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★ **NEW INFORMATION** since last filming

Brake – Mechanical Components

All Wheel Drive

Engine type	5-cylinder 20V	
Master cylinder diameter	25.4 mm	
Hydraulic brake servo piston diameter	24.0 mm	
Amount of brake fluid (approximately)	0.6 liter	
	Front	Rear
Brake caliper piston diameter	60 mm	43 mm
Brake disc diameter	310/312 mm	269 mm
Brake disc thickness	25 mm	20 mm
Pad thickness	12 mm	12 mm
Pad surface of 4 pads	206 cm ²	108 cm ²

Brake – Mechanical Components

CAUTION

After installing new brake pads, depress brake pedal firmly several times while vehicle is stationary to permit piston and brake pads to adjust to brake disc.

Disc machining must be performed on both sides of disc — never on one side only. Always check condition/thickness of brake pads.

Note

Disconnect brake hoses only when replacing brake calipers.

CAUTION

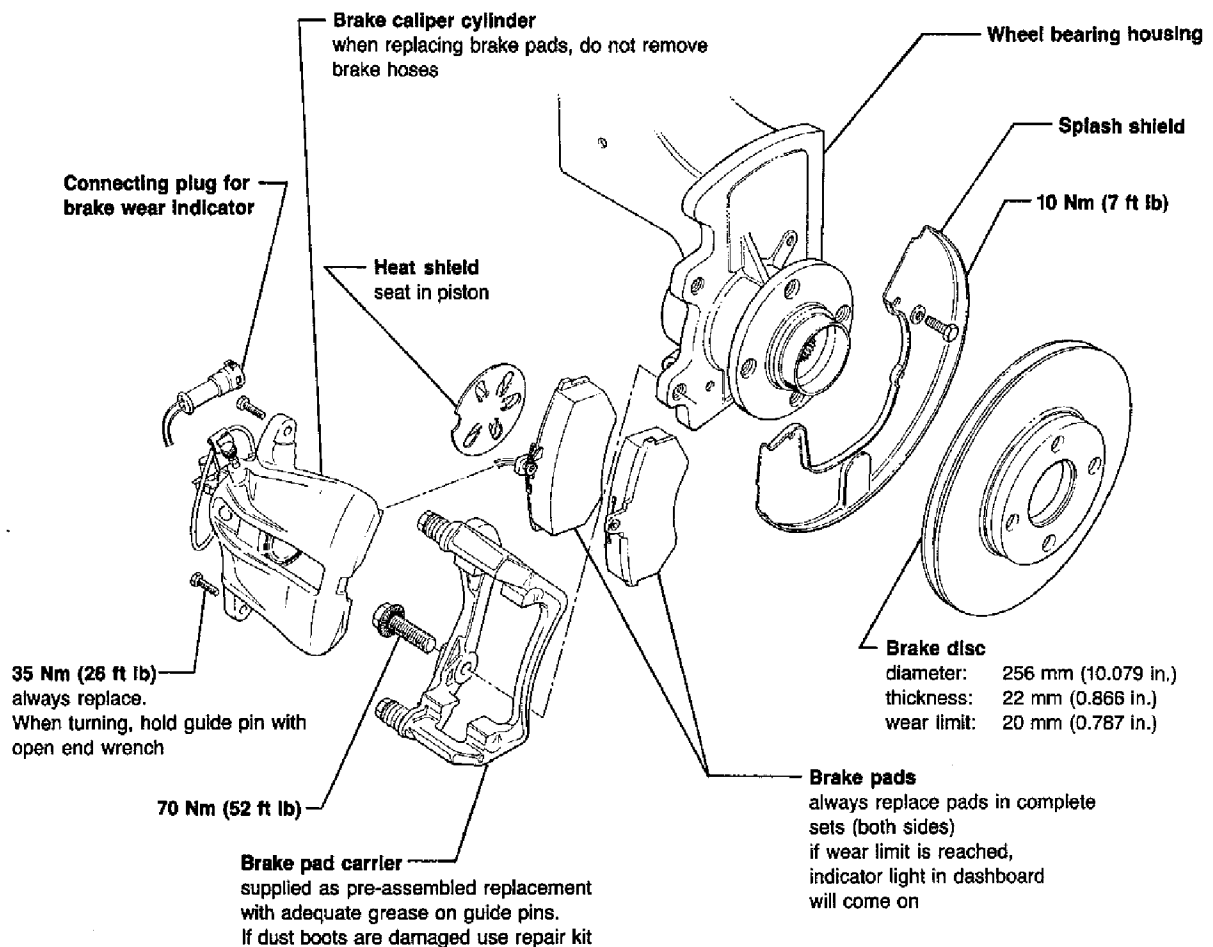
Always remove brake caliper before removing disc. Never try to remove disc by using force. Force may cause caliper mounting frame to crack or break.

WARNING

Brake fluid is poisonous. Brake fluid will also damage paint. Do not siphon by mouth.

Note

Always install all parts supplied in repair kit.



46-580

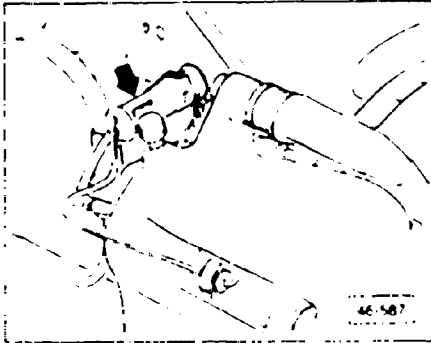
Brake – Mechanical Components

CAUTION

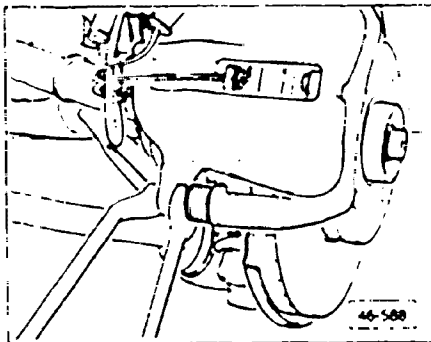
When re-using brake pads, mark to prevent changing inside to outside or from one caliper to another.

Brake pads, removing

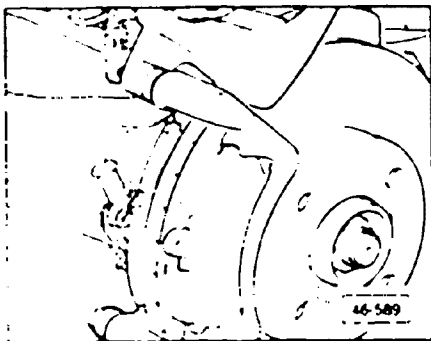
- remove front wheels



- pull plug connector out of clip (**arrow**)
- press connector plug on knurled surface and pull apart



- remove lower caliper mounting bolt (hold guide pin with open end wrench while loosening bolt)

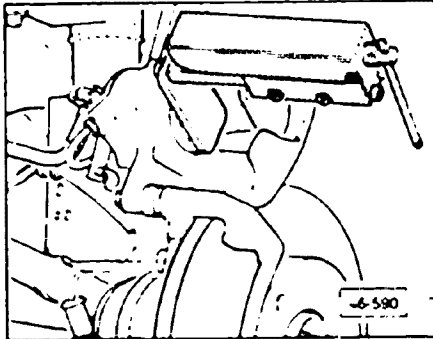


- swing caliper up and lift out pads

Brake – Mechanical Components

CAUTION

Always remove some brake fluid from reservoir before installing new brake pads. When caliper piston is pushed back, fluid is forced out of caliper and into reservoir. After pads are installed, refill reservoir only to **MAX** mark.



WARNING

Friction materials such as brake and clutch linings or brake pads may contain asbestos fibers.

Do not create dust by grinding, sanding or by cleaning with compressed air.

Avoid breathing asbestos fibers and asbestos dust.

Breathing asbestos may result in serious diseases, such as asbestos or cancer.

Breathing asbestos may cause severe injury and death.

Brake pads, installing

- push piston into caliper housing
- install brake pad and heat shield with shield facing piston (supplied with repair kit)
- swing caliper down
- install new lower self-locking mounting bolts (supplied with repair kit)
- torque bolts to **35 Nm (26 ft lb)**. Hold guide pin with open end wrench while tightening bolt
- reconnect plug connector and attach to retaining clip

Brake – Mechanical Components

CAUTION

After installing new brake pads, depress brake pedal firmly several times while vehicle is stationary to permit piston and brake pads to adjust to brake disc.

Disc machining must be performed on both sides of disc — never on one side only. Always check condition/thickness of brake pads.

CAUTION

Always remove brake caliper before removing disc. Never try to remove disc by using force. Force may cause caliper mounting frame to crack or break.

WARNING

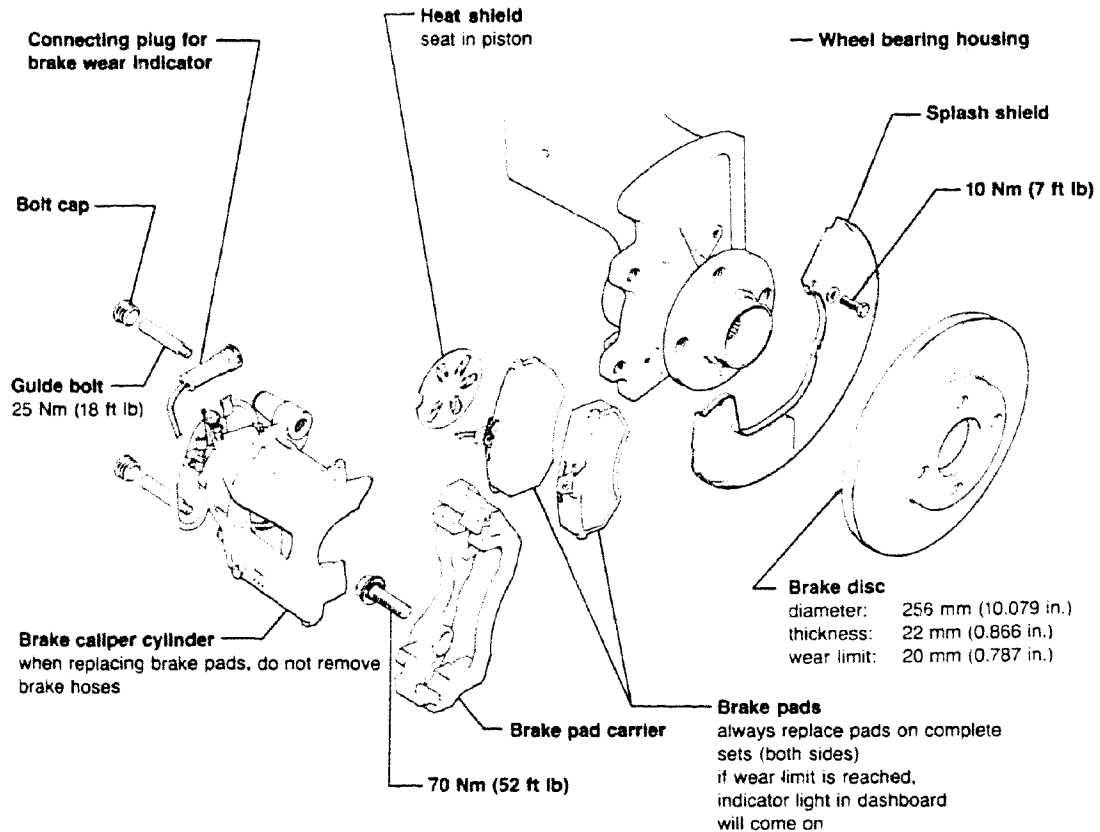
Brake fluid is poisonous. Brake fluid will also damage paint. Do not siphon by mouth.

Note

Disconnect brake hoses only when repairing brake calipers.

Note

Always install all parts supplied in repair kit.



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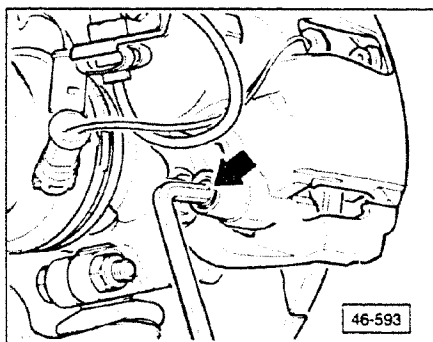
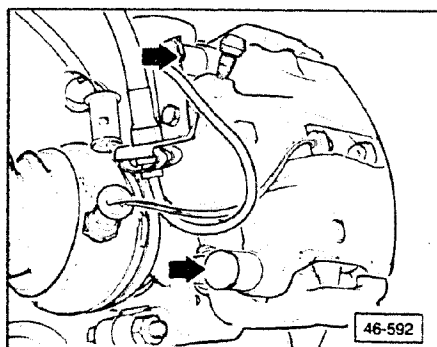
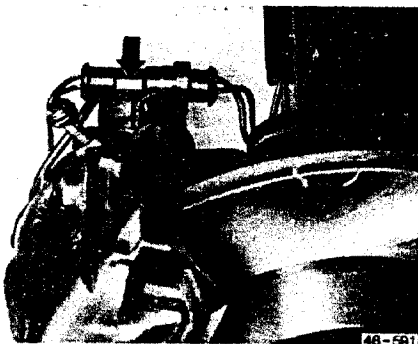
Brake – Mechanical Components

CAUTION

When re-using brake pads, mark to prevent changing inside to outside or from one caliper to another.

Brake pads, removing

- remove front wheels
- pull plug connector out of clip (arrow)
- press connector plug on knurled surface and pull apart
- remove both bolt caps (arrows)
- remove both guide bolts (arrow)
- remove brake caliper housing
- remove brake pads

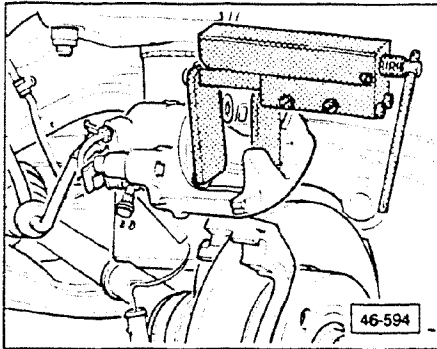


Brake – Mechanical Components

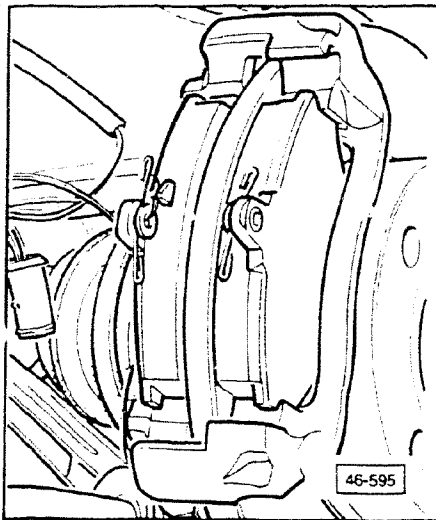
CAUTION

Always remove some brake fluid from reservoir before installing new brake pads. When caliper piston is pushed back, fluid is forced out of caliper and into reservoir. After pads are installed, refill reservoir only to **MAX** mark.

Front brake pads, installing



- push piston into caliper housing

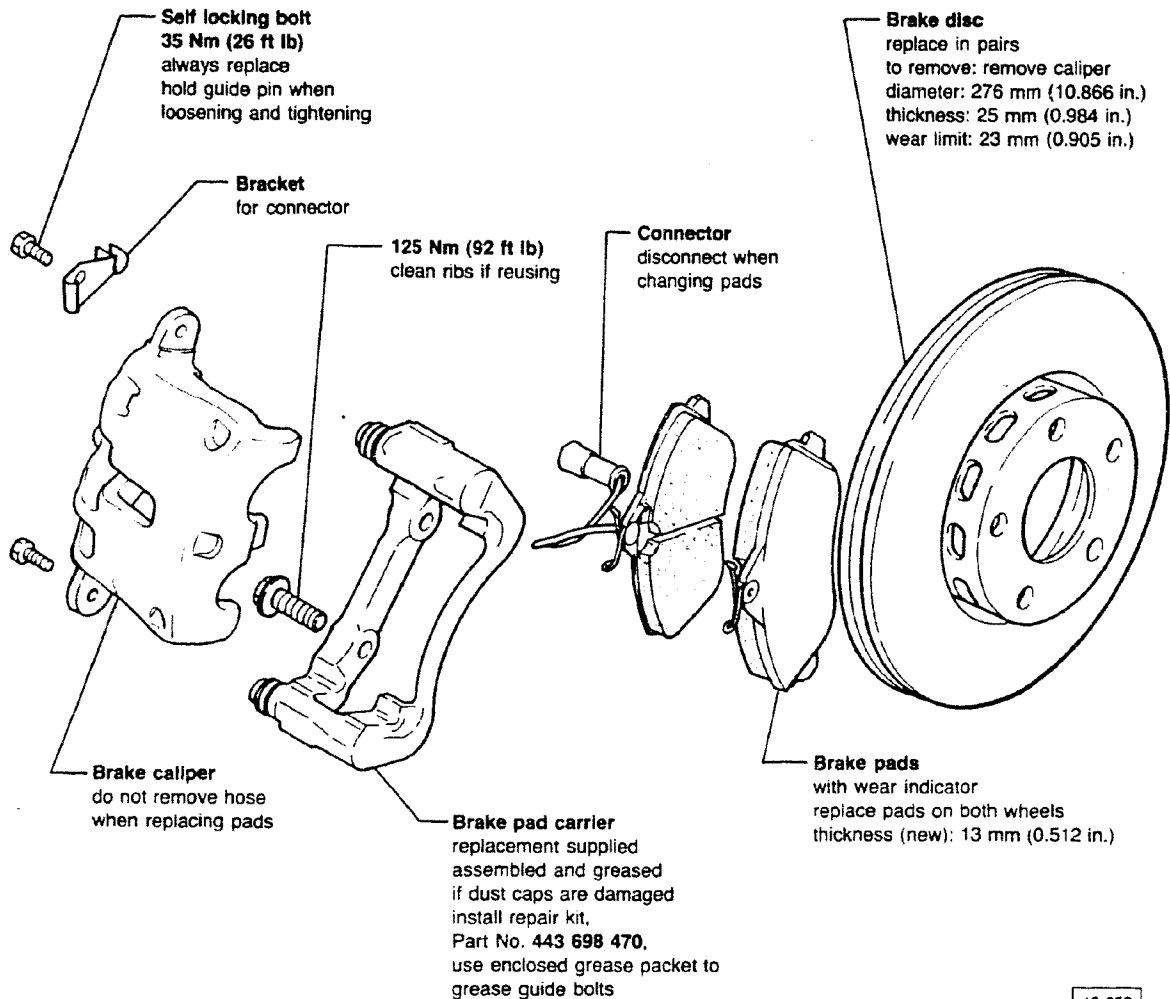


- install brake pads
- tighten brake caliper housing guide bolts to **25 Nm (18 ft lb)**
- attach both bolt caps
- reconnect plug connector and attach to retaining clip
- with vehicle stationary, depress brake pedal firmly several times to adjust pads to brake disc

Note

Two new self-locking bolts are contained in the repair kit which are not required for the Teves caliper.

Brake – Mechanical Components

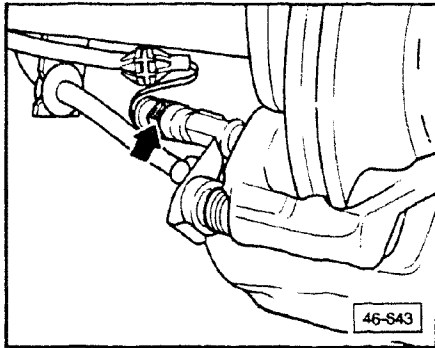


46-652

CAUTION

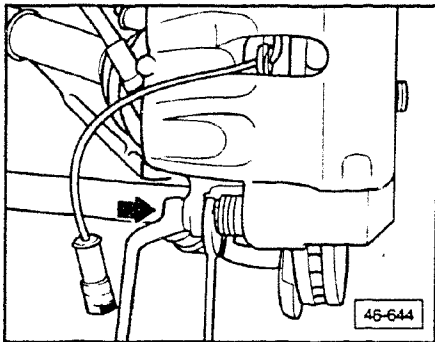
Disc machining must be performed on both sides of disc — never on one side only. Always check condition/thickness of brake pads.

Brake – Mechanical Components



Front brake pads, removing (Double piston caliper)

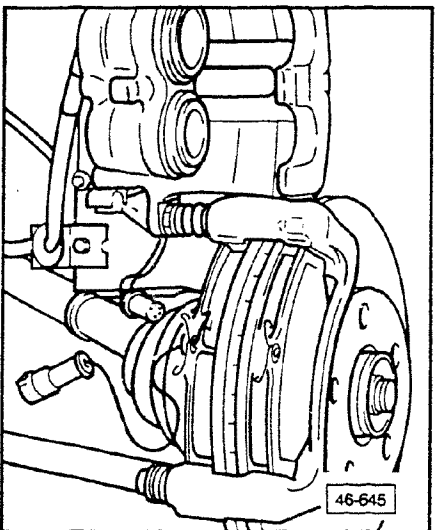
- remove front wheels
- pull plug connector out of bracket
- press connector plug on knurled surface (arrow) and pull apart



- remove lower fastening bolt for brake caliper housing (arrow) while holding guide pin

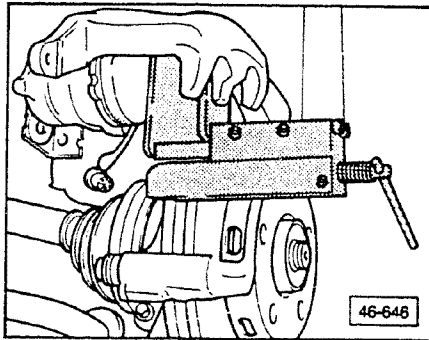
CAUTION

When reusing brake pads, mark pads to prevent changing inside to outside or from one caliper to another. Mixed pads can cause uneven braking.



- swing brake caliper housing upward and remove brake pads

Brake – Mechanical Components



- place old pad in brake caliper housing and press pistons in

Installing

- insert brake pads into carrier
- swing caliper housing down and tighten bolts to 35 Nm (26 ft lb)

Note

New self-locking bolts **MUST** be used when refastening brake caliper housing.

- reconnect plug connector and attach to bracket
- depress brake pedal firmly several times before driving to assure proper seating of brake pads

CAUTION

With this procedure brake fluid is pushed into reservoir. To prevent overflowing, siphon some fluid out with an appliance which is used for this purpose only.

WARNING

Friction materials such as brake and clutch linings or brake pads may contain asbestos fibers.

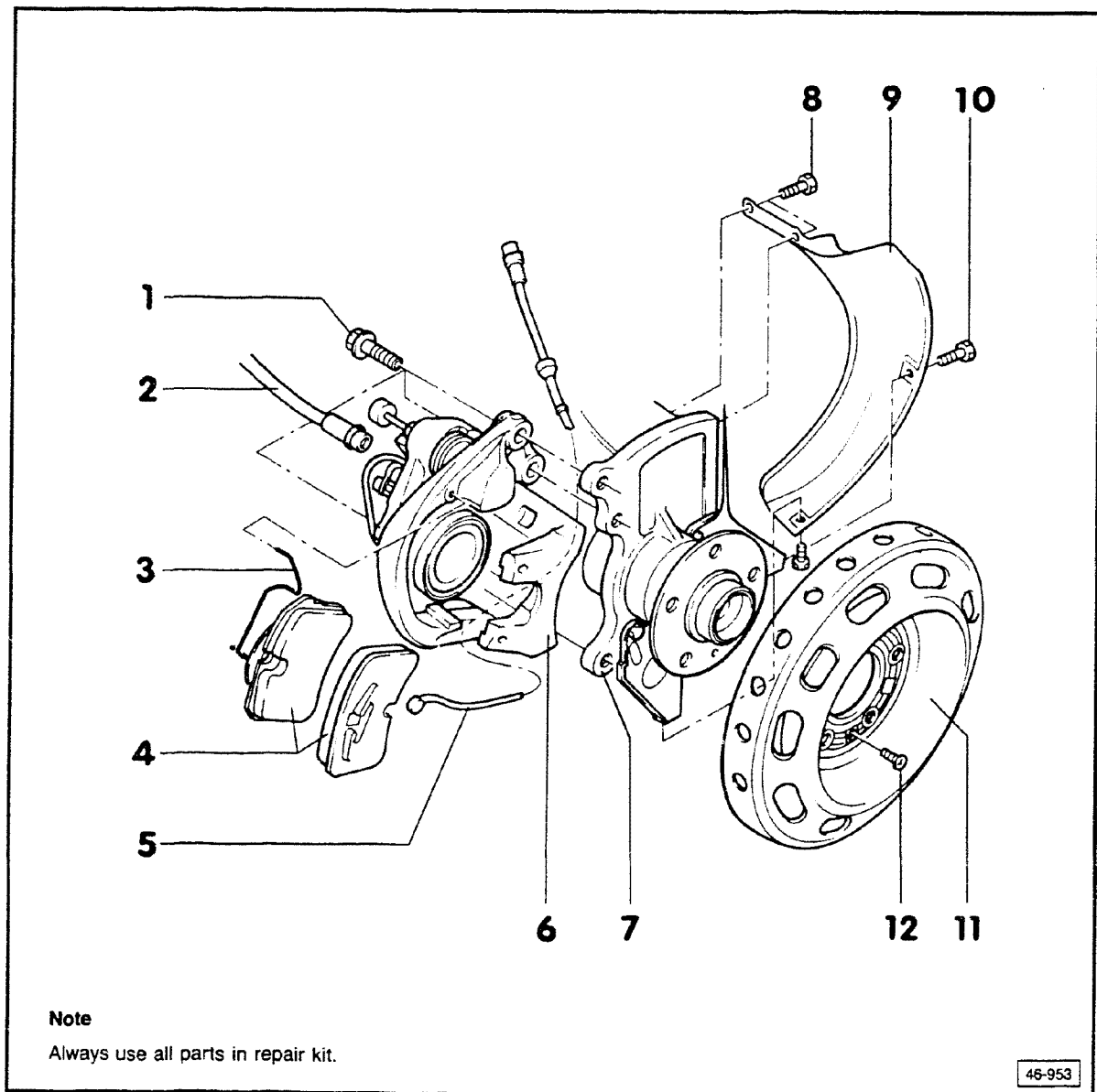
Do not create dust by grinding, sanding or by cleaning with compressed air.

Avoid breathing asbestos fibers and asbestos dust.

Breathing asbestos may result in serious diseases, such as asbestosis or cancer.

Breathing asbestos may cause severe injury and death.

Brake – Mechanical Components



1 — 125 Nm (92 ft lb)
clean ribs before re-using

2 — **Brake hose**
do not disconnect when replacing
brake pads

3 — **Brake pad retaining spring**
always replace

4 — **Brake pads**

- pad wear warning light comes on when pads are worn
- always replace pads in sets (per axle)
- pad thickness when new: 12.0 mm (0.47 in.)

5 — **Pad wear indicator wiring**
replace if necessary

6 — **Brake calliper**

- cannot be repaired
- replace if necessary

7 — **Wheel bearing housing**

8 — 5 Nm (45 in. lb)

9 — **Cover plate**

10 — 10 Nm (7 ft lb)

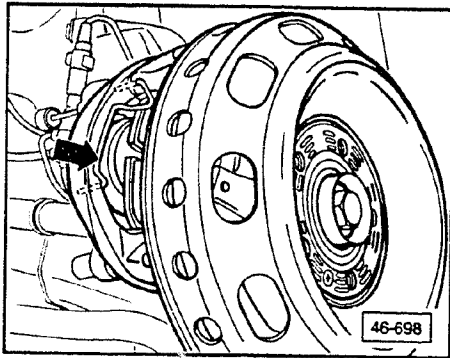
11 — **Brake disc**

- replace discs in pairs (per axle)
- removing/installing, see brake pads, replacing, Group 46
- brake disc diameter = 310/312 mm (12 in.)
- brake disc thickness = 25 mm
- brake disc wear limit = 23 mm

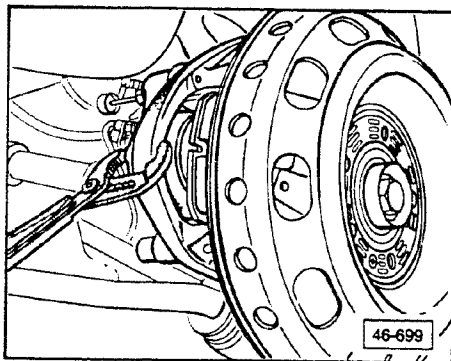
12 — **Locating screw**

Brake – Mechanical Components

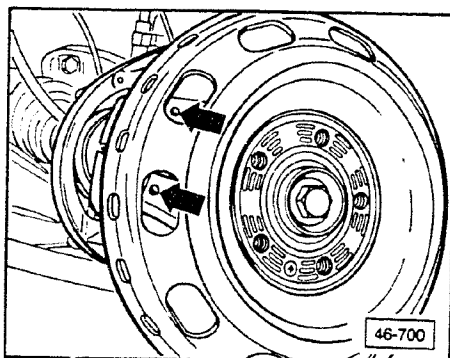
Front brake pads, replacing



- remove wheels
- unhook brake pad retaining spring by pressing spring in direction of **arrow**

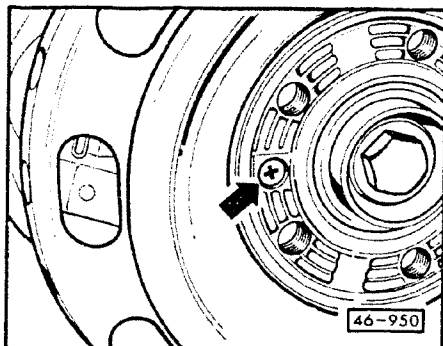


- push piston back into brake caliper housing by pressing against caliper housing as shown

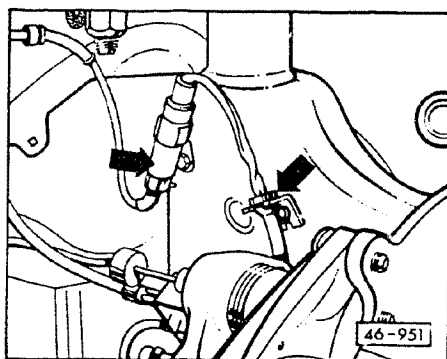


- press caliper housing in direction of **arrow** as far as possible
- remove brake pad near piston

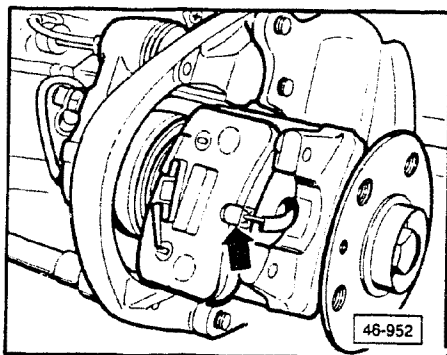
Brake – Mechanical Components



- remove brake disc wheel hub locating screw (**arrow**)
- tilt brake disc outward and remove from brake caliper



- remove brake pad wear indicator wire
- unclip pad wear indicator wire connection from mountings (**arrows**)



- remove outer brake pad from brake caliper housing
- disconnect brake pad wear indicator wire from brake pad

Note

Damaged wires can be replaced if necessary.

- connect wire for brake pad wear indicator to brake pad (**arrow**)
- install brake pad
 - do not allow pad wear indicator wire to rest against wheel hub
 - brake pad retaining spring must lock into brake caliper with an audible click
- install brake disc
- install brake disc locating screw
- install brake pad near piston
- install brake pad retaining spring
- insert wire for brake pad wear indicator into mounting
- with vehicle stationary, repeatedly depress brake pedal firmly until brake pads have seated

Brake – Mechanical Components

CAUTION

After installing new brake pads, depress brake pedal firmly several times while vehicle is stationary to permit piston and brake pads to adjust to brake disc.

Disc machining must be performed on both sides of disc — never on one side only. Always check condition/thickness of brake pads.

Note

Disconnect brake hoses only when replacing brake calipers.

CAUTION

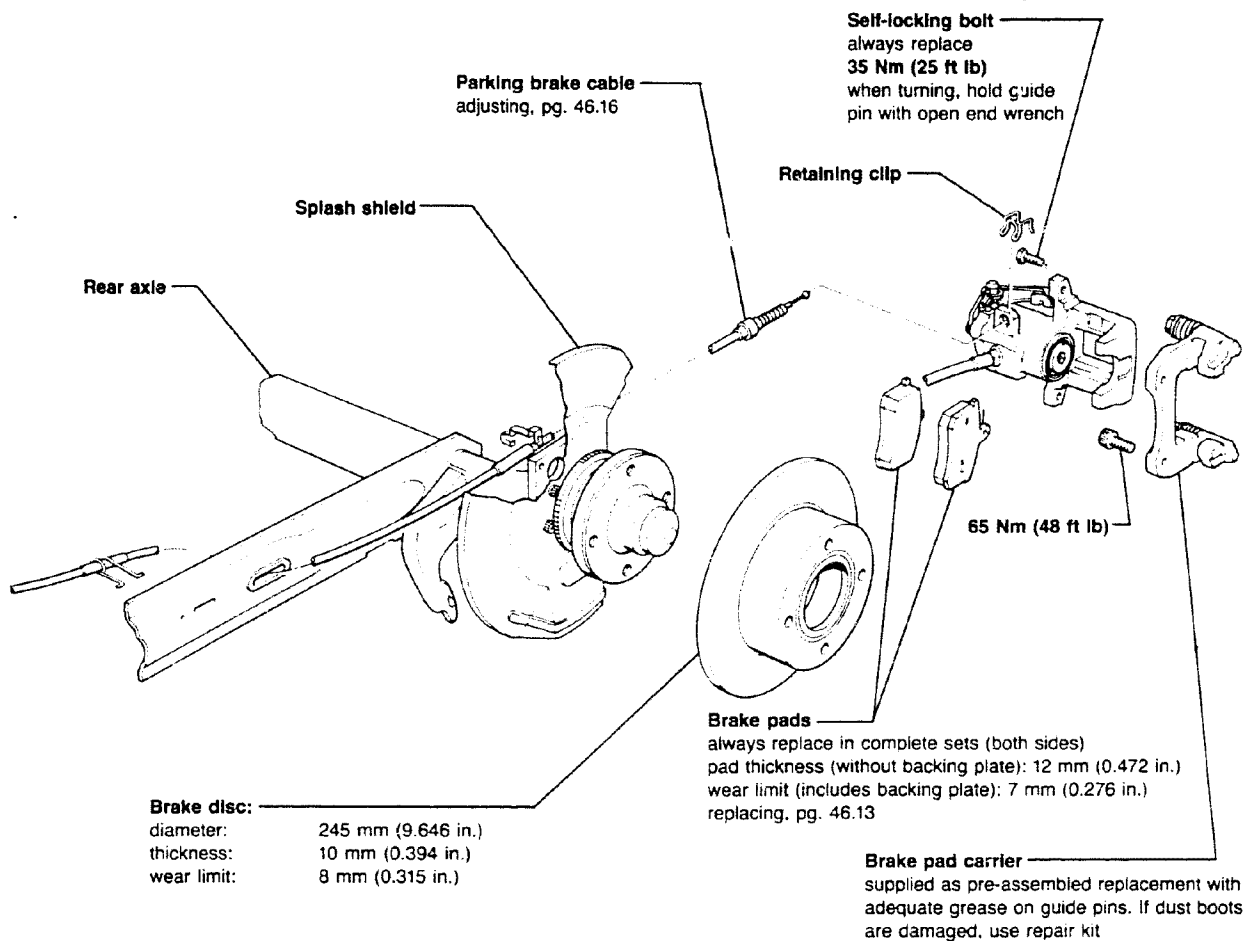
Always remove brake caliper before removing disc. Never try to remove disc by using force. Force may cause caliper mounting frame to crack or break.

WARNING

Brake fluid is poisonous. Brake fluid will also damage paint. Do not siphon by mouth.

Note

Always install all parts supplied in repair kit.



46-582

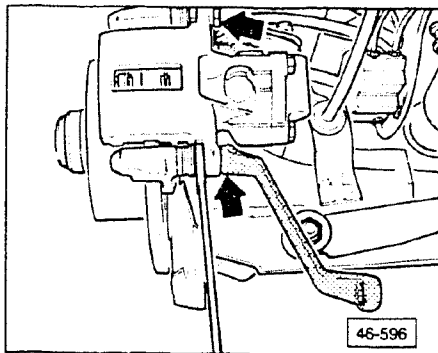
Brake – Mechanical Components

Brake pads, checking thickness

- check thickness of outer brake pad through space in wheel rim
 - wear limit (including backing plate):
7 mm (9/32 in.)

CAUTION

When reusing brake pads, mark them to prevent changing from original position.



Brake pads, removing

- remove rear wheel
- remove brake caliper cylinder (hold guide pin with open end wrench while loosening bolts)
 - upper bolt (arrow)
- remove brake pads

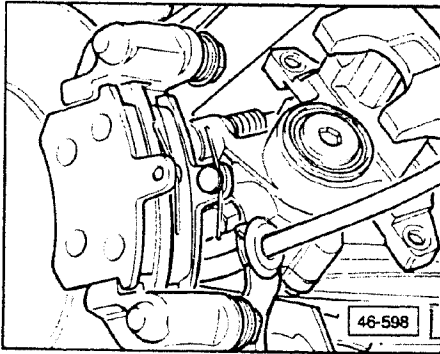
CAUTION

Always remove some brake fluid from reservoir before installing new brake pads. When caliper piston is turned in, brake fluid is forced out of caliper and into reservoir. After pads are installed, refill reservoir only to **MAX** mark.

Brake pads, installing

- move piston into housing by turning piston clockwise with Tool No. 3131 (grind off two opposite teeth)

Brake – Mechanical Components

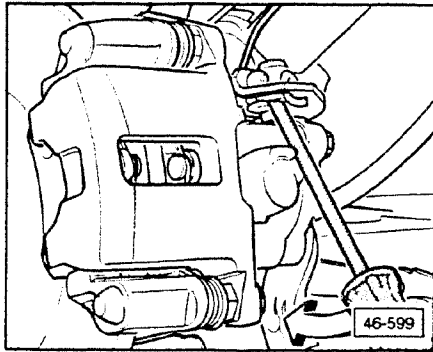


- install brake pads in pad carrier
- install caliper cylinder with new self-locking mounting bolts (supplied in repair kit)
- torque bolts to **35 Nm (26 ft lb)** (hold guide pin with open end wrench while tightening bolts)

CAUTION

After installing new brake pads, always check basic setting of rear brakes.

Brake – Mechanical Components

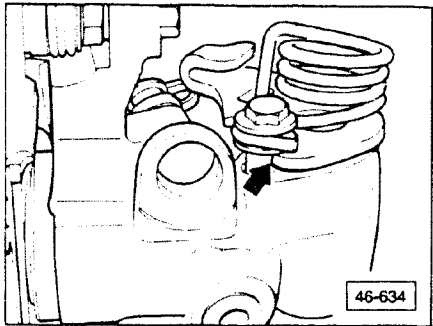


Rear brake basic setting, checking

Note

Parking brake cable must be free of tension during basic setting check.

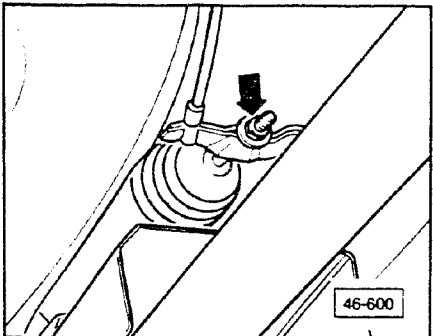
- push caliper brake lever with screwdriver against stop on left and right side



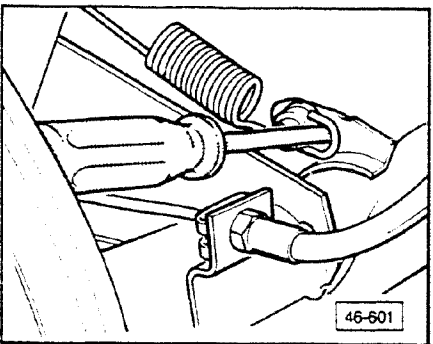
- cable is too tight if lever of opposite side caliper is pulled away from stop (arrow)

Note

The caliper is removed in the illustration.

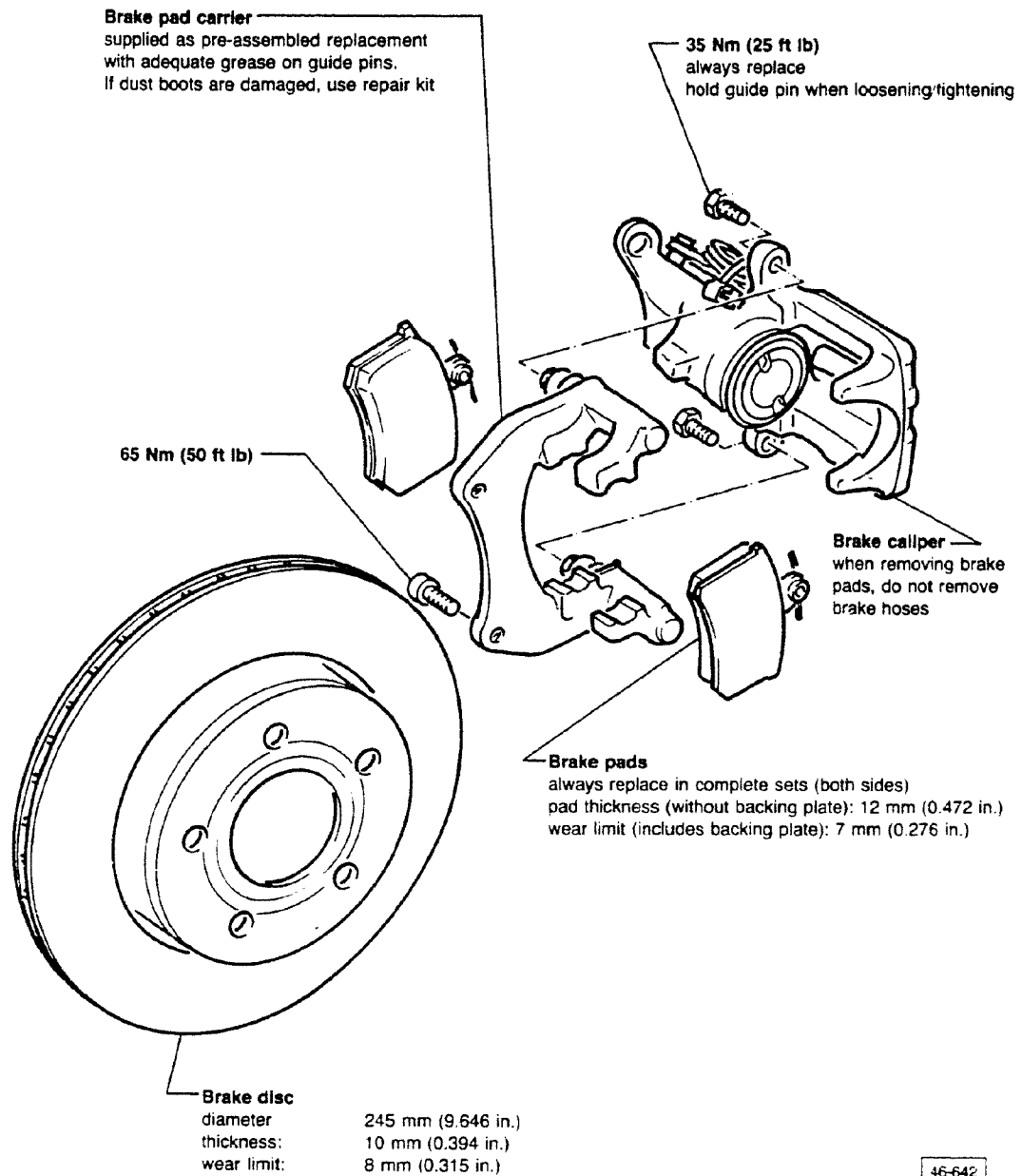


- if cable is too tight, loosen adjusting nut (arrow) until both caliper brake levers rest against stops



- insert screwdriver between the end of the rear spring and the roller
- apply the brake pedal **ONCE** with the vehicle stationary
- remove screwdriver
- check that both wheels rotate freely

Brake – Mechanical Components



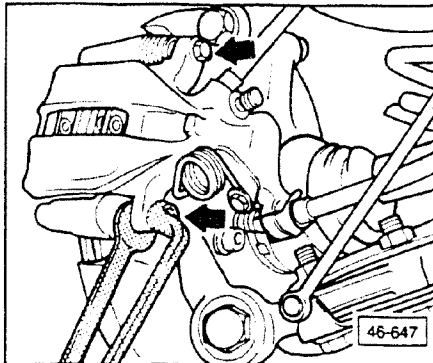
CAUTION

Disc machining must be performed on both sides of disc — never on one side only. Always check condition/thickness of brake pads.

Brake – Mechanical Components

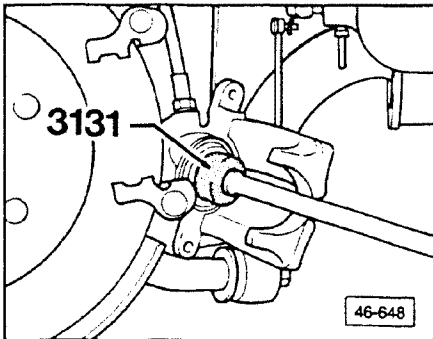
CAUTION

When reusing brake pads, mark to prevent changing inside to outside or from one caliper to another.



Brake pads, replacing

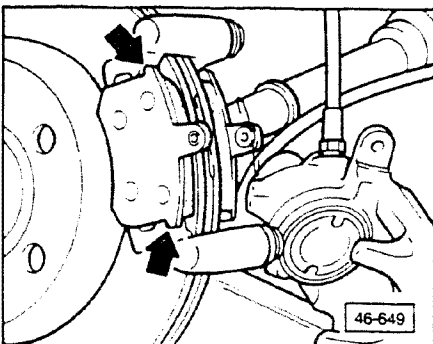
- remove rear wheels
- remove bolts fastening brake caliper to carrier (**arrows**)
- remove caliper and take out brake pads



- move piston into caliper housing by turning clockwise while pushing in

CAUTION

Always remove some brake fluid from reservoir before installing new brake pads. When caliper piston is pushed back, fluid is forced out of caliper and into reservoir. After pads are installed, refill reservoir only to **MAX** mark.



- install brake pads (**arrows**)
- install caliper and tighten **NEW** bolts to 35 Nm (25 ft lb)

CAUTION

Always check basic setting of rear brakes after installing brake pads.

Brake – Mechanical Components

Rear brake basic setting, checking

Note

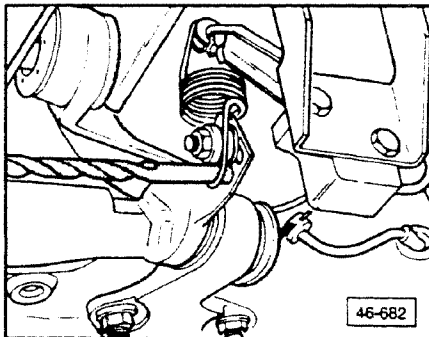
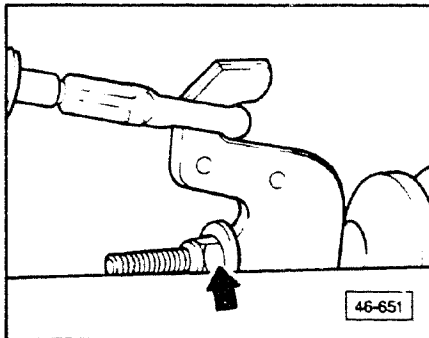
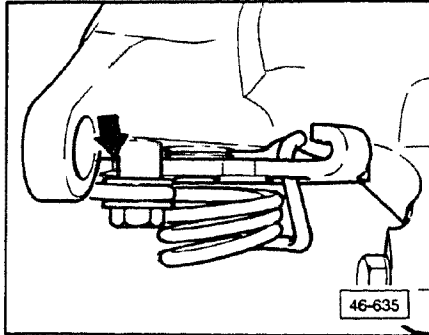
Parking brake cable must be free of tension during basic setting check.

- push caliper brake lever with screwdriver against stop on left and right sides
 - cable is too tight if lever of opposite side caliper is pulled away from stop (**arrow**)

Note

The caliper is removed in the illustration.

- if cable is too tight, loosen adjusting nut (**arrow**) until both caliper brake levers rest against stops

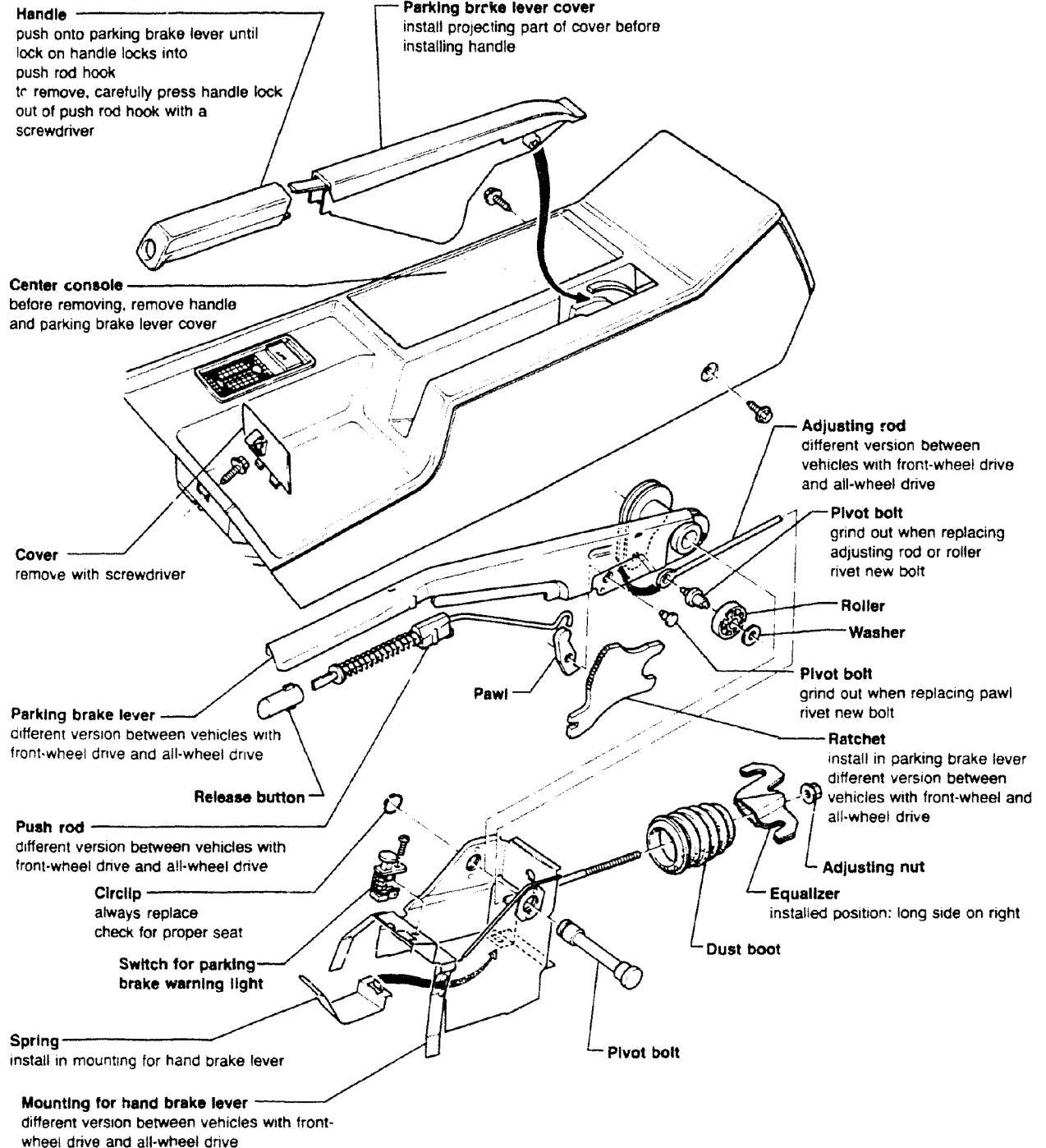


- insert 6 mm drill bit between end of brake pressure regulator spring and roller
- apply brake pedal one time with vehicle stationary
- remove drill bit
- check that both wheels rotate freely

Brake – Mechanical Components

Note

Grease all bearing locations with white lubricant, Part No. AOS 126 000 05 before assembly.

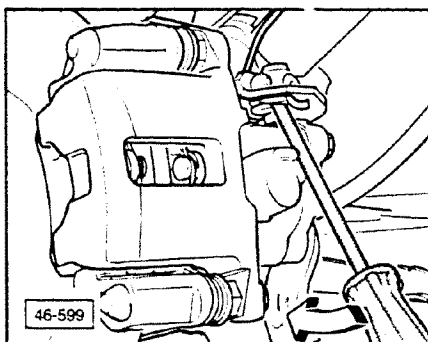
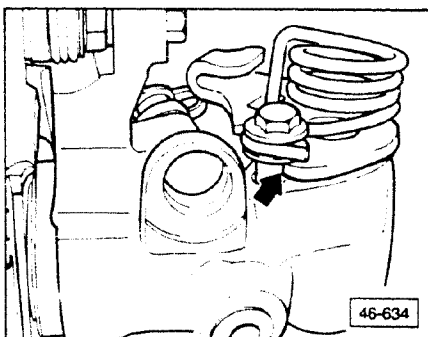
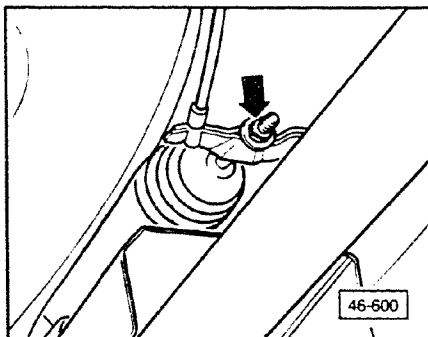


46-681

Brake – Mechanical Components

CAUTION

Always check rear brake basic setting before adjusting parking brake.



Parking brake, adjusting/checking

Note

Because of self-adjusting rear brakes, adjustment is only necessary after replacement of parking brake cables, rear calipers or cable adjusting rod.

Adjusting

- tighten adjusting nut for parking brake cable (**arrow**) until both brake levers just move off stops (**arrow** in illustration 46-634)
- loosen adjusting nut 2 turns

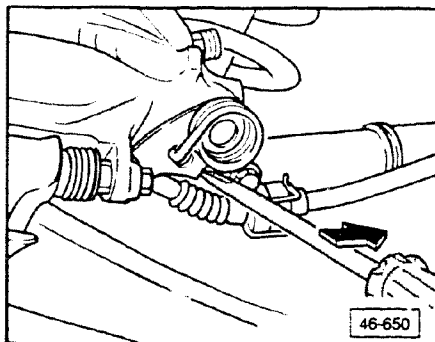
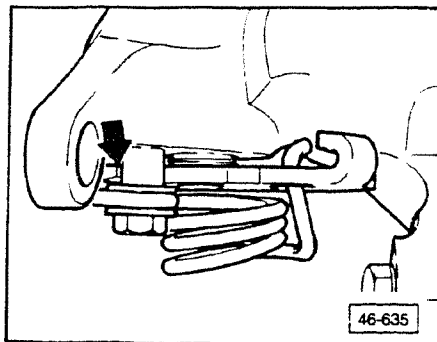
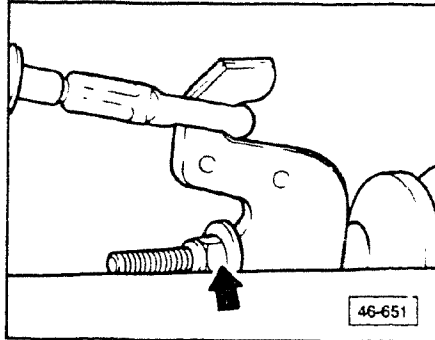
Checking

- push lever for parking brake cable with screwdriver against stop on left and right sides
 - cable is too tight if lever of opposite side caliper is pulled away from stop
- check that both rear wheels rotate freely

Brake – Mechanical Components

CAUTION

Always check rear brake basic setting before adjusting parking brake.



Parking brake, adjusting/checking

Note

Because of self-adjusting rear brakes, adjustment is only necessary after replacement of parking brake cables, rear calipers or cable adjusting rod.

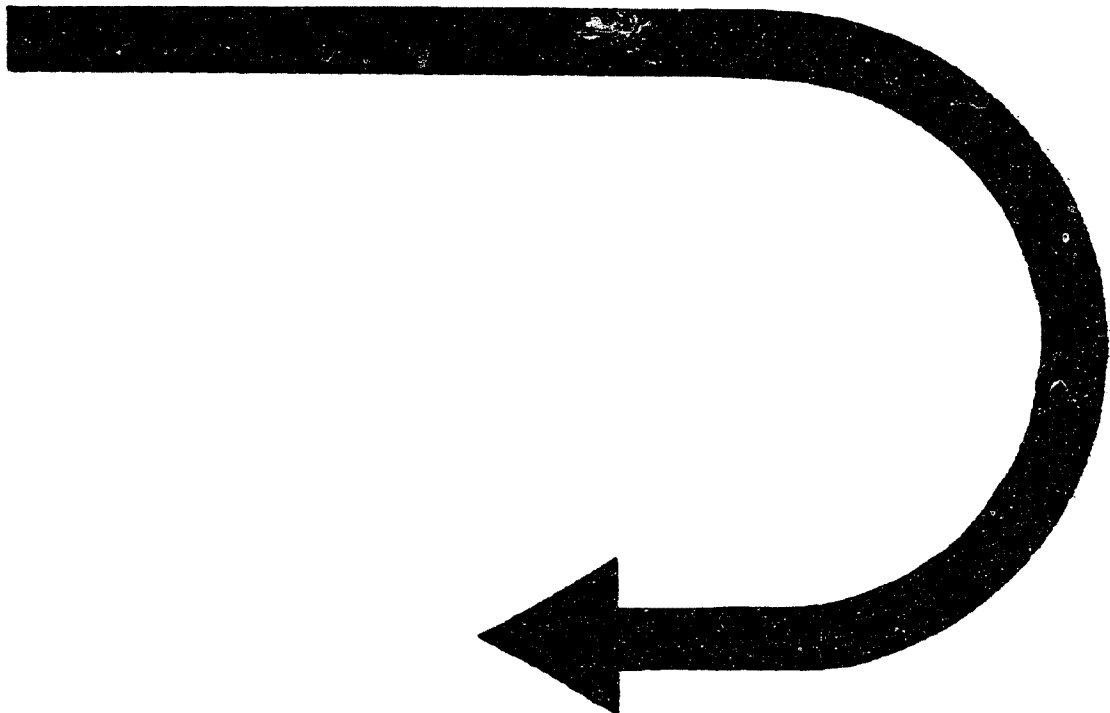
Adjusting

- tighten adjusting nut for parking brake cable (**arrow**) until both brake levers just move off stops (see **arrow** in illustration 46-635)
- loosen adjusting nut 2 turns

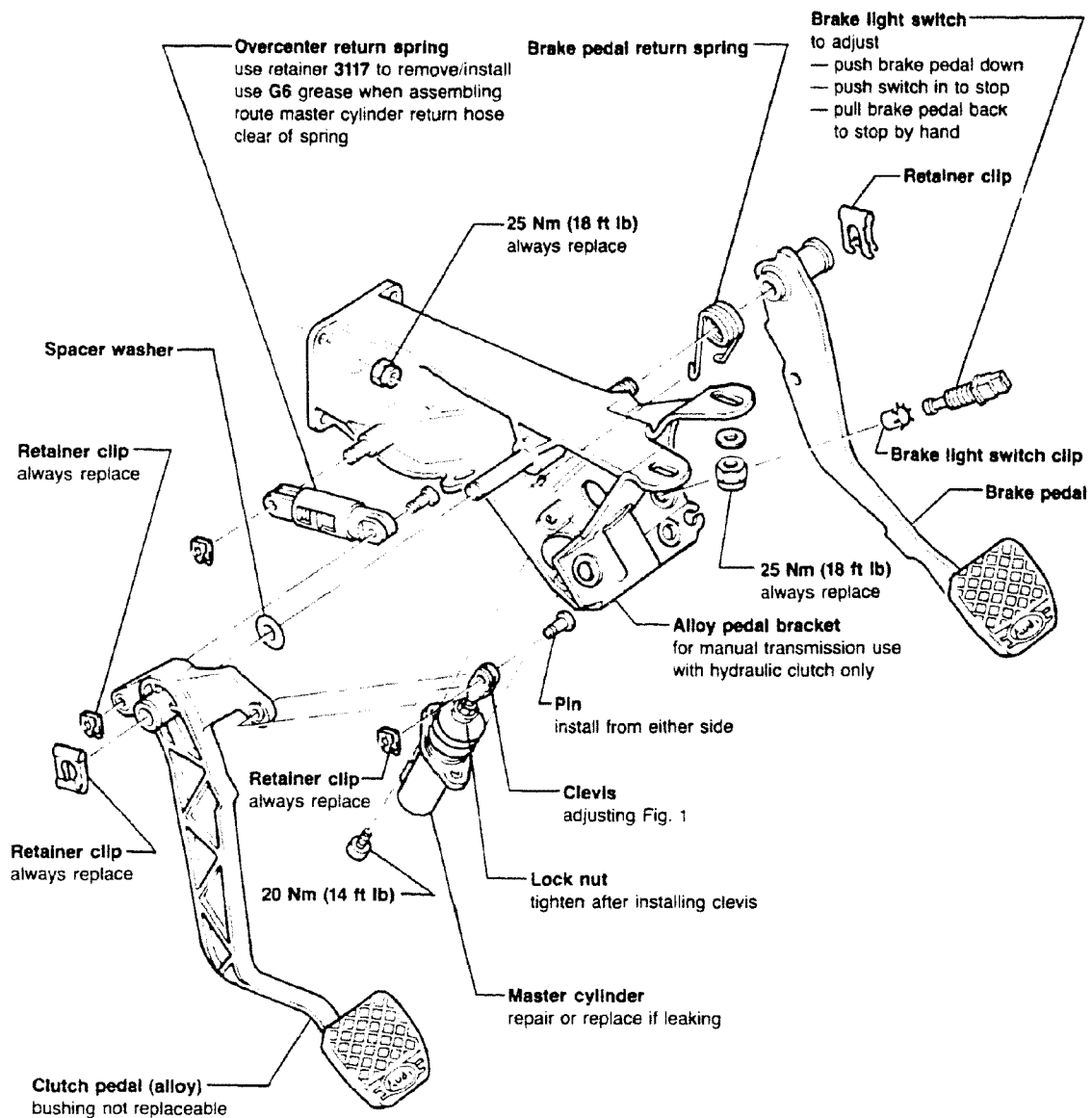
Checking

- push lever for parking brake cable with screwdriver against stop on left and right sides
 - cable is too tight if lever of opposite side caliper is pulled away from stop
- loosen adjusting nut for parking brake cable until both levers rest on stop
- pull up on parking brake lever, then release it
- check that both rear wheels rotate freely

CONTINUED IN THE
BEGINNING OF NEXT ROW



Brake – Mechanical Components



Note

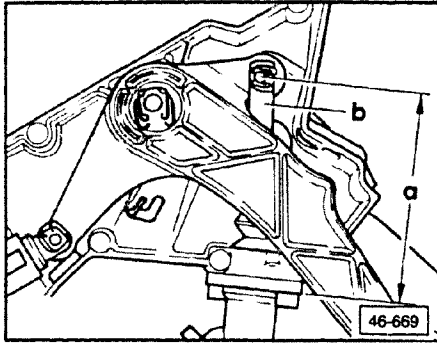
Grease all mounting points before assembly with G6 grease. Part No. AOS 126 000 05.

CAUTION

The brake pedal travel must not be restricted by extra carpeting or mats.

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Brake – Mechanical Components



► Fig. 1 Clutch master cylinder clevis, adjusting

a = 116.0 ± 0.2 mm (4.56 + 0.008 in.)

b = clevis

CAUTION

If clutch pedal does not fully return, check for:

- air in hydraulic system
- restricted movement of pedal at mounting

Brake noise is mainly the result of vibrations between components of the brake caliper assembly.

The following procedure has proven effective in reducing brake noise and eliminating customer complaints arising from noisy brakes.

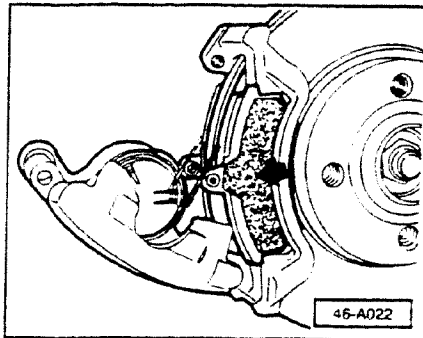
CAUTION

Brake noise will be effectively reduced only if ALL steps of this procedure are followed.

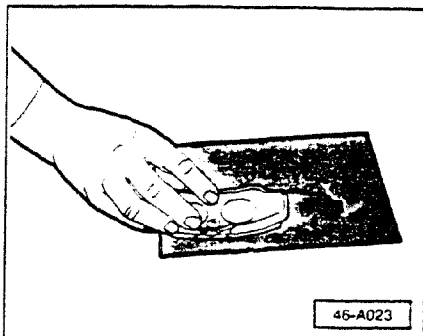
Use only Plastilube Moly 3[®] high temperature grease, P/N ZVP 264 103. Similar products may not have the lubricating qualities necessary to achieve successful results for this repair.

See Brake discs, front and rear – before assembling brake components.

Front brake caliper



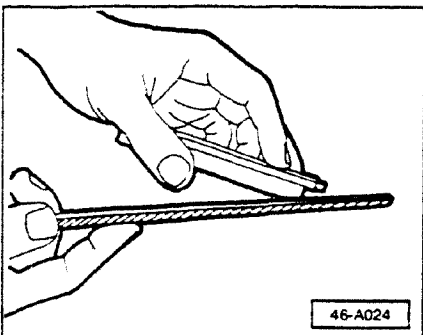
- ▶ Brake pads must have anti-vibration material (arrow). If not, replace pads with P/N 443 698 151 F.



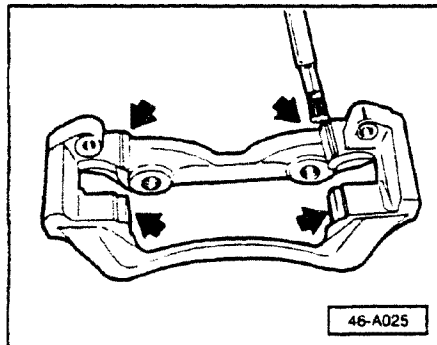
- ▶ ■ inspect pads, deglaze and clean face of pad with sandpaper if necessary.

CAUTION

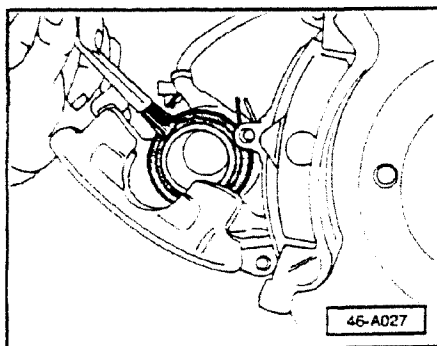
Part numbers are for reference only. Always check with your Parts Department for latest information.



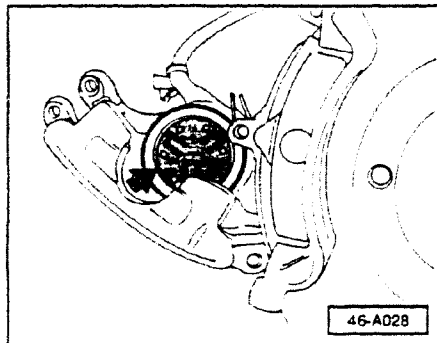
- ▶ ■ slightly chamfer (bevel) edges of brake pad material with file



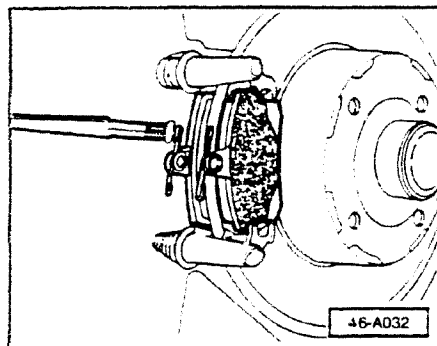
- ▶ ■ clean brake pad carrier contact points (arrows) and apply Plastilube Moly 3® high temperature grease, P/N ZVP 264 103



- ▶ ■ clean and lubricate caliper piston with high temperature grease

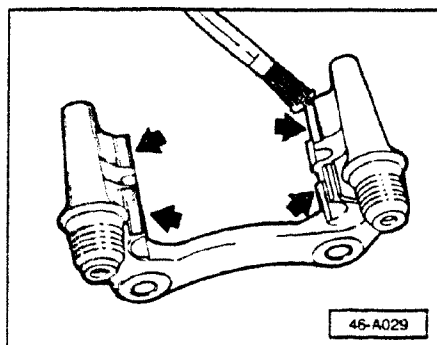


- ▶ ■ install anti-knock shim (shim has six [6] indentations), chrome color, P/N 443 615 231 A, (arrow) into caliper piston (two required)
- apply thin coating of high temperature grease on surface of shim

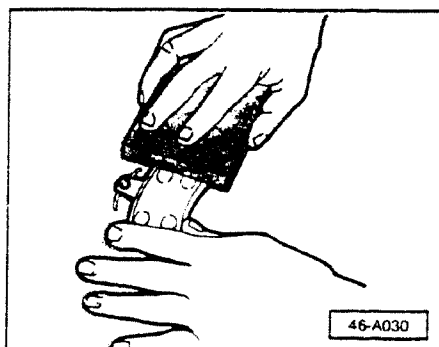


- ▶ ■ apply small amount of high temperature grease to spring contact points when reassembling

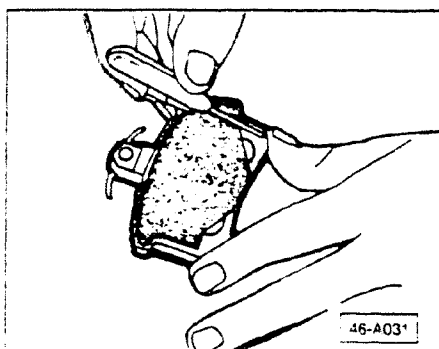
Rear brake caliper



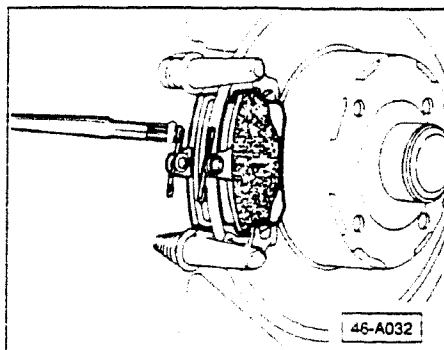
- ▶ ■ remove brake pad carriers and clean pad contact points (arrows)
- apply Plastilube Moly 3® high temperature grease, P/N ZVP 264 103, to pad contact points of pad carriers



- ▶ ■ remove paint on back of pads using sandpaper or wire brush

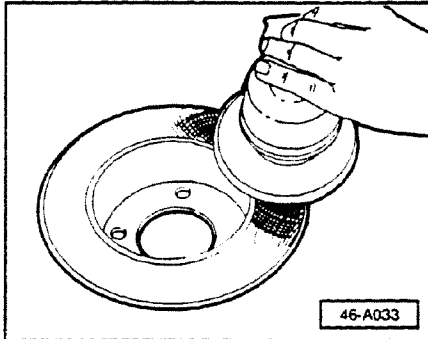


- ▶ ■ install anti-vibration stickers, P/N 171 698 993, to backs of all four rear brake pads and trim to proper size
- deglaze face of pads with sandpaper, if necessary
- slightly chamfer (bevel) edges of brake pad material with file



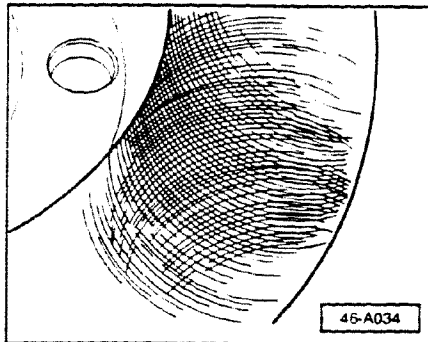
- ▶ ■ install brake pads and lubricate spring contact points with high temperature grease

Brake discs, front and rear



Glazed discs must be cleaned using a power disc-type sander and 80 grit sandpaper. Sand brake discs to achieve a "cross-hatch" pattern:

- ▶ ■ lightly sand in clockwise direction using leading edge of sanding disc
- ▶ ■ continue to sand in clockwise direction using trailing edge of sanding disc



Steering Wheel Shimmy During Braking

Follow the procedure below to eliminate recurring problems with steering wheel shimmy during braking.

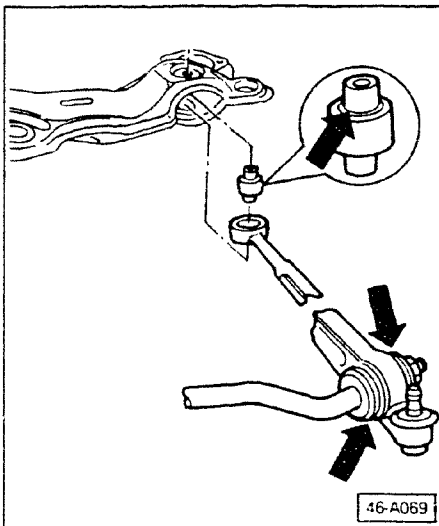
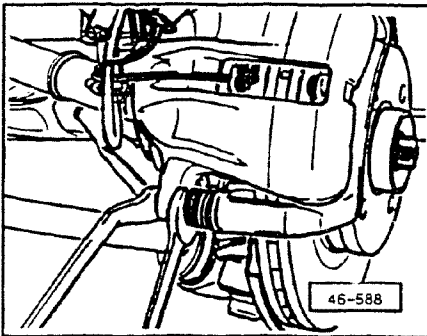
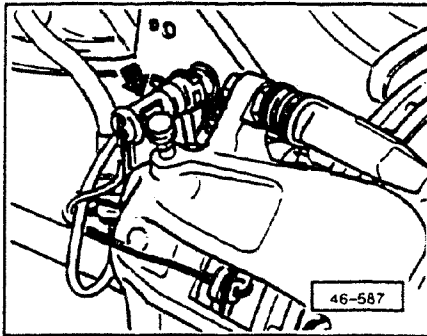
Note

The wheels and tires on the vehicle must be in good condition before proceeding with the following operations.

- remove front wheels
- disconnect front brake pad sensors (arrow)
- remove front brake pads
- remove both front brake calipers but do not disconnect hydraulic lines

CAUTION

Use wire to suspend brake calipers from body of vehicle. Do not let calipers hang from hydraulic lines.



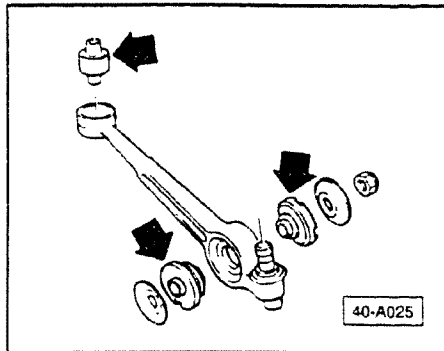
Vehicles with less than 40,000 miles

- carefully inspect inner and outer control arm bushings for cracking, splitting and deterioration (arrows)

Note

Bushings are difficult to inspect in the installed position. Use a flex mirror and a bend-a-light to inspect the bushings as thoroughly as possible.

- replace worn or damaged bushings as necessary

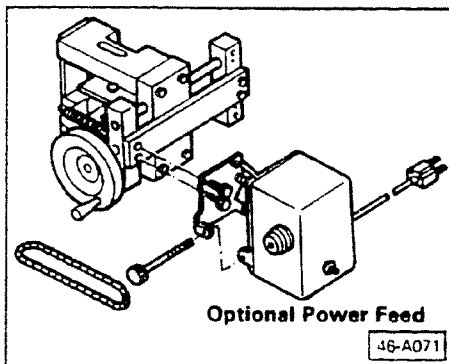


Vehicles with more than 40,000 miles

- replace both front inner and outer front control arm bushings (arrows)

Note

Refer to the repair manual microfiche for bushing replacement procedures.



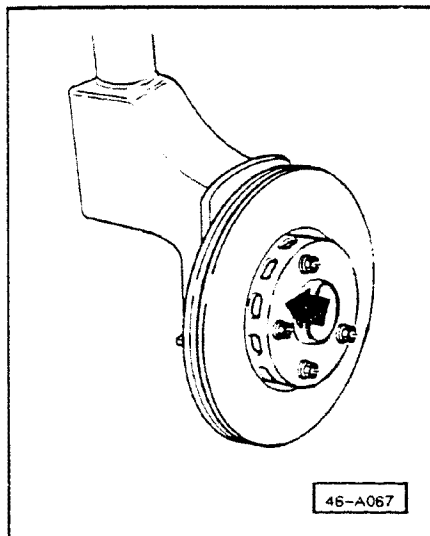
Front brake rotors, truing

- true front brake rotors with an on-the-car brake lathe, e.g. Kwik-Way Kwik-Lathe®

Note

If an on-the-car brake lathe is not available, replace both front brake rotors.

See page 46.30 for instructions regarding installation of new rotors.



CAUTION

Do not true the front brake rotors off the car during this procedure.

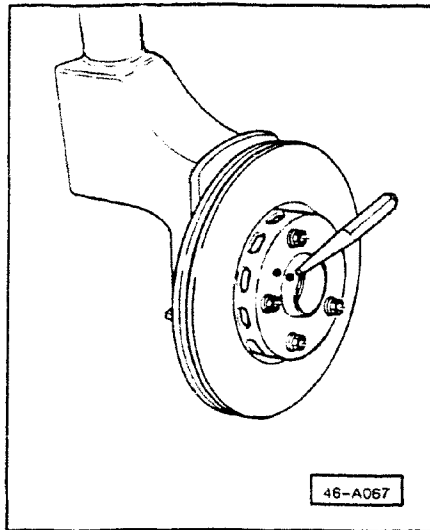
Note

The minimum thickness specification for brake rotors is located on the outside of the part (arrow)

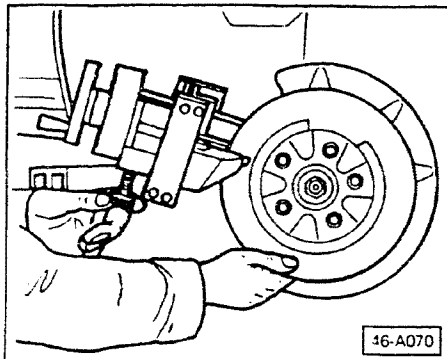
- if necessary, install new brake rotors.
Part No. 447 615 301 B

CAUTION

Part numbers are for reference only. Always check with your Parts Department for latest information.



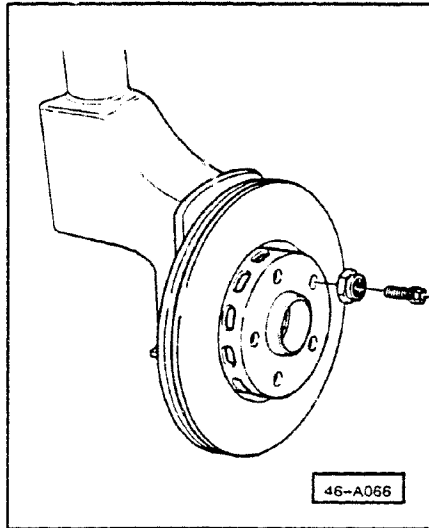
- index rotor to hub using center punch



Note

Follow the manufacturer's instructions for correct setup and operating procedures.

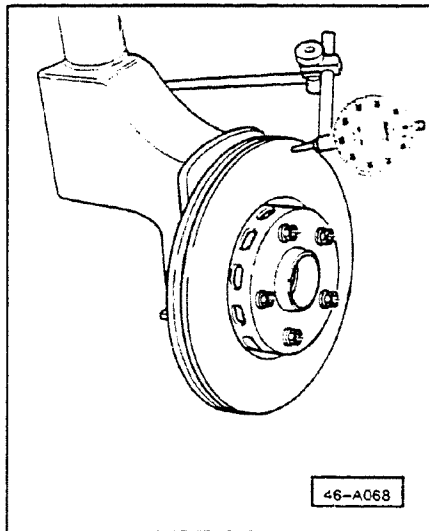
After rotors are trued proceed to caliper and wheel installation, page 46.31.



46-A066

When new brake rotors are required:

- thoroughly clean contact surfaces of brake rotor and hub
- install using all lug bolts with suitable spacers (e.g. axle nuts)
- tighten lug bolts diagonally in stages to 40 Nm (29 ft lb)



46-A068

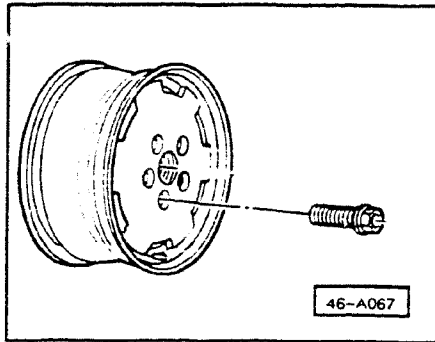
- attach dial indicator to measure brake rotor runout
 - locate dial indicator approximately 10mm (3/8 in.) from outer edge of rotor
- rotate brake rotor and record highest runout
- remove brake rotor and remount after rotating rotor to next lug bolt hole
- recheck brake rotor runout
- continue remounting rotor checking runout at each lug bolt position
 - maximum rotor runout: 0.06mm (0.002 in.)
- mount rotor in position where lowest runout was achieved
- mark hub and rotor with center punch as mounted in lowest runout position
- repeat runout checking procedure on opposite front rotor

Brake calipers/wheels, installing

- install front brake calipers
- install new Ferodo 3411 brake pads, Part No. 447 698 151 F

CAUTION

Part numbers are for reference only. Always check with your Parts Department for latest information.



- install wheels and torque lug bolts to 110 Nm (81 ft lb)