Section G4

Bleeding the hydraulic systems

Introduction

In order to obtain optimum performance of the hydraulic systems it is essential that they are free of air at all times. The two hydraulic systems are re-circulatory and therefore, if air is allowed to enter them at any point it will reduce efficiency.

Bleed screws are provided on the side of the accumulators, on the left-hand pressure switch, on each pair of brake calipers, on each height control ram and on the deceleration conscious pressure limiting valve. The bleed screws for the height control rams are positioned on the inner side of the right-hand body sill just forward of the rear wheel arch (see Fig. G3).

The accumulators are situated on each side of the engine. The accumulator for the number one system is situated on the 'A' bank side of the engine; the accumulator for the number two system is situated on the 'B' bank side of the engine. The pressure switches are mounted on each valance adjacent to its respective accumulator.

The front compartment of the hydraulic reservoir supplies fluid for the number one braking system. From the reservoir fluid is supplied to the front brake pump which in turn supplies hydraulic fluid under pressure to the right-hand accumulator, the upper distribution valve, the deceleration conscious pressure limiting valve, the front calipers of the front brakes and the upper cylinders of the rear brake calipers.

The rear compartment of the hydraulic reservoir supplies fluid for the number two braking system. From the reservoir fluid is supplied to the rear brake pump which in turn supplies fluid under pressure to the left-hand accumulator, the lower distribution valve, the rear calipers of the front brakes, the lower cylinders of the rear brakes and the height control rams.

If a rectification has been carried out between the brake pumps and the distribution valves, it will be necessary to bleed at all the bleed points in that particular circuit.

If a rectification has been carried out between the distribution valves and the brake calipers, it should only be necessary to bleed at the bleed points between the distribution valve and the brake calipers in the faulty circuit. However if in any doubt it is advisable to bleed the complete system.

Care must be taken when bleeding at the brake pressure switch not to allow brake fluid to come into contact with the paintwork, as serious damage would result. As the pressure switch is located in close proximity to the engine cooling fan and various driven belts, bleeding of the switch should only be carried out with the engine switched off.

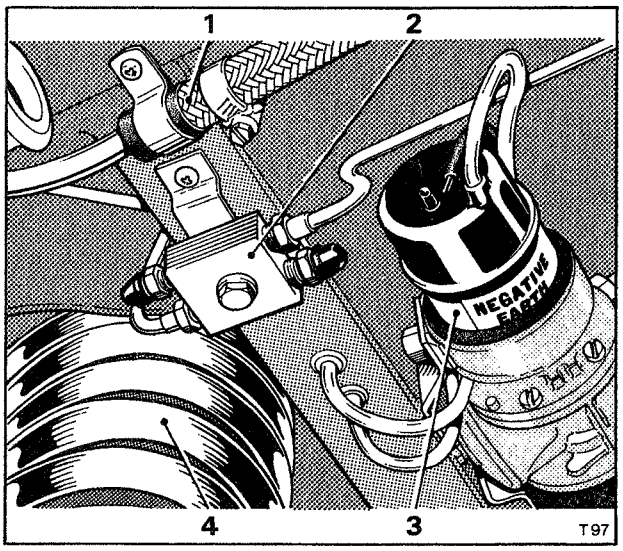

Fig. G3 Rear height control ram bleed screw location

1 Fuel pipe
2 Bleed screws
3 Fuel pump
4 Right-hand rear road spring

The power brake circuits should be bled at low pressure ensuring that the system is depressurised and the fluid levels in the reservoirs are kept above the minimum marks at all stages of the bleeding operation.

To obtain low pressure bleeding the system(s) must remain open at all times. Also throughout the bleeding operation, the brake pressure warning panel(s) 1 BRAKE PRESSURE and/or 2 BRAKE PRESSURE should be illuminated. Only when bleeding the height control rams and the pressure switch should the systems be fully pressurised and the warning panel lamps extinguished.

When bleeding the height control rams the interior of the car should be weighted to compress the suspension sufficiently for the height control valves to actuate and allow pressurised fluid through to the rams and bleed screws. The engine should be allowed to run for four minutes to ensure that the system is fully charged. Bleed both of the rams until all the air bubbles cease then allow fifteen seconds to elapse before fully tightening each bleed screw.

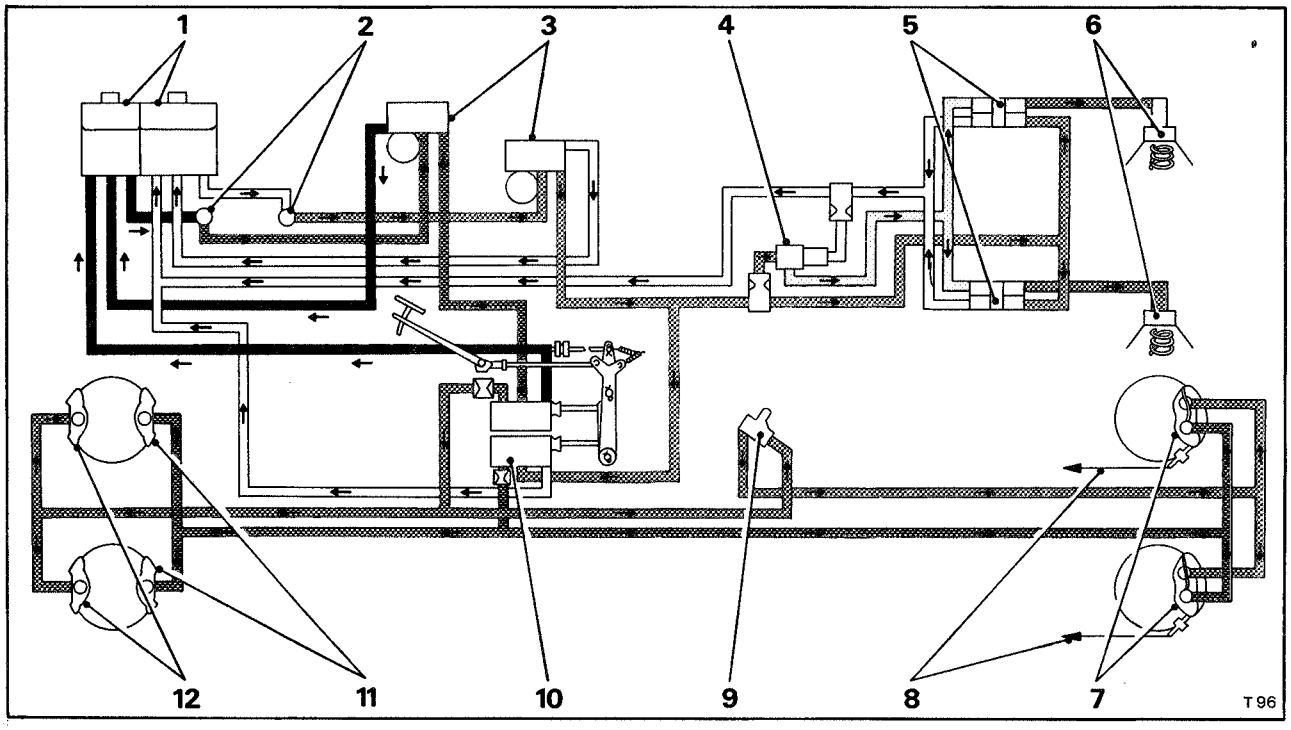

Fig. G4 Diagram of the hydraulic systems

No.1 Braking system
- High pressure
- Brake line pressure
- Low pressure
- Restrictors

No.2 Braking and levelling system
- High pressure
- Brake line pressure
- Low pressure
- Intermediate pressure
- High/low (solenoid signal pressure

1 Fluid reservoirs
2 Hydraulic pumps
3 Hydraulic accumulators
4 Solenoid valve
5 Height control valves
6 Height control rams
7 Rear wheel brake calipers
8 Parking brake cables
9 Deceleration conscious pressure limiting valve
10 Brake distribution valves
11 Rear brake calipers - front wheels
12 Front brake calipers - front wheels

Bleeding the systems

The following information is a comprehensive bleeding operation which should be carried out to ensure removal of air from the complete hydraulic systems but, as previously stated, each system can be bled separately at all points downstream of any replacements or pipe disconnections. A planned bleeding chart is given at the end of this section but if any doubt exists, it is advisable to bleed the complete system concerned.

Whilst bleeding is being carried out it is essential that the fluid level of the two reservoir compartments is kept to at least the topping-up level mark on the sight glasses using clean approved fluid (refer to Chapter D Lubricants).

All bleed screws should be torque tightened in accordance with the figure quoted in Chapter P.

When bleeding the hydraulic systems attach a length of rubber tube to each bleed screw prior to the bleed screw being opened, immerse the free end of the tube in approximately 2,5 cm. (1 in.) of brake fluid contained in a clean bottle.

With the gear selector in the 'P' park position and the parking brake applied, remove the gear-change thermal cut-out from the fuseboard below the facia.

Bleed the complete systems in the following sequence (refer to Fig. G5).

Depressurise the hydraulic systems.

Open bleed screws at points A, B and C.

Depress brake pedal. Start and run engine at between 750 r.p.m. and 800 r.p.m.

Ensure facia warning panels 1 BRAKE PRESSURE and 2 BRAKE PRESSURE are illuminated.

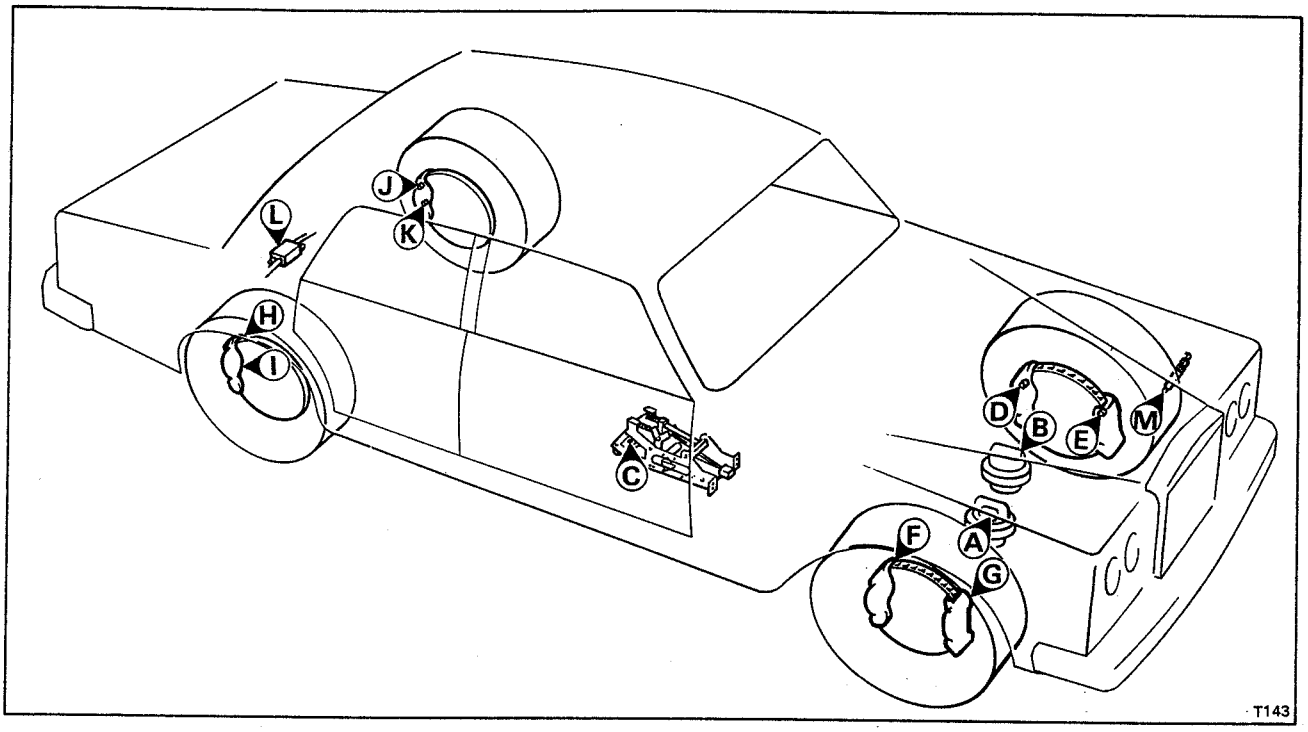

Fig. G5 Hydraulic system bleed point locations

A 'A' Bank accumulator
B 'B' Bank accumulator
C Pressure limiting valve
D Rear caliper left-hand front wheel
E Front caliper left-hand front wheel
F Rear caliper right-hand front wheel
G Front caliper right-hand front wheel
H Right-hand rear caliper (upper cylinder)
I Right-hand rear caliper (lower cylinder)
J Left-hand rear caliper (upper cylinder)
K Left-hand rear caliper (lower cylinder)
L Height control rams (underside rear floor)
M Pressure switch (left-hand valance)

Allow points A, B and C to bleed until air free.
Open bleed screws at points D and E; allow bleeding to start.
Close bleed screws at points A, B and C.
Bleed at points D and E until air free.
Open bleed screws at points F and G; allow bleeding to start.
Close bleed screws at points D and E.
Bleed at points F and G until air free.
Open bleed screws at points H and I; allow bleeding to start.
Close bleed screws at points F and G.
Bleed at points H and I until air free.
Open bleed screws J and K; allow bleeding to start.
Close bleed screws at points H and I.
Bleed at points J and K until air free.
Close bleed screws at points J and K.
Release brake pedal.
Add weight to rear of car to actuate levelling valves.
Allow systems to pressurise (facia warning panels extinguished).
Open bleed screws at point L; bleed until air free.
Close bleed screws at point L.
Switch off engine.
Open bleed screw at point M; bleed until air free.
Close bleed screw at point M.
Check fluid levels in reservoir, top up as necessary.
Fit rubber dust covers to each bleed screw.

Note

System 1 BRAKE PRESSURE bleed points A,C,E,G, H and J.
System 2 BRAKE PRESSURE bleed points B,D,F,I, K,L and M.

When bleeding the height control rams and the pressure switch extra care should be taken when slackening the bleed screws as the system will be operating at full pressure.

Sectional bleed requirements

Red pipe line

Any pipe disturbed between the hydraulic reservoir front compartment, front hydraulic pump, right-hand accumulator and upper distribution valve (No. 1 system).

Bleed the complete system: right-hand accumulator, deceleration conscious pressure limiting valve, front calipers on the front wheels, upper cylinder on the rear wheels.

Orange pipe line

Any pipe disturbed between the hydraulic reservoir rear compartment, rear hydraulic pump, left-hand accumulator, lower distribution valve and height control valves (No. 2 system).

Bleed the complete system: left-hand accumulator, rear calipers on the front wheels, lower cylinder on the rear wheels, height control rams and pressure switch.

Blue pipe line
Any pipe disturbed between the upper brake distribution valve and front calipers on the front wheels and the upper cylinders on the rear wheel calipers.

Bleed the deceleration conscious pressure limiting valve, the front calipers on the front wheels and the upper cylinder on the rear wheel calipers.

Mauve pipe line
Any pipe disturbed between the lower brake distribution valve and rear calipers on the front wheel and lower cylinder on the rear wheel calipers.

Bleed the rear calipers on the front wheels and the lower cylinders on the rear wheel calipers.

Brown pipe line
Any pipe disturbed between the height control valves and the height control rams.

Bleed the height control rams.

After bleeding, the systems must be fully charged and the reservoir compartments topped-up in accordance with the instructions given on the sight glass instruction plate.