

Brake System - General Information -

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

Item	Specification
Footbrake type:	
Vehicles without Brembo brakes	Hydraulic, servo assisted, self-adjusting with front/rear split hydraulic system, twin piston sliding calipers to the front and single piston sliding calipers to the rear
Vehicles with Brembo brakes	Hydraulic, servo assisted, self-adjusting with front/rear split hydraulic system, opposed six piston calipers to the front and single piston sliding calipers to the rear
Parking brake type	Twin shoe (leading/trailing) operating on rear wheels and controlled from park brake lever in floor console via twin cables

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Brake System - General Information - Brake System

Diagnosis and Testing

Principles of Operation

For a detailed description of the Brake System and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to:

[Front Disc Brake](#) (206-03 Front Disc Brake, Description and Operation),
[Rear Disc Brake](#) (206-04 Rear Disc Brake, Description and Operation),
[Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
 - If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical	
● Brake pad(s) condition and installation ● Brake caliper(s) condition and installation ● Brake disc(s) condition and installation ● Parking brake disc(s)/parking brake drum(s) condition and installation ● Parking brake shoes condition and installation ● Parking brake cable(s) condition and installation ● Brake booster condition and installation ● Brake booster vacuum hose condition and installation ● Brake master cylinder condition and installation ● Hydraulic Control Unit (HCU) ● Brake fluid leaks ● Brake warning indicator	

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Brake noise	● Debris ● Brake pads ● Brake disc(s)	Refer to the relevant section of the workshop manual.
Brake vibration	● Suspension components ● Brake disc(s)	Refer to the relevant section of the workshop manual.
Excessive brake pedal travel/brake pedal spongy	● Brake pads ● Air in the brake system ● Brake master cylinder ● Brake fluid leak (see visual inspection)	Worn pads may make the pedal travel excessive, new pads may make the pedal spongy. Check after bedding in the pads. Check the pedal travel. If the pedal "pumps-up", suspect air in the system. Check for a cause for air ingress, rectify as necessary. If the pedal sinks to the floor when held under pressure when there are no external leaks, suspect a master cylinder fault. Refer to the relevant section of the workshop manual.
Excessive brake pedal effort/brake pedal hard	● Brake pipe(s) ● Brake caliper slide(s) ● Brake caliper piston(s) ● Brake vacuum pipe ● Brake vacuum pump ● Brake booster	Check for damaged brake pipes. Check the brake calipers. Check the brake vacuum pipe for air leaks, rectify as necessary. Check the brake vacuum pump operation. Refer to the relevant section of the workshop manual. Check the brake booster.

Symptom	Possible Causes	Action
Low foot brake efficiency/brakes pulling/sticking/binding	● Brake pipe(s) ● Pads ● Brake caliper piston(s) ● Brake caliper slide(s) ● Brake disc(s)	Check the vehicle for damaged brake pipes. Inspect the brake pads. Check the brake calipers. Check the brake discs. Refer to the relevant section of the workshop manual.
Parking brake will not engage or release	● Parking brake cables ● Parking brake shoes ● Parking brake adjusters ● Rear brake disc(s)/parking brake drum(s) ● Parking brake actuator malfunction	Check the parking brake cable(s) for operation/condition. Check that the cable end connector(s) are correctly installed to the operating lever(s). Inspect the parking brake shoes for wear. Check the parking brake shoes for correct adjustment. Check the rear brake disc(s)/parking brake drum(s). Check the parking brake actuator for damage and/or excessive noise in normal operation. Refer to the relevant section of the workshop manual.
Low parking brake efficiency/parking brake sticking/binding		
Brake warning indicator staying illuminated	● Brake reservoir fluid level ● Brake pads ● Brake pad wear sensor leads ● Brake fluid level sensor	Check the brake fluid level, top up if required. Inspect the brake pads. Check the brake pad sensor circuit. Refer to the electrical guides. Check the function of the brake fluid level sensor. Refer to the relevant section of the workshop manual.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Brake System - General Information - Rear Brake Disc Runout Check

General Procedures

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- NOTE: RH illustration shown, LH is similar.
- NOTE: It is not necessary to carry out the parking brake shoe 'bedding-in procedure' if the rear brake discs or parking brake shoes have been removed for access to other components.

1.  CAUTION: Do not turn the ignition on when the parking brake service mode has been set, this will result in the parking brake being released from the service mode.

Enter the parking brake into the service mode.

- Turn the ignition on.
- Apply, and hold, the footbrake.
- Apply, and hold, the parking brake switch to the RELEASE position.
- Turn the ignition off.
- Release the footbrake.
- Release the parking brake switch.

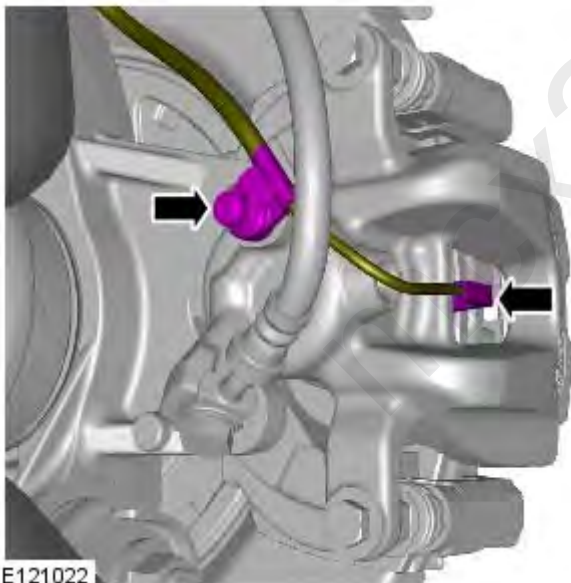
2.  WARNING: Make sure to support the vehicle with axle stands.

Raise rear of vehicle.

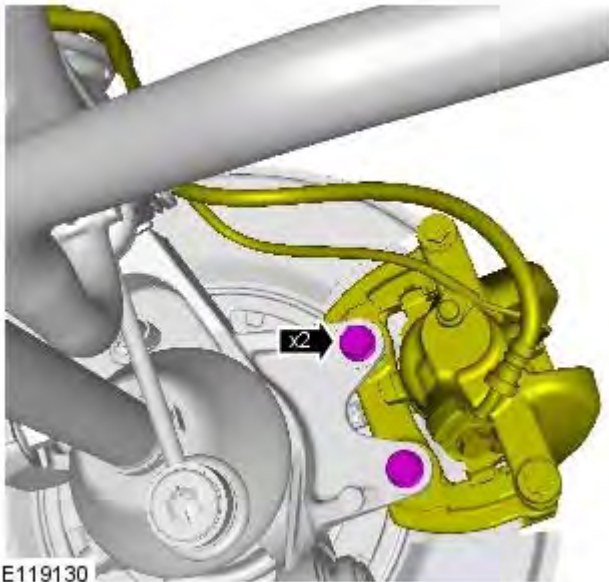
3. Remove road wheel.

4.  CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side rear only: Disconnect the brake pad wear indicator sensor lead.

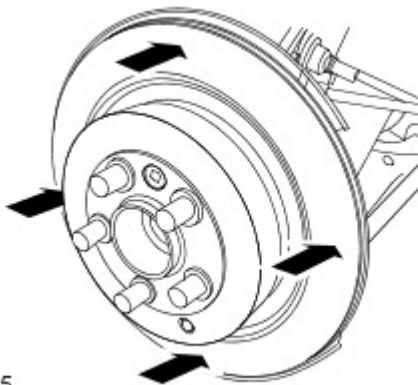


5. Remove 2 bolts securing brake caliper to hub. Release caliper from hub and tie aside.



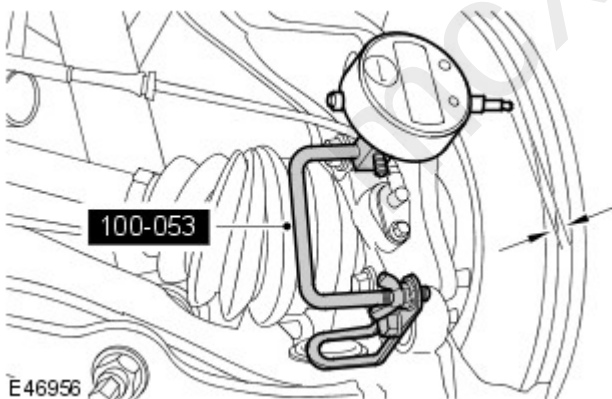
6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

At 4 points around the disc, measure disc thickness using a micrometer; renew disc if less than service limit or if variation is exceeded: Disc thickness, NEW = 20 mm Service limit = 18 mm. Thickness variation maximum = 0.01 mm.

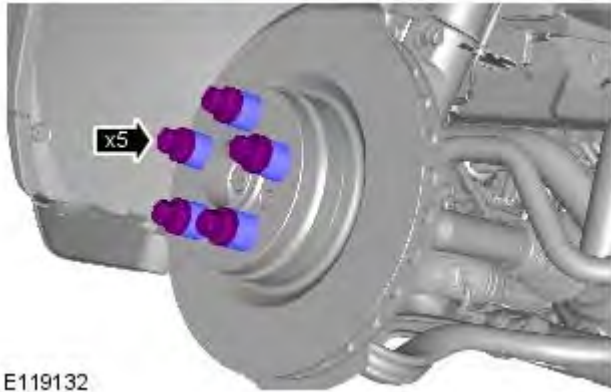


7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Mount a Dial Test Indicator (DTI) to and secure to inboard side of hub using caliper assembly upper bolt hole.



8. Position DTI probe 5 mm in from outer edge of disc.



9. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten the wheel nuts to 140 Nm (103 lb.ft).

- Install spacer washers under the wheel nuts.

10. Zero DTI and rotate wheel one complete revolution to measure disc runout. Disc runout must not exceed 0.09 mm (0.003 in).

11. If disc runout is outside limits:

12. Remove the wheel hub nuts.

- Remove the spacer washers.

13. Remove Allen screw securing brake disc to drive flange.

14. Remove brake disc.

15. Ensure mating surfaces of disc and drive flange are clean.

16. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

17. Tighten the wheel nuts to 140 Nm (103 lb.ft).

- Install spacer washers under the wheel nuts.

18. Check disc runout as detailed above.

19. If runout is still outside limits, renew disc and/or hub.

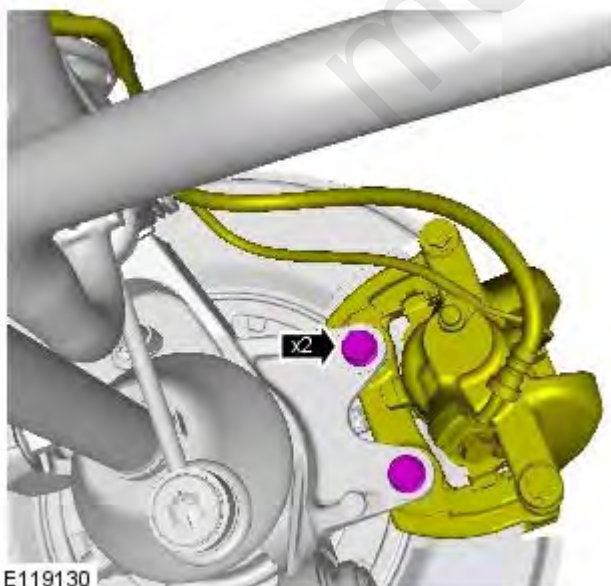
20. Remove the wheel hub nuts.

- Remove the spacer washers.

21. Remove the DTI.

22. Install the brake caliper anchor bolts

- Tighten the bolts to 115 Nm (85 lb.ft).



23. Tighten the wheel nuts to 140 Nm (103 lb.ft).

24. Depress brake pedal several times to set brake pads.

25. Remove stands and lower vehicle.

Brake System - General Information - Brake System Bleeding

General Procedures



WARNING: If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using Land Rover approved diagnostic equipment. This will ensure that all air is expelled from the new component(s).

- **NOTE:** Bleeding of the complete brake system must be carried out using Land Rover approved diagnostic equipment. Where only the primary or secondary brake circuits have been disturbed in isolation, it should only be necessary to bleed that circuit. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

- **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.



1. WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.



3. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

- **CAUTIONS:**



! Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



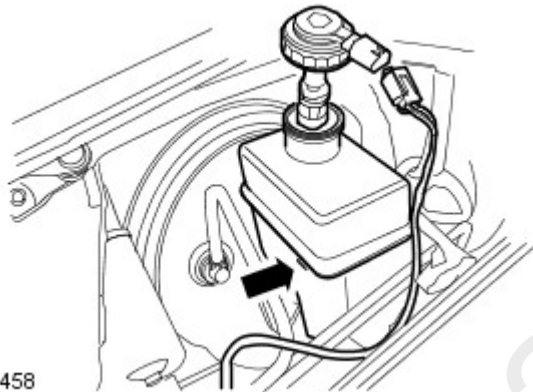
! The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

Fill the brake fluid reservoir to the MAX mark.

- Disconnect the brake fluid reservoir electrical connector.
- Remove the brake fluid reservoir cap.

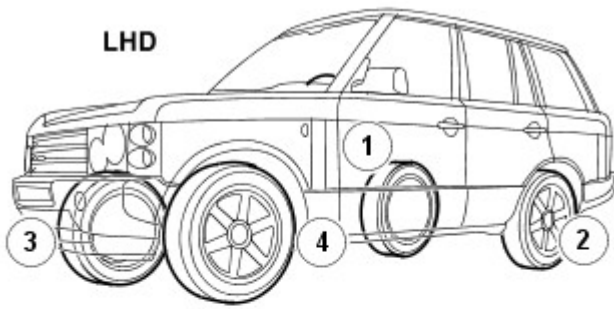
4. Conduct the bleed procedure with the engine running.

5. Connect the diagnostic tool to the vehicle, select diagnostic and proceed as directed for bleeding the brake system.



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6. Starting at the brake caliper furthest away from the brake master cylinder, loosen the bleed screw by one-half to three-quarters of a turn.



E62462

RHD

7. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.

- Hold the bleed container at least 300 mm above the Caliper that is being bled.

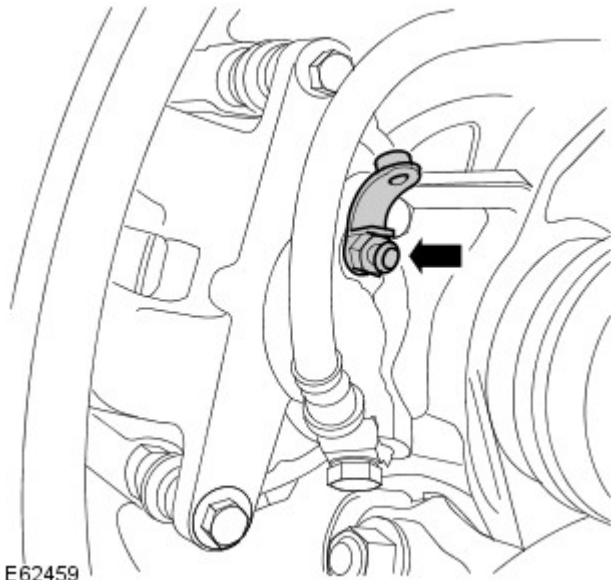
8.  **CAUTION:** The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

With assistance, depress the brake pedal steadily through to 2/3 of its full stroke.

9. With the brake pedal held down, close bleed screw and then return the brake pedal to 1/3 of its full stroke and hold.

10. Repeat steps 8 and 9, 28 times for the rear brake and 10 times for the front brake.

11. At the end of the bleed process, depress and hold the brake pedal down.



E62459

12.  **CAUTION:** Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw to 10 Nm (7 lb.ft).

13. Fill the brake fluid reservoir to the MAX mark.

14.  **WARNING:** Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper, following the above sequence.

15. Fill the brake fluid reservoir to the MAX mark.

16. Apply the brakes and check for leaks.

17. Install the brake fluid reservoir cap.

- Connect the brake fluid reservoir electrical connector.

18. On completion, road test the vehicle and check the brake pedal operation. The pedal travel should be short with a firm feel.

Brake System - General Information - Brake System Pressure Bleeding

General Procedures

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.

3.  **WARNING:** Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

- CAUTIONS:

 Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

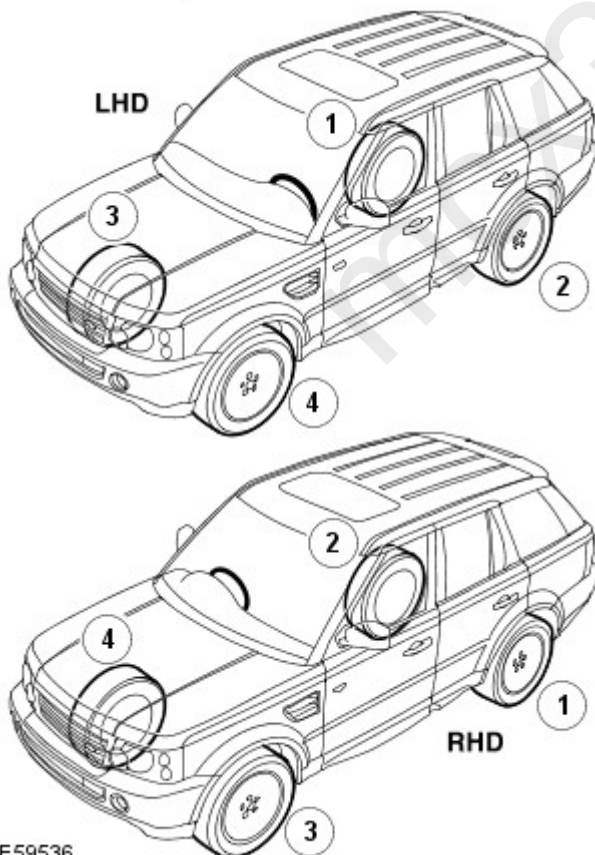
 The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

Fill the brake fluid reservoir to the MAX mark.

- Disconnect the brake fluid reservoir electrical connector.
- Remove the brake fluid reservoir cap.

4. Conduct the bleed procedure with the engine running.

5. Starting at the brake caliper furthest away from the brake master cylinder, loosen the bleed screw by one-half to three-quarters of a turn.



E59536

- 6.

- Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar

containing a small quantity of approved brake fluid.

- Hold the bleed container at least 300 mm above the Caliper that is being bled.

7.  **CAUTION:** The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

With assistance, depress the brake pedal steadily through to 2/3 of its full stroke.

- 8.** With the brake pedal held down, close bleed screw and then return the brake pedal to 1/3 of its full stroke and hold.
- 9.** Repeat steps 7 and 8, 28 times for the rear brake and 10 times for the front brake.
- 10.** At the end of the bleed process, depress and hold the brake pedal down.

11.  **CAUTION:** Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw.

- On vehicles with high performance brakes, tighten the front caliper bleed screw to 19 Nm (14 lb.ft).
- On vehicles with standard brakes, tighten the front caliper bleed screw to 10 Nm (7 lb.ft).
- Tighten the rear caliper bleed screws to 10 Nm (7 lb.ft).

- 12.** Fill the brake fluid reservoir to the MAX mark.

13.  **WARNING:** Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper, following the above sequence.

- 14.** Fill the brake fluid reservoir to the MAX mark.
- 15.** Apply the brakes and check for leaks.
- 16.** Install the brake fluid reservoir cap.

- Connect the brake fluid reservoir electrical connector.

- 17.** On completion, road test the vehicle and check the brake pedal operation. The pedal travel should be short with a firm feel.

Brake System - General Information - Component Bleeding

General Procedures



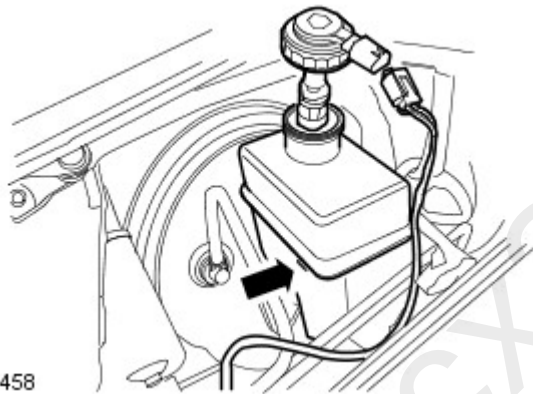
WARNING: If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using Land Rover approved diagnostic equipment. This will ensure that all air is expelled from the new component(s).



CAUTION: LH illustration shown, RH is similar.

• **NOTE:** Bleeding of the complete brake system must be carried out using Land Rover approved diagnostic equipment. The following manual procedure covers bleeding the brake system for components down stream of the HCU, where only the primary or secondary brake circuits have been disturbed in isolation. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

• **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.



1. WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.

3. Pump the brake pedal until the brake vacuum assistance is exhausted.



4. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

• **CAUTIONS:**



Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

Remove the brake fluid reservoir cap.

- Disconnect the brake fluid reservoir electrical connector.
- Fill the brake fluid reservoir to the MAX mark.

5. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.

- Hold the bleed container at least 300 mm above the Caliper that is being bled.

6. Loosen the bleed screw by one-half turn to three-quarters of a turn.



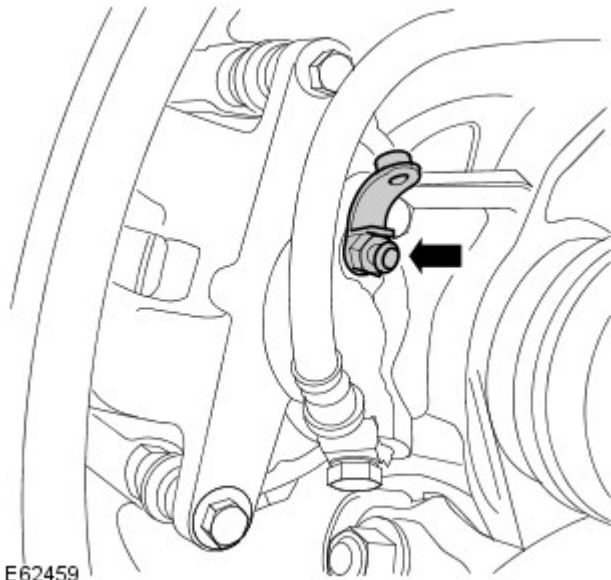
7. CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

With assistance, depress the brake pedal steadily through to 2/3 of its full stroke.

8. With the brake pedal held down, close bleed screw and then return the brake pedal to 1/3 of its full stroke and hold.

9. Repeat steps 7 and 8, 28 times for the rear brake and 10 times for the front brake.

10. At the end of the bleed process, depress and hold the brake pedal down.



11.  **CAUTION:** Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw.

- On vehicles with high performance brakes, tighten the front caliper bleed screw to 19 Nm (14 lb.ft).
- On vehicles with standard brakes, tighten the front caliper bleed screw to 10 Nm (7 lb.ft).
- Tighten the rear caliper bleed screws to 10 Nm (7 lb.ft).

12. Fill the brake fluid reservoir to the MAX mark.

13. Apply the brakes and check for leaks.

14. Install the brake fluid reservoir cap.

- Connect the brake fluid reservoir electrical connector.

15. On completion, road test the vehicle and check the brake pedal operation. The pedal travel should be short with a firm feel.