



Technical Bulletin

THE BRITISH MOTOR CORPORATION (AUSTRALIA) PTY. LIMITED

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FOR THE ATTENTION OF SERVICE AND PARTS MANAGERS

COOLING SYSTEMS

The purpose of this bulletin is to outline the general principle of pressurised and sealed cooling systems, thermostat operation; together with instructions on the important aspects of service procedure.

A Pressurised Cooling Systems

By providing a pressurised cooling system, loss of coolant by boiling, evaporation and surging is considerably reduced. One p. s. i. gauge pressure increase will raise the boiling point of water approximately 3°F , thus a system which is pressurised to 13 p. s. i. gauge will not boil until the coolant temperature reaches approximately 246°F .

B Sealed Cooling Systems

This system virtually eliminates coolant loss due to evaporation etc. As the coolant is heated, it expands and passes from the radiator top tank to the expansion tank. On cooling down, the fluid contracts and so is drawn back from the expansion tank into the radiator top tank. In this way the radiator will be full at all times, the level being automatically adjusted by the coolant present in the expansion tank. The operation of this system excludes all air from the circulating coolant and can therefore claim the added advantage of increased efficiency due to a reduction in corrosion with its attendant problems.

THE THERMOSTAT

The Thermostat is a temperature sensitive water flow control valve. It must never be discarded because it 'restricts the flow of water',

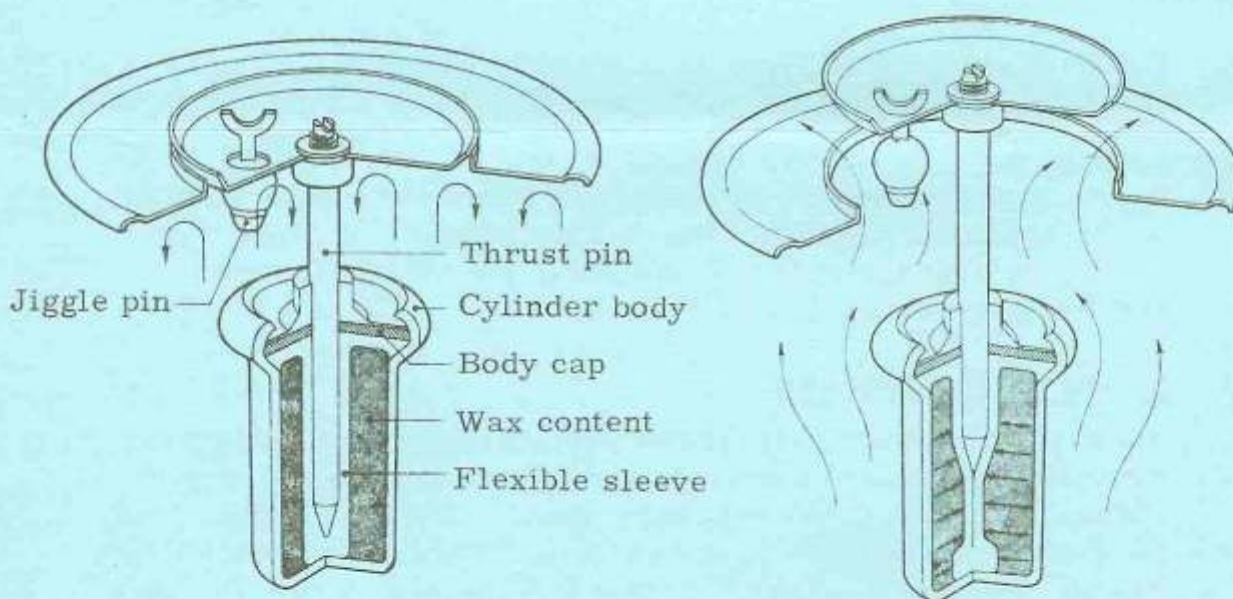
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greatly increased sludging and wear will result.

Two types of thermostat have been fitted in recent production:-

A The Bellows type thermostat is operated by the difference in pressure between the inside and outside of a flexible metal capsule. The capsule contains a volatile liquid which, when heated, vaporises and creates pressure, thereby opening the valve. Should this type fail then the valve automatically remains open.

B The Wax Element type thermostat consists of a cylinder, flexible sleeve, tapered thrust pin with valve head attached, and wax content. When heated, the wax, which is between cylinder and flexible sleeve, expands and collapses the sleeve which in turn forces the thrust pin outwards. Refer to the accompanying diagram.



Considerable misunderstanding, over the circumstances surrounding the failure of wax type thermostats, has resulted in unfair criticism being directed at this type, when compared with the Bellows type thermostat. It must therefore be explained that:-

1. The Wax type is NOT pressure sensitive as is the Bellows type, thus it permits the use of advanced design incorporating relatively high pressures in the system.
2. Experience has shown that the majority of cases where a power unit has overheated resulting in extensive damage, loss of coolant, and NOT thermostat failure has been the cause.

IMPORTANT: When loss of coolant has been experienced, it is possible that minor overheating has occurred, and although this may not be apparent from engine performance or appearance, it may have caused the thermostat to fail in closed position. Apart from correcting the cause of overheating, the thermostat **MUST** be removed and checked as instructed, refer Service Tests & Procedure section. **REMEMBER** the cost of checking the thermostat is slight compared with the cost of a major overheating problem. **DON'T TAKE RISKS.**

COOLING SYSTEM MAINTENANCE

EXTREME CAUTION MUST BE EXERCISED WHEN REMOVING THE RADIATOR CAP FROM ANY PRESSURISED SYSTEM IF THE COOLANT IS HOT. At normal operating temperature escaping steam, if suddenly released, is sufficient to cause injury.

If the coolant temperature is above 212^oF a sudden release of pressure will cause immediate uncontrolled boiling of the coolant and serious injury can result. If as pressure is initially released boiling is evident (audible warning) the system **MUST** be allowed to cool sufficiently to allow the safe removal of the cap.

In cases of urgency, sealed system coolant level can be checked when hot, if pressure is first released at the **EXPANSION TANK** by carefully releasing the pressure cap.

All new vehicles must be carefully checked prior to delivery to ensure that the coolant is 1½" below the radiator filler neck, or in the case of the sealed system to the top of the radiator filler neck. This must be done when the engine is cold. The level should again be checked with the engine cold at the After Sales Service and thereafter every 3000 miles. If the level is found to drop between inspections the system **MUST** be thoroughly checked, refer Service Tests & Procedure section.

To maintain the system in good order it must be drained, and reversed flushed at least once every two years, or when an additive such as anti-freeze is to be added, refer Service Tests & Procedure section.

SERVICE TESTS & PROCEDURE

A. Pressure Tests- the use of a pressurising tool (refer Service

Bulletin ST8/65E) enables the Service operator to make two important tests on the cooling system.

1. Radiator Cap Blow-off Pressure - this is most important as the radiator or expansion tank cap incorporates the Pressure Relief Valve for the system i. e. it governs the maximum pressure at which the system operates. If pressure is too low then loss of coolant and/or boiling will result, if too high, then leakage may occur.
 2. Operating Pressure Test - by pressurising the system with the above tool it is possible to locate leaks which would not be apparent from visual inspection. Before testing, the system should be brought to normal operating temperature. Internal leakage can be diagnosed by observing the attached pressure gauge for loss of pressure. If this condition occurs and the head gasket is suspect, pressurise system 2-3 p. s. i. gauge, and start motor. A leak from combustion chamber to cooling system will result in a rapid increase in gauge pressure.
- B. Thermostat Test - before testing the thermostat ensure that it is the correct type for the vehicle. Thermostat testing equipment with electric heating elements and thermometers are available; however in the absence of one of these, the thermostat may be tested by the following method:-
- i) Fill a container with water and SUSPEND the thermostat and a thermometer in the water. DO NOT place the thermostat or thermometer on the bottom of the container otherwise incorrect readings and possible damage will result.
 - ii) Heat water and observe temperature at which the thermostat begins to open. Cracking temperature for Wax element type fitted to B. M. C. Vehicles is 82°C (180°F) Valve lift at full open position is $0.312''$ ($5/16''$).
- C. Filling Sealed System - if for any reason the system has been drained, the following procedure must be adopted (Heater fitted):-
1. Remove radiator cap.
 2. Remove the heater inlet hose from the heater flow control valve.
 3. Ensure that the heater flow control valve is in the OFF position; in the case of the Morris 1100 (constant flow heater) plug the cylinder head outlet elbow.
 4. Attach a LOW pressure water supply to the heater inlet hose and fill the system until coolant rises to the top of the

radiator filler neck. An alternative method is to fill the system with the aid of a suitable funnel inserted in the heater inlet hose, however the low head of water may be insufficient to exclude all the air from the heater matrix. It may therefore be necessary to bleed the system, see below.

5. Reconnect heater hose to the heater flow control valve (Morris 1100, remove plug from elbow) and refit radiator cap.
6. If system is being flushed or anti-freeze is to be added the expansion tank MUST be drained, either by removal of the tank, or siphoning. Refill the expansion tank to the correct level (if adding anti-freeze then fill with the pre-mixed fluid to the correct percentage). This should be to a depth of $2\frac{1}{4}$ " Morris 1100, $2\frac{1}{2}$ " Austin 1800, with the engine COLD. Replace pressure cap on expansion tank.
7. Run engine up to operating temperature and allow to cool. Remove radiator cap and top up with coolant to top of radiator filler neck. Replace cap.
8. Check coolant level in expansion tank.

D. Filling Pressurised Systems - the above method may be used for this type of system with the following alterations:-

1. Fill to a level of $1\frac{1}{2}$ " below radiator filler neck.
2. Disregard instructions on expansion tank.

E. Method of Bleeding (BOTH SYSTEMS) - if air is trapped in the system, start engine and run at a fast idle, OPEN heater flow control valve (if fitted), disconnect the heater outlet hose and bleed until all air is removed (topping up as required), reconnect heater hose and stop engine.

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SERVICE DIVISION

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