Hydraulic accumulators

Introduction
The hydraulic accumulators are mounted at the front of the crankcase, on the 'A' bank side of the engine.

The only exception being the Bentley Turbo R, where the accumulators are mounted at the rear of the crankcase, on the 'B' bank side of the engine.

The front accumulator (vertically mounted) supplies the No. 1 Hydraulic system; the rear accumulator (horizontally mounted) supplies the No. 2 Hydraulic system.

Both accumulators have an internal bleed screw incorporated into the valve housing. Bleeding or depressurizing an accumulator is achieved by slackening the bleed screw (see figs. G9-1 and G9-2), approximately one full turn. This allows the hydraulic system mineral oil to return internally through the valve housing to its respective reservoir.

In the event of an accumulator failure, a sphere, accumulator valve assembly, and 'O' rings can be obtained as individual items. Alternatively, a complete accumulator can be obtained.

Prior to despatch from the manufacturer, all spheres are charged to a pressure of between 60 bar and 64 bar (870 lbf/in² and 928 lbf/in²). The charge pressure (in bar) is stamped on the screw head located at the top of the sphere. Whenever a sphere is found to be below a working pressure of 31 bar (450 lbf/in²) a replacement sphere must be fitted. **Never attempt to recharge a sphere.**

Hydraulic accumulator sphere – To renew whilst in position (see figs. G9-1 and G9-2)
On cars other than the Bentley Turbo R, to remove the sphere from No. 2 system the sphere from No. 1 system will have to be removed first. On Bentley Turbo R cars to remove the No. 2 system sphere, the **complete** accumulator of No. 1 system will have to be removed, refer to Hydraulic accumulator – To remove.

1. Depressurize the hydraulic system(s) as described in Section G3.
2. Carefully hold the valve body of the accumulator. Then, using a suitable chain wrench located around the circumference of the sphere, unscrew and remove the sphere from the valve housing. Discard the sealing ring (see fig. G9-3).
3. Locate a new sealing ring lubricated with clean hydraulic system mineral oil into the valve body.
4. Fit the new sphere to the valve body and torque tighten to the figures quoted in Section G22.
5. After fitting the sphere, top-up the reservoir(s) with a recommended hydraulic system mineral oil (see Chapter D). With the engine running, check for leaks.
6. Test the accumulator(s) as described in Hydraulic accumulator – To test.

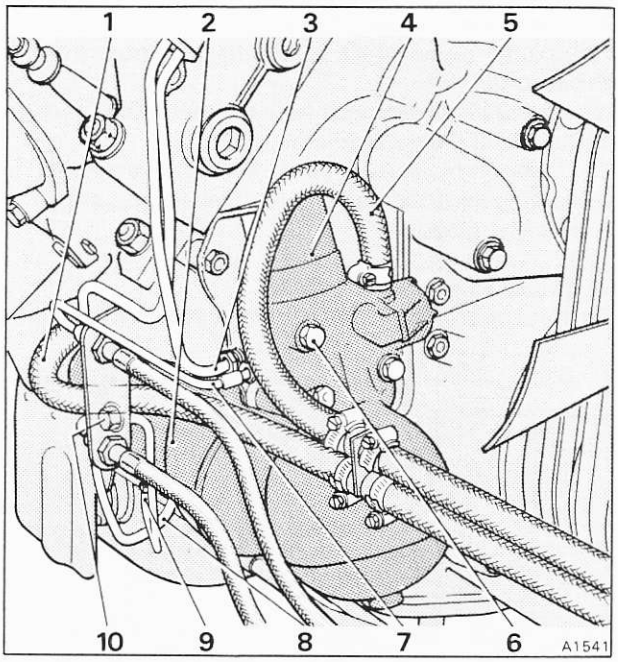

Fig. G9-1 Hydraulic accumulators (excluding Bentley Turbo R)
1 Low pressure return to reservoir
2 Accumulator (No. 2 system)
3 High pressure inlet from pump
4 Accumulator (No. 1 system)
5 Low pressure return to reservoir
6 Bleed screw
7 High pressure outlet to upper distribution valve and suspension struts
8 High pressure inlet from pump
9 High pressure outlet to lower distribution valve
10 Bleed screw

7. Bleed the hydraulic system(s) as described in Section G5.

Hydraulic accumulator – To remove
It should be noted that the high pressure pipe connections on the accumulators are of the rubber sleeve type (see Section G4). All pipes and ports should have blanks fitted when disconnected.

1. Depressurize the hydraulic system as described in Section G3.
2. Disconnect the high pressure outlet pipe (red or orange) from the accumulator and connector block; remove the pipe.
3. Disconnect the high pressure inlet pipe from the accumulator.

Note On all cars except the Bentley Turbo R when removing a front accumulator it will be

necessary to detach the outlet pipe from its mounting bracket. This allows the inlet pipe to be withdrawn from the accumulator port.

4. Fit a hose clamp to the hose of the accumulator return pipe. This prevents the flow of hydraulic system mineral oil from the reservoir.
5. Unscrew the worm drive clip on the accumulator return pipe connection and withdraw the hose from the accumulator.
6. Remove the setscrew from the mounting bracket at the end of the accumulator.
7. Support the accumulator, then remove the two remaining securing bolts. Lower the accumulator from the engine.

Hydraulic accumulator – To fit

Fit the accumulator to the engine by reversing the procedure given for removal, noting the following.

1. When fitting the high pressure pipe connections, new rubber sleeves must be fitted to the pipe ends.
2. All setscrews and pipe connections must be torque tightened in accordance with the figures quoted in Section G22 and Chapter P.
3. After fitting, top-up the reservoir(s) with a recommended hydraulic system mineral oil (see Chapter D). With the engine running, leak check all joints and unions which have been disturbed.
4. Test the accumulator as described in Hydraulic accumulator – To test.
5. Bleed the hydraulic system(s) as described in Section G5.

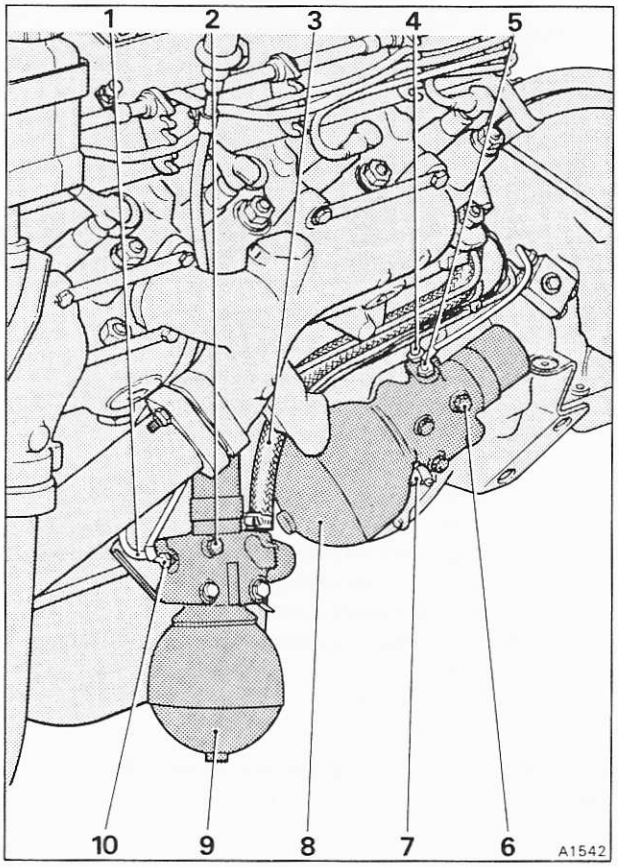

Fig. G9-2 Hydraulic accumulators (Bentley Turbo R)

1 High pressure inlet from pump
2 Bleed screw
3 Low pressure return to reservoir
4 High pressure inlet from pump
5 High pressure outlet to lower distribution valve
6 Bleed screw
7 Low pressure return to reservoir
8 Accumulator (No. 2 system)
9 Accumulator (No. 1 system)
10 High pressure outlet to upper distribution valve and suspension struts

Accumulator valve housing assembly – To dismantle

(see fig. G9-4)

1. Remove the accumulator as described under Hydraulic accumulator – To remove.
2. Carefully hold the valve housing in a vice. Using a suitable strap spanner located around the circumference of the sphere, unscrew and remove the sphere from the valve housing. Discard the sealing ring (see fig. G9-3).
3. Remove the setscrew securing the connection valve retaining plate (see item 3). Remove the plate and valve ball.
4. Remove the bleed screw and ball (see item 1). Remove and discard the 'O' ring from the bleed screw.
5. Position the valve housing onto a press and depress the spring retaining plug (see item 2) sufficiently to allow the snap ring to be removed.
6. Release the pressure on the retaining plug and remove the plug, adjusting washers (if fitted), spring, and spring retainer. Remove and discard the 'O' ring from the retaining plug.
7. Remove the connection valve (see item 3). The valve can only be removed from the sphere end of the housing.
8. Position the housing onto a press with the cut-out spring housing (see item 4) located under the spindle. Apply sufficient pressure to retain the housing when the retaining screws are removed.
9. Remove the screws and carefully ease off the pressure.
10. Remove the spring housing, adjusting shims (if fitted), spring, spring seating, and the cut-out valve. The cut-out valve contains a stop ring and therefore can only be removed in the direction of the cut-out chamber. Remove and discard the sealing ring from the cut-out chamber.
11. Thoroughly clean all components with petroleum ether (120/160°C). Dry with dry compressed air. Do not use any type of cloth.

Accumulator valve housing assembly – To assemble

(refer to fig. G9-4)

During assembly, ensure that all components are handled with care. Also, meticulous care must be taken during assembly to ensure that complete cleanliness is maintained.

1. Fit a new 'O' ring to the bleed screw (see item 1).

Inspect the ball and if not damaged, place the ball onto its seating. If the ball is damaged, replace with a new one. Screw in the bleed screw; do not overtighten.

2. Lubricate the connection valve (see item 3) with clean hydraulic system mineral oil and then fit the valve into the body ensuring that it slides into position.

3. Fit a new 'O' ring to the spring retaining plug (see item 2). Fit the spring retainer, spring, adjusting washers (if previously fitted), and the spring retaining plug. Position the retaining plug under a press and depress the plug sufficiently to enable the snap ring to be fitted. Remove the valve housing from the press.

4. Inspect the connection valve ball (see item 3) and if not damaged place the ball onto its seating. If the ball is damaged, replace with a new one. Fit the connection valve retaining plate (see item 3) and secure with the setscrew.

5. Inspect the cut-out valve (see item 4) to ensure that the stop ring is fitted. Lubricate the cut-out valve with clean hydraulic system mineral oil and then fit the valve into position.

6. Fit a new sealing ring (see item 4) into the cut-out chamber.

Position the valve housing onto a press and then fit the spring seating, spring, adjusting shims (if previously fitted) and spring housing. Apply sufficient pressure onto the spring housing to enable the two retaining screws to be fitted. After tightening the screws remove the valve housing from the press.

7. Lubricate a new sealing ring (see item 5) with clean hydraulic system mineral oil and then fit the ring into position.

8. Fit the sphere to the valve body and torque tighten to the figures quoted in Section G22.

9. Fit the accumulator(s) as described under Hydraulic accumulator – To fit.

Hydraulic accumulator – To test

1. Depressurize the hydraulic system as described in Section G3.

2. Fit the pressure gauge RH9727 into the service points of the relevant system by means of a suitable high pressure pipe. The service points are shown in Section G5.

3. Start the engine. The gauge needle should immediately rise to approximately 62 bar (900 lbf/in²) on a new sphere, indicating the nitrogen gas pressure in the accumulator sphere. The pressure should then slowly rise to between 165 bar and 180 bar (2393 lbf/in² and 2610 lbf/in²). At this pressure the accumulator cut-out valve should actuate and the pump cease to charge the accumulator.

4. After the cut-out pressure has been reached, note the pressure to which the gauge settles. This settling takes up to one minute and the pressure should not be more than 10 bar (150 lbf/in²) below the cut-out pressure. The pressure should then remain steady unless the brake pedal is applied or the levelling system actuated.

5. Fit a bleed tube onto the bleed screw of the gauge

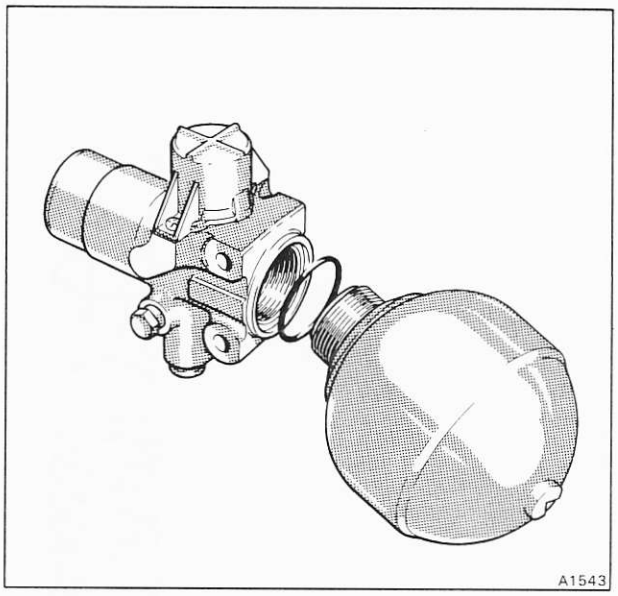

Fig. G9-3 Hydraulic accumulator with sphere removed

connecting pipe. Open the bleed screw and allow the pressure gauge reading to fall. When the pressure has fallen to between 140 bar and 155 bar (2030 lbf/in² and 2248 lbf/in²) the accumulator control valve should allow the hydraulic pump to recharge the accumulator.

6. If, on first starting the engine, the pressure gauge needle fluctuates violently, rapidly climbs to 172 bar (2500 lbf/in²) and then immediately falls to zero on application of the brake pedal, complete loss of nitrogen gas pressure from the accumulator sphere is indicated.

7. In the event of the nitrogen gas pressure of the accumulator being less than 31 bar (450 lbf/in²) (refer to Operations 3 and 6) the accumulator sphere must be renewed.

8. If the cut-in and cut-out pressures of the accumulator are outside the limits quoted in Operations 3 and 5 the accumulator valve assembly must be renewed.

9. If the pressure continues to fall after the accumulator has reached the cut-out pressure of between 165 bar and 180 bar (2393 lbf/in² and 2610 lbf/in²) and then settles, an internal leak is indicated.

10. If observations of the gauge show that the pump is still pumping (needle fluctuating with the pump pulses) without giving a rise in pressure, then there is a leak equal to the pump flow at that pressure. Pump 'cut-out' indicated by the change in the audible note of the pump, can be heard if the end of the engine dipstick is placed on top of the pump and used as a hearing aid.

To verify an accumulator internal leak, depressurize the system and remove the gauge from the service point. Secure the service point to withstand hydraulic pressure.

The following action separates the accumulator from the rest of the system and allows the

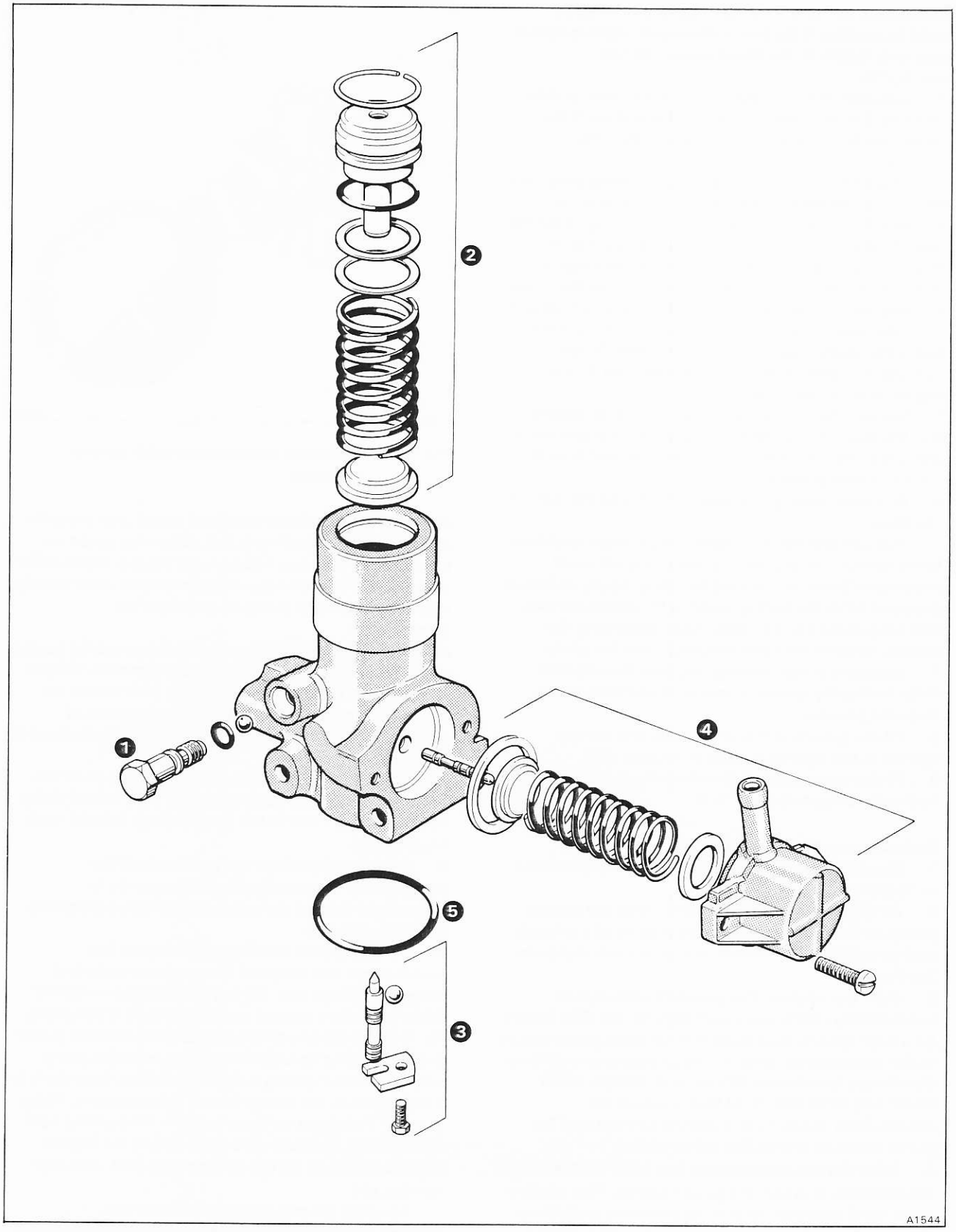

Fig. G9-4 Accumulator valve housing assembly

1 Bleed screw, 'O' ring, and seating ball
2 Valve housing, retaining plug, and associated components
3 Connection valve and associated components
4 Cut-out housing and associated components
5 'O' ring - Accumulator valve housing to sphere

accumulator and hydraulic pump to be checked thoroughly.

Disconnect the 'accumulator to frame' high pressure steel braided hydraulic hose from the junction block located at the engine end. Blank off the steel braided hydraulic hose.

Fit the pressure gauge RH9727 into the junction block. Start the engine and observe the pressure. If the symptoms persist (check that the accumulator bleed screw is sealing correctly), the accumulator valve assembly has an internal leak and the valve assembly should be renewed. If however, the gauge now behaves correctly and the pump can be heard to cut-out, the leakage is occurring downstream and a component isolating procedure should be undertaken.

The component isolating procedure necessary to locate the fault, consists of depressurizing the systems, then removing or blanking off the pressure feed to the various components in turn and repeating the test procedure.

The pressure feeds to the components can be readily identified from the colour coding chart (see Section G4).

Note Always ensure that the mineral oil in the reservoirs is just below the black line on the indicator sight glass at all times during the test procedure.

When a unit has been blanked off, before removing the blank, the systems must be depressurized either by continuous system operation with the engine switched off, or by bleeding the appropriate accumulator until it is depressurized.

After tests have been carried out involving blanking off of components, all blanks should be removed and the components reconnected. The systems should then be bled in accordance with the information given in Section G5.