Pressure Merchant – Ins, Outs & In-betweens of the Radiator Cap

"Try Our Recovery Plan"

Introduction.

Radiator caps just sit there providing excellent service with rarely any let down on their part. Do you understand the service our pressure merchant provides? Well if not then either whet your curiosity by reading the summary and viewing the sequenced images or jump into the detailed flow that expands from here.

Parts of the Cooling System {Pictures 1 & 11}.

The radiator cap is only one part of a system. System parts are:

-Thermostat. Controls coolant temperature to a working specification
-Water Pump. Provides positive coolant circulation
-Radiator. Heat transfer to the air
-Radiator Fan. Aids heat transfer with guaranteed airflow
-Radiator Cap. Maintain pressurisation of coolant within design parameters
-External expansion container. Reservoir for recovering coolant

Picture 1 Cooling system

Why a Radiator Cap?

Earliest radiator caps kept the coolant contained at atmospheric pressure. Although it was soon appreciated that gains in engine efficiency would be achieved if the radiator cap were redesigned to pressurize the coolant and raise its boiling point.

Short Steps to the Modern Radiator Cap [Picture2]
MG into the 1960's had pressurized coolant systems that relied on the radiator cap to provide a standard pressure in conjunction with an overflow pipe that expelled any excess coolant.

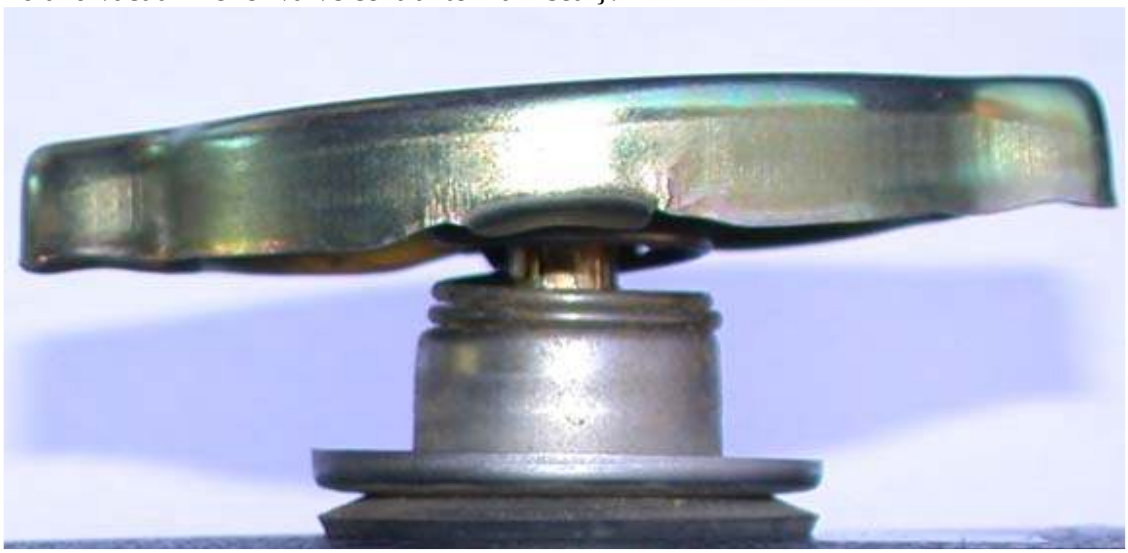
Late1960's & 1970's cars such as the MGB and Austin/Morris 1800 had an external brass expansion container, with pressurizing cap, added to prevent any excess coolant being lost.

From about the 1980's most manufacturers where beginning to use a recovery type lid on the radiator. The external expansion container now had added advantages in that it was not pressurized and was either glass or plastic for ease of inspection and replenishment.

Picture 2 Radiator Caps - Recovery type left and standard 1950's type right

Standard ZA/ZB Magnette Radiator Cap [Pictures 3a & 3b]

The MG Z type Magnette uses a radiator cap **{Brand=CPC. Part No.=506-07}** rated at 4 lb or 7 lb. Its function is to allow the coolant to reach 4lb and maintain this value under operating conditions [Note main seal and its 4 lb spring in Picture 3a].
Additionally once the engine is stopped a second valve comes into play to relieve the vacuum formed by the cooling of the radiator fluid {Picture 3b shows brass disc inside lid and vacuum relief valve central to main seal}.



Picture 3a Side View – Standard 50's Radiator Cap

Picture 3b End View
– Standard 50's Radiator Cap. Note vacuum relief valve at centre

Operation of the Standard 4 lb 50's Coolant System

Picture 4 Coolant under 4lbs and pressure relieved once over 4 lbs

Once the engine is started the coolant will begin to warm up, expanding in the process to develop a pressure that eventually lifts the tensioned main seal of the radiator cap. Lifting the main seal vents the excess pressure to maintain the desired 4lb operating value.

Picture 5. Radiator goes cold and relief valve sucked open.

Switching the engine off removes the heat from internal combustion but heat stored in the engine will continue to raise the coolants temperature and pressure. Often fluid is seen coming out of the overflow pipe at this point. Eventually the temperature peaks and begins to cool. Cooling results in the radiator fluid contracting and sucking the vacuum relief valve open [see Picture 3b]. Also note vacuum draws air from overflow pipe and possibly cap to housing fit [Picture 5].

Picture 6. 1950's Radiator Housing with Cap installed – Side and End view

The radiator cap housing is manufactured from brass [Picture 6 shows housing removed from the radiator] and designed with: locating cutouts, cam periphery, stops for safe cap fit, internal seat for main pressure seal and overflow outlet.

ZA/ZB Magnette - Modified to accept Recovery Radiator Cap

A 7 lb recovery type radiator cap **{Brand= CPC. Part No=536-07}** is available although the housing it locates into on the 1950's MG Magnette needs to be changed to accept its shorter reach. Picture 2 gives a height comparison of both cap types.

The prime feature of this recovery cap is the large seal just under the lid and prominent coolant recovery [vacuum relief] valve centred at the main seal. Picture 7a shows 7 lb spring, main seal, recovery valve and partially visible large atmosphere seal at the lid. Picture 7b clearly shows main valve seal and co located recovery valve.

Picture 7a Recovery Cap- Side profile

Picture 7b Recovery Cap – End View

7 lb Recovery Radiator Cap- Operation

Picture 8a. Internal pressure less than 7 lb.

Internal pressure in the radiator builds up under operating conditions to act against the main seal and its opposing spring tension. Once pressure exceeds 7 lb coolant will push past the main seal to the expansion container.

Picture 8b Radiator Cools.

After the engine is switched off the heat will eventually dissipate to the point where the coolant begins to contract .As the fluid contracts extra coolant is drawn from the expansion contain into the radiator to maintain its volume.

Recovery valve is prominent in returning fluid to the radiator by the differential pressure between radiator [vacuum] and expansion container [atmosphere]. Not to be taken for granted the air [atmosphere] seal, located on the inside of the cap, forces the differential pressure to always work via the overflow outlet.

Recovery cap and its housing
It's my understanding that to upgrade to a standard available radiator recovery cap the best option is to fit the radiator with a matching housing. Picture 9 is provided to help.

Picture 9. Radiator Housing with Recovery Cap installed – Side and End view

Summary

Motoring up a very steep hill to a radio communications tower seemed uneventful until the car had been parked and I was walking away, only to be stopped by the sound of the radiator chundering [releasing] its little heart [coolant] out through the overflow pipe.

Nothing was wrong or at fault but perhaps this doesn't need to happen.

Asking around provided two options:
One – Use the radiator expansion container from an Austin1800/MGB.
This requires a special blanking cap on the radiator, pressure pipe from radiator to expansion container and normal but shorter radiator cap on expansion container.
Two – Change the radiator cap housing to accept a more modern recovery type of cap.
Now any suitable container could be used for the non-pressurized expansion container, although the interconnection tube needs to be of reasonable pressure/vacuum quality.

> **Option Two** seemed a good way to go. See preceding text and pictures.
> **Also consider Appendix 1** below for thoughts on expansion containers

Appendix1

Picture 10. Four types of expansion containers

An expansion container was never designed for our great little MG ZA/ZB Magnette; where as later cars have them and provide some options. Above are practical examples that will now be commented on:

#***No1*** Advantages: Unobtrusive, ideal shape, practical to install and easy to fill.
Disadvantages: Can't see coolant level and heavy {made of brass}.
Type- Brass fabrication

#***No2*** Advantages: Ideal shape, easy to install, level is easy to see and easy to fill.
Disadvantages: Looks cheap and distorts with heat.
Type – Plastic drink bottle

No3 Advantages: Well made, purpose built, and used by Austin and MG
Disadvantages: Obtrusive, additional cap for radiator, pressure cap fitted, interconnecting pressure pipe and coolant level cannot be seen.
Type – Brass automotive expansion container {BMC}

#***No4*** Advantages: very good shape, visible coolant level, marked levels, practical opening, and ease of installation.
Disadvantages: Non original
Type – Plastic automotive expansion container {early Nissan}

Appendix 1 continued

**Note [a] Non-pressurized container must have a vented lid.

##Note [b] Overflow pipe should be of a length and shape within the expansion container so it wont be blocked by jamming or sucking on any internal surface; it can happen! Importantly use tubing that will not collapse or shrink or distort.

Picture 11. Recovery system

Warped Wisdom. *As the squirrel will always tell you, "Don't waste the excess, have a recovery plan; store in the good times and recover when things cool off".*

-End-

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PRESSURE
UNDER
4 lbs


SEAL MOVED
UP. FORCE
OVER 4LBS