

# TEE ONE TOPICS

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Number 40 November 2004

## HEADER TANK FITTINGS



There are three things staring at you here. The filler cap, the cover of the level sensor and the steam valve cover.

**The Cap.** This arrangement was used on all Shadows and Phantoms V and VI. The filler cap was a hangover from the pre-war days when the Factory finally decided that the grille should be decorative and not contain the multi cellular radiator core! Its sole purpose was

to seal which it did by forcing a molded ridge on the lower part of the cap, onto a soft rubber annular seal. Two things can go wrong, the rubber seal will perish and/or the sealing ridge on the underside of the cap can be chipped through dropping it, destroying its sealing properties.

**The Level Sensor.** This consists of two prongs that poke into the tank. When the ends are exposed through the water level dropping, a circuit is broken a relay relays and the lights she's a-blinkin. Little trouble at this end except that in a few early cars their angle of 'insertion' was a little high. This resulted in the blinkin light coming on when going a bit quick around corners. The solution is to remove the prongs and bend them down slightly. They must not touch the internal surfaces. Occasionally one of the baffles in the tank becomes unsoldered and wanders around until it touches the prongs and presto the light she is on again. The only cure is to take the tank off and deliver it to your friendly radiator man who will unsolder the side seams open the tank up, re-solder the baffles and re assemble the tank.

**The Steam Valve.** Conventional radiator setups as you know use a spring loaded cap that seals on a flange at the bottom of the filler hole. When the pressure gets high enough through overheating it lifts the seal against the spring letting out the steam and coolant until the pressure has returned to normal.

The Factory used this system on the 'S' series Continentals probably to achieve clearance in their lowered bonnets.

The steam valves came in two sizes and consisted of a cage in which there was a disc valve sitting on a seat with an appropriate small spring holding it on its seat. The valve then worked the same way as the conventional radiator cap. The steam valve assemblies came in two sizes, large and small. The former are no longer available. To use the smaller valve the seat in the header tank needs to be modified with an appropriate washer for a seat. Either way the valve sits on a rubber seat to contain the coolant and is held down by the round cover seen so prominently on our cars.

There is another way. A number of operatives remove the screwed cap assembly and the steam valve, sealing the latter off. A 'conventional' radiator filler neck is then soldered to the tank and a conventional cap fitted. This arrangement was nearly used on the later Corniches except that the Factory went one step further and used a cap that is quite common these days is used for recovery systems. These caps have a two way valve. When the pressure gets too high the valve opens and allows coolant to escape but instead of squirting on the floor the overflow squirts into a bottle. When the engine cools, because the radiator is sealed a vacuum occurs and a separate valve in the cap allows the system to suck fluid back from the bottle. All cars now use this system, it just took the Factory over 50 years to adopt it. It does require that the whole cooling area is full and free of air.

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## OH WHAT A LOVERLY DOOR



It is a pity I can't produce this picture in colour for you, but the finished product in this 1987 Spirit is probably better than original.

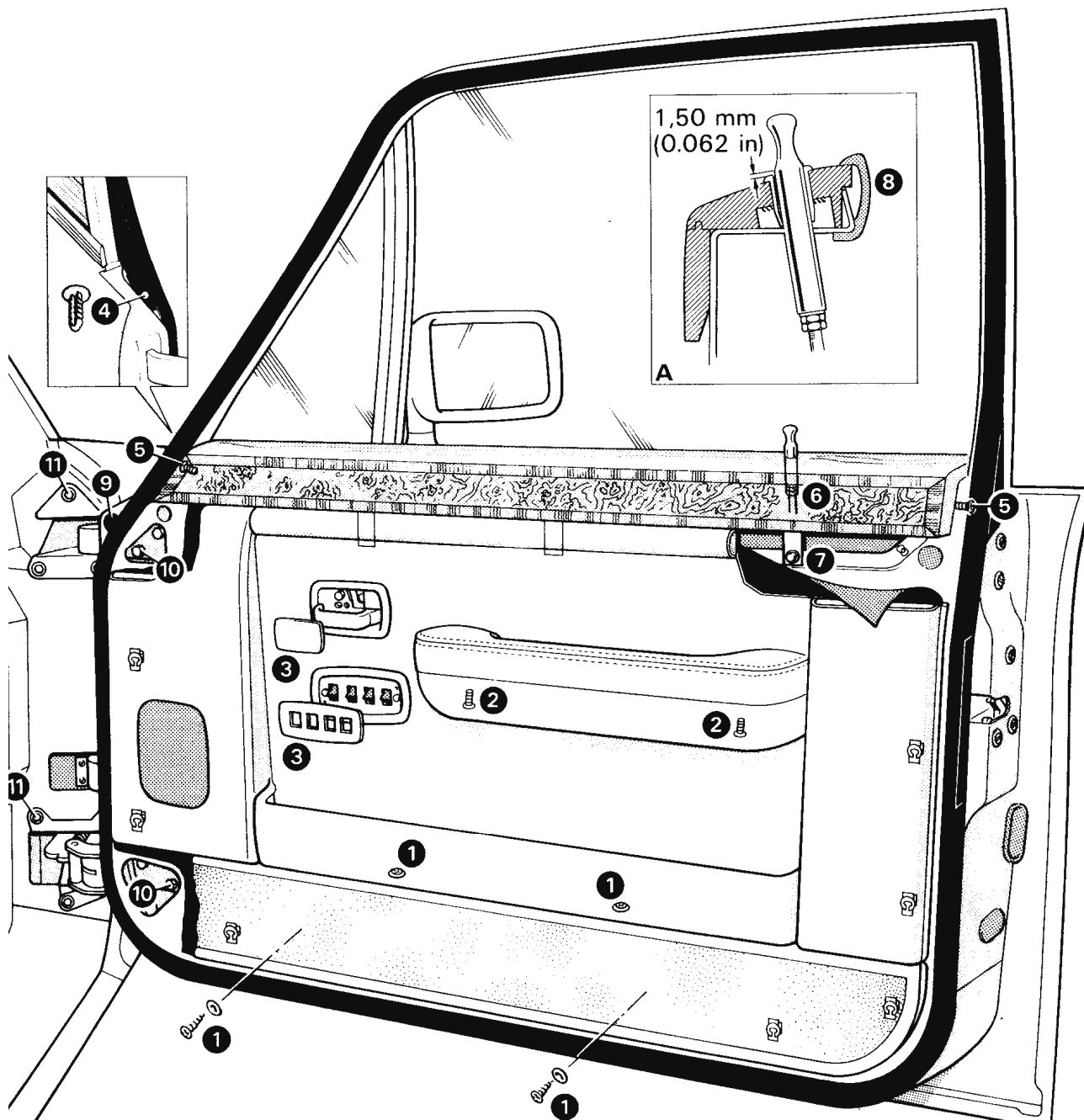
These cars have been bearing up under our relentless sun and the top of the wooden waist rails are starting to shed their coatings.

The result looks fairly horrible but if you have a reputable furniture restorer in the

neighborhood take the rails off and ask him to re-finish them. While you are at it Get a good leather

cleaner and take the opportunity to clean all the dirt off and soak the leather. Getting the waist rails off a car can be a bit daunting without a map so I am reproducing an excellent guide from the Factory to give the order in which things should be done in a 1987 car.

### Front Doors



This is a time consuming job but doesn't require the skills of either Einstein or Henry Royce. But a few hints may help.



### **Item 1 the pocket screws**

These are chrome plated self tappers countersunk heads and pass through finishing washers. If these are missing or rusted replace them

### **Item 3 the escutcheon plates.**

Next time you go to the dentist ask him/her for a few of his 'old' probes - those things they use to try and prise the teeth out of your head with the excuse they are looking for cavities. I think they are just trying to create them! Anyhow they are usually useless when they get blunt. But they are great for poking behind escutcheons and carefully prising them out. When they are out have a good look at the little plastic ferrules the legs of the plates plug into. If they are worn cracked or missing replace them as they are readily available. And of course if a leg is broken off, replace the plate.

### **Item 5 Waist rail end screws**

You need to be bloody bold and resolute here. The door seals and the push button (4) needs to be prised free of the door before you can get at these screws. They are a countersunk metric metal thread.

### **Item 6 Locking Push Button.**

You need to loosen the locknut under the button before remove the latter. If the waist rails are to be re-finished then order black sleeves and retaining clips that the button runs in since trying to remove them will break them.

Lastly take particular note and preferably some pics of all the packing pieces on and around the waist rail.



The above is the front end of one of the rails. The captive nut is a metal thread and not infrequently you will find vandals have been there and inserted self tappers. The assembly is the one into which the end screws (5) under the door seals screw.



One of the elusive end screws. When you deliver the rails to the finisher you may choose to remove all the hardware or leave it to him. Note however that the window side seal attached to the glass side of the waist rail requires both gluing and stapling.



If the fume seal or plastic liner is missing or badly torn get a sheet of builders' plastic and make a new one. Without it moisture that inevitably gets down into the door will damage the door liner and rot the wooden base.

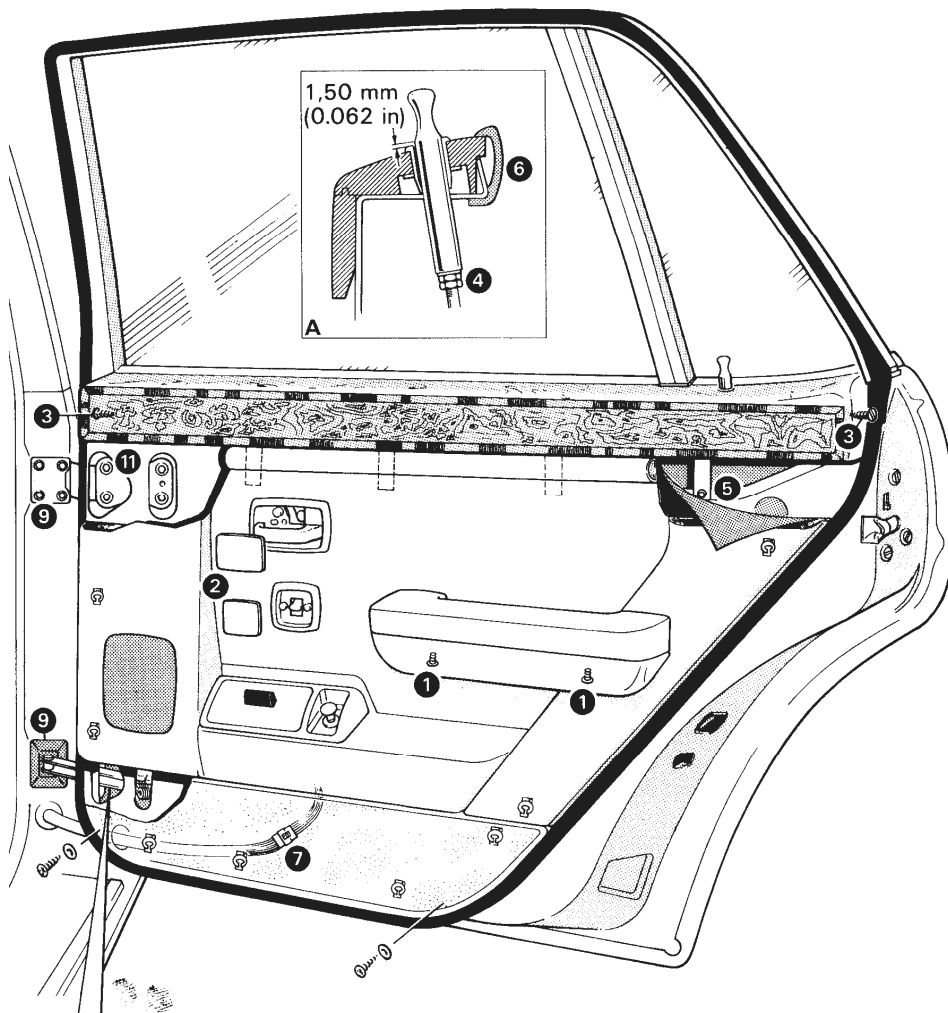




And whilst on the subject of doors, have you noticed the number of cars with badly scratched escutcheon plates around the inner door handles?

And you will also notice scratches on the driver's door window. They seem to be unique to Rolls-Royce cars. The answer is diamonds worn by bejeweled maidens. A novelle malady!

The back door presents no new problems and the method of dismantling is much the same but here is a diagram for that.



## OBVIOUS BITS MISSING



None of my readers would be guilty of this, a missing bonnet cushion – see the dirty hole in the centre and no filter on the air intake for the air conditioning. Both items are used on both Shadows and the Spirits and their derivatives. Both are important. The bonnet cushion is the only positive locator for the panel. If it is not there the thing can get damaged if slammed but more likely the sideways movement of the

bonnet while traveling will damage the paintwork. The filter of course prevents the air conditioner harvesting the local leaf population and mulching it through the fans.

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## POWER STEERING





Of recent times I have driven with the younger generation and commented on the power steering of their car. This has met with a look of disbelief and denial of such a fitment. Of course I simply say stop, switch off the engine and now try and steer it. 'Oh', one young lad said 'That's a security thing to stop people stealing the car!'. I don't think I bothered arguing at that point.

But we do take power steering very much for granted. Modern systems on any car call for no more maintenance than occasionally checking to see that the pump reservoir has enough oil in it. The complication today however is that the systems are getting old, flexible hoses are getting hard and permeable and seals aren't. Many owners forget that pressures in these systems run at 500-600 psi when stressed and are quite astonished when various components start to leak.

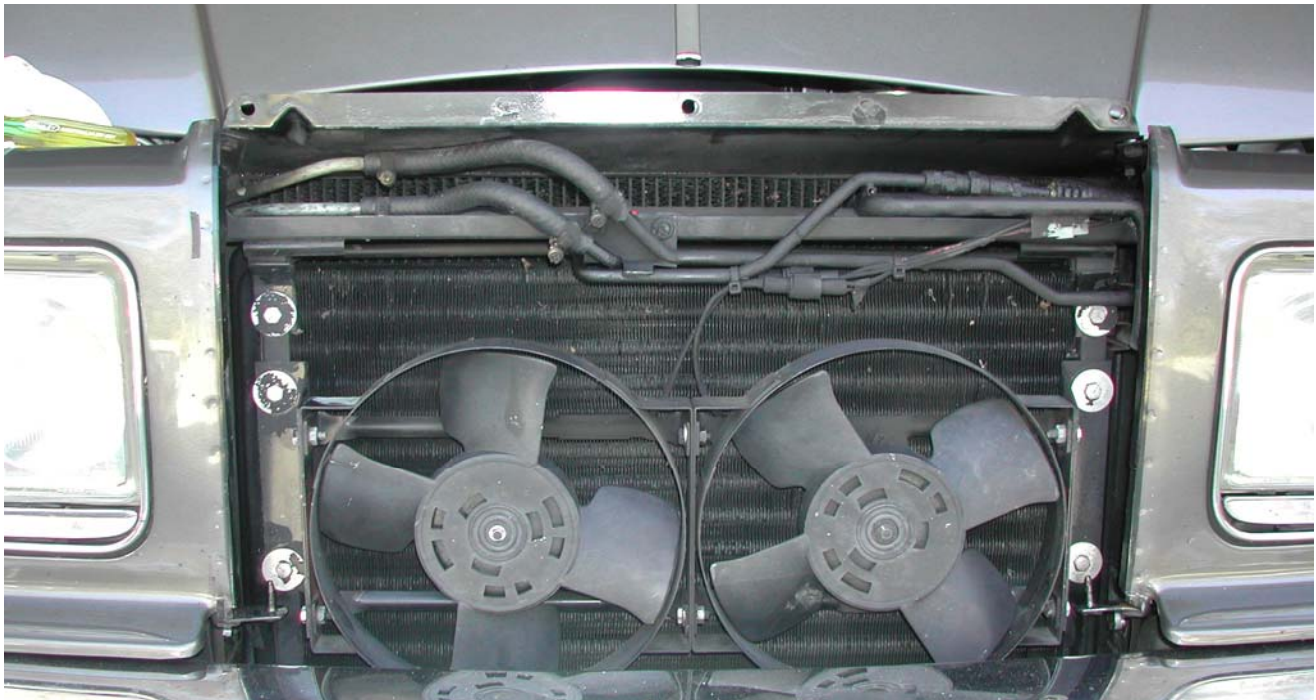
Rolls-Royce first introduced power steering on their cars in the 'S' series cars. Even then the first models were fitted with manual steering which to steer was a bit like trying to steer the dining room table! Many of those early cars were retro-fitted but there are still a few around that weren't. Power steering requires three basic components. A pump to develop hydraulic pressure, a valve that responds to steering wheel movement and switches hydraulic pressure into the push pull department and pipes to reticulate the high pressure oil between these functions.

The pumps are virtually trouble free unless you are unfortunate enough to have your mechanic dent the body of the pump when trying to the tension the drive belts.belts.

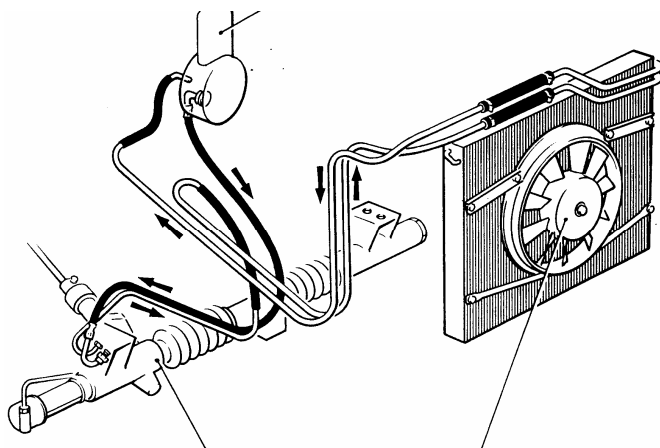


The above is a later pump used by many car makers and replaces the old Hoburn Eaton pump used on the Silver Clouds. The only repairs (apart from panel beating) these pumps seem to need is seal replacement and with age the replacement of the main shaft bearing which being basically white metal crystalises with age.





And while on hoses don't forget the little darlings behind the grille. Seen here on an '85 Spirit they connect the low pressure side of the power steering system through a variety of heat exchanger to try and keep the oil at a reasonable temperature. They are not eternal and usually dribble a lot which is difficult to pick up. But when they eventually blow the result is quite spectacular with jets of oil squirting out of the front of the grill. It is difficult to ignore at this stage.



This schematic applies to the Silver Shadow II and the Spirit. The oft forgotten small hoses behind the grill are clearly shown and which should be inspected regularly for leakage.

Given the trouble many owners have had with rack and pinion units on these cars, an in-line filter on the low pressure return line is highly desirable. The filters are regular transmission units of a throw away design and are very efficient at removing damaging particulate.

The pipes getting the oil from the pump to the box however deserve watching. Referring to the top picture again, this is a view of the vee eight engined power steering box fitted to the 'S' series cars. This would have to be the worst situation since the box is under the toe board, the push pull bit up in front of the radiator and the pump up on the engine. This needs lots of hose. The hoses on these cars most at risk are the ones seen coming over the top of the box and passing uncomfortably close to the 'A' bank exhaust pipe. It is at this point that hoses have been known to burst, spray the hot manifold and create an instant barbecue!

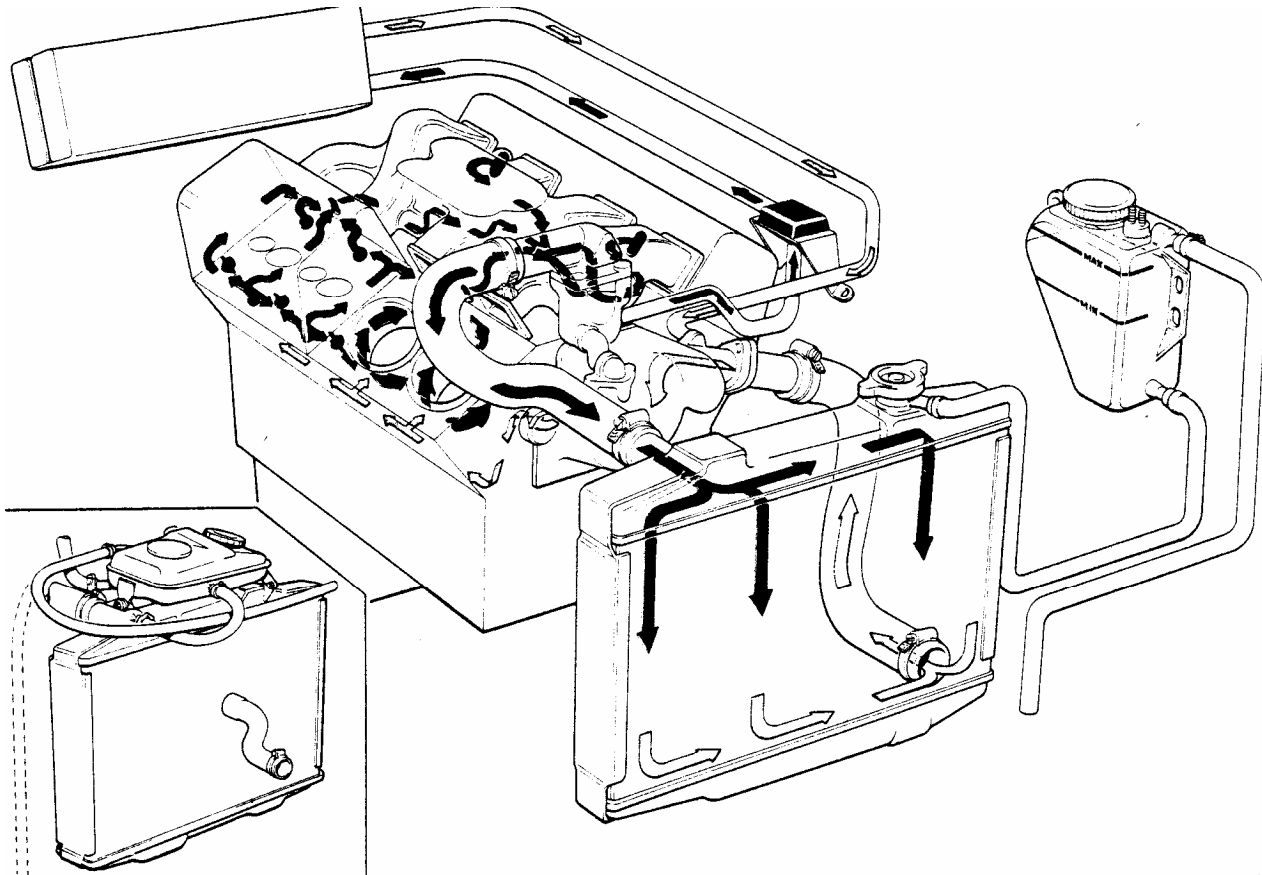
Silver shadows are a bit safer and use a lot less hose. Even so an owner is well advised to change hoses the minute oil slicks appear on their surface.

## DIRTY OVERFLOW BOTTLES

A correspondent writes ' I have found gunk in the bottom of the overflow bottle which blocks the flow to the radiator in the last four spirits which I have serviced. Water stays in the bottle, the low water warning light will not come on and the radiator can run low and the motor overheat. It needs to be removed from the car. Do not lose the washers. Washout in hot water using a pipe/bottle brush. Outside can be cleaned with grease and wax remover, this will make it look like new. Also drill the outlet hole to a bigger size to help stop blockages. This is an age problem and can wreck the motor if not fixed.'

I can add that the same gunk can block the windscreen washer motor and burn it out. A very expensive replacement.

We have talked about fitting low water alarms on earlier Spirits and some readers have enquired how this is desirable. The following diagrams should help.

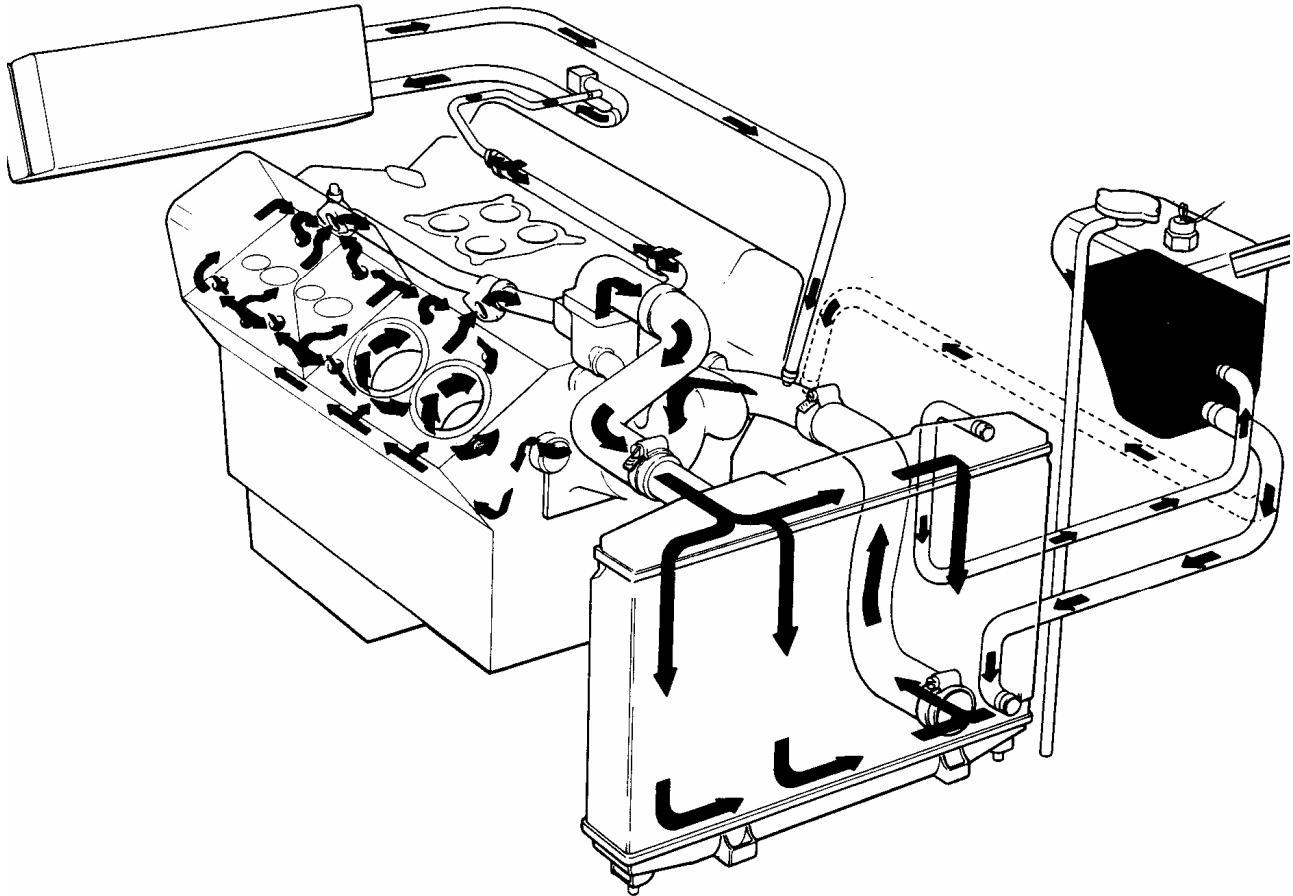


This is the original system. Water is sucked out of the lower part of the radiator through the lower hose and into the pump where it is forced back through the engine casting and emerges through the thermostat. The hot coolant then passes from the thermostat through the upper radiator hose to the top of the radiator where it descends whilst being cooled by the air flow through the radiator. As the coolant gets hot it expands and forces its way through a pressure valve in the radiator cap then passes to the coolant bottle. If the bottle which is not pressurised, fills to capacity it overflows to the ground.



When the engine cools, the coolant contracts in volume creating a vacuum at the radiator cap since the system to that point is sealed. A separate valve in the cap allows the fluid in the overflow bottle to be sucked back into the radiator until the vacuum is neutralised. At all times the water level sensor is under coolant assuming the level has not been allowed to drop below the minimum line so no warning light appears on the dash board. In the event of a catastrophic loss of fluid such as a burst radiator hose, no vacuum would be created, the engine would be without coolant but the overflow bottle would remain full. The sensors would still be covered with coolant so no warning light would appear.

Compare this with the later arrangement.



Here the overflow bottle becomes part of the header tank in effect and is itself pressurised. Note that the top of the radiator no longer has any filler cap. In the event of a major loss of coolant the bottle would immediately empty, the sensors would be exposed and the alarm would light on the dashboard. It is probably not practical to upgrade the old system but one solution seems to be to fit the audible alarms detailed in the last Topics. Silver Shadows of course don't have this problem.

Ironically the later system is simply a version of the original Shadow system except that the old brass tank is now plastic and strapped on to the left hand valance which allows the designers to lower the bonnet line.

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*The chance of dropping a screw into the bowels of your car is indirectly proportional to your chances of being able to replace it.*  
*Daniel Murphy*

## WHEN DID YOU LAST CHECK YOUR AIR FILTER?



Well here is a before and after picture. Tucked away under the mudguard on Shadows it is often forgotten and even on Clouds undoing the old knurled nut is something that seems we can't remember to do. Considering the muck that we allegedly breath in our cities today, when you think of the comparative volume of air being sucked through these filters, they have a hard job to do.

A blocked filter is equivalent to pulling the choke out on the old cars, which does nothing for the engine or your pocket.

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## UNIVERSAL JOINTS

Recentley I have been making concerned enquiries about the tail shaft vibrations I was getting out of a Phantom VI. The problem is not as yet fixed and the next step is to extract the whole assembly and get it to the manufacturers in Sydney for a careful balance. Since it appears that apart from any physical distortion of the actual shafting, any vibration must originate in the actual universal joints. I also thought of the relevance of the problem to the rear axles of the Shadow and Spirit vehicles where as you know the Factory has gone to considerable trouble to ensure that they operate in as neutral a position as possible.

The need to transmit power from one shaft to another is a fundamental engineering requirement which has existed since man began using the most simple machines driven by water, wind and even treadmills. The need is essential to our modern life since almost every machine ever made or likely to be made must transmit power from one shaft to another. This is most difficult when the shafts



concerned are not in direct line with one another as in the case of cars and trucks transmitting power from the gearbox to the wheels. The problem here is difficult since the angle between the gearbox and wheels continuously changes as the suspension moves and is even more difficult with front wheel drive vehicles with the angle changing with the steering of the vehicle.

### **The Cardan Joint**

The first applicable invention was the common universal joint which is found in the tail shaft or propeller shaft of most trucks and cars. Called a Cardan joint after its inventor it was invented during the 1500's. The Cardan joint however suffers from a major problem. Two shafts which are connected together by one of these joints do not rotate at the same speed when the shafts are at an angle to one another. They complete one revolution at the same time but during a single revolution one shaft goes faster than the other four times and slower than the other four times and for four instances during each revolution they actually rotate at the same speed or angular velocity. In other words the two shafts do not rotate at a constant angular velocity to one another. This is a major problem where the shaft speed is high or if the load on the shafts is great.

Due to the problems associated with the Cardan joint there has been a quest to design a universal joint which would transmit power from one shaft to another so that both shafts would always rotate at the same angular velocity as one another. It is this apparently straight forward task which has proved most difficult. The first compromise solution was invented by Sir Robert Hooke who was a British scientist and physicist and associate of Sir Isaac Newton of gravity and apple dropping on the head fame.

Hooke worked out that if two Cardan joints were used in strict geometric relationship with one another with an intermediate shaft connecting them then the second Cardan joint would act in the opposite manner to the first so that only the shaft between the two joints would not rotate at a constant angular velocity. This assembly is still used today. They are however compromises because the strict geometric relationship required to be maintained between the two Cardan joints is all but impossible to achieve. However because no suitable constant velocity joint is available the truck and bus manufacturers and heavy industry generally have no other option and to this day this 400 year old technology is still used.

### **Bendix-Weiss Constant Velocity Joint**

During the late 1800's and early 1900's several types of constant velocity joints were invented but every one of them was impractical due to high wear and large losses of power due to friction. During the 1920's an American company patented the Bendix-Weiss constant velocity joint. This used steel balls running in grooves to transmit power between two shafts.

### **Rzeppa Joint**

In 1929 an American named [Rzeppa](#) invented a constant velocity joint also using steel balls running in grooves to transmit power between two shafts. It was this joint which gained widespread use in 1960 when it was used in the British Morris Mini. Variations of the Rzeppa joint are used in all front wheel drive vehicles today.

## Double Cardan Joints

This assembly uses two Cardan joints in strict geometric relationship with one another by using a centering mechanism and a very short intermediate shaft. The Rzeppa and Double Cardan type constant velocity joints are compromise joints which have limitations to their usage. In the case of the Rzeppa type joints the steel balls do not roll in the grooves, rather they slide or skid when the joint is operating at an angle.

In the case of the Double Cardan joint the mechanical centering mechanism involves load bearing sliding surfaces. In addition due to their construction both the Rzeppa and Double Cardan type joints wear at a greater rate if there is any axial load (push/pull load) or if there is a radial load (sideways load) on the joints. The Cardan joint however is a very strong joint. It can transmit high torque at high speed and withstand both axial and radial load and can therefore be used to couple shafts together and is sometimes referred to as the Cardan Coupling. However, as mentioned the Cardan joint is not a constant velocity joint and is impractical for most applications unless used with a second Cardan joint.

Both the Rzeppa and Double Cardan joints suffer efficiency losses and have increased wear rates if subject to axial and/or radial loads. Consequently, neither the Rzeppa or Double Cardan joints can be used as true couplings. They are limited to the function of a joint, albeit poor ones with limited utility.

## Tripod CV Joint

A further type of CV joint is of the so called "[Tripod CV Joint](#)" type. Tripod type joints consist of a shaft with three protrusions each of which has a roller bearing in the end and each one of these bearings slides in a groove cut into the inside surface of a tube like component and the power is transmitted through the point of contact between the three bearings and three grooves. Tripod joints have the similar problems to the Rzeppa type joints in that whenever the joint is operating at an angle the bearings slide or skid in the grooves of the joint. Tripod joints are also restricted to low power applications and have a high wear rate. Despite this the joint is commonly used as a plunging CV in front wheel drive vehicles.

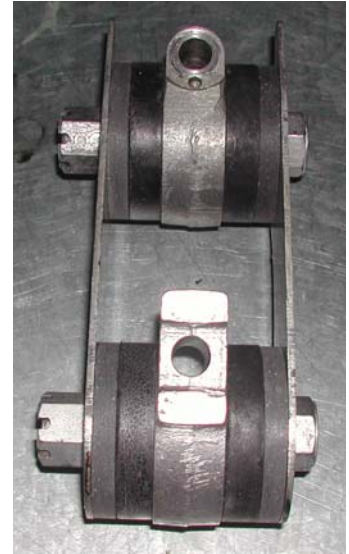
As with Rzeppa Joints, the Tripod also requires special lubrication and boots. (Note:- a plunging joint is one which permits axial movement between the shafts.)



Well I hope you are wiser than before about what most of us take for granted. Actually they can figure fairly prominently in destroying a car if they come adrift or whirl. This happens when the centre bearing seizes or the support fails and the jointed shaft can then swing much like a skipping rope. This is known as 'whirling' in the trade. The total weight of a tail shaft assembly on a Silver Cloud is of the order of 30 kilos and it spins as fast as the engine. I will leave it to you to imagine the energy that would be unleashed.



This is the centre bearing arrangement for all postwar Rolls-Royce cars. The support 'arm' connects to the chassis via one bolt seen high up on the left. Between the arm and the mount there are friction washers and rubber packings. The castellated nuts are done up to a specific tension which holds the support at whatever angle you wish. The springs apparently augment the support but as will be seen above they have been strained beyond their limits.



Above is a happier assembly with new washers and springs as well as new carden joints and a centre bearing. Recently I had a nice ride in a dear old 20/25 HP. The owner was reluctant to exceed 55 MPH at which speed there was a very intrusive high speed vibration. The source had to be the tail shaft and this was proved when the car was put in neutral and allowed to coast. The vibration stayed. The cause was probably worn universals and general unbalance.

At top right is a better view of the support arm assembled with new washers. These have not been tensioned yet which is done when the shaft is in position. The finished assembly is sufficiently stiff so that it cannot easily be pulled down but does have a spring in it.

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## WEB SITES YOU SHOULD HAVE ON YOUR COMPUTER

<http://www.rroc.org.au/>

Rolls-Royce Owners' Club of Australia

<http://web.rroc.org/>

Rolls-Royce Owners' Club of America

<http://www.swammelstein.nl/rolls.htm>

A Dutch private web site with an excellent forum

All the above sites have free forums where you are welcome to share your knowledge and ask your questions. Or write to me - Bill Coburn Post Office Box 827 FYSHWICK ACT 2609 Australia or spur84@bigpond.com.

[www.BritishStarters.com](http://www.BritishStarters.com)

An American site offering Nippondenso Starters for among other British cars, units for our cars.

<http://www.nzrrbc.co.nz/>

Our New Zealand enthusiasts web site

<http://www.books4cars.com/>

A great source for handbooks and workshop manuals

<http://www.rrec.co.uk/>

The British RREC.

[barbarawestlake@rrec.org.uk](mailto:barbarawestlake@rrec.org.uk)

The address of the lady who will send you the build sheets for your car.

[www.enginesaver.com.au](http://www.enginesaver.com.au)

The sensor to warn you about the loss of coolant

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