



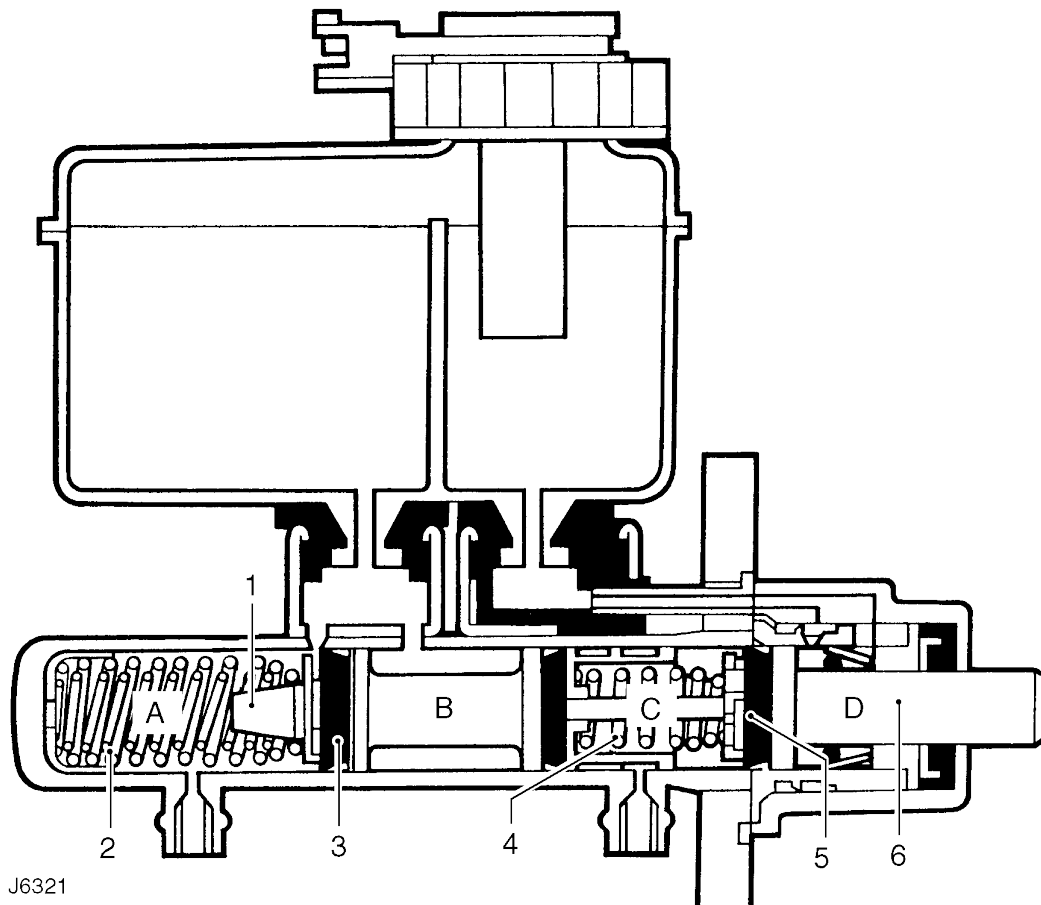
## DESCRIPTION

The mechanical components of the hydraulic braking system consists of four piston caliper disc brakes at the front and two piston caliper disc brakes at the rear.

Vented front brake discs are fitted as standard on 110/130 models, while 90 models have solid discs. However, on 90 models with a heavy duty chassis, vented front discs may also be fitted.

A cable controlled parking brake operates a single drum brake mounted on the output shaft of the transfer gearbox and is completely independent of the main braking system.

The basic hydraulic system involves 2 separate and independent primary and secondary circuits which permits a degree of braking should a fault occur in one of the circuits. The primary circuit operates the rear brake calipers and the secondary circuit the front brake calipers.



### Master cylinder components

- |                      |                      |
|----------------------|----------------------|
| 1. Secondary plunger | 4. Primary spring    |
| 2. Secondary spring  | 5. Recuperation seal |
| 3. Recuperation seal | 6. Primary plunger   |

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**OPERATION**

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**Master cylinder**

A tandem master cylinder, which is assisted by a light weight, short, compact servo, is fed by a divided fluid reservoir. The rear section supplies fluid for the primary circuit and the front section the secondary circuit.

When the brakes are off, the fluid can move unrestricted between the dual line system and the separate reservoirs in the fluid supply tank.

When the footbrake is applied, the primary plunger assembly moves up the cylinder bore and the pressure created acts in conjunction with the primary spring to overcome the secondary springs, thus moving the secondary plunger assembly up the bore. At the same time initial movement of both plungers takes the recuperating seals past the cut-off holes in the cylinder chambers "A" and "C", see J6321, and applies pressure to the fluid in those chambers, which is directed to the respective circuits.

The fluid in chambers "B" and "D" is unaffected by movement of the plungers and can move unrestricted between the separate chambers and respective reservoirs in the fluid supply tank, both before and during brake application. When the brakes are released, the plunger assemblies, aided by the return springs are retracted faster than the fluid; this creates a depression between the fluid in chambers "A" and "C" and the recuperation seals.

The recuperation seals momentarily collapse allowing fluid in chambers "B" and "D" to flow through the holes in the plungers, over the collapsed seals and into chambers "A" and "C" respectively. The movement of fluid from one set of chambers to the other, is compensated for by fluid from the separate reservoirs in the supply tank moving through the feed holes in the cylinder. Conversely, the final return movement of the plunger assemblies causes the extra fluid in chambers "A" and "C" to move through the cut off holes into the fluid reservoir.

The servo unit provides controlled power assistance to the brake pedal when pressure is applied. Power is obtained from a vacuum pump located on the RH side of the engine cylinder block. The vacuum is applied to both sides of a flexing diaphragm, and by admitting atmospheric pressure to the rear diaphragm, assistance is obtained. The servo unit is mounted between the brake pedal and master cylinder and is linked to these by push rods. Should a vacuum failure occur, the two push rods will act as a single rod allowing the brakes to function in the normal way, although more effort will be required to operate the brake pedal.

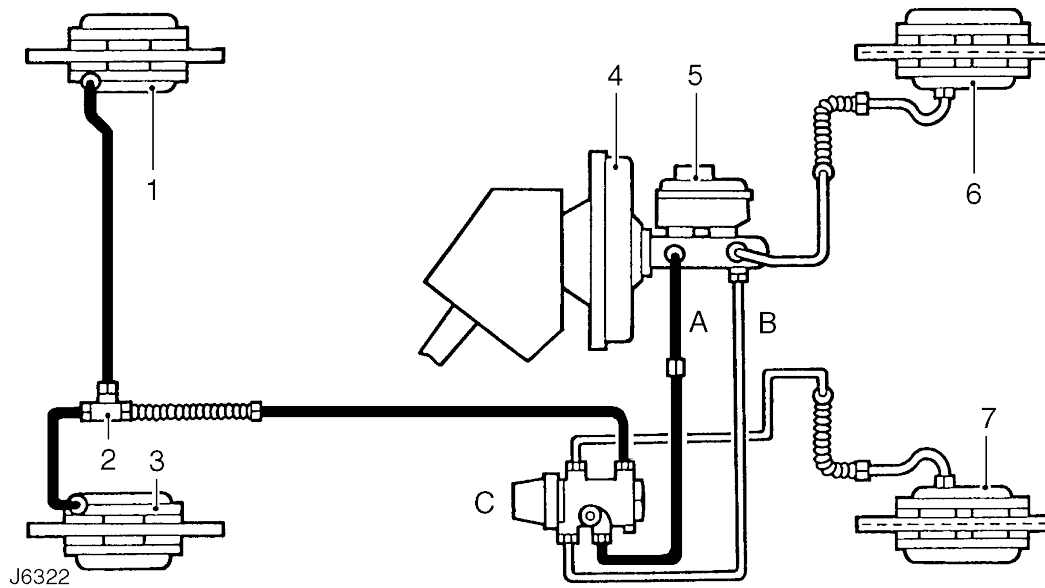
**Hydraulic system**

A brake fluid loss switch is fitted to the master cylinder reservoir filler cap. The switch is wired to a warning light on the vehicle fascia and will illuminate as a bulb check when the ignition is switched on and extinguishes when the engine is running and the handbrake is released. A hydraulic failure in the system will result in fluid loss, causing the warning light to illuminate.

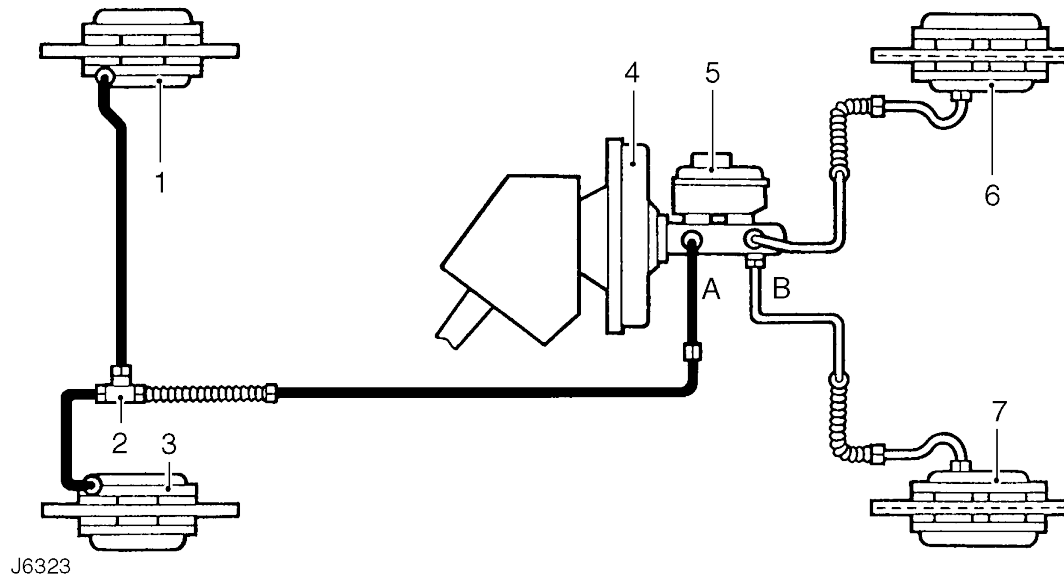
On 90 models a pressure reducing valve (PRV), fitted to the RH bulkhead in the engine compartment, maintains the braking balance, see J6322. Pressure to the rear calipers is regulated by the PRV, this valve is of the failure by-pass type, allowing full system pressure to the rear brake calipers in the event of a front (secondary) circuit failure.



**NOTE: In some countries, a pressure reducing valve may be fitted to 110 models to conform to legal requirements.**



### 90 Models



### 110/130 Models

#### Hydraulic system

**A-** Primary circuit

**B-** Secondary circuit

**C-** Pressure reducing valve (PRV)

1. LH rear brake caliper
2. T connector
3. RH rear brake caliper
4. Brake servo
5. Master cylinder and reservoir
6. LH front brake caliper
7. RH front brake caliper



## GENERAL BRAKE SERVICE PRACTICE

### Brake fluid precautions



**WARNING:** Do not allow brake fluid to come into contact with eyes or skin.



**CAUTION:** Brake fluid can damage paintwork, if spilled wash off immediately with plenty of clean water.



**CAUTION:** Use only correct grade of brake fluid. If an assembly fluid is required use **ONLY** brake fluid. Do **NOT** use mineral oil, i.e. engine oil etc.



**CAUTION:** Thoroughly clean all brake calipers, pipes and fittings before commencing work on any part of the brake system. Failure to do so could cause foreign matter to enter the system and cause damage to seals and pistons which will seriously impair the efficiency of the brake system. To ensure the brake system efficiency is not impaired the following warnings must be adhered to :-

- **DO NOT** use any petroleum based cleaning fluids or any proprietary fluids containing petrol.
- **DO NOT** use brake fluid previously bled from the system.
- **DO NOT** flush the brake system with any fluid other than the recommended brake fluid.

The brake system should be drained and flushed at the recommended service intervals.

Cover all electrical terminals carefully to make absolutely certain that no fluid enters the terminals and plugs.

## FLUID LEVEL CHECK/TOP UP



**WARNING:** Clean reservoir body and filler cap before removing cap. Use only fluid from a sealed container.

1. Park vehicle on level ground.
2. Check level is between 'MIN' and 'MAX' marks.
3. If level is below 'MIN' mark top up fluid level to 'MAX' mark on reservoir, using correct fluid. **See LUBRICANTS, FLUIDS AND CAPACITIES, Information, Recommended lubricants and fluids**



**CAUTION:** Do not fill reservoir above maximum line.

**BRAKE SYSTEM BLEED**

Service repair no - 70.25.02

**Preparation**

**WARNING:** Before bleeding the brake system refer to general brake service practice. *See General Brake Service*

**Practice .**

- During bleed procedure, brake fluid level must not be allowed to fall below the MIN level.
- To bleed the hydraulic circuits, four bleed nipples are provided, one at each caliper.
- There are two methods by which air can be removed from the braking system:-

1. **MANUAL BLEED PROCEDURE.**
2. **PRESSURE BLEED PROCEDURE.**

**Pressure bleed procedure**

Purpose designed equipment for pressure filling and bleeding of hydraulic systems may be used on Land Rover vehicles. The equipment manufacturer's instructions must be followed and the pressure must not exceed 4.5 bar, 65 lb/in<sup>2</sup>.

**Manual bleed procedure****Equipment required**

- Clean glass receptacle
- Bleed hose
- Wrench
- Approx 2 litres (3 pints) brake fluid. *See LUBRICANTS, FLUIDS AND CAPACITIES, Information, Recommended lubricants and fluids*

**Master cylinder bleed**

1. Disconnect battery.
2. Depress brake pedal fully and slowly 5 times.
3. Release the pedal and wait for ten seconds.
4. Air bubbles will rise into the reservoir during these instructions.
5. Repeat instructions until a firm resistance is felt at the pedal.

**Complete circuit bleed**

1. Disconnect battery.
2. Bleed front calipers, driver's side first. Fit bleed hose to bleed screw.
3. Dip free end of bleed hose into brake fluid in bleed bottle.
4. Open bleed screw of caliper.
5. Depress brake pedal fully several times until fluid is clear of air bubbles.
6. Keeping pedal fully depressed, tighten bleed screw, then release pedal.
7. Repeat procedure on other front caliper followed by rear calipers.
8. Fit all bleed screw protection caps.
9. Check/top-up fluid level when bleeding is complete *See Fluid Level Check/Top-Up .*



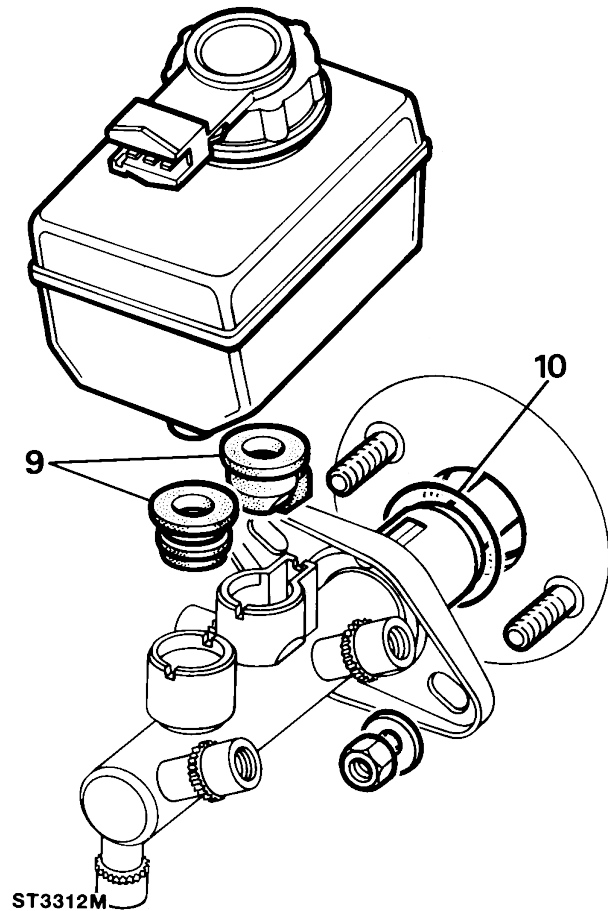
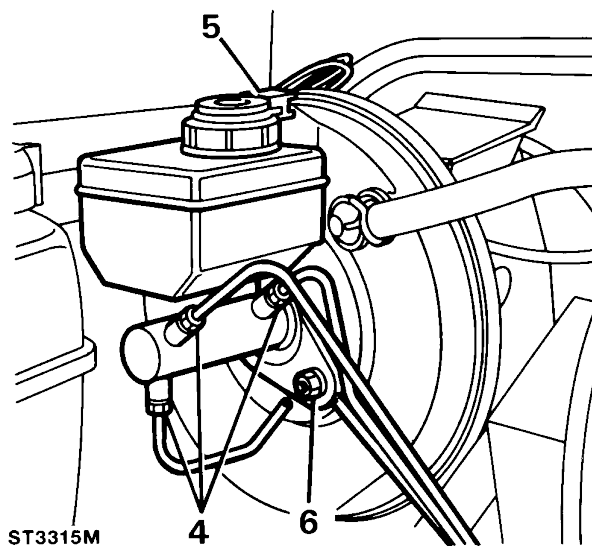
## MASTER CYLINDER

Service repair no - 70.30.08

Before starting repair refer to general brake service practice **See General Brake Service Practice**.

### Remove

1. Disconnect battery.
2. Place a container under the master cylinder to catch escaping brake fluid.
3. Clean area round master cylinder ports.



### Refit

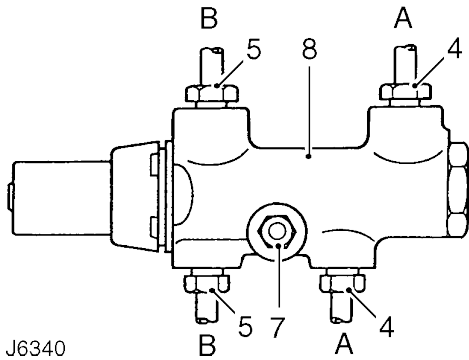
4. Disconnect pipes from master cylinder ports. Cover, not plug, the pipe ends to prevent entry of dirt.
5. Disconnect electrical leads from reservoir cap.
6. Remove two nuts securing master cylinder to servo and withdraw cylinder.
7. Remove reservoir cap and drain fluid into suitable container for disposal.
8. The reservoir is a push fit in the master cylinder and secured by seals. Carefully ease the reservoir from the master cylinder by rolling it from the seals. Note that the two seals are different sizes.
9. Insert new reservoir seals in the master cylinder ports and fit reservoir to master cylinder.
10. Ensuring that water ingress seal is in position, fit master cylinder to servo. Tighten fixings to **26 Nm (19 lbf/ft)**.
11. Connect brake pipes to master cylinder ports and tighten to **15 Nm (11 lbf/ft)**.
12. Fit electrical leads to reservoir cap.
13. Fill reservoir with recommended brake fluid. **See LUBRICANTS, FLUIDS AND CAPACITIES, Information, Recommended lubricants and fluids**
14. Bleed the brake system **See Brake system bleed**.
15. Reconnect battery and road test vehicle.

## PRESSURE REDUCING VALVE (PRV)

Service repair no - 70.25.21

### Remove

1. Disconnect battery.
2. Clean area around reducing valve ports.
3. Place a container under valve to catch escaping brake fluid.



4. Disconnect primary circuit pipe unions æAæ from valve.
5. Disconnect secondary circuit pipe unions æBæ from valve.
6. Cover pipes to prevent ingress of dirt.
7. Remove single retaining nut and bolt securing valve to engine bulkhead.
8. Remove valve.

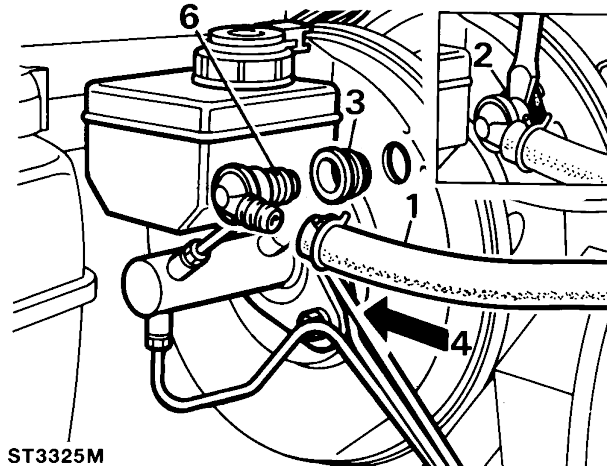
### Refit

9. Fit valve to engine bulkhead. Tighten bolt to **15 Nm (11 lbf/ft)**.
10. Connect primary and secondary circuit pipes to valve. Tighten to **16 Nm (12 lbf/ft)**.
11. Fill brake reservoir with recommended brake fluid **See LUBRICANTS, FLUIDS AND CAPACITIES, Information, Recommended lubricants and fluids**.
12. Bleed the brake system **See Brake system bleed**.
13. Reconnect battery and road test vehicle.

## SERVO NON RETURN VALVE

Service repair no - 70.50.15

### Remove



1. Disconnect brake vacuum hose from servo non return valve.
2. Carefully prise valve out with a screwdriver blade between valve and grommet. Take care not to exert too much pressure on the vacuum chamber.
3. Remove rubber grommet but be careful not to allow it to fall into the vacuum chamber.
4. Check the valve for correct operation; it should not be possible to pass air through into the servo in direction of arrow. Do not use compressed air.

### Refit

5. Fit rubber grommet.
6. Smear ribs of the valve with Lucas Girling rubber grease to assist assembly, and push valve fully home.
7. Connect vacuum hose to the valve.
8. Road test vehicle.