

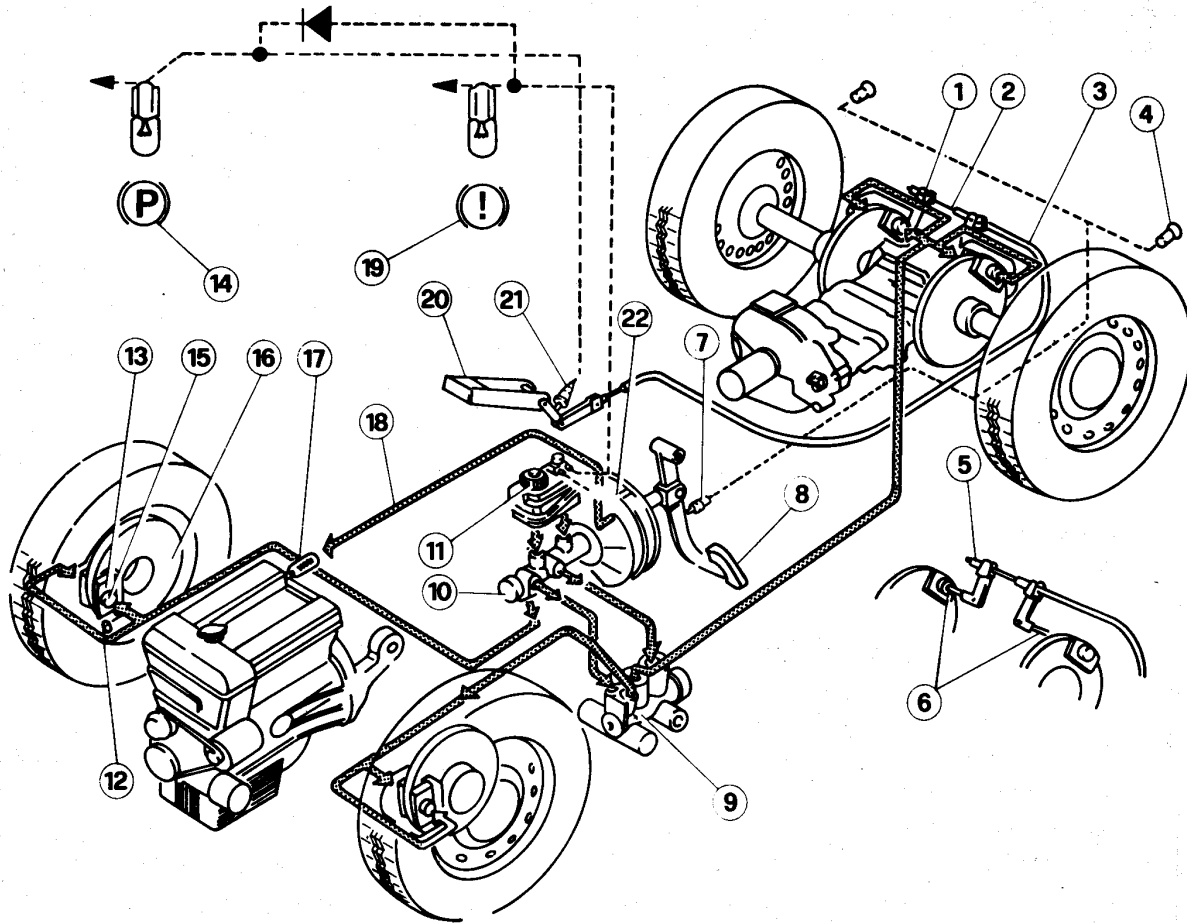
FRONT AND REAR BRAKES

GROUP 22

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TRADITIONAL BRAKING SYSTEM



- | | |
|-----------------------------------|---|
| 1 Hand brake pad actuating levers | 12 Air bleed screws |
| 2 Hand brake cable | 13 Brake pads |
| 3 Hand brake cable sheath | 14 Hand brake on indicator |
| 4 Stop light bulbs | 15 Piston |
| 5 Hand brake adjusting nuts | 16 Brake disc |
| 6 Hand brake pad push rods | 17 Vacuum port |
| 7 Stop light bulbs | 18 Pipe connecting vacuum port to brake servo |
| 8 Brake pedal | 19 Low brake fluid level indicator |
| 9 Load proportioning valve | 20 Hand brake lever |
| 10 Brake master cylinder | 21 Hand brake on indicator sending unit |
| 11 Brake fluid reservoir | 22 Brake servo |

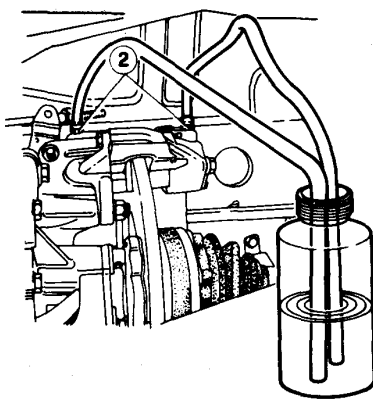
- The hydraulic circuit is supplied by a tandem brake master cylinder, mounted co-axially on the vacuum brake servo unit.
- Brake servo operates through vacuum generated in inlet manifold for gasoline engines and in vacuum pump for diesel engines, to facilitate brake master cylinder actuation.
- The front master cylinder section acts on front brake caliper circuit and directs a pressure signal to load proportioning valve. The rear master cylinder section acts on rear brake caliper circuit through load proportioning valve.
- The system, consisting of two independent circuits, ensures braking should either one of the two circuits fail and, through load proportioning during braking in that it prevents rear wheel locking.
- Hand brake acts on rear brake calipers through a mechanical linkage consisting of cable and clearance adjuster.

BRAKE SYSTEM BLEEDING

WARNING:

- Check that fluid level does not fall below minimum during bleeding.
- Do not reuse fluid after draining.
- Brake fluid is harmful to paintwork: avoid contact.
- Carry out operation simultaneously on front and rear brake calipers, first on one side, then on the other.

- Place car on a lift.
- If necessary, fill up reservoirs with the recommended fluid (ATE "S" or AGIP Brake Fluid Super or IP Auto Fluid FR).
- Raise car and remove dust excluders from brake caliper bleed points.
- Connect a flexible hose to bleed screws ① and ② and dip the other hose end in a container filled with the recommended brake fluid.



- Front brake bleed screw
- Rear brake bleed screws

- Slacken bleed screws and pump the brake pedal; allow brake pedal to return and pause a few seconds between each stroke and the next; keep pumping until issuing fluid is free from air bubbles. Fully depress brake pedal and tighten bleed screws.
- Remove hoses, install dust excluders and top up reservoir.
- If bleeding has been carried out correctly, no sponginess should be felt after initial free travel. If pedal sponginess is felt repeat the bleeding operation.

BRAKE HYDRAULIC SYSTEM LINES

INSPECTION

Check brake system lines (pipes and hoses) for distortion, cracks or external oxidation. Replace any defective parts.

REMOVAL AND INSTALLATION

WARNING:

- Prior to removing and installing brake lines, draw fluid from brake and clutch system reservoir by means of a syringe.
- When removing lines, plug ends to prevent the entry of foreign matter.
- After installation, check that front and rear hoses are not twisted. For checking, refer to supplier's identification mark on rear hose periphery or to light stripe on front hoses.
- After assembly, top up reservoir and bleed (see Brake System Bleeding).

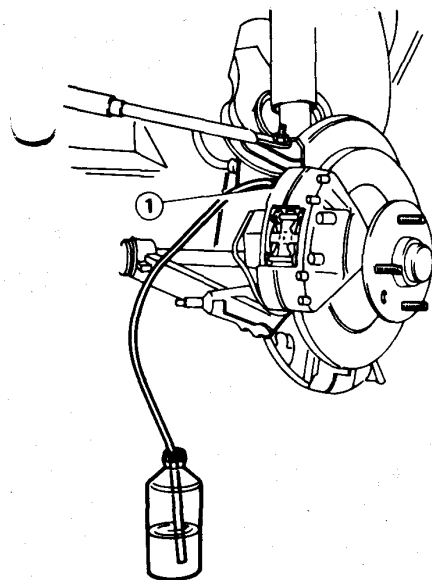
Ⓣ: Tightening torques

Brake hydraulic system hose fittings

10 to 15 N · m
(1 to 1.5 kg · m)
(7.4 to 11.1 ft · lb)

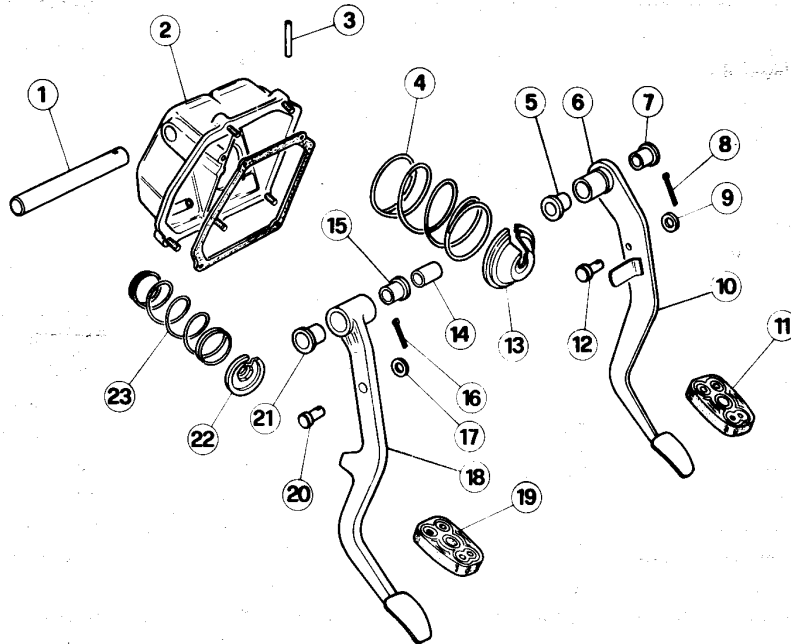
Brake hydraulic system pipe fittings

10 to 12 N · m
(1 to 1.2 kg · m)
(7.4 to 8.9 ft · lb)



FRONT AND REAR BRAKES

PEDALS



- 1 Pedal shaft
- 2 Pedal support
- 3 Pin
- 4 Brake pedal return spring
- 5 Brake pedal bushing
- 6 Bushing housing
- 7 Brake pedal bushing
- 8 Cotter

- 9 Washer
- 10 Brake pedal
- 11 Pedal cover
- 12 Pin
- 13 Brake pedal spring cup
- 14 Spacer
- 15 Clutch pedal bushing
- 16 Cotter

- 17 Washer
- 18 Clutch pedal
- 19 Pedal cover
- 20 Pin
- 21 Clutch pedal bushing
- 22 Clutch pedal spring cup
- 23 Clutch pedal return spring

REMOVAL

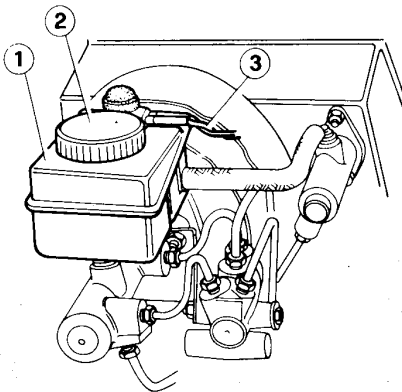
1. Disconnect brake fluid level indicator cables (3) from engine compartment, remove plug (2) and filter from reservoir (1) and draw clutch and brake fluid by means of a syringe.

2. Back off screws retaining windshield washer reservoir to body and move reservoir sideways.

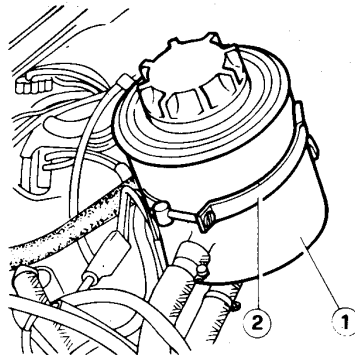
3. Six cylinder cars only. Slacken reservoir hose clamp (2) and move reservoir (1) sideways.

4. Disconnect brake servo vacuum port pipe from check valve.

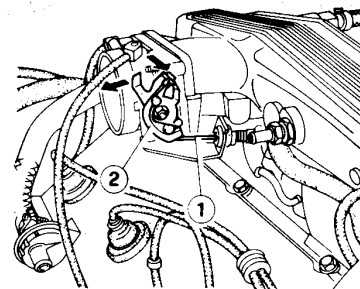
5. Disconnect cable (1) pin from accelerator control lever (2), remove cable with sheath from housing and disconnect from sheath retainer on pedal support, behind brake servo.



- 1 Brake fluid reservoir
- 2 Plug
- 3 Brake fluid level indicator cables



- 1 Power steering fluid reservoir
- 2 Hose clamp

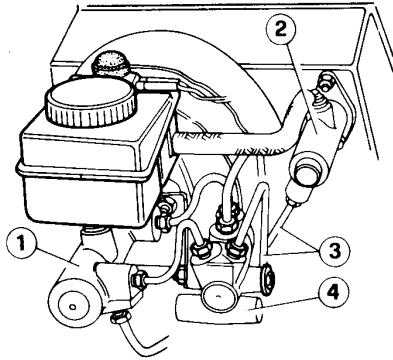


- 1 Accelerator control cable
- 2 Accelerator control lever

FRONT AND REAR BRAKES

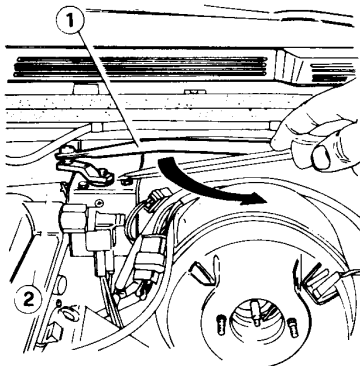
6. Disconnect pipe fittings (3) from load proportioning valve (4) and clutch and brake master cylinders (2) and (1).

WARNING:
Brake fluid is harmful to paintwork.



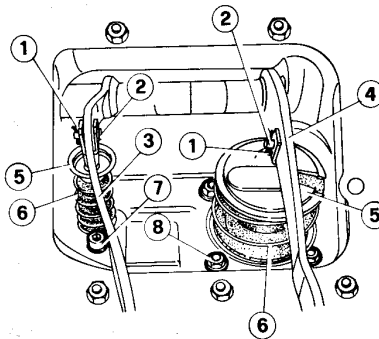
- 1 Brake master cylinder
- 2 Clutch master cylinder
- 3 Brake and clutch system pipes
- 4 Load proportioning valve

7. Six cylinder cars only.
Disconnect 5th and 6th cylinder spark plug cables; disconnect wiring harness from terminal board to permit pedal removal.
8. Back off nut and disconnect motor level (1) from motor (2), rotate lever in direction arrowed and remove pedal assembly.



- 1 Windscreen wiper control lever
- 2 Windscreen wiper motor

9. From car interior take sheath off accelerator cable previously disconnected.
10. Six cylinder cars only.
- a. Remove cotter (1) with associated washer on both pedals and take off pin (2), disconnect clutch and brake pedals (3) and (4) from associated forks.
 - b. Remove cups (5) and retrieve springs (6).



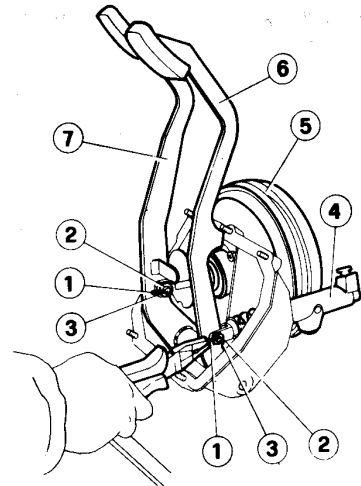
- 1 Cotter
- 2 Washer
- 3 Pin
- 4 Clutch pedal
- 5 Brake pedal
- 6 Spring cup
- 7 Clutch master cylinder/pedal support cap screw
- 8 Brake servo/pedal support nut

11. Back off nuts retaining pedal support to body.
12. Take off pedal support assy from engine compartment.

DISASSEMBLY

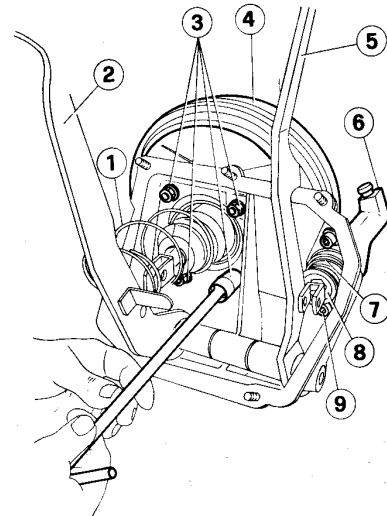
Disassembly pedals as follows:

1. All models, six cylinder cars excluded.
 - a. Remove cotters (1) and take off washers (2) and pins (3) connecting pedals to associated brake servo (5) and clutch master cylinder (4) actuating forks.



- 1 Cotter
- 2 Washer
- 3 Pin
- 4 Clutch master cylinder
- 5 Brake servo
- 6 Clutch pedal
- 7 Brake pedal

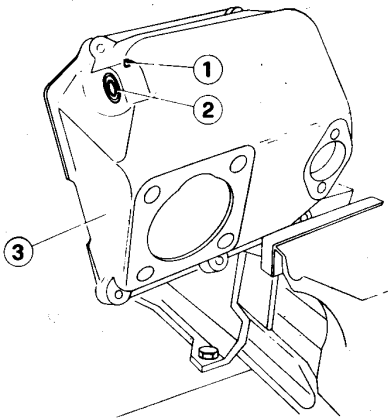
- b. Remove brake pedal (2) return spring (1) cup.
 - c. Remove spring cup (8) and take off clutch pedal (5) return spring (7).
2. Back off and remove four brake servo (4) nuts (3) and take off brake servo.
 3. Back off and remove 2 clutch master cylinder (6) socket head cap screws (9) and take off master cylinder.



- 1 Brake spring
- 2 Brake pedal
- 3 Brake servo/pedal support nuts
- 4 Brake servo
- 5 Clutch pedal
- 6 Clutch master cylinder
- 7 Clutch spring
- 8 Spring cup
- 9 Clutch master cylinder/pedal support cap screw.

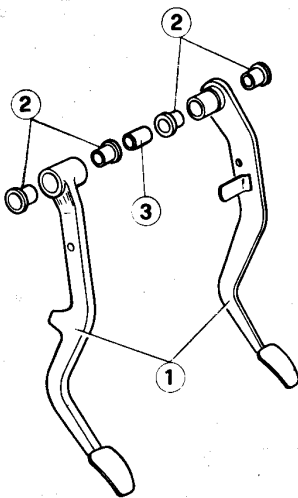
FRONT AND REAR BRAKES

4. Remove pin ① and take off pedal pin ② from pedal support ③.



- 1 Pin
2 Pedal pin
3 Pedal support

5. Disassemble pedals ①, take out associated bushings ② and retrieve spacer ③.



- 1 Pedals
2 Bushings
3 Spacer

INSPECTION

1. Check bushings and associated housings on pedals, pin and spacer for wear and seizure, and replace as necessary.
2. Check return springs for weakness and replace if necessary.

ASSEMBLY

Assemble pedals reversing the disassembly sequence and adhering to the instructions given below.

- Apply a film of the recommended grease (ISECO Molykote Longterm no. 2) to sliding parts and return springs.
- Apply recommended jointing compound (LOWAC Perfect Seal) to brake/pedal support surfaces. Tighten nuts retaining brake servo to pedal support to the specified torque.

T : Tightening torque

Brake servo/pedal support nuts
12 to 15 N·m
(1.2 to 1.5 kg·m)
(8.9 to 11.1 ft·lb)

- Install clutch pedal taper spring positioning larger dia. end in contact with pedals.
- Lubricate pins connecting brake servo and clutch master cylinder forks to pedals using the recommended grease (AGIP Grease 15).

INSTALLATION

Install by reversing the removal sequence and adhering to the instructions given below.

- Lubricate accelerator cable and before connecting to throttle valve actuating lever and adjust travel (see Group 04 — Accelerator Cable Adjustment).
- Replace seal between pedal support and body after thoroughly cleaning surfaces in contact.
- Fill reservoir with the recommended fluid (ATE Blau S; AGIP Brake Fluid Super; IP Auto Fluid FR).
- Adhere to the following tightening torque.

T : Tightening torque

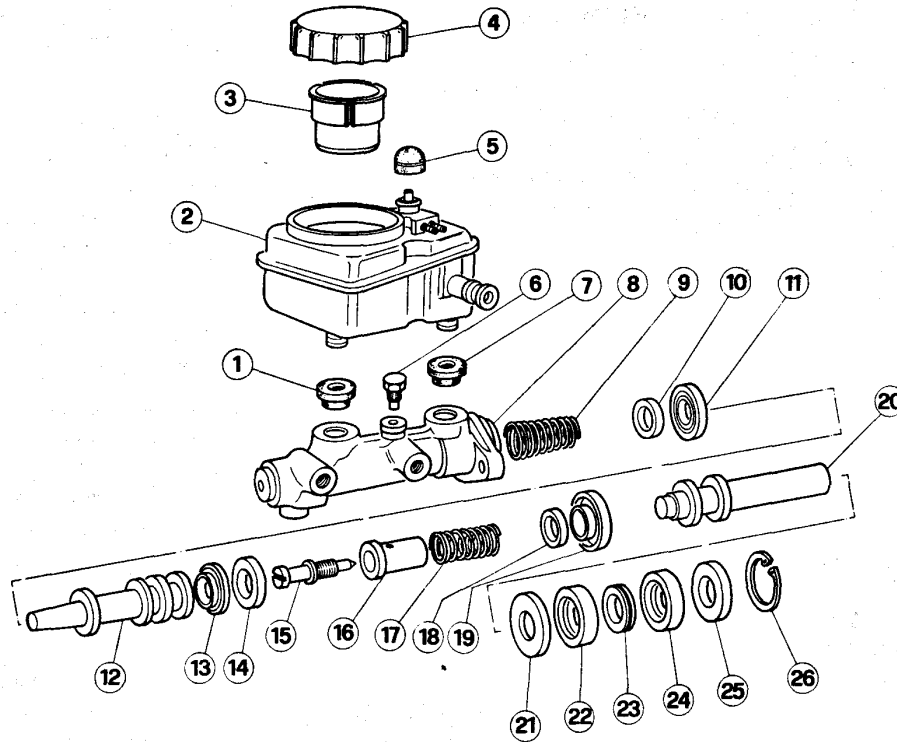
Brake and clutch hydraulic system pipe fittings

10 to 12 N·m
(1 to 1.2 kg·m)
(7.4 to 8.9 ft·lb)

- Bleed brake system (see: Brake system bleeding) and clutch system (see Group 12 - Hydraulic Control - Hydraulic system Bleeding).

FRONT AND REAR BRAKES

BRAKE MASTER CYLINDER



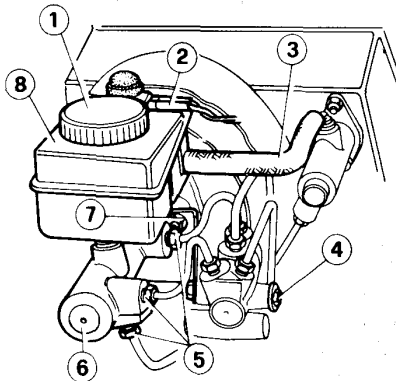
- 1 Rubber connection
- 2 Reservoir
- 3 Filter
- 4 Plug
- 5 Float cover
- 6 Stop screw
- 7 Rubber connection
- 8 Master cylinder body
- 9 Spring

- 10 Spring cup
- 11 Seal
- 12 Intermediate plunger
- 13 Seal
- 14 Spacer
- 15 Screw
- 16 Bushing
- 17 Spring
- 18 Spring cup

- 19 Seal
- 20 Actuating plunger
- 21 Washer
- 22 Seal
- 23 Ring
- 24 Seal
- 25 End washer
- 26 Retaining ring

REMOVAL

1. Disconnect brake fluid level indicator cables (2).
2. Remove plug (1) from reservoir (8), remove filter and draw fluid using a syringe.
3. Disconnect pipe (3) from reservoir (8) and plug.
4. Disconnect fittings (5) from brake master cylinder, (6).
5. Back off nuts (7) and screw (4); remove load proportioning valve bracket.



- 1 Plug
- 2 Brake fluid level indicator cables
- 3 Hose connecting reservoir to clutch master cylinder
- 4 Bracket/load proportioning valve screw
- 5 Brake master cylinder pipe fittings
- 6 Bracket/brake servo retaining nut
- 7 Reservoir

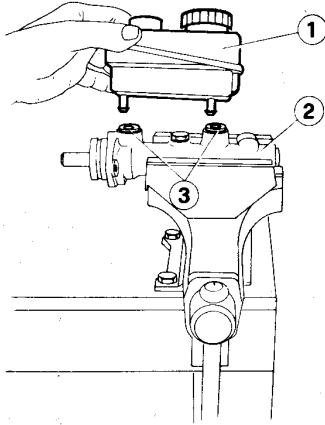
6. Back off nuts retaining brake master cylinder to brake servo and remove master cylinder.

DISASSEMBLY (ATE MASTER CYLINDER)

Clamp master cylinder in a vice provided with jaw liners and carry out the following operations:

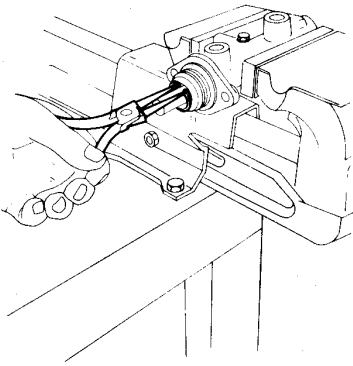
1. Separate brake fluid reservoir (1) from master cylinder body (2) and take off rubber hoses (3) from two connections.

FRONT AND REAR BRAKES

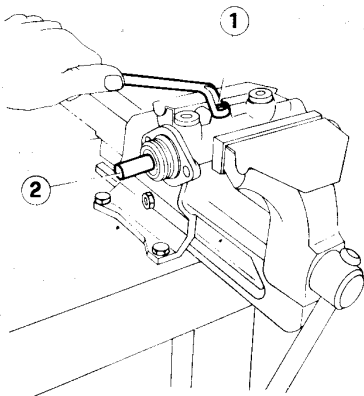


- 1 Reservoir
- 2 Brake master cylinder
- 3 Rubber connections

2. Remove retaining ring from master cylinder body.



3. Back off and remove stop screw (1) with associated washer and take out actuating plunger assembly (2) from master cylinder body.



- 1 Stop screw
- 2 Actuating plunger

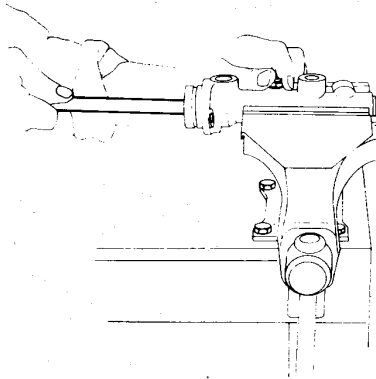
4. Remove master cylinder from vice and overturn to take out and disassemble plunger.

INSPECTION

1. Thoroughly clean all parts using alcohol or brake fluid and blow dry with compressed air.
2. Check master cylinder body sleeve inner surface for score marks or corrosion spots. Replace if necessary.
3. Check internal components, replace worn or damaged parts and always replace seals.

ASSEMBLY

1. Assemble intermediate plunger, ensure that seals are pressed fully home and insert plunger with associated spring in master cylinder body.
2. Press plunger fully home in body and tighten stop screw with washer to contact plunger end shoulder.



3. Assemble actuating plunger, ensure that seals are correctly positioned and insert plunger with associated spring in master cylinder body.
4. Install retaining ring suitably pressing end washer.

BENDITALIA MASTER CYLINDER

For overhaul carry out the same operation as per Ate master cylinder, bearing

in mind that spare parts for Benditalia master cylinder are supplied in sets which are not interchangeable.

On replacement, check trademark on master cylinder body to ensure that only genuine spare parts are used.

CAUTION:

On intermediate plunger assembly, check that stop screw engages plunger groove correctly.

INSTALLATION

Install by reversing the removal sequence and adhering to the instructions given below.

- Ensure that retaining ring is inserted between master cylinder and brake servo.
- Adhere to the following tightening torques.

T: Tightening torques

Pipes/brake master cylinder fittings

10 to 12 N · m
(1.0 to 1.2 kg · m)
(7.4 to 8.9 ft · lb)

Brake master cylinder/brake servo retaining nuts

12 to 15 N · m
(1.2 to 1.5 kg · m)
(8.9 to 11.1 ft · lb)

- Fill reservoir with the recommended fluid (ATE Blau S; AGIP F1 Brake Fluid Super HD; IP Auto Fluid FR).
- Bleed brake system (see Brake System Bleeding).

BRAKE SERVO

INSPECTION

Check brake servo operation proceeding as follows.

CAUTION:

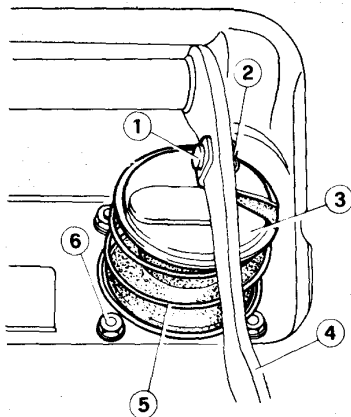
Before testing, check that vacuum system non-return valve is efficient (see: Vacuum System).

FRONT AND REAR BRAKES

1. With engine shut off and no vacuum in brake servo (after operating brake pedal 5 to 6 times) slightly depress brake pedal and maintain in this position.
2. Start engine.
3. Applying a constant pressure on pedal and with a good vacuum and engine running, the pedal should lower.
4. If pedal kicks back against driver's foot, brake servo is inefficient.

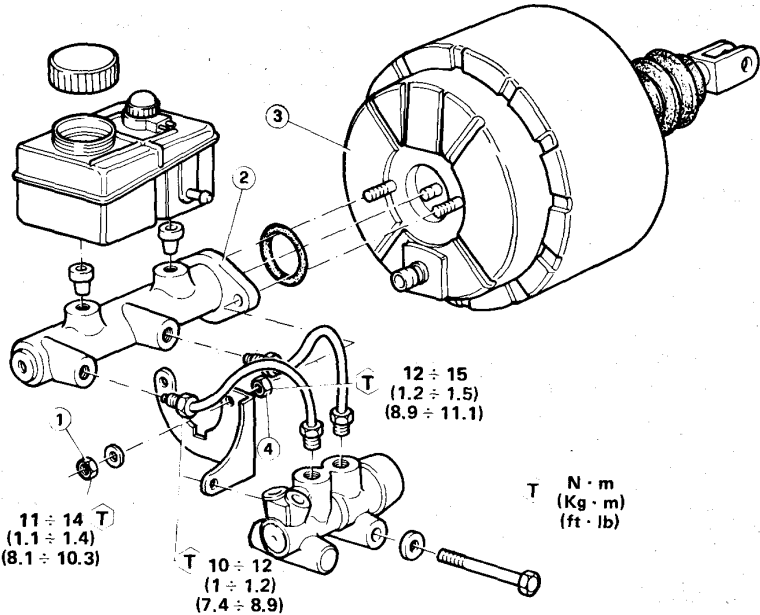
REMOVAL

1. Proceed as per "Brake master cylinder removal" up to para. 4.
2. From car interior, remove cotter ② with associated washer and pin ①, and disconnect pedal ④ from brake servo actuating fork.
3. Remove spring cup ③ and retrieve spring ⑤.
4. Back off 4 nuts ⑥ and remove brake master cylinder/brake servo unit.



- 1 Pin
- 2 Cotter
- 3 Spring cup
- 4 Brake pedal
- 5 Spring
- 6 Brake servo/pedal support retaining nut.

5. Move to bench, back off nut ④ and separate brake master cylinder ② from brake servo ③.



- 1 Load proportioning valve/brake servo retaining nut
- 2 Brake master cylinder
- 3 Brake servo
- 4 Brake master cylinder/brake servo retaining nut

INSTALLATION

Install by reversing the removal sequence and adhering to the instructions given below.

- Ensure that retaining ring is inserted between master cylinder and brake servo.
- Lubricate pin connecting pedal to brake servo control fork using the recommended grease (AGIP F1 Grease 15).
- Adhere to the following tightening torques.

T : Tightening torques

Pipes/brake master cylinder fittings

10 to 12 N·m
(1 to 1.2 kg·m)
(7.4 to 8.9 ft·lb)

Brake servo/pedal support retaining nuts

12 to 15 N·m
(1.2 to 1.5 kg·m)
(8.9 to 11.1 ft·lb)

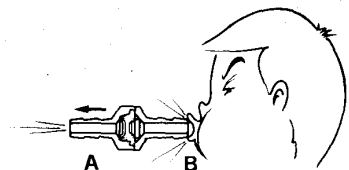
Brake master cylinder/brake servo retaining nuts

12 to 15 N·m
(1.2 to 1.5 kg·m)
(8.9 to 11.1 ft·lb)

- Fill reservoir with the recommended fluid (ATE Blau S; AGIP F1 Brake Fluid Super; IP Auto Fluid FR).
- Bleed brake system (see: Brake system Bleeding).

VACUUM SYSTEM

1. Visually check lines for obstructions and/or damage and hose clamps for looseness.
2. Remove non-return valve if necessary.
3. Check valve operation; valve must allow air to flow in the direction indicated by arrow only.



- A Vacuum port end
- B Brake servo end

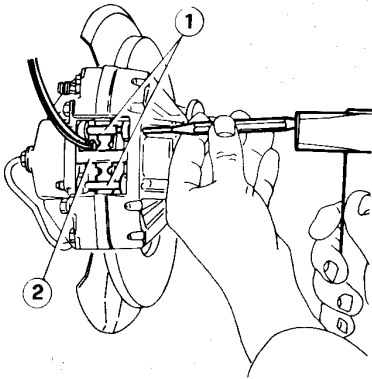
FRONT AND REAR BRAKES

4. On assembly, position non-return valve, with arrow pointing toward vacuum actuator.

FRONT BRAKES

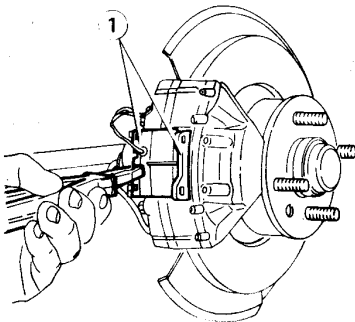
PAD REPLACEMENT

1. Place car on a lift and slacken front wheel retaining nuts.
2. Raise front end of car and apply support stands; remove front wheels.
3. Using a punch, remove one of pins ①, take off cross spring ② and remove the other pin.



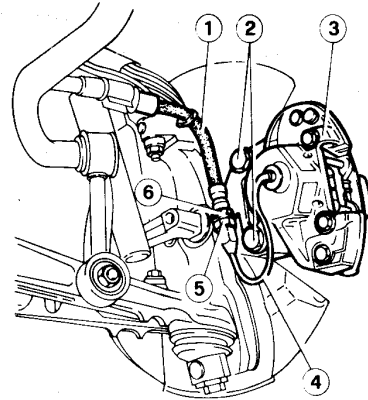
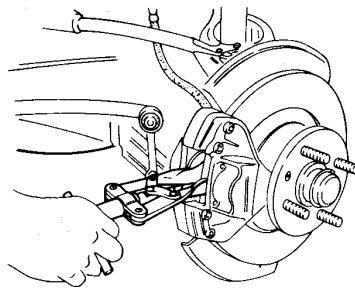
- 1 Pins
- 2 Cross spring

4. On cars provided with pad wear indicator, disconnect relevant connection from engine compartment.
5. Take off pads ①.



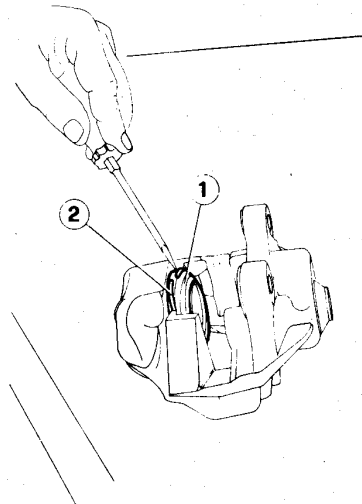
- 1 Pads

6. Using a suitable tool, push back pistons in calipers.



- 1 Hose
- 2 Brake caliper/steering knuckle retaining screws
- 3 Brake caliper
- 4 Pipe
- 5 Hose fitting/bracket retaining nut
- 6 Bracket

5. If necessary, replace brake caliper bellows. To remove, take off retaining ring ② and slide off bellows ①.



- 1 Bellows
- 2 Retaining ring

Inspection

Clean all parts.

CAUTION:

- With pads removed do not depress brake pedal to prevent piston ejection from housing in caliper body.
- Replace pads on both calipers using genuine spare parts.
- Do not lubricate pad seats in contact with brake caliper.
- Partially draw brake fluid from reservoir using a syringe to prevent brake fluid overflow when moving pistons backward.
- Prior to disassembling pads which do not need replacing, apply reference marks to facilitate subsequent assembly.

7. Proceed in the reverse order for assembling.
8. Top up reservoir with the recommended brake fluid (ATE Blau S; AGIP F1 Brake Fluid Super HD; IP Auto Fluid FR).

BRAKE CALIPER

Removal

1. Using a syringe, draw brake fluid from reservoir.
2. Remove pads as per "Pad Replacement", apply suitable reference marks to facilitate subsequent assembly.
3. Back off pipe fitting ④, disconnect from hose fitting ① and plug.
4. Back off screws ② and remove caliper ③ and bracket ⑥.

CAUTION:

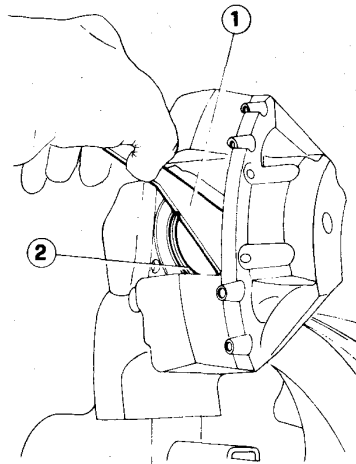
Do not use mineral oil base detergents or metallic tools.

FRONT AND REAR BRAKES

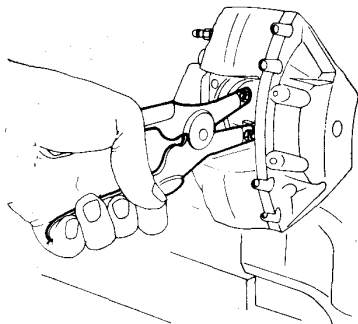
Check each component for wear or damage and replace if necessary. Always replace bellows and associated retaining rings.

Installation

1. Install dust bellows (if previously removed) applying the recommended grease (ATE Bremszylinder Pasta) and secure by means of retaining rings.
2. On Ate brake caliper, check brake actuating piston position ② using a 20° angle gauge ①; if piston is not correctly positioned rotate piston using suitable pliers.



1 Gauge
2 Piston



CAUTION:

Brake calipers are not interchangeable as bleed fitting must be at the top on both calipers.

3. Install adopting a reversal of the removal sequence and adhering to the instructions given below.

- Check that pad thickness is correct (see: Inspection Specifications - Checks and Adjustments).
- If the same pads are installed, align the marks applied on removal.
- Adhere to the following tightening torques.

T : Tightening torques

Brake caliper to steering knuckle screws

74 to 83 N · m
(7.5 to 8.5 kg · m)
(54.6 to 61.2 ft · lb)

Pipe fittings

10 to 12 N · m
(1 to 1.2 kg · m)
(7.4 to 8.9 ft · lb)

- Fill reservoir with the recommended fluid (ATE Blau S; AGIP F1 Brake Fluid Super HD; IP Auto Fluid FR).
- Bleed brake system (see Brake System Bleeding).

BRAKE DISC

Removal

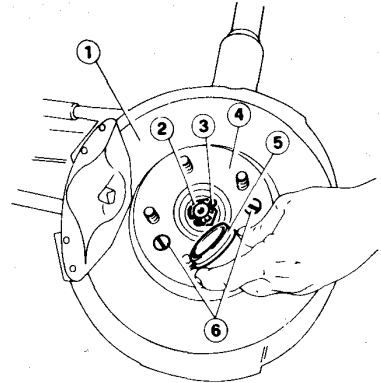
1. Remove pads as per "Pad Replacement" applying suitable reference marks to facilitate subsequent installation.
2. Back off two brake caliper/steering knuckle screws without disconnecting from system. Secure brake caliper to one suspension link.

CAUTION:

Non ventilated brake disc may be removed without removing brake caliper.

3. Remove cover ⑤.
4. Remove cotter ③, back off nut ② and screws ⑥.

5. Remove hub ④ and brake disc ①.



1 Brake disc
2 Wheel hub nut
3 Cotter
4 Wheel hub
5 Wheel hub nut cap
6 Wheel hub/brake disc screws

Inspection

1. Clean brake discs and check that working surfaces are free from score marks or porosity. Replace or grind as necessary.
2. Should working surfaces require grinding, the following instructions should be adhered to.
 - a. Always grind off the same amount of material on both surfaces.
 - b. Dimensions and tolerances as per "Inspection Specifications", "Checks and Adjustments" are mandatory.

Installation

Install adopting a reversal of the removal sequence and adhering to the instructions given below.

- Lubricate wheel hub nut thread using the recommended grease (AGIP F1 Grease 33 FD; IP Autogrease FD).
- Adhere to the following tightening torque.

T : Tightening torque

Brake caliper to steering knuckle screws

74 to 83 N · m
(7.5 to 8.5 kg · m)
(54.6 to 61.2 ft · lb)

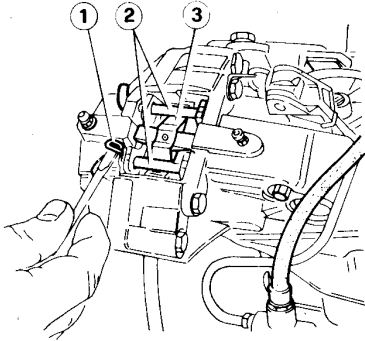
FRONT AND REAR BRAKES

- Adjust wheel bearings (see Group 00 - Wheel Bearing Adjustment).

REAR BRAKES

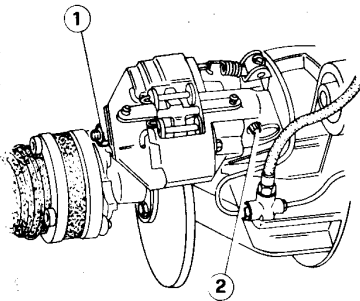
PAD REPLACEMENT

1. Raise car on a lift.
2. Remove retaining springs ①, pad retaining pins ② and cross spring ③.

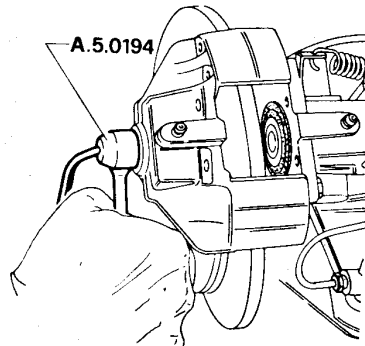


- 1 Retaining spring
- 2 Pad retaining pins
- 3 Cross spring

3. Push back pistons acting on screw ① using wrench A.5.0194 for outer piston and on screw ② for inner piston.



- 1 Outer piston adjusting screw
- 2 Inner piston adjusting screw



4. On cars provided with pad wear indicator, disconnect associated electrical connection.
5. Remove brake pads upward.

CAUTION:

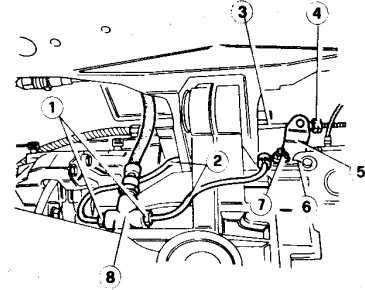
- With pads removed do not depress brake pedal to prevent piston ejection from housing in caliper body.
- Replace pads on both calipers using genuine spare parts.
- Do not lubricate pad seats in contact with brake caliper.
- Partially draw brake fluid from reservoir using a syringe to prevent brake fluid overflow when moving pistons backward.
- Install pads positioning arrow in the direction of forward vehicle travel.

6. Proceed in the reverse order for assembling.
7. Top up reservoir with the recommended brake fluid (ATE Blau S; AGIP F1 Brake Fluid Super HD; IP Auto Fluid FR).
8. Adjust pad clearance as per "Pad Clearance Adjustment".
9. Adjust hand brake as per "Hand Brake - Hand Brake Lever Travel Adjustment".

BRAKE CALIPER

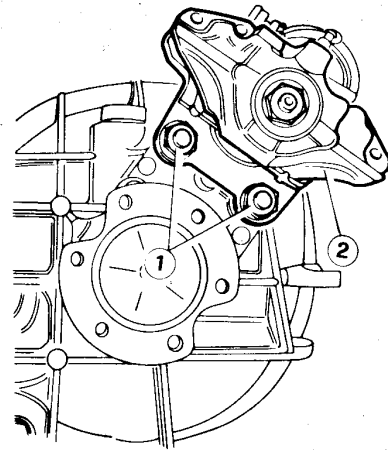
Removal

1. Using a syringe, draw brake fluid from reservoir.
2. Remove pads as per "Pad Replacement".
3. Back off fittings ① and disconnect piping ② from fitting ⑧.
4. Back off nut ⑦ and disconnect pipe from bracket ⑥.
5. Back off nuts ④ and disconnect cable ③ from levers.



- 1 Piping three-way connection fittings
- 2 Brake caliper supply pipes
- 3 Hand brake control cable
- 4 Hand brake adjusting and retaining nuts
- 5 Brake pad control lever
- 6 Pipe bracket
- 7 Nut
- 8 3-way connection

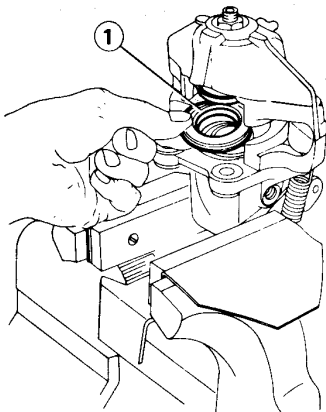
6. Remove brake discs (see: Brake Disc - Removal).
7. Back off nuts ① and remove brake caliper ②.



- 1 Brake caliper - gear box - differential housing retaining nuts
- 2 Brake caliper

8. If necessary, replace brake caliper bellows. To remove take off retaining ring and slide off bellows ①.

FRONT AND REAR BRAKES



1 Bellows

Inspection

Clean all parts.

WARNING:

Do not use mineral oil base detergents or metallic tools.

Check each component for wear or damage and replace if necessary. Always replace bellows and associated retaining rings.

Installation

Install adopting a reversal of the removal sequence and adhering to the instructions given below.

- Check that pad thickness is correct (see: Inspection Specifications - Check and Adjustments).
- Adhere to the following tightening torques.

T : Tightening torques

Brake caliper/gearbox - differential housing retaining nuts

46 to 52 N·m
(4.7 to 5.3 kg·m)
(33.9 to 38.4 ft·lb)

Pipe fittings

10 to 12 N·m
(1 to 1.2 kg·m)
(7.4 to 8.9 ft·lb)

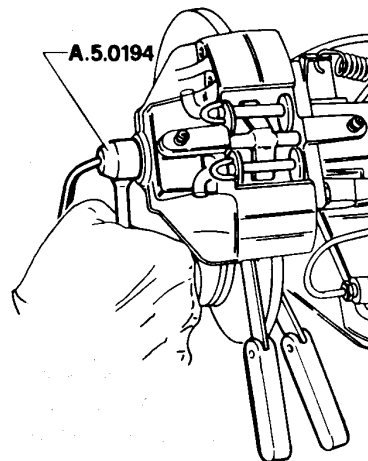
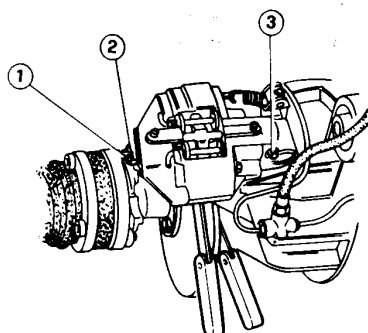
- Top up reservoir with the recommended fluid (ATE Blau S; AGIP Brake Fluid HD; IP Auto Fluid FR).
- Adjust pad clearance as per "Pad Clearance Adjustment".

- Adjust hand brake as per "Hand Brake - Control Cable Adjustment".
- Bleed brake system (see Brake System Bleeding).

Pad Clearance Adjustment

1. Insert two 0.25 mm (0.01 in) feeler gauges between the disc and the pads.
2. Remove the dust cover and unscrew the lock nut ② by means of the A.5.0194 tool.
3. Acting on the pin ① and the screw ③ bring the pads into a light contact with the two feeler gauges; in this way, the prefixed clearance is reset.

Pad clearance: 0.25 mm (0.01 in)



- 1 Outer pad adjusting pin
- 2 Adjusting pin locknut
- 3 Inner pad adjusting screw

4. Fasten the lock nut at the prescribed driving torque and refit the dust cover.

T : Driving torque of the adjustment pin - fixing locknut:

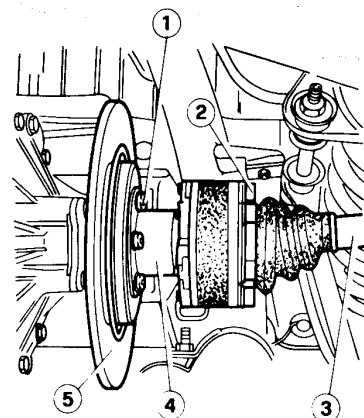
7 to 10 N·m
(0.7 to 1 Kg·m)
(5.2 to 7.4 ft·lb)

5. Draw back the two feeler gauges.
6. Restore the breaking condition by repeatedly acting on the brake pedal.

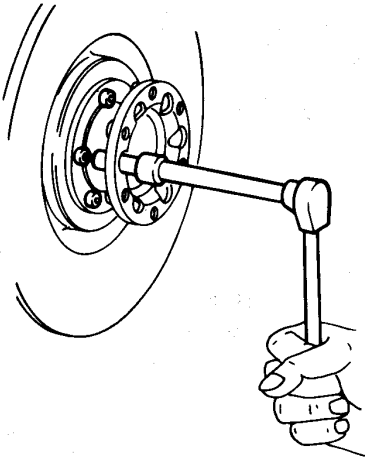
BRAKE DISC

Removal

1. Cars equipped with spacer (refer to Unit 00 - Use of Units in Car). Back off screw ② and disconnect shaft ③, back off screws ① and disconnect spacers ④ from inner shafts.



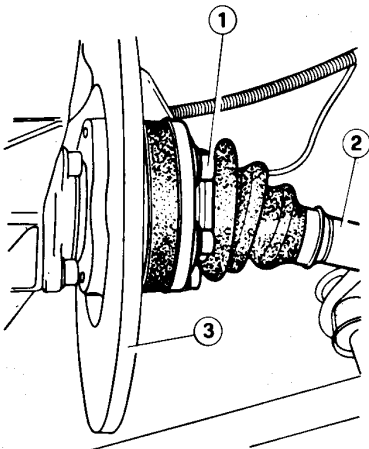
FRONT AND REAR BRAKES



- 1 Spacer/inner shaft screws
- 2 Spacer/outer shaft screws
- 3 Outer shaft
- 4 Spacer
- 5 Brake disc

Other models.

Back off screws ① and disconnect outer shafts ② from inner shafts.



- 1 Outer/inner shaft screws
- 2 Shaft
- 3 Brake disc

2. Hold brake disc and remove pads as per "Pad Replacement".
3. Remove brake disc.

Inspection

1. Clean brake discs and check that working surfaces are free from score marks or porosity. Replace or grind as necessary.

2. Should working surfaces require grinding, the following instructions should be adhered to.

- a. Always grind off the same amount of material on both surfaces.
- b. Dimensions and tolerances as per "Inspection Specifications", "Checks and Adjustments" are mandatory.

Installation

Install adopting a reversal of the removal sequence and adhering to the instructions given below.

- Adhere to the following tightening torques.

Cars equipped with spacer.

Ⓣ : Tightening torques

Screw retaining spacer and brake disc to inner shaft (use ISECO Molykote BR2 grease)
 49 to 54 N·m
 (5 to 5.5 kg·m)
 (36.1 to 39.8 ft·lb)

Spacer/outer shaft retaining screws
 44 to 54 N·m
 (4.5 to 5.5 kg·m)
 (32.5 to 39.8 ft·lb)

Other models

Ⓣ : Tightening torque

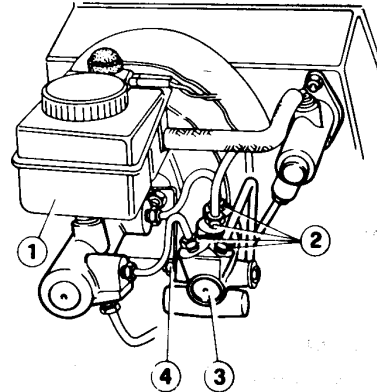
Screw retaining spacer and brake disc to inner shaft (use ISECO Molykote BR2 grease)
 29 to 35 N·m
 (3 to 3.6 kg·m)
 (21.4 to 25.8 ft·lb)

- Top up reservoir with the recommended fluid (ATE Blau S; AGIP Brake Fluid Super HD; IP Auto Fluid FR).
- Adjust pad clearance as per "Pad Clearance Adjustment".
- Adjust hand brake as per "Hand Brake - Control Cable Adjustment".

LOAD PROPORTIONING VALVE

Removal

1. Remove reservoir plug and filter and draw fluid using a syringe.
2. Disconnect 4 fittings ② from load proportioning valve ③
3. Back off screw ④ with associated washer and retrieve load proportioning valve ③.



- 1 Reservoir
- 2 Pipes/load proportioning valve fittings
- 3 Load proportioning valve
- 4 Load proportioning valve/bracket retaining screw

WARNING:

Do not disassemble load proportioning valve.

Installation

Install adopting a reversal of the removal sequence and adhering to the instructions given below.

- When connecting pipes to load proportioning valve, match arrows on valve body.
- Adhere to the following tightening torque.

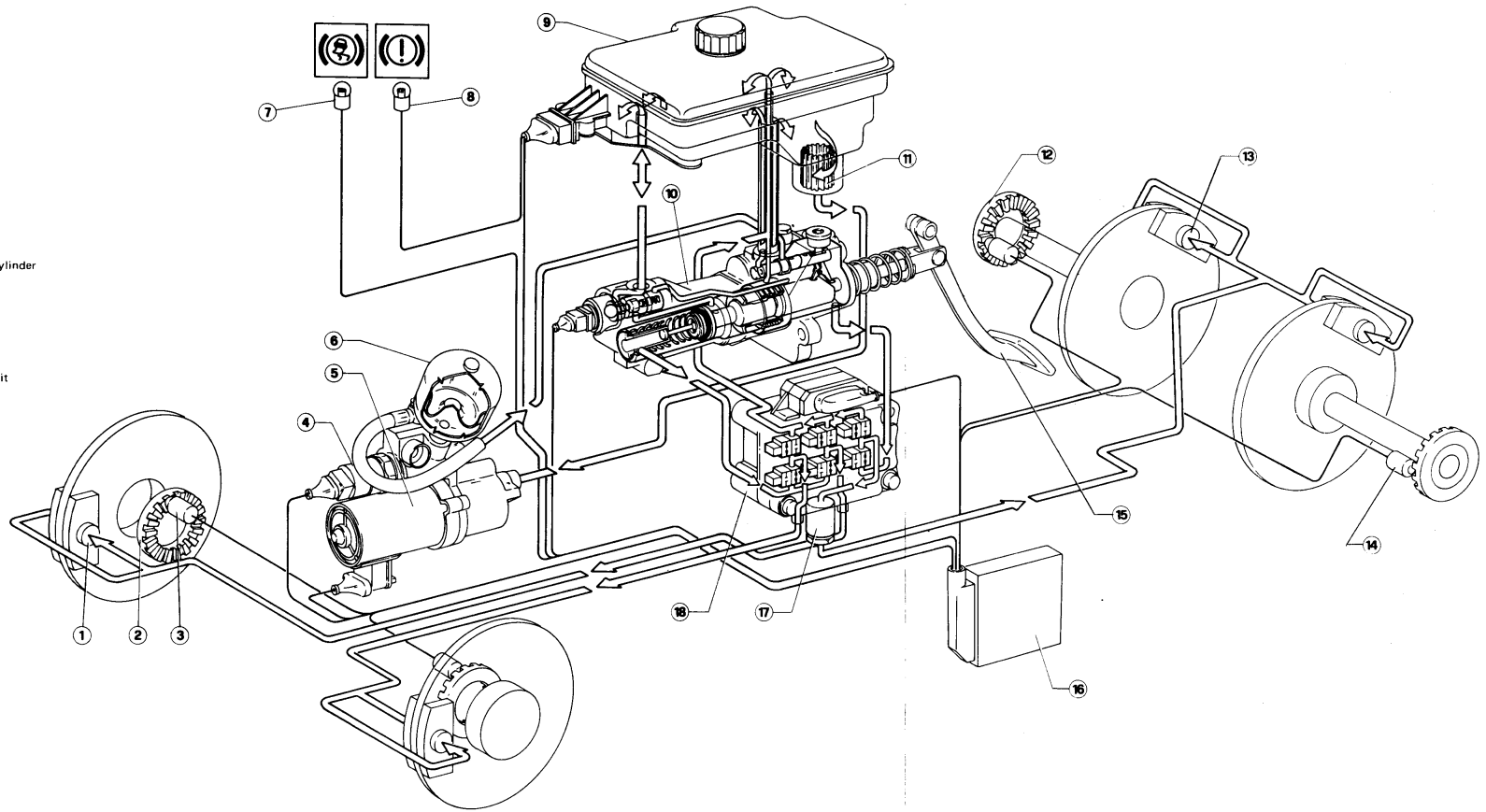
Ⓣ : Tightening torque

Pipes/load proportioning valve fittings
 10 to 12 N·m
 (1 to 1.2 kg·m)
 (7.4 to 8.9 ft·lb)

- Fill reservoir with the recommended fluid (ATE Blau S; AGIP Brake Fluid Super HD; IP Auto Fluid FR).
- Bleed brake system (see Brake System Bleeding).

(ABS) MARK II BRAKING SYSTEM WITH
WHEEL ANTILOCK

- 1 Front brake caliper
- 2 Front impulse emitting wheel
- 3 Front impulse pick-up
- 4 Min./max. pressure switch
- 5 Electropump unit
- 6 Accumulator
- 7 ABS MARK II system warning light
(antilock system failure)
- 8 Brake fluid minimum level and brake pad
wear warning light on A.R. CONTROL
- 9 Brake fluid tank
- 10 Brake master cylinder and hydraulic servo cylinder
- 11 Filter
- 12 Rear impulse emitting wheel
- 13 Rear brake caliper
- 14 Rear impulse pick-up
- 15 Brake pedal
- 16 Antilock system control unit
- 17 Brake pressure adjusting valve
- 18 Braking pressure modulating electrovalve unit



FRONT AND REAR BRAKES

- The (ABS) MARK II wheel antilock system is a sophisticated computerized system designed to increase driving safety and in fact constitutes the ultimate technical guarantee as regards braking.
- An impulse pick-up (3) is assembled on each wheel and records the r.p.m. by means of an impulse emitting wheel (2) and sends it to the electronic unit (16) for data processing. The electronic unit takes direct action, if one or more wheels tend to lock, by means of electrovalves (18), adjusting the braking pressure on each wheel to prevent it locking. The electronic unit thus "takes" the pressure from the brake caliper of the wheel that is locking to "return" it only when locking no longer occurs; this "giving and taking" of pressure takes place in very short intervals of time and continues until braking ends that is of course if locking persists and independent of the pressure exerted on the brake pedal.
- On a dry, or even wet, surface the ABS system may not even go into operation for thousands of kilometers. However, in the event of sudden braking due to an unexpected obstacle or immediate danger when a traditional braking system would tend to lock, the ABS system intervenes and ensures that the "correct" braking force is applied at all times to each wheel thus allowing the vehicle to stop in the **shortest possible distance** compatible with the road surface.
- Other important advantages offered by the ABS system are:
 - **Complete vehicle control:** the driver at the wheel of a vehicle equipped with the ABS system can avoid any obstacles by turning the steering wheel while the driver of a vehicle without the ABS system, in the event of wheel locking, would not be able to carry out the same manoeuvre in as much as the vehicle goes out of control and may skid dangerously.
 - **More even tyre wear:** as the wheels never lock; the tyres will

never suffer damage due to tyre abrasion on the asphalt.

- The (ABS) MARK II wheel antilock braking system is equipped with a **hydraulic servobrake**; an electropump unit (5) with accumulator (6) sucks in oil directly from the tank (9) and, having taken it to a pressure of 140 thru 180 bar (13970 thru 17960 KPa; 142.5 thru 183.2 kg/cm²; 2025.67 thru 2604.42 p.s.i.), then sends it to the hydraulic servo cylinder. During normal braking, that is when no wheels lock and therefore without antilock system activation, the hydraulic servocylinder sends oil under pressure to the brake calipers of the rear wheels only while those of the front wheels are supplied directly by the brake master cylinder (see: Operating principle).
- The instances where a high probability, of ABS system activation exists are examined hereafter.

Braking on a wet road surface

On a wet road surface, the (ABS) MARK II wheel antilock system guarantees considerable reductions in stopping distances and is particularly advantageous in the event of **ACQUAPLANING** (at a certain vehicle speed the water can no longer be disposed of by the tread grooves and a film of water consequently forms between the wheel and the road surface, causing the tyre to lose its grip and impeding it from absorbing braking and steering impacts). If a vehicle not equipped with the ABS system is running at such a speed that this phenomenon has not yet arisen and wheels lock during braking the outrush of water from the tread grooves is impeded and the phenomenon of **acquaplaning** may thus occur. The ABS system, on the other hand, removes this danger because by preventing wheel lock from occurring, it allows the disposal of water via the tread grooves to continue and the tyre remains in contact with the road surface.

If, however, the phenomenon of aquaplaning has already begun, the ABS system, although intervening, is no longer able to assure efficacious control of the vehicle during braking.

Braking on a slippery road surface

The ABS system may activate more frequently on a slippery road surface since the tyre grip limit is reached immediately subsequent to brake activation.

If the vehicle is to be stopped in the shortest distance possible, the brake pedal may be pressed down hard to solicit the activation of the ABS on all wheels.

Braking on loose road surface

If, on the other hand the road surface is not compact (sand, gravel, soft snow or mud), vehicles equipped with the ABS system can stop in greater distances compared to vehicles without locked wheels, in fact, penetrate deeper into the ground and allow increased tyre function surface, thus guaranteeing a shorter stopping distance; this notwithstanding, the ABS system is most useful on this type of surface because it still assures complete handling of the vehicle.

Braking on different holding coefficients

It is possible for the wheels of the same axis to be running on surfaces which have varying holding coefficients (for example, on ice at the right and dry asphalt at the left).

During braking the vehicle will tend to turn towards the dry asphalt, that is towards the side with the greater holding coefficient due to the arising of a swaying torque as compared to the vertical axis of the vehicle.

This phenomenon arises both on vehicles equipped with the ABS system and those with a traditional braking system; whereas for the latter there is no remedy, in the former steering is by no means jeopardized and the driver may compensate for the swaying torque by countersteering the vehicle and thus keeping it straight.

Traffic conditions permitting, on these occasions it is wise not to press the brake too hard so that the driver can apply the adequate steering reaction necessary.

WARNING:

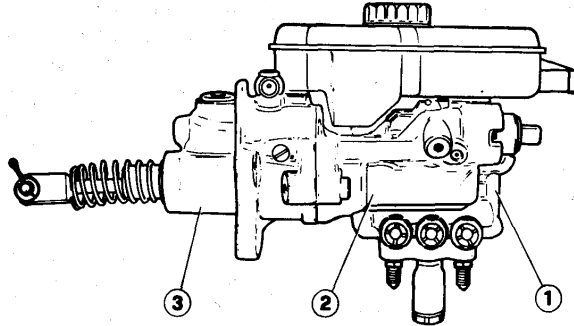
Under no circumstances should the (ABS) MARK II antilock system induce the driver to drive dangerously or take risks.

For the safety of the driver and others it is always necessary to observe speed limits, safe distances and to maintain a prudent approach to driving especially when road surface conditions so demand.

(ABS) MARK II WHEEL ANTILOCK SYSTEM COMPONENTS

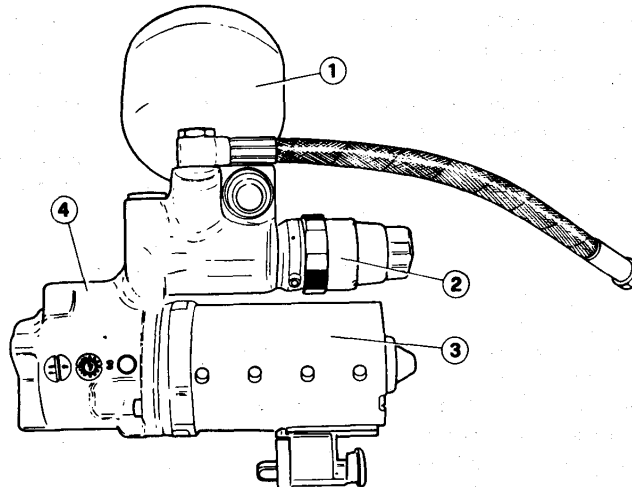
The ABS system installed by Alfa Romeo on some of its cars (see: Group 00- Use of Units in Cars) is manufactured by ALFRED TEVES GmbH (ATE): the system components are:

Hydraulic assembly: comprising a high pressure hydraulic servocylinder (3), a master cylinder (2) and braking pressure modulating electrovalves (1).



- 1 Braking pressure modulating electrovalve unit
- 2 Brake master cylinder
- 3 Hydraulic servo cylinder

Electropump unit: comprising a pump (4) activated by an electric motor (3), an accumulator (1) (containing the brake fluid at a pressure between 140 and 180 bar (13970 thru 17960 KPa; 142.5 thru 183.2 Kg/cm²; 2025.67 thru 2604.42 p.s.i.)) and a pressure switch (2).



- 1 Accumulator
- 2 Pressure switch
- 3 Electric motor
- 4 Pump

FRONT AND REAR BRAKES

Impulse pick-ups and impulse emitting wheels: assembled one on each wheel to detect r.p.m..

Electronic unit: this represents the intelligent unit of the entire system in that it is capable of processing all the input signals deriving from the impulse pick-ups

and supplying in output the control signals to the braking pressure modulating electrovalves.

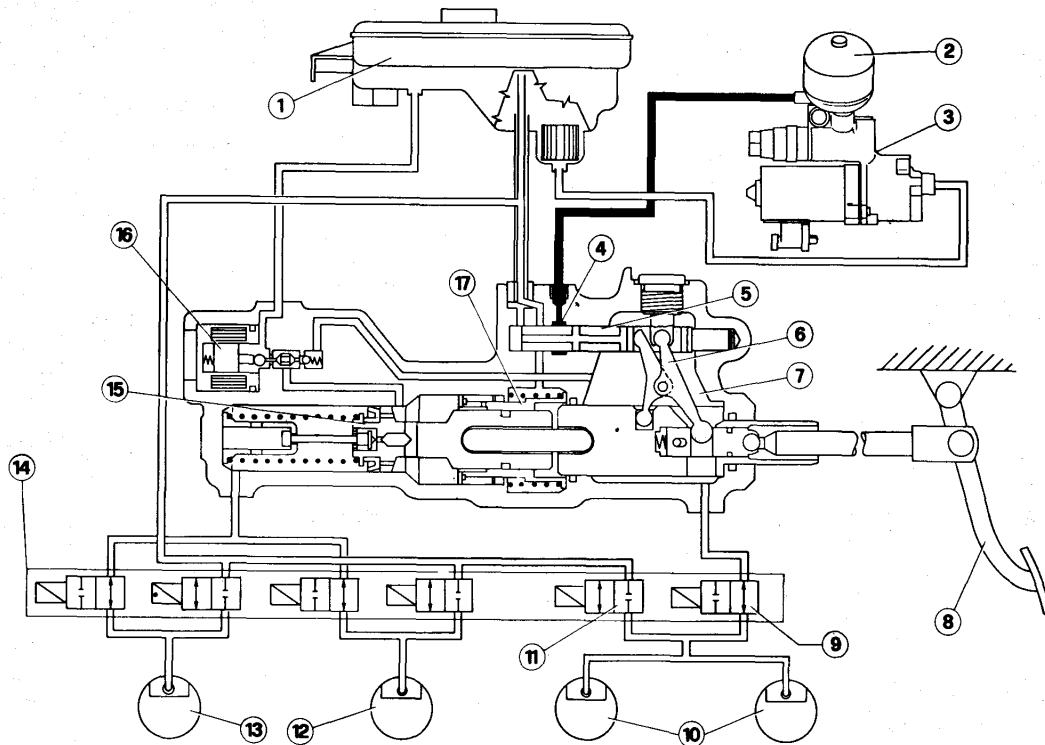
ABS MARK II system warning light (⚠) : assembled on the instrument panel, it notifies the driver of ABS system auto cut

off when the electronic unit has encountered a failure (which may only be temporary).

With the warning light (⚠) illuminated but "brake fluid minimum level and pad wear" on the A.R. CONTROL extinguished it is still possible to carry out normal servoassisted braking actions.

OPERATING PRINCIPLE

BRAKE NON APPLIED



■ Accumulator pressure

□ Connection to tank

- | | |
|--|--|
| 1 Brake fluid tank | 10 Rear wheels |
| 2 Accumulator | 11 Drain electrovalve, normally closed |
| 3 Electropump unit | 12 R.H. front wheel |
| 4 Chamber with high pressure brake fluid | 13 L.H. front wheel |
| 5 Adjusting valve | 14 Braking pressure modulation electrovalves |
| 6 Leverage | 15 Brake master cylinder |
| 7 Hydraulic servo cylinder | 16 Main electrovalve |
| 8 Brake pedal | 17 Positioning bush |
| 9 Load electrovalve, normally open | |

FRONT AND REAR BRAKES

The braking circuit is subdivided into three sections:

- Front wheels: controlled by separate hydraulic circuits.
- Rear wheels: controlled by a single hydraulic circuit.

The ABS system is thus based on **INDIVIDUAL ADJUSTMENT** of the front wheels and according to the **SELECT-LOW** principle for the rear wheels. The term select-low means that the electronic unit processes the signals coming from the

impulse pick-ups of the rear wheels separately and carries out the same adjustment on both wheels according to which one tends to lock.

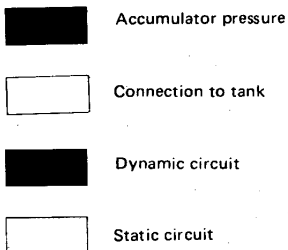
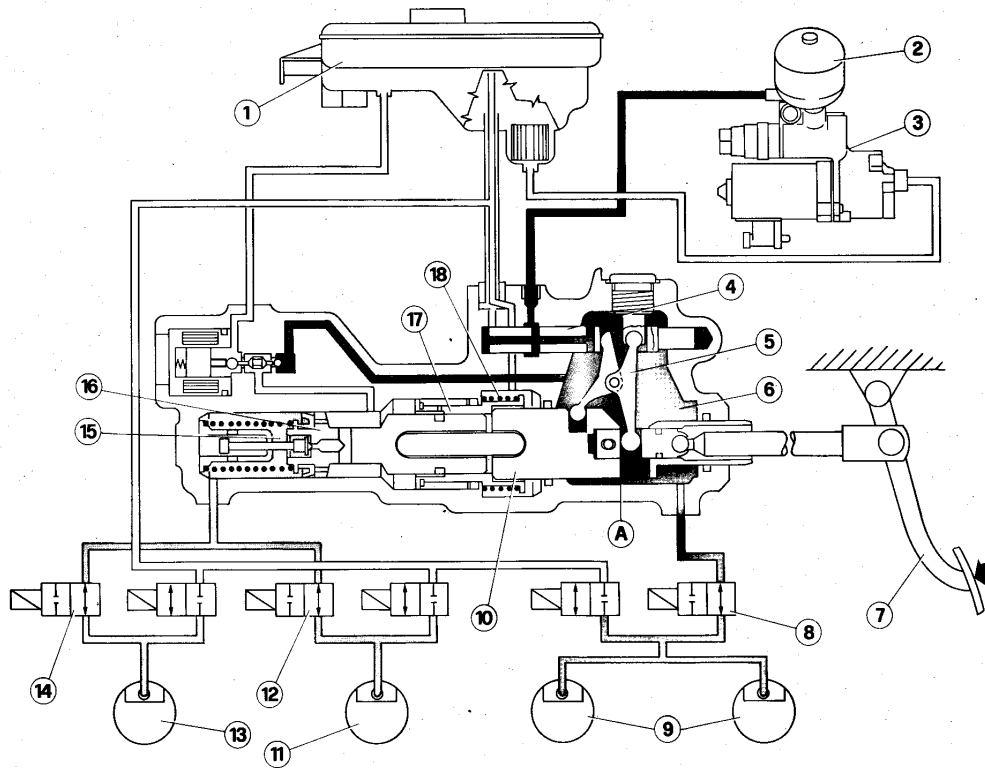
Bear in mind that brake fluid is always present in the accumulator (2) at a pressure between 140 and 180 bar (13970 thru 17960 KPa; 142.5 thru 183.2 Kg/cm²; 2025.67 thru 2604.42 p.s.i.) and that this high pressure is exerted right up to the chamber (4) of the adjusting valve (5).

If braking is not in progress none of the other areas are under pressure (*).

(* Prior to carrying out repair work involving the removal of system components, it is necessary to discharge braking system pressure as follows:

- remove the ignition key.
- press the brake pedal down repeatedly (at least 20 times) until it sticks.

BRAKING WITHOUT ANTILOCK SYSTEM ACTIVATION



- | | |
|------------------------------------|-------------------------------------|
| 1 Brake fluid tank | 10 Brake piston |
| 2 Accumulator | 11 R.H. front wheel |
| 3 Electropump unit | 12 Load electrovalve, normally open |
| 4 Adjusting valve | 13 L.H. front wheel |
| 5 Leverage | 14 Load electrovalve, normally open |
| 6 Hydraulic servo cylinder | 15 Cylinder |
| 7 Brake pedal | 16 Brake master cylinder |
| 8 Load electrovalve, normally open | 17 Positioning bush |
| 9 Rear wheels | 18 Spring |

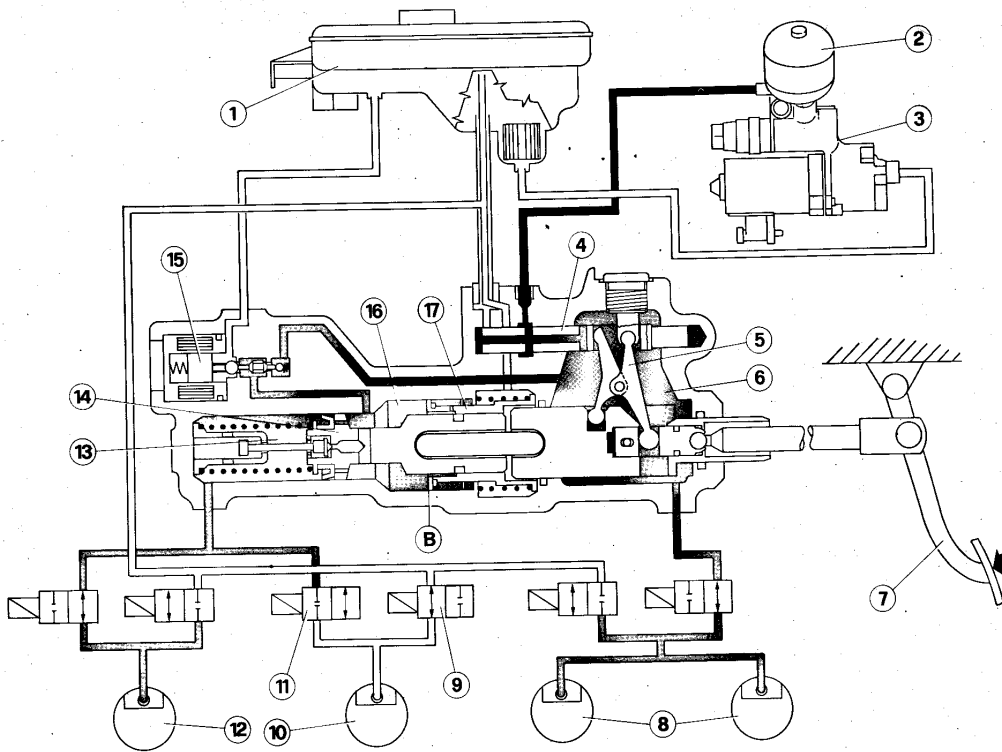
FRONT AND REAR BRAKES

During normal braking the ABS control system is not activated in as much as none of the wheels decelerates at such a rate as to be interpreted by the electronic unit as a tendency to lock; braking therefore occurs as a normal servo assisted action. Each of the three hydraulic circuits (two front and a single rear one) is controlled by means of two electrovalves: a load one which is normally open and a drain one, normally closed. On activation of the brake pedal, the adjusting valve (4) opens by means of the

leverage (5) thus generating in the hydraulic servo cylinder (6) a pressure which is proportional to the force applied to the brake pedal. This pressure is used directly to activate the rear axis brakes (DYNAMIC CIRCUIT) by means of the load electrovalve (8), normally open. Moreover, by acting on surface (A) of brake pedal (10), this pressure produces a force which goes to the aid of that exerted by the driver on the brake pedal; these two forces simultaneously activate the master cylinder

(16) and a further braking pressure is created, in the cylinder (15), which is transmitted to the front brake calipers (STATIC CIRCUIT) by means of load electrovalves (12) and (14), normally open. By further increasing pressure on the brake pedal, piston (10) reaches positioning bush (17), pulling it into motion. This does not affect the activation however in as much as the pressure of the spring (18) against the bushing is very slight and therefore imperceptible at the pedal.

BRAKING WITH ACTIVATION OF THE ANTILOCK SYSTEM



■ Accumulator pressure

□ Connection to tank

■ Dynamic and static circuits connected

- | | |
|---------------------------------------|--|
| 1 Brake fluid tank | 10 R.H. front wheel |
| 2 Accumulator | 11 Load electrovalve, normally open |
| 3 Electropump unit | 12 L.H. front wheel |
| 4 Adjusting valve | 13 Cylinder |
| 5 Leverage | 14 Brake master cylinder |
| 6 Hydraulic servo cylinder | 15 Main electrovalve |
| 7 Brake pedal | 16 Chamber behind master cylinder gasket |
| 8 Rear wheels | 17 Positioning bush |
| 9 Drain electrovalve, normally closed | |

If, during activation of the braking system, a wheel, the front RH (10) for example, tends to lock, then the associated loading electrovalve (11) closes and the drain one (9) opens.

Following this the pressure on the brake caliper decreases, on account of the return circuit to the brake fluid tank (1) being opened.

At the same time the main electrovalve (15) is energized and the dynamic circuit (rear) is connected to the static one (front).

When the wheel being braked starts to regain speed, following the decrease in pressure at the calipers, the drain electrovalve is closed and the loading one opened again. In this way, pressure is gradually restored to the brake calipers by means of the main electrovalve (15) which connects the hydraulic servocylinder (6), to the cylinder (13), until the next tendency to lock is detected, at which point the cycle repeats itself.

During ABS control, the high pressure acting on the surface (B) of the positioning bush (17) restricts brake pedal travel. This means that, even in the event of a failure during ABS system operation, there is always a certain volume of reserve fluid. ABS control concluded (during or on termination of the braking action), the main electrovalve is de-activated, thus severing the connection between the hydraulic servocylinder and master cylinder.

Besides this, the chamber (16), at the rear of the master cylinder gasket, is reconnected to the tank and the positioning bush (17) de-activated.

Normal brake activation is thus restored.

BRAKE SYSTEM BLEEDING

WARNING:

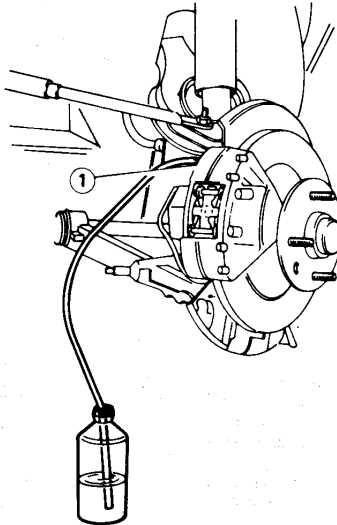
- Check that fluid level does not fall below minimum during bleeding, especially when working on the rear calipers as the high pressure oil tends to spurt.
- Do not reuse fluid after draining.
- Brake fluid is harmful to paintwork: avoid contact.

- Do not carry out this operation simultaneously on front and rear brake calipers, but first on one side, then on the other.
- The electropump should never idle as this may cause damage; ensure that there is sufficient fluid in the tank.

CAUTION:

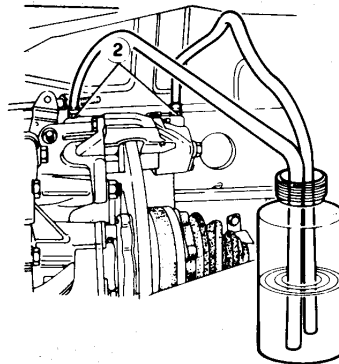
The system contains pressurized fluid; WORK WITH CAUTION.

- Place car on a lift.
- If necessary, fill up tanks with the recommended fluid (ATE "S" or AGIP Brake Fluid Super or IP Auto Fluid FR).
- Raise car and remove dust excluders from brake calipers bleed points.
- Front brake system bleeding.
 - Connect a flexible hose to bleed screw (1) and dip the other hose end in a container filled with the recommended brake fluid.



1 Front brake bleed screw

- Slacken bleed screw and pump the brake pedal; allow brake pedal to return and pause a few seconds between each stroke and the next; keep pumping until issuing fluid is free from air bubbles. Tighten bleed screw and remove hose.
 - Repeat steps a. and b. on the other front caliper.
5. Rear brake system bleeding.
- Turn key to IGNITION, check electropump activation and await disconnection.
 - Connect a flexible hose to bleed screws (2) and dip the other hose ends in a container filled with the recommended brake fluid.



2 Rear brake bleed screws

- Slacken bleed screws and keep brake pedal slightly pressed until issuing fluid is free from bubbles. Tighten bleed screws and remove hoses.
 - Repeat the operations described at steps b. and c. on the other two rear bleed screws.
6. Reinstall dust excluders and top up level in tank.
7. If bleeding has been carried out correctly, no sponginess should be felt after initial free travel; contrarily, repeat bleeding.

FRONT AND REAR BRAKES

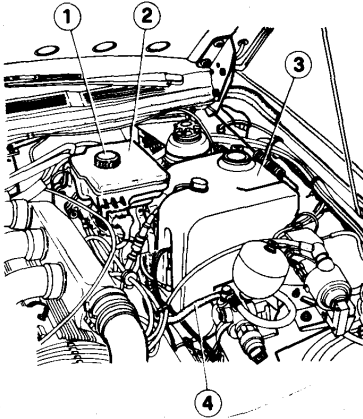
PEDALS

REMOVAL

CAUTION:

Prior to removing, discharge brake system pressure; with the ignition key removed, press the brake pedal down hard repeatedly (at least 20 times) until it sticks.

1. Disconnect the battery.
2. Remove windscreen washing liquid container (3) to create greater working space.
3. Drain the clutch and brake fluid from the tank thus.
 - a. Remove plug (1) from tank (2).

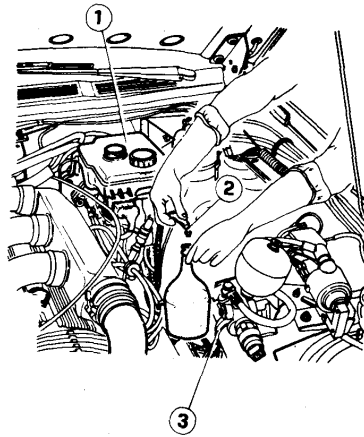


- 1 Plug
- 2 Clutch and brake fluid tank
- 3 Windscreen washing liquid container
- 4 Electropump feed hose

- b. Disconnect the feed hose (2), from the electropump (3) and collect fluid directly beneath the tank.

WARNING:

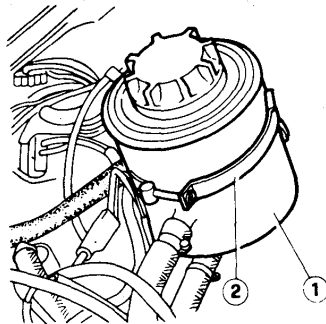
Clutch and brake fluid is corrosive; protect paintwork adequately.



- 1 Clutch and brake fluid tank
- 2 Electropump feed hose
- 3 Electropump

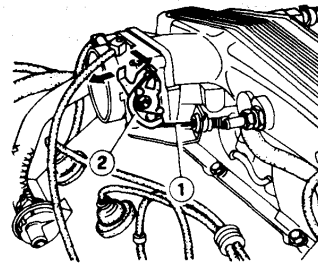
4. Turbodiesel vehicles only.

Loosen the clip (2) securing the power steering fluid tank (1) and move the latter sideways.



- 1 Power steering fluid tank
- 2 Clip

5. Vehicles on which accelerator control cable passes through the pedal assembly only. Detach the pawl (1) from the accelerator control lever (2) then slip out the cable complete with sheath from under the plenum chamber and release it from the sheath fastener on the pedal assembly.

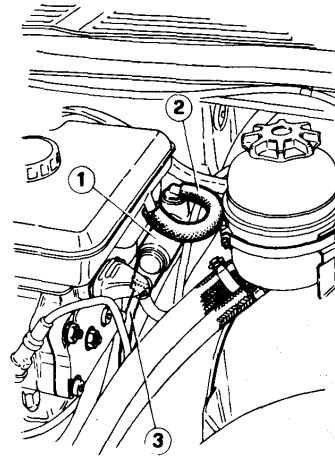


- 1 Accelerator control cable
- 2 Accelerator control lever

6. Disconnect pipe union (3) and supply duct (2) from the clutch master cylinder.

WARNING:

Clutch and brake fluid is corrosive; protect paintwork adequately.



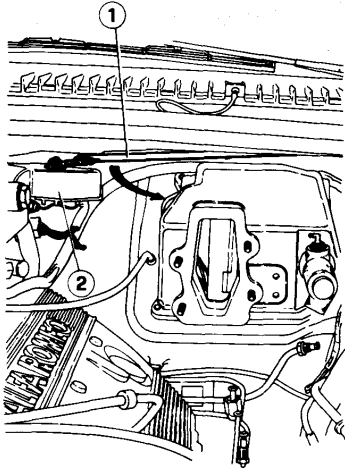
- 1 Clutch master cylinder
- 2 Clutch master cylinder feed duct
- 3 Clutch system pipe

FRONT AND REAR BRAKES

7. Carry out the operations described at steps 4., 5., 6., 7., 8. and 9. - Hydraulic Assembly - Removal.

8. Six cylinder cars only.
Disconnect 5th and 6th cylinder spark plug cables; disconnect wiring harness from terminal board to permit pedal removal.

9. **Alfa 75** only.
Back off the nut and disconnect the lever ① from the motor ② then turn the lever as shown by the arrow to extract the pedal.

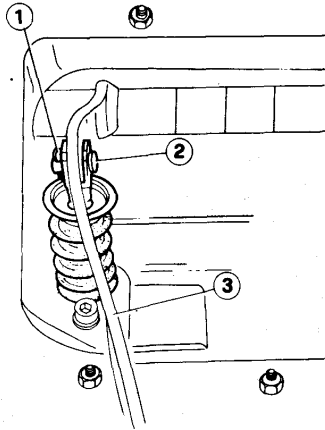


- 1 Windscreen wiper control lever
- 2 Windscreen wiper motor

10. Vehicles on which the accelerator control lever passes through the pedal assy.

Working from within the engine compartment, slip off the cable sheath from the previously disconnected accelerator cable.

11. Remove clutch pedal ③, cotter pin ① with washer and slide off pin ②.



- 1 Cotter pin
- 2 Pin
- 3 Clutch pedal

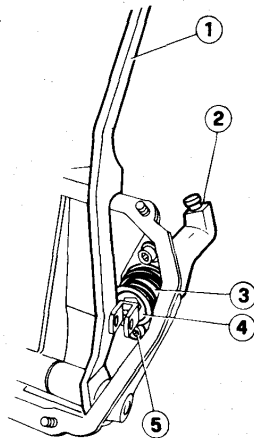
12. Back off nuts securing pedal assy to body.

13. Extract pedal assy from engine compartment.

DISASSEMBLY

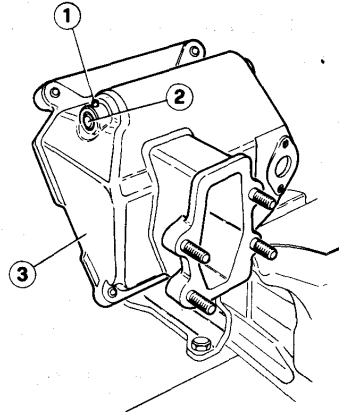
Disassemble pedal as follows:

1. Remove cup ④ and slip off return spring ③ of clutch pedal ①.
2. Back off and remove the two screws ⑤, securing the clutch master cylinder ② and take off pump.



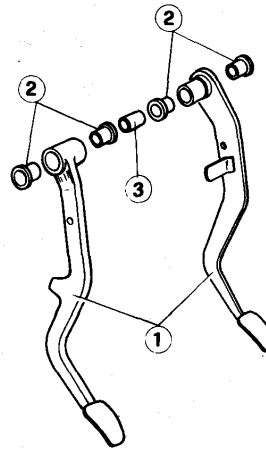
- 1 Clutch pedal
- 2 Clutch master cylinder
- 3 Return spring
- 4 Cup
- 5 Screw

3. Extract check pin ① and remove pedal pin ② from the pedal support ③.



- 1 Pin
- 2 Pedal pin
- 3 Pedal support

4. Disassemble the pedals ①, remove the bushings ② and keep the spacer ③.



- 1 Pedal
- 2 Bush
- 3 Spacer

FRONT AND REAR BRAKES

Inspection

1. Check bushings and associated housings on pedals, pin and spacer for wear and seizure, replacing as necessary.
2. Check return springs of clutch pedal for weakness, replacing as necessary.

ASSEMBLY

Assemble pedals in reverse order of removal, adhering to the instructions given below.

- Apply a film of the recommended grease (ISECO Molykote Longterm n. 2) to sliding parts.

- Install clutch pedal taper spring positioning larger dia end in contact with pedals.
- Lubricate pins connecting pedals - clutch master cylinder forks with recommended grease (AGIP Grease 15).

INSTALLATION

Install in reverse order of removal, adhering to the following instructions.

- Replace seal between pedal support and body if necessary.
- Observe the following tightening torque.

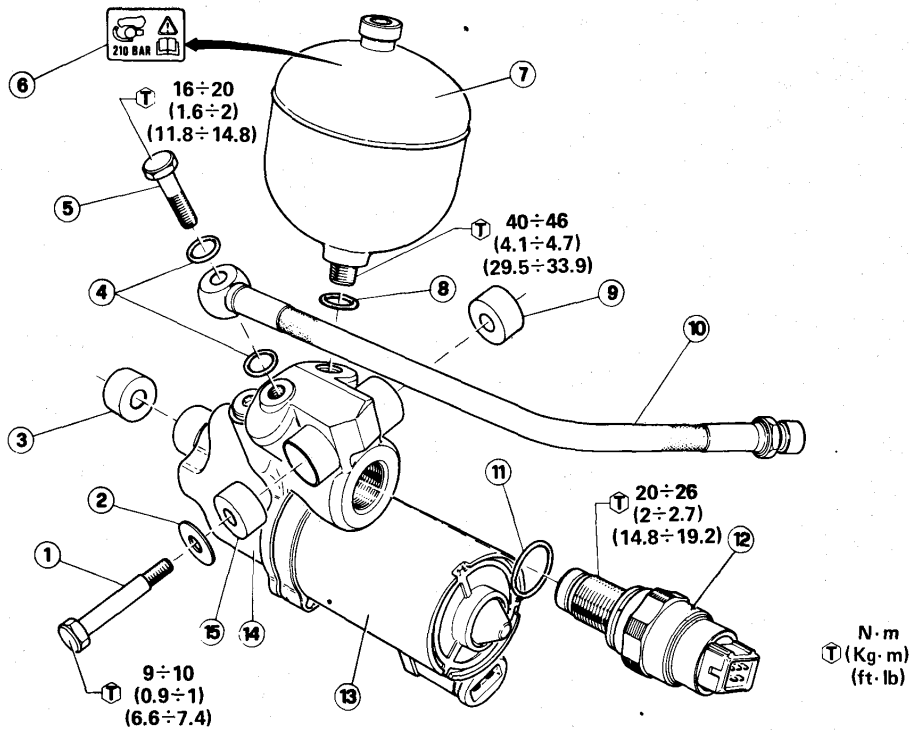
Tightening torque

Brake and clutch hydraulic system pipe fittings

10 thru 12 N·m
(1 thru 1.2 kg·m)
(7.4 thru 8.9 ft·lb)

- To install hydraulic assy to pedal assy follow steps 1 and 2 - Hydraulic Assy - Installation.
- Fill tank with recommended fluid (ATE Blau S; AGIP Brake Fluid Super; IP Auto Fluid FR).
- Bleed the brake system (see: (ABS) MARK II Braking System with Wheel Antilock - Brake System Bleeding) and clutch system (see: Group 12 - Clutch - Hydraulic System Bleeding).

ELECTROPUMP UNIT



- 1 Electropump unit - support securing screw
- 2 Washer
- 3 Spring bushing
- 4 O-Rings
- 5 Screw

- 6 Label
- 7 Accumulator
- 8 O-Ring
- 9 Spring bushing
- 10 Pressurized fluid feed hose

- 11 O-Ring
- 12 Pressure switch
- 13 Electric motor
- 14 Pump
- 15 Spring bushing

N·m
(Kg·m)
(ft·lb)

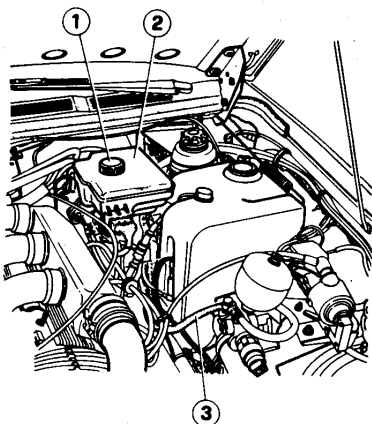
FRONT AND REAR BRAKES

REMOVAL

CAUTION:

Prior to removing the electropump unit it is necessary to discharge the braking system pressure; remove the ignition key and press the brake pedal right down repeatedly (at least 20 times) until it sticks.

1. Disconnect the battery.
2. Drain the brake and clutch fluid by operating as follows.
 - a. Remove plug ① from tank ②.

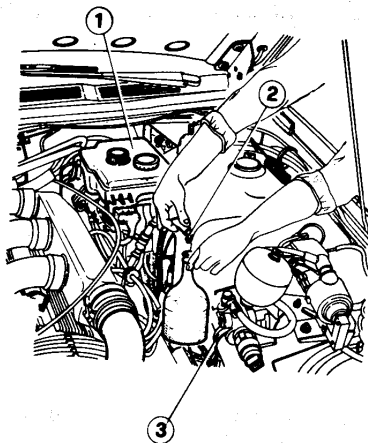


- 1 Plug
- 2 Clutch and brake fluid tank
- 3 Electropump feed hose

- b. Disconnect the feed hose ② from the electropump ③ and catch fluid drained directly from tank ①.

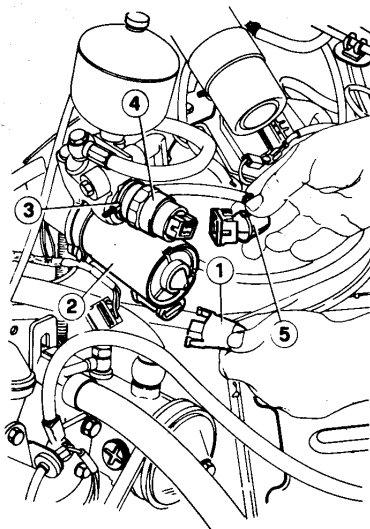
WARNING:

Clutch and brake fluid is corrosive; protect paintwork adequately.



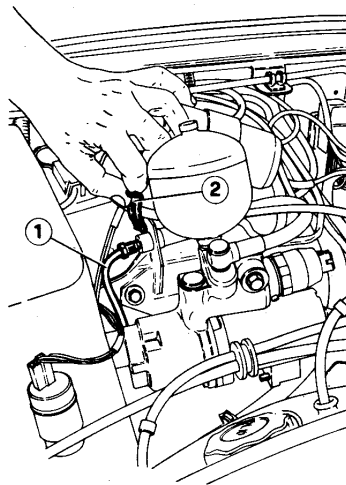
- 1 Clutch and brake fluid tank
- 2 Electropump feed hose
- 3 Electropump

3. Disconnect connector ① from the electric motor ② and connector ⑤ from the pressure switch ④. Remove clip ③.



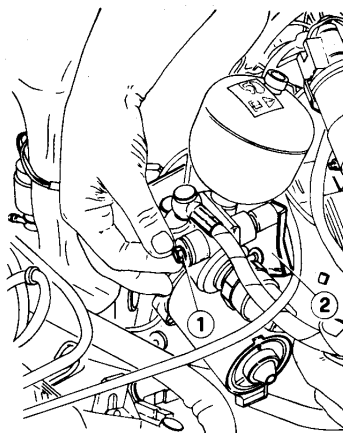
- 1 Connector for electric motor
- 2 Electric motor
- 3 Clip
- 4 Pressure switch
- 5 Connector for pressure switch

4. Disconnect the pipe ① from the electropump unit; keep spring ②.



- 1 Pressurized fluid delivery pipe
- 2 Spring

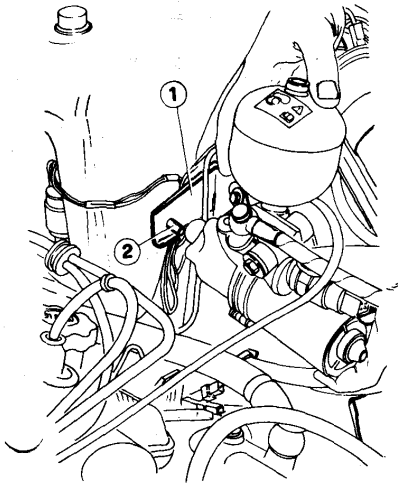
5. Back off screw ① securing the electropump unit to the support ②.



- 1 Screw
- 2 Support

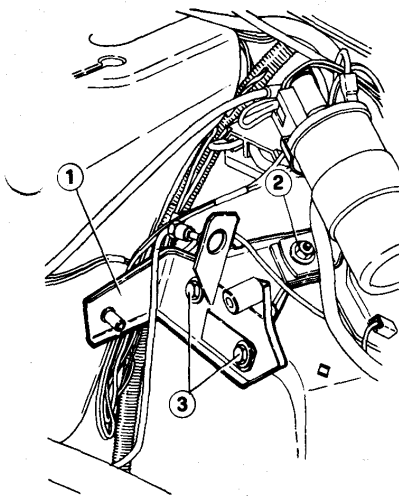
FRONT AND REAR BRAKES

6. Remove the electropump unit from the support (1), by sliding it off the pin (2).



- 1 Support
2 Pin

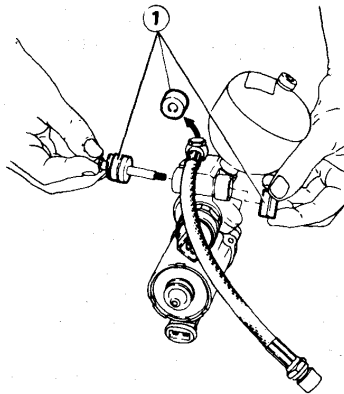
7. If necessary, remove the support (1) by unscrewing screws (3) and nuts (2).



- 1 Support
2 Nut
3 Screws

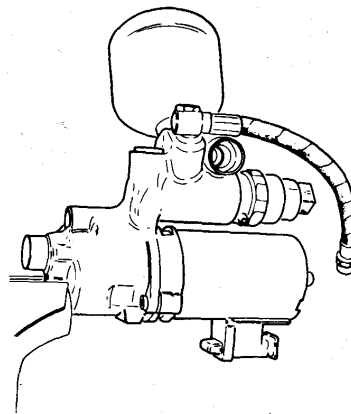
DISASSEMBLY

1. Get hold of spring bushings (1).

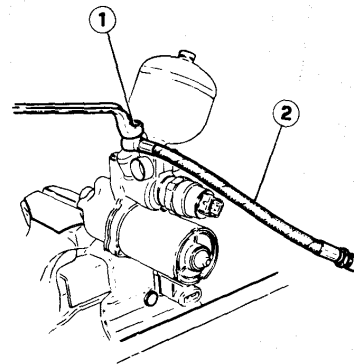


- 1 Spring bushings

Having clamped the electropump unit in a vice provided with jaw lines, disassemble as follows.

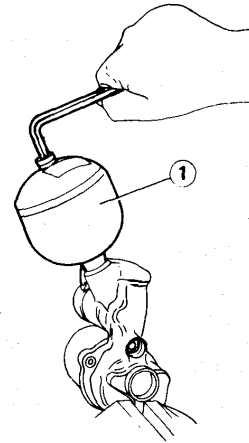


2. Unscrew screw (1) and remove hose (2), retrieving the O-Rings.



- 1 Screw securing hose - electropump unit
2 Hose

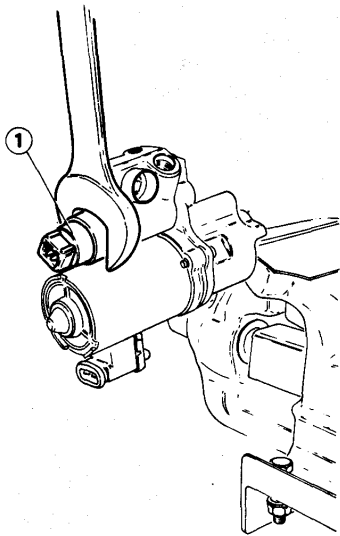
3. With a suitable tool, unscrew the accumulator (1) from the electropump unit and retrieve the O-Ring.



- 1 Accumulator

4. Unscrew the pressure switch (1) and remove it from the electropump unit, retrieving the O-Ring.

FRONT AND REAR BRAKES



1 Pressure switch

Accumulator - electropump unit connection

40 thru 46 N·m
(4.1 thru 4.7 kg·m)
(29.5 thru 33.9 ft·lb)

Screw connecting hose on electropump unit

16 thru 20 N·m
(1.6 thru 2 kg·m)
(11.8 thru 14.8 ft·lb)

Tightening torques

Screws and nuts securing support - body

9 thru 10 N·m
(0.9 thru 1 kg·m)
(6.6 thru 7.4 ft·lb)

Screw securing electropump unit - support

9 thru 10 N·m
(0.9 thru 1 kg·m)
(6.6 thru 7.4 ft·lb)

Hose - pressurized fluid delivery pipe connection

16 thru 20 N·m
(1.6 thru 2 kg·m)
(11.8 thru 14.8 ft·lb)

INSTALLATION

Re-install by operating in reverse order of removal, adhering to the following instructions.

- Replace the spring bushings if damaged or worn.
- Observe the following tightening torques.
- Fill tank with recommended fluid (see: Inspection Specifications) then bleed (see: (ABS) MARK II Braking System with Wheel Antilock - Brake System Bleeding).

WARNING:

Do not separate the pump from the electric motor.

REASSEMBLY

Reassemble the electropump unit by operating in reverse order of removal, taking care to lock the various connections to the specified torques.

CAUTION:

The circuit is a high pressure one and correct reassembly is extremely important for the safety of the vehicle during braking; adhere strictly to instructions.

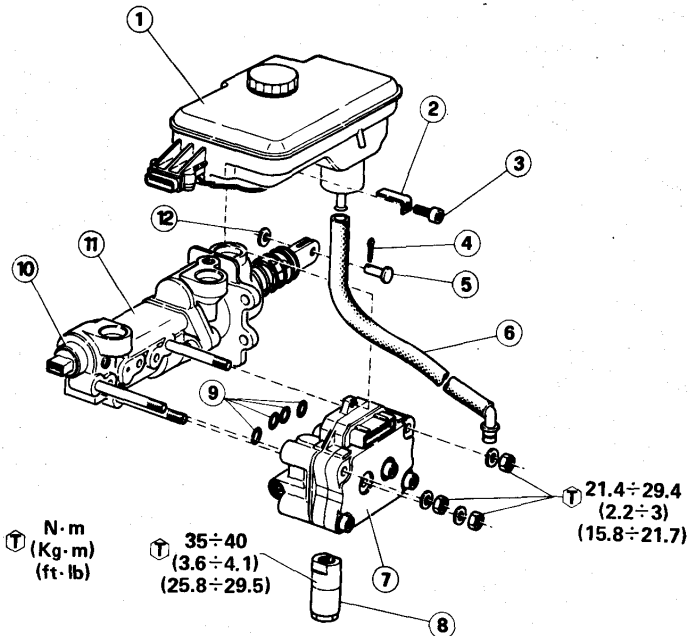
- Replace the O-Rings.
- Observe the following tightening torques.

Tightening torques

Pressure switch - electropump unit connection

20 thru 26 N·m
(2 thru 2.7 kg·m)
(14.8 thru 19.2 ft·lb)

HYDRAULIC ASSEMBLY



1 Clutch and brake fluid tank

2 Bracket

3 Screw

4 Cotter pin

5 Pin

6 Electropump feed hose

7 Braking pressure modulating electrovalve unit

8 Brake pressure adjusting valve

9 O-Rings

10 Main electrovalve (cannot be separated from 11)

11 Brake master cylinder and hydraulic servo cylinder

12 Washer

Tightening torque:
N·m (Kg·m) (ft·lb)

35 ÷ 40
(3.6 ÷ 4.1)
(25.8 ÷ 29.5)

21.4 ÷ 29.4
(2.2 ÷ 3)
(15.8 ÷ 21.7)

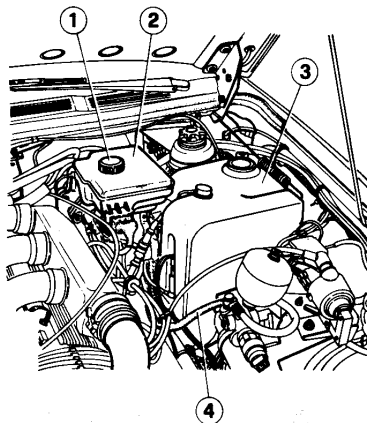
FRONT AND REAR BRAKES

REMOVAL

WARNING:

Prior to removing the hydraulic assembly it is necessary to discharge the braking system pressure; remove the ignition key and press the brake pedal right down repeatedly (at least 20 times) until it sticks.

1. Disconnect the battery.
2. Remove the windscreen washing liquid container (3) to create greater working space.
3. Drain the clutch and brake fluid from the tank by operating thus.
 - a. Remove plug (1) from tank (2).

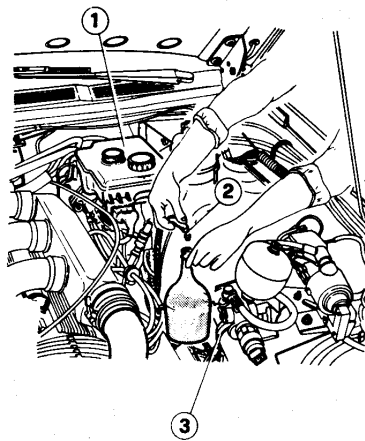


- 1 Plug
- 2 Clutch and brake fluid tank
- 3 Windscreen washing liquid container
- 4 Electropump feed hose

- b. Disconnect the feed hose (2) from the electropump (3) and collect the fluid draining directly from the tank (1).

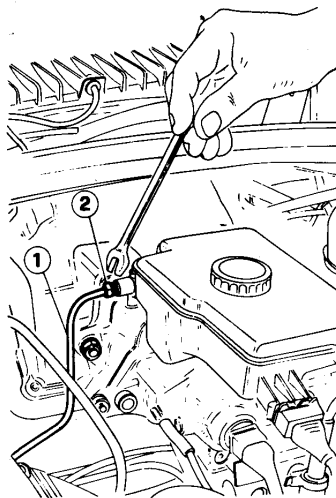
WARNING:

Clutch and brake fluid is corrosive; protect paintwork adequately.



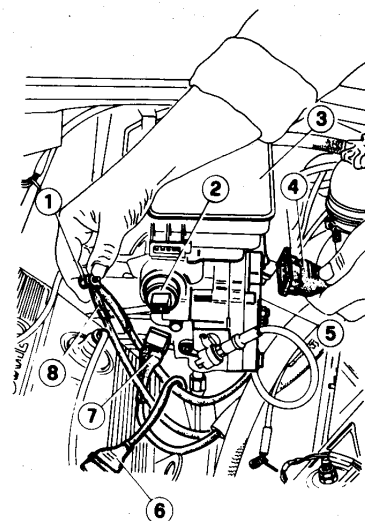
- 1 Clutch and brake fluid tank
- 2 Electropump feed hose
- 3 Electropump

4. Unscrew the union (2) and disconnect the pipe (1) from the hydraulic assembly.



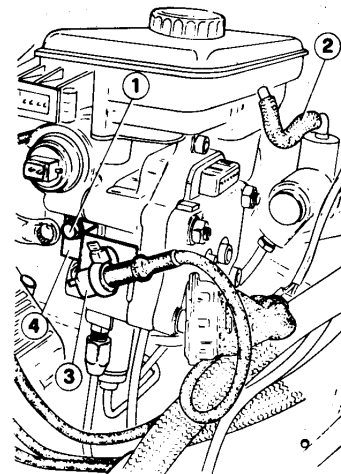
- 1 Pipe carrying pressurized fluid from the electropump unit to the hydraulic assy
- 2 Union

5. Back off the screw (1) tying the ground wires (8) to the hydraulic assy. Disconnect connector (7) from the main electrovalve (2), connector (4) from the electrovalve unit (5) and connector (6) from the tank (3).



- 1 Screw
- 2 Main electrovalve
- 3 Brake fluid tank
- 4 Connector for electrovalve unit
- 5 Electrovalve unit
- 6 Connector for brake fluid tank
- 7 Connector for main electrovalve
- 8 Ground wires

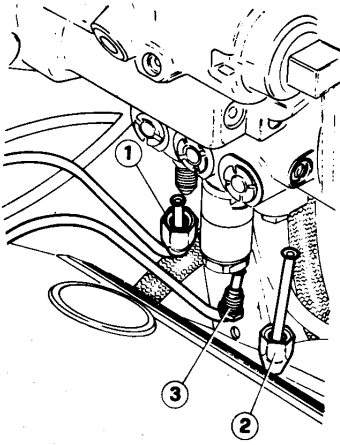
6. Back off the screw (1) securing the square (4) for connection (3) of the front wheel impulse pick-up to the hydraulic assy. Disconnect the clutch master cylinder supply duct (2).



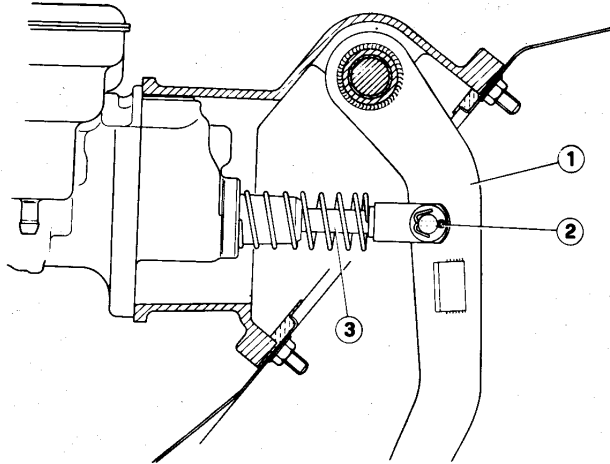
- 1 Screw
- 2 Clutch master cylinder supply duct
- 3 L.H. front wheel impulse pick-up connection
- 4 Square

7. Unscrew unions (1), (2) and (3) then disconnect corresponding pipes from the hydraulic assy.

FRONT AND REAR BRAKES



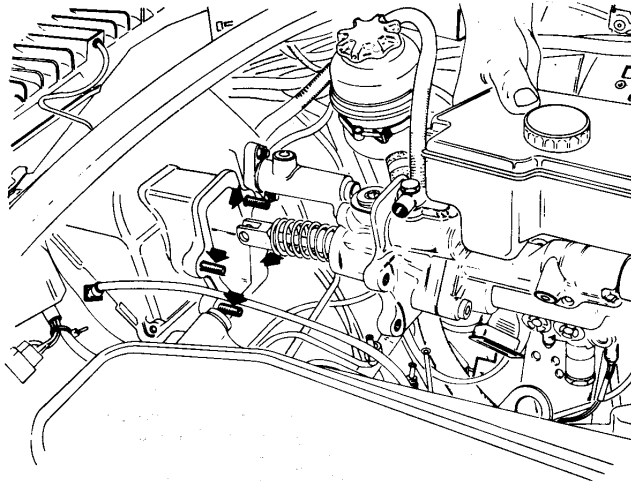
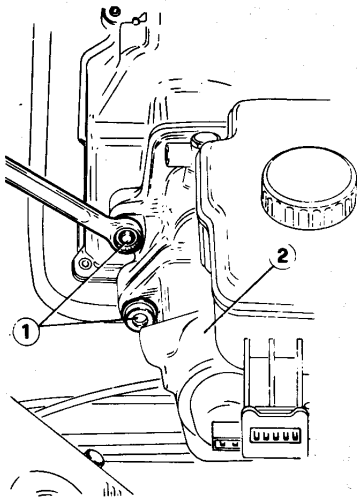
8. Working from within the passenger compartment, disconnect the brake pedal (1) from the piston of the master cylinder (3) by acting on the cotter pin (2).



- 1 Union
- 2 Union
- 3 Union

- 1 Brake pedal
- 2 Cotter pin
- 3 Master cylinder piston

9. Back off the four units (1) connecting the hydraulic assy (2) to the pedal assy and remove the former by extracting it from the four studs.

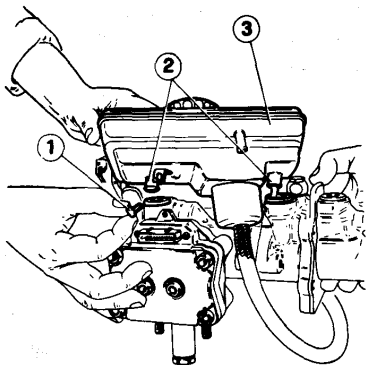


- 1 Nuts connecting the hydraulic - pedal assy
- 2 Hydraulic assy

FRONT AND REAR BRAKES

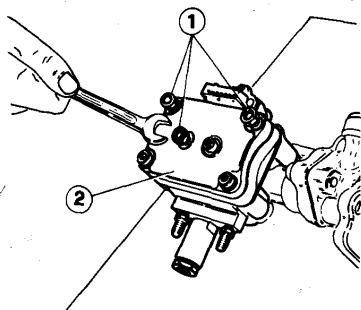
DISASSEMBLY

1. Unscrew screw ① and with the aid of a lever, free the brake fluid tank ③ from the two unions ②.



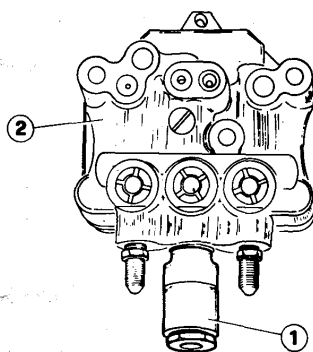
- 1 Screw connecting the brake fluid tank - hydraulic assy
- 2 Unions
- 3 Brake fluid tank

2. Back off the three nuts ①, separate the electrovalve unit ② from the hydraulic assy and retrieve the O-Rings.



- 1 Nuts connecting the electrovalve unit - brake master cylinder
- 2 Electrovalve unit

3. If necessary unscrew the brake pressure adjusting valve ① and remove it from the electrovalve unit ②.



- 1 Brake pressure adjusting valve
- 2 Electrovalve unit

WARNING:

Do not disassemble the electrovalve unit and brake pressure adjusting valve components; do not separate the brake master cylinder from the hydraulic servocylinder.

REASSEMBLY

Reassemble the hydraulic assembly in reverse order of removal, making sure to tighten the various connections to the specified torques.

CAUTION:

The circuit is a high pressure one and correct reassembly is extremely important for the safety of the vehicle during braking; adhere strictly to instructions.

- Replace the O-Rings.
- Observe the following tightening torques.

Tightening torques

Brake pressure adjusting valve-electrovalve unit connection
 35 thru 40 N·m
 (3.6 thru 4.1 kg·m)
 (25.8 thru 29.5 ft·lb)

Nuts securing the electrovalve unit - hydraulic assy
 21.4 thru 29.4 N·m
 (2.2 thru 3 kg·m)
 (15.8 thru 21.7 ft·lb)

Screw locking union on hydraulic assy

16 thru 20 N·m
 (1.6 thru 2 kg·m)
 (11.8 thru 14.8 ft·lb)

INSTALLATION

Install in reverse order of removal, adhering to these instructions.

1. Apply Lowac Perfect Seal to the hydraulic assy - pedal assy joining surfaces.
2. Observe the following tightening torques.

Tightening torques

Nuts connecting the hydraulic assembly - pedal assy
 11.3 thru 14 N·m
 (1.1 thru 1.4 kg·m)
 (8.3 thru 10.3 ft·lb)

Unions connecting the hydraulic assy - pipes carrying pressurized fluid to the brake calipers

12 thru 16 N·m
 (1.2 thru 1.6 kg·m)
 (8.9 thru 11.8 ft·lb)

Screw securing the square connecting the front left hand wheel impulse pick-up to the hydraulic assy

9 thru 10 N·m
 (0.9 thru 1 kg·m)
 (6.6 thru 7.4 ft·lb)

Union connecting pipe ("from" electropump) - hydraulic assy

16 thru 20 N·m
 (1.6 thru 2 kg·m)
 (11.8 thru 14.8 ft·lb)

3. Fill the tank with recommended fluid (see: Inspection Specifications) then bleed (see: (ABS) MARK II Braking System with Wheel Antilock - Brake System Bleeding).

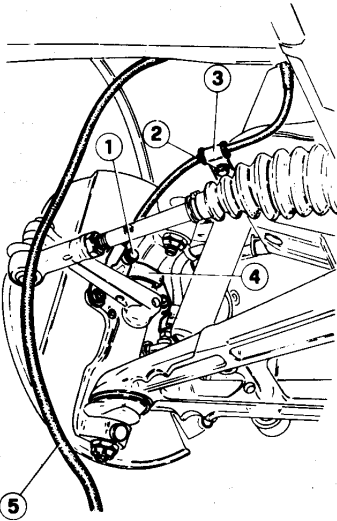
IMPULSE PICK-UPS AND IMPULSE EMITTING WHEELS

FRONT IMPULSE PICK-UPS

Removal

1. Disconnect the battery.
2. Working in the engine compartment, disconnect the electrical connection of the cable of the front impulse pick-up in question.
3. Place the car on a lift, put on the hand brake and raise the car.
4. Back off the screw ① securing the cable plate ③ to the suspension upper link.

Back off the screw ① securing the impulse pick-up to the support ④; retrieve the impulse pick-up.



- 1 Screw securing impulse pick-up support
- 2 Screw
- 3 Cable plate
- 4 Impulse pick-up support
- 5 Impulse pick-up cable

5. If necessary, remove the support of the impulse pick-up by unscrewing the two nuts securing it to the steering knuckle.

Installation

Re-install by operating in reverse order of removal and adhering to the following instructions.

CAUTION:

The impulse pick-ups are not interchangeable (neither front with rear nor left with right).

When re-installing take great pains to ensure that the impulse pick-ups, new or used, are installed in the correct position.

- Observe the following tightening torques.

Ⓡ : Tightening torques

Screw securing cable plate - suspension upper link
 9 thru 10 N·m
 (0.9 thru 1 kg·m)
 (6.6 thru 7.4 ft·lb)

Screw securing impulse pick-up support

9 thru 10 N·m
 (0.9 thru 1 kg·m)
 (6.6 thru 7.4 ft·lb)

Nuts securing support - steering knuckle

9 thru 10 N·m
 (0.9 thru 1 kg·m)
 (6.6 thru 7.4 ft·lb)

- Ensure that the impulse pick-up cables are secure in their anchor points on the body and secured to the suspension assemblies to prevent damage when the vehicle is running.
- Adjust the air gap between the impulse pick-up and the impulse emitting wheel by operating as follows.

Adjustment of the air gap between the front impulse pick-up and impulse emitting wheel.

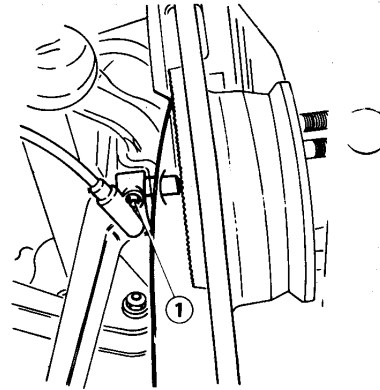
- If installing a new impulse pick-up
 - a. Loosen the air gap adjusting screw ①.
 - b. Drive the impulse pick-up home against the impulse emitting wheel (there

is a plastic spacer on the impulse pick-up head of the same thickness as the air gap required).

- c. Keeping the impulse pick-up against the impulse emitting wheel, tighten the air gap adjusting screw ① to the specified torque.

Ⓡ : Tightening torque

Screw adjusting the air gap between the impulse pick-up and impulse emitting wheel
 2.4 thru 3 N·m
 (0.24 thru 0.3 kg·m)
 (1.77 thru 2.21 ft·lb)



- 1 Screw adjusting air gap between the impulse pick-up and impulse emitting wheel

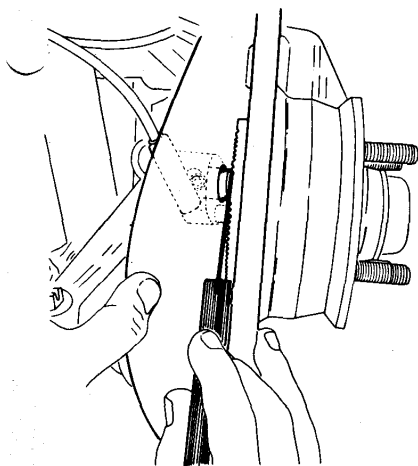
• If the impulse pick-up is re-used.

- a. Using a thickness gauge, check that the air gap between the impulse pick-up and impulse emitting wheel is as specified. Make the same test in two or three other positions of the impulse emitting wheel.

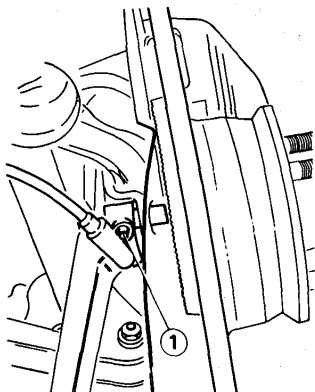
Air gap between front impulse pick-up and impulse emitting wheel:

t = 0.7 mm
 (0.03 in)

FRONT AND REAR BRAKES



b. Failing to find such a value, loosen the air gap adjusting screw ①.



1 Screw adjusting air gap between impulse pick-up and impulse emitting wheel

c. Put a spacer equivalent to the specified air gap between the impulse pick-up and the impulse emitting wheel (0.7 mm; 0.03 in).

Keeping the impulse pick-up in contact with the spacer and impulse emitting wheel, tighten the adjusting screw to the specified torque.

ⓧ : Tightening torque

Screw adjusting the air gap between the impulse pick-up - impulse emitting wheel

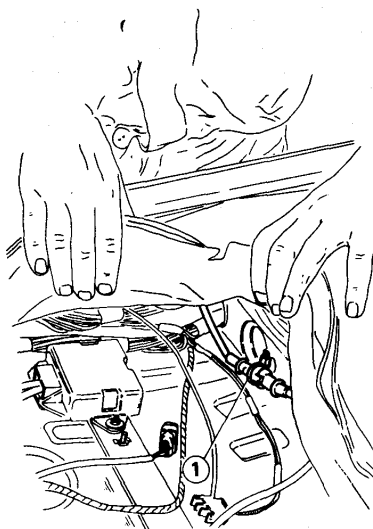
2.4 thru 3 N·m
(0.24 thru 0.3 kg·m)
(1.77 thru 2.21 ft·lb)

d. Check that the air gap remains as specified in two or three further positions of the impulse emitting wheel.

REAR IMPULSE PICK-UPS

Removal

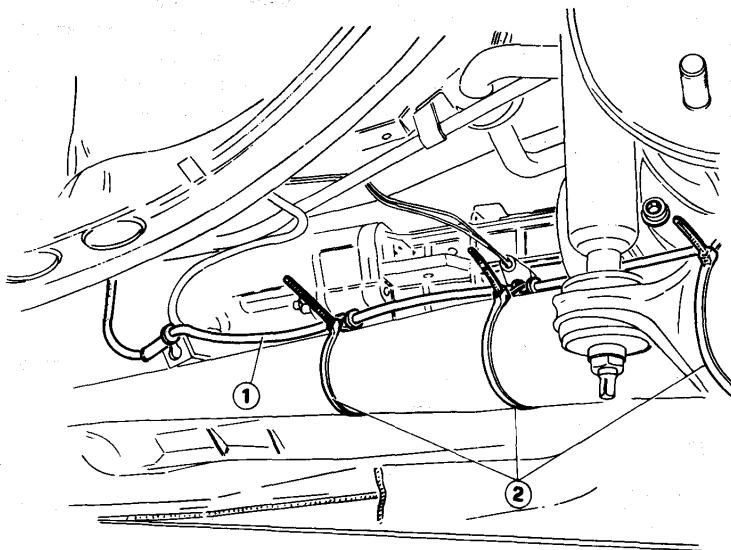
1. Disconnect the battery.
2. Working in the passenger compartment, remove the rear seat, raise the sound proof upholstery then disconnect the electrical connection ① of the rear impulse pick-up cable concerned, sliding it off from outside the car.



1 Rear impulse pick-up connection

3. Place the vehicle on the lift, activate the hand brake and raise the car.

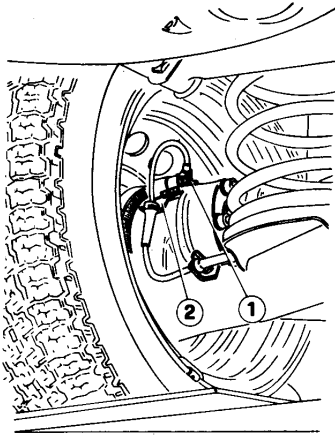
4. Free the impulse pick-up cable ① from the three clips ② securing it to the De Dion axle.



1 Rear impulse pick-up cable
2 Clips

FRONT AND REAR BRAKES

5. Unscrew the screw ① securing the impulse pick-up to the support ② and get hold of the impulse pick-up.



- 1 Screw securing impulse pick-up - support
2 Support

6. If necessary, remove the support by unscrewing the two nuts holding it to the wheel hub.

Installation

Install in reverse order of removal, adhering to the following instructions.

CAUTION:

The impulse pick-ups are not interchangeable (neither front with rear nor left with right).

When re-installing take great pains to ensure that the impulse pick-ups, new or used, are installed in the correct position.

- Observe the following tightening torques.

- Ⓡ: Tightening torques
Screw securing impulse pick-up - support
9 thru 10 N·m
(0.9 thru 1 kg·m)
(6.6 thru 7.4 ft·lb)

Nuts securing support - wheel hub

- 9 thru 10 N·m
(0.9 thru 1 kg·m)
(6.6 thru 7.4 ft·lb)

- Ensure that the impulse pick-up cables are secure in their anchor points on the body and secured to the suspension assemblies to prevent damage when the vehicle is running.
- Adjust the air gap between the impulse pick-up and the impulse emitting wheel by operating as follows.

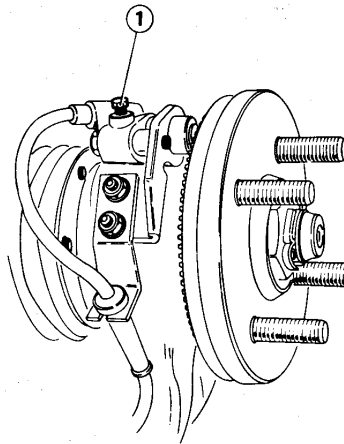
Adjustment of the air gap between the rear impulse pick-up and impulse emitting wheel.

- If installing a new impulse pick-up
 - Loosen the air gap adjusting screw ①.
 - Drive the impulse pick-up home against the impulse emitting wheel (there is a plastic spacer on the impulse pick-up head of the same thickness as the air gap required).
 - Keeping the impulse pick-up against the impulse emitting wheel, tighten the air gap adjusting screw ① to the specified torque.

Ⓡ: Tightening torque

Screw adjusting the air gap between the impulse pick-up and impulse emitting wheel

- 2.4 thru 3 N·m
(0.24 thru 0.3 kg·m)
(1.77 thru 2.21 ft·lb)

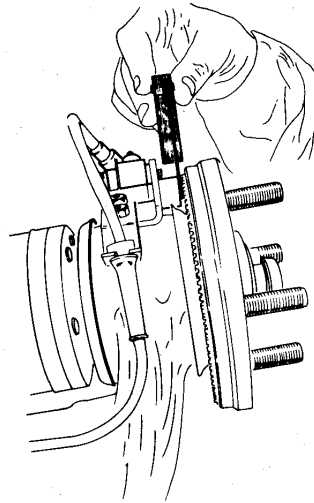


- 1 Screw adjusting air gap between the impulse pick-up and the impulse emitting wheel

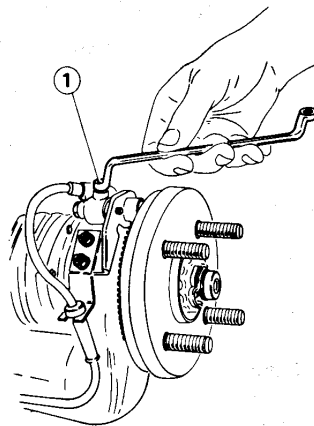
- If the impulse pick-up is re-used.
 - Using a thickness gauge, check that the air gap between the impulse pick-up and impulse emitting wheel is as specified. Make the same test in two or three other positions of the impulse emitting wheel.

Air gap between rear impulse pick-up and impulse emitting wheel:

- t = 1.1 mm
(0.04 in)



- b. Failing to find such a value, loosen the air gap adjusting screw ①.



- 1 Screw adjusting air gap between the impulse pick-up and the impulse emitting wheel

FRONT AND REAR BRAKES

c. Put a spacer equivalent to the specified air gap between the impulse pick-up and the impulse emitting wheel (1.1 mm; 0.04 in).

Keeping the impulse pick-up in contact with the spacer and impulse emitting wheel, tighten the adjusting screw to the specified torque.

T : Tightening torque

Screw adjusting the air gap between the impulse pick-up - impulse emitting wheel

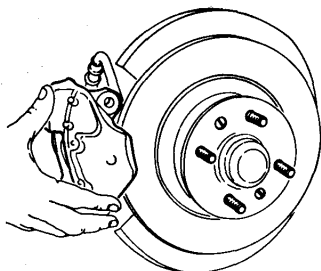
2.4 thru 3 N·m
(0.24 thru 0.3 kg·m)
(1.77 thru 2.21 ft·lb)

d. Check that the air gap remains as specified in two or three further positions of the impulse emitting wheel.

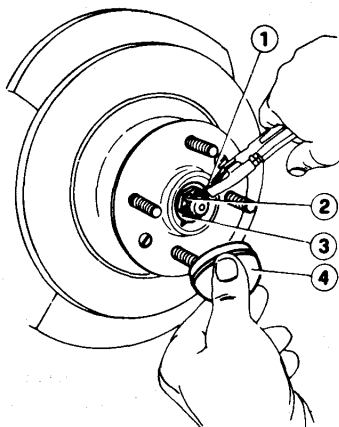
FRONT IMPULSE EMITTING WHEELS

Removal

1. Place car on lift, activate the hand brake, raise the car at the front using a column type jack, secure with stands and remove the wheel.
2. Remove the pads (see: Traditional Braking System - Front Brakes - Pad Replacement - steps 3 and 5).
3. Unlock and back off the two screws, securing the brake caliper to the steering knuckle, without disconnecting it from the brake hose.
4. Remove the brake caliper unit; secure the brake caliper on one of the suspension links.

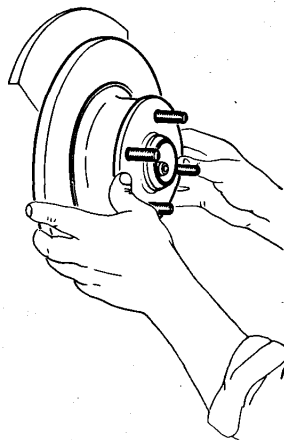


5. Extract the hub cover (4) and cotter pin (1).
6. Back off nut (2) and extract together with washer (3).

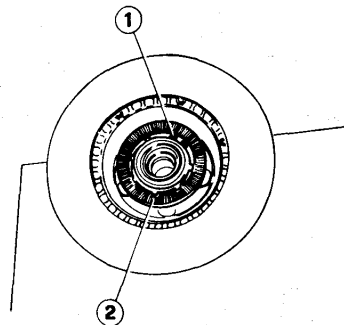


- 1 Cotter pin
- 2 Nut
- 3 Washer
- 4 Hub cover

7. Remove the hub complete with brake disc and place on bench.



8. Using pliers, remove the retainer ring (1) and separate the impulse emitting wheel (2) from hub.



- 1 Retainer ring
- 2 Front impulse emitting wheel

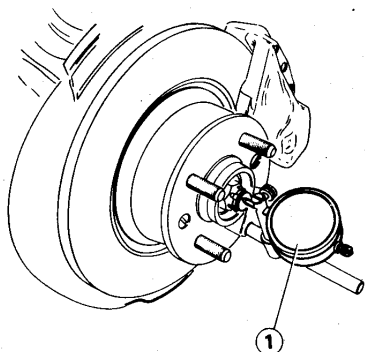
Installation

Re-install by operating in reverse order of removal, adhering to the following instructions.

- Clean the impulse emitting wheel thoroughly, checking that there are no signs of damage.
- Put the impulse emitting wheel into place and secure it to the hub with the retainer ring.
- Re-install the hub on the steering knuckle but do not insert the cotter pin.
- Check the clearance of the front hub bearings by operating as follows.

Front hub bearing clearance check

a. Install a comparator on a magnetic base (or suitable tool) so that it touches the steering knuckle axis (pre load the comparator to 1 mm (0.04 in)).



1 Comparator

b. Move the wheel hub axially (back and forth) and read the clearance indicated on the comparator. This clearance should come within specified values.

Front hub bearing clearance:
G = 0.02 thru 0.12 mm
(0.0008 thru 0.005 in)

c. Re-position the cotter pin thus:
 — If the clearance value is 0.02 thru 0.06 mm (0.0008 thru 0.002 in), back off nut until cotter pin is inserted.
 — If the clearance value is 0.06 thru 0.12 mm (0.002 thru 0.005 in), screw on the nut until cotter pin is inserted.

d. Bend the cotter pin back and re-assemble the hub cover.

• Observe the following tightening torque.

T: Tightening torque
Screw securing the brake caliper to the steering knuckle
74 thru 83 N·m
(7.5 thru 8.5 kg·m)
(54.6 thru 61.2 ft·lb)

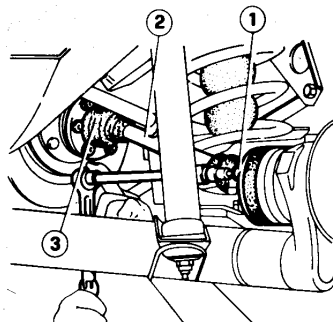
- Check the air gap between the impulse pick-up and the impulse emitting wheel (see: Impulse Pick-ups and Impulse Emitting Wheels - Front Impulse Pick-ups - Adjustment of the Air Gap between the Front Impulse Pick-up and the Impulse Emitting Wheel).

REAR IMPULSE EMITTING WHEELS

Removal

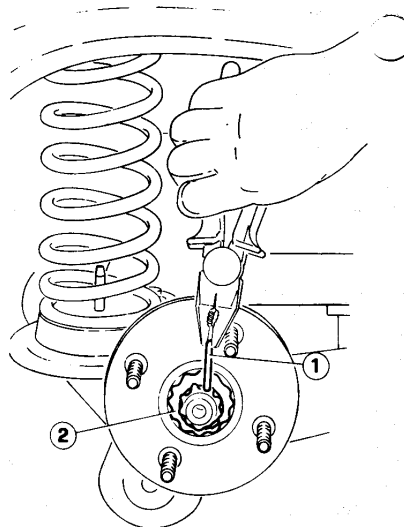
1. Place car on lift, chock front wheels, raise rear using a column type jack secure on stands and remove the wheel.
2. Back off screws (1), get hold of washers and plates then uncouple the outer axle shaft (2).

CAUTION:
 During operations take care to avoid damage to the bellows (3) protecting the joints.



1 Screw securing outer axle shafts
 2 Outer axle shaft
 3 Bellows protecting joint

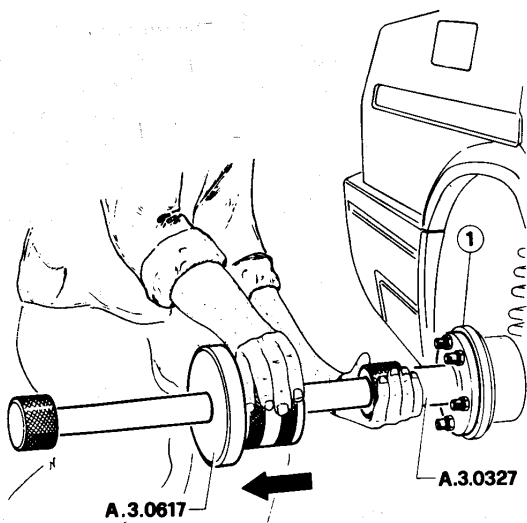
3. Extract the cotter pin (1) from the wheel shaft and slide off the lock nut (2).



1 Cotter pin
 2 Lock nut

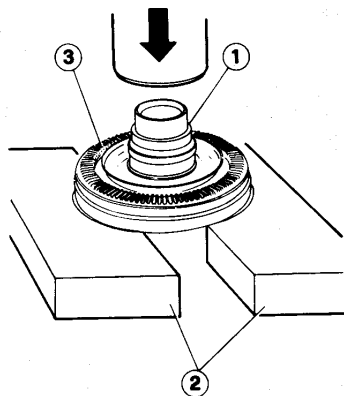
4. Having installed a suitable tool to prevent wheel shaft from turning, back off the nut securing the hub to the wheel shaft and slide off the associated washer.
5. Assemble percussion tool A.3.0617 on tool A.3.0327, then, operating as illustrated hereafter, extract the wheel hub (1) and retrieve equipment.

FRONT AND REAR BRAKES



1 Wheel hub

6. Using two suitable half-plates (2) and with the aid of a press, divide the impulse emitting wheel (3) and hub (1).



1 Wheel hub
2 Half plate
3 Impulse emitting wheel

Installation

Install in reverse order of removal, adhering to these instructions.

- Clean the impulse emitting wheel thoroughly, checking that there are no signs of damage.

- Using a press, slip the impulse emitting wheel onto the hub and check correct installation (see: Inspection Specifications - Checks and Adjustments).
- Lock the wheel hub securing nut to the following tightening torque.

T: Tightening torque
Nut securing wheel hub
265 thru 324 N·m
(27 thru 33 kg·m)
(195.5 thru 239 ft·lb)

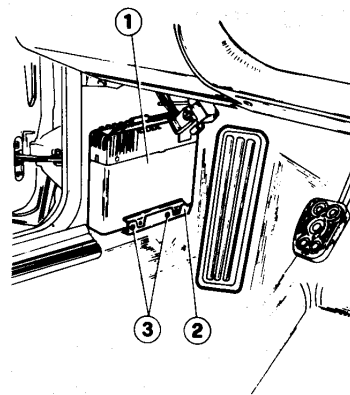
ANTILOCK SYSTEM CONTROL UNIT

NOTE:

The electronic unit is situated in the passenger compartment, to the left of the pedal assy.

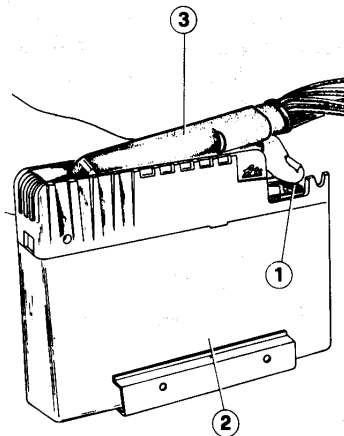
REMOVAL AND INSTALLATION

1. Disconnect the battery.
2. Remove protective casing by acting on associated nails.
Back off screws (3) and remove the control unit (1) from the support (2).



1 Electronic unit
2 Support
3 Screws

3. Disconnect the connector (3) from the control unit (2) by pressing the release lever (1).



1 Release lever
2 Electronic unit
3 Connector

WARNING:

Avoid knocks to the electronic unit

4. Re-install in reverse order of removal.

FRONT BRAKES

PAD REPLACEMENT

See: Traditional Braking System - Front Brakes.

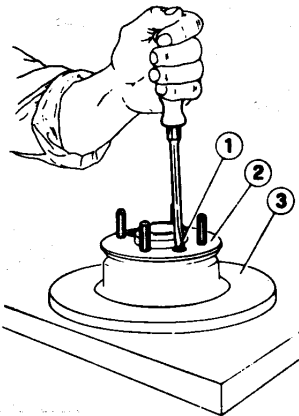
BRAKE CALIPER

See: Traditional Braking System - Front Brakes.

BRAKE DISC

Removal

1. Remove pads as per "Pad Replacement", applying suitable reference marks to facilitate subsequent installation.
2. Back off two brake caliper/steering knuckle screws without disconnecting from system. Secure brake caliper to a suspension link.
3. Carry out the operations described in steps 5., 6., 7. and 8. - Impulse Pick-ups and Impulse Emitting Wheels - Front Impulse Emitting Wheels.
4. Back off two screws ① securing the wheel hub ② to the brake disc ③ and separate the two parts.



- 1 Screw
- 2 Wheel hub
- 3 Brake disc

Inspection

1. Clean brake discs and check that working surfaces are free from score marks and porosity. Replace or grind as necessary.
2. Should working surfaces need grinding, adhere to the following instructions.
 - a. Always grind off the same amount of material on both surfaces.
 - b. Dimensions and tolerances as per "Inspection Specifications", "Checks and Adjustments" are mandatory.

Installation

Install in reverse order of removal, adhering to these instructions.

- Lubricate wheel hub nut thread using recommended grease (AGIP Grease 33 FD; IP Autogrease FD).
- Check front wheel hub bearing clearance (see: Impulse Pick-ups and Impulse Emitting Wheels - Front Impulse Emitting Wheels - Installation).
- Observe the following tightening torque.

ⓧ : Tightening torque
Screw securing brake caliper to steering knuckle
74 thru 83 N·m
(7.5 thru 8.5 kg·m)
(54.6 thru 61.2 ft·lb)

- Check the air gap between the impulse pick-up and the impulse emitting wheel (see: Impulse Pick-ups and Impulse Emitting Wheels - Front Impulse Pick-ups - Adjustment of the Air Gap between the Front Impulse Pick-up and the Impulse Emitting Wheel).

REAR BRAKES

For:

PAD REPLACEMENT

BRAKE CALIPERS

BRAKE DISC

See: Traditional Braking System - Rear Brakes.

FRONT AND REAR BRAKES

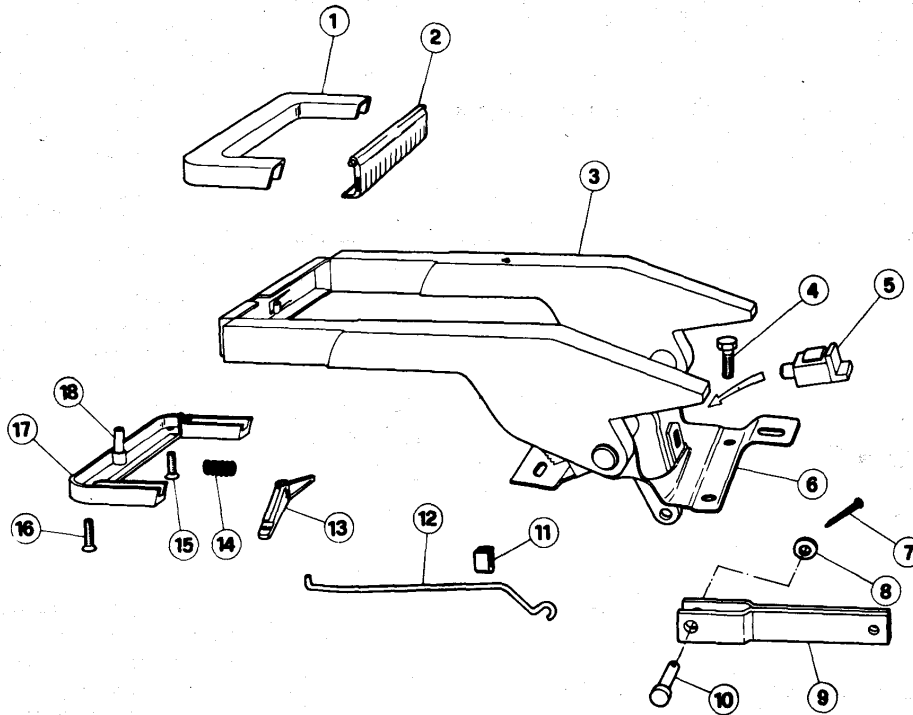
HAND BRAKE

CONTROL LEVER

x Super 90
Alfa 90

AND

Alfa 75

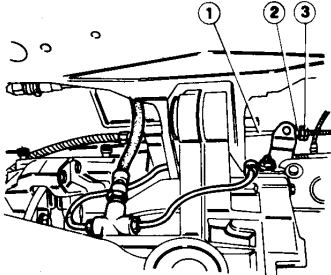


- | | |
|--|---------------|
| 1 Upper grip | 10 Pin |
| 2 Control bar | 11 Guide |
| 3 Control lever body | 12 Push rod |
| 4 Support/body retaining screw | 13 Bracket |
| 5 Hand brake on indicator sending unit | 14 Spring |
| 6 Lever support | 15 Screw |
| 7 Cotter | 16 Screw |
| 8 Washer | 17 Lower grip |
| 9 Actuating fork | 18 Bucket pin |

FRONT AND REAR BRAKES

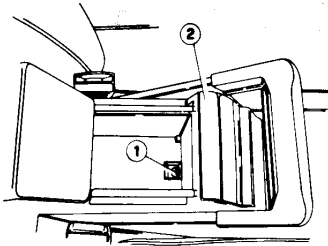
REMOVAL

1. Raise car on a platform lift.
2. Back off locknut (3) and nut (2), and disconnect cable (1).



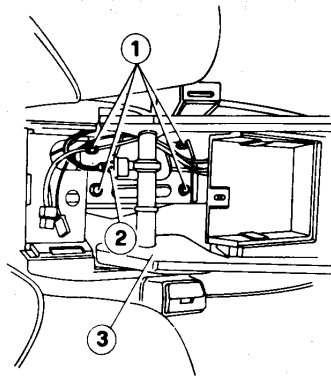
- 1 Hand brake control cable
- 2 Hand brake adjusting nut
- 3 Locknut

3. Back off screw (1) from car interior, disconnect rear cigar lighter wiring and remove console (2).



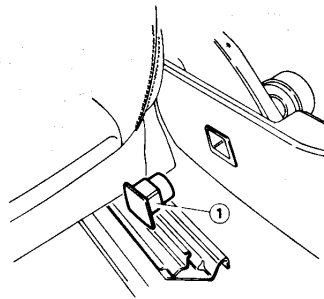
- 1 Console screw
- 2 Rear console

4. Back off four screws (1) and disconnect sending unit lead (2).



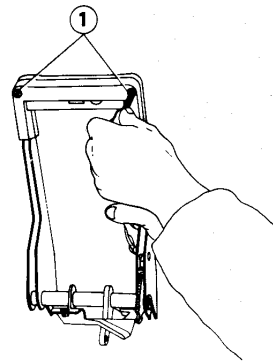
- 1 Lever support/body retaining screws
- 2 Hand brake on indicator sending unit
- 3 Hand brake control lever

5. Move front seats fully forward; remove plugs (1).



- 1 Rear console plug

6. Move lever to gain access to lever/control cable conn. rod connection.
7. Remove cotter and lever/conn. rod pin; remove control lever.
8. If necessary, back off 2 control lever grip screws (1), disassemble lever and take off indicator sending unit.



- 1 Handle screws

INSPECTION

1. Visually check that components are not excessively worn or damaged. In particular, check ratchet and pawl are not worn or damaged; if necessary replace lever assembly.
2. Check that hand brake on indicator sending unit is working properly.

INSTALLATION

If previously disassembled, assemble lever and install adopting a reversal of the removal sequence, and adhering to the instructions given below.

- Coat cable sliding surfaces with the recommended grease (AGIP Grease 15; SHELL RETINAX G11).
- Adjust hand brake (see Hand Brake Lever Travel Adjustment).

FRONT AND REAR BRAKES

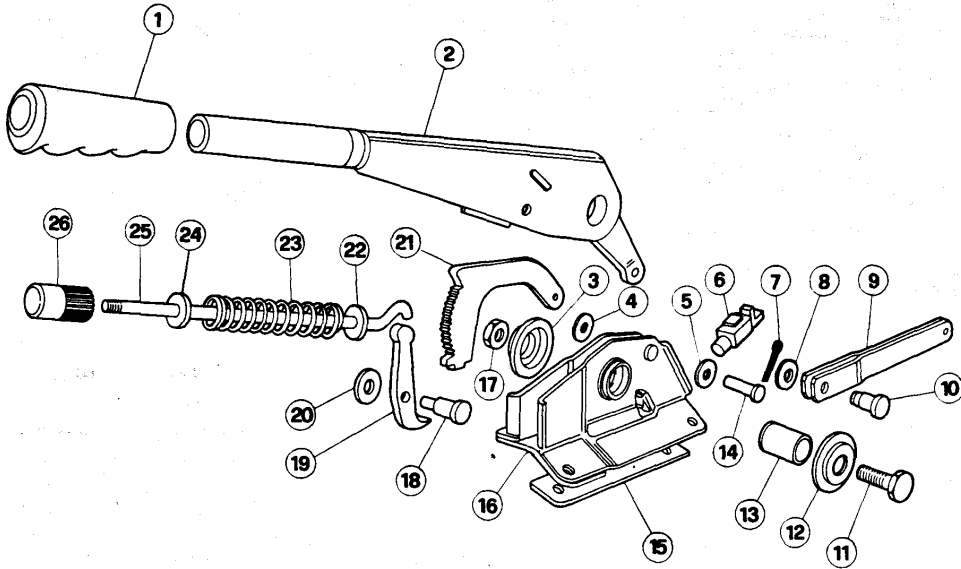
CONTROL LEVER

Alfetta

Giulietta

GTV 2.0

GTV 6 2.5



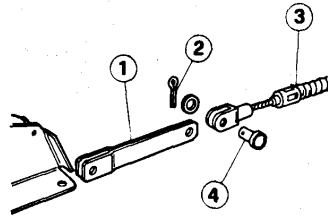
- 1 Handle
- 2 Control lever
- 3 Washer
- 4 Spacer
- 5 Spacer
- 6 Hand brake on indicator sending unit
- 7 Cotter
- 8 Washer
- 9 Fork

- 10 Pin
- 11 Screw
- 12 Washer
- 13 Bushing
- 14 Pin
- 15 Gasket
- 16 Lever support
- 17 Nut
- 18 Pin

- 19 Pawl
- 20 Spacer
- 21 Ratchet
- 22 Inner washer
- 23 Spring
- 24 Outer washer
- 25 Control rod
- 26 Push button

REMOVAL

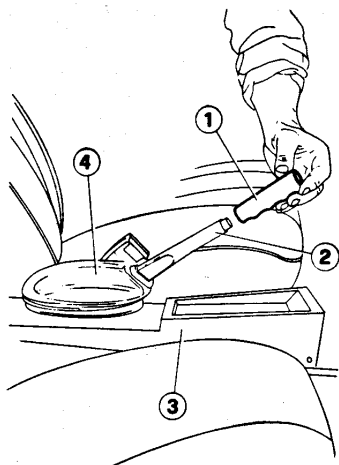
1. Place car on platform lift, raise and acting on control lever relay assy. remove cotter (2), fork connecting pin (4) and control cable (3).



- 1 Fork
- 2 Cotter
- 3 Control cable
- 4 Pin

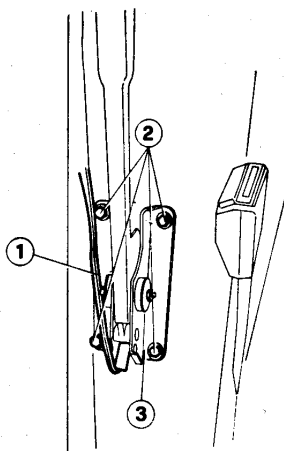
2. Remove control lever handle (1) from car interior, back off screws retaining center console (3) to body and remove console with bellows (4).

FRONT AND REAR BRAKES



- 1 Handle
- 2 Control lever
- 3 Center console
- 4 Bellows

3. Disconnect hand brake on indicator sending unit lead ①.
4. Back off and remove four lever support screws ②.

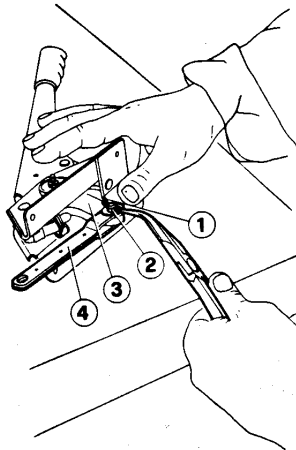


- 1 Cables
- 2 Support/body retaining screws
- 3 Lever support

5. Remove lever with support.

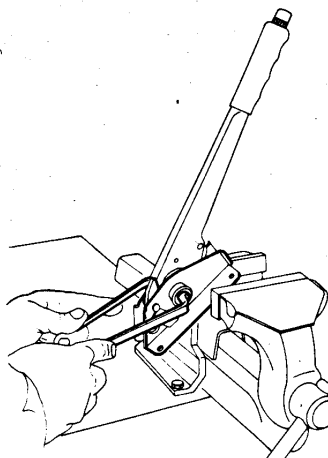
DISASSEMBLY

1. Take off cotter ① from pin ② connecting lever ③ to relay fork ④, remove pin, retrieve associated washer and detach fork from lever.

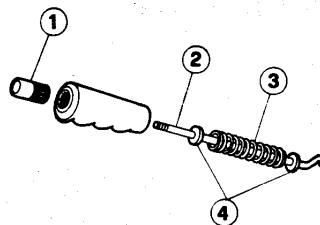


- 1 Cotter
- 2 Pin
- 3 Lever
- 4 Fork

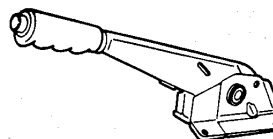
2. Back off bolt retaining lever to support and pull out associated bushing.



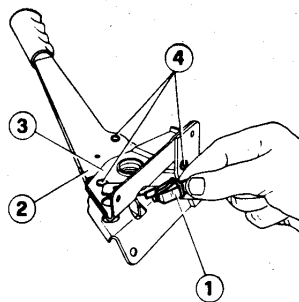
3. Back off push button ① and take off push rod ② with spring ③ and associated washers ④.



- 1 Push button
- 2 Push rod
- 3 Spring
- 4 Washers



4. If necessary, take off indicator sending unit ① and detach lever ② from support ③, and disassemble ratchet and pawl mechanism removing rivets ④.



- 1 Hand brake on indicator sending unit
- 2 Lever
- 3 Lever support
- 4 Rivets

INSPECTION

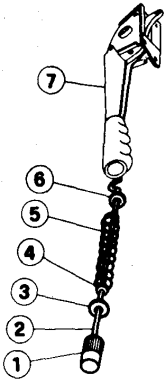
1. Visually check components for excessive wear or damage. In particular, check lever/support bushing surface conditions and ratchet mechanism teeth for wear.

FRONT AND REAR BRAKES

2. Check that hand brake on indicator sending unit is working properly.
3. Replace worn or defective parts.

ASSEMBLY

Assemble support and lever adopting a reversal of the disassembly sequence and positioning control components as indicated in figure.



- 1 Push button
- 2 Control rod
- 3 Outer washer
- 4 Shoulder
- 5 Spring
- 6 Inner washer
- 7 Lever

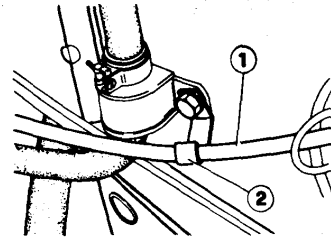
INSTALLATION

1. Install control lever with support on car adopting a reversal of the removal sequence.
2. Adjust hand brake as per "Hand Brake Lever Travel Adjustment".

CONTROL CABLE

REMOVAL

1. Raise car on platform lift.
2. Remove exhaust pipe center section and front end (see: Group O4 - Exhaust System - Removal).
3. Disconnect remote control rod from gear lever and move out of the way to gain access to hand brake control lever/cable connection.
4. Remove cotter (1) and take out pin (2), thereby releasing cable (3).

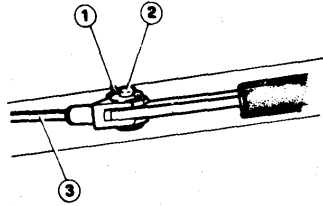


- 1 Cable sheath
- 2 Retaining bracket

INSTALLATION

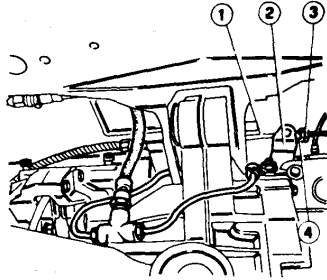
Install by adopting a reversal of the removal sequence and adhering to the instructions given below.

- Adjust hand brake cable as per "Hand Brake Lever Travel Adjustment".



- 1 Cotter
- 2 Pin
- 3 Hand brake control cable

5. Back off locknut (3) and nut (4), remove cable (1) from levers (2) and take off together with sheath.



- 1 Hand brake cable
- 2 Brake pad actuating lever
- 3 Locknut
- 4 Hand brake adjusting nut

6. Release sheath (1) from retaining brackets (2).

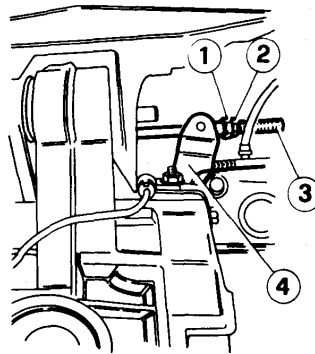
FRONT AND REAR BRAKES

HAND BRAKE LEVER TRAVEL ADJUSTMENT

1. Check that hand brake lever is in rest position.
2. Adjust pad clearance as indicated in "Rear Brakes - Clearance Adjustment".
3. Tighten nut ① on threaded terminal ③ until cable end float is nil.

4. Tighten locknut ②.

5. Operate hand brake lever and check that rear wheels are locked after 4 to 6 clicks.



WARNING:

Tighten nut without moving levers ④ from rest position (levers abutting limit travel pin) to avoid a reduction in clearance between inner pads and brake disc, as this would cause binding, even with hand brake released.

- 1 Hand brake adjusting nut
- 2 Locknut
- 3 Cable threaded terminal
- 4 Brake pad actuating lever

INSPECTION SPECIFICATIONS

SPECIFICATION

BRAKE CALIPERS

Model	Front	Rear
Alfa 90 2.5i iniezione	BREMBO	ATE
Alfa 75i 6V iniezione		
Alfa 75 turbo		
GTV 6 2.5		
Other models	ATE	ATE

Cylinder dia.

Front	48 mm (1.89 in)
Rear	38 mm (1.50 in)

FRONT AND REAR BRAKES

TRADITIONAL BRAKING SYSTEM

BRAKE-SERVO

Type: ATE or BENDITALIA	
Car type	Vacuum cylinder diam.
6V engine cars	6 in
Other models	8 in

BRAKE MASTER CYLINDER

Type: ATE or BENDITALIA	
Diameter	22.2 mm (0.87 in)
Stroke (front/rear)	16.5/10

BRAKING SYSTEM WITH (ABS) MARK II ANTILOCK

ANTILOCK SYSTEM	ATE ABS MARK II
SERVO BRAKE	High pressure hydraulic
Operating pressure	140 thru 180 bar (13970 thru 17960 KPa) (142.5 thru 183.2 Kg/cm ²) (2025.67 thru 2604.42 p.s.i.)
Maximum pressure (prior to safety valve activation)	210 bar (20954 KPa) (213.7 Kg/cm ²) (3038.5 p.s.i.)

FRONT AND REAR BRAKES

GENERAL REQUIREMENTS

FLUIDS AND LUBRICANTS

Description	Type	Recommended product
Hydraulic brake system	FLUID	ATE: Blau S AGIP: Brake Fluid Super HD IP: Auto Fluid FR Part no.: 3681-69903
Brake caliper bellows	GREASE	ATE: Bremszylinder Pasta
Pedal pivot	GREASE	ISECO: Molykote Longterm n. 2 Part no.: 3671-69831
Parking brake cable sliding surfaces	GREASE	AGIP Grease 15 Part no.: 3671-69810 SHELL RETINAX G 11 Part no.: 3671-69811

SEALANTS

Description	Type	Recommended product
Brake servo-shim and pedal support contact surfaces (1)	JOINTING COMPOUND	LOWAC: Perfect Seal Part no. 3522-00011
Hydraulic assy - pedal assy adjoining surfaces (2)		

(1) Vehicles equipped with traditional braking system

(2) Vehicles equipped with (ABS) MARK II antilock braking system

FRONT AND REAR BRAKES

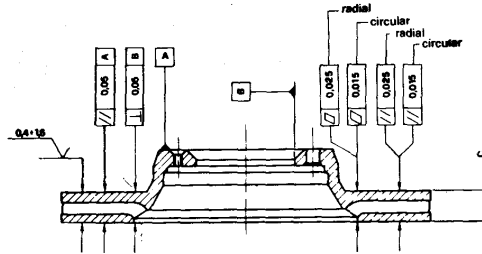
CHECKS AND ADJUSTMENTS

DISC REGRINDING DATA ⁽¹⁾

Front disc

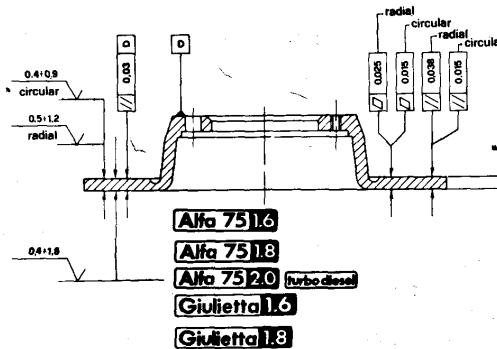
Cars with selfventilated front discs

Brake disc thickness C [mm] (in)	
New	22 (0.866)
Min. thickness after grinding	21 (0.827)
Max. wear thickness	20 (0.787)



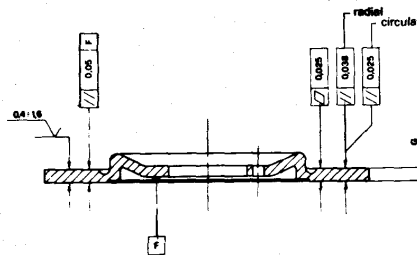
Other models

Brake disc thickness E [mm] (in)		
<p>75 1.6 75 1.8 75 turbo</p>	<p>Alfa 75 1.6 Alfa 75 1.8 Alfa 75 2.0 <i>turbo diesel</i> Giulietta 1.6 Giulietta 1.8</p>	<p>Alfa 90 <i>75 Super</i> Alfa 75 Other models Alfetta Giulietta 2.0 Giulietta 2.0 <i>turbo diesel</i> GTV 2.0</p>
New	12.7 (0.5)	12.7 (0.5)
Min. thickness after grinding	10 (0.39)	11.7 (0.46)
Max. wear thickness	9 (0.35)	10.7 (0.42)



Rear disc

Brake disc thickness G [mm] (in)	
New	10 (0.39)
Min. thickness after grinding	9 (0.35)
Max. wear thickness	8 (0.315)



⁽¹⁾ Symbols ✓ Roughness [μ] // Parallelism [mm] ▱ Flatness [mm] ⊥ Squareness [mm]

FRONT AND REAR BRAKES

REAR BRAKE PAD CLEARANCE

On assembly (0.1 to 0.15 mm) (0.004 to 0.006 in)

BRAKE PAD THICKNESS [mm] (in)

FRONT		REAR	
New	Max. wear thickness	New	Max. wear thickness
16.5 (0.65)	(1)	15 (0.59)	(1)

(1) On cars provided with brake pad wear indicator, replace pads when indicator lights up

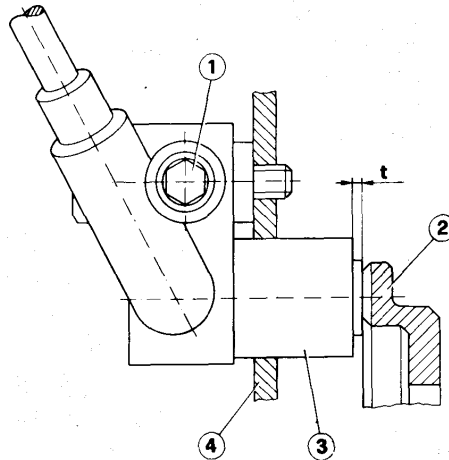
HAND BRAKE LEVER TRAVEL ADJUSTMENT

Number of free notches on ratchet before wheel locking: 4 to 6

ADJUSTMENT OF THE AIR GAP BETWEEN THE IMPULSE PICK-UPS AND THE IMPULSE EMITTING WHEELS (*)

t = air gap

- 1 Screw adjusting air gap (t) between the impulse pick-up and impulse emitting wheel
- 2 Impulse emitting wheel
- 3 Impulse pick-up
- 4 Impulse pick-up support



CAUTION:

The impulse pick-ups are not interchangeable (neither front with rear nor left with right).

When re-installing make sure that the impulse pick-ups, new or re-used, are installed in their correct position.

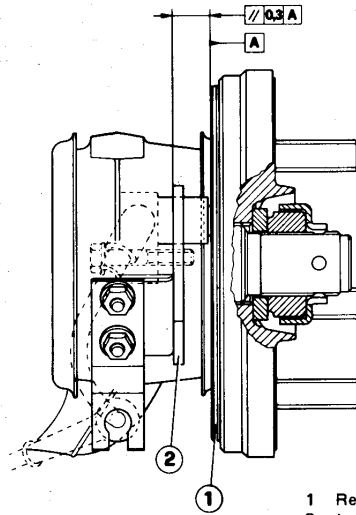
(*) Vehicles equipped with (ABS) MARK II antilock braking system

FRONT AND REAR BRAKES

REAR IMPULSE EMITTING WHEELS (*)

Assembly tolerance

Parallelism error between the impulse emitting wheel ① and impulse pick-up support ②:
 0,3 mm
 (0.01 in)



- 1 Rear impulse emitting wheel
- 2 Impulse pick-up support

(*) Vehicles equipped with (ABS) MARK II antilock braking system

TIGHTENING TORQUES [N·m (kg·m; ft·lb)]

Description	[N·m (kg·m; ft·lb)]
Screws front brake caliper to steering knuckle	74 to 83 (7.5 to 8.5) (54.6 to 61.2)
Nuts, rear brake caliper to gearbox/differential housing	46 to 52 (4.7 to 5.3) (33.9 to 38.4)
Screws, spacer and rear brake disc to inner axle shaft (1)	49 to 54 (5 to 5.5) (36.1 to 39.8)
Screws, spacer to outer axle shaft (1)	44 to 54 (4.5 to 5.5) (32.5 to 39.8)
Screws, rear brake disc to axle shaft (2)	29 to 35 (3 to 3.6) (21.4 to 25.8)
Locknut, rear brake disc clearance adjusting screw (torque for guidance only, to be obtained by means of a wrench)	7 to 10 (0.7 to 1) (5.2 to 7.4)

(1) Cars with axle shafts equipped with spacer (refer to Group 00 - Use of Units in Car)

(2) Cars with axle shafts not equipped with spacer (refer to Group 00 - Use of Units in Car)

FRONT AND REAR BRAKES

TRADITIONAL BRAKING SYSTEM data

Part	[N·m (kg·m; ft·lb)]
Fittings, hydraulic brake system piping	10 thru 12 (1 thru 1.2) (7.4 thru 8.9)
Fittings, hydraulic brake system hoses	10 thru 15 (1 thru 1.5) (7.4 thru 11.1)
Nuts, brake servo to pedal support	12 thru 15 (1.2 thru 1.5) (8.9 thru 11.1)
Nuts, brake master cylinder to brake servo	12 thru 15 (1.2 thru 1.5) (8.9 thru 11.1)

(ABS) MARK II WHEEL ANTILOCK BRAKING SYSTEM data

Part	[N·m (kg·m; ft·lb)]
Pressure switch - electropump unit connection	20 thru 26 (2 thru 2.7) (14.8 thru 19.2)
Accumulator - electropump unit connection	40 thru 46 (4.1 thru 4.7) (29.5 thru 33.9)
Screw connecting hose - electropump unit (union)	16 thru 20 (1.6 thru 2) (11.8 thru 14.8)
Screw securing electropump unit - support	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Hose (on electropump unit) - pressurized fluid delivery pipe connection	16 thru 20 (1.6 thru 2) (11.8 thru 14.8)
Screws securing electropump unit support - body	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Nuts securing coil and electropump unit support - body	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Brake adjusting valve - braking pressure modulation electrovalve unit connection	35 thru 40 (3.6 thru 4.1) (25.8 thru 29.5)
Nuts securing electrovalve unit - hydraulic assy	21.4 thru 29.4 (2.2 thru 3) (15.8 thru 21.7)
Screw tightening union on hydraulic assy	16 thru 20 (1.6 thru 2) (11.8 thru 14.8)
Nuts connecting hydraulic - pedal assies	11.3 thru 14 (1.1 thru 1.4) (8.3 thru 10.3)
Unions connecting hydraulic assy - pipes carrying pressurized fluid to brake calipers	12 thru 16 (1.2 thru 1.6) (8.9 thru 11.8)
Screw securing hydraulic assy - square for connection of front left hand wheel impulse pick-up	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Union connecting pipe ("from" electropump unit) - hydraulic assy	16 thru 20 (1.6 thru 2) (11.8 thru 14.8)
Screw securing front impulse pick-up cable plate - suspension upper link	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Screw securing impulse pick-up (front and rear) - support	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Nuts securing front impulse pick-up - steering knuckle	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Nuts securing rear impulse pick-up - wheel hub	9 thru 10 (0.9 thru 1) (6.6 thru 7.4)
Screw adjusting air gap, impulse pick-up impulse emitting wheel (front and rear)	2.4 thru 3 (0.24 thru 0.3) (1.77 thru 2.21)

FRONT AND REAR BRAKES

TROUBLESHOOTING FOR TRADITIONAL BRAKING SYSTEM

For correct brake system troubleshooting check:

- Tyres for wear
- Tyre inflation pressure
- Brake fluid and compliance with programmed maintenance instructions.

Fault	Cause	Remedy
Excessive pedal travel	<ul style="list-style-type: none"> • Brake master cylinder leakage • Defective vacuum system non return valve • Load proportioning valve leakage • Brake system fittings leakage • Air in brake system 	<p>Overhaul brake master cylinder</p> <p>Replace valve</p> <p>Overhaul or replace</p> <p>Tighten fittings</p> <p>Bleed</p>
Pedal sponginess	<ul style="list-style-type: none"> • Air in brake system • Clogged air vent on reservoir • Hose swelling caused by deterioration or use of poor quality hose • Worn caliper seals • Low boiling point brake fluid 	<p>Bleed</p> <p>Clean and bleed system</p> <p>Replace hoses and bleed system</p> <p>Drain hydraulic system, wash using spirit and replace seals</p> <p>Change to recommended brake fluid and bleed system</p>
Insufficient braking power	<ul style="list-style-type: none"> • Brake line leakage • Air in brake system • Grease, oil, mud or water on pad surfaces • Excessive pad wear or deterioration • Improper contact between pad and disc • Brake master cylinder malfunction • Worn or seized pad actuating pistons • Obstruction to pedal travel and pad movement 	<p>Check brake master cylinder and piping to detect and repair any leakage</p> <p>Bleed system</p> <p>Clean and detect cause of trouble. Replace pads</p> <p>Replace pads and grind discs as necessary</p> <p>Replace pads and grind discs as necessary</p> <p>Repair or replace</p> <p>Remove brake calipers, overhaul pistons as necessary</p> <p>Remove as necessary</p>

FRONT AND REAR BRAKES

Fault	Cause	Remedy
Uneven braking	<ul style="list-style-type: none"> • Incorrect tyre pressure • Grease, mud or water on pad surfaces • Pad surfaces excessively worn or deteriorated • Load proportioning valve not properly adjusted or inefficient • Incorrect wheel bearing adjustment • Incorrect wheel alignment 	<p>Inflate to the correct pressure</p> <p>Clean components and detect cause of trouble Replace pads</p> <p>Replace pads</p> <p>Adjust or overhaul or replace as necessary</p> <p>Adjust bearings</p> <p>Adjust alignment</p>
Fade	Unsuitable or inefficient friction materials	Replace pads
Vibration on brake application	<ul style="list-style-type: none"> • Scored discs • Distorted pads • Grease or brake fluid on braking surfaces 	<p>Grind or replace as necessary</p> <p>Replace as necessary</p> <p>Replace pads</p>
Brake squeal	<ul style="list-style-type: none"> • Return springs weakened or failed • Glazed pads 	<p>Replace defective parts</p> <p>Dress or replace pads</p>
Brakes binding	<ul style="list-style-type: none"> • Pedal articulation binding or excessive brake servo output rod length • Brake master cylinder by-pass clogged • Brake master cylinder pistons seized • Piston protectors distorted • Defective brake calipers spring-back because of defective piston seals • Excessive disc distortion • Hand brake stuck • Brake master cylinder clogged • System lines clogged • No pedal free travel 	<p>Lubricate connection, check pedal return spring and adjust rod as necessary</p> <p>Remove foreign matter by blowing compressed air</p> <p>Overhaul brake master cylinder and bleed system</p> <p>Replace</p> <p>Replace piston seals</p> <p>Grind or replace disc</p> <p>Check and repair</p> <p>Overhaul master cylinder and bleed system</p> <p>Check and clean</p> <p>Adjust pedal travel</p>

FRONT AND REAR BRAKES

Fault	Cause	Remedy
Pedal rattle	<ul style="list-style-type: none"> • Excessive disc runout • Excessive disc thickness variation 	<p>Check using a gauge, manually rotating disc. If runout exceeds requirements, repair or replace disc.</p> <p>Measure using a suitable gauge. Replace disc if necessary</p>
Rear wheel locking (on light braking)	Defective load proportioning valve	Replace
Rear wheel locking (on hard braking)	<ul style="list-style-type: none"> • Low front brake effectiveness • Grease, oil, mud or water on braking surfaces • Excessive front pad wear • Brake master cylinder in pad condition 	<p>Overhaul front brakes</p> <p>Clean or replace and detect causes of trouble</p> <p>Replace pads</p> <p>Repair or replace</p>
Brake servo Lack of assistance	<ul style="list-style-type: none"> • Non-return valve leakage • Seal leakage between vacuum housing and control unit • Disc valve leakage • Actuating piston gland leakage • Master cylinder/brake servo sealing ring leakage • Damaged hose or fittings 	<p>Check valve</p> <p>Replace brake servo assembly</p> <p>Replace sealing ring</p> <p>Repair or replace</p>
Idle adjustment impossible (all connections tight)	Engine draws air from brake servo	Replace non-return valve or brake servo
Hand brake inoperative	<ul style="list-style-type: none"> • Incorrect adjustment • Control cable damaged or broken • Defective brake control cable connection 	<p>Adjust</p> <p>Replace cable</p> <p>Check connection</p>
Hand brake stuck after application	<ul style="list-style-type: none"> • Binding in cable return travel • Lever push button stuck 	<p>Remove obstacles or replace cable</p> <p>Disassemble and unlock or replace lever</p>

FRONT AND REAR BRAKES

Fault	Cause	Remedy
Hand brake on indicator fails to light up	<ul style="list-style-type: none">• Open circuit• Defective sending unit• Defective indicator	Restore circuit continuity Replace Replace

TROUBLESHOOTING FOR THE (ABS) MARK II ANTILOCK BRAKING SYSTEM

For correct brake system troubleshooting check:

- Tyres for wear
- Tyre inflation pressure
- Brake fluid and compliance with scheduled maintenance instructions.

NOTE:

The correct operation of the "brake fluid min. level and pad wear" warning light on the A.R. CONTROL and of the "ABS MARK II system" warning light (Ⓢ) on the instrument panel is the following:

- On turning the key to IGNITION, both lights illuminate and extinguish (not at the same time) after approximately two seconds.
- On starting the engine, the (Ⓢ) light only will illuminate again, to extinguish about two seconds after the key has returned from the START position to IGNITION.
- In motion, both lights are off.

WARNING:

If ABS control is disconnected, indicated by the illumination of the (Ⓢ) light on the instrument panel, the servo assisted braking system still continues to operate; the simultaneous illumination of the (Ⓢ) light on the instrument panel and the "brake fluid minimum level and pad wear" warning light on the A.R. CONTROL, on the other hand indicates an effectively hazardous situation on account of an excessive reduction in hydraulic circuit pressure and the lack of servo assistance.


NOTE:

Reference should be made to the wiring diagram and cabling shown at the end of this paragraph for electrical testing and component location.

FRONT AND REAR BRAKES

Fault	Cause	Remedy
(P) light fails to illuminate with key to IGNITION	<ul style="list-style-type: none"> • Blown bulb • Diode N29a (see Wiring Diagram) is cut off and ABS unit not supplied at same time 	<p>Replace bulb or check wiring</p> <p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>
(P) lights but remains so with key to IGNITION	<ul style="list-style-type: none"> • ABS unit not supplied or inefficient • Brake fluid tank switch H34 or N28 pressure switch (see Wiring Diagram) inefficient 	<p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>
With key to IGNITION, the (S) light and the "brake fluid minimum level and pad wear" light on the A.R. CONTROL light up but both remain so	<ul style="list-style-type: none"> • Insufficient brake fluid • The pressure in the high pressure circuit has not overtaken the minimum safety value (105 bar) • N28 pressure switch (see Wiring Diagram) inefficient 	<p>Top up</p> <p>Wait 30 seconds</p> <p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>
With key to IGNITION, the "brake fluid minimum level and pad wear" on A.R. CONTROL lights up but remains so	<ul style="list-style-type: none"> • Worn pads • Insufficient brake fluid • Brake fluid tank switch H34 (see Wiring Diagram) inefficient • N28 pressure switch (see Wiring Diagram) inefficient 	<p>Replace</p> <p>Top up</p> <p>Carry out electrical diagnosis of the brake fluid tank for the (ABS) MARK II antilock braking system</p> <p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>
With key to IGNITION, (S) light illuminates and extinguishes duly after 2 seconds but fails to light up again on starting	<ul style="list-style-type: none"> • Relay I38 (see Wiring Diagram) inefficient 	<p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>
With the key to IGNITION, the (P) light illuminates and duly extinguishes after 2 seconds, but on starting lights up again and remains so	<ul style="list-style-type: none"> • ABS unit inefficient 	<p>Replace</p>
When running, the (P) light illuminates or both the (P) light and the "brake fluid minimum level and pad wear" on A.R. CONTROL light up	<ul style="list-style-type: none"> • Multiple causes 	<p>Carry out diagnosis procedure of the (ABS) MARK II antilock system</p>

FRONT AND REAR BRAKES

Fault	Cause	Remedy
When running the  light illuminates now and again due to causes unknown (and not shown by the diagnosis of the (ABS) MARK II antilock system)	<ul style="list-style-type: none"> • Badly connected or rusty connections • Clearance of the front wheel hub bearings not within specified tolerance limits • Diode N29b (see Wiring Diagram) cut off • Relay I40 (see Wiring Diagram) inefficient • ABS control unit occasionally inefficient 	<p>Verify and rectify</p> <p>Return clearance to within specified values (see: Group 21 - Front Suspension Inspection Specifications - Checks and Adjustment)</p> <p>Replace</p> <p>Replace</p> <p>Replace</p>
Insufficient braking power	<ul style="list-style-type: none"> • Brake line leakage • Air in brake system • Grease, oil, mud or water on pad surfaces • Pad deterioration • Worn or seized pad actuating pistons • Brake master cylinder/hydraulic servo cylinder inefficient due to internal leakage 	<p>Repair or replace faulty parts</p> <p>Bleed system</p> <p>Clean and detect cause of trouble. Replace pads</p> <p>Replace pads and grind discs as necessary</p> <p>Replace calipers</p> <p>Verify presumed cause thus:</p> <ul style="list-style-type: none"> - Connect two 100 bar pressure gauges (A.2.0440) to the front caliper bleed screws - Turn the key to IGNITION and wait for the electropump to come to a halt - Remove key - Press brake pedal with suitable tool (A.2.0442) until 100 bar is reached on front caliper pressure gauges - Wait about 3 minutes for the pressure to settle then check that the loss of pressure is no greater than 5 bar in 5 minutes. <p>If pressure loss is greater, replace master cylinder with hydraulic servo cylinder</p>
Excessive pedal travel	<ul style="list-style-type: none"> • Brake master cylinder and/or hydraulic servo cylinder leakage • Fluid leakage from brake pressure adjusting valve • Brake system union leakage • Air in brake system • Gaskets inside master cylinder and/or hydraulic servo cylinder inefficient 	<p>Replace brake master cylinder with hydraulic servo cylinder</p> <p>Replace</p> <p>Tighten unions to specified torque. Replace</p> <p>Bleed</p> <p>Replace brake master cylinder with hydraulic servo cylinder</p>

FRONT AND REAR BRAKES

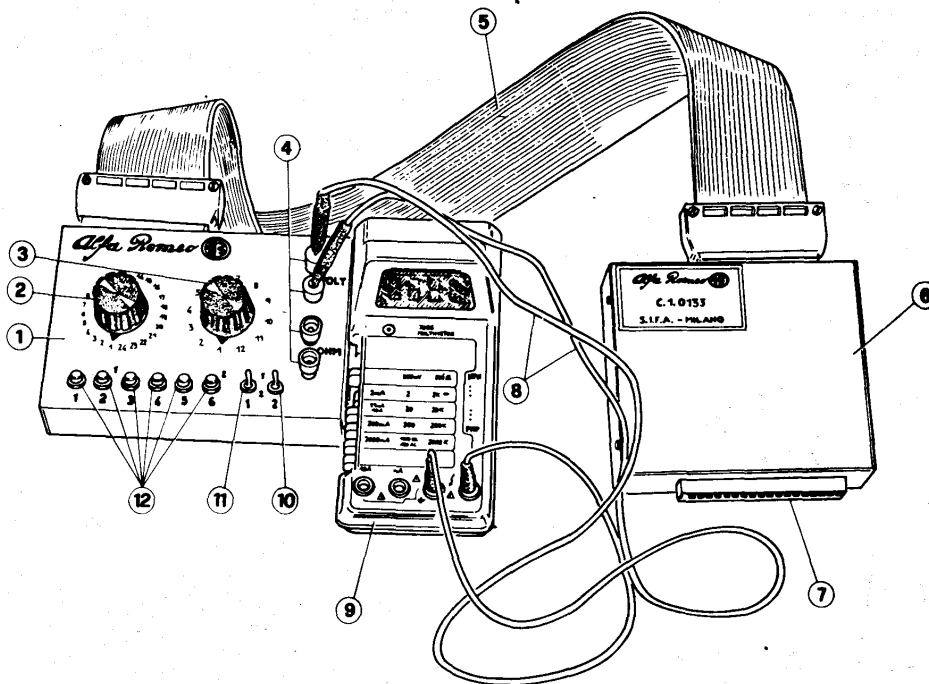
Fault	Cause	Remedy
Pedal sponginess	<ul style="list-style-type: none"> • Air in brake system • Clogged air vent on brake fluid tank • Use of unsuitable brake fluid 	<p>Bleed</p> <p>Clean and possibly replace</p> <p>Change to recommended brake fluid and bleed system</p>
Uneven braking	<ul style="list-style-type: none"> • Incorrect tyre pressure • Grease, oil, mud or water on pad surfaces • Pad surfaces unevenly worn or deteriorated • Inefficient brake pressure adjusting valve • Incorrect wheel trim 	<p>Inflate to correct pressure</p> <p>Clean components and detect cause of trouble. Replace pads</p> <p>Detect cause of trouble and replace pads</p> <p>Replace</p> <p>Adjust</p>
Vibration on brake application	<ul style="list-style-type: none"> • Unevenly worn pads • Grease or brake fluid on braking surfaces • Distorted discs 	<p>Detect cause and replace pads</p> <p>Detect cause and replace pads</p> <p>Grind or replace</p>
Brakes squeal	<ul style="list-style-type: none"> • Unsuitable pads • Rusty discs 	<p>Replace</p> <p>Grind or replace</p>
Brakes binding	<ul style="list-style-type: none"> • Pedal fails to return to rest position • Calipers stay partially closed • Hand brake stuck 	<p>Check pedal motion and repair fault. Replace master cylinder with hydraulic servo cylinder</p> <p>Check and possibly replace</p> <p>Check and repair</p>
Rear wheels tend to brake more than front ones	Inefficient brake pressure adjusting valve	Replace
Hand brake inoperative	<ul style="list-style-type: none"> • Pads not adjusted • Hand brake travel adjustment incorrect • Control cable damaged or broken • Hand brake control on calipers defective 	<p>Adjust</p> <p>Adjust</p> <p>Replace cable</p> <p>Replace calipers</p>
Car still braking with hand brake off	Binding in cable return travel	Remove obstacles or replace cable

FRONT AND REAR BRAKES

Fault	Cause	Remedy
Hand brake stuck	Lever pushbutton stuck	Disassemble and release or replace lever
Hand brake on indicator fails to light up	<ul style="list-style-type: none"> • Open circuit • Defective switch • Defective A.R. CONTROL 	Restore circuit continuity Replace Check and possibly replace

DIAGNOSIS PROCEDURE OF THE (ABS) MARK II ANTILOCK SYSTEM

DIAGNOSTIC INSTRUMENTATION

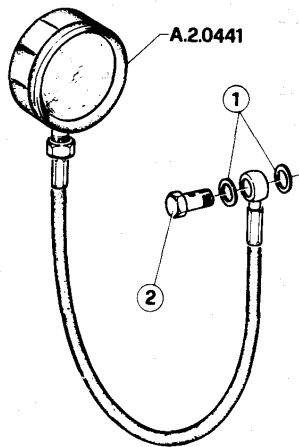


- 1 Universal diagnoser for electronic systems (C.1.0132)
- 2 Selector (1)
- 3 Selector (2)
- 4 Jacks

- 5 Connecting cable (C.9.0032)
- 6 Interface for ABS MARK II (C.1.0133)
- 7 Connection to wiring connector
- 8 Tie cables

- 9 Multimeter
- 10 Switch (2)
- 11 Switch (1)
- 12 Pushbuttons

FRONT AND REAR BRAKES



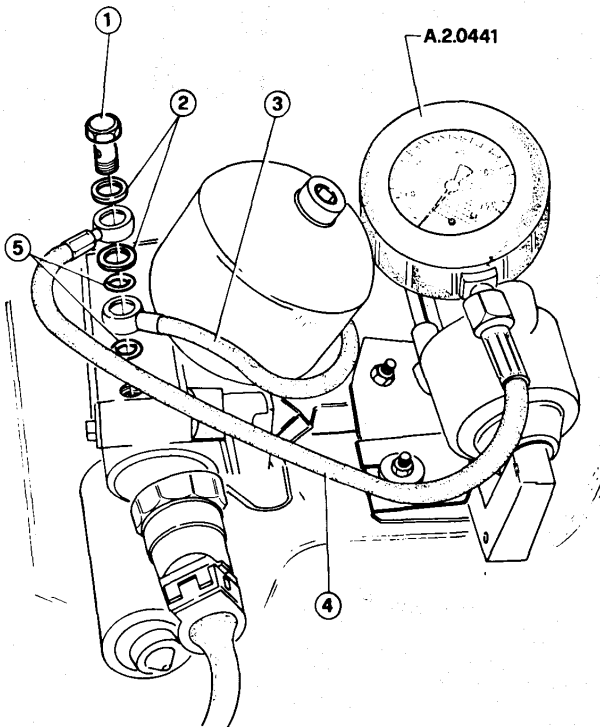
CAUTION:
Prior to working on the hydraulic circuit, the brake fluid pressure should be completely discharged by pressing the brake pedal at least 20 times until it sticks, with the ignition key removed. The circuit is at 180 bar.

Hydraulic circuit pressure gauge (A.2.0441)

- 1 Washers
- 2 Screw

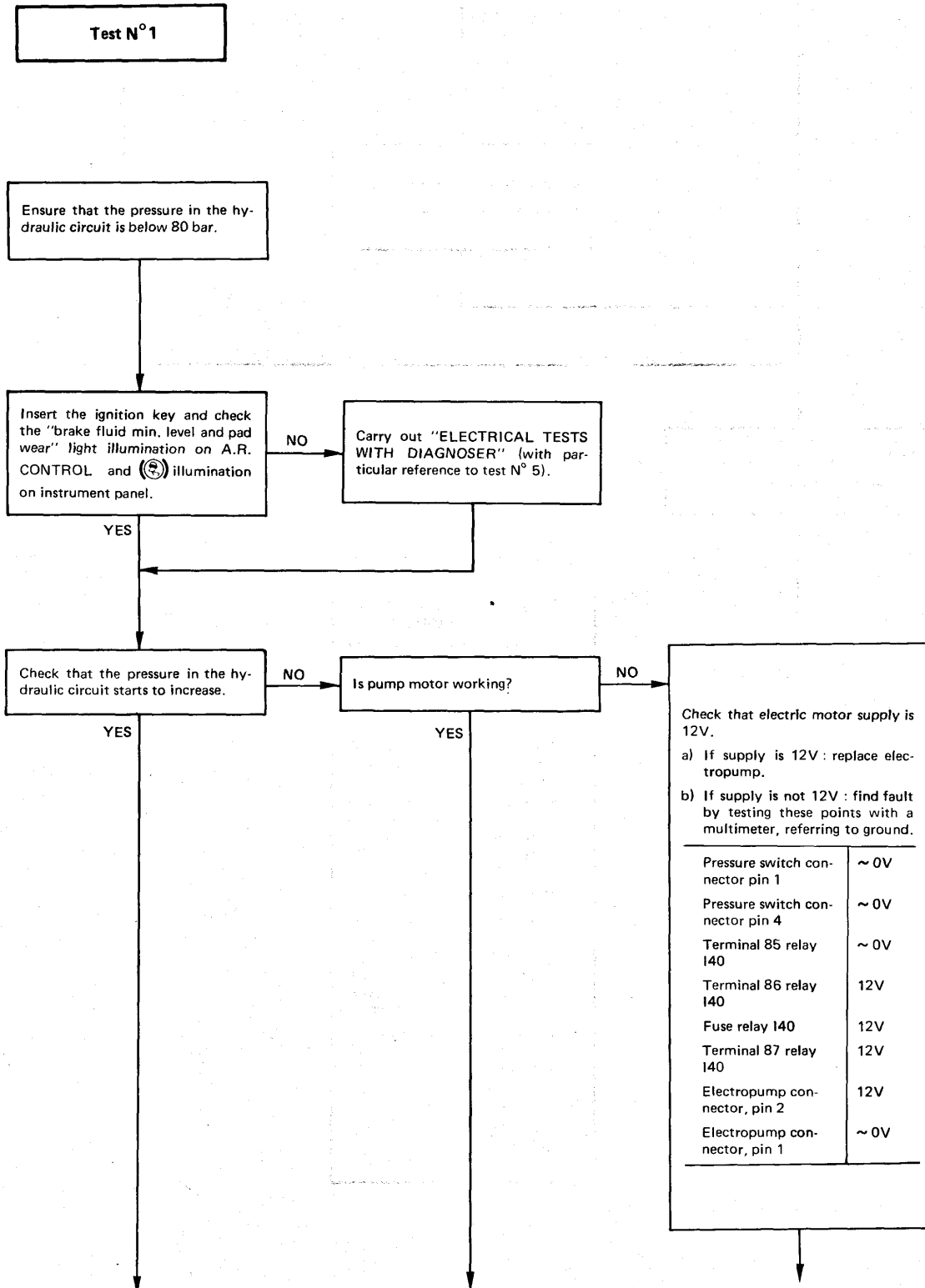
PRELIMINARY OPERATIONS

- Remove the ignition key.
- Fully discharge the hydraulic circuit pressure (**press brake pedal at least 20 times until it sticks**).
- Connect the pressure gauge (A.2.0441) to the pump unit outlet.

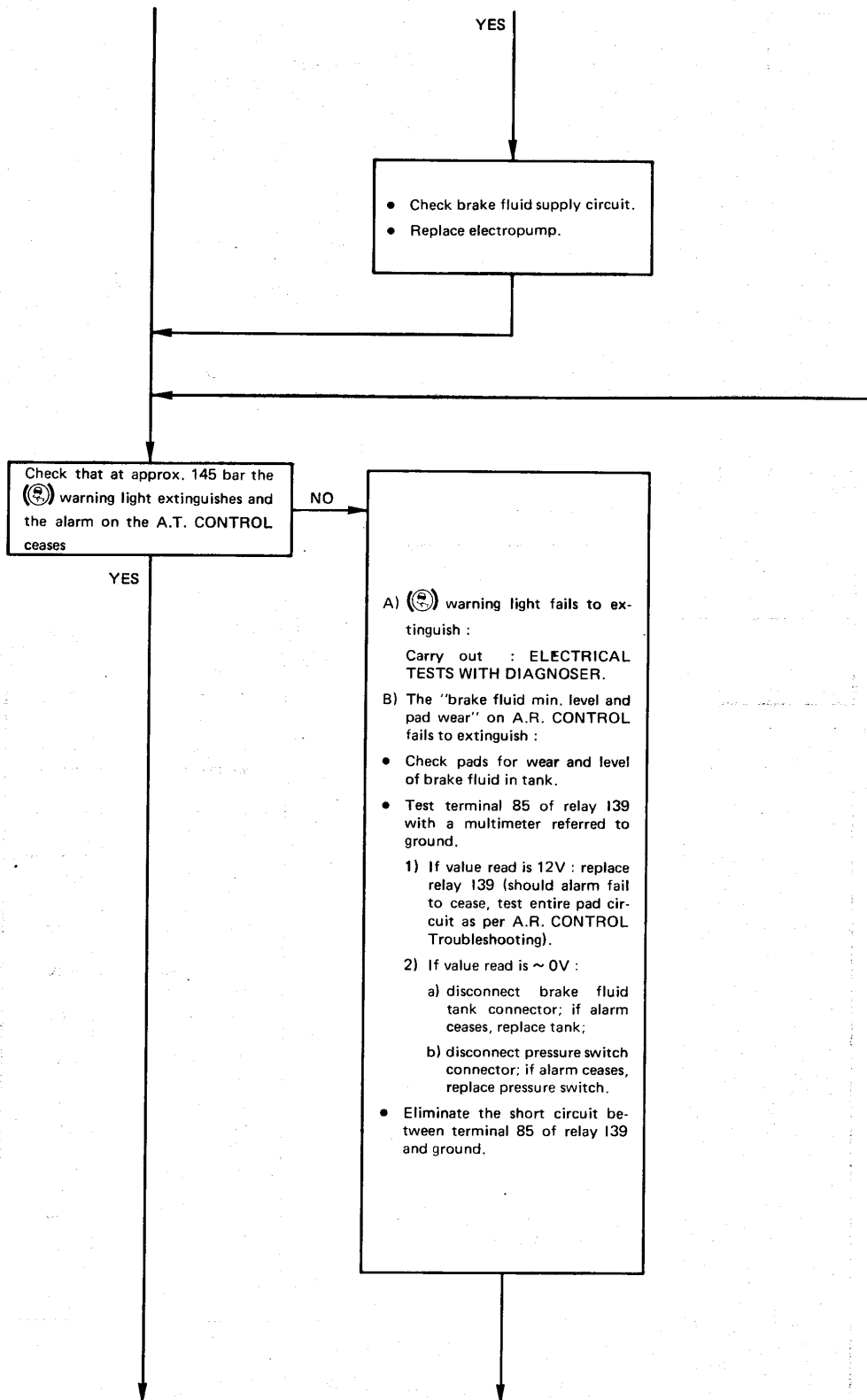


- 1 Screw
- 2 Washers
- 3 Pressurized fluid delivery hose
- 4 Pressure gauge A.2.0441 hose
- 5 O-Rings

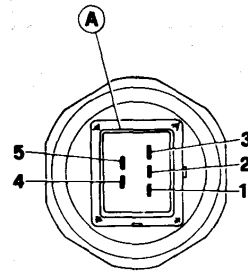
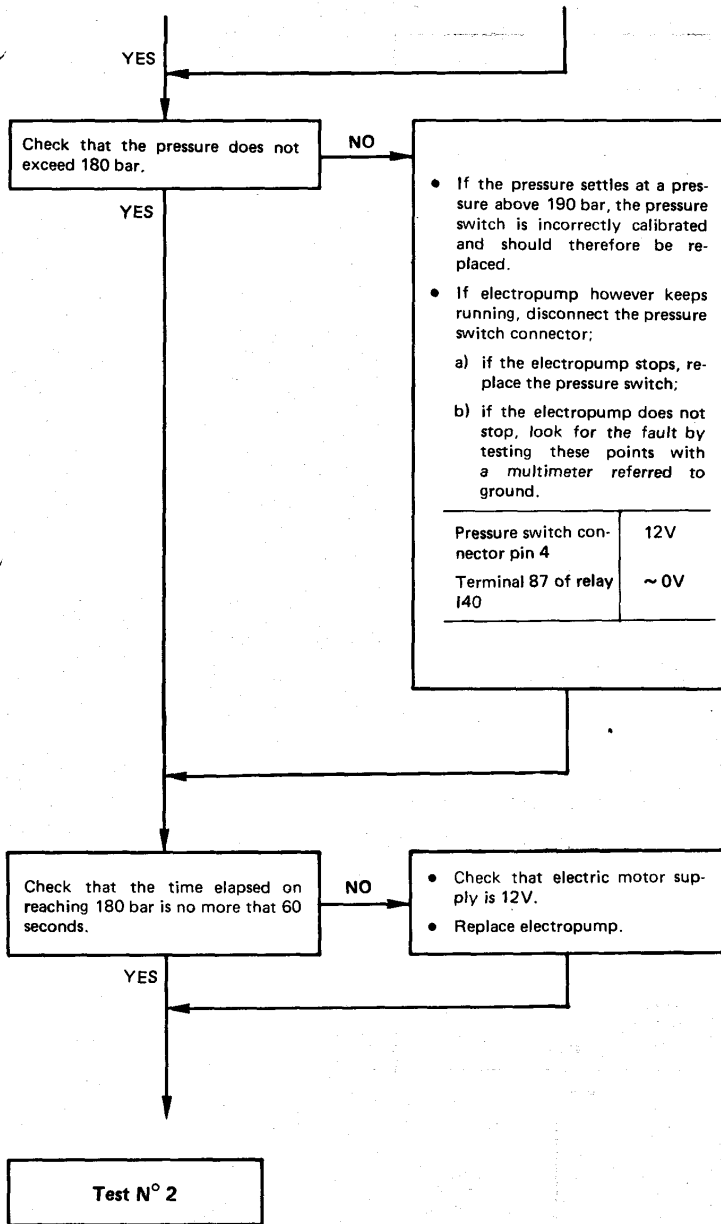
FRONT AND REAR BRAKES



FRONT AND REAR BRAKES



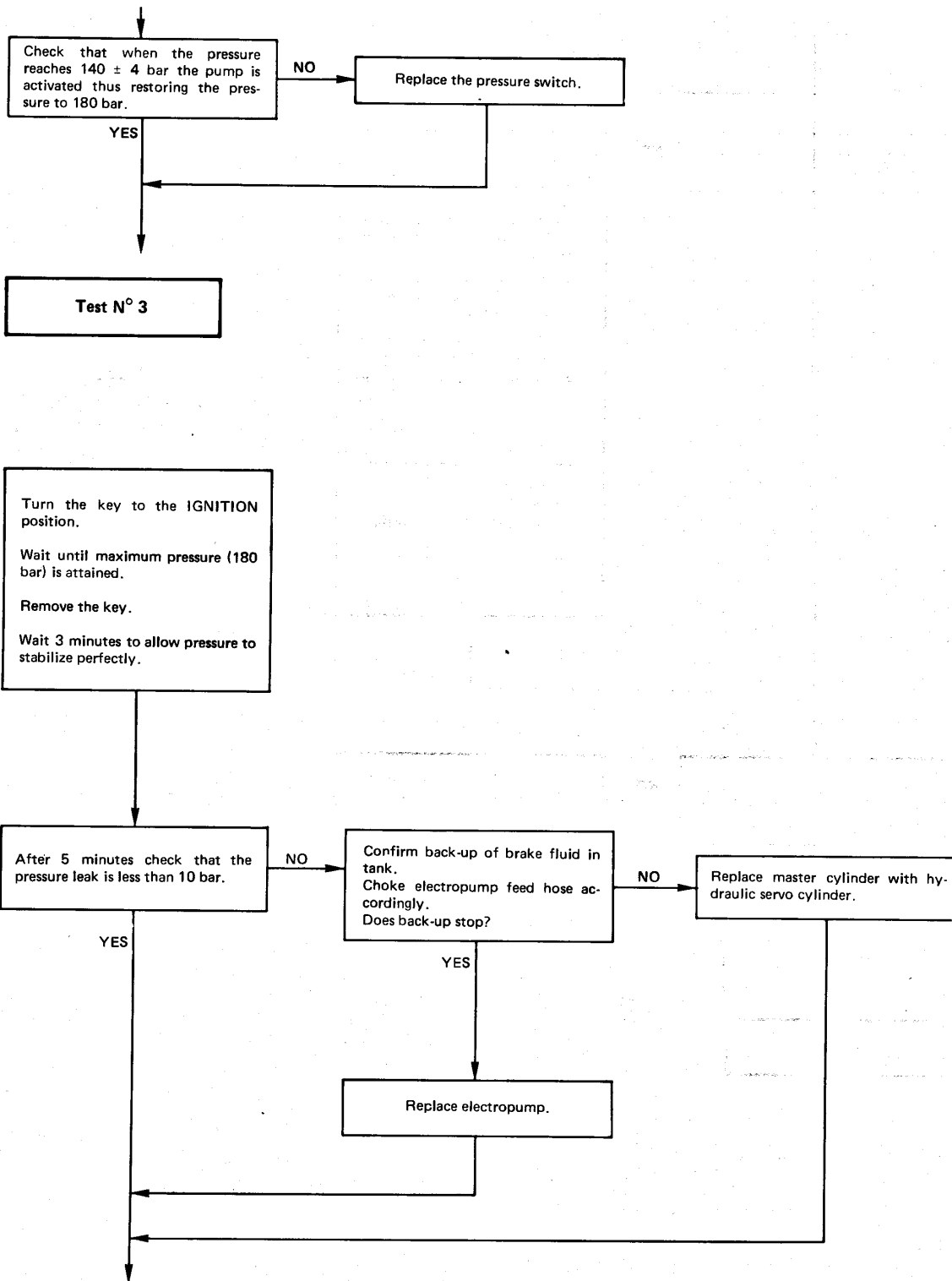
FRONT AND REAR BRAKES



A Pressure switch connector

With a pressurized hydraulic circuit (pump at a halt) and the key inserted, press the brake pedal several times.

FRONT AND REAR BRAKES



FRONT AND REAR BRAKES

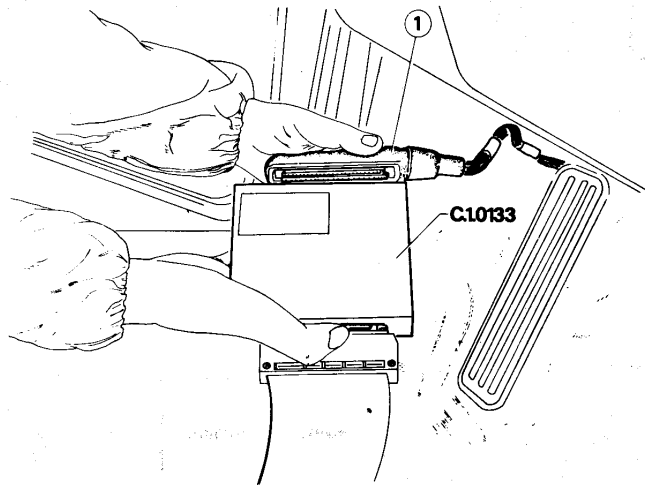
ELECTRICAL TESTS WITH DIAGNOSER

NOTE:

Subsequent to a repair it is advisable to resume the diagnosis from the start.

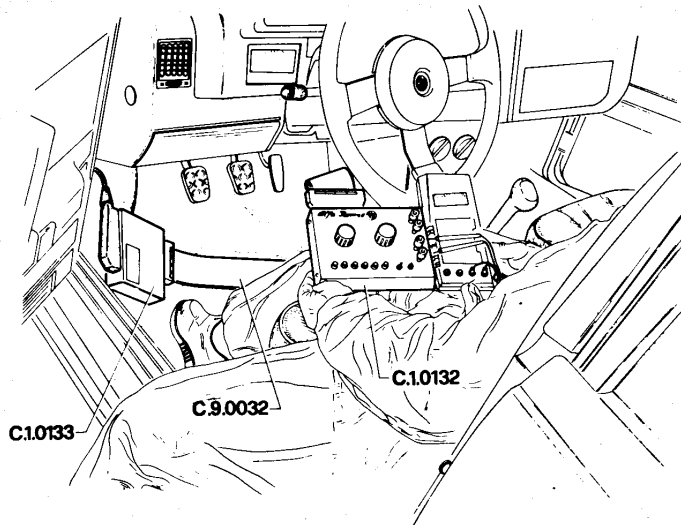
Ohmmetric measurement set-up

- Disconnect the connector from the ABS unit.
- Insert the diagnostic equipment interface (C.1.0133) in the cable connector.



1 Cable connector

- Ensure that the interface (C.1.0133) is connected to the diagnoser (C.1.0132) by means of the cable supplied (C.9.0032).



FRONT AND REAR BRAKES

- Set rotating selectors (1) and (2) to position 1.
- Set switches (1) and (2) to position 1.
- Verify that the pressure in the hydraulic circuit is 140 thru 180 bar.
- Remove the key.
- Set-up the multimeter for OHM measurement and insert the prods of the tie cables into the blue and black jacks of the diagnoser marked OHM.
- Selectors (1) and (2) to position 1.

Test N° 4

Impulse pick-ups test

Selector (1) to position 1.
Set multimeter to position 20 KΩ F.S..

Read $2100 \pm 300 \Omega$ on the multimeter.
Turn selector (1) to positions 2 - 3 - 4 and check that the value obtained remains between $2100 \pm 300 \Omega$.

Selector 1	Impulse pick-up tested
position 1	RH rear
position 2	LH front
position 3	LH rear
position 4	RH front

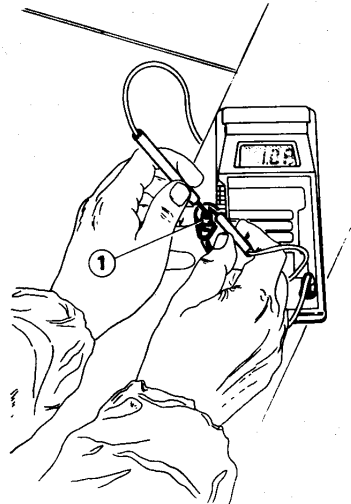
NO

Operate on defective impulse pick-up only.

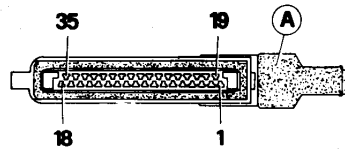
- A) If the value read on the diagnoser is approx. 1000Ω , one of the two connecting cables between the impulse pick-up and control unit connector is short circuiting on the body; eliminate the problem.
- B) For other values (and therefore for other types of failure) the resistance should be measured directly on the impulse pick-up involved and also on the control unit connector.

NOTE :
Measuring directly on the multimeter (without the diagnoser) the impulse pick-up resistance should be $1100 \pm 300 \Omega$.

Impulse pick-up	Control unit connector
RH rear (L30)	4 - 22
LH front (L29)	5 - 23
LH rear (L31)	6 - 24
RH front (L28)	7 - 25



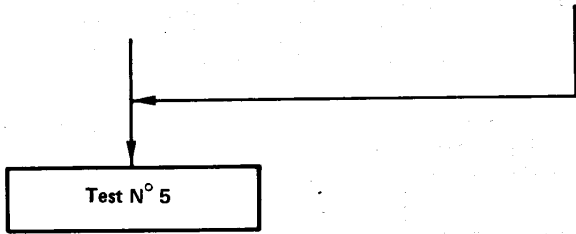
1 Impulse pick-up electrical connection



A Control unit connector

YES

FRONT AND REAR BRAKES



(⊗) warning light alarm SW test (tank and pressure switch)

Selector (1) to position 5.
Set up multimeter to position
200 Ω F.S..

Read ~ 0 Ω on the multimeter.

YES

NO

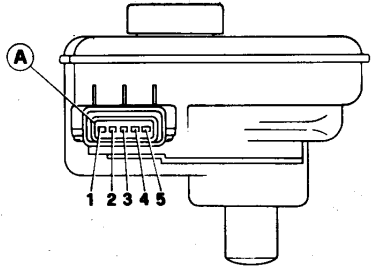
Check brake fluid tank level.
If level is normal, use the pre-
viously set up multimeter directly
on the tank connector, pins 1 and
2 to check that the resistance value
is ~ 0 Ω.

Is the value read ~ 0 Ω?

NO

YES

Replace tank.

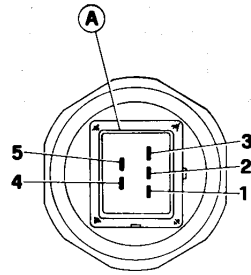


A Tank connector

FRONT AND REAR BRAKES

- Reconnect connector to tank.
 - Turn key to IGNITION position.
 - Wait for electropump to stop.
 - Remove key.
 - Disconnect pressure switch connector.
 - Using previously set up multimeter, check directly on the pressure switch connector, pins 3 and 5 that the resistance value is $\sim 0 \Omega$.

Is the value read $\sim 0 \Omega$?



A Pressure switch connector

NO → Replace pressure switch.

YES

Reconnect the connectors and check continuity between pins 9 and 10 of the control unit connector (disconnecting interface C.1.0133). Otherwise look for opening on cable between :

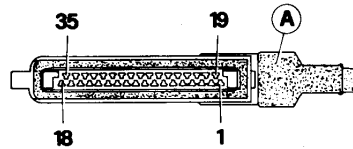
- Pin 2 tank connector and pin 3 pressure switch connector.
- Pin 1 tank connector and pin 9 control unit connector.
- Pin 5 tank connector and pin 10 control unit connector.

Remove brake fluid tank connector.

Read infinite resistance on the multimeter.

NO

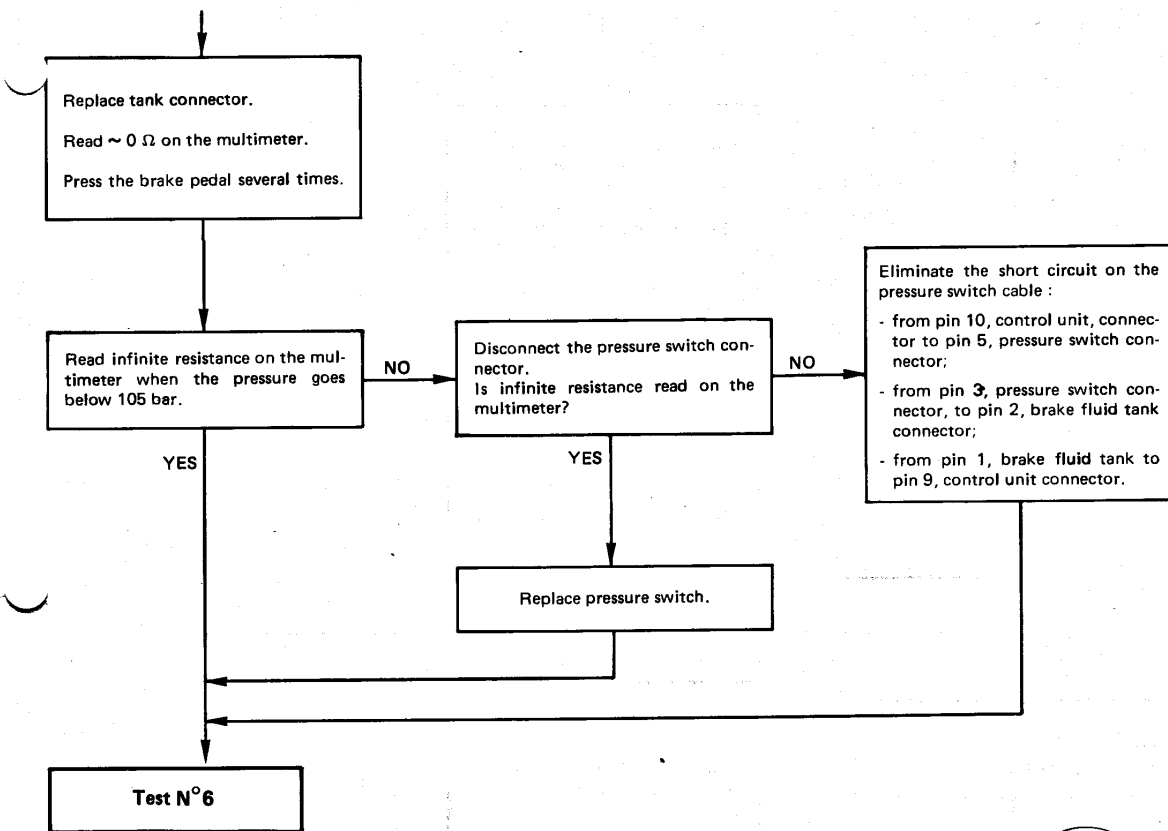
Verify that there is no continuity to ground on one of the two pins 9 and 10 of the control unit connector (with interface C.1.0133 disconnected). Otherwise look for the short circuit in the connections of pins 1 and 2 of the tank connector.



A Control-unit connector

YES

FRONT AND REAR BRAKES



Electrovalve test

Multimeter to position 200 Ω F.S..

Check the resistances indicated below for the various selector positions (1) :

position 6	5 thru 8 Ω (FRONT RH load)
position 7	3 thru 5 Ω (rear drain)
position 8	3 thru 5 Ω (FRONT LH drain)
position 9	3 thru 5 Ω (FRONT RH drain)
position 10	5 thru 8 Ω (rear load)
position 11	5 thru 8 Ω (FRONT LH load)

YES

NO

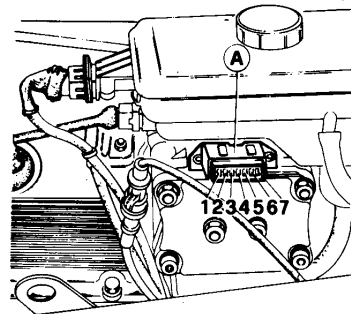
Using previously set up multimeter, check the following values directly on the electrovalve unit connector.

Prod position	Correct value [Ω]	Corresponding electrovalve
7 - 1	5 thru 8	Front LH Load
7 - 2	3 thru 5	Front LH Drain
7 - 3	5 thru 8	Rear Load
7 - 4	3 thru 5	Rear Drain
7 - 5	3 thru 5	Front RH Drain
7 - 6	5 thru 8	Front RH Load

YES

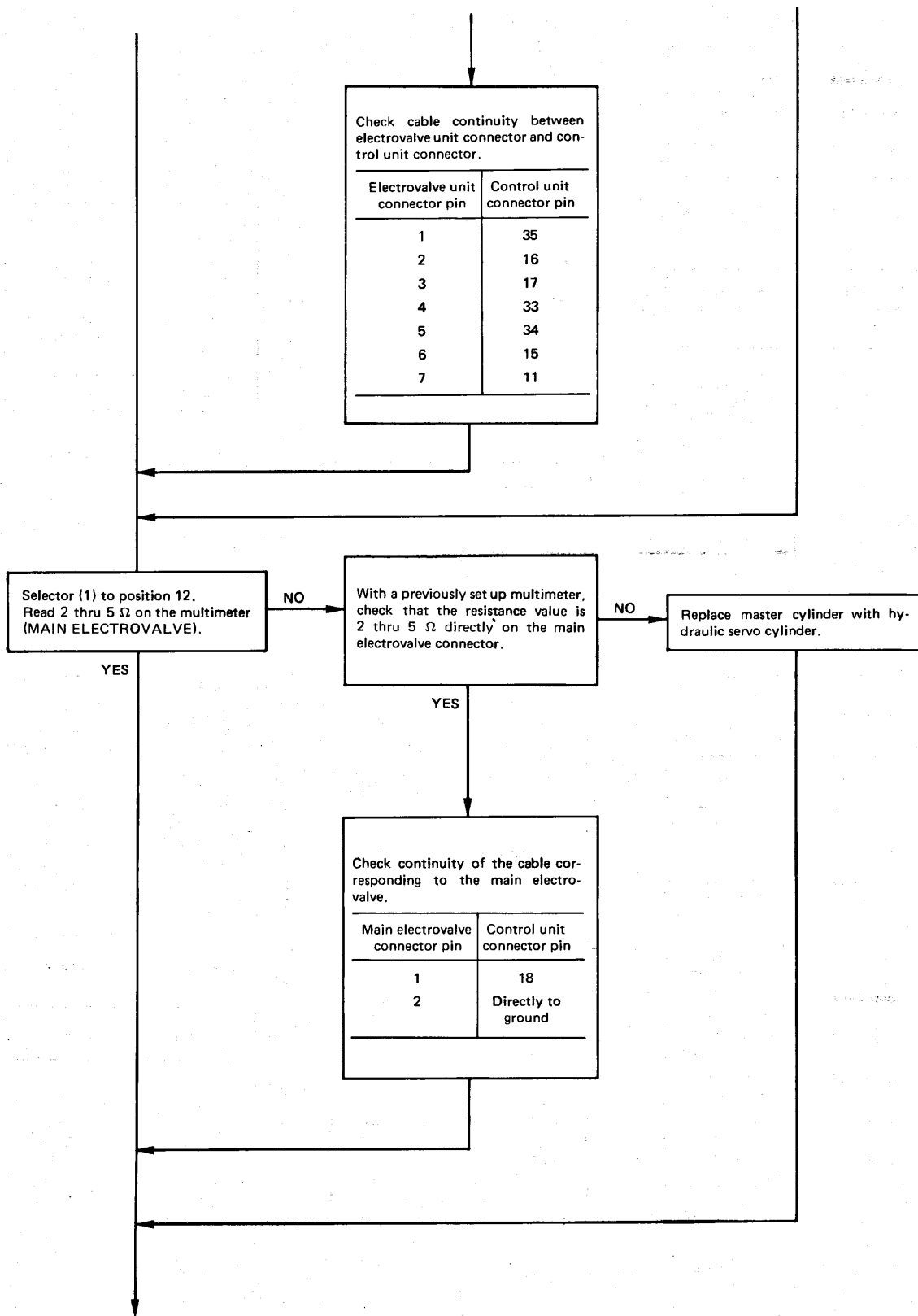
NO

Replace electrovalve unit.



A Electrovalve unit connector

FRONT AND REAR BRAKES



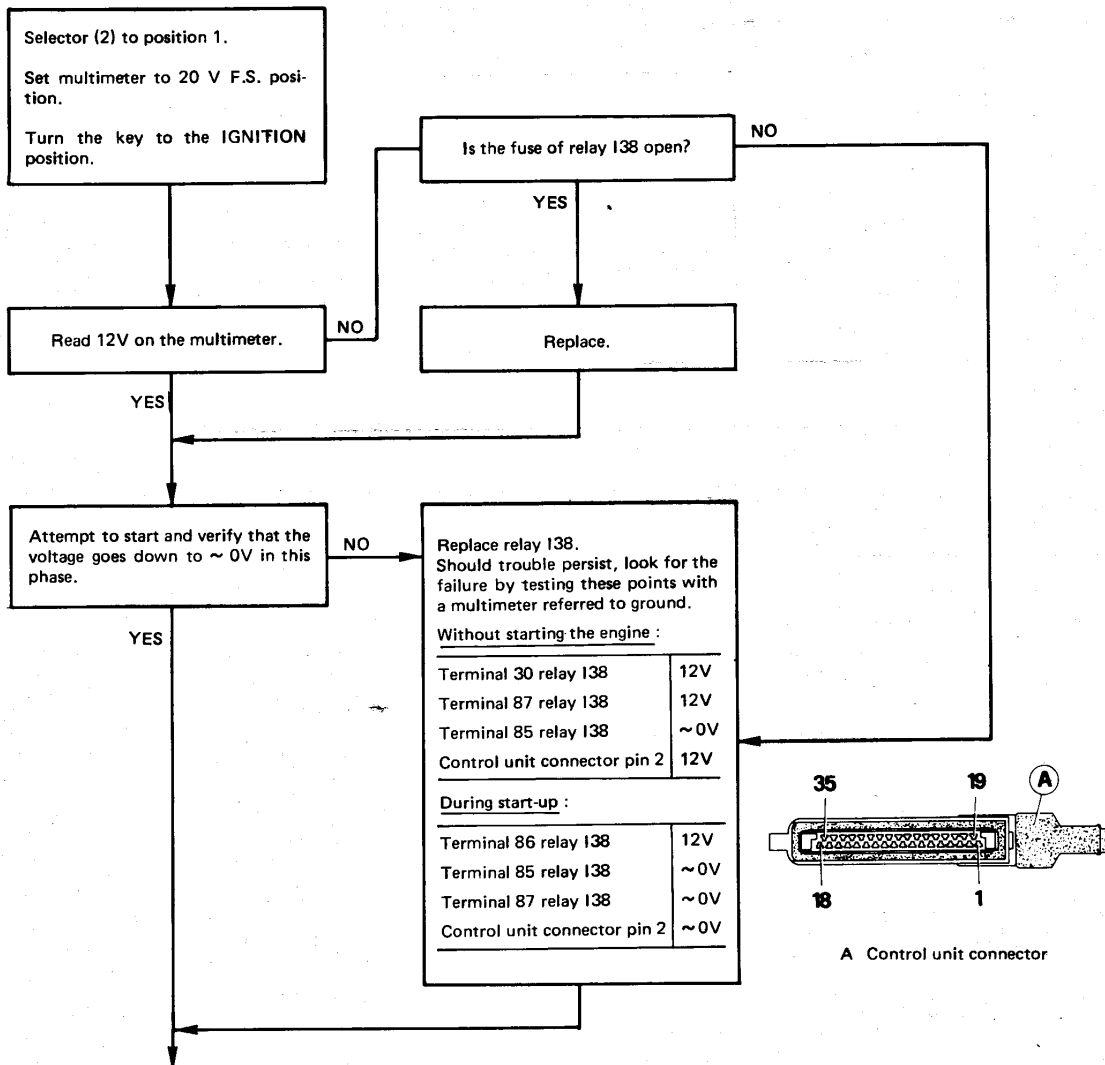
FRONT AND REAR BRAKES

Voltmetric measurement set-up

- Remove the key.
- Selector (1) to position 1.
- Selector (2) to position 1.
- Switches (1) and (2) to position 1.
- Turn the key and wait until maximum pressure (180 bar) is reached in the hydraulic circuit.
- Remove the key.
- Set the multimeter up for VOLT measurement and insert the cable tie black prod into the black jack marked VOLT and the red prod of the other cable tie into the red jack marked VOLT.

Test N° 7

Control unit inhibit test during start-up phase

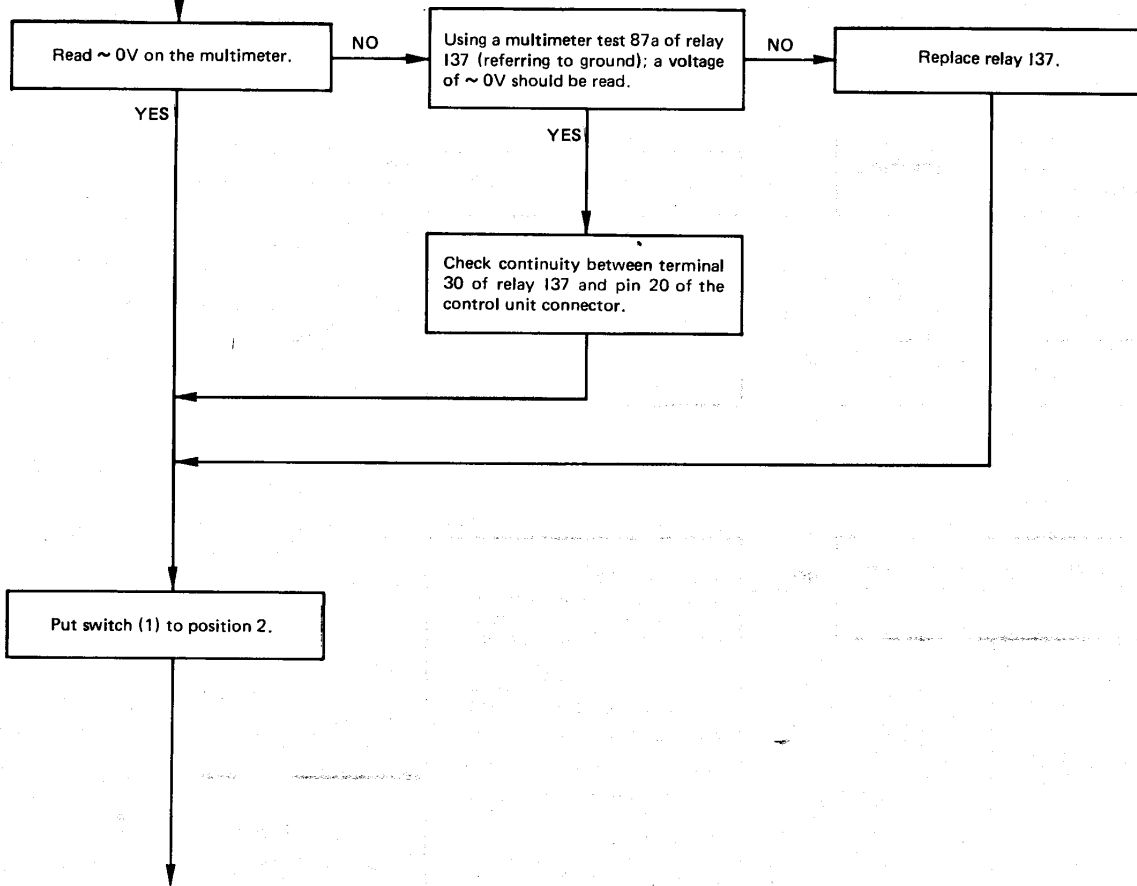


FRONT AND REAR BRAKES

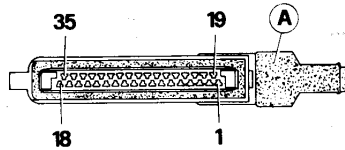
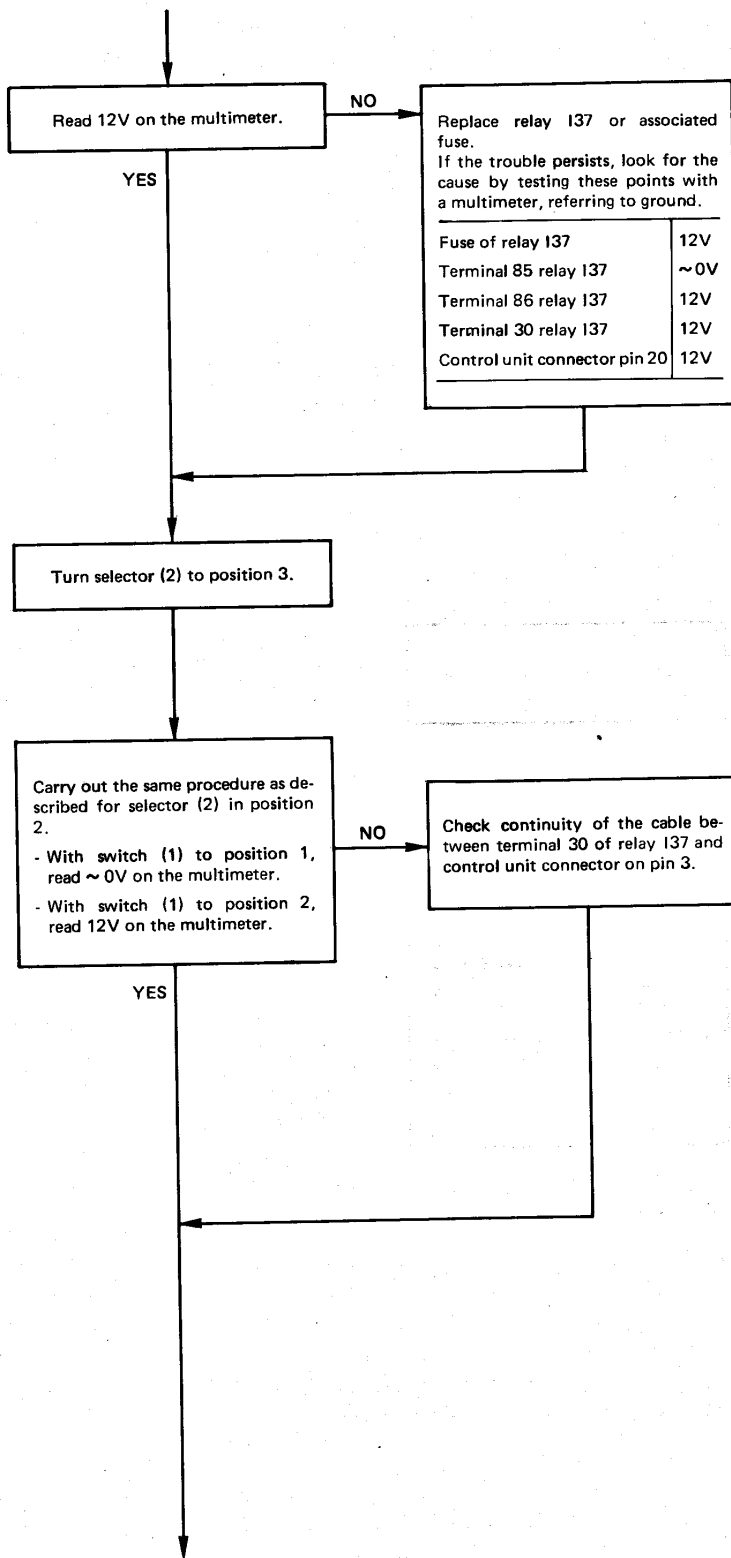
Test N° 8

ABS control unit main supply test

Selector (2) to position 2.
Multimeter to position 20V F.S..
Turn the key to the IGNITION position.



FRONT AND REAR BRAKES

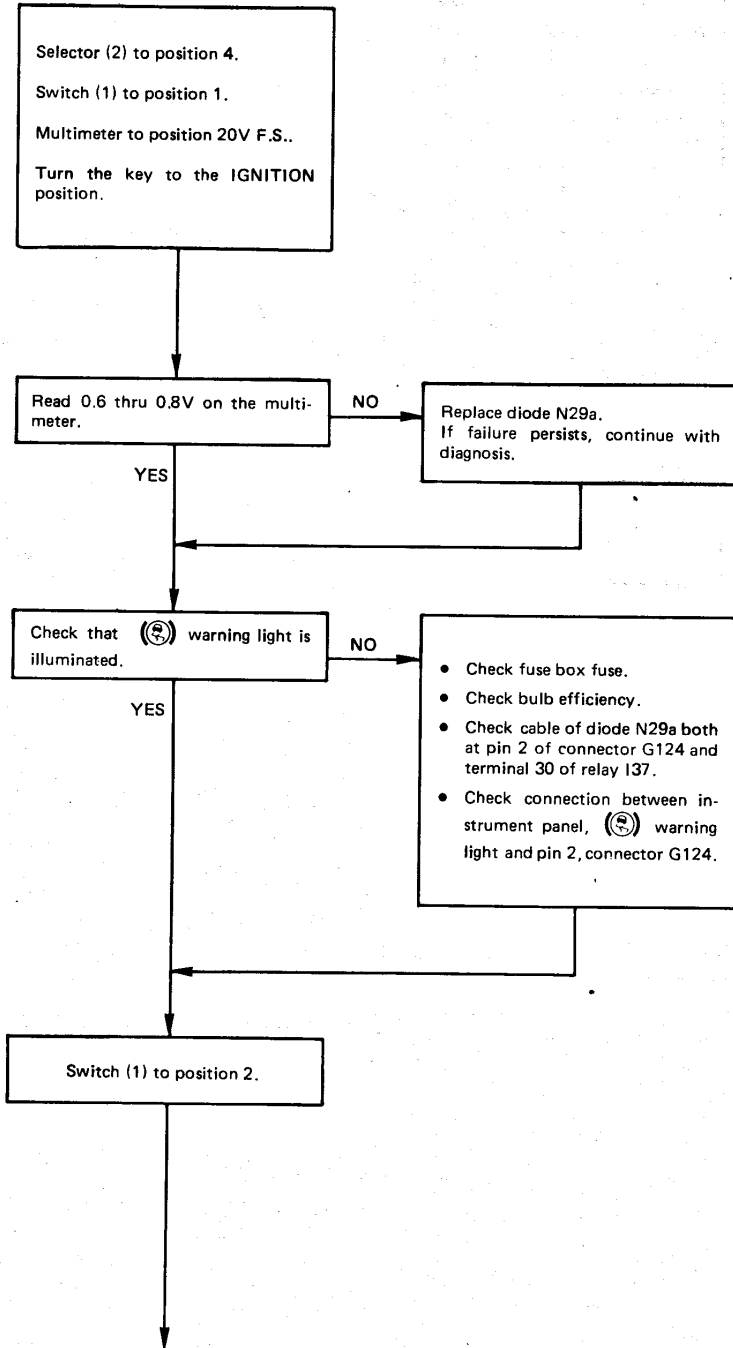


A Control unit connector

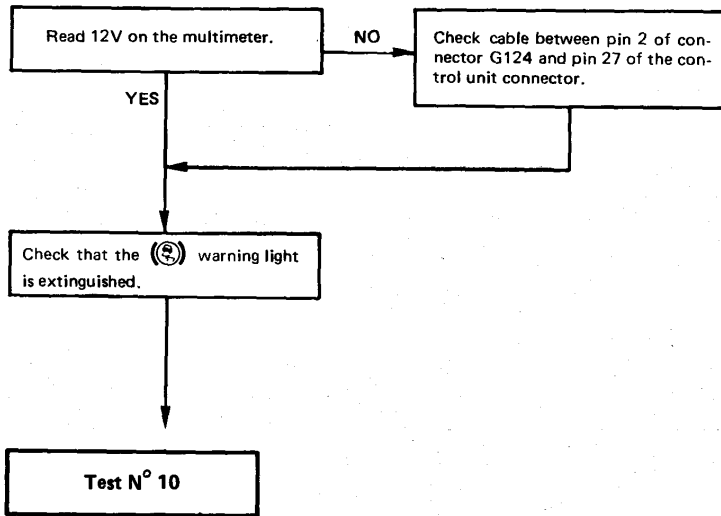
FRONT AND REAR BRAKES

Test N° 9

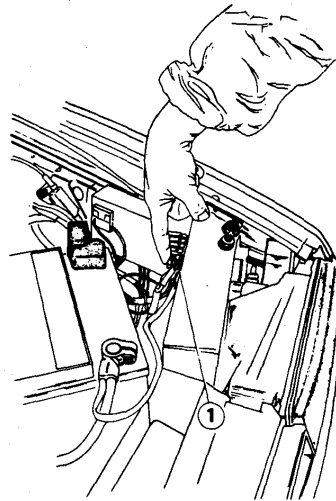
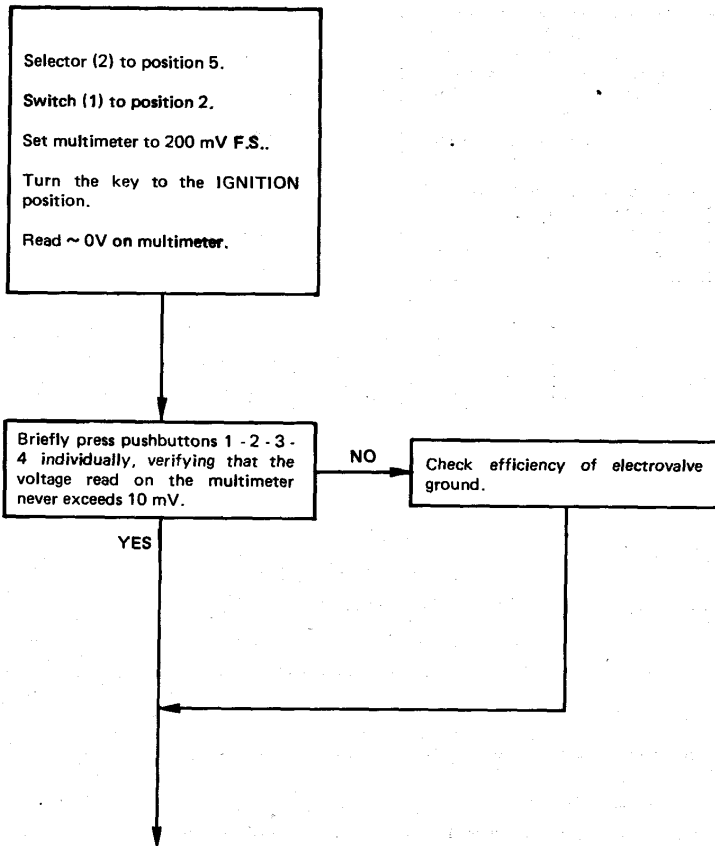
Diode N29a diminished voltage test (see Wiring Diagram)



FRONT AND REAR BRAKES



Electrovalve ground efficiency test

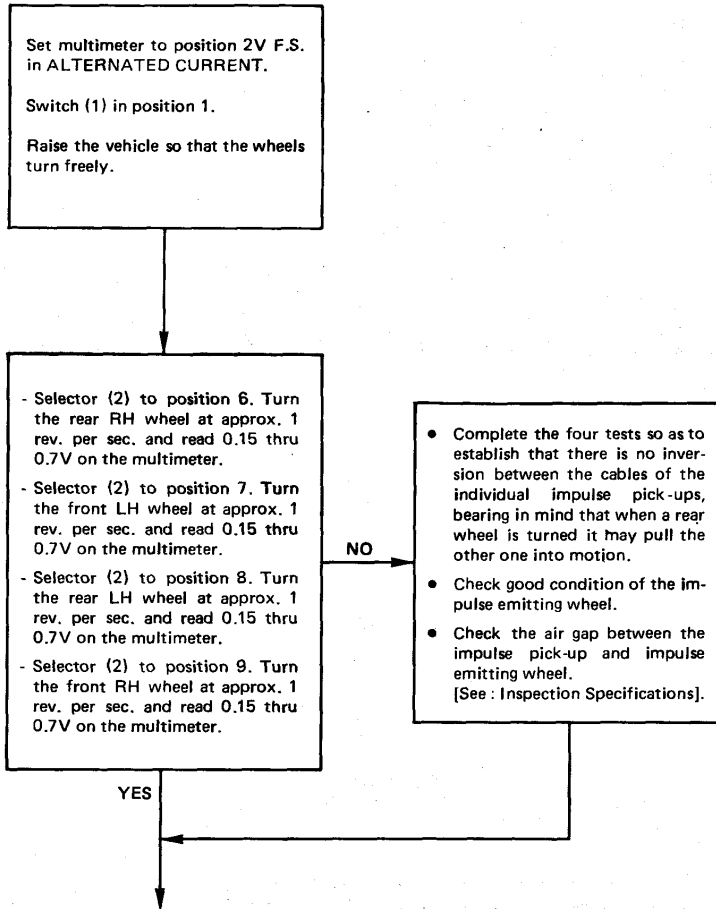


1 Electrovalve unit ground.

FRONT AND REAR BRAKES

Test N° 11

Impulse pick-up dynamic test



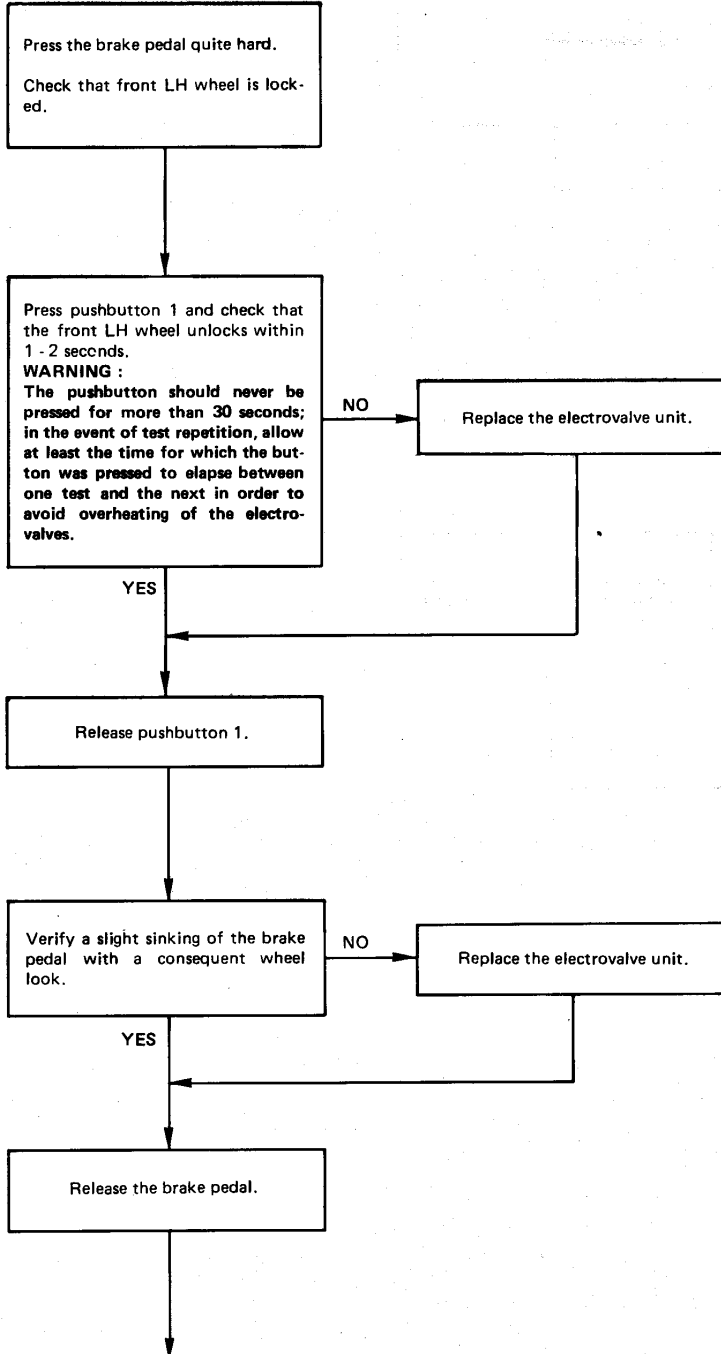
Electrovalve dynamic test set-up

- Remove the key.
- Ascertain that all previous tests proved positive otherwise refrain from carrying out the following.
- Selector (1) to position 1.
- Selector (2) to position 1.
- Switch (1) to position 2.
- Switch (2) to position 1.
- Raise the car enough to allow the wheels to turn freely.
- Insert the key and wait until the pressure in the hydraulic circuit reaches the maximum pressure of 180 bar.

FRONT AND REAR BRAKES

Test N° 12

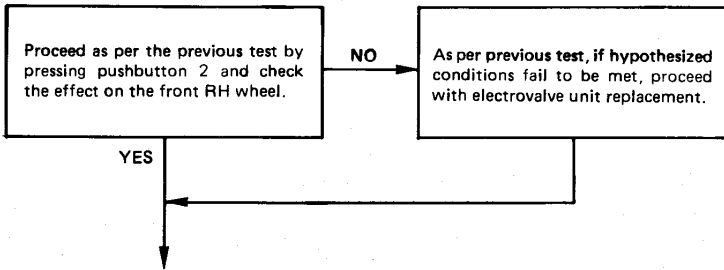
Front LH load and drain electrovalve test



FRONT AND REAR BRAKES

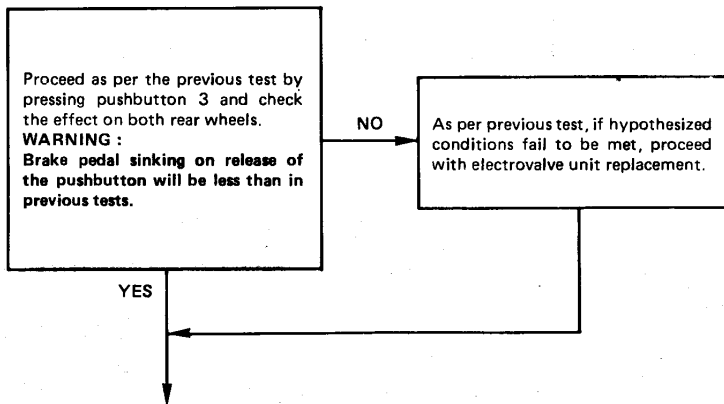
Test N° 13

Front RH load and drain electrovalve test



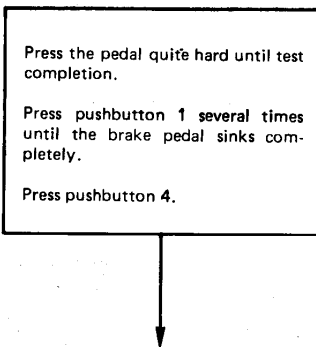
Test N° 14

Rear load and drain electrovalve test

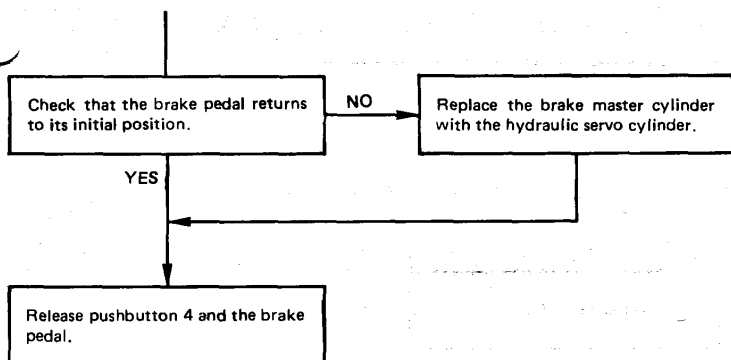


Test N° 15

Main electrovalve test



FRONT AND REAR BRAKES

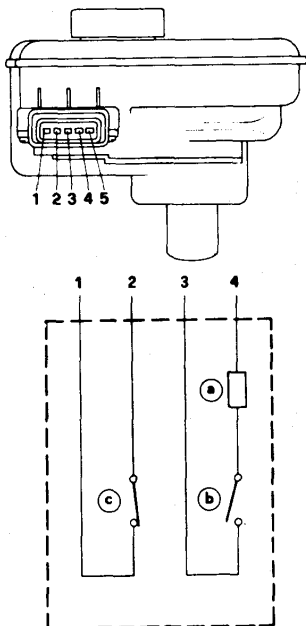


OBSERVATIONS

Should the problem persist on completion of the diagnostic procedure, proceed thus:

- Check that all the connections are well connected and rust free.
- Check that the clearance of the front wheel hub bearings come within the tolerance limits (see: Group 21 - Front Suspensions - Inspection Specifications).
- Check that diode N29b (see Wiring Diagram) is not open.
- Check that relay I40 (see Wiring Diagram) is efficient.
- Replace ABS control unit.

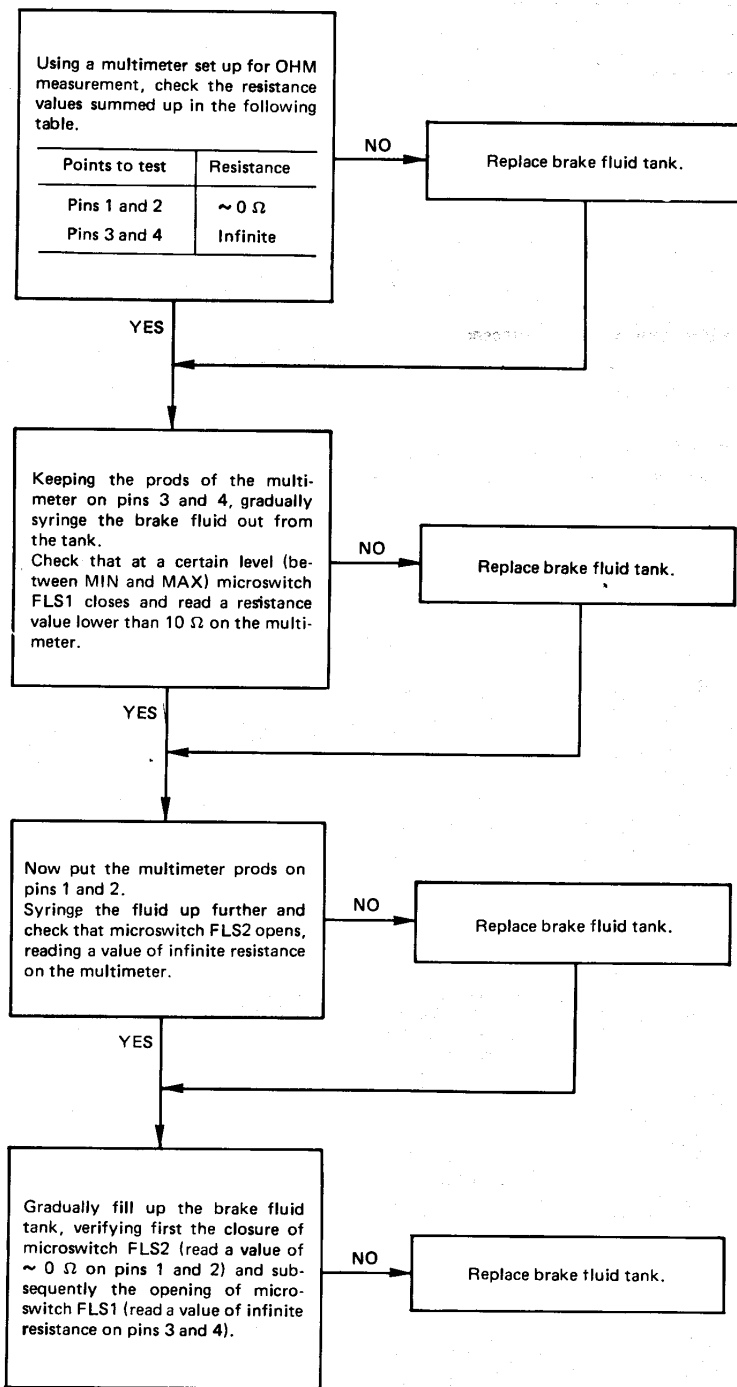
ELECTRICAL DIAGNOSIS OF THE BRAKE FLUID TANK FOR THE (ABS) MARK II ANTILOCK BRAKING SYSTEM



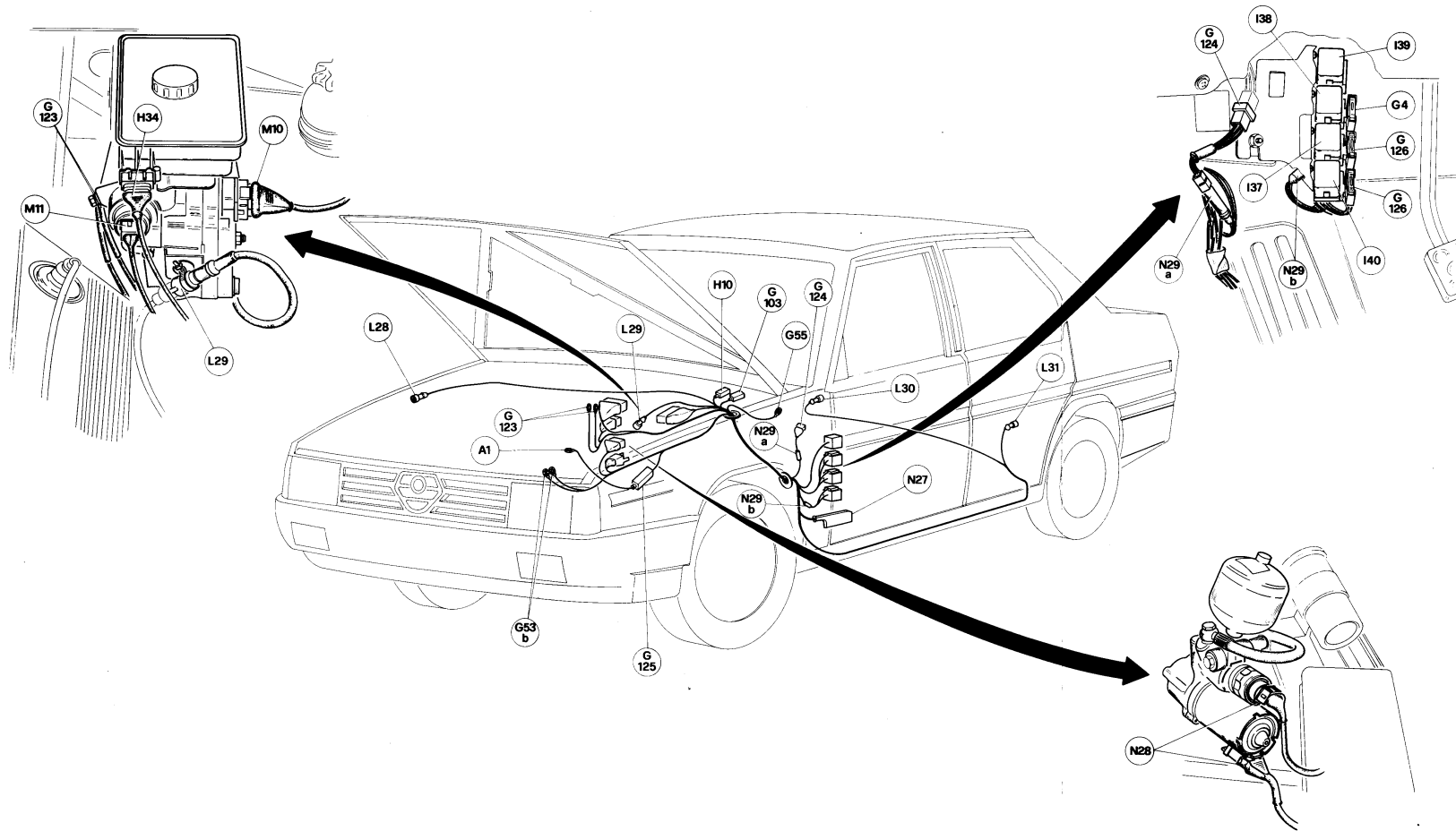
- Resistance ($\leq 10 \Omega$)
- Microswitch FLS1; it sends a tank minimum oil level alarm to the A.R. CONTROL
- Microswitch FLS2; it signals an excessive decrease in the tank brake fluid level to the ABS control unit.

FRONT AND REAR BRAKES

- Disconnect the brake fluid tank connector.
- Remove the plug.
- Check that the level of the brake fluid in the tank reaches the MAX mark otherwise top up.

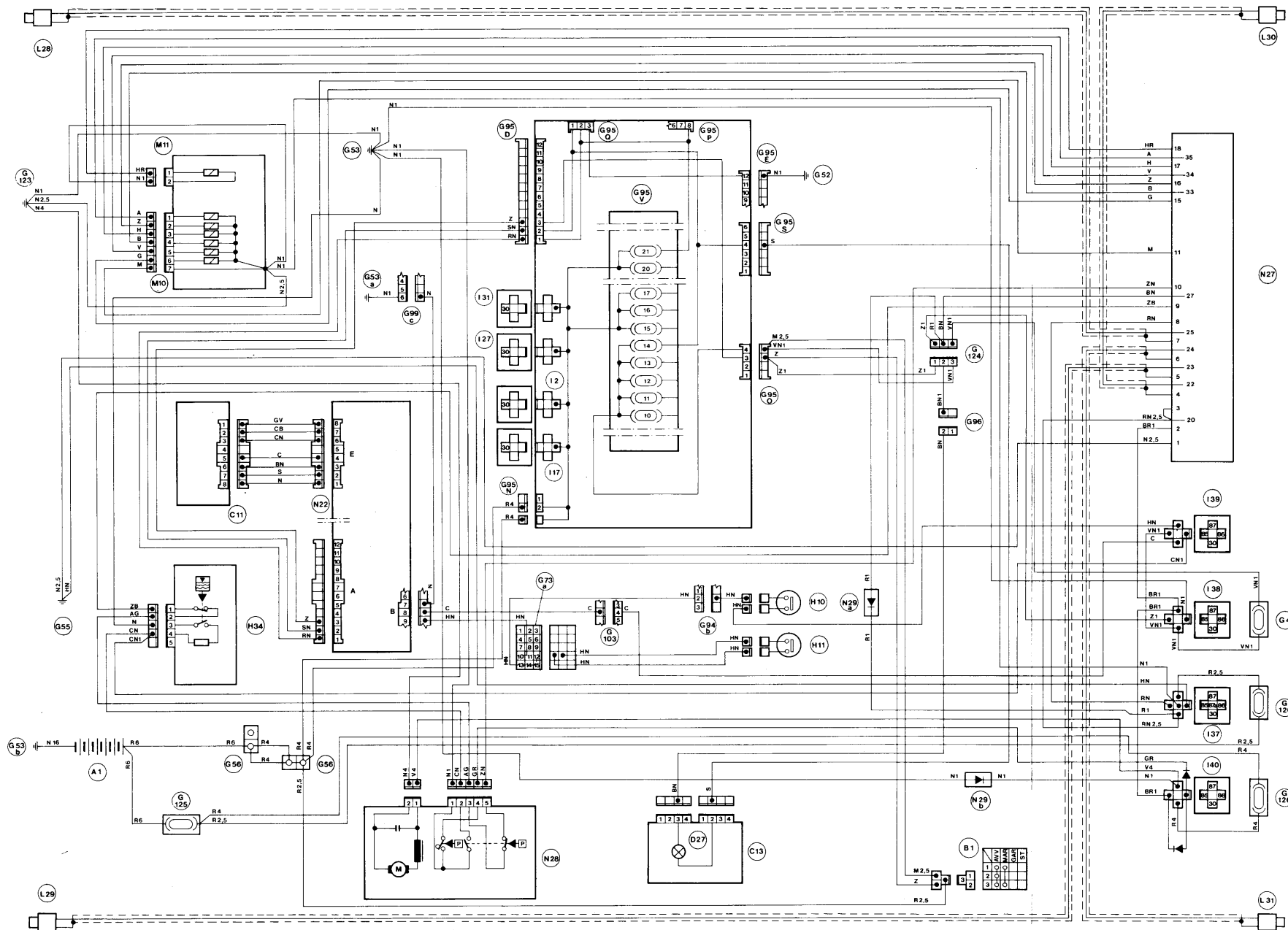


CABLING OF THE (ABS) MARK II WHEEL ANTILOCK SYSTEM
(vehicles Alfa 90 Super (GV iniezione))



FRONT AND REAR BRAKES

WIRING DIAGRAM OF THE (ABS) MARK II WHEEL ANTILOCK SYSTEM (vehicles Alfa 90 Super 16V iniezione)



FRONT AND REAR BRAKES

A1	Battery
B1	Ignition switch
C11	ALFA ROMEO Control display
C13	Optoelectronic cluster
D27	ABS system warning lamp
G4	Free fusebox
G52	Fusebox ground
G53	Engine compartment ground
G53a	Engine compartment ground - right side
G53b	Engine compartment ground - left side
G55	Hood ledge panel ground
G56	Branch terminal board
G73a	Connector for right rear services
G94b	8-way connector for engine compartment
G95	Central fusebox
G95D	Connector for ALFA ROMEO Control
G95E	Connector for console
G95N	Connector for battery
G95O	Connector for ignition switch
G95P	Connector for door services
G95Q	Connector for performance gauge
G95S	Connector for cluster
G95V	Fuses
G96	Single connector for ALFA ROMEO Control - cluster
G99c	Connector for engine dashboard (C)
G103	Connector for grounds and brakes fluid tank
G123	Pedal assembly ground
G124	ABS system connector
G125	ABS system free fusebox
G126	ABS system relay safety fuse
H10	Left front brake pad switch
H11	Right rear brake pad switch
H34	ABS system brake fluid tank switch
I2	Heated rear window relay
I17	Fog light relay
I27	Seat height adjustment relay
I31	Front power windows - heater relay
I37	ABS system control unit relay
I38	ABS system auxiliary relay
I39	Brake fluid level warning lamp relay
I40	ABS system brake fluid electropump relay
L28	Front RH pick-up
L29	Front LH pick-up
L30	Rear RH pick-up
L31	Rear LH pick-up
M10	Brake fluid adjusting valves
M11	ABS system main valve
N22	ALFA ROMEO Control unit
N27	ABS system control unit
N28	Brake fluid electropump apparatus
N29a	Connection for free diode (A)
N99b	Connection for free diode (B)

FRONT AND REAR BRAKES

SPECIAL TOOLS

Part No.	Description	Page
A.5.0194	Wrench, wheel cylinder, 17	22-12 22-13
A.3.0327	Hub puller (to be used, without screw, with tool A.3.0617)	22-36 22-37
A.3.0617	Percussion tool for rear wheel hub pulling (to be used with tool A.3.0327 without screw)	22-36 22-37
C.1.0132	Universal diagnoser for electronic system	22-59 22-65
C.9.0032	Cable connecting C.1.0132 and C.1.0133	22-59 22-65
C.1.0133	Interface for ABS MARK II	22-59 22-65 22-68
A.2.0440	Front and rear brake calipers 100 bar pressure gauges	22-57
A.2.0441	Hydraulic circuit 200 bar pressure gauge (ABS MARK II system)	22-60
A.2.0442	Brake pedal operating tool	22-57