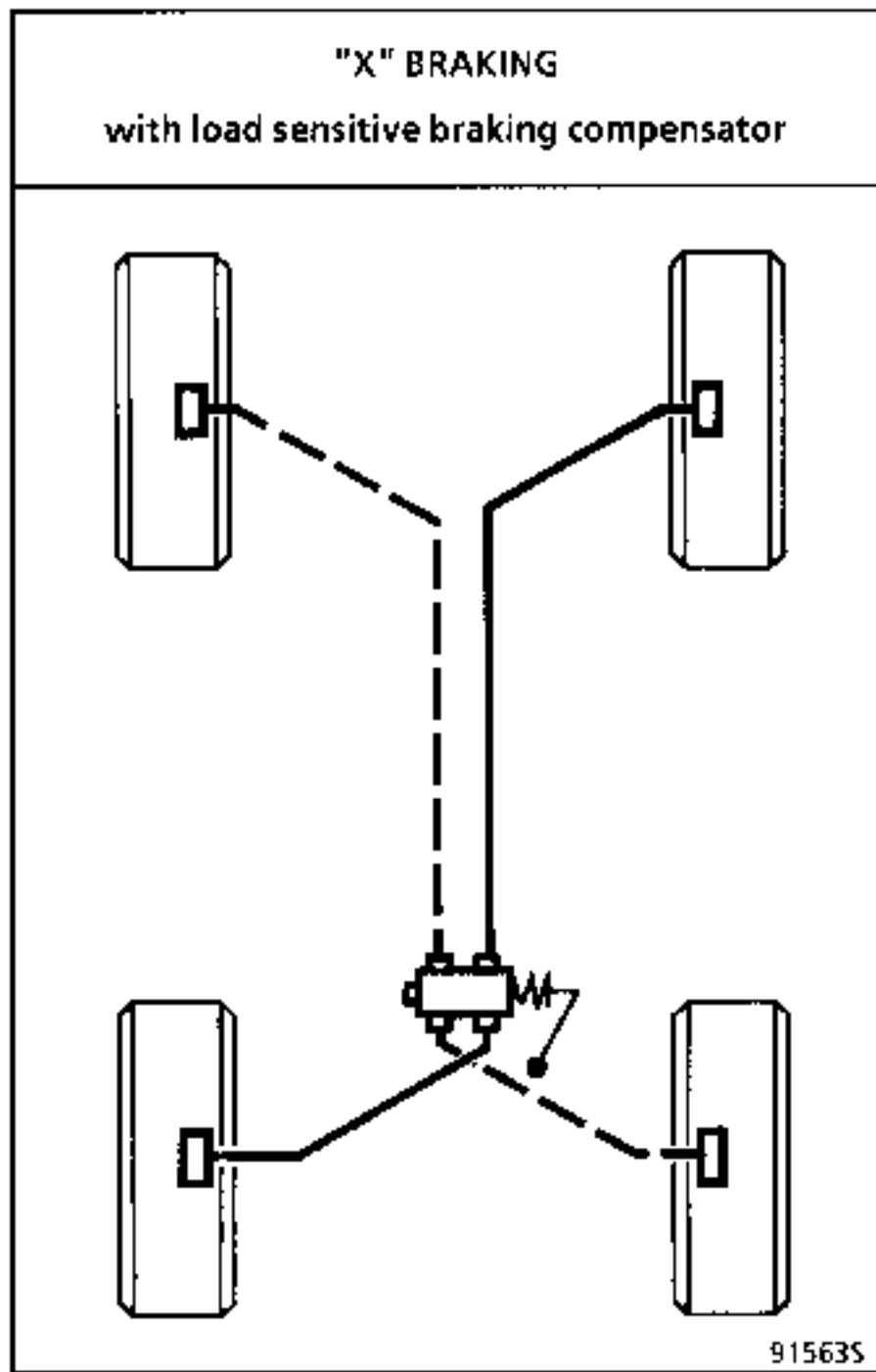
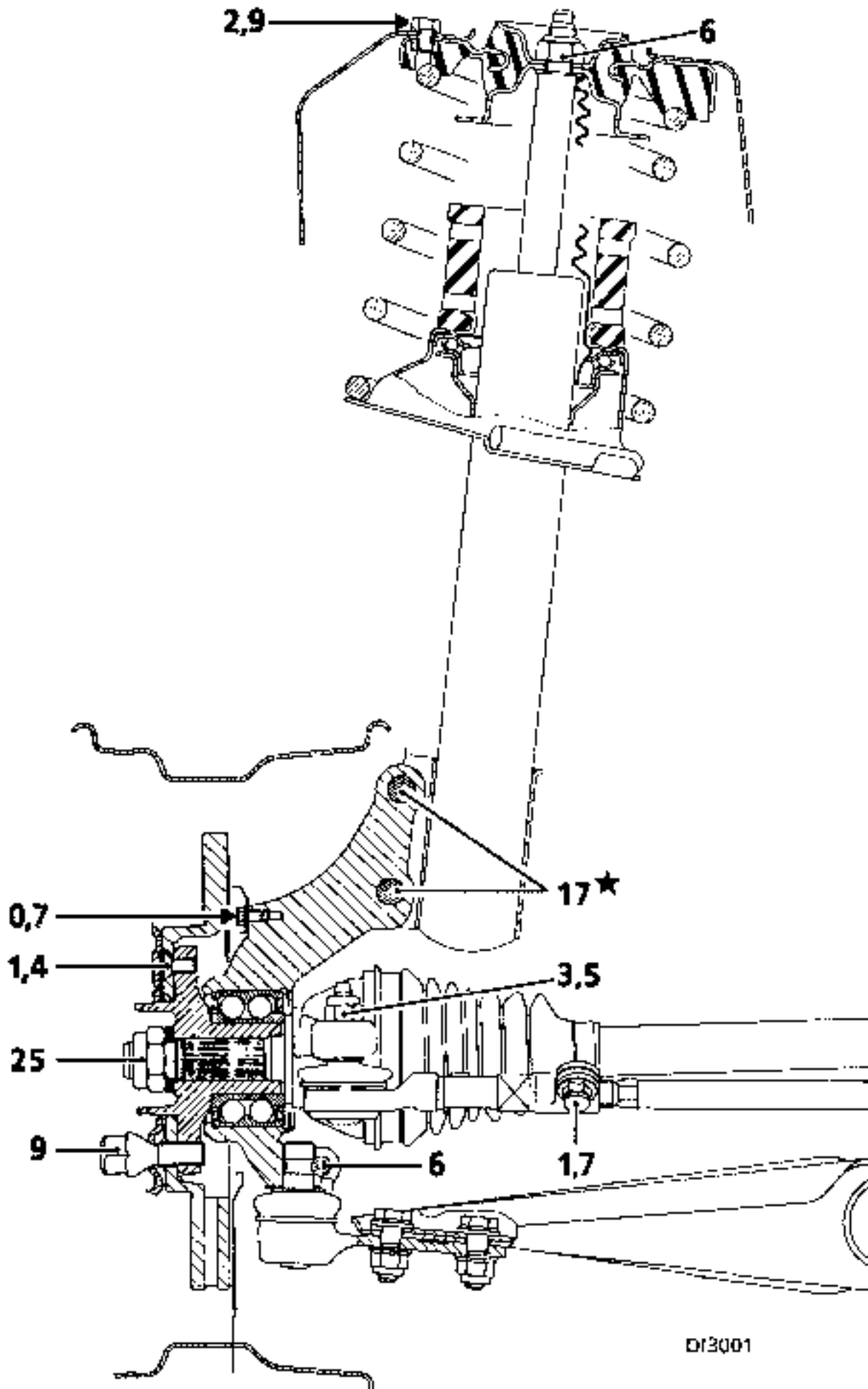
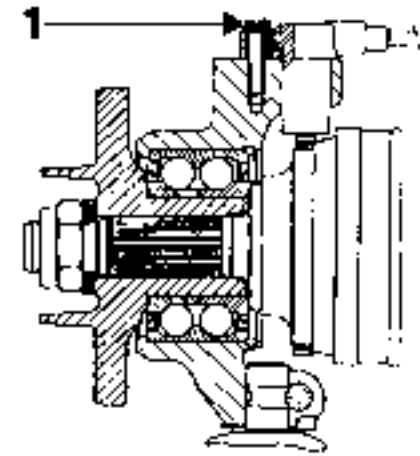


NOTE : the diagram below shows the general principle ; in no case should it be taken as reference for the circuit connections and allocations. When replacing one of the components of the brake circuit on a vehicle, always mark the pipes before removing them so that they can be connected back in their original positions.





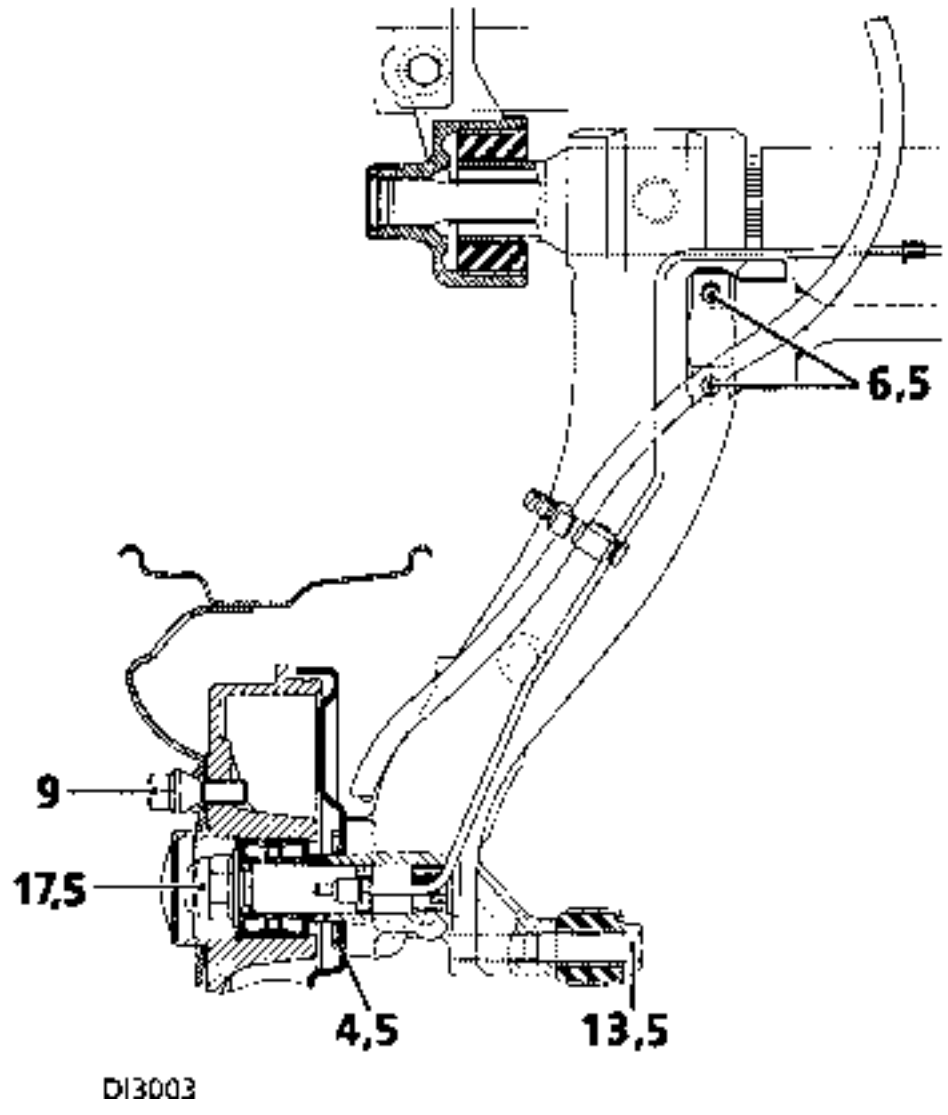
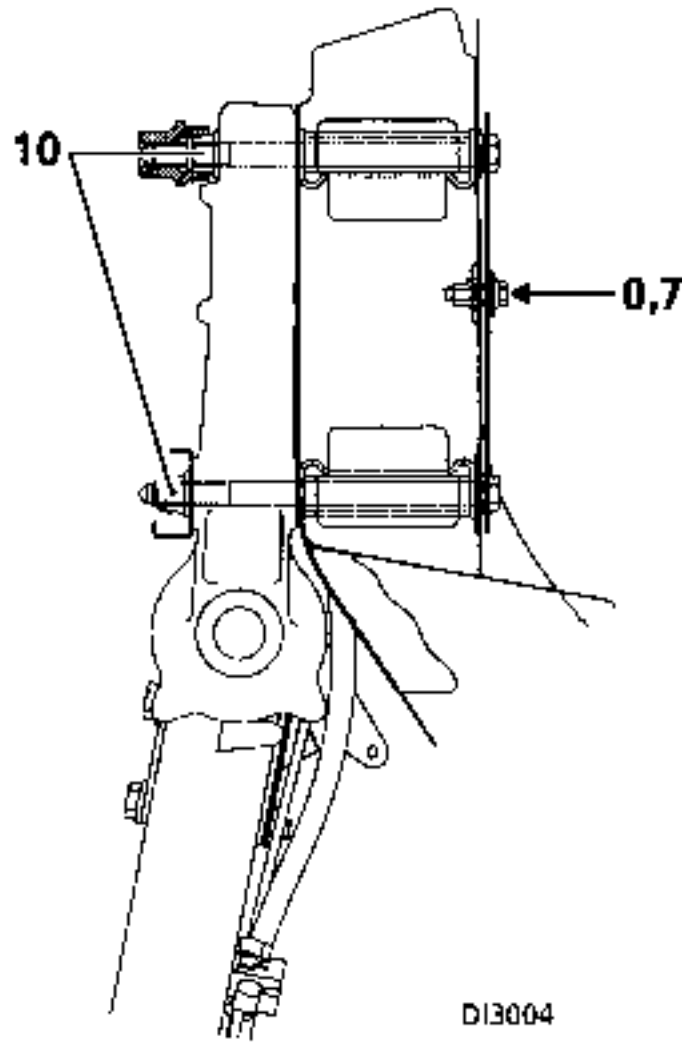
For vehicles fitted with an
ABS system

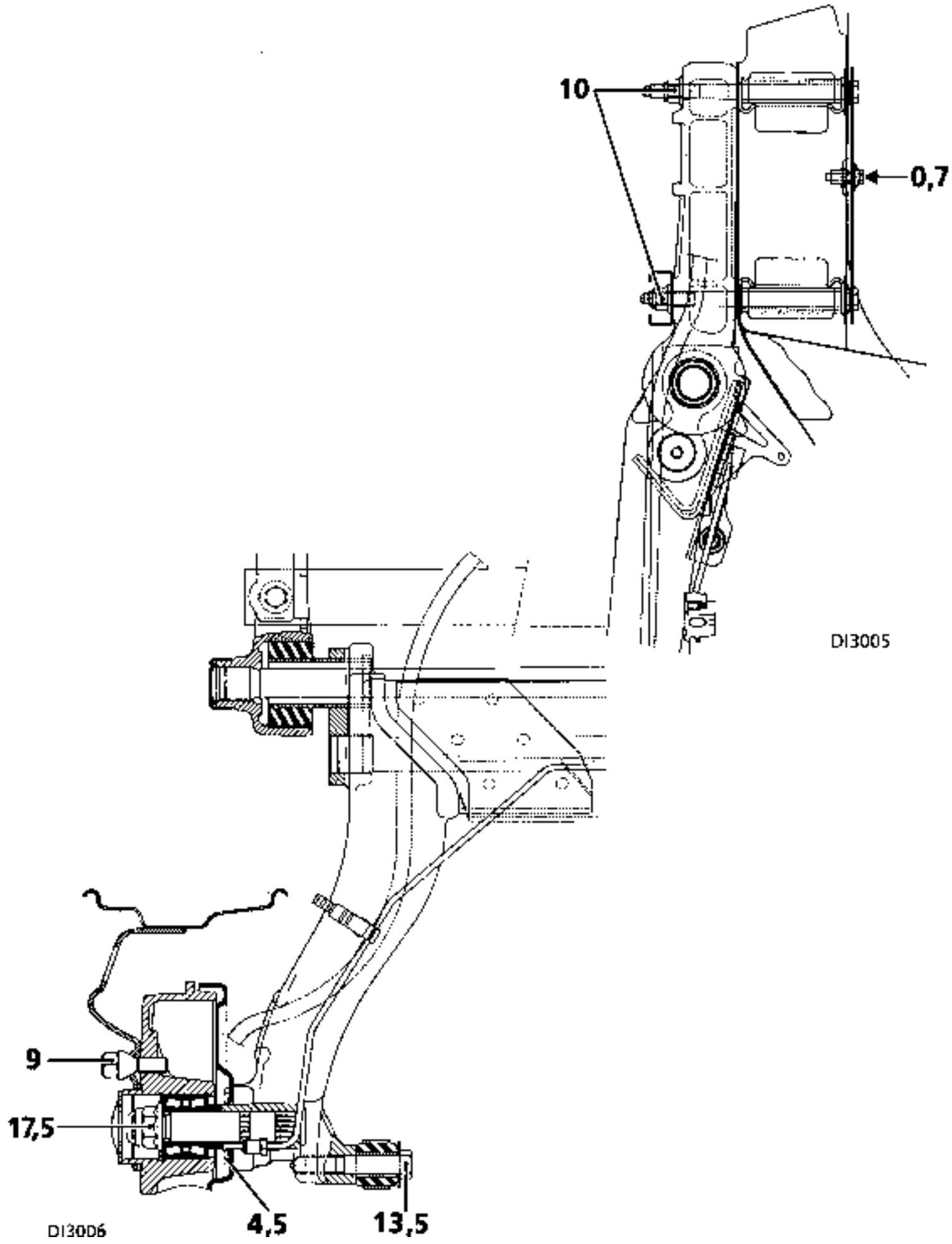


D13002

D13001

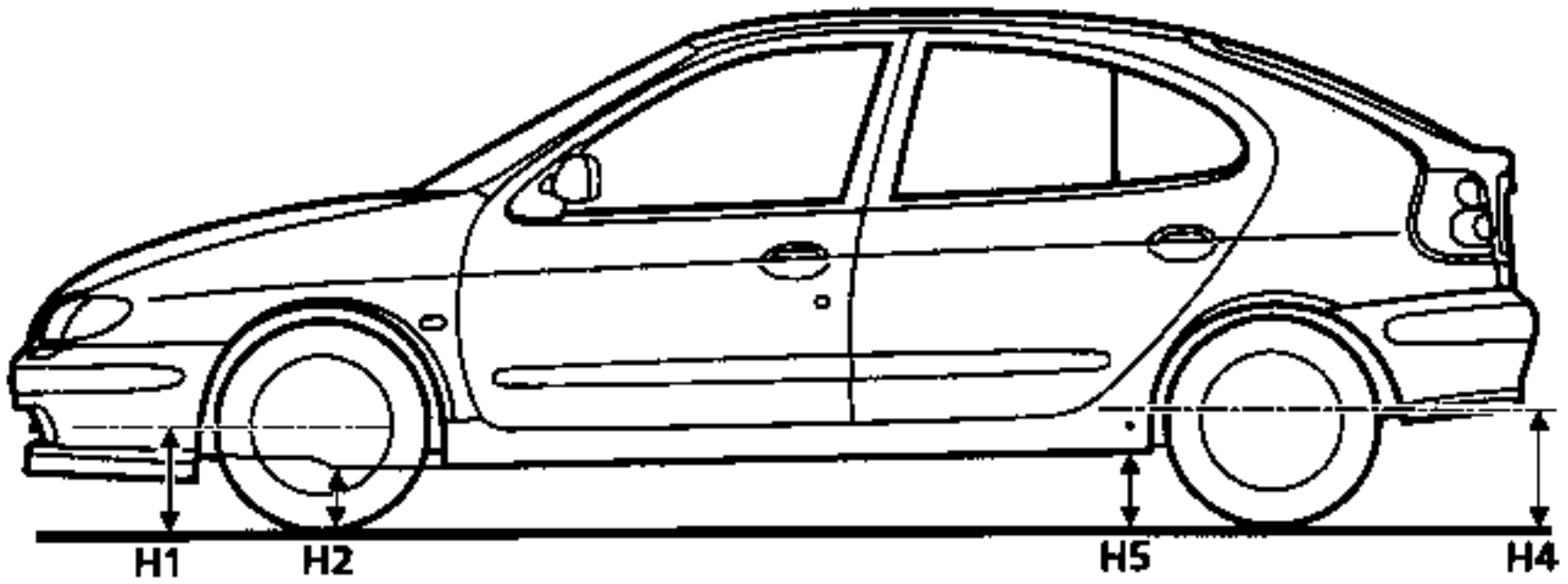
★ Fitting direction must be observed
(head of bolt on brake caliper side).





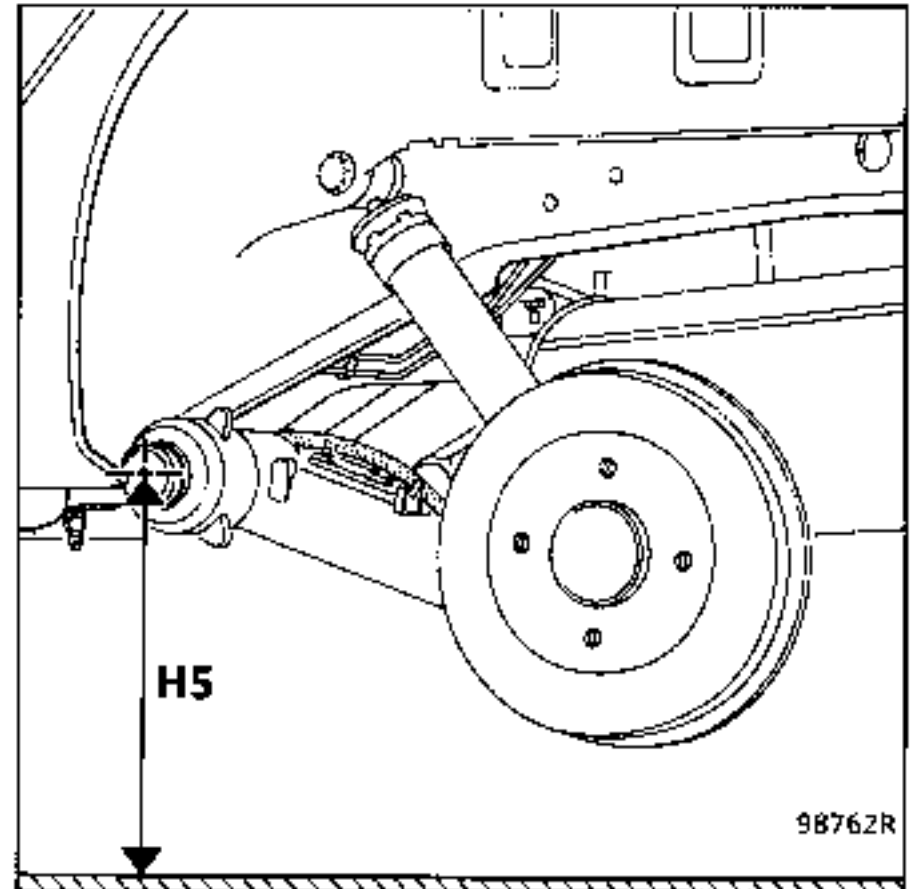


	DIMENSIONS	TIGHTENING TORQUES
Bleed screw	-	0.5 to 0.8
Hoses for front calipers	M 10 × 100	1.3
Hoses on rear arm	M 10 × 100	1.3
Rear cylinder supply	M 10 × 100	1.3
Master cylinder outlets	M 10 × 100	1.3
Compensator inlet	M 12 × 100	1.3
Compensator outlets	M 10 × 100	1.3
ABS hydraulic assembly inlets and outlets	M 10 × 100	} 1.3
	M 12 × 100	



98336R

Dimension H5 is taken from the suspension arm axis.



98762R

Underbody heights are measured with the vehicle unladen on a flat surface (preferably on a 4 post lift) :

- fuel tank full,
- correct tyre inflation pressures.

H1 and H4 : wheel axis to ground

H2 : front side member to ground in the wheel axis

H5 : suspension bar axis to ground

Measure the dimensions:

H1 and H2 at the front

H4 and H5 at the rear

and subtract.

See the values given in the section on values and adjustments.

Consumables

TYPE	QUANTITY	COMPONENTS
Loctite FRENBLOC	1 to 2 drops	Axial ball joint threads Rear brake backing plate mounting bolt
Loctite SCELBLOC	5 to 6 drops	Stub axle
SAE 80W oil	Coat	Rear stub axle

- Axial ball joint stop.
- Balance weight hook.
- Hub bearing.
- Driveshaft bearing gaiter.
- Girling caliper guide bolts
- Stub axle lock nut.
- Mounting bolts for:
 - steering rack,
 - front axle assembly mounting,
 - rear axle assembly.

Brake fluid

BRAKE FLUID RENEWAL FREQUENCY

Braking technology, in particular for disc brakes (hollow pistons which transmit little heat, low volume of fluid in the cylinder, sliding calipers avoiding the need for a fluid reservoir in the least cooled area of the wheel), has allowed us to avoid the risk of vapour lock as far as possible, even if the brakes are used intensively (in mountainous areas).

Modern brake fluids still degrade slightly during the first few months of use due to a small uptake of humidity (refer to vehicle's Warranty and Servicing Handbook for fluid replacement frequency).

Topping up the level:

Wear of the brake pads and shoes will cause a gradual drop in the fluid level in the reservoir. This drop should not be compensated for since the level will rise again when the pads are changed. The level should not however be allowed to fall below the minimum mark.

Approved brake fluids:

Mixing two incompatible brake fluids in the circuit will cause a risk of major leaks, mainly due to deterioration of the cups. To avoid such risks, it is important to use only those brake fluids which have been tested and approved by our Technical Department and which conform to standard SAE J 1703 dot 3 or dot 4.

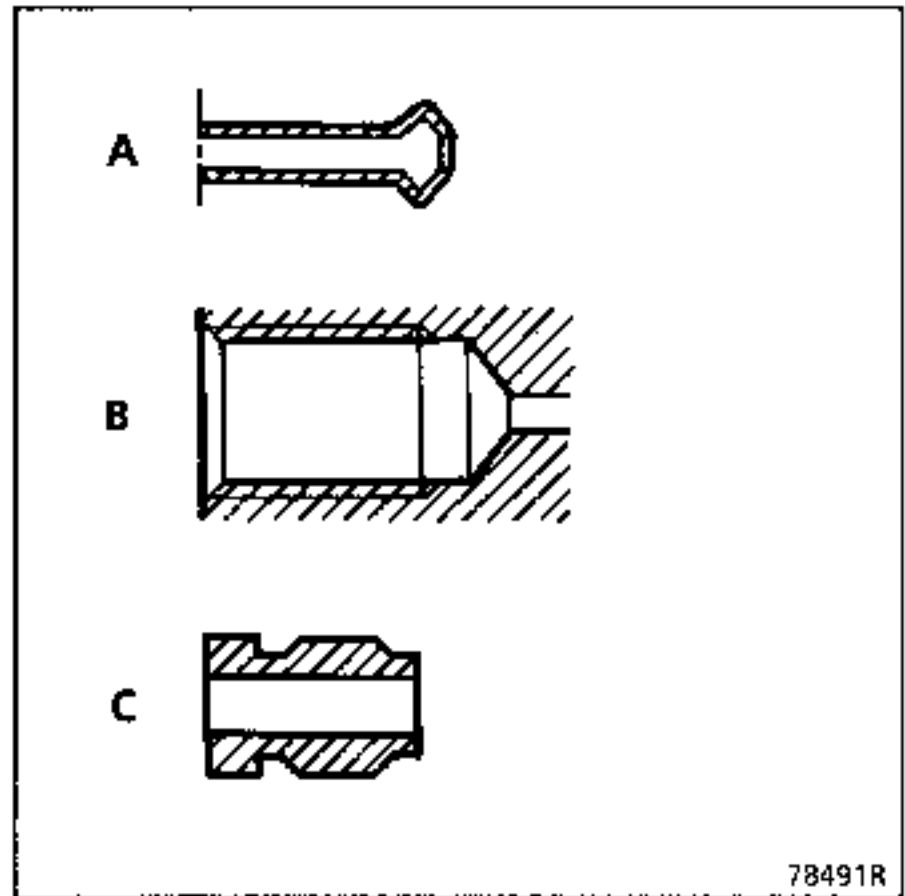


The connection of the pipes between the master cylinder, calipers, compensator and the hydraulic assembly is made using threaded unions with a METRIC THREAD.

Consequently, only parts specified in the Parts Catalogue for this vehicle should be used.

Identification of parts

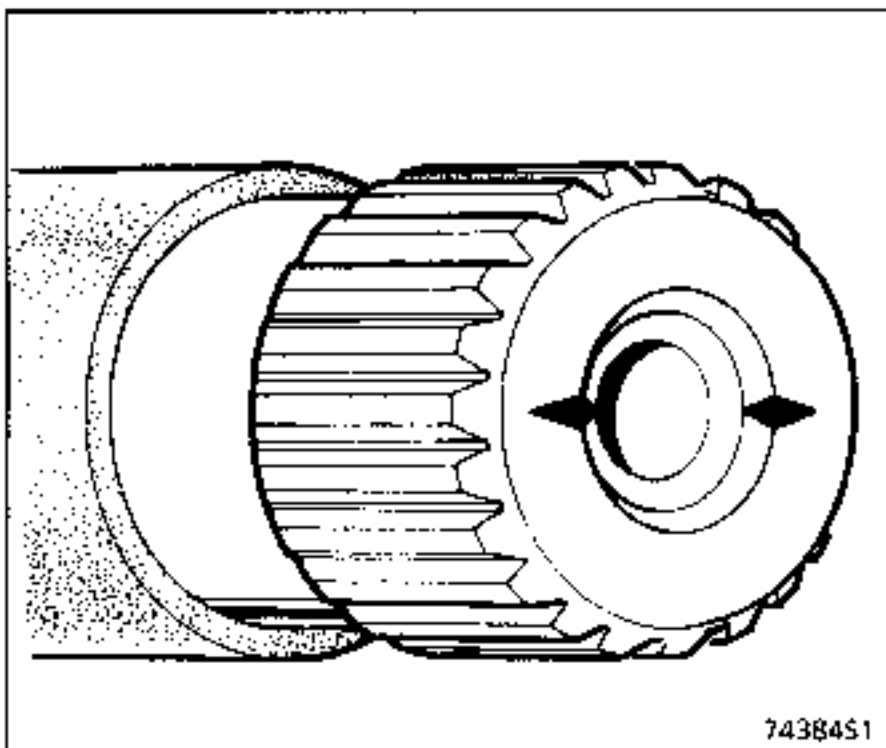
- SHAPE of the ends of PIPES in steel or copper (A),
- SHAPE of the THREADED LOCATIONS on components (B),
- pipe UNIONS coloured GREEN or BLACK: HEXAGONAL OUTSIDE 11 mm or 12 mm (C).



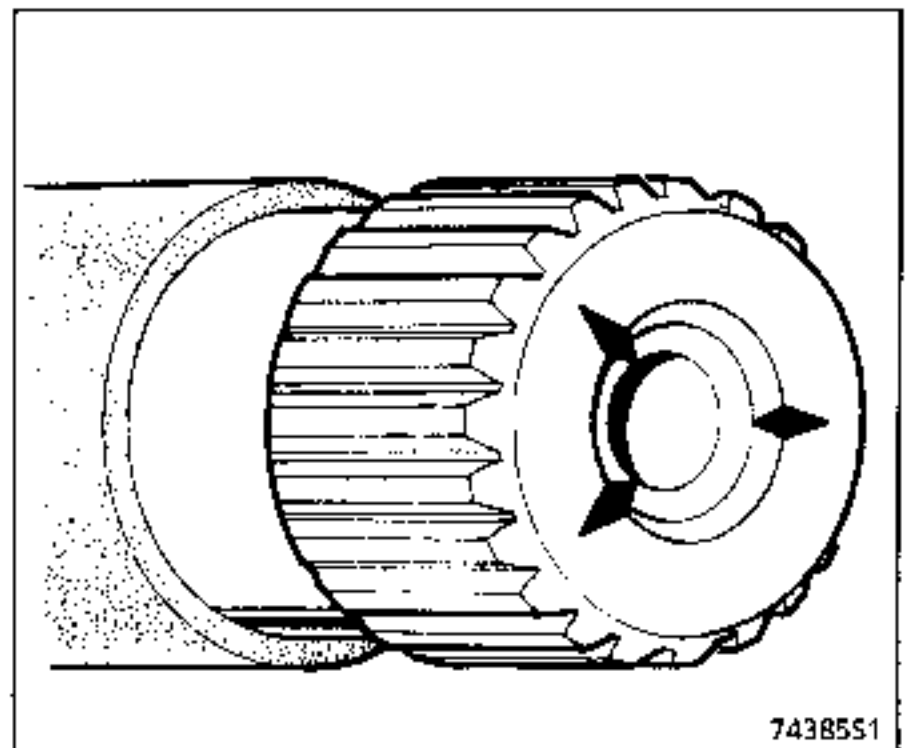
Rear torsion bar marking

Since the torsion direction under load is inverted, the left and right hand bars are marked by a stamped mark on the end.

LEFT HAND BAR



RIGHT HAND BAR



2 marks

3 marks

Vehicle types	BA0A/BA0E BA0F/BA0G BA0L/BA0U
DIAMETER	23 mm

Specifications for the rear anti-roll bars

Vehicle types	TUBULAR REAR AXLE		4 BAR REAR AXLE
	BA0E BA0L	BA0A BA0F BA0U	BA0G
Diameter	15.5 mm	18 mm	23.15 mm
Number of splines, bearing side	-	-	31
Number of splines, shackle side	-	-	30

Specifications for the rear suspension bars

Vehicle types	TUBULAR REAR AXLE	4 BAR REAR AXLE
	BA0A / BA0E BA0F / BA0L BA0E	BA0G
Diameter	20.5 mm	23.8 mm
Number of splines, bearing side	25	27
Number of splines, shackle side	24	26

Influence of various angles on course holding and tyre wear.

CAMBER

Comparison of left hand and right hand angles is important. If there is a difference between the two sides of more than one degree, course holding will be affected, which must be corrected at the steering wheel, causing abnormal tyre wear.

This angle is generally small: approximately 1°.

CASTOR

Comparison of left hand and right hand angles is important. If there is a difference of more than one degree, course holding will be affected, which must be corrected at the steering wheel, causing abnormal tyre wear.

This is characterised by pulling at a stable speed towards the side where the angle is smaller.

STEERING HEIGHT

This angle affects the variation in parallelism when the suspension system moves.

Variations in parallelism between the right hand and left hand wheels will cause (without the steering wheel being moved) :

- pulling to one side on acceleration,
- pulling to the other side on braking,
- changes in course holding on poor road surfaces.

PARALLELISM

This adjustment has no affect on the vehicle behaviour.

It should be noted:

- that **excessive toe-out** will cause symmetrical wear on the inside edges of the tyres on both wheels
- that **excessive toe-in** will cause symmetrical wear on the outside edges of the tyres on both wheels

PRELIMINARY CHECKS

Before checking the axle assembly angles, the following points must be checked and repaired if necessary:

- symmetry of tyres on the same axle:
 - dimensions,
 - pressures,
 - degree of wear.
- articulation :
 - condition of rubber bushes and bearings,
 - ball joint play,
 - bearing play.
- wheel run-out: it should not exceed 1.2 mm (compensated for by measuring equipment).
- symmetry of underbody heights (condition of the suspension).

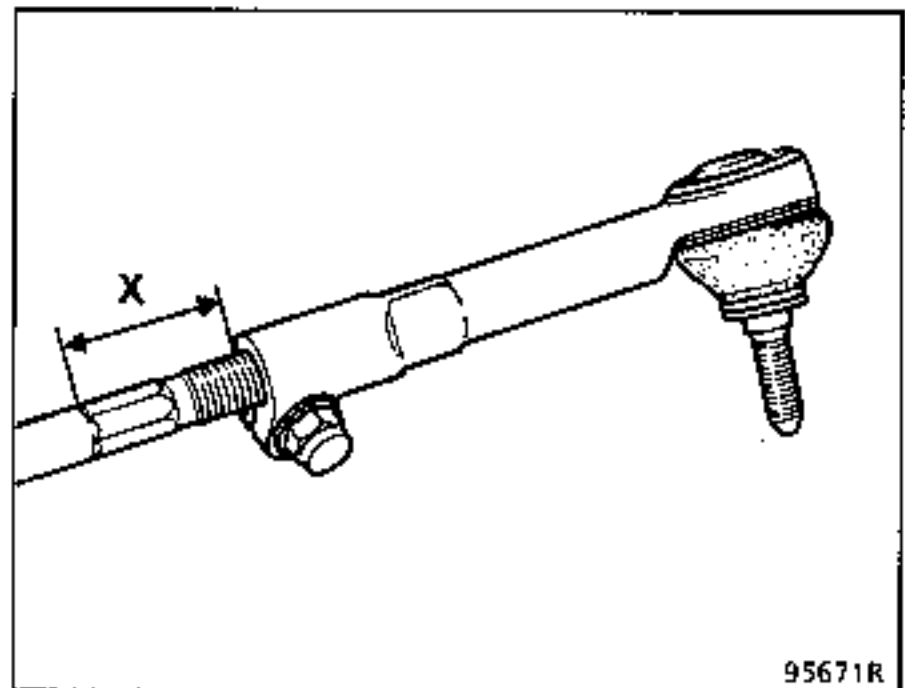
DETERMINATION OF THE STEERING CENTRE POINT

Checking and adjusting the front axle assembly requires the steering to be centred to avoid pulling faults.

- Remove the keys from the vehicle ignition.
- Set the wheels straight.
- Lock the steering: this gives the steering "centre point".

In this position, fit the measuring equipment and proceed with the test.

When adjusting parallelism, ensure the symmetry of the track rod end lengths X is observed.

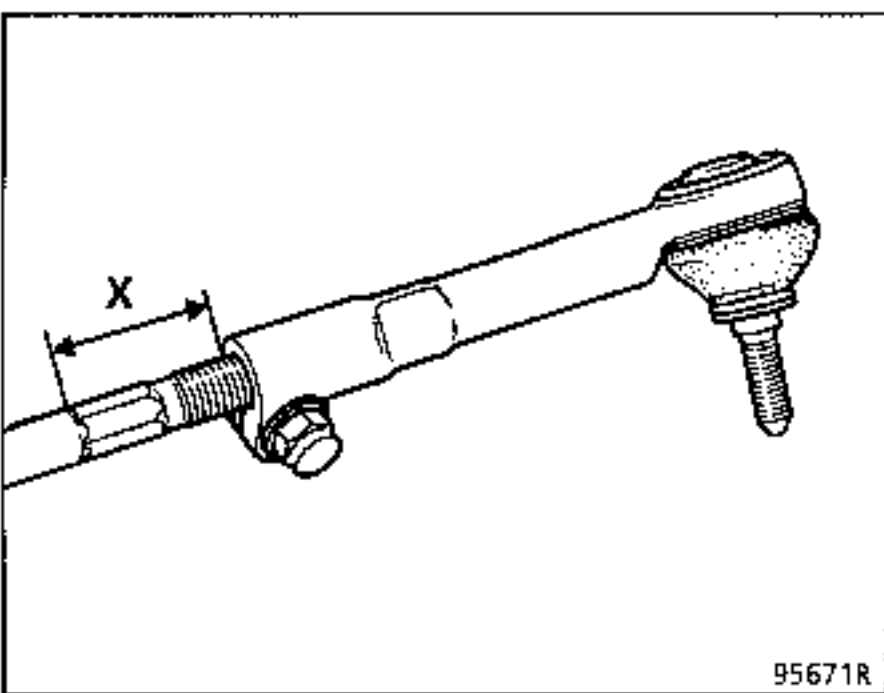


ORDER OF OPERATIONS

Because of the design of front axle assemblies, a modification to one of the angles (castor, camber, kingpin, parallelism and variation) has a greater or lesser effect on the values of the other angles. (The castor angle has the most influence).

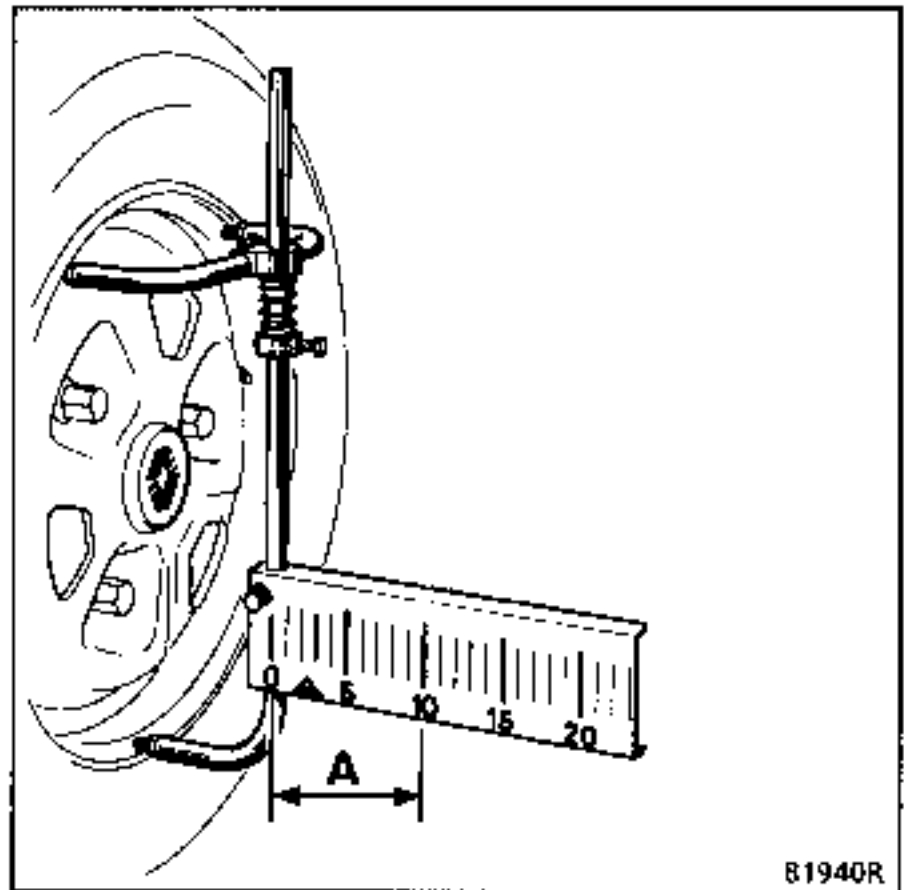
The following order must therefore be strictly observed:

- fit the measuring equipment to the vehicle, following the manufacturer's instructions,
- determine the steering centre point (see previous paragraph) and lock the steering wheel,
- lift the vehicle under the body,
- compensate for wheel run-out,
- put the vehicle on floating plates,
- fit the brake pedal press,
- bounce the suspension to return the vehicle to free height,
- ensure the symmetry of the track rod end lengths X is observed,



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- note the values A on the measuring scales.



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1 Symmetry of lengths X correct:

- dimension (A) should be equal.

2 Symmetry of lengths X incorrect:

- measure dimensions (A) on the right and left hand sides, subtract and apply half of the result to each side.

Example :
 Right hand side value: 16
 Left hand side value: 10
 $16 - 10 = 6$
 $6 : 2 = 3$

Adjust the track rods to balance dimensions (A) on each side:

$A = 13$

- in this position, set the floating plates to zero,
- check in the following order:
 - castor,
 - kingpin,
 - camber,
 - parallelism.

ADJUSTING PARALLELISM

Several cases may arise:

	Parallelism	Distribution	Correction to apply
①	CORRECT	INCORRECT	Adjust the adjusting sleeve (or end) by the same number of turns, but in opposite directions on each side to obtain the same value (A) on both sides.
②	INCORRECT	CORRECT	Adjust the parallelism by the same value on each side, ensuring that the values (A) remain identical on both sides.
③	INCORRECT	INCORRECT	Make an initial adjustment to equalise values (A) on each side then adjust the parallelism as for case n° ②

Fault finding for the front axle assembly

FAULTS	POSSIBLE CAUSES
Incorrect castor	<ul style="list-style-type: none"> -- Arm bent -- Side member or axle mounting bent
Camber + kingpin correct but Camber incorrect Kingpin incorrect	<ul style="list-style-type: none"> -- Arm bent -- Side member or axle mounting bent
Camber correct but Kingpin incorrect	<ul style="list-style-type: none"> -- Stub axle carrier bent
Kingpin correct but Camber incorrect	<ul style="list-style-type: none"> -- Stub axle carrier bent
Variation in parallelism incorrect	<ul style="list-style-type: none"> -- See castor Arm bent Side member bent
Parallelism incorrect by more than 6 mm	<ul style="list-style-type: none"> -- Left or right hand stub axle carrier bent

This fault finding information covers all types of circuits and braking components for the current range of vehicles without ABS.

For vehicles with ABS, refer to section 38.

Only components belonging to the vehicle described in this Workshop Repair Manual should be examined during fault finding.

This fault finding information has two separate parts to aid repair.

- I Faults noted at the pedal
- II Faults noted in behaviour

I FAULTS NOTED AT THE PEDAL

FAULTS	POSSIBLE CAUSES
<p>Hard pedal: high degree of force required for low deceleration.</p>	<ul style="list-style-type: none"> - Assistance fault - Pads and Brake Shoes: <ul style="list-style-type: none"> - greasy, - frozen, non conforming, - overheating, prolonged braking with the pedal constantly applied (descending a hill), non conforming. - Piston seized - Brake pipe crushed
<p>Soft pedal</p> <p>Note : since the amount of assistance in modern vehicles is high, this may give the impression of a soft pedal. To determine if there is a fault or if it is a question of normal use, two tests should be carried out.</p> <ol style="list-style-type: none"> 1. Vehicle moving Judgment test: ratio of pedal travel to deceleration 2. Vehicle stationary, engine not running Complementary test to the pedal travel test: depress the brake pedal 5 times to empty the brake servo, before noting the results of the test. 	<ul style="list-style-type: none"> - Air in the circuit : incorrect bleeding. - Internal leak in braking circuit - Lack of fluid in the reservoir (external leak in braking circuit)

Spongy pedal

Test to be carried out vehicle stationary, engine not running.

Note : depress the brake pedal 5 times to empty the brake servo, before noting the results of the test.

- Incorrect brake shoe adjustment

Disc and drum brakes

Automatic adjustment: handbrake cable too tight.

Note : the automatic adjustment is made using the brake pedal if the handbrake cable is not abnormally tight when at rest.

- High degree of asymmetrical wear to the linings (concave or convex)
- Master cylinder clearance too large
- Fluid bubbling or overheating

Pedal goes to the floor

Test to be carried out vehicle stationary, engine not running.

Note : depress the brake pedal 5 times to empty the brake servo, before noting the results of the test.

- Hydraulic leak (check sealing)
- Sealing cup between two master cylinder circuits is faulty
- Fluid bubbling

II FAULTS NOTED IN BEHAVIOUR

FAULTS	POSSIBLE CAUSES
Brakes stick	<ul style="list-style-type: none"> - Linings need backing off - Linings slightly greasy - Springs require replacing
Brakes judder	<ul style="list-style-type: none"> - Oval drums - Disc run-out too great - Disc thickness not constant - Abnormal deposits on the discs (oxidation between the pads and disc)

<p>Pulling under braking (front)</p>	<ul style="list-style-type: none"> - Suspension front axle assembly, steering must be checked - Piston seized * - Tyres (wear - inflation pressures) - Brake pipe crushed * <p>*IMPORTANT: on vehicles with a negative offset front axle assembly, pulling to one side results from a fault on the circuit on the opposite side</p>
<p>Offset braking (rear)</p>	<ul style="list-style-type: none"> - Braking compensator or limiter (adjustment - operation) - Piston seized - Incorrect adjustment of the brake shoes <p>Automatic adjustment : handbrake cable too tight</p> <p>Note : the automatic adjustment is made using the brake pedal if the handbrake cable is not abnormally tight when at rest.</p> <ul style="list-style-type: none"> - Return springs
<p>Brakes overheat</p>	<ul style="list-style-type: none"> - Master cylinder clearance too small, which does not permit the master cylinder to return to the rest position - Piston seized or does not return correctly - Brake pipe crushed - Handbrake control seized - Handbrake control incorrectly adjusted

SPECIAL TOOLING REQUIRED	
M.S. 815	Bleeding equipment

As these vehicles are fitted with a brake servo, it is important that the assistance device is not activated during the bleeding operation, regardless of the method used.

The brake circuit should be bled using equipment M.S. 815, with the vehicle on a four post lift, with all four wheels on the ground.

Connect the pipes of equipment M.S. 815 to the bleed screws of the :

- master cylinder
- brake cylinder
- compensator.

Connect the equipment to a source of compressed air (minimum pressure 5 bars).

Connect the filling system to the brake fluid reservoir.

Open:

- the supply, wait for the reservoir to fill (both sections).
- the compressed air valve.

These vehicles are fitted with X type brake circuits. Proceed as follows:

Open:

- the bleed screw on the rear right hand wheel and allow fluid to run out for approximately 20 seconds,
- the bleed screw on the front left hand wheel and allow fluid to run out for approximately 20 seconds.

Ignore any air bubbles in the bleeding equipment pipes.

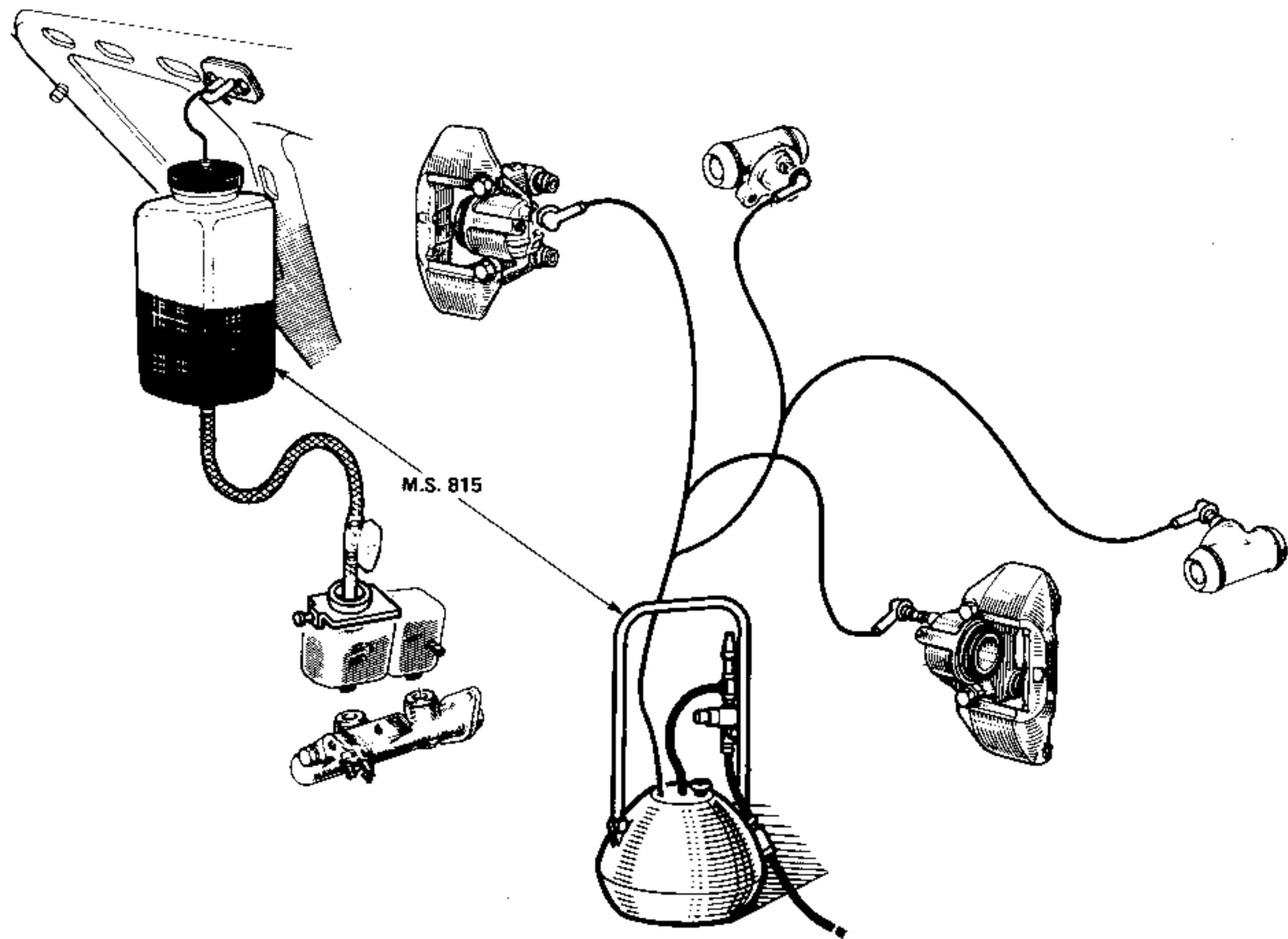
Carry out the same operation for the rear left hand wheel and the front right hand wheel.

Check there is pressure at the brake pedal when it is depressed (press it several times).

Repeat the bleeding operation if necessary.

Top up the fluid level in the reservoir after disconnecting the equipment.

(For bleeding the ABS braking circuit, refer to section 38).



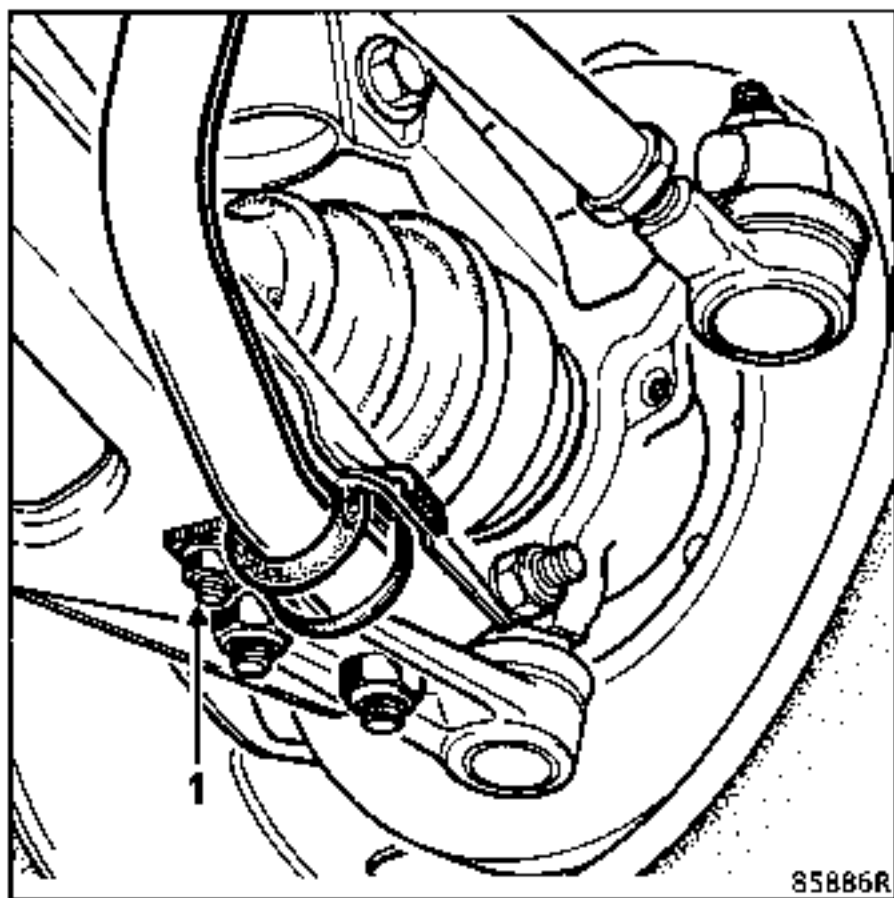
TIGHTENING TORQUES (in daN.m)



Lower wishbone nuts on cradle	9
Key nuts on stub axle carrier	8
Anti-roll bar bearing nuts	3.2
Lower ball joint nuts	6
Wheel bolts	9

REMOVAL

With the vehicle on its wheels, remove the bearings (1) from the anti-roll bar on the lower arms.

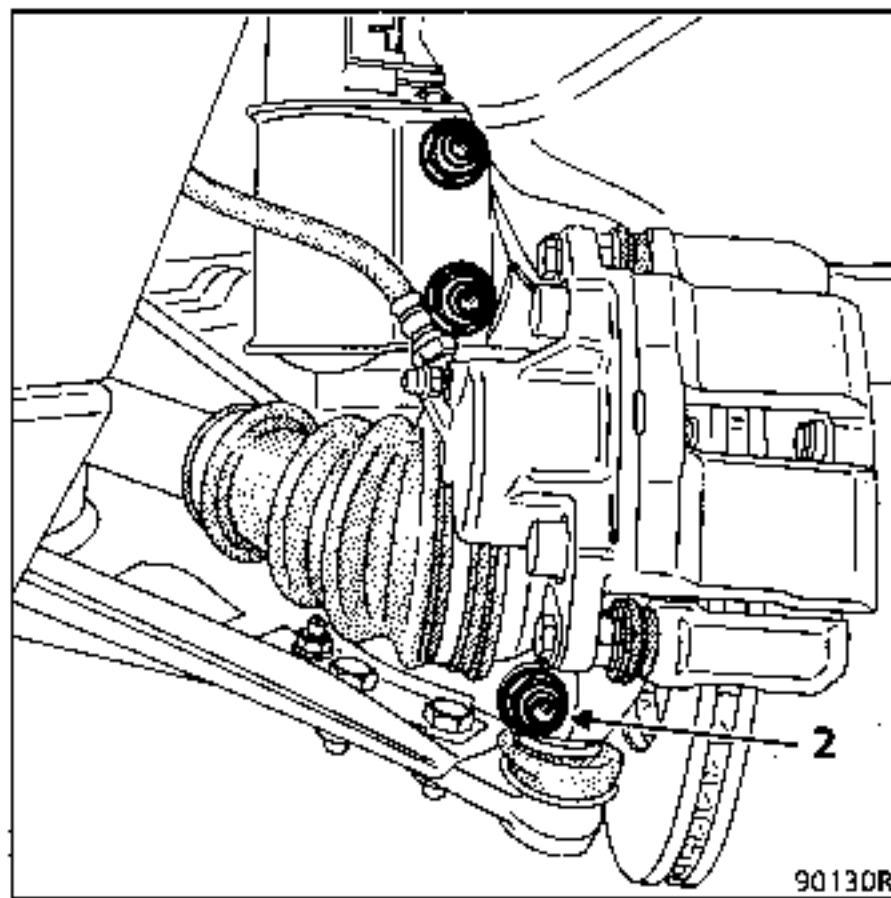


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Release the anti-roll bar towards the rear.

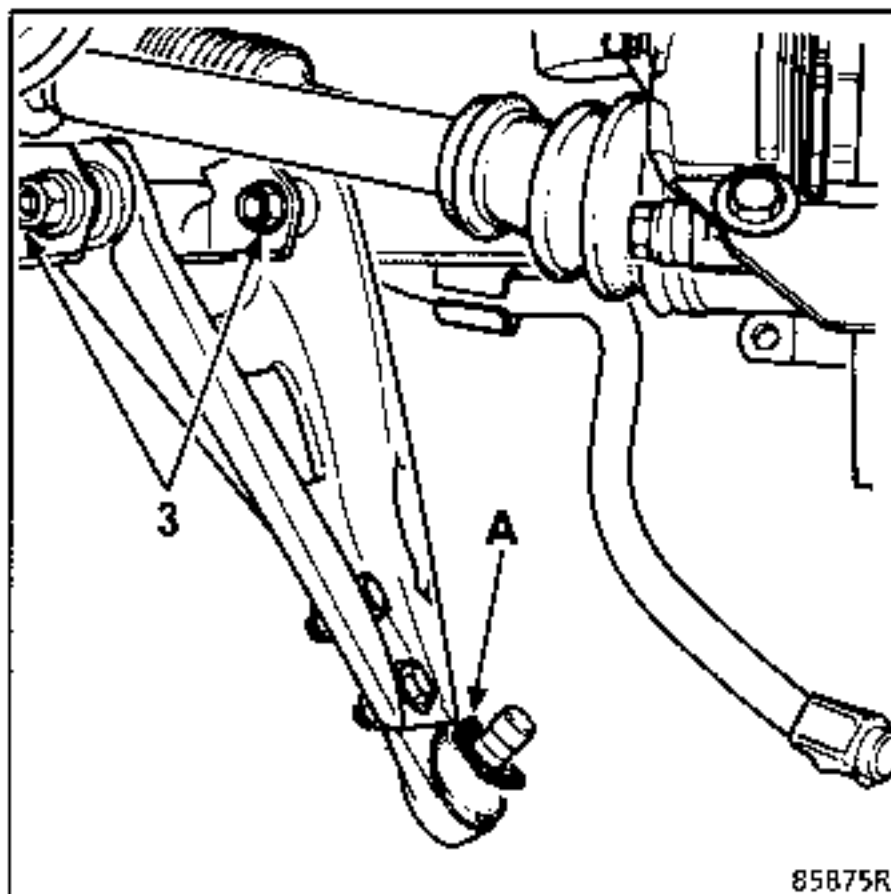
With the vehicle on axle stands, remove:

- the nut and the key (2),



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- the two mounting bolts (3) from the arm on the cradle,



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- the arm.