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System Type

Hydraulic servo assisted service brakes in rear axle only, operated from
* separate pedals. Independant cable operated parking brake in the drive to
the rear wheels.

Service Brake

Type

JCB Oil-immersed multi-plate disc

Actuation

Hydraulic - vacuum servo assisted

Location

Rear axle centre casing (2 brake packs)

Friction Plates (5 per brake pack)

Outside Diameter

220 mm (7.992 in)

Inside Diameter

160 mm (6.299 in)

Nominal Facing Area per Plate

18603 mm² (28.8 in²)

Hydraulic Piston Diameter

216 mm (8.5 in)

Master Cylinder (combined servo assistance)

Number of Cylinders

2

Type

Compensated master cylinder

Piston Diameter (each)

22.22 mm (0.875 in)

Parking Brake

Type

Disc brake, manually adjusted calliper

Actuation

Cable operated

Location

* Mounted on the rear axle drive head.

Disc Diameter

279.4 mm (11 in)

Note: Because the service brakes are located in the rear axle, instructions for dismantling and assembly are shown in Section
F - **Rear Axle Brakes**.

Compensating Master Cylinder

Description

Compensating master cylinders overcome the problem of unequal wear between the right and left brake. The units incorporate both master cylinder and compensating valve.

Each brake has its own master cylinder **A**, **A1**, brake pedals **B**, **B1**, servo units **N**, **N1** and associated pipework. Both master cylinders have one common reservoir **C**.

Note: Dual pedal braking is applicable only to 2WS machines. 4WS machines have a single brake pedal.

Pedals Locked - Normal Operation

When the brake pedals are pushed down (the brake pedals are mechanically locked together), rod **D** pushes the plunger **E** down the bore of the master cylinder. Pressurised oil acting on centre valve seal **F** via valve stem **G** causes the seal to close off the reservoir supply port. As the plunger continues to move down the bore, pressurised oil flows to the brake pack **H** via service port **J** and the associated pipework.

Master cylinder **A1** operates in the same way to feed brake pack **H1**.

With valve stem **G** at maximum travel, further movement of plunger **E** causes valve **K** to lift off its seat. Both master cylinders are interconnected via bridge pipe **M**, therefore hydraulic pressure in both cylinders will be equal.

If the brake packs **H** and **H1** have worn equally, then the amount of oil displacement between cylinders will be minimal and the brakes will be applied evenly.

Pedals Locked - Compensating Operation

When the brake pedals are pushed down (the brake pedals are mechanically locked together), actuation of the brake packs **H** and **H1** is as described in Pedals Locked - Normal Operation. If however, the brakes have not worn equally, then the amount of fluid displaced from each master cylinder will vary and some form of compensation is required.

Pedal application moves plungers **E** down the bores of master cylinders **A** and **A1**. Linings of brake **H** are brought into contact before the linings of brake **H1** because they have not worn as severely.

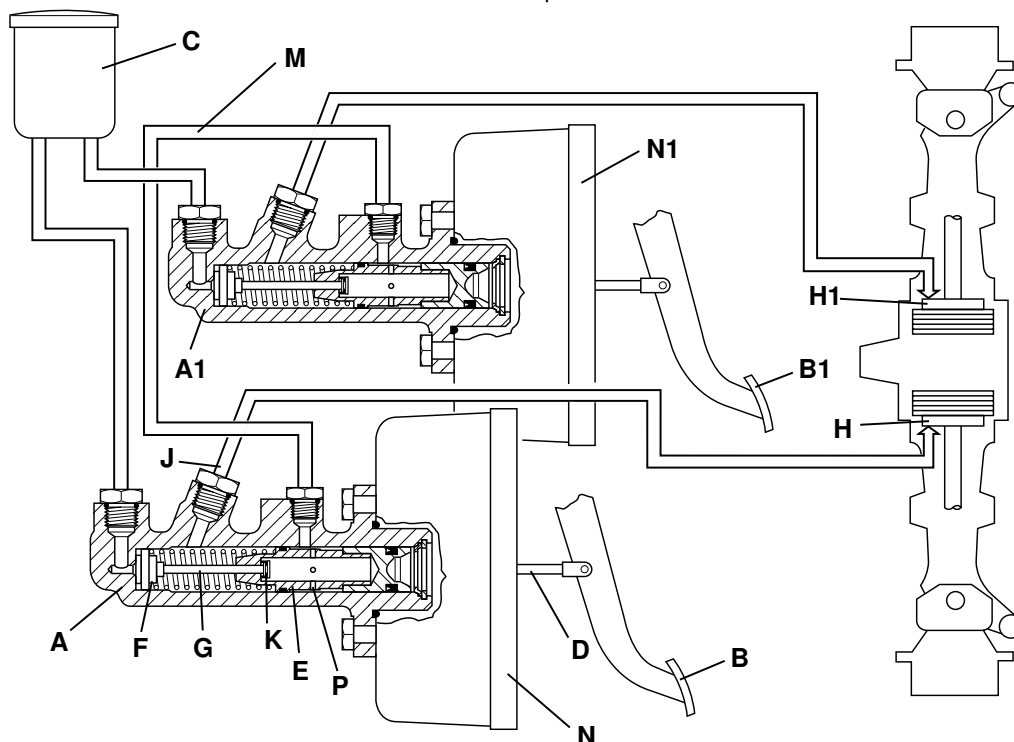
If further displacement took place at the linings, brake **H** would be applied before brake **H1**. Therefore master cylinder **A** begins to compensate for master cylinder **A1**.

Fluid is displaced from **A** to **A1** via bridge pipe **M** until the pressures are equalised. In this condition both compensating valves are open and both brakes are applied evenly.

Pedals Unlocked - Normal Operation

When a single brake pedal is pushed down, rod **D** pushes the plunger **E** down the bore of the master cylinder. Pressurised oil acting on centre valve seal **F** via valve stem **G** causes the seal to close off the reservoir supply port. As the plunger continues to move down the bore, pressurised oil flows to the brake pack **H** via service port **J** and associated pipework, thus braking one wheel only.

With valve stem **G** at maximum travel, further movement of plunger **E** causes valve **K** to lift off its seat. Fluid is displaced through drillings **P** from the active cylinder **A** via bridge pipe **M** to passive cylinder **A1**. Valve **K1** in the passive cylinder is held on its seat by the displaced pressurised fluid.



Brake System

Note: The brakes generate a high temperature when operating, this means that the casing will be hot to touch, this condition is normal. Note also that 4WS machines do not have dual pedal braking.

FAULT	POSSIBLE CAUSE	ACTION
A One or both brakes do not apply. (Brake travel not excessive, brakes not pulling to one side).	1 Master cylinder fault.	1 Check master cylinder in single and coupled pedal modes to identify fault area, service as required.
	2 Friction/counter plate distortion.	2 Check friction/counter plates.
B Pedal travel excessive (but not touching floor).	1 Air in hydraulic system.	1 Check fluid reservoir level. Check for fluid/air leaks, rectify as required.
	2 Leak in hydraulic system.	2 Check for fluid loss at master cylinder and brake piston, all pipes and fittings for loose connections. Rectify as required.
	3 Friction/counter plate distortion.	3 Renew friction/counter plates - BOTH sides.
C Applying one brake (pedals unlocked) also partially engages the other brake.	1 Valve stem seal inside (non-active) master cylinder piston not sealing.	1 Renew master cylinder piston.
D Pedal hard to operate.	1 Tightness at pedal pivot.	1 Inspect pedal pivot. Free-off/lubricate.
	2 Fluid contamination/seal damage.	2 Flush system and renew all hydraulic seals.
	3 Misaligned push rod/pedal.	3 Check and rectify as required.
	4 Kinked or crushed brake pipes.	4 Check/renew brake pipework.
	Items 5 to 7 are for machines fitted with servo assisted brakes only:	
	5 Vacuum failure due to low vacuum at source.	5 Inspect/service engine mounted exhaust unit as required.
	6 Blocked/leaking vacuum pipe.	6 Check/renew vacuum pipe.
E Pedals touch floor under constant pressure - no fluid loss.	7 Servo defect.	7 Renew servo unit.
	1 Master cylinder fault.	1 Check master cylinder in single and coupled pedal modes to identify fault area, service as required.
	2 Friction/counter plate distortion.	2 Renew friction/counter plates - BOTH sides.
F Pedals touch floor under constant pressure - and fluid loss.	3 Air in hydraulic system.	3 See item B.1.
	1 External fluid leaks.	1 Visually check brake circuit for fluid loss, service as required.
G Pulling to one side when pedals locked together.	2 Internal fluid leaks.	2 Refer to Service Procedures - Brake Piston Seal Leakage Test.
	1 Compensating feature not working.	1 Inspect master cylinder compensating operation. Check if blockage in bridging pipe. Service as required.

FAULT	POSSIBLE CAUSE	ACTION
G Pulling to one side when pedals locked together (cont'd).	2 Braking system inoperative on one side.	2 Unlatch pedals to test circuits individually.
	3 Friction plates worn beyond limits or distorted on one side.	3 Renew friction/counter plates - BOTH sides.
	4 Badly adjusted push rods.	4 Adjust push rod (1mm minimum).
	5 Servo operating rod out of adjustment.	5 Adjust servo operating rod.
	6 Annular piston fault (see item J6).	6 See item J6.
H Poor braking (not pulling to one side).	1 Friction plates worn beyond limits or distorted on one side.	1 Renew friction/counter plates - BOTH sides.
	2 Master cylinder fault.	2 Check master cylinder in single and coupled pedal modes to identify fault area, service as required.
	3 Annular piston fault (see item J6).	3 See item J6.
	4 Incorrect/low axle oil.	4 Fill axle with correct type of oil.
	5 Vacuum failure (machines fitted with servo assisted brakes only).	5 Inspect vacuum source/pipes, service as required.
J One or both brakes not releasing.	1 Brake pedal spring fault.	1 Fit a new spring.
	2 Master cylinder fault (plunger stuck in bore).	2 Service as required.
	3 Blocked hole in master cylinder reservoir cap.	3 Fit a new reservoir cap.
	4 Brake pedal free travel incorrect.	4 Adjust pedal free travel.
	5 Fluid contamination/seal damage.	5 Flush system and renew hydraulic seals.
	6 Annular brake piston(s) binding in axle.	6.1 Check that correct brake fluid has been used (incorrect fluid could swell the annular brake piston seals). 6.2 Check if annular brake piston seals in good condition. 6.3 Check that annular brake piston rotates freely in its housing with no seals fitted. 6.4 Check that the annular brake piston seal retracts the piston approximately 0.5mm (0.020 in).
	7 Kinked or crushed brake pipes.	7 Check and renew pipes as required.
	8 Friction/counter plates not free on splines and/or dowels.	8 Check friction/counter plates for free movement, replace if required - BOTH sides.

FAULT	POSSIBLE CAUSE	ACTION
K Poor braking when hot.	1 Moisture in system vapourizing when axle is hot.	1 Strip axle and clean annular piston to remove moisture. Remove master cylinders and check for corrosion, service as required. Flush hydraulic brake system.
L Excessive brake noise in operation. Note: Due to the metal to metal contact of oil immersed brakes, limited noise can be heard which is consistent with this type of design - this is normal.	1 Deterioration of axle oil or wrong type of axle oil. 2 Axle oil loss. 3 Friction plates worn beyond limits. 4 Friction/counter plates in poor condition.	1 Change axle oil. 2 Refill axle with correct oil and check for leaks. 3 Renew friction/counter plates. 4 Check for distortion or surface pitting and/or roughness of friction/counter plates (annular grooving of counter plates is acceptable).
M Fluid loss when machine standing, for instance - overnight (see note). Note: Confirm fault is as indicated by checking that the pedals DO NOT touch floor under constant pressure.	1 Slight cut or nick in the brake piston seal, refer to Service Procedures - Brake Piston Seal Leakage Test .	1 Strip axle, replace seal.

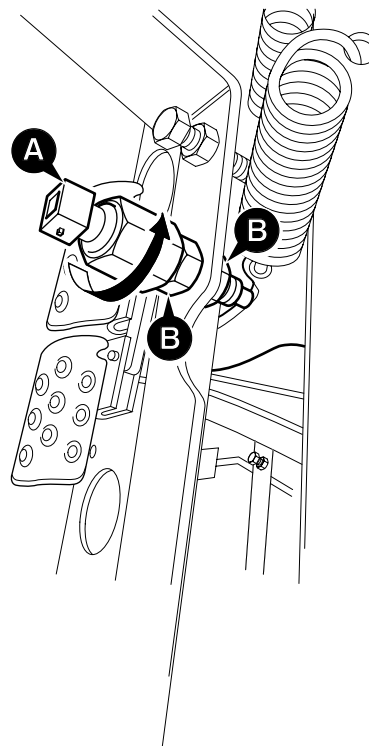
Service Brakes

Brake Light Switch - Adjustment

- 1 Select the starter key switch to the ON position, do not start the engine.
- 2 With the brake pedal in the return position, adjust locknuts **B** and use feeler gauges to set the proximity switch **A** so that there is clearance of 2mm MIN - 3mm MAX between the end of the switch and the brake pedal lever. The light emitting diode (L.E.D.) on the switch should be illuminated.
- 3 Secure the switch in position by tightening locknuts **B**.
- 4 Depress the brake pedal and check the correct operation of the brake lights.

Torque Settings

Item	Nm	kgf m	lbf ft
B	29	2.95	21



Service Brakes

Brake Piston Seal Leakage Test

The following procedure explains how to check if a brake piston seal is severely damaged/perished or if the seal has a small cut or nick. The test must only be done when the axle is COLD.

⚠ WARNING

Before working on the brake system make sure the machine is on level ground and chock all four wheels.

BRAK 1-4

⚠ WARNING

Do not drive the machine with any part of its brake system disconnected. When the following test has been completed reconnect all brake pipes and bleed the brake system using the recommended procedure.

BRAK 2-1

- 1 Remove and cap brake piston feed pipe **A**.
- 2 Fill the brake piston housing with JCB Light Hydraulic Fluid.
- 3 Check for severe piston seal damage:
 - a Install a hand pump fitted with a 0 - 40 bar (0 - 600 lbf/in²) pressure gauge to port **B**, as shown at **X**.

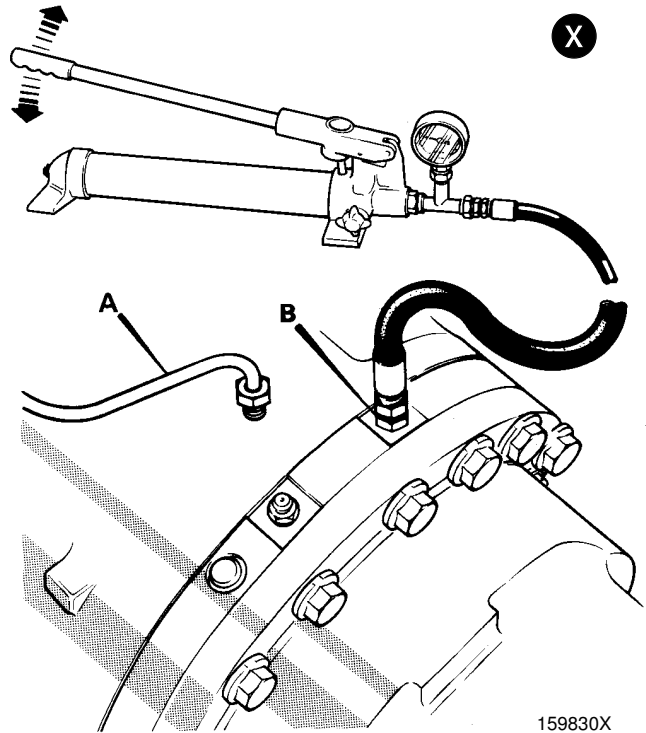
Note: The hand pump MUST be filled with JCB Light Hydraulic Fluid. DO NOT exceed 69bar (1000 lbf/in²).

- b Use the hand pump to generate a pressure in the brake piston housing.
 - c If the pressure falls off rapidly, or if no pressure reading can be obtained, the seal is severely damaged and needs replacing with a new one.
- 4 Check for small cuts or nicks in the piston seal:
 - a Install an adapter fitted with a piece of clear tube to the brake piston port **B**, as shown at **Y**.

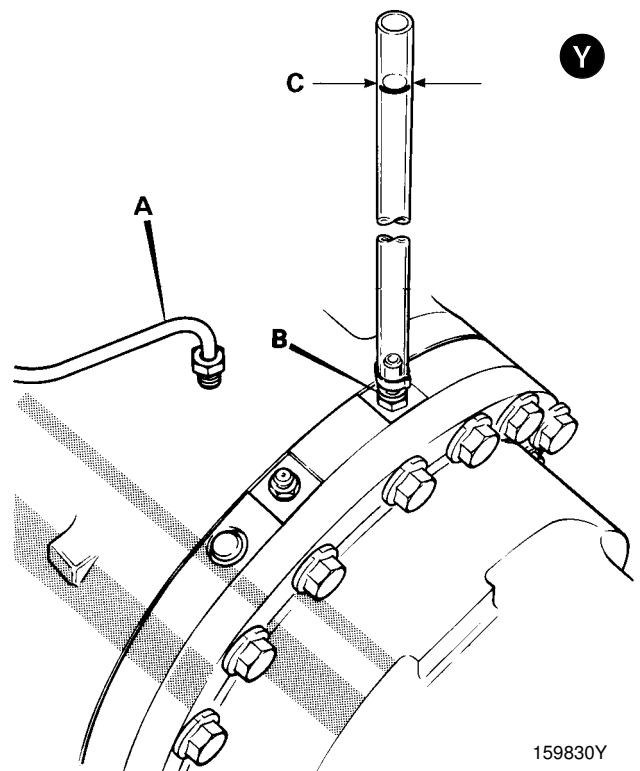
Note: The tube must be kept vertical during the test, use tape to attach the tube to the side of the machine.

- b Fill the tube until approximately three quarters full with JCB Light Hydraulic Fluid
 - c Using a suitable pen, mark the level line of the brake fluid on the tube, as shown at **C**.
 - d After approximately 1/2 hour, check if the level has dropped below the original marked line, if it has then check the brake piston seal for slight nicks, cuts or generally for wear.

- 5 Repeat steps 1 to 4 for the opposite brake piston seal.
- 6 Reconnect all brake pipes and bleed the brake system. Refer to **Service Brakes - Bleeding**.



159830X



159830Y

Parking Brake - Testing

SAFETY NOTICE: Ensure all routine health and safety precautions are observed before operating machines.

WARNING

Before testing the parking brake make sure the area around the machine is clear of people.

2-2-4-5

- 1 Enter the machine. Fasten your seat belt and park the machine on a level dry surface.
- 2 Fully apply the parking brake 1.
- 3 On machines with two brake pedals ensure they are locked together.
- 4 Start the engine and raise the attachments to the appropriate travelling position.
- 5 Select fourth gear, 2 for synco shuttle machines or 3 for powershift machines.
- 6 Push down hard on foot brake pedal 4.
- 7 Select forward drive 5.

WARNING

If the machine starts to move during the following test, immediately apply the foot brakes and reduce the engine speed.

2-2-5-1

Test the parking brake as follows:

- 8 Move the parking brake lever fractionally forward until the warning light 6 is just extinguished.
- 9 Slowly release the foot brake pedal 4.
- 10 If the machine has not moved, use the accelerator pedal to gradually increase the engine speed to 1500 RPM. The machine should not move.
- 11 Do not do this test for longer than 20 seconds.
- 12 Reduce the engine speed to idle and select neutral 5.
- 13 Return the park brake lever 1 to the fully on position from its partially applied position.
- 14 Lower attachments and stop the engine.
- 15 If the machine moved during this test, adjust the parking brake and repeat the test. See **Service Procedures, Parking Brake - Adjustment**.

If you have any queries concerning this test procedure or parking brake adjustment, consult your local JCB distributor.

WARNING

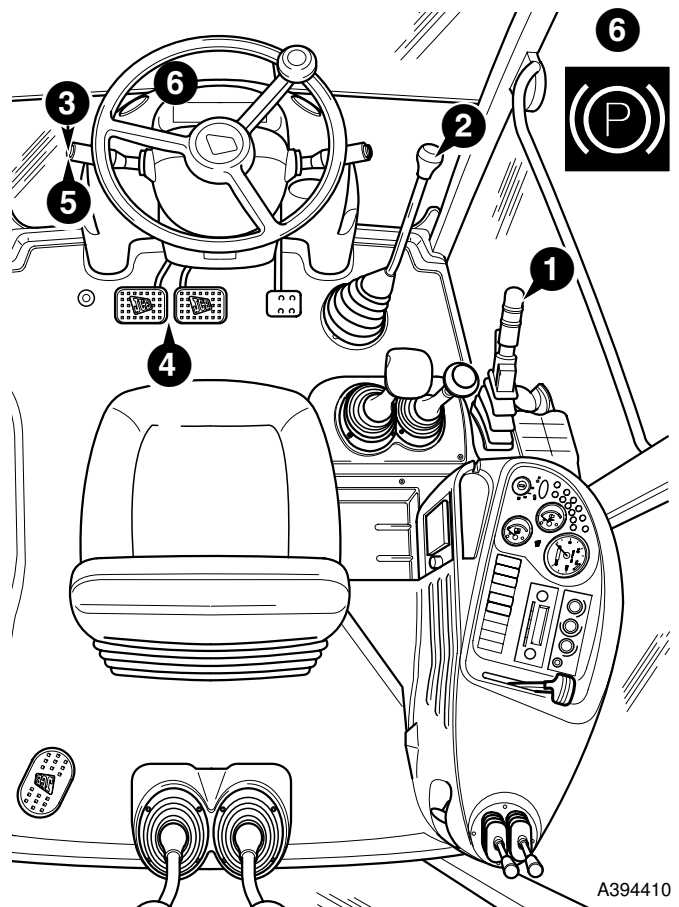
Do not use a machine with a faulty parking brake.

3-2-3-10

CAUTION

Non approved modifications to axle ratios, machine weight or wheel and tyre sizes may adversely affect the performance of the parking brake.

3-2-3-11



A394410

Parking Brake - Adjustment

⚠ CAUTION

The parking brake must not be used to slow the machine from travelling speed, except in an emergency, otherwise the efficiency of the brake will be reduced. Whenever the parking brake has been used in an emergency, always renew both brake pads.

4-2-1-1/2

⚠ WARNING

Before working on the parking brake, make sure that the machine is on level ground. Put chocks each side of all four wheels. Disconnect the battery so that the engine cannot be started. If you do not take these precautions the machine could run over you.

2-3-2-4/1

The parking brake should be fully engaged when the lever is vertical. The parking brake indicator light should light when the brake is engaged with the forward/reverse lever away from neutral (starter switch at IGN).

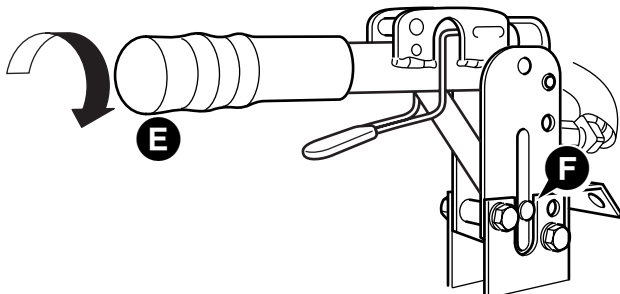
⚠ WARNING

Over adjustment of the parking brake could result in the parking brake not fully releasing

0011

Lever Adjustment

- 1 Disengage the parking brake (lever horizontal).
- 2 Turn handle grip **E** clockwise, half a turn.
- 3 Test the parking brake, refer to **Parking Brake - Testing**.
- 4 If the brake fails the test, repeat steps 1, 2 and 3. If there is no more adjustment and pin **F** is at the end of its travel adjust the cable.



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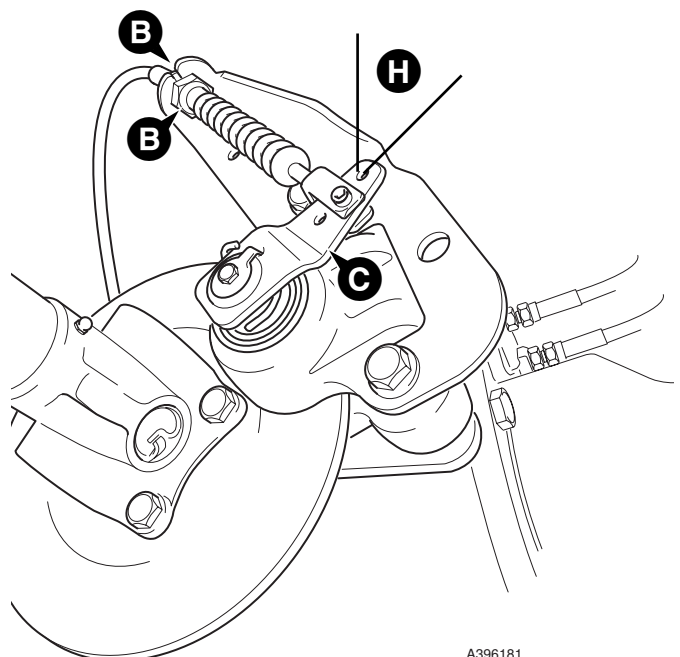
Cable Adjustment

Adjust the cable at the calliper if there is insufficient adjustment at the parking brake lever.

If there is no adjustment at the lever or the calliper, change the brake pads, refer to **Parking Brake - Renewing the Brake Pads**.

Always renew a worn or damaged cable.

- 1 Disengage the parking brake (lever horizontal).
- 2 Turn hand grip **E** anti-clockwise to centre the pin **F** in its slot.
- 3 Release the two locknuts at **B** and adjust the cable length to give 10 to 15mm (0.40 to 0.60 in) of caliper lever movement at the outer cable fixing hole **H**. The total clearance between the brake pad to brake disc should be 0.5 to 0.75 mm (0.02 to 0.3 in).
- 4 Make sure there is adequate freedom of movement of operating lever **C** to ensure a positive brake application, and that the lever returns to the rest position when the parking brake is released.
- 5 Test the parking brake, refer to **Parking Brake - Testing**. Make final adjustments at the park brake lever if the brake fails the test. Refer to **Lever Adjustment**.



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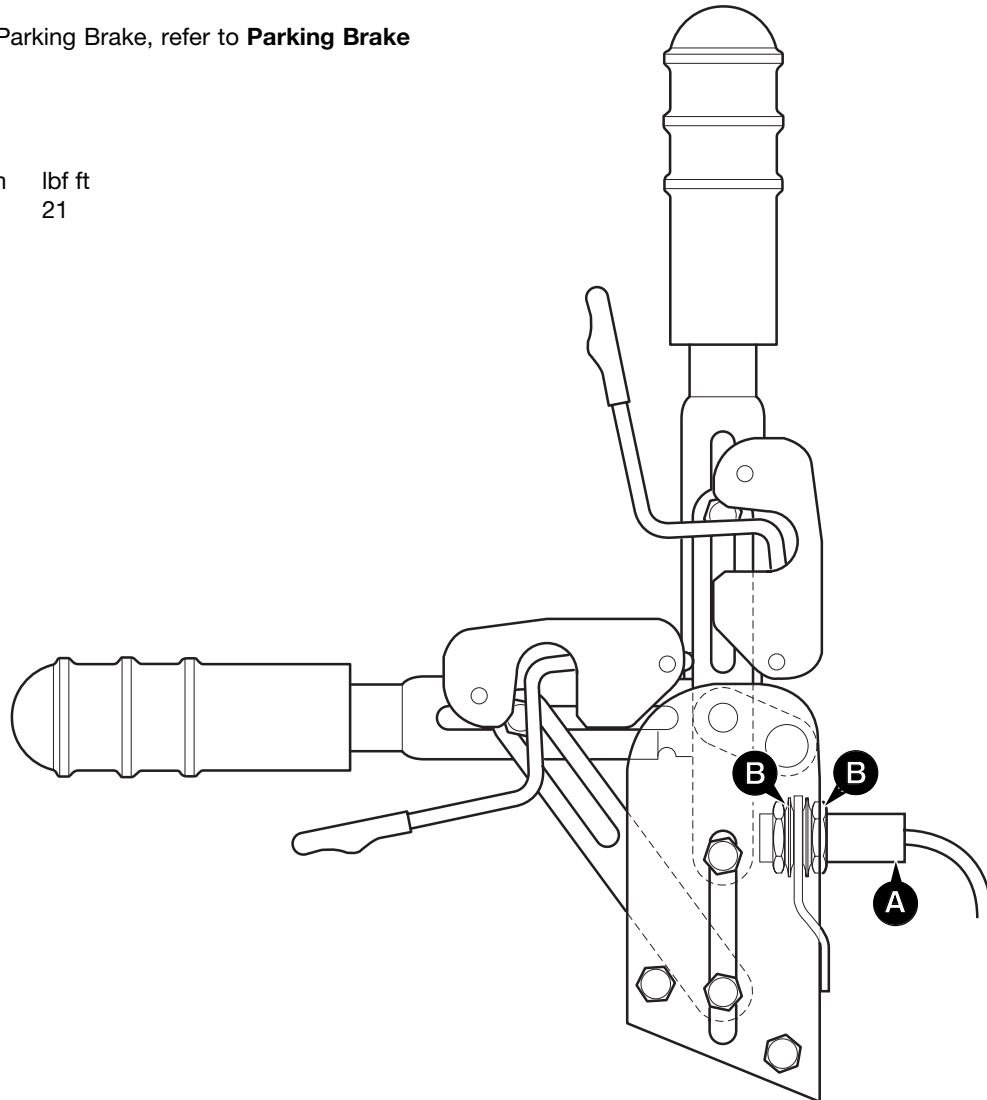
Parking Brake - Switch Adjustment

- 1 Select the starter key switch to the ON position, do not start the engine.
- 2 Select either forward or reverse.
- 3 Raise the handbrake to the ON position.
- 4 Adjust locknuts **B** and use feeler gauges to set the proximity switch **A** so that there is clearance of 2mm MIN - 3mm MAX between the end of the switch and the handbrake lever. The light emitting diode (L.E.D.) on the switch should be illuminated and the audible alarm should sound.
- 5 Secure the switch in position by tightening locknuts **B**.
- 6 Release the parking brake and the audible alarm should cease.

For adjustment of the Parking Brake, refer to **Parking Brake - Adjustment**.

Torque Settings

Item	Nm	kgf m	lbf ft
B	29	2.95	21



A396440

Parking Brake - Renewing the Brake Pads

WARNING

This is a safety critical installation. Do not attempt to do this procedure unless you are skilled and competent to do so.

Installation and mounting of the parking brake calliper requires tightening of the mounting bolts to a specific torque figure. Do not attempt to do this job unless you have the correct tools available.

0010

WARNING

Before working on the parking brake, park on level ground and put chocks each side of all four wheels. Stop the engine and disconnect the battery so that the engine cannot be started. If you do not take these precautions the machine could run over you.

BRAK 8-8

WARNING

Brake pads generate dust which if inhaled, may endanger health. Wash off the calliper before commencing work. Clean hands thoroughly after work.

13-3-1-3

Pad Removal

- 1 Remove the parking brake calliper from the axle mounting bracket, refer to **Parking Brake - Calliper Removal and Replacement**.
- 2 Press carrier side pad 1 into housing 15 and remove. Ensure any residual silicone used for pad retention during assembly is removed.
- 3 Carefully lever pad 2 from the rotor inside the housing using a flat blade screwdriver. Take care to prevent damage to the plastic clip in the centre of the rotor 9 (there is no need to remove the rotor from the calliper).

Pad Inspection

WARNING

Oil on the brake disc will reduce brake effectiveness. Keep oil away from the brake disc. Remove any oil from the disc with a suitable solvent. Read and understand the solvent manufacturer's safety instructions. If the pads are oily, new ones must be fitted.

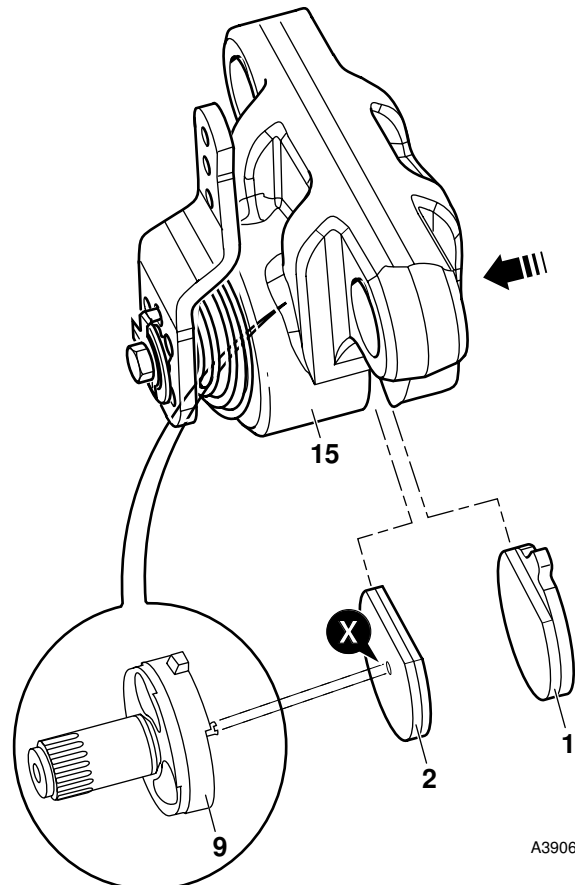
2-3-2-3/3

- 1 The minimum thickness of the friction material on either pad is 1mm (0.04 in), but it is recommended new pads are fitted as pads worn to this limit may not be able to be adjusted.
- 2 Check the condition of the disc surface. Renew the disc if badly warped, pitted or worn. For brake disc removal, refer to **Parking Brake, Brake Disc - Removal and Replacement**.
- 3 Renew the cable if worn or damaged.

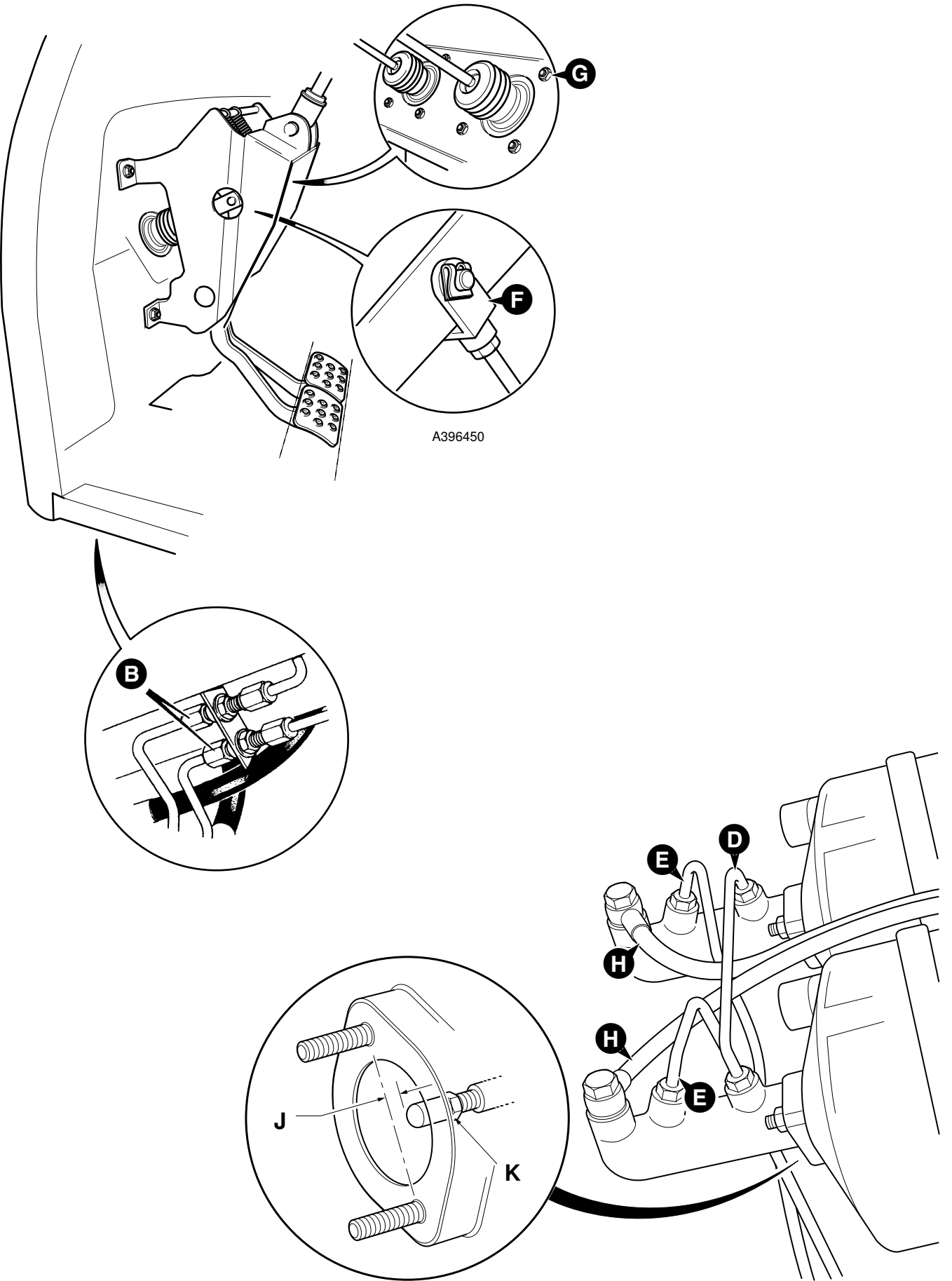
Pad Replacement

- 1 Fit the pad 2 to the lever side of the calliper. Position the pad inside housing 15. Locate the plastic clip in the centre of the rotor 9 into the hole X, and press the pad into place.
- 2 Fit the pad 1 to the carrier side of the calliper. Add a small amount of silicon sealant to the back outer edge of the backing plate to hold the pad in place within the housing.
- 3 Replace the calliper, refer to **Parking Brake - Calliper Removal and Replacement**.

Note: If there is insufficient adjustment after fitting new pads change the brake cable.



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Removal and Replacement

WARNING

Before working on the brake system make sure the machine is on level ground and chock all four wheels.

BRAK 1-4

Removal

- 1 Gain access to the brake pedal box assembly. Remove the steering wheel, column switches and console assembly. See **Section D, Steering Column - Removal** for procedures.
- 2 Working outside the cab, loosen and remove brake pipe unions **B**, plug and cap to prevent loss of fluid and ingress of dirt.
- 3 Remove the brake pipes from the master cylinders: master cylinders bridging pipe **D**; axle feed pipes **E** and reservoir supply pipes **H**.
- 4 Working inside the cab, remove the brake pedals clevis **F** and disengage the brake pedal from the servo unit (both pedals).
- 5 Loosen and remove the servo unit retaining nuts **G** (both units).
- 6 Tag the cylinders (left and right hand). Remove the master cylinder and servo units.

Replacement

Replacement is a reversal of the removal sequence.

Refit the cylinders in their original positions.

If the brake master cylinders or brake servo units are removed it is recommended that the servo brake assembly operating rod measurement is checked.

If the rod length is not checked it may result in differing brake pedal travel which could result in uneven braking.

- 1 With the brake master cylinder removed, measure from the face of the servo unit to the end of the servo brake rod as shown at **J** which should be 8.5 to 8.3mm (0.334 to 0.326in).
- 2 Adjust measurement **J** by screwing domed bolt **K** in/out as required, secure in position with JCB Threadlocker & Sealer.

Note: If no adjustment is required make sure the domed bolt **K** can not be rotated by finger pressure.

WARNING

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

BRAK 1-1

- 3 Fill the brake system with JCB Light Hydraulic Fluid and bleed the system. Refer to **Service Brakes - Bleeding**.

Note: 4WS machines do not have dual pedal braking. Procedures described still apply to a single pedal application.

- 4 Unlatch pedals and ensure that pedal pads are level with each other and fully back against their stops.
- 5 Adjust pedal linkages for free movement to give 1 mm (0.040 in) on each pushrod.
- 6 With pedals still unlatched, apply an equal force to each pedal and check if pedals remain level. If necessary adjust by increasing the clearance on one of the pushrods. Do not decrease either clearance below 1 mm (0.040 in).
- 7 On completion bleed the brake system and check the brakes operate correctly and that machine stops in a straight line. Refer to **Service Brakes - Bleeding**.
- 8 Latch pedals and check for straight line braking; if satisfactory straight line braking cannot be achieved refer to **Fault Finding**.

Torque Settings

Item	Nm	kgf m	lbf ft
H	30-34	3.0-3.5	22-25

Dismantling and Assembly

Note 1: The servo unit (not shown) is a non serviceable part. A faulty servo unit must be replaced with a new one.

Note 2: Seal kits are no longer available for the master cylinders, the only servicing permitted is a major repair kit which comprises of a full piston assembly. A faulty master cylinder and piston assembly must be replaced with new ones.

Dismantling

- 1 Remove circlip 1 and washer 2.
- 2 Shake the cylinder body, or use compressed air, to eject piston assembly 3. Take care not to damage the piston assembly or the bore of the cylinder body.
- 3 Examine the working surfaces of piston and cylinder. If these are not in perfect condition the master cylinder assembly must be renewed. The piston assembly 3 cannot be dismantled. If it is damaged (including seal 5), the complete piston/seal assembly must be renewed, see Note 2:

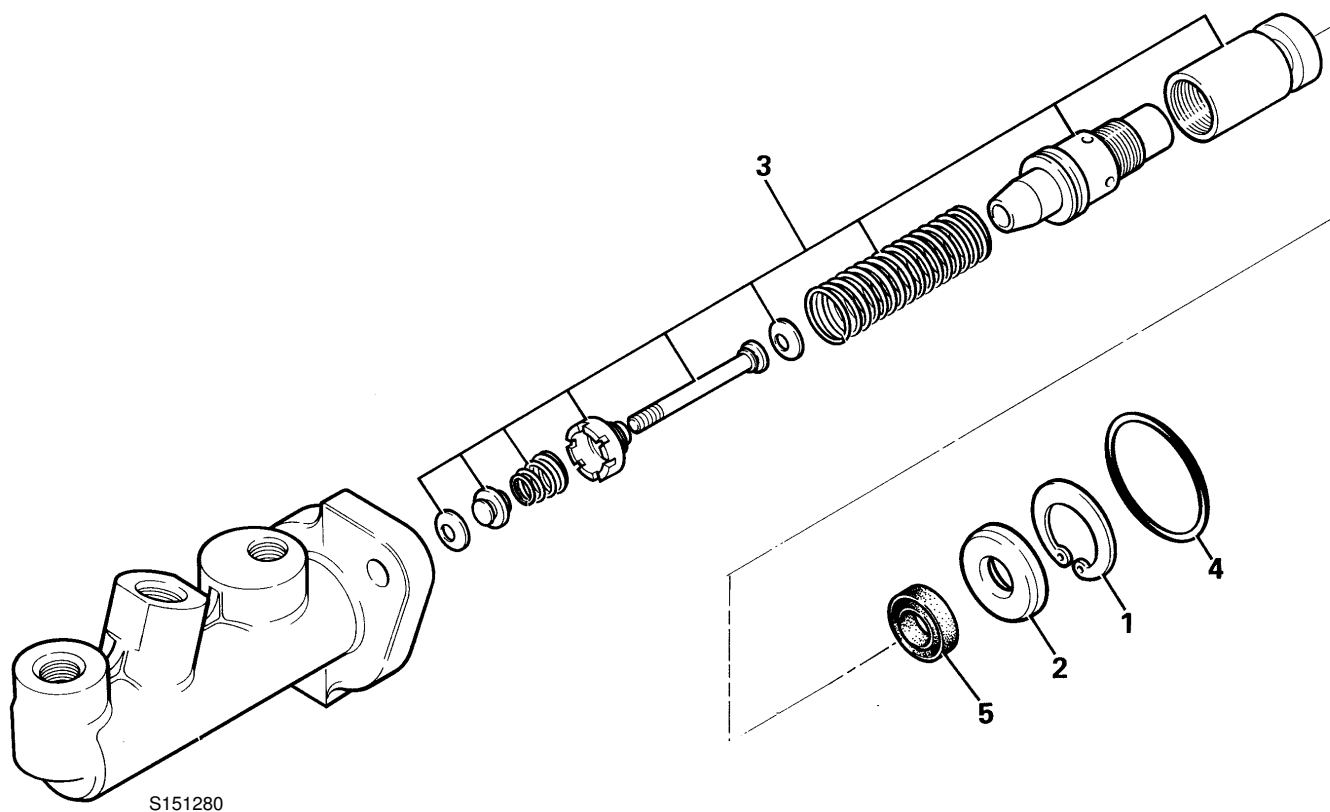
Assembly

⚠ WARNING

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

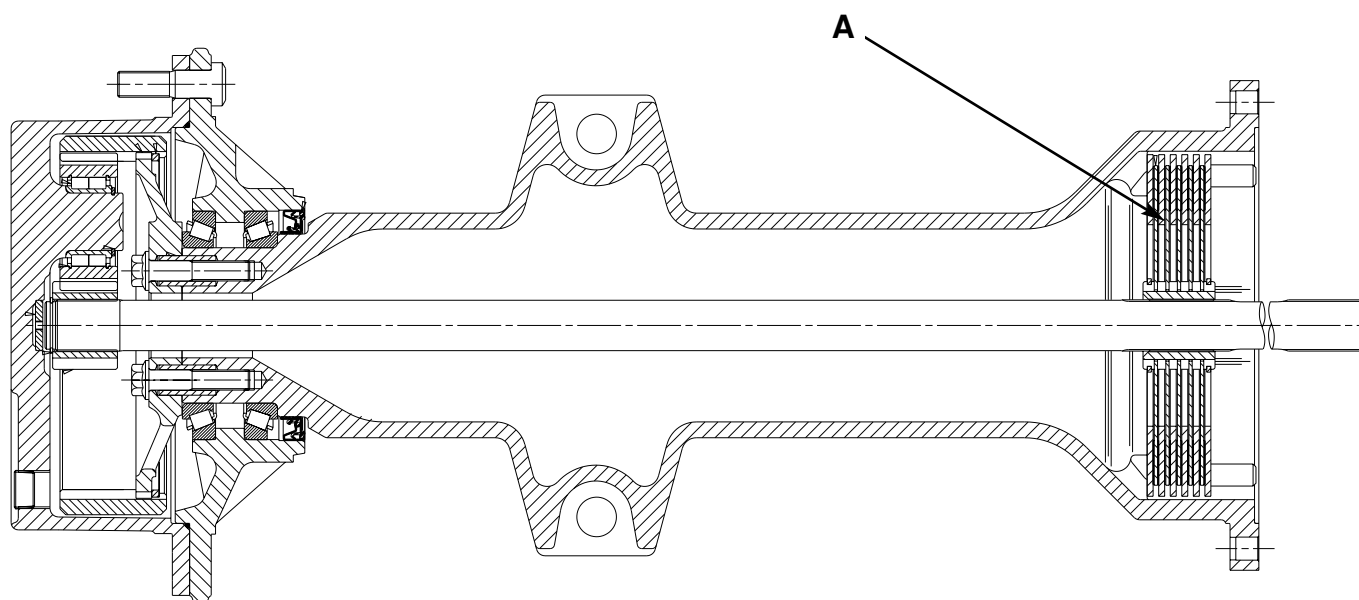
BRAK 1-1

- 1 Clean and lubricate all components, including new seals, with JCB Special Hydraulic Fluid. DO NOT USE CONVENTIONAL BRAKE FLUID OR SERIOUS DAMAGE WILL BE CAUSED.
- 2 Take care not to damage the machined faces of piston assembly 3 when assembling.



Dismantling and Assembly

The service brakes are located in the rear axle, as shown at **A**. Instructions for dismantling and assembly of the brake are described in Section F - **Rear Axle Brakes**.



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Bleeding

WARNING

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

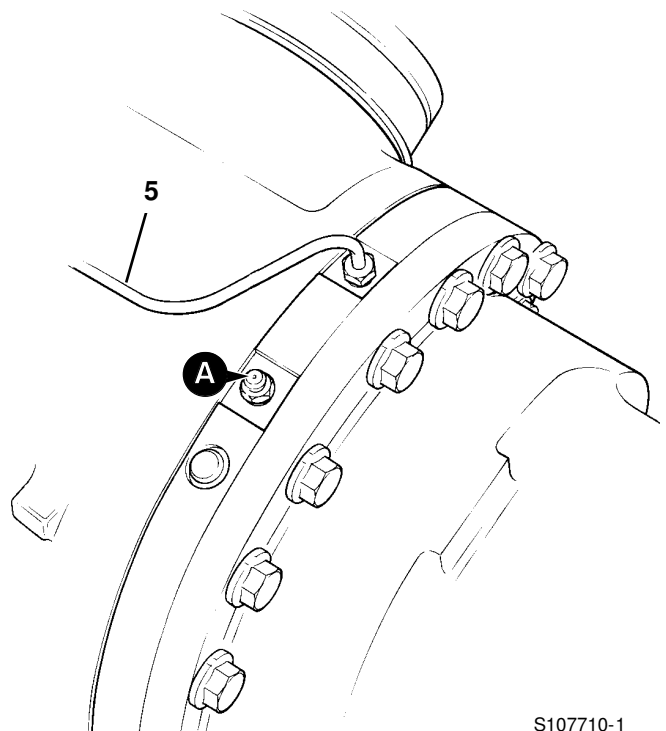
BRAK 1-2

WARNING

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

BRAK 1-1

- 1 Fill the master cylinder reservoir with the correct fluid, refer to Section 3 **Fluids, Lubricants, Capacities and Specifications**, and ensure that throughout the bleeding process the level is not allowed to fall below the MINIMUM mark.
 - 2 Unlatch the pedals, and bleed each brake separately as follows:
 - 3 Right Hand Master Cylinder
 - a Attach a tube to the right hand brake bleed screw **A**, ensuring that the free end of the tube is immersed in fluid contained in a suitable container.
 - b Open the brake bleed screw and apply full pedal strokes of the right hand brake pedal until all air is expelled.
 - c Close the brake bleed screw with the pedal fully depressed.
 - 4 Left Hand Master Cylinder
 - a Repeat procedure as for 'Right Hand Master Cylinder' but use left hand bleed screw and pedal.
 - 5 Bridge Pipe
 - a Attach a tube to either the left or right hand brake bleed screw, ensuring that the free end of the tube is immersed in fluid contained in a suitable container.
 - b Make sure that the brake pedals are **locked** together.
- Note:** 4WS machines do not have dual pedal braking. These machines are fitted with a single pedal that operates both master cylinders.
- c Open the bleed screw and apply full pedal strokes of the brake pedals until all air is expelled.
 - d Close the bleed screw with the pedals fully depressed.
 - 6 Repeat the procedures as necessary.
 - 7 Top up the reservoir to the full mark.



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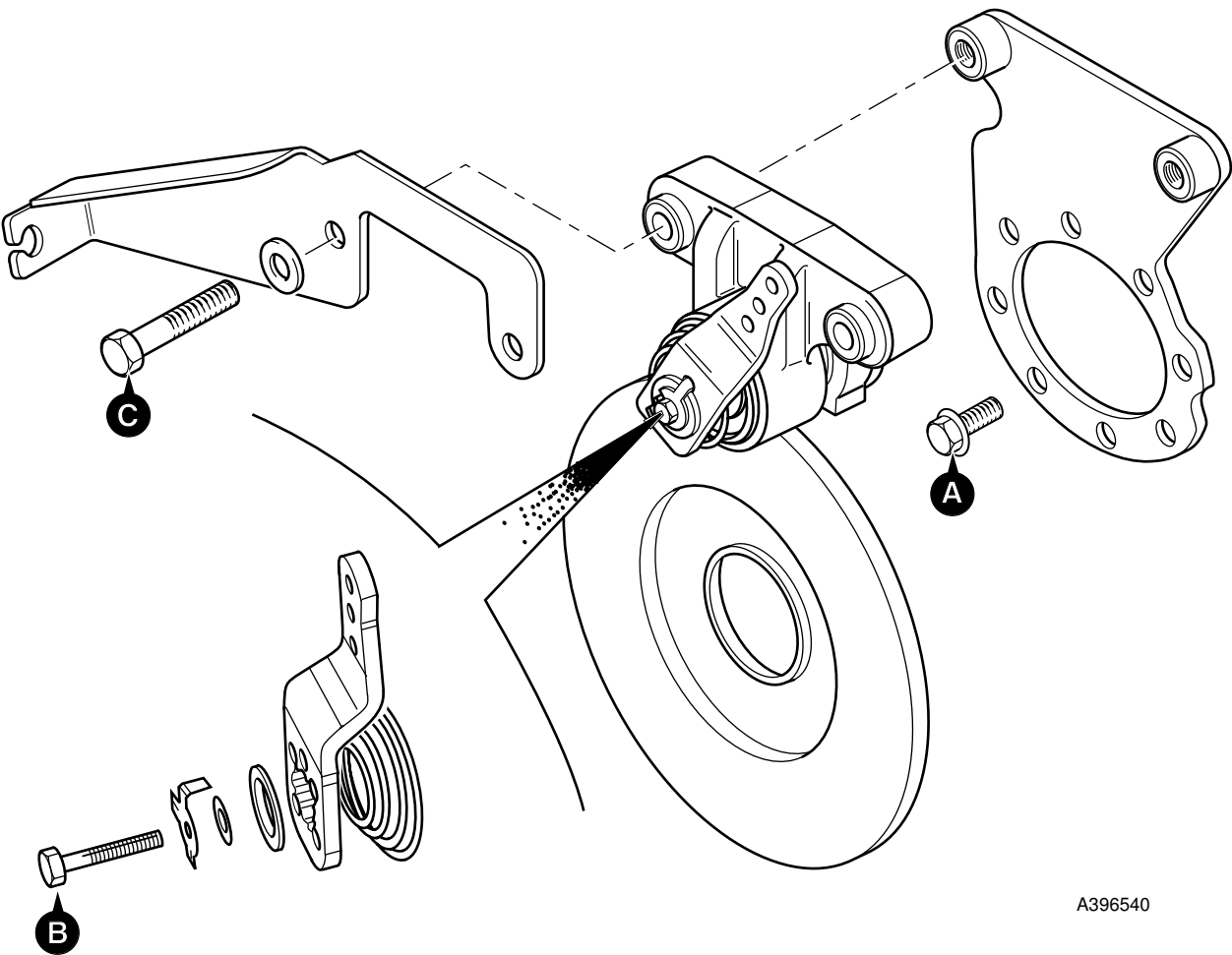
Torque Figures

The illustration shows a typical installation.

Where appropriate, the grade of bolt is indicated in parenthesis eg. (10.9). Refer also to relevant dismantling and assembly procedures.

Torque Settings

Item	Nm	lbf ft	
A	166	122	(12.9)
B	13-15	9-12	
C	255	188	(10.9 Tuflok)



A396540

Calliper Removal and Replacement

⚠ WARNING

This is a safety critical installation. Do not attempt to do this procedure unless you are skilled and competent to do so.

Installation and mounting of the parking brake calliper requires tightening of the mounting bolts to a specific torque figure. Do not attempt to do this job unless you have the correct tools available.

0010

⚠ WARNING

Before working on the parking brake, park on level ground and put chocks each side of all four wheels. Stop the engine and disconnect the battery so that the engine cannot be started. If you do not take these precautions the machine could run over you.

BRAK 8-8

⚠ WARNING

Brake pads generate dust which if inhaled, may endanger health. Wash off the calliper before commencing work. Clean hands thoroughly after work.

13-3-1-3

Removal

- 1 Release the parking brake lever (lever horizontal).
- 2 Disconnect clevis **A**, note which of the three holes on the lever is used.
- 3 Undo locknuts **B** and disconnect the cable from the bracket **D**.
- 4 Support the calliper and remove the two mounting bolts and hardened washers **C**. Lift the calliper and bracket **D** clear of the brake disc.

Note: Do not remove axle mounting bracket **F** unless it needs to be renewed.

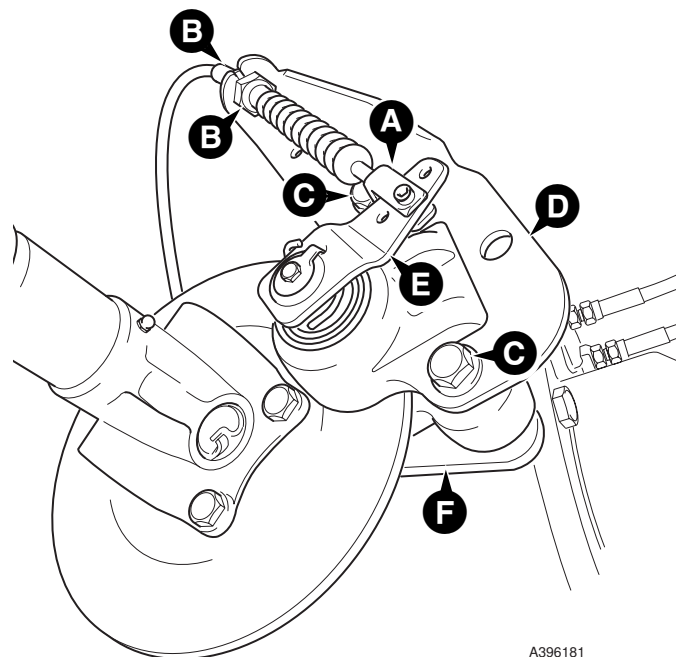
Replacement

Replacement is the reverse of the removal sequence.

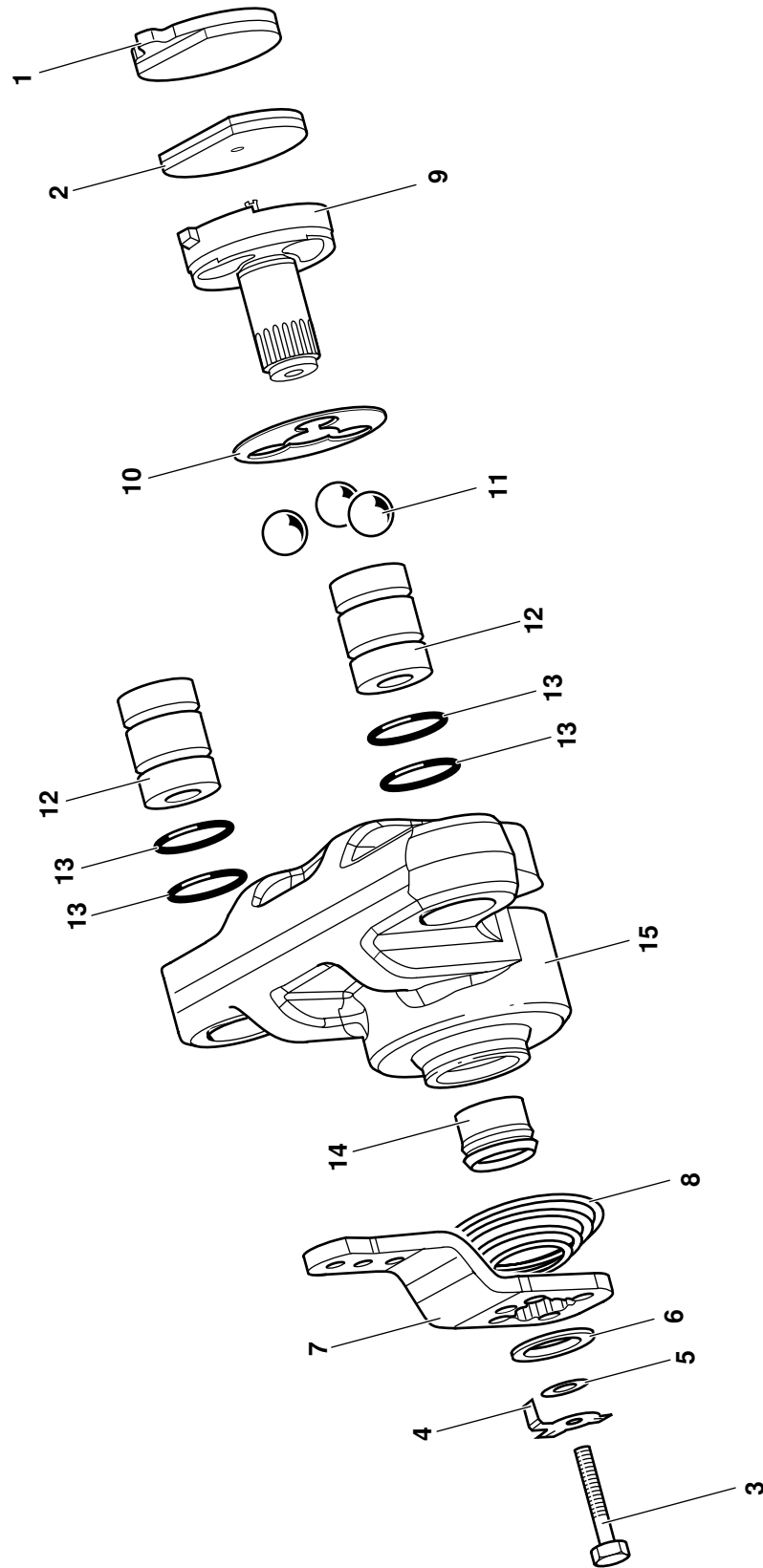
- 1 Locate the calliper on the brake disc and fit new mounting bolts **C** with hardened washers, torque tighten to 255 Nm (188 lbf ft).
- 2 Insert cable into bracket **D**, do not tighten locknuts **B** at this stage as the brake will need adjusting.
- * 3 Refit the clevis **A** into the hole in the operating lever **E** as shown.
- 4 Make sure there is adequate freedom of movement of operating lever **E** to ensure a positive brake application, and that the lever returns to the rest position when the parking brake is released.
- 5 Adjust the parking brake, see **Service Procedures, Parking Brake Adjustment**. Never unscrew the clevis **A** to adjust the cable.

Torque Settings

Item	Nm	lbf ft
C	255	188



A396181

**Component Listing:**

- 1 Carrier Side Pad
- 2 Lever Side Pad
- 3 Bolt
- 4 Anti-rotation Clip
- 5 Washer
- 6 Washer
- 7 Lever
- 8 Spring
- 9 Rotor
- 10 Ball Spacer
- 11 Ball Bearings
- 12 Mounting Bush
- 13 O-ring
- 14 Shaft Seal
- 15 Housing

228362

Calliper Dismantling and Assembly

Dismantling

The numerical sequence shown on the illustration on the adjacent page is intended as a guide to dismantling.

WARNING

This is a safety critical installation. Do not attempt to do this procedure unless you are skilled and competent to do so.

Installation and mounting of the parking brake calliper requires tightening of the mounting bolts to a specific torque figure. Do not attempt to do this job unless you have the correct tools available.

0010

WARNING

Before working on the parking brake, park on level ground and put chocks each side of all four wheels. Stop the engine and disconnect the battery so that the engine cannot be started. If you do not take these precautions the machine could run over you.

BRAK 8-8

WARNING

Brake pads generate dust which if inhaled, may endanger health. Wash off the calliper before commencing work. Clean hands thoroughly after work.

13-3-1-3

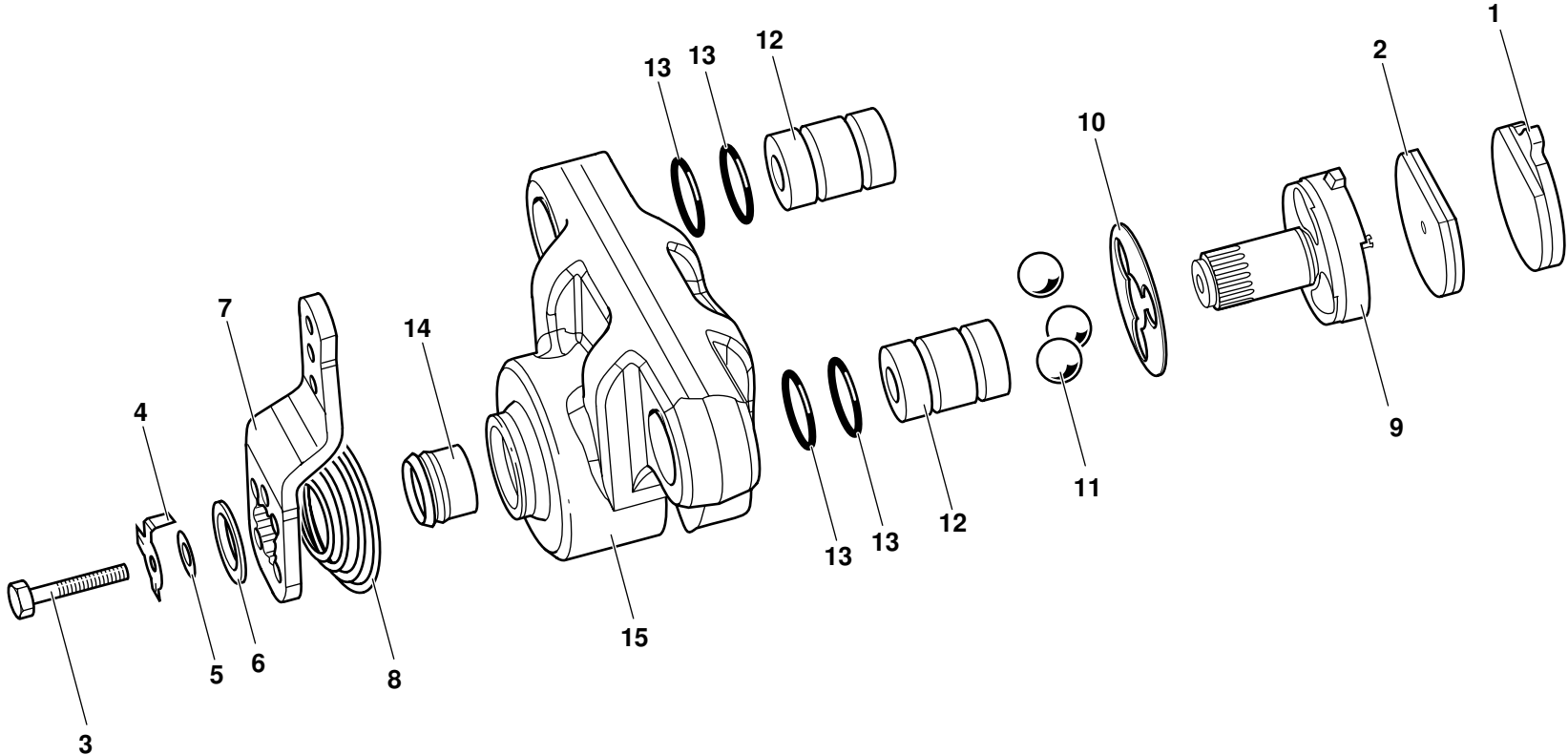
- 1 Remove the calliper and brake pads, refer to **Calliper - Removal and Replacement**.
- 2 Bend the tabs on anti-rotation clip **4**. Remove bolt **3**, anti-rotation clip **4** and washers **5** and **6**. Hold lever **7** against the tension of the spring as the bolt is removed.
- 3 Note the position of lever **7** and the splines of the shaft. Mark the end of the shaft and lever **7** to aid assembly. Remove lever **7** and spring **8**.
- 4 Push out rotor **9** and remove ball spacer **10** and ball bearings **11**. Take care not to lose the ball bearings.
- 5 Push out mounting bushes **12** and remove O-rings **13**.

Note: Shaft seal **14** will not need to be renewed unless excessively worn or damaged. If removal is necessary, press the seal out from inside the housing using a suitable spacer block and bench press. Clean out any remains of the seal after removal.

Inspection

- 1 Clean and dry all parts. Check all parts are free from excessive wear, damage or corrosion. Light scores or stains should be removed. Renew corroded or deeply scored parts.
- 2 Check rotor **9** for damage or distortion. Renew if necessary.

Always renew both brake pads if the parking brake has been used in an emergency.
- 3 Check the ball pockets in housing **15** for signs of scoring, pitting, damage or corrosion. Renew the housing if damaged.
- 4 Check spring **8** is not broken or distorted.
- 5 Check the condition of the disc surface. Renew the disc if badly warped, pitted or worn.

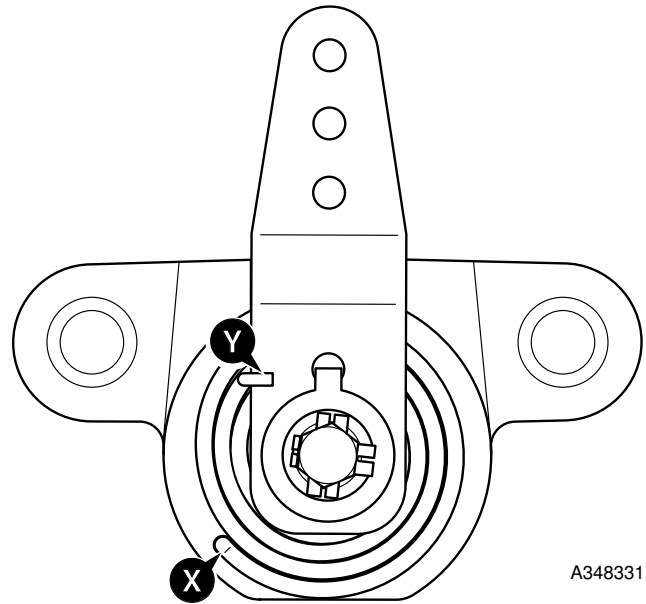


Dismantling and Assembly (cont'd)

Assembly

Before assembly make sure all parts are clean and serviceable.

- 1 Fit a new shaft seal **14** if removed. Install the seal as shown. Press the seal into the housing using a suitable spacer block and bench press.
- 2 Coat the the shaft and ball pockets of rotor **9** and the ball pockets of housing **15** with silicone grease.
- 3 Insert the three ball bearings **11** into the pockets in the housing **15**. Insert ball spacer **10**.
- 4 Slide rotor **9** through the casting and seat the ball pockets against the bearings.
- 5 Position spring **8** over the shaft of rotor **9**. Insert the large diameter end of the spring into hole **X** in the face of the housing.
- 6 Locate the small diameter end of spring **8** around the outside edge of lever **7** as shown at **Y**.
- 7 Fit lever **7**. Align the lever to the mark made during dismantling.
- 8 Hold the lever against the tension of the spring and fit washers **6** and **5**, and new anti-rotation clip **4**. Fit bolt **3** and tighten to 13-16 Nm (9-12 lbf ft).
- 9 Bend up a tab of the anti-rotation clip that aligns with one of the flats on the bolt.
- 10 Fit the new brake pads, refer to **Service Procedures - Parking Brake - Renewing the Brake Pads**.
- 11 Lubricate the O-rings **13** and bushes **12** with silicone grease. Fit O-rings into the housing and insert mounting bushes. Wipe off any excess grease.
- 12 Before fitting the calliper, ensure the lever rotates smoothly and that the lever side pad **2** returns to the off position when the lever is released.
- 13 Refit the brake calliper. Refer to **Calliper - Removal and Replacement**.
- 14 Adjust the parking brake, refer to **Service Procedures - Parking Brake - Adjustment**.



A348331

Torque Settings

Item	Nm	lbf ft
3	13-16	9-12

Brake Disc - Removal and Replacement

WARNING

This is a safety critical installation. Do not attempt to do this procedure unless you are skilled and competent to do so.

WARNING

Before working on the parking brake, park on level ground and put chocks each side of all four wheels. Stop the engine and disconnect the battery so that the engine cannot be started. If you do not take these precautions the machine could run over you.

BRAK 8-8

Removal

- 1 Disconnect the propshaft to the rear axle, refer to Section F **Propshafts - Removal and Replacement**.
- 2 Remove the calliper from the axle mounting bracket **F**, refer to **Calliper Removal and Replacement**.
- 3 Undo the stake nut and withdraw the brake disc from the drive pinion shaft.

Note: If the axle is not mounted to a machine, fit flange spanner (service tool 992/04800) to prevent brake disc and drive pinion shaft turning when loosening or tightening the stake nut. Refer to Section F - **Service Tools**.

Replacement

Replacement is the reverse of the removal sequence.

- 1 Fit a new stake nut and torque tighten to 300 Nm (221 lbf ft), see Note:
- 2 Re-stake the nut using a square ended staking tool.

Torque Settings

Item	Nm	kgf m	lbf ft
1	300	30.6	221