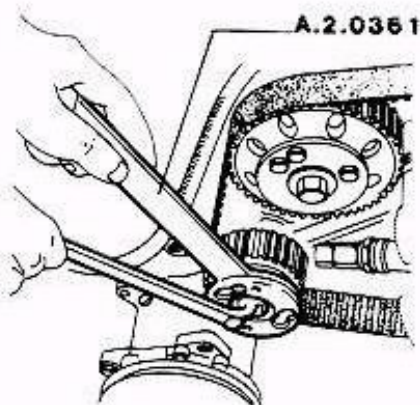
- 1 Belt tightener arm

11. Unscrew nuts ① and ②, so as to loosen the timing system drive belt; then remove both belt and tightener.

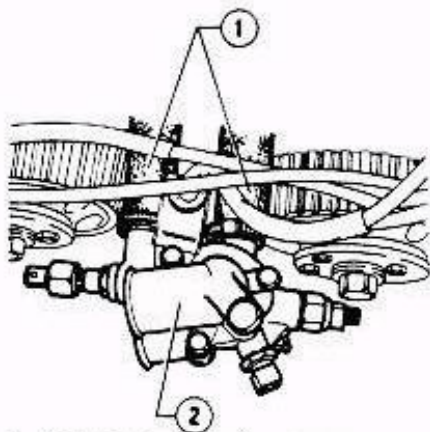


- 1 Nut
- 2 Nut
- 3 Belt tightener arm

12. Using tool A.2.0361, unscrew the screw which secures distributor drive pulley; remove pulley.



13. Loosen clamps of hoses ①, and detach these last from thermostat unit ②.



1 Coolant return hoses from heads  
2 Thermostat unit

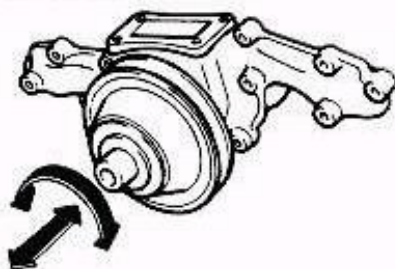
14. Unscrew the screws which secure pump body to engine block; then remove pump together with thermostat unit.

15. If required, operating at bench, unscrew the four screws which secure pump body to thermostat unit and separate them.

## CHECKS AND INSPECTIONS

1. Thoroughly clean pump body and the related mating surfaces.

2. Check pump body and impeller; in the event of signs of serious oxidation replace pump.
3. Check that play in the rotation and axial movement of impeller is not excessive.



## INSTALLATION

Install pump by reversing the order of removal, complying with the following indications.

- Thoroughly clean the mating surfaces between pump body, engine block and thermostat unit; insert new gaskets.
- Tighten to the specified torque:

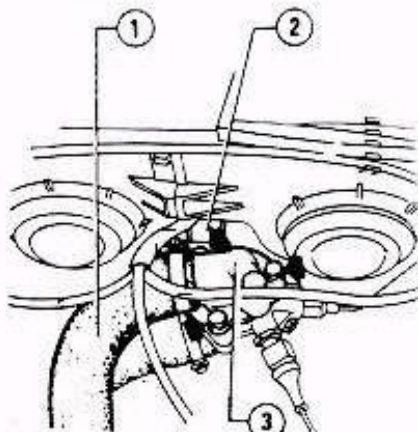
Ⓣ: Tightening torques  
Screws securing pump body to engine block  
8.1 to 9.3 N·m  
(6 to 6.9 ft·lb;  
0.83 to 0.95 kg·m)

## REMOVAL

1. Drain and recover coolant, up to lower edge of thermostat housing.
2. Detach sleeve ① from thermostat ③.
3. Unscrew the three securing screws of thermostat, then remove it together with gasket and bracket ②.

### CAUTION:

Take care not to detach lower gasket between thermostat intermediate spacer and thermostat housing.



1 Coolant-to-radiator delivery sleeve  
2 ECU wiring support bracket  
3 Thermostat

## CHECKS AND INSPECTIONS

Using suitable equipment, check that:

- Thermostat opens when coolant temperature is between 81 to 85°C (177.8 to 185°F)

- Carry out timing system adjustment, fit timing system belt and restore correct tensioning (refer to: Group 00 - Engine Maintenance - Engine Main Mechanical Unit - Check on Timing System and Drive Belt Tensioning).
- Restore correct tensioning of drive belts related to coolant and alternator pump, and power steering and air conditioner compressor pump (if present) (refer to: Group 00 - Engine Maintenance - Engine Main Mechanical Unit. Checking Good Conditions, Replacing and Adjusting Drive Belts of Alternator, Air Conditioner Compressor, Power Steering Pump).
- Restore coolant level.
- Start the engine, run it to the normal running temperature and check for leaks from system.

## THERMOSTAT

- When coolant temperature reaches 95°C (203°F) thermostat opens fully, also check that, when in these conditions, the thermostat movement is greater or equal to 7.5 mm (0.295 in). If it is not, replace thermostat.

## INSTALLATION

1. Clean the mating surfaces of thermostat.
2. Position thermostat on intermediate spacer, inserting a new gasket; reconnect the sleeve for coolant delivery to radiator.
3. Restore coolant level.

# SERVICE DATA AND SPECIFICATIONS

## GENERAL SPECIFICATIONS

### COOLANT

Min. Temperature	°C (°F)	- 20 (-4)	- 35 (-31)
Concentrated antifreeze Std. No. 3681-69956	l (Gals)	3.6 (0.95)	5 (1.32)
Distilled water	l (Gals)	6.4 (1.69)	5 (1.32)
Antifreeze ready to use Std. No. 3681-69958	l (Gals)	10 (2.64)	-

### CAUTION:

- a. To increase antifreeze protection at temperatures below  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) without draining the system completely, replace 1.5 l (0.4 gals) of the mixture with the same amount of concentrated antifreeze. For temperatures below  $-45^{\circ}\text{C}$  ( $-49^{\circ}\text{F}$ ) replace 3.3 l (0.87 gals) of the mixture.
- b. If the coolant level sensor is to be replaced, take care, when reassembling, to tighten relief valve completely to ensure tightness.

### WARNING:

Products harmful to paint. Avoid contact with painted surfaces.

## FLUIDS AND LUBRICANTS

Application	Type	Name	Quantity
Threading of electric fan control thermal switch on radiator	ANTISEIZE	R. GOR: Never Seez Std. No. 3671-69850	As required
Threading of coolant temperature sender, engine temperature sensor and thermo-time switch			

## SEALANT AND FIXING AGENTS

Application	Type	Name	Quantity
Cooling system sealant	SEALING POWDER	AREXONS Std. No. 8622-00101	30 g (1.058 oz.)

Alternatively ALUMASEAL can be used

## CHECKS AND ADJUSTMENTS

### DRIVE BELT

Load 78.4 N (8 kg; 17.6 lb)  
Yield 15 mm (0.6 in)

### THERMOSTAT

#### TEMPERATURE

- Initial opening 81 to 85°C (178 to 185°F)
- Fully open 95°C (203°F)
- Bulb travel  $\geq 7.5$  mm (0.3 in)

### RADIATOR

Leakage test pressure 107.9 kPa (1.08 bar; 1.1 kg/cm<sup>2</sup>; 15.6 psi)

### PRESSURE RELIEF VALVE

Calibration pressure 88.3 to 107.9 kPa (0.88 to 1.08 bar; 0.9 to 1.1 kg/cm<sup>2</sup>; 12.8 to 15.64 psi)

### FAN

Cut-in temperature 84 to 88°C (183 to 190°F)



## TIGHTENING TORQUES

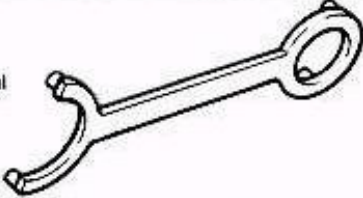

Item	Measurement unit	N·m (ft·lb; Kg·m)
Coolant temperature sender on thermostat housing (1)		20 to 25 (14.5 to 18.1; 2 to 2.5)
Electric fan control thermal switch on radiator (1)		20 to 25 (14.5 to 18.1; 2 to 2.5)
Engine temperature sensor on thermostat casing (1)		15 (10.8; 1.5)
Thermo-time switch on thermostat housing (1)		29 (21.7; 3)
Sender for ignition advance ECU (1)		30 (22.4; 3.1)
Screws securing pump body to engine block		8.1 to 9.3 (6 to 6.9; 0.83 to 0.95)

(1) With anti-seize R. GORI: Never Seez

## TROUBLE DIAGNOSIS AND CORRECTIONS

Defect	Probable Cause	Remedy
Coolant leakage	<ul style="list-style-type: none"> <li>• Radiator damaged</li> <li>• Leaks in system couplings</li> <li>• Loose or broken clamps</li> <li>• Leaks from thermostat</li> <li>• Damaged cylinder head gasket</li> <li>• Loose cylinder head tightening screws</li> </ul>	Replace radiator Replace Tighten or replace Replace gasket or thermostat Replace. Check engine oil for contamination Restore correct tightening
Poor coolant circulation	<ul style="list-style-type: none"> <li>• Pipes obstructed</li> <li>• Insufficient coolant</li> <li>• Inoperative coolant pump</li> <li>• Coolant pump and alternator driving belt loosen</li> </ul>	Check pipes and clean system Top up Replace Adjust
Corrosion and scaling	<ul style="list-style-type: none"> <li>• Improper liquid</li> </ul>	Periodically change coolant at recommended intervals Follow instructions for use shown on packaging
Overheating	<ul style="list-style-type: none"> <li>• Inoperative thermostat</li> <li>• Dirty and scaled radiator</li>   <li>• Ignition out-of-phase</li> <li>• Poor lubrication</li> <li>• Faulty coolant pump</li> <li>• Insufficient coolant</li> <li>• Electric fan control switch faulty</li> <li>• Electric fan faulty</li> </ul>	Replace Clean pipes by flushing with the specified descaling compound. Follow instructions for use shown on packaging  Retime Restore oil level Replace Restore coolant level and check system for leaks Replace thermal switch Replace

## SPECIAL SERVICE TOOLS

Tool number	Tool name	Refer to page
A.2.0361	Tool for rotating camshaft and auxiliary control pulley 	07-6
A.2.0363	Pin for stopping belt tightener device 	07-6

Radiator Pressure Tester Adapter

Source	Part Number
Napa	700-1308
Mac	TA 18
SAAB	8393217