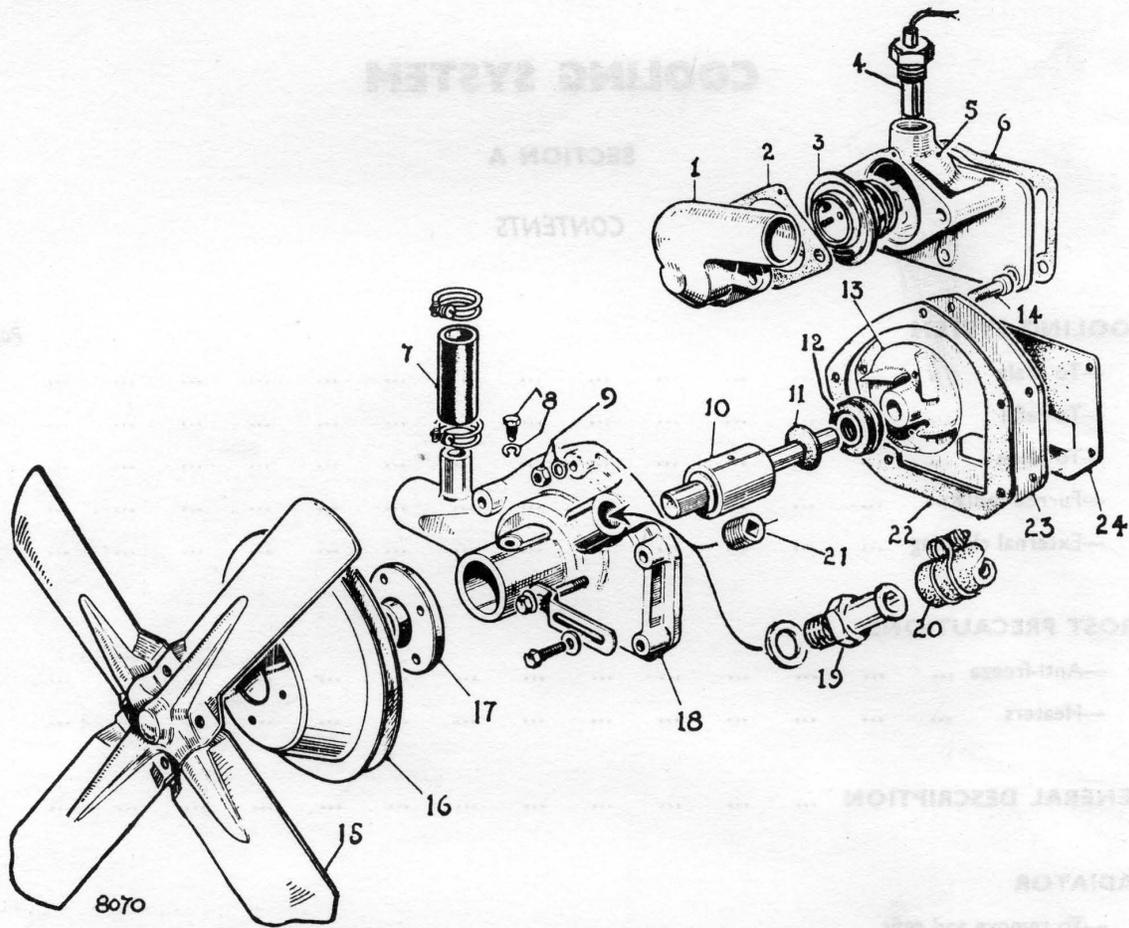


COOLING SYSTEM

SECTION A

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Fig. 1. Exploded view of water pump

COOLING SYSTEM

Fill with clean rainwater, or softened water, it is preferable to tap water which may contain dissolved lime.

GENERAL DESCRIPTION

The cooling system includes the following main parts: pump, cylinder block water jacket, radiator, bottom and top hoses, thermostat and filler cap.

The impellor type pump is driven by the "V" belt which also drives the generator. The pump is mounted on the front of the cylinder block, and a cooling fan is bolted to the pump drive pulley.

Water circulation, by the pump, is from the radiator, through the bottom hose, into the cylinder block. The water passes round the cylinder barrels and into the cylinder head, then through brass water jets to the valve seats before returning to the radiator through the pump, the thermostat housing and top water hose.

The thermostatically operated valve, located between the pump and the radiator top tank, ensures that when the engine is started from cold it reaches normal working temperature as soon as possible and is then kept at this temperature.

When the engine is cold the thermostat valve is closed, and water from the pump returns to the pump intake through the small bore pump by-pass pipe without passing through the thermostat. There is no circulation through the radiator so the water temperature in the engine rises.

When normal working temperature in the engine water jacket is reached, the thermostat valve will open, water commences to flow through the radiator to maintain this temperature.

Under normal conditions the thermostat will operate to open and close the valve as necessary to maintain normal working temperature.

In conditions of high atmospheric temperature and/or conditions of heavy load the thermostat is capable of opening the valve wide and holding it open to maintain normal working temperature over a wide range of working conditions.

The radiator filler cap houses a spring-loaded pressure release valve which has two functions:—

- (a) It prevents water loss through the overflow pipe when the water is at normal working level. (See "Cooling System—To refill").
- (b) The valve maintains a small pressure in the cooling system, so that the water boiling point is raised, this is an advantage at high altitudes and in the tropics.

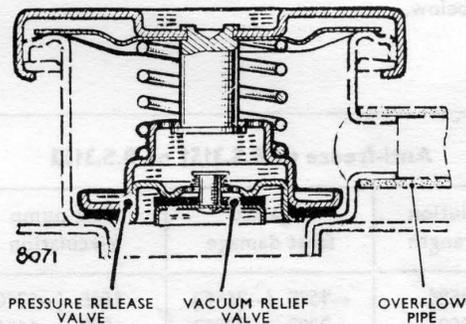


Fig. 2. Radiator filler cap

When the cooling system temperature falls a partial vacuum is formed and this operates a vacuum relief valve which is built into the pressure release valve. This permits the re-entry of air through the overflow pipe.

See "General Data—Cooling System" for:—

Thermostat operating temperatures

Pressure release valve pressure.

FROST PRECAUTIONS

In frosty weather without anti-freeze in the cooling system the following precautions should be taken to avoid serious damage:—

- (a) Drain the system whenever the car is left for any length of time, ensure that system is fully drained, i.e., that taps are not blocked. Also see subheading "Heaters".

- (b) In very cold weather ensure radiator is warm before driving the car and ensure that temperature is maintained during journey. The bottom of the radiator, especially the bottom tank should be protected.
- (c) When filling radiator use WARM, NOT boiling water, and pour in slowly.

Anti-freeze

To protect the system whilst the vehicle is stationary and whilst being driven in very cold weather it is recommended that an inhibited ethylene glycol anti-freeze mixture is used in the quantities recommended in the table below.

Anti-freeze to B.S.3151 or B.S.3152		
Solution strength	Against frost damage	Safe pump circulation
25%	-15°F (-26°C)	10°F (-12°C)
30%	-28°F (-33°C)	3°F (-16°C)
35%	-38°F (-39°C)	-4°F (-20°C)
40%	-42°F (-41°C)	-10°F (-23°C)
50%	-53°F (-47°C)	-32°F (-36°C)

Anti-freeze mixtures based on alcohol are not suitable as loss of anti-freeze will occur by evaporation.

Before putting anti-freeze into the cooling system the cylinder head should be checked for tightness, as any leakage of anti-freeze into the engine sump may cause engine seizure and resultant serious damage. See "General Data" for cylinder head nut torque figures, do not overtighten. Due to the searching effect of anti-freeze, hoses, hose connections and all cooling system joints should also be inspected and tightened if required.

When filling system take care to avoid spillage and if anti-freeze is spilt, flush away with clean water.

When the cooling system is filled with anti-freeze a label should be attached to the radiator header tank to indicate the fact and date of filling.

The following precautions are then necessary:—

- (a) Never overfill the header tank. See "Cooling System—To refill". Leave space for natural expansion and top up when warm.
- (b) If the cooling system has to be emptied, run the mixture into a clean container and use again.
- (c) Whenever the system requires topping up, use the correct strength of mixture.
- (d) When the anti-freeze is withdrawn and the system is filled with water, REMOVE THE ANTI-FREEZE LABEL ON THE HEADER TANK.

Heaters

Where a heater unit is installed a reliable anti-freeze mixture MUST BE USED, as when the system is drained a small amount of water remains, sufficient to damage the heater if it freezes.

When refilling the cooling system it is essential to have the water control valve full open, to prevent airlocks in the system. The water control valve is operated by the Heat and Car lever, which should be set to the HOT position.

If necessary release the upper hose clip at the heater and expel air, retighten hose clip and top up radiator.

COOLING SYSTEM

To drain

Remove the radiator filler cap.

If a heater is fitted set the heat control to HOT.

Open drain tap in bottom tank of radiator.

Open drain tap on the left-hand side of cylinder block. On "Alpine" cars the cylinder block drain tap is mounted on the left-hand front engine support bracket.

If the system contains anti-freeze drain into a clean container, if required for re-use.

To refill

If heater fitted, set heat control to hot.

Close radiator and cylinder block drain taps.

Whenever possible use clean soft water rather than hard water containing lime in solution. Clean rainwater may be used.

Pour water in slowly to avoid airlocks.

After refilling, run engine for a short time and check externally for leakage.

Top up, if necessary, to *normal running level of radiator—about one inch below bottom of filler neck*. Do not overfill.

To clean

Periodically the cooling system should be cleaned, this is most necessary when hard water having a high lime content has been used.

Proceed as follows:—

Remove the radiator filler cap.

Open, or better, remove drain taps in base of radiator and left-hand side of engine, when engine is still hot.

Allow time for engine to cool after water has drained off.

When cool, insert hose in radiator filler neck and flush radiator to remove loose sediment.

Close or refit drain taps.

Fill system to normal level with a reliable brand of cleaning solution (*solutions containing caustic soda must not be used*) and run the engine as directed by the makers of the solution.

Cleaning solutions may have an injurious effect on paintwork. Use with care.

Drain cleaning solution as soon as recommended period is over. This is important.

Using hose, flush system thoroughly.

Close drain taps and fill with clean soft water or anti-freeze mixture as required.

Furred radiator

If lime deposits are allowed to dry out they set hard and will not soften again. The radiator soon becomes un-serviceable. So when a radiator is removed from a vehicle and found to be "furred" the following precautions are necessary.

Keep the radiator in its normal upright position to prevent sediment from the bottom tank entering cooling ducts.

Clean radiator immediately whilst still wet inside. Alternatively seal radiator and fill with water or immerse in suitable tank of water pending treatment, but keep radiator in upright position.

External cleaning

In very dusty conditions or where insects are numerous, the radiator tube system should be kept clean by blowing with compressed air from the engine side.

THERMOSTAT

To remove and refit

The thermostat housing is at the front end of the cylinder head.

Drain radiator to below thermostat level.

Disconnect water hose from water outlet pipe (Fig. 1, item 1).

Remove two nuts holding water outlet pipe to thermostat housing.

Remove water outlet pipe and lift out thermostat.

When refitting a new joint should be used between the water outlet pipe and the thermostat housing.

The thermostat must be fitted with the "jiggle" pin at the 12 o'clock (top) position.

To test—Wax type

Examine the thermostat to ensure that riveted and soldered joints are secure.

Ensure that jiggle pin is in position and free to move.

Inspect for signs of wax escaping from top of element.

Plunge the thermostat into boiling water (at sea level 210°—212°F (98.9°—100°C)). Suspend so that thermostat does not touch the container, and its operation is not obstructed. After three minutes at this temperature the thermostatic valve will be open approximately $\frac{1}{4}$ in. (6 mm.).

If it is necessary to conduct the above test at an altitude well above sea level, place the thermostat in a 50/50 glycerine water mixture and raise to 211°F (99.4°C) using an accurate thermometer. This glycerine/water mixture boils at sea level at 226°F (107.8°C) and so enables this test to be carried out up to altitudes of 8,000 ft. above sea level. Save the glycerine/water mixture for re-use.

Examine valve seating whilst valve is open, if necessary, carefully remove any foreign matter that would hold valve open. It is not recommended that the valve is opened by hand.

Remove thermostat from hot water and submerge in cold water (approximately room temperature). Valve must reseat securely in 15—20 seconds.

If thermostat operates as describe above, its starting temperature may be taken as being correct without further test. If the thermostat fails to pass any stage of test, a replacement thermostat of correct rating must be fitted. See "General Data—Cooling System". The nominal operating temperature of the thermostat is stamped on the base of the element.

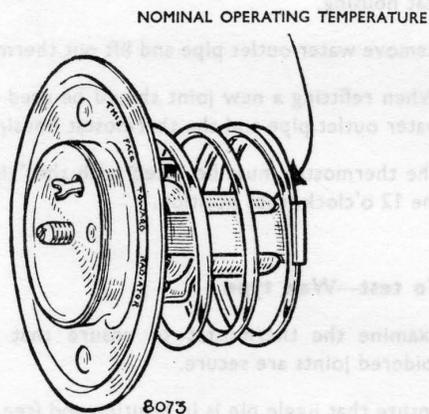


Fig. 3. Thermostat

If a replacement thermostat is not immediately available, the faulty unit should be left out as it could cause serious overheating. Do not attempt rectification or resetting, this is a specialist's work.

WATER TEMPERATURE GAUGE

This is an electrical instrument made up of a temperature sensitive element (transmitter) in the thermostat housing and a gauge or indicator in the instrument panel.

These units are connected to an instrument voltage regulator and only record the temperature when the ignition is switched on. The instrument voltage regulator is mounted behind the instrument panel.

To remove element

Drain radiator to below thermostat housing level.

Disconnect battery.

Remove the lead from element terminal.

This lead between element and gauge must never short to earth as this would burn out the instrument winding. If it is necessary to reconnect the battery whilst this lead is disconnected, first insulate the lead. Always disconnect battery whilst working on lead.

Unscrew and remove element.

To remove gauge or indicator

See "Section N—Instruments to remove".

Temperature reading

A reasonably accurate reading will be dependent upon a satisfactory battery performance, also upon the satisfactory operation of the instrument voltage regulator, and sensitive element (transmitter).

See "Section N—Instruments", to check the gauge.

RADIATOR

To remove and refit

Drain cooling system.

Disconnect top and bottom water hoses.

Remove fixing bolts that secure radiator to baffle plates.

Replacement is made in reverse order. Fixing bolts and their cage nuts should be lubricated with grease to prevent rusting of the bolt threads.

WATER PUMP

To remove

Drain cooling system.

Disconnect bottom hose at the pump end.

Slacken by-pass hose at its upper connection.

Disconnect heater-hose (if fitted).

Loosen dynamo mounting and adjustment bolts.

Remove driving belt.

Remove the four setscrews and spring washers securing the fan blade assembly and withdraw fan, and driving pulley.

Remove the four bolts securing pump to cylinder block.

The pump can now be withdrawn.

To refit

Use the removal procedure in the reverse order. The following are additional requirements.

Fit new gaskets which should be lightly smeared with grease to ensure leakproof joints.

Ensure that the countersunk bolt securing the rear cover plate is firmly in position before installing the pump.

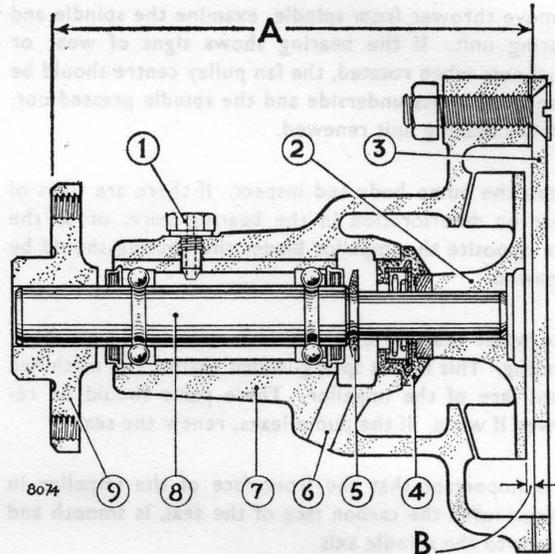
Renew any faulty water hoses.

If a new pump is being fitted, transfer by-pass hose and heater connection from old pump before installation.

When replacing the driving belt, adjust it so that there is $\frac{5}{8}$ in. (16 mm.) belt slackness in the centre of the longest run.

To dismantle

A sectional view of the water pump is shown in Fig. 4. The impellor and fan pulley centre are a press fit on the pump spindle which forms part of the bearing unit.



- | | |
|--------------------------------------|----------------------|
| A. 4-875/4-865 in. (123-8/123-6 mm.) | 5. THROWER |
| B. 0-04 in. (1-02 mm.) | 6. DRAIN HOLE |
| 1. BEARING LOCATING SCREW | 7. PUMP BODY |
| 2. IMPELLOR | 8. BEARING ASSEMBLY |
| 3. BACK COVER PLATE | 9. FAN PULLEY CENTRE |
| 4. SEAL UNIT | |

Fig. 4. Sectional view of water pump

The bearing unit is lubricated in manufacture and there is no provision for lubrication in service. It is important not to wash the pump in petrol (gasoline), paraffin (kerosene) or other cleaning fluids as these would enter the bearing and destroy the lubricant. Cleaning of the pump body should be left until the pump is dismantled.

The pump should be dismantled in the following manner:—

Remove bearing locating screw, see Fig. 4, item 1, and the countersunk bolt and nut holding the back cover plate. Remove cover plate and its paper joint.

Support pump body and press the spindle from the impellor end. This will bring the impellor against the pump body and allow the spindle to be pressed out of the impellor and housing, leaving the water seal in position.

Lift the water seal out of the pump body.

Remove thrower from spindle, examine the spindle and bearing unit. If the bearing shows signs of wear or roughness when rotated, the fan pulley centre should be supported on its underside and the spindle pressed out, and the bearing unit renewed.

Clean the pump body and inspect. If there are signs of wear or deterioration in the bearing bore, or to the face opposite the impellor blades the housing should be renewed.

The water seal has a carbon face mounted in a rubber housing. This face is spring-loaded against the machined front face of the impellor. These parts should be renewed if worn. If the pump leaks, renew the seal.

It is important that the front face of the impellor in contact with the carbon face of the seal, is smooth and square to the spindle axis.

To reassemble

Place the bearing unit in the pump body with the larger diameter of the spindle to the front of the housing. Line up the locating hole in the bearing with the threaded hole in the pump body.

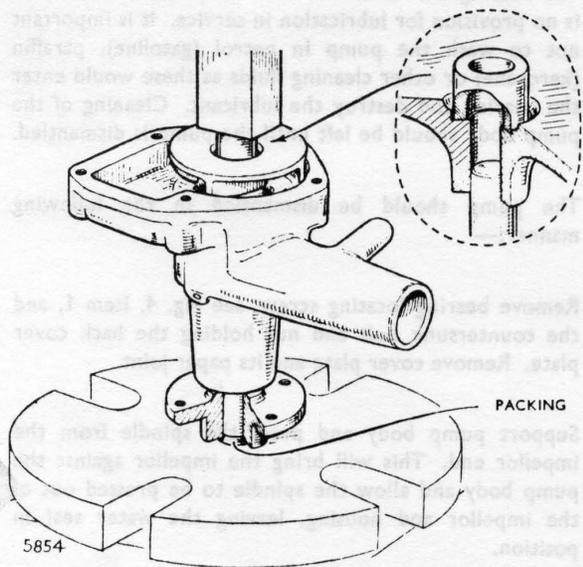


Fig. 5. Pressing the impellor on to the pump spindle

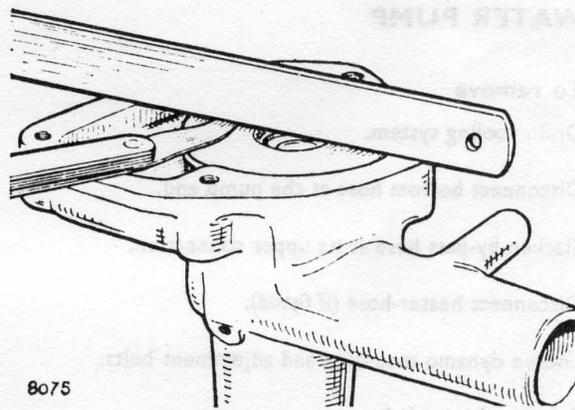


Fig. 6. Checking clearance between impellor and pump body face plane

Replace the bearing locating screw in the top of the pump body.

Place the fan pulley centre on a press table and press the spindle into the pulley centre until the front face of the pulley is positioned as shown by dimension "A" in Fig. 4. This ensures the correct alignment of the fan pulley to the crankshaft pulley.

Place the thrower disc in its groove on the spindle between the bearing and seal unit as shown in Fig. 4, item 5.

Place the water seal on the smaller diameter of the spindle with the carbon face towards the back face of the water pump and push the seal firmly into the housing. See Fig. 4, item 4.

Support the pump spindle inside the fan pulley centre on a packing as shown in Fig. 5 and press the impellor on to the shaft until the impellor is in the position shown in Fig. 4, dimension "B". This clearance can be checked with feelers and straight edge as shown in Fig. 6.

Fit cover plate using a new joint and secure with the countersunk bolt and nut in the uppermost hole.