Brakes

Service Manual - Backhoe Loader

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Notes:

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Service Tools

Numerical List

The tools listed in the table are special tools required for carrying out the procedures described in this section. These tools are available from JCB service.

Some tools are supplied as kits. Cross references are given to tables showing kit contents.

Note: *Tools other than those listed will be required. It is expected that such general tools will be available in any well equipped workshop or be available locally from any good tool supplier.*

Part Number	Description	Tool Detail Reference
892/01059	Wear Indicator Tool	⇒ *Fig 1. (G-2)*

Tool Detail Reference

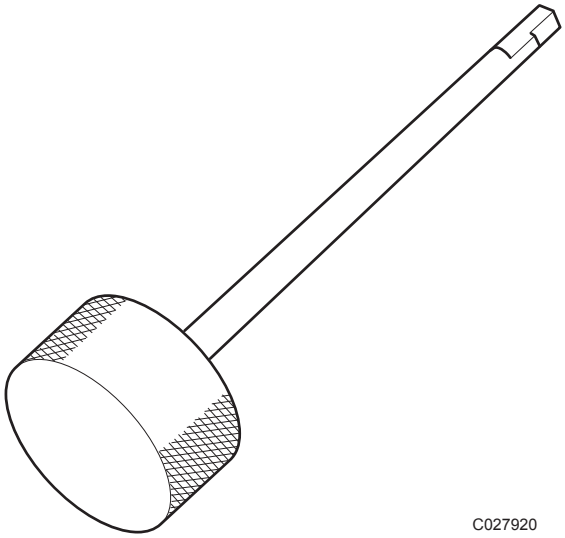


Fig 1. 892/01059 Wear Indicator Tool

For checking brake friction plate wear on service brakes.

Technical Data

System Type

Hydraulic service brakes in rear axle only, operated from separate pedals. No servo assistance. Independent cable operated parking brake on output to front wheels.

Service Brakes:	
Type	JCB Oil-Immersed Multi-Plate Discs
Actuation	Hydraulic
Location	Rear Axle Centre Casing (2 brake packs)
Friction Plates (5 per brake pack)	
Outside Diameter	165 mm (6.496 in) nominal
Inside Diameter	103 mm (4.055 in) nominal
Hydraulic Piston Diameter	166 mm (6.535 in)
Master Cylinder:	
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 transmission output to the front wheels
Disc Diameter	279.4 mm (11 in)

Note: *Because the service brakes are located in the rear axle, the procedures for dismantling and assembly are described in a separate publication, see* ***Transmissions Service Manual*** *(Publication No. 9803-8610) which includes procedures for the axle sub-assemblies.*

Basic System Operation

Compensating Master Cylinder

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

⇨ *Fig 1. (G-5)*. Each brake has its own master cylinder **A**, **A1**, brake pedals **B**, **B1**, and associated pipework. Both master cylinders have one common reservoir **C**.

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.

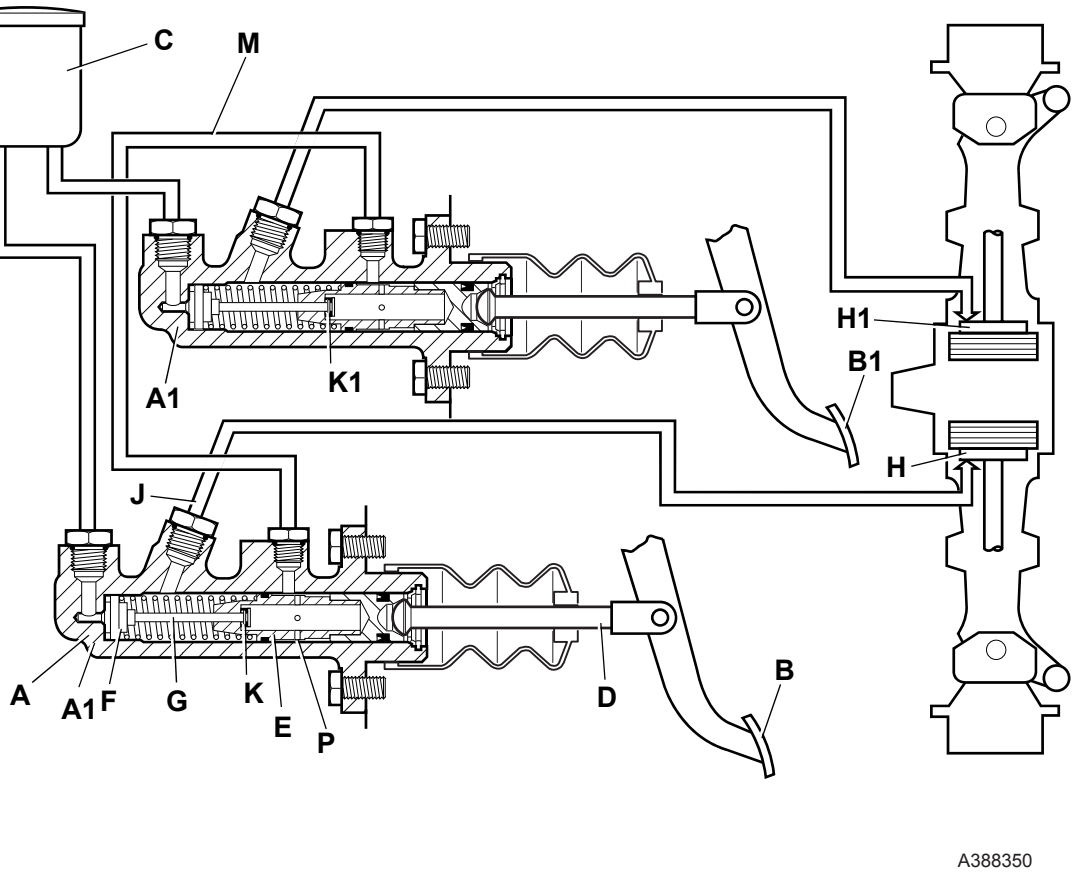


Fig 1.

Fault Finding

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.*

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.
E	Pedals touch floor under constant pressure - no fluid loss.	1	Master cylinder fault.	1	Check master cylinder in single and coupled pedal modes to identify fault area, service as required.

FAULT		POSSIBLE CAUSE		ACTION	
E	continued...	2	Friction/counter plate distortion.	2	Renew friction/counter plates - BOTH sides.
		3	Air in hydraulic system.	3	See item B.1.
F	Pedals touch floor under constant pressure - and fluid loss.	1	External fluid leaks.	1	Visually check brake circuit for fluid loss, service as required.
		2	Internal fluid leaks.	2	Refer to ***Service Procedures - Brake Piston Seal Leakage Test.***
G	Pulling to one side when pedals locked together.	1	Compensating feature not working	1	Inspect master cylinder compensating operation. Check if blockage in bridging pipe. Service as required.
		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	Annular piston fault (see item J6).	5	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.
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.

FAULT	POSSIBLE CAUSE	ACTION
J continued...	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.
K Poor braking when hot.	1 Moisture in system vaporising 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.	1 Change axle oil.
	2 Axle oil loss.	2 Refill axle with correct oil and check for leaks.
	3 Friction plates worn beyond limits.	3 Renew friction/counter plates.
	4 Friction/counter plates in poor condition.	4 Check for distortion or surface pitting and/or roughness of friction/ counter plates (annular grooving of counter plates is acceptable).

FAULT	POSSIBLE CAUSE	ACTION
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 Procedures

Service Brakes

Bleeding

⚠ 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.

BRAK-1-1

1 Fill the master cylinder reservoir with the correct fluid as specified in ***Section 3, Routine Maintenance***, and ensure that throughout the bleeding process the level is not allowed to fall below the MINIMUM mark.

2 Unlatch the pedals, and bleed the bridge pipe and each brake separately.

3 Bridge pipe:

a Attached a tube to the left hand brake bleed screw **A**, ensuring that the free end of the tube is immersed in the correct fluid contained in a suitable container.

b Open the left hand bleed screw, slightly depress the left hand pedal to activate the compensating valve (e.g approximately 10% of pedal travel), and apply full pedal stroke of the right hand pedal.

c Close the bleed screw with the right hand pedal fully depressed and allow the pedal to return to its stop.

d Continue bleeding the bridge pipe until all air is expelled.

4 Left hand master cylinder:

a Leave the tube still attached to the left hand brake bleed screw **A**, ensuring that the free end of the tube is immersed in the correct fluid contained in a suitable container.

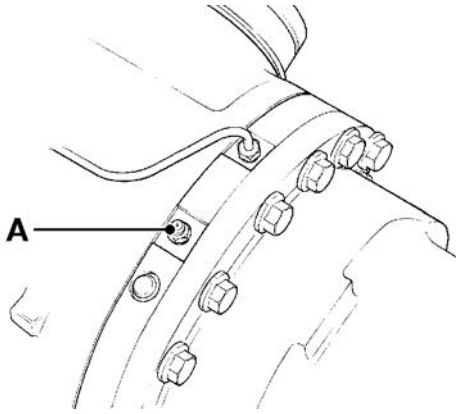


Fig 1.

b Open the brake bleed screw and depress the left pedal full stroke, close the brake bleed screw and allow the pedal to return to its stop.

c Continue bleeding of the left hand master cylinder until all air is expelled.

5 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 the correct fluid contained in a suitable container.

b Open the brake bleed screw and depress the right pedal full stroke, close the brake bleed screw and allow the pedal to return to its stop.

c Continue bleeding of the right hand master cylinder until all air is expelled.

6 Top up the reservoir to the full mark.

7 On completion, check the brake circuit for leaks and correct operation.

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.

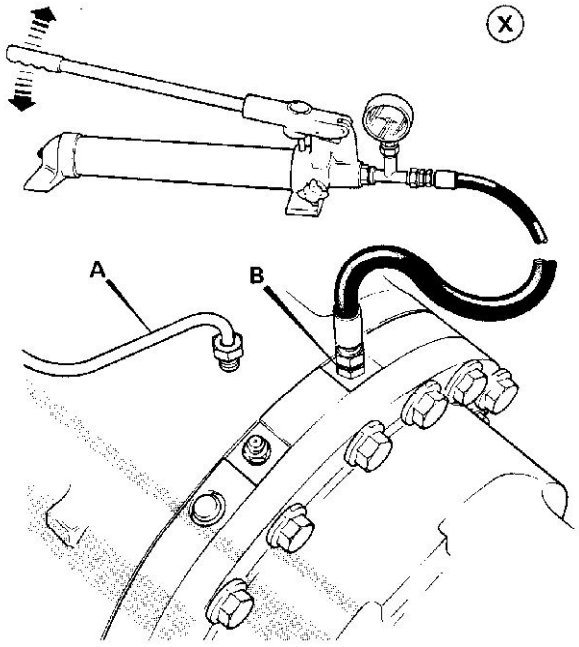


Fig 2.

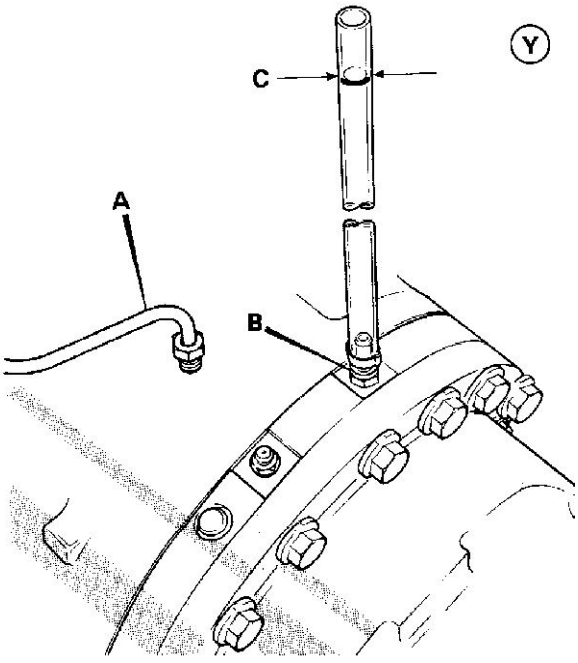


Fig 3.

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***.

Brake Friction Plate Wear Check

⇨ *Fig 4. (G-14)*.

The following procedure explains how to check friction plate wear in the brake packs within the rear axle. An access hole is provided in each brake piston housing either side of the drivehead, to enable a wear indicator tool to be inserted. The access hole for the R/H brake pack faces forward and the access hole for the L/H brake pack faces to the rear of the machine.

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the attachments to the ground. Apply the park brake, put the transmission in neutral and stop the engine. Block both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-4-1_1

1 Park the machine on level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground. Stop the engine and remove the starter key.

2 Working underneath the rear of the machine, carefully remove the grub screw **A** in the brake piston housing.

3 Insert the wear indicator tool **B** (service tool 892/01059, refer to ***Service Tools***) into the access hole as shown. Slowly rotate the tool and by applying gentle pressure, feel if the stepped diameters on the tool will enter behind the brake piston, therefore allowing the tool to be inserted still further.

The level of brake wear is determined as follows:

a If the 1st step on the tool will NOT enter behind the brake piston as shown at **C**, then the friction plates are not worn significantly. The brakes are deemed to be serviceable.

When it is possible to engage the 1st step on the tool behind the brake piston, this indicates that the brake pack has 1mm of permissible wear remaining.

b Should it be possible to engage the 2nd step on the tool behind the brake piston as shown at **D**, then the friction plates have worn outside acceptable limits. The brakes are deemed to be beyond their serviceable life and the complete brake pack should be renewed immediately.

4 Withdraw the wear indicator tool and fit a new grub screw. Apply JCB Threadseal to the threads of the grub screw and torque tighten to 20 Nm (2 kgf m, 14.8 lbf ft).

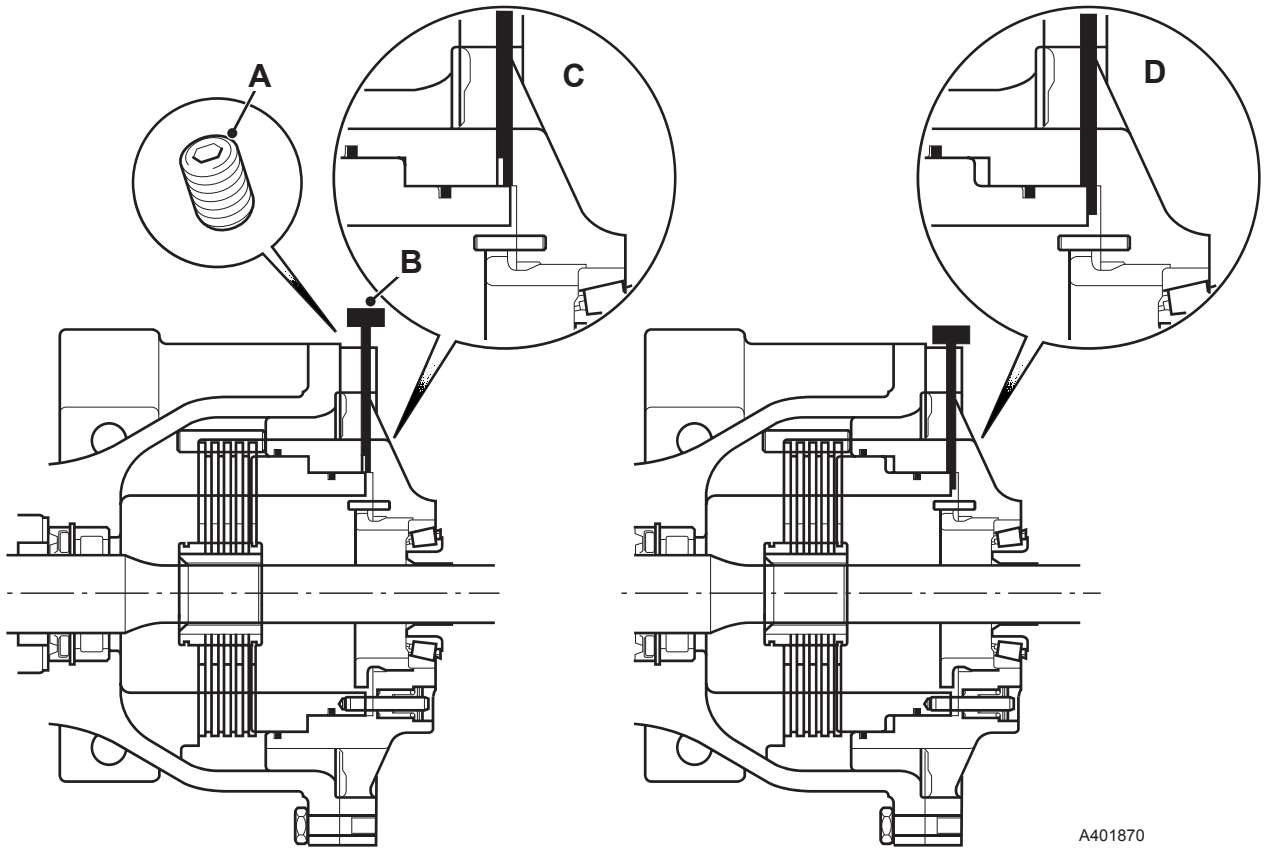


Fig 4. Brake Friction Plate Wear Check

Parking Brake

Testing

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

⚠ WARNING

Before testing the park 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 Lock the brake pedals together.

4 Start the engine and raise the attachments to the appropriate travelling position.

5 Select fourth gear **2**.

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 brake 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. ⇒ *Adjustment (G-16)*.

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 park brake.

3-2-3-10_2

⚠ WARNING

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

3-2-3-11

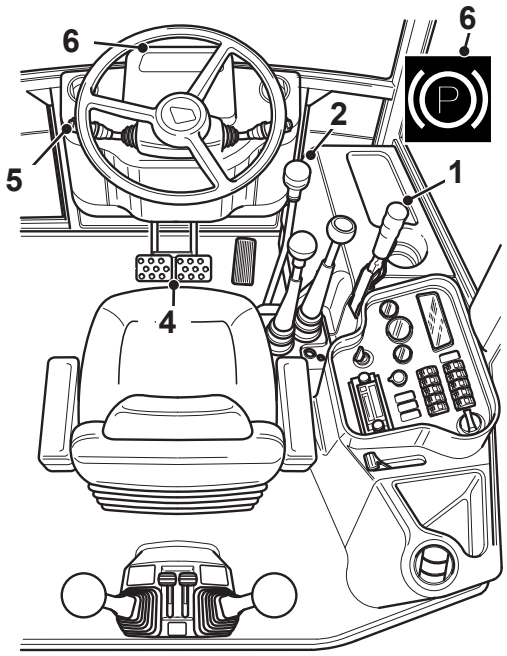


Fig 5.

Adjustment

⚠ CAUTION

The park 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 park brake has been used in an emergency, always renew both brake pads.

4-2-1-1_2

⚠ WARNING

Before adjusting the park brake, make sure that the machine is on level ground. Put blocks 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

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 park brake could result in the park 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, ⇨ *Testing (G-15)*.

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. ⇨ *Cable Adjustment (G-17)*.

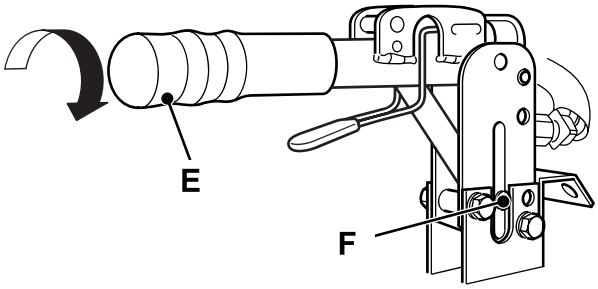


Fig 6.

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, ⇨ *Renewing the Brake Pads (G-19)*.

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, ⇨ *Testing (G-15)*. Make final adjustments at the park brake lever if the brake fails the test. ⇨ *Lever Adjustment (G-16)*.

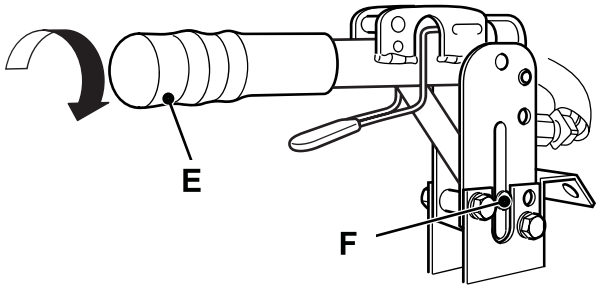


Fig 7.

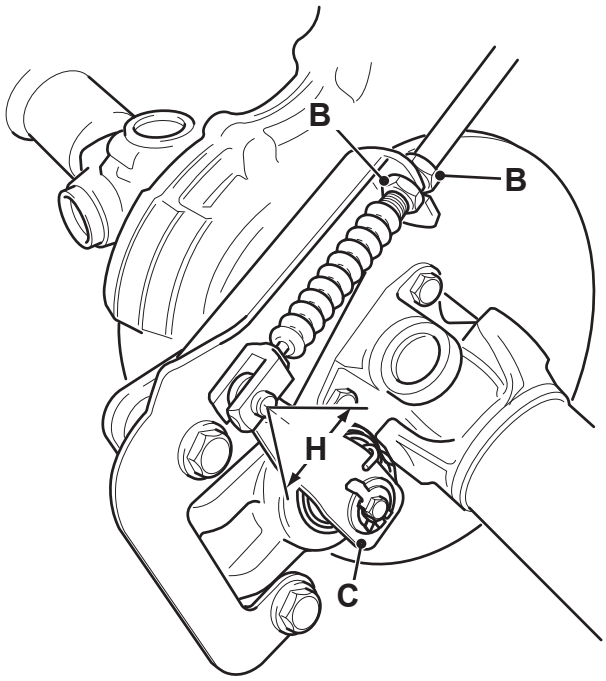


Fig 8.

Switch Adjustment

Type 1: Proximity Sensor

Machines upto serial no. 955577

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, ⇨ *Adjustment (G-16)*.

Type 2: Reed Switch

Machines from serial no. 955578

The reed type switch **X** operates when the metal vane **Y** moves between the switch faces **Z**. The switch is not adjustable.

If the switch is suspected as being faulty, check the associated wires and electrical connectors for damage. Ensure that the vane **Y** moves between the switch faces **Z** when the parking brake is operated. If the switch has failed it must be renewed.

For adjustment of the parking brake, ⇨ *Adjustment (G-16)*.

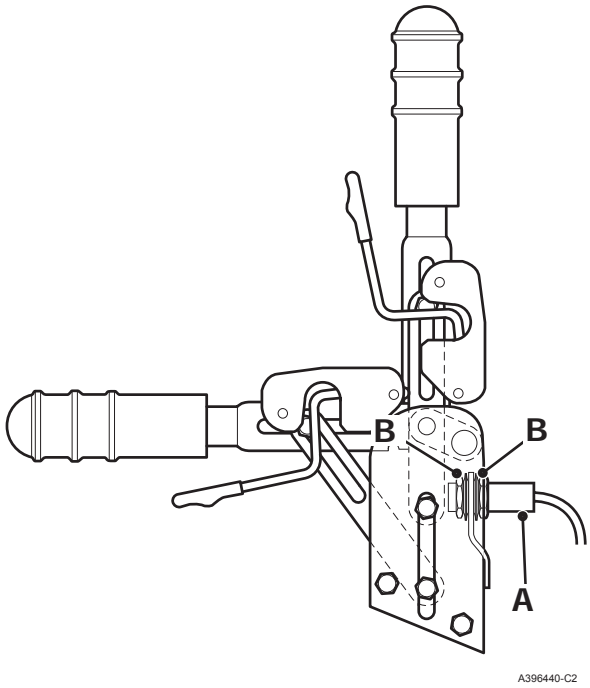


Fig 9.

Table 1. Torque Settings

Item	Nm	Kgf m	lbf ft
B	29	2.95	21

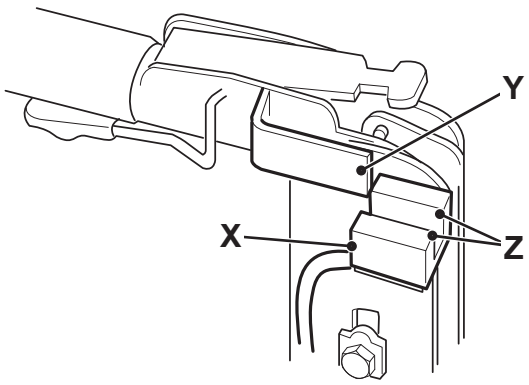


Fig 10.

Renewing the Brake Pads

⇨ *Fig 11. (G-20)*.

⚠ 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 park brake caliper 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 park brake, park on level ground and put blocks on 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 caliper assemblies before commencing work. Clean hands thoroughly after work.

13-3-1-3

Pad Removal

1 Remove the parking brake calliper from the transmission 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 ***Section F, Synchro Shuttle Gearbox - Dismantle and Assemble***.

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 Make sure that the plastic anti-rattle pad **Y** is correctly located. 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.*

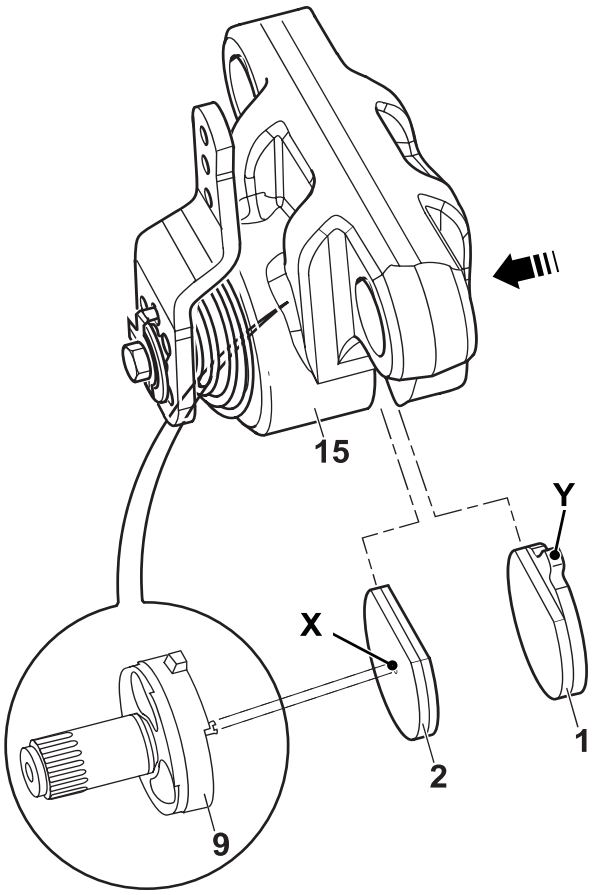


Fig 11. Renewing the Brake Pads

Compensating Master Cylinder

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

⇨ *Fig 1. (G-22)*.

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 inside the cab, remove the actuating rod clevis pin **A** at the top of each brake pedal.

3 Working outside the cab, loosen and remove brake pipe unions **B**, plug and cap to prevent loss of fluid and ingress of dirt.

4 Remove the brake pipes from the master cylinders: Master cylinders bridging pipe **C**, axle feed pipes **E** and reservoir supply pipes **F**.

5 Loosen and remove the two master cylinder retaining bolts **G** (both units).

6 Tag the cylinders (left and right hand). Remove the master cylinders.

Replacement

Before replacing the cylinders check the adjustment of the brake pedals as follows:

1 Unlatch the pedals **H** and check to see if they are aligned. Both pedals should be at the same height. If they are not, undo lock nut **J** and turn the stop bolt **K** to correctly align. Tighten the lock nut **J**.

Do not remove or adjust the actuating rod clevis **L**. If the clevis is to be removed (for fitting to a replacement cylinder for example), measure the position of the pin location hole relative to the cylinder body as shown at **X**. Refit the clevis in the same position.

Replacement is a reversal of the removal sequence, but note the following;

Refit the cylinders in their original positions.

When reconnecting the cylinder actuating rods at the brake pedals, ensure that the clevis pins **A** align without moving the rods **P** or brake pedals. If necessary loosen the clevis lock nut **N** and turn the rod **P** until the clevis pin aligns with the brake pedal. Tighten the lock nut **N**.

⚠ WARNING

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

BRAK-1-1

2 On completion, bleed the brake system and check the brakes operate correctly. Refer to ***Service Procedures - Bleeding***.

3 Latch pedals and check for straight line braking; if satisfactory straight line braking cannot be achieved refer to ***Fault Finding***.

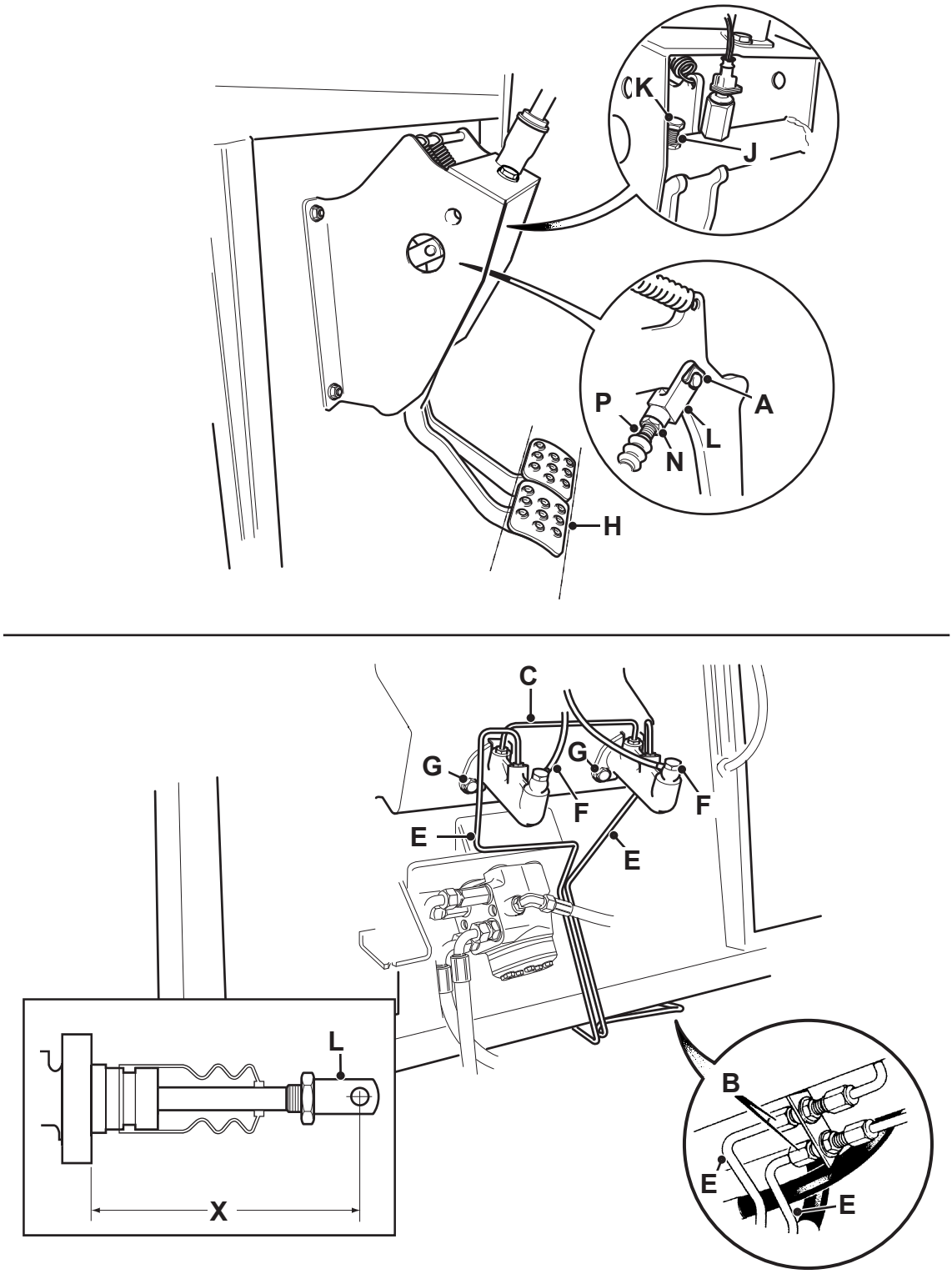


Fig 1.

Table 1. Torque Settings

Item	Nm	Kgf m	lbf ft
F	30 - 34	3.0 - 3.5	22 - 25

Dismantle and Assemble

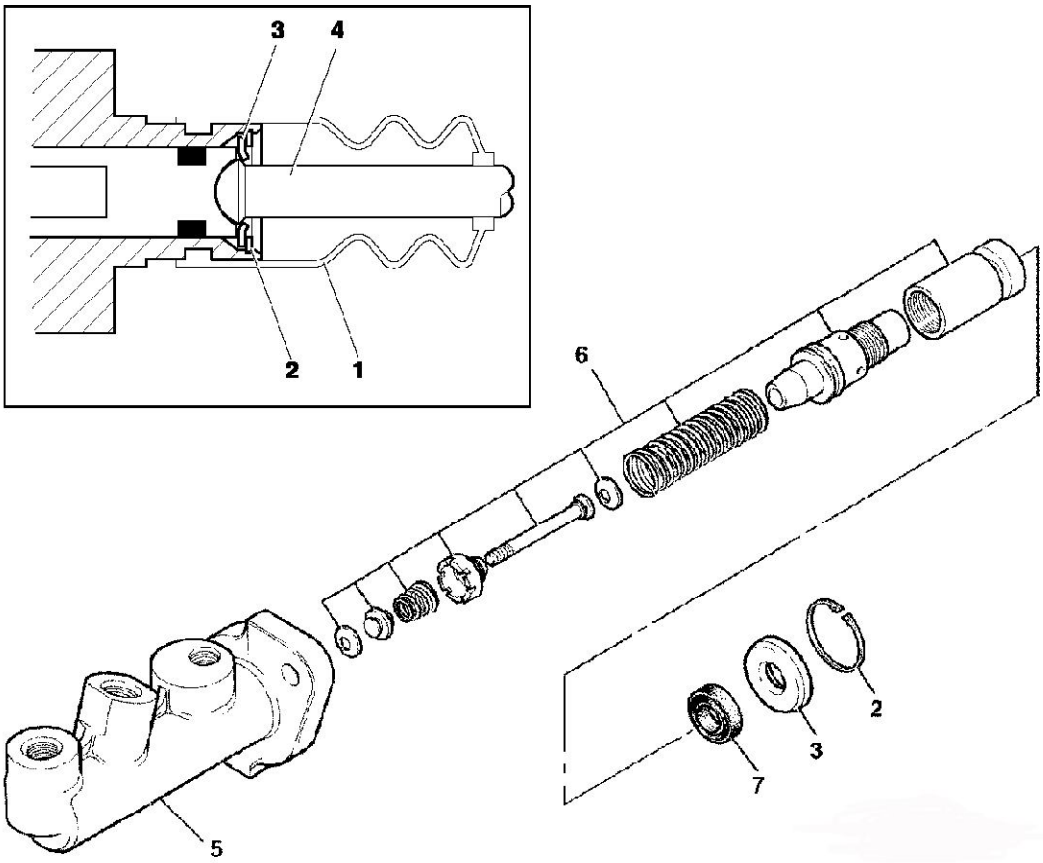


Fig 2.

Dismantle

1 Remove gaiter **1**. Remove circlip **2** and washer **3**. followed by the actuating rod **4**.

2 Shake the cylinder body **5**, or use compressed air, to eject piston assembly **6**. Take care not to damage the piston assembly, or the bore of the cylinder body **5**.

3 Examine the working surfaces of piston and cylinder. If these are not in perfect condition the master cylinder assembly must be renewed.

Note: *The piston assembly **6** can not be dismantled. If it is damaged (including seal **7**), the complete piston/seal assembly must be renewed.*

Assemble

⚠ WARNING

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

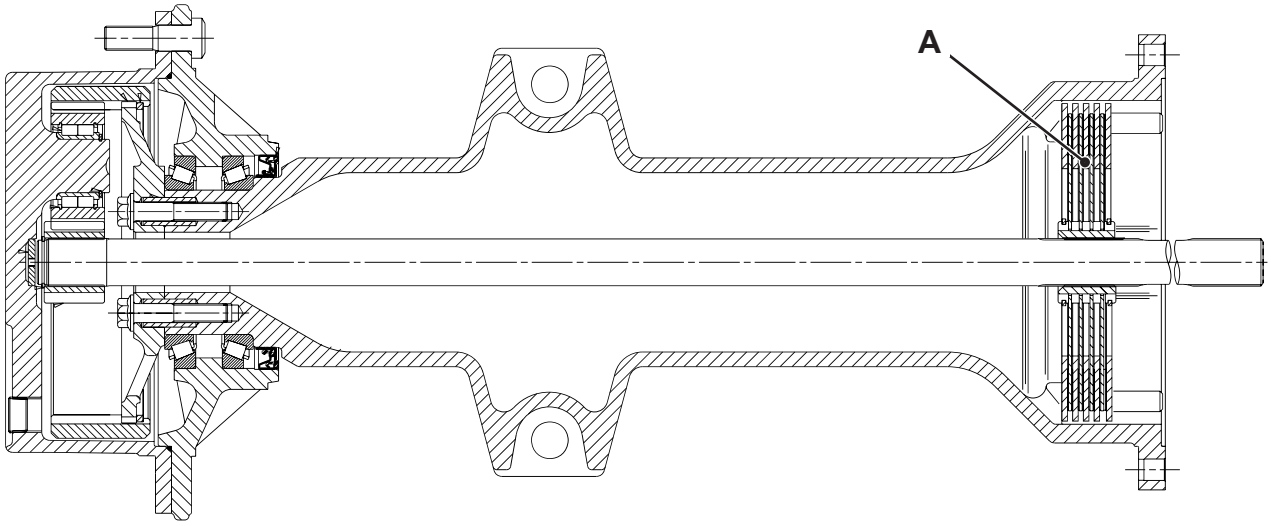
BRAK-1-1

1 Clean and lubricate all components, 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 **6** when assembling.

Service Brakes

Dismantle and Assemble



A388340

Fig 1.

The service brakes are located in the rear axle, as shown at **A**. The procedures for dismantling and assembly are described in a separate publication, see ***Transmissions Service Manual*** (Publication No. 9803-8610) which includes procedures for the axle sub-assemblies.

Parking Brake

Torque Figures

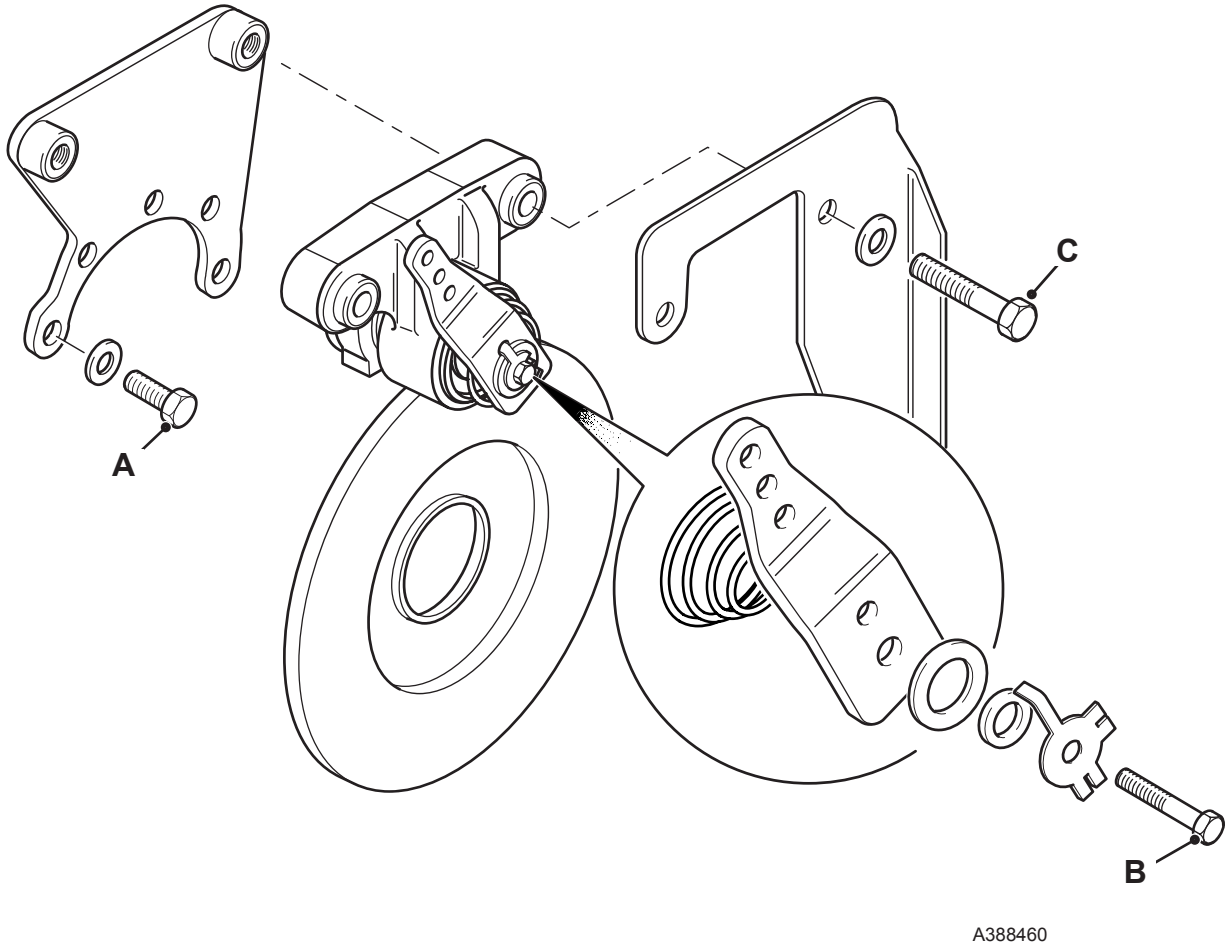


Fig 1.

The illustration shows a typical installation.

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

Table 1. Torque Settings

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

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 park brake caliper 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 park brake, park on level ground and put blocks on 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 caliper assemblies 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 transmission mounting bracket **F** unless it needs to be renewed.*

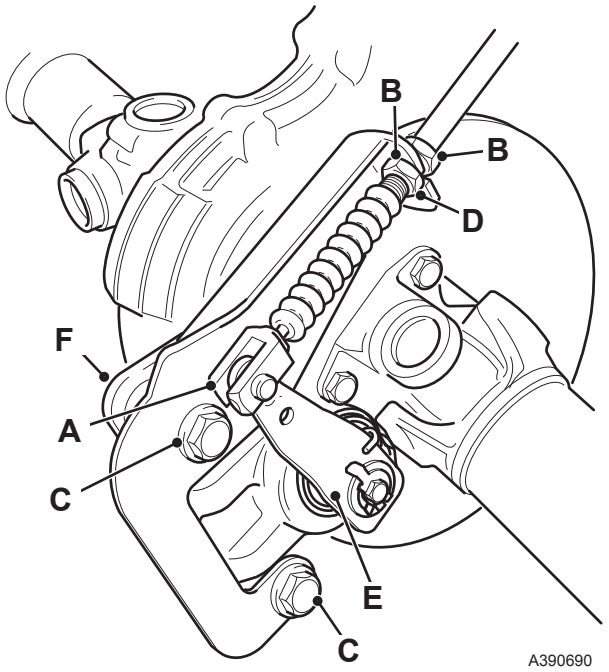


Fig 2.

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 to the top hole in the operating lever **E**.

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.

Table 2. Torque Settings

Item	Nm	lbf ft	
C	255	188	

Dismantle, Inspection and Assemble

Calliper - Type 1

Dismantle

⇒ *Fig 3. (G-28)*. 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 park brake caliper 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 park brake, park on level ground and put blocks on 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 caliper assemblies before commencing work. Clean hands thoroughly after work.

13-3-1-3

1 Remove the calliper and brake pads, ⇒ *Removal and Replacement (G-26)*.

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.

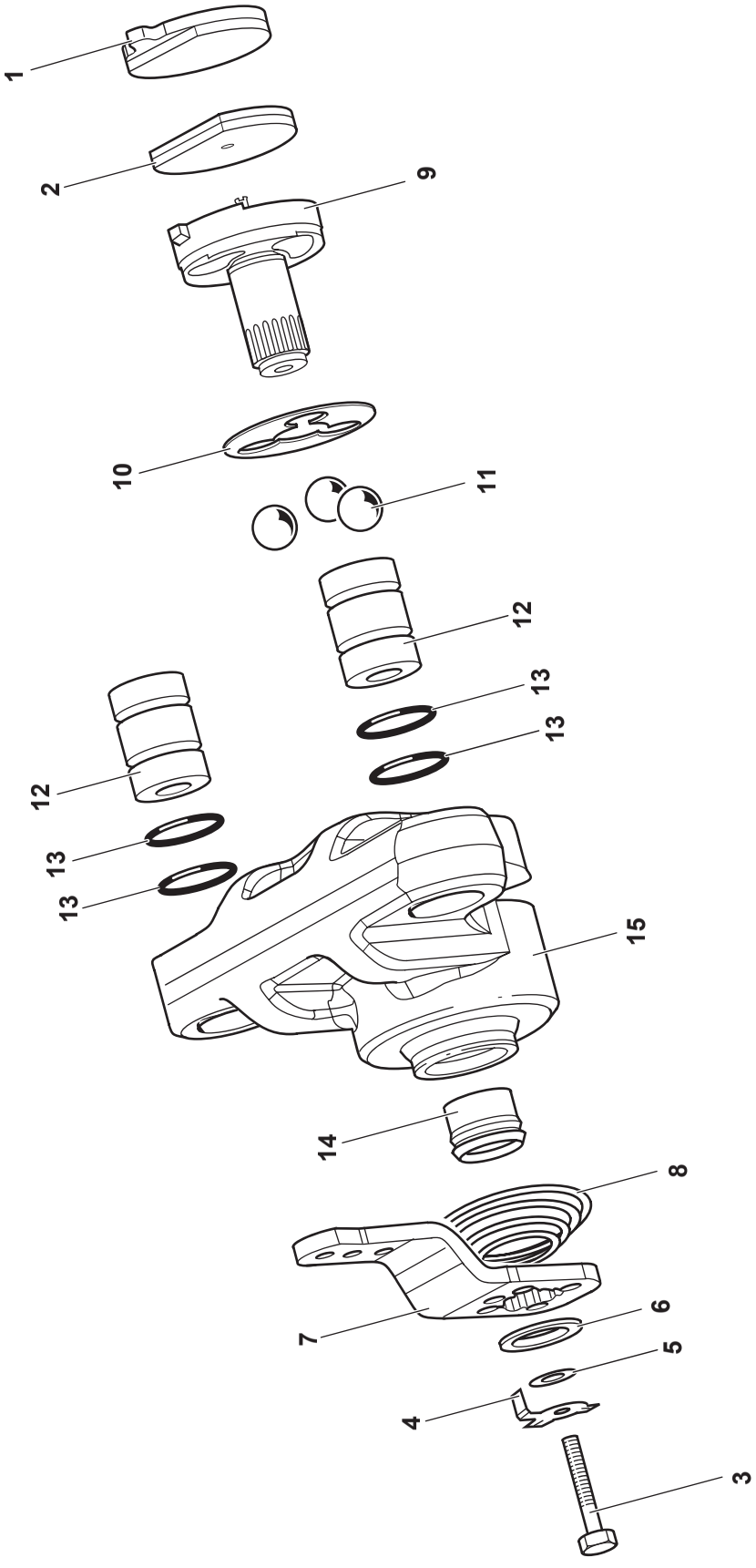


Fig 3. Calliper - Type 1

Assemble

⇨ *Fig 3. (G-28)*. 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 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. ⇨ *Removal and Replacement (G-26)*.

14 Adjust the parking brake, refer to ***Service Procedures, Parking Brake - Adjustment***.

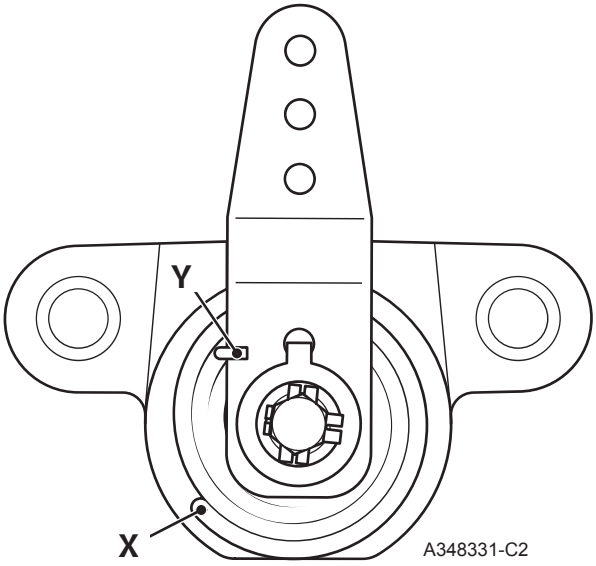


Fig 4.

Table 3. Torque Settings

Item	Nm	lbf ft	
3	13 - 16	9 - 12	

Calliper - Type 2

⚠ 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 park brake caliper 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 park brake, park on level ground and put blocks on 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 caliper assemblies before commencing work. Clean hands thoroughly after work.

13-3-1-3

Dismantle

⇒ *Fig 5. (G-31)*. The numerical sequence shown on the illustration is intended as a guide to dismantling.

1 Remove the calliper and brake pads, ⇒ *Removal and Replacement (G-26)*.

2 Remove the screw **3**, and washers **4** and **5**. Hold lever **6** against the tension of the spring as the screw is removed.

3 Note the position of lever **6** relative to the splines of the rotor shaft **8**. Mark the end of the shaft and lever **6** to aid assembly. Remove lever **6** and spring **7**.

4 Push out rotor **8** and remove ball spacer **9** and ball bearings **10**. Take care not to lose the ball bearings.

5 Push out mounting bushes **11** and remove dust seals **12**.

6 Remove the rotor seal **13** followed by bearing ring **14**. Note that the rotor seal may be located on the rotor shaft or may have been left in the calliper housing **15**.

Note: *Shaft seal **16** 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.*

Component Key: ⇒ *Fig 5. (G-31)*

1	Carrier side pad
2	Lever side pad
3	Screw
4	Washer
5	Washer
6	Lever
7	Spring
8	Rotor
9	Ball spacer
10	Ball bearings
11	Mounting bushes
12	Dust seals
13	Rotor Seal
14	Bearing ring
15	Housing
16	Shaft seal

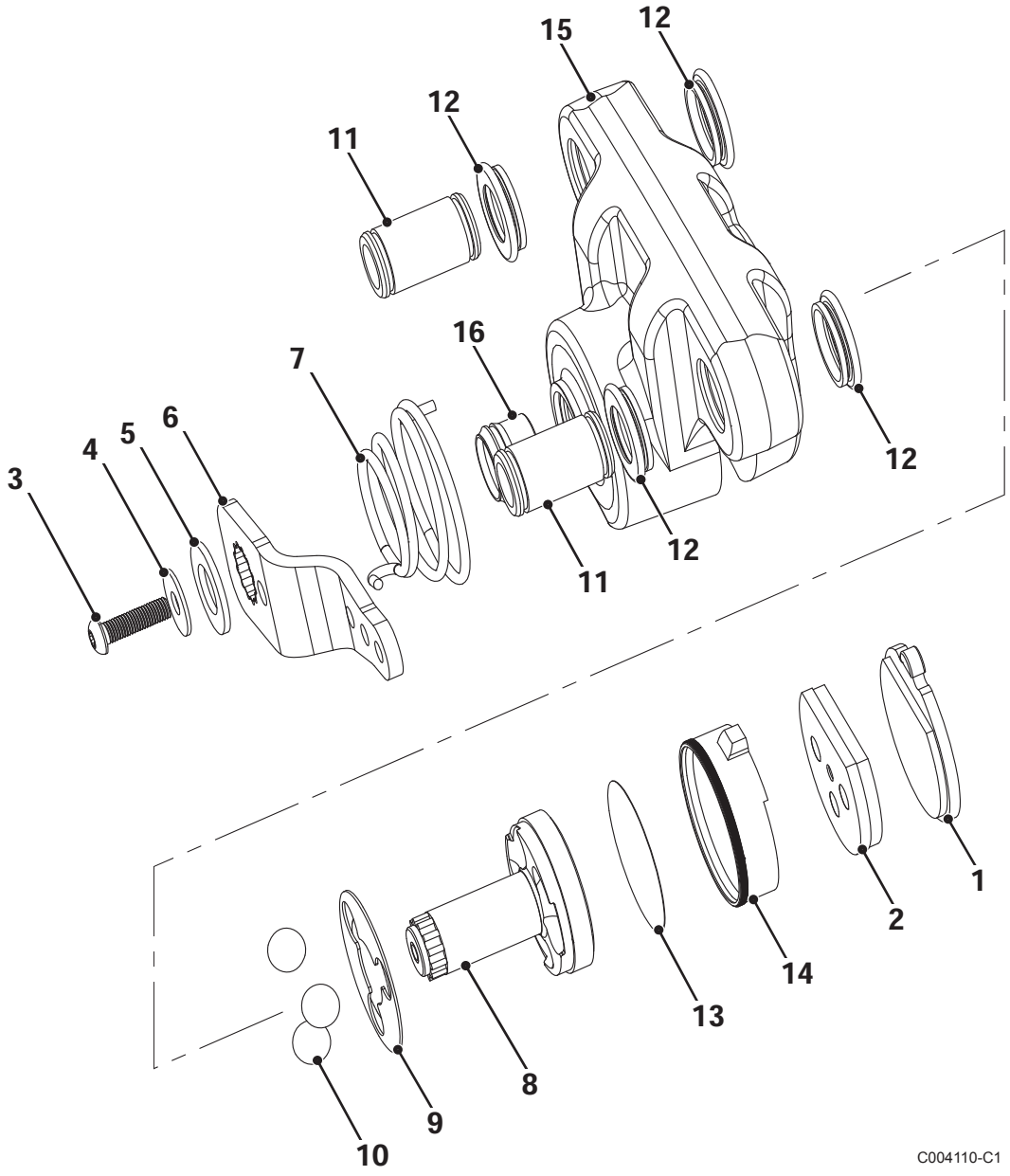


Fig 5. Calliper - Type 2

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 **8** for damage or distortion. Renew if necessary.Always renew both brake pads if the parking brake has been used in an emergency.Check the ball pockets in housing **15** for signs of scoring, pitting, damage or corrosion. Renew the housing if damaged.Check spring **7** is not broken or distorted. Check the condition of the disc surface. Renew the disc if badly warped, pitted or worn.

Assemble

⇨ *Fig 5. (G-31)*. The numerical sequence shown on the illustration is intended as a guide to assembling.

Before assembly make sure all parts are clean and serviceable.

1 Fit a new shaft seal **16** if removed. Install the seal as shown. Press the seal into the housing using a suitable spacer block and bench press.

2 Coat the shaft, outer diameter and ball pockets of rotor **8** and the ball pockets of housing **15** with silicone grease.

3 Insert the three ball bearings **10** into the pockets in the housing **15**. Insert ball spacer **9**.

4 Coat the bearing ring **14** with silicone grease and fit the ring to the inner diameter on rotor seal **13**. Assemble the rotor seal to the rotor **8**.

5 Slide rotor **8** through the casting and seat the ball pockets against the bearings.

6 Position spring **7** over the shaft of rotor **8**. Insert the large diameter end of the spring into hole **6X** in the face of the housing.

7 Locate the small diameter end of spring **7** around the outside edge of lever **6** as shown at **6Y**.

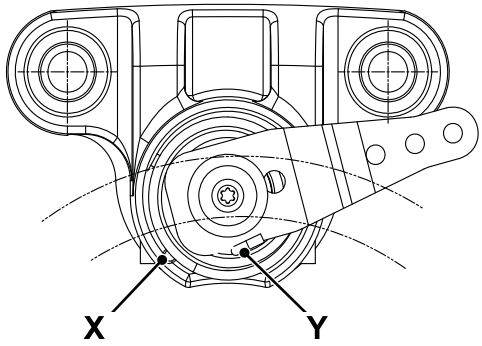


Fig 6.

8 Fit lever **6**. Align the lever to the mark made during dismantling.

9 Hold the lever against the tension of the spring and fit washers **4** and **5** Fit screw **3** and torque tighten, ⇨ *Table 4. Torque Settings (G-32)*.

10 Fit the new brake pads, refer to ***Service Procedures, Parking Brake - Renewing the Brake Pads***.

11 Lubricate the dust seals **12** and bushes **11** with silicone grease. Fit the dust seals to the housing and insert mounting bushes. Make sure that the dust seals locate in their location grooves on the bushes **11** and housing **15**. 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. ⇨ *Removal and Replacement (G-26)*. Adjust the parking brake, refer to ***Service Procedures, Parking Brake - Adjustment***.

Table 4. Torque Settings

Item	Nm	kgf m	lbf ft
3	13 - 16	1.3 - 1.6	9 - 12