

# Hydraulic Brake Pumps

by John Palma

The old trial and tribulation years of research and development can sometimes be a costly endeavor. In the early days of hydraulic systems a French automaker, Robert Citroen, designed a car called the Citroen. One of the neatest things that this car offered was a hydraulic leveling system. Rolls-Royce used the Robert Citroen patented hydraulic system and redesigned the complete system to work with their hydraulic system.

The Silver Shadow series started with a hydraulic system that was designed by the French and re-engineered by the English. Need I say more? This time around let's just talk about the brake pumps in this short technical article.

The original brake pumps that were fitted to the original cars were heavy industrial diesel injectors that were used on locomotives. They were adapted by CAV, a company that Lucas owned.

Our dear friend from "The Shadow's Corner" said from the start of the very first Shadow through the early Spirit and Spur series there were problems with brake pump barrel and plunger assemblies. Camshaft driven plunger type brake pumps started with the beginning of the Silver Shadow Series V8 engines.

There are two extra eccentric cam lobes on the engine camshaft. As the engine rotates, the plungers are forced upwards by the connecting pushrods. These are kept in continual contact with the eccentric lobes of the cam by the internal return spring in the brake pumps. As the plungers are moved downwards by the spring, the brake fluid is drawn into the pumps through the open inlet ports of the brake pumps. A non-return valve internal of the pumps ensures that fluid in the delivery lines is not drawn back into the pumps. As the plungers are forced upwards against their internal springs, fluid pressure closes the non-return valves in the inlet ports and opens the outlet ports to the supply lines. This allows fluid to start charging the accumulator spheres.

Both pumps are mounted centrally, front and rear, on the tappet cover in the middle of all V8 engines. They are behind and between the intake manifold and

## Early and Late Style Mineral Oil Pumps

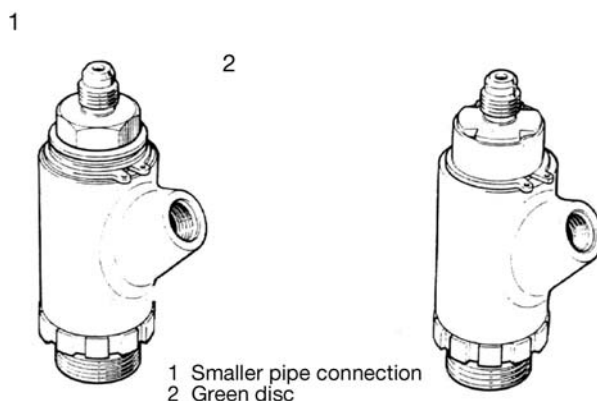


Figure 1  
Early type pump with hexagon outlet adapter

Figure 2  
Revised pump with round staked outlet adapter

### Procedure

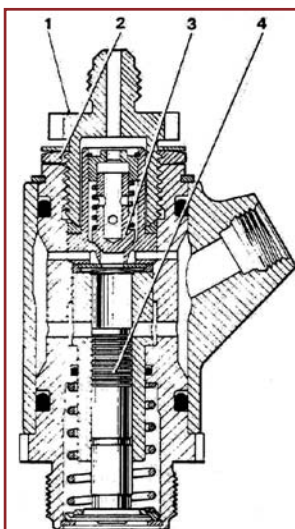
The revised pump is completely interchangeable with all previous mineral oil pumps. Therefore, the removal and replacement procedures in Chapter G of the relevant Workshop Manual should be adopted.

### Parts Required

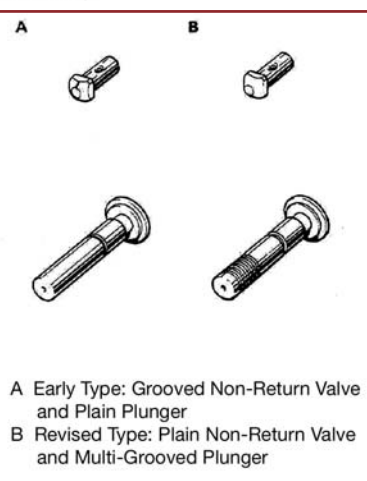
The following new and existing parts are required:

Displaced Part No.	Description	New Part No.
GMF 1118	Hydraulic Pump	GMF 1167
	'O' Ring-Pump	GMF 1022
	'O' Ring-Pump	GMF 1023

## Mineral Oil Brake Pump

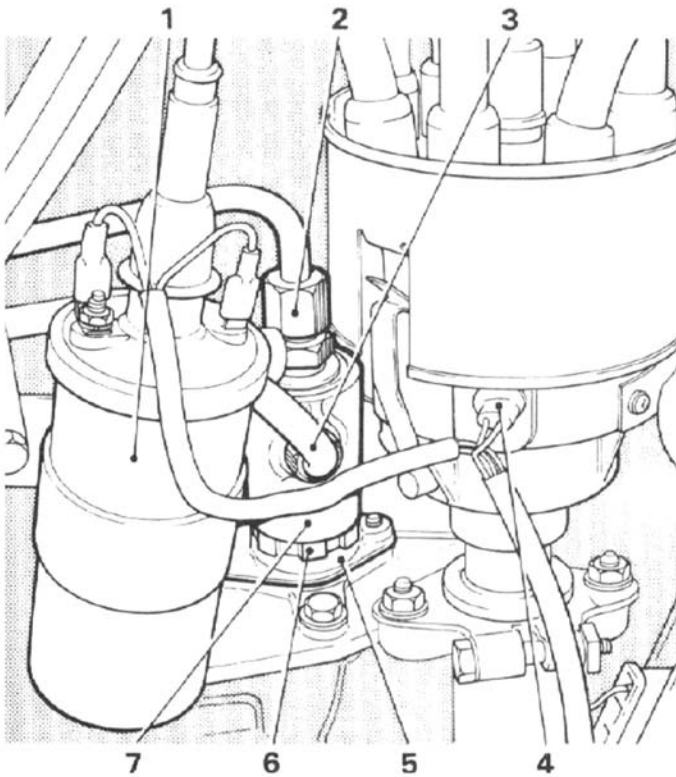


- 1 Outlet Adapter
- 2 Locknut-Outlet Adapter
- 3 Non-Return Valve
- 4 Multi-Grooved Plunger



- A Early Type: Grooved Non-Return Valve and Plain Plunger
- B Revised Type: Plain Non-Return Valve and Multi-Grooved Plunger

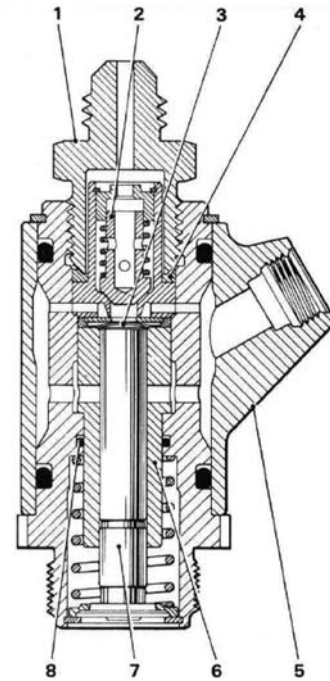
**Cutaway section of the revised mineral oil pump.**



Rear Hydraulic Pump

- 1 Ignition Coil
- 2 High Pressure Outlet Pipe
- 3 Low Pressure inlet Pipe
- 4 Ignition Distributor
- 5 Pump Mounting Pedestal
- 6 Hydraulic pump Spanner Point
- 7 Pump Outer Housing

**Rear brake pump mounted on top of tappet cover at back of engine.**



RR363 Brake Pump Assembly  
Sectional View

- 1 Adapter-High Pressure Outlet
- 2 Non-Return Valve
- 3 Unlet Valve
- 4 Chamfered Ring
- 5 Outer Housing
- 6 Pump Barrel
- 7 Plunger
- 8 Sealing Ring

Part No.	Description
SPC1957	Housing 'O' Ring
SPC1957	Housing 'O' Ring
UE35616	Inlet 'O' Ring

screwed on top of the tappet cover. The front pump is known as hydraulic system pressure one and the rear is system is two. The two brake pumps circulate the fluid in the system and create fluid pressure for the braking and leveling hydraulic accumulators.

This design has stayed the same through the end of the 6.75 litre V8 engine. The old Crewe built Bentley Continental R series and the new Corniche also use the original 6.75 Litre engine with the original hydraulic system. The Silver Seraph and the Bentley Arnage, with the BMW V8 and V12 engines, use the BMW designed braking system incorporated into the later series cars.

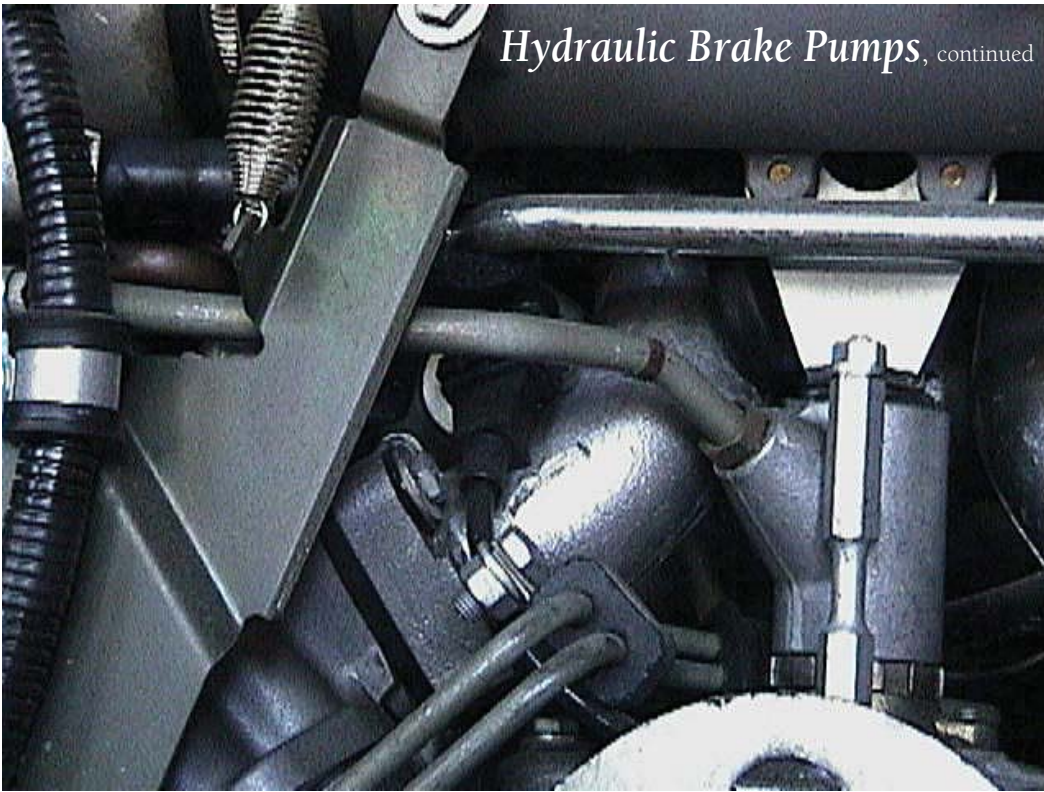
These brake pumps were used in early and late series motorcars that used both brake fluids ... RR363 or mineral oil. The brake pumps may appear to be the

same but they are not interchangeable. There are several ways to determine the difference between the two pumps. The RR363 pump is NOT painted green on the reservoir housing. Also, the feed pipe is connected to a larger diameter threaded nipple which is located at the top of the outlet adapters.

The early type mineral oil brake pump has a quarter inch diameter threaded nipple that connects to the feed pipe of the accumulator. There is a green plastic ring around the top adapter and the outer pump reservoir housing is painted green. A later revised mineral oil brake pump was made when supplies of the older style were depleted. The top threaded outlet adapter identifies the revised pump. It has a staked outlet adapter and has the same green identification disc.

*BRAKE PUMPS, continued*

## Hydraulic Brake Pumps, *continued*

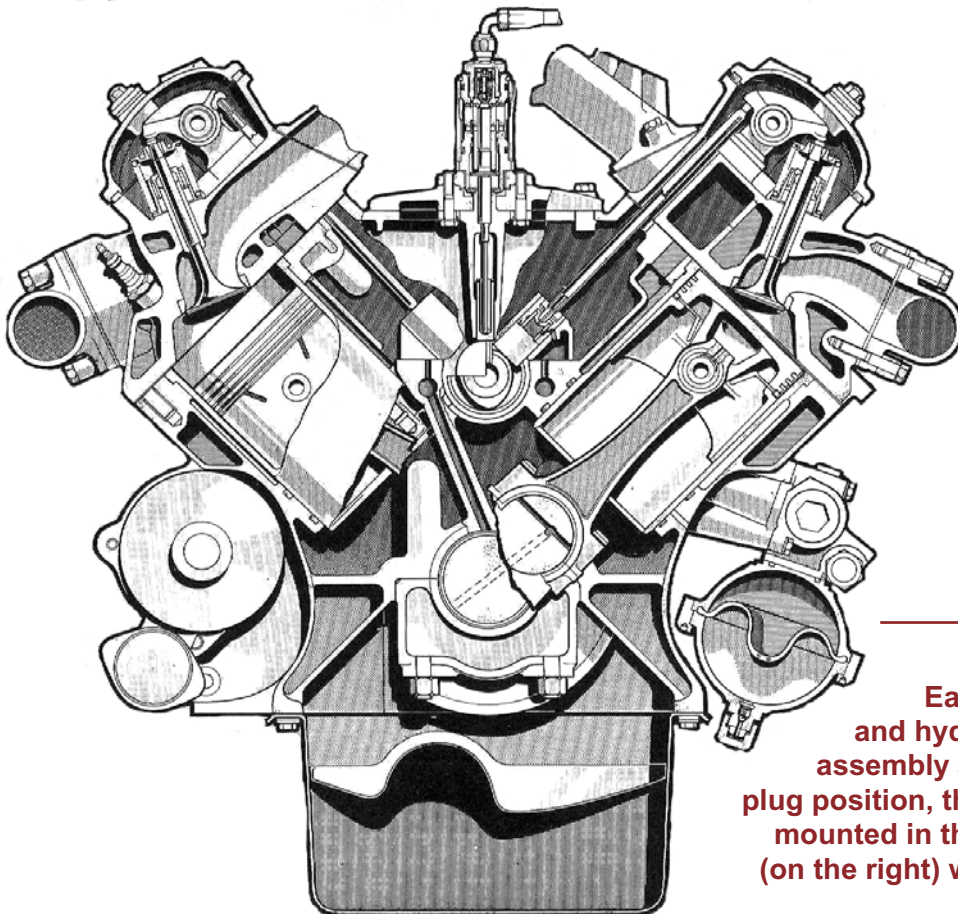


**Close-up of rear brake pump mounted in place on top of tappet cover, under the engine's intake manifolds of a late 6.75-liter V8 engine.**

The early pump had internal seepage problems. Mineral oil seeped past the plunger and mixed with the engine oil. This caused excessive use of mineral oil. The modified multi-grooved type plunger design stopped the mineral oil from seeping past the plunger and mixing with the engine oil. The revised pump is a non-serviceable item except for the replacement of the pump housing 'o' rings.

Given the right set of circumstances the plunger could stick at the top position in the barrel. The clearance in the barrel and plunger assembly was not enough, particularly if the engine was switched off after a long hard run. The

already extremely high under bonnet engine temperature would spike even higher when the engine was shut off. The engine camshaft plays an important part in this problem. If the position of the camshaft brake pump lobes are in the most upwards position when switching off the engine for a short period of time, the camshaft lobes continue to compress the plunger in the brake pump in the upwards position. When restarting the engine, the plunger return springs would not have enough pressure to return the plungers to the bottom position.



**Cutaway section of the complete Early Silver Shadow 6.2 liter V8 engine and hydraulic brake pump and accumulator assembly's components. Shows the new high plug position, the camshaft driven hydraulic pumps mounted in the V and the hydraulic accumulators (on the right) which are initially filled with nitrogen at a pressure of 1,000 lbs./sq. in.**

Remember my short technical article about having no gas in the brake accumulator spheres if the engine would quit while driving in traffic ... NO BRAKE AT ALL? Well, here is another scenario for you.

Imagine both brake pumps experiencing the problem of being overheated and sticking in the upward position. Now, picture yourself driving along as you normally would, applying the brakes as you stop for traffic and not noticing the warning panel light on because it is difficult to see in the daylight. Each time you apply the brake peddle you are depressurizing the stored pres-

sure in the accumulator spheres and you are unaware that you only have one or two applications left to stop the car from rolling. Again ... NO BRAKES AT ALL.

The worst two years for this problem were 1984 and 1985. However, Cal West has said that any year of Silver Shadow or Silver Spirit could experience this problem given the right set of circumstances and that numerous accidents have been caused by sticking brake pumps with the drivers claiming that they had no brakes. When the cars had cooled and were examined, no fault could be found. This was because the

pumps had sufficiently cooled and were now functioning normally.

Rolls-Royce had taken steps to correct this problem. They redesigned the camshaft so that the brake pump lobes on the camshaft are offset from each other. This means that only one brake pump can fail at a given time if the right set of circumstances would arise. They also increased the tolerance between the pump plunger and barrel. This made the pump less likely to stick. However, this caused more fluid to bypass the plunger into the engine. That caused them to develop the grooved plunger which is now in use.



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**Bottom of page shows the same picture of a late mineral oil rear mounted brake pump showing engine intake manifold system over top of brake pump. this view of the rear brake pump can only be viewed with the engine removed from the car.**

