Welcome to the V8 Newsletter

GTS104 thermostat – drilled vent or undrilled?

Dave Morris sought clarification on whether the MGV8 thermostat is vented. He asked "does anyone know if the thermostat on the RV8 should be drilled or undrilled? I ask because I decided to replace mine while renewing the cooling system hoses using silicon hose kit from Clive Wheatley mg8parts which I am very happy with. I ordered a new **GTS104** thermostat from one of the usual suppliers and found when it arrived there was no vent. The old one (I don't know if it is original but doubt it) was the drilled type with the little bobble valve. I have tried to look at the spec for the GTS104 and can find both types so now I am not sure which is correct or best".

Looking at the service repair section (Cooling system: Repair, page 3) of the RV8 Repair Manual AKM7153ENG the procedure for replacing the thermostat is set out. The illustration in the workshop manual shows the thermostat (**1)** mounted horizontally and a note specifically says "fit the thermostat to the housing with the vent pin (bobble valve) (**2**) in the 12 o'clock position – caution, failure to position the thermostat correctly can lead to air locks and overheating".

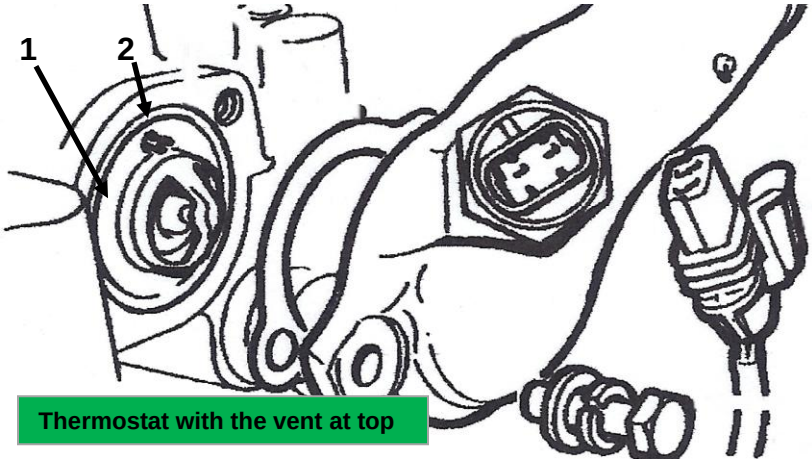
Dave Morris later added he had "spoken with Brown & Gammons and they said the thermostat does need to be vented. So I will indeed drill it accordingly, but I wonder why the drilled type isn't specified as it was on my old XJR?"

So it is clear the thermostat originally fitted to both the MGBGTV8 and RV8 model had a vent pin and it is important that it is located correctly in the thermostat housing.

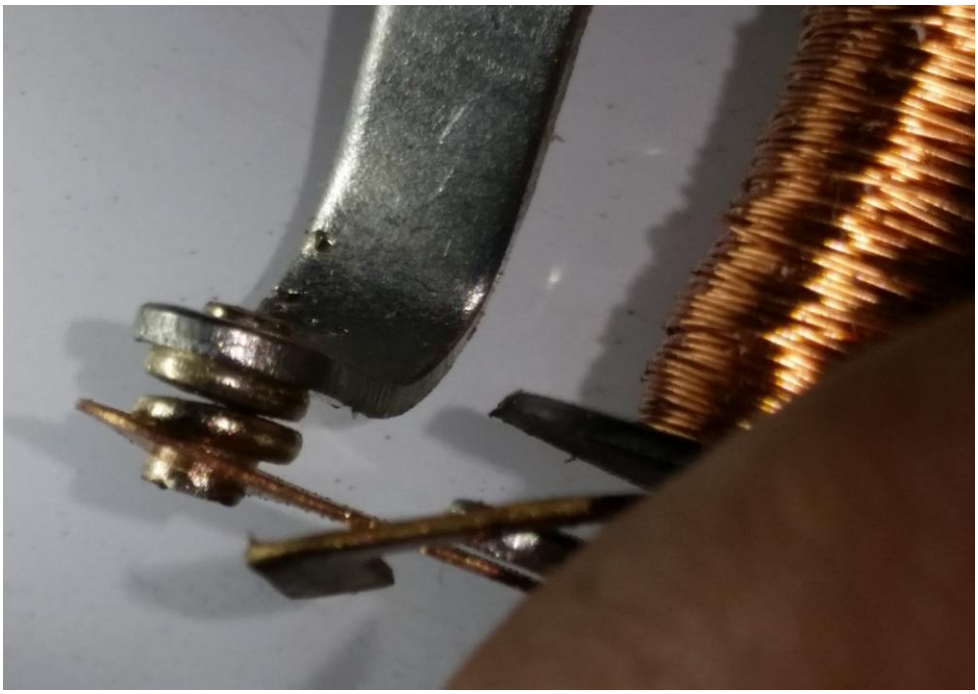
Nic Houslip says "the Rover parts manual for the RV8 lists the thermostat as **GTS104**, so we are sure that is the correct part. I think that a caution for members is to check for the presence of the vent pin, bleed valve, bobble pin or whatever it is called, and to reject any thermostat supplied that does not have one. A quick survey of the leading parts suppliers shows four seem to offer a GTS104 with **no vent** and three suppliers offer a GTS104 with a vent **–** they are Brown & Gammons, Clive Wheatley mgv8parts and Moss Europe. There is also a very wide variation in price, from as little as £2.40 to over £6.00, but in absolute terms not expensive.

Dave Morris added "yesterday I went to my local motor factor and looked at their stock of thermostats. What I found was that all of their 82°C thermostats, including those listed as a GTS104 equivalent, were unvented. Conversely their 88°C part, listed for 3.9 Discoveries and Range Rovers, was vented. Not a very scientific survey I know but what I think it means is that we need to take care when buying replacements from non-specialist suppliers using the MG or Unipart part numbers".

Nic Houslip added "the small drilled hole is a bleed hole, primarily to allow a small amount of heated water to go past the thermostat and ensure that the wax bulb gets heated and allows the thermostat to open. It also allows the release of any air trapped (which may also prevent the bulb getting heated) to pass. The "bobble valve" allows a reverse flow of water during cooling down when the thermostat may be closed. When buying a replacement GTS104 thermostat you need to check carefully it has a vent and bobble valve".



Thermostat with the vent at top



Fault with the starter 6RA relay

The familiar bright alloy case of a 6RA relay on the offside inner wing of an MGBGTV8 greets you every time you go into the engine bay. The 6RA forward of the fuse box controls the twin cooling fans and the other on the bulkhead side controls the engagement of the starter motor. In both cases the 6RA relay is managing the switching on and off of a high current device with a signal from a switch on a low current circuit – so in effect the 6RA is **relaying the signal** from the low current circuit into an action on a high current circuit.

Recently Steve Newton replaced the 6RA relay for the starter motor as part of the refurbishment of an MGBGTV8 owned by a longstanding V8 Register member, John Gay. Within a day or so a fault developed where having turned on the ignition key to engage the starter motor to fire up the engine, the starter would not stop turning once the engine was running. Usually once the engine fires up the starter motor automatically stops and disengages, but with John's V8 even turning the ignition off left the starter motor turning! The only way to stop this was to tap the alloy case of the 6RA to free the contacts or to break the power supply to the starter motor from the batteries. With John's car he has a battery isolator switch so that was a readily available option.

Steve replaced the 6RA but the problem was repeated a few days later. So he opened up both 6RA relays to investigate what was going on and causing this problem. What he found was sadly not unusual with many replacement parts in the classic car spares market today – poor quality parts, often imported from Far Eastern suppliers and manufacturers.

On examining the faulty 6RA relay Steve found the contacts in the switch came together under the magnetic force of the coil in the relay but did so at an angle and not parallel to each other as they should, so there was a reduced area of surface contact between the contacts. With the large current drawn by the starter motor, the result was a fusing in one spot with the limited area of surface contact between the fixed and flexing contacts. This could only be broken by tapping the 6RA case to free the contacts. Steve also detected a lack of sufficient spring tension on the sprung blade (the lower of the two contacts in the photo above).

Where a 6RA relay is used in less demanding roles, for example with the twin cooling fans, the surface fusing problem above is far less likely to arise. So a serious operational fault will not develop although we have seen a case of a "burn out" on the **C1** terminal with a 6RA relay used for twin cooling fans.

Why were 6RA relays used?

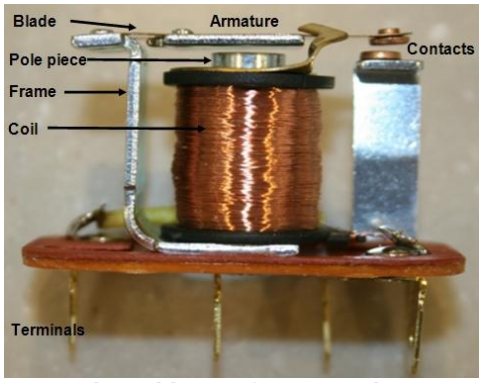
As with many other cars of the period, MGBGTV8s used Lucas 6RA relays to control the power supply to various electrical ancillaries, specifically those that draw larger currents like the starter motor and twin cooling fans fitted to V8s. The benefit of using a relay, an electrically operated switch, is it allows a high current circuit (for example the circuit supplying power to the twin fans) to be controlled by an isolated, low current circuit (the circuit with the switch). This enables all the wiring handling the highest currents to be located within the engine bay but controlled by low current wiring routed from a switch. With the twin fans the switch is the Otter thermostat switch on the top of the MGBGTV8 engine but in cases where the switch is near the dashboard, removing the high current wiring from the dashboard area reduces a potential fire hazard and also allows a lighter grade of wiring to be used for the switch.

How does a 6RA relay work?

When reading workshop notes or V8 Bulletin Board threads mentioning technical terms or particular replacement parts, many members may welcome information on how various components work. The 6RA relay fitted to the MGBGTV8 model is an example and here Nic Houslip explains how a 6RA relay works.

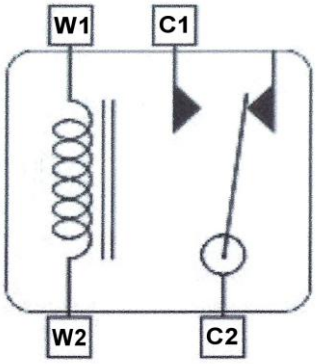
The 6RA designation is a generic one and more properly it should include information on the number of contacts so that you get the right part. To start with, let's use the one we often see on the MGBGTV8, the **6RA with 4 terminals**. The 6RA relay below is a new one so I scraped away the silicon sealant that was applied to keep the canister watertight and bent the crimps slightly to allow the internal workings to be exposed. Highlighting the markings stamped into the Bakelite base with a small marker pen ensures that the legend **C1**, **C2**, **W1** and **W2** is now clear.

Older 6RA relays may not have the silicon sealant, certainly original equipment would not have had sealant. With replacement 6RAs the sealant also obscures the terminal markings, so you may need good light and even a magnifying glass to see them.



Internal workings of a 6RA relay

If we now turn to the internal workings you can clearly see the **Coil** (or winding) in the centre of the photo. The coils are wound on an insulating former (the Bobbin) which is fitted over a soft iron **Pole piece**, the circular part protruding from the top of the Bobbin. Note too, the thick silver coloured iron frame that is fixed under the Coil and supports the **Armature** that is suspended above the Pole piece. The phosphor bronze spring that carries the armature, called the **Blade**, can be seen riveted to the frame and extends to



the right to carry the **Contact**, the button shaped piece top right, directly under it is the other Contact which is connected to Terminal **C1** via the silver coloured metal strip.

The Pole piece is riveted through the base and is actually the connection for the Contact to Terminal **C2**. When current is passed through the Coil via Terminals **W1** and **W2**, a magnetic flux is set up in the Pole piece which flows through the air gap that you see just above the Pole piece and under the Armature, back to the Frame and thus back to the Pole. This flux causes a magnetic force that attracts the Armature, closing the air gap and moving the upper Contact downwards toward the other Contact, thus making the electrical circuit. Soft Iron is the material of choice as it has little remanence, or lack of residual magnetism, which means the magnetic field collapses quickly when the current through the Coil stops and the Armature is no longer attracted.

Now the circuit is made, current will flow from Terminal **C2** via the frame, the riveted spring Blade to the upper and then the lower Contact and out via Terminal **C1** which is riveted to the metal strip that supports the lower Contact. This metal strip has another function that isn't immediately obvious, during final test after assembly the strip, which you will notice has a kink, is tweaked by the test operator to position the lower contact immediately below the upper.

The Contacts might seem to the layman to be simply a couple of buttons made of a material that conducts electricity well, but most of the development effort in relays in the last 100 years has been in this area. The choice of metal used depends on the duty the relay is required to perform, there are myriad choices and the manufacturer will have taken into account the operating environment, vibrations, life time cycles and many other factors such as pressure and speed of operation. The Contacts are arranged so that they do not appear to align very well, but this is deliberate, because as they come together the springy Blade bends a little and the Contacts move axially allowing them to "wipe" against each other, giving a slight cleaning action. Too much wipe introduces wear, so this has to be carefully controlled. The spring also exerts a force on the Contacts that keeps them together. A certain pressure is necessary to ensure low contact resistance.

The **top view of the 6RA relay** workings reveals a curious piece of bent brass that protrudes over the top of the Armature. Despite its crude construction, this is a very critical part of the relay and should not be bent or moved at all. Its function is to limit the size of the air gap between the Armature and Pole piece so that when the Coil is energized the Armature is instantly attracted. If the gap is too large the Armature may not pull in, too small and the contact separation may be too little.

Contact separation is also important when switching an inductive load, such as a motor or a solenoid, there is a voltage generated in the windings of a motor that is in opposition to the normal and depending on the magnetic properties of the iron and the assembly may be many times higher than the humble 12 volts being switched. Too little separation can allow this voltage (or back emf as it is known) to cause arcing that pits the contacts and erodes them. In more serious cases it could actually cause arcing which may weld them together.

An important consideration too is the **vibration** that the relay will experience in its daily life. If the relay is subject to shock loads caused for example by pot holes in the road it isn't difficult to understand that the force on the Armature may be sufficient to cause the Contacts to momentarily separate. Usually the manufacturer will have determined the correct orientation for the relay mounting. With a 6RA, bolting it to the bulkhead is probably the best possible location, although under a heavy bump and rebound there may be a slight axial displacement of the Contacts and momentarily loss of electrical contact.

Corrosion is a source of 6RA failure

The 6RA relay is prone to another curious failure mode; the construction of the relay is riveted and depending on the skill of the operator and the set-up of the press to do it, there may be a small resistance between the various parts, particularly at the rivets to the Faston or Lucar blades. Over time the penetration of moisture can result in corrosion setting in – the environment in the engine bay is a very nasty place, so there must be airflow, but when it's raining cats and dogs on the M1 a lot of water gets in there. What happens here is unexpected, the increase in resistance causes the blades and rivet to heat up and after some cycles the material of the rivet will lose its clamping force and resistance will increase, causing further heating. This becomes self-destroying as eventually the terminals will get quite hot, the heat is transferred to the Faston connector and this too will lose its temper and contribute, by lessened holding force, to further heating and leading to eventual burning of the Bakelite base and a failure just when you need the fans most.

The best recommendation here is to replace the 6RA relay and at the same time replace the crimped on Faston connections on the wires if you have any doubt about their holding force. If they pull off and go back on easily they may have softened, so replacement is a must.

Finally, when assembling the whole thing a quick spray of WD40 on the contacts blades makes them much easier to reconnect and will keep moisture away from the contact interfaces leading to long life.

V8 Workshop Notes series passes the 500 milestone!

Launched in April 1979 the V8 Workshop Notes series began with a note from John Dupont on removing and refitting a V8 water pump and in February 2016 the 500th note was released reporting a fault seen with 6RA relays supplied as replacement parts. That's an average of one new note a month for 38 years! The series of RV8 Workshop Notes was launched in in September 1999 and has reached 415 notes, so a combined total this month of 918 notes. With 31 notes generated over the last 12 months it's likely we will reach a thousand notes by the time we celebrate the 40th anniversary of the formation of the V8 Register in October 2018. The workshop notes are popular with V8 enthusiasts and are now supplied on a neat **Twister memory stick** bearing the V8 Register logo. The success of the workshop notes series underlines the way V8 members actively participate in the V8 Register by contributing articles and notes on servicing concerns and spares issues.

Visit to the Black Country Living Museum

Steve Newton has arranged a group visit to the Black Country Living Museum on **Saturday 9th April 2016** meeting at 11am. Located in Dudley in the West Midlands it is one of the finest and largest open-air museums in the United Kingdom. After very humble beginnings, a bright idea and 40 years of inspiration, this is twenty six acres worth exploring. Amazing as it may seem, they have created a 'place' – a real and lively place - where once there was nothing and nobody. Now with a village and charismatic residents to chat with, trams to ride and games to play. Things being made, stories to hear, people with their triumphs to admire and troubles to be thankful they are not ours. Contact Steve Newton on 07811 474774 or by email. Full details via the "More" webpage on the V8 website.

RV8 Spring Run in Yorkshire

Stuart Mumby is organising a Spring Run on **Sunday 24th April 2016**, primarily for MG RV8s, but all MGV8s are welcome. This coincides with the FBHVC Drive-it-Day and will offer an ideal opportunity to get your car out and be seen on this important annual event. The route will take in Bronte and Summer Wine Country in the scenic Yorkshire Pennines. The run will be free to enter for MG Car Club members, £5 for non-members. Please contact Stuart by email or on 01430 871078 if you wish to join the tour as it helps with catering arrangements. The day will start with coffee and morning victuals and end at a suitable refreshment venue. Full details via the "More" webpage on the V8 website.

V8 Technical Day 2016

Following the successful V8 Technical Days in 2014 and 2015, Roger Aldridge is planning another for **Saturday 21st May 2016** in the John Thornley Suite at Club Office with three speakers in the morning, lunch and then a move over to Frontline Developments in Abingdon for presentations on their activities and a tour of their new factory. There will also be a chance to look at their new MGBs. Contact Roger Aldridge to book a place. Full details via the "More" webpage on the V8 website.

V8 Autumn Tour 2016

The next V8 Tour in the popular series will be based in The New Forest National Park from **Thursday 1st to Monday 5th September 2016**. The tour will be through beautiful areas of the forest and visiting various establishments, including a winery, the famous Buckler's Hard where ships of the line were built and finishing at the Museum of Army Flying for a tour followed by a buffet lunch prior to departure for home. Contact Mike Lane on 01264 350040 to book a place. Full details via the "More" webpage on the V8 website.

Swiss-MGV8 event in Portugal before the EEOY 2017

MGV8 enthusiasts planning to travel to Portugal to attend the MG Car Club's European Event of the Year 2017 will welcome the early news that a preliminary event for V8 enthusiasts - "Visiting Portugal 2017" - is being planned there from **Saturday 29th July to Thursday 3rd August 2017** by the Swiss V8 Group run by Victor Rodrigues and his Swiss wife Evelyne. Although he has lived for many years in Zurich in Switzerland, Victor originally comes from Portugal and has used his local knowledge to arrange the additional event. He and Evelyne would welcome early indications of interest from V8 Register members. The number of cars will be limited to 20 with their crews. The planned accommodation is described in the preliminary information available via the "More" webpage on the V8 website.

Repairing an electronic key fob

Finding your electronic key fob has developed a fault - for example one of the buttons has fallen out or it simply stops working - can leave you with a puzzle as to how to get the fob repaired or replaced without too much hassle or expense. Richard Lomas reported in 2011 that he had used **Automobile Locksmith** to repair the fob for his RV8 and found an excellent service. He sent the fob on Wednesday and it was returned Friday morning with a new fob. They also sell both new and used remote transponder keys, blank key blades, replacement batteries and other parts for the auto locksmith industry and repair kits for technically-minded DIY people. Visit their website to see the full range of services they provide and the models they support or call them on 01733 705009 (Monday to Friday 8am to 5pm), you can pay online. See our "More" webpage for further details.

Where is a V8 I used to own?

An increasing number of enquiries are coming from enthusiasts who are trying to trace an MGV8 they had once owned and enjoyed in earlier years. Colin Matthews had an MGBV8GT from new, registration number **BRE 960M**, and wondered if by chance it is still in existence. On checking the V8 Database (which we believe has records of more than 70% of the surviving MGBGTV8s) there was no trace of a V8 with that registration number. On checking the VES (Vehicle Enquiry Service) on the GOV.UK website a record popped up reporting the car with that registration plate is an MG with a 3528cc engine and is taxed to 1st July 2016 and with a current MOT to 20th July 2016. So it appears this V8 is very much alive! Does anyone know this car?

In another case Bob Neville revealed a painting of an MGBGTV8 and would like it to be passed on to the current owner of the car. The painting notes the registration number was **JJH 263N**. An MGBGTV8 with the registration number JJH 263N is not recorded on the V8 Database so we did a Vehicle Enquiry Service check on the GOV.UK website which shows an MG in Red with a 3528cc engine is on a SORN with an MOT due to expire in April 2016. So it appears the car is out there - does anyone know the car and its owner so the painting can be passed to the present owner? See the painting and links to the VES GOV.UK website on **our "More" webpage at www.v8register.net/more.htm**