



## Section G

# Brakes

Service Manual - Groundhog 4x4

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## Section G - Brakes

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# Section G - Brakes

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# Technical Data

## Groundhog 4x4

Disc brake on each wheel, split front to rear.

### Service Brake

Type:	Disc
Actuation:	Hydraulic
Location:	Each wheel
Disc Diameter:	Front 5.588 mm (0.22 in.) Rear 5.334 mm (0.21 in.)

### Park Brake

Type:	As service brake
Actuation:	Mechanical cables/linkages
Location:	Rear wheels only

# Basic Operation

## Brake Circuit

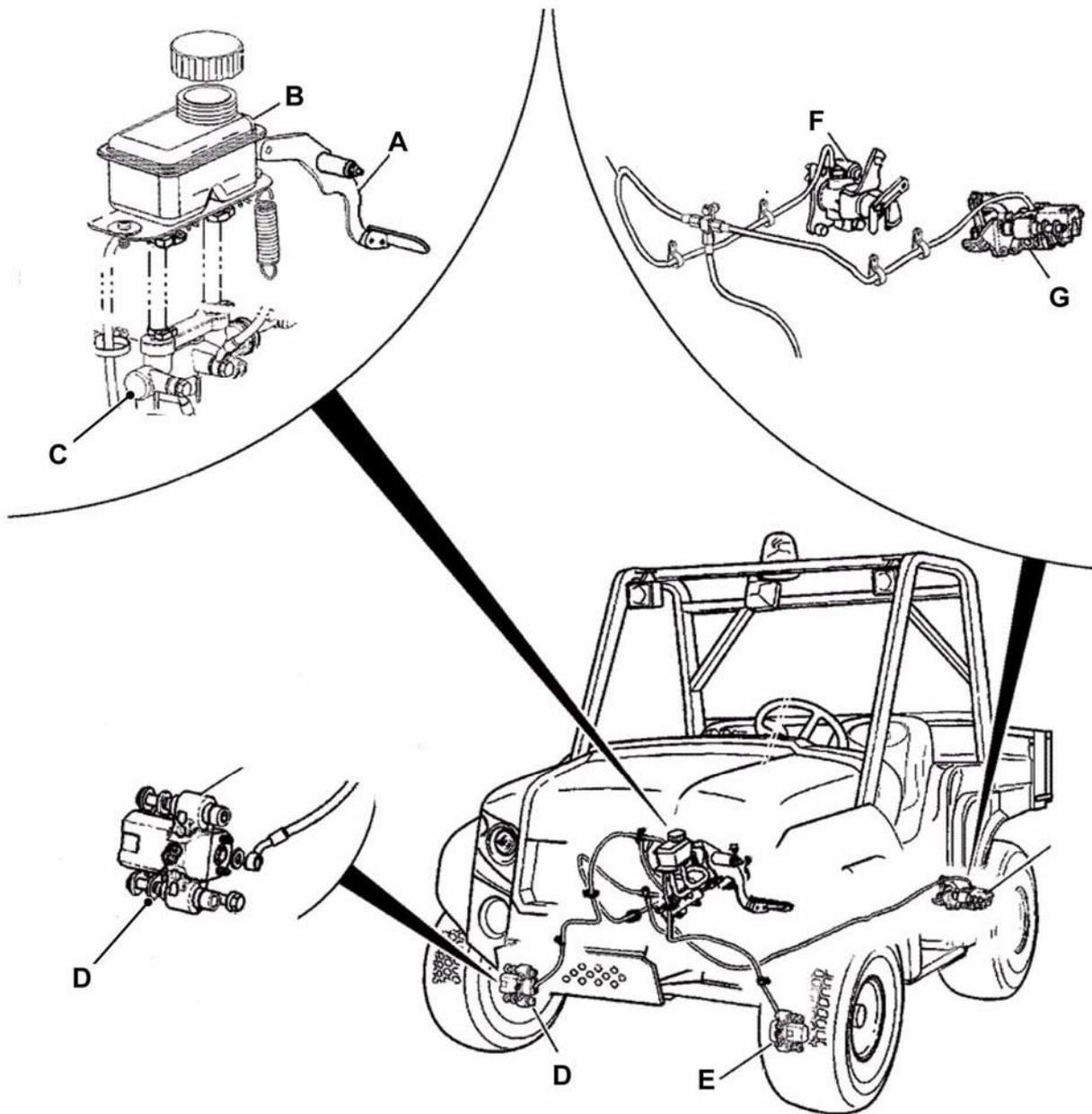


Fig 1.

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- A Brake Pedal
- B Remote Reservoir
- C Brake Master Cylinder
- D Brake Caliper - Right Hand Front
- E Brake Caliper - Left Hand Front
- F Brake Caliper - Right Hand Rear

- G Brake Caliper - Left Hand Rear

The brakes comprise a disc and caliper fitted to each wheel.

Actuation is by hydraulics to all wheels from the foot pedal, and by mechanical cable and linkages to the rear wheels only by the parking brake lever.

# Fault Finding

## Brake System

**Note:** The brakes generate a high temperature when operating, this means that the disc will be hot to touch, this condition is normal.

### Fault(s)

⇒ [Table 1. One or more brakes do not apply. \(Brake travel not excessive, brakes not pulling to one side\) \(□ G-3\)](#)

⇒ [Table 2. Pedal travel excessive \(but not touching floor\) \(□ G-3\)](#)

⇒ [Table 3. Pedal hard to operate. \(□ G-3\)](#)

⇒ [Table 4. Pedal touches floor under constant pressure - no fluid loss. \(□ G-4\)](#)

⇒ [Table 5. Pedal touches floor under constant pressure and fluid loss. \(□ G-4\)](#)

⇒ [Table 6. Poor braking \(not pulling to one side\). \(□ G-4\)](#)

⇒ [Table 7. Brakes not releasing \(□ G-4\)](#)

⇒ [Table 8. Poor braking when hot \(□ G-4\)](#)

⇒ [Table 9. Excessive brake noise in operation \(□ G-5\)](#)

⇒ [Table 10. Fluid loss when machine standing for instance - overnight \(□ G-5\)](#)

**Table 1. One or more brakes do not apply. (Brake travel not excessive, brakes not pulling to one side)**

Possible Cause	Action
1 Master cylinder fault.	Check master cylinder to identify fault area, service as required.
2 Brake disc distortion.	Renew front or rear brake discs in pairs

**Table 2. Pedal travel excessive (but not touching floor)**

Possible Cause	Action
3 Air in hydraulic system.	Check fluid reservoir level. Check for fluid/air leaks, rectify as required. Bleed the brake system.
4 Leak in hydraulic system.	Check for fluid loss at master cylinder and brake piston, all pipes and fittings for loose connections. Rectify as required. Top up brake reservoir and bleed the brake system.
5 Brake disc distortion.	See Item 2.

**Table 3. Pedal hard to operate.**

Possible Cause	Action
6 Tightness at pedal pivot.	Inspect pedal pivot. Free-off/lubricate.
7 Fluid contamination/seal damage.	Flush system and renew all hydraulic seals. Bleed the brake system.
8 Misaligned push rod/pedal.	Check and rectify as required.
9 Kinked or crushed brake hoses.	Check/renew brake hoses.

**Table 4. Pedal touches floor under constant pressure - no fluid loss.**

Possible Cause	Action
10 Master cylinder fault.	See Item 1.
11 Brake disc distortion.	See Item 2.
12 Air in hydraulic system.	See Item 3.

**Table 5. Pedal touches floor under constant pressure and fluid loss.**

Possible Cause	Action
13 External fluid leaks.	Visually check brake circuit for fluid loss, service as required. Top up brake reservoir and bleed the brake system.

**Table 6. Poor braking (not pulling to one side).**

Possible Cause	Action
14 Brake pads worn beyond limits or distorted.	Renew brake pads- both front sets or both rear sets.
15 Master cylinder fault.	See Item 1.
16 Annular piston fault.	See Item 22.

**Table 7. Brakes not releasing**

Possible Cause	Action
17 Brake pedal spring fault.	Fit a new spring.
18 Master cylinder fault (plunger stuck in bore).	See Item 1.
19 Blocked hole in master cylinder reservoir cap.	Fit a new reservoir cap.
20 Brake pedal free travel incorrect.	Adjust pedal free travel.
21 Fluid contamination/seal damage.	Flush system and renew hydraulic seals. Refill with clean fluid and bleed the brake system.
22 Brake piston(s) binding in caliper.	<ul style="list-style-type: none"> <li>- Check that correct brake fluid has been used (incorrect fluid could swell the brake piston seals).</li> <li>- Check if brake piston seals in good condition.</li> <li>- Check that brake piston rotates freely in its housing with no seals fitted.</li> <li>- Check that the brake piston seal retracts the piston approximately 0.5 mm (0.020 in).</li> </ul>
23 Kinked or crushed brake pipes.	Check and renew pipes as required.
24 Brake pads not free on sliding pins.	Check brake pads for free movement, renew if required - both front sets or both rear sets.

**Table 8. Poor braking when hot**

Possible Cause	Action
25 Moisture in system vaporising when caliper is hot.	Strip caliper and clean piston to remove moisture. Remove master cylinder and check for corrosion, service as required. Flush system refill with clean fluid. Bleed the brake system.

**Table 9. Excessive brake noise in operation**

Possible Cause	Action
<b>26</b> Brake pads worn beyond limits.	Renew brake pads - both front sets or both rear sets.
<b>27</b> Brake pads in poor condition.	Check for distortion or surface pitting and/or roughness of pads.

**Table 10. Fluid loss when machine standing for instance - overnight**

Possible Cause <sup>(1)</sup>	Action
<b>28</b> Severe damage or slight cut/nick in the brake piston seal.	Check piston seals. If necessary, strip caliper and renew seal(s).
<b>29</b> External leakage through brake pipe connections, etc.	Check for and repair leaking connections.

(1) *Confirm fault is as indicated by checking that the brake pedal does not touch the floor under constant pressure.*



## Section G - Brakes Fault Finding

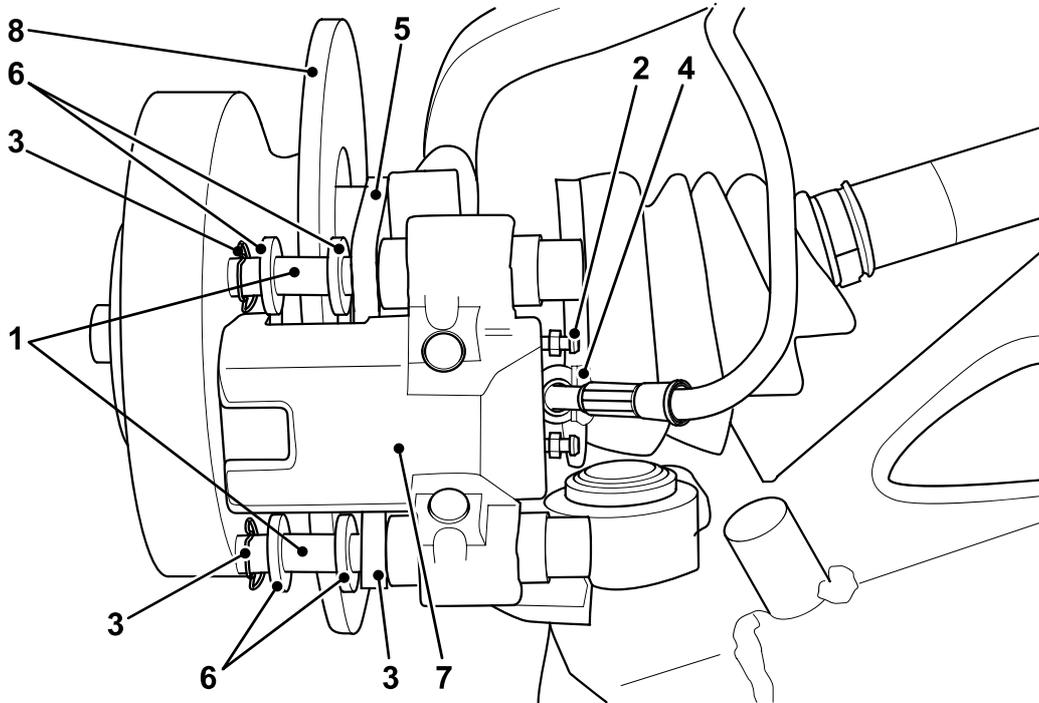
Brake System

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# Service Procedures

## Front Brake



**Fig 2. Front Brake Caliper (right hand shown)**

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- 1 Sliding pins
- 2 Bleed screws
- 3 Clip
- 4 Brake hose union bolt
- 5 Mounting brackets
- 6 Brake pads
- 7 Caliper
- 8 Brake disc

- 1 Loosen both sliding pins (1).
- 2 Remove the clips (3) from both sliding pins.
- 3 Remove the upper sliding pin.
- 4 The caliper (7) can now be rotated about the lower sliding pin.
- 5 Remove the brake pads (6) from the lower sliding pin. Note the orientation of the pads as they are removed.
- 6 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8). When the pistons are pushed back in, fluid may spill from the reservoir.

### Front brake pad removal and replacement

To replace the front brake pads, proceed as follows:

⇒ [Fig 2.](#) ( [□ G-7](#) )

- 7 Examine the sliding pins for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 8 Apply a thin coat of suitable grease to the lower sliding pin.
- 9 Fit the replacement pads over the lower sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 10 Rotate the caliper about the lower sliding pin, and fit the pads into place on each side of the disc.
- 11 Apply a thin smear of suitable grease to the upper sliding pin.
- 12 Replace the upper sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 13 Replace the clips on the sliding pins.
- 14 Tighten both sliding pins.
- 15 Pump the brake pedal to bring the replacement pads into contact with the brake disc.

### Front brake caliper removal

⇒ [Fig 2. \(□ G-7\)](#)

To remove the front brake caliper, proceed as follows:

- 1 Slightly loosen the brake hose union bolt (4).
- 2 Remove the clips (3) from both sliding pins (1).
- 3 Remove both sliding pins and brake pads (6).
- 4 Remove the brake caliper (7) from the machine.
- 5 Remove the brake hose union and place the brake hose into a suitable container and allow the fluid to drain.
- 6 Drain the fluid from the caliper into the same suitable container.

### Front brake caliper refitting

⇒ [Fig 2. \(□ G-7\)](#)

To refit the front brake caliper, proceed as follows:

- 1 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8).
- 2 Examine the sliding pins (1) for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 3 Apply a thin coat of suitable grease to the lower sliding pin.
- 4 Hold the caliper in position and insert the lower sliding pin.
- 5 Fit the brake pads over the lower sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 6 Rotate the caliper about the lower sliding pin, and fit the pads into place on each side of the disc.
- 7 Apply a thin smear of suitable grease to the upper sliding pin.
- 8 Replace the upper sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 9 Replace the clips on the sliding pins.
- 10 Tighten both sliding pins.
- 11 Replace the brake hose union bolt (4).
- 12 Make sure that the brake hose is phased correctly. ⇒ [Fig 3. \(□ G-9\)](#)
- 13 Bleed the brakes. **See Section G - Service Procedures**



**Fig 3. Correct Phasing**

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**Fig 4. Incorrect Phasing**

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### Front brake caliper piston/seal removal

⇒ [Fig 2. \(□ G-7\)](#)

To remove the front brake piston, proceed as follows:

- 1 Remove the clips (3) from both sliding pins (1).
- 2 Remove both sliding pins and brake pads (6).
- 3 Remove the brake caliper (7) from the machine.

#### **⚠ WARNING**

**If it is necessary to force out the piston, use only gentle pressure, ensuring that adequate safety precautions are taken. Severe injury can be caused by a piston being released suddenly.**

BRAK-8-4

- 4 Gently apply pressure to the brake pedal and ease the piston out of the caliper.
- 5 Place the caliper in a suitable container to hold any fluid that drains out.
- 6 Examine the piston and seal for signs of wear or damage. Replace if necessary.

### Front brake caliper piston/seal refitting

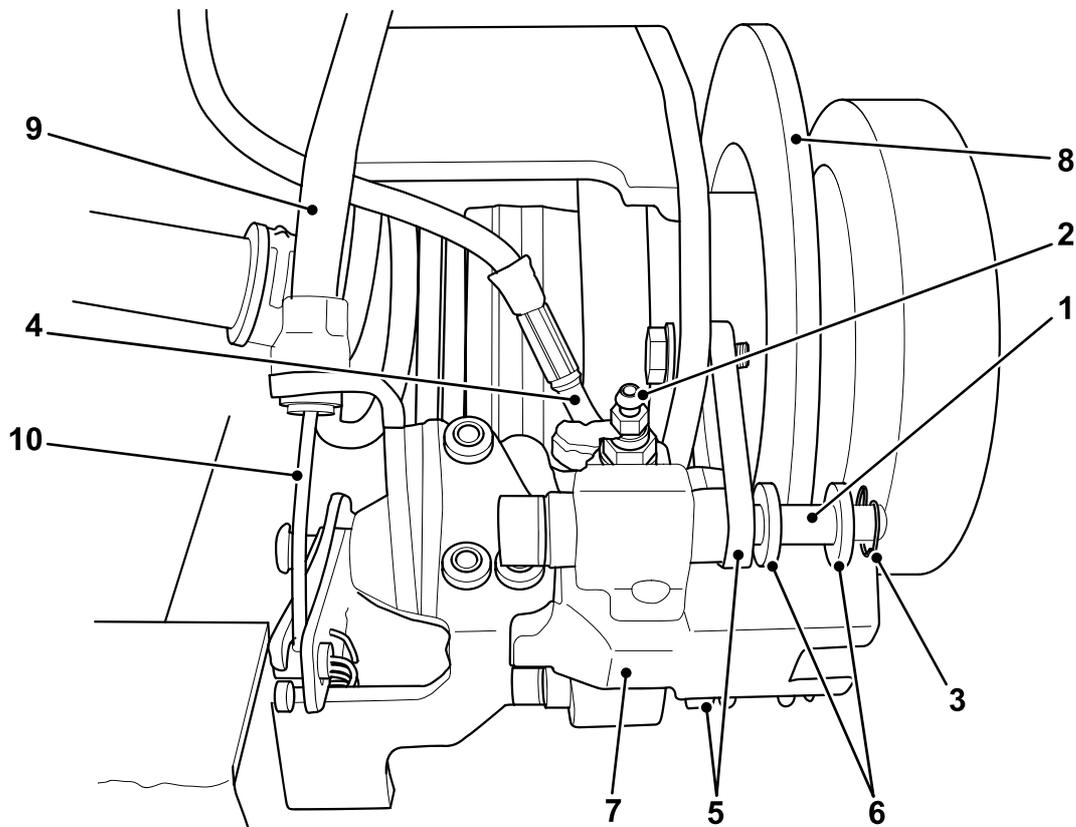
⇒ [Fig 2. \(□ G-7\)](#)

To refit the front brake piston, proceed as follows:

- 1 Apply a thin coat of fresh brake fluid to the piston and seal, and insert it back into the caliper. Ensure that the piston slides easily into the caliper (7), and that the seal is not damaged or twisted.
- 2 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8).
- 3 Examine the sliding pins (1) for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 4 Apply a thin coat of suitable grease to the lower sliding pin.

- 5 Hold the caliper in position and insert the lower sliding pin.
- 6 Fit the brake pads over the lower sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 7 Rotate the caliper about the lower sliding pin, and fit the pads into place on each side of the disc.
- 8 Apply a thin smear of suitable grease to the upper sliding pin.
- 9 Replace the upper sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 10 Replace the clips on the sliding pins.
- 11 Tighten both sliding pins.
- 12 Bleed the brakes. → [Bleeding Procedure \(□ G-19\)](#)

## Rear Brake



**Fig 5. Rear Brake Caliper (right hand shown)**

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- 1 Sliding pins (top pin shown)
- 2 Bleed screw
- 3 Clip (top clip shown)
- 4 Brake hose union bolt
- 5 Mounting brackets
- 6 Brake pads
- 7 Caliper
- 8 Brake disc
- 9 Parking brake cable outer
- 10 Parking brake cable inner

### Rear brake pad removal and replacement

To replace the rear brake pads, proceed as follows:

⇒ [Fig 5.](#) ([□ G-11](#))

- 1 Loosen both sliding pins (1).
- 2 Remove the clips (3) from both sliding pins.
- 3 Remove the lower sliding pin.
- 4 The caliper (7) can now be rotated about the upper sliding pin.
- 5 Remove the brake pads (6) from the upper sliding pin. Note the orientation of the pads as they are removed.

- 6 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8).
- 7 Examine the sliding pins for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 8 Apply a thin coat of suitable grease to the upper sliding pin.
- 9 Fit the replacement pads over the upper sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 10 Rotate the caliper about the upper sliding pin, and fit the pads into place on each side of the disc.
- 11 Apply a thin smear of suitable grease to the lower sliding pin.
- 12 Replace the lower sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 13 Replace the clips on the sliding pins.
- 14 Tighten both sliding pins.
- 15 Pump the brake pedal to bring the replacement pads into contact with the brake disc.

### Rear brake caliper removal

⇒ [Fig 5. \(□ G-11\)](#)

To remove the rear brake caliper, proceed as follows:

- 1 Loosen the parking brake cable. ⇒ [Parking Brake Adjustment \(□ G-15\)](#)
- 2 Slightly loosen the brake hose union bolt (4).
- 3 Remove the clips (3) from both sliding pins (1).
- 4 Remove both sliding pins and brake pads (6).
- 5 Remove the brake caliper (7) from the machine.

- 6 Unhook the parking brake cable (9) and detach it from the caliper.
- 7 Remove the brake hose union and place the brake hose into a suitable container and allow the fluid to drain.
- 8 Drain the fluid from the caliper into the same suitable container.

### Rear brake caliper refitting

⇒ [Fig 5. \(□ G-11\)](#)

To refit the rear brake caliper, proceed as follows:

- 1 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8).
- 2 Attach the parking brake cable (9).
- 3 Examine the sliding pins (1) for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 4 Apply a thin coat of suitable grease to the upper sliding pin.
- 5 Hold the caliper in position and insert the upper sliding pin.
- 6 Fit the brake pads over the upper sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 7 Rotate the caliper about the upper sliding pin, and fit the pads into place on each side of the disc.
- 8 Apply a thin smear of suitable grease to the lower sliding pin.
- 9 Replace the lower sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 10 Replace the clips on the sliding pins.
- 11 Tighten both sliding pins.

- 12 Replace the brake hose union bolt (4).
- 13 Bleed the brakes. **See Section G - Service Procedures**
- 14 Adjust the parking brake cable. [⇒ Parking Brake Adjustment \(□ G-15\)](#)

### Rear brake caliper piston/seal removal

[⇒ Fig 5. \(□ G-11\)](#)

To remove the rear brake piston, proceed as follows:

- 1 Loosen the parking brake cable. [⇒ Parking Brake Adjustment \(□ G-15\)](#)
- 2 Remove the clips (3) from both sliding pins (1).
- 3 Remove both sliding pins and brake pads (6).
- 4 Remove the brake caliper (7) from the machine.
- 5 Unhook the parking brake cable (9) and detach it from the caliper.

### WARNING

**If it is necessary to force out the piston, use only gentle pressure, ensuring that adequate safety precautions are taken. Severe injury can be caused by a piston being released suddenly.**

BRAK-8-4

- 6 Gently apply pressure to the brake pedal and ease the piston out of the caliper.
- 7 Place the caliper in a suitable container to hold any fluid that drains out.
- 8 Examine the piston and seal for signs of wear or damage. Replace if necessary.

### Rear brake caliper piston/seal refitting

[⇒ Fig 5. \(□ G-11\)](#)

To refit the rear brake piston, proceed as follows:

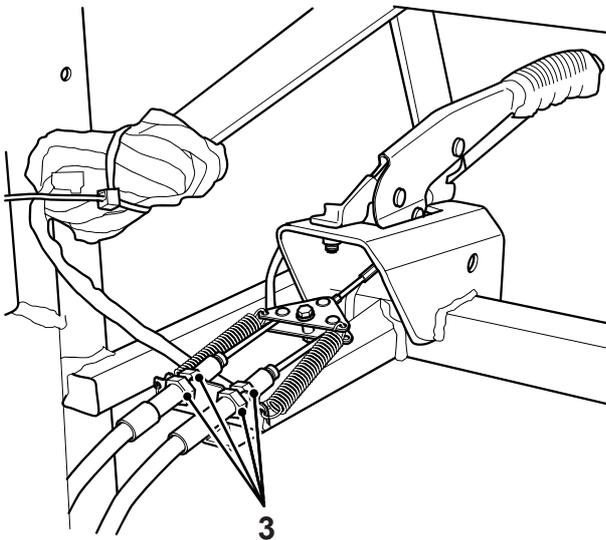
- 1 Apply a thin coat of fresh brake fluid to the piston and seal, and insert it back into the caliper. Ensure that the piston slides easily into the caliper (7), and that the seal is not damaged or twisted.
- 2 Using a suitable tool, press the brake piston back into the caliper, in order to create sufficient clearance to allow the replacement pads to be fitted over the disc (8).
- 3 Attach the parking brake cable (9).

- 4 Examine the sliding pins (1) for signs of wear or corrosion. If necessary clean or replace the sliding pins.
- 5 Apply a thin coat of suitable grease to the upper sliding pin.
- 6 Hold the caliper in position and insert the upper sliding pin.
- 7 Fit the brake pads over the upper sliding pin, take care to orient the pads correctly. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 8 Rotate the caliper about the upper sliding pin, and fit the pads into place on each side of the disc.
- 9 Apply a thin smear of suitable grease to the lower sliding pin.
- 10 Replace the lower sliding pin. Ensure that it passes through the mounting bracket, and **both** brake pads. Ensure that no grease comes into contact with the friction surface of the pads or the brake disc.
- 11 Replace the clips on the sliding pins.
- 12 Tighten both sliding pins.
- 13 Bleed the brakes. **See Section G - Service Procedures**
- 14 Adjust the parking brake cable. → [Parking Brake Adjustment \( G-15\)](#)

## Parking Brake Adjustment

The cables at the parking brake lever are adjusted as follows:

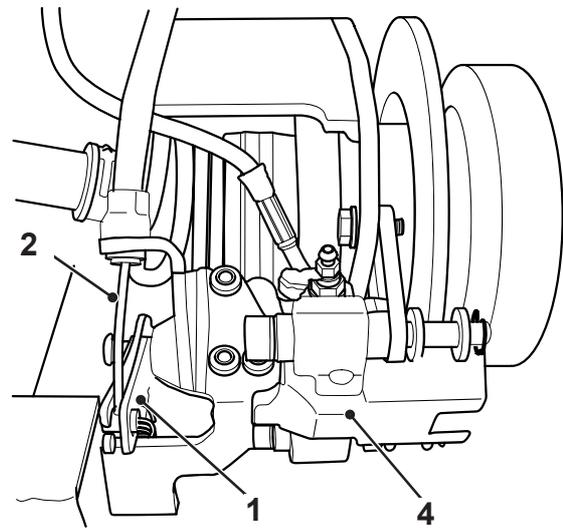
- 1 Park the machine on hard, level ground.
- 2 Engage the park brake.
- 3 Stop the engine and remove the starter key from the ignition switch.
- 4 Put chocks in front of the front wheels and behind the rear wheels.
- 5 Tip the load bay to a vertical position.
- 6 Disengage the park brake.



**Fig 6.**

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- 7 Adjust the locknuts (3) on the brake cables at the cab to release the tension.
- 8 Clean the rear brake callipers thoroughly.
- 9 Adjust the brake calliper (4) as follows:

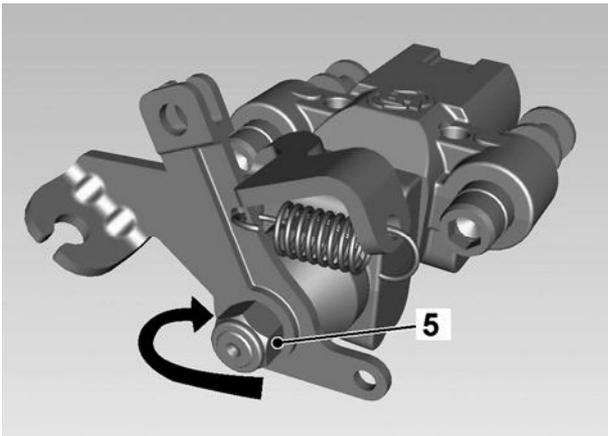


**Fig 7.**

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- a Remove the brake control cable (2) from the brake calliper lever (1).
- b Remove the brake calliper lever and its nut from the splined calliper shaft.
- c Turn the brake calliper lever on to the splined calliper shaft by one spline:

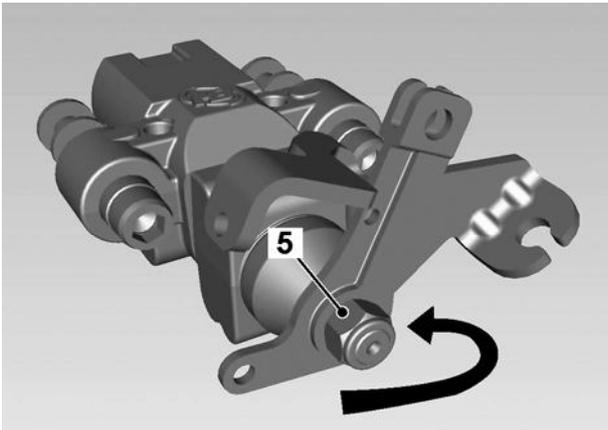
### Parking Brake Adjustment



**Fig 8.**

V018970-4

Clockwise for the right-hand calliper.  
[⇒ Fig 8. \(□ G-16\)](#)



**Fig 9.**

V018970-3

Anti-clockwise for the left-hand calliper.

- d** Connect the brake calliper lever and its nut to the splined calliper shaft.

**Note:** Torque the nut (5) to 43-48 Nm

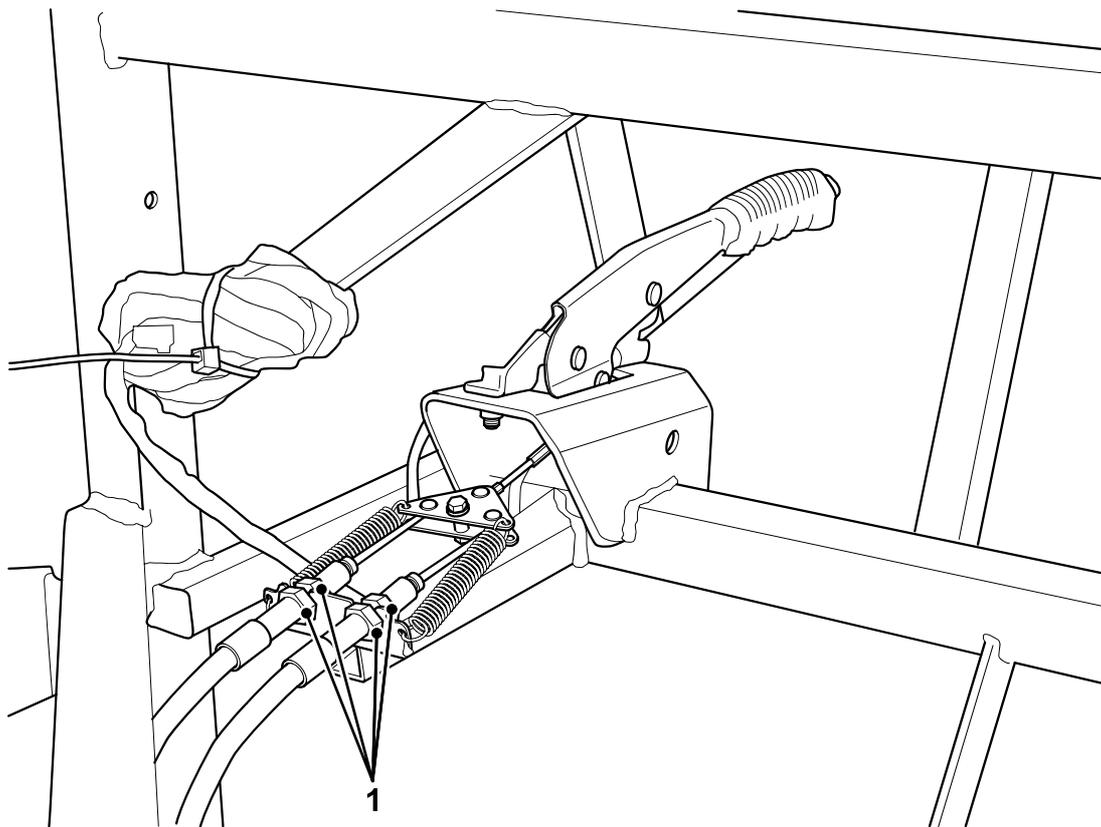
- e** Connect the brake control cable to the brake calliper lever.

- 10** Do Step 9 again to adjust the opposite brake calliper.

- 11** Adjust the locknuts 3 on the brake cables at the cab to give the correct amount of park brake engagement.

- 12** Check the park brake hold by stopping the machine on a slope and engaging the park brake. If the machine moves, do Step 11 again.

**Note:** When the brake calliper lever has been adjusted two times, if the park brake loses its hold for a third time, examine the brake pads and replace as necessary.



**Fig 10.**

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### Service brake pedal

The service brake pedal (1) movement is adjusted as follows:

- 1 Remove the lower fascia panel to gain access to the brake pedal attachment.
- 2 Adjust the clevis locknuts (2) to set the pedal movement.
- 3 The master cylinder must retract fully before the brake pedal touches the stop plate.
- 4 When the adjustment is complete, tighten the clevis locknuts.

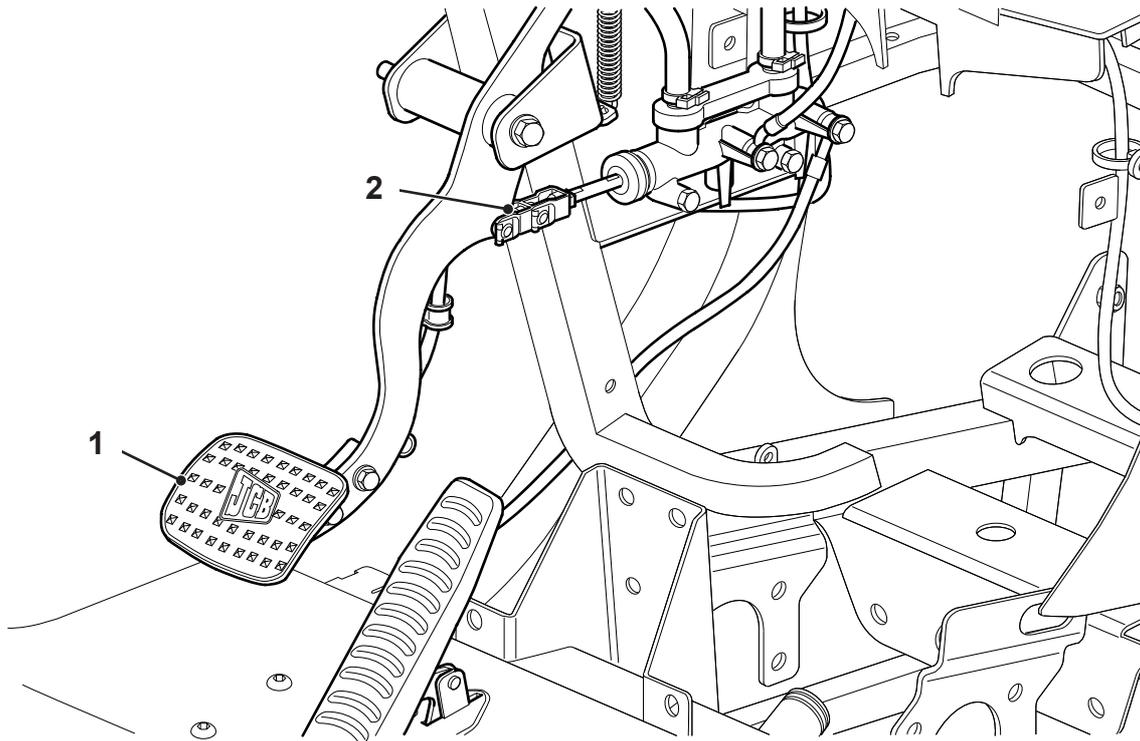


Fig 11.

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## Bleeding Procedure

### WARNING

**Before proceeding with the bleeding procedure it is important to ensure that the park brake is engaged and that one pair of wheels is blocked on both sides.**

BRAK-1-2

### WARNING

**Use of incorrect fluid will cause serious damage to the seals which could in turn cause brake failure.**

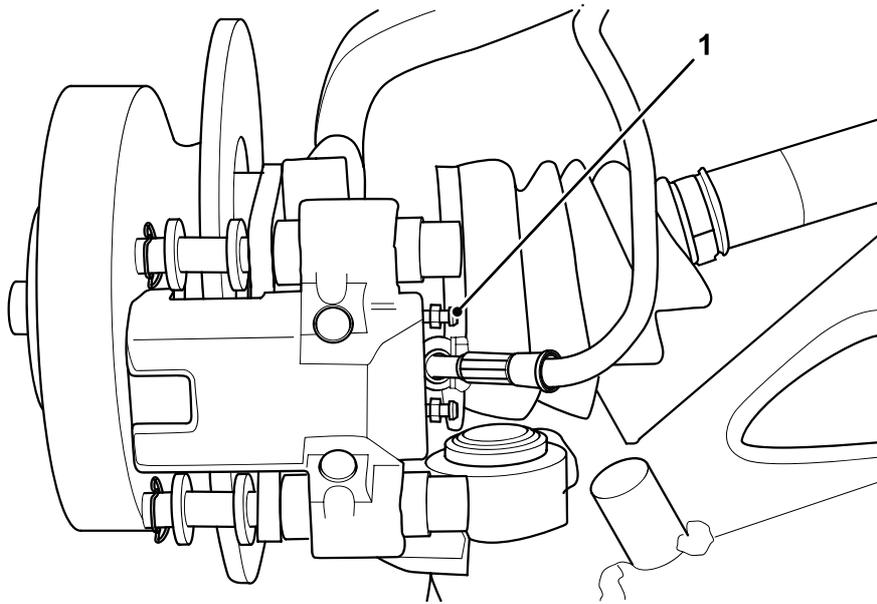
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- 1 Fill the reservoir with correct fluid (see **Lubricants and Capacities**, Section 3) and make sure that throughout the bleeding procedure the level is not allowed to fall below the MINIMUM mark.

**Note:** There are **two** bleed screws fitted to each front brake caliper. The bleeding procedure must be performed on the top bleed screw only.

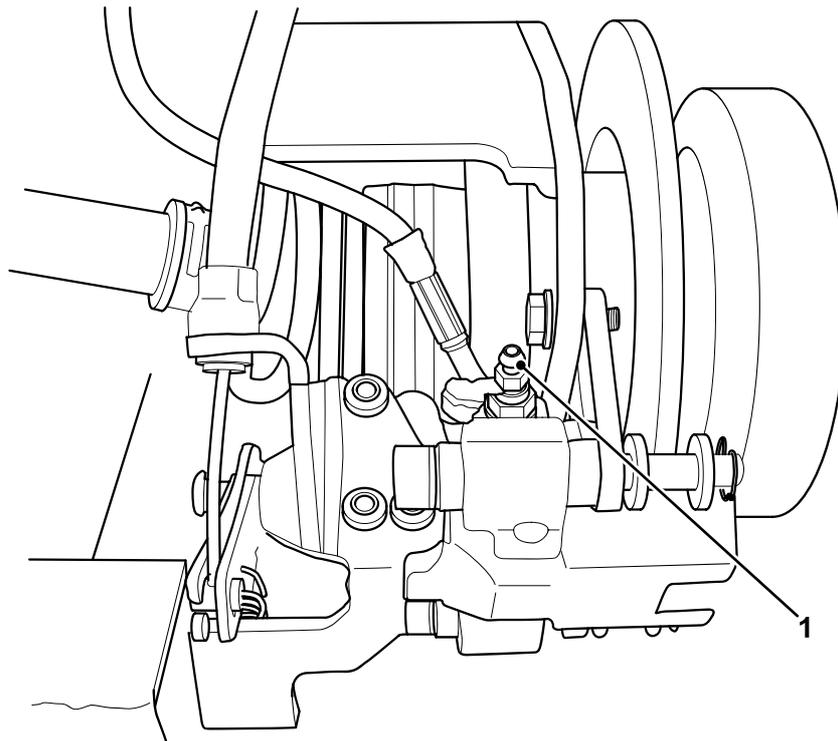
- 2 Attach a tube to the appropriate bleed screw (1), starting at the brake farthest from the reservoir. Make sure that the free end of the tube is immersed in fluid in a suitable container.
- 3 Open the bleed screw half a turn, depress the brake pedal to the floor then slowly release it.
- 4 Tighten the bleed screw at the end of each down stroke to prevent expelled air being drawn back into the system.
- 5 After bleeding, press the pedal down a few times to help circulate the fluid. Make sure that the pedal pressure is very firm.
- 6 Repeat the procedure until clean brake fluid, free from air bubbles can be seen entering the jar then tighten the bleed screw.
- 7 Remove the plastic tubing and dispose of the fluid in the jar, do not re-use.

**Note:** A pressure bleed system can be used to do this procedure.



**Fig 12. Front Brake Caliper (right hand shown)**

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**Fig 13. Rear Brake Caliper (right hand shown)**

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