

SECTION K
COOLING SYSTEM

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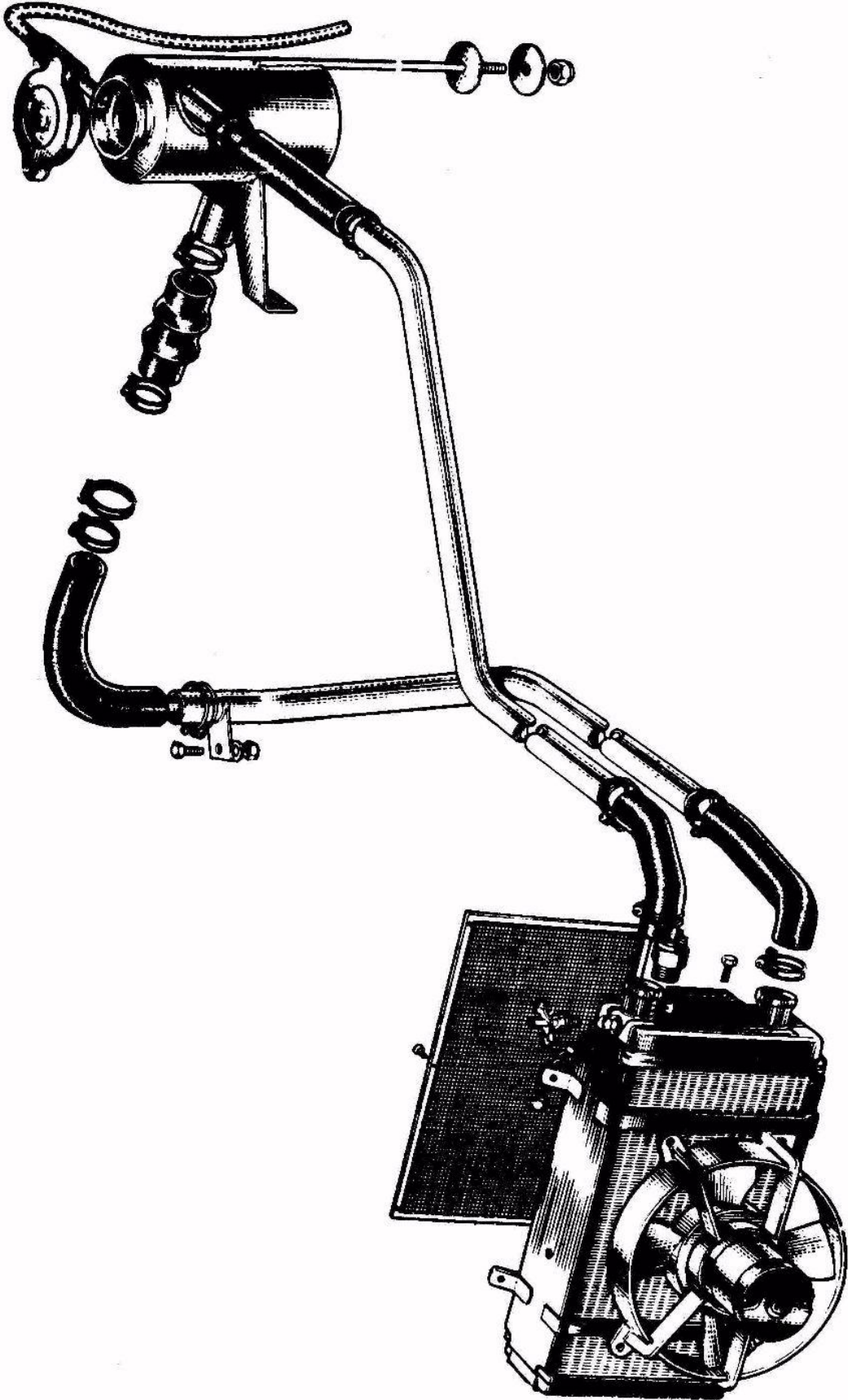


Fig. 1 - Components of the Cooling System.

K.1 - GENERAL DESCRIPTION.

The engine cooling system operates on the conventional thermo-siphon system and is impeller pump assisted. The system incorporates a radiator mounted in the front right hand wheel arch accessible from within the front luggage compartment. An electrically driven fan is mounted on the front face of the radiator to assist air flow through the radiator block. A thermostat is fitted into the side of the radiator, which automatically operates the fan via a relay when the coolant has reached its maximum operating temperature.

A thermostat is also fitted on the outlet side of the water pump to ensure rapid engine warm-up. When starting from cold, the thermostat prevents coolant flow through the radiator block, until a predetermined temperature has been obtained. Upon reaching the operating temperature the thermostat will automatically redirect the coolant flow through the radiator.

The cooling system is designed to operate at a pressure of 7 lb./sq. in. (0.49 kg/cm²). In addition to other benefits, this ensures greater engine efficiency. A pressure relief valve is combined with the radiator header tank cap. If the cap is to be removed when the engine is warm, care must be exercised to prevent injury from scalding. Instructions are stamped on the cap top.

A 17 mm. hex. drain plug is provided at the rear right-hand side of the engine unit for draining the cylinder block. Should it be necessary to drain the main system, it is suggested that the lower hose connection to the radiator be detached at the pipe end and the coolant drained away below the steering unit. Since it is practically impossible to completely drain the heater system, a good quality glycol base anti-freeze solution, should be used during the winter months.

In order to avoid an air lock when draining or refilling the cooling system, the heat control on the tunnel top should be placed in the 'Hot' position, and the tap on the radiator be opened (or vent plug be removed - Series One vehicles). The capacity of the system (with heater) is 18 pints (10.3 litres; 21.6 US pints). Coolant temperature is shown on an electrically operated instrument mounted on the facial panel.

K.2 - DRAIN AND REFILL.

If an anti-freeze mixture is being used, it is suggested that the coolant be drained into a suitable container and carefully preserved for replacement.

To enable this operation to be carried out efficiently it is advisable to remove the chassis closing plate before placing the container beneath this area, at the lower water pipe to hose connection.

From beneath the vehicle: remove the three bolts and spring and penny washers holding the rear of the chassis closing plate. Undo the two nuts and washers holding the front of the plate. Remove the two bolts and washers from within the front luggage compartment, and remove the plate by withdrawing the front lip of the plate from above the anti roll-bar. Place a clean container beneath the opening.

To drain.

Remove the spare wheel and tool kit from the front luggage compartment.

Remove the two steering unit access panels (attached by eleven self-tap screws). Remove the header tank filler cap.

Remove the vent plug, (or open the tap) on the top of the radiator.

Undo the hose clip at the connection to the lower water pipe connection where it protrudes through the front of the chassis cross-member (see fig.2).

Deflect the flow of coolant from the detached connections to either side of the chassis closing plate (if still in situ).

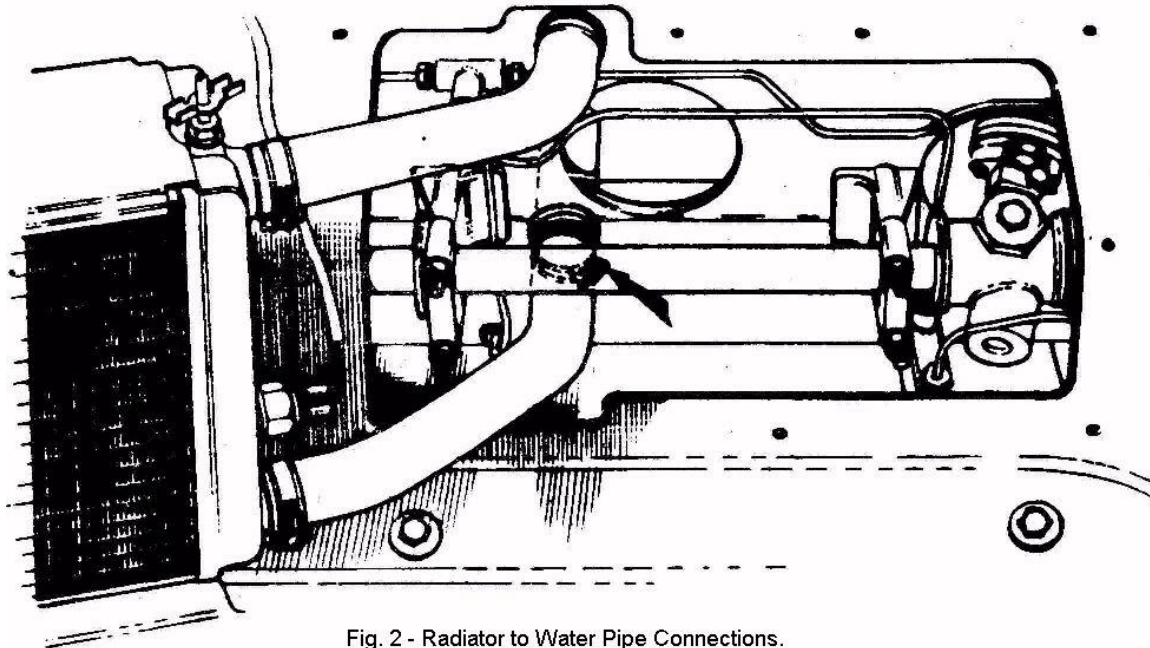


Fig. 2 - Radiator to Water Pipe Connections.

Using a 17 mm. socket wrench or spanner, undo the drain plug situated on the right hand side of the engine to drain the cylinder block. After coolant has been drained:

Reconnect the flexible hose from the radiator to the lower chassis water pipe and tighten the hose clip.
 Refit the chassis closing plate (if removed).
 Refit the two steering unit access panels.
 Replace the drain plug on the engine and tighten.
 Replace the header tank filler cap.
 Close vent tap or refit plug on radiator.

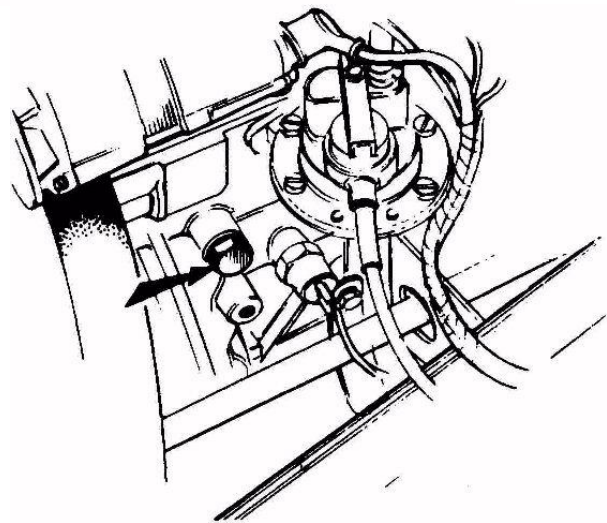


Fig. 3 - Cylinder Block Coolant Drain Plug.

To refill.

- 1) Pull the heater control knob situated on the tunnel top to 'Hot' position.
- 2) Remove the vent plug, or open the tap on the top of the radiator.
- 3) Remove the filler cap on the header tank and fill with coolant until coolant escapes continuously from the vent on the radiator.
- 4) Replace vent plug-finger tight, or close tap.
- 5) Fill the header tank to the brim - keep topped up.
- 6) Start engine and run at about 1500 r.p.m, constantly topping up with coolant.

- 7) Remove the clip and pull off the outlet hose from the pipe on the heater valve. Nip the end of the hose until coolant issues continuously from the pipe on the heater valve. Refit the hose to the pipe and tighten the clip.
- 8) Open the vent screw on the manifold vent pipe and close when the coolant escapes continuously.
- 9) Check that the radiator and heater are warming up. If not repeat operations 3, 7 and 8.
- 10) Occasionally slacken the vent plug or tap on the radiator to bleed out any trapped air.
- 11) Run until not - i.e. fan starts.
- 12) Top up and replace header tank cap.

NOTE (New Vehicles Only).

Check coolant level after first 100 miles (160 km) and daily for the first ten days of use. Take great care when removing filler cap if the system is not cold. Coolant level, when warm, should be up to the filler cap, and when cold should be no lower than 4 in. (101 mm) below the neck of the header tank orifice.

K.3 – FROST PRECAUTIONS.

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 a reputable brand of anti-freeze solution should be used, and added in the quantities stipulated by the manufacturers.

Owing to the difficulties in completely draining the heater system with normal draining of the engine cooling system, it is essential that anti-freeze is used when cold conditions are anticipated.

An anti-freeze solution, based on inhibited ethylene glycol is recommended. Anti-freeze solutions using alcohol as a base are not suitable, as they are subject to loss by evaporation.

The quantities of anti-freeze for various degrees of protection may differ slightly according to the manufacturers' recommendations.

It is recommended as a guide that the following proportions of anti-freeze solution be used.

Degrees of frost: (F & C)	0 F (-17 C)	-8 F (-22 C)	-18 F (-28 C)
Proportion (per cent)	25%	30%	35%
	4.5 pints	5.4 pints	6.3 pints
Amounts of antifreeze :	(2.5 litres;	(3.1 litres;	(3.5 litres
	5.4 US pints	6.5 US pints)	7.5 US pints)

The percentage of anti-freeze in the cooling system should be checked regularly by measuring the specific gravity of the coolant with a suitable hydrometer, calibrated at 60°F. When checking the specific gravity, the temperature of the coolant should be between 58 and 62°F but if this is inconvenient see that the reading taken is corrected to 60°F. Instructions for this are normally available for the particular hydrometer in use.

Before adding the anti-freeze solution, thoroughly flush out the cooling system (including cylinder block) and ascertain that all hoses and connections are in perfect condition.

The anti-freeze solution recommended does not usually evaporate, thus apart from leakage, it should only be necessary to top up with water as the level in the header tank drops.

K.4 - THERMOSTAT - REMOVING AND REPLACING.**To remove.**

Drain the cooling system (see section K.2).

Remove the rear luggage compartment by undoing the two bolts set in the floor of the unit, taking care to note the quantity and position of the spacer washers situated between the cross member and the under surface of the compartment.

Undo the three hose clips on the 90° flexible pipe immediately beneath the alternator, taking care to note their relative positions (see fig.4).

Undo the fourth hose clip and remove the 90° flexible pipe from the water pump and its vertical connection with the return pipe.

Carefully withdraw the thermostat from the body of the water pump.

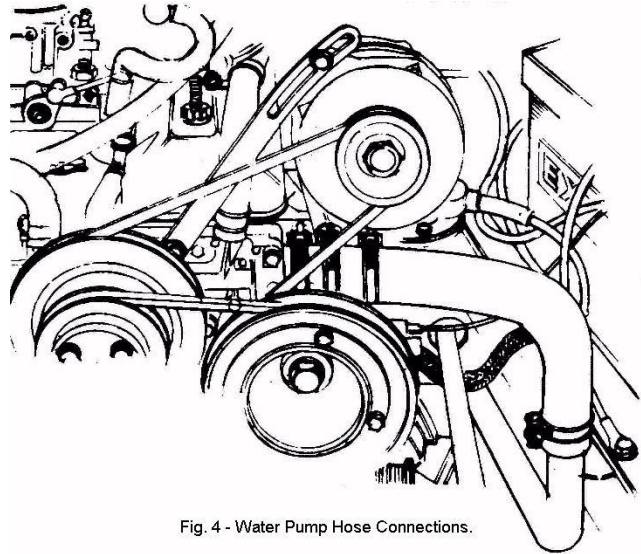


Fig. 4 - Water Pump Hose Connections.

To replace.

Reverse the procedure outlined above.

Check that the thermostat leak hole is upwards, opposite the slot in the water pump.

K.5 - WATER PUMP - REMOVING AND REFITTING.**To remove.**

Disconnect the battery (negative lead first).

Drain the cooling system (see section K.2).

Remove the outer camshaft pulley flange, the shims and the belt. Loosen the alternator fastenings and remove the belt.

Remove the alternator belt tension bolt on the pump.

Disconnect the hoses from the water pump. Remove the pump securing bolts.

Free it by means of a plastic mallet and remove it.

Remove the backplate and clean the gasket faces.

To refit.

Carry out the removing operations in reverse. Carefully remove any sharp edges from the ribs on the water pump ends in order to avoid damage to the hoses.

The gaskets are fitted dry.

Check that the thermostat leak hole is upwards, opposite the slot in the pump body (see fig. 5).

Tighten the hose (on the pipe) from the manifold to pump body by means of key (Part No 46E 6433). When fitting the water pump

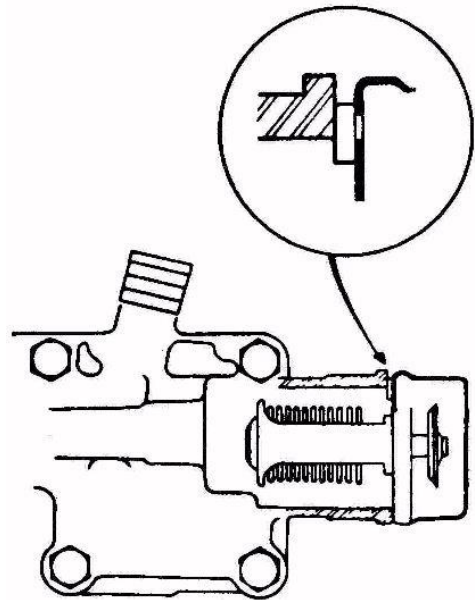


Fig. 5 - Thermostat Location.

drive belt, slowly tighten the nuts on the outer flange of the camshaft.

Note. On no account should the pulley securing bolts be used to turn the engine. One must therefore:

- Lift one side of the rear of the vehicle.
- Engage fourth gear.
- Rotate the road wheel in the forward drive direction.
- Check the belt deflection by means of tool (Part No 46M 6206) (see fig. 6).
- Alternator belt 7 to 9.5 mm (9/32" to 3/8").
- Water pump belt 2.5 to 4 mm (3/32" to 5/32").

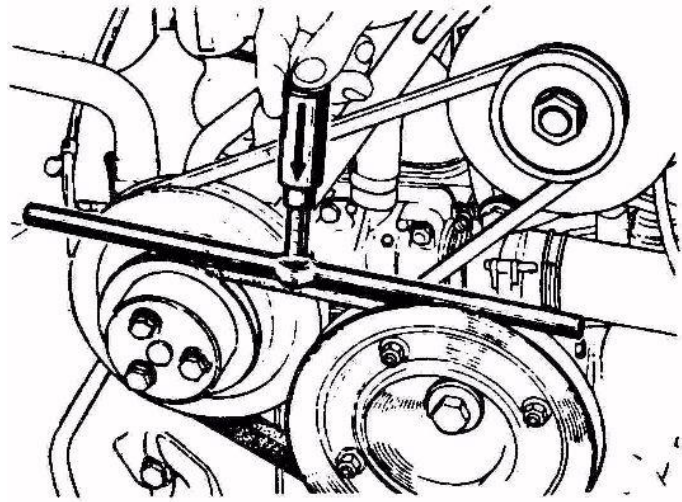


Fig. 6 - Water Pump Vee Belt Adjustment.

Fill the cooling system (see section K.2). Run the engine and check for leaks.

K.6 - HEADER TANK - TO REMOVE AND REPLACE.

To remove.

Drain the cooling system (see section K.2). Undo the two hose clips adjacent to the header tank at inlet and outlet connectors. Remove the two self tap screws securing the heater control valve to the bracket on the header tank.

Pull the vent pipe to the filler neck through the aperture in the side of the engine compartment. Undo the nut and washer securing the leg of the tank to the chassis (See fig.7).

Remove the tank.

To replace.

Reverse the procedure outlined above.

Refill the cooling system (see section K.2).

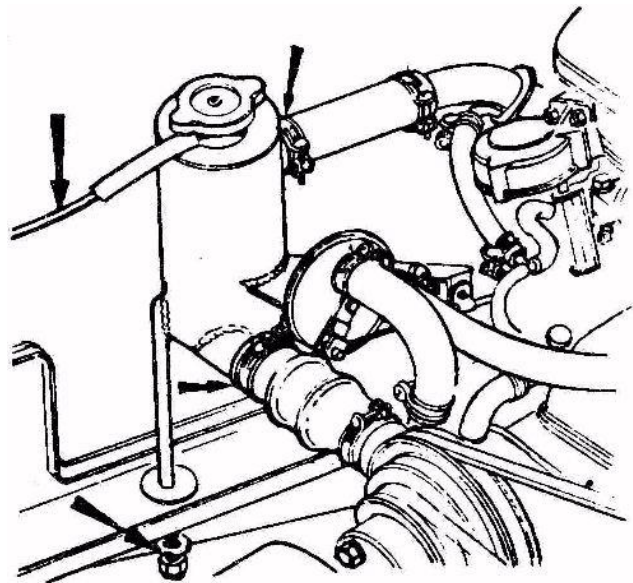


Fig. 7 - Cooling System Header Tank.

NOTE. For information regarding the heater control valve, see section 'P' (Heating and Ventilation).

K.7 - RADIATOR FAN - REMOVING AND REFITTING.

To remove.

Unscrew the two pivot bolts and remove the front luggage compartment lid taking care to note the quantity and position of the spacer washers.

Remove the spare wheel and tool kit etc. from the lower compartment.

Detach the red and black leads from the fan relay situated by the side of the washer bottle.

Using a 7/16" A.F. socket wrench, undo the four Nyloc nuts and washers securing fan unit to the stud fixings on the radiator straps.

Remove the fan unit from the vehicle.

To replace.

Reverse the procedure outlined previously.

Note:

The following action should be taken when replacing the unit, to ensure the correct functioning of the fan motor and its longevity.

1. Waterproofing:

The edges of the end caps on the motor unit should be taped over with black tank tape. The body of the motor and rubber cable protector should be covered with chassis undersealing compound.

2. Mounting:

The motor unit should be mounted such that the cable protector points down.

3. Brush Holders:

Series 1 and early Series 2 cars were fitted with a radiator fan motor having a reversed polarity to enable a suitable airflow direction. To improve its durability, a modification consisting of two 'pop' rivets was incorporated to the brush plate, this being instituted to prevent the brushes moving tangentially under the revised direction of rotation (see Section 'K.9'). Later models have been fitted with reversed pitch fan blades.

A check should be made when a new motor is installed to see that the airflow is correct.

K.8 - RADIATOR - REMOVING AND REFITTING.To remove.

Unscrew the two pivot bolts and remove the front luggage compartment lid taking care to note the quantity and position of the spacer washers.

Remove the spare wheel and tool kit etc. from the lower compartment.

Detach the red and black leads from the fan relay situated by the side of the washer bottle.

Detach the two black leads from the thermostat on the side of the radiator.

Drain the cooling system (see section K.2).

Undo the two hose clips and detach both flexible pipes from the radiator.

Undo the single 7/16" A.F. Nyloc nut and bolt securing the fixing strap on the top of the radiator to the wheel arch and remove the penny washer from within the arch.

Undo the two 7/16" A.F. Nyloc nuts and penny washers from the mounting studs where they project through the under surface of the vehicle.

Remove the radiator from the vehicle.

To replace.

Reverse the procedure outlined above.

Refill with coolant (see section K.2).

Note:

Thermocontactor switch (radiator thermostat).

Vehicles manufactured prior to Sept.1968, were equipped with a thermocontactor switch operating at 76/86° C. In order to improve the cooling, a revised switch operating at 68/82° C has been subsequently fitted. It is suggested that in the event of the original switch being unserviceable, it should be replaced by the new item.

K.9 - RADIATOR FAN MOTOR

In certain circumstances, the brushes in the radiator fan motor can tip thus causing premature failure of the motor.

The following modification to the brush gear of the motor will eliminate

this problem, prolonging the life and increasing the efficiency of the motor.

1. Remove the fan (Section 'K.7' and Section 'M').
2. Remove the fan from the motor. Detach the motor from the fan cowling by releasing the securing bolts.
3. Release the two through bolts securing the end covers to the motor body and remove end cover and brush gear.
4. With the brushes in position, scribe a line on each brush plate parallel to the side of each brush, equidistance from the brush and the existing small hole in the brush plate on the open side of the brush guide. Lift the brushes clear of their seating and drill a .0625 in. (1.875 mm) hole at the centre point of each scribe mark. The hole should pass into but NOT through the Tufnol base.
5. Insert a length of .0625 in. (1.875 mm) brazing wire into each hole and solder into place. Trim the wire flush with the top of the brush guide. Replace the brushes and ensure that they are free to move freely in their guides.
6. Re-assemble the motor, then waterproof by wrapping tape around the end cover joints with the body, finally applying a liberal coating of body underseal to the motor.
7. Refit the fan cowling and fan. Remount the fan unit in the car with the cable protector pointing downwards.
8. Connect the motor cables in their original positions, ensuring that the fan turns CLOCKWISE when viewed from the front of the car.

K.10 - RADIATOR COOLING FAN

Commencing at Chassis No. 7003070089Q, a new cooling fan (Part No. A054 K 6002) has been introduced which has a reversed blade pitch.

The new fan is directly interchangeable with the original unit, BUT since the fan blades now have a reversed pitch, to maintain the same direction airflow, the direction of rotation must be reversed. This is simply achieved by reversing the position of the cables fitted to the fan relay; transpose the RED cable to the black position and BLACK cable to the red position (see Fig.8).

By operating the heater/cooling switch on the facial panel, check that the airflow is blown onto the front wheel.

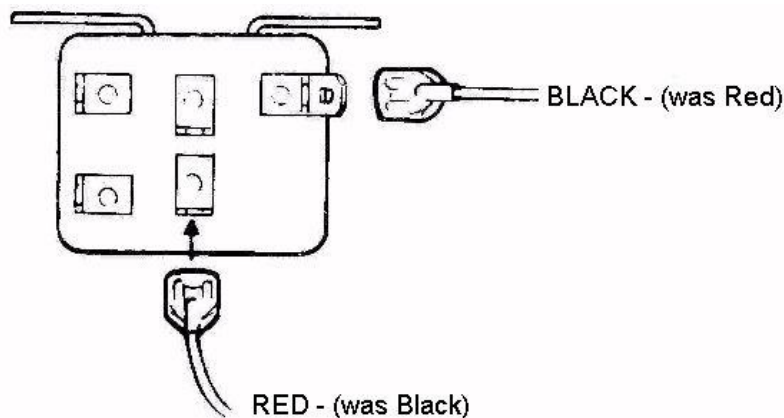


Fig. 8 - Position of Fan Relay Cables.