

COOLING SYSTEM

CONTENTS

	Page No.
GENERAL DESCRIPTION	2
RADIATOR RELIEF VALVE	2
DRAINING AND REFILLING THE COOLING SYSTEM	3
FROST PRECAUTIONS	
—Without using anti-freeze	3
—Using anti-freeze	3
—Heaters	4
COOLING SYSTEM	
—To clean	4
THERMOSTAT	
—To remove and refit	4
—To test	5
RADIATOR	
—To remove and refit	5
WATER TEMPERATURE GAUGE	
—To remove element	5
—To remove gauge	5
—To check temperature gauge reading	5
WATER PUMP	
—To remove and refit	5
—To dismantle	5
—To reassemble	7

COOLING SYSTEM

All threads are of the Unified series and the appropriate spanners must be used

GENERAL DESCRIPTION

Water is circulated by an impellor type pump mounted on the front of the cylinder block. It is driven by a vee belt which also drives the generator. The radiator cooling fan is bolted to the pump-driving pulley.

Alpine Service I and II

A cross flow radiator is used on these cars. Water is drawn from the bottom end of the right-hand (offside) vertical tank of the radiator and delivered into the cylinder block where it passes around the cylinder barrels. From the cylinder block the water flows into the cylinder head through one brass water jet and several water holes. The brass jet is used to direct the circulation of water in the cylinder head. Water passes from the cylinder head into the thermostat housing, and when the thermostat valve is open, into an aluminium header tank that is bolted to the thermostat housing immediately above the thermostat. The header tank is coupled to the top end of the left-hand (nearside) vertical tank of the radiator by the top water hose.

Rapier models and Alpine Series III

A vertical type of radiator is used on these cars. Water is drawn from the bottom tank of the radiator through the bottom water hose by the water pump, and passes through the engine to the thermostat housing in exactly the same way as described above. It then flows through the top water hose to the radiator top tank.

Whenever possible clean rainwater, or softened water should be used, in preference to tap water.

The cooling system is not required to come into full operation until the engine has attained its normal working temperature, and it is desirable that this should be brought about as quickly as possible after starting the engine from cold.

To accomplish this, a thermostatically operated valve is located in a cast-iron body bolted to the front end of the cylinder head.

The thermostat valve remains closed when the engine is cold, and when the engine is started from cold, water returns to the pump intake through a small by-pass pipe which connects the pump intake pipe with the engine side of the thermostat valve.

Water also flows through a pipe from the rear end of the cylinder head to the water-heated induction manifold jacket and from here to the suction side of the water pump.

After starting the engine, the water temperature will rapidly rise, but circulation of the water through the radiator does not commence until a suitable temperature has been reached in the cylinder head, cylinder block water jackets, and induction manifold jacket.

At this temperature the thermostat begins to open and water commences to flow through the radiator. The thermostat becomes fully open at the normal operating temperature.

The thermostat operating temperatures are given in the Data Section under "Cooling System".

Radiator Relief Valve (See Fig. 1)

Incorporated in the filler cap is a spring-loaded relief valve which prevents water loss through the overflow pipe when the water is at normal level.

In addition, this valve allows a small pressure to build up in the cooling system. This raises the boiling point of the water which is a great advantage in high altitudes and in tropical conditions.

As the cooling system temperature falls partial vacuum is formed. This is relieved by entry of air through the overflow pipe and the vacuum release valve which is built into the pressure relief valve.

Details of the relief valve release pressures are given in the General Data Section under "Cooling System".

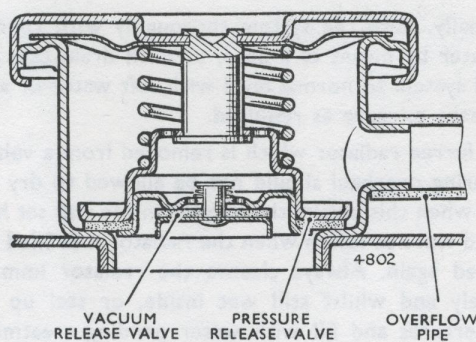


Fig. 1. Radiator relief valve

DRAINING THE COOLING SYSTEM

The radiator drain tap is situated under the offside (right-hand) of the radiator and the cylinder block drain tap on the front of the nearside (left) part of the engine front bearer plate. Both taps should be opened together by turning the taps in an anti-clockwise direction. When a car heater is fitted, the temperature control must be set to the HOT position.

REFILLING THE COOLING SYSTEM

Whenever possible clean rainwater, or softened water should be used in preference to water taken from a main supply.

If fitted the heater control must not be set to the HOT position.

Under extreme cold conditions, warm, but not boiling water, may be used if necessary. Water, or anti-freeze solution should be poured in slowly to prevent air locks.

After filling, the engine should be run for a short time and the level rechecked to ensure that no loss of water has occurred due to filling of the heater, if fitted.

FROST PRECAUTIONS

Without using anti-freeze

When the car is used in very cold weather without anti-freeze in the cooling system, great care should be taken to ensure that the radiator is warm before

attempting to drive the vehicle. If this is neglected there is a danger that the radiator may freeze if the car is driven in temperatures below freezing point before the thermostat is open. In cold weather the bottom of the radiator should be blanked off so that its bottom tank keeps warm, because it is here that freezing commences.

Using anti-freeze

To avoid the possibility of the cooling system freezing whilst the vehicle is stationary, or whilst being driven in very cold weather, it is recommended that an anti-freeze mixture is used, and added in the quantities recommended by the anti-freeze manufacturers.

We recommend anti-freeze mixture based on inhibited ethylene glycol. Mixtures using alcohol as a base are not suitable, as this will cause loss of anti-freeze by evaporation.

Before putting anti-freeze compounds of any kind in the cooling system, it is imperative that the cylinder head and all hose connections should be checked for tightness, as these compounds have a very searching effect and should any leak into the sump, very serious damage may occur owing to the possibility of engine seizure. Do not exceed specified torque figures for cylinder head nuts, given in the Data Section under "Cylinder Head".

Cars with anti-freeze mixture in the cooling system should have a label attached to the header tank of the radiator, under the bonnet, to indicate the fact. The following precautions are necessary on cars so marked:—

- (a) Never fill the header tank up to the overflow. Leave space for the natural expansion of the mixture to avoid unnecessary topping up and consequent dilution. Top up when the system is warm.
- (b) If the cooling system has to be emptied run the mixture into a clean container and use again.
- (c) If for any reason the mixture is lost 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 always be used, because even when the cooling system is drained, a small amount of water remains in the heater unit. If this water freezes the heater unit will be seriously damaged.

When refilling the cooling system with anti-freeze mixture (or when refilling with water) it is essential to have the water control valve, on the heater unit, fully open in order to prevent air becoming trapped in the heater system. The water valve is operated by the finger slide, and is fully open when the finger slide is in the maximum position on the temperature control panel.

COOLING SYSTEM—To clean

Periodically, the entire cooling system should be cleaned, particularly in districts where, contrary to instructions, water having a high content of lime has been used for replenishing the radiator.

Remove the radiator filler cap.

Open drain tap in bottom of radiator (or preferably remove the tap complete), when engine is still hot; also open or remove tap from left-hand side of cylinder block.

Allow time for engine to cool after all water has drained off. When cold, flush radiator through to remove all loose sediment by means of a hose inserted in the filler neck.

Allow to drain and then close the drain taps or refit if removed.

Fill system to normal level with a cleansing solution (several reliable brands of which are available) and run the engine as directed by the makers of the solution.

It is most important to ensure that the cleansing solution used does not contain anything that will cause corrosion of the aluminium cylinder head.

Solutions containing caustic soda must not be used.

It is important to drain off the cleansing solution directly it has been used for its recommended period.

Finally, flush the system thoroughly with running water by means of a hose, turn off drain taps and fill system to normal level with soft water or anti-freeze mixture as required.

A furred radiator which is removed from a vehicle during overhaul should not be allowed to dry out as when this occurs the deposit inside will set hard and will not soften when the radiator is refilled and used again. Always cleanse the radiator immediately and whilst still wet inside, or seal up the apertures and fill with water pending treatment. Alternatively, the radiator can be left immersed in a suitable tank of water.

Do not invert the radiator or lay it flat as this allows any sediment which has accumulated in the bottom tank to pass into the cooling ducts. Always store the radiator in its normal upright position.

When using flushing compounds it is important to avoid splashing the paintwork of the car as they can have an injurious effect.

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

THERMOSTAT

To remove and refit

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

Drain radiator to below thermostat level.

Disconnect water hose connection to the header tank (*Alpine I and II*) or water outlet pipe (*Rapier and Alpine III*).

Remove the two bolts holding the header tank or water outlet pipe to the thermostat housing.

Remove header tank, or water outlet pipe, and lift out thermostat.

If the thermostat valve is found open on removal, it is defective, and a new unit should be fitted.

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

To test

Suspend unit in a vessel of water with a reliable thermometer.

Heat the water slowly, noting the thermometer reading and stirring the water continually.

The thermostat valve should commence to open and be fully open at the temperatures given in the Data Section under "Cooling System".

Thermostats are sealed and their setting and manufacture is specialised work. Always renew if doubt exists. If a replacement is not immediately available, it should be left out, as a faulty unit could cause serious overheating.

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 thick oil to prevent rusting of the bolt threads.

WATER TEMPERATURE GAUGE

This instrument is electrically operated and consists of two units, the temperature element (transmitter) in the thermostat housing, and the temperature gauge in the instrument panel. These units are connected by a single insulated wire in the wiring harness, and temperature is only recorded when the ignition is switched on.

Removal of element

Drain the radiator enough to allow removal of element without loss of water or anti-freeze.

Disconnect battery.

Remove the insulated lead from element terminal.

Unscrew and remove element.

It is most important that the interconnecting cable between the gauge and the temperature element should not be shorted to earth when the ignition is switched on. If this occurs the temperature gauge winding will burn out and for this reason the battery should be disconnected or the end of the lead insulated when it is removed from the element terminal.

Removal of Temperature Gauge

Two electrical leads have to be disconnected and the two knurled instrument fixing nuts removed to allow the instrument head to be lifted out of the instrument panel.

To Check Temperature Gauge Reading

Remove the temperature element and earth its outer body to the thermostat housing and switch on the ignition. Immerse the element in a small container of almost boiling water and take the temperature of this water with a reliable glass thermometer. A comparison of the glass thermometer reading with the instrument will show if the later is reasonably correct.

WATER PUMP

To remove and refit

Remove radiator.

Slacken by-pass hose.

Remove thermostat housing.

Slacken dynamo mounting bolts.

Remove driving belt and fan blades.

Disconnect heater hose (if fitted).

Remove four bolts and withdraw pump.

Reassemble in the reverse order, renewing any faulty joints or water hoses. When replacing the fan belt adjust so that there is $\frac{5}{8}$ " (16 mm.) belt slackness in the centre of the longest run of the belt.

To dismantle

A sectional view of the water pump is shown in Fig. 2. The impellor and fan pulley centre are a press

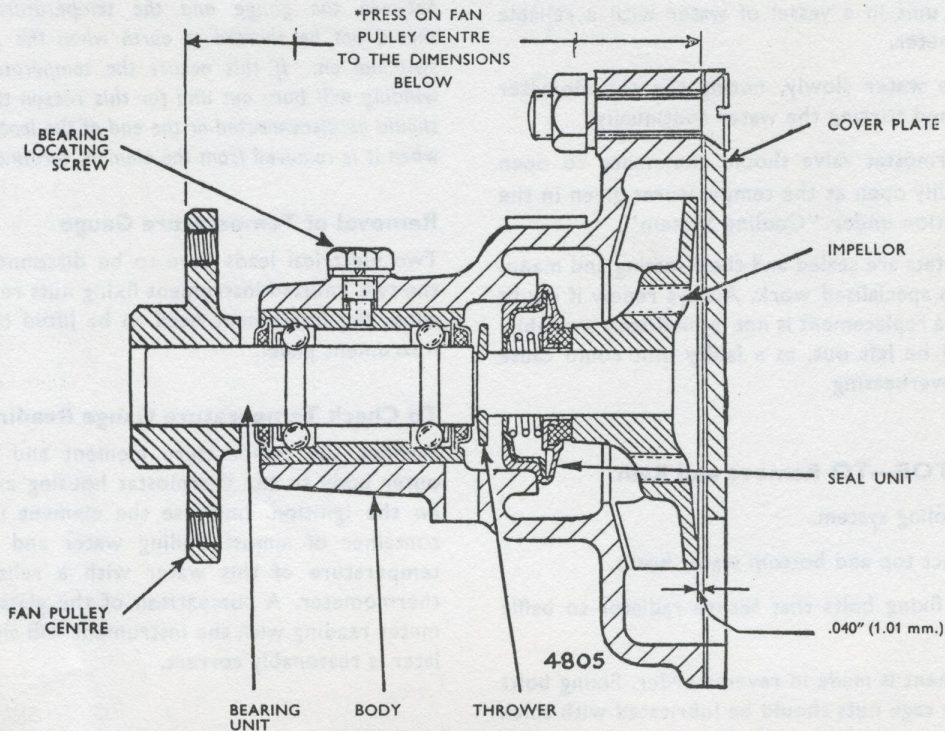


Fig. 2. Sectional view of water pump

ALPINE SERIES I AND RAPIER III 4.00"—4.01" (101.6—101.8 mm.)

ALPINE SERIES II AND III 4.865"—4.875" (121.5—123.8 mm.)

fit on the pump spindle which forms part of a specially constructed shaft and bearing unit.

The bearing unit is lubricated in manufacture only. There is no provision for renewal of the lubricant in service. It is therefore most important not to wash the complete pump in petrol (gasolene), paraffin (kerosene) or any other form of cleaning fluid, 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:—

1. Remove bearing locating screw, see Fig. 2, and the countersunk bolt and nut holding on the

back cover plate. Remove cover plate and its paper joint.

2. Support pump body and press on spindle at 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.
3. Lift the water seal out of the pump body.
4. Carefully examine the spindle and bearing unit. If the bearing shows any signs of wear or roughness when rotated, the fan pulley centre should be supported on its underside and the spindle pressed out.

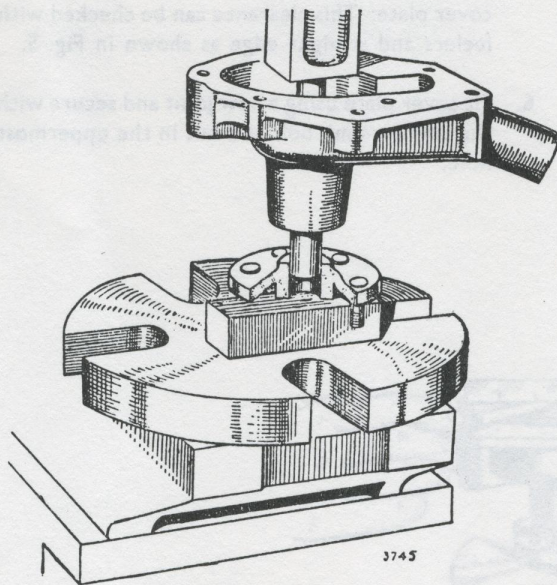


Fig. 3. Pressing on fan centre

5. Clean out all deposits from the pump body and inspect this item. If there are any signs of wear or deterioration in the bearing bore, or the face immediately behind the impellor the housing should be renewed.

The water seal has a carbon face mounted in a rubber housing. This face is held against the machined face on the rear of the impellor by a spring in the rubber housing of the seal. If either of these parts are worn, or if the pump is leaking these parts should be renewed.

It is most important to have a smooth flat face, square to the axis of the spindle, on the part of the impellor in contact with the carbon face of the seal.

To reassemble

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

2. Replace the bearing locating screw in the top of the pump body.
3. Place the fan pulley centre on a press table and press the larger diameter of the spindle into the pulley centre, as illustrated in Fig. 3 until the front face of the pulley is positioned as shown by the dimension in Fig. 2. This position ensures the correct alignment of the fan pulley to the crankshaft pulley.
4. Place the thrower disc in its groove on the spindle between the bearing and seal unit.

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. 2.

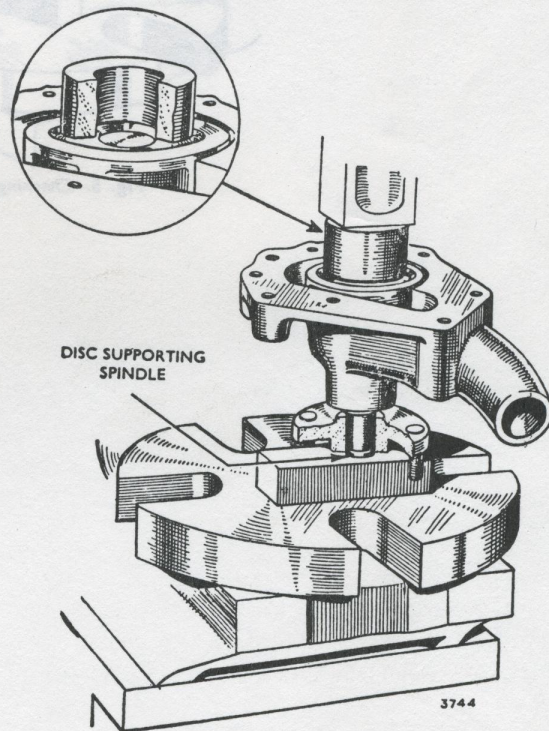


Fig. 4. Pressing on pump impellor

5. Support the pump spindle end inside the fan pulley centre as shown in Fig. 4 and press the impellor on to the shaft until the impellor is in the position shown in Fig. 2. It should be noted that a clearance of .040" (1.01 mm.) should exist between the outer face of the impellor and

cover plate. This clearance can be checked with feelers and straight edge as shown in Fig. 5.

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

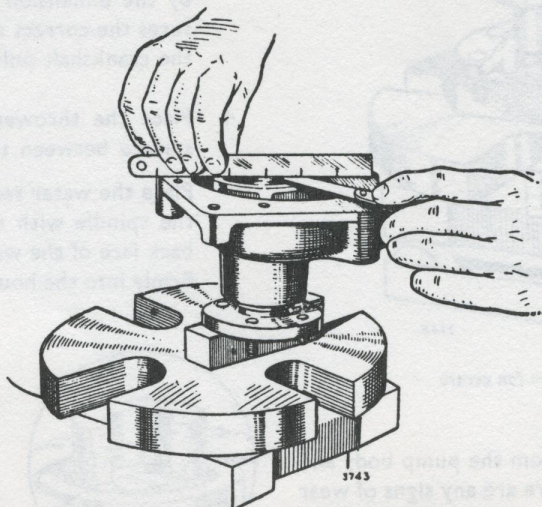


Fig. 5. Checking impellor clearance