Published: May 23, 2008

Specifications

Brake Hydraulic Fluid

Item	Specification
* Recommended hydraulic fluid	SHELL DONAX YB DOT4 ESL FLUID

CAUTION: * If the above fluid is not available, use a low viscosity DOT 4 brake fluid meeting ISO 4925 Class 6 and Land Rover LRES22BF03 requirements.

General Specification

NOTE:

Pressure reducing valves are not fitted to all 110 specifications.

Item	Specification
Front caliper	AP Lockheed, four opposed pistons
Operation	Hydraulic, self adjusting
Front disc:	
- 90 Models	Solid, outboard
- 110/130 Models	Ventilated, outboard
Disc diameter	298 mm (11.73 in)
Front disc thickness:	
- 90 Models	14.1 mm (0.56 in)
- 110/130 Models	24 mm (0.95 in)
Wear limit	1 mm (0.04 in) per side of disc
Disc run-out maximum	0.15 mm (0.006 in)
Pad area	58 cm^2 (9.0 in^2)
Total swept area	801.3 cm^2 (124.2^2)
Pad material	Ferodo 3440 non asbestos
Pad minimum thickness	3 mm (0.12 in)
Rear caliper	AP Lockheed, four opposed pistons
Operation	Hydraulic, self adjusting
Rear disc	Solid, outboard
Rear disc diameter:	
- 90 Models	290 mm (11.42 in)
- 110/130 Models	298 mm (11.73 in)
Rear disc thickness:	
- 90 Models	12.5 mm (0.49 in)
- 110/130 Models	14.1 mm (0.56 in)
Wear limit:	
- 90 Models	0.38 mm (0.015 in) per side of disc
- 110/130 Models	1 mm (0.04 in) per side of disc
Disc run-out maximum	0.15 mm (0.006 in)
Pad area:	
- 90 Models	30.5 cm^2 (4.37 in^2)
- 110/130 Models	36.2 cm^2 (5.61 in^2)
Total swept area	694 cm^2 (106.98 in^2)
Pad material	Ferodo 3440 non asbestos

Pad minimum thickness	3 mm (0.12 in)
Parking brake	
Parking brake type	Mechanical, cable operated drum brake on the rear of the transfer gearbox output shaft
Parking brake drum internal diameter	254 mm (10.0 in)
Width	70 mm (2.75 in)
Pad material	Ferodo 3611 non asbestos
Master cylinder/Booster	
Master cylinder manufacturer	Lucas
Master cylinder type	Tandem, 25.4 mm (1.0 in) diameter
Booster type	LSC 80
Pressure reducing valve, failure conscious:	
- 90 Models	Cut-in pressure 24 bar (360 lbf/in²), ratio 4.0:1
- 110/130 Models	Cut-in pressure 43 bar (645 lbf/in²), ratio 2.9:1

Torque specifications

Description	**Nm**	**lbf-ft**
Brake pipe to pressure reducing valve	15	11
Brake pipe to brake calipers	15	11
Brake pipe to master cylinder	15	11
Flexible hoses to calipers	15	11
Bleed screws	15	11
Brake caliper to swivel pin housing	82	60
Brake disc bolts*	73	54
Brake drum screw	8**	6
Brake drum adjuster bolt	25	18
Booster assembly to pedal box	26	19
Pedal box to bulkhead	25	18
Master cylinder to booster	26	19

* Apply Loctite 270 before assembly **If you are refitting old screws, tighten to 25 Nm (18 lbf-ft).

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Brake System Bleeding (70.25.02)

 **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. Cover all electrical terminals carefully to make absolutely certain that no fluid enters the terminals and plugs. During bleed procedure, brake fluid level must not be allowed to fall below the MIN mark. Keep reservoir topped up to the MAX mark. To bleed the hydraulic circuits, four bleed nipples are provided, one at each caliper.**

1. There are two methods by which air can be removed from the braking system:
   - MANUAL BLEED PROCEDURE
   - PRESSURE BLEED PROCEDURE

2. Pressure bleed procedure
   - Purpose designed equipment for pressure filling and bleeding of hydraulic systems may be used on Land Rover vehicles . The equipment manufacturers instructions must be followed and the pressure must not exceed 4.5 bar, 65lb/in.

3. Manual bleed procedureEquipment required
   - Clean glass receptacle
   - Bleed hose
   - Wrench
   - Approx. 2 litres (3 pts) brake fluid

4. Master cylinder bleed
   - Disconnect battery negative lead
   - Depress brake pedal fully and slowly 5 times.
   - Release pedal and wait 10 seconds.
   - Repeat until firm resistance is felt at the pedal.

5. Complete circuit bleed
    - Disconnect battery negative lead
    - Fit bleed hose to caliper bleed screw.
    - Dip free end of bleed hose into brake fluid in bleed bottle.
    - Open bleed nipple.
    - Depress brake pedal fully several times until fluid is clear of air bubbles.
    - Keeping pedal fully depresses, tighten bleed nipple then release pedal.
    - Repeat procedure for remaining calipers.
    - Fit bleed screw protection caps.
    - Check/top-up fluid level when bleeding is complete.

Published: Jul 12, 2006

Brake System

Master cylinder description

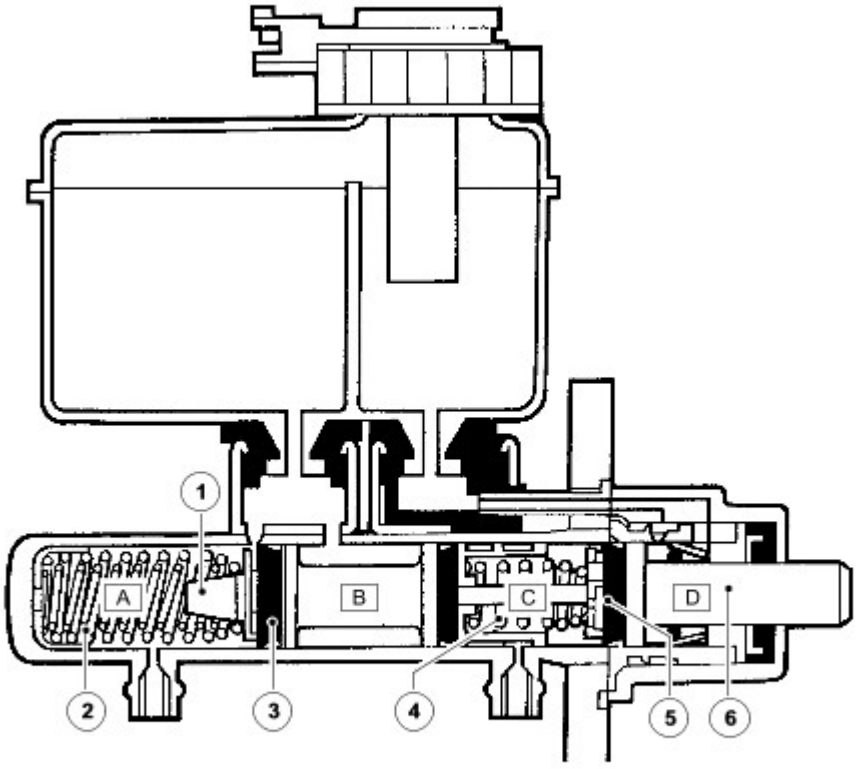
The mechanical components of the hydraulic braking system consists of four piston caliper disc brakes at the front and two piston caliper disc brakes at the rear.

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



J6321

Item	Part Number	Description
1		Secondary plunger
2		Secondary spring
3		Recuperation seal
4		Primary spring

5		Recuperation seal
6		Primary plunger

Master cylinder operation

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.

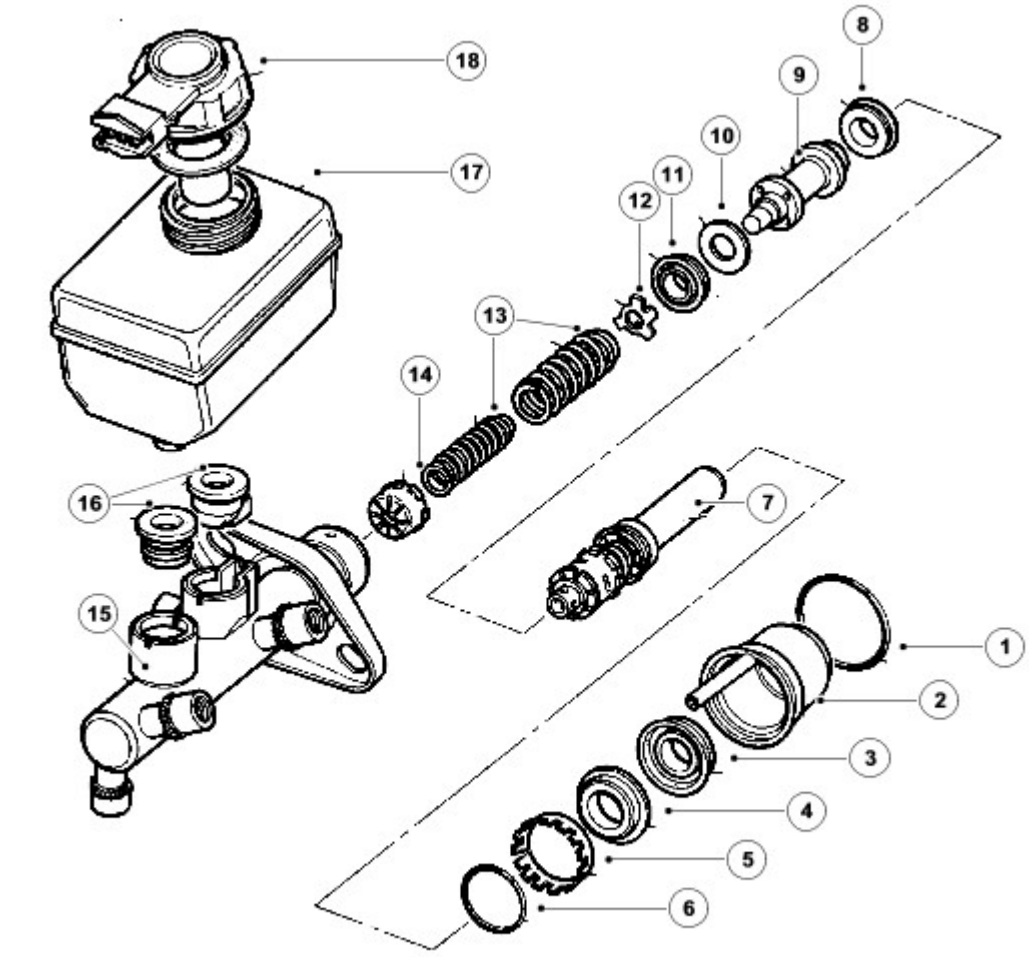
When the footbrake is applied, the primary plunger assembly moves up the cylinder bore and the pressure created acts in conjunction with the primary spring to overcome the secondary springs, thus moving the secondary plunger assembly up the bore. At the same time initial movement of both plungers takes 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.

Master cylinder overhaul components



ST3324M

Item	Part Number	Description
1		Water ingress seal
2		Transfer housing
3		Vacuum seal
4		Guide ring
5		Retaining ring
6		O-ring seal
7		Primary plunger assembly
8		'L' seal
9		Secondary plunger
10		Washer
11		Recuperating seal (primary cup)
12		Seal retainer
13		Springs
14		Swirl tube
15		Master cylinder body
16		Reservoir seals
17		Reservoir
18		Low fluid level switch and cap

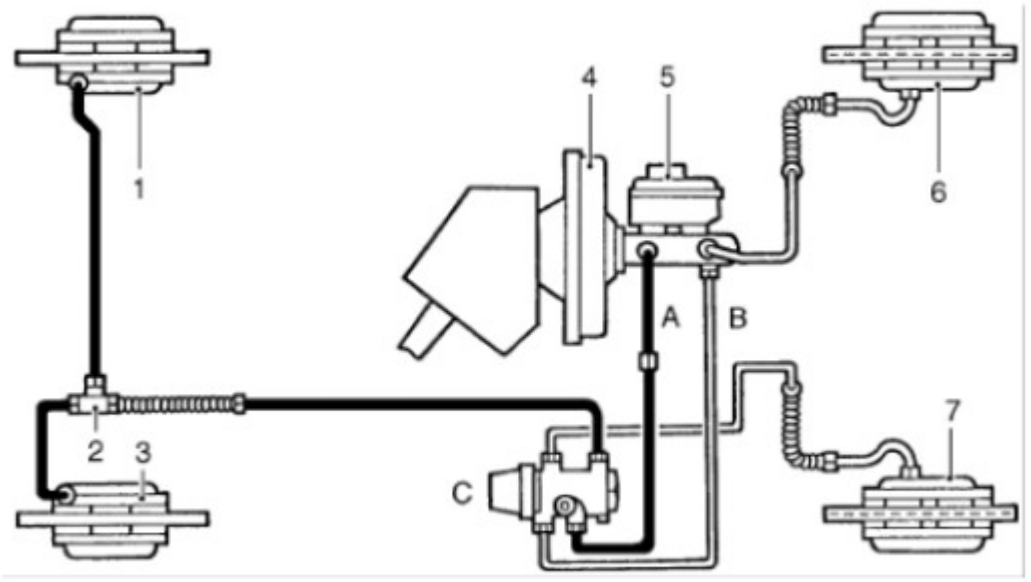
Hydraulic system

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

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.

90 Models

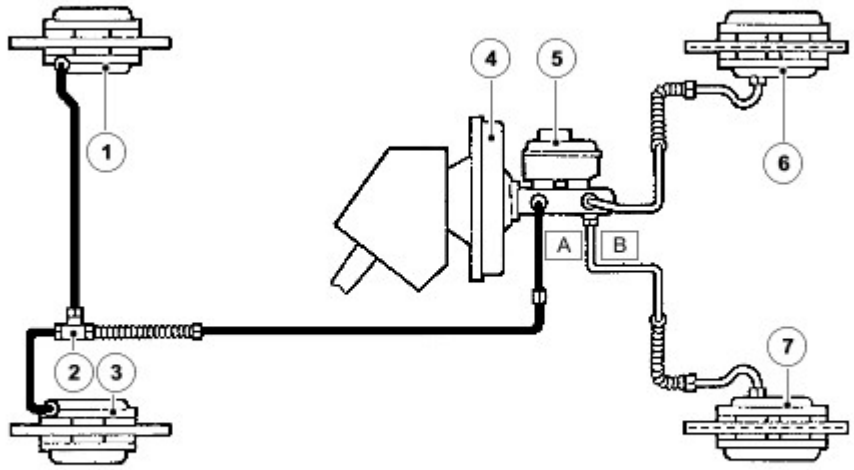


J6322

110/130 Models

NOTE:

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

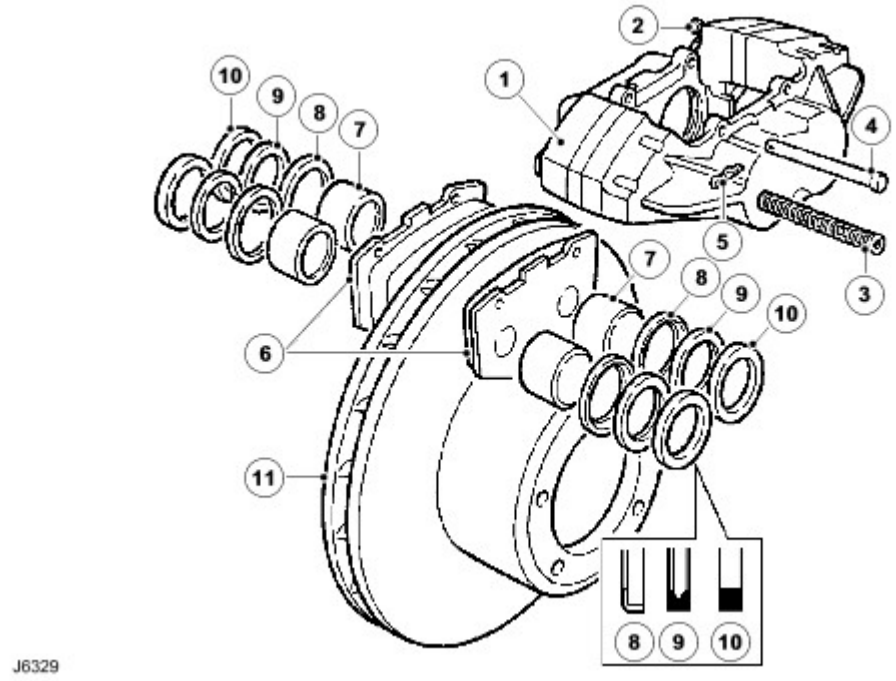


J6323

Item	Part Number	Description
A		Primary circuit
B		Secondary circuit
C		Pressure reducing valve
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

Front brake caliper assembly

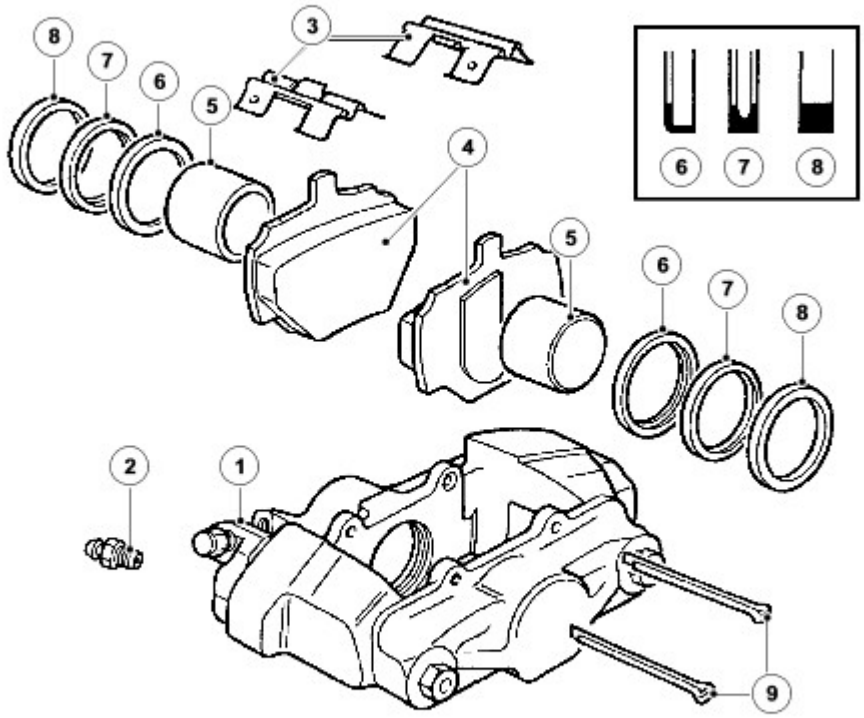
Front brake caliper components



Item	Part Number	Description
1		Caliper
2		Bleed screw
3		Anti-rattle springs
4		Pad retaining pins
5		Split pin
6		Friction pads
7		Piston
8		Wiper seal retainer
9		Wiper seal
10		Fluid seal
11		Brake disc

Rear brake caliper assembly

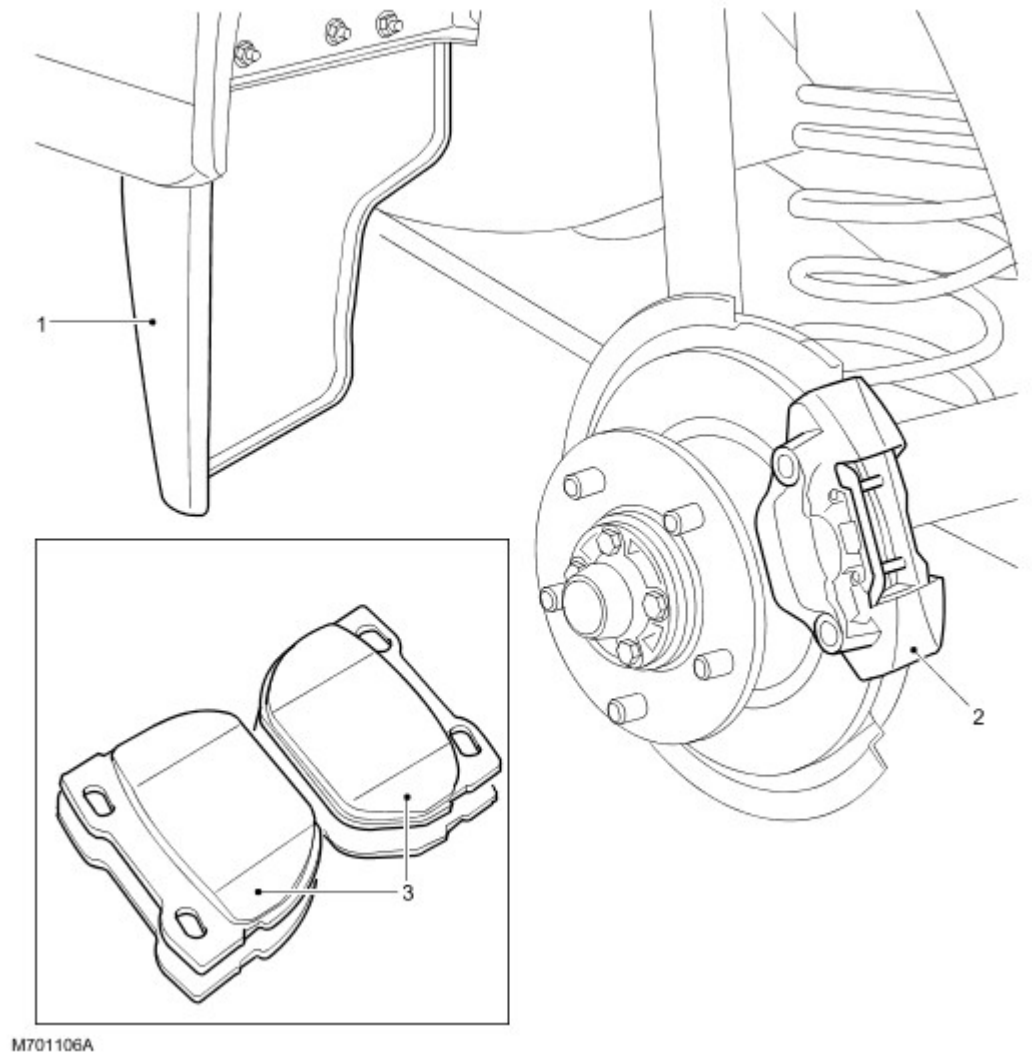
Rear brake caliper components



J6335

Item	Part Number	Description
1		Caliper
2		Bleed screw
3		Pad retaining springs
4		Brake pads
5		Piston
6		Wiper seal retainer
7		Wiper seal
8		Fluid seal
9		Retraining pins

Rear brake caliper installation - From 02MY



M701106A

Item	Part Number	Description
1		Deflector
2		Rear brake caliper
3		rear brake pads

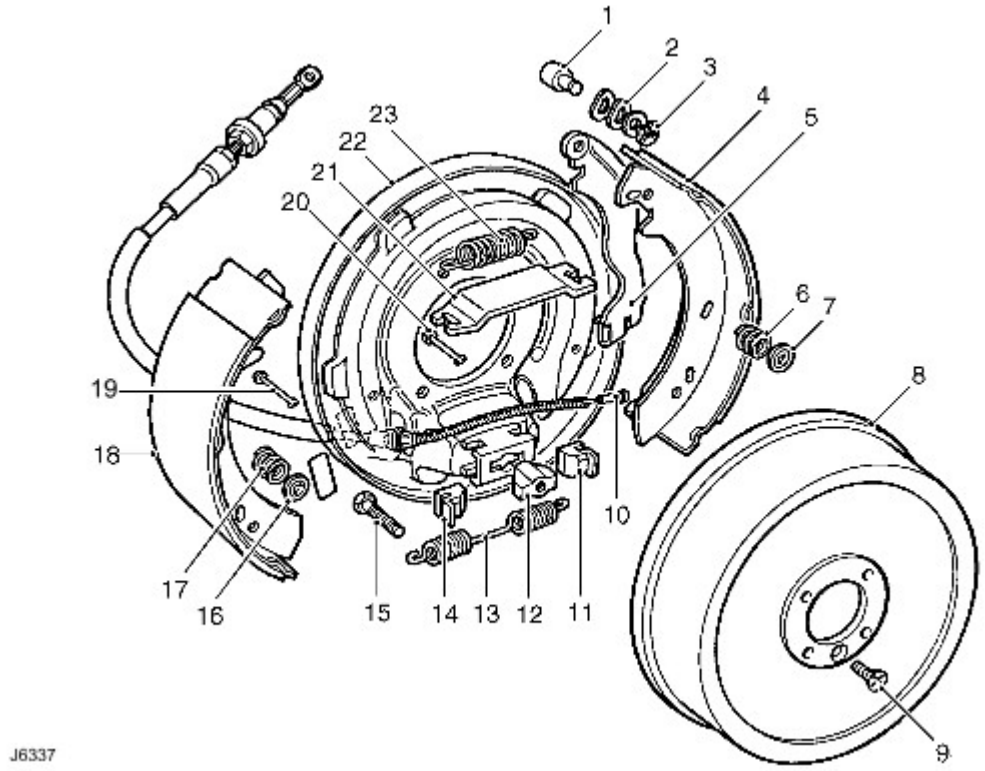
Modifications to the rear brakes have been introduced on 110 and 130 models. This is to increase the service life of the rear brake pads in harsh environments.

New rear brake calipers are introduced which allow the fitment of brake pads with a thicker friction material. The brake pads have increased leading and trailing edge chamfers which improve efficiency

Aerodynamic deflectors are located forward of the rear wheels to protect the rear calipers from the ingress of dirt, which can cause excessive pad wear. The deflectors are fitted to 90, 10 and 130 models in markets where environmental conditions can cause excessive brake pad wear.

Parking brake

Parking brake components



Item	Part Number	Description
1		Pin
2		Washer
3		'C' clip
4		Brake shoe
5		Cable lever
6		Hold down spring
7		Dished washer
8		Brake drum
9		Screw
10		Brake cable
11		Adjuster slide
12		Adjuster nut
13		Spring
14		Adjuster slide
15		Adjuster bolt
16		Dished washer
17		Hold down spring
18		Brake shoe
19		Hold down pin
20		Hold down pin
21		Abutment plate
22		Back plate
23		Spring