



Service Bulletin No. 1066

COACH MODEL	: T2100 Series ; C2000 Series
BULLETIN TYPE	: Service information
MANUAL & SECTION	: Maintenance Manual : Chapter 5 - Brakes Spare Parts Manual : Sections 642008, 642108 and 642208
DATE	: January 31st, 2001
SUBJECT	: Introduction of D-ELSA disc brakes
TERMS & CONDITIONS	: No claims will be accepted with reference to this Bulletin.

APPLICATION :

The service information subject of this Bulletin is applicable to the following units :

Coach type	Model	Engine	VIN
Touring	T2145	Cummins	44055
		Detroit Diesel	43945
Commuter	C2045	Cummins	45137
		Detroit Diesel	45621

DESCRIPTION :

Effective as from the above-mentioned units, design changes have been made to the brake system.

1. In addition to the front and tag axle, also the standard version of the drive axle has been equipped with disc brakes.
2. The disc brakes are no longer lever-operated (D3 type) but are actuated directly (D-ELSA type).

This Bulletin compares both brake types and includes the recommended maintenance intervals and service procedures for D-ELSA.

PARTS : Always use genuine maintenance products and parts. Do not accept imitations.

Part No.	Description	Qty
N508206016	Brake pad kit (includes 4 pads and 4 springs)	1
N508226011	Brake wear sensor	1
N508046189	Brake caliper, complete, LH	1
N508046190	Brake caliper, complete, RH	1
VH10691355	Brake chamber, front axle, LH	1
VH10691359	Brake chamber, front axle, RH	1
VH10691325	Brake chamber, drive axle	1
VH10691324	Brake chamber, tag axle	1
N508030038	Brake disc	1

Service Bulletins are issued to supplement or supersede information in the Van Hool manuals. Note Service Bulletin number, date and subject on the register at the end of the relevant chapter(s). File Service Bulletin separately for future reference.

INTRODUCTION :

1. D3 v. D-ELSA comparison - Construction and operation :

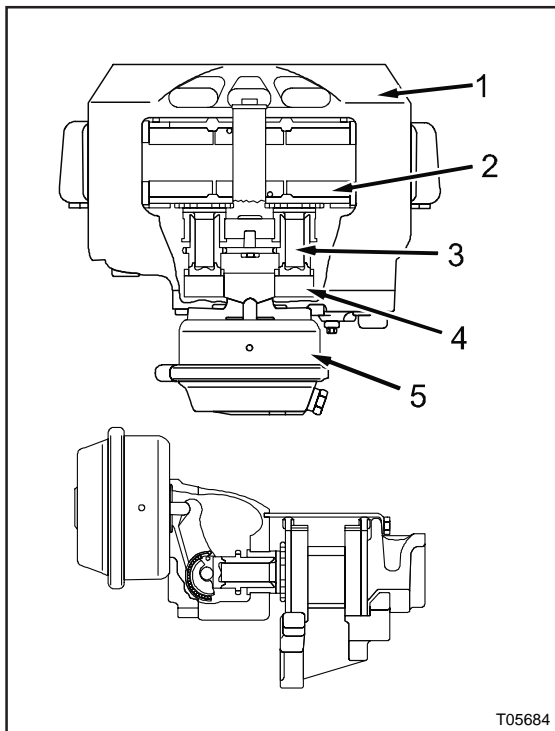


Figure 1 : D-ELSA direct-actuated brake

- 1. Caliper**
- 2. Pads**
- 3. Tappet**
- 4. Lever/camshaft**
- 5. Brake chamber**

- The brake chamber is fitted directly to the caliper.
- The brake chamber push-rod operates an internal lever/camshaft assembly.
- The camshaft applies force to the inboard pad through two tappets.

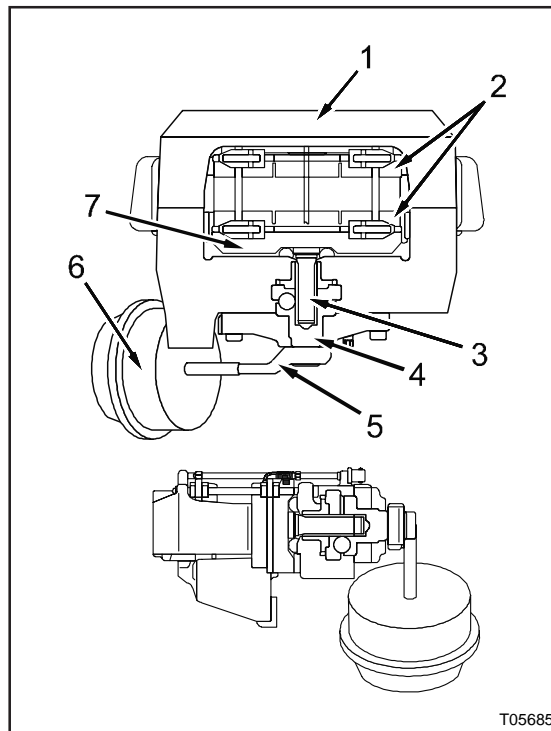


Figure 2 : D3 lever-operated brake

- 1. Caliper**
- 2. Pads**
- 3. Tappet**
- 4. Ball & ramp mechanism**
- 5. Lever**
- 6. Brake chamber**
- 7. Spreader plate**

- The brake chamber is attached to the caliper through a separate bracket.
- The brake chamber push-rod operates a lever attached to an internal ball and ramp mechanism.
- The cam transmits force to the inboard pad through a tappet and a spreader plate

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2. D3 v. D-ELSA comparison - Specifications :

Make and type	D-ELSA Ventilated disc, reaction beam caliper, air-actuated	D3 Ventilated disc, reaction beam caliper, air-actuated
Brake disc		
• Diameter	432 mm/17 inch	437 mm/17.2 inch
• Maximum permissible run-out, when installed	0.15 mm/0.006 inch	0.2 mm/0.008 inch
• Thickness, new	45 mm/1.77 inch	45 mm/1.77 inch
• Oversize brake pads needed at disc thickness of	41 mm/1.61 inch	41 mm/1.61 inch
• Maximum remachining thickness	38 mm/1.5 inch	38 mm/1.5 inch
• Minimum thickness	35 mm/1.38 inch	35 mm/1.38 inch
Brake pads		
• Brake area per pad	229 cm ² /35.5 in ²	229 cm ² /35.5 in ²
• Lining		
Thickness, new	20 mm/0.79 inch	20 mm/0.79 inch
Minimum permissible thickness	2 mm/0.08 inch	2 mm/0.08 inch
Material	Textar T3010 3AX (asbestos-free)	Textar T3010 3AL (asbestos-free)
• Backplate		
Thickness, standard pad	8 mm/0.31 inch	8 mm/0.31 inch
Thickness, oversize pad	10 mm/0.39 inch	10 mm/0.39 inch
Maximum allowable lining-to-disc clearance	0.6 to 0.8 mm/0.025 to 0.030 inch	0.6 to 0.8 mm/0.025 to 0.030 inch
Tightening torques		
• Brake anchor plate to steering knuckle	430±30 Nm/320±20 ft lbf (M18 x 1.5 x 60)	600±50 Nm/445±35 ft lbf (M20 x 1.5 x 55)
• Brake disc and wheel mounting flange to hub	430±30 Nm/320±20 ft lbf (M18 x 1.5 x 65)	-
• Brake disc to wheel hub	-	270±20 Nm/200±15 ft lbf (M16 x 1.5 x 60)
• Brake chamber to caliper	160±15 Nm/120±20 ft lbf (M16 x 1.5)	-
• Brake chamber to bracket	-	210±25 Nm/155±20 ft lbf (M16 x 1.5)
• Brake chamber bracket to caliper	-	80±5 Nm/60±5 ft lbf (M12 x 1.5 x 35)
• Guide sleeve screws	530±40 Nm/400±30 ft lbf (M20 x 1.5 x 110/150)	380±40 Nm/285±30 ft lbf (M18 x 1.5 x 95/120)
• Brake pad retainer	40±3 Nm/30±2 ft lbf (M10 x 1.25 x 20)	40±3 Nm/30±2 ft lbf (M10 x 1.25 x 18)

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SERVICE PROCEDURES :

1. D-ELSA brake system maintenance intervals :

- After the first 3,000 miles (this includes after rebuilding the brakes) :
 - Check brake operation.
 - Check brake chambers, valves, lines and fittings for air leaks.
- Every 12,000 miles (C-interval) :
 - Check the general condition of the brake assemblies for damage and corrosion.
 - Check brake lining wear.
 - Check brake chambers for condition and leaks.
 - Check brake system valves, lines and fittings for leaks.
 - Lubricate brake pedal pivot pin.
- Every 60,000 miles (E-interval) :
 - Check brake operation and performance on a brake analyzer.
- Every 120,000 miles (F-interval), or at least once a year :
 - Check the condition of the rubber boots protecting the guide pins and tappets. Make sure they are properly secured and show no signs of damage.
 - Check the caliper sliding system for ease of sliding on the guide pins and wear.
 - Check the brake discs for signs of heavy scoring, cracking or corrosion.
 - Check brake discs for minimum thickness.
 - Check brake discs for run-out.
- Every 180,000 miles (G-interval) :
 - Replace brake chamber diaphragms.

2. D-ELSA brake system service :

NOTE
<i>Brake lining materials on Van Hool coaches no longer contain asbestos fibers. Medical experts do not agree on the possible long-term risks of working with and breathing non-asbestos fibers. Therefore it is recommended that workers observe caution to avoid dust, when working on brakes containing non-asbestos materials.</i>

CAUTION
OBSERVE SAFE SHOP PRACTICES AT ALL TIMES. READ THE ENTIRE PROCEDURE BEFORE BEGINNING TO WORK.

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CAUTION
BEFORE ANY MAINTENANCE, BLOCK WHEELS TO PREVENT VEHICLE MOVEMENT.

- **To check brake operation on front and tag axle**

Perform these checks at the intervals given in the maintenance schedule. The checks require the aid of an assistant.

1. Apply the brakes to 90 psi and hold. Have all air line fittings and air chambers checked for leaks.
2. Jack up the coach. Check the roadwheels one by one for freedom of rotation by turning them by hand. Have the brakes applied and released while observing wheel motion. As the brakes are applied and released, the wheels should stop turning, then be free to be rotated again.
3. Following the above checks, drive the coach to test brake action. The coach should stop quickly and smoothly. There must be no grabbing and no tendency to dive or to pull to one side.

- **To check brake operation on drive axle**

To check service brake operation, refer to items 1 and 2 of "To check brake operation on front and tag axle".

To check parking brake operation, proceed as follows :

1. With the drive axle jacked up, the front wheels chocked and the service brake released, check the road wheels for freedom of rotation by turning them by hand.
2. Have the parking brake applied. As the air escapes from the parking brake chambers, the drive wheels should lock solid.
3. Have the parking brake released again. The wheels should be free to be rotated once more.

CAUTION :
NEVER APPLY THE PARKING BRAKE WHILE DRIVING.

4. To test parking brake operation on the road, apply the parking brake at standstill. Put the gear in drive. Hold your left foot in position to stop the coach with the service brake, should parking brake action be insufficient. It should be impossible now to move the coach, while accelerating briefly to fast idle (1,200 rpm).

- **To check brake pad wear**

NOTE

The vehicle has been fitted with electric brake wear indicators. If the brake pad lining is almost worn to the limit, a warning signal on the instrument panel will illuminate each time the brake pedal is depressed. If the brake pads are worn to the limit, the signal will illuminate continuously. To determine which axle is affected, go to the lower part of the relay rack in the main junction box. There you find the three control units of the brake wear indicator system. The red LED on the control unit of the affected axle will illuminate. Control unit RSC1 refers to the front axle, RSC2 to the drive axle and RSC3 tells whether the tag axle is affected (see Figure 3).

Regardless of the presence of electric wear indicators, it is recommended to visually check the brake lining wear at regular intervals. To do this you have to remove the wheel(s). The brake pads should be replaced, at the latest when worn down to the minimum permissible thickness of 0.08 inch (2 mm).

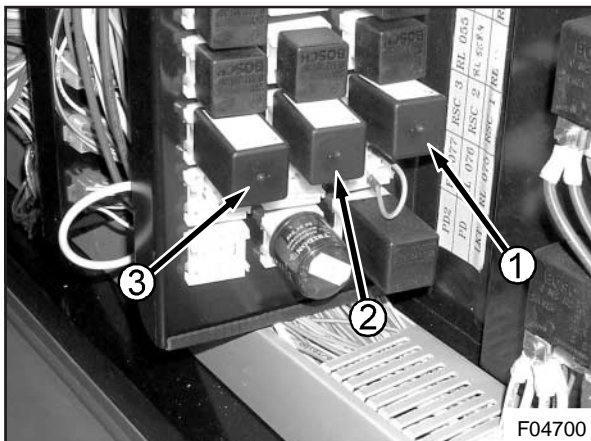


Figure 3: Control units of brake wear indicator system

1. Control unit of the front axle brakes
2. Control unit of the drive axle brakes
3. Control unit of the tag axle brakes

- **To check brake disc condition (see Figure 4)**

Check the brake disc for cracks and grooves. The criteria to examine the brake disc are :

A: small cracks on the disc surface showing a network are *allowed*;

- B:** radial cracks are *allowed*, if they are less than 0.02 inch (0.5 mm) wide and deep, and not longer than $\frac{3}{4}$ (=0,75) of the height of the brake pad lining contact surface;
- C:** concentric grooves or scores on the brake lining contact surface of the disc are *allowed* to a depth of 0.06 inch (1.5 mm) ;
- D:** cracks running over the full height of the brake pad lining contact surface are *not allowed*.

Also measure the thickness of the brake disc. The brake disc must not be re-used, if the wear limit of 1.38 inch (35 mm) has been reached.

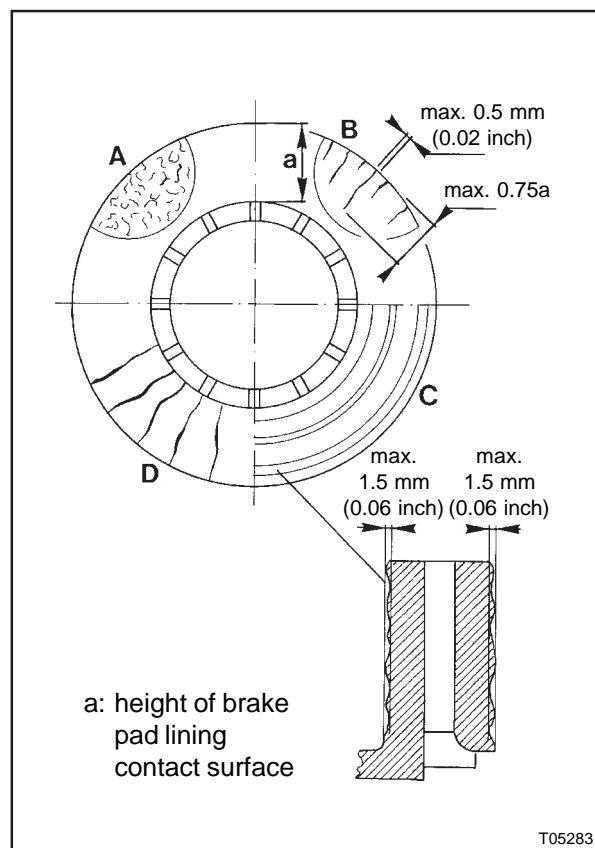


Figure 4: Brake disc condition criteria

- **To check brake disc run-out (see Figure 5)**

1. Measure the wheel bearing run-out with a dial indicator as explained in Service Bulletin SB.... "Maintenance-free wheel bearing units on coaches with D-ELSA brakes". Remove the road wheel.
2. Attach the dial indicator to the brake carrier. Position the stylus of the dial indicator at a right angle to the brake disc, 1.38 inches (35 mm) from the disc edge. Set the dial indicator to zero. Rotate the wheel hub and read the total

variation on the dial indicator. Subtract the wheel bearing run-out from this figure. Maximum permissible run-out : 0.06 inch (0.15 mm). If a run-out of more than 0.06 inch (0.15 mm) is measured, the brake disc should be remachined or replaced.

CAUTION
ALWAYS REPLACE BRAKE DISCS ON BOTH SIDES OF THE AXLE AT THE SAME TIME.

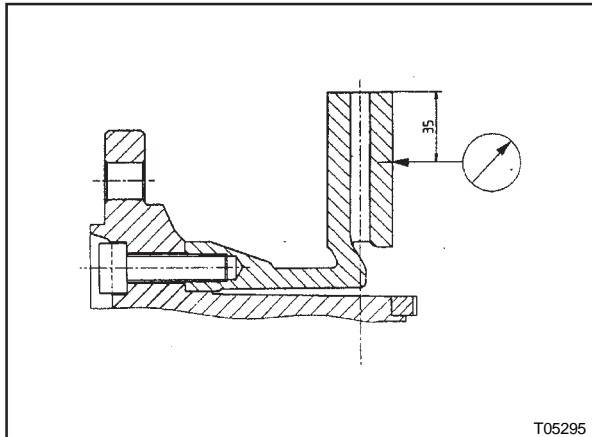


Figure 5: To check brake disc run-out

- **To check the adjusting mechanism operation**

1. Remove the adjuster stem cap (see Figure 6).

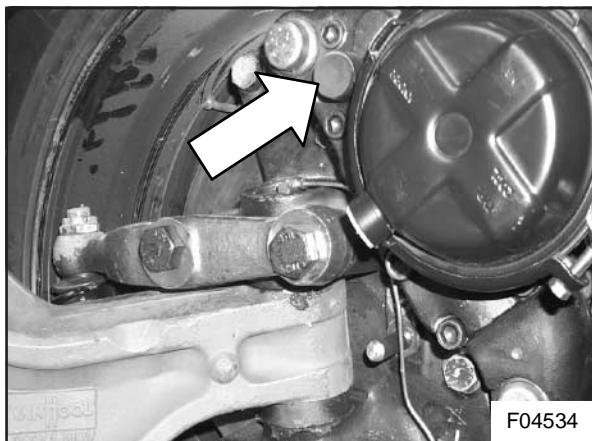


Figure 6: Adjuster stem cap

NOTE
<i>Calipers are directional. Direction of adjuster rotation differs left to right.</i>

2. Using a 10 mm-box wrench, turn the adjuster stem (see Figure 7) :
 - of a right-hand brake to the left;
 - of a left-hand brake to the right,until a lining-to-disc clearance of 0.08 to 0.12 inch (2 to 3 mm) is achieved.
3. Leave the box wrench engaged on the adjuster stem.
4. While an assistant makes a series of foot brake applications, check whether the wrench turns slightly (some degrees):
 - clockwise on a right-hand brake;
 - counterclockwise on a left-hand brake.

If it does, this is an indication that the adjusting mechanism operates properly. After a successful check, set the running clearance between the brake disc and pad. To do so, turn the adjuster stem in the appropriate direction, until both pads touch the disc. Then back off the adjuster $\frac{1}{4}$ turn, thus guaranteeing the running clearance of $\frac{15}{64}$ to $\frac{23}{64}$ inch (0,6 to 0,9 mm). Remove the box wrench and re-install the adjuster stem cap.



Figure 7 : To turn the adjuster stem with a box wrench

- **To check caliper sliding system (see Figure 8)**

1. Remove the brake pads (see further in this Bulletin).

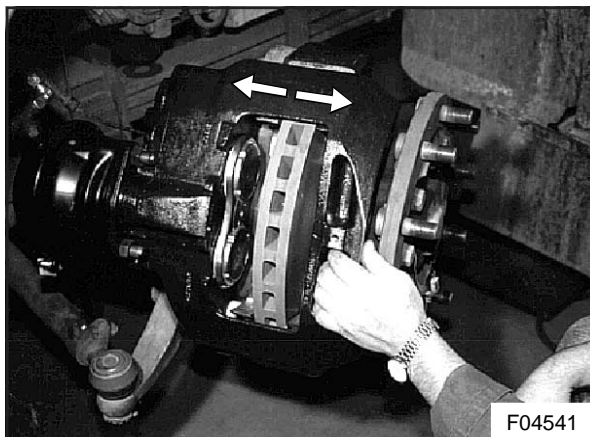


Figure 8 : To slide the caliper

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2. Move the caliper backwards and forwards in the direction of the arrows as shown in Figure 8 and check whether the caliper slides easily on the guide sleeves.
3. If in doubt, check the force required to slide the caliper. The force must be less than 34 lbf (150 N).
4. Check the sliding system for wear (see Figure 9).

Procedure:

- a. Pull caliper fully to the wheelside.
- b. Attach dial indicator (2). Position the stylus of the dial indicator at a right angle to the caliper and in line with centre line (3) of short guide pin (4). Set the dial indicator to zero.

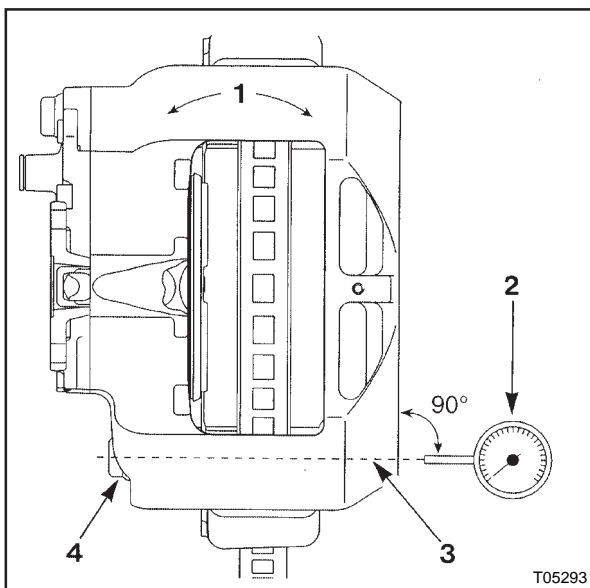


Figure 9 : Dial indicator installation

- c. Grab the caliper with both hands at the long guide sleeve side (see Figure 10) and tilt it in the direction of the arrows (1) indicated in Figure 9 (do not slide the caliper!).
- d. Note the total variation shown by the dial indicator. Maximum permissible variation: 0.1 inch (2.5 mm).



Figure 10 : Tilting the caliper

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- e. Attach dial indicator (3) as indicated in Figure 11. The drawing shows a top view of caliper (1), in which is tapped a hole (2) to receive the screw of the pad retaining plate.

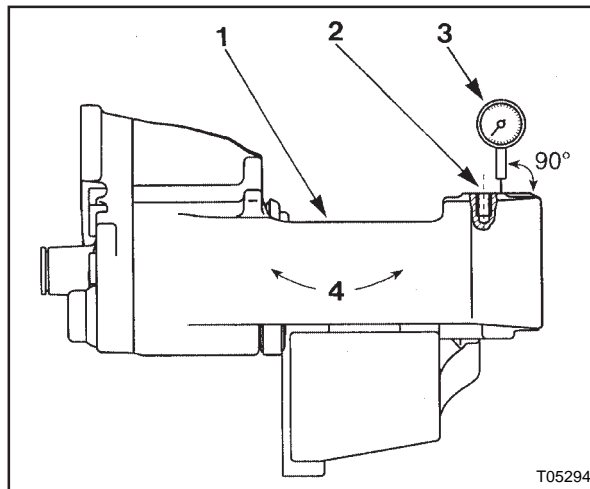


Figure 11 : Dial indicator installation

- f. Hold the caliper at the side of the outer pad (see Figure 12). Tilt the caliper by hand in the direction of the arrows (4) indicated in Figure 11 (Do not slide the caliper!).
- g. Note the total variation shown by the dial indicator.
Maximum permissible variation: 0.06 inch (1.5 mm).
5. The guide sleeves and bushes must be replaced, if one of these values is exceeded.



Figure 12 : Tilting the caliper

- **To remove brake pads on front and tag axle**

1. Chock and jack the vehicle. Remove the road wheel.

2. Remove the electrical pad wear indicator cable holder (see Figures 13 and 14).

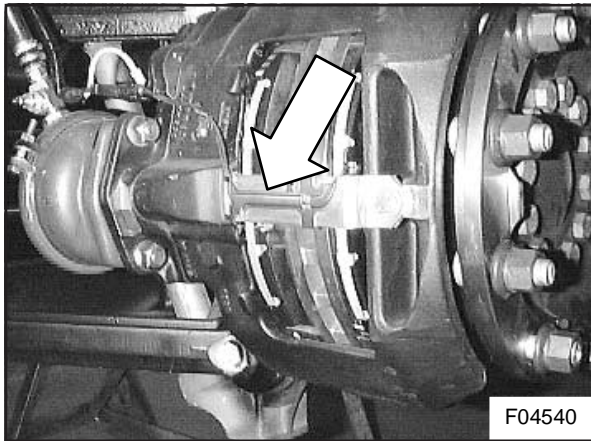


Figure 13 : Pad wear indicator cable holder (early type)

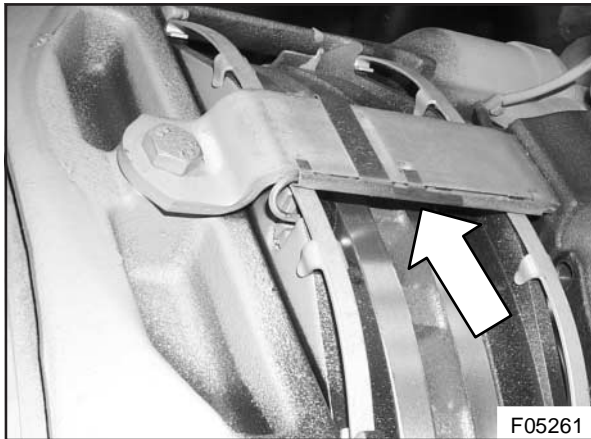


Figure 14 : Pad wear indicator cable holder (later type)

3. Remove the screw (2, Figure 15) of the pad retaining plate (1, Figure 15).

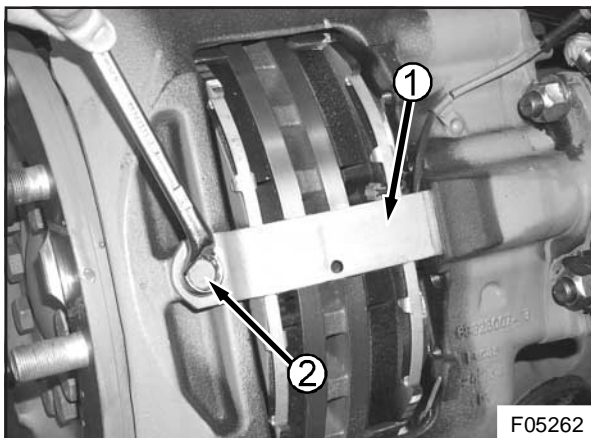


Figure 15 : Pad retaining plate

4. Remove the pad retaining plate as indicated in Figure 16.

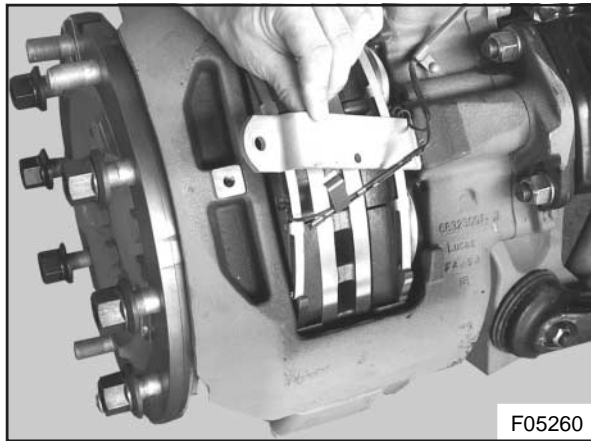


Figure 16 : Pad retaining plate removal

5. Remove the adjuster stem cap (see Figure 17).

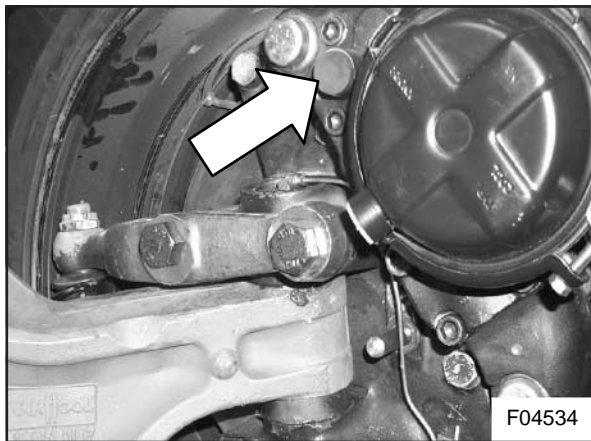


Figure 17 : Adjuster stem cap

6. Using a 10 mm-box wrench, turn the adjuster stem (see Figure 18) :

- of a right-hand brake to the left;
- of a left-hand brake to the right,

to allow sufficient room to remove the pads.



Figure 18 : De-adjusting the brake pads

7. Remove and discard the old wear indicators with their leads and plug. Take the inner brake pad out of the caliper (see Figure 19).

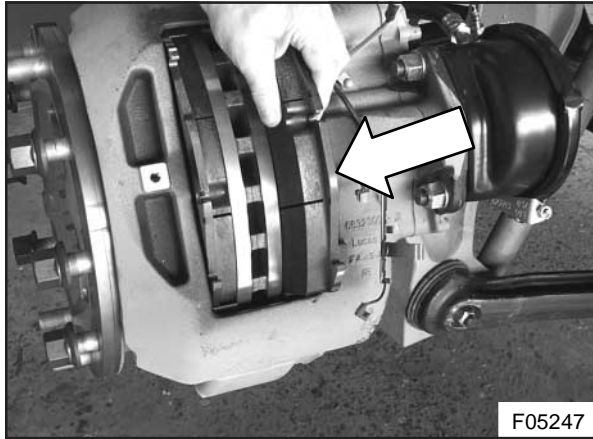


Figure 19 : Inner pad removal

8. Slide the caliper as indicated in Figure 20 and remove the outer brake pad.

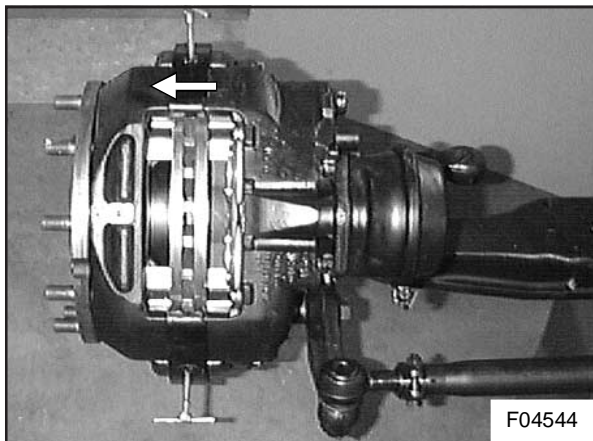


Figure 20 : sliding the caliper outwards

9. Clean the pad sliding faces of the brake carrier with a wire brush or a flat scraper (see Figure 21).

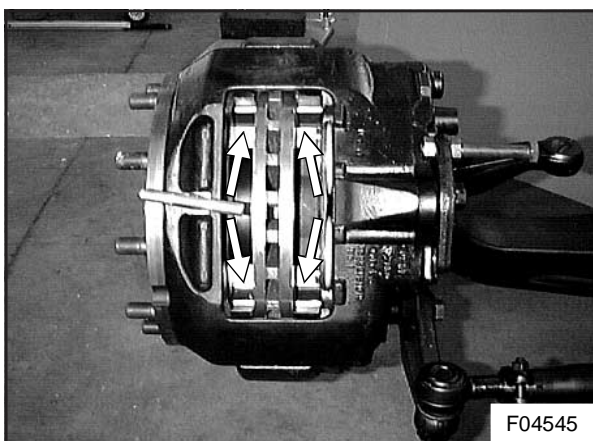


Figure 21 : Cleaning the brake carrier

10. Turn the adjuster stem of a right-hand brake to the right and of a left-hand brake to the left, until the rubber boots of the tappets are visible (see Figure 22). Check the rubber boots (2 and 3) of the tappets and the rubber boots (1 and 4) of the guide sleeves for damage. Replace them, if necessary.

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11. Check the caliper sliding system and the brake disc as explained earlier in this Bulletin.

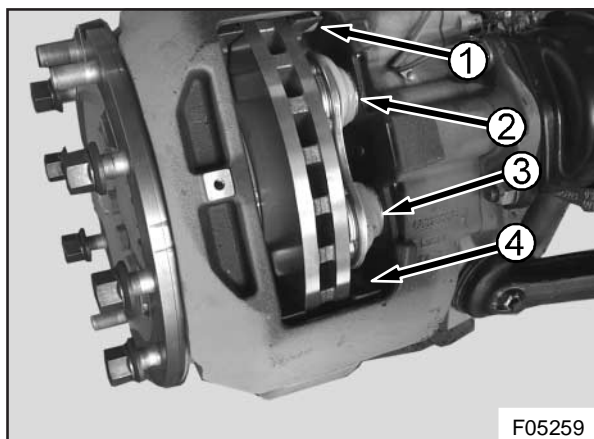


Figure 22 : Rubber boots

- To install brake pads on front and tag axle

CAUTION

DO NOT USE PADS WITH LINING MATERIAL OTHER THAN THE ONE SPECIFIED (TEXTAR T3010).

ALWAYS REPLACE PADS ON BOTH SIDES OF THE AXLE AT THE SAME TIME. ALWAYS USE NEW PAD HOLD-DOWN SPRINGS AND ELECTRICAL PAD WEAR INDICATORS, WHEN REPLACING PADS.

1. Using a 10 mm-box wrench, turn the adjuster stem of a right-hand brake to the left and of a left-hand brake to the right. In doing so, the tappets, which are secured by a plate to prevent them from rotating, will move towards the disc.
2. With your hands pull the caliper to the wheelside as indicated in Figure 23, until the outer brake pad can be fitted.

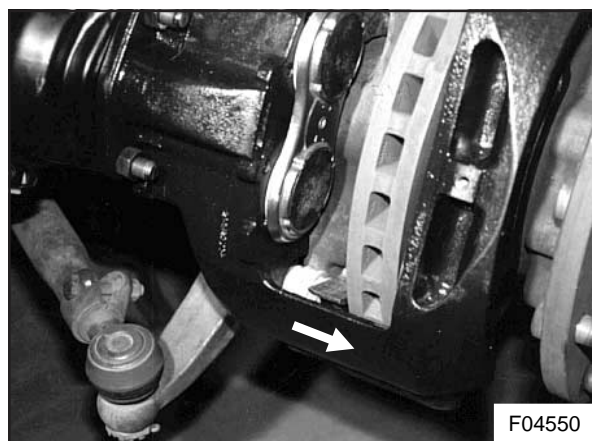


Figure 23 : Sliding the caliper outwards

3. Fit the outer pad into the caliper and slide the caliper so that the outer pad makes full contact with the brake disc. Fit the inner pad into the caliper (see Figure 24).

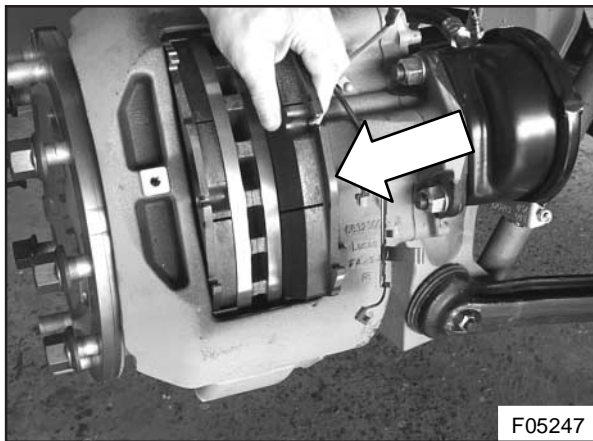


Figure 24 : Installing the inside pad

4. Turn the adjuster stem of a right-hand brake to the right and of a left-hand brake to the left, until both pads are in contact with the disc. Back off the adjuster stem $\frac{1}{4}$ of a turn to achieve the necessary lining-to-disc clearance. Using a feeler gauge, measure lining-to-disc clearance. The correct clearance is $\frac{15}{64}$ to $\frac{23}{64}$ inch (0.6 to 0.9 mm). Adjust by turning the adjuster stem in the appropriate direction. Check that brake disc runs freely.
5. Fit the hold-down springs to the pad back-plates.
6. Re-install the adjuster stem cap.
7. Install new electrical pad wear indicator cables on the brake pads. Make sure the wear indicator wires do not get pinched.
8. Refit the brake pad retaining plate. Tighten the pad retaining plate screw to a torque of 28 to 32 ft lbf (35 to 40 Nm).
9. Route the electrical pad wear indicator cables through the cable holder as indicated in Figures 25 and 26. Clamp the cable holder on the brake pad retaining plate. Plug in the connector.

CAUTION

**BRAKE PADS MUST BE BEDDED IN FIRST.
BE EXTREMELY CAREFUL DURING THE FIRST BRAKE APPLI-
CATIONS.**

10. With the air system charged, apply the brake pedal several times. Check for correct lining-to-disc clearance. Check that the hub runs freely. Refit the road wheel and perform a brake operation road test.

NOTE

Avoid severe or long braking, if possible, during the first 120 miles (200 km).

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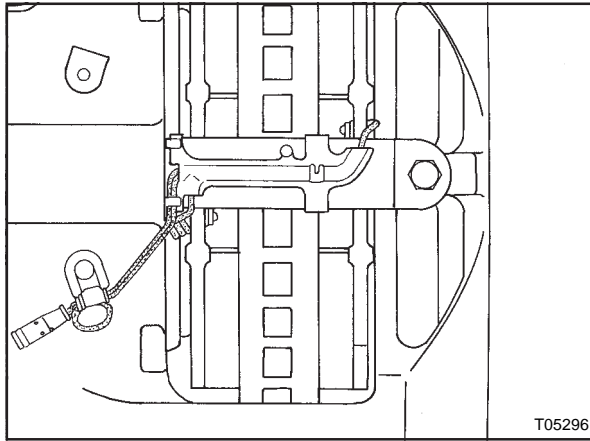


Figure 25 : Pad wear indicator cable installation (early type)

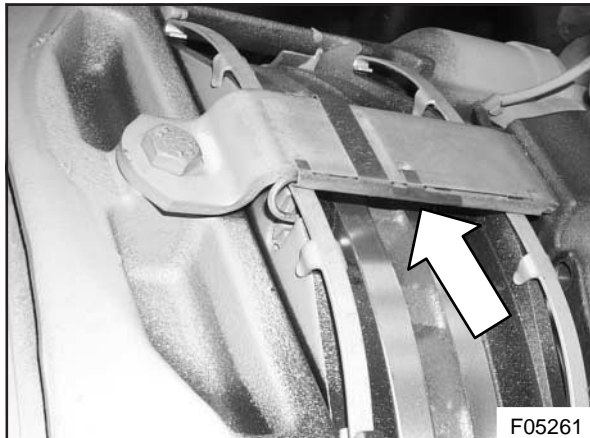


Figure 26 : Pad wear indicator cable installation (later type)

- **To remove brake pads on drive axle**

1. Install chocks at the front and tag axle. Jack the coach, remove the road wheels and release the parking brake.
2. Remove the brake pad wear indicator cable holder (see Figure 27).

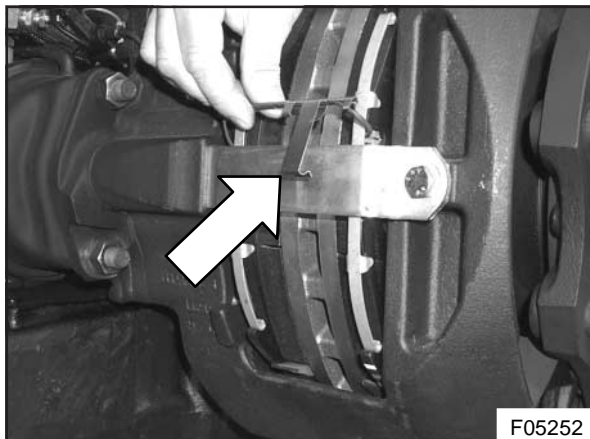


Figure 27 : Brake pad wear indicator cable holder removal

3. With a 17 mm-box wrench, undo and remove bolt (2, Figure 28), securing the brake pad retaining plate (1, Figure 28) to the caliper.

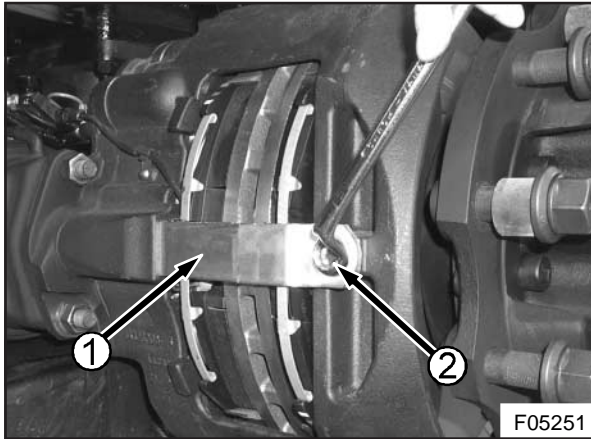


Figure 28 : Brake pad retaining plate and bolt

4. Remove the retaining plate as indicated in Figure 29.

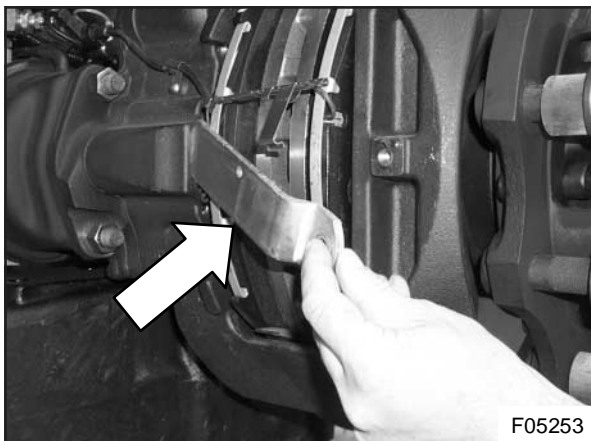


Figure 29 : Pad retaining plate removal

5. Remove and discard the brake pad springs (see Figure 30).

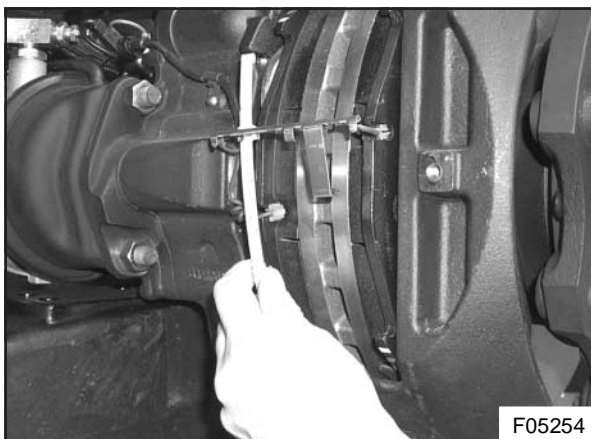


Figure 30 : Brake pad spring removal

6. Remove and discard the old wear indicators with leads and plug (see Figure 31).

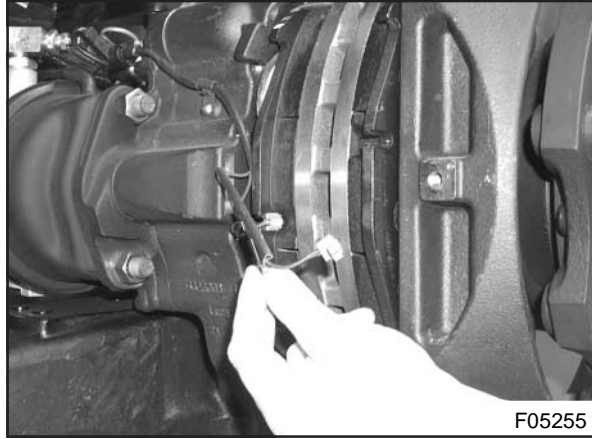


Figure 31 : Wear indicator removal

7. Remove the adjuster stem cap (see Figure 32).



Figure 32 : Adjuster stem cap removal

8. Using a 10 mm-box wrench, back off the brake pads completely by turning the adjuster stem (see Figure 33) :
- of a right-hand brake counterclockwise,
 - of a left-hand brake clockwise.



Figure 33 : De-adjusting the brake pads

9. Remove the old brake pads (see Figure 34). If necessary, slide the caliper inwards or outwards to make sufficient room.



Figure 34 Brake pad removal

- **To install brake pads on drive axle**

1. Thoroughly clean the caliper brake pad guides with a wire brush or a scraper.
2. Turn the adjuster stem, until the tappet and guide sleeve boots are visible. Check for damage and replace, if necessary.
3. Check the caliper sliding system and the brake disc as explained earlier in this Bulletin.

CAUTION
<p>DO NOT USE PAD LINING MATERIAL OTHER THAN THE ONE SPECIFIED (TEXTAR T3010). ALWAYS REPLACE PADS ON BOTH SIDES OF THE AXLE AT THE SAME TIME. ALWAYS USE NEW PAD SPRINGS AND WEAR INDICATORS.</p>

4. Turning the adjuster stem, back off the tappets completely to make sufficient room for the new brake pads. Slip the outer pad into the caliper. Slide the caliper towards the disc so that the pad makes full contact with it. Install the inner caliper.
5. Turn the adjuster stem in the proper direction, until both pads contact the disc. Back off the adjuster stem $\frac{1}{4}$ turn to achieve the necessary lining-to-disc clearance. Push the inner pad towards the adjuster end, until it contacts the tappets. Using a feeler gauge, check that the running clearance value lies between $\frac{15}{64}$ and $\frac{23}{64}$ inch (0.6 to 0.9 mm). Re-adjust, if necessary.
6. Rotate the disc and check that it runs freely. Re-install the adjuster stem cap.
7. Install the new wear indicators.

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8. Install the new pad springs. Make sure the wear indicator wires do not get pinched.
9. Refit the brake pad retaining plate. Tighten the pad retaining plate bolt to a torque of 28 to 32 ft.lbf (35 to 40 Nm).
10. Route the wear indicator wires through the cable holder. Clamp the holder on the pad retaining plate. Plug in the connector.

CAUTION

BRAKE PADS MUST BE BEDDED IN FIRST. BE EXTREMELY CAREFUL DURING THE FIRST BRAKE APPLI- CATIONS.
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11. With the air system charged, apply the brake pedal several times. Check for correct lining-to-disc clearance. Check that the disc runs freely. Re-install the road wheels and perform a brake operation road test.

Service procedures complete.

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