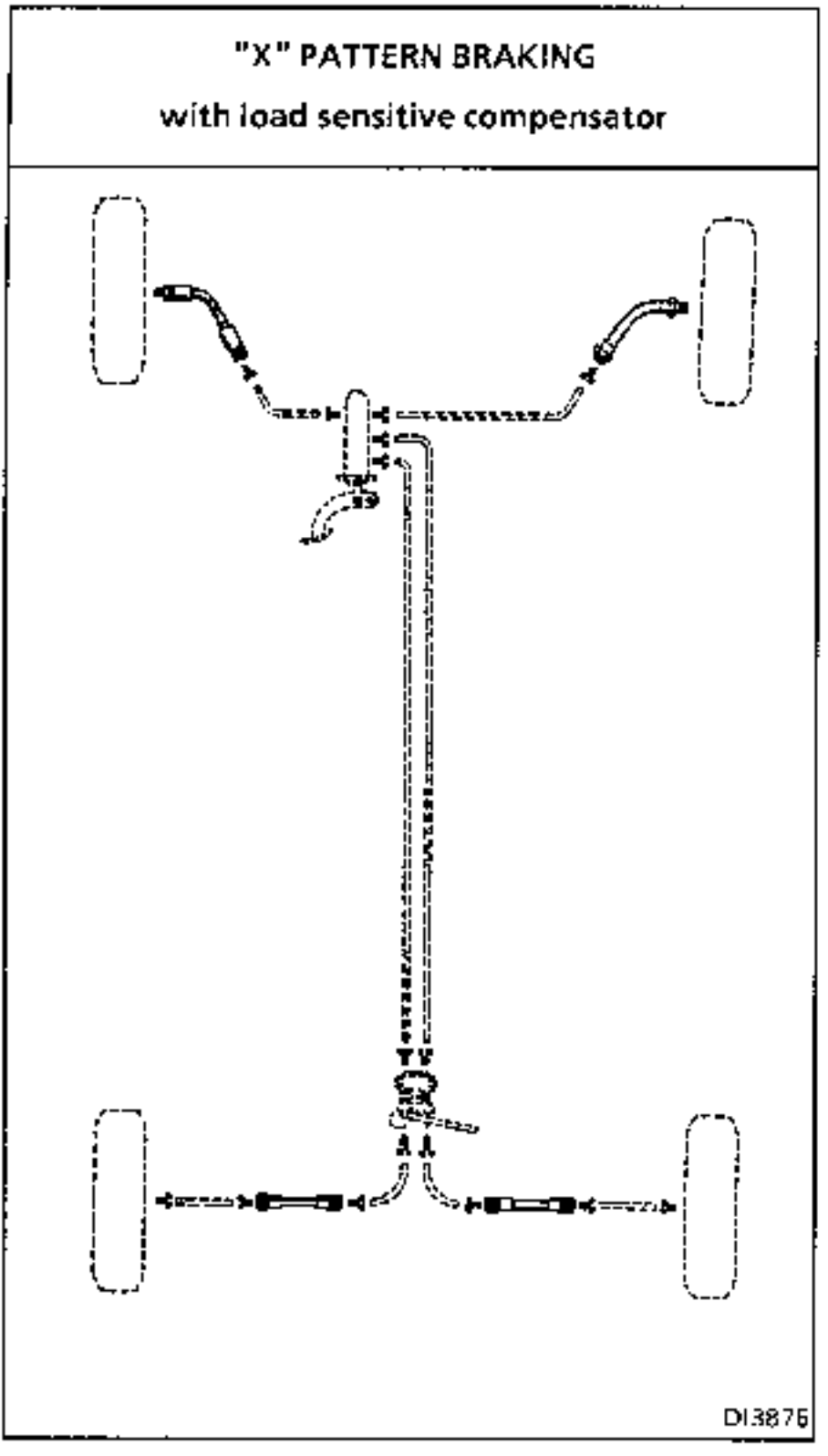
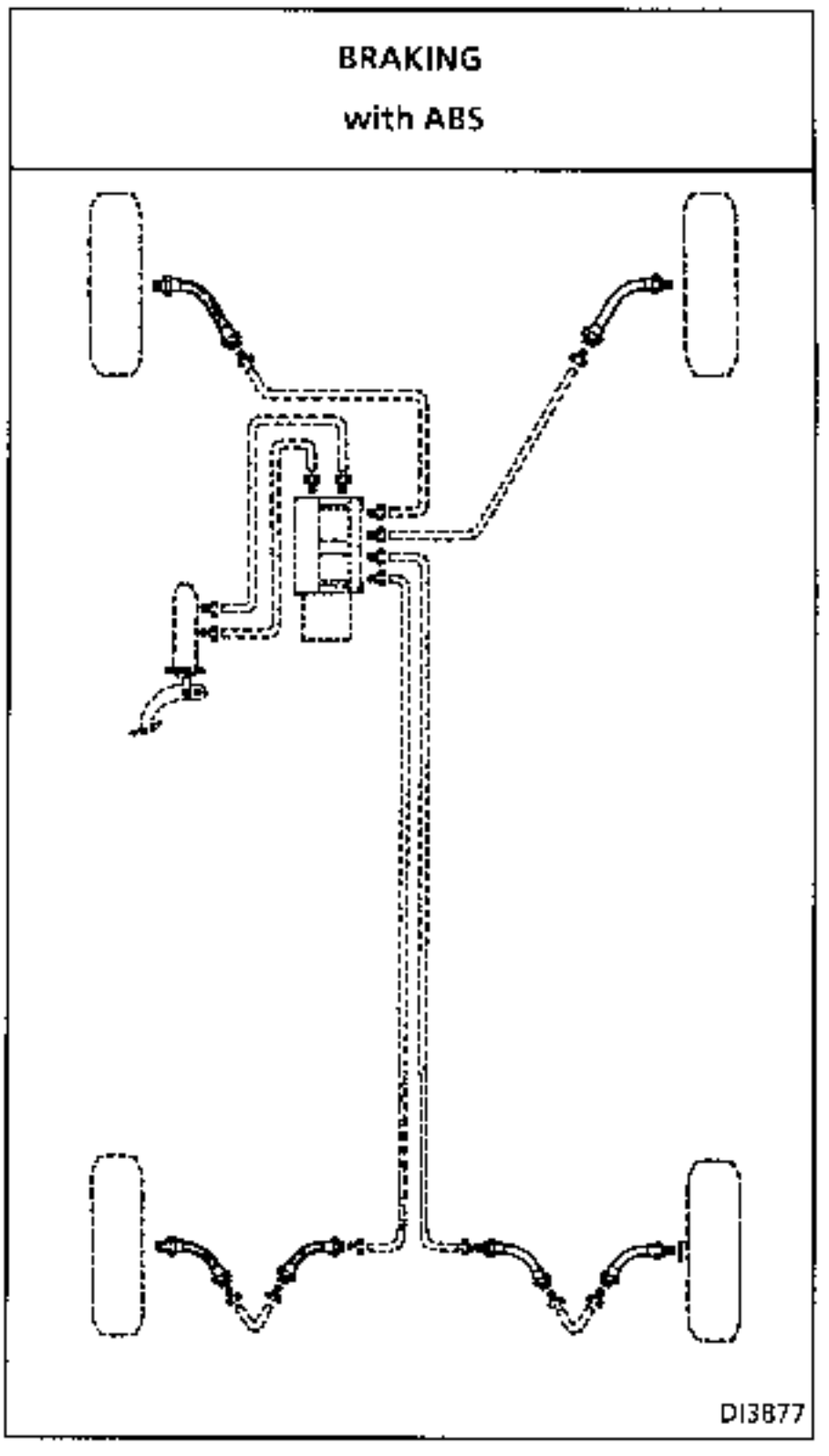
NOTE : the diagram below shows the general principle ; in no case should it be taken as reference for the circuit connections and allocations. When replacing one of the components of the brake circuit on a vehicle, always mark the pipes before removing them so that they can be connected back in their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

"X" PATTERN BRAKING
with load sensitive compensator



DI3876

BRAKING
with ABS



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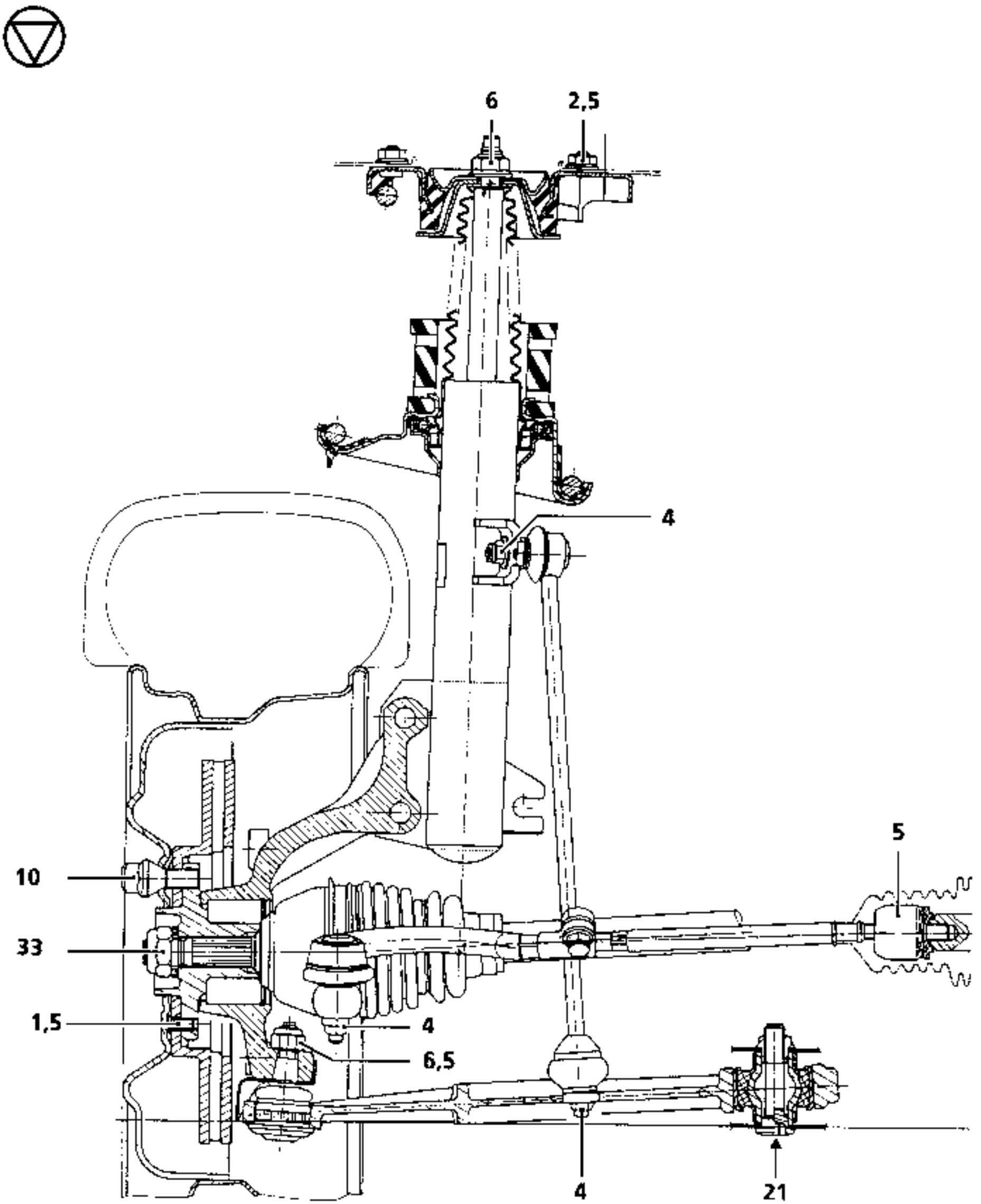
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2,5
4
10
33
1,5
4
6,5
5
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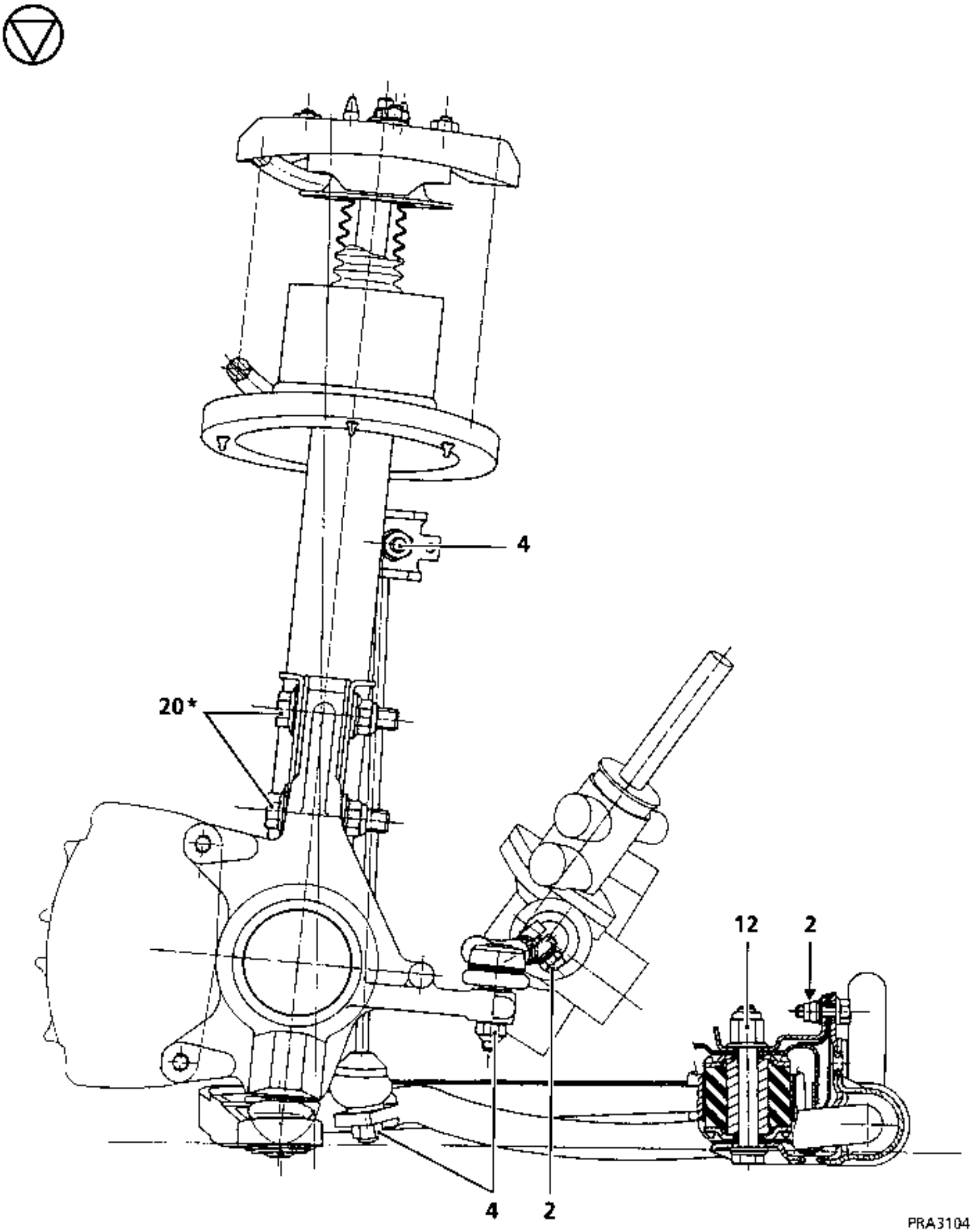
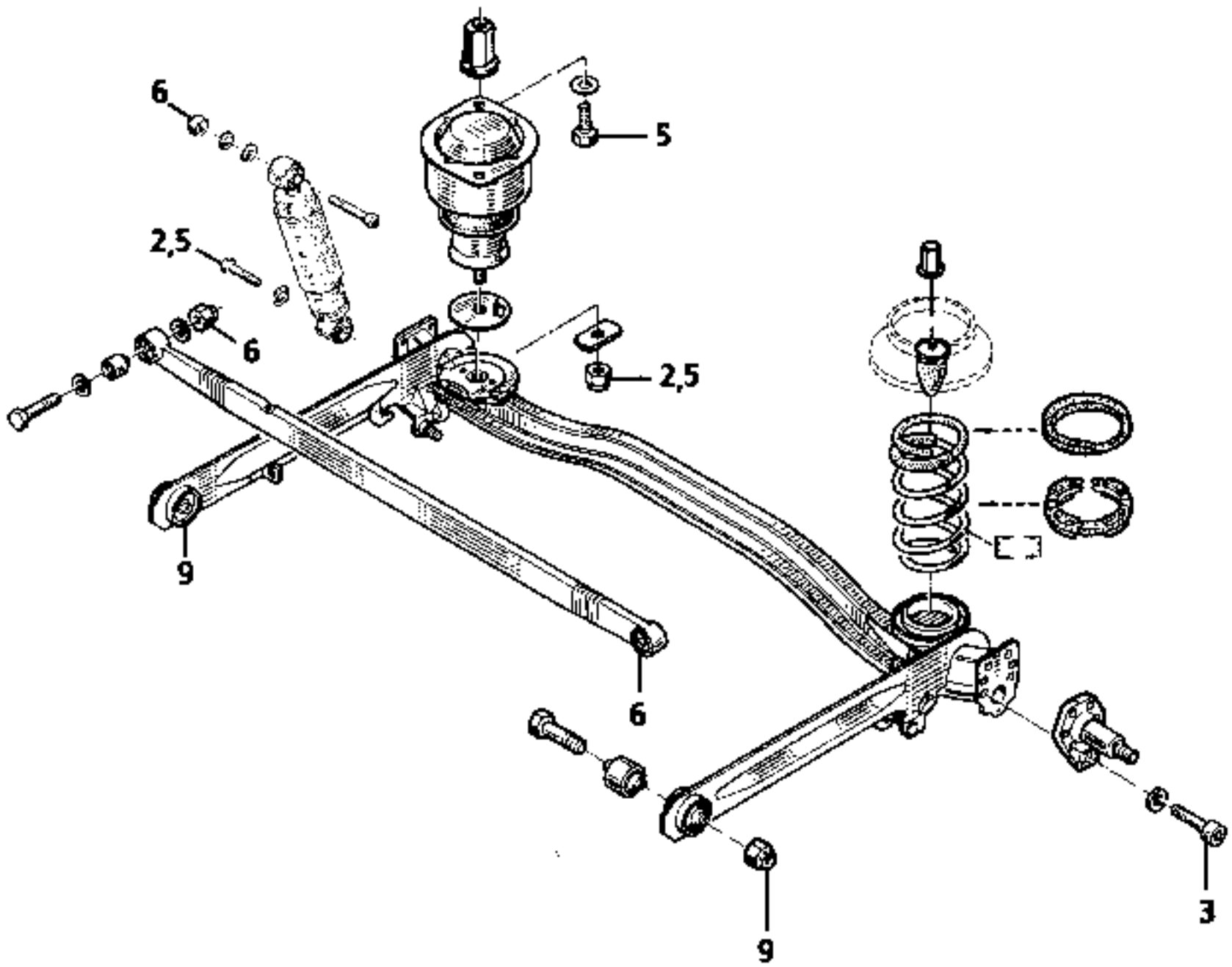
21
PRA31D3



(*) fitting direction must be observed



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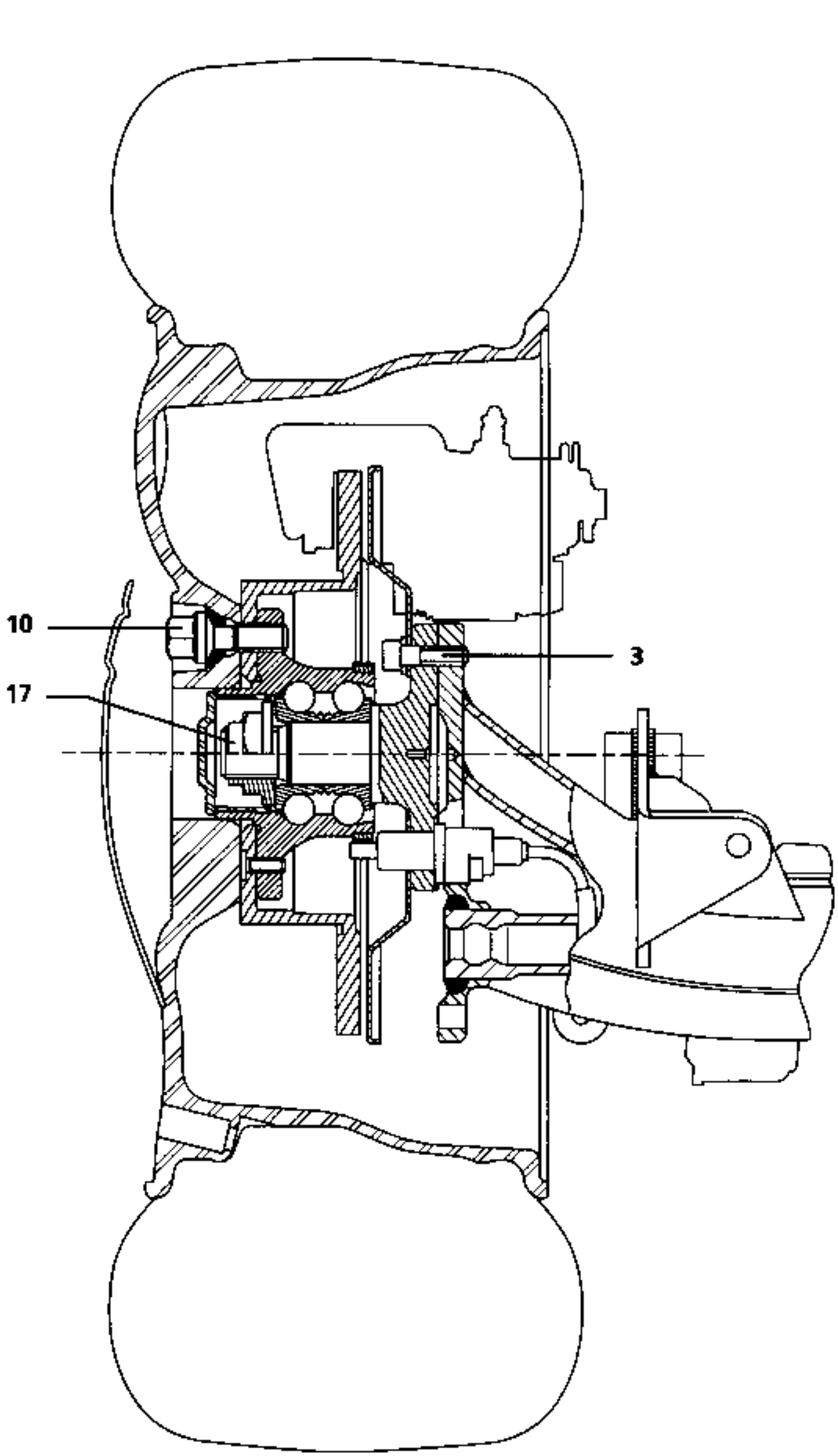
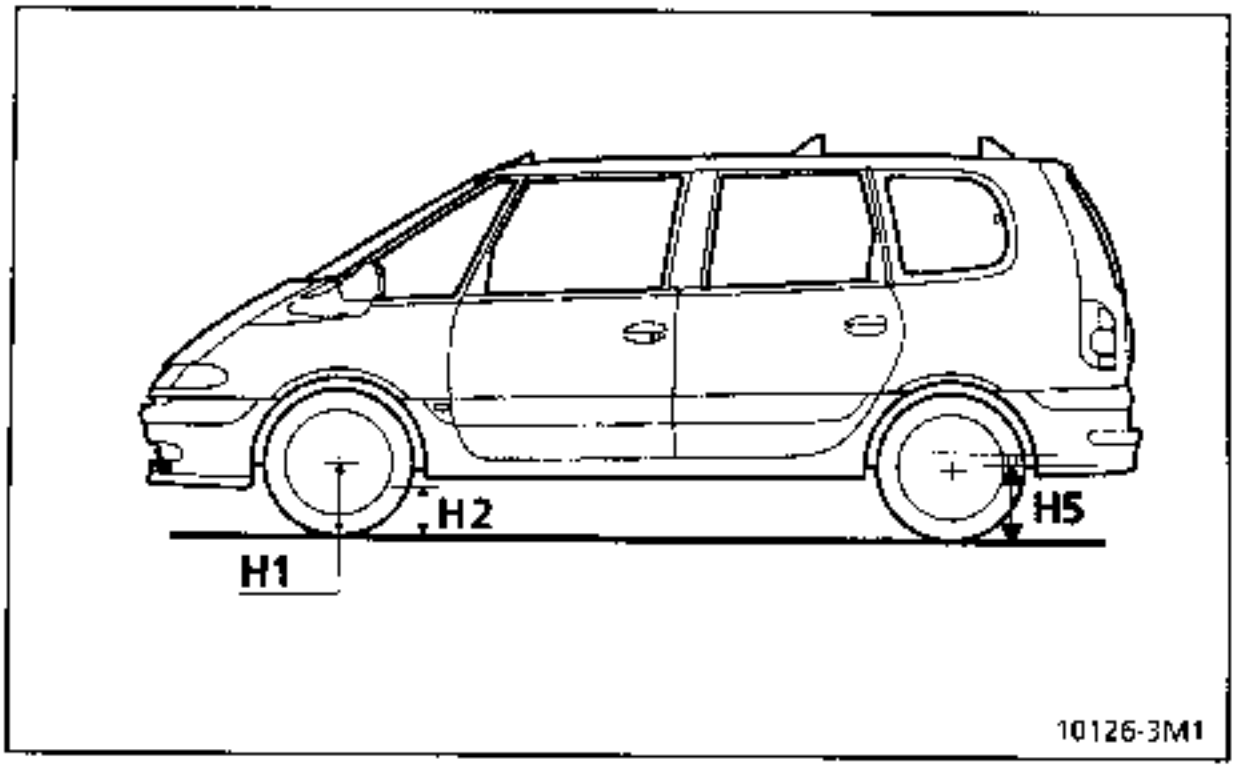
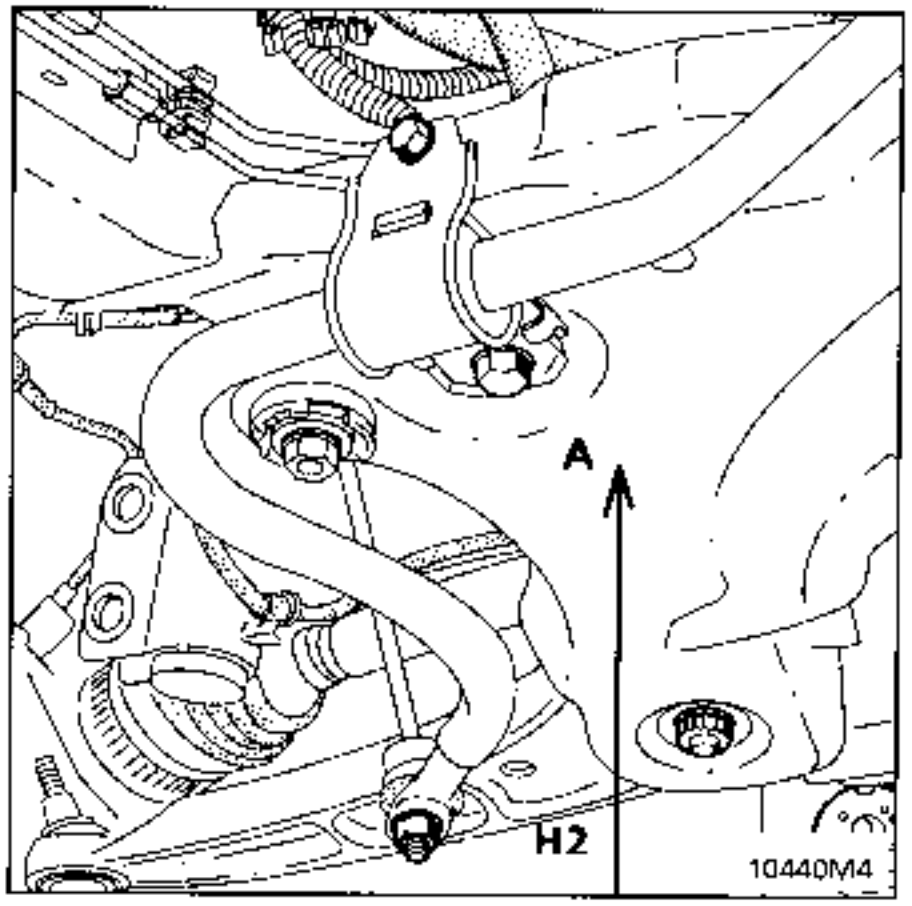


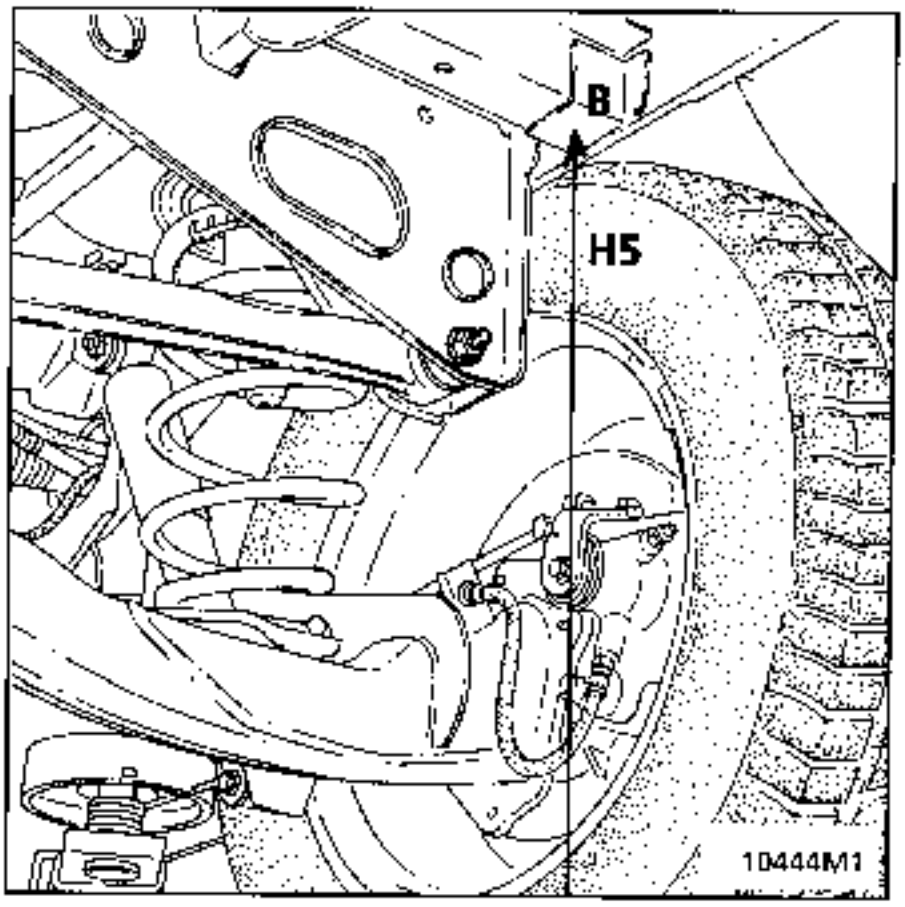
11633M1

	DIMENSIONS	TIGHTENING TORQUES
Bleed screw	–	0.6 to 0.8
Hoses for front calipers	M 10 × 100	1.7
Hoses on rear wheel cylinder	M 10 × 100	1.7
Master cylinder outlets	M 10 × 100 or M 12 × 100	1.7
Compensator inlet	M 12 × 100	1.7
Compensator outlets	M 10 × 100	1.7
ABS hydraulic assembly inlets and outlets	M 10 × 100 or M 12 × 100	1.7





Measure on the sub-frame, vertically from point A.
H2 = distance between the sub-frame and the plane on which the wheels rest



H5 = measured between the floor 3rd row cross member and the plane on which the wheels rest/ground.

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 : wheel axis to ground

H2 : sub-frame at point A .
H5 : 3rd row chassis cross member.

Measure the dimensions:
H1 and H2 at the front
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 Stub-axle mounting bolt COA sensor lever - bar assembly bolt
Loctite SCELBLOC	5 to 6 drops	Front bearing Driveshaft
SAE 80W oil	Coat	Rear stub axle

- Axial ball joint stop.
- Balance weight retainer.
- Hub bearing.
- Driveshaft bearing gaiter.
- Girling caliper guide bolts, self locking nuts on brake servo
- Stub axle lock nut and mounting bolts
- Steering box mounting bolts,
- Lock nuts for axle assembly component mounting

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 and replacement of the fluid is therefore recommended (refer to vehicle's Warranty and Servicing Handbook).

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:

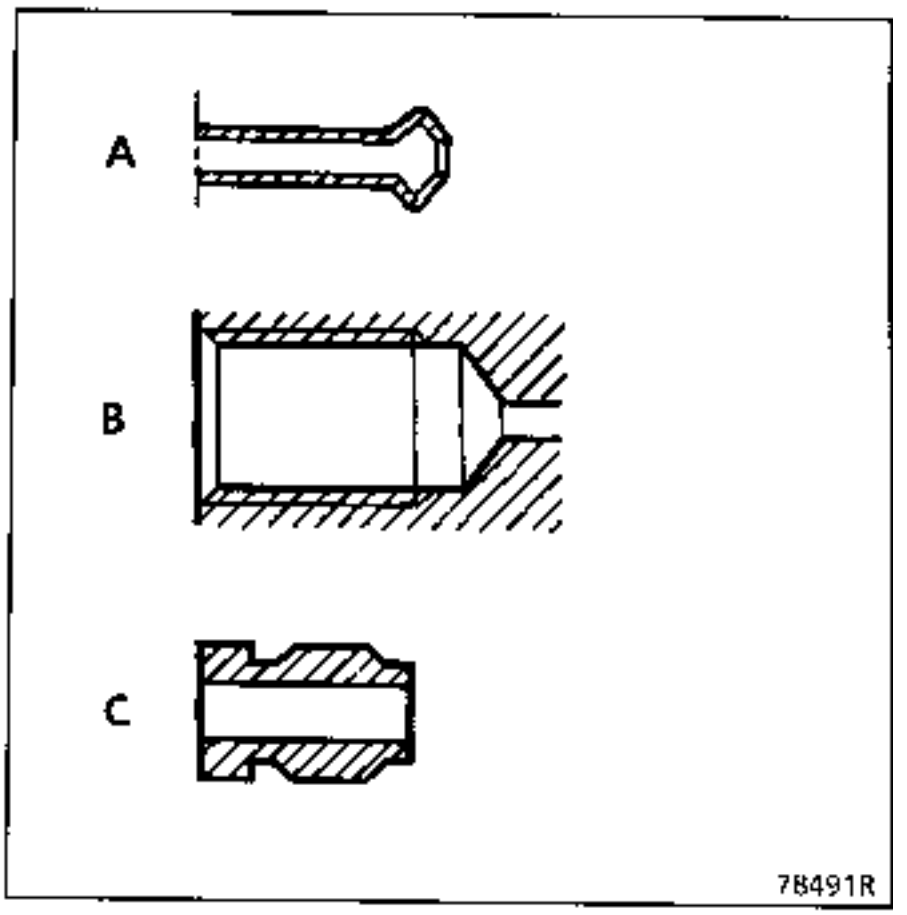
Mixing two incompatible brake fluids in the circuit will cause a risk of major leaks, mainly due to deterioration of the cups. To avoid such risks, it is important to use only those brake fluids which have been tested and approved by our Technical Department and which conform to standard **SAE J 1703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



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.

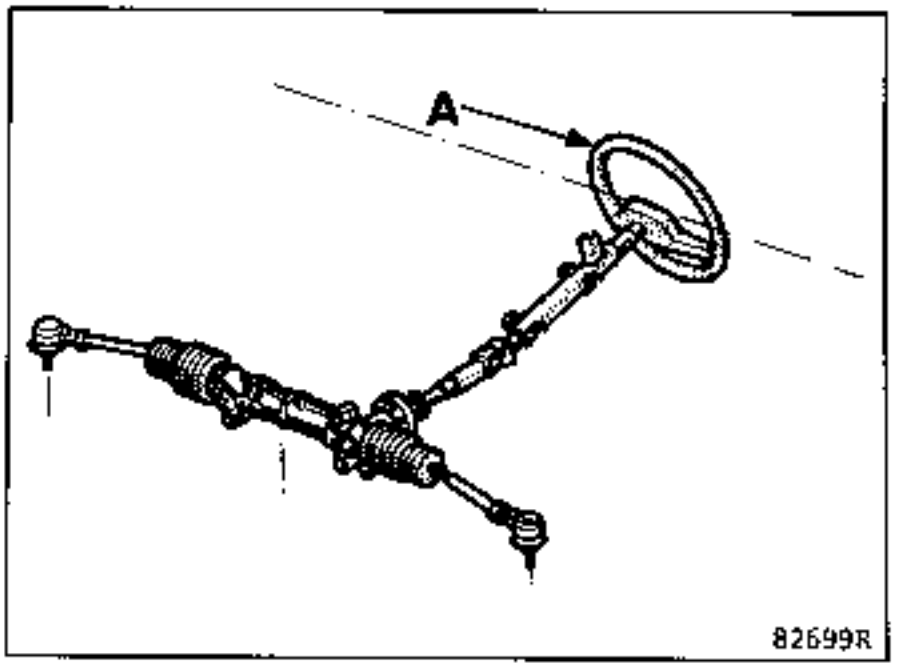
– wheel run-out: it should not exceed **1.2 mm** (compensated for by measuring equipment).

– symmetry of underbody heights (condition of the suspension).

DETERMINING THE STEERING CENTRE POINT (check using 2 head bench)

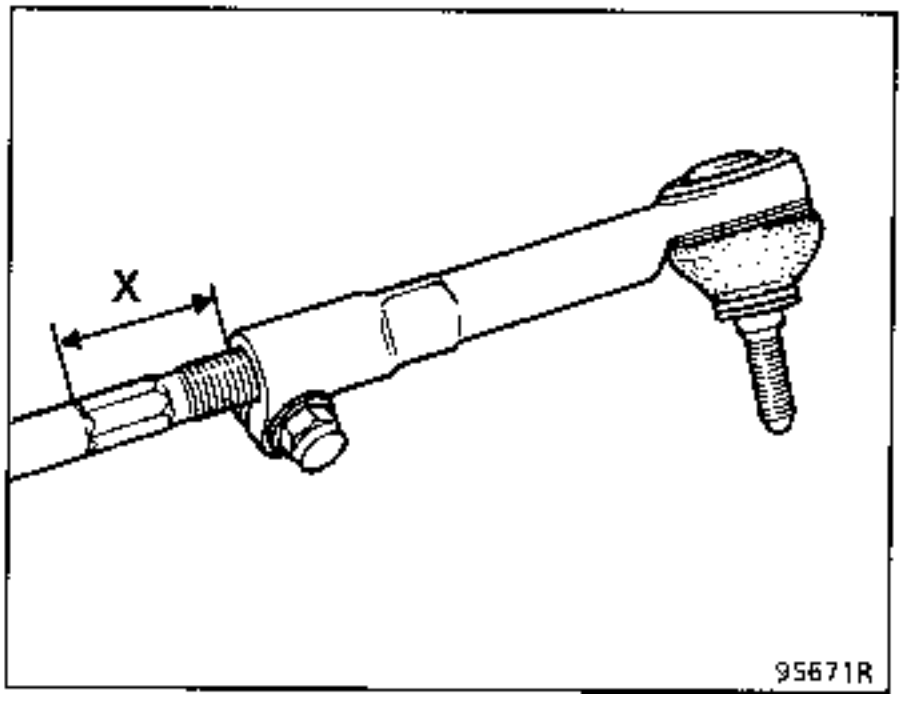
Checking and adjusting the front axle assembly requires the steering to be centred to avoid pulling faults.

- Remove the keys from the vehicle ignition.
- Lock the steering wheel (A) in the "anti-theft" position: 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.

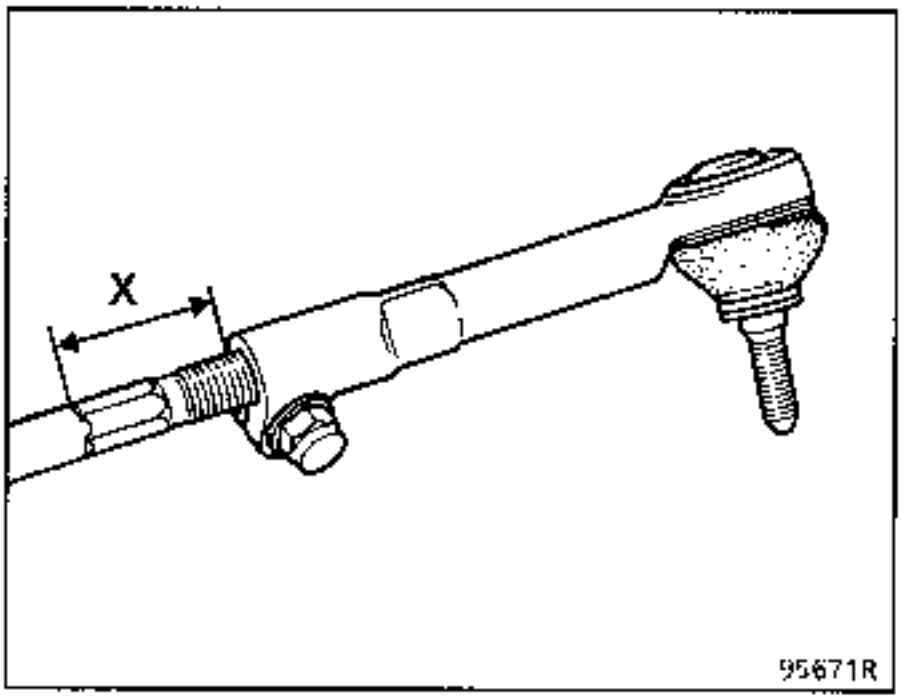


ORDER OF OPERATIONS

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).

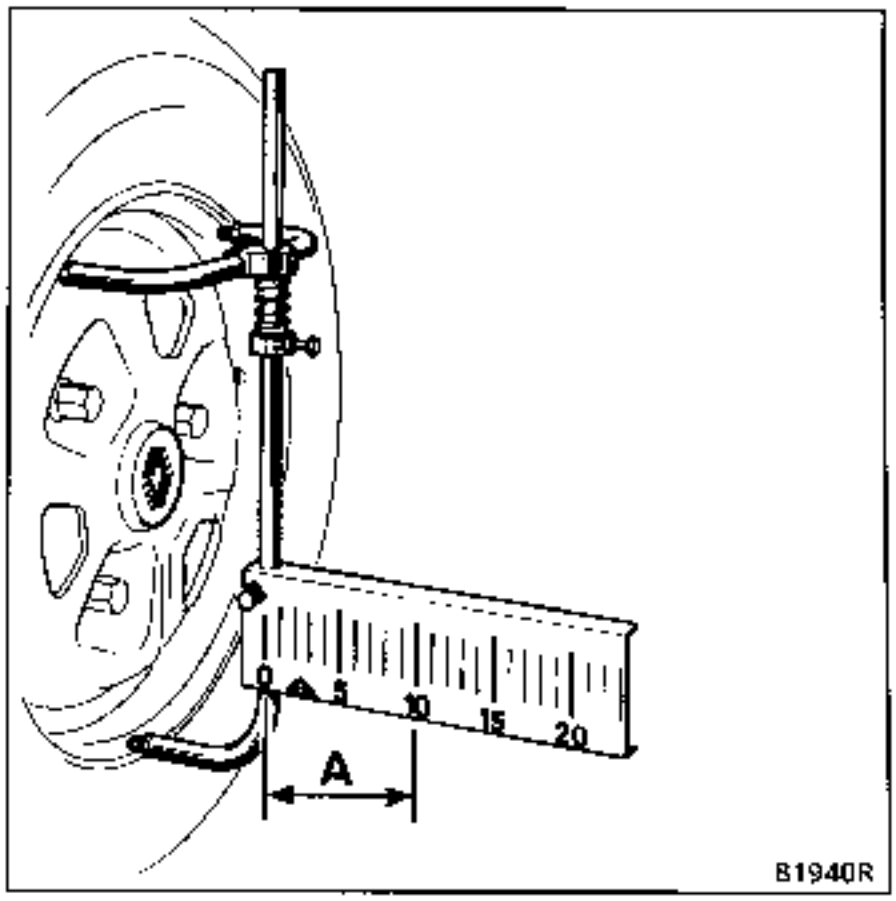
The following order must therefore be strictly observed:

- 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,



Length X should be identical on each side of the vehicle, to 1.5 mm.

Using a bench with 2 heads:
note the values A on the measuring scales.



(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	Arm bent – Side member or axle mounting bent
"Included angle" correct but Camber incorrect Kingpin incorrect	– Arm bent – Side member or axle mounting bent
Camber correct but Kingpin incorrect	– Stub axle carrier bent
Kingpin correct but Camber incorrect	– Stub axle carrier bent
Variation in parallelism incorrect	See castor Arm bent Side member bent
Parallelism incorrect by more than 6 mm	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
Hard pedal: high degree of force required for low deceleration.	– **Assistance fault** – **Pads and Brake Shoes:** - greasy, - frozen, non conforming, - overheating, prolonged braking with the pedal constantly applied (descending a hill), non conforming. – **Piston seized** – **Brake pipe crushed**
Soft pedal **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. **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.	– **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	- **Linings need backing off** - **Linings slightly greasy** - **Springs require replacing**
Brakes judder	- **Oval drums** - **Disc run-out too great** - **Disc thickness not constant** - **Abnormal deposits on the discs** (oxidation between the pads and disc)

Pulling under braking (front)	– **Suspension** front axle assembly, steering must be checked – **Piston seized *** – **Tyres** (wear - inflation pressures) – **Brake pipe crushed *** ***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
Offset braking (rear)	– **Braking compensator or limiter** (adjustment - operation) – **Piston seized** – **Incorrect adjustment of the brake shoes** 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. – **Return springs**
Brakes overheat	– **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

For vehicles 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 wheel cylinders.

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.

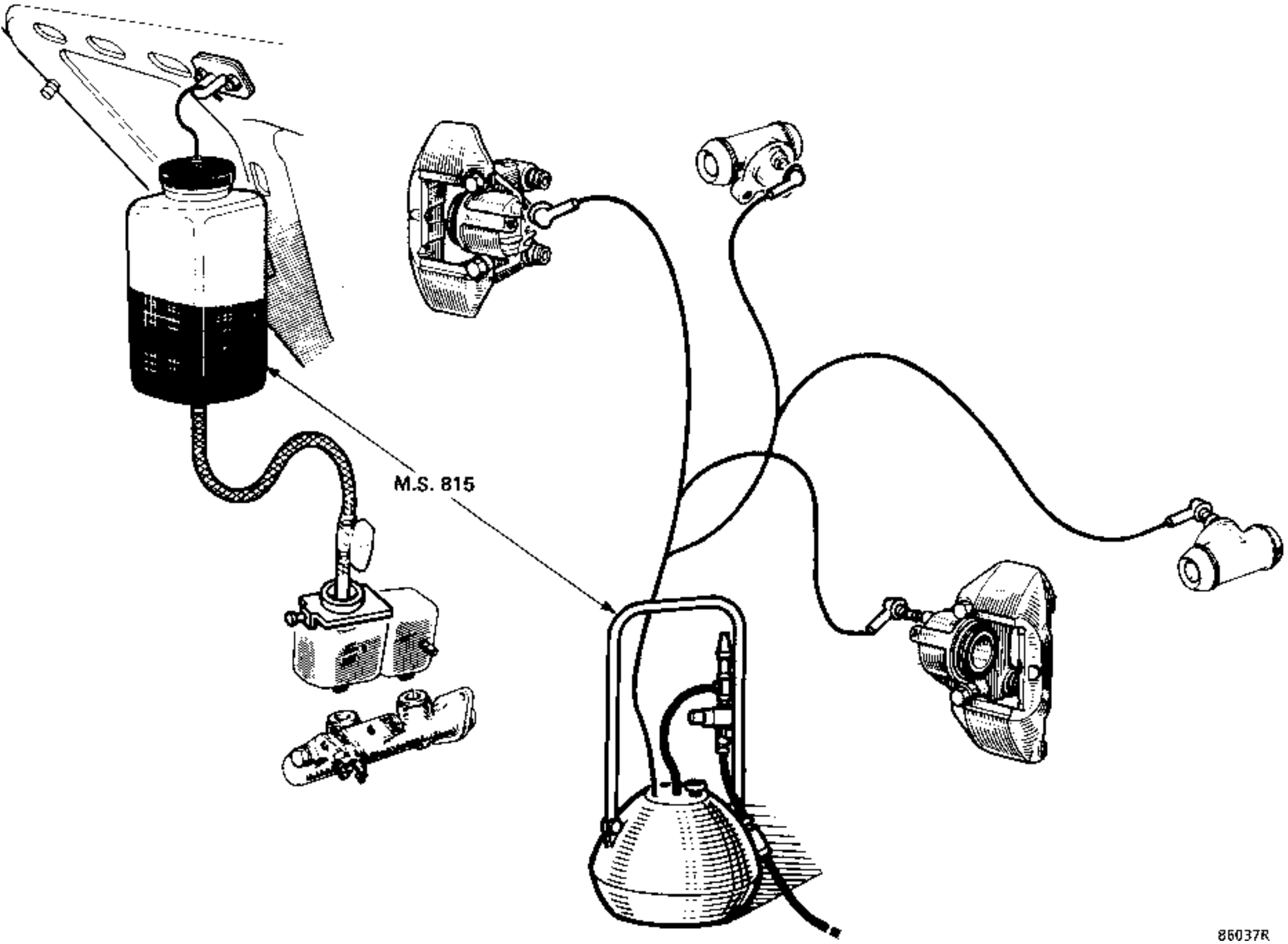
Check there is pressure at the brake pedal when it is depressed (press it several times).

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.

* Bleeding may be carried out under pressure using bleeding equipment or using the pedal.

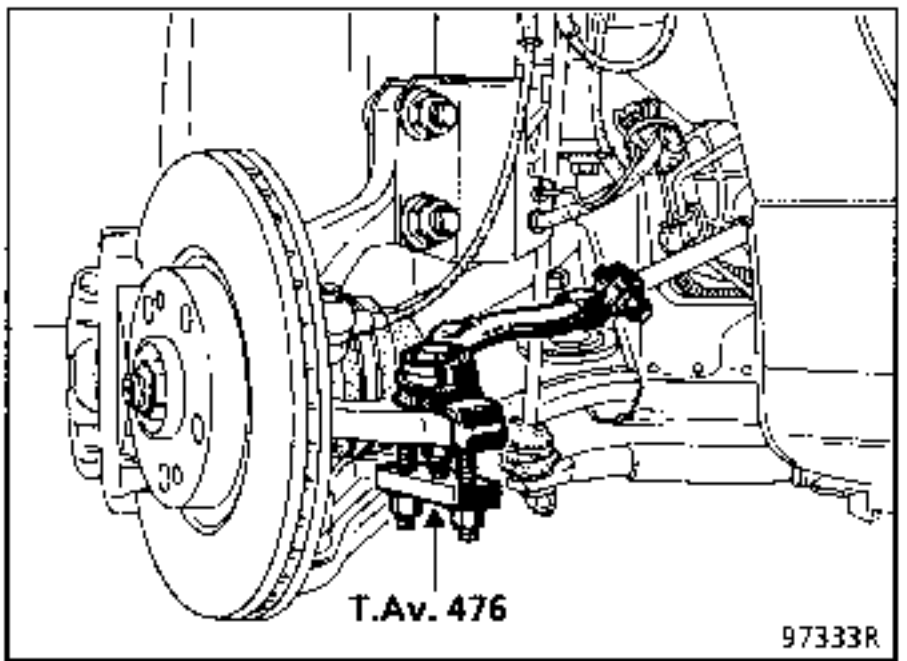

M.S. 815
86037R

SPECIAL TOOLING REQUIRED	
T.Av. 476	Ball joint extractor
EQUIPMENT REQUIRED	
Impact ball joint extractor	
12 sided socket - 22 mm	

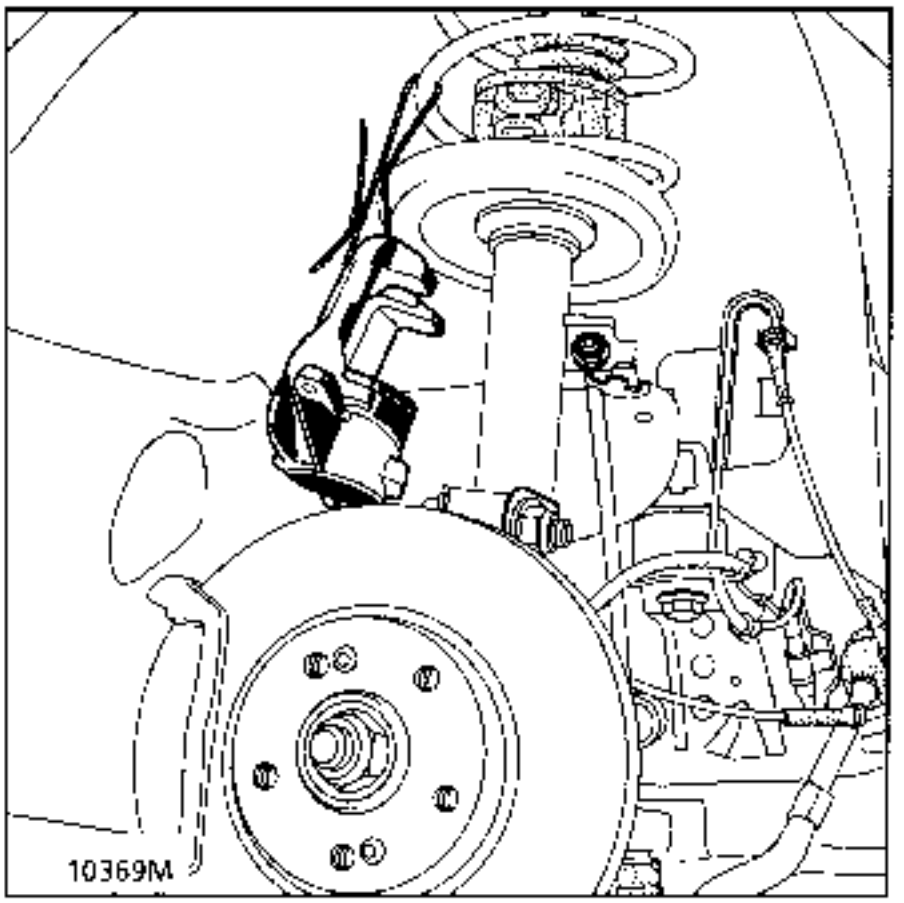
TIGHTENING TORQUES (in daN.m)		
Shock absorber base mounting bolt		
	M16 X 200	20
Rubber bush mountings on		
axle mounting	point A	21
	point B	12
Lower ball joint		6.5
Track rod end		4
Anti-roll bar link		4
Brake caliper guide bolt		3.5
Wheel bolt		10

REMOVAL

Remove:
- the wheel,
- the track rod end (using tool T.Av. 476 if necessary),

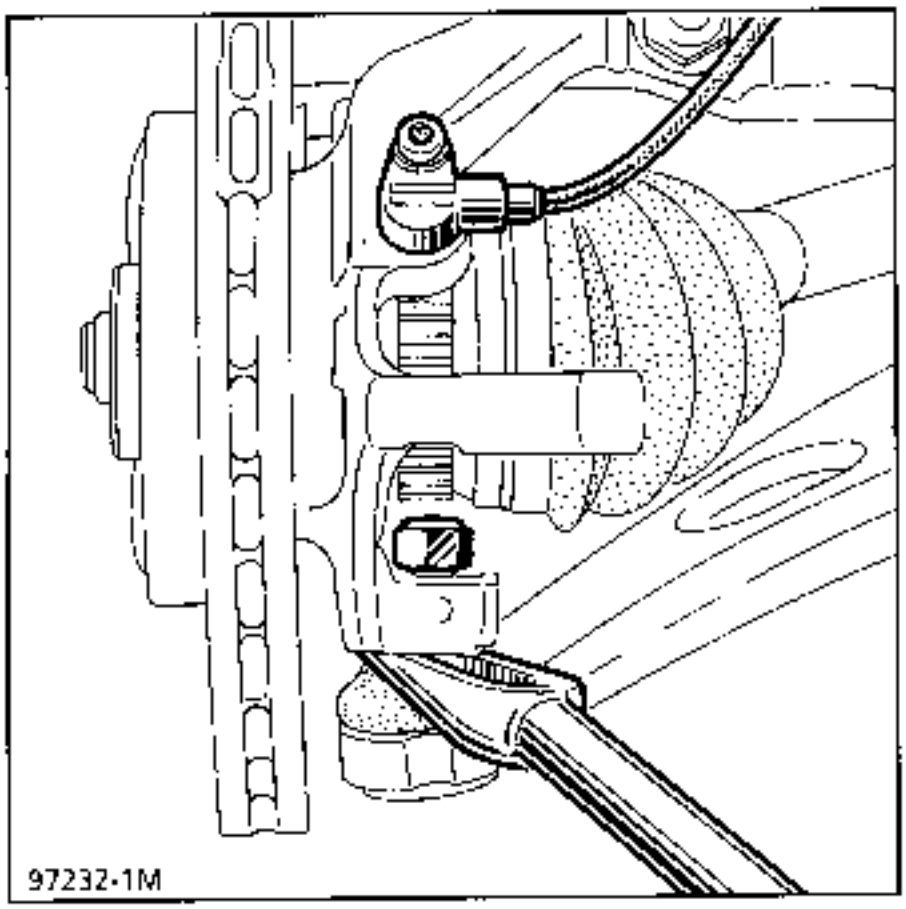


- the brake caliper (see appropriate section) and attach it to the spring to avoid damaging the pipe.

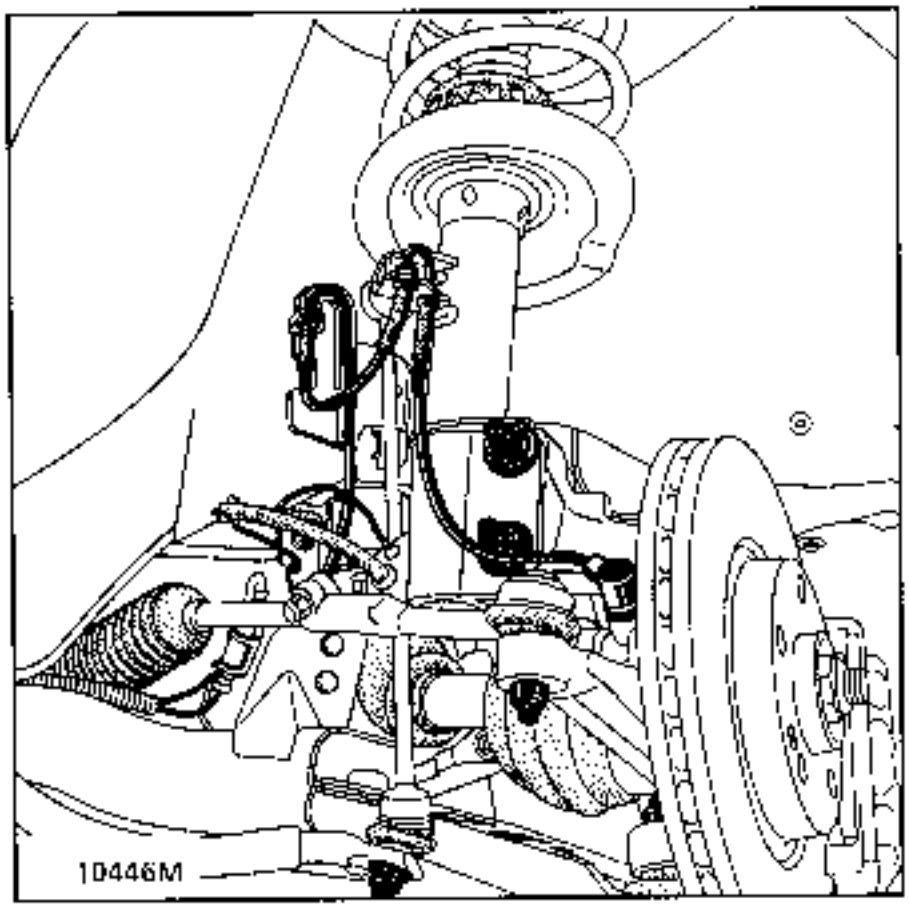


Fit a protector on the driveshaft gaiter (wheel end).

Slacken the lower wishbone ball joint nut and release the joint using an impact ball joint extractor if necessary.

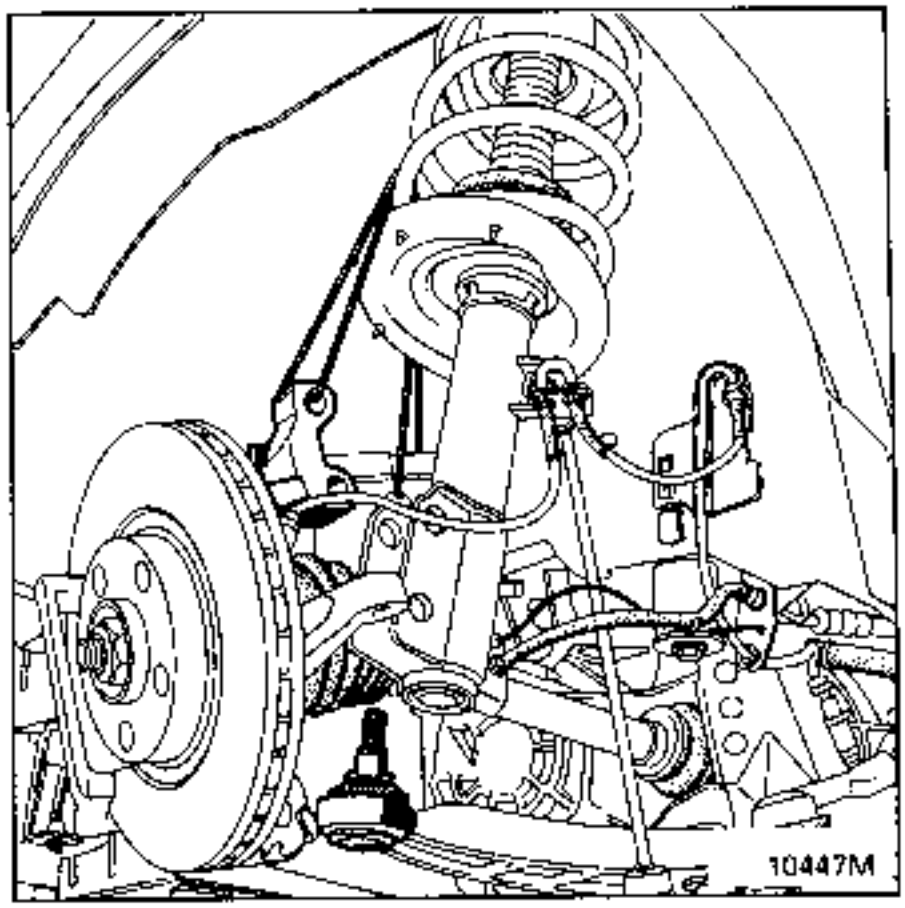


Remove the shock absorber base mountings.

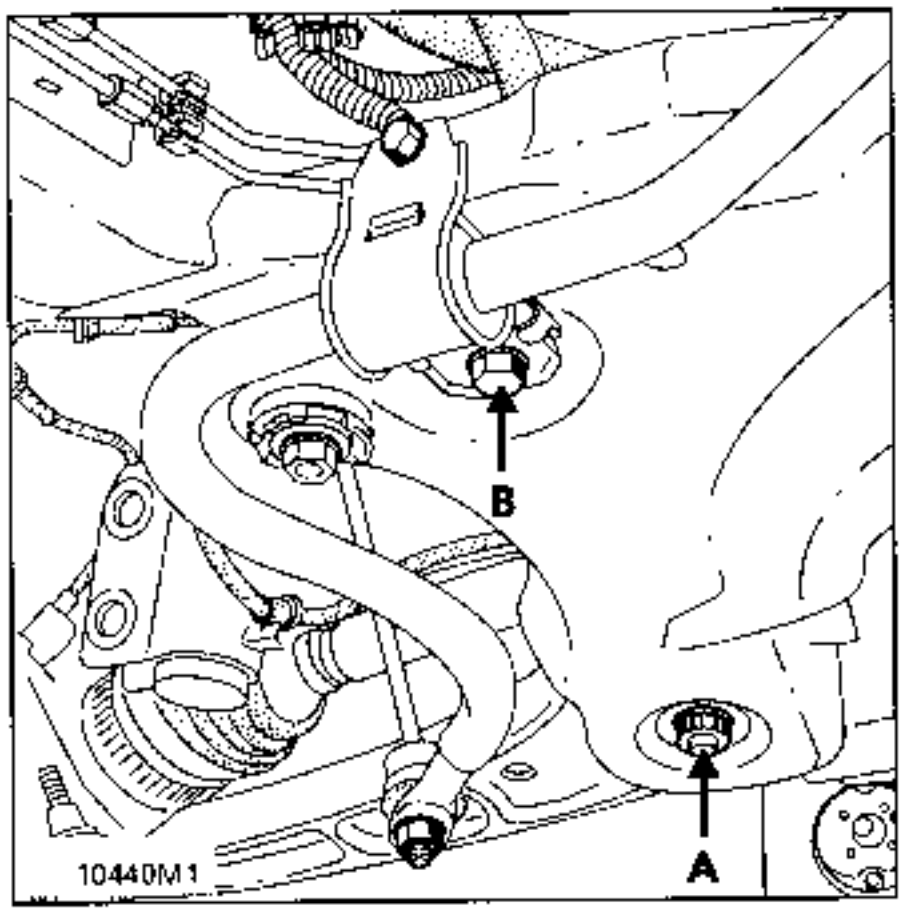


Release the stub axle carrier from the shock absorber base taking care not to damage the gaiter on the lower wishbone ball joint.

Separate the stub axle carrier / driveshaft assembly and suspend it.



Slacken the two mountings (A) and (B) for the wishbone on the sub-frame and release it.



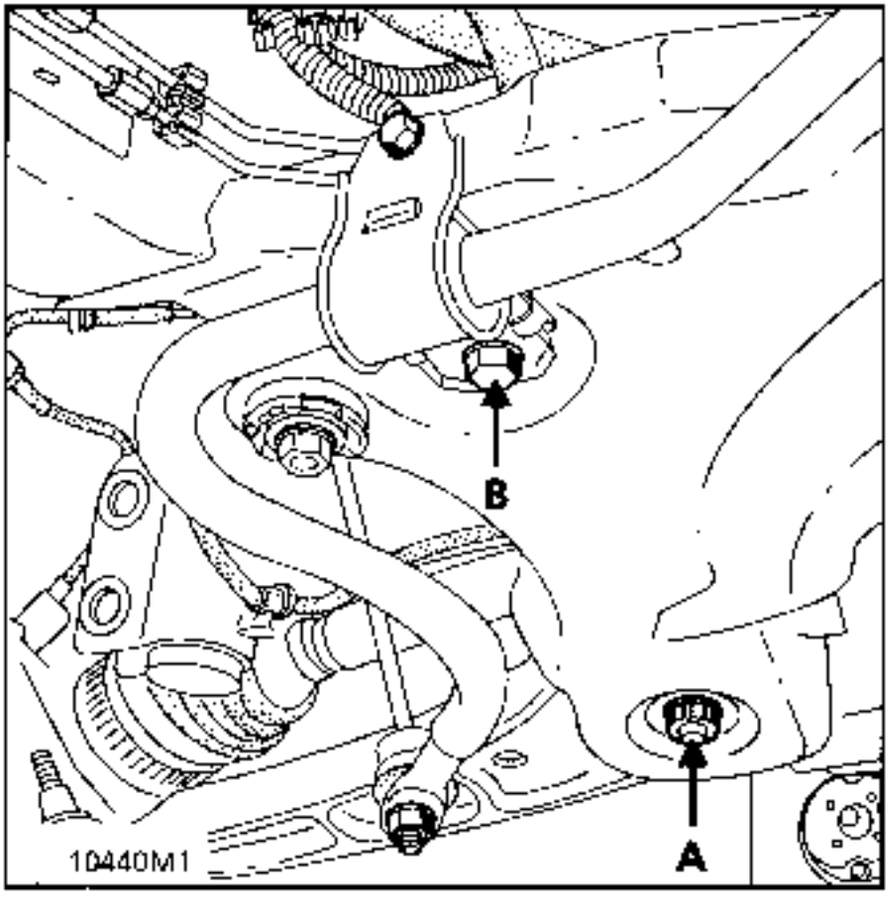
To remove bolt (A), use a **22 mm** 12 sided socket.

REFITTING

Systematically renew the nut and bolt for point (A) and the nut for point (B) on the lower wishbone. **The tightening torques MUST be observed.**

Refit the nut – bolt assemblies (A) and (B) and torque tighten them before refitting the wishbone ball joint.

Refitting is then the reverse of removal. Take care not to damage the driveshaft gaiter.



Press the brake pedal several times to bring the piston into contact with the pads.

Check the front axle assembly angles and adjust the parallelism if necessary.

SPECIAL TOOLING REQUIRED	
T.Av. 1274	Tool for replacing lower wishbone rubber bushes
T.Av. 1274-01	Additional rings for bush at point B

To ensure the bushes are correctly positioned in relation to the lower wishbone, they are replaced one after the other : bush (1) then (2).

IMPORTANT: during these operations, the threaded rod of the ball joint must always be pointing downwards.

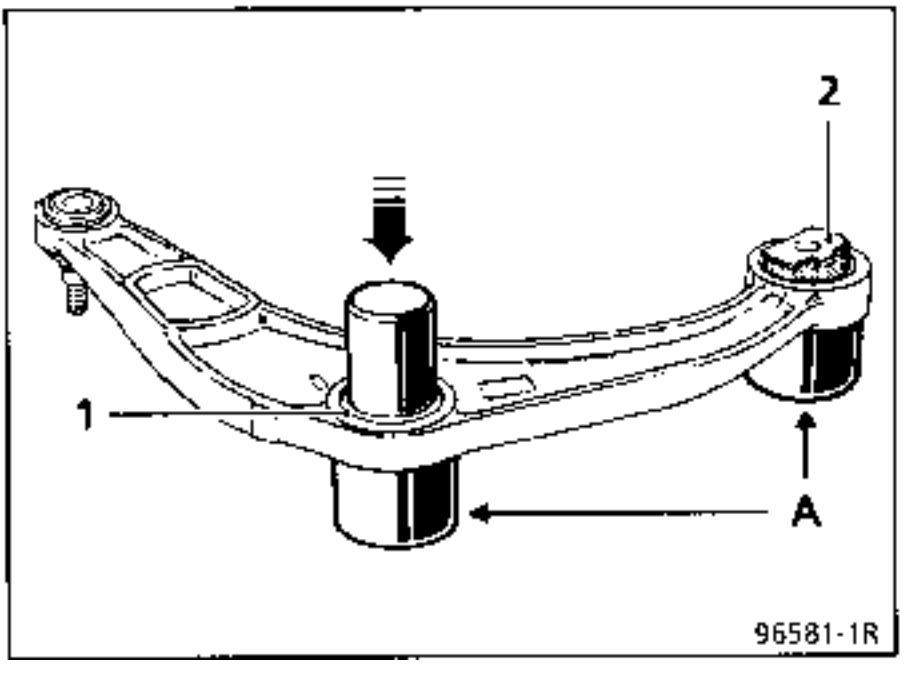
REPLACEMENT

BUSH 1

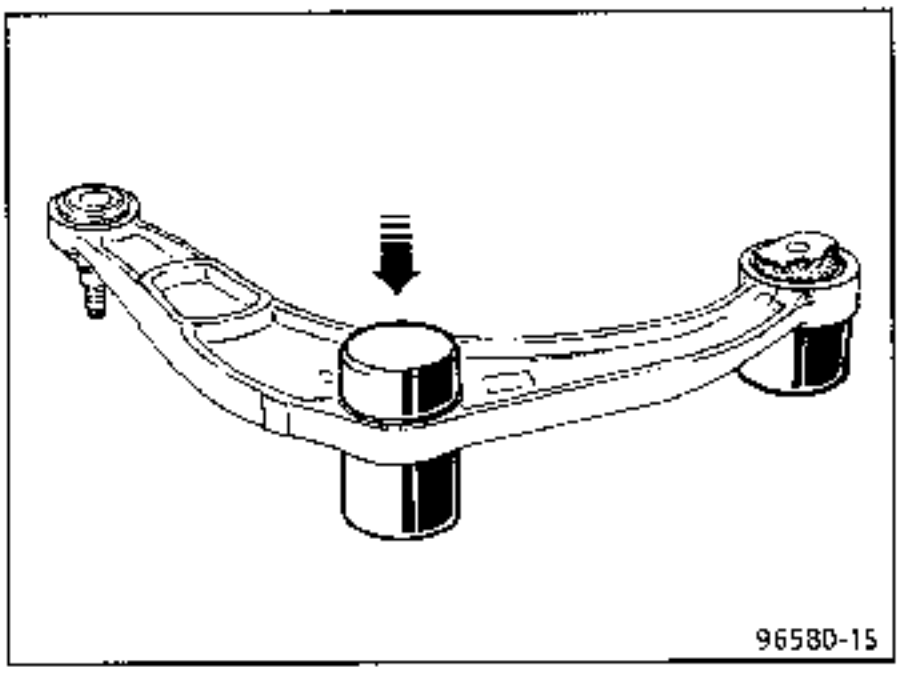
Fit the two rings (A) under the wishbone.

Remove and replace bush (1) using a press.

REMOVAL



REFITTING



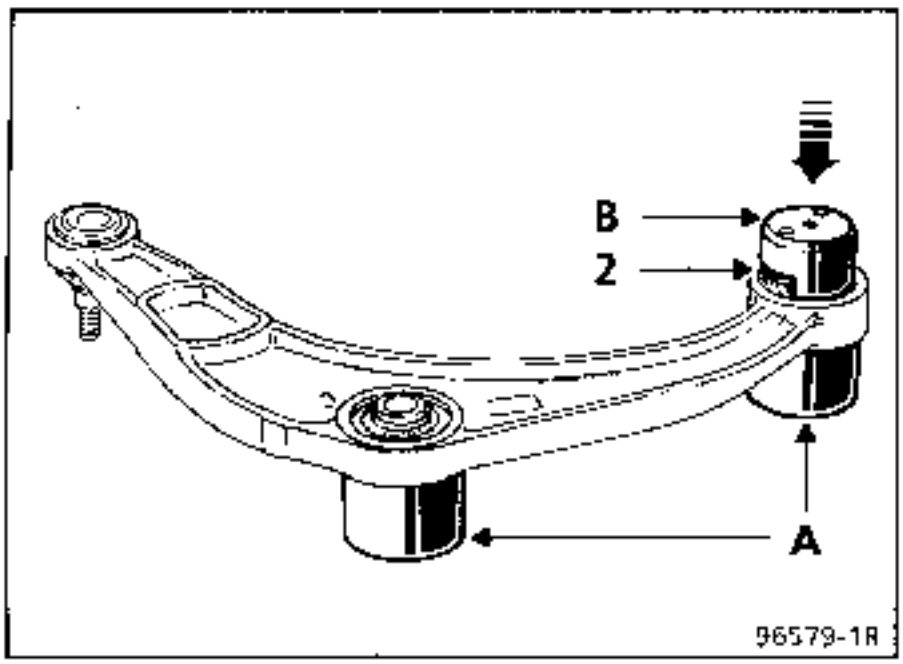
Press the bush in until the fitting ring touches the bearing face of the wishbone.

BUSH 2

Fit the two rings (A) under the wishbone.

Remove bush (2) using a press and ring (B) from kit **T.Av. 1274-01**.

REMOVAL



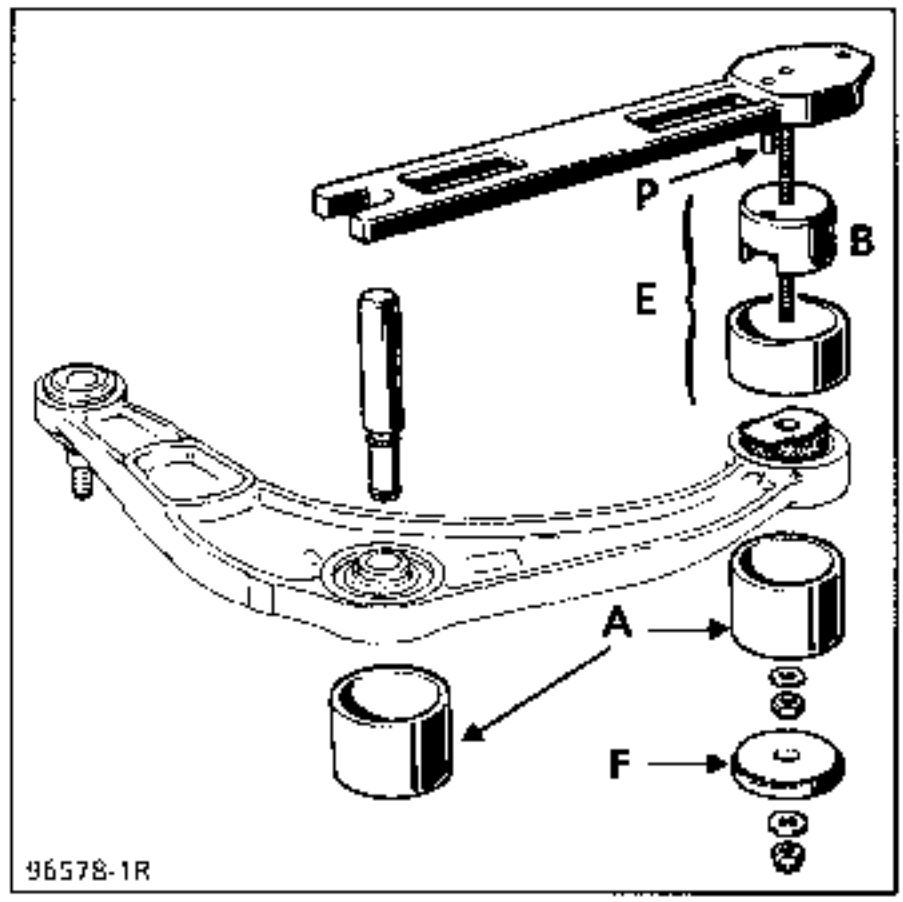
REFITTING

This bush (2) is refitted in two stages :

1. Fit the assembly (E) to the rule:
   - ring (B),
   - spacer (**T.Av. 1274-01**),
   - new bush,
   - threaded rod (screwed to rule),
   - washer,
   - nut.

2. Insert one end of the rule into the guide tube and at the other, fit the assembly (E) into the bush bore.
   NOTE:
   Remove the O rings and reduce the diameter of the lower part of the guide tube with sandpaper, if necessary.

In this position fit the centring washer (F) and tighten the assembly (nut - washer).



F Ring **T.Av. 1274-01**

Then fit this assembly on the two rings (A).

Press the bush in until the spacer touches the bearing face of the wishbone.

IMPORTANT

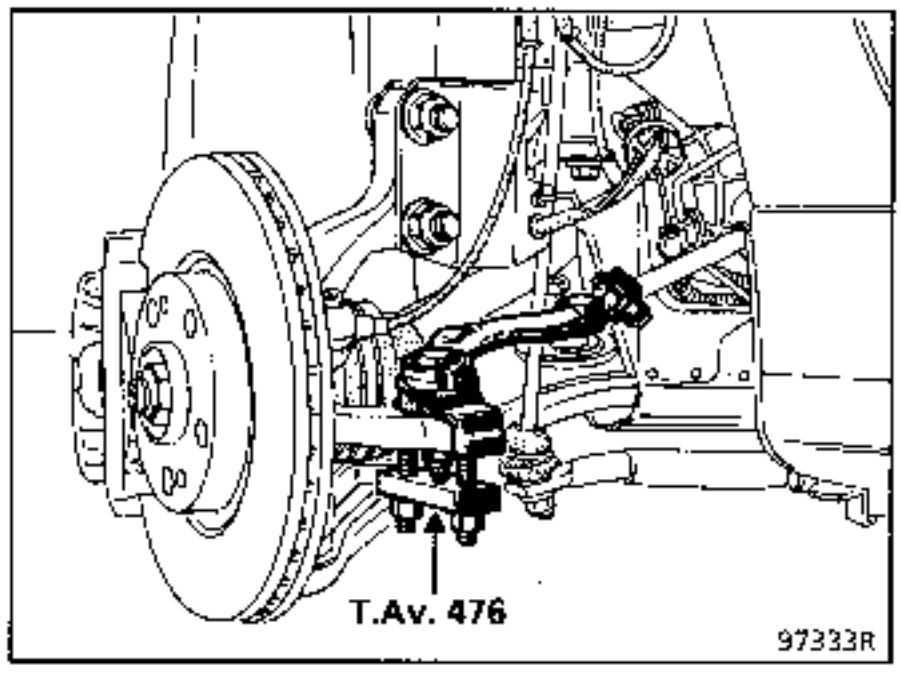
The ball joint **may be replaced** on the same wishbone once only. For this purpose, replacement ball joints have a notch on the bearing face (milled).

- Unmarked ball joint → standard part: **may be replaced**
- Ball joint with notch → replaced part: **may not be replaced again,** . The complete wishbone **MUST** be renewed.

SPECIAL TOOLING REQUIRED	
T.Av. 476	Ball joint extractor
T.Av. 1261	Tool for fitting and removing lower wishbone ball joint
T.Av. 1261-01	Additional ring for refitting ball joint

EQUIPMENT REQUIRED
Impact ball joint extractor

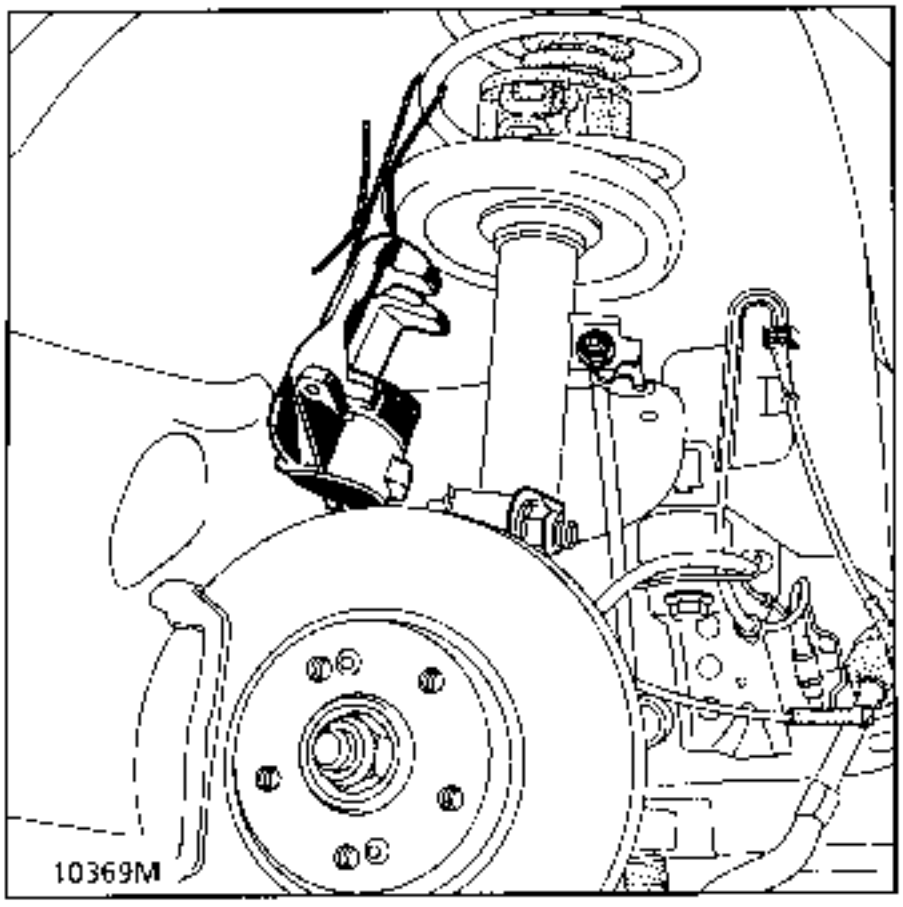
TIGHTENING TORQUES (in daN.m)	
Shock absorber base mounting bolt	
M16 X 200	20
Lower ball joint	6.5
Track rod end	4
Brake caliper guide bolt	3.5
Wheel bolt	10



REMOVAL

Remove:
- the wheel,
- the track rod end using tool **T.Av. 476** (if necessary),

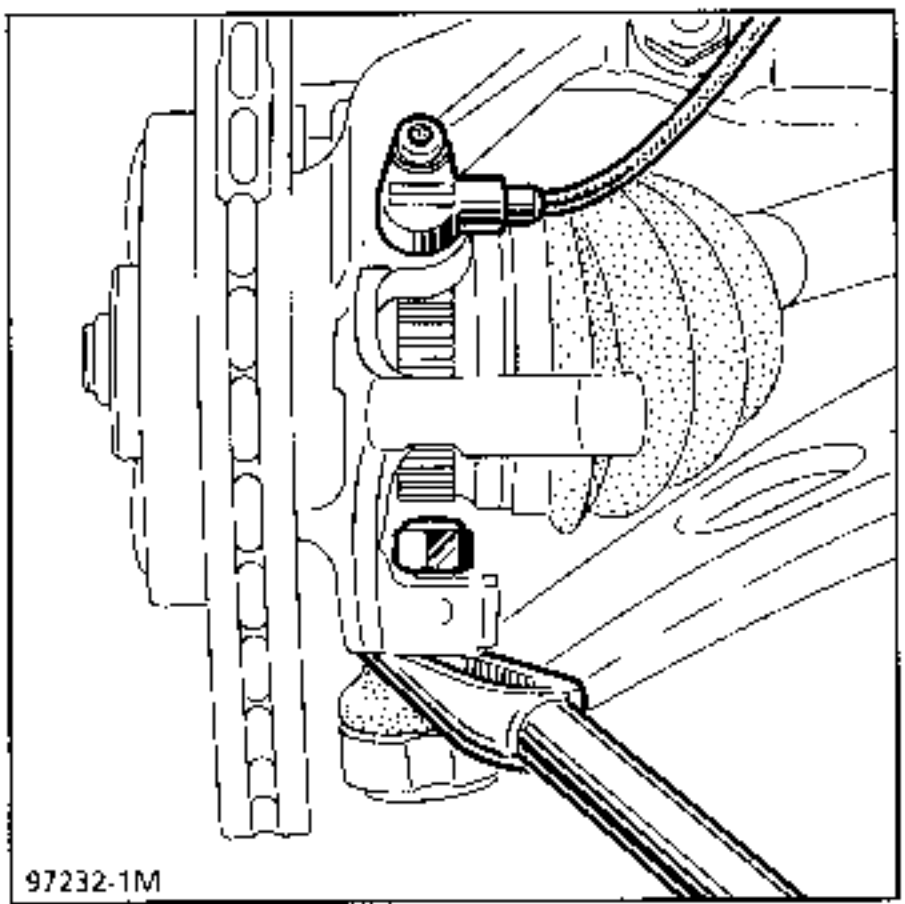
- the brake caliper (see appropriate section).



Attach the caliper to the spring to avoid damaging the pipe.

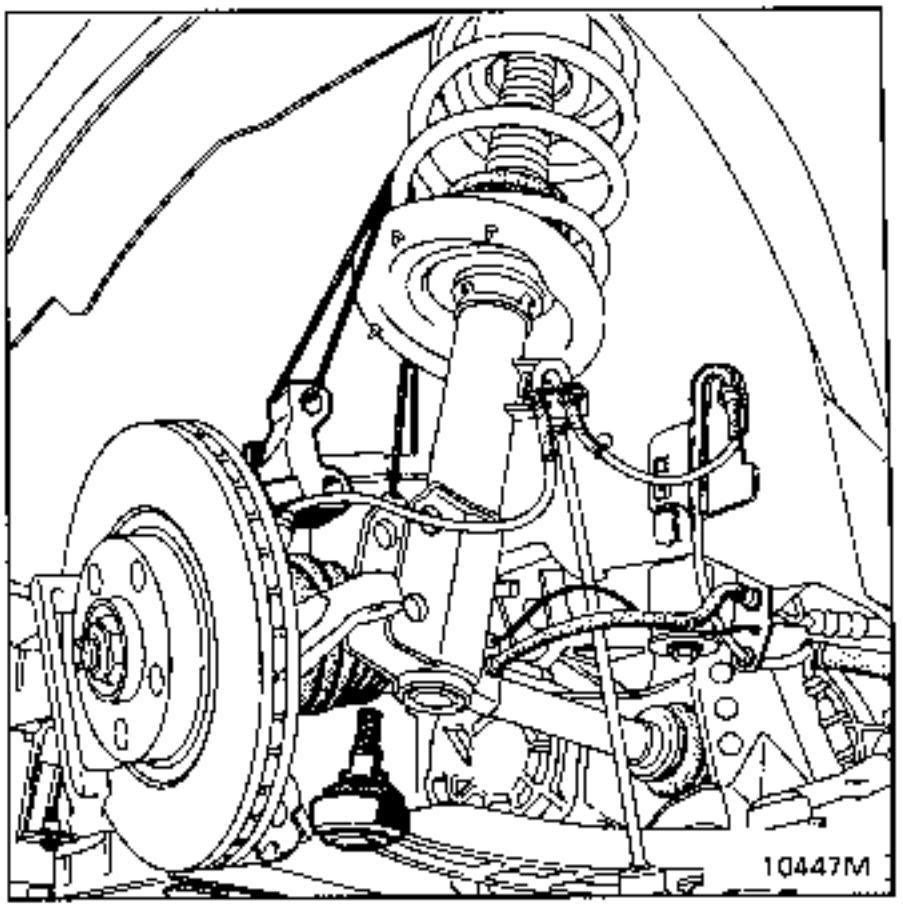
Fit a protector on the driveshaft gaiter.

Slacken the lower wishbone ball joint nut and release the joint using an impact ball joint extractor if necessary.

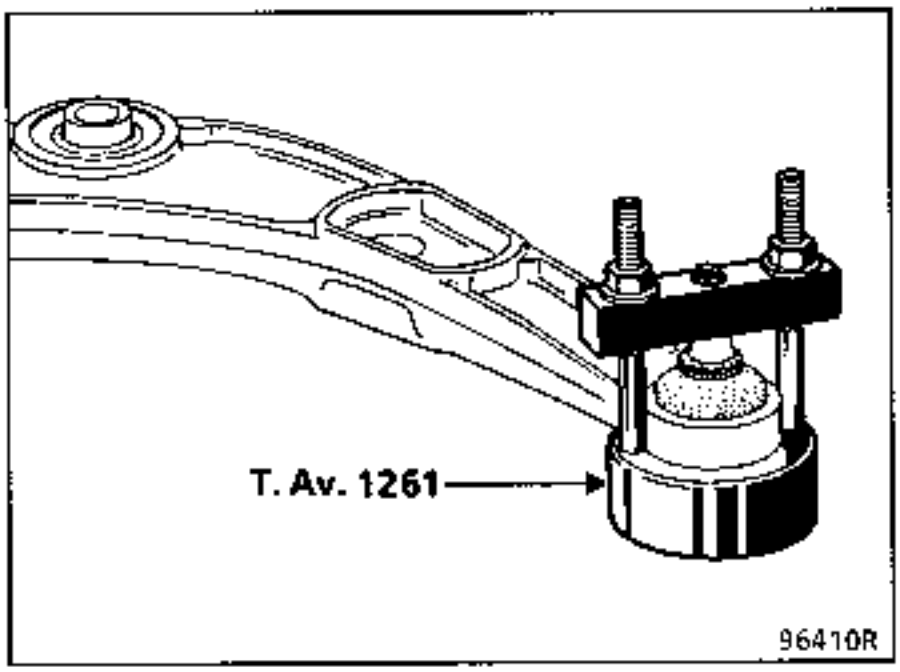


Remove the shock absorber base mountings.

Release the stub axle carrier from the shock absorber base and separate the stub axle carrier / driveshaft assembly and suspend it.



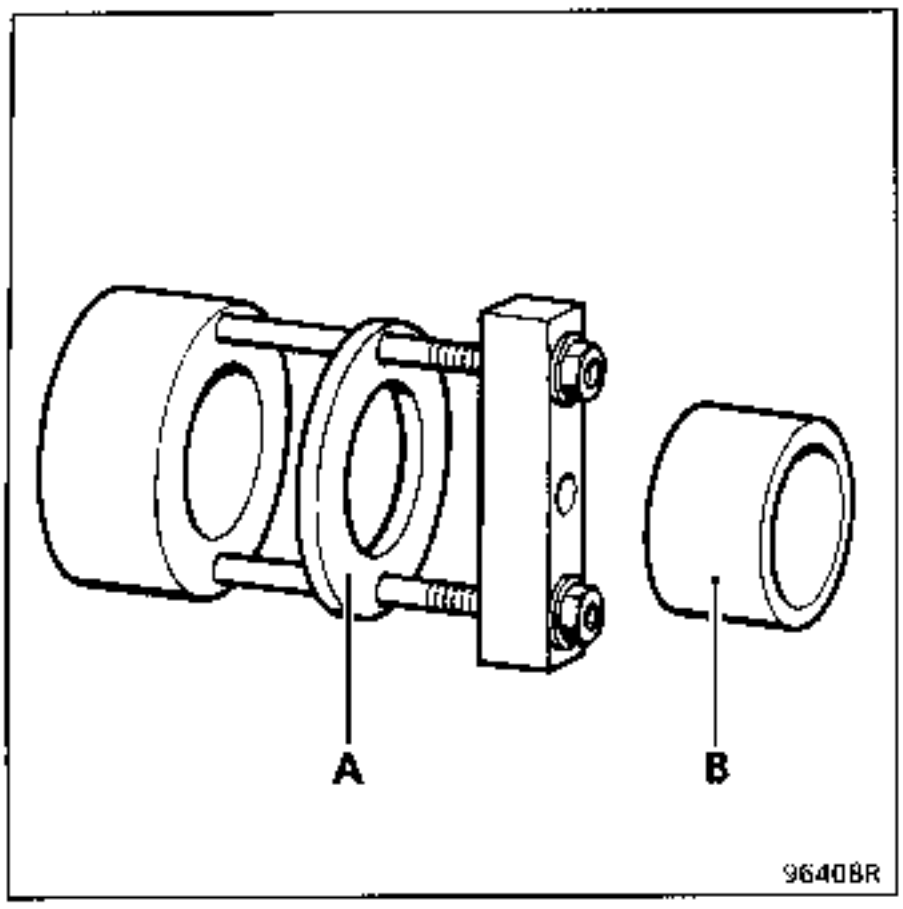
Remove the ball joint from the arm using tool **T.Av. 1261**.



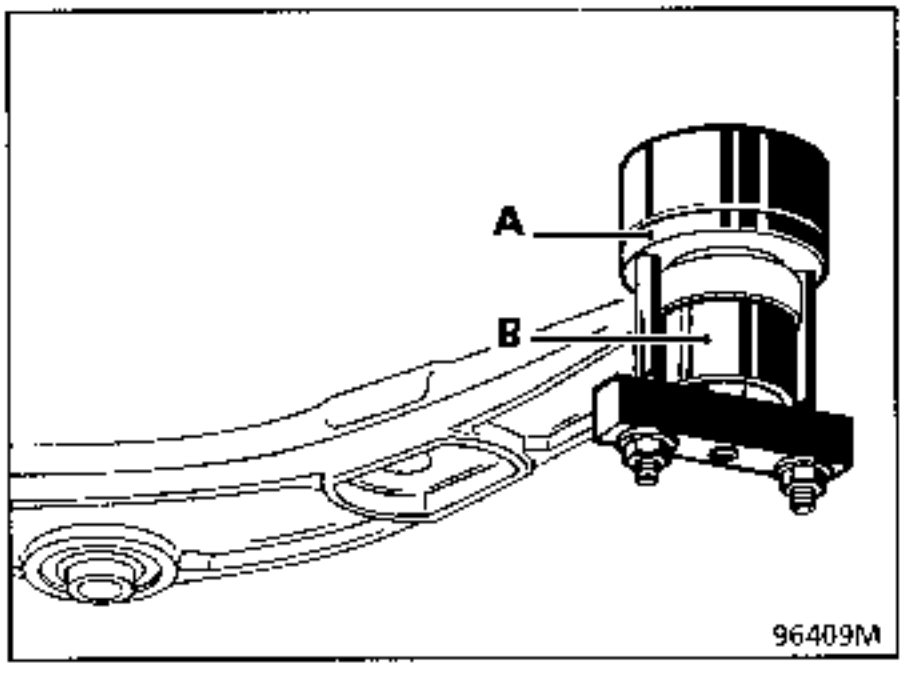
To be able to fit tool **T.Av. 1261**, use a file to deburr the sides of the arm, if necessary.

REFITTING

Refit the new ball joint (with notch marking) using tool **T.Av. 1261** inserting the washer (A) and spacer (B) (**T.Av. 1261-01**).



Use tool **T.Av. 1261** to refit the ball joint.

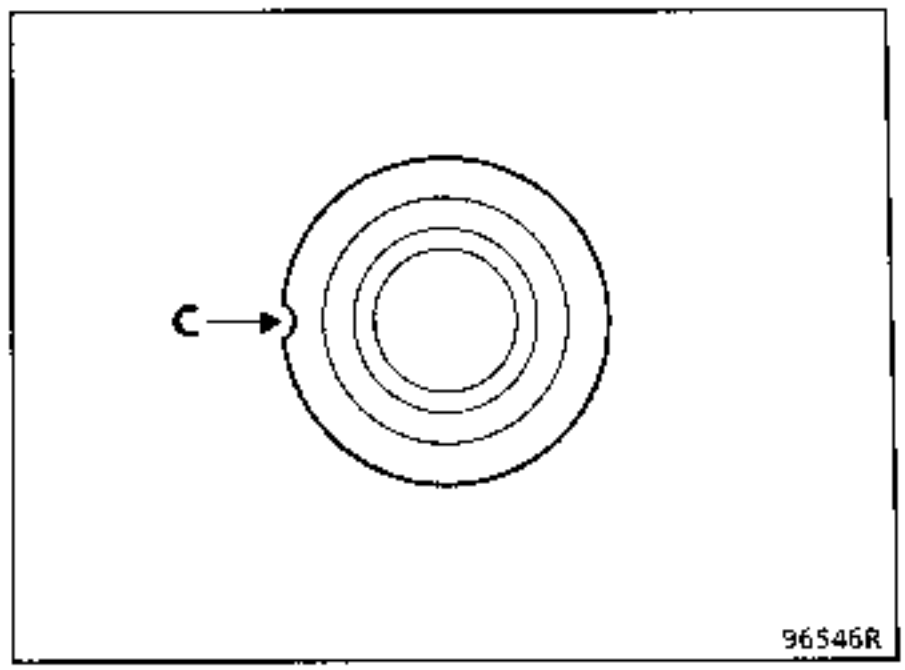


Refitting is then the reverse of removal. Take care not to damage the driveshaft gaiter.

Ensure the tightening torques are observed.

Press the brake pedal several times to bring the piston into contact with the pads at the end of the operation.

PRESENTATION OF "REPLACEMENT" BALL JOINT



Replacement ball joint with notch (C) on the bearing face (seen from below).

REMINDER

- Unmarked ball joint→ replacement is possible
- Ball joint with notch marking→ replacement is not possible (part has already been replaced).

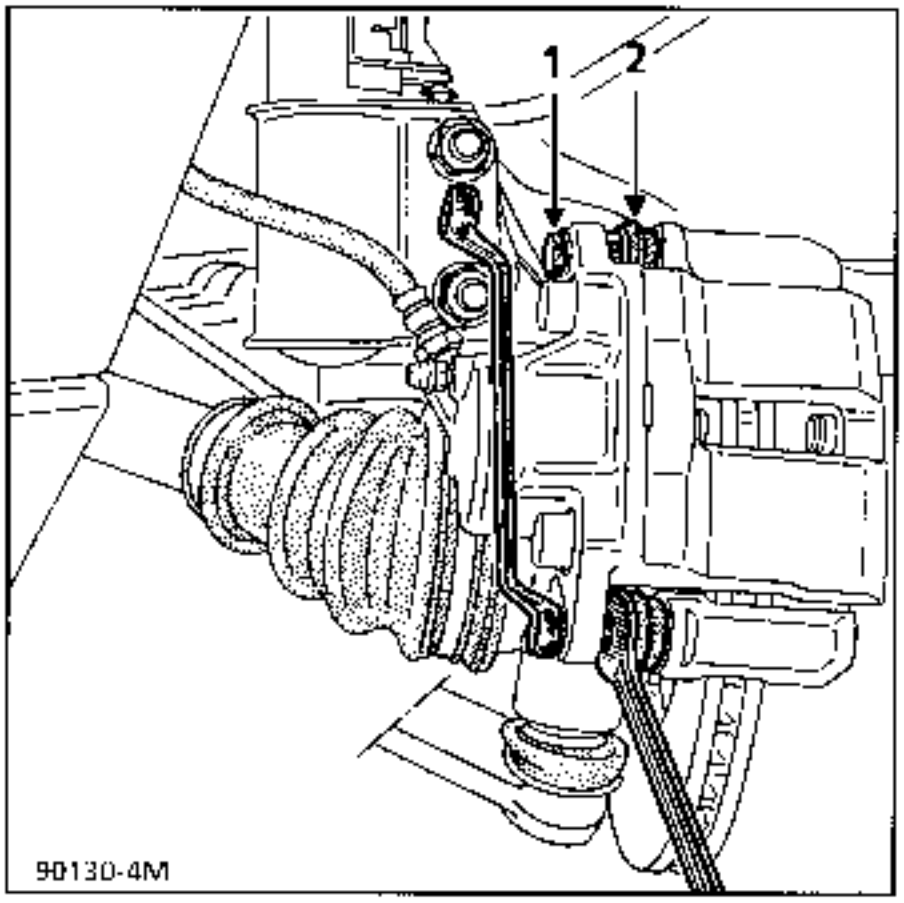
SPECIAL TOOLING REQUIRED	
Fre. 823	Tool for pushing back piston

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Brake caliper guide bolt	3.5

REMOVAL

Disconnect the brake pad wear warning light wire.

Push the piston back, sliding the caliper towards the outside by hand.



Remove the guide bolts (1) using two wrenches.

Do not re-use these bolts.

Release the sliding caliper.

Remove the anti-noise plate.

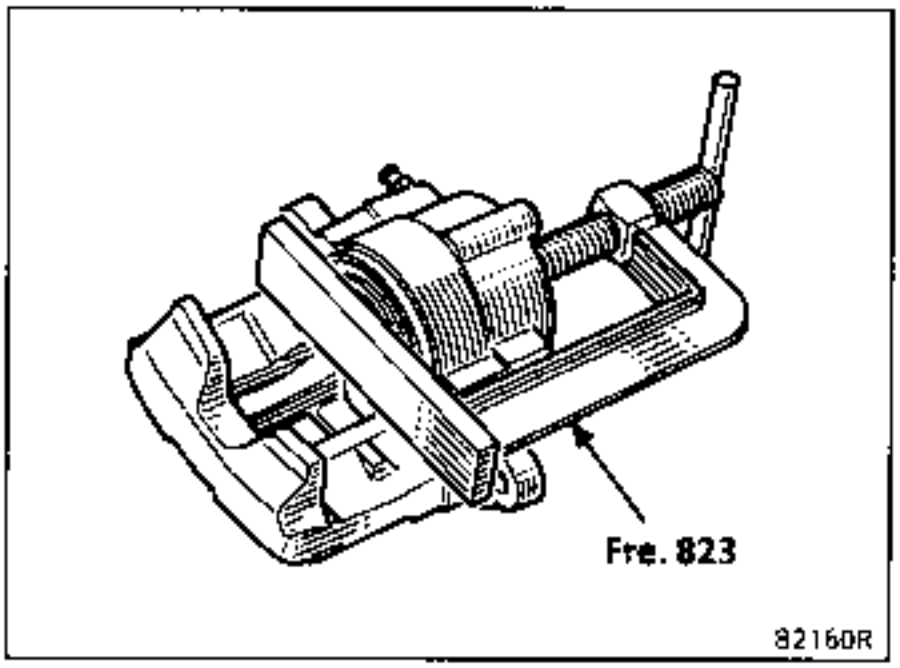
Remove the pads.

CHECKING

Check :
- the condition and fitting of the dust cover on the piston and its retaining ring,
- the condition of the dust cover (2) on the guides (caliper retaining bolts).

REFITTING

Push the wheel cylinder piston back using tool Fre. 823.



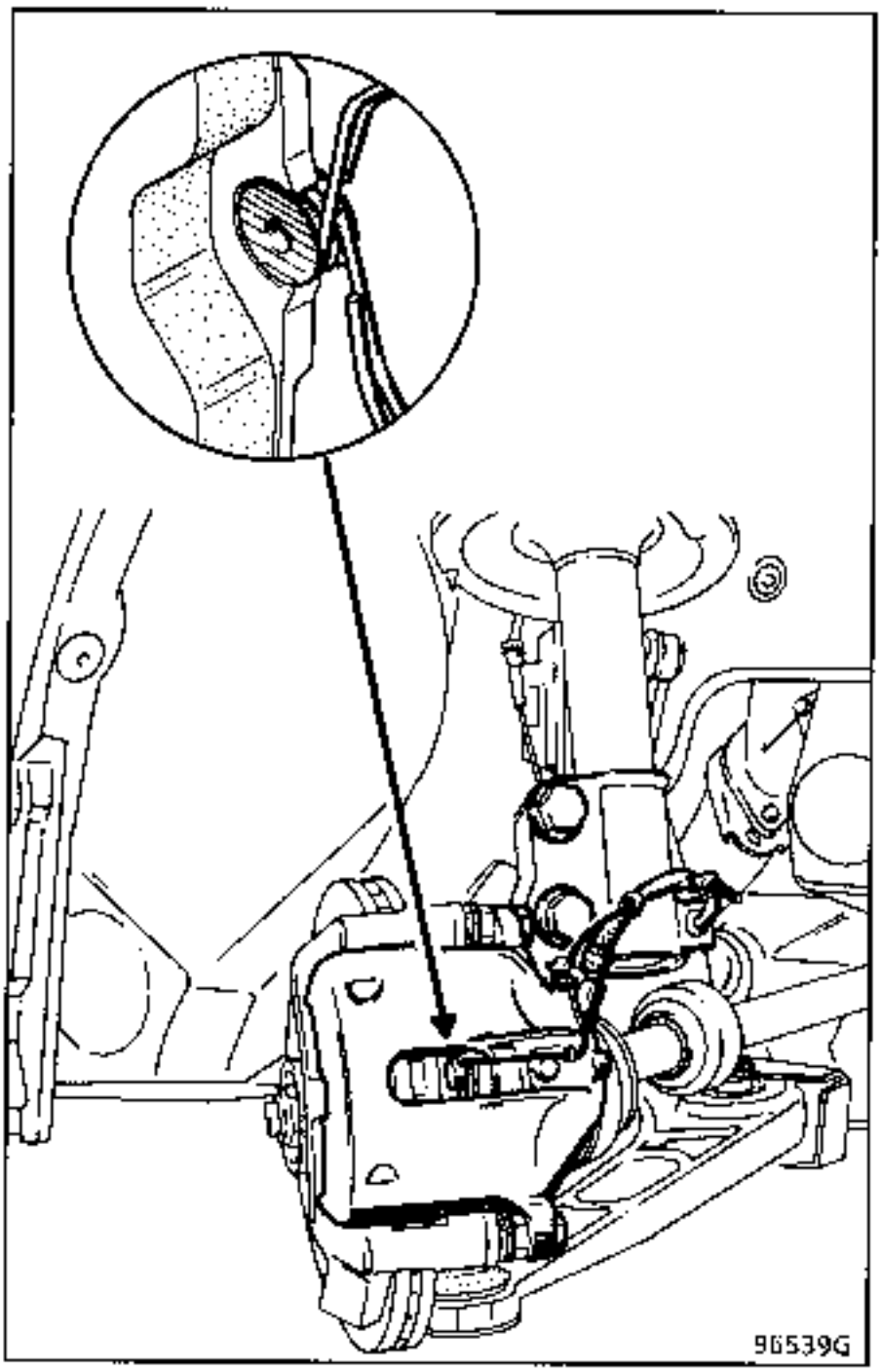
Fit the new pads with their spring, ensuring they are fitted the correct way round.
The pad with the wear warning light wire is fitted on the inside.

Replace the anti-noise plate with the arrow pointing towards the front of the vehicle.

Fit the caliper and fit a new lower guide bolt.

Press on the caliper and fit the upper guide bolt.

Tighten the guide bolts to the recommended torque, starting with the lower guide bolt.



Reconnect the wear warning light wire, ensuring it is correctly routed.

Press the brake pedal several times to bring the piston into contact with the pads.

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Caliper mounting bolt	10
Guide bolt	3.5

REMOVAL

Fit a pedal press to the brake pedal to limit the amount of brake fluid which will run out.

Release the brake pipe at the wheel cylinder end.

Remove the brake pads (see corresponding paragraph).

Slacken the wheel cylinder connection on the pipe (take precautions to catch the fluid which will run out).

Check the condition of the pipe and replace it if necessary (see replacing a pipe).

If the caliper is being renewed, the pipe should be systematically replaced.

REFITTING

Screw the new brake caliper on to the brake pipe.

Remove the pedal press.

Slacken the wheel cylinder bleed screw and wait for fluid to run out (check the level in the compensation reservoir is high enough).

Tighten the bleed screw.

Check the condition of the pads : if they are greasy renew them.

Partially bleed the circuit only if the compensation reservoir did not completely empty during the operation, otherwise the circuit must be fully bled.

Press the brake pedal several times to bring the piston into contact with the pads.

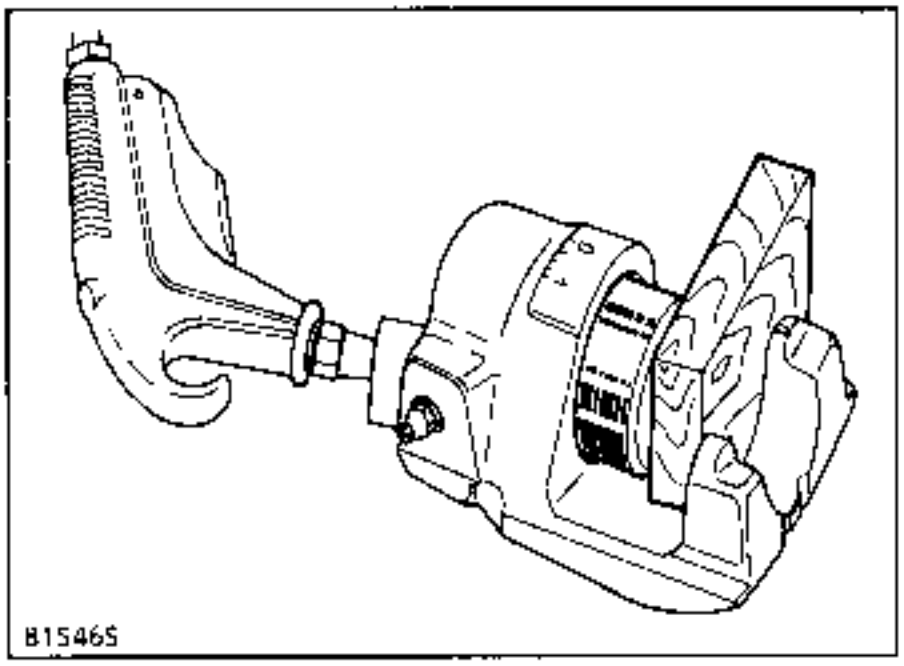
REPAIR

Any scratches in the caliper bore require the complete caliper to be renewed.

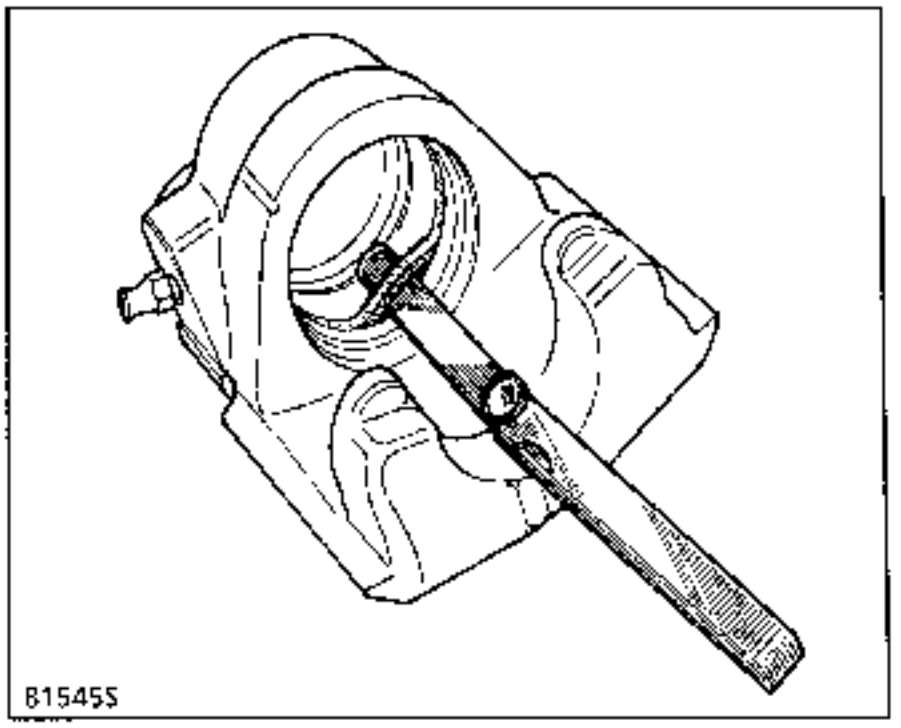
Remove the brake caliper.

Remove the rubber dust seal (GIRLING retaining spring).

Remove the piston using compressed air, inserting a wooden block between the caliper and the piston to prevent damage to the piston: any trace of damage to the piston skirt will render it unusable.


B15546S

Using a rounded flexible blade (feeler gauge for example) remove the rectangular section seal from the caliper groove.


B15455

Clean the parts using methylated spirits.

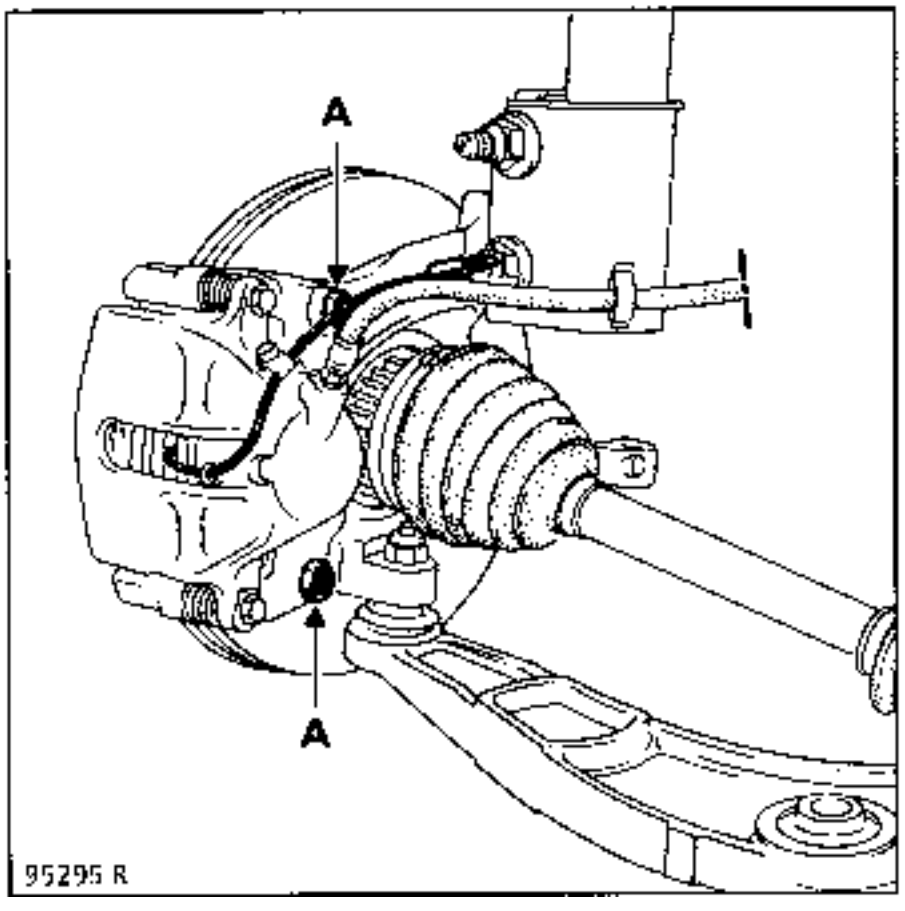
Replace any faulty parts using original parts and then refit the seal, piston and dust seal (with the GIRLING retaining spring).

Brake discs cannot be reground. If they are too heavily worn or are scratched they must be replaced.

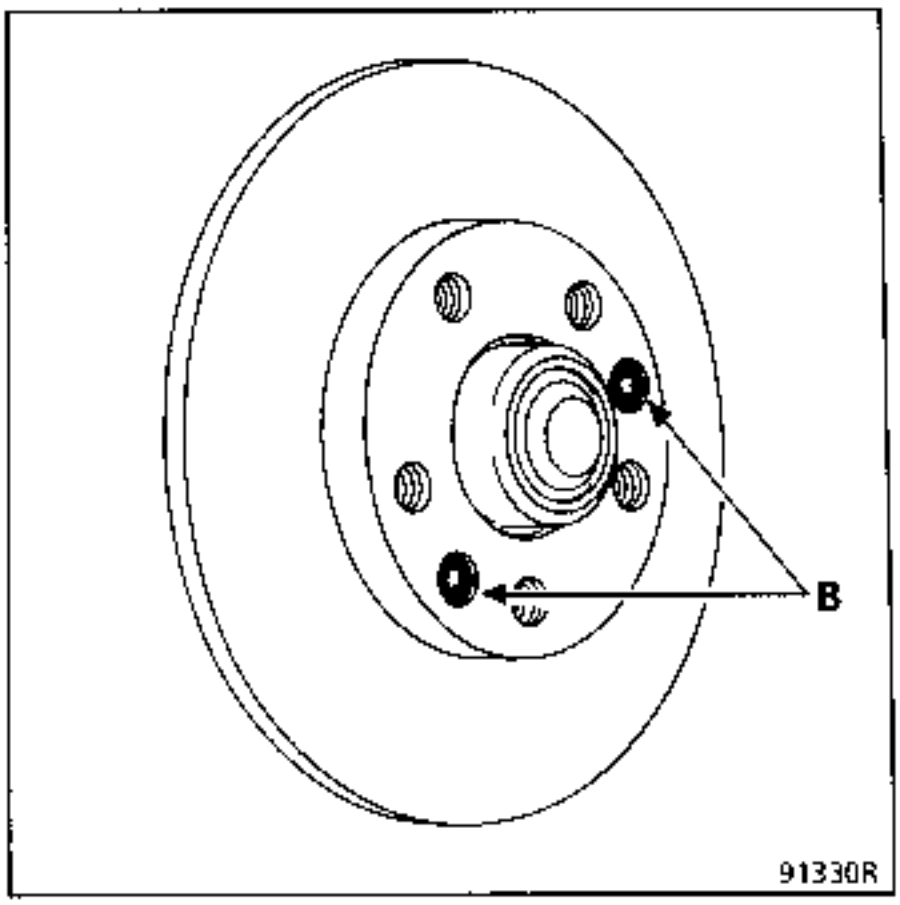
TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Brake caliper mounting bolt	10
Disc mounting bolt	1.5

REMOVAL

Remove:
- the brake pads (see corresponding section),
- the two caliper mounting bolts (A),



- the two disc mounting bolts (B) **Torx 30 allen key.**



- the disc.

REFITTING

Clean the disc and hub of all traces of Loctite.

Fit the disc onto the hub and secure it using the two bolts (B).

Coat the caliper bolts with Loctite **FRENBLOC** and torque tighten.

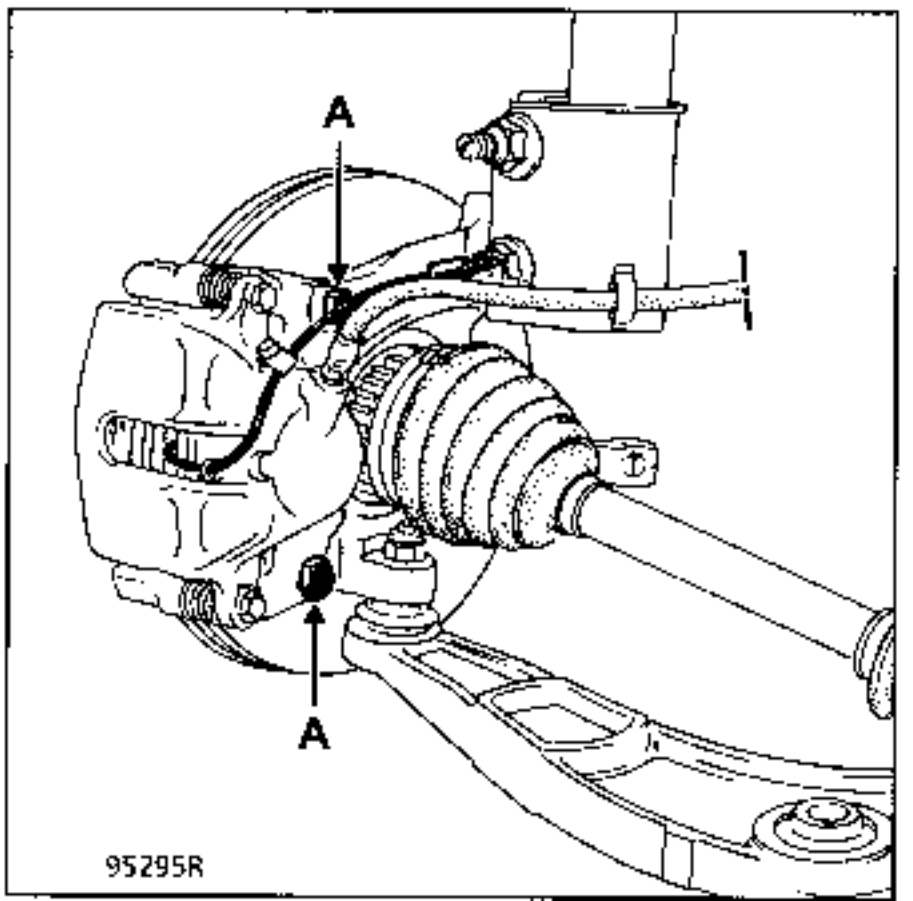
Press the brake pedal several times to bring the piston into contact with the pads.

SPECIAL TOOLING REQUIRED	
Rou.1392 T.Av. 1230	Ring for replacing stub axle carrier bearing
Rou. 604-01	Hub locking tool
T.Av. 476	Ball joint extractor
T.Av. 1050-02	Tool for pushing driveshaft back

TIGHTENING TORQUES (in daN.m)	
Shock absorber base mounting bolt M16 X 200	20
Lower ball joint	6.5
Track rod end	4
Brake caliper mounting bolt	10
Driveshaft nut	33
Wheel bolt	10

REMOVAL

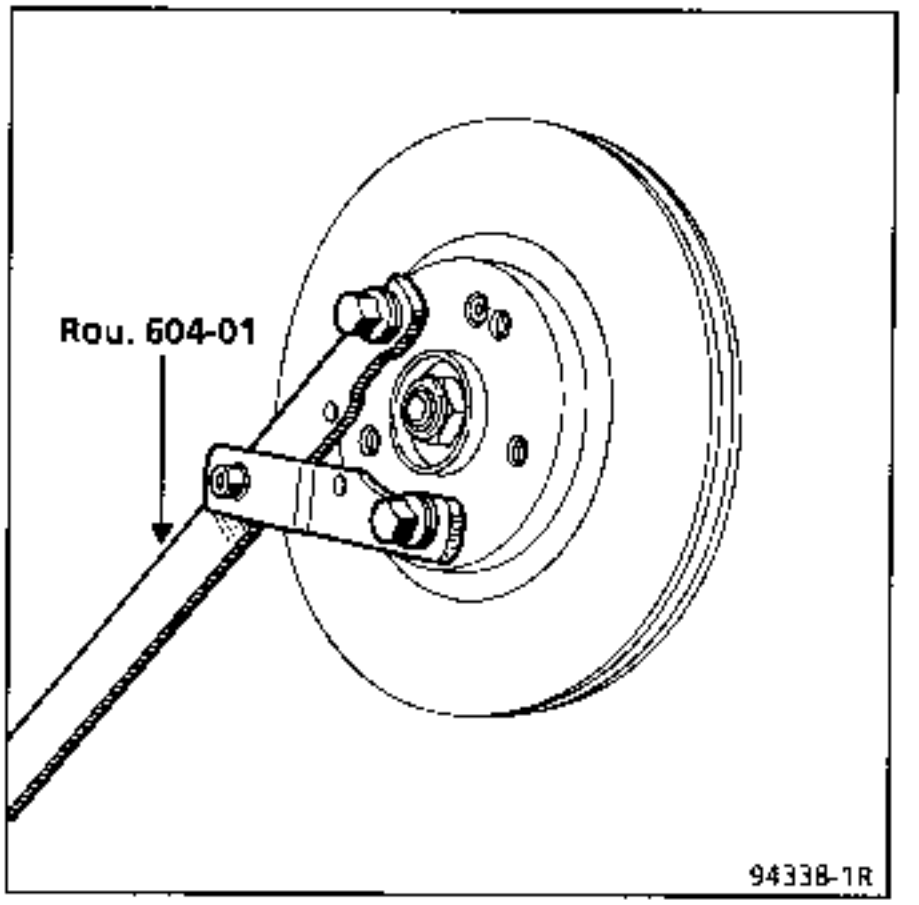
Remove:
- the track rod end (using tool **T. Av. 476** if necessary),
- the pads - caliper - caliper mounting assembly by the two bolts (A) .



Release the brake pipe and the wear warning light wire from the shock absorber base.

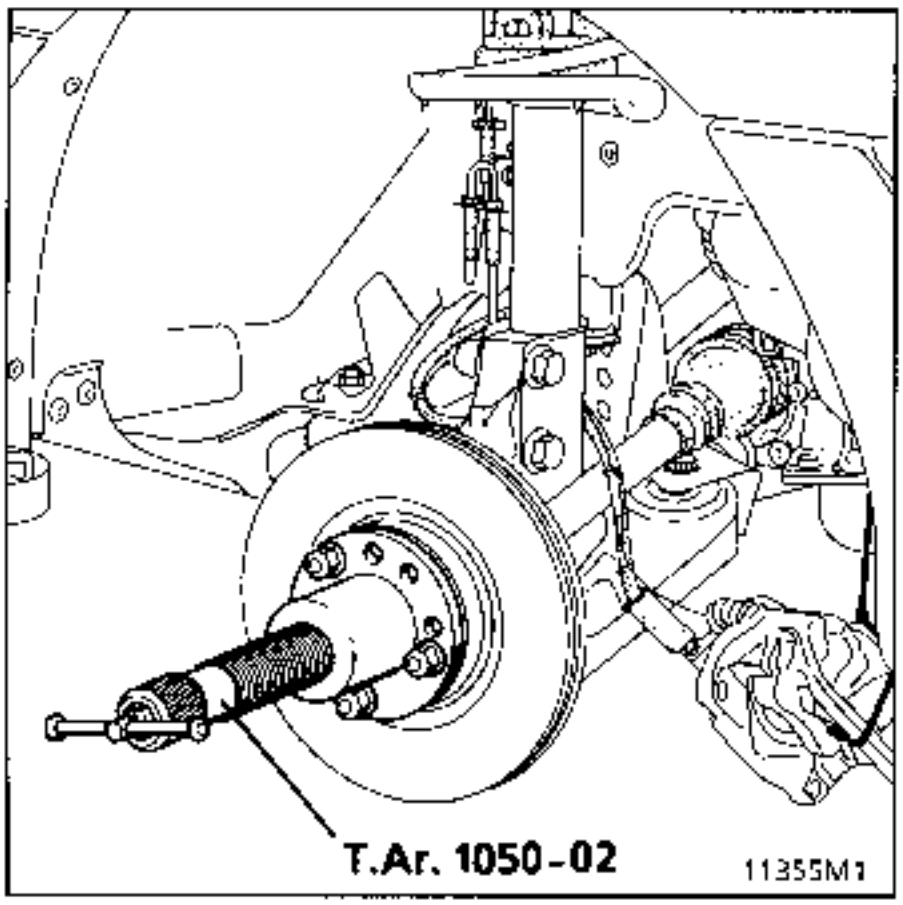
Attach this assembly to a coil of the spring.

Remove:
- the ABS sensor (if fitted),
- the driveshaft nut using tool ROU. **604-01**,
- the brake disc and its heat shield.



These vehicles have bonded driveshafts. They must be pushed back using tool **T.Av. 1050-02** .

Fit a protector to the driveshaft gaiter.

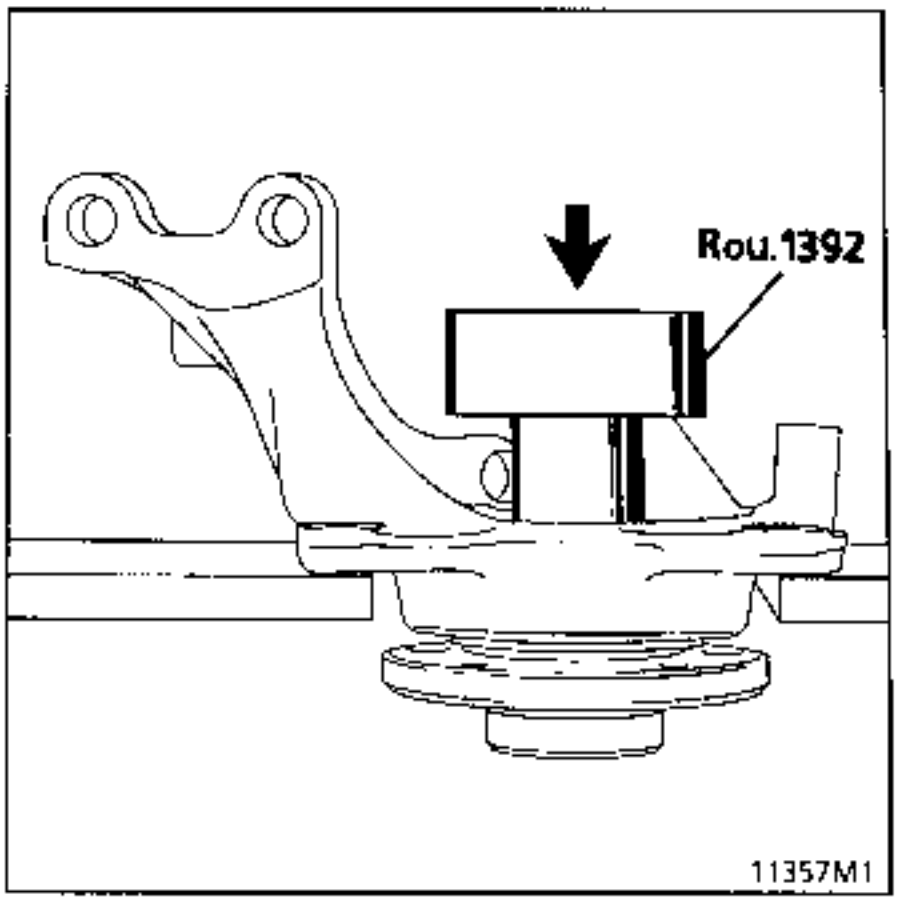


Slacken the lower wishbone ball joint nut and release the ball joint.

Remove the shock absorber base mountings.

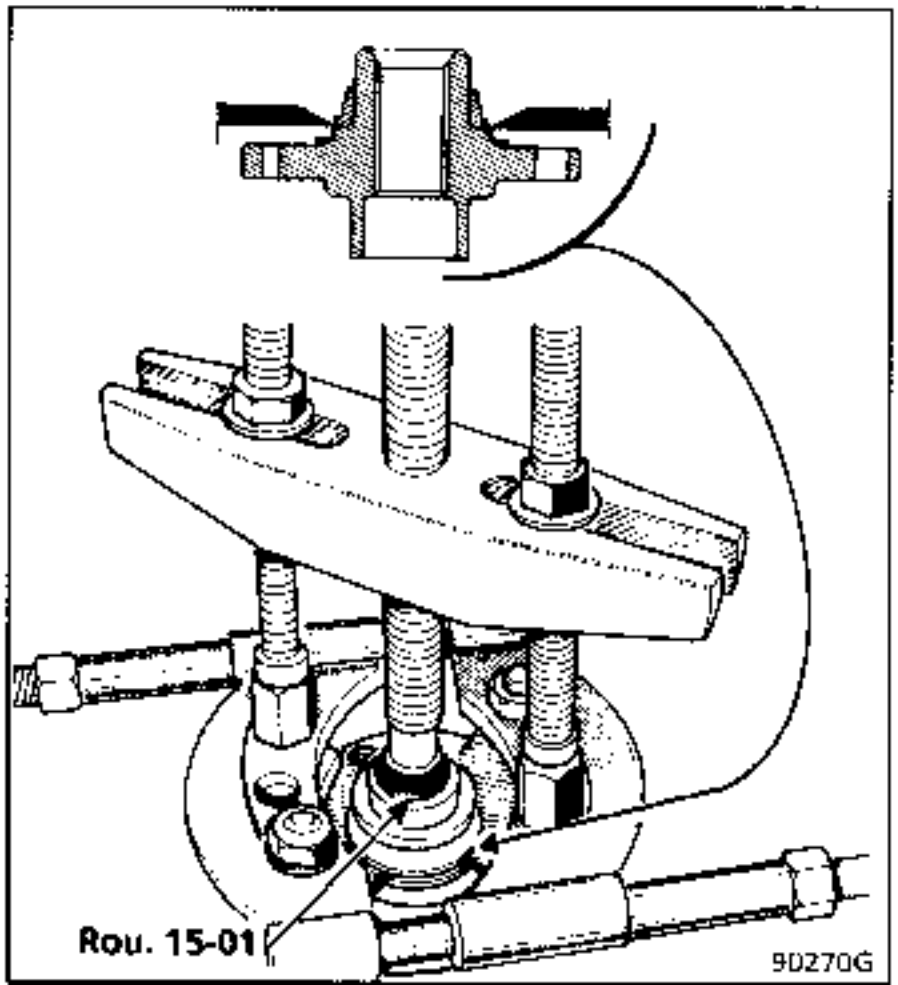
Release the driveshaft from the stub axle carrier and remove it.

Remove the hub on the press using tool **Rou. 1392**.

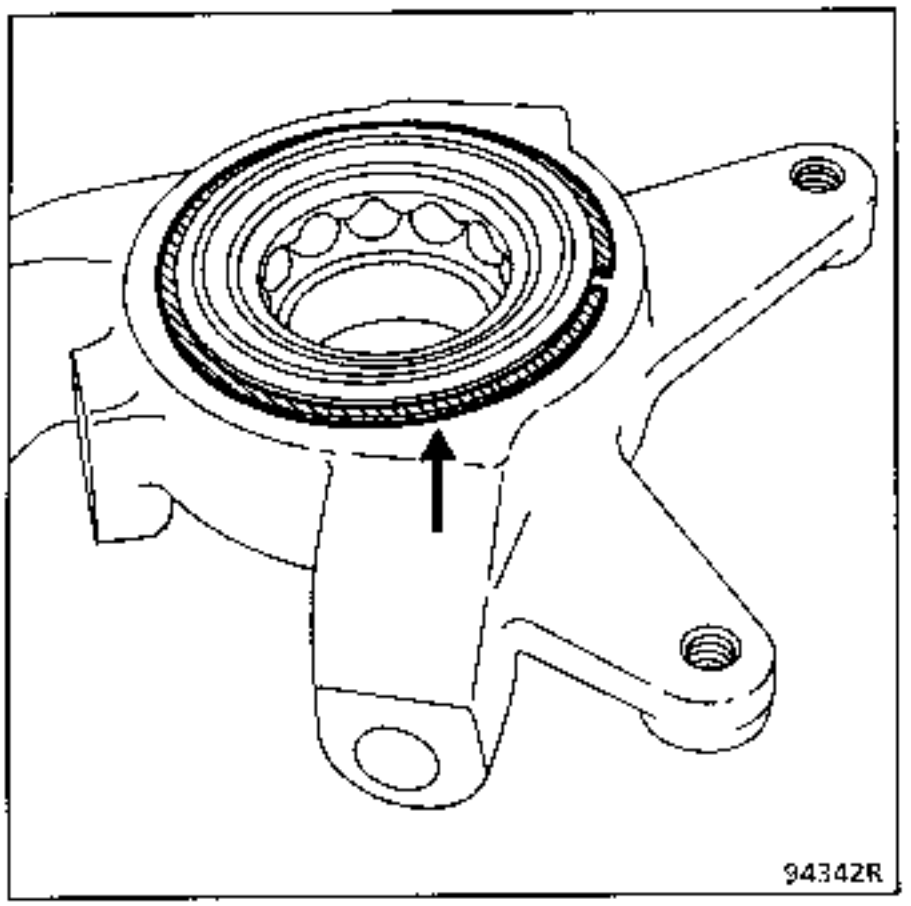


Remove the bearing inner ring from the hub using an extractor with jaws and tool **Rou. 15-01**.

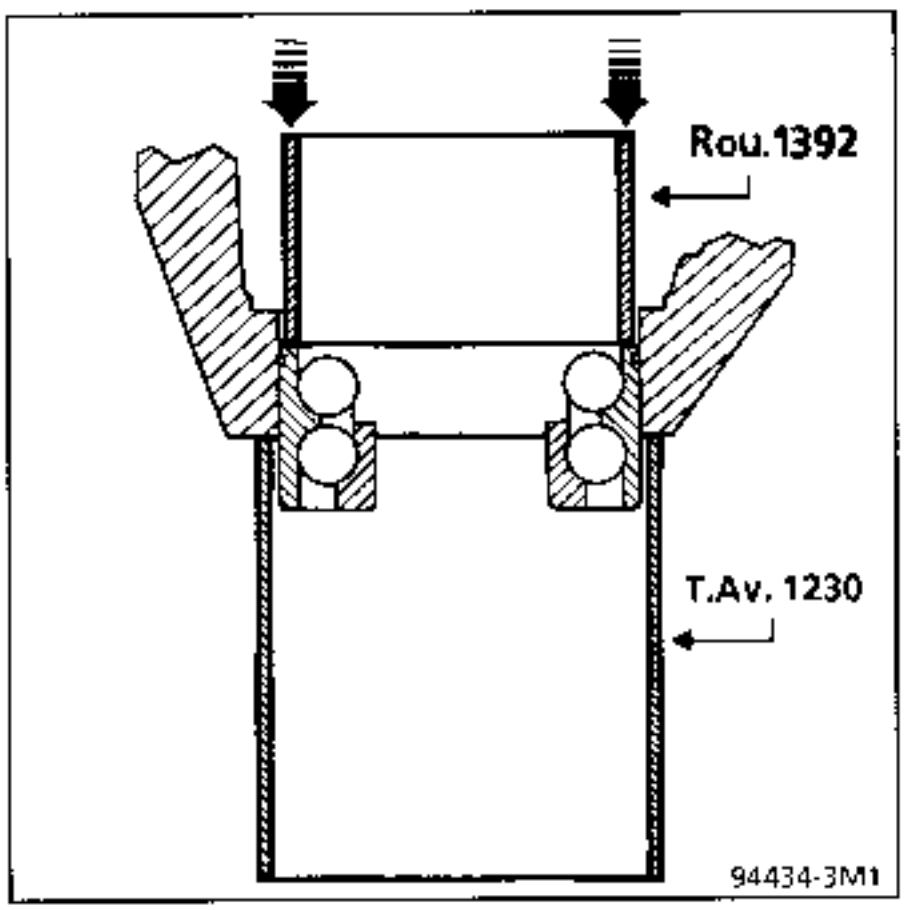
IMPORTANT :
Fit the guillotine into the groove on the ring to avoid damaging the bearing face of the hub - bearing assembly.



Remove the bearing circlips.



Remove the bearing on the press using tool **Rou. 1392**, with the stub axle carrier resting on tool **T.Av. 1230.**

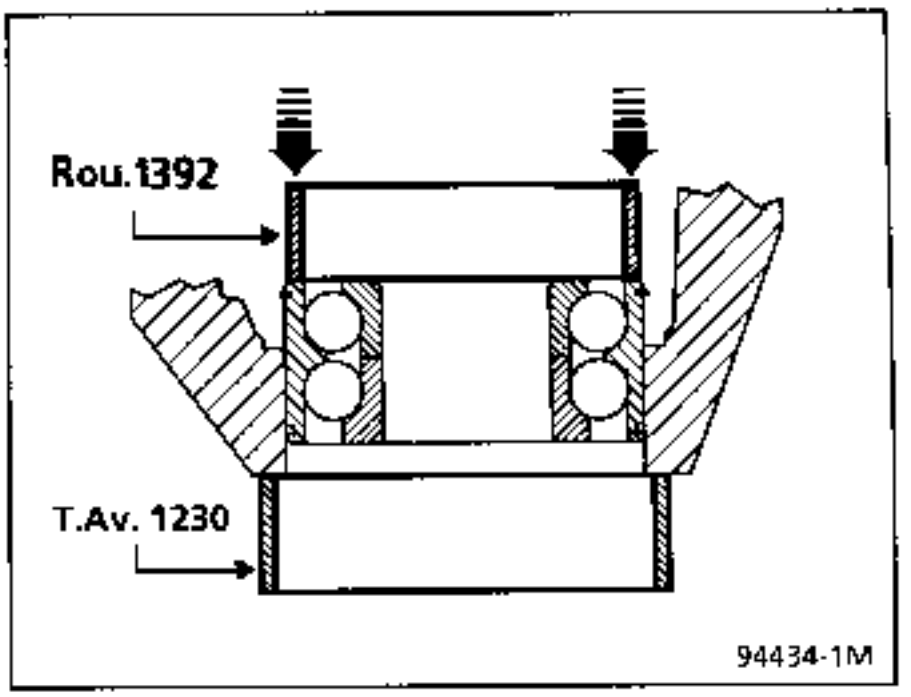


Clean the bearing face on the stub axle carrier of all traces of **Loctite.**

REFITTING

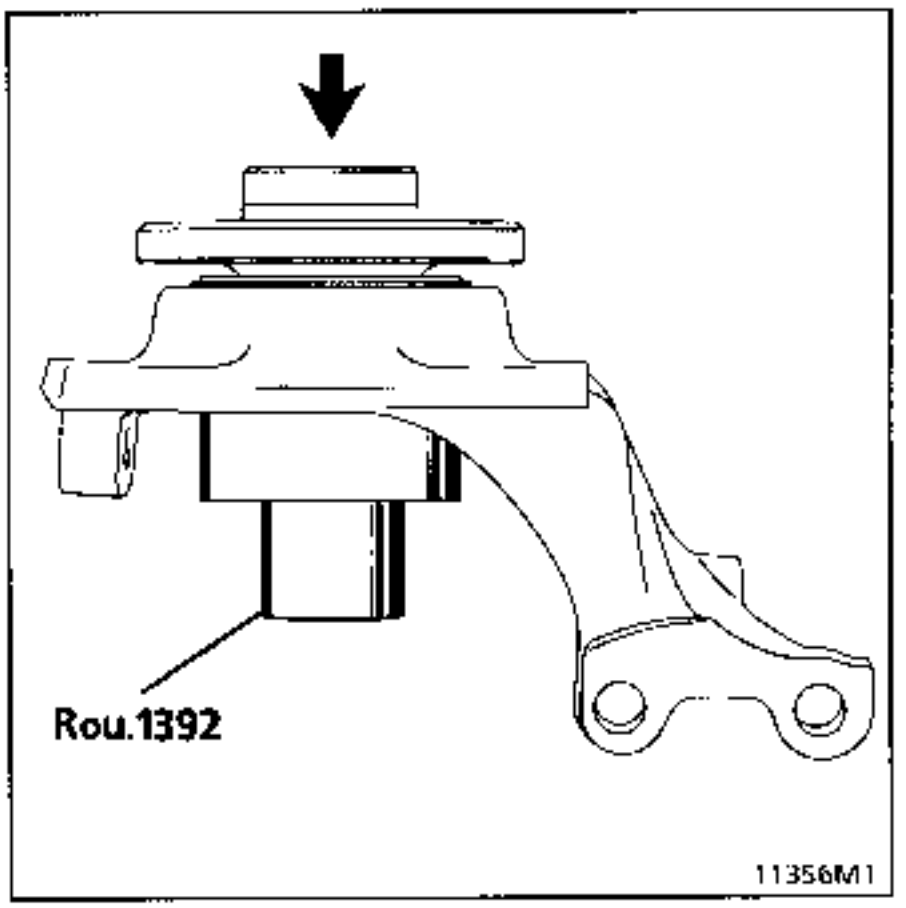
Check that the bearing face of the hub - bearing assembly is not damaged (chamfered, deformed..).

Around the edge of the outer bearing cage apply a fine bead of **Loctite SELBLOC.**
Using the press, fit the complete bearing with circlip, using the tool used for removal.



Fit the second bearing circlip.

Position the bearing against tool **Rou. 1392** and fit the hub on the press.

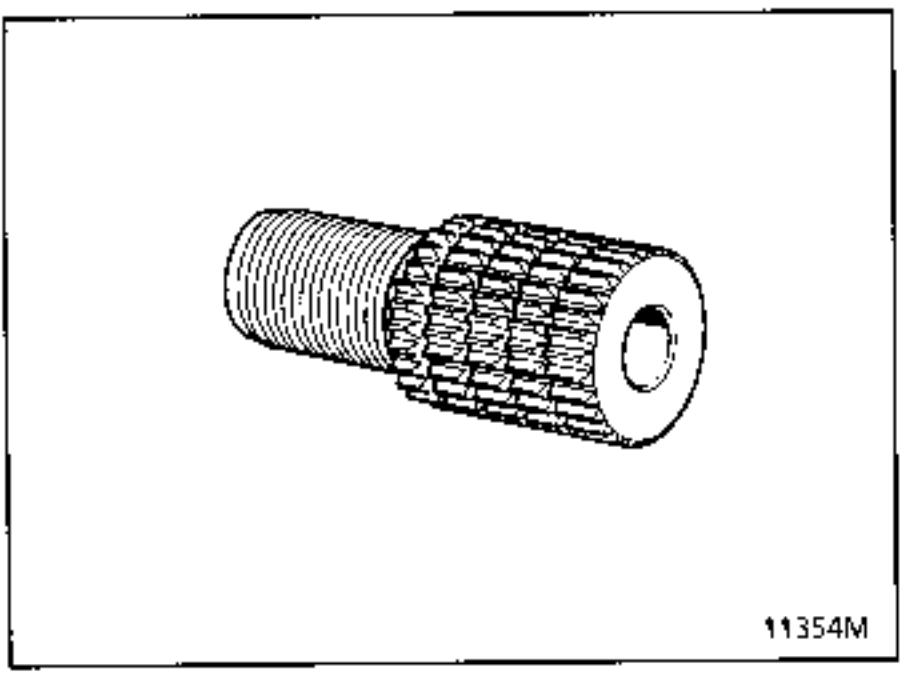


IMPORTANT :

Clean the splines of the hub of all traces of Loctite SELBLOC.

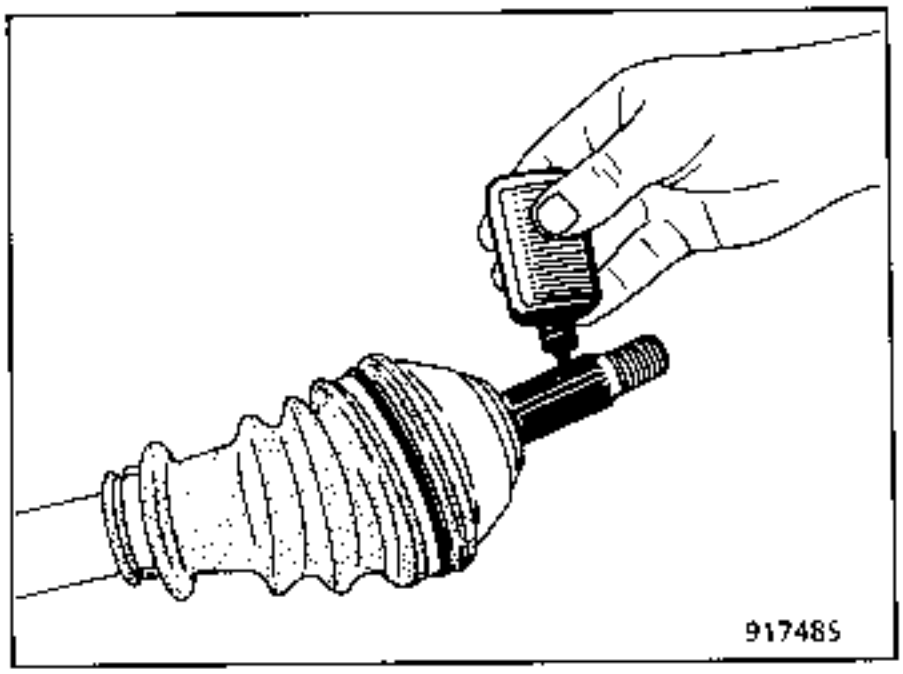
A cleaning tool may be made to make this operation easier:
- Take an old ESPACE (JE XX) driveshaft,
- cut off the splined end (wheel end),
- slightly chamfer each of the ends.

Fit the tool into the hub several times to remove the old SELBLOC.



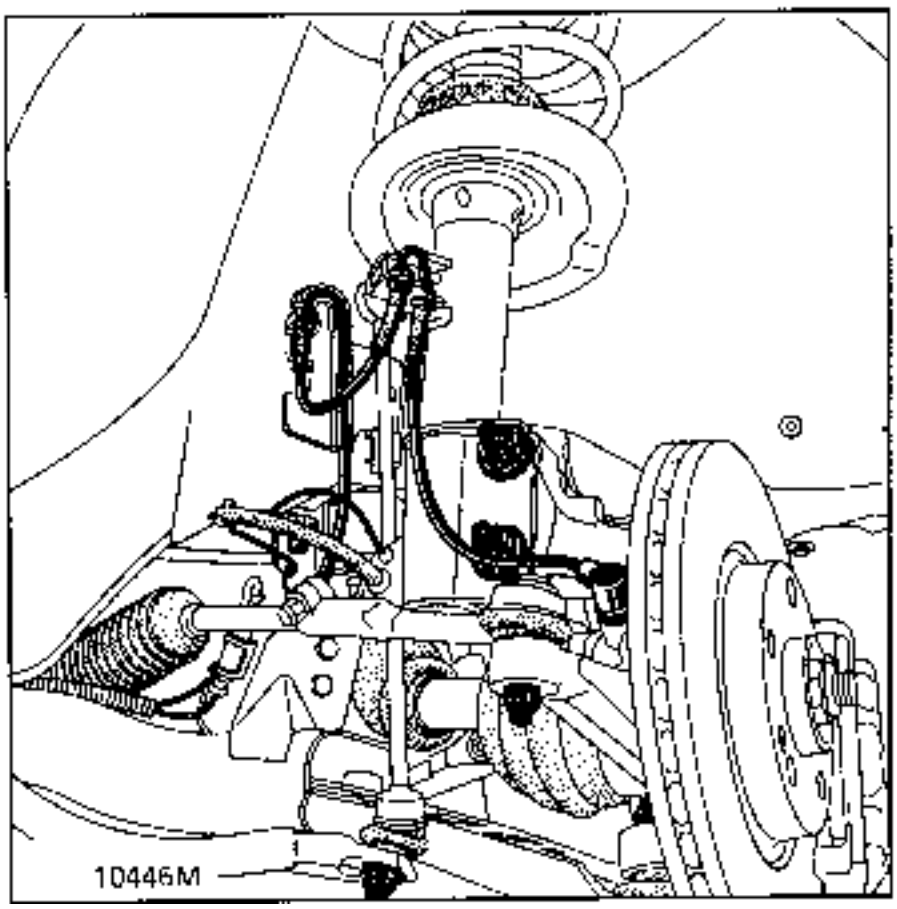
Refit the stub axle carrier to the ball joint on the lower wishbone and tighten the new nut to the recommended torque.

Coat the driveshaft stub axle with Loctite SELBLOC.



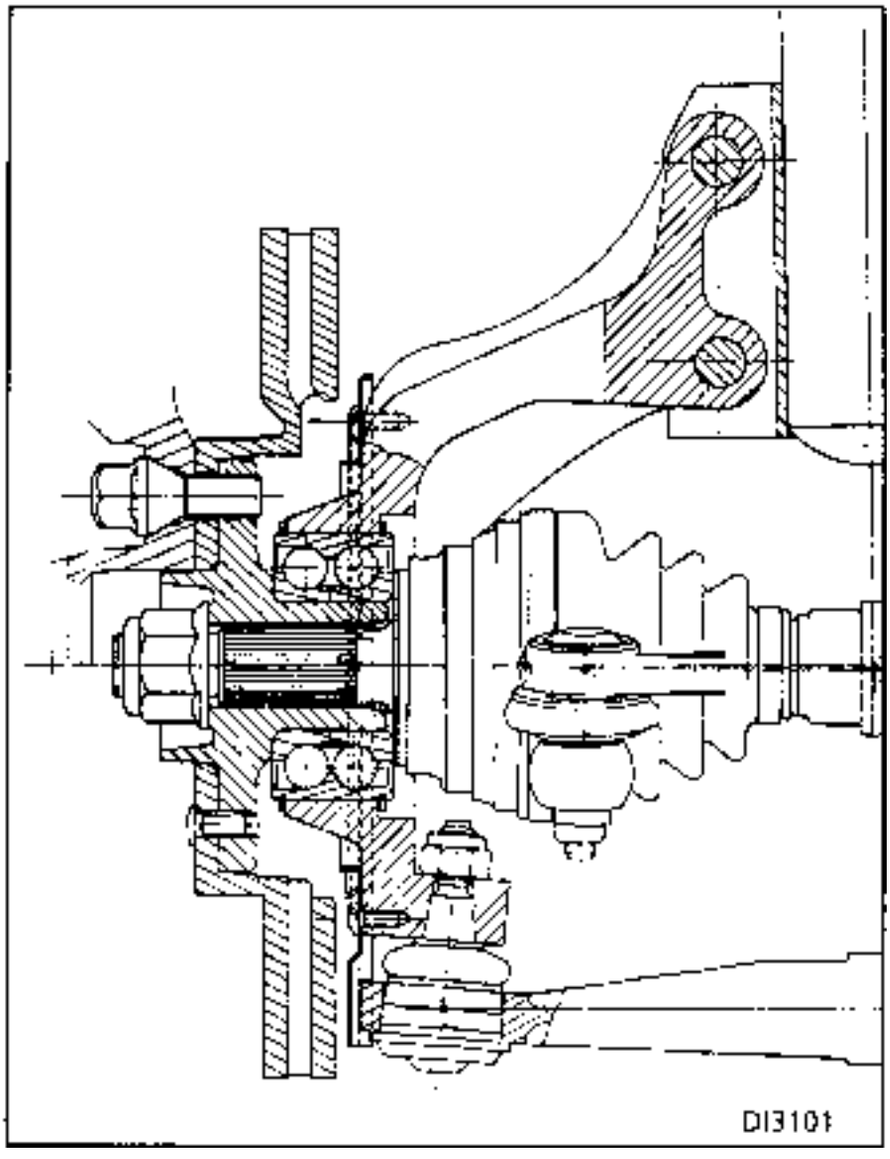
Fit the driveshaft into position. It should press in freely until just after the thread is reached, allowing the stub axle nut to be fitted.

Refitting is then the reverse of removal. Take care not to damage the driveshaft gaiters.



The method for removing and refitting is identical to that used for replacing the bearing.

NOTE : the force required to fit the outer bearing ring into its bore is quite high, so when this ring is removed the complete bearing should be renewed, since the bearing race will have been damaged.



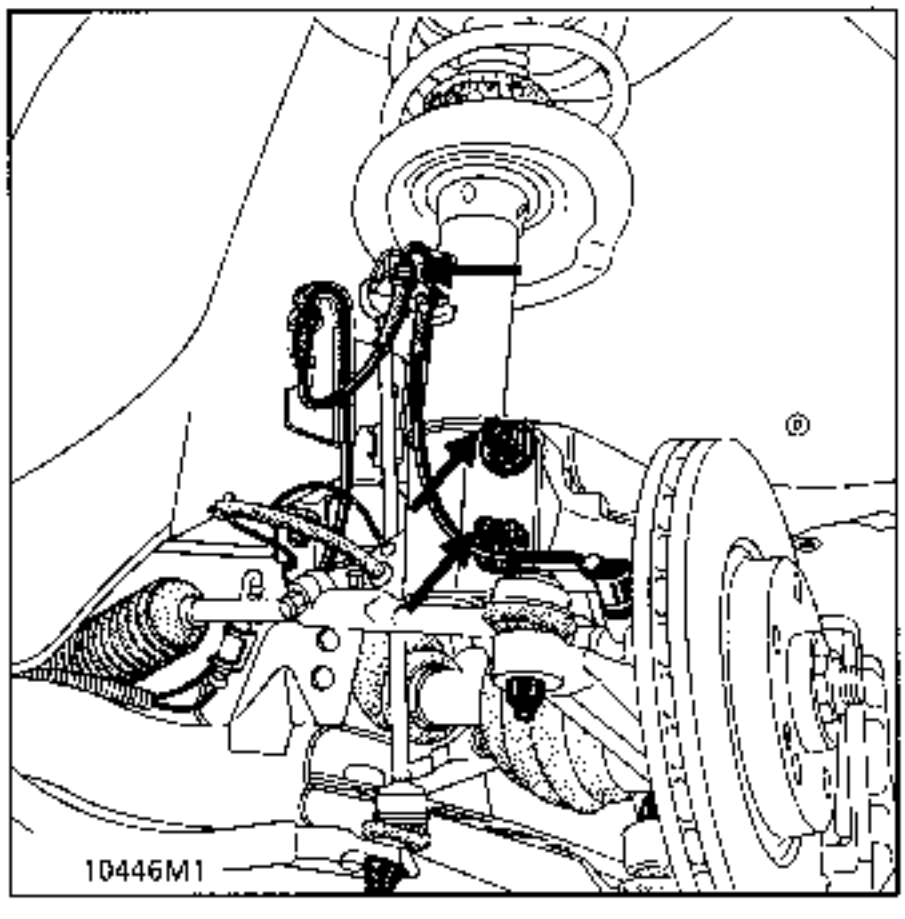
TIGHTENING TORQUES (in daN.m)	
Upper shock absorber mounting nuts	2.5
Shock absorber base mounting bolt M16 X 200	20
Anti-roll bar link nut (lower and upper)	4
Wheel bolt	10

REMOVAL

Remove the wheel.

Release:
- the ABS wiring and its mountings,
- the brake pipe and the brake pad wear warning light wire from the shock absorber base.

Remove the nut from the upper ball joint on the anti-roll bar link. Hold the ball joint shaft with a wrench to prevent it from turning.
Fit a protector on the driveshaft gaiter, wheel end.
Remove the two shock absorber base mounting bolts.



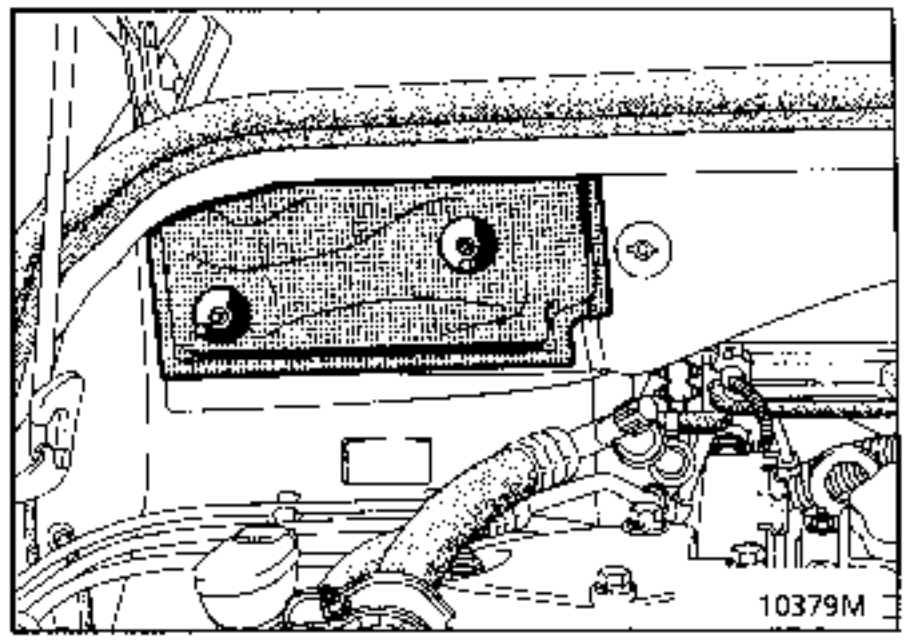
In the engine compartment:

– Disconnect the battery.

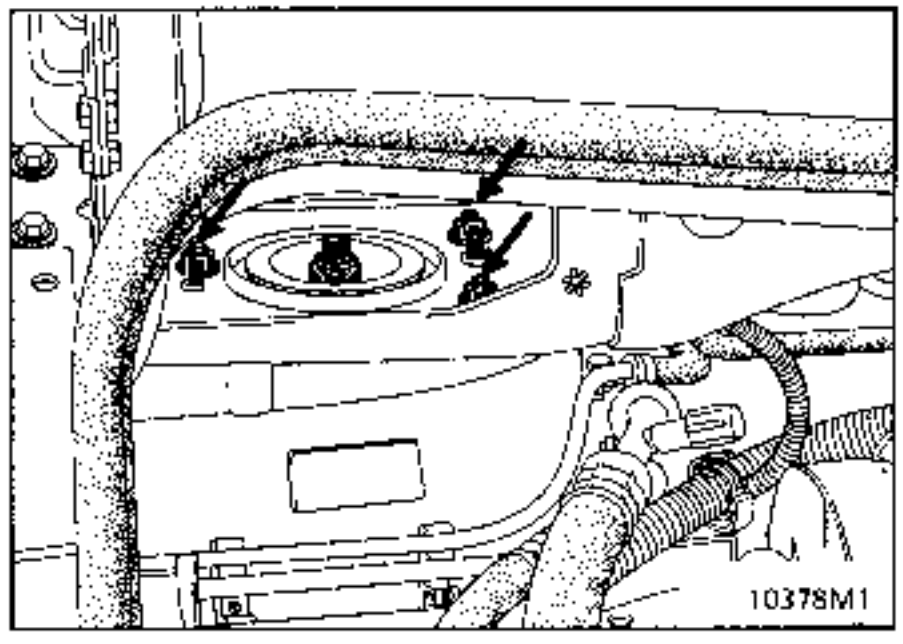
– Release the wiper connector.

To reach the three upper mounting nuts, remove:
- the soundproofing by removing the 2 clips,
- the four cover mounting bolts.

Take care not to lose the washers between the cover and the first layer of soundproofing.



Remove the three upper mounting nuts.



Move the stub axle carrier to one side slightly and remove the spring and shock absorber assembly.

REFITTING

Refitting is the reverse of removal, **taking care not to damage the driveshaft gaiter.**

Torque tighten:
- the shock absorber base bolts (nuts at track rod end),
- the upper mounting nuts,
- the link ball joint nut,
- the wheel bolts.

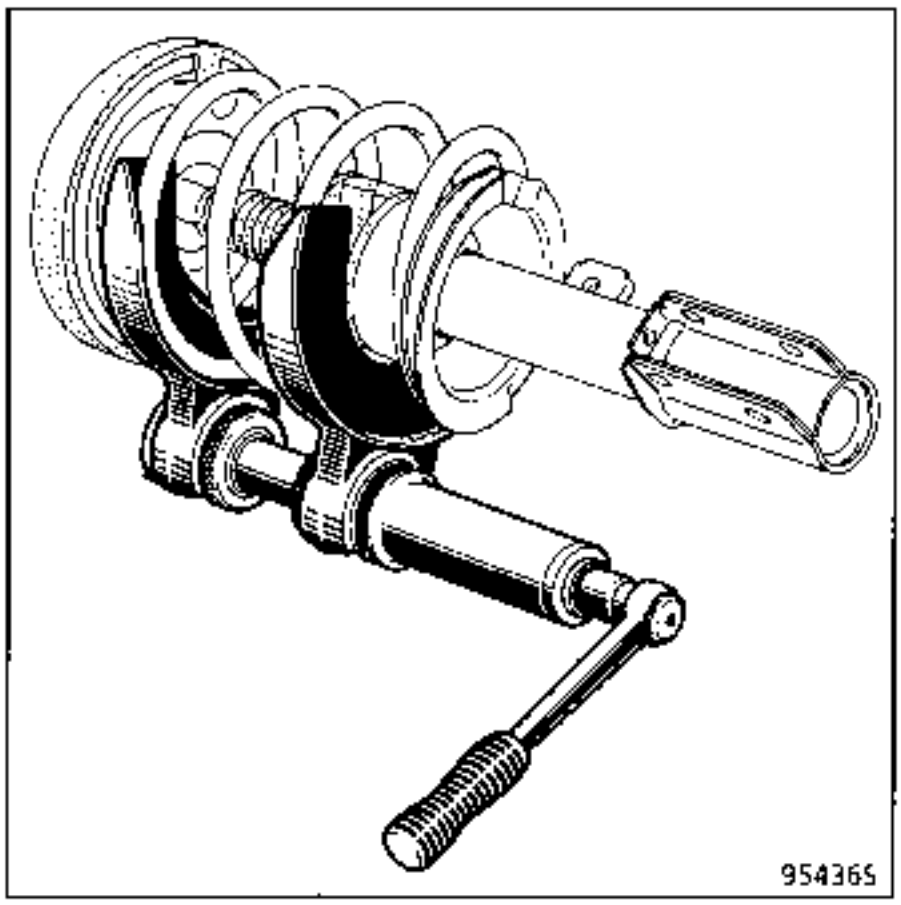
In view of the high degree of energy in the spring it is vital to ensure the tooling is in perfect condition.

EQUIPMENT REQUIRED			
Make	Type	Description	Cup
MG	M90	Spring compressor	M3
ZI	ZKL 2013 ZKL 0055	Spring compressor Vice	NO2
FACOM	D83 RENA	Tool for removing shock absorber nut	

TIGHTENING TORQUES (in daN.m)	
Shock absorber upper mounting nut	6

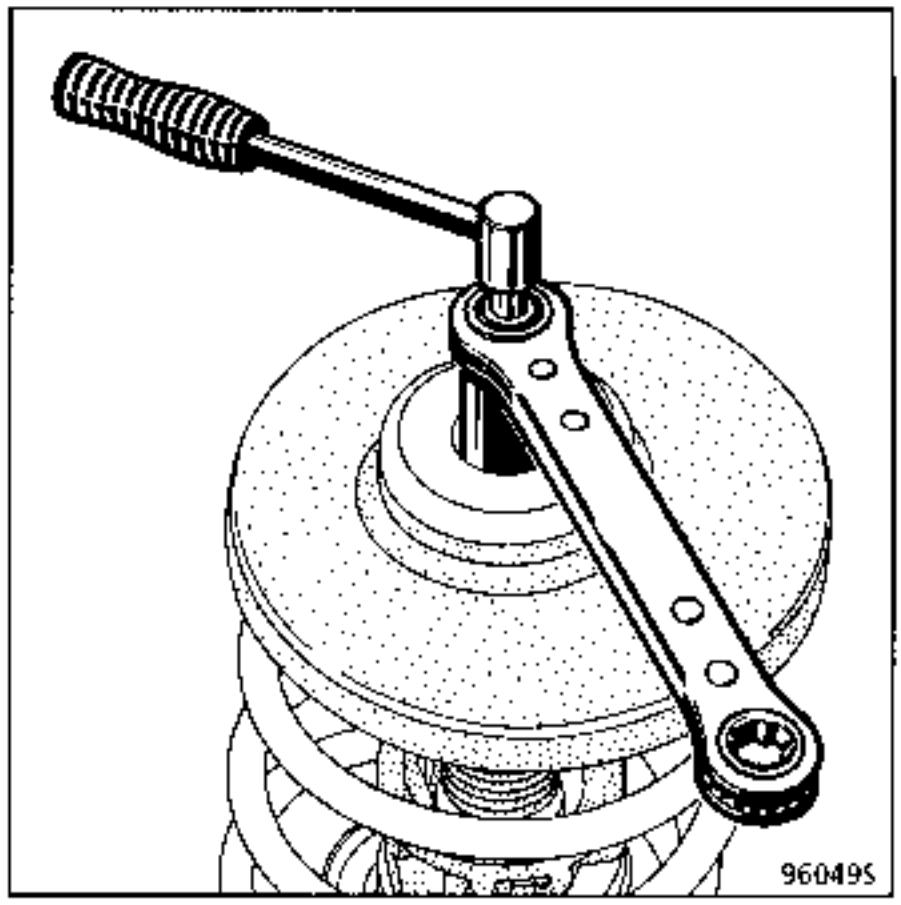
REMOVAL

Fit the cups on the compression tool and position the assembly on the spring.

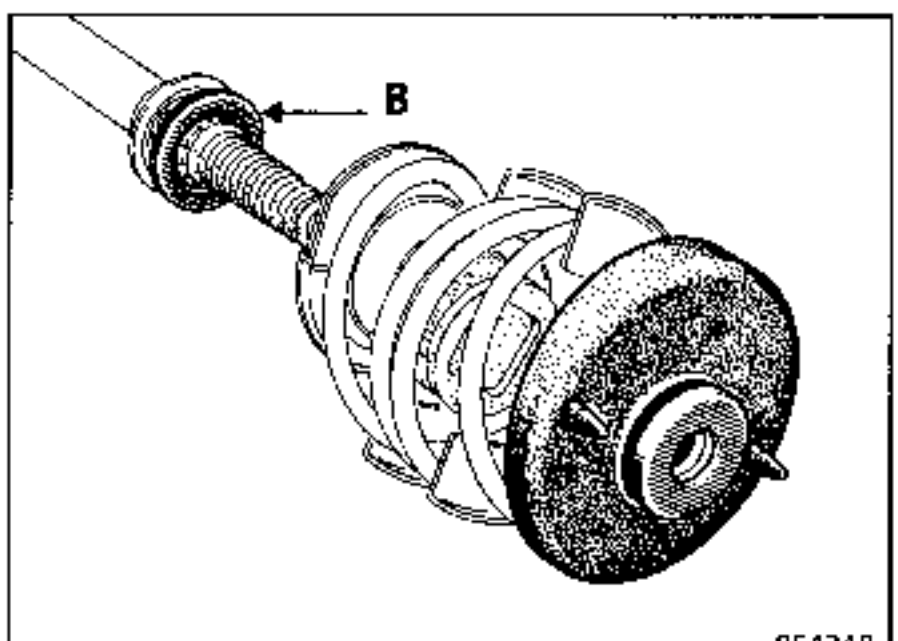


Compress the spring until the spring no longer touches the pads on the cups.

Using tool **FACOM D83 RENA** remove the nut from the shock absorber rod.



Separate :
- the upper mounting,
- the shock absorber,
- the bearing stop (B).



REFITTING

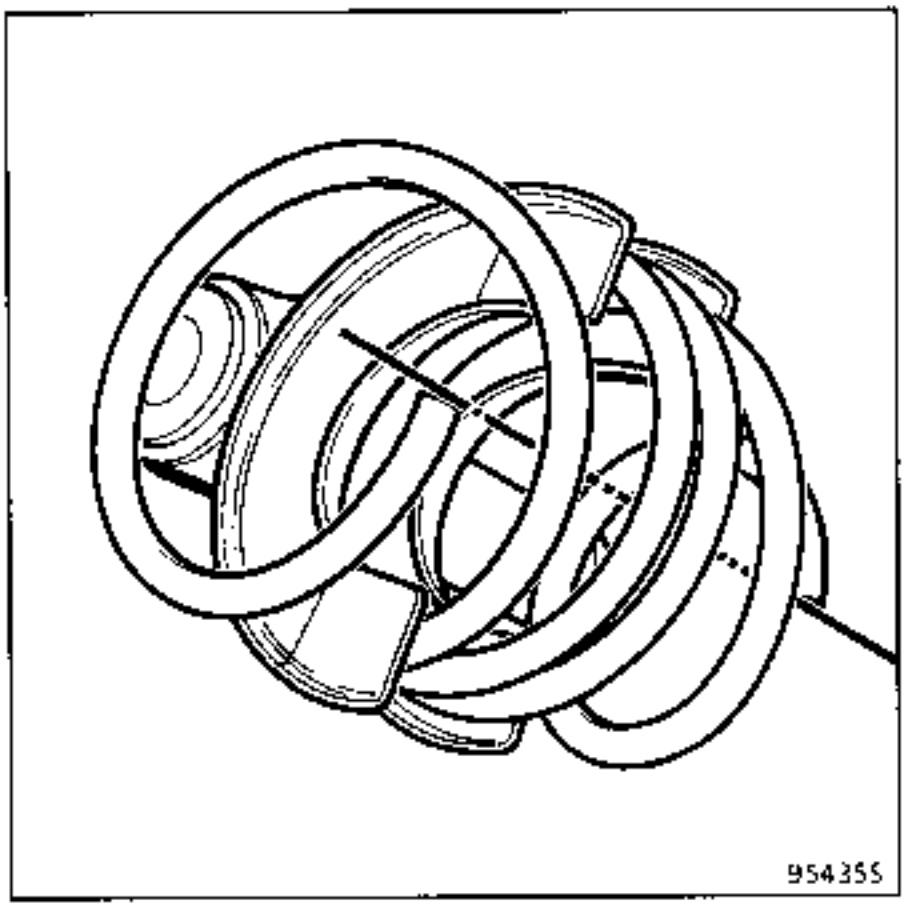
Precautions to be taken before fitting

Shock absorbers are stored horizontally in the Parts Stores.

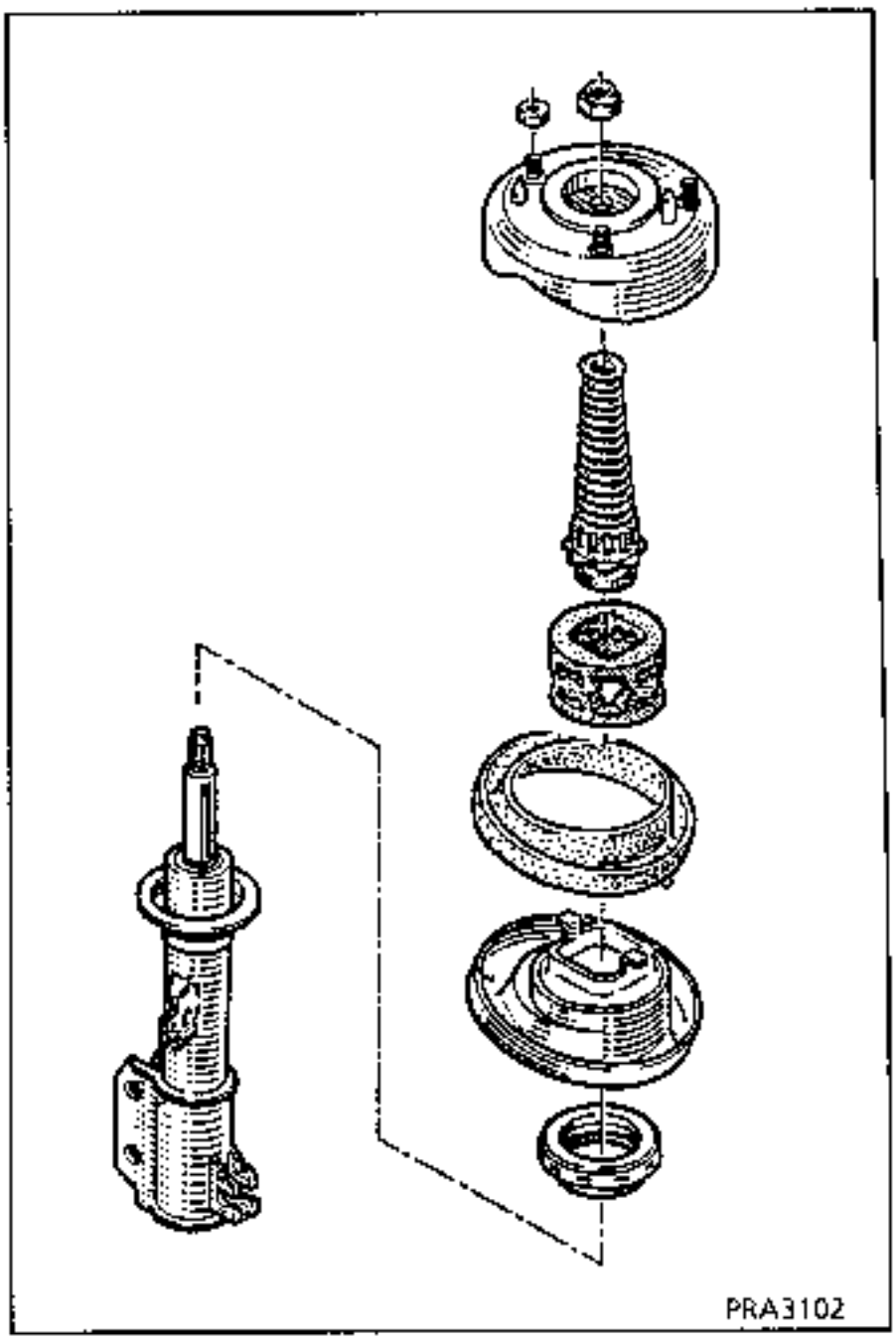
Under these conditions it is possible that the shock absorbers, which are designed to operate in a vertical direction, will have de-primed.

Before fitting the shock absorbers to the vehicle compress them a few times by hand in the vertical position.

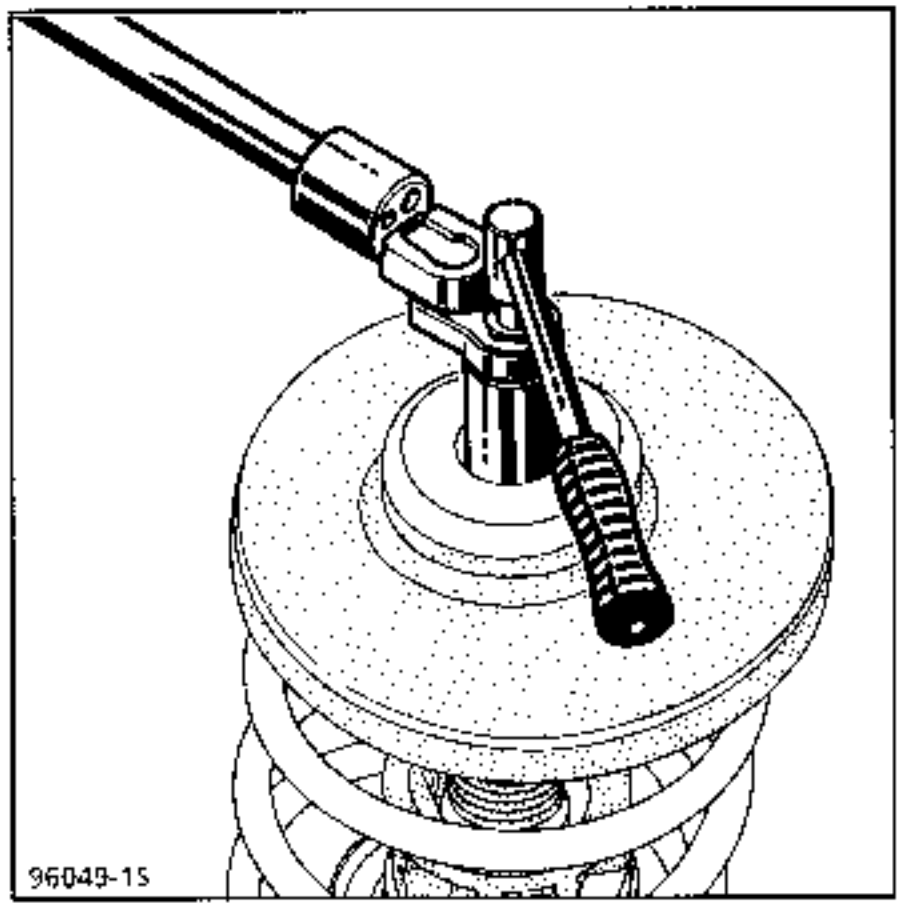
If the spring is to be replaced, to facilitate refitting, observe the position and alignment of the spring and cups of the tool.



Observe the fitting order and direction for the component parts.



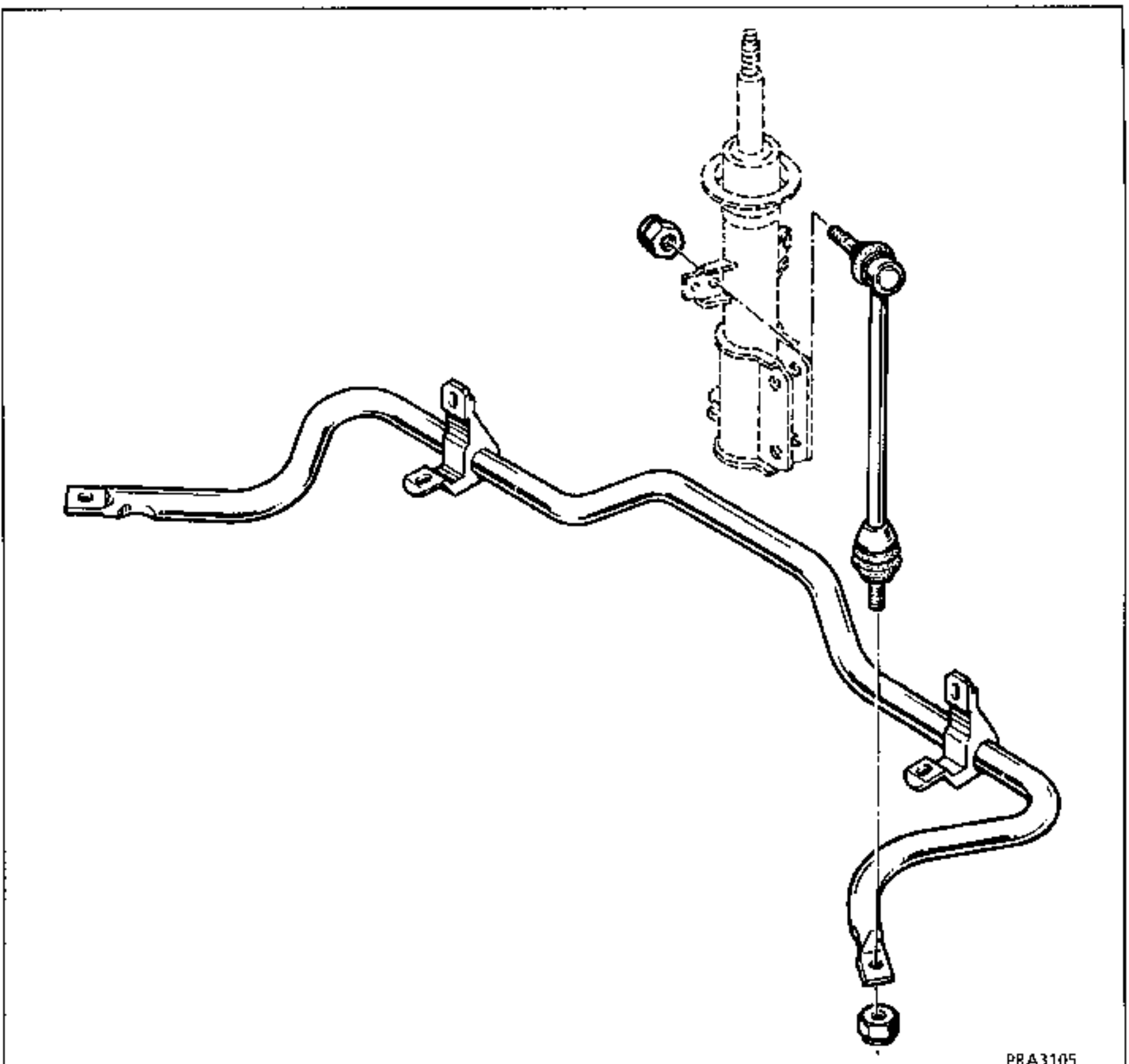
Tighten the nut (new) to the correct torque using tool **FACOM D83 RENA.**



Decompress the spring and remove the tool.

REMOVAL - REFITTING

TIGHTENING TORQUES (in daN.m)	▽
Link mounting nuts	4
Bearing upper mountings	2
Bearing mountings (point B)	12
Rear sub-frame mounting bolt, diameter 12	11

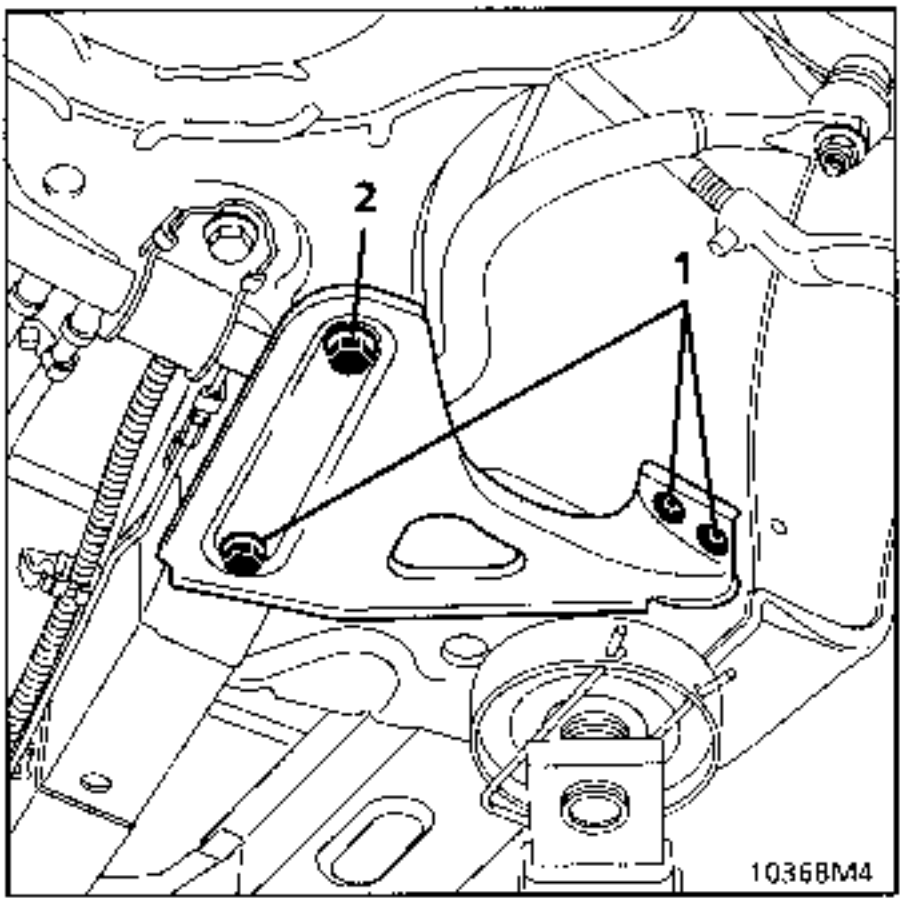


PRA3105

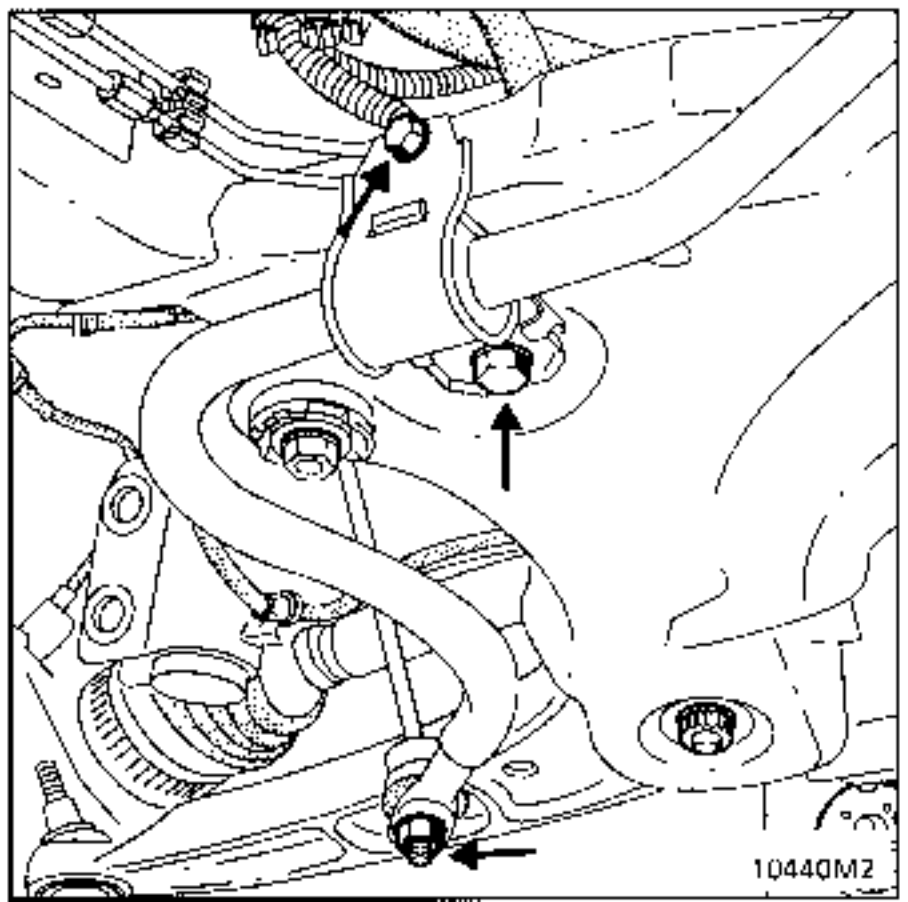
Put the vehicle on a 4 post lift to facilitate this operation.

REMOVAL

Remove the 3 bolts (1) from the sub-frame reinforcement.
Slacken bolt (2) and pivot the reinforcement.

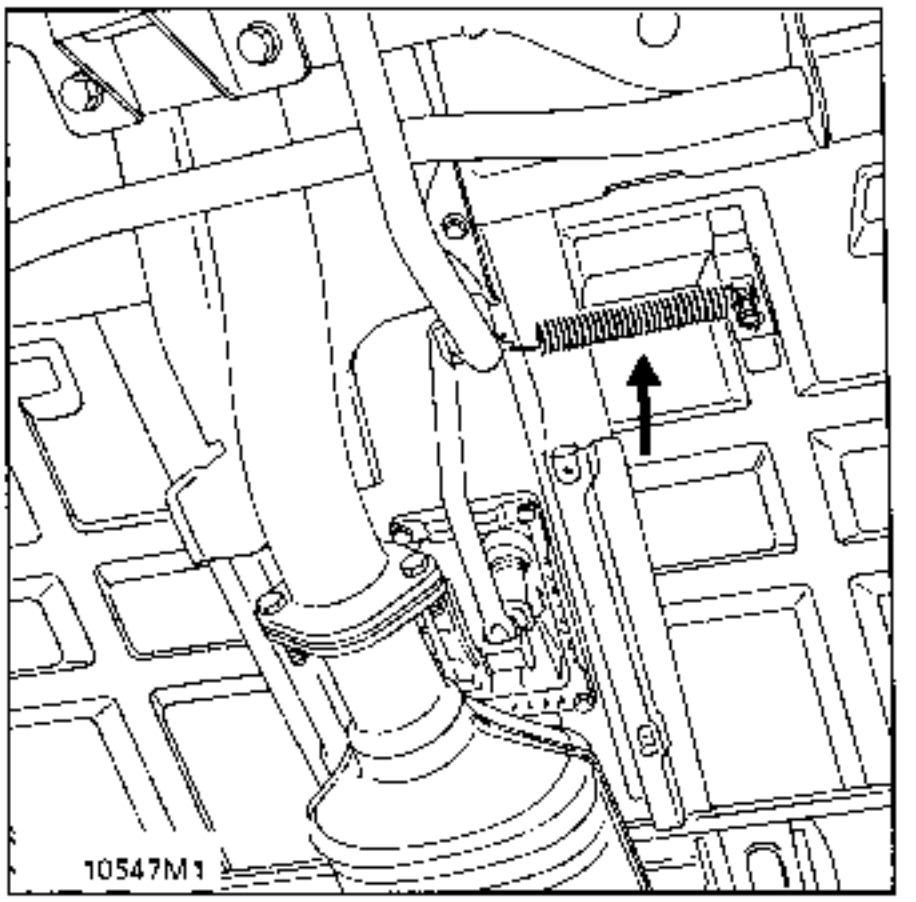


Remove:
- the bolts mounting the anti-roll bar on the sub-frame,
- the anti-roll bar link nuts. To prevent the ball joint turning, hold the shaft with a wrench.

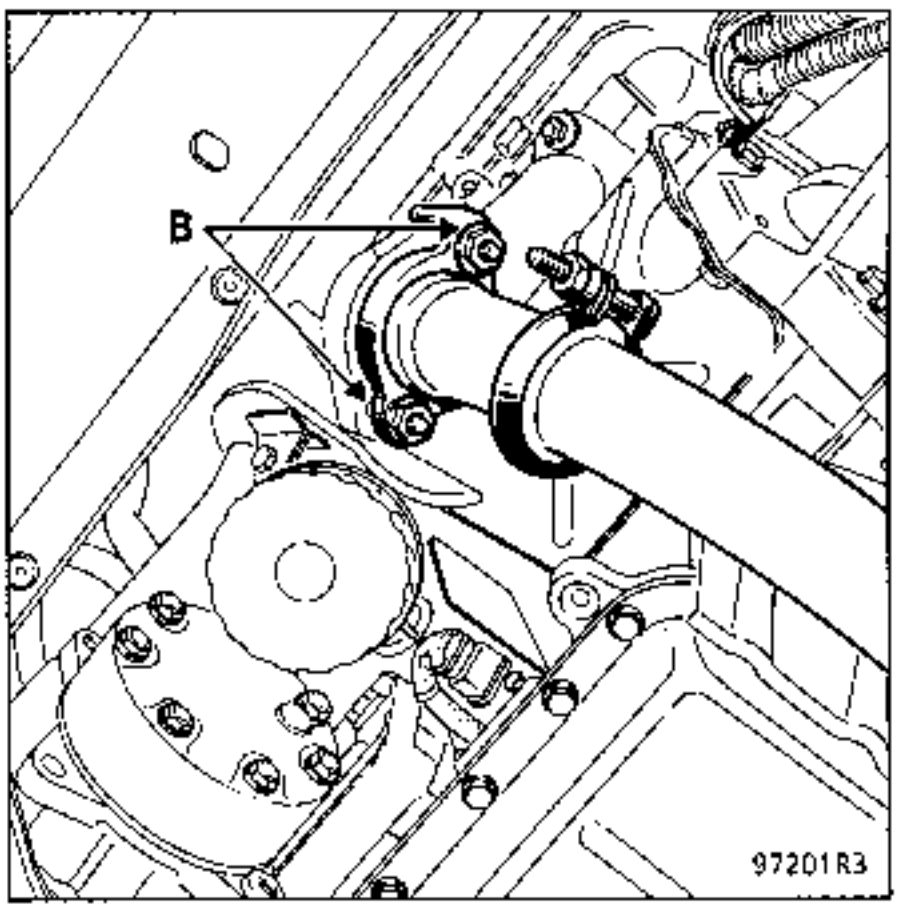


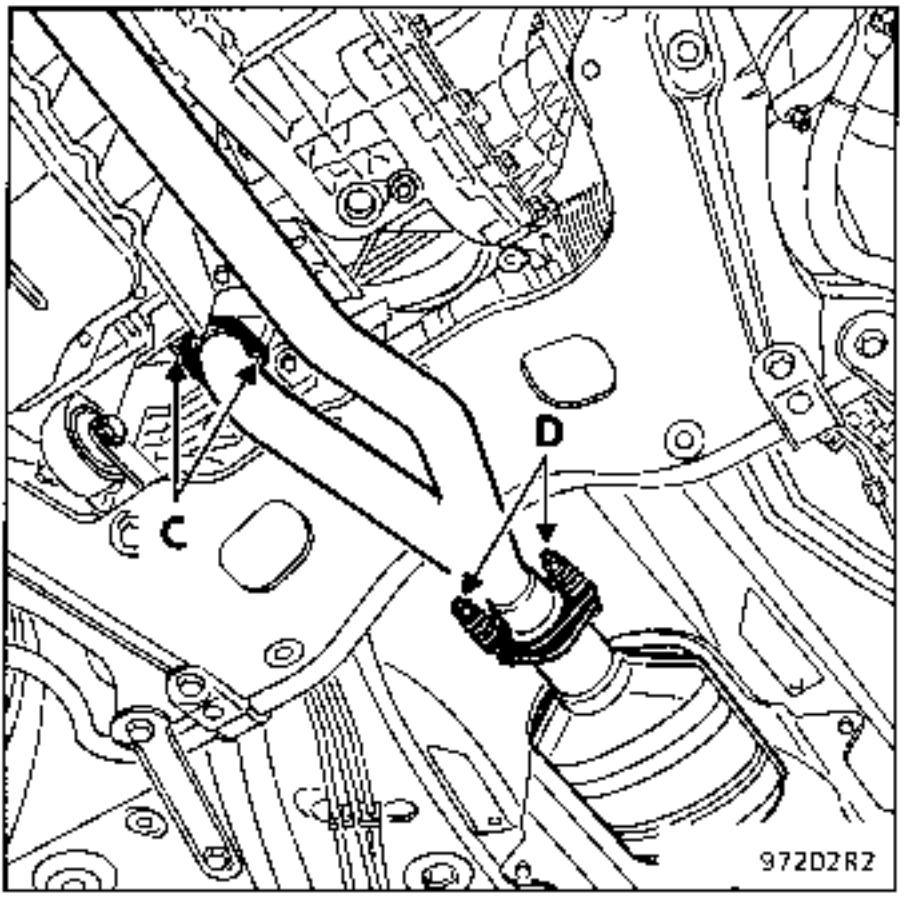
F ENGINE

Remove the gear control spring.



Z ENGINE
Remove the exhaust pipes from the manifold outlet to the entry to the catalytic converter at (B) - (C) and (D).





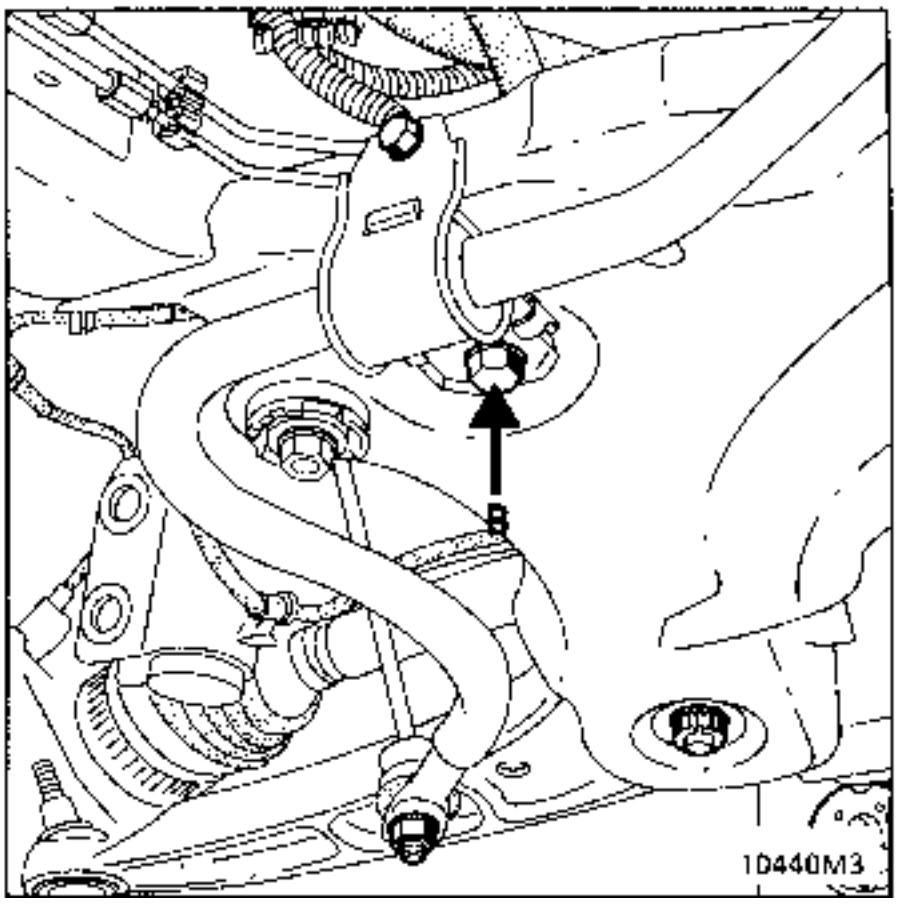
REFITTING

Fit the mountings for the anti-roll bar and the reinforcements on the sub-frame.

Move the steering to refit bolt (B).

Refit the nuts on the link.

Torque tighten all nuts and bolts.



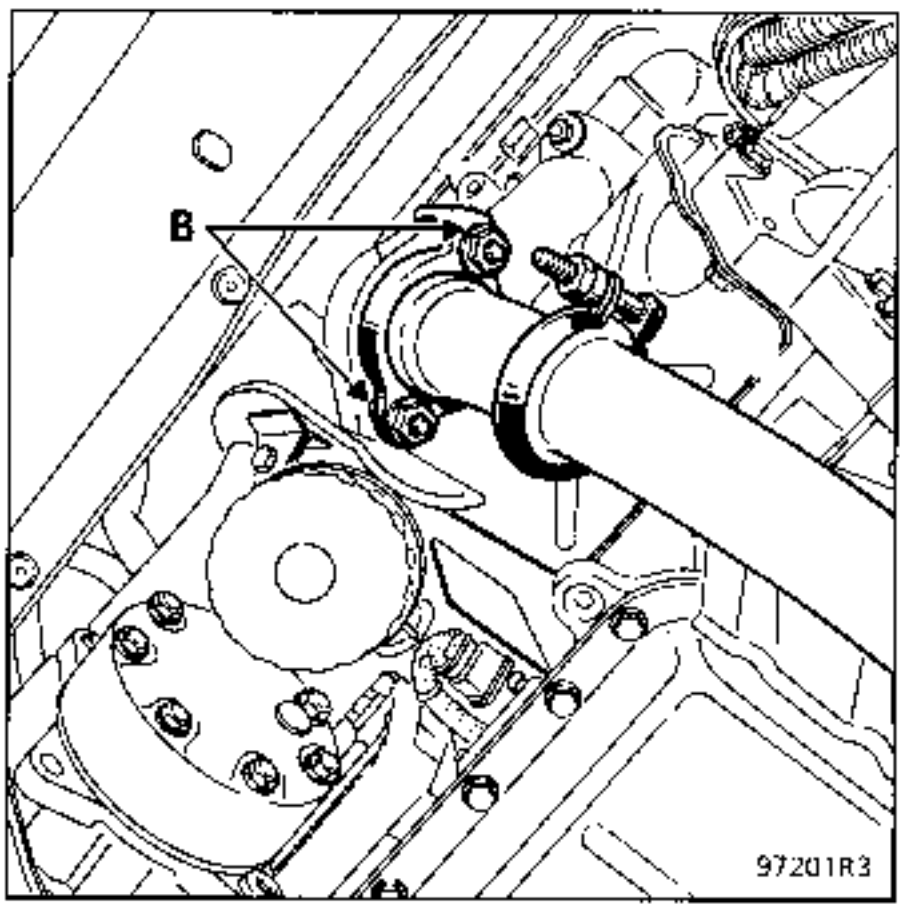
SPECIAL TOOLING REQUIRED	
T.Av. 476	Ball joint extractor
Dir. 1408	Pliers for adjusting steering universal joint
Dir.1282-01	17 mm wrench for PAS high pressure pipe (Z engine)
Dir.1282-02	19 mm wrench for PAS low pressure pipe (Z engine)

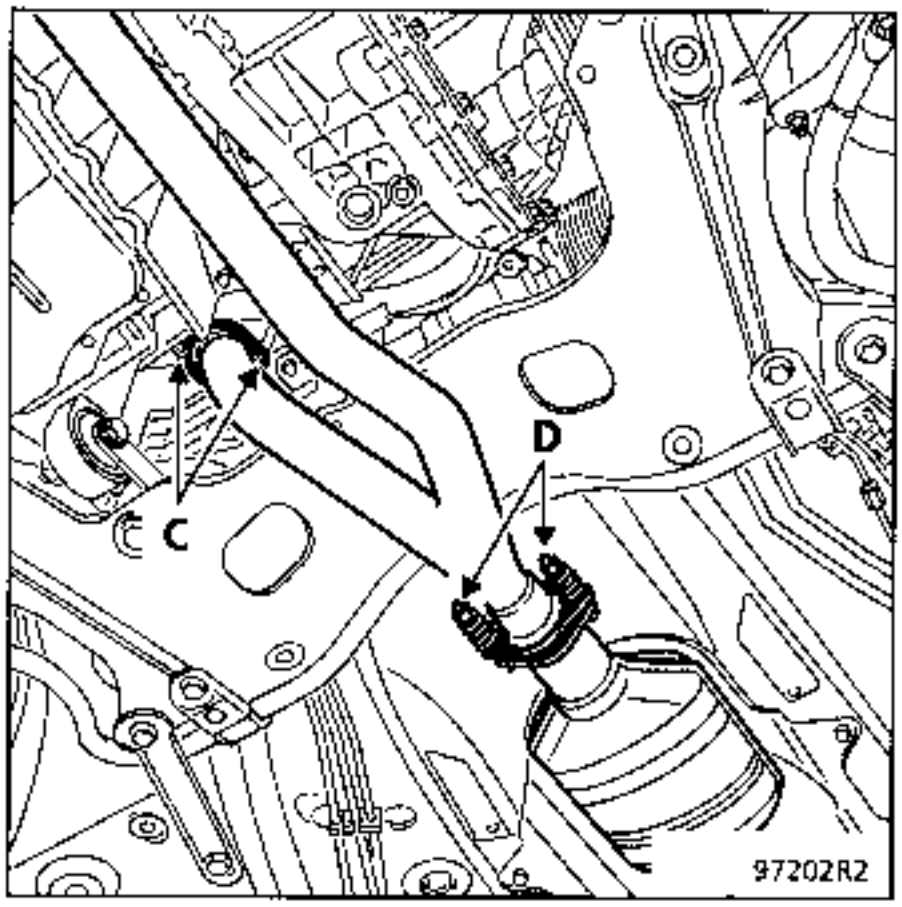
TIGHTENING TORQUES (in daN.m)		
Track rod end nut		4
Steering universal joint bolt		2.5
Cradle mounting bolt	front diameter 10	3.5
	rear diameter 12	11
Lower wishbone ball joint nut		6.5
Anti-roll bar link nut		4
Engine tie bar	F engine	6
	2-G engine	15

REMOVAL

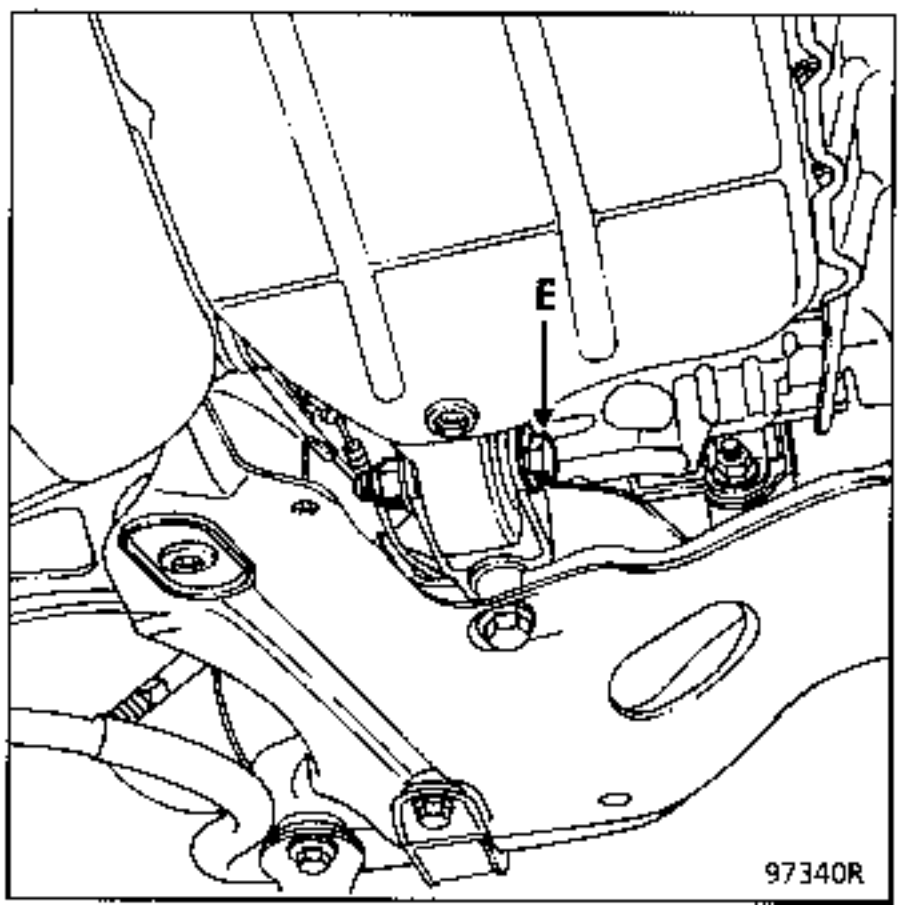
Disconnect the battery.

Z ENGINE :
Remove the exhaust pipes from the manifold outlet to the entry to the catalytic converter at (B) - (C) and (D).





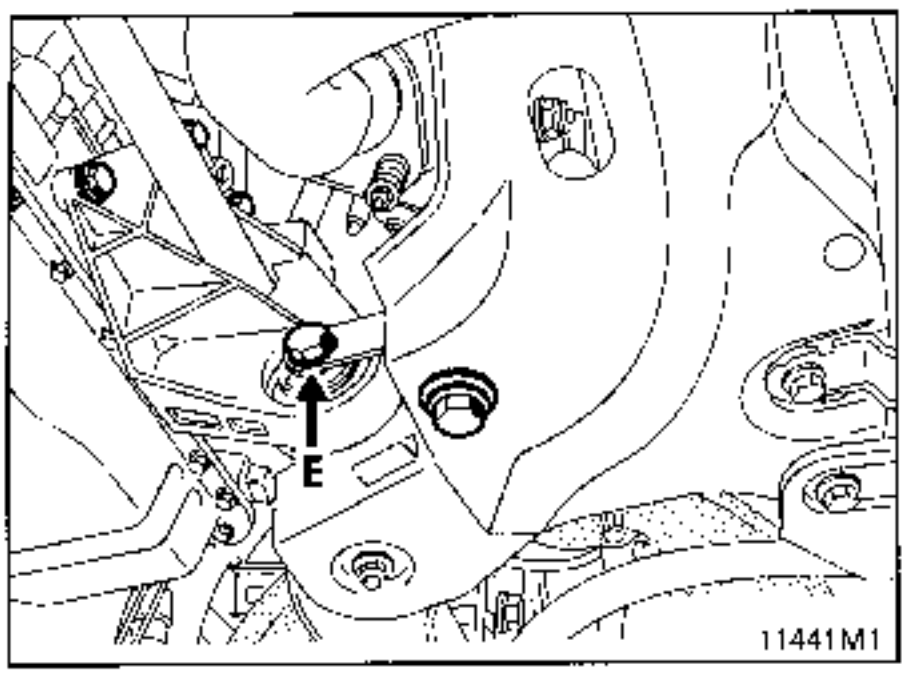
Release the engine tie bar at (E).



G ENGINE :

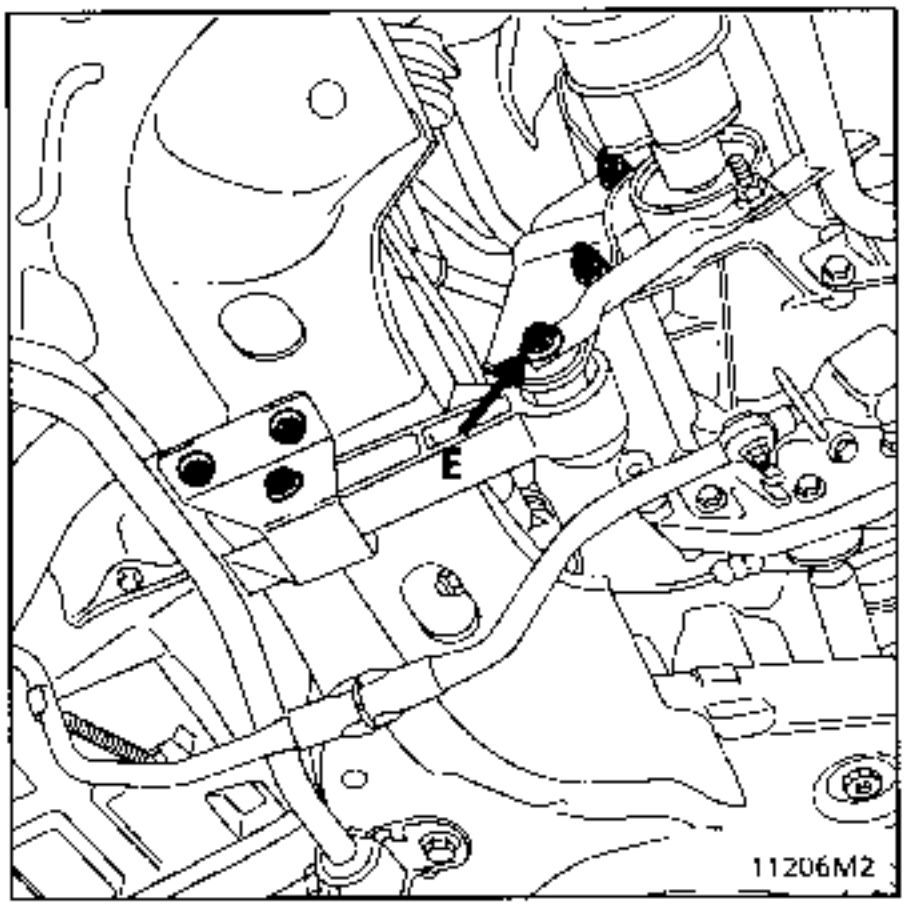
Remove the exhaust pipe from the manifold outlet to the entry to the catalytic converter.

Release the engine tie bar at (E).



F ENGINE :

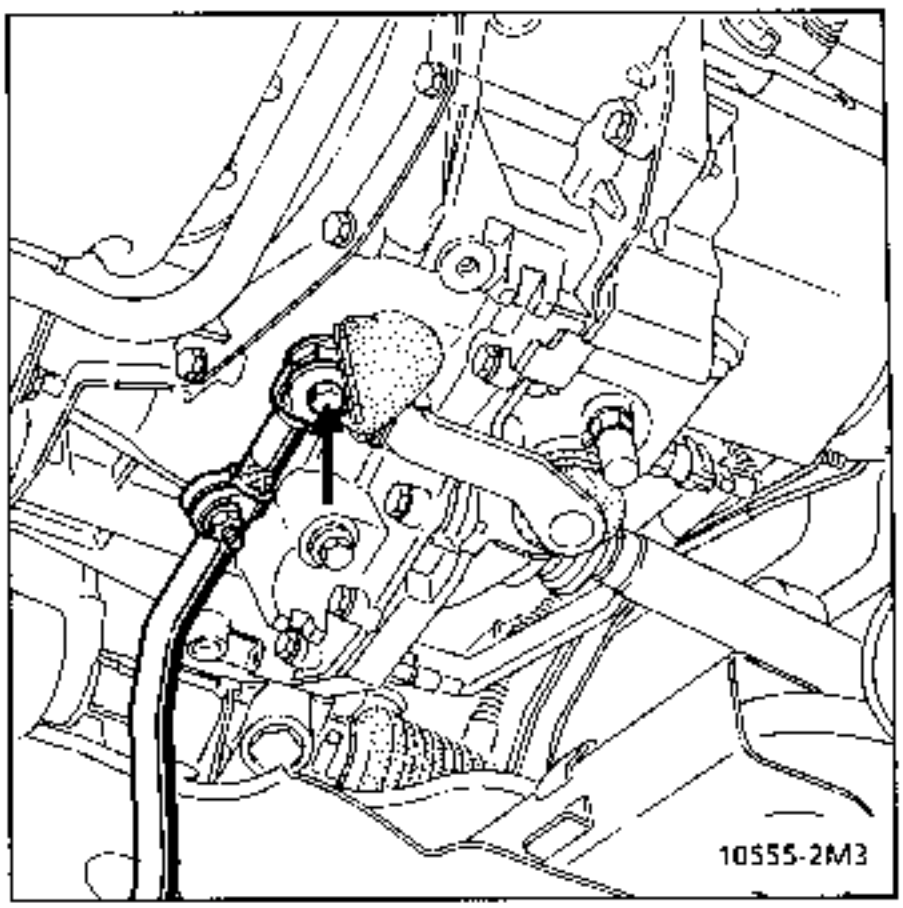
Release the engine tie bar at (E).



Remove the gear control:

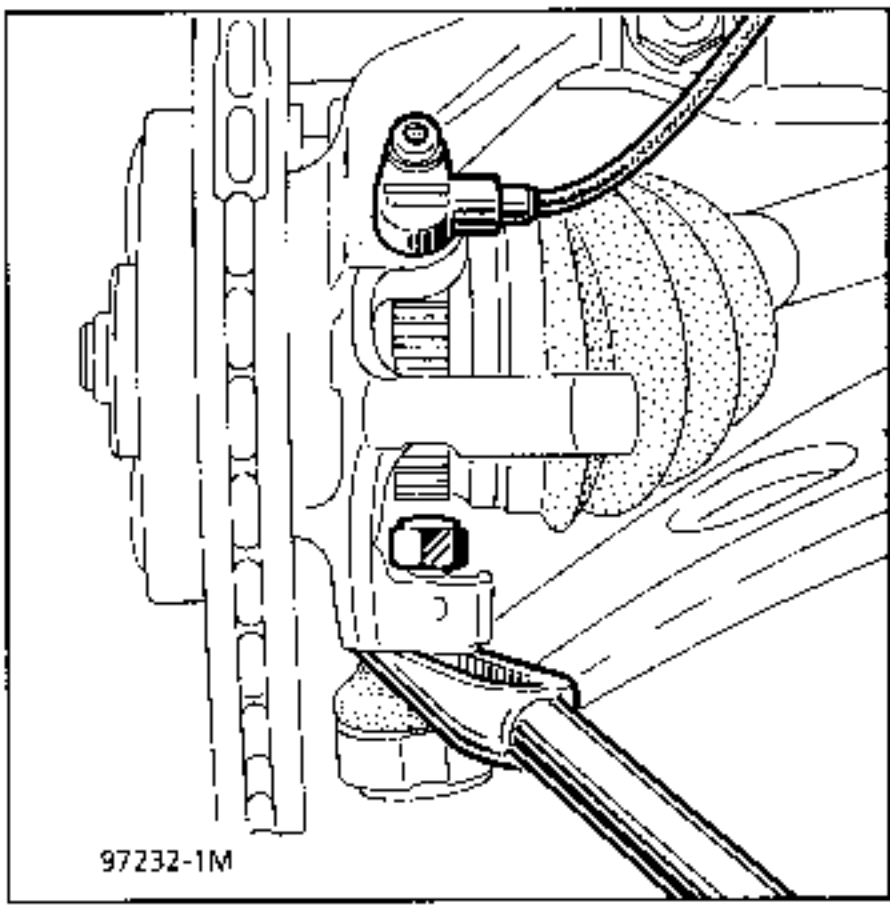
Release the gaiter.

Remove the mounting bolt from the clevice on the return bar.

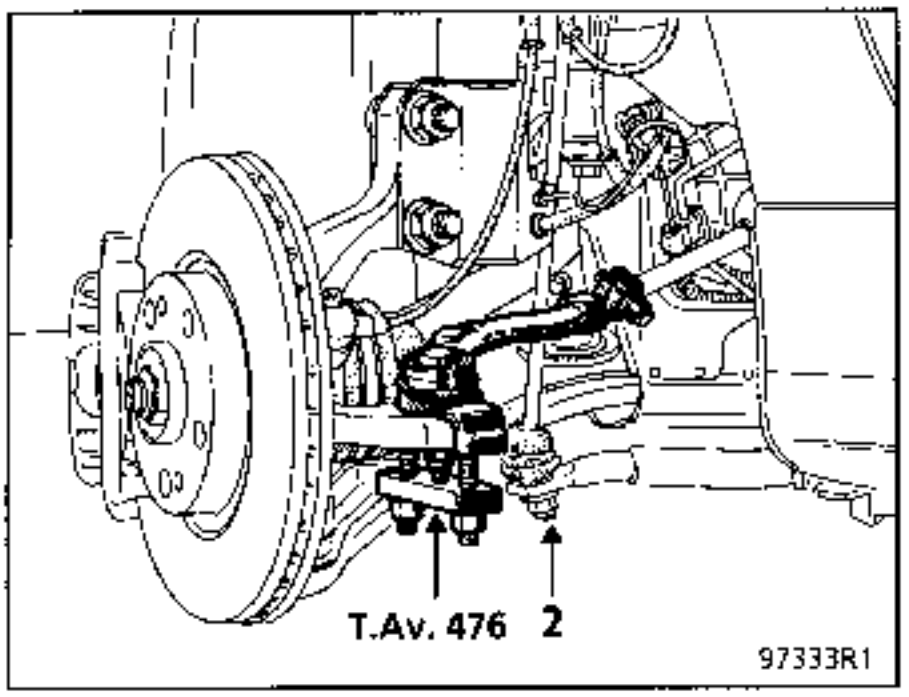


ALL ENGINES

Slacken the lower wishbone ball joint nut and release it.

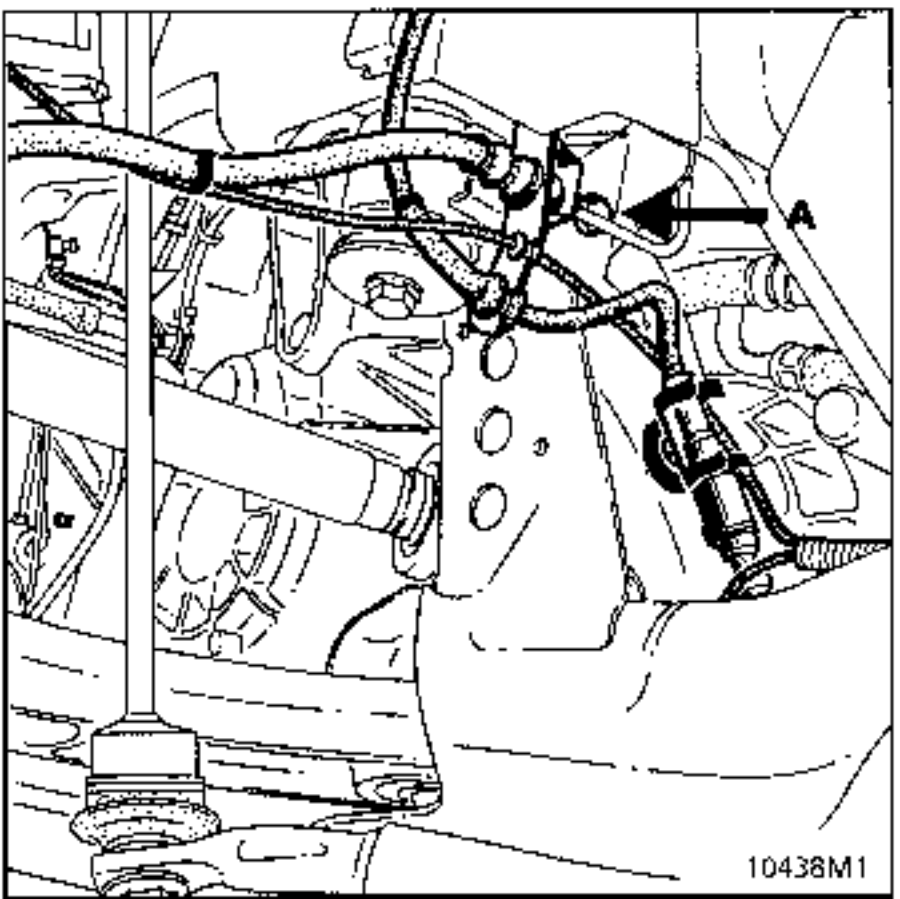


Remove:
- the anti-roll bar link lower ball joint nuts (2),
- the track rod ends (tool **T.Av. 476**),

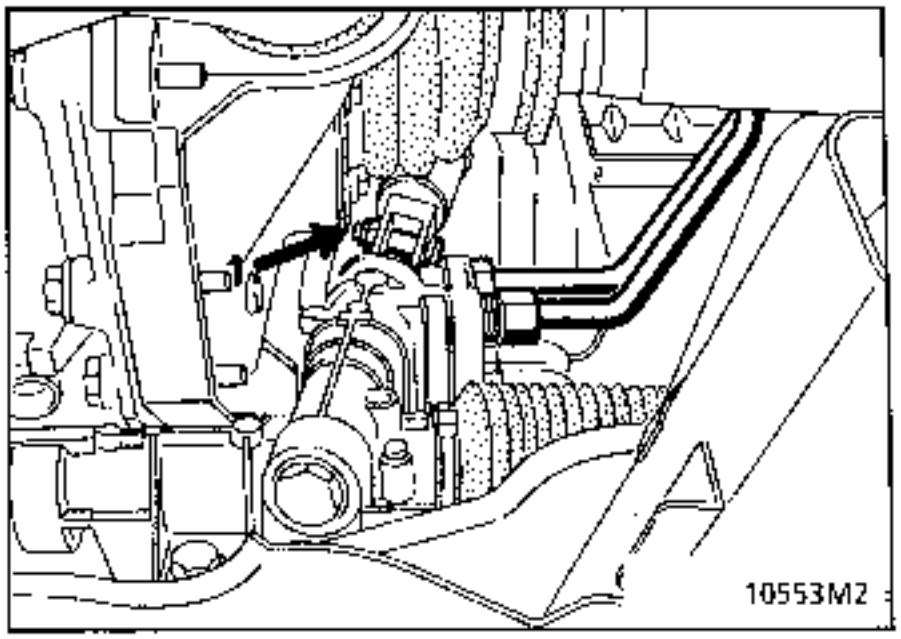


- the two bolts (A) mounting the support for :
- the pipe,
- the brake pad wear warning light wire,
- the ABS wiring (if fitted).

Release the ABS wiring connector and the wear warning light wire from their mountings on the cradle.

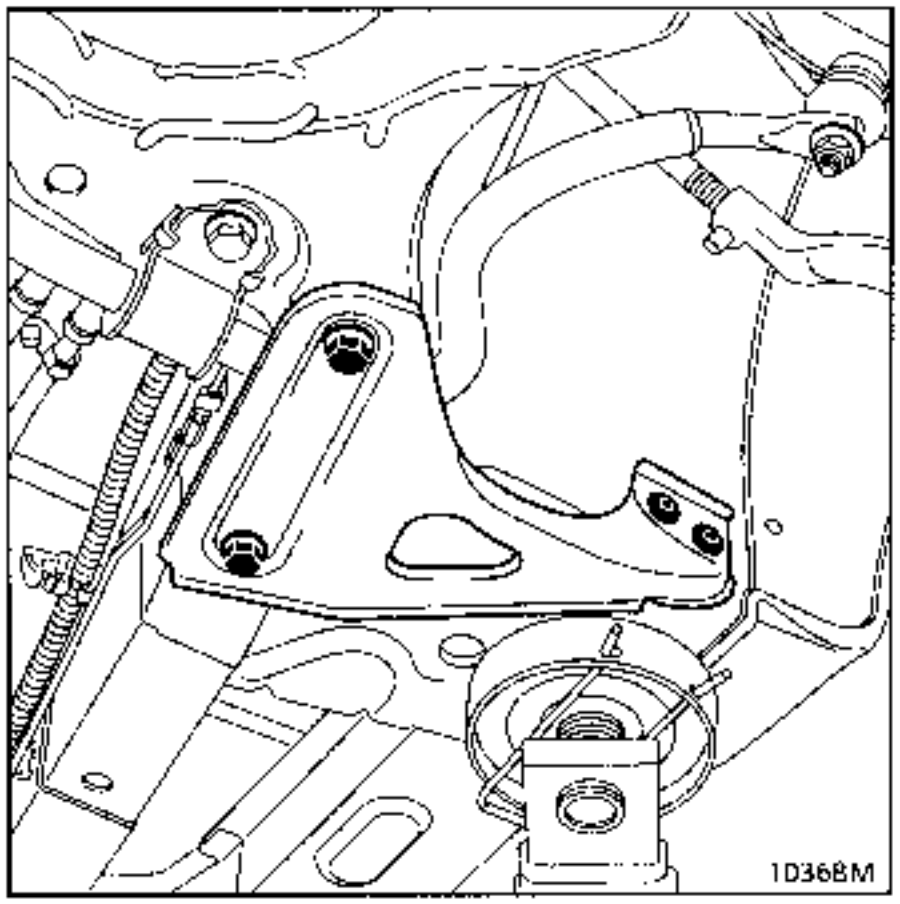


Remove the nut and eccentric bolt (1) from the power assisted steering universal joint.
Fit a steering wheel locking tool to prevent the rotary switch from losing its central position (see section concerned).



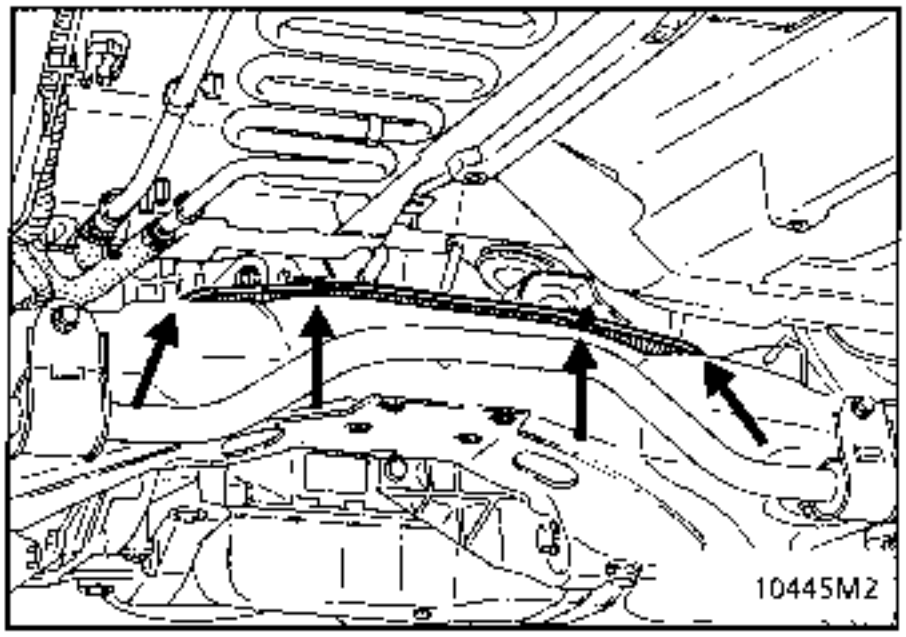
Fit the component jack under the axle mounting and secure it to the jack plate.

Remove the cradle reinforcements.



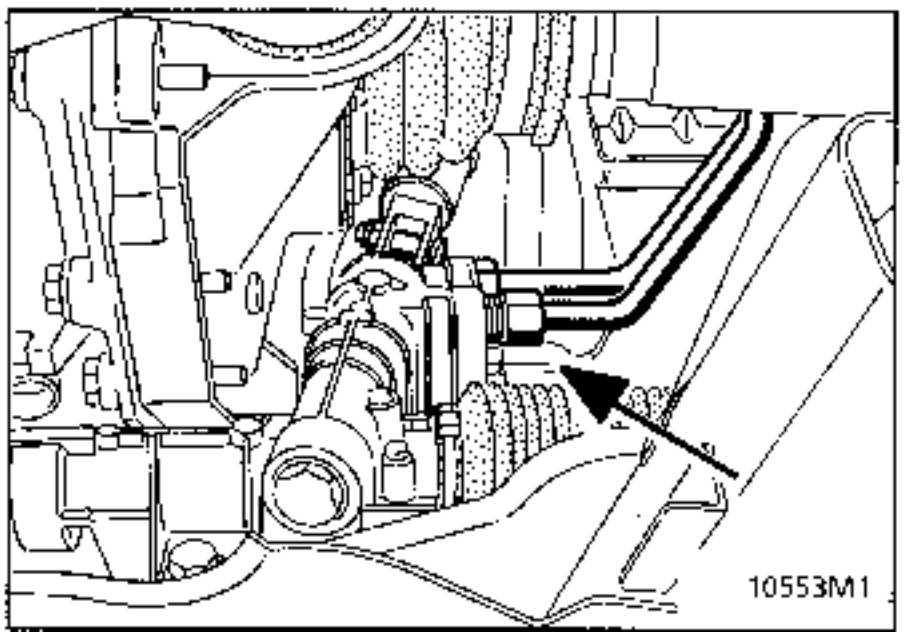
Remove the heat shield from the brake pipes (2bolts).

Release the brake pipe (4 mounting points) and the ABS wiring (4 mounting points).



Disconnect the steering box pipes.

Z ENGINE
Use tools **Dir.1282-01** and **Dir.1282-02** via the wheel arch.



G AND Z ENGINES :
Release the power assisted steering cooler pipe.

Remove the mounting nuts for the sub-frame and lower the jack - sub-frame assembly.

Remove the sub-frame from the jack.

NOTE : when lowering the sub-frame- jack assembly with the steering box, take care not to damage the rigid brake pipes.

SPECIAL NOTES FOR REFITTING

When refitting the steering - sub-frame assembly, take care not to damage the rigid brake pipes.

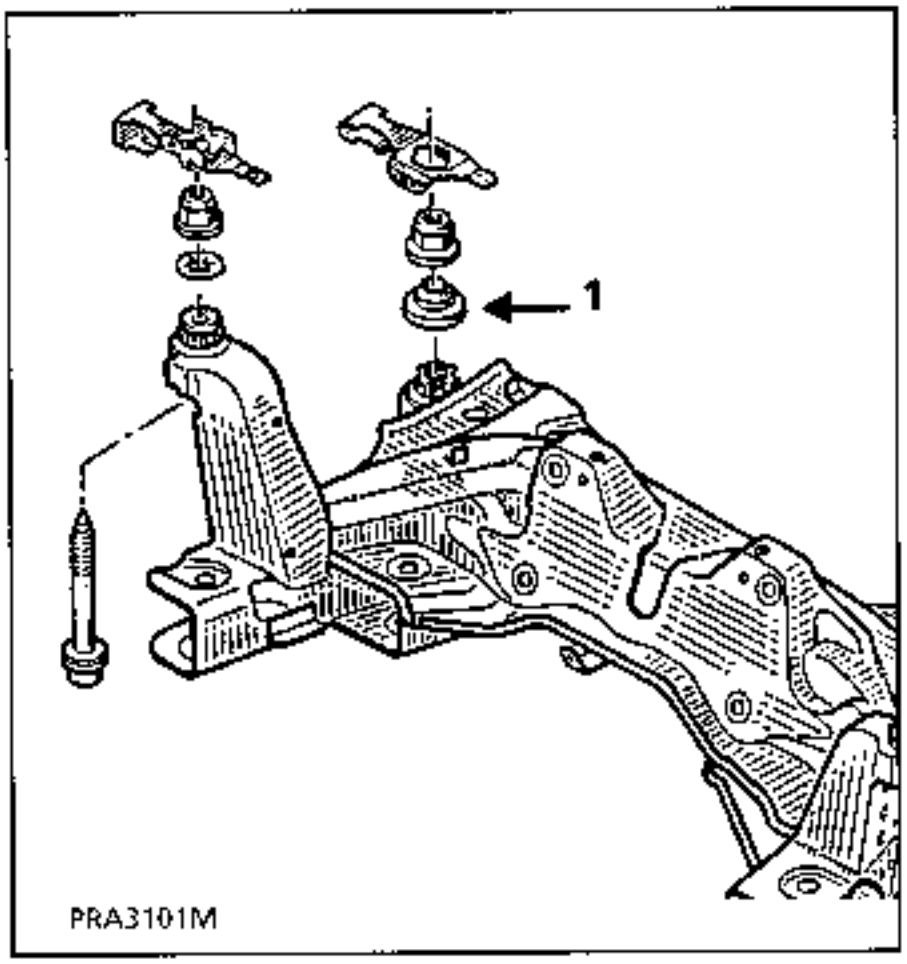
If the steering box is being renewed, use the adjusting pin **Dir. 1303-01** (see corresponding section).

CRADLE:

Renew all the sub-frame mounting nuts and observe the correct tightening torques.

NOTE : two washers (1) on the rear sub-frame mountings centre the sub-frame - axle assembly correctly on refitting to the body.

It is VITAL to ensure these washers are present and correctly positioned. To do this, begin tightening the sub-frame at the rear left hand mounting (reference point).

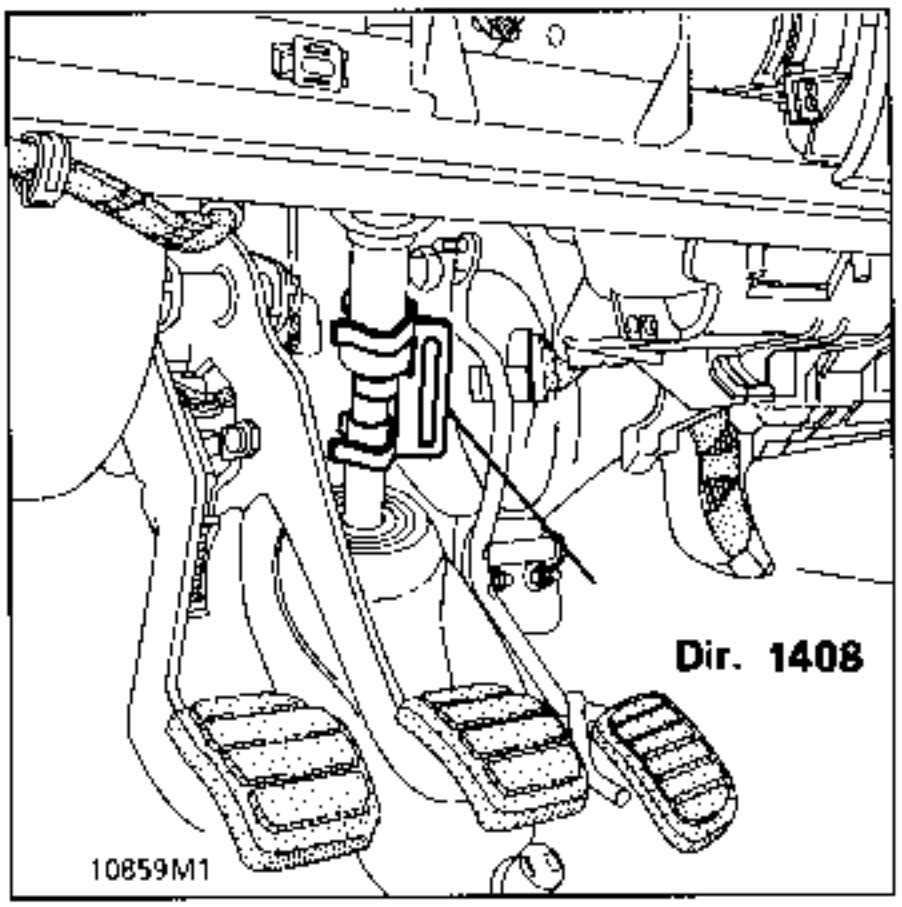


STEERING COLUMN UNIVERSAL JOINT

IMPORTANT :
The lower part of the steering column slides so the position of the universal joint on the steering box must be adjusted.

In the passenger compartment, fit tool **Dir. 1408** to the lower part of the column.

Refit the joint mounting and torque tighten. Remove the tool.



POWER ASSISTED STEERING:

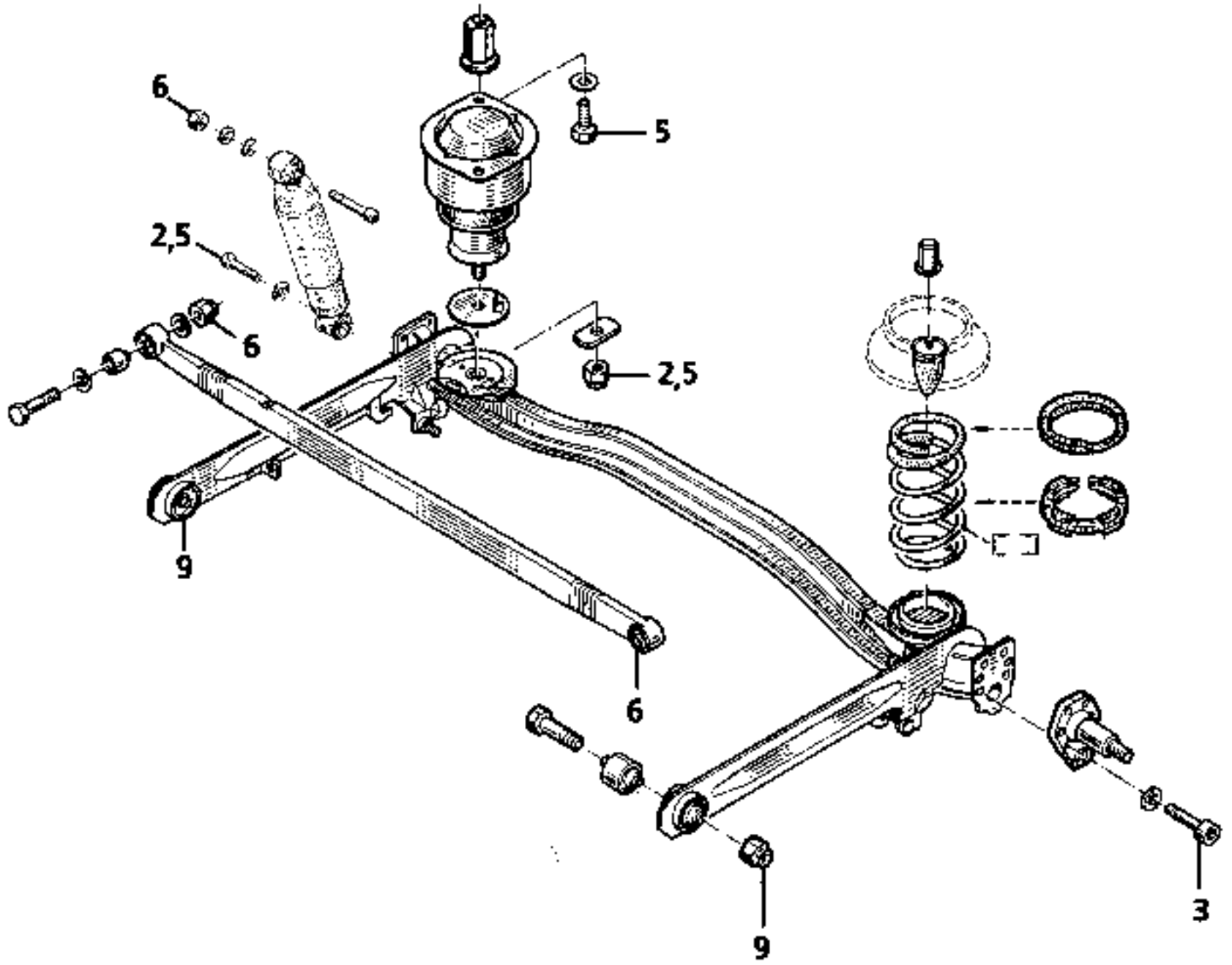
Torque tighten the power assisted steering pipes (tools **Dir.1282-01** and **Dir.1282-02**).

Three quarters fill the reservoir.

With the engine running, move the steering gently from lock to lock.

Check the circuit is sealed and top up the level.

Check the front axle assembly angles and adjust the parallelism if necessary.



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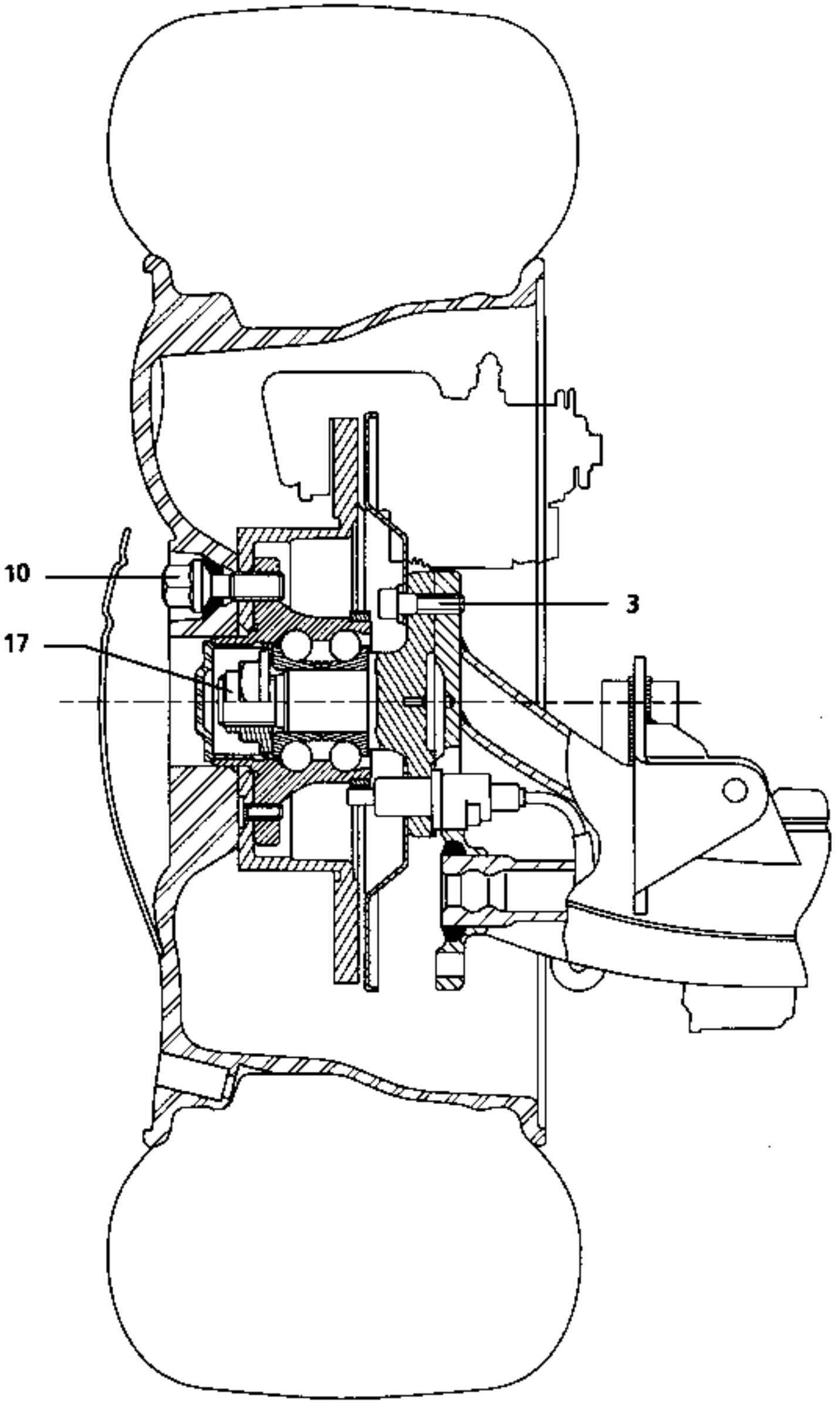

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SPECIAL TOOLING REQUIRED		
Cha.	280 -02	Block for axle stand
Cha.	408 -01	Socket for axle stand
Cha.	408 -02	

TIGHTENING TORQUES (in daN.m)	▽
Suspension arm mounting nut	9
Lower shock absorber bolt	2.5
Upper shock absorber bolt	6
Wheel bolt	10
Transverse guide bar	6

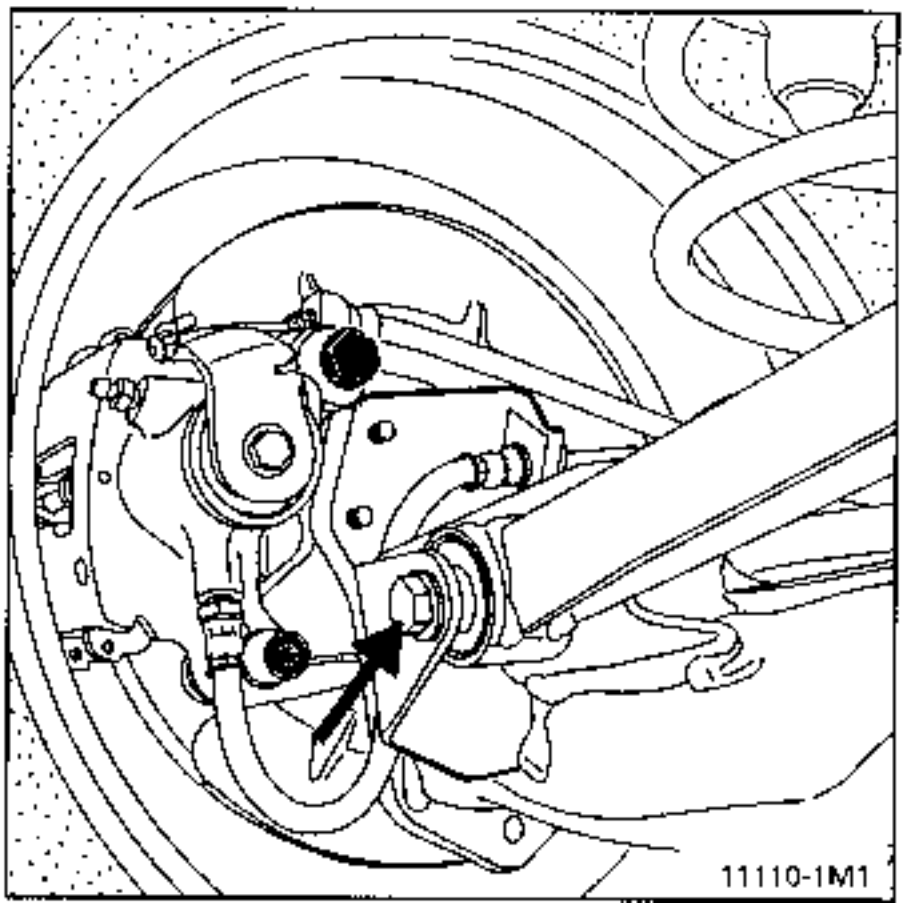
REMOVAL

Put the vehicle on a 4 post lift and raise the lift.

Fit a high axle stand with pad **Cha. 280-02** under the emergency spare wheel and gently lower the lift.

Remove:
- the two lower shock absorber mounting bolts,
- the bolt mounting the transverse guide bar to the axle. Do not touch the brake limiter (vehicle without A.B.S.).

Lower the lift once more and remove the springs.



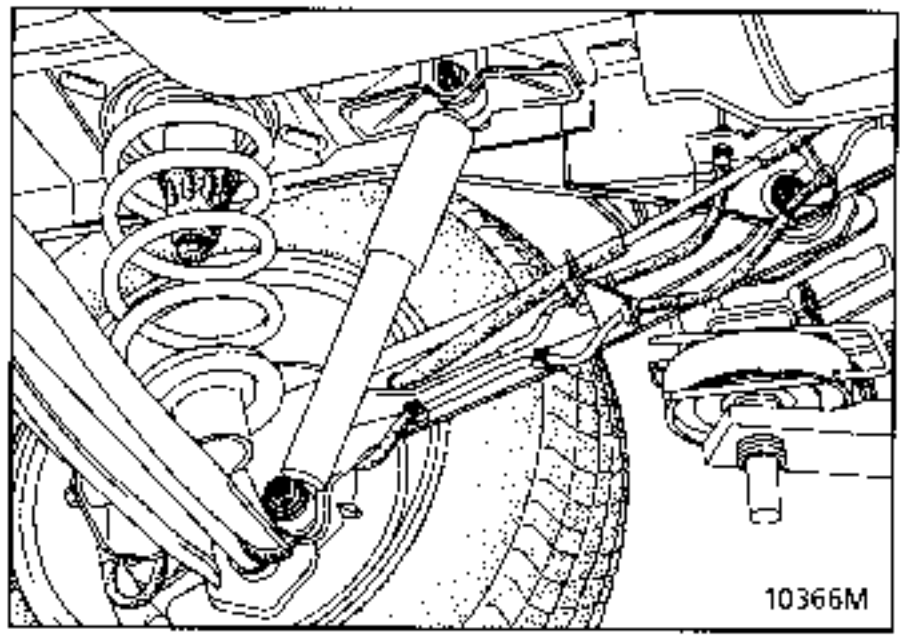
Put the vehicle on axle stands.

Remove:
- the two rear wheels,
- the two brake drums.

Disconnect the handbrake cables:
- from the lever,
- from the drum backing plate,
- from the suspension arm.

Fit a pedal press to prevent brake fluid running out.

Disconnect the brake pipes from the suspension arms.



Fit a component jack under the axle.

Remove the mounting bolts from the suspension arms.

Release the axle.

REFITTING

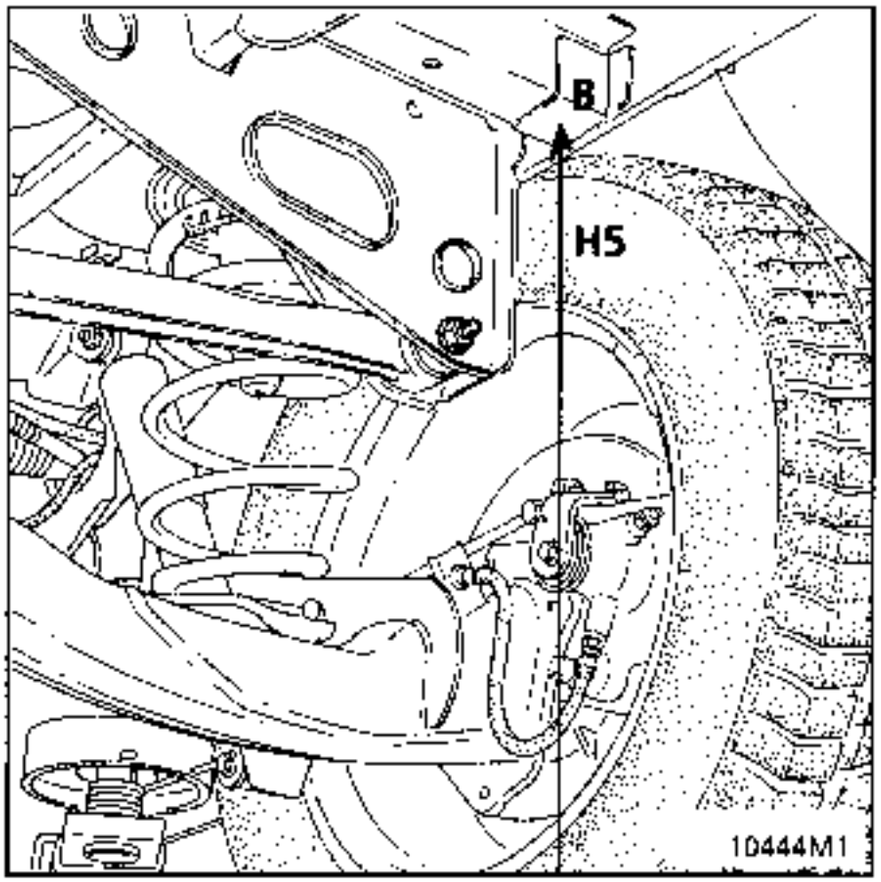
Refitting is the reverse of removal.

Tighten the rubber bush mountings to the correct torque when the vehicle is laden.

Set the vehicle to dimension **(H5) = 408mm** measured between the floor 3rd row cross member and the ground.

To do this:
- compress the rear axle assembly using straps,
- or load the vehicle;

this dimensions corresponds to the vehicle having 4 persons on board with 5 seats, fuel tank full and a 50kg load. Check dimension (H5).



Bleed the braking circuit.

Check the rear axle assembly angles if necessary (no adjustment is possible).

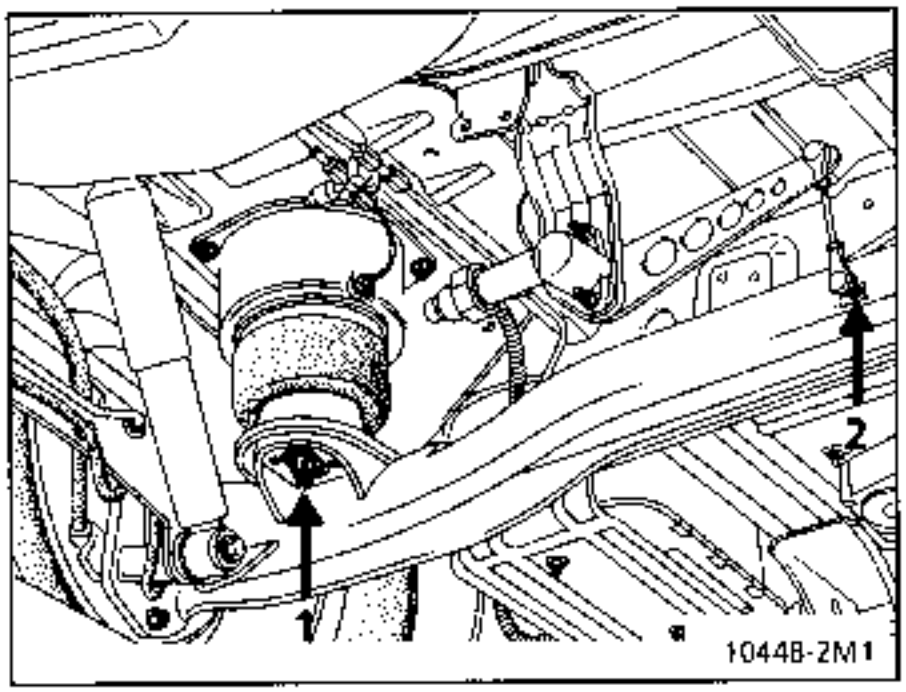
SPECIAL TOOLING REQUIRED	
Sus. 1193	Pneumatic spring centring device

TIGHTENING TORQUES (in daN.m)	
Suspension arm mounting nut	9
Lower shock absorber bolt	2.5
Wheel bolt	10
Transverse guide bar	6

REMOVAL

Proceed as for removing the axle described previously, with the following differences:

Remove:
- the lower mounting bolt (1) for each pneumatic spring,
- the level sensor control bar, by unscrewing the axle ball joint (2).

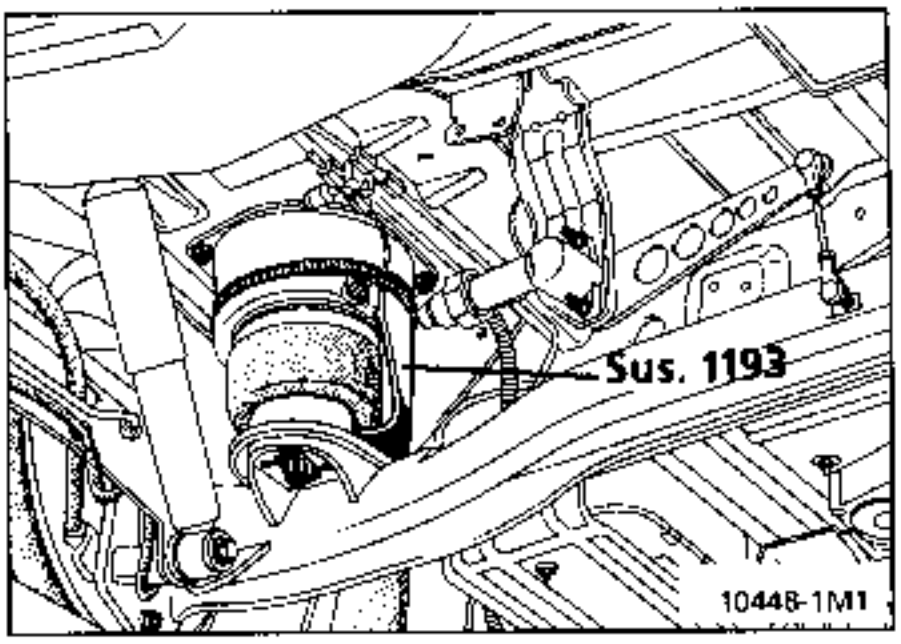


IMPORTANT:

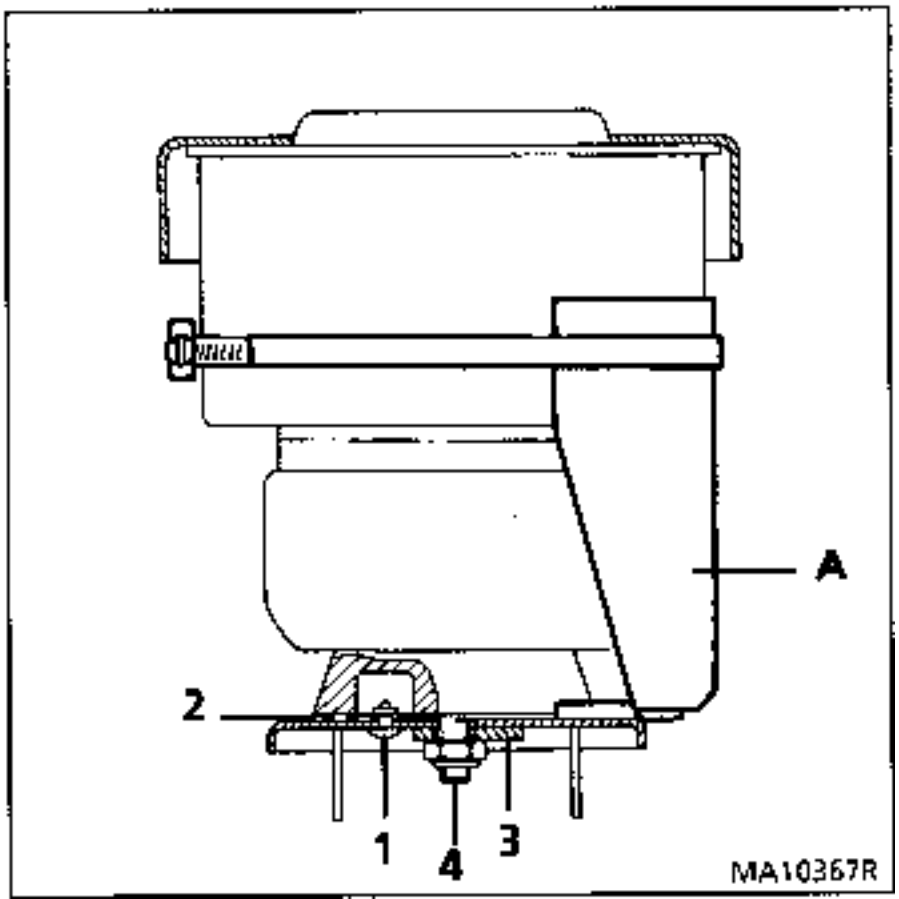
If the cross member is to be replaced, the base of the pneumatic springs must be centred on the cups on the new cross member.
This centring is vital to ensure the correct operation and life of the pneumatic diaphragm.

CENTRING THE PNEUMATIC SPRINGS:

Secure tool **Sus.1193** (A) to the pneumatic spring (upper mountings in position).



Countersink the anti-rotation washer (2) through the two holes (1), then immobilise it using two 3.2 mm stem-break rivets.



Remove the tool then fit the lower washer (3) and nut (4).

REFITTING

Refitting is the reverse of removal.

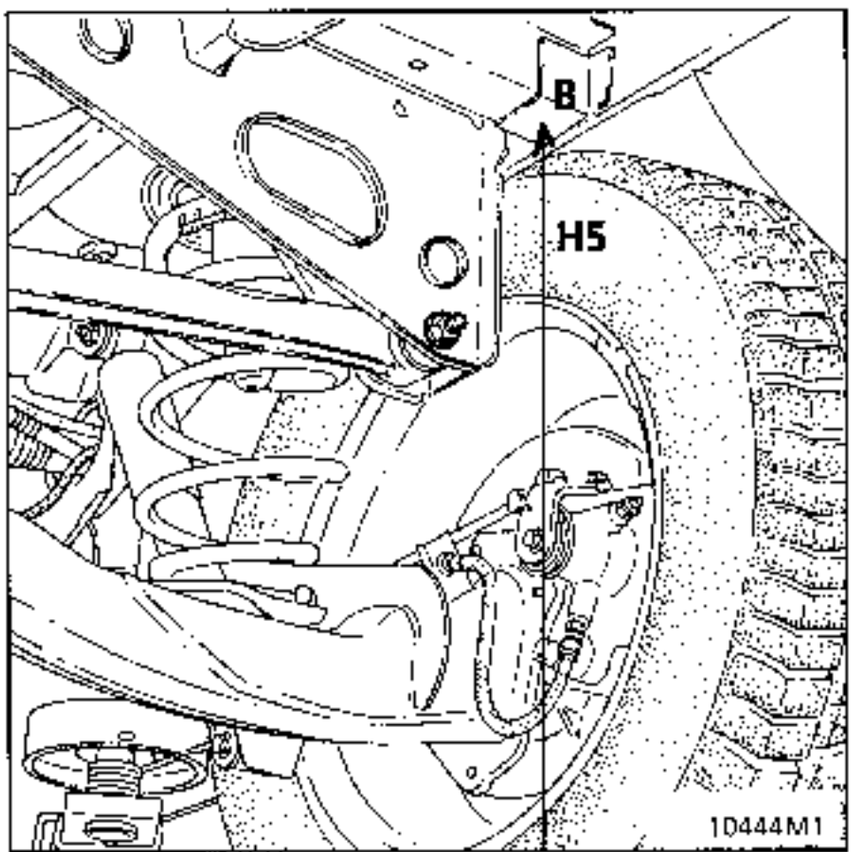
Tighten the rubber bush mountings to the correct torque when the vehicle is at normal trim height.

Bleed the braking circuit.

NOTE : check the pneumatic system is operating correctly and the normal trim height is correct:

Tyre size	Dimension (H5)
195	412
205	422

Dimension (H5) is measured between the floor 3rd row cross member and the ground (tyre pressures correct).



The two brake drums must be of the same diameter, if one is reground, the other must also be reground.
Never exceed the diameter marked on the drum.

SPECIAL TOOLING REQUIRED	
Emb. 880	Inertia extraction tool
Rou. 943	Hub cover plug extractor

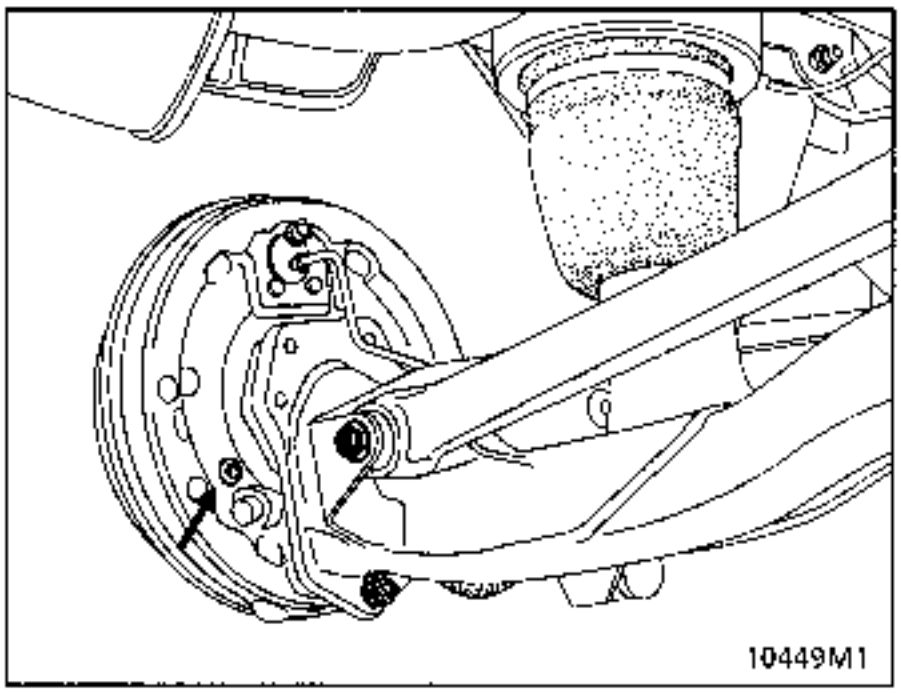
TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Hub nut	17

REMOVAL

Release the handbrake.

If **necessary:**

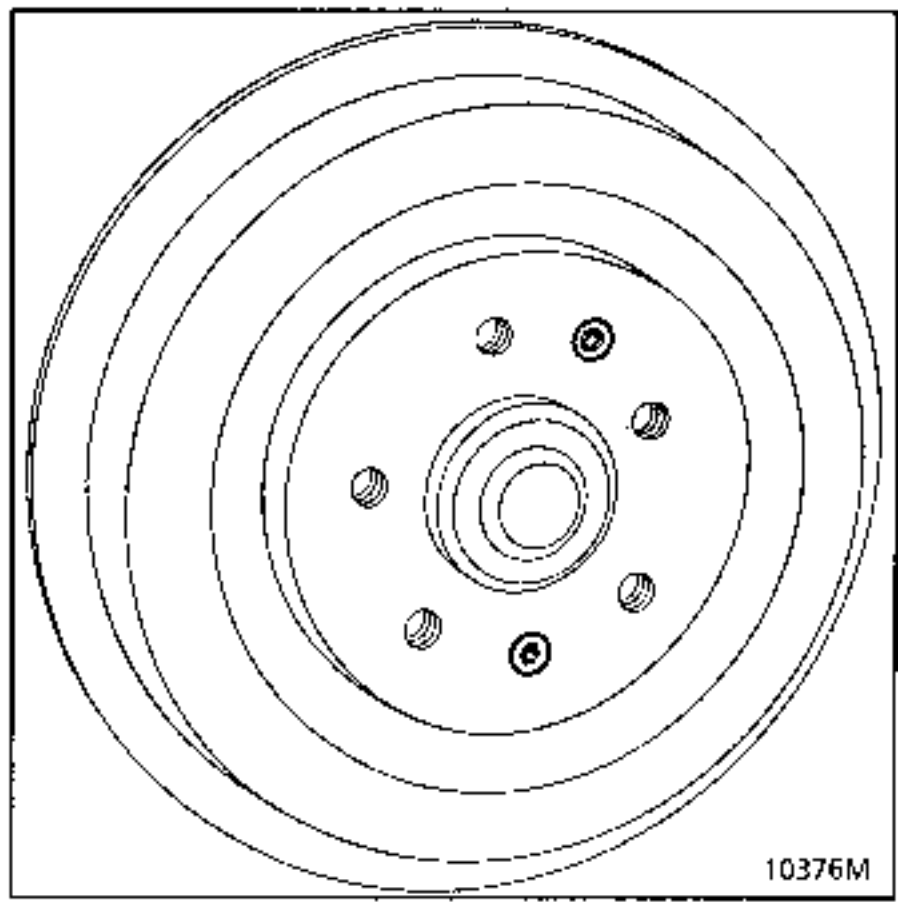
- Slacken the handbrake cables at the central adjuster.
- Remove the plug from the backing plate to release the automatic wear compensation system.



Position a screwdriver against the handbrake lever and push to release the lever from the brake shoe.
After it has been released, assist the lever in slackening off by pushing it to the rear.

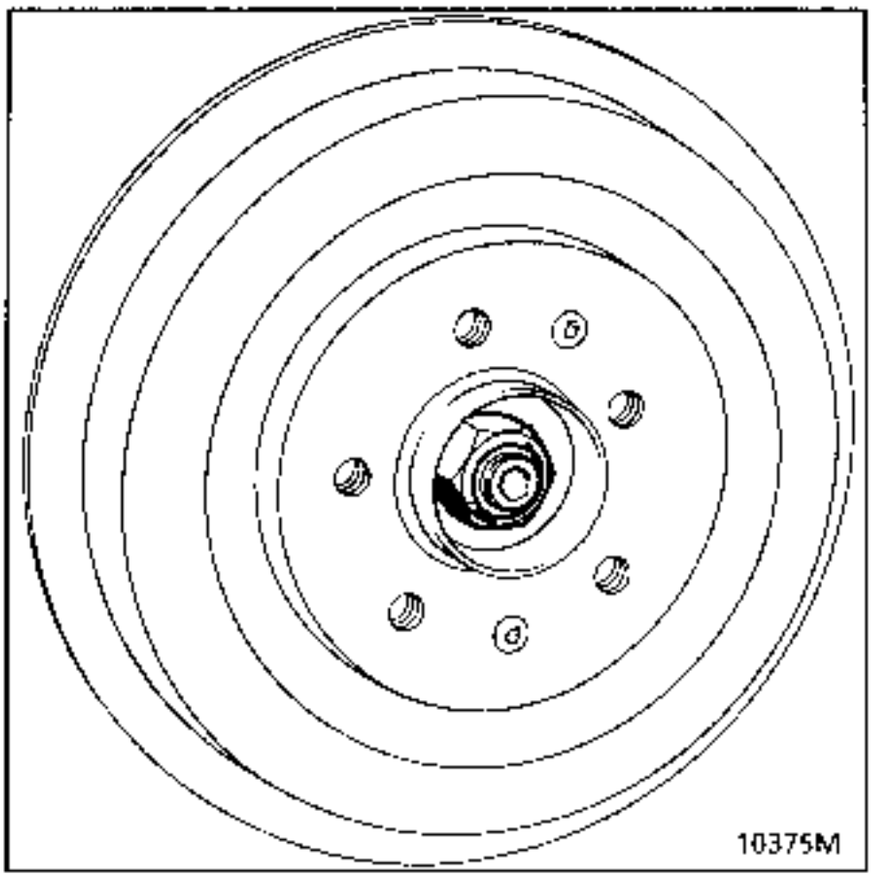
Remove:

- the two drum mounting bolts (Torx allen key 30),
- the drum.



Special notes before replacing the linings:

Remove:
- the hub plug using tools **Rou. 943** + **Emb. 880,**
- the nut,
- the hub - drum assembly.



REFITTING

Remove all dust from the drum and the linings using brake cleaner.

Fit:
- the drum,
- the nut and torque tighten it (if removed),
- the plug, applying grease if necessary.

Adjust:
- the linings by repeatedly pressing the brake pedal,
- the handbrake (see section 37 "Controls") if necessary.

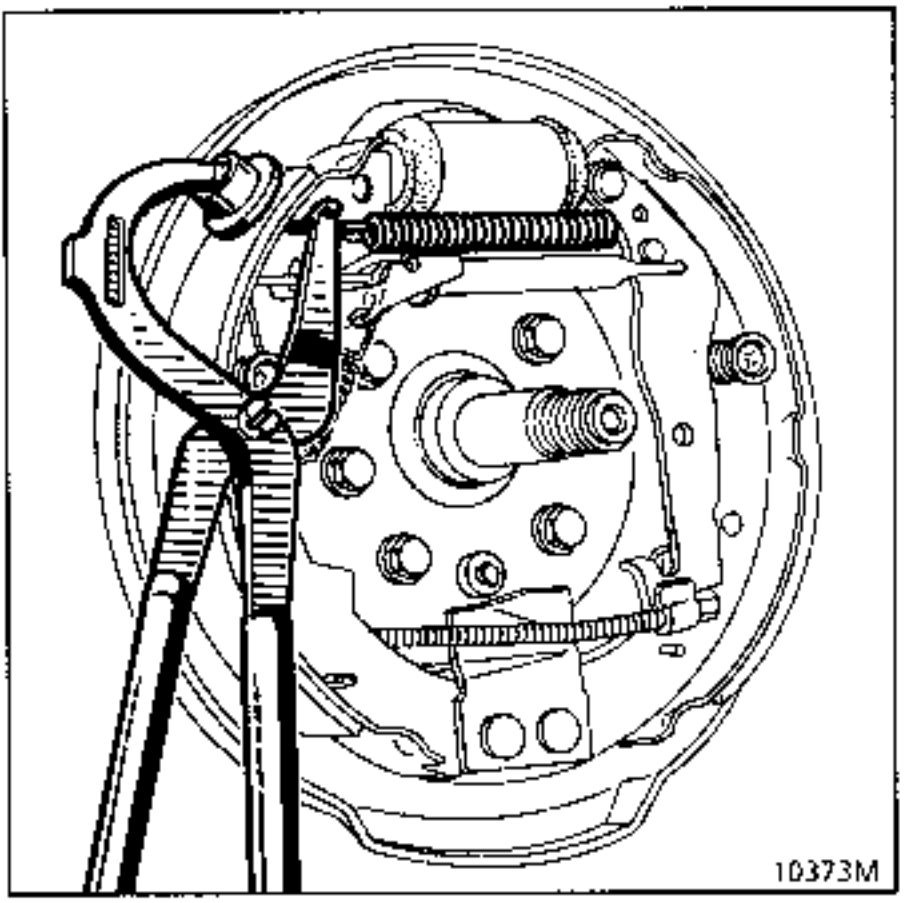
EQUIPMENT REQUIRED

Brake shoe spring pliers

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Pipe union bolt	1.7

REMOVAL

Remove:
- the hub - drum assembly (protect the inner bearing ring using a cloth),
- the upper return spring using brake shoe pliers.



Separate the brake shoes.

Unscrew:
- the rigid pipe union on the brake cylinder,
- the two cylinder mounting bolts

Remove the brake cylinder.

REFITTING

Check the condition of the shoes. If they have traces of oil on them, renew them.

Refitting is the reverse of removal.

Bleed the braking circuit.

Adjust the linings by repeatedly pressing the brake pedal.

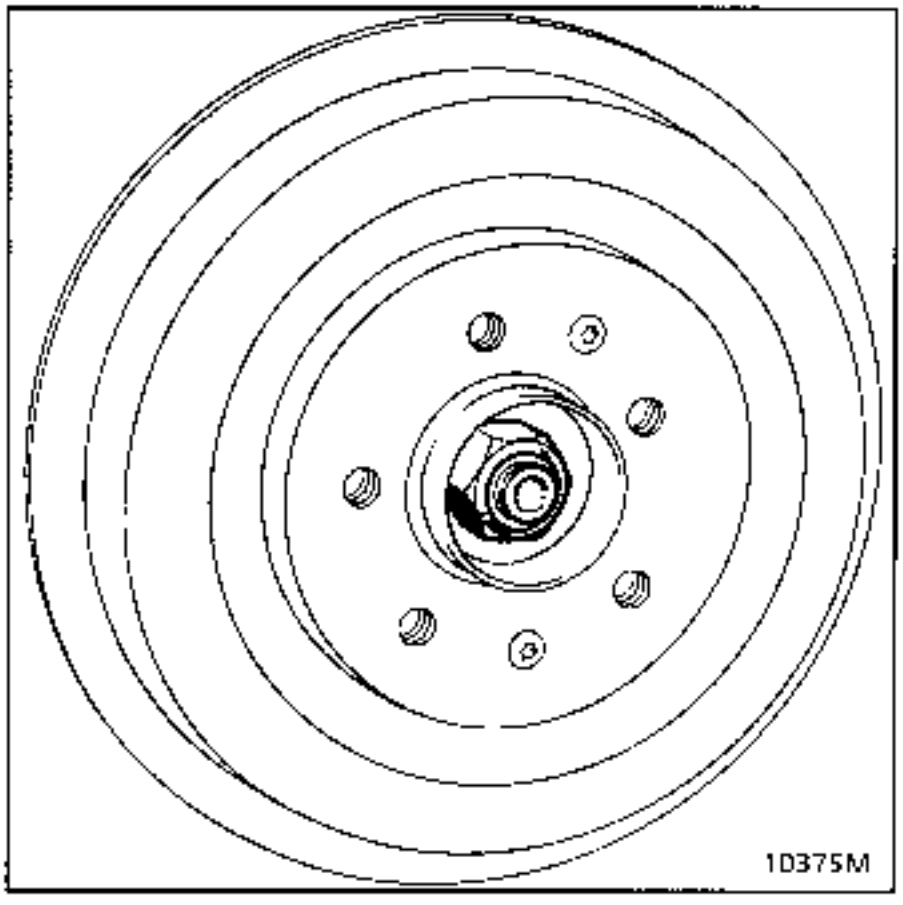
SPECIAL TOOLING REQUIRED	
Fre. 573-01	Handbrake cable pliers
EQUIPMENT REQUIRED	
Brake shoe spring pliers	

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Stub axle nut	17

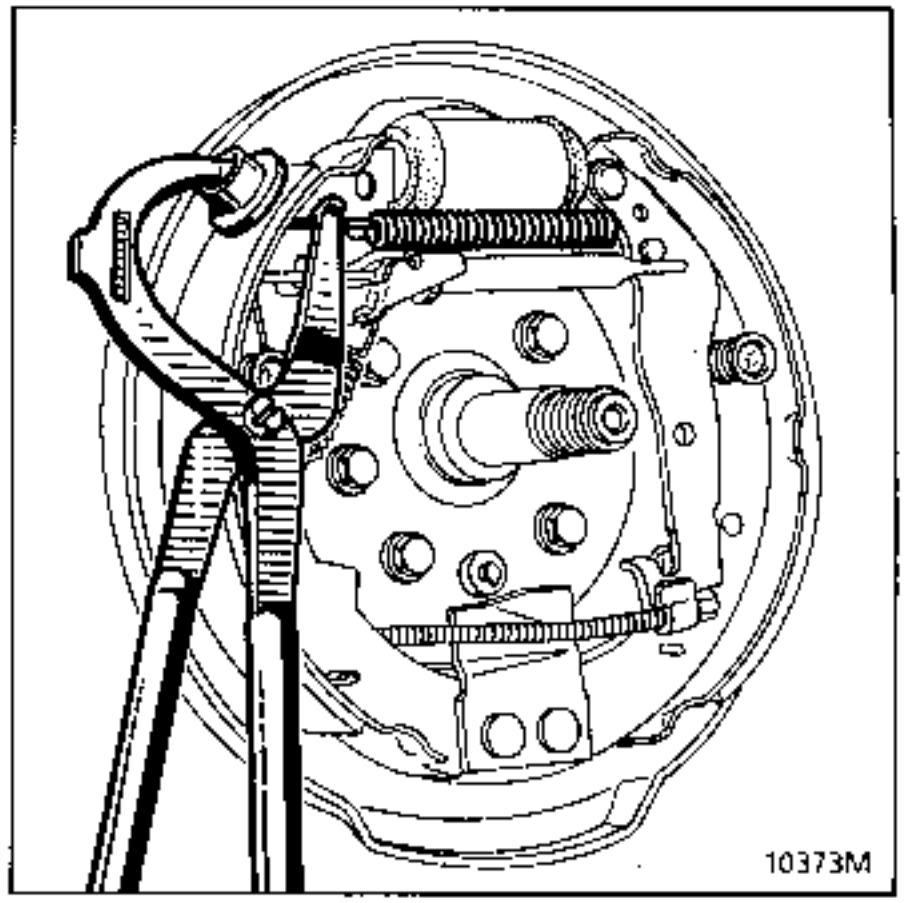
REMOVAL

Slacken the handbrake cables at the central adjuster.

Remove:
- the hub plug
- the hub - drum - nut assembly (see section on drum).

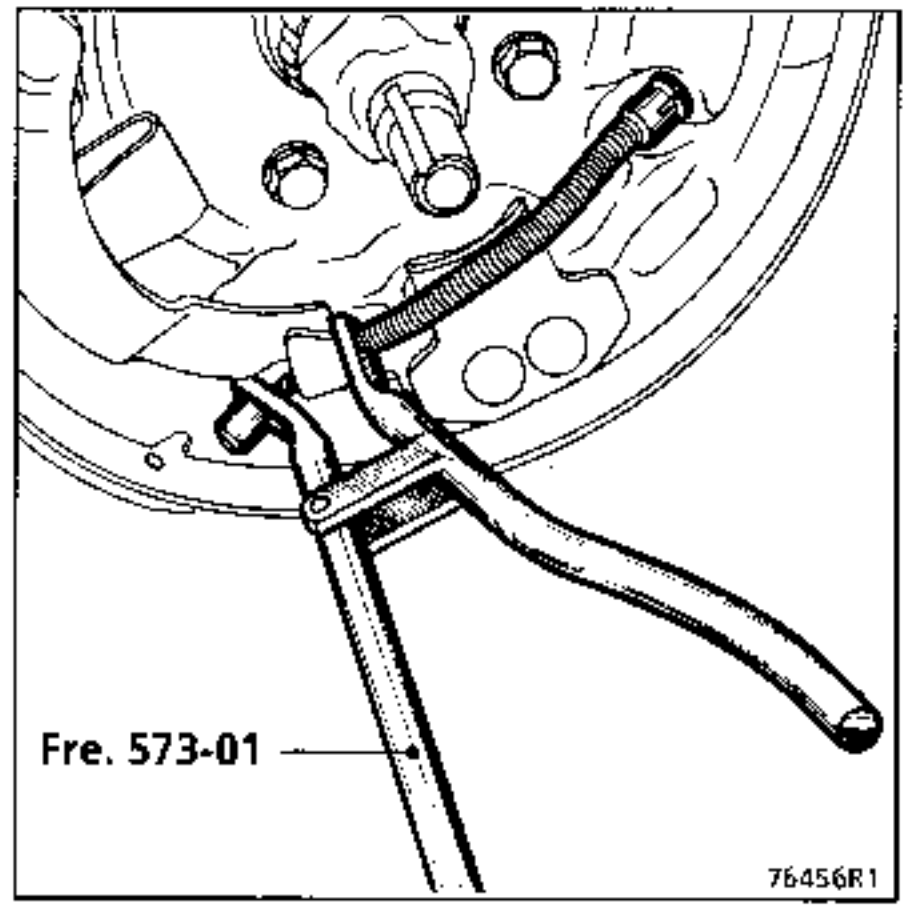


Protect the inner bearing ring using a cloth.

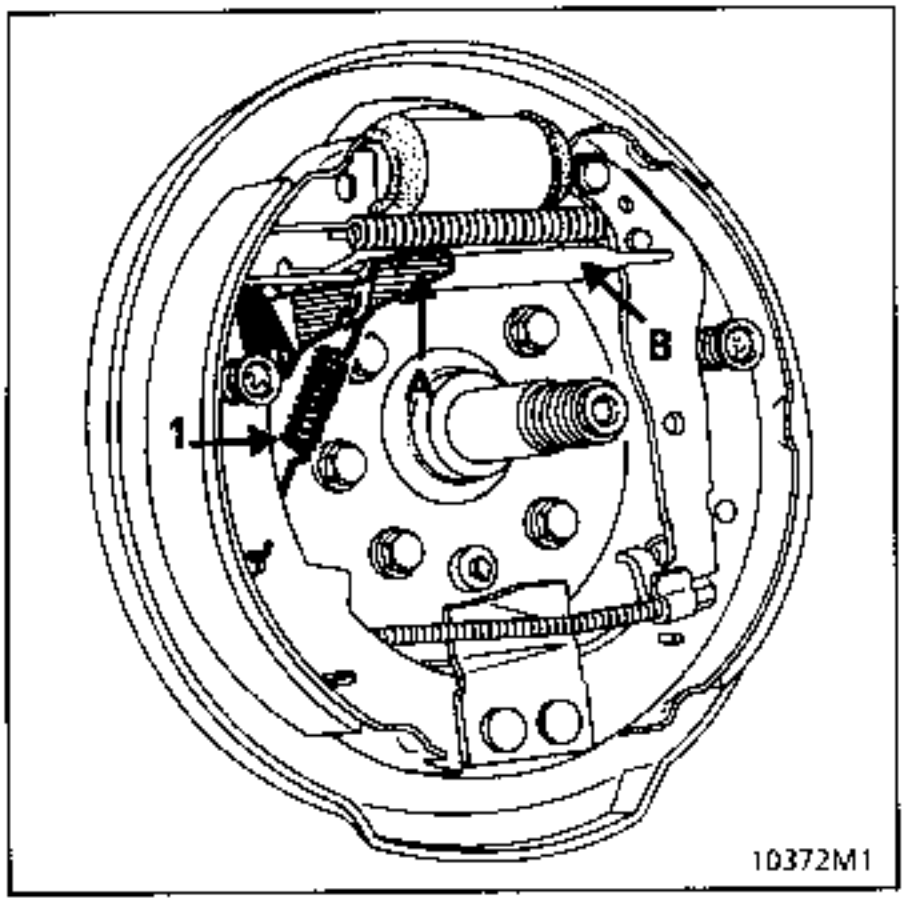


Remove:

- the upper return spring,
- the handbrake cable using tool Fre. 573-01,



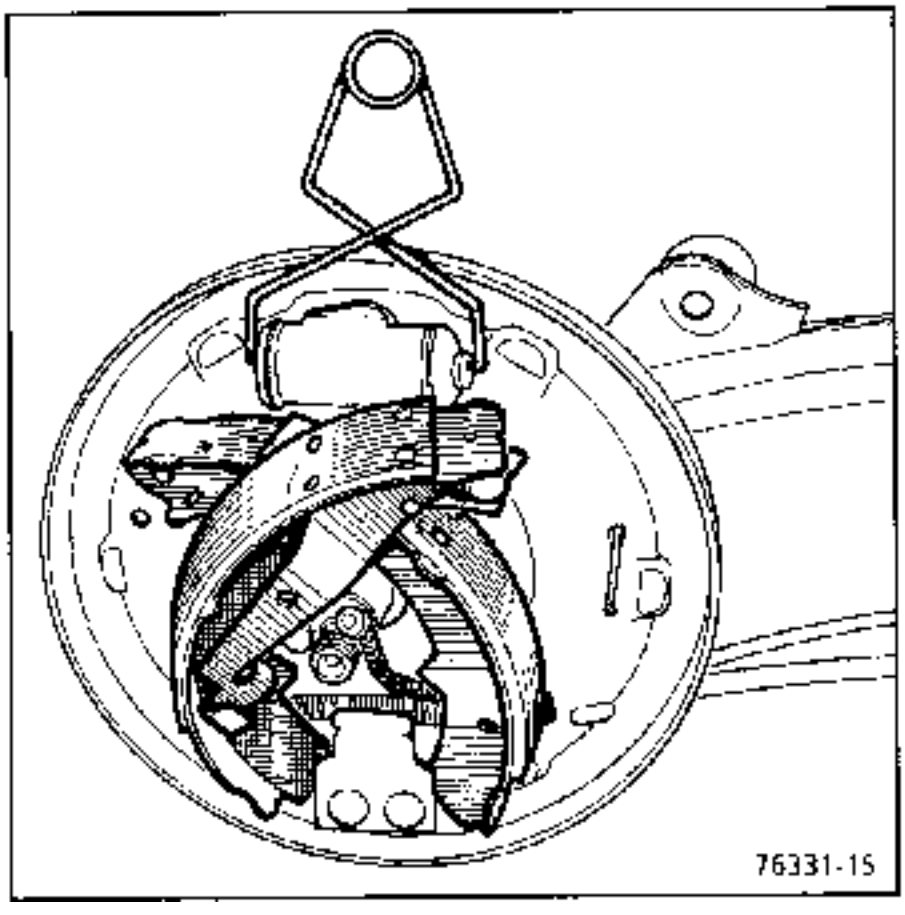
- the spring (1) which tensions the adjustment lever (A),
- the adjustment lever (A),



- the shoe retaining system (press and turn through a quarter turn),
- the adjusting pressure bar (B).

Without ABS sensor:

Remove the shoes by crossing them over on the stub axle to release the lower spring behind the fixed point bracket.



With ABS sensor:

Cross the shoes on the stub axle. Release the spring from one shoe (using a screwdriver if necessary) then release the other.

REFITTING

Remove all dust from the drums and backing plates.

Fit the brake shoes:

Without ABS sensor:
Hook the lower spring onto the shoes.

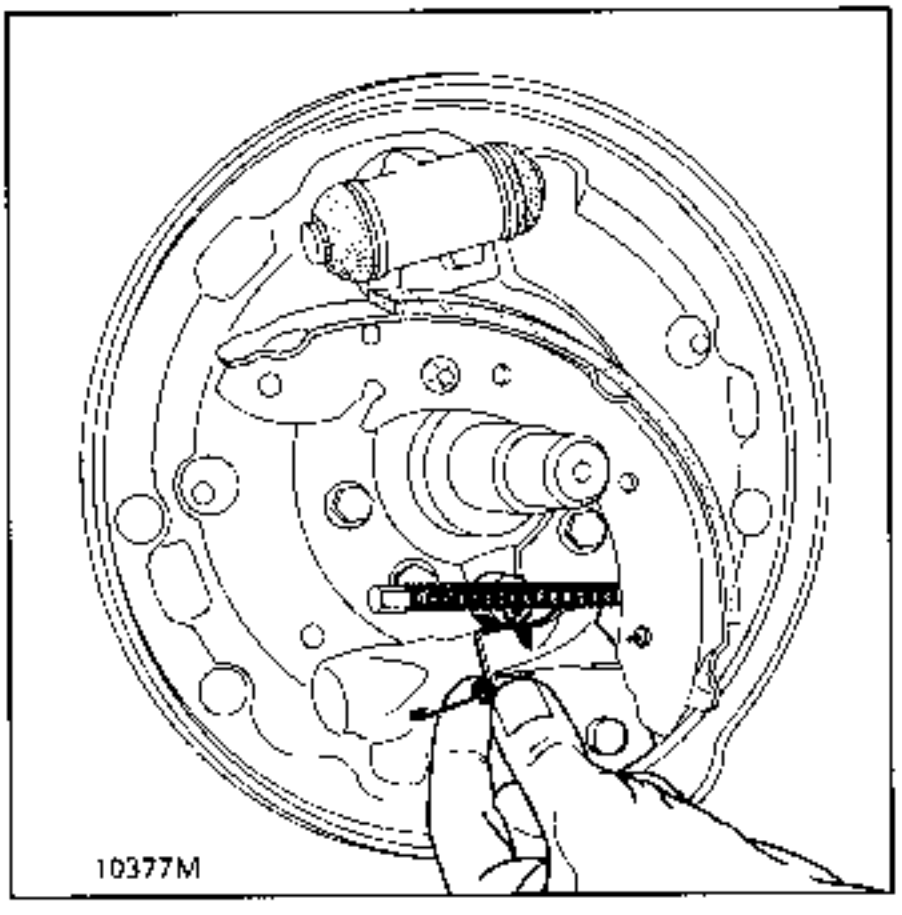
Cross the shoes over on the stub axle.

Push the lower spring behind the fixed point bracket.

With ABS sensor:
Fit the spring behind the fixed point.

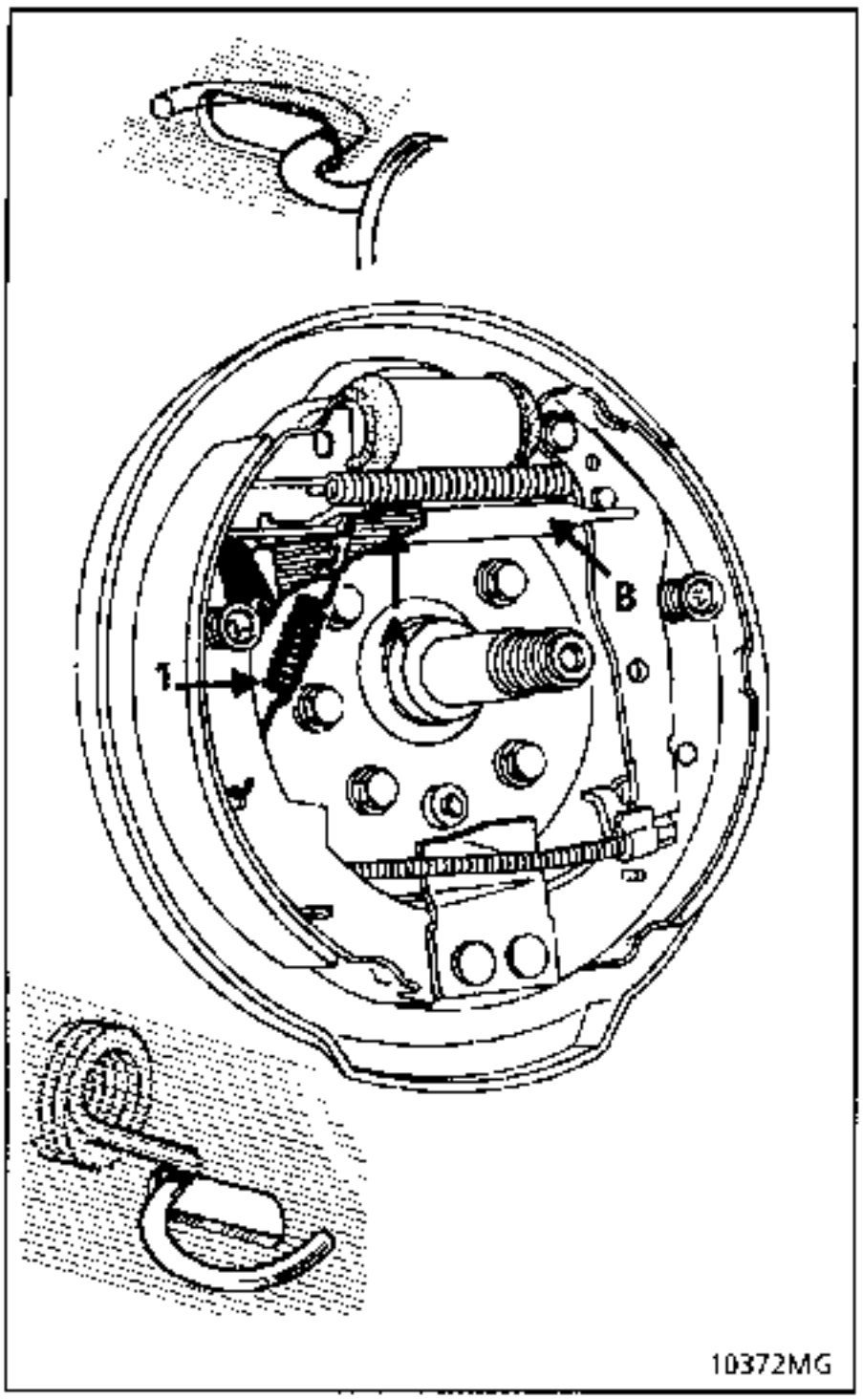
Attach the spring to one of the shoes.

Cross the shoes over and then attach the spring to the second shoe.



Fit:

- the adjustment pressure bar (A),
- the shoe retaining system (press and turn through a quarter turn),
- the upper return spring,
- the spring (1) which tensions the adjustment lever,
- the adjustment lever (B).



10372MG

Reconnect the handbrake cable: use tool Fre.573-01 and set the lever against the shoe.

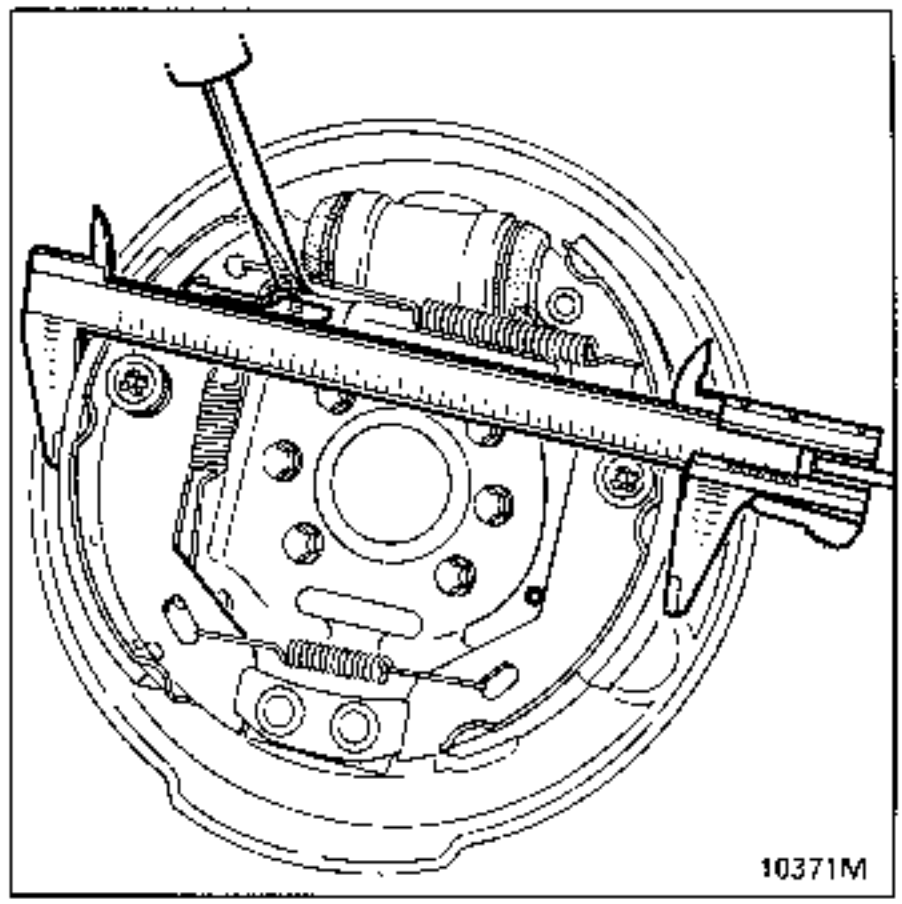
Check the ends of the upper and lower springs are correctly positioned on the shoes.

ADJUSTMENT

Pre-adjusting the automatic wear compensation system

Using a screwdriver, adjust the brake shoe diameter using the notched segment on bar (B) to give a diameter of 228mm.

Refit the hub - drum assembly (without tightening the nut).


10371M

Centre the linings by repeatedly pressing the brake pedal (engine running).

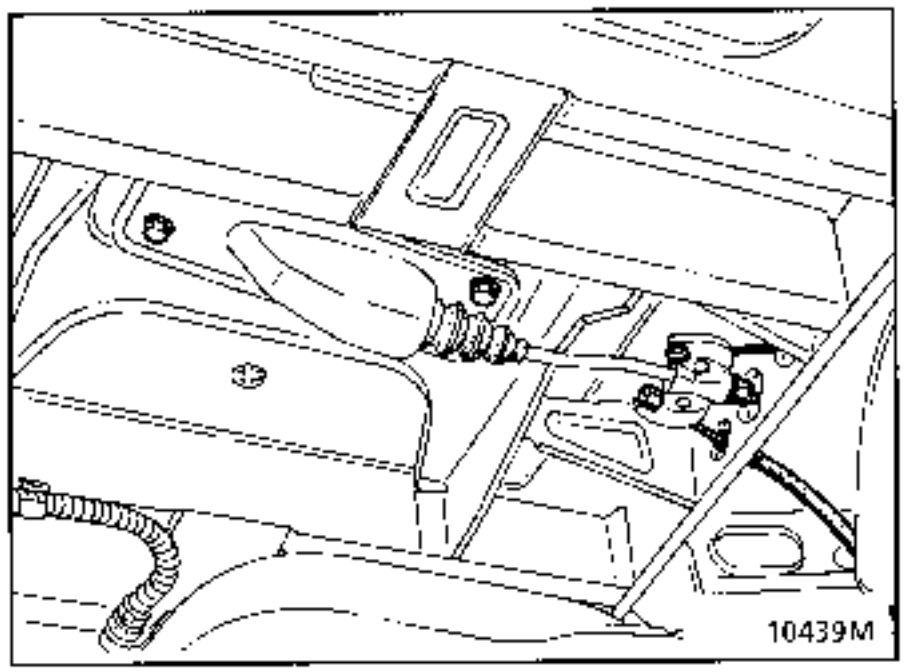
Rotate the drum, which should rub lightly on the linings while turning freely.

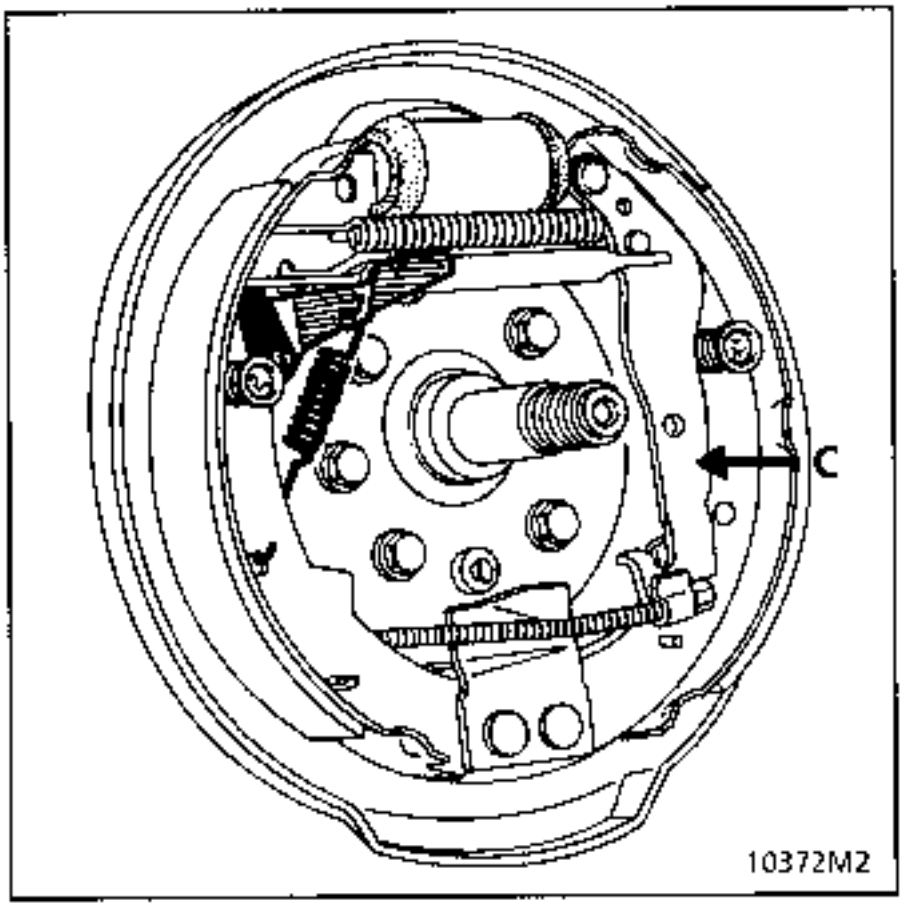
If this is not the case, slacken or tighten the adjustment system by one or more notches.

Adjust the handbrake.

ADJUSTING THE HANDBRAKE:

Progressively tighten the cables at the central adjustor so that levers (C) **start to move between the 1st and 2nd notch** of the control lever travel and remain applied from the 2nd notch.





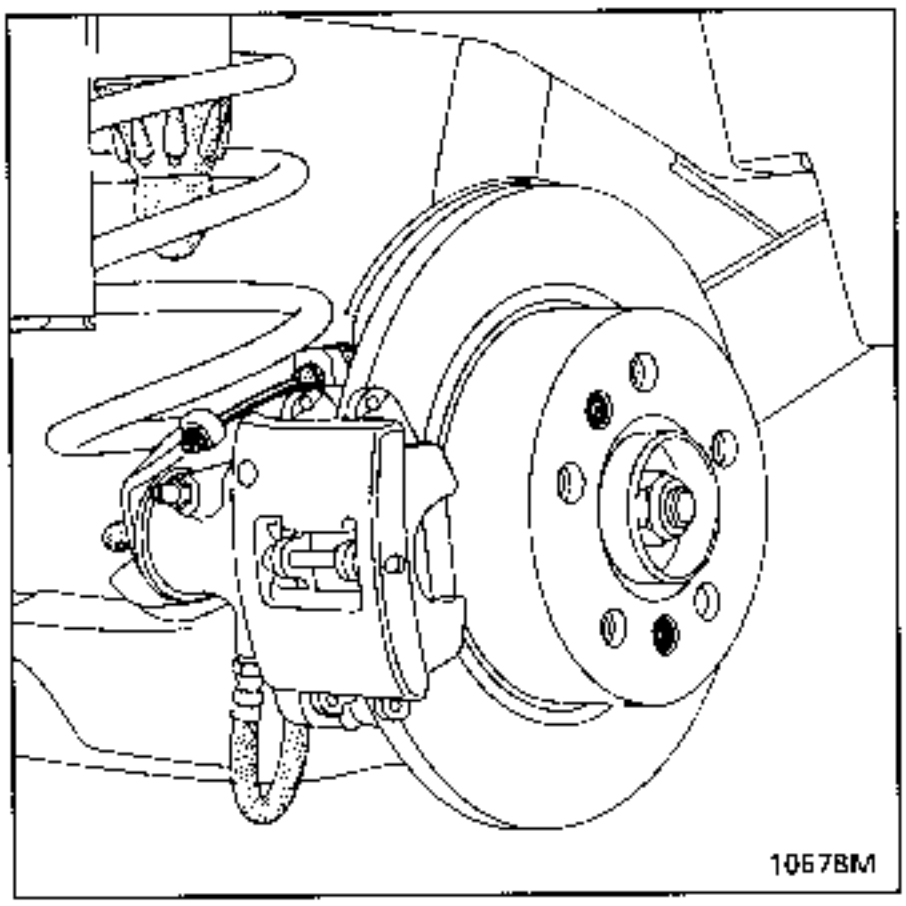
Refit:

- the drums and torque tighten the nuts,
- the hub plugs, applying grease if necessary,
- the plugs on the backing plates (if removed).

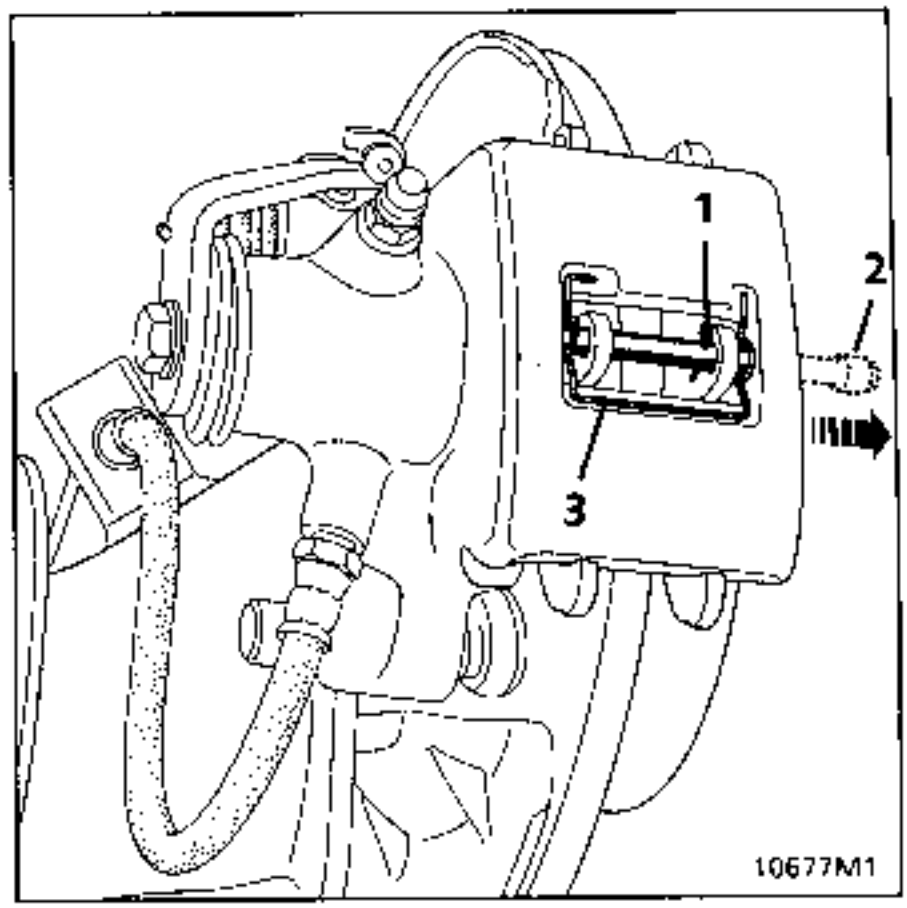
SPECIAL TOOLING REQUIRED	
Fre. 1190	Tool for pushing BREMBO caliper piston back

TIGHTENING TORQUES (in daN.m)	
Wheel bolts	10
Secondary caliper retaining bolt	3.5
Primary caliper retaining bolt	7

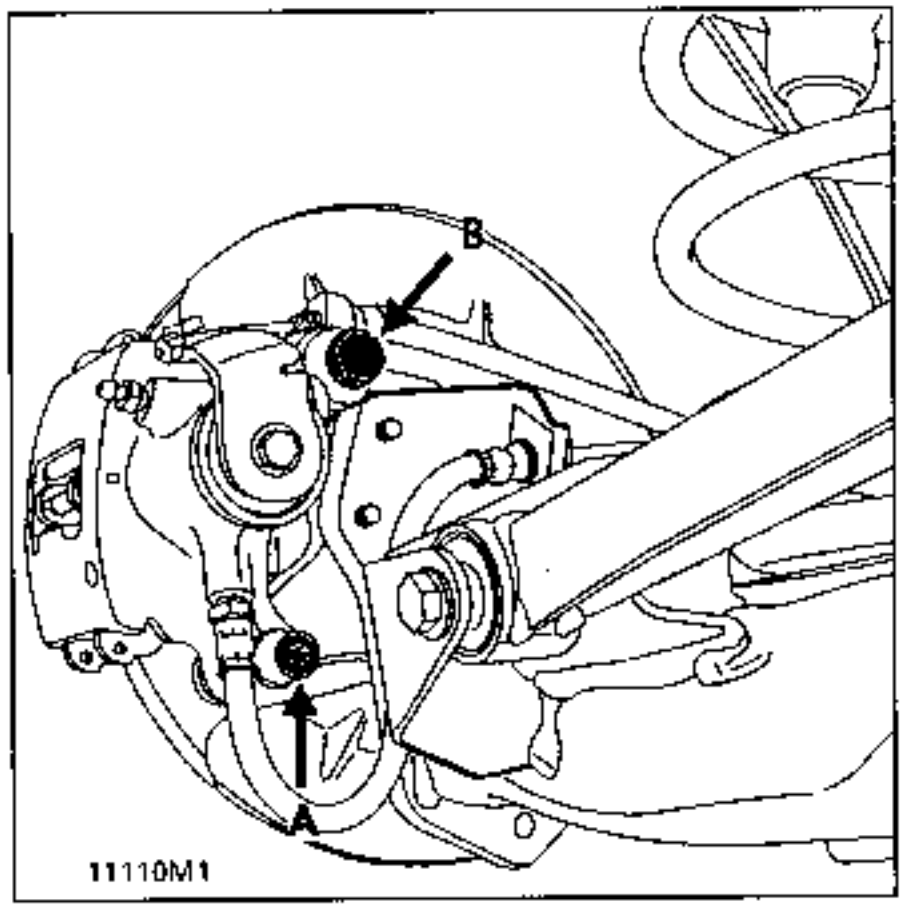
REMOVAL



Remove:
- the roll pin (1),

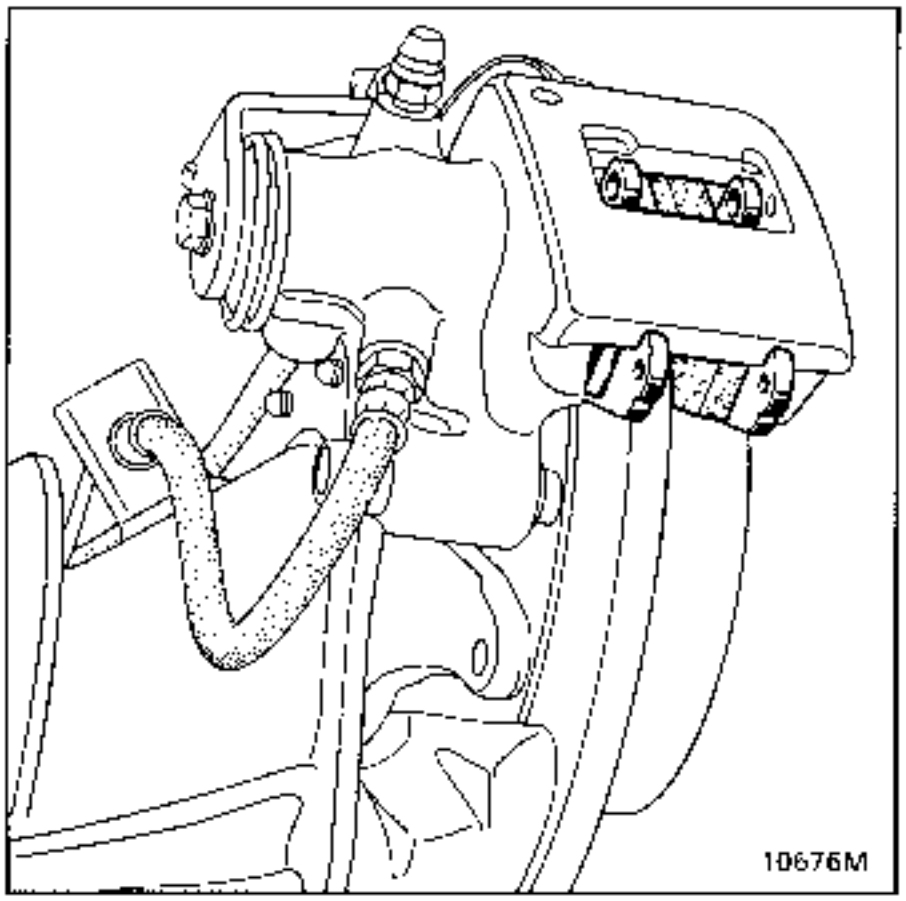


- the pad retaining pin (2) using a roll pin punch,
- the spring (3),



- the secondary caliper retaining bolt (A).

Pivot the caliper around the primary caliper retaining bolt (B).



Remove the outer pad then the inner pad.

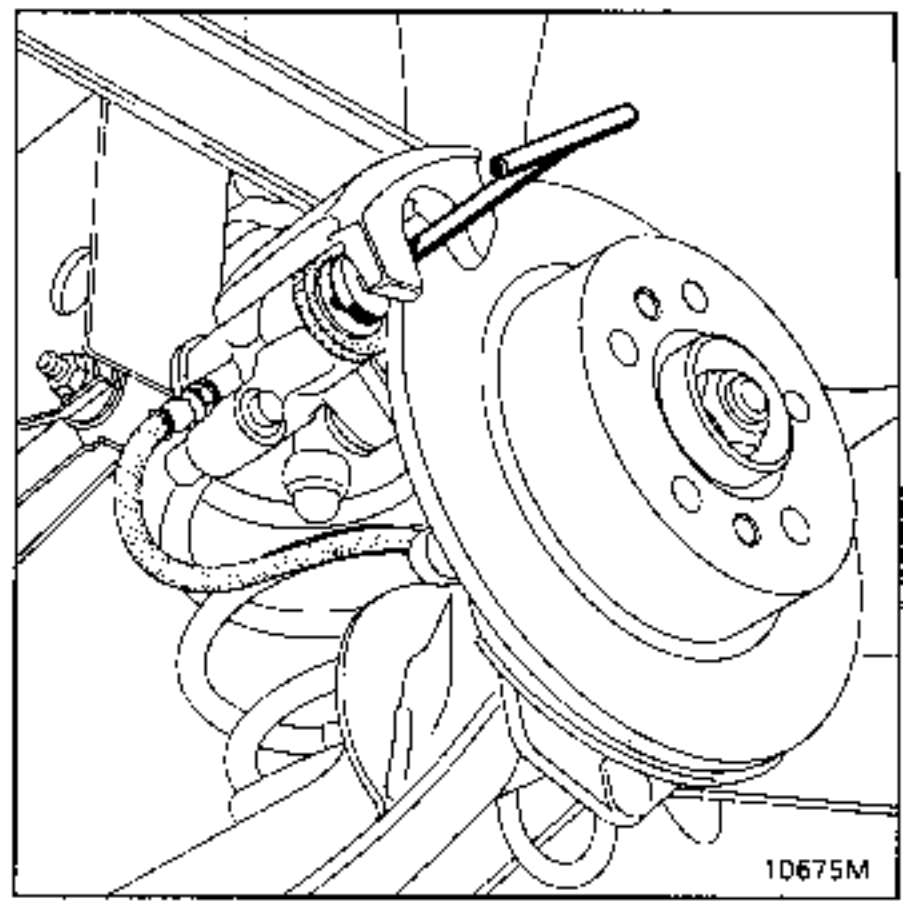
CHECKING

Check:
- the condition and mounting of the dust cover for the piston and the springs,
- that the caliper slides correctly on the primary retaining bolt.

REFITTING

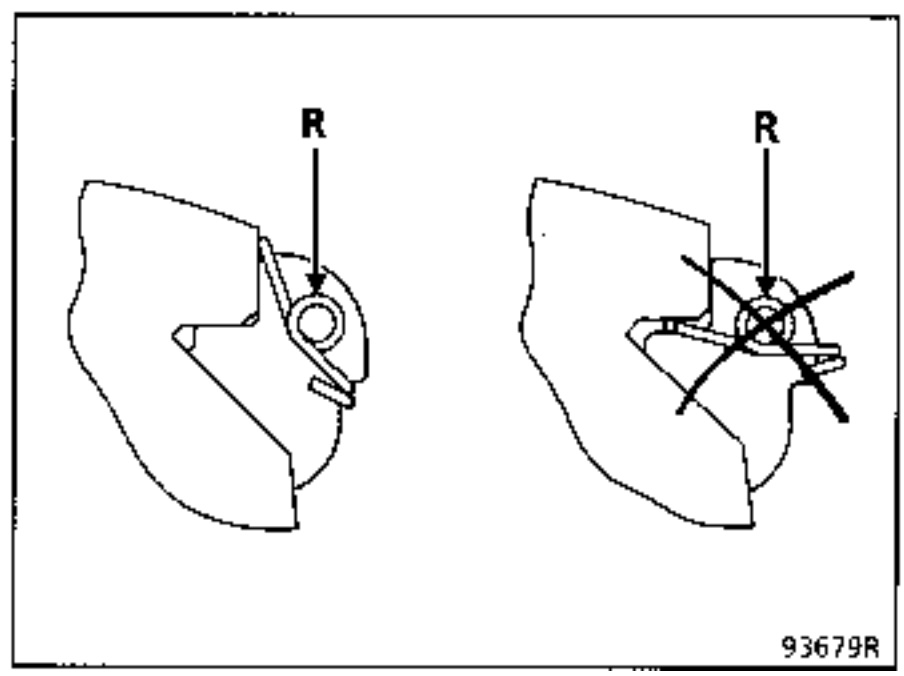
Push the piston back in while turning it using tool **Fre. 1190** until it reaches the bottom of its bore.

NOTE: If necessary, to fit the tool, slacken the primary caliper retaining bolt (B).



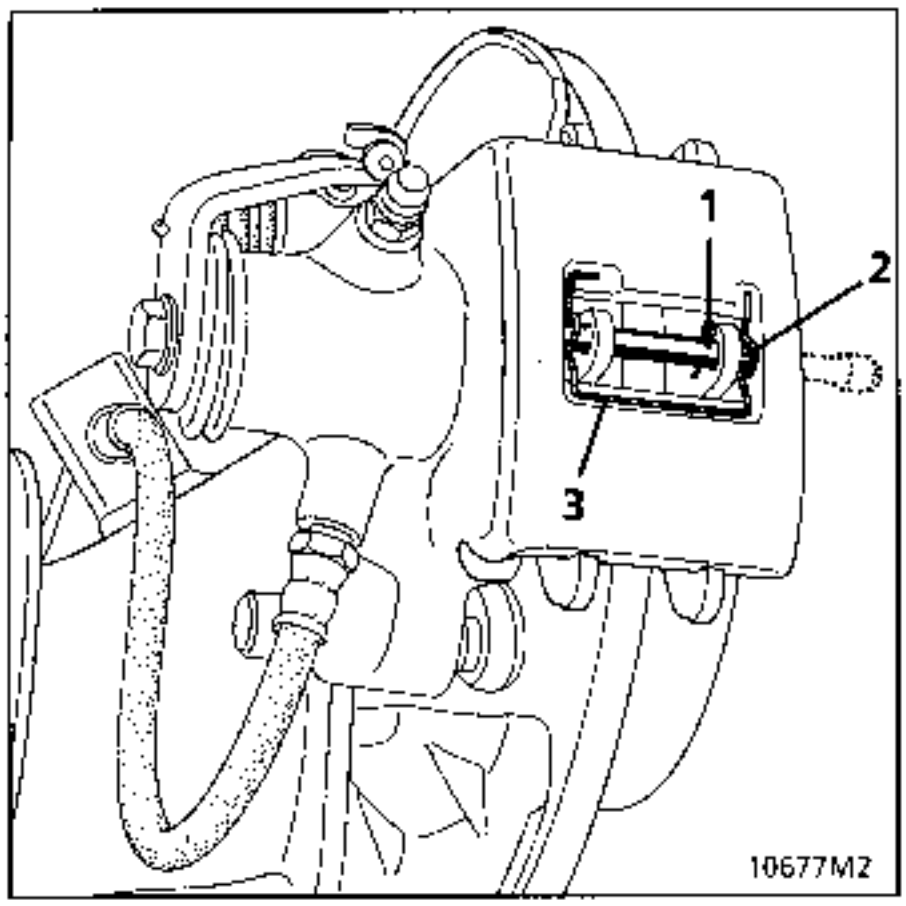
Fit the new pads, the inner one first.

IMPORTANT: the side springs (R) MUST be correctly positioned.



Refit the caliper into its operating position and fit the secondary caliper retaining bolt (A), coated with **Loctite FRENBLOC** and tighten it to the recommended torque.

NOTE : If you have removed the primary caliper retaining bolt (B) this must be refitted first, coated with **Loctite Frenbloc** and tightened to the correct torque.

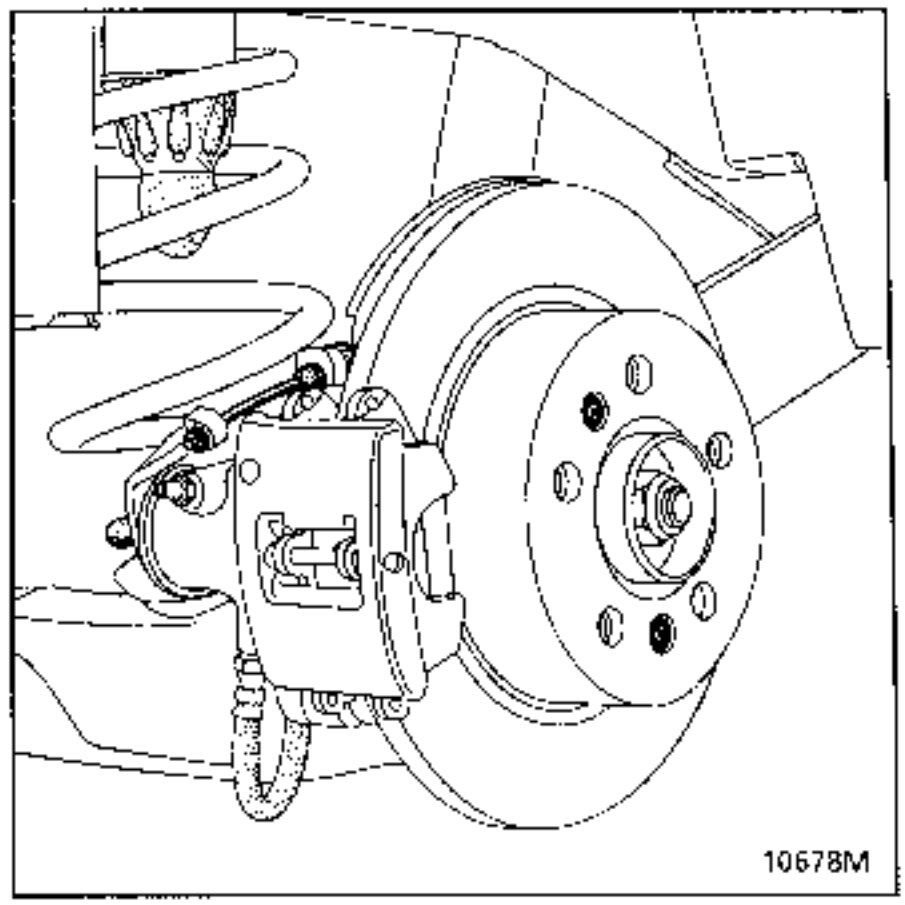


Position the pad retaining pin (2), fitting it through the coils of the spring (3).

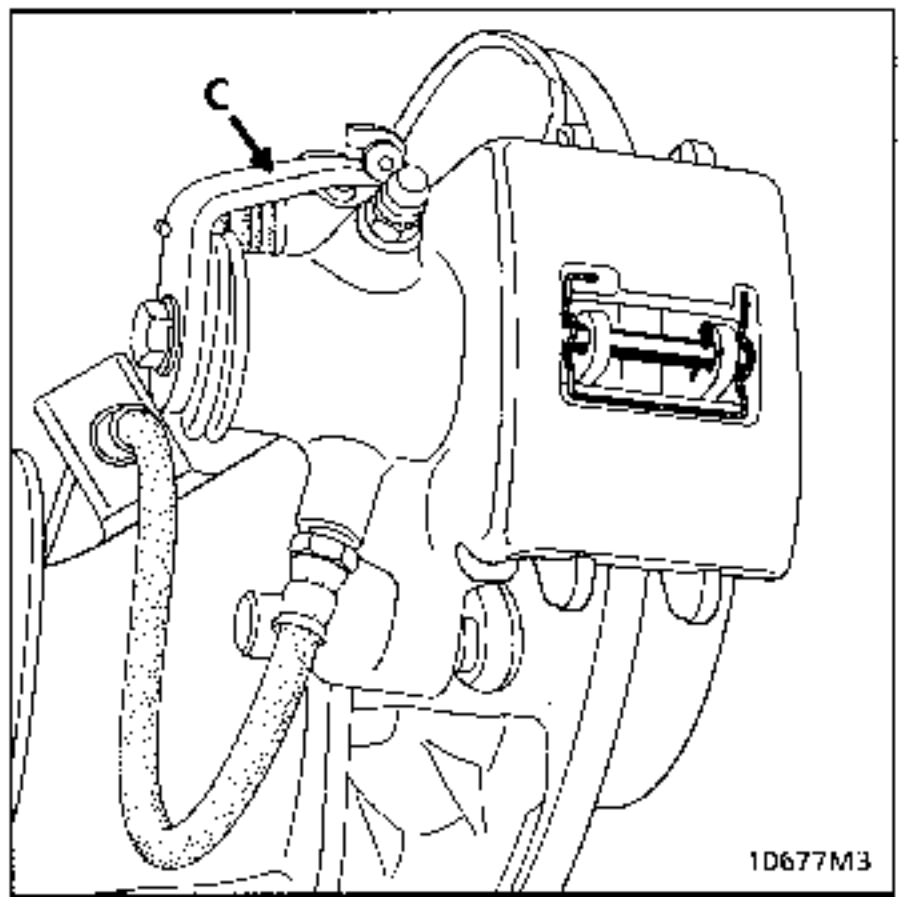
Clip the retaining pin into position using a roll pin punch.

Refit the safety pin (1).

Press the brake pedal several times to bring the piston into contact with the pads.



Check the handbrake adjustment.
Levers (C) **should start to move between the 1st and 2nd notch** of the control lever travel and remain applied from the 2nd notch.



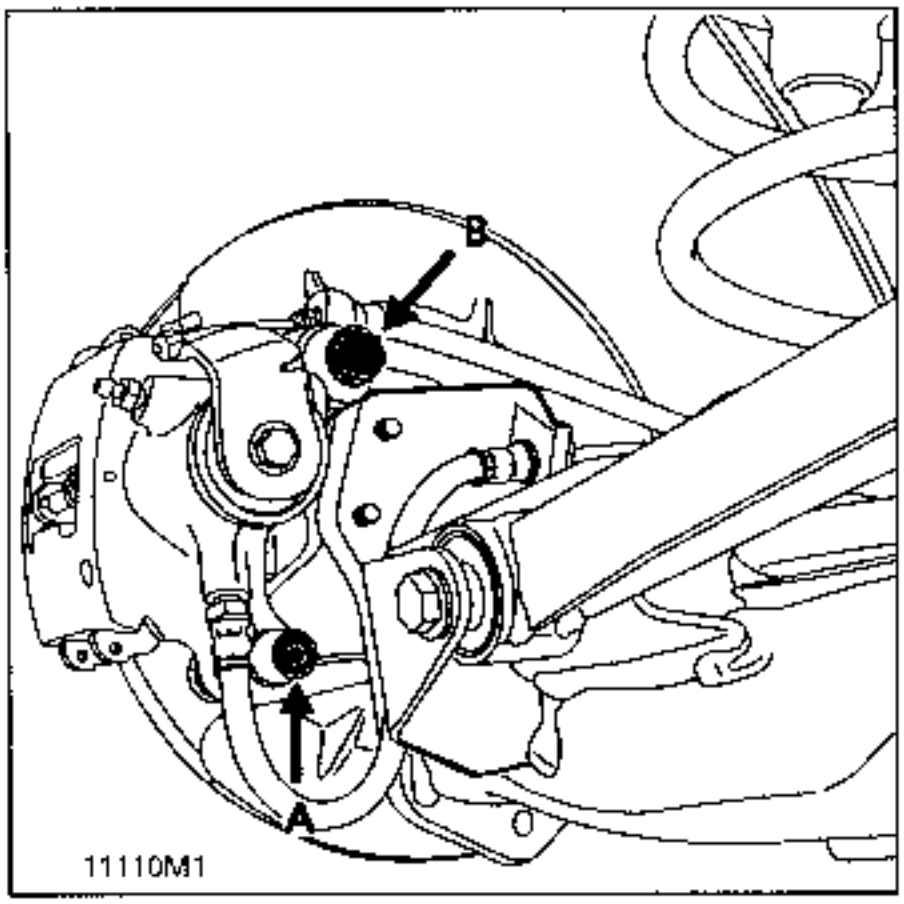
TIGHTENING TORQUES (in daN.m)	
Wheel bolts	10
Secondary caliper retaining bolt	3.5
Primary caliper retaining bolt	7

REMOVAL

Fit a pedal press to prevent brake fluid running out.

Release the brake pipe at the wheel cylinder end.

Remove:
- the brake pads (see corresponding section),
- the handbrake cable,
- the primary caliper retaining bolt (B).



Unscrew the pipe.

Check the condition of the pipe and renew it if necessary (see replacing a pipe).

If the caliper is to be renewed, the pipe must be systematically renewed.

REFITTING

Refitting is the reverse of removal.

Screw the brake pipe back on.

Check the condition of the pads. If they are greasy, renew them.

Refit the pads (see corresponding section).

The primary and secondary caliper retaining bolts must be coated with **Loctite Frenbloc** and tightened to the correct torque.

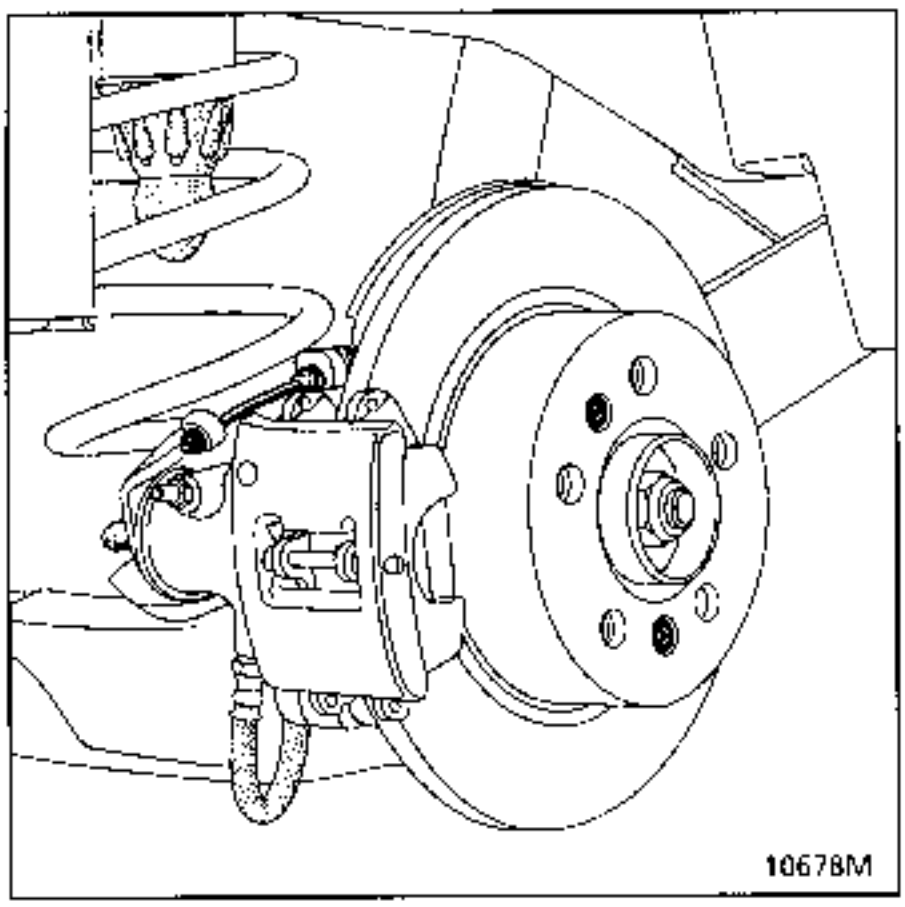
Press the brake pedal several times to bring the piston into contact with the pads.

Bleed the braking circuit.

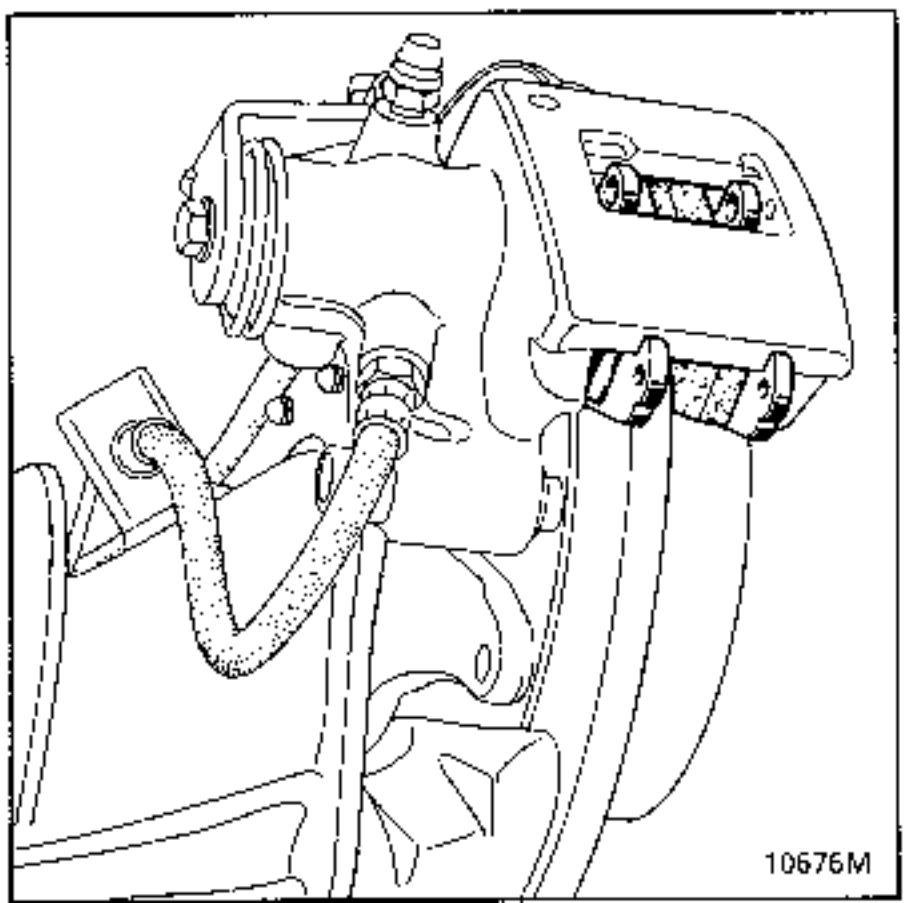
Brake discs cannot be reground. If they are too heavily worn or are scratched they must be replaced.

TIGHTENING TORQUES (in daN.m)	
Wheel bolts	10
Disc mounting bolt	1.5
Secondary caliper retaining bolt	3.5
Primary caliper retaining bolt	7

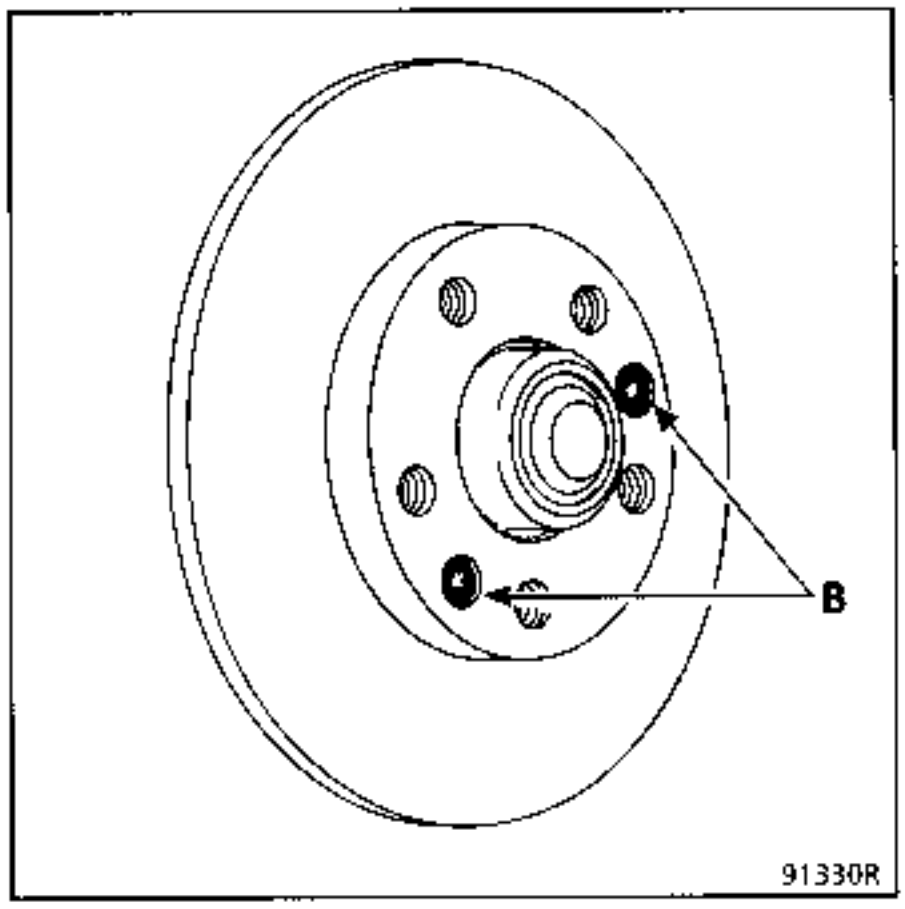
REMOVAL



Remove the brake pads (see corresponding section).



– the two disc mounting bolts (B), Torx allen key 30 .



REFITTING

Position the disc on the hub and secure it with the two bolts (B).

Refit new pads.

Coat the secondary caliper retaining bolt with Loctite **FRENBLOC** and tighten it to the correct torque.

Press the brake pedal several times to bring the piston into contact with the pads.

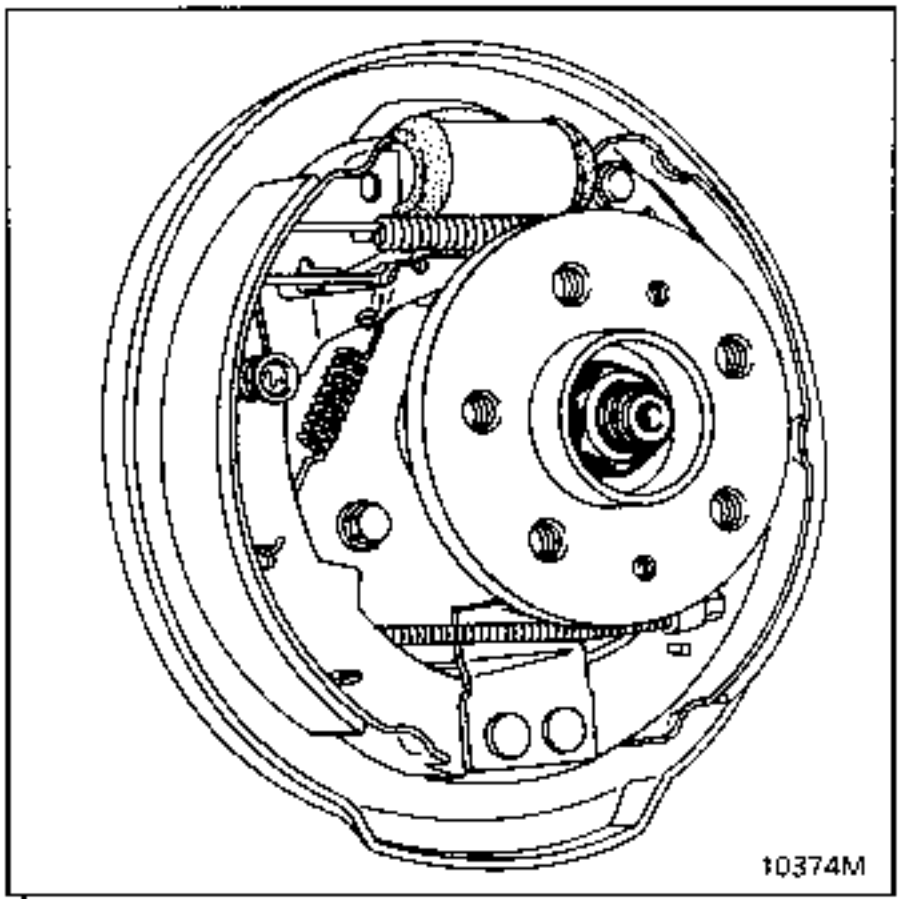
These vehicles are fitted with rear hubs with integral bearings.
The bearing cannot be removed from the hub. If one of the components is faulty, the complete assembly requires replacement.

SPECIAL TOOLING REQUIRED	
Emb. 880	Inertia extraction tool
Rou. 943	Hub cover plug extractor

TIGHTENING TORQUES (in daN.m)	
Stub axle nut	17
Wheel bolt	10

REMOVAL

Remove:
- the hub plug using tools **Rou. 943 + Emb. 880,**
- the drum or disc (see corresponding section),
- the hub - nut assembly,
- the inner cage.



REFITTING

Lubricate the stub axle using **SAE W 80 oil.**

Fit:
- the hub and torque tighten it,
- the drum or disc (see corresponding section).
- the hub plug, adding grease if necessary.

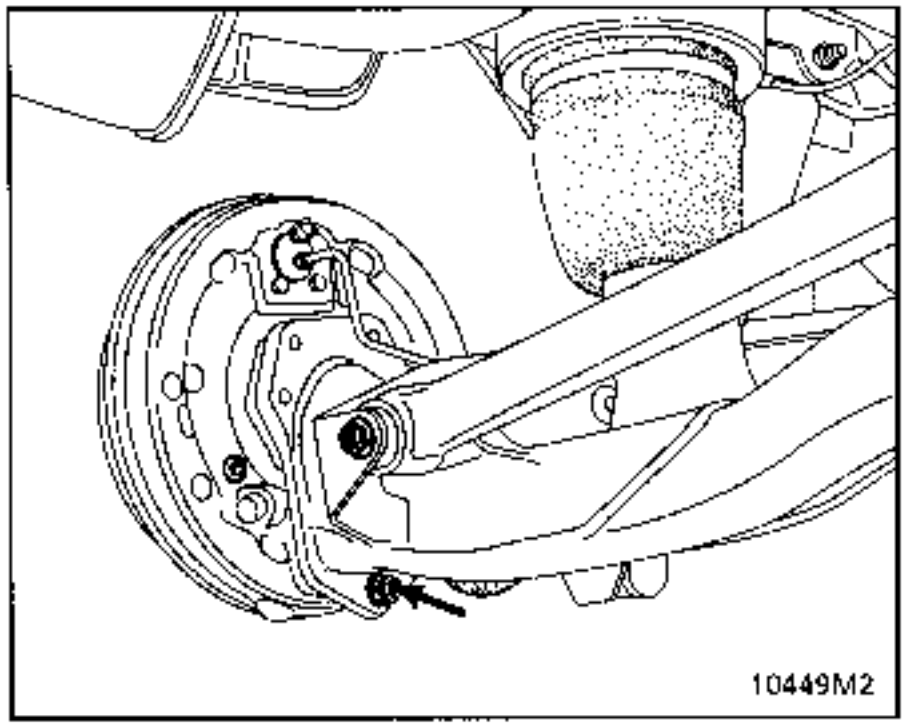
TIGHTENING TORQUES (in daN.m)	
Stub axle nut	17
Wheel bolt	10
Stub axle mounting bolt	3
Union bolt	1.7

REMOVAL

Remove the hub - drum - nut assembly (see section on brake drum).

Disconnect the hydraulic union from the wheel cylinder.

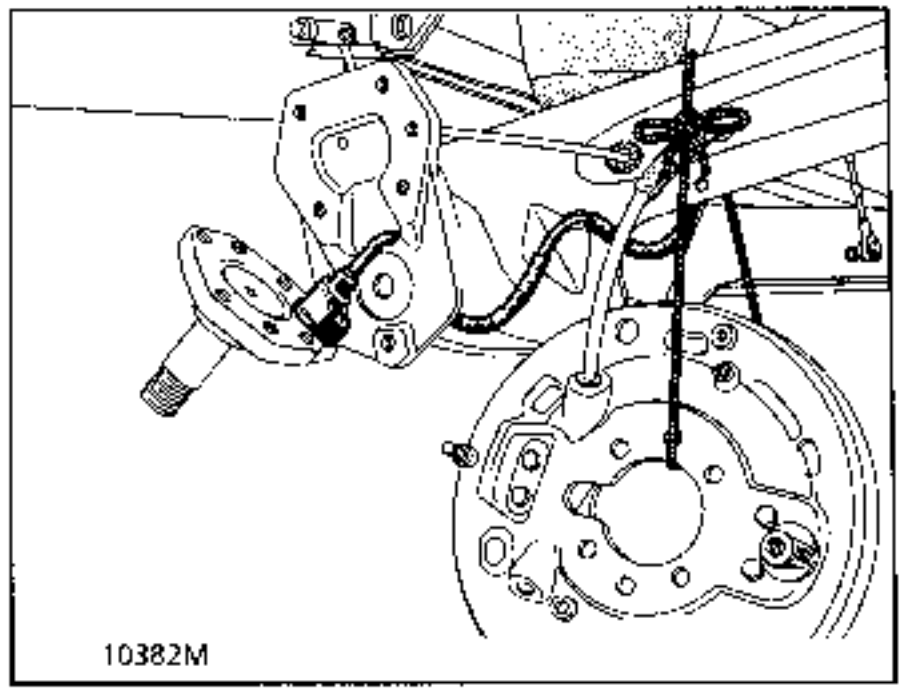
Remove:
- the backing plate tensioning stud nut, noting its position for refitting,



- the six mounting bolts for the backing plate and the stub axle.

Attach the backing plate to the axle with string.

Remove:
- the ABS sensor bolt (if fitted).



REFITTING

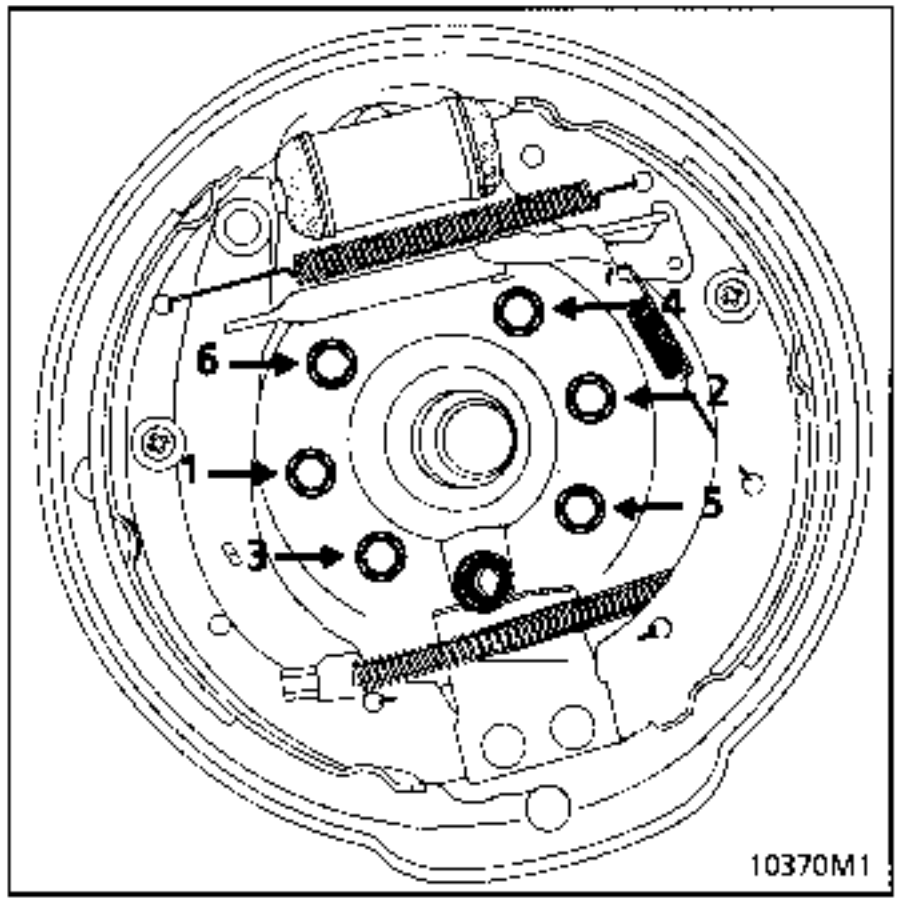
Refitting is the reverse of removal.

If the stub axle mounting bolts are re-used, they must be coated with Loctite FRENBLOC.

Tighten the stub axle bolts in the order 1-2-3-4-5-6 to a torque of **3 daN.m**.

Tighten the stub axle nut to a torque of **17 daN.m**.

Bleed the braking circuit.



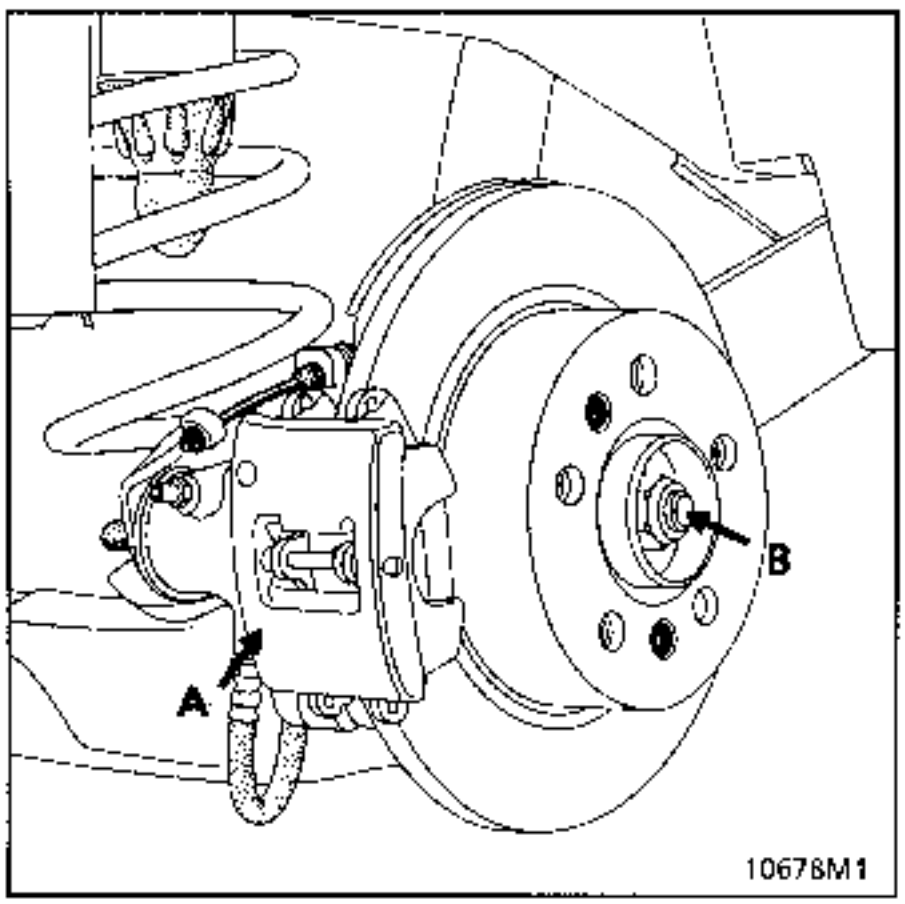
TIGHTENING TORQUES (in daN.m)	
Stub axle nut	17
Wheel bolt	10
Stub axle mounting bolt	3
Secondary caliper retaining bolt	3.5

REMOVAL

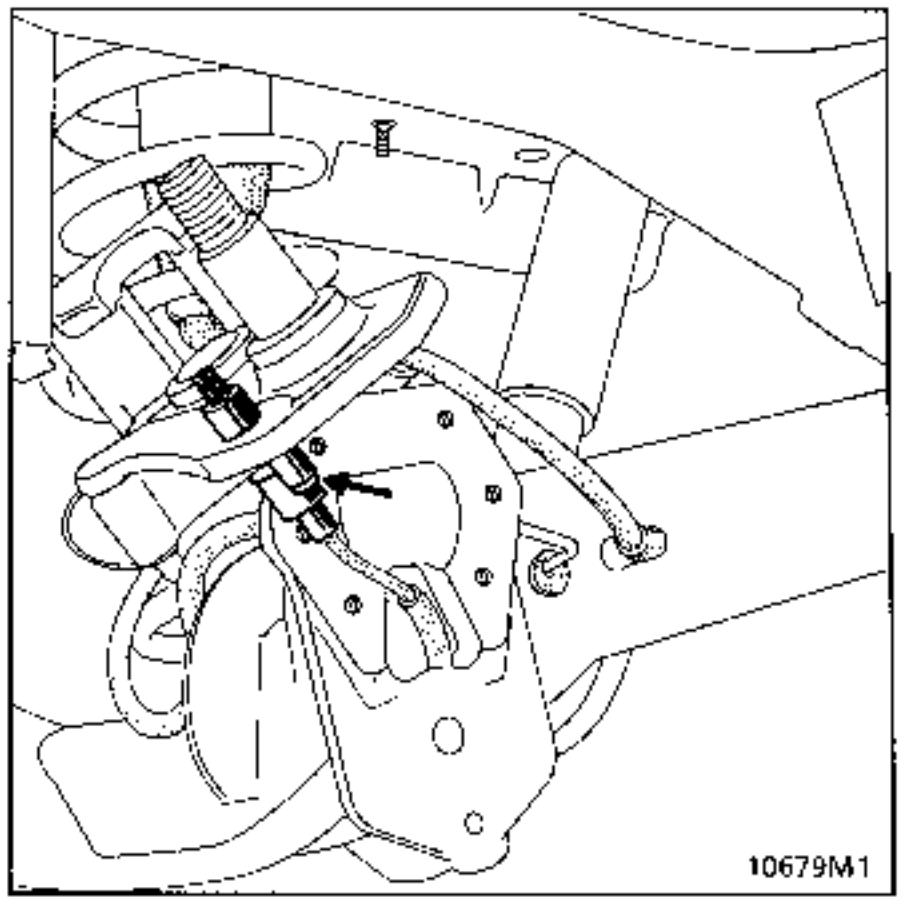
Remove:

- the brake caliper - pads assembly (A),
- the brake disc and the hub (B),

(see section concerned)



- the six stub axle mounting bolts,
- the ABS sensor bolt (if fitted).



REFITTING

Refitting is the reverse of removal.

If the stub axle mounting bolts are re-used, they must be coated with Loctite FRENBLOC.

Tighten the stub axle bolts in the order 1-2-3-4-5-6 (see previous page) to a torque of **3 daN.m**.

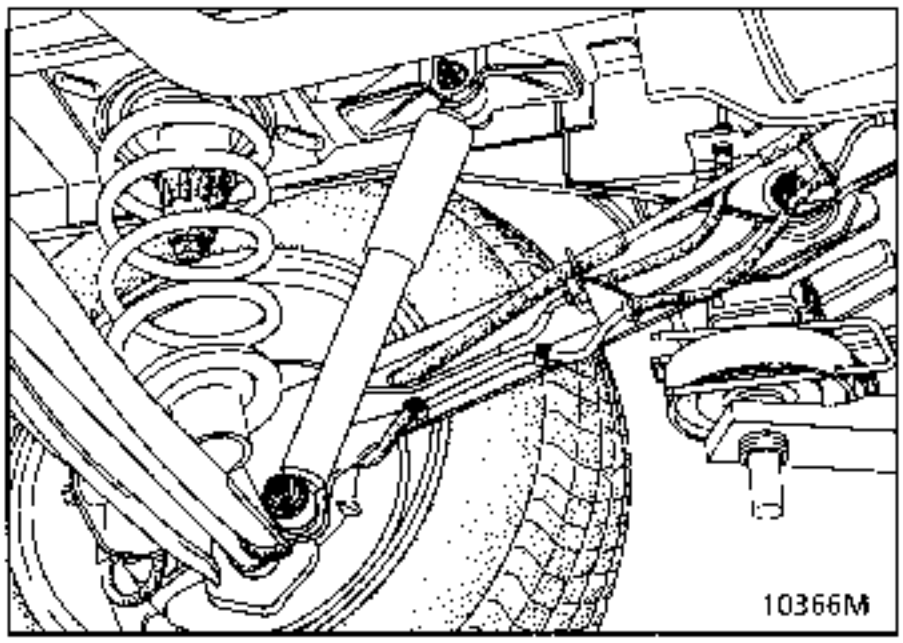
Tighten the stub axle nut to a torque of **17 daN.m**.

TIGHTENING TORQUES (in daN.m)	
Upper mounting bolt	6
Lower mounting bolt	2.5

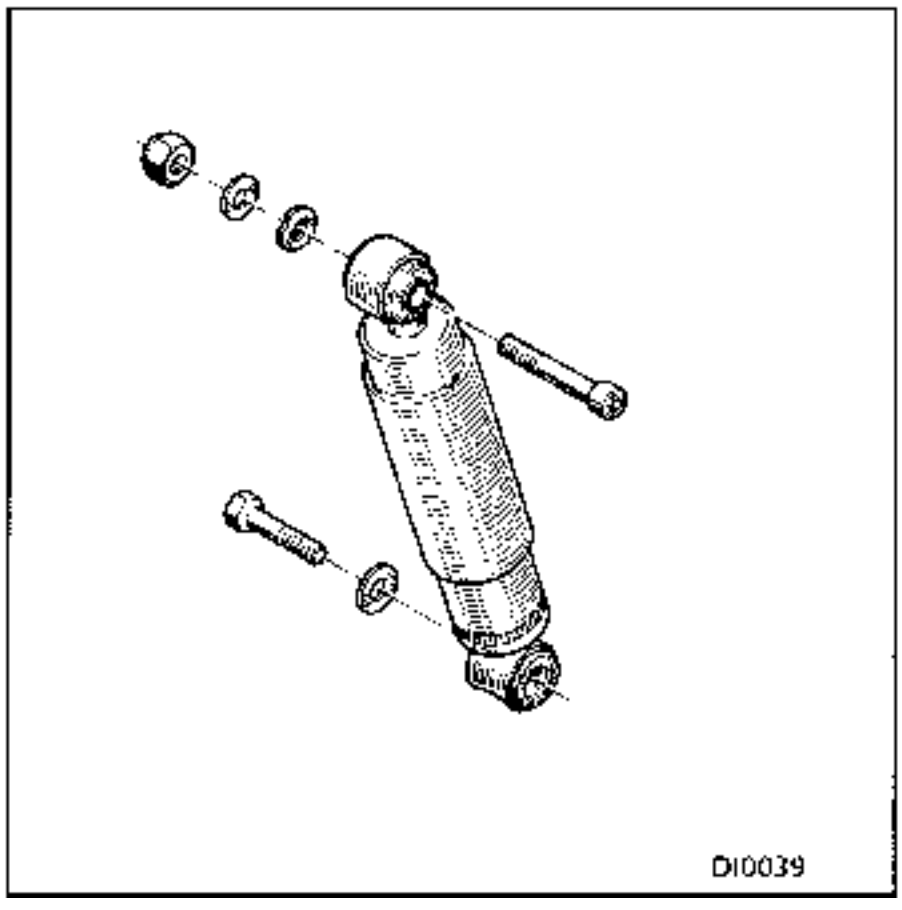
REMOVAL

Put the vehicle on a four post lift.

Fit a high axle stand under the emergency spare wheel (see section "Rear axle") and gently lower the lift.



Remove:
- the lower mounting,
- the upper mounting,
- the shock absorber.



REFITTING

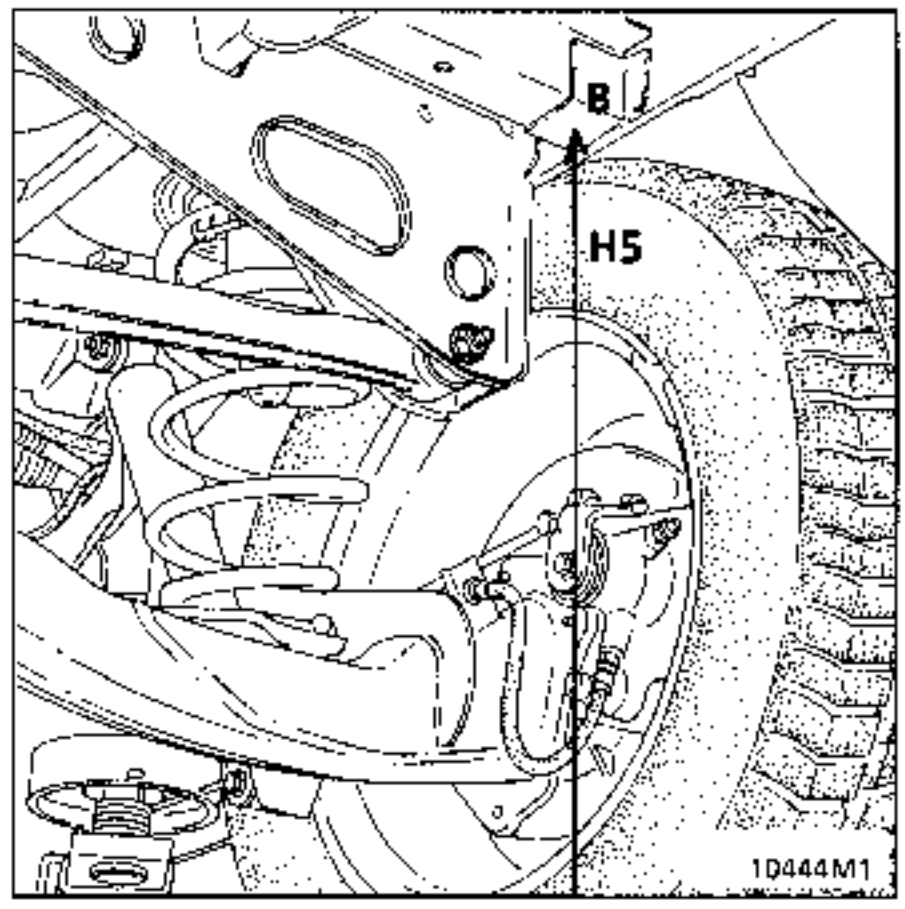
Fit the shock absorber and its mountings into position.

Set the vehicle to dimension **(H5)=408mm** measured between the floor 3rd row cross member and the ground.

To do this:
- compress the axle assembly using straps,
- or load the vehicle;

this dimensions corresponds to the vehicle having 4 persons on board with 5 seats, fuel tank full and a 50kg load. Check dimension (H5).

Torque tighten the two bolts, vehicle laden.



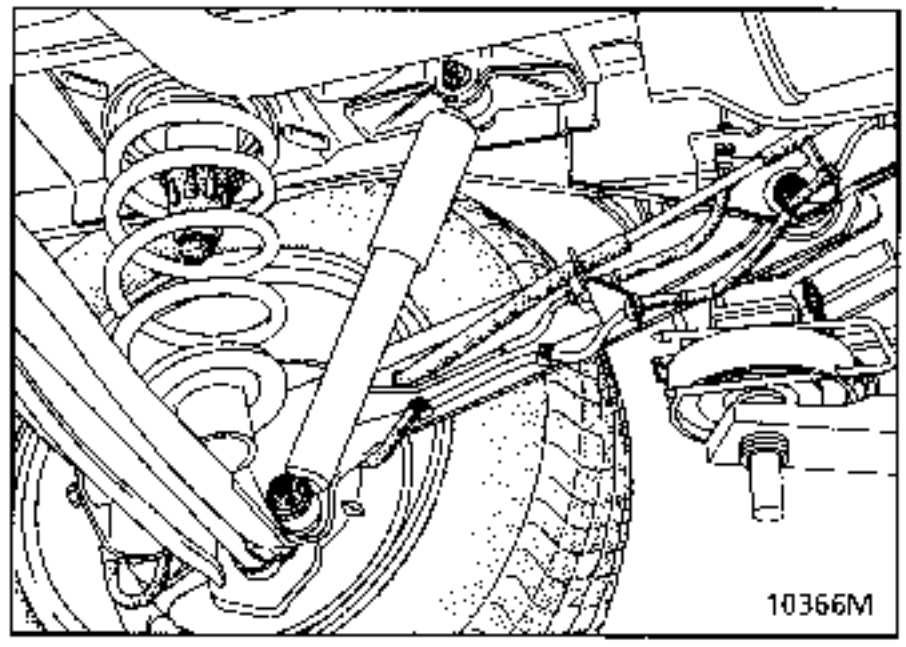
TIGHTENING TORQUES (in daN.m)	
Shock absorber lower bolt	2.5

REMOVAL

Put the vehicle on a lift with ramps.

Fit an axle stand under the emergency spare wheel (see section "Rear axle") and gently lower the lift.

Remove the lower shock absorber mountings.



Lower the lift to separate the axle until the springs release.

Remove the springs.

REFITTING

Refitting is the reverse of removal.

Look at the upper cup (boss) to determine the spring positions.

Torque tighten the lower shock absorber mountings with the vehicle laden (see section on shock absorbers).

TIGHTENING TORQUES (in daN.m)	
Upper spring bolt	5
Lower spring bolt	2.5

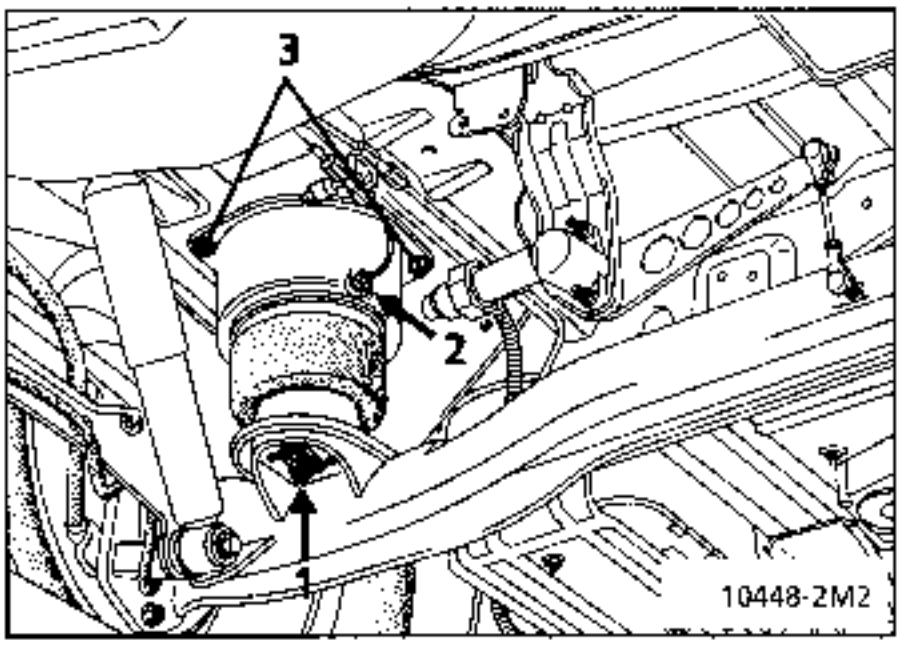
REMOVAL

Drain the circuit via the 3 way union valve.

Slacken:
- the lower mounting nut (1) on the cross member cup and retain the washer,
- the air inlet pipe union (2).

Remove the two upper mounting bolts (3) for the cup on the chassis.

Lift the vehicle to release the base of the spring from its position.



REFITTING

IMPORTANT : never expand the spring before it is fitted into position.

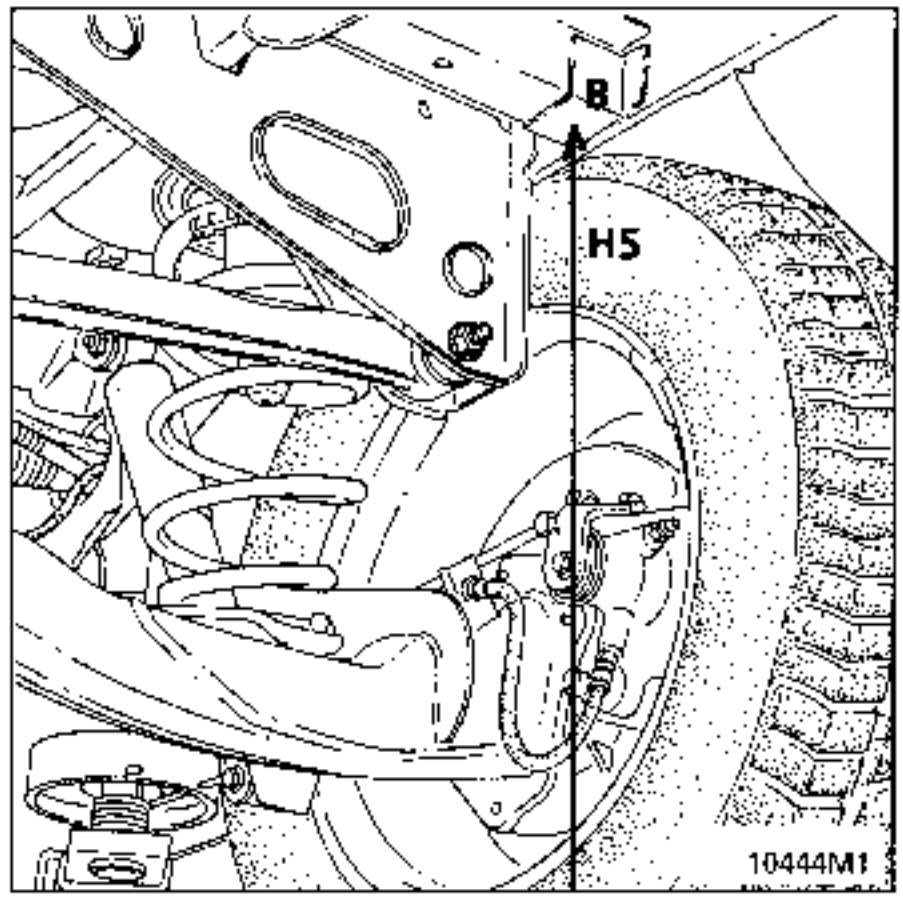
Refitting is the reverse of removal.

Tighten the mountings to the recommended torque.

NOTE : check the pneumatic system operates correctly and that the normal trim level is correct:

Tyre size	Dimension (H5)
195	412
205	422

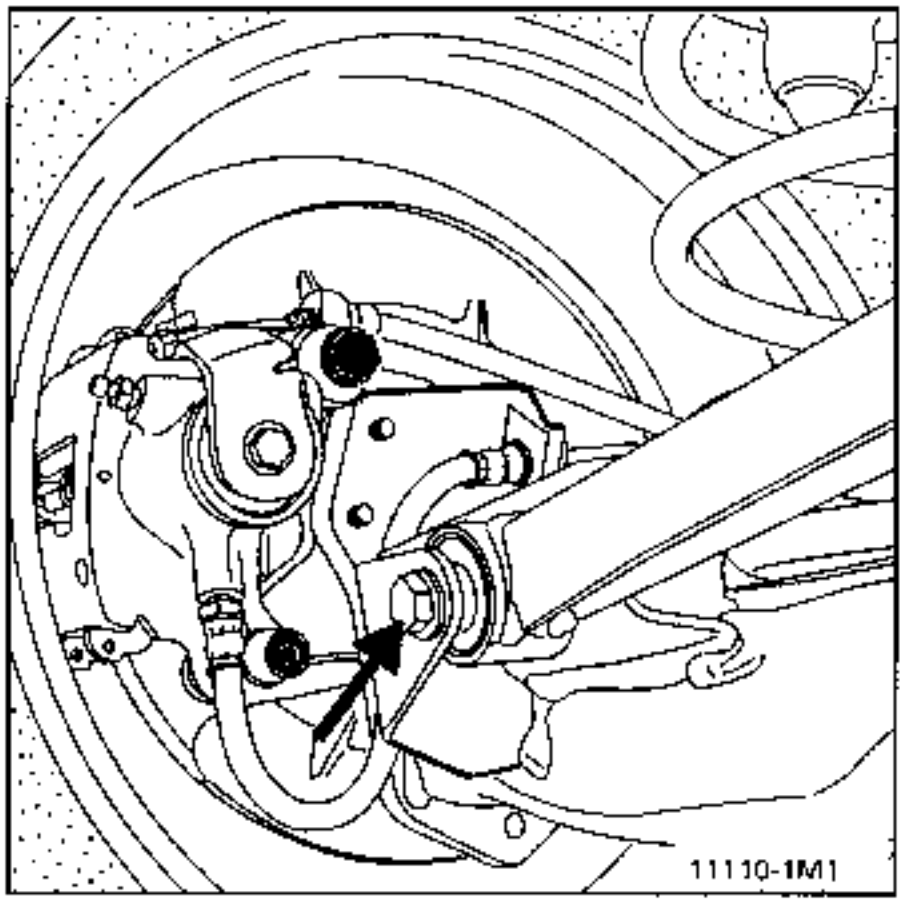
Dimension (H5) is taken between the floor 3rd row cross member and the ground (tyre pressures correct).

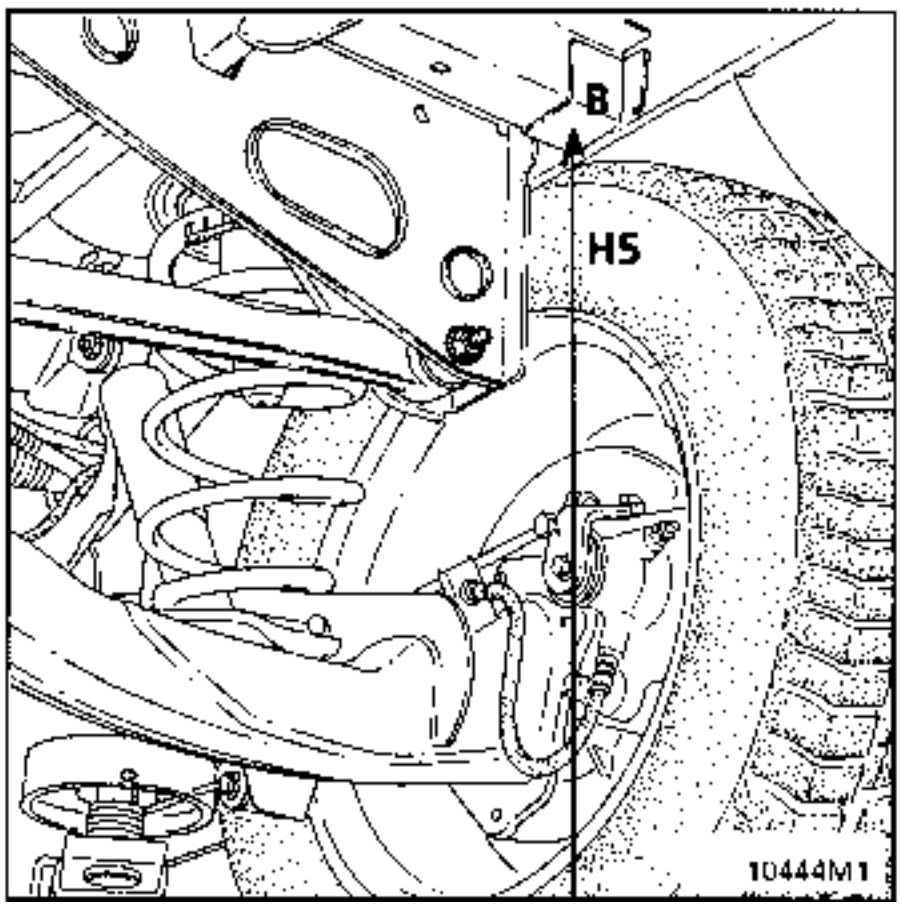


TIGHTENING TORQUES (in daN.m)	
Mounting on chassis	5.5
Mounting on axle	5.5

REMOVAL

Remove:
- the mountings on the axle and on the chassis,
- the bar, without altering the brake limiter adjustment (vehicle without ABS).





REFITTING

Refitting is the reverse of removal.

Coat the mounting pins with grease.

Tighten the mountings to the recommended torque, vehicle laden.

Set the vehicle to dimension (H5)=408mm measured between the floor 3rd row cross member and the ground.

To do this:
- compress the axle assembly using straps,
- or load the vehicle;

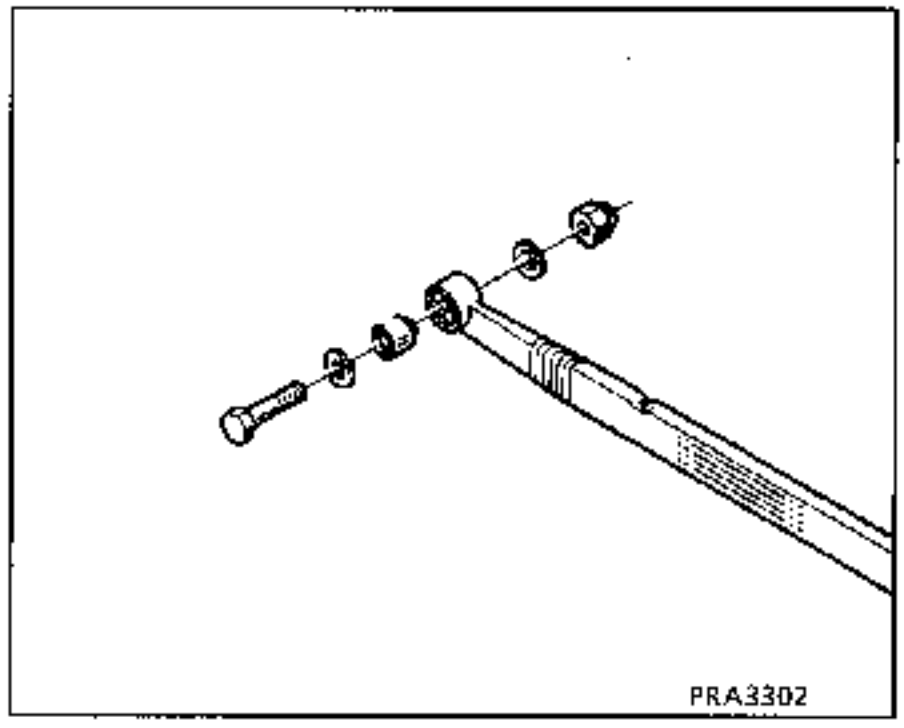
this dimensions corresponds to the vehicle having 4 persons on board with 5 seats, fuel tank full and a 50kg load. Check dimension (H5).

LINK RUBBER MOUNTING

REPLACEMENT :

Remove the transverse link.

The mountings are replaced on the press.

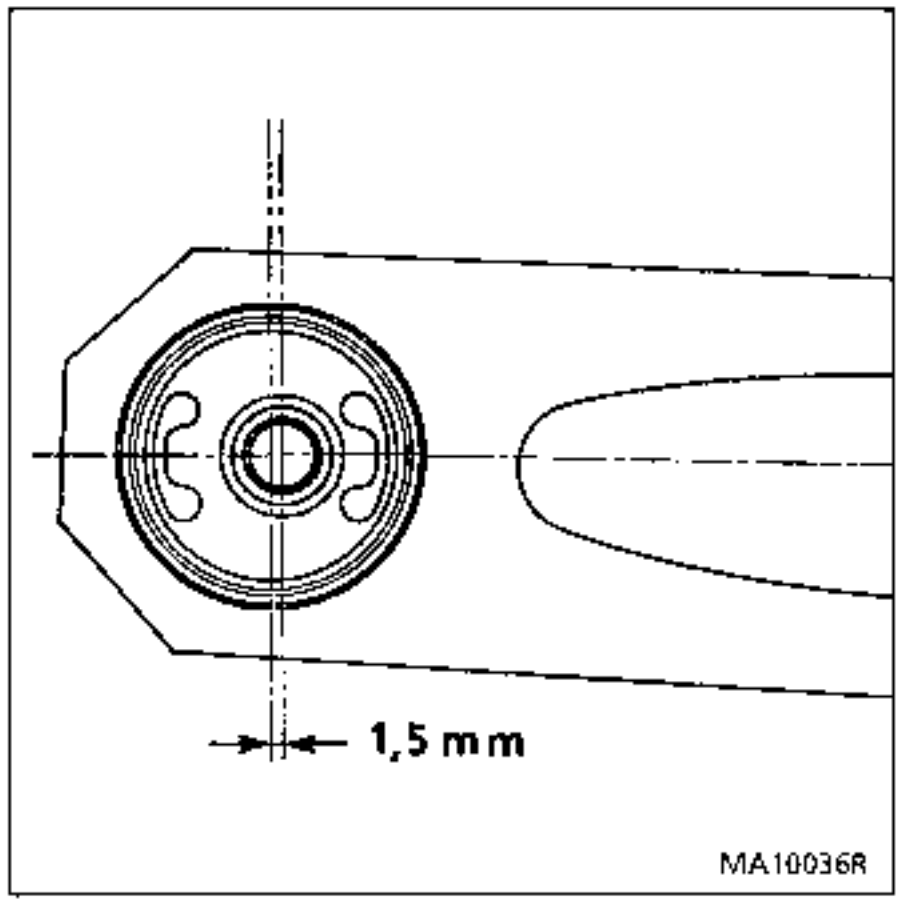


The rubber mountings are replaced on the press, with the rear axle removed.

PRECAUTIONS FOR FITTING THE RUBBER MOUNTINGS

Refit the rubber mounting, taking care to position it as shown in the diagram.

The arm mounting axis is offset towards the rear of the vehicle in relation to the axis of the rubber mounting's location.



WHEEL RIMS

There are two forms of wheel identification marking:

- stamped marking for steel rims,
- cast marking for alloy rims.

The marking gives the main dimensional specifications of the wheel.

The marking may be complete:

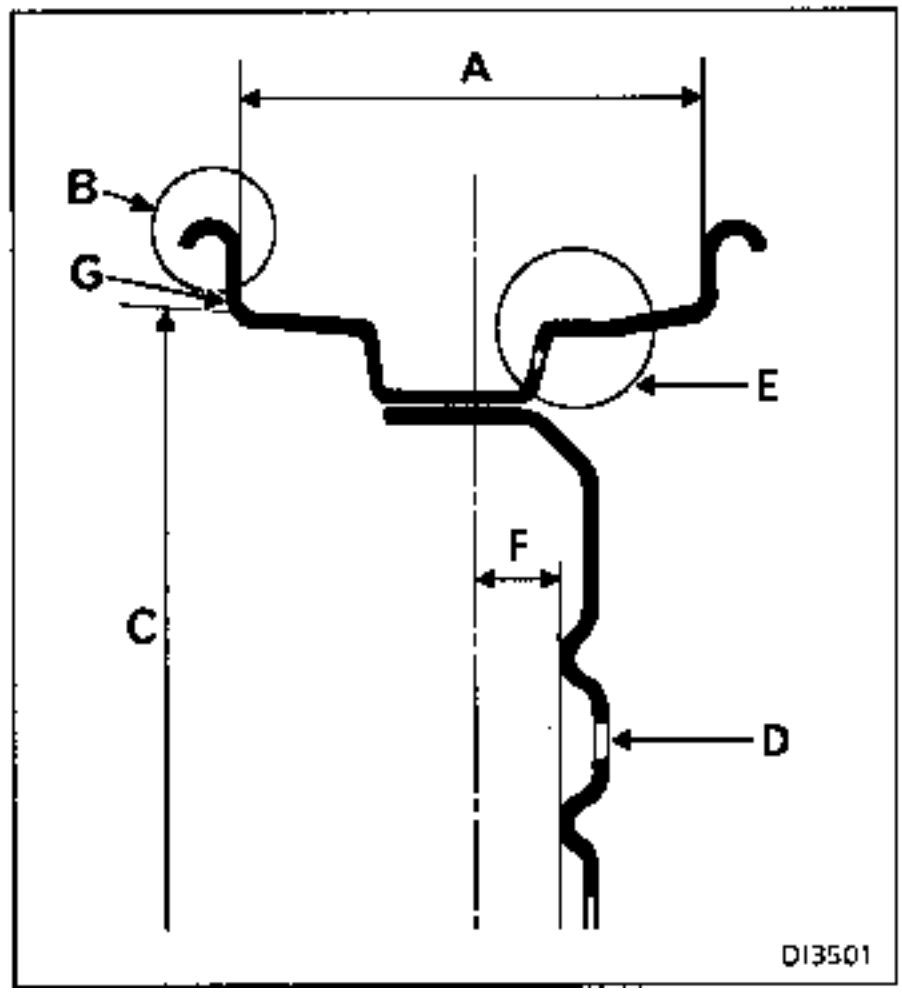
Example : 5 1/2 J 14 4 CH 36
or simplified
Example : 5 1/2 J 14

	A	B	C	D	E	F
TYPE OF WHEEL	WIDTH (in inches)	RIM PROFILE	NOMINAL DIAMETER (in inches). under tyre bead	Number of holes	Tyre bead profile	Offset (in mm)
5 1/2 J 14 4 CH 36	5 1/2	J	14	4	CH	36

The four wheel bolts are of diameter **108 mm**.

Maximum run-out: 1.2 mm measured on the rim edge (at G).

Maximum eccentricity: 0.8 mm measured on the pressure face of the tyre beads.



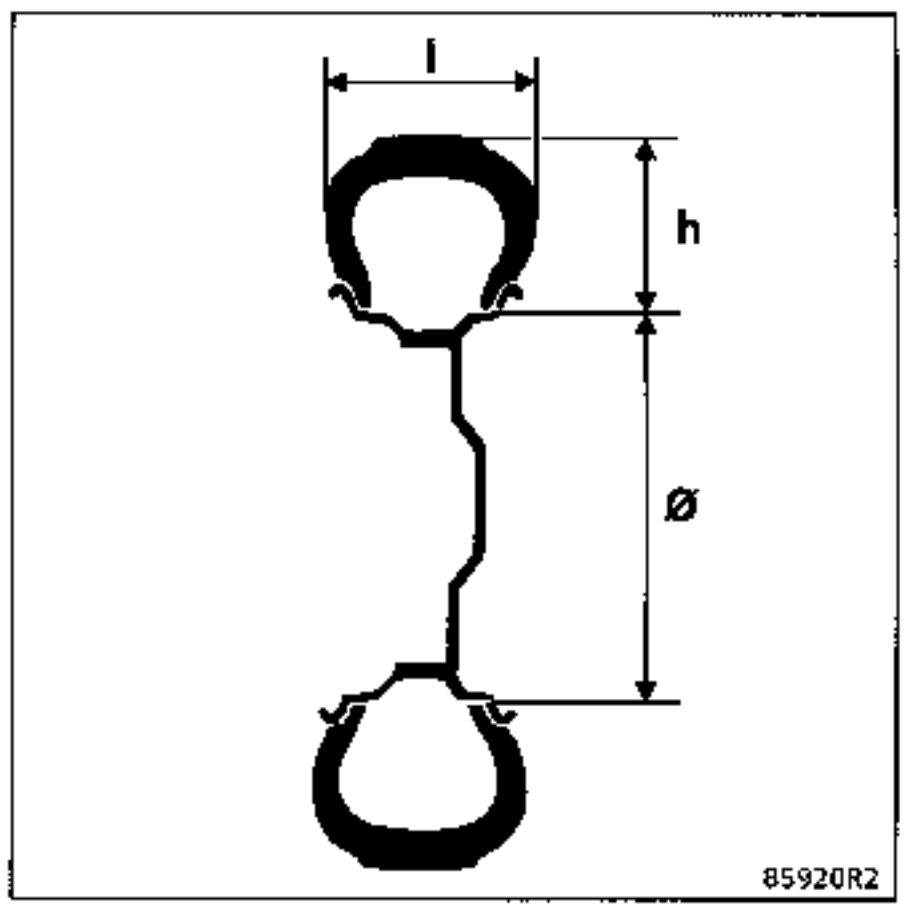
TYRES

There may be two types of identification marking for the same type of tyre.

Example : 185/70 H R 14
or 185/70 R 14 88 H

185 / 70 H R 14
1 2 3 4 5

185 / 70 R 14 88 H
1 2 4 5 6 3



1	185	Tyre width in mm
2	70	Ratio h/w $\frac{\text{height}}{\text{width}}$
4	R	Radial structure
5	14	Inner diameter expressed in inches. Corresponds to the diameter of the rim.
6	88	Load index 88 (560 kg)
3	H	Speed index 210 km/h maximum

Some speed symbols :

	Maximum speed km/h
R	170
S	180
T	190
U	200
H	210
V	240
Z R over	240

Types of structure :

Diagonal	No marking
Radial	R
Bias belted	B

Type	Rim	Rim run-out (mm)	Wheel bolt torque (daN.m)	Tyres	Inflation pressure (bar)
JE0 A (1) JE0 F	6,5 J 15*	1,2	5 bolts: 10	195/65 15 91 T	See inflation pressure label on vehicle **
JE0 A (2) JE0 E SE0E	6,5 J 15*	1,2		205/65 15 94 T	
JE0 D	6,5 J 15*	1,2		205/65 15 94 H	

(1) Manual gearbox
(2) Automatic transmission
(*) Alloy rims optional depending on version.

(**) As the values may change, refer to the inflation pressure label on the driver's door frame or refer to the vehicle's Driver's Handbook.

The tyre inflation pressure must be checked when cold. The increase in temperature during driving increases the pressure by **0.2** to **0.3 bar.**

If the inflation pressures are checked when the tyres are warm, take this pressure increase into consideration. **Never deflate a warm tyre.**

Chains

Only the front wheels may be chained.

The emergency spare wheel may not be chained.

Tyre size	chains
195	17 or 14 mm
205	14mm

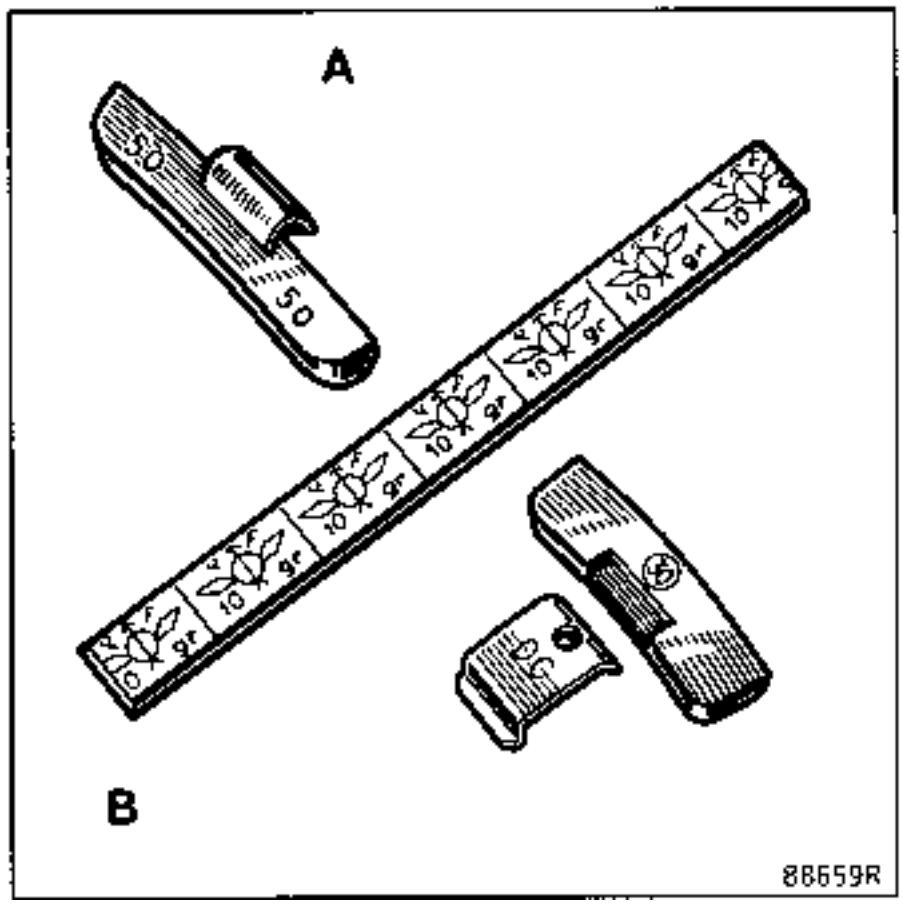
Snow" or "thermorubber" tyres : all four wheels must be fitted with these tyres to preserve the vehicle's adhesion qualities as far as possible.

BALANCE WEIGHTS

Only use weights provided by the Parts Department:

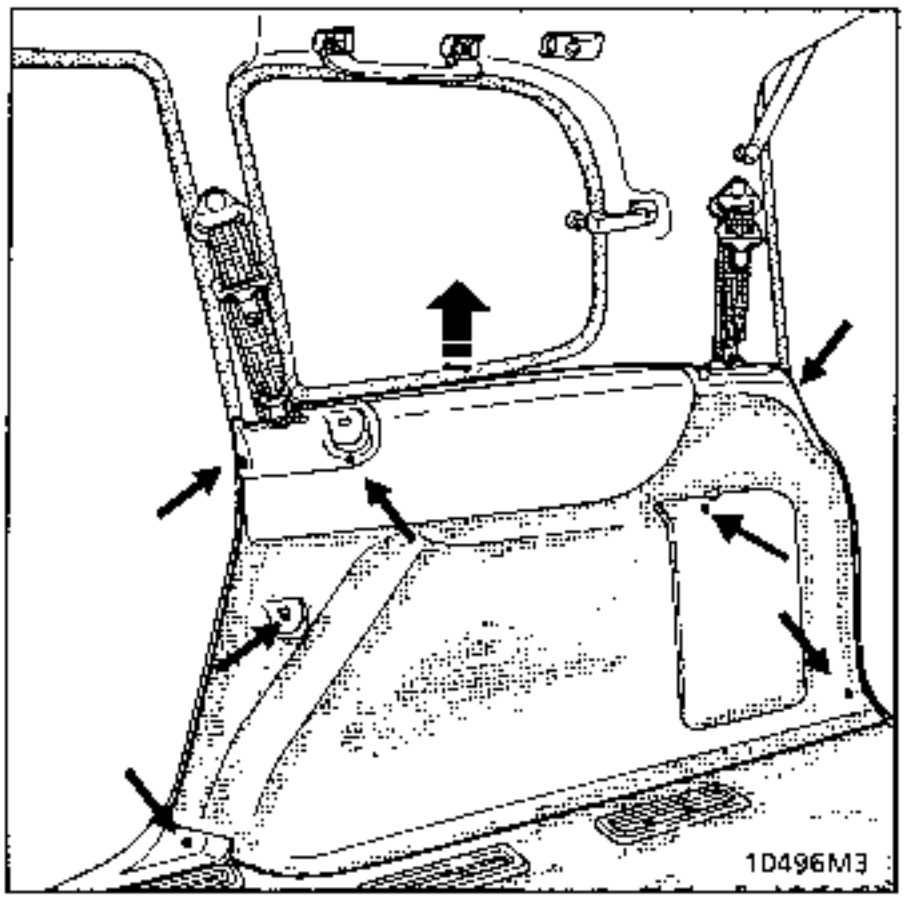
- fitted using an integral clip to steel wheels,
- fitted using clips (flat clips) or self adhesive for alloy wheels.

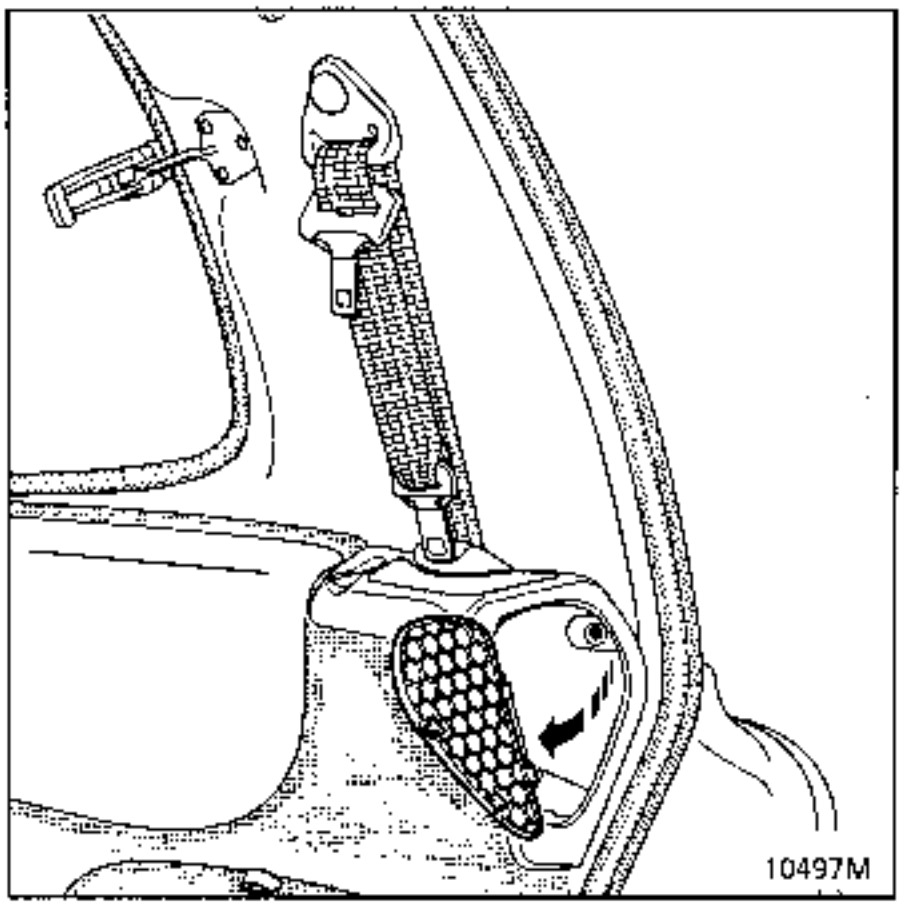
A Steel wheel rim
B Alloy wheel rim



REMOVAL

Remove one of the wheel arch linings (see section 7).

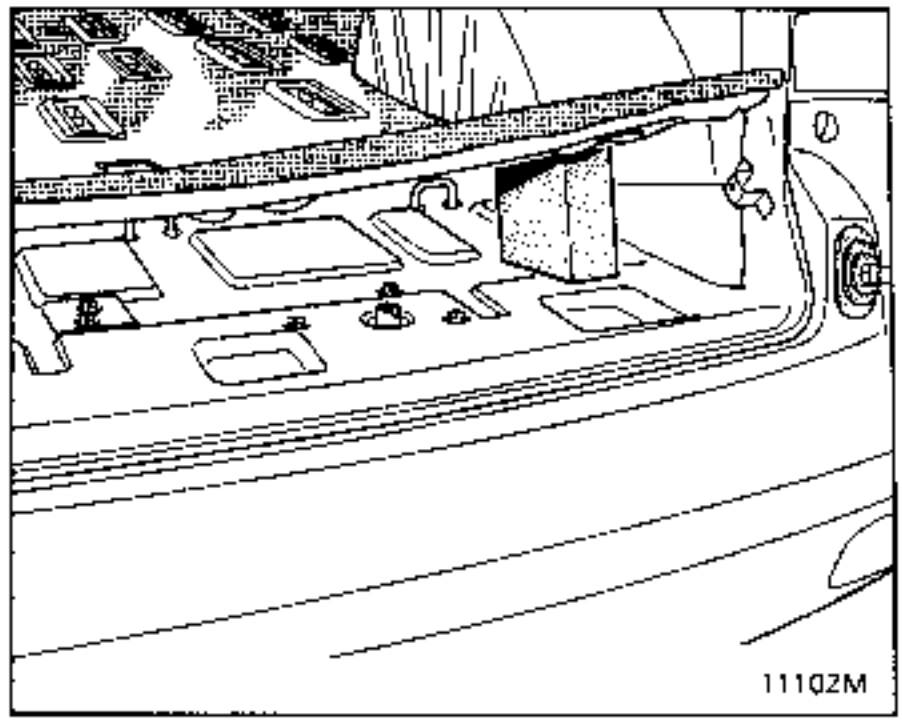




Remove the emergency spare wheel.

Remove:
- the tailgate seal at the level of the carpet,
- the metal tab on the sill.

Release the carpet (see section 7) and use a block to support it to enable the winch bolts to be reached.

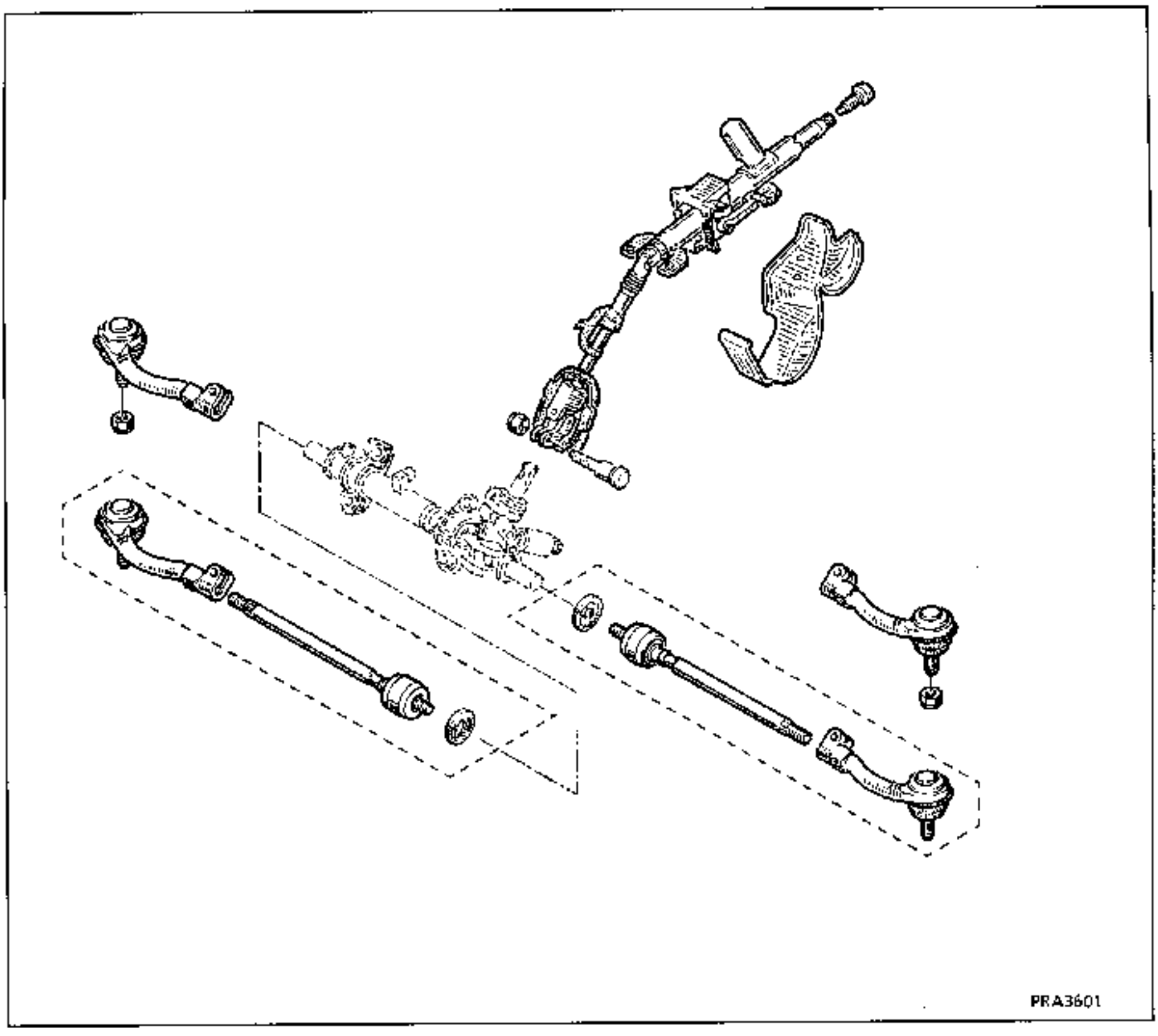


Remove the 5 winch mounting bolts.

REFITTING

Refitting is the reverse of removal.

Check the mechanism operates correctly and ensure the emergency spare wheel fits in the bottom of its location.

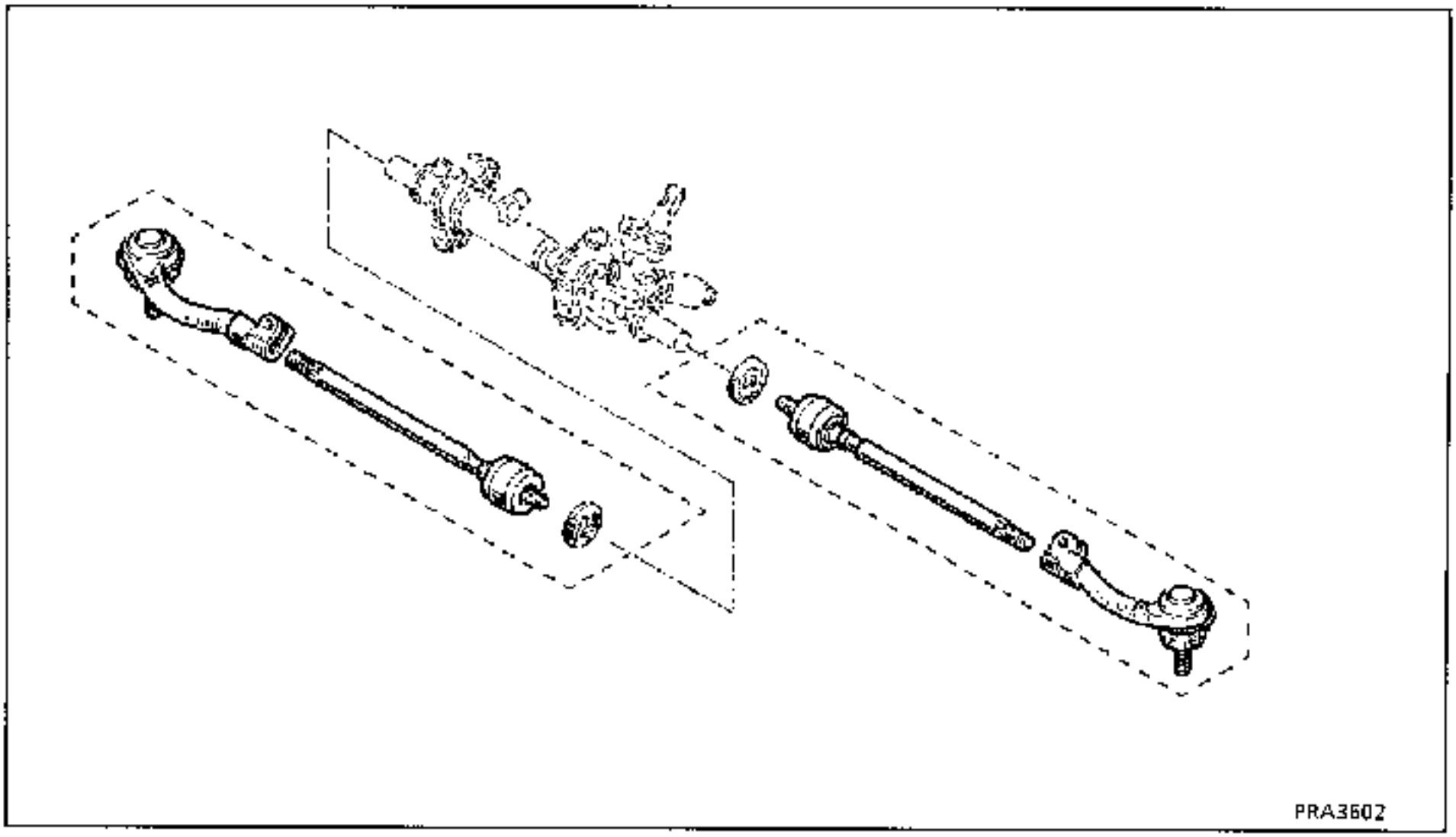


PRA3601

SPECIAL TOOLING REQUIRED	
Dir. 1305	Tool for removing - refitting axial ball joint
Dir. 1306-02	Tool for retaining the rack
T.Av. 476	Ball joint extractor

The axial ball joint may be replaced with the steering box on the vehicle. Tools Dir. 1306-02 and Dir. 1305 are used to retain the steering rack and to slacken the axial ball joints.

IMPORTANT : to avoid damaging the gear and the rack during this operation, it is VITAL to hold the rack using tool Dir.1306-02 .



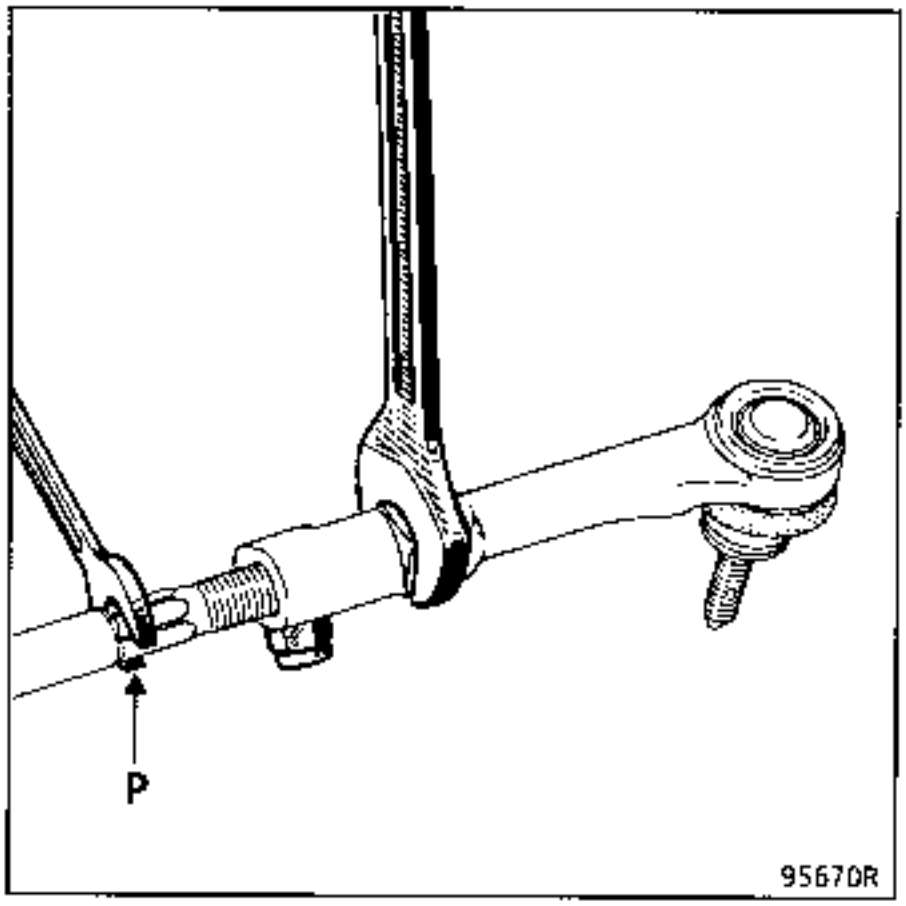
PRA3602

TIGHTENING TORQUES (in daN.m)	
Axial ball joint	5
Bolt on parallelism adjustment sleeve (tangential tightening)	2
Track rod end nut	4
Wheel bolt	10

REMOVAL

Disconnect the track rod end using tool T.Av. 476 if necessary.

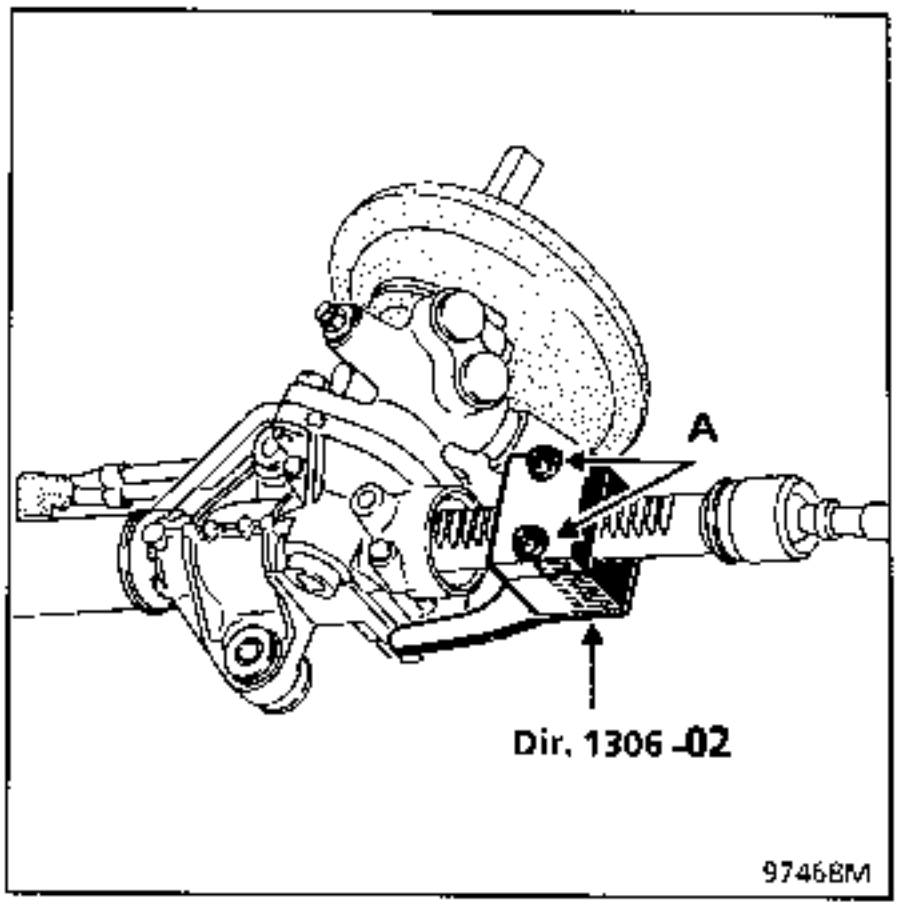
Slacken the parallelism adjustment sleeve and unscrew the ball joint unit while holding the axial ball joint with an open wrench at point "P".



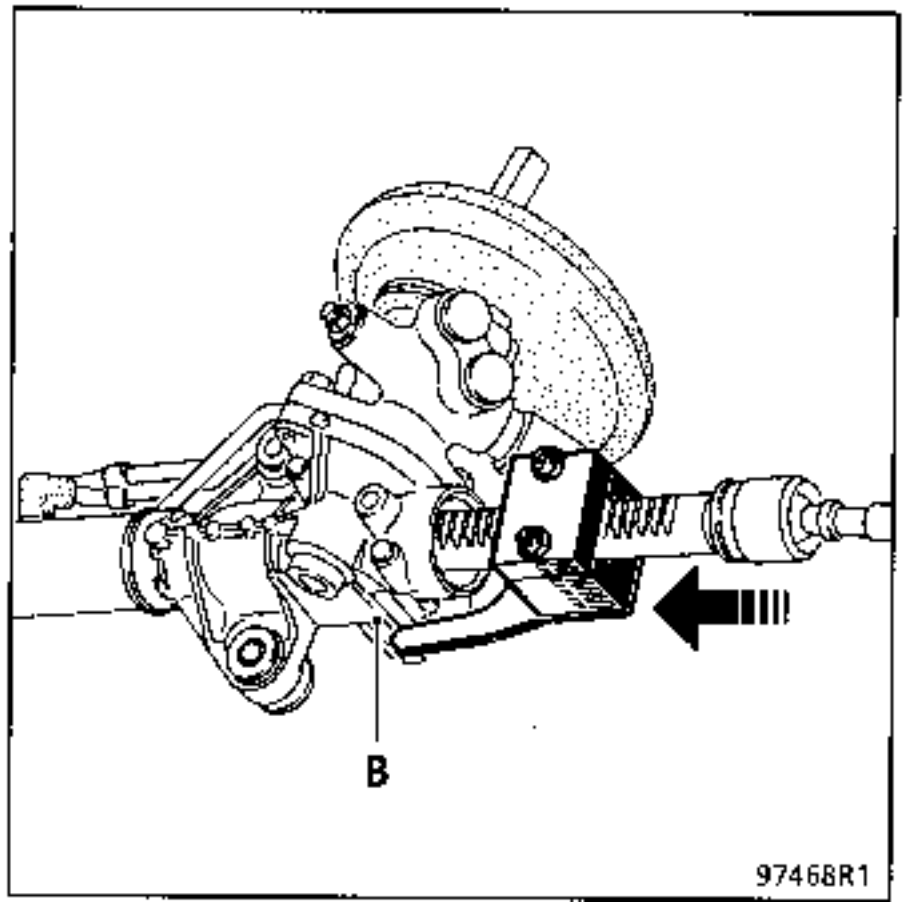
Count the number of threads used so the parallelism may be preset when refitting.

Remove the plastic gaiter clip and remove the gaiter.

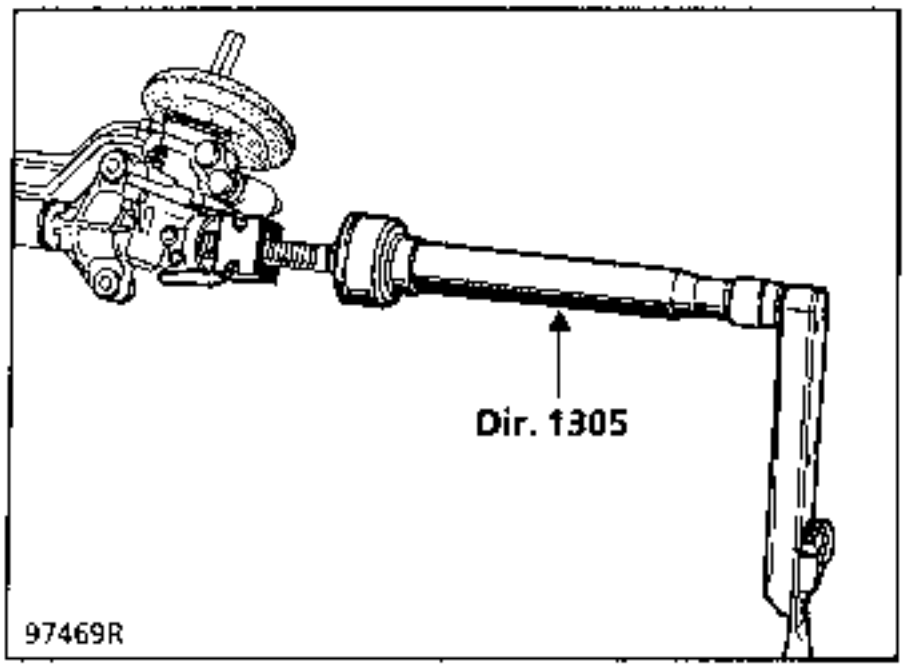
Fit tool Dir. 1306-02 on the teeth on the rack at the valve end and tighten the two bolts (A).



Turn the wheels to engage tool Dir. 1306-02 in the steering housing (B).



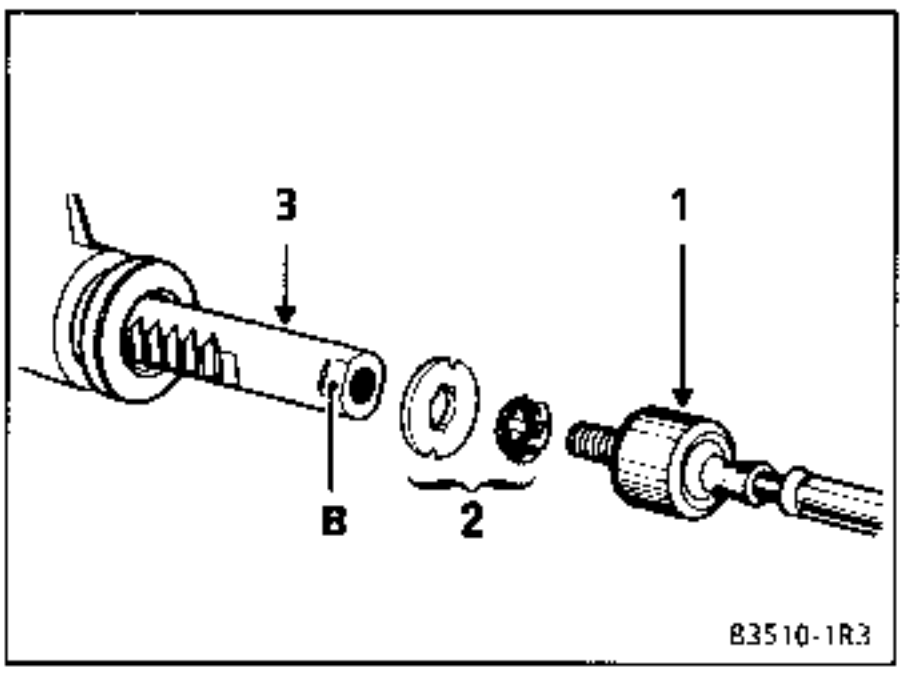
In this position, slacken the axial ball joint using tool **Dir. 1305**.



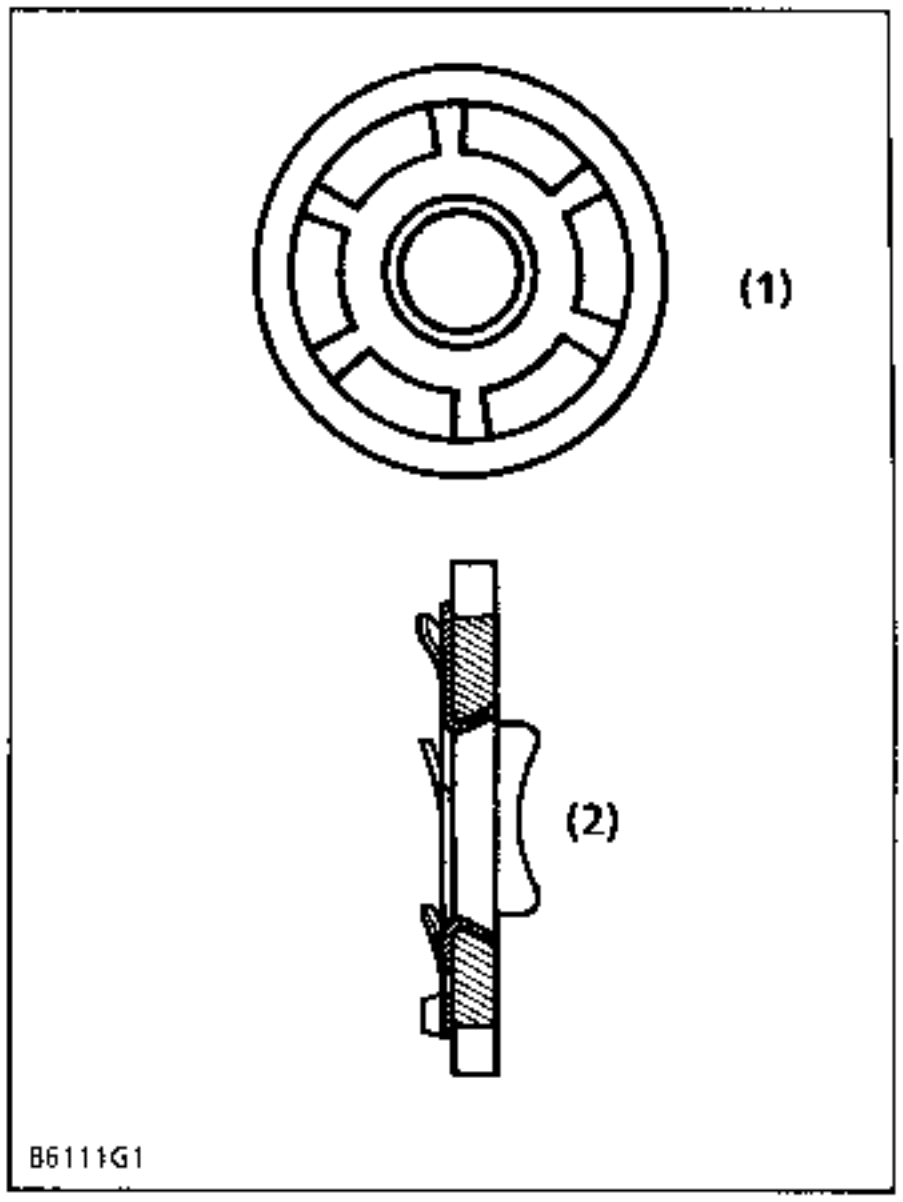
REFITTING

NOTE : before refitting the new track rods, use a 12 X 100 tap in the threads at the end of the steering rack to remove all traces of LOCTITE from the original fitting and avoid any danger of the threaded parts seizing on refitting.

Renew the assembly (2) - **THIS IS ESSENTIAL**.



Refit to the steering rack (3) :
- the stop washer with the locking ring (2),
- the new axial ball joint (1) after lightly coating the threads with **LOCTITE FRENBLOC**.



Before finally tightening the axial ball joint using tool **Dir. 1305**, check the tabs on the stop washer (2) fit correctly in the flats (B) on the steering rack.

Tighten the axial ball joint to the recommended torque.

Set the steering to the centre point to equalise the air in the gaiters before refitting them.

Tighten the ball joint unit by the number of turns noted on removal.

Check and adjust the parallelism then tighten the adjustment sleeve bolt to the recommended torque.

The size of the steering unit requires the engine cradle to be separated from the body and tools T.Av. 1233-01 to be used. The steering unit is removed via the right hand side (driver's side).

SPECIAL TOOLING REQUIRED	
T.Av. 1233-01	Tools for engine cradle operations
Dir. 1303-01	Tool for adjusting steering box
Dir. 1408	Tool for adjusting steering column
Dir.1282-01	17 mm wrench for PAS high pressure pipe (Z engine)
Dir.1282-02	19 mm wrench for PAS low pressure pipe (Z engine)

TIGHTENING TORQUES (in daN.m)		
Track rod end nut		4
Steering column universal joint bolt		2.5
Cradle mounting bolt	front Ø 10	3.5
	rear Ø 12	11
Steering box mounting nut on cradle		7
High pressure pipe on valve		2.2
Low pressure pipe on valve		3
Anti-roll bar link nut		4
Gear control clevice bolt		3
Engine tie bar	F engine	5
	Z-G engine	15
Wheel bolt		10

REMOVAL

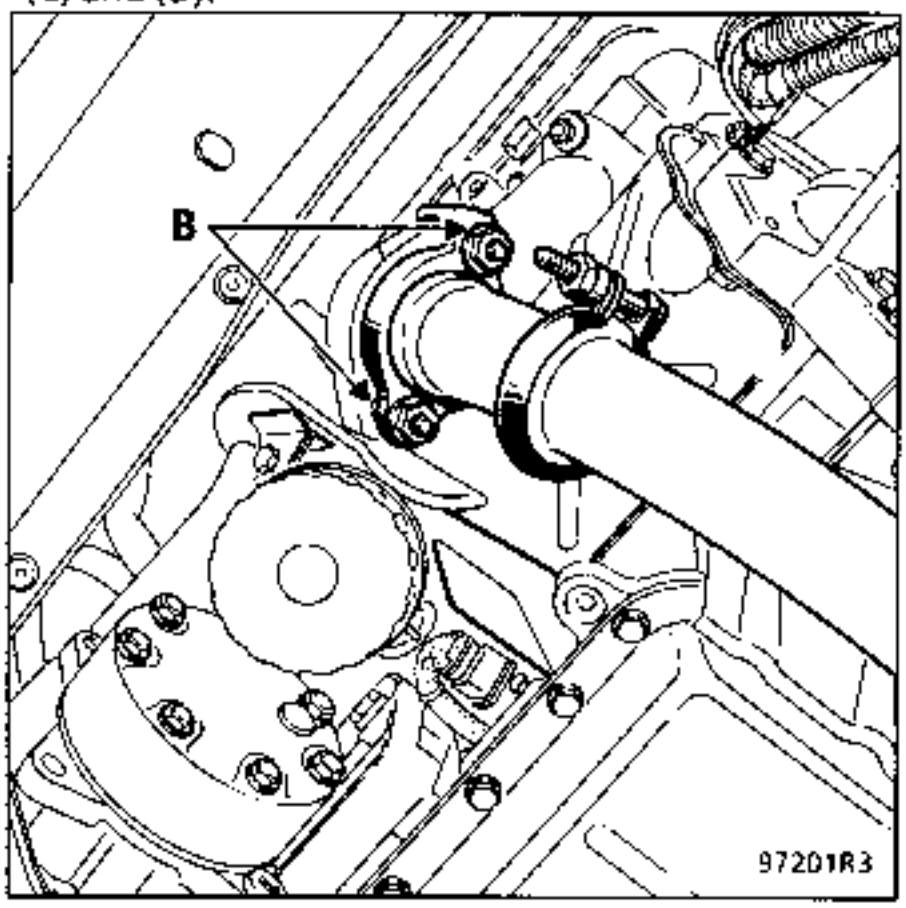
Set the vehicle wheels straight.

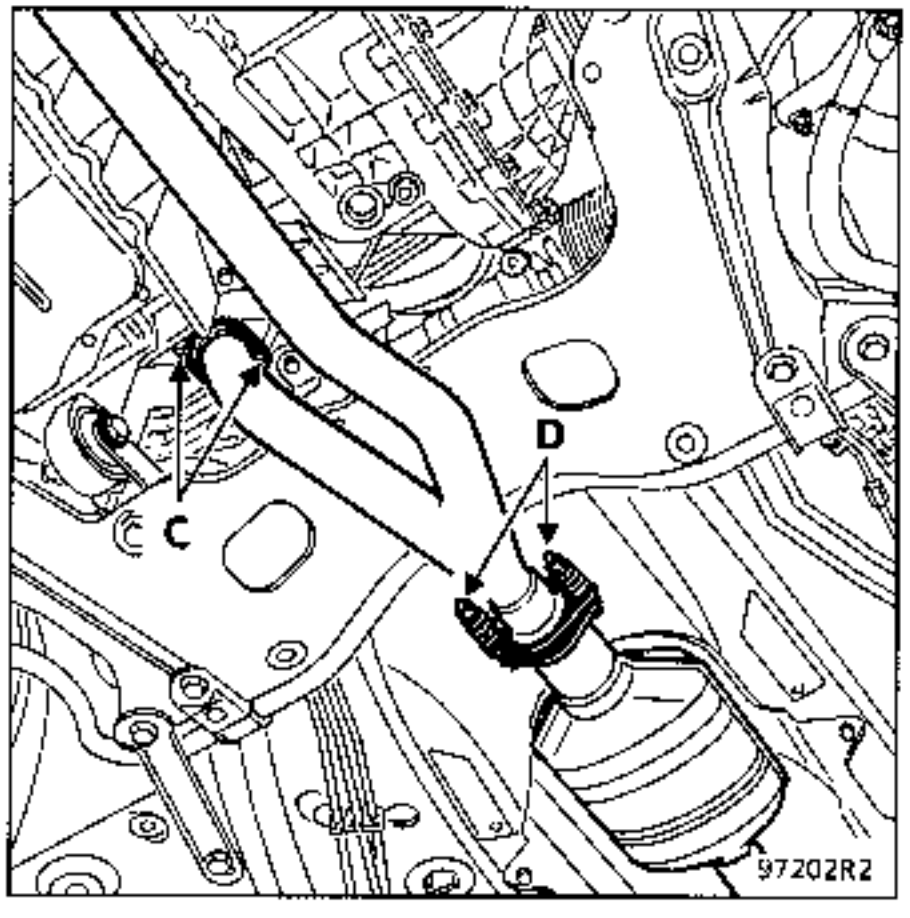
Remove:
- the wheels,
- the left or right hand wheel arch protector (depending on driver position),
- the track rod ends (tool **T.Av. 476** if necessary),
- the lower ball joint nuts on the anti-roll bar link.

Slacken the lower wishbone ball joint nuts.

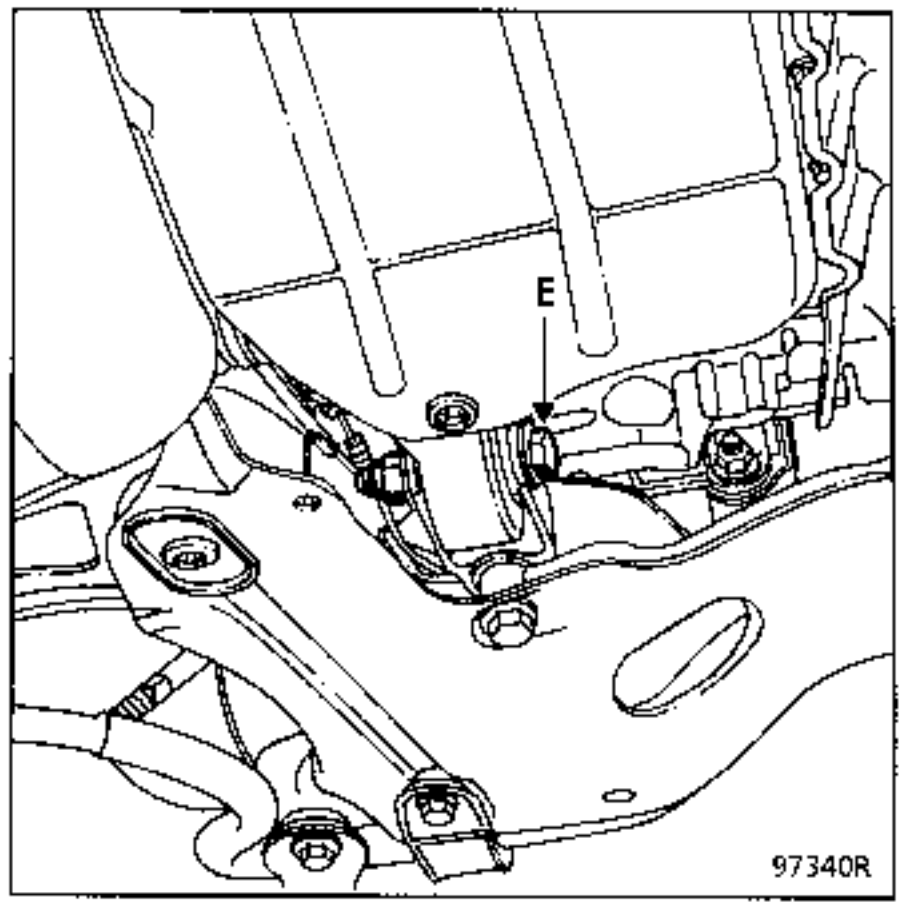
Z ENGINE :

Remove the exhaust pipes from the manifold outlet to the entry to the catalytic converter at (B) - (C) and (D).





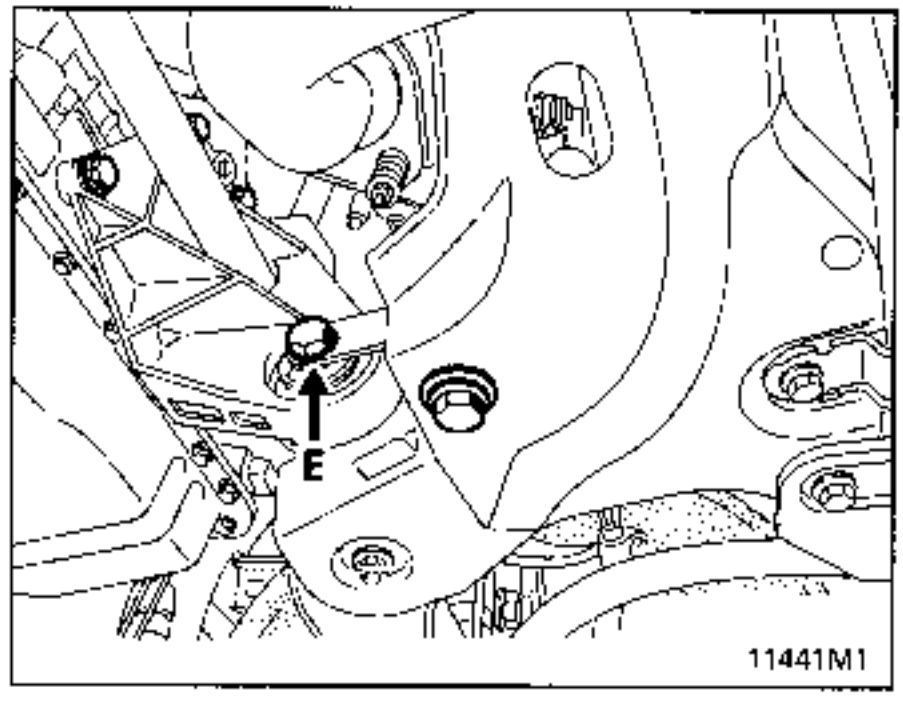
Release the engine tie bar at (E).



G ENGINE :

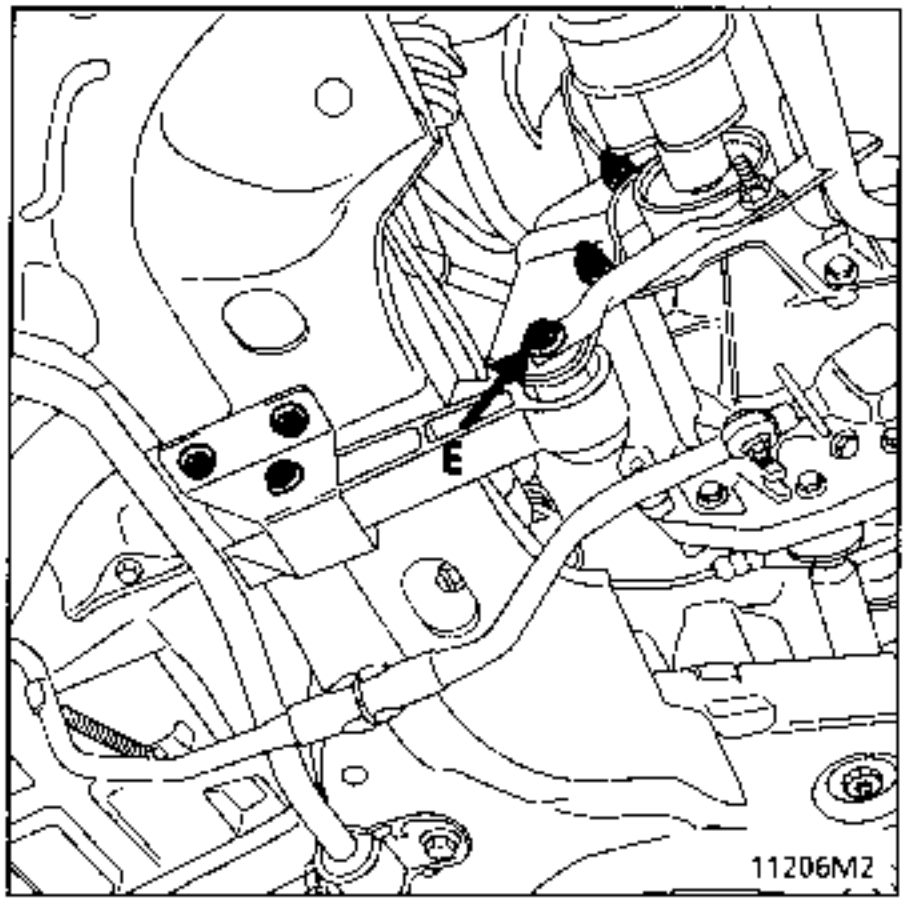
Remove the exhaust pipe from the manifold outlet to the entry to the catalytic converter.

Release the engine tie bar at (E).



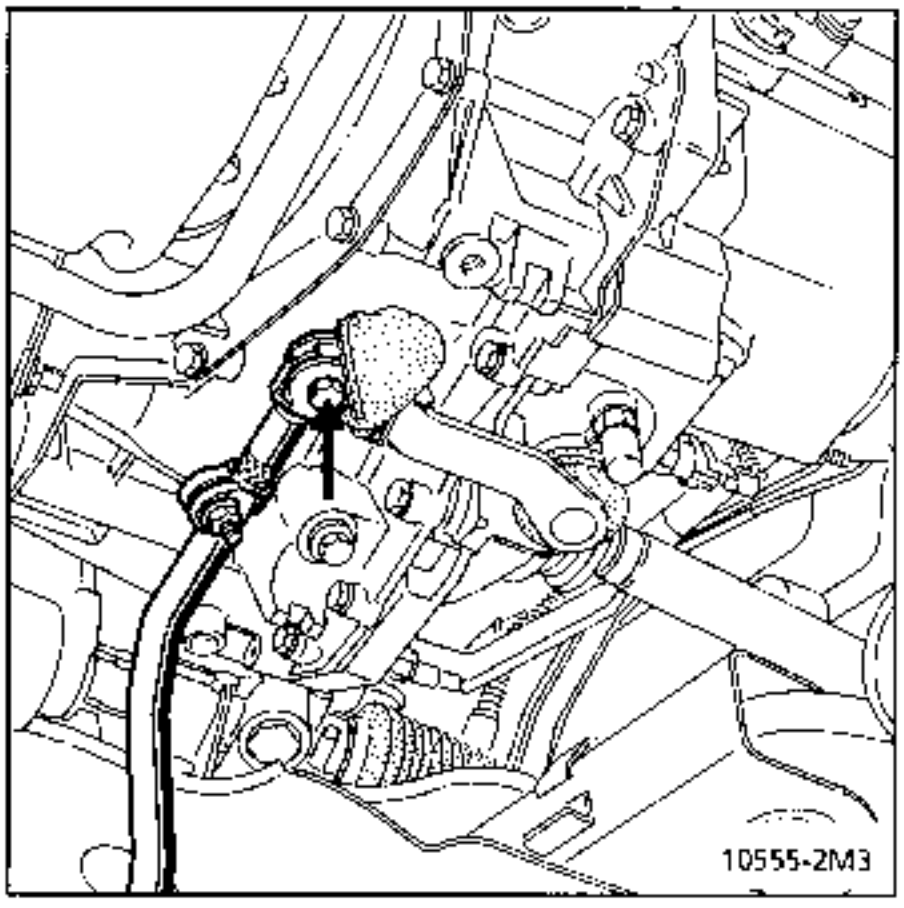
F ENGINE

Release the engine tie bar at (E).



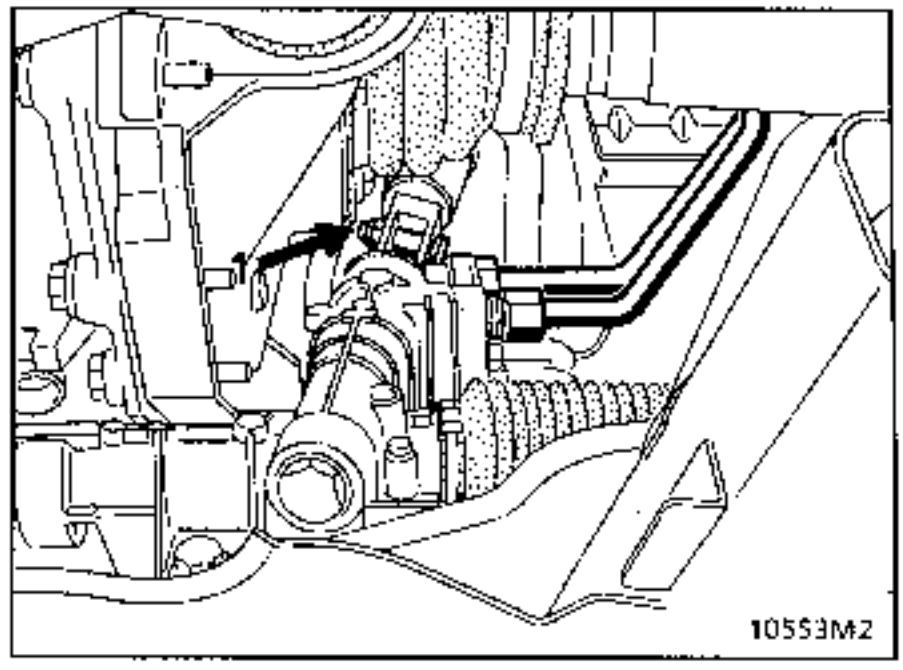
Remove the gear control. To do this:

- Release the gaiter.
- Remove the mounting bolt from the clevice on the return bar.

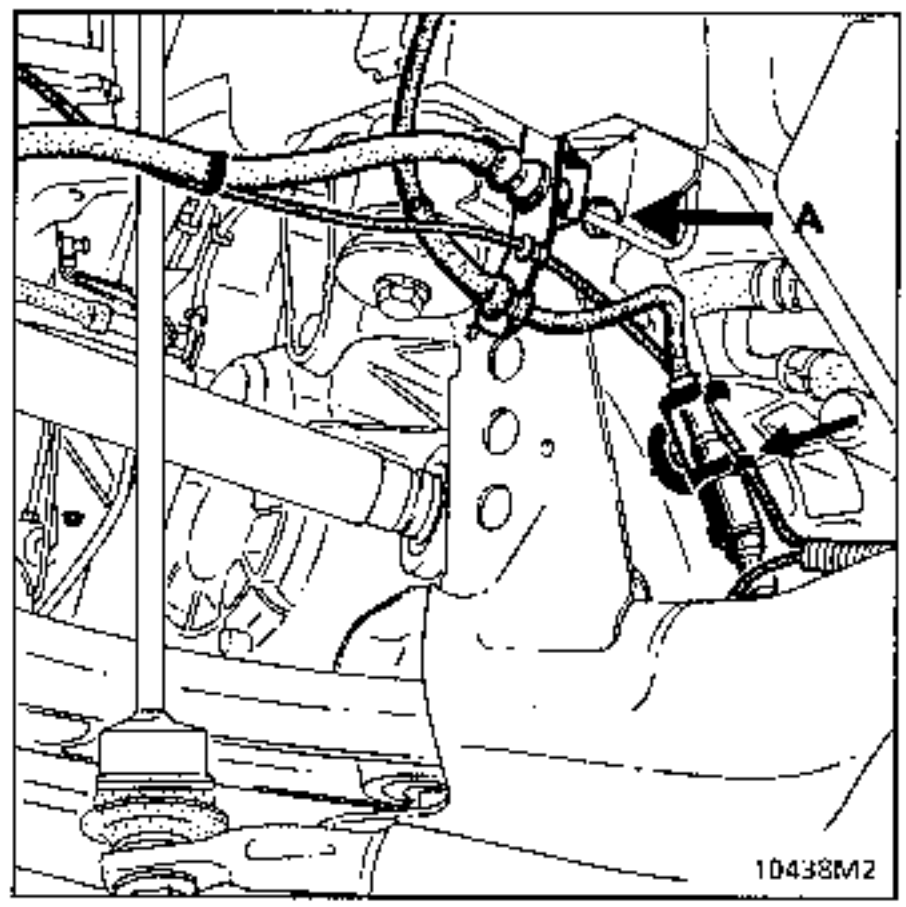


ALL ENGINES

Remove the nut and the eccentric bolt (1) from the steering column universal joint.
Fit a steering wheel locking tool to prevent the rotary switch from de-centralising (see section on steering wheel).



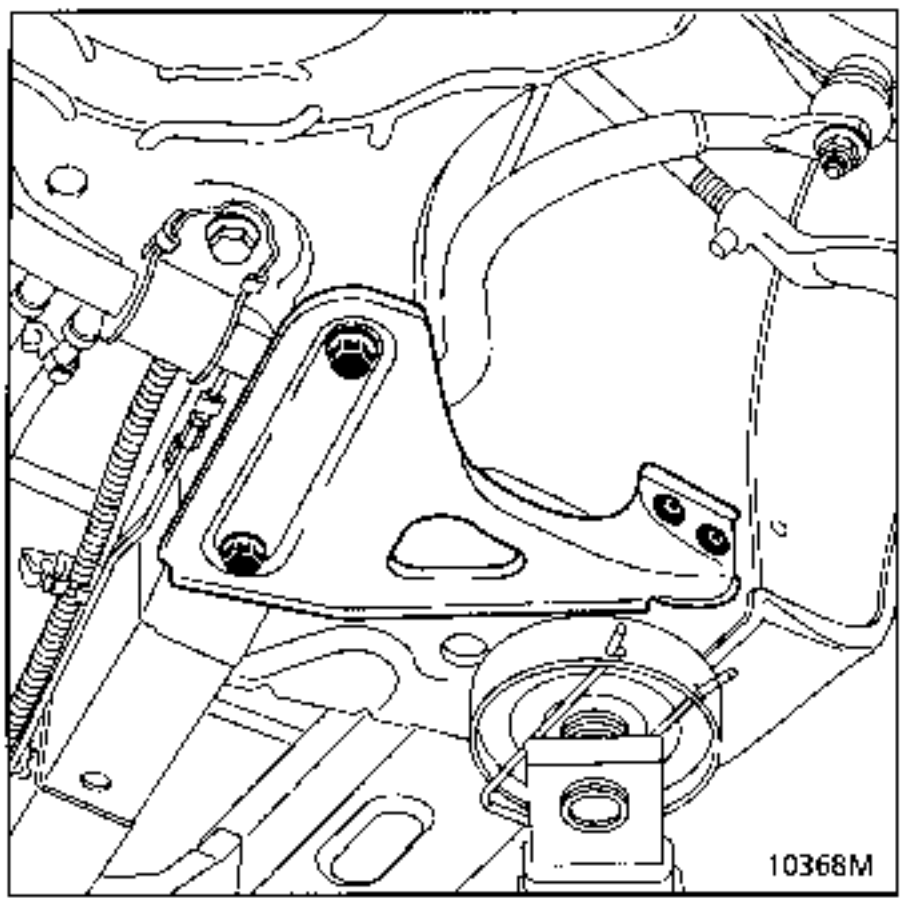
Remove the two bolts (A) mounting the supports :
- for the pipe,
- for the brake pad wear warning light wire,
- for the ABS wiring.

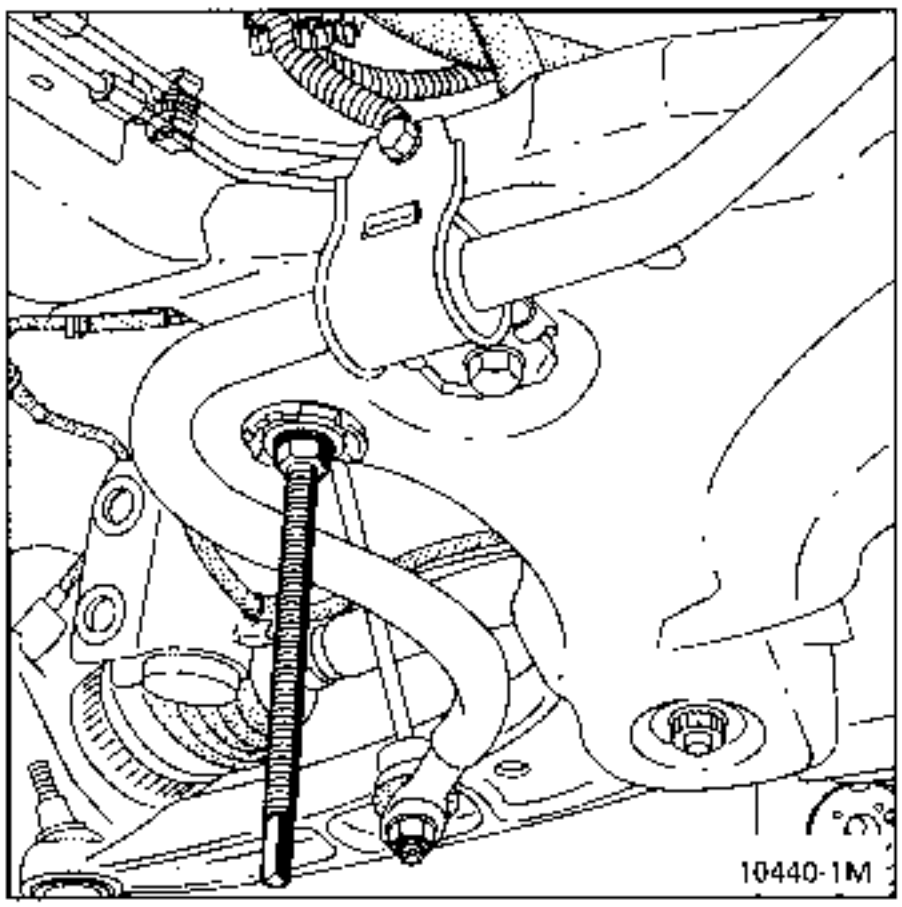


Right or left hand side (depending on driver position): unhook the ABS connector and the wear warning light wire.
Then disconnect and release the ABS wiring and the wear warning light wire.

Place a component jack under the cradle.

Remove the cradle reinforcements and replace the cradle mounting bolts with threaded rods **T.Av. 1233-01**, one by one.

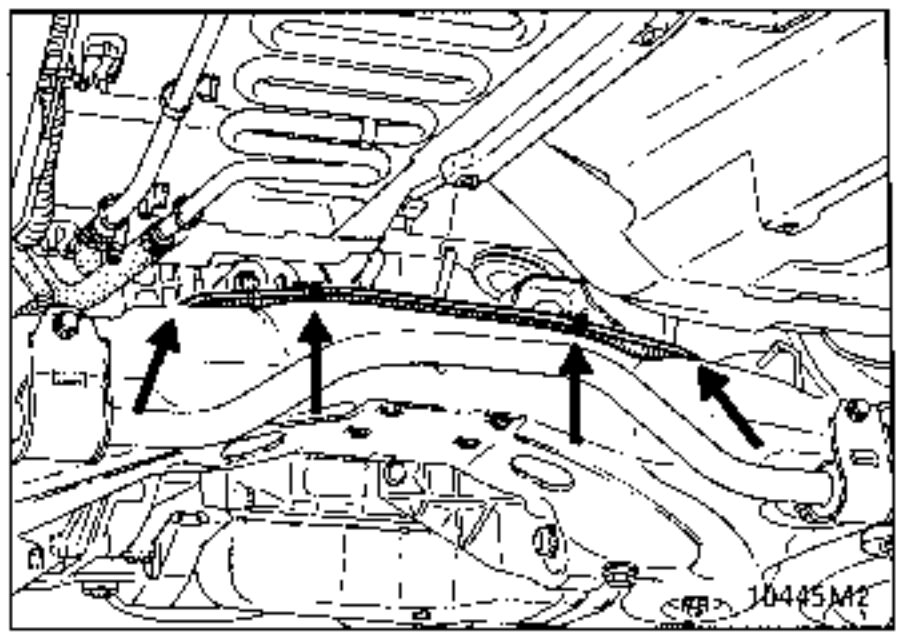




Slacken the nuts using tool **T.Av. 1233-01** so that the cradle is lowered by **4** to **5** cm.

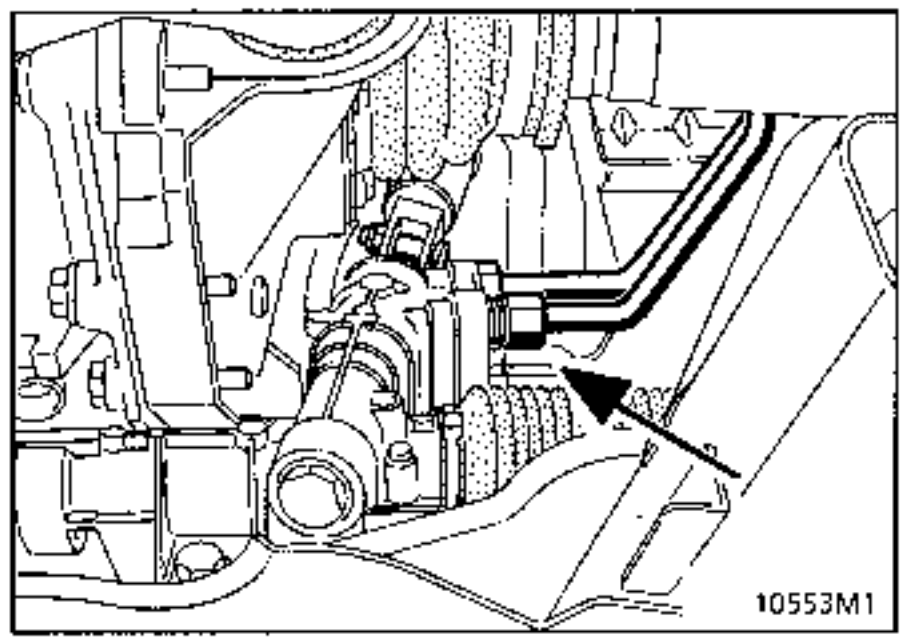
Remove the heat shield for the brake pipes (2 bolts).

Release the brake pipe (4 mounting points) and the ABS wiring (4 mounting points) from behind the cradle.



Disconnect the power assisted steering pipes.

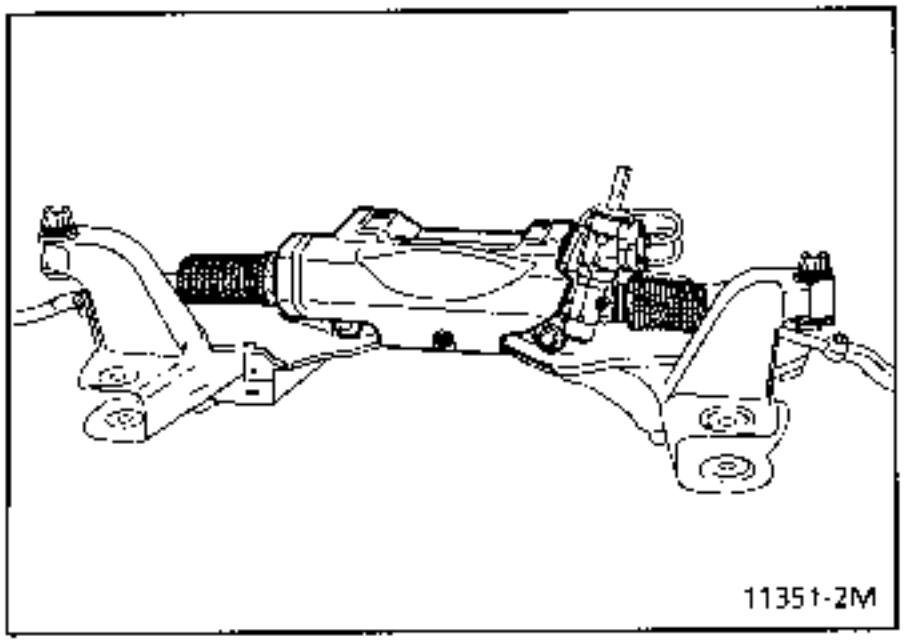
Z ENGINE
Use tools **Dir.1282-01** and **Dir.1282-02** via the wheel arch.



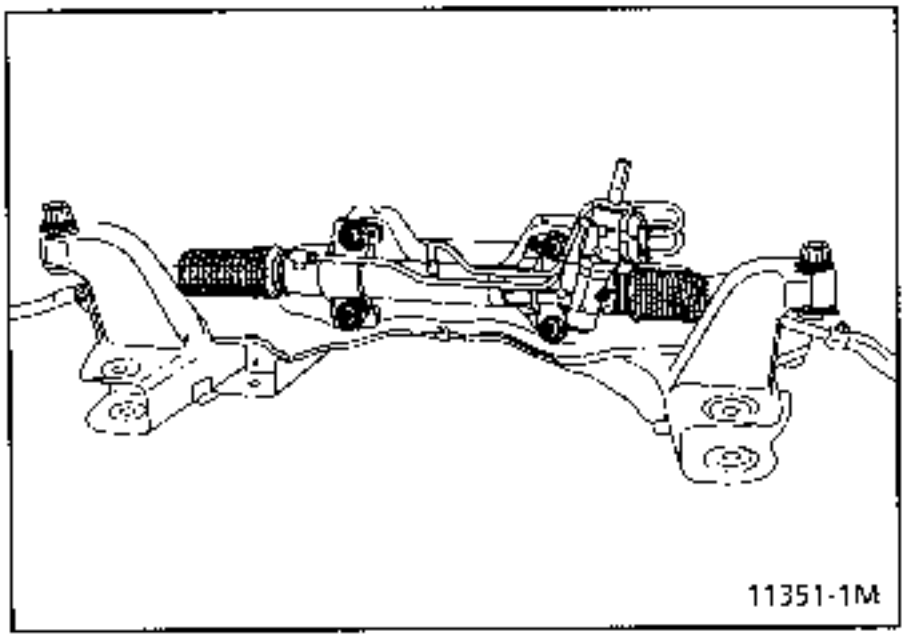
Release the cooler pipe (Z and G engine).

Lower the cradle again (approximately 8 cm).

Remove the heat shield.



Remove the four mounting nuts for the steering box.

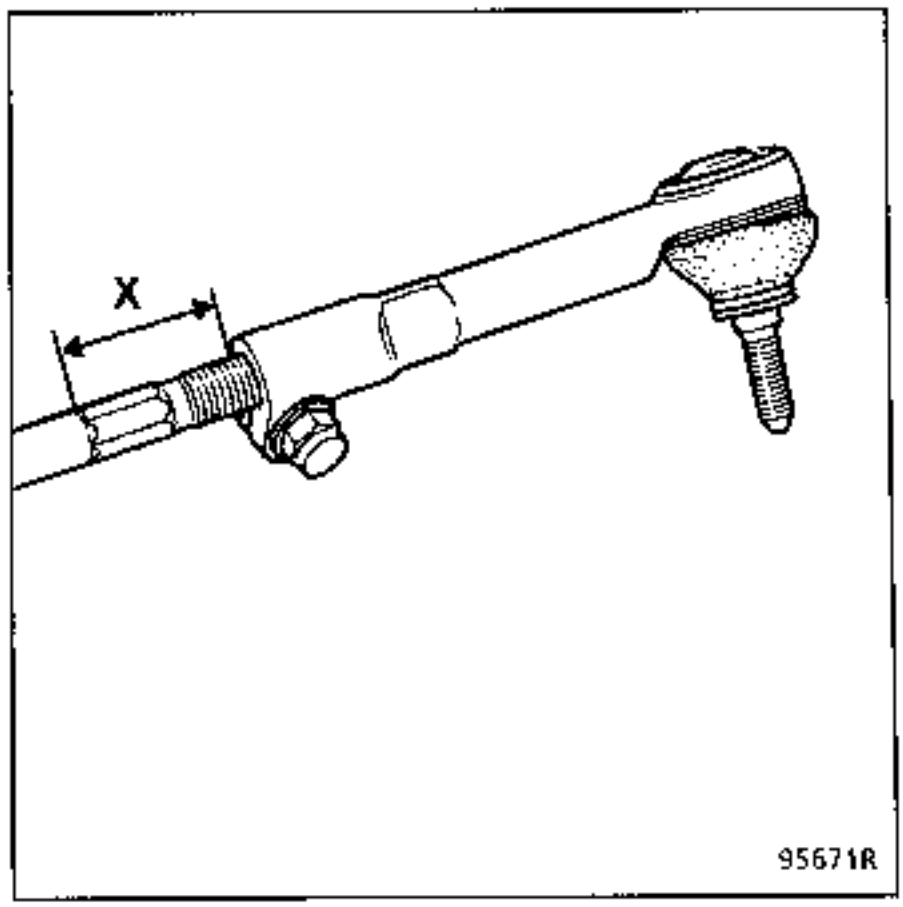


Remove the steering box via the left or right hand side (depending on driver position).

IMPORTANT: During all operations:
- **do not hold the steering by the gaiters,**
- **do not carry the steering by the pipes,**
- **do not allow the mounting, tube end, to be subjected to impacts,**
- **do not allow the track rods, to be subjected to impacts.**

If the steering box is to be replaced, retain the ball joint units.

To do this:
- Release and slacken the bolt on the track rod sleeve by one turn.
- Unscrew the ball joint units, noting dimension (X).

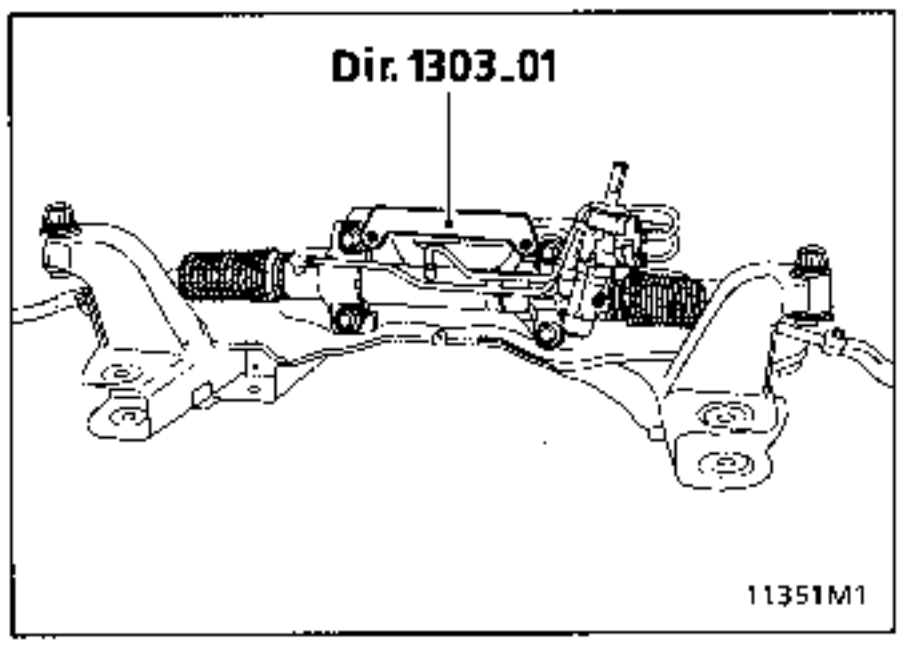


REFITTING (Special notes)

If a new steering unit is to be fitted, ensure the ball joint units are refitted in the position marked on removal. Ensure the dimension (X) is observed.

Renew the steering box mounting nuts.

Refit the steering box to the cradle and fit adjusting tool **Dir. 1303-01**.



Tighten the four mountings to the recommended torque (with tool Dir. 1303-01 still in place).

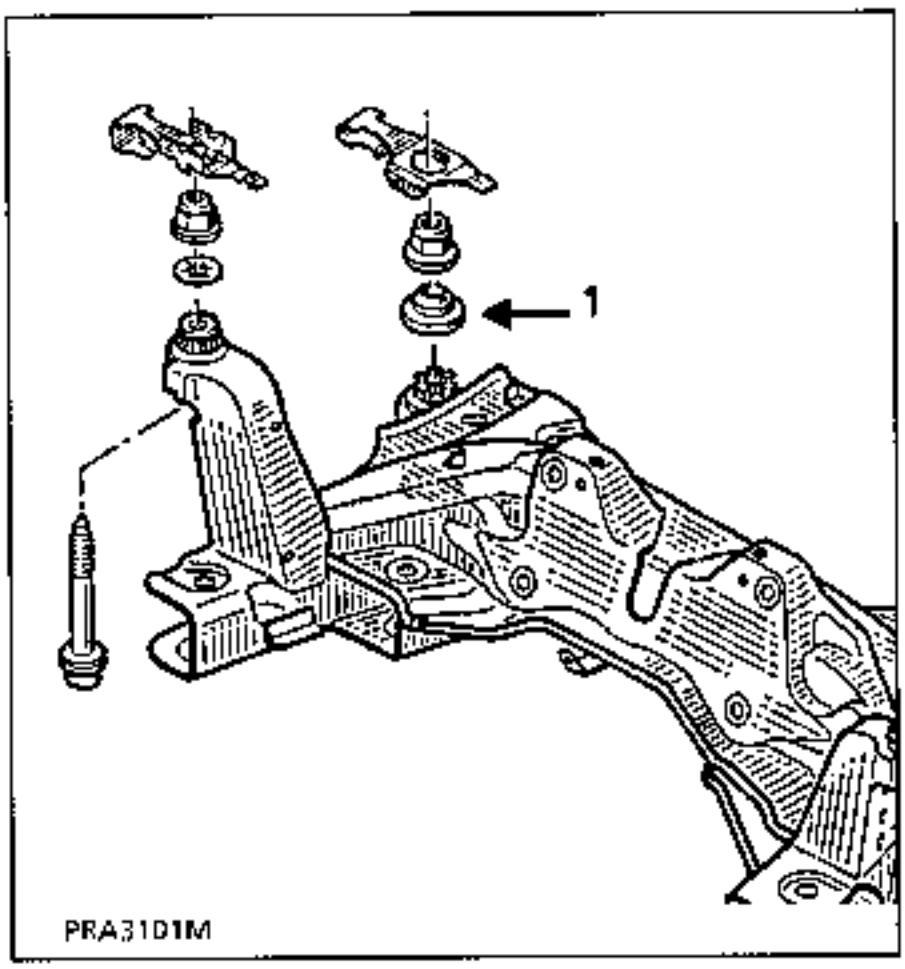
Remember to refit the heat shield.

Reconnect the power assisted steering pipes and tighten them to the correct torque before the cradle is refitted (access).

CRADLE
The cradle mounting nuts should be systematically renewed and the correct tightening torque MUST be observed.

NOTE : the cradle is centred on the body by two washers (1) on the rear cradle mountings.

These washers MUST be correctly positioned. To do this, tighten the rear left hand cradle mounting first (reference point).

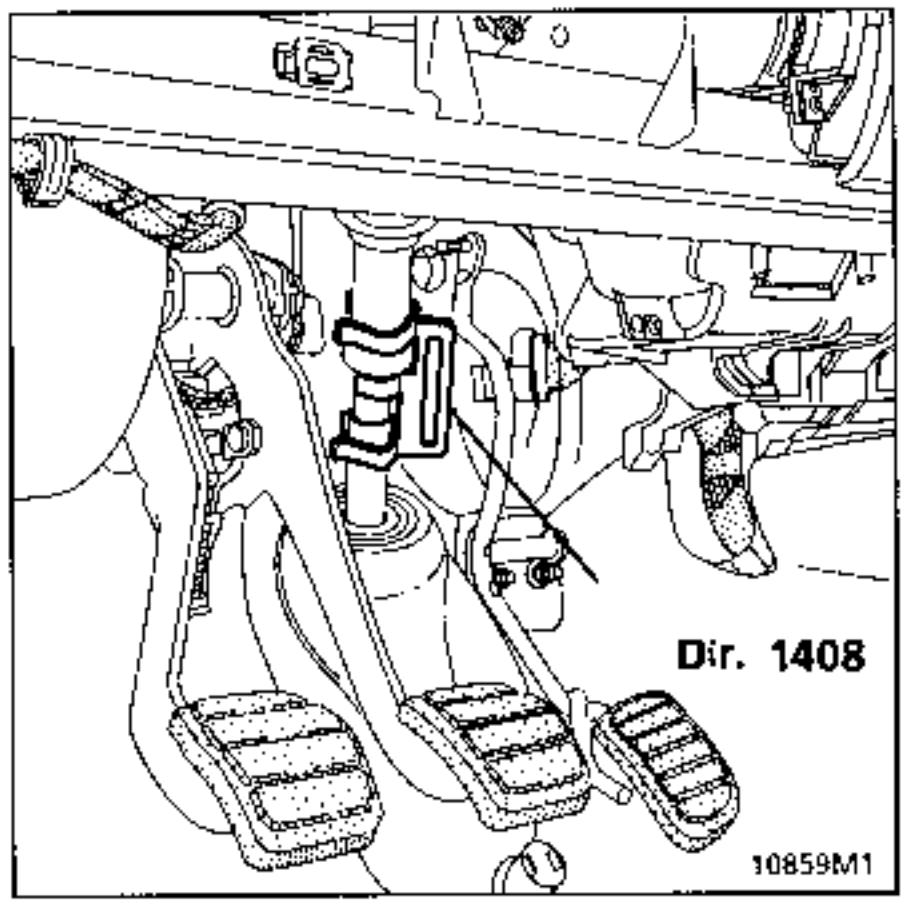


STEERING COLUMN UNIVERSAL JOINT

IMPORTANT :

The lower section of the steering column slides so the position of the universal joint on the steering box must be adjusted.

In the passenger compartment, fit tool Dir. **1408** to the lower part of the column.
Refit the joint mounting and torque tighten.
Remove the tool.

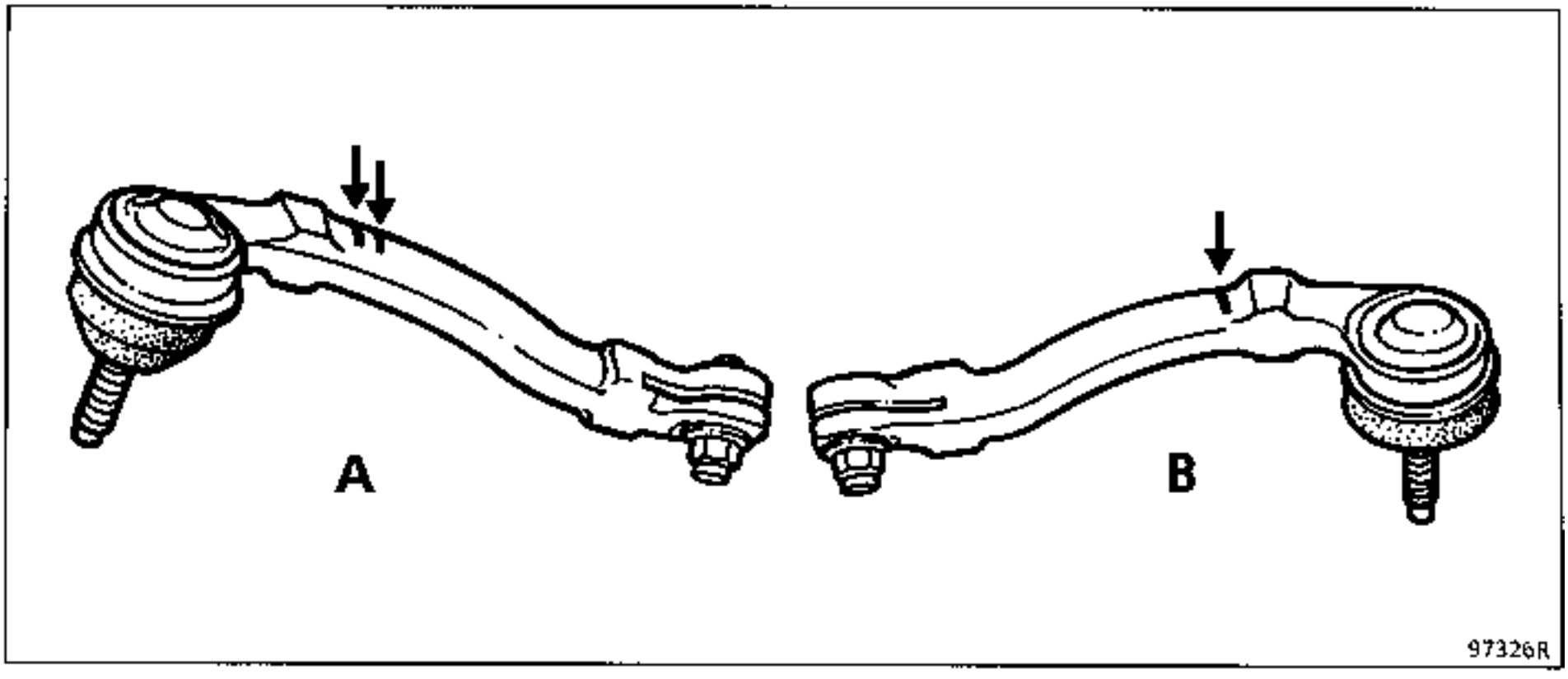


POWER ASSISTED STEERING CIRCUIT
Three quarters fill the oil reservoir.

Engine running, move the steering gently from lock to lock.

Check the circuit is sealed and top up the level.

Check the front axle angles and adjust the parallelism.

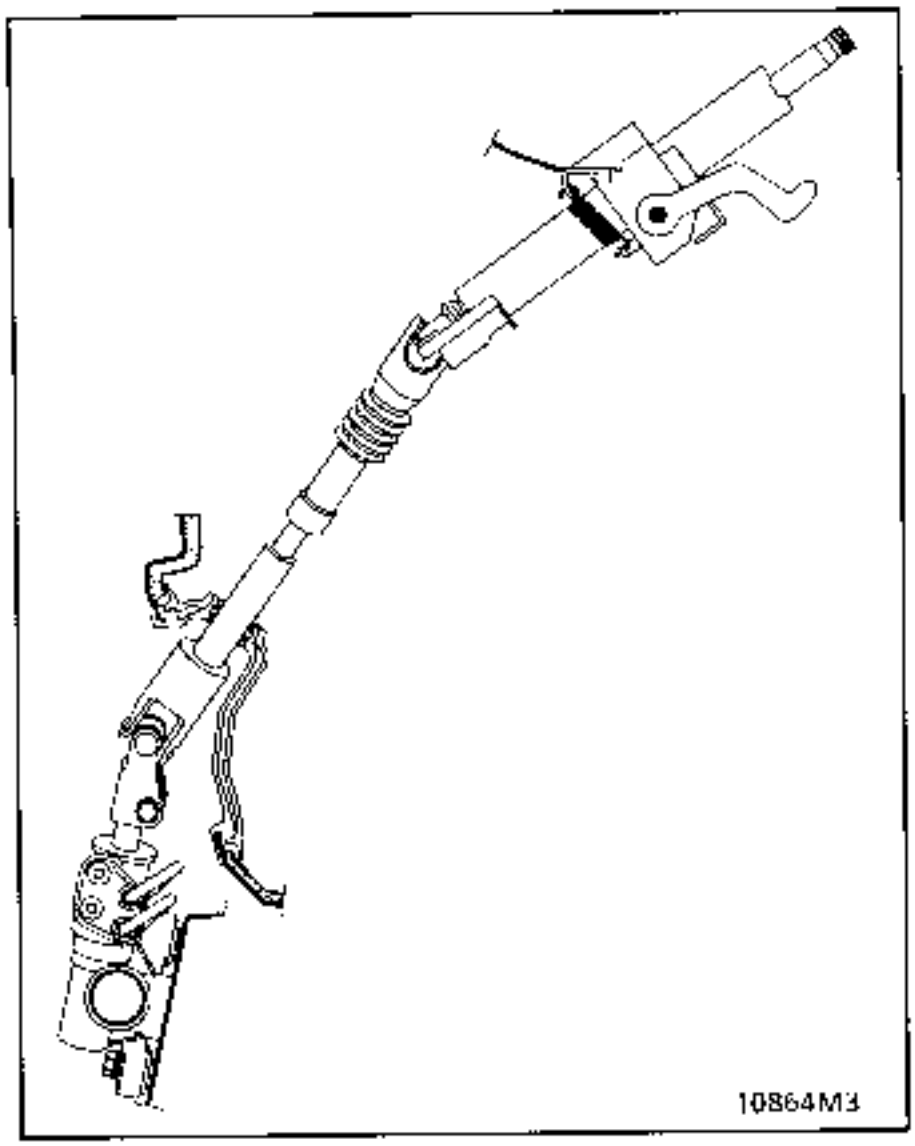


A Left hand unit (2 cast marks)
B Right hand unit (1 cast mark)

SPECIAL TOOLING REQUIRED	
Dir. 1408	Tool for adjusting steering column

TIGHTENING TORQUES (in daN.m)	
Steering wheel nut	4.5
Air bag cushion bolt	0.5
Steering column universal joint eccentric bolt	2.5
Steering column mounting nuts	1.5

The steering column is sold as a complete unit.
No component parts will be described.

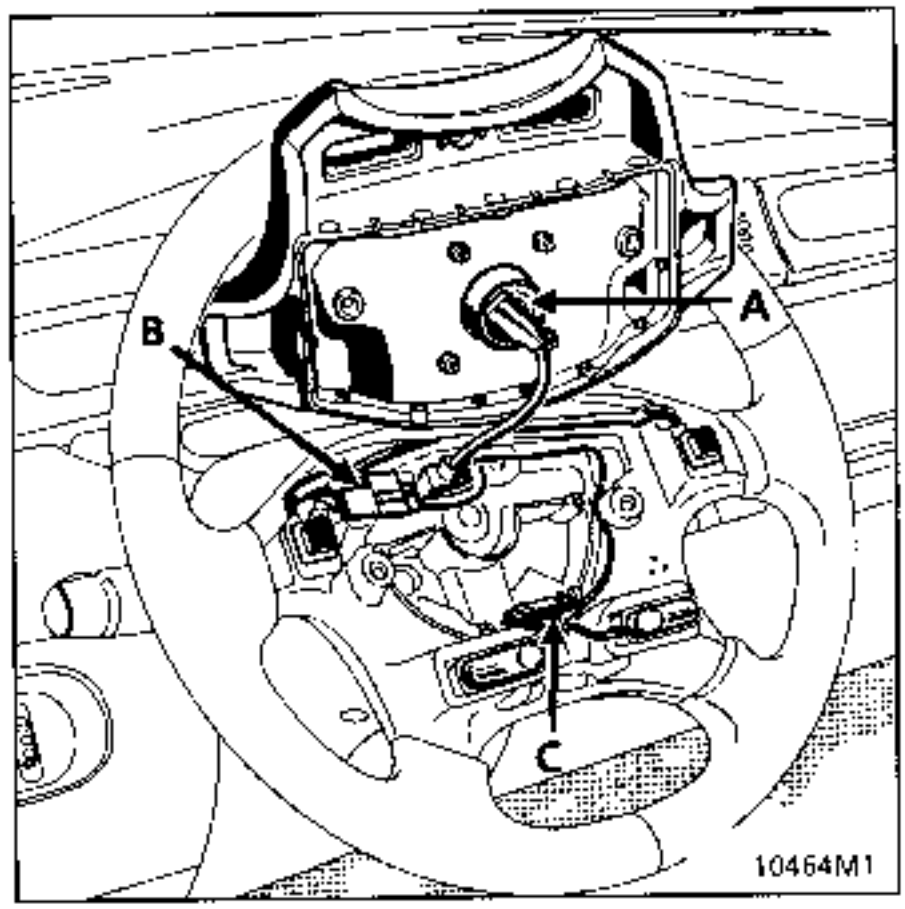


IMPORTANT:
When removing the steering wheel, the airbag / pretensioner system must be de-activated (see section "Steering wheel").

If these instructions are not observed the systems may not operate normally and may be triggered incorrectly.

REMOVAL

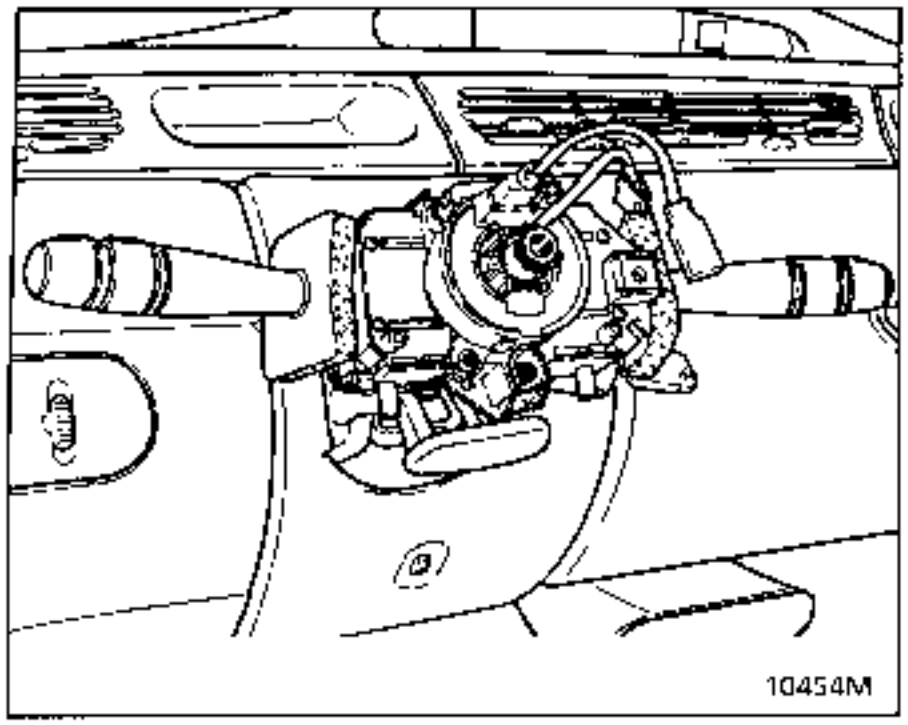
Remove:
- the airbag cushion mounted by 2 bolts behind the steering wheel and disconnect the connector (A),



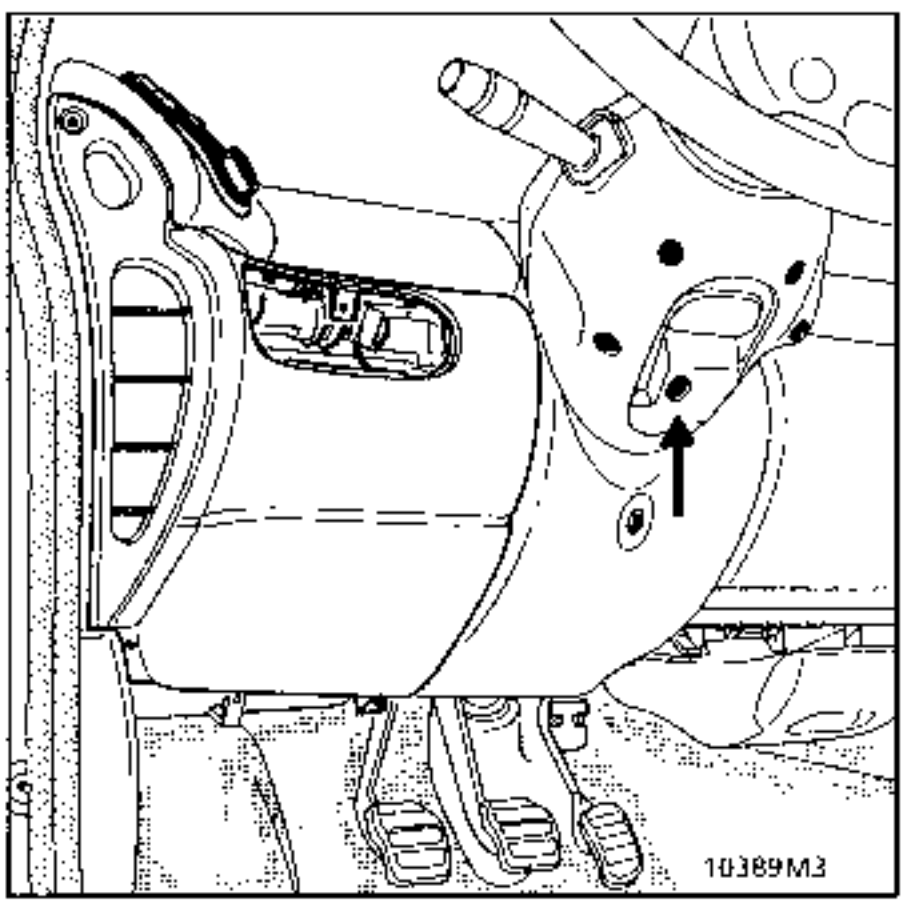
- connector (B) for the horn,
- connector (C) for the cruise control (if fitted),

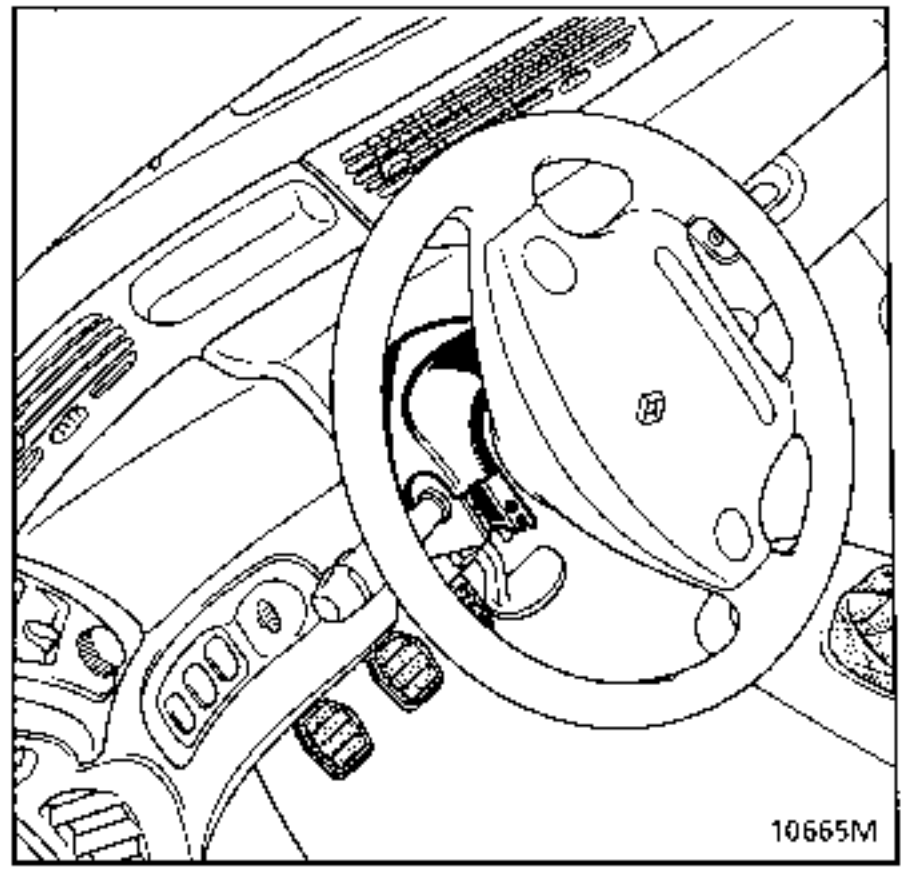
- the steering wheel nut (this must be renewed on refitting),
- the steering wheel, taking care to ensure that the wires do not become trapped.

Immobilise the rotary switch using adhesive tape to prevent it from becoming decentralised.

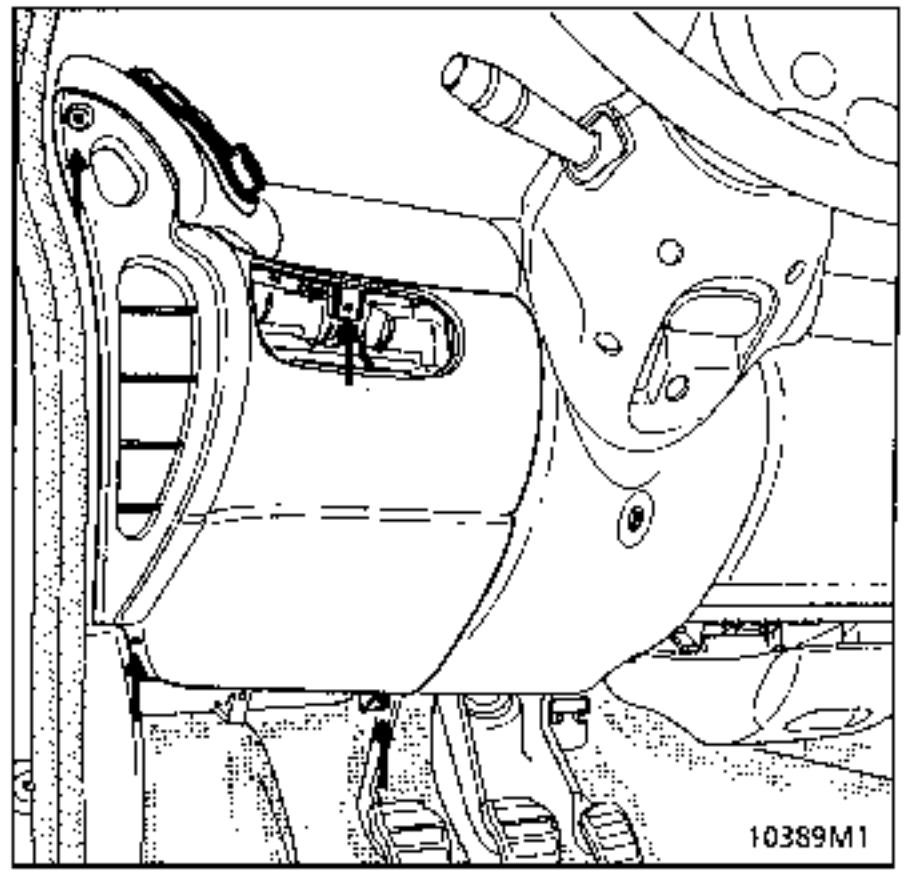

10454M

Remove:
- the radio satellite,
- the upper and lower steering wheel half cowlings,


10389M3

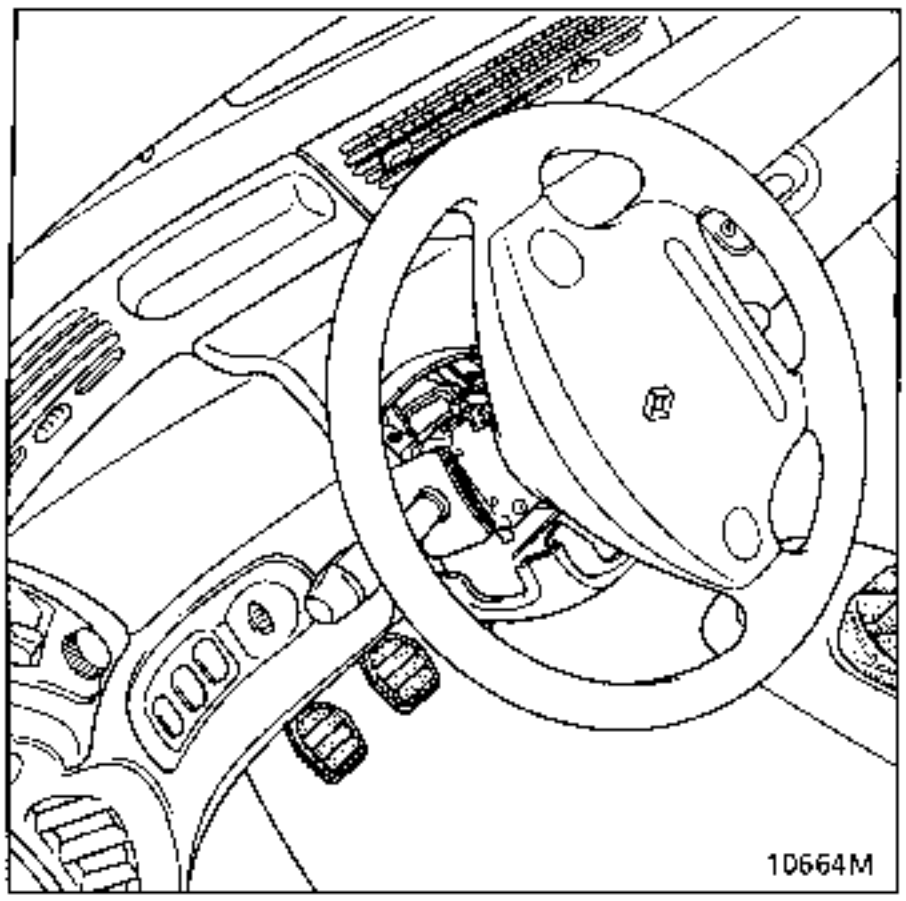

10665M

- the left hand lower console.

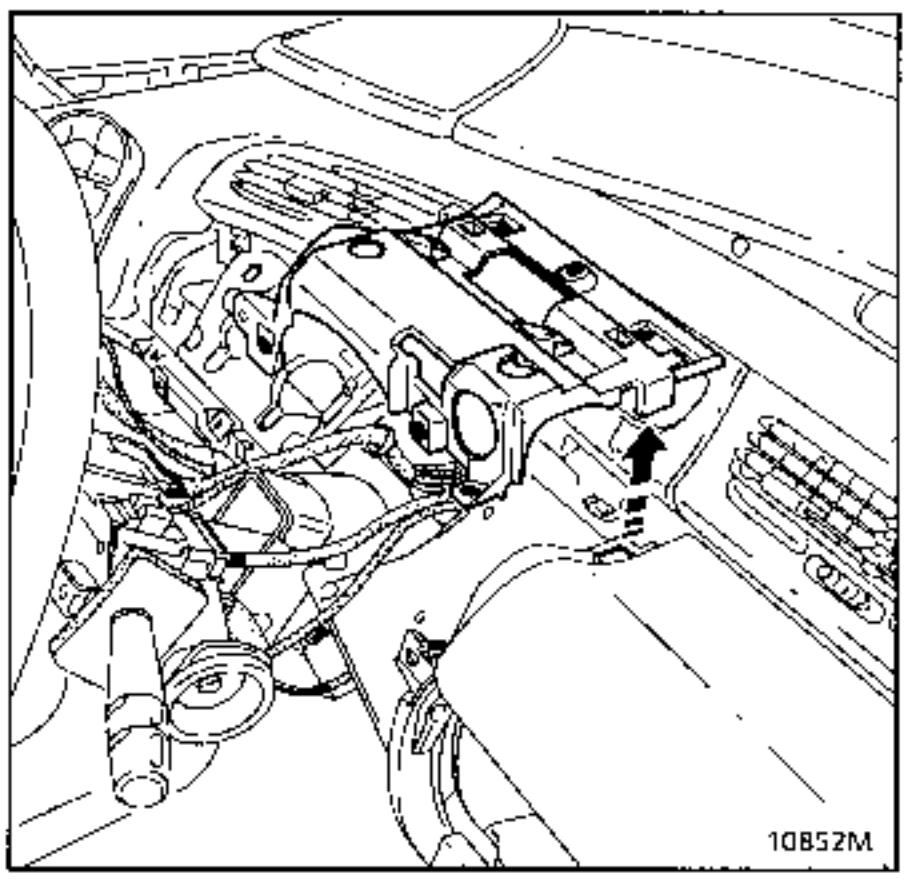

10389M1

- the cloth cover or the automatic transmission selector display surround (depending on version),

- the console under the steering wheel (disconnect the lighting rheostat).

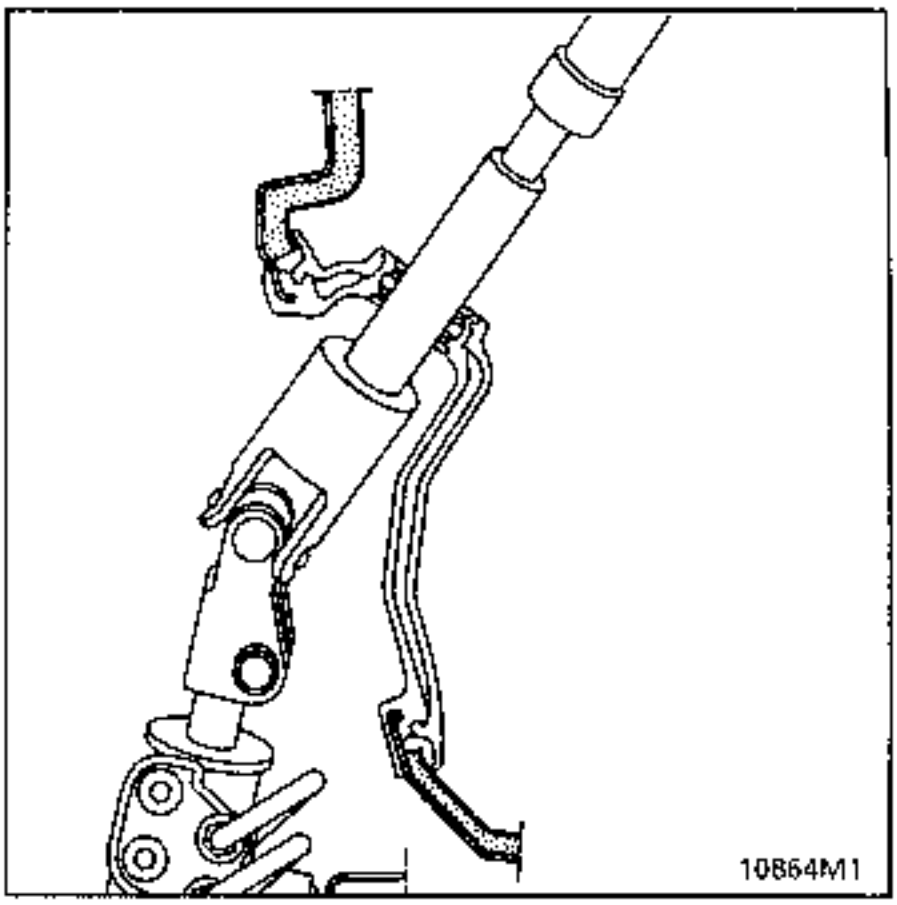


- the steering surround and disconnect the automatic transmission selector display (depending on version) to reach the steering column mountings.

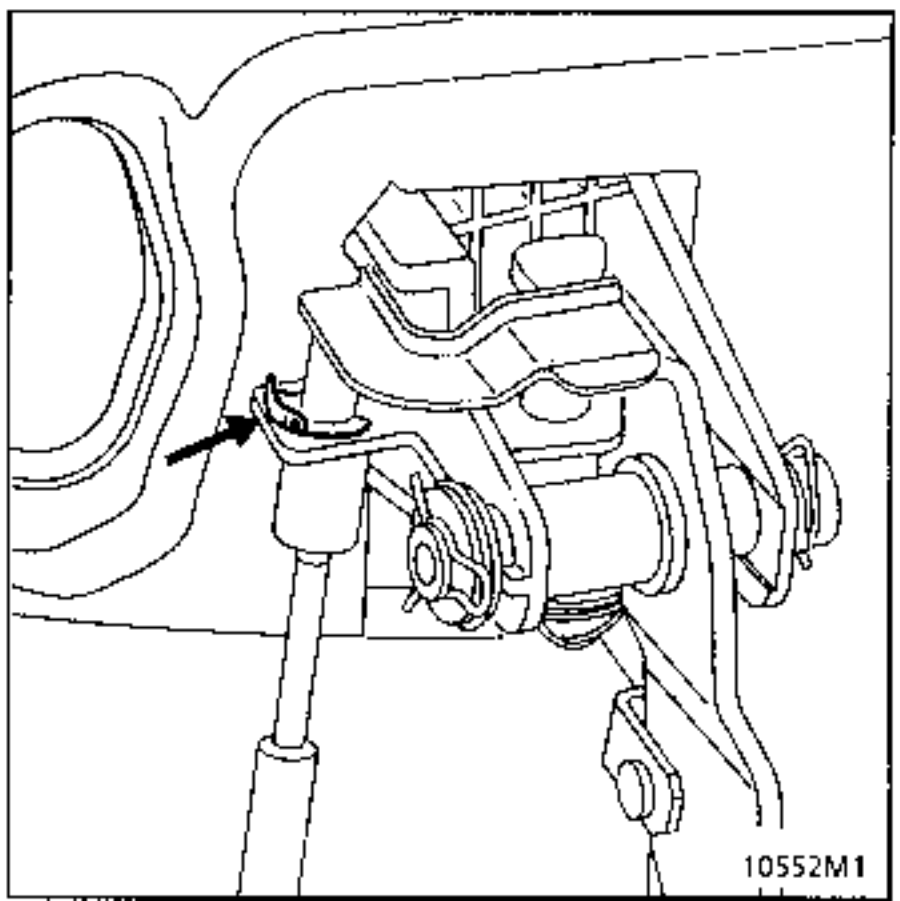


Disconnect the connectors for:
- the ignition switch,
- the wash - wipers stalk,
- the lights stalk.

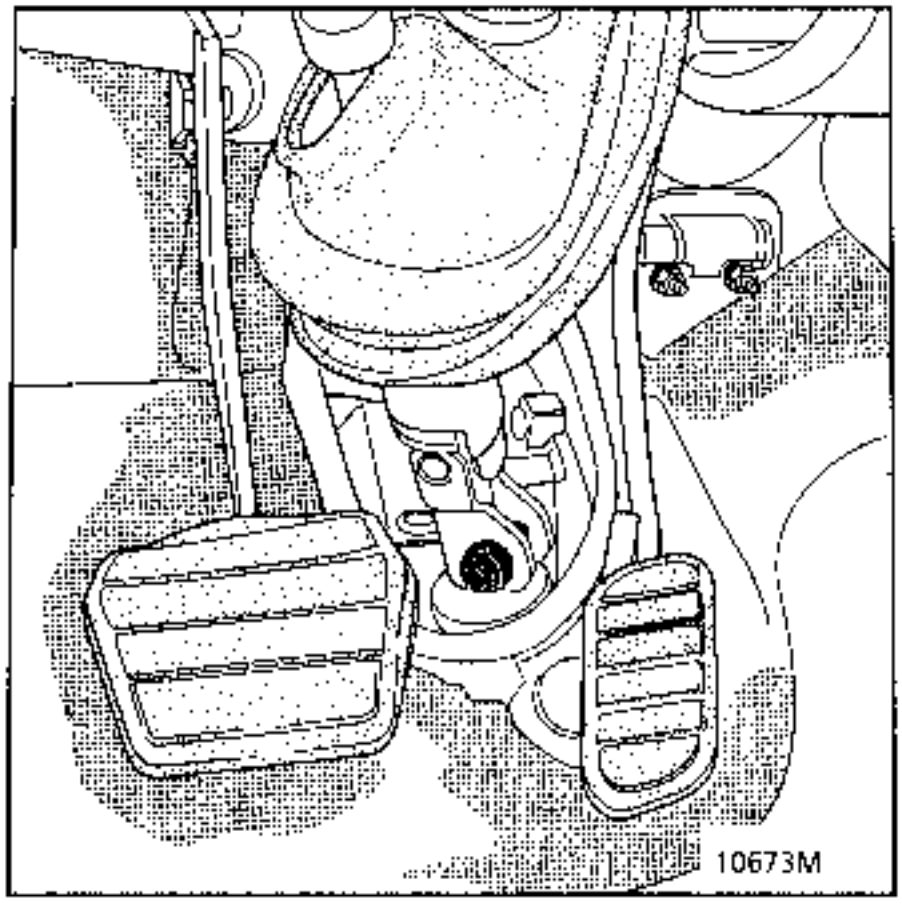
Release the carpet to reach the steering column joint.
Release the joint. Take care as this has two lips:
- one for the soundproofing,
- one for the bulkhead.



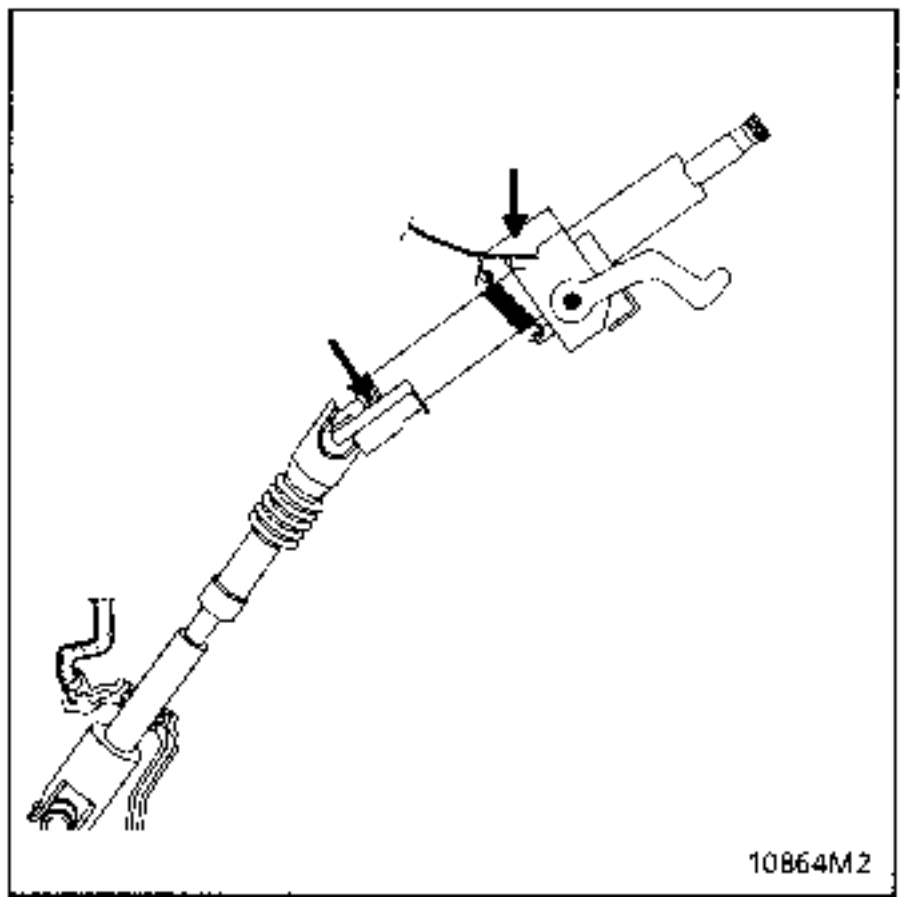
Disconnect the gear change safety cable (automatic transmission) by removing the clip.



Set the wheels straight and remove the nut and eccentric bolt for the steering column universal joint via the passenger compartment.



Remove the steering column mounting nuts and bolt and remove the steering column - stalks assembly.



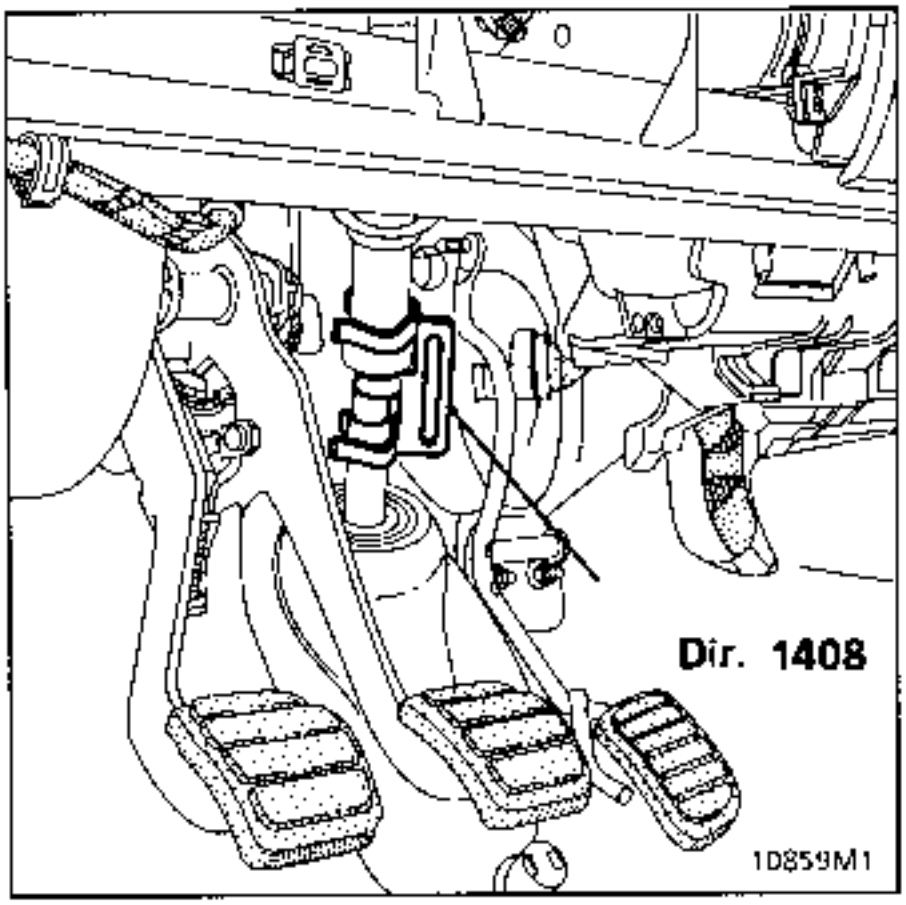
REFITTING (Special notes)

Refit the steering column.

Refit the universal joint and its nut.

IMPORTANT: The lower section of the steering column slides so the position of the universal joint on the steering box must be adjusted.

In the passenger compartment, fit tool **Dir. 1408** to the lower part of the column.
Refit the joint mounting and torque tighten.
Remove the tool.



Wheel straight, with the steering column locked by the ignition switch, the steering wheel is at the centre point.

Check that the rotary switch is still immobilised by the adhesive tape. If not, or you are in any doubt, recentre the switch (see section on steering wheel).
Remove the adhesive.

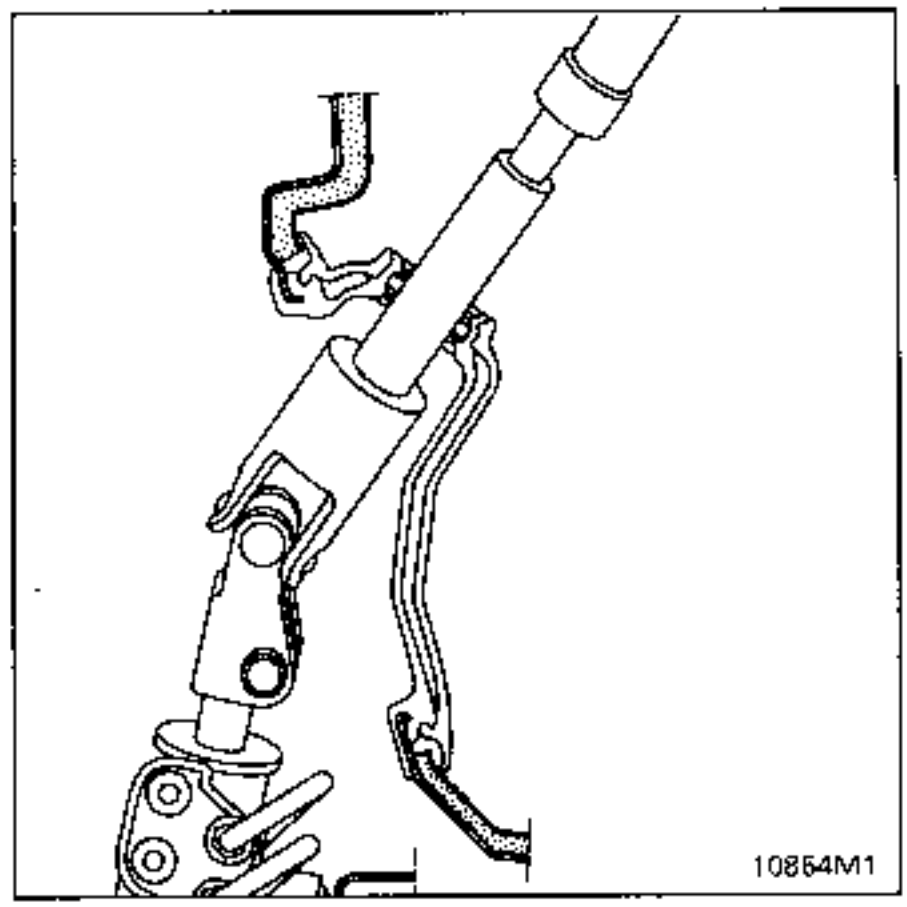
Refit the steering wheel and fit a new bolt and torque tighten it to 4.5 daN.m.

Refit the airbag cushion:

IMPORTANT :

- Connect the cushion to the steering wheel then tighten its mounting bolts (tightening torque **0.5 daN.m)**
- **The airbag / pretensioner system must be reactivated (see section "Steering wheel").**

Fit the steering column joint into position.
Use a spatula or string to refit the outer lip.



Refitting is then the reverse of removal.
IMPORTANT :
Tighten the steering column mountings to a torque **of 1.5 daN.m**.

STEERING WHEEL

IMPORTANT

- **Before removal**
- Connect the XR25 to the vehicle
- Turn the ignition on
- Use fiche n°49 **(ISO selector on S8, code)**

D 4 9

Lock the computer using the XR25

and command G 8 0 *

- When this function is activated, all the trigger lines are inhibited, the airbag warning light on the instrument panel and bargraph 14 LH side on the XR25 illuminate **(new computers are supplied locked)**.

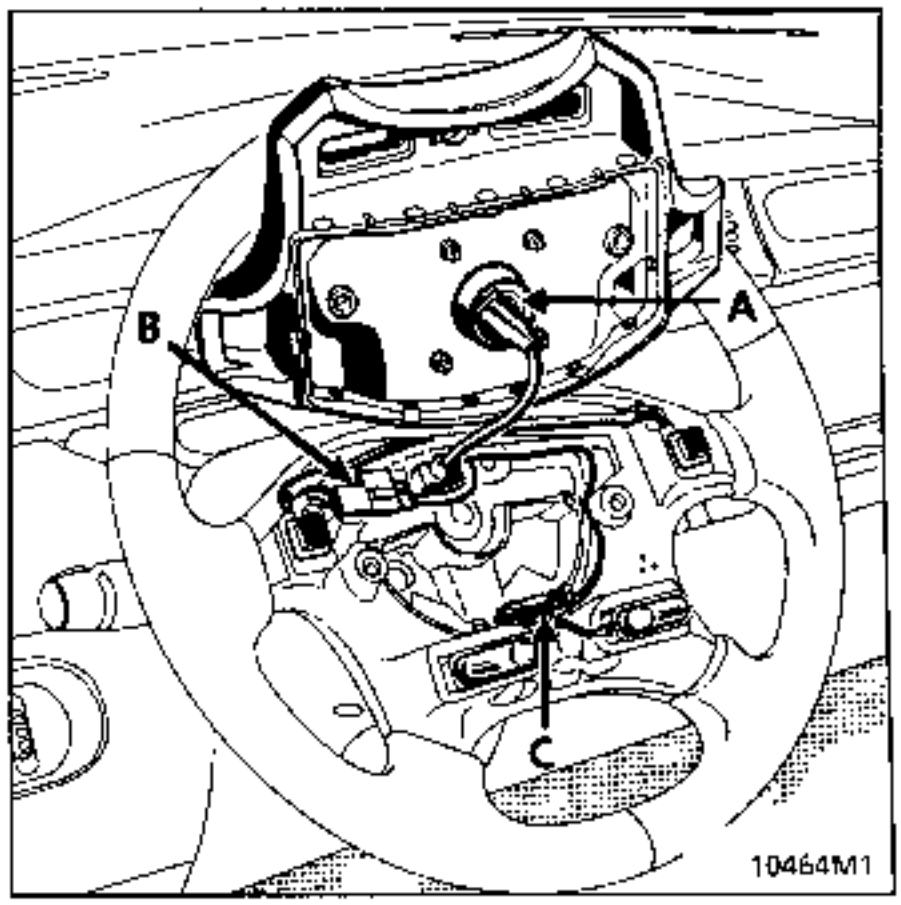
- **Wait for 2 seconds** for the unit to automatically discharge.
- Turn the ignition off.

IMPORTANT: pyrotechnic systems (airbags and pretensioners) must not be handled near to a heat source or flame - they may be triggered.

IMPORTANT: If these instructions are not observed the systems may not operate normally and may be triggered incorrectly.

REMOVAL

Remove:
- the airbag cushion by the 2 mounting bolts (eg. Torx 30) located behind the steering wheel and disconnect its connector (A),



- the horn connector (B) and cruise control connector (C) (if fitted),

Set the wheels straight.
Remove:
- the steering wheel nut (this must be renewed on refitting),
- the steering wheel, taking care to ensure the wires do not become trapped.

REFITTING

Refit the steering wheel using a new nut and torque tighten to 4.5 daN.m. Take care not to trap the wires.

Refit the airbag cushion.

IMPORTANT:

When everything has been refitted:

- Check using the XR25 that there are no faults on the system.
- If all is correct, unlock the computer

  using command G 8 1 *
- Check that bargraph 14 LH side on the XR25 is extinguished.

SPECIAL NOTES FOR THE ROTARY SWITCH UNDER THE STEERING WHEEL

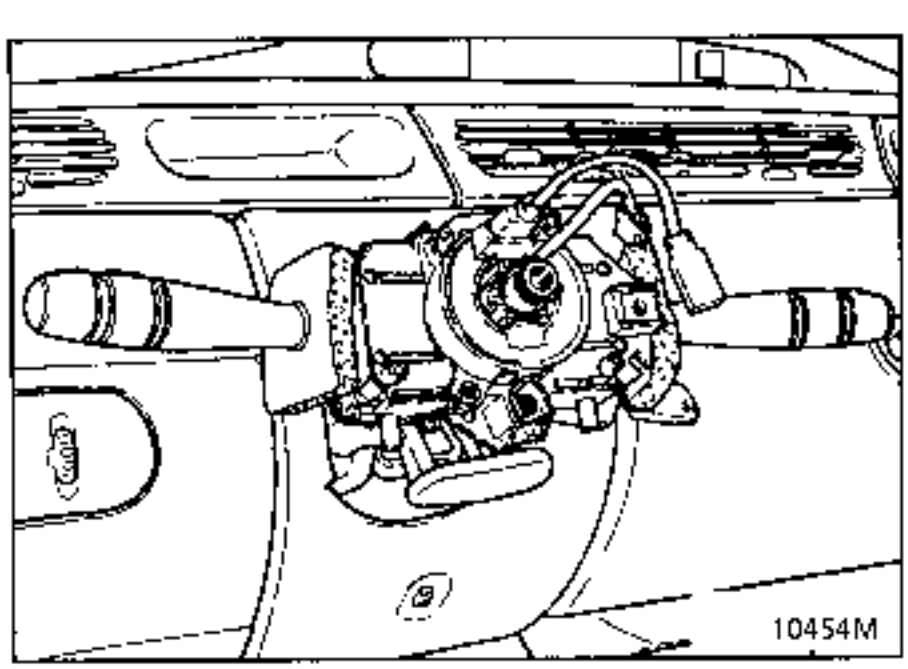
This switch ensures the electrical connection between the steering column and the steering wheel.

It has a strip with conductive tracks (airbag) of a length such that the steering wheel may be turned 2.5 times (to the lock plus extra for safety) to each side.

REMOVAL

When it is removed, its position must be noted,:

- by ensuring that the wheels are straight when it is removed so the strip is positioned in the centre,
- by immobilising the rotary switch rotor using adhesive tape.



REFITTING

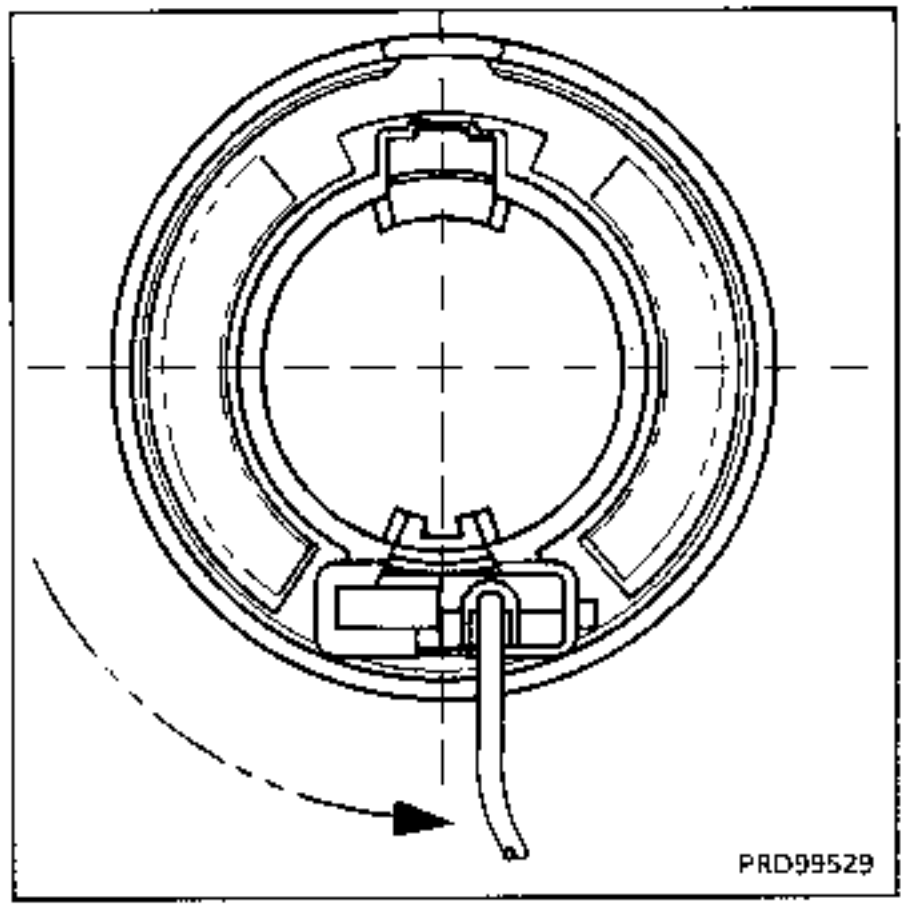
Ensure the wheels are still straight.

Check that the rotary switch is still immobilised before refitting.

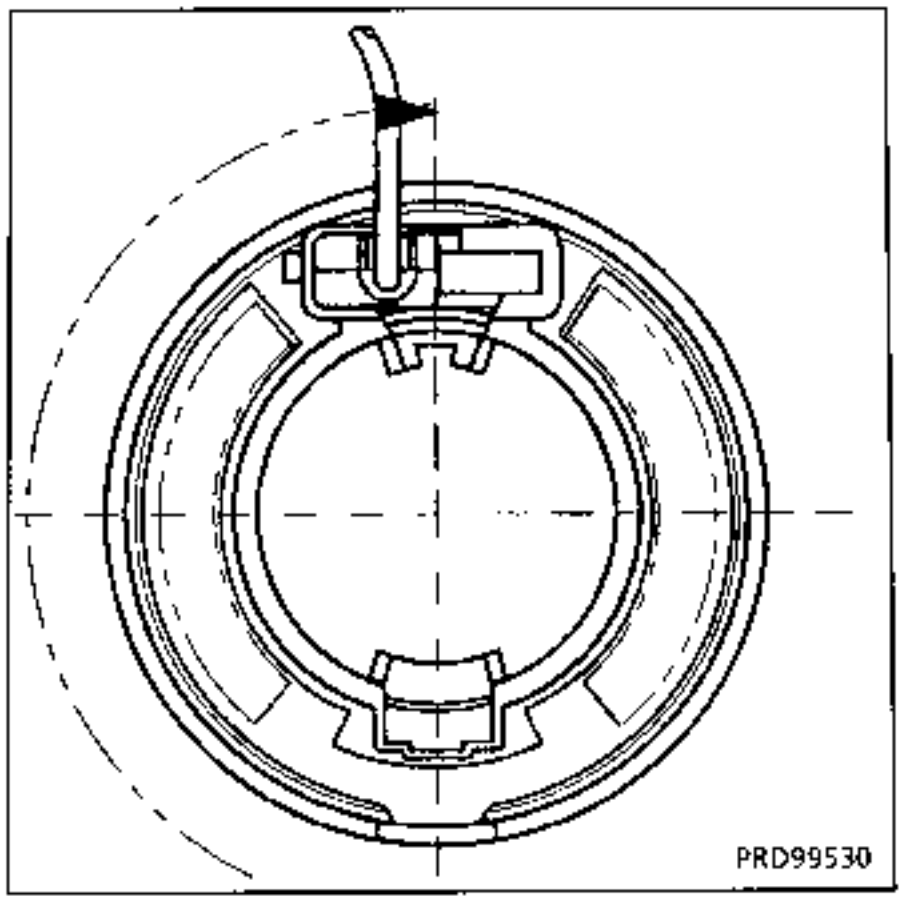
If this is not the case, follow the centring method below.

METHOD FOR CENTRING THE ROTARY SWITCH:

- turn the upper part of the rotary switch anti-clockwise. When it is at the end position, as shown in the diagram below, it will be hard to turn (do not force it).



- now turn the upper part of the switch gently clockwise and check that the rotary switch is in the position shown below.

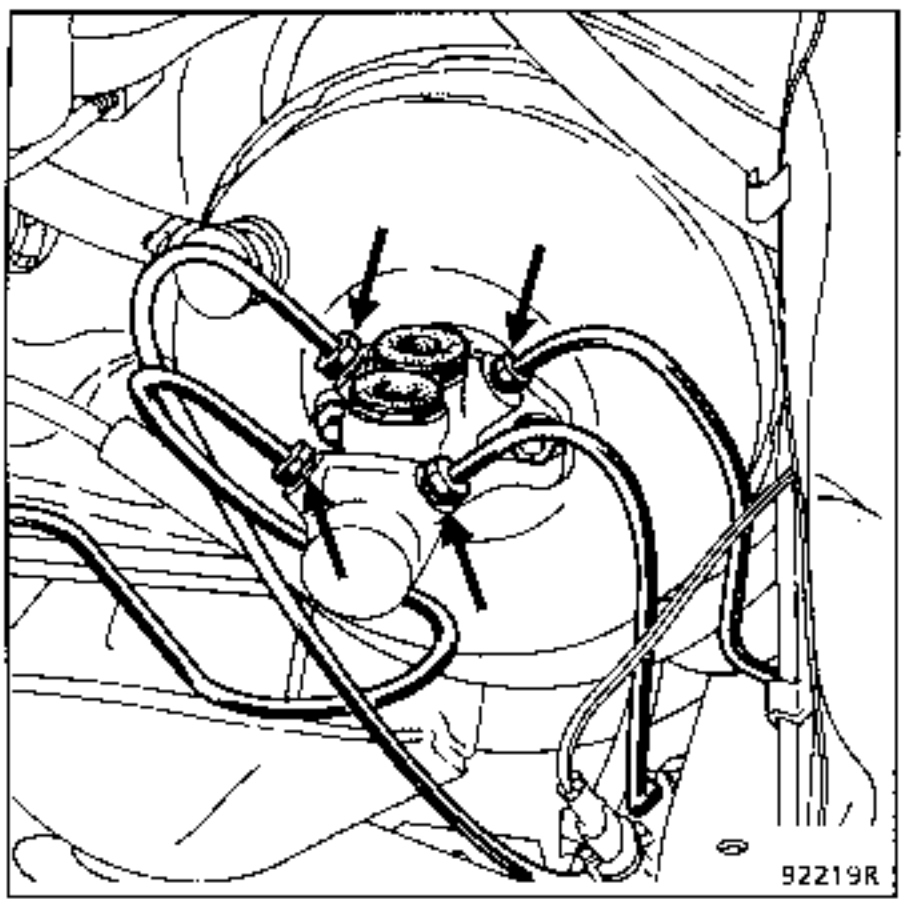


- turn the component clockwise once more, two full turns, and ensure after this operation that the rotary switch is in the position described previously.

TIGHTENING TORQUES (in daN.m)	
M 10 X 100	1.7
M 12 X 100	1.7
Brake servo mounting nut	2.5

REMOVAL

Drain and remove the brake fluid reservoir by pulling it from above (take precautions to catch the brake fluid which will run out).



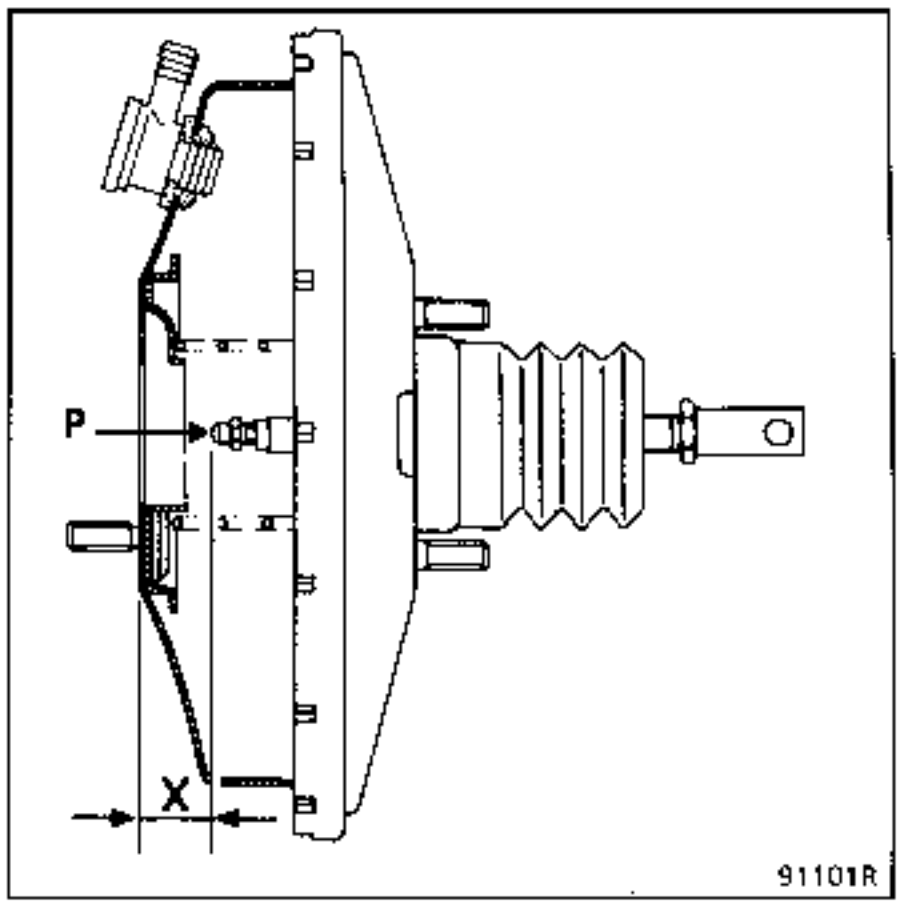
Remove:
- the pipes and mark their position,
- the two mounting nuts on the brake servo.

REFITTING

Check the length of the pushrod.

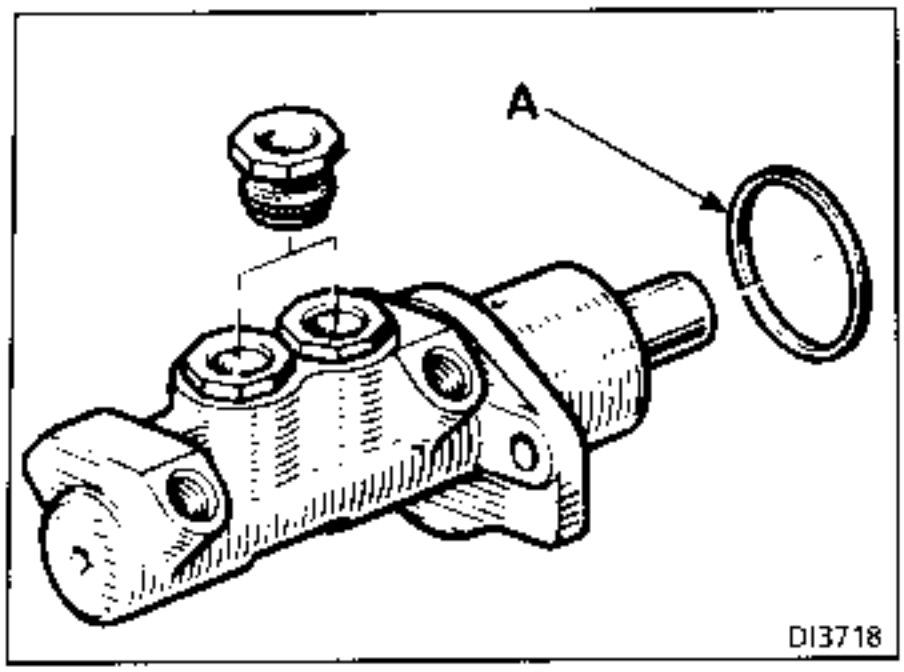
Dimension X = 22.3 mm.

Adjust using pin (P).

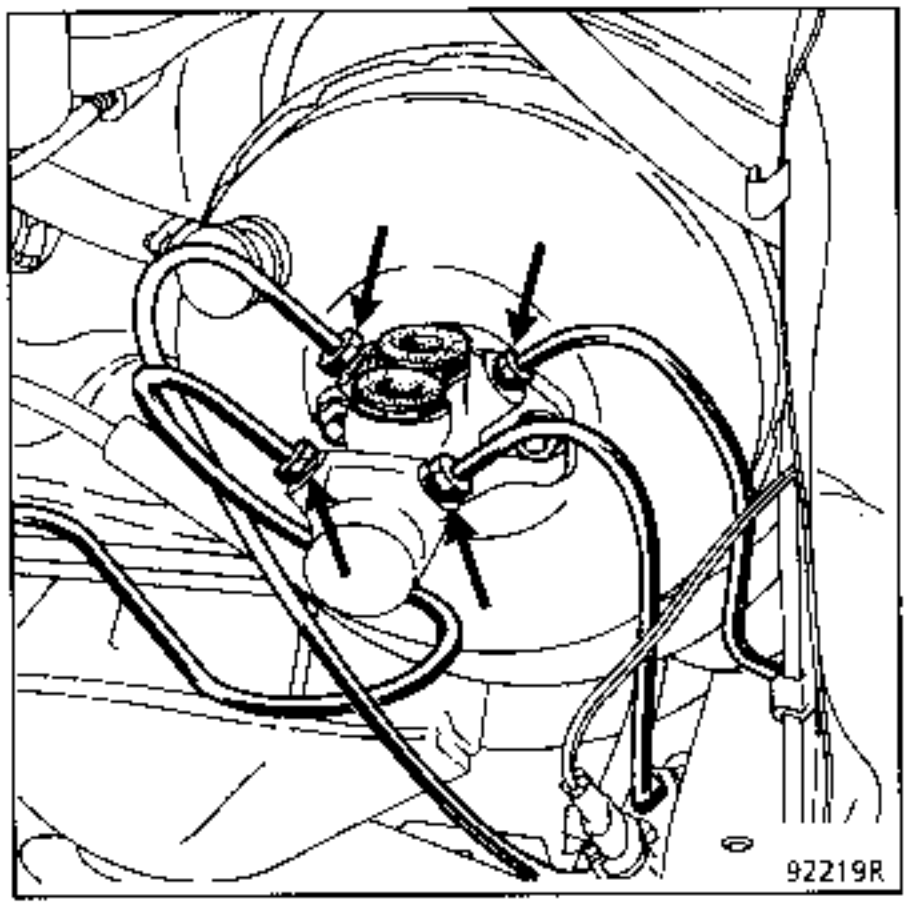


NOTE : these vehicles have a master cylinder which is integral to the brake servo. Sealing of the brake servo is directly linked to that of the master cylinder. During any operation, a new seal (A) must be fitted.

Fit the master cylinder in alignment with the brake servo so that pushrod pin (P) enters correctly into the master cylinder housing.



Reconnect:
- the pipes in the positions marked on removal,

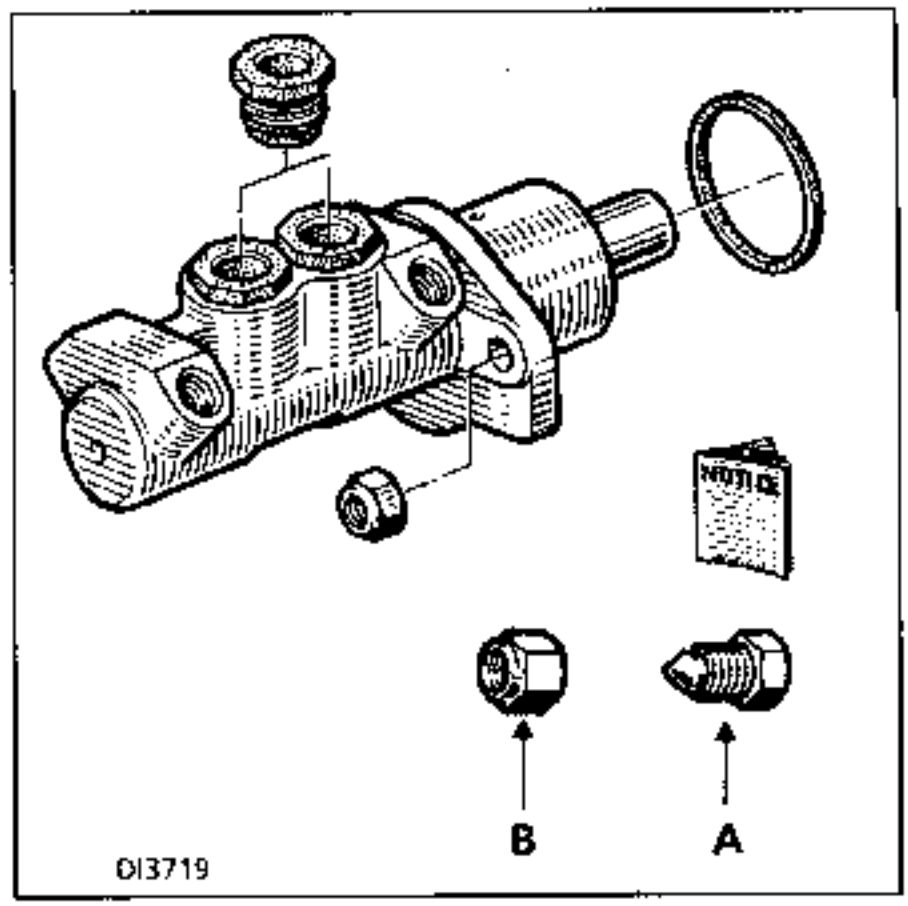


- the compensation reservoir, pressing on it to ensure it clicks into position in the master cylinder.

Bleed the braking circuit.

MASTER CYLINDER (EXCHANGE)

The kit sold by the Parts Department comprises :
- one master cylinder (4 outlets),
- two plugs (A),
- two mounting nuts (B).



For vehicles not fitted with ABS, all four outlets are used (the two plugs (A) are not used).

For vehicles with ABS, fit plugs (A) into the unused outlets.

SPECIAL TOOLING REQUIRED	
Fre. 1396	Special socket for radio ratchet

TIGHTENING TORQUES (in daN.m)	
M 10 X 100	1.7
M 12 X 100	1.7
Brake servo on mounting	2.5

REMOVAL

Remove the battery.

Remove :
- the master cylinder from the brake servo and attach the reservoir to the master cylinder using a plastic clip,
- the master cylinder (vehicle without ABS).

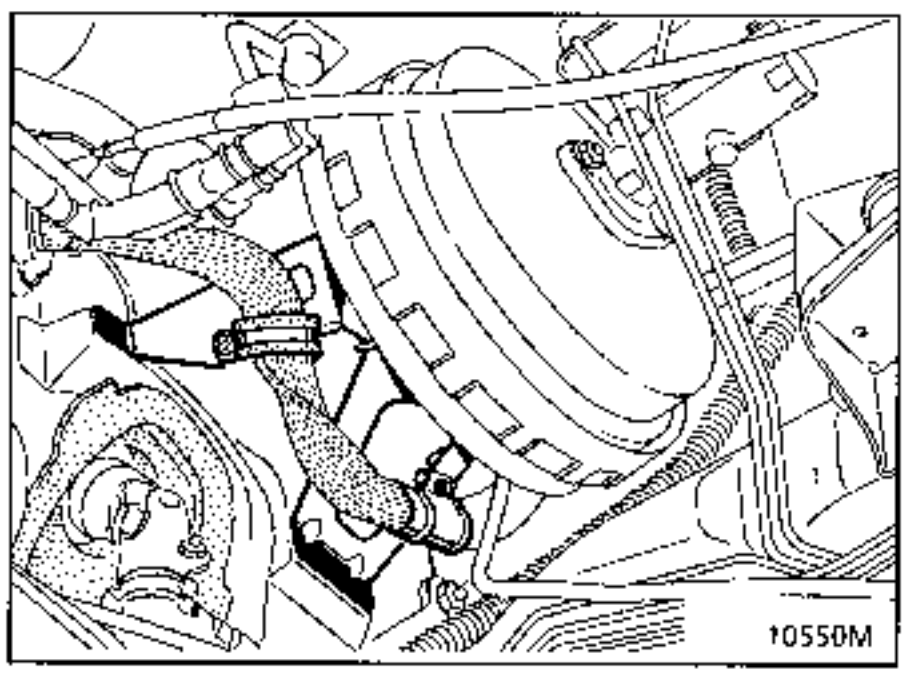
Disconnect the vacuum pipe from the brake servo.

Remove the pin connecting the brake pedal to the pushrod shaft.

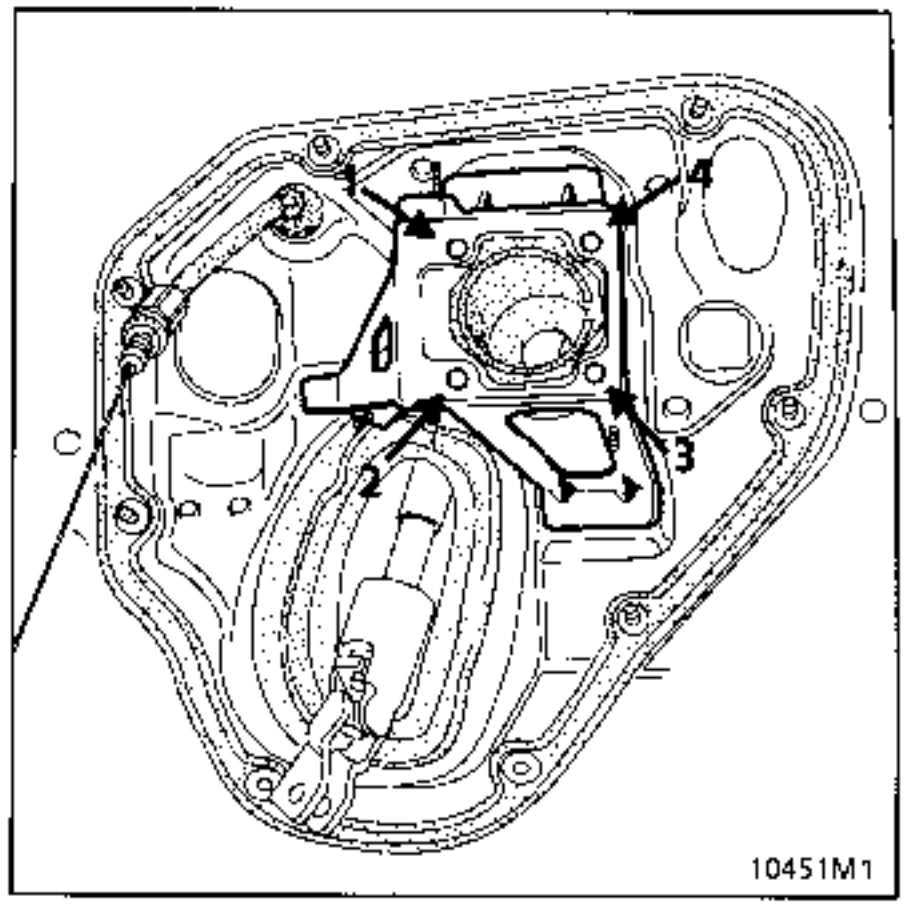
F ENGINE

Under the vehicle:

Unclip and release the wiring (2 mountings on the brake servo mounting and 1 mounting on the shock absorber turret) .



Slacken nuts (1)-(2)-(3) .

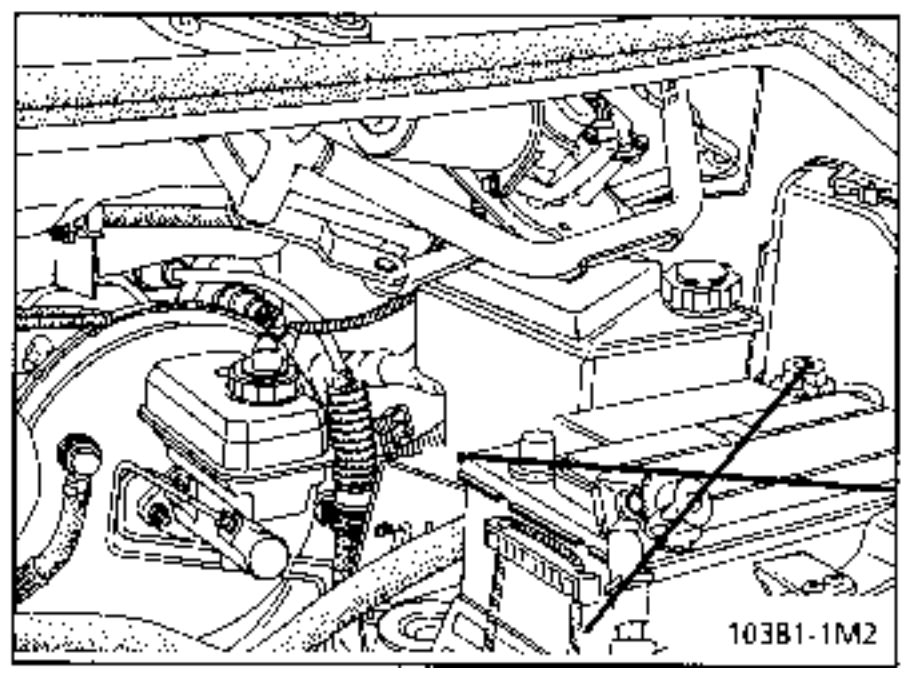


In the engine compartment:

Remove the air filter assembly.

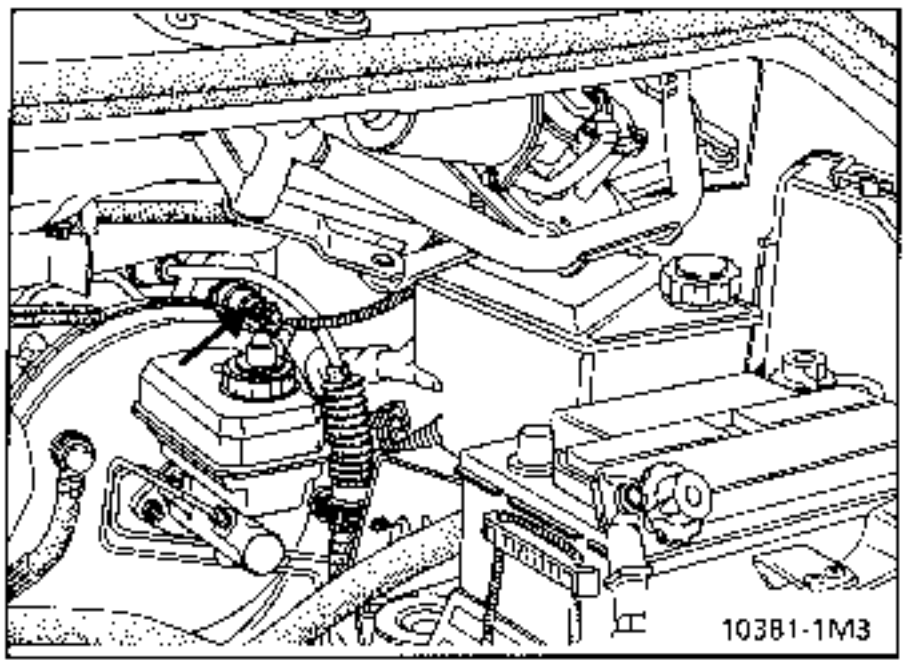
Release the clutch cable from the engine mounting plate and remove the clip.

Pass the cable behind the brake servo.



If necessary:

- Unclip the coolant pipes (press on the clip and pull).
- Release the coolant pipes to reach nut (4).



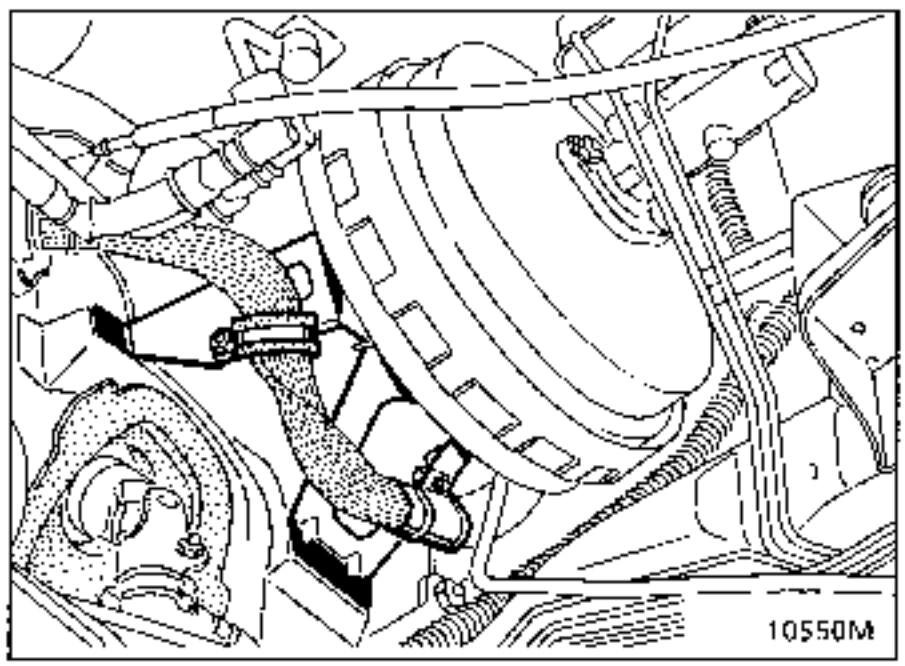
Slacken nut (4) using socket Fre.1396 on a "radio" ratchet.

Remove the brake servo.

Z ENGINE

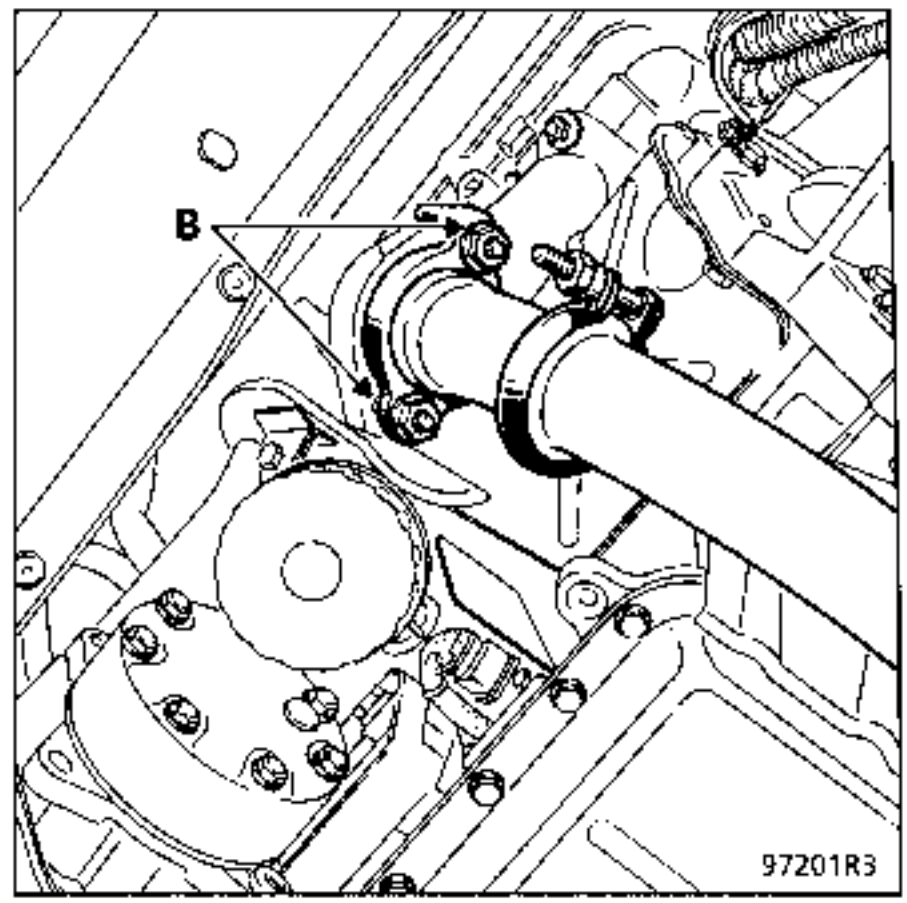
Under the vehicle:

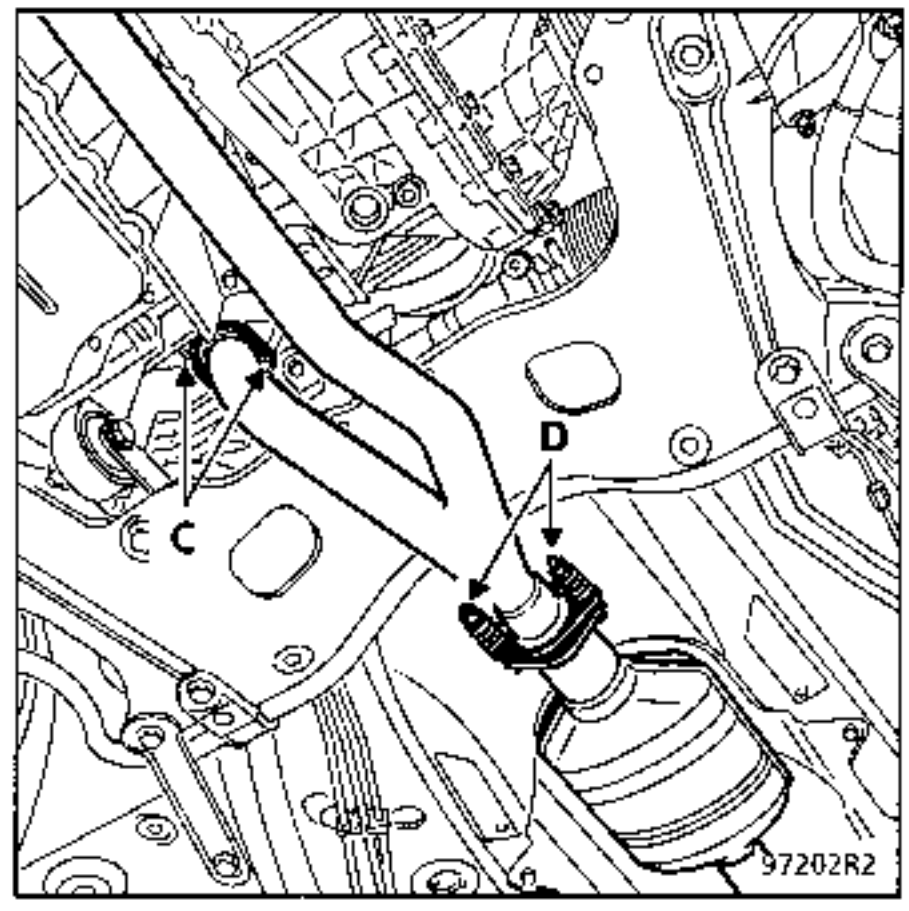
Unclip and release the wiring (2 mountings on the brake servo mounting and 1 mounting on the shock absorber turret) .



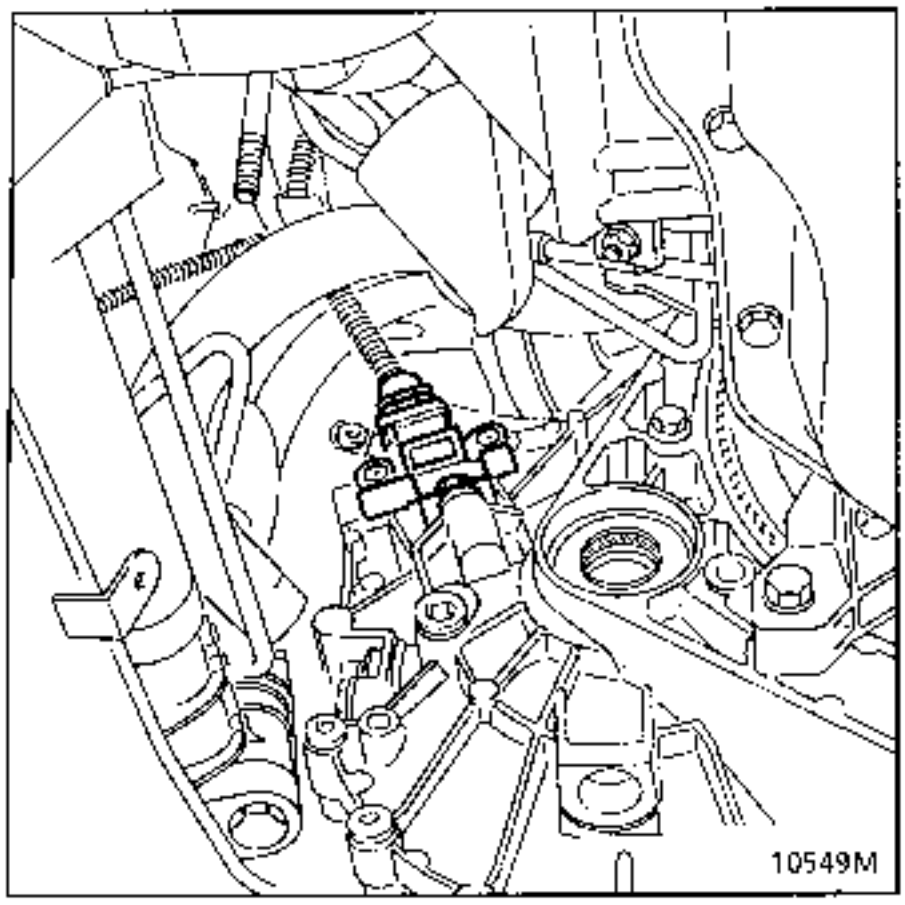
To reach the brake servo mountings, remove,:

- the exhaust pipes from the manifold outlet to the catalytic converter,
- the exhaust heat shield.

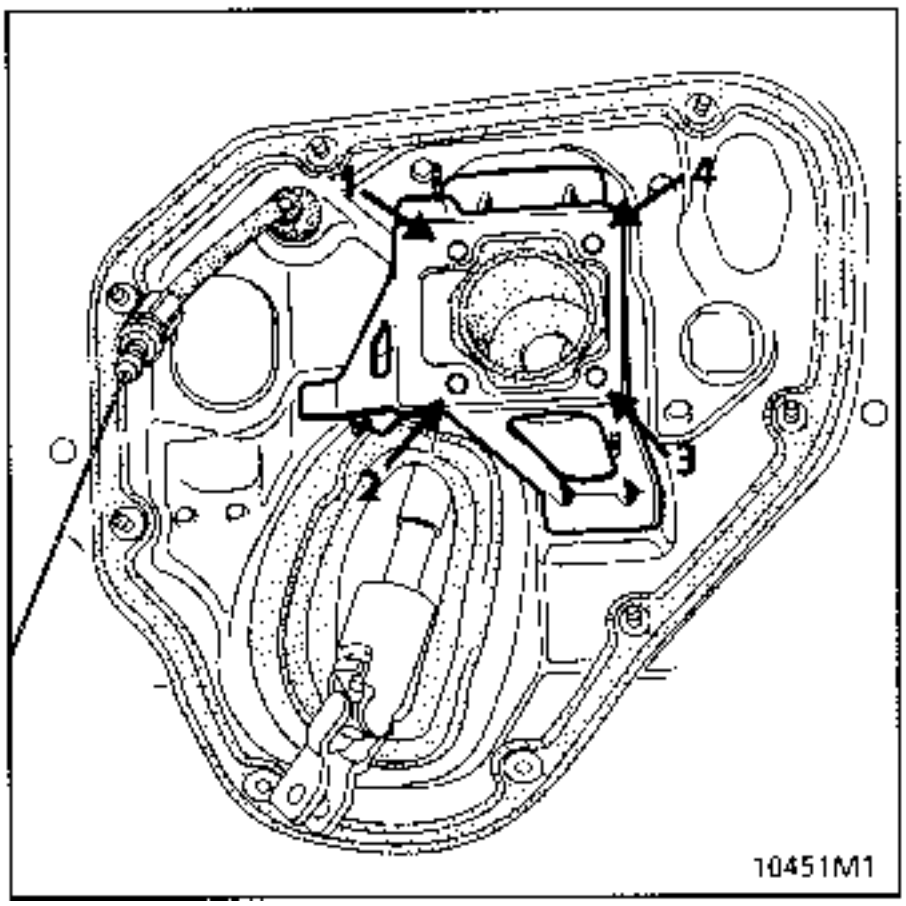




Disconnect the speedo cable from the gearbox.

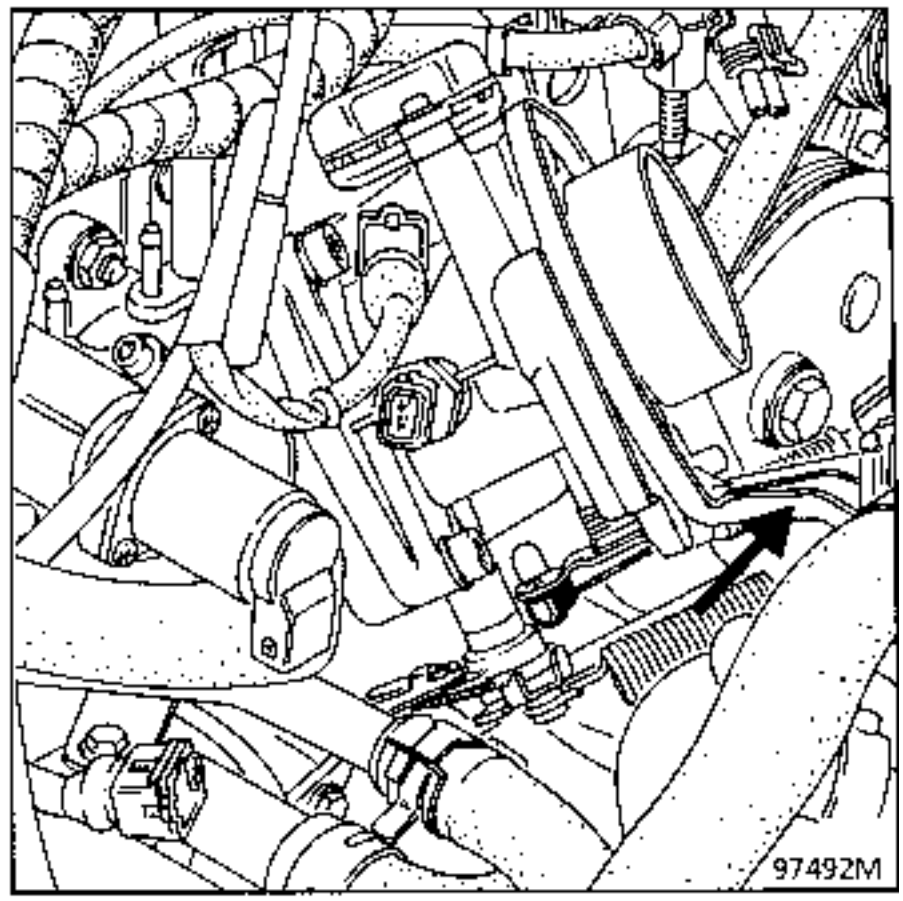


Slacken nuts (1)-(2)-(3) .



In the engine compartment:
Remove:

- the air filter cover and the filter cartridge (fit a cloth into the air inlet),
- the bracket on the throttle body which mounts the cable sleeve stop for the accelerator cable.



If necessary:

- Unclip the coolant pipes (press on the clip and pull).
- Release the coolant pipes to reach nut (4).

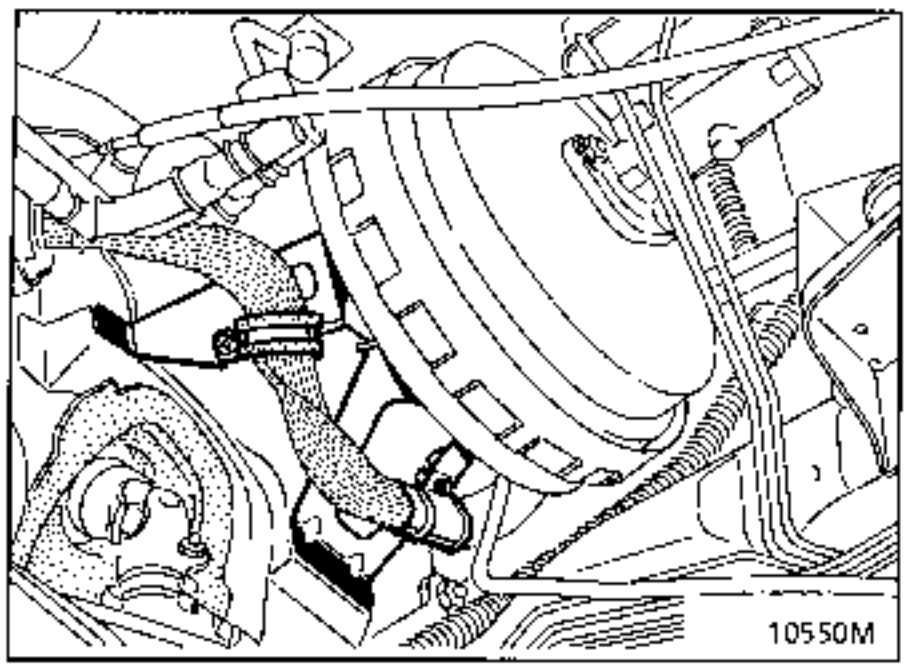
Slacken nut (4) using socket **Fre.1396** on a "radio" ratchet.

Remove the brake servo.

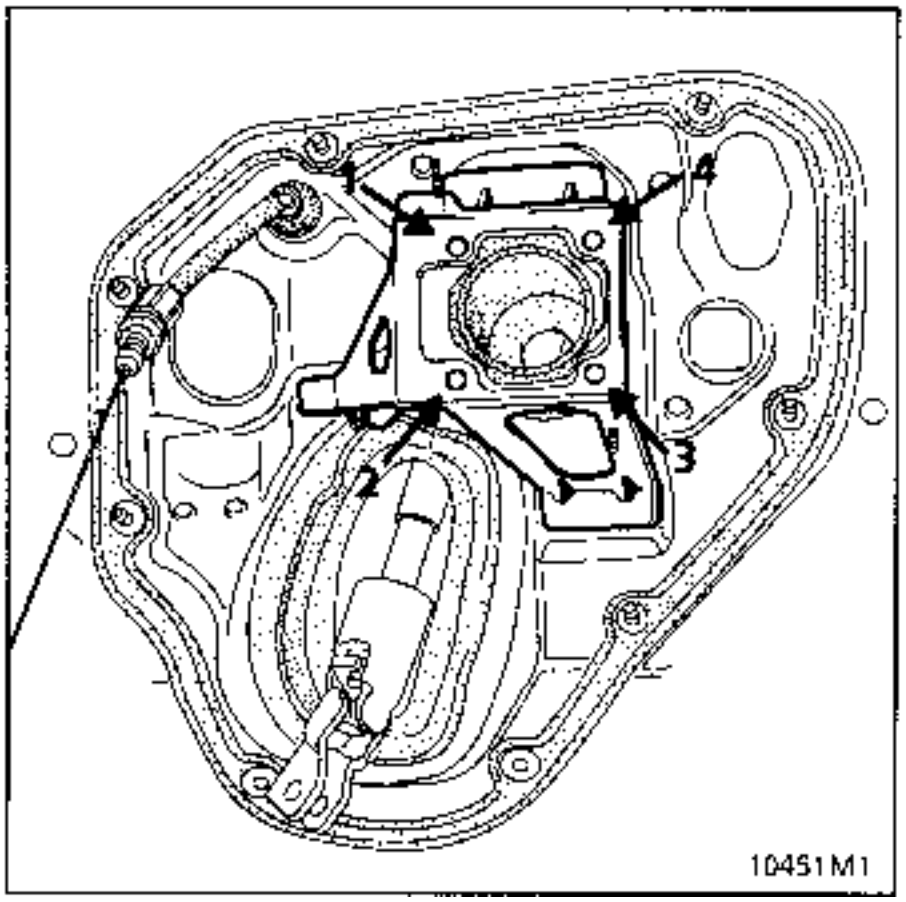
G ENGINE

Under the vehicle:

Unclip and release the wiring (2 mountings on the brake servo mounting and 1 mounting on the shock absorber turret) .

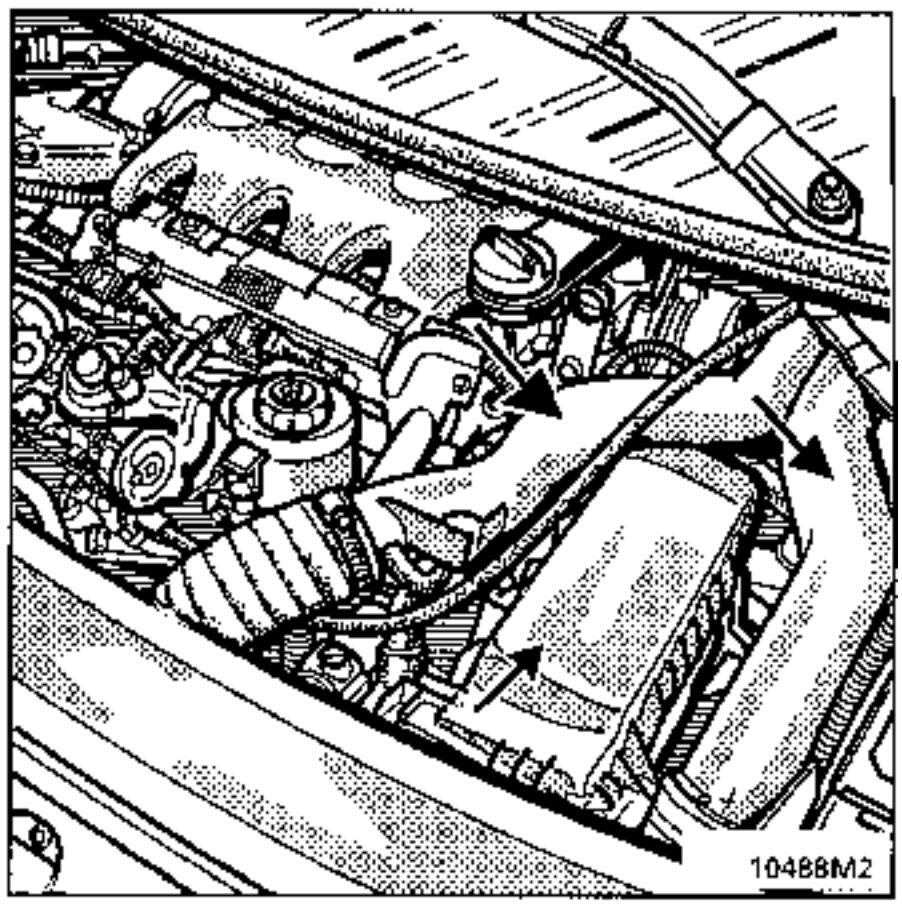


Slacken nuts (1)-(2)-(3) .



In the engine compartment:

Remove:
- the air filter assembly,
- the rigid air inlet pipe to the manifold,
- the rigid air outlet pipe for the turbo.



If necessary:
- Unclip the coolant pipes (press on the clip and pull).
- Release the coolant pipes to reach nut (4).

Slacken nut (4) using socket **Fre.1396** on a "radio" ratchet.

Remove the brake servo.

REFITTING

Before refitting, check:

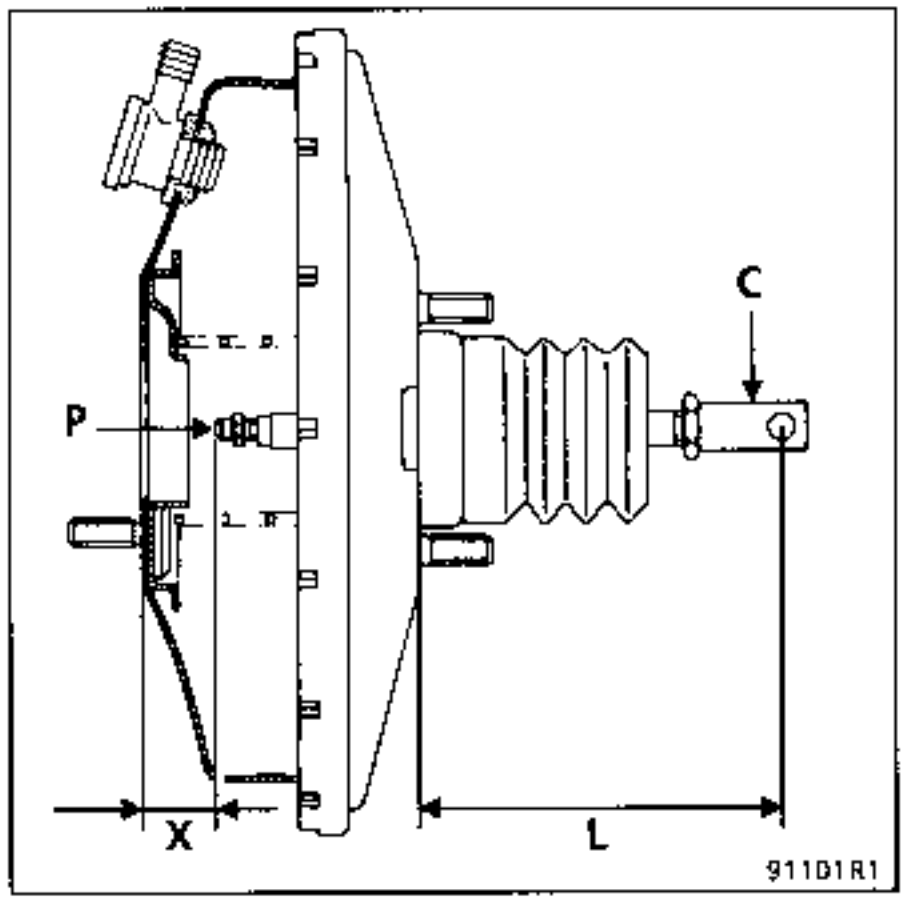
Z-GBT ENGINE
Dimension L = **193.5** mm (LH drive)

F ENGINE
Dimension **L** = **198.5** mm (LH drive)

Adjust using rod (C).

Dimension **X** = **22.3** mm
adjust using rod (P).

Before fitting the brake servo studs into the mounting, check the gaiter is correctly positioned.



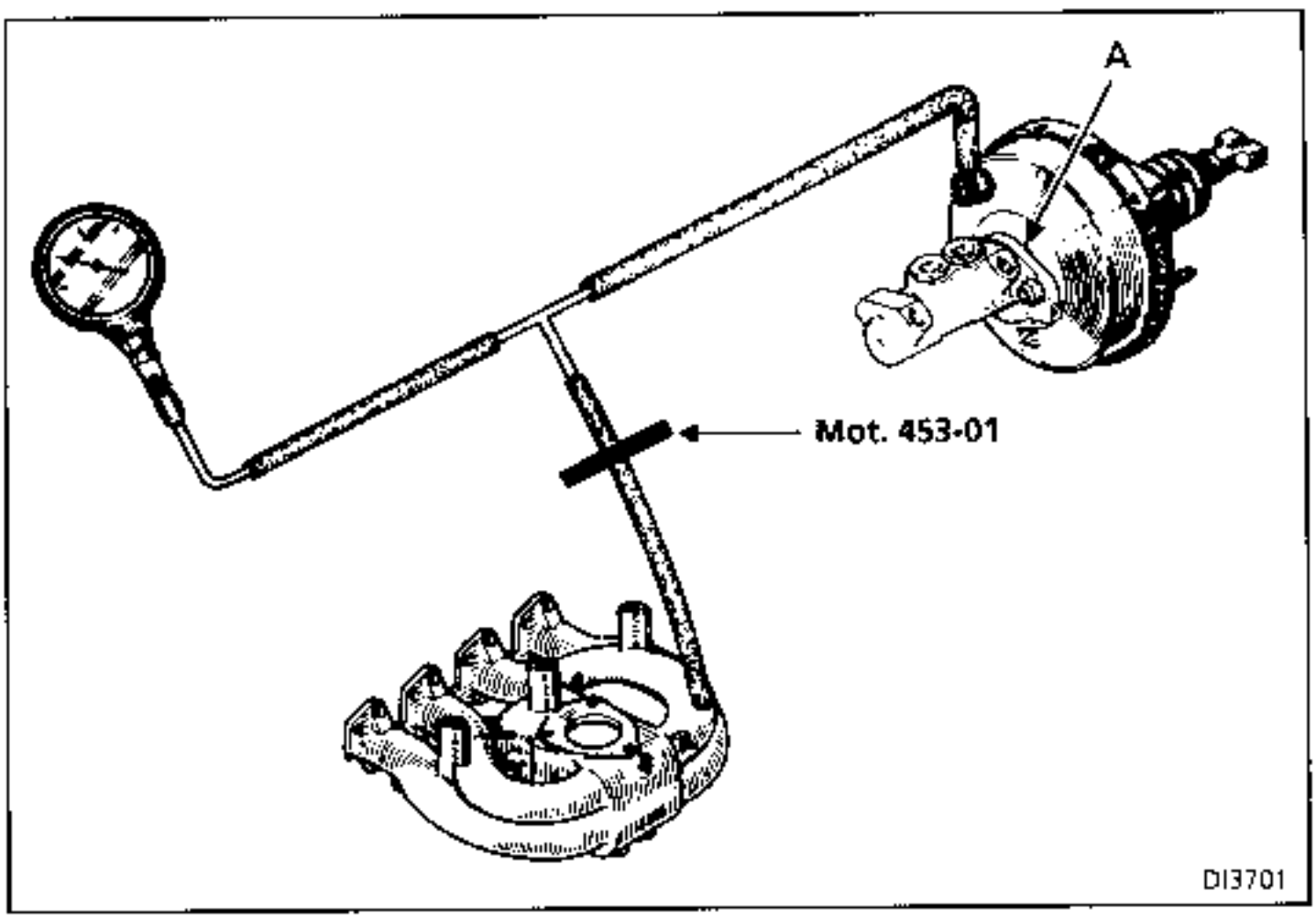
Fit the master cylinder (see recommendations in the section concerned).

Bleed the braking circuit (if the master cylinder was removed) .

SPECIAL TOOLING REQUIRED	
Mot. 453 -01	Hose clamp pliers
EQUIPMENT REQUIRED	
NAUDER* vacuum pump	

CHECKING SEALING

When checking the sealing of the brake servo, ensure the seal between the brake servo and the master cylinder is perfect. If there is a leak, replace the seal (A).



The sealing of the brake servo is checked on the vehicle when the hydraulic circuit is in operating condition.

Connect the NAUDER* vacuum pump between the brake servo and the vacuum source (inlet manifold) using a "T" union and the shortest possible pipe.

Run the engine at idle speed for one minute.

Clamp the pipe (clamp **Mot. 453-01**) between the "T" union and the vacuum source.

Turn the engine off.

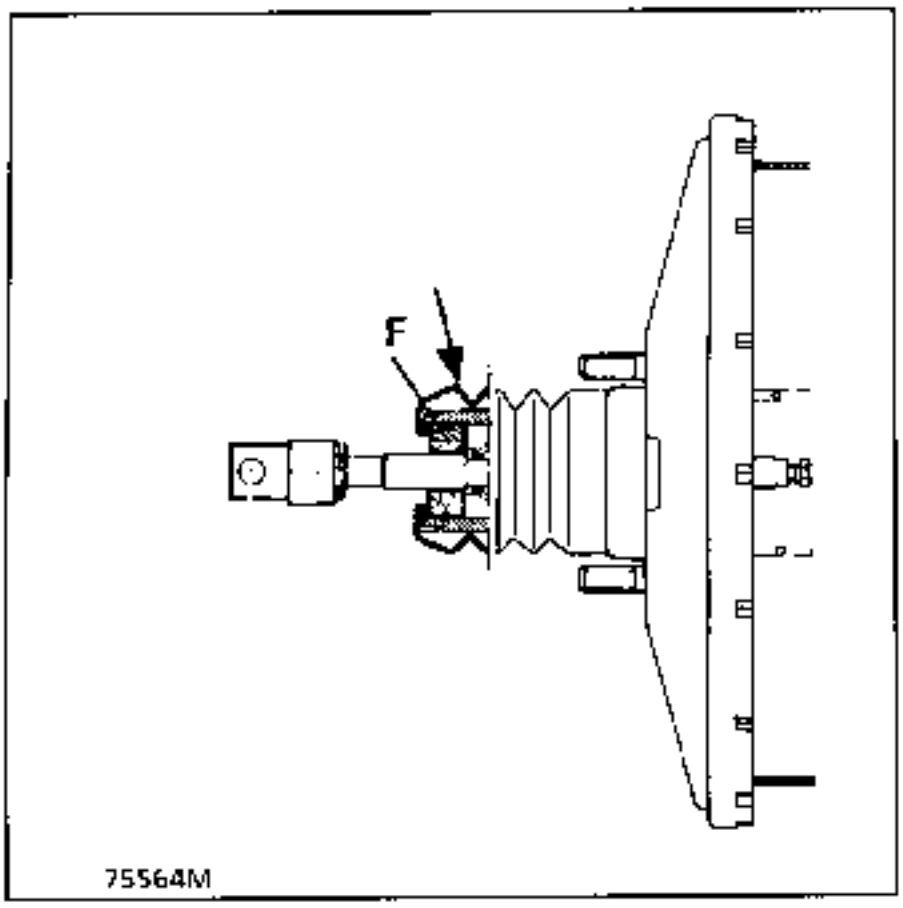
(*) Use as a vacuum gauge

If the vacuum drops by more than 33 mbar (25 mm/Hg) in 15 seconds, there is a leak located either :

- at the non-return valve (replace it),
- or at the pushrod diaphragm (replace the brake servo).

If the brake servo is not operational the braking system will operate but the force required at the pedal to obtain the equivalent deceleration as for assisted braking is considerably higher .

REPLACING THE AIR FILTER



To replace the air filter (F), the brake servo does not need to be removed.

Remove the protective gaiter and replace the air filter.

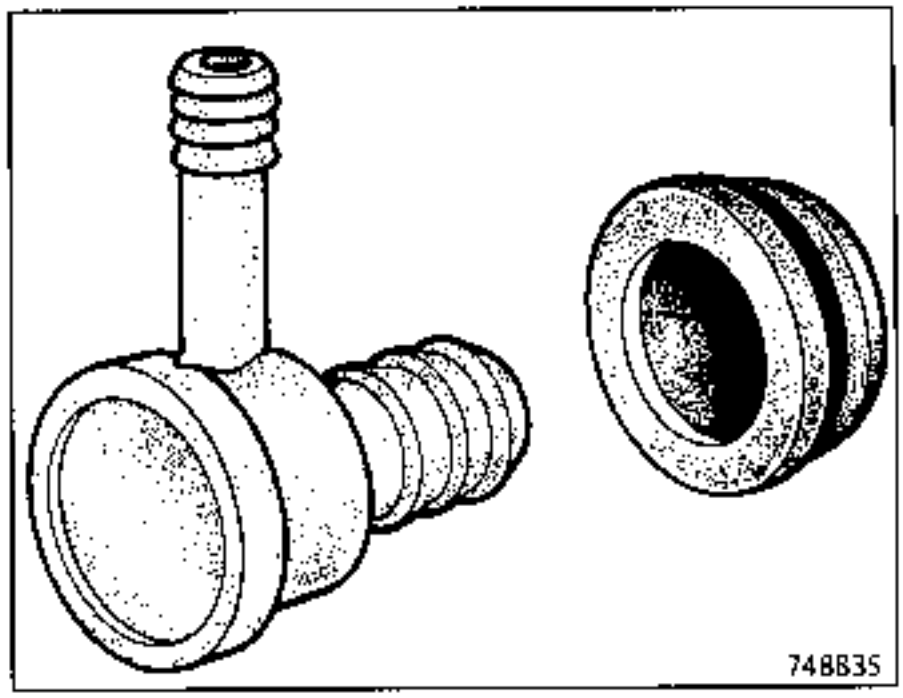
REPLACING THE NON-RETURN VALVE

This operation may be carried out on the vehicle.

REMOVAL

Disconnect the brake servo vacuum inlet pipe.

Pull the non-return valve while twisting it to release it from the rubber sealing washer.



REFITTING

Check the condition of the rubber sealing washer and the non-return valve.

Replace any faulty parts.

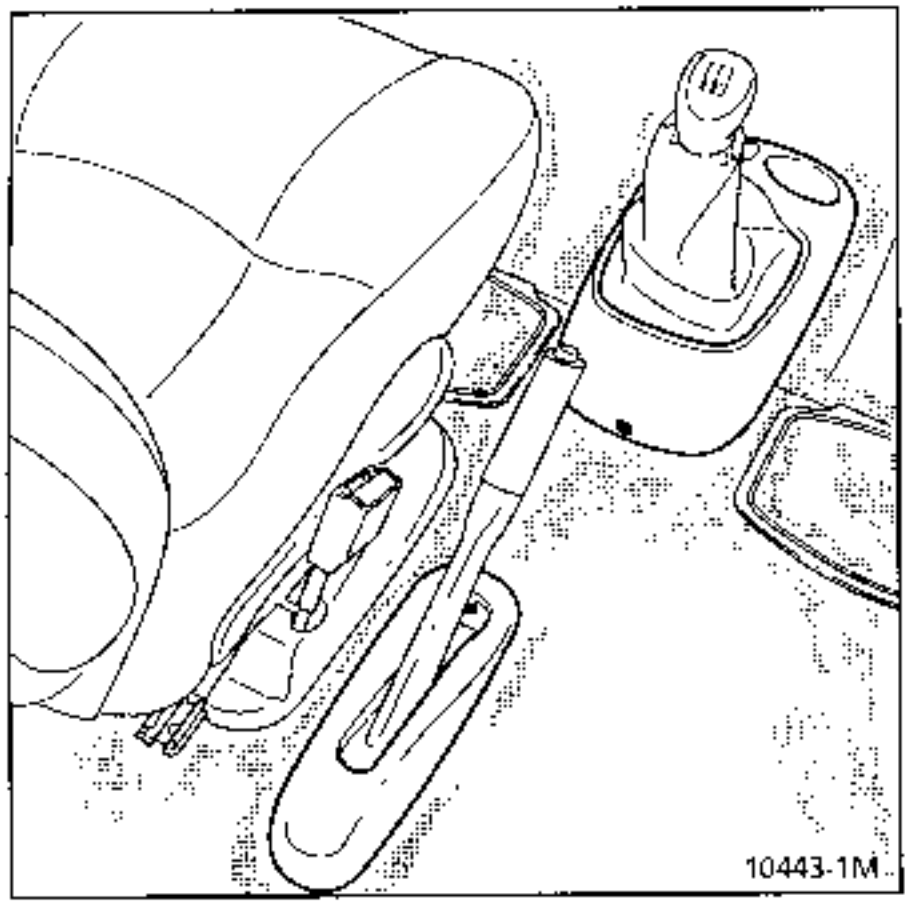
Refit the assembly into position.

REPLACEMENT

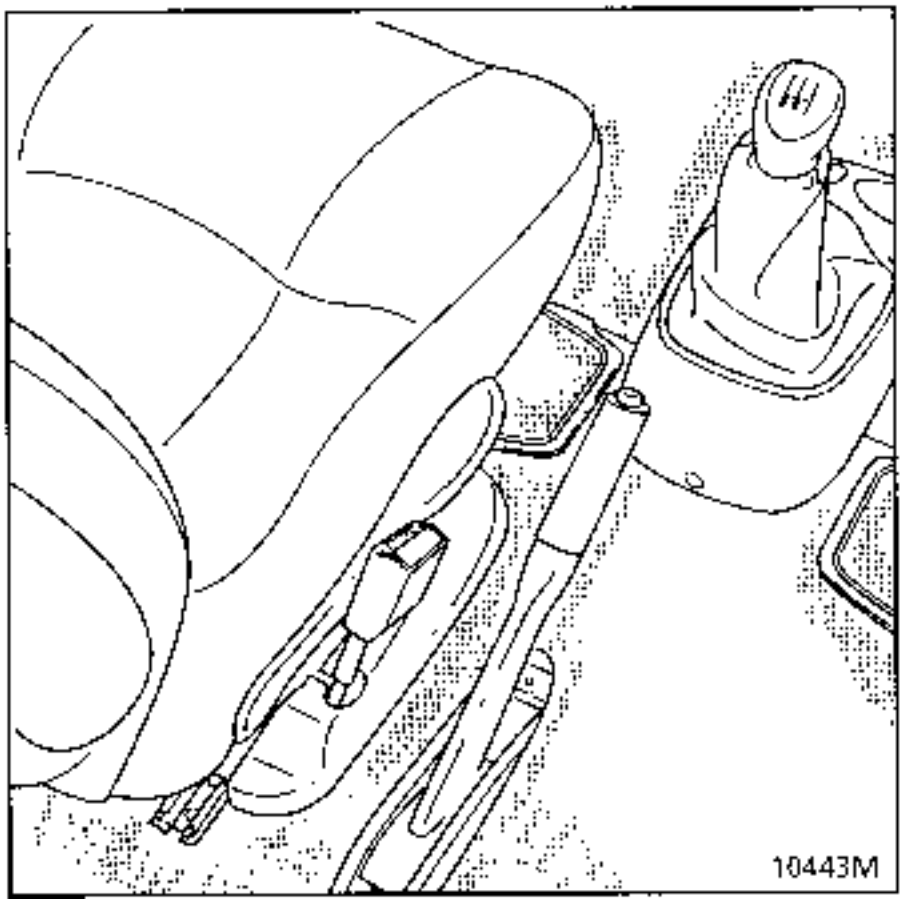
In the passenger compartment:

Remove the mounting bolt from the handbrake console.

Release the handbrake.



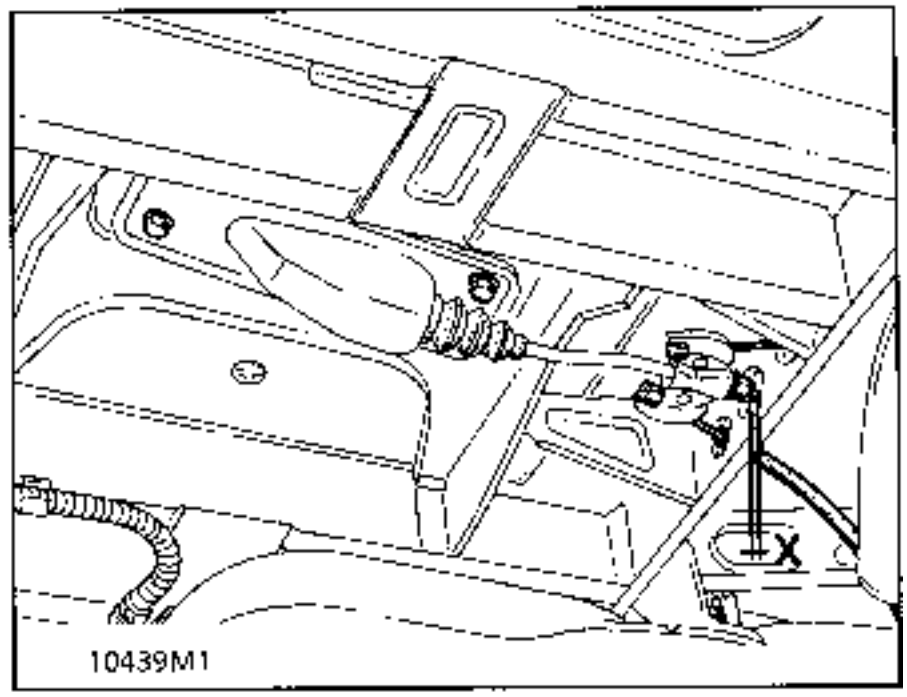
Disconnect the handbrake connector and release the wiring.



Under the vehicle:

Note the handbrake adjustment dimension "X".

Remove :
- the adjuster nut and release the cables,



- the two mountings on the plate.

Remove the handbrake lever.

REFITTING (Special notes)

Refitting is the reverse of removal.

Ensure the handbrake linkage is set to the handbrake setting "X" marked before removal.

Adjust the lever travel (see paragraph "Adjusting the control").

ADJUSTMENT

Incorrect adjustment of the handbrake where the cable is too tight:

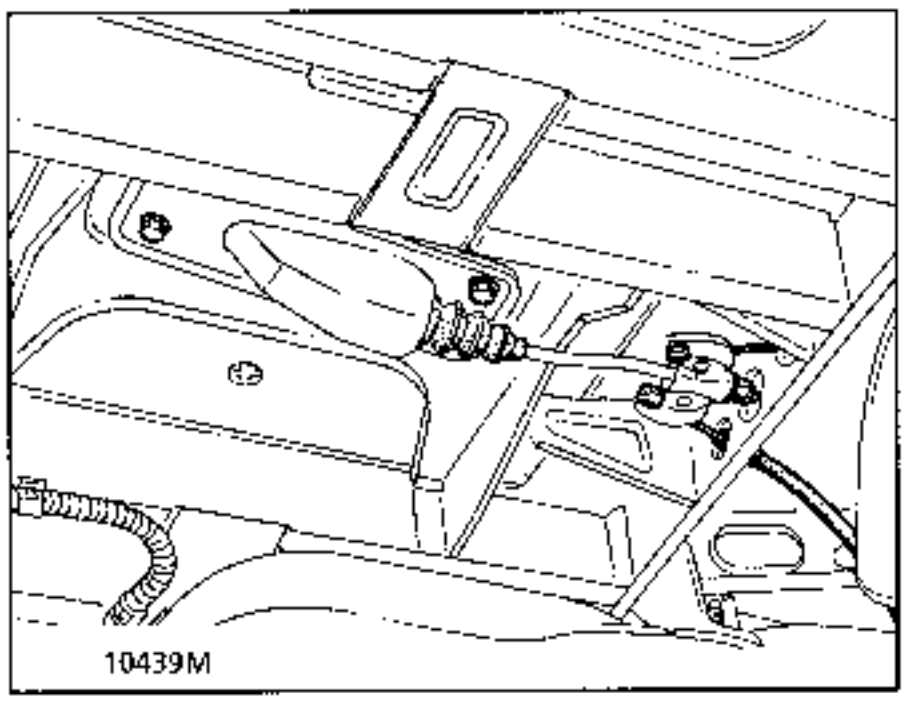
- **prevents the correct operation of the automatic compensation system for the brake shoes or pads,**
- **causes long brake pedal travel.**

The cables should not be re-tensioned to correct this fault since it will quickly occur again.

The handbrake should not be used to adjust play, it should only be adjusted when replacing :
- brake linings,
- cables,
- the control lever.

Any other adjustment except in the above cases is not permitted.

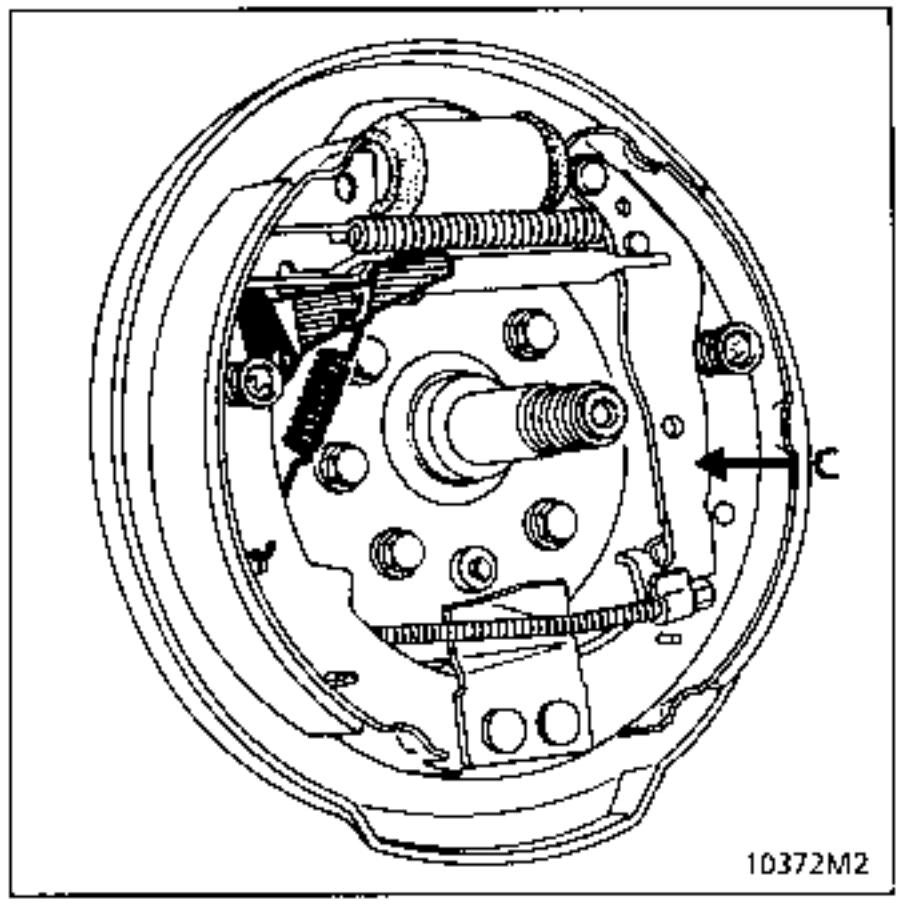
With the vehicle on a lift supported under the body, slacken the nut so the central adjuster is completely free.



ADJUSTING WITH DRUM BRAKES

Remove:
- the two rear wheels,
- the two drums.

Check the operation of the compensation system by rotating the notched sector (ensure it turns in both directions), then turn it back by 5 to 6 teeth.



Ensure :
- the cables slide correctly,
- the handbrake levers (B) are in the correct position against the brake shoes.

Progressively tighten the cables at the central adjuster so that **levers (B) start to move between the 1st and 2nd notch** of the control lever travel and **remain applied from the 2nd notch.**

Fit:
- the drums,
- the wheels.

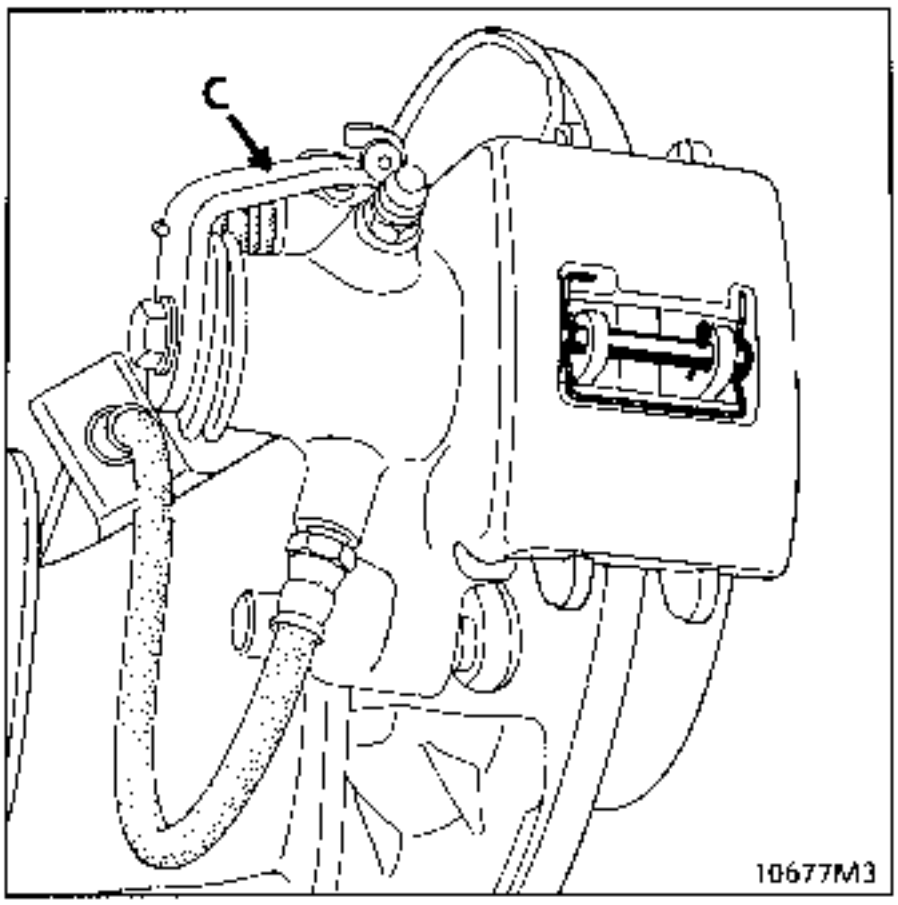
Adjust the brake linings by pressing the brake pedal firmly and progressively for a number of times while listening for the automatic compensation system clicking.

Check the overall travel of the handbrake lever -it should be a maximum of 8 to 10 notches.

ADJUSTING WITH DISC BRAKES

Remove the two rear wheels.

Ensure :
- the cables slide correctly,
- the handbrake levers move correctly and bring them to the bottom.



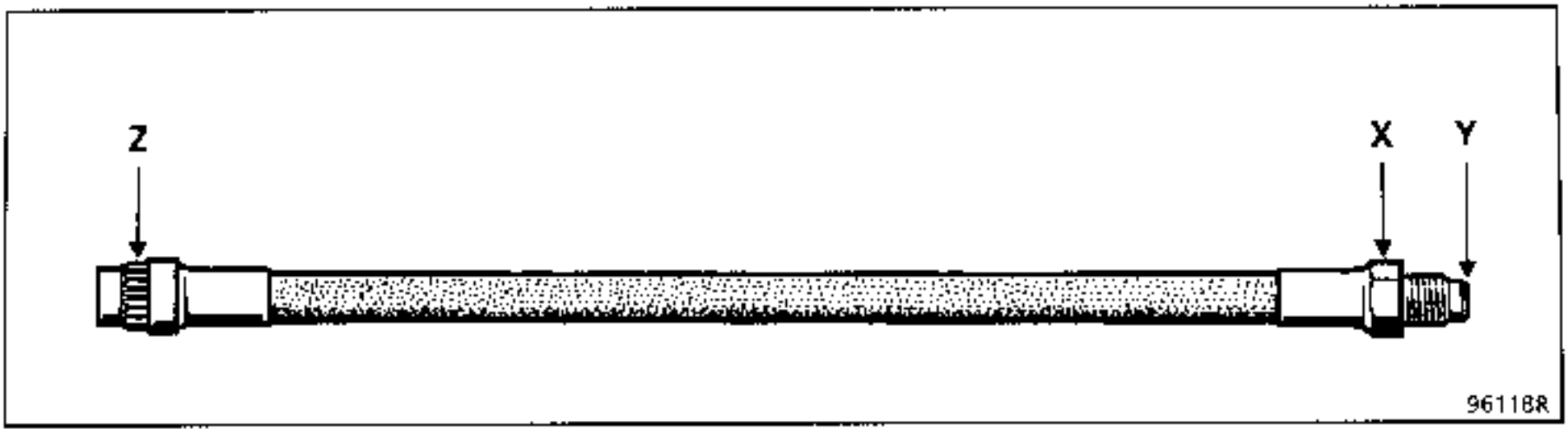
Progressively tighten the cables at the central adjuster so that the stop touches the lever without the lever moving.

Adjust the setting so that the levers C **start to move between the 1st and 2nd notch** of the control lever travel and **remain applied from the 2nd notch.**

Refit the wheels.

These vehicles have brake pipes without a copper seal. The seal is by contact "at the bottom of the cone" of the shoulder (Y) on the pipe.

TIGHTENING TORQUES (in daN.m)
X = 1.7 Z = 1.7

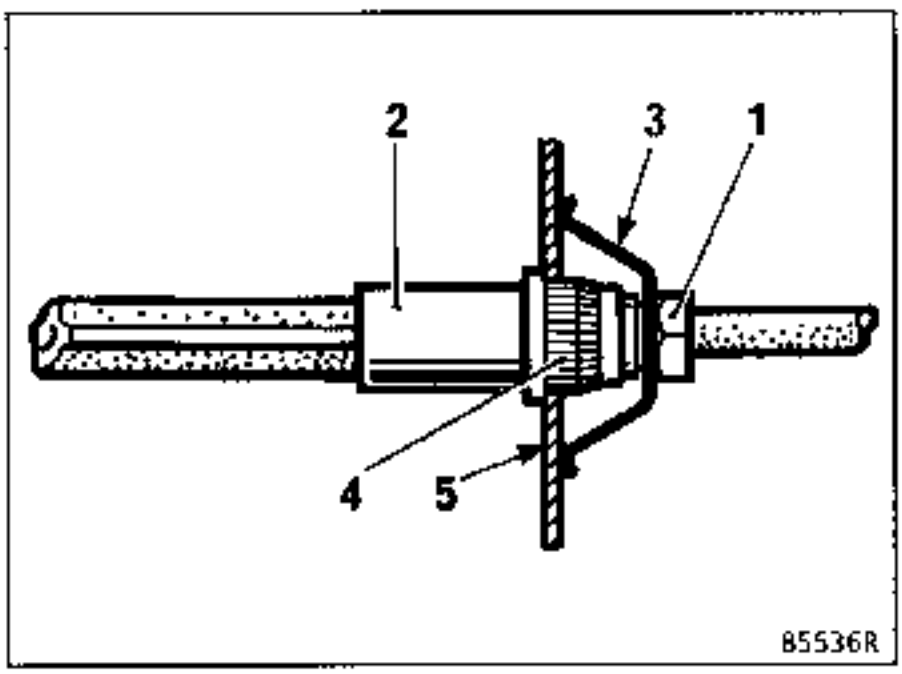


PRECAUTIONS TO BE TAKEN WHEN REMOVING - REFITTING A BRAKE CYLINDER OR A BRAKE PIPE.

For safety reasons and to ensure that the brake pipe is not twisted and is not liable to touch a suspension component the following order of operations must be observed:

REMOVAL

Slacken:
- the union (1) (pipe wrench) between the rigid pipe and the hose (2) until the spring (3) becomes slack which releases the hose from the splines (4).



- the hose from the caliper and if necessary remove the caliper.

REFITTING

Fit the caliper to the brake and screw the hose onto it, then torque tighten to **1.4 daN.m**.

The brake pipes are fitted when the axle assembly is in position:
- Wheels suspended (suspension in place)
- Axle assembly aligned (wheels straight)

Position the female end of the hose on the retaining bracket (5), without twisting it and check that the end piece (4) fits freely into the splines of the bracket, then fit:
- the spring (3),
- the rigid pipe to the hose, checking that the hose does not turn when the assembly is screwed together.

Torque tighten the union.

Bleed the braking circuit.

CHECKING PRINCIPLE

These vehicle are fitted with a load sensitive braking compensator.

The pressure is read in an X pattern, by comparing the pressure at the rear wheels with a given pressure at the front wheels.

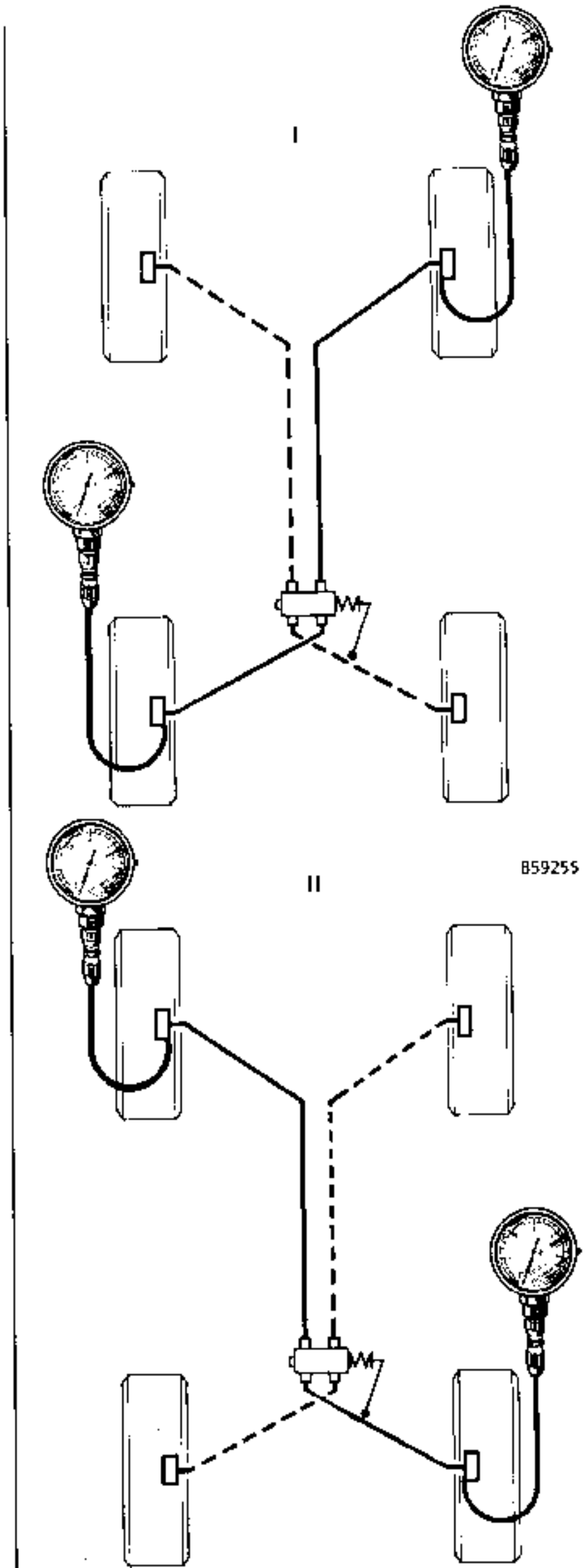
The dual compensator has two totally separate bodies which act in an X pattern on one front wheel and one rear wheel.

Both circuits must be checked.

I : front right/ rear left.
II : front left/ rear right.

For assisted compensators, the adjustment allows alteration of the rear pressure depending on the front pressure.

The adjustment is made simultaneously in both bodies. If the pressure is incorrect for one of the two bodies, replace the compensator.



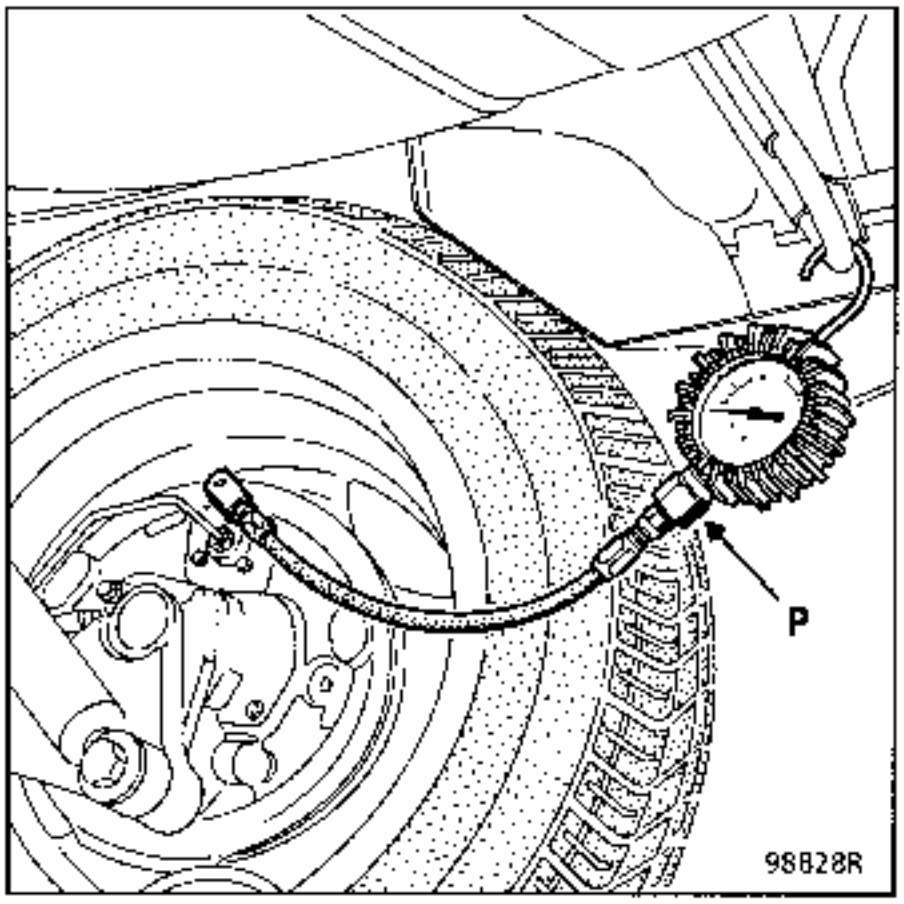
SPECIAL TOOLING REQUIRED	
Fre. 244 -03 + 284-06 or Fre. 1085	Pressure gauge for checking compensator rating

IMPORTANT:
Checking and adjusting the braking compensator must be carried out with the vehicle laden using the adjustment dimension H . See section "07".

CHECKING

Connect two pressure gauges **Fre. 244-03** or **Fre. 1085** :
- one at the front right hand side,
- one at the rear left hand side.

Bleed the pressure gauges via screw (P).



Carry out the same operation on the other circuit:
- one at the front left hand side,
- one at the rear right hand side.

If there is a large difference (values exceed tolerance ranges), **replace the compensator since no repair is permitted.**

Progressively press the brake pedal until the pressure at the front wheels is the setting pressure (see table of values - section "07"). Read the corresponding pressure at the rear wheels; correct it if necessary.

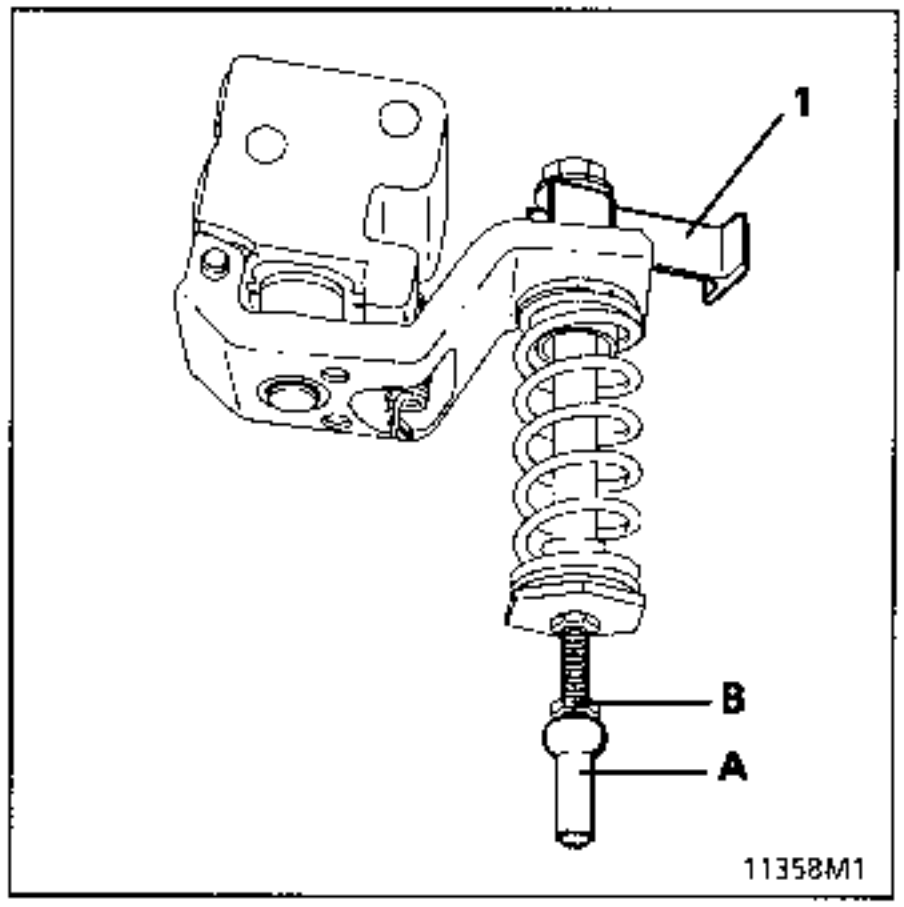
REPLACEMENT

The Parts Department supplies pre-adjusted compensators with an adjusting shim (1).

Fit the new compensator with the adjusting shim (1).

Align the adjusting shim (1) as shown below.

Refit the protector.



Ensure the vehicle meets the adjusting conditions.

Adjust the nut and ball joint (A) to position it against the transverse guide bar.

Tighten the lock nut (B).

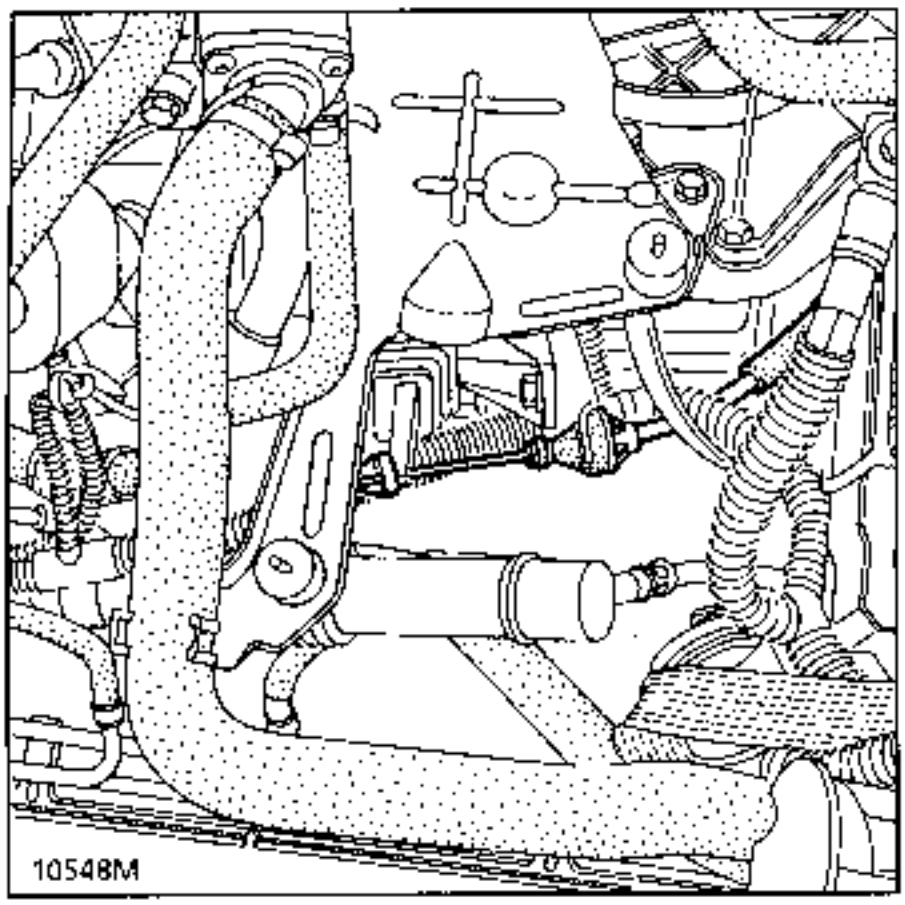
Remove the adjusting shim (1).

Bleed and check the circuit.

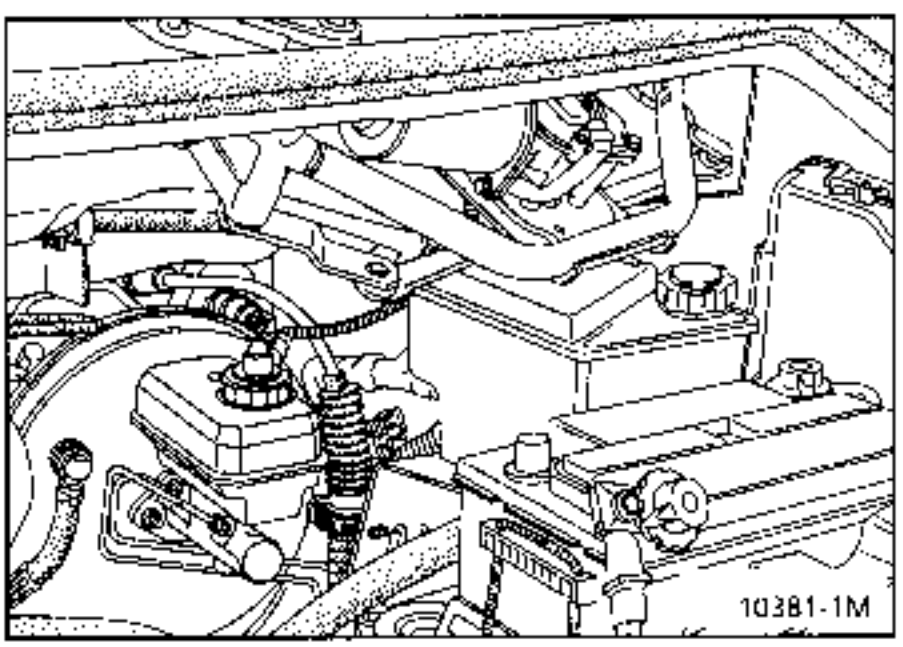
REMOVAL

Disconnect the battery.

Remove:
- the air filter,
- the cable from the clutch fork.



Release the clutch cable from the engine mounting plate.



Remove the console under the steering wheel (see section 57) to remove the bulkhead clip - seal.

Remove the cable via the engine compartment.

REFITTING

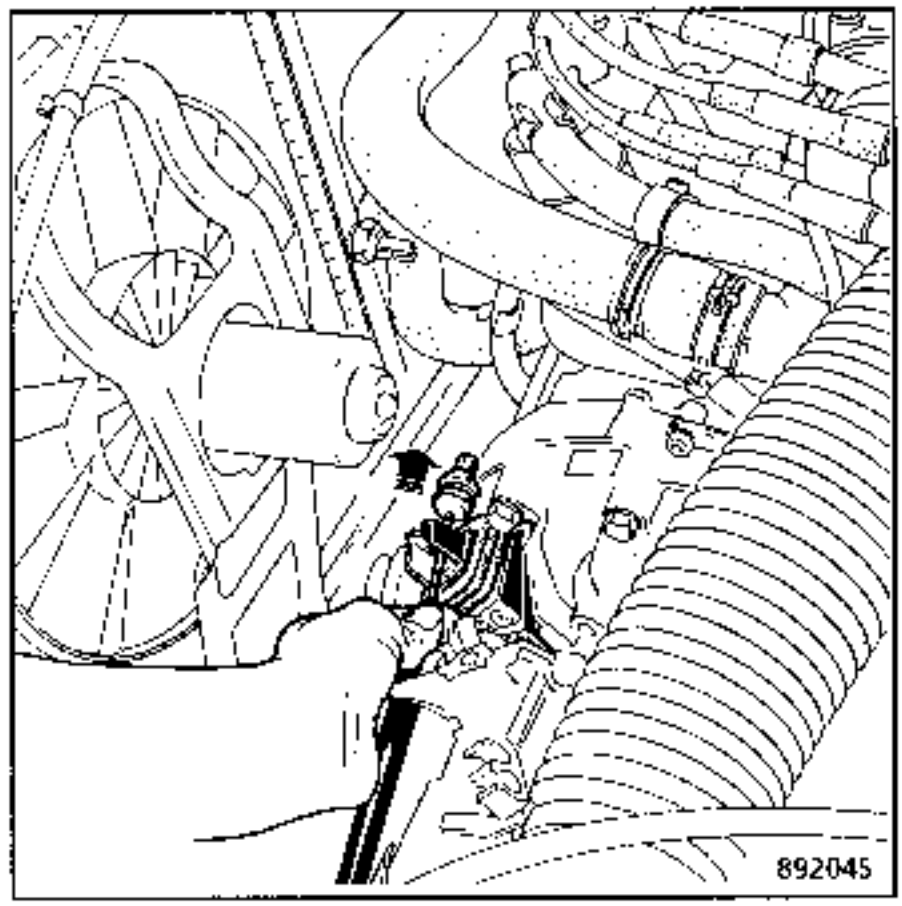
From the engine compartment, thread the cable into the passenger compartment.

Refit the cable:
- to the pedal,
- to the engine mounting plate.

Fit the cable onto the fork.

Press the clutch pedal to clip the seal on the bulkhead.

The cable is adjusted automatically.



Check the assembly is correctly positioned.

With the pedal at rest, pull on the cable at the clutch fork.

There should be 1 to 3cm play in the cable.

Refit the air filter and reconnect the battery.

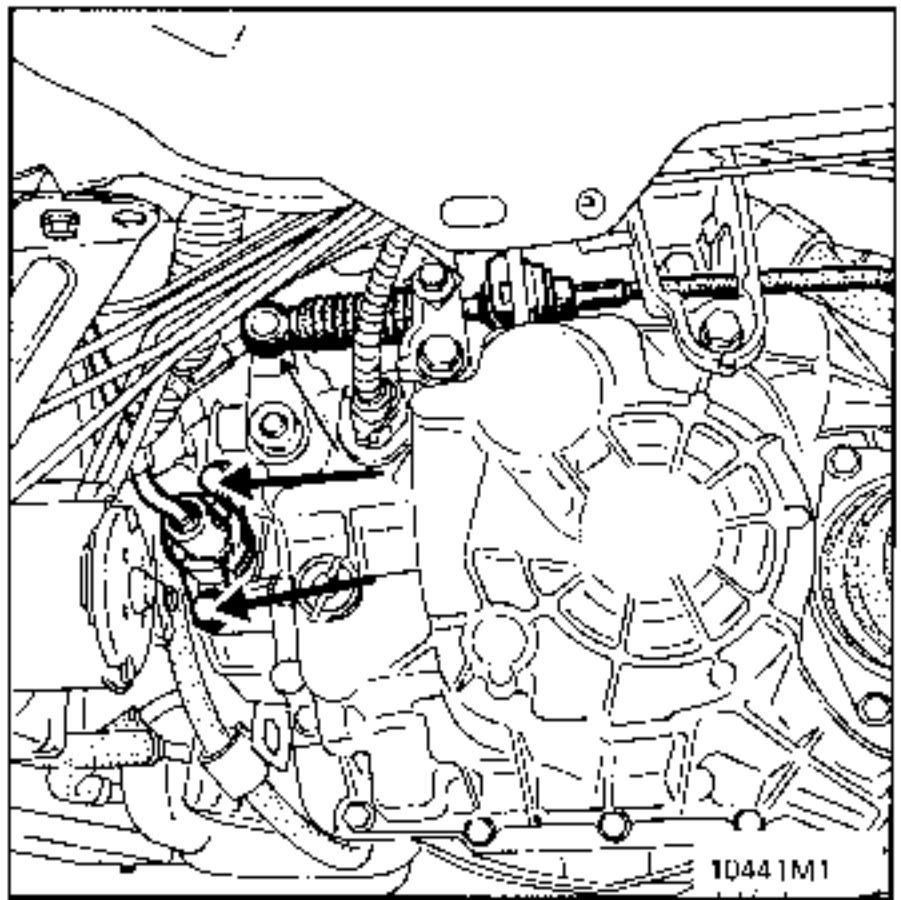
REMOVAL - REFITTING

This equipment is supplied ready filled and bled (master cylinder and slave cylinder). If one component is replaced, the other must therefore also be replaced.

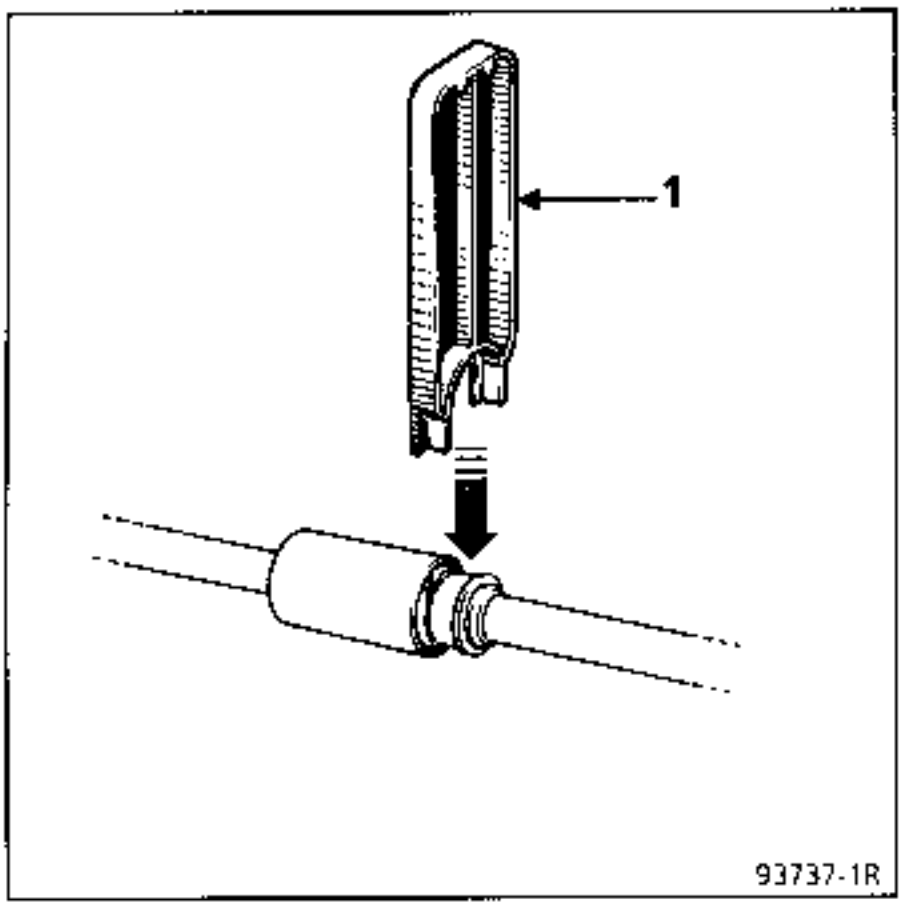
When refitting, the order of operations must be observed to avoid any incorrect operation.

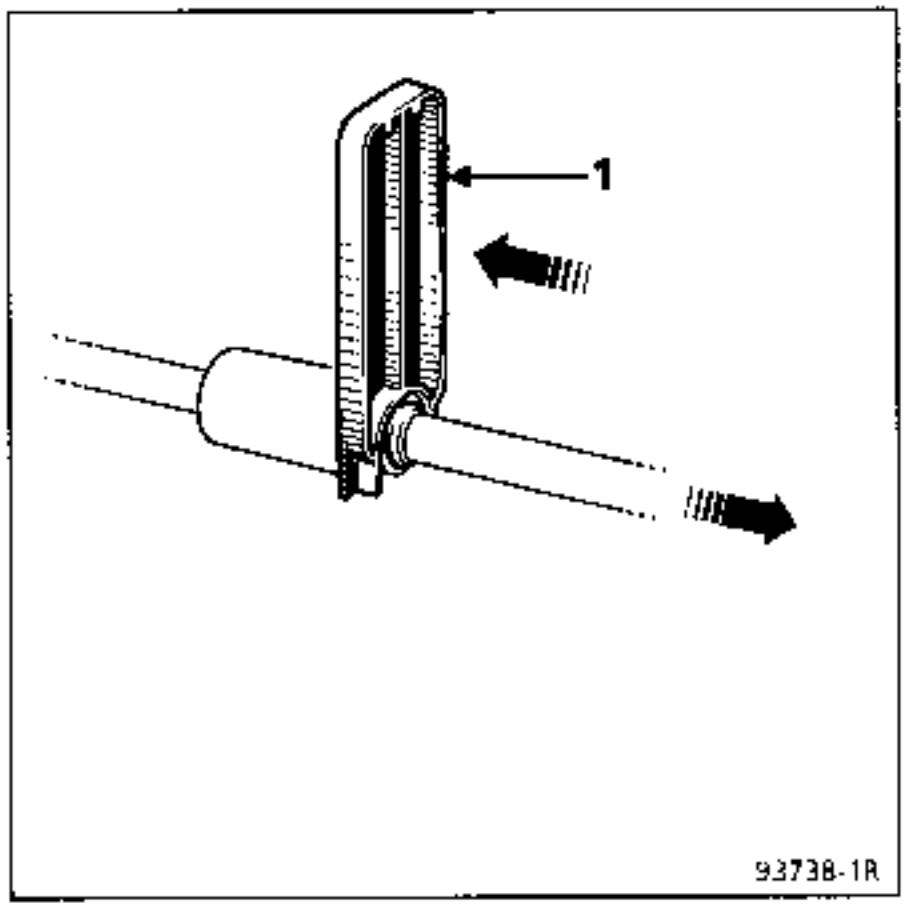
REPLACEMENT

On the left hand side, remove:
- the wheel and wheel arch protection,
- the slave cylinder.



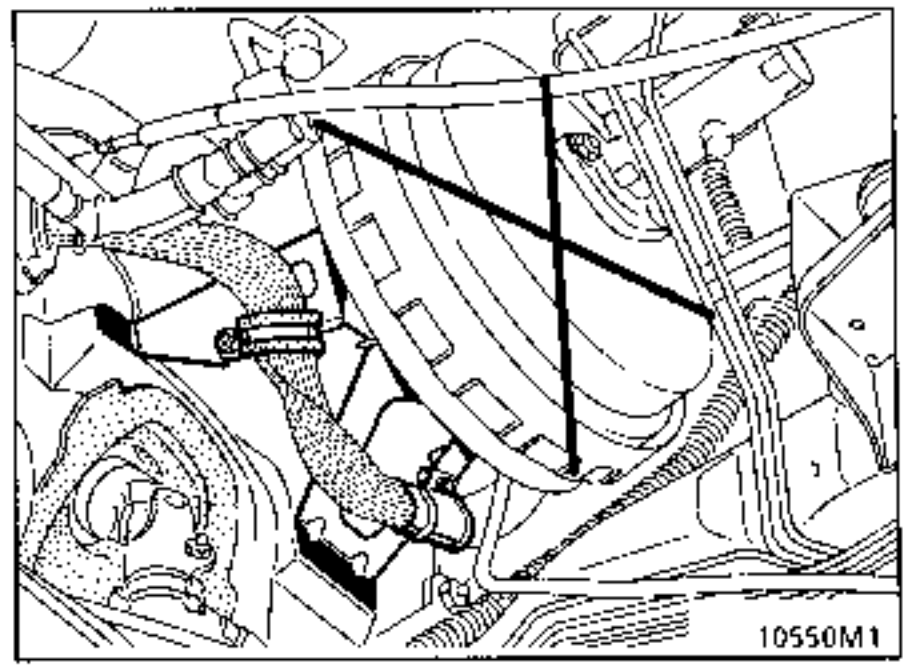
Remove the air filter and disconnect the quick release union on the master - slave cylinder pipe connection.
Use tool (1) supplied in the kit.





Remove :

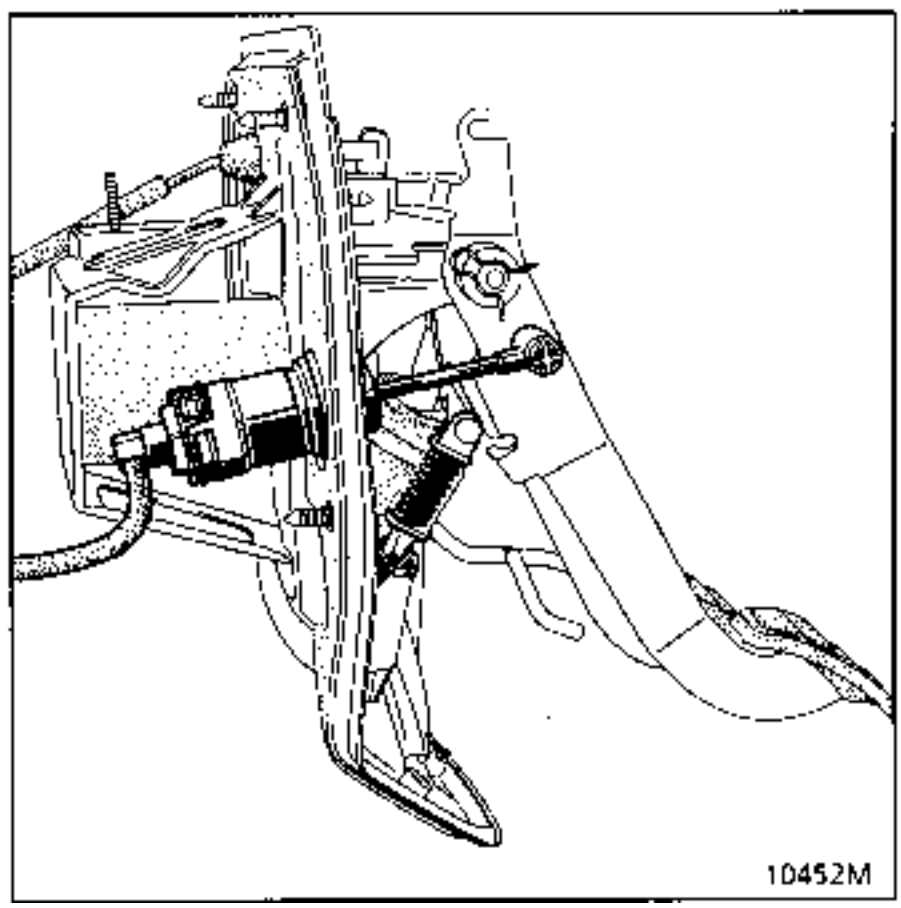
- **the brake servo** (see section concerned).



- the master cylinder.

Unclip the pushrod shaft from the pedal pin.

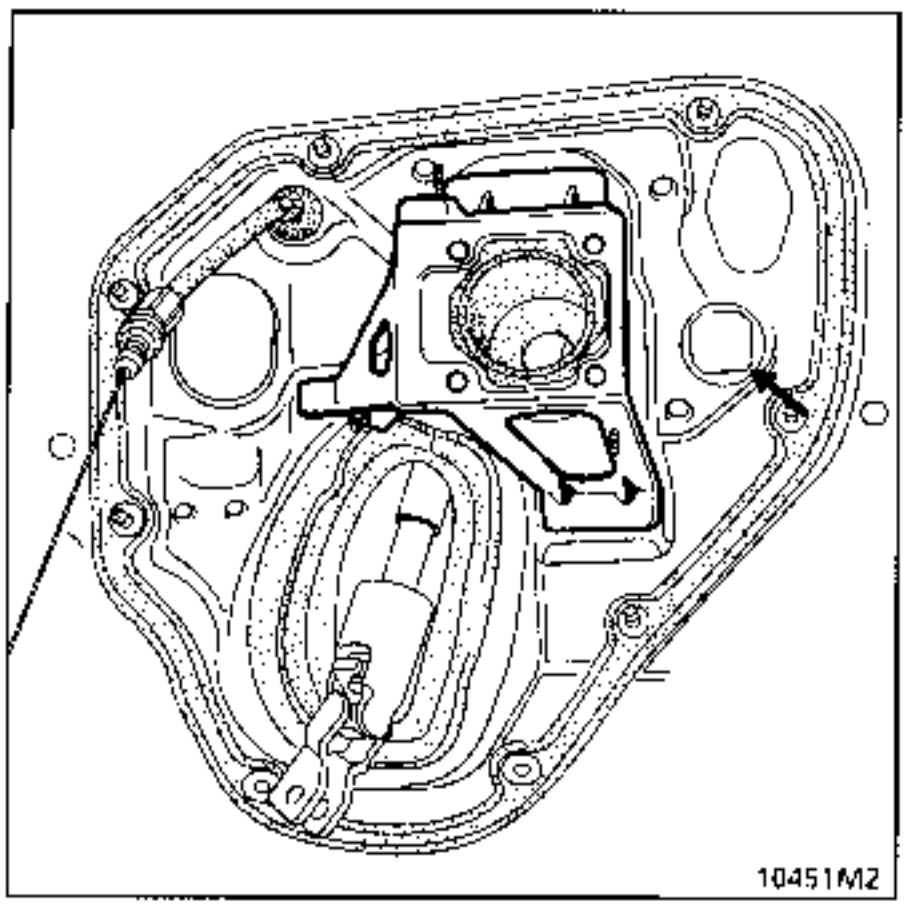
The mounting is a bayonet type, turn the master cylinder body 1/8th of a turn anti-clockwise.

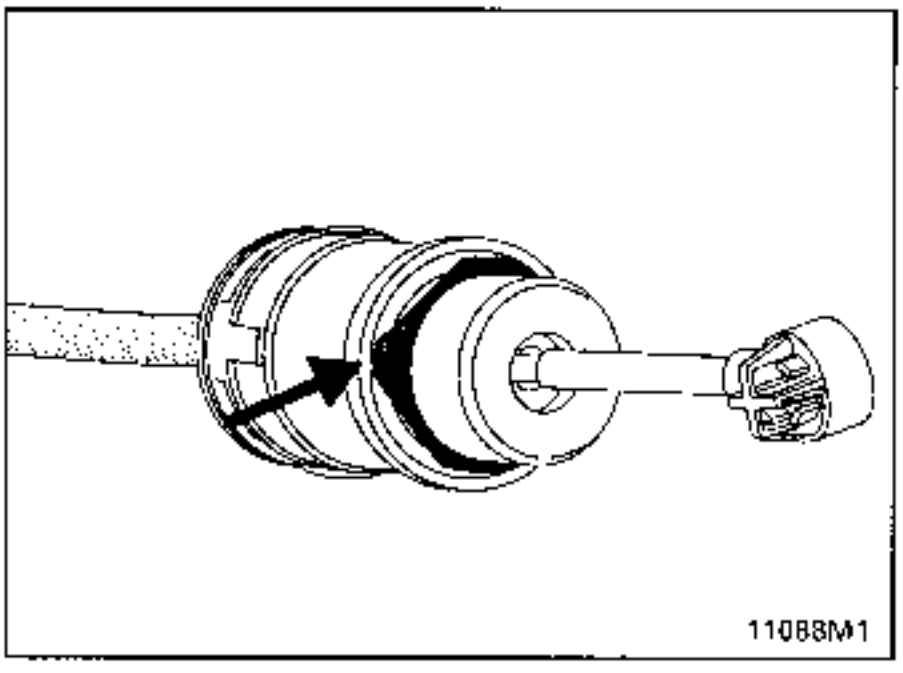


REFITTING

IMPORTANT

- The master cylinder body has an index. Position this opposite the index on the plate.





- Position the master cylinder perpendicular to the plate.

IMPORTANT

- the fitting order must be observed:

Fit and lock the master cylinder on its mounting by turning it 1/8th of a turn clockwise. Clip the pushrod shaft to the pedal pin.

Fit the slave cylinder on the gearbox.

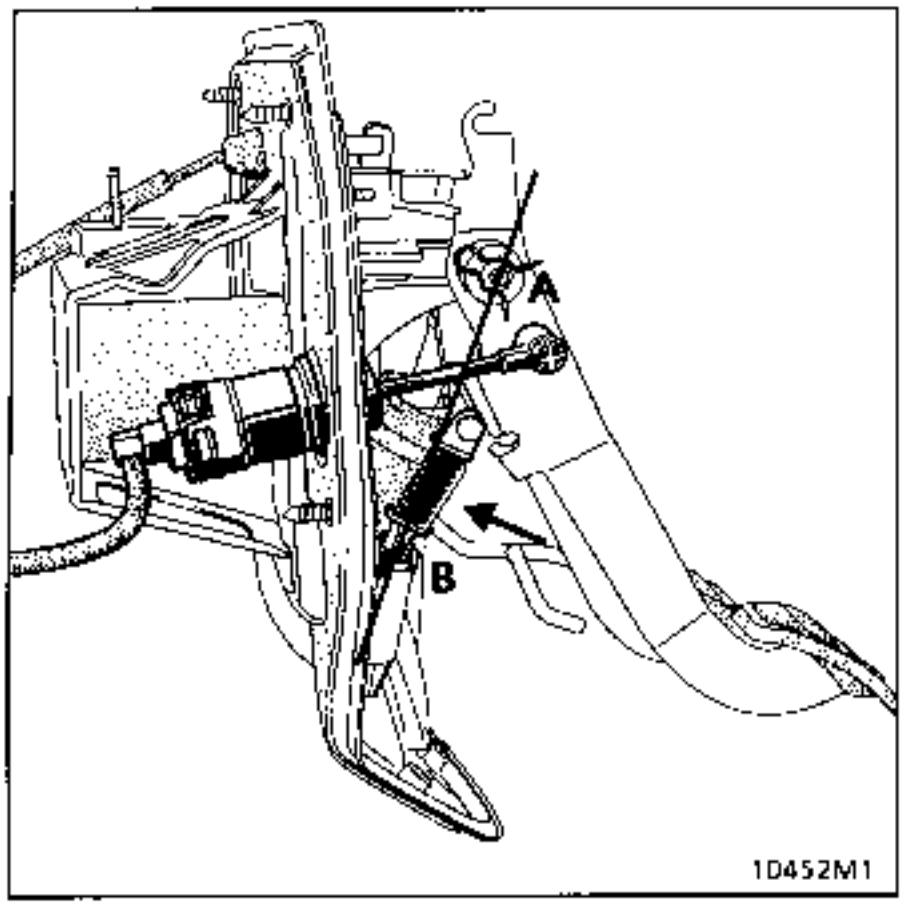
Connect the quick release union.

Press the pedal and allow it to rise again. Ensure the pedal is against the upper stop.

Repeat this operation.

The control is operational.

The system comprises a unit and spring located between the clutch pedal and the pedal mounting.



OPERATION

When at rest, the assistance spring keeps the pedal against the upper stop.

After crossing the inversion line (straight line A - B), the spring helps the action of the driver's foot as it decompresses.

REMOVAL

On the unit - spring assembly, fit a plastic clip through the two ends of the spring to keep it compressed.

Remove the circlip.

Press the pedal down fully to release the spring unit.

Release the pedal and remove the pin.

REFITTING

To refit the spring unit, compress the assembly in a vice and keep it compressed using a plastic clip.

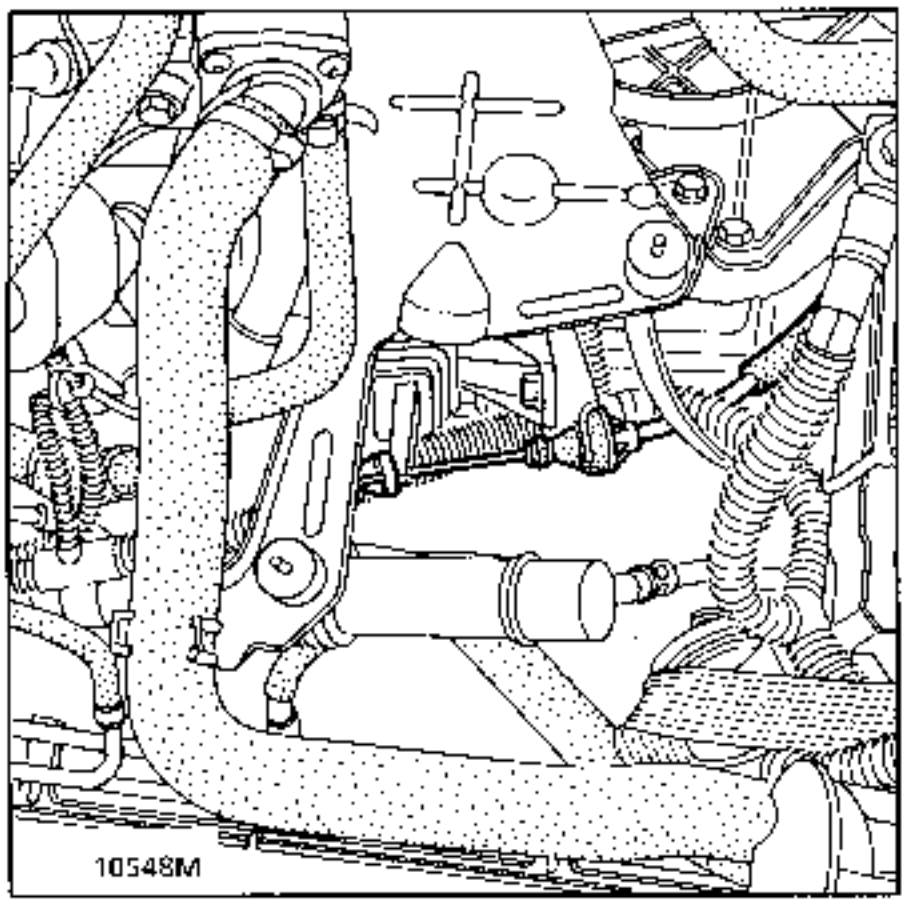
- Coat the pin with grease.
- Fit the pin into position, while slightly pressing the pedal down.
- Refit the circlip to the pin and remove the plastic clip.

REMOVAL

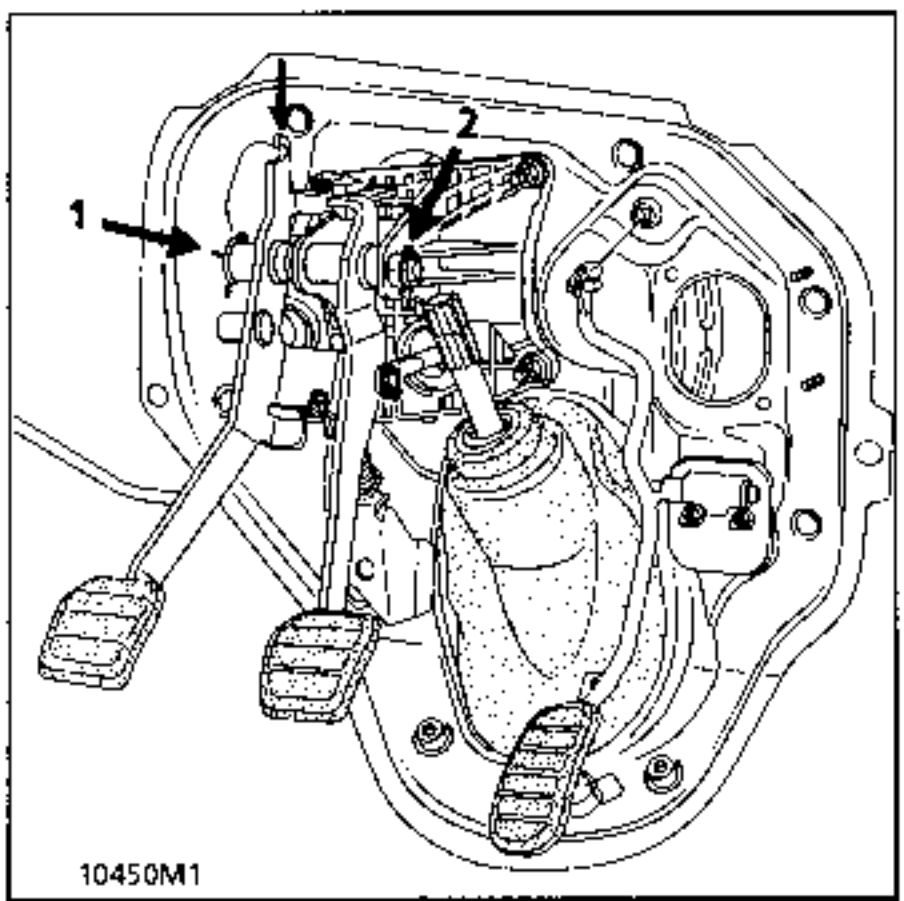
F ENGINE

Disconnect the battery.

Remove the cable from its mounting on the gearbox (see section on clutch control cable).



Release the cable from the pedal.
Remove clip (1).
Release clip (2) from the plastic mounting.
Push the pin to release the pedal.



REFITTING

Refitting is the reverse of removal.

Refit the cable to the pedal then to the clutch fork.

Check the assembly operates correctly (see section on clutch control cable).

G ENGINE

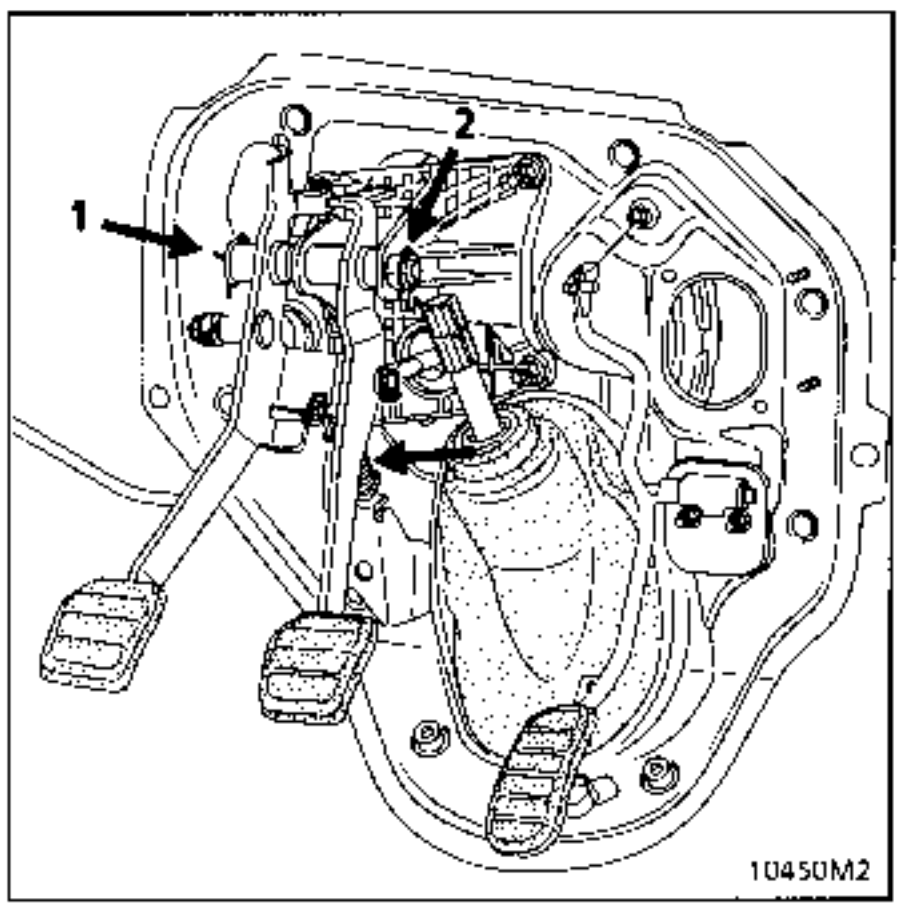
Unclip the pin from the hydraulic master cylinder.

Remove the assistance spring unit (see section "Hydraulic clutch control assistance unit").

Remove the clip (1).

Release clip (2) from the plastic mounting.

Push the pin to release the pedal.



REFITTING

Refitting is the reverse of removal.

Check the operation of the clutch pedal.

REMOVAL

Remove:
- the console under the steering wheel,
- the brake pedal.

Disconnect :
- the brake switches,
- the gear changing safety cable (automatic transmission) by removing the clip.

Cut out the soundproofing to allow the pedal mounting to pass.

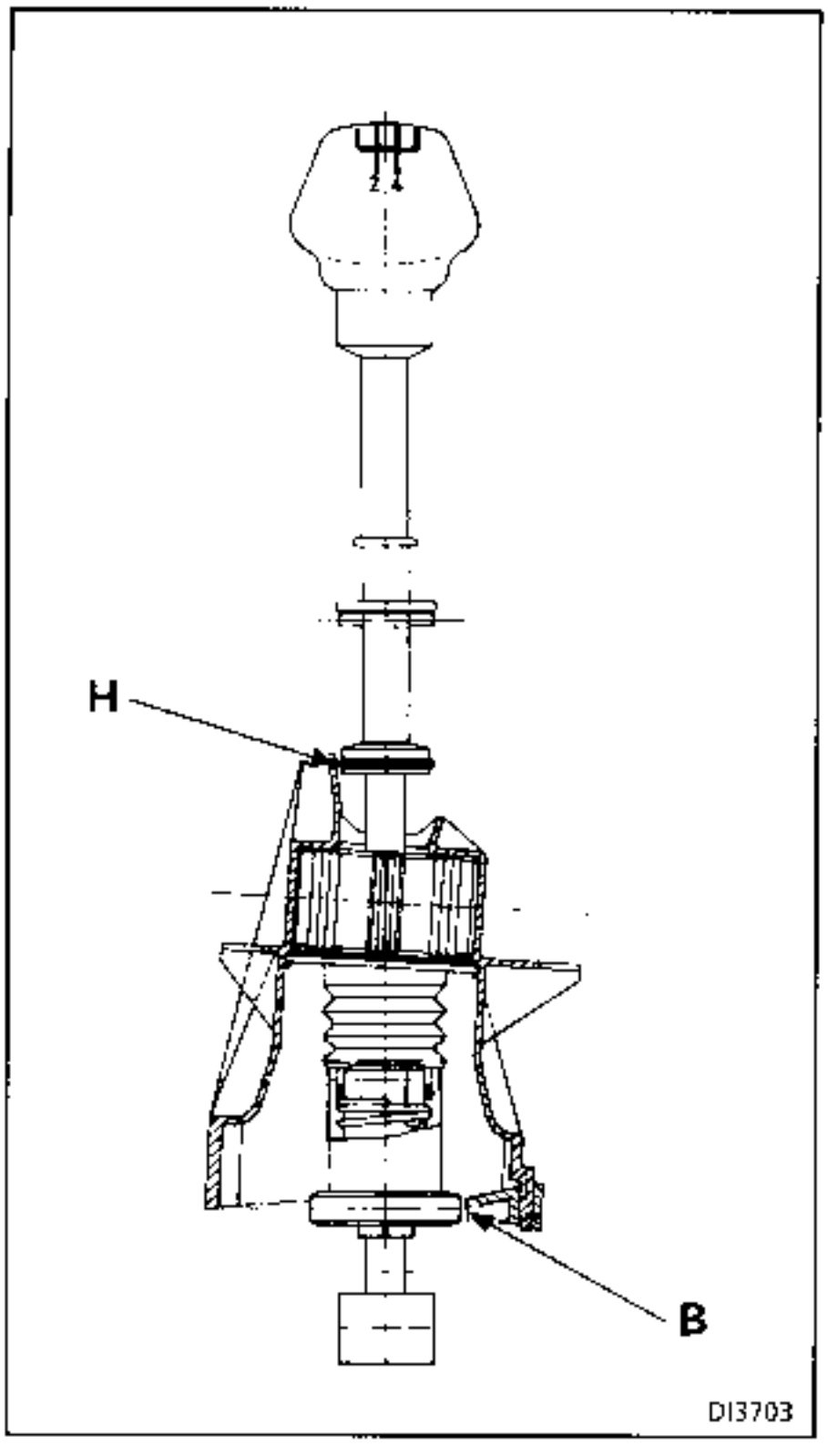
Remove the 4 pedal mounting bolts.

REFITTING

Refitting is the reverse of removal.

Bond the soundproofing back using neoprene type adhesive.

JE0 (F engine) vehicles have a dual lock gear control which prevents changing to reverse gear instead of first gear without releasing the locking ring.

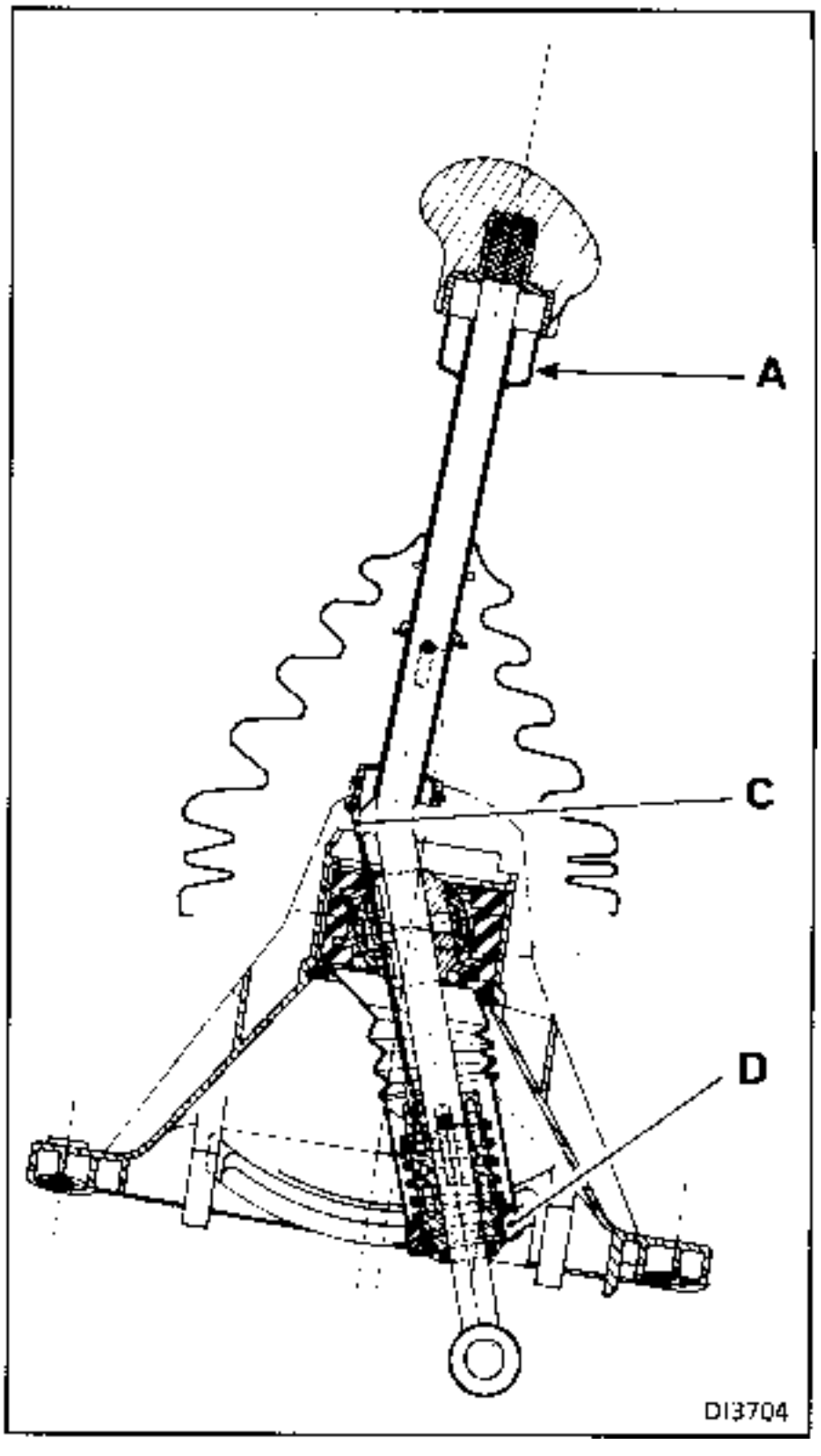


OPERATION

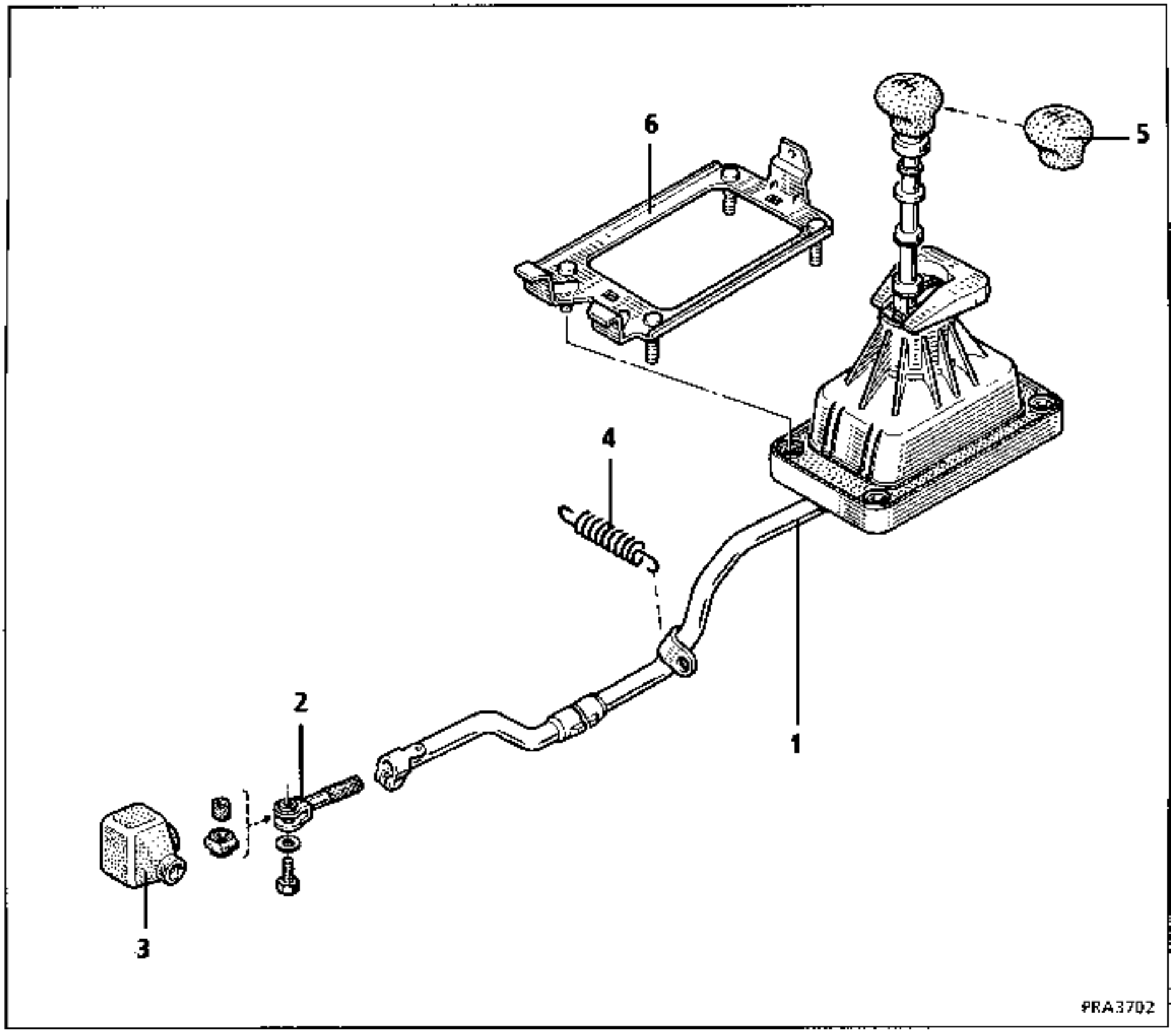
The upper locking ring (A) operates via a cable (C) on a second locking ring (D) located on the lower part of the lever.

The lever is prevented from moving at the bottom (B) and the top (H) at the same time.

NOTE : this control must be adjusted with first gear engaged.



EXPLODED VIEW



1 Bar and unit
2 Clevice
3 Gaiter
4 Return spring to 3/4 position
5 Gear lever knob
6 Mounting plate

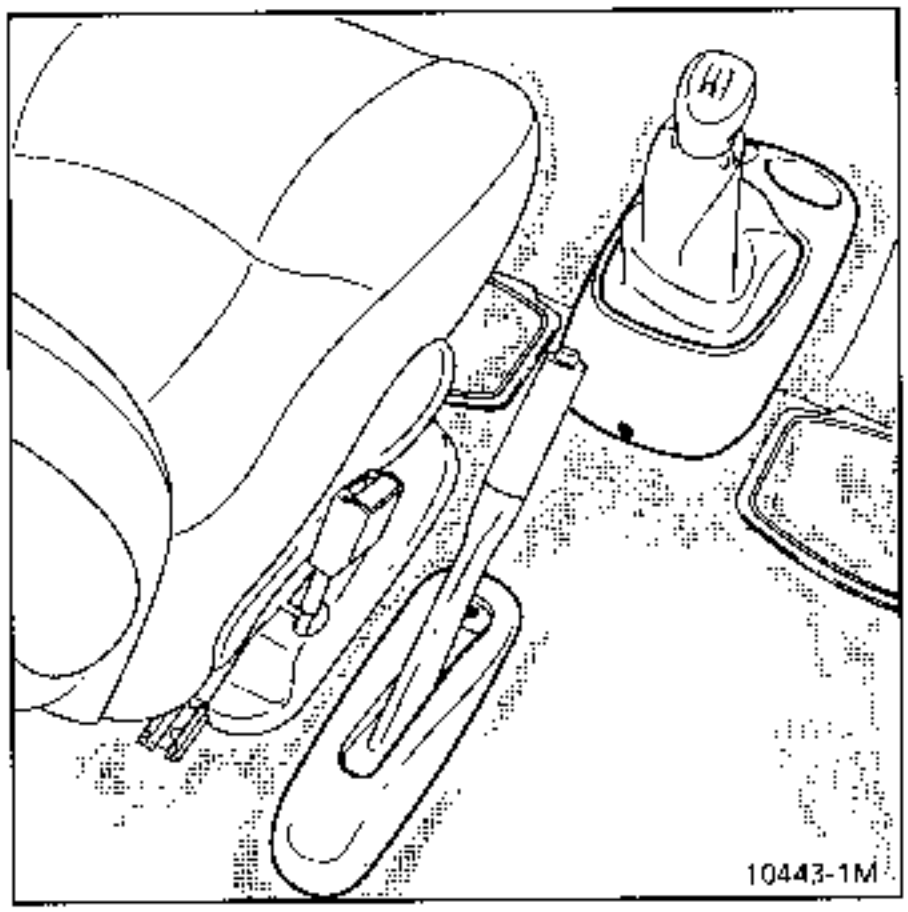
TIGHTENING TORQUES (in daN.m)	
Clevice bolt	3
Bar mounting clip bolt on clevice	3

REMOVING THE LEVER - CONTROL BAR ASSEMBLY (1)

In the passenger compartment:

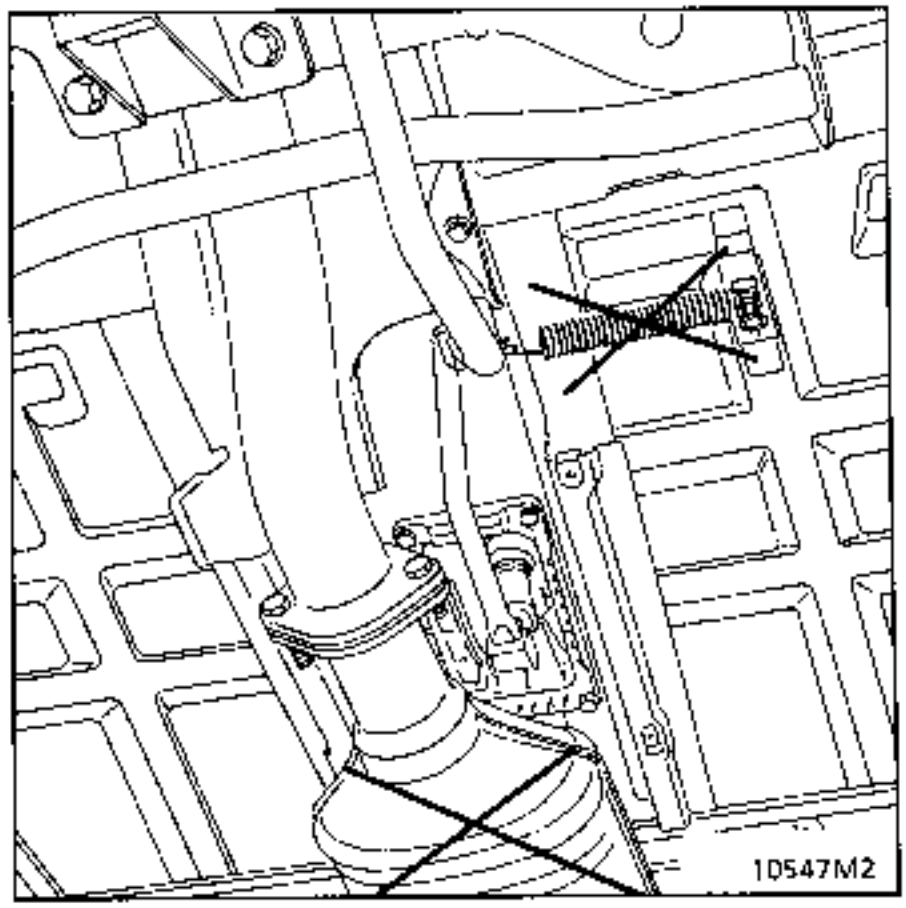
Unclip the gaiter from the console.
Cut the plastic retaining clip on the gear lever knob and remove the gaiter.

Remove the console (1 bolt).

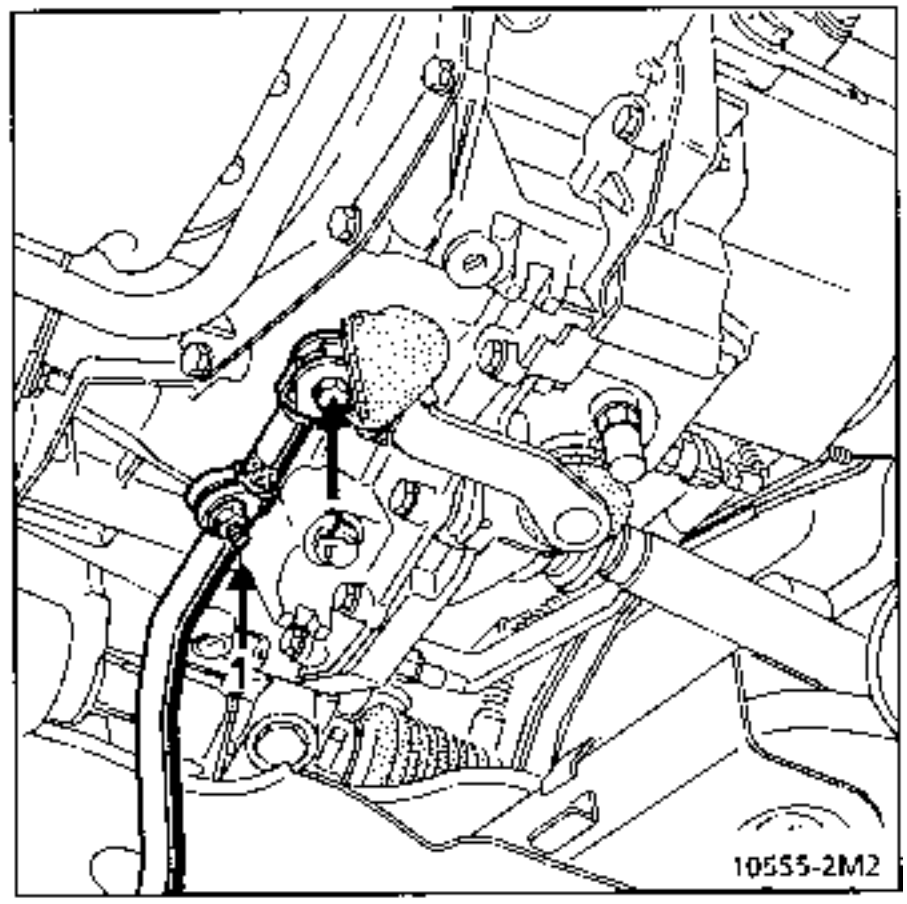


Under the vehicle:

Remove:
- the catalytic converter,
- the heat shield,
- the control bar spring,

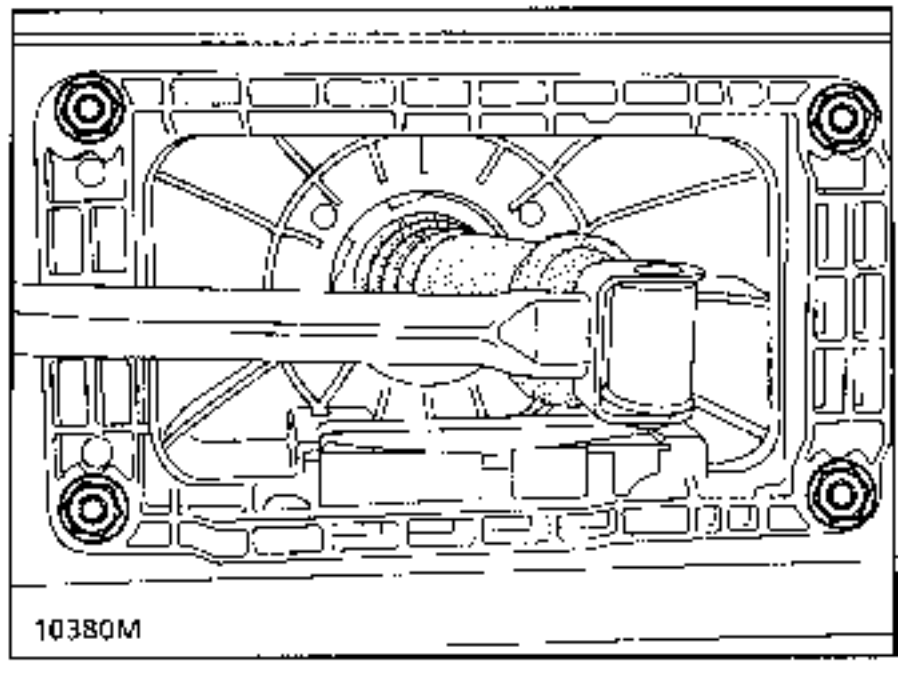


- bolt (1) if renewing the control.



NOTE: If the unit is to be removed then refitted, to avoid losing the gear control adjustment, release the gaiter from the clevice and remove the bolt (2) .

Remove:
- the 4 unit mounting bolts.



Remove the lever and bar assembly.

REFITTING

Refitting is the reverse of removal.

Adjust the control:
- use the adjusting shims provided with the new control;
- if no shims are available, follow the method in the following pages.

IMPORTANT:

- Ensure the exhaust pipe is perfectly sealed (see section 19) (catalytic converter may be damaged).

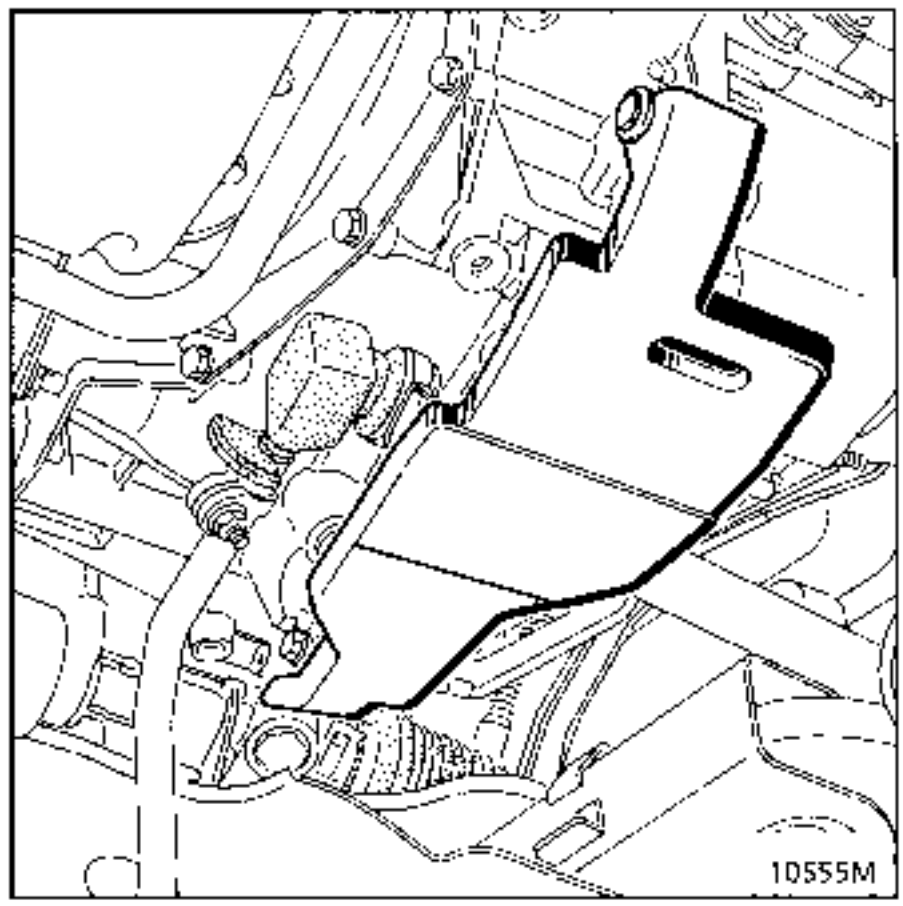
- Ensure the heat shield is correctly mounted.

ADJUSTMENT

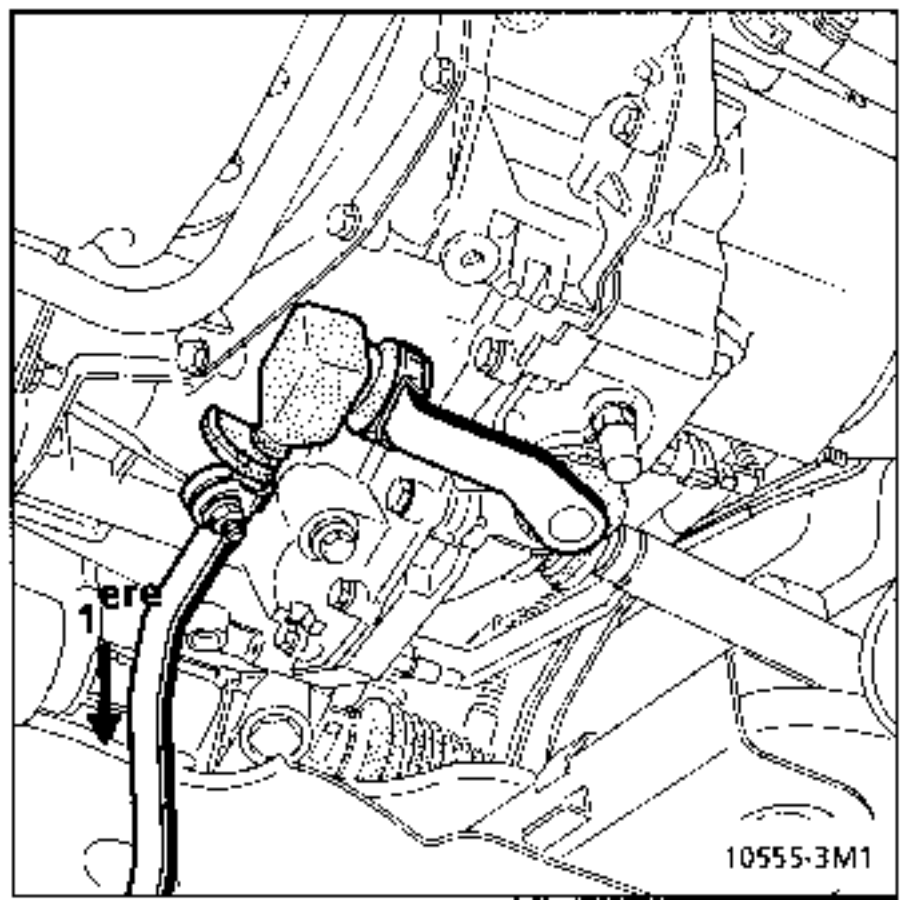
SPECIAL TOOLING REQUIRED	
B.Vi. 1133	Tool for locking the gearbox input lever in 1st gear

TIGHTENING TORQUES (in daN.m)	
Bolt for bar mounting clip on clevice	3

Remove the collector.

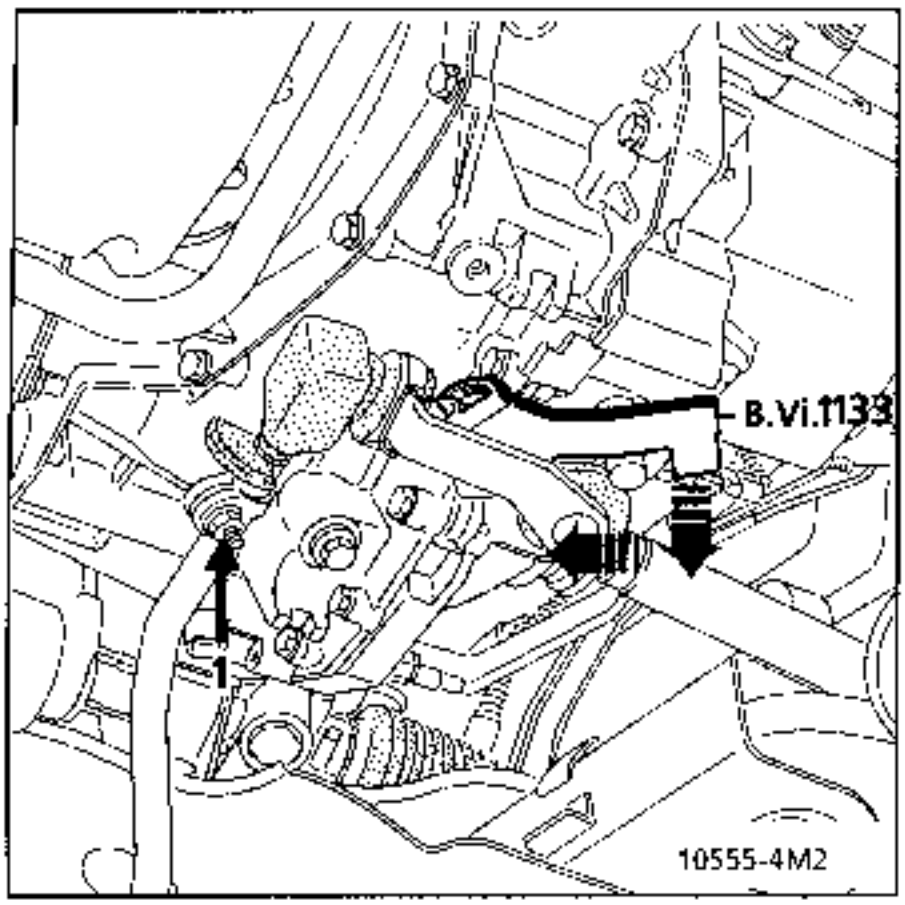


Engage 1st gear and remove the return spring from the bar.

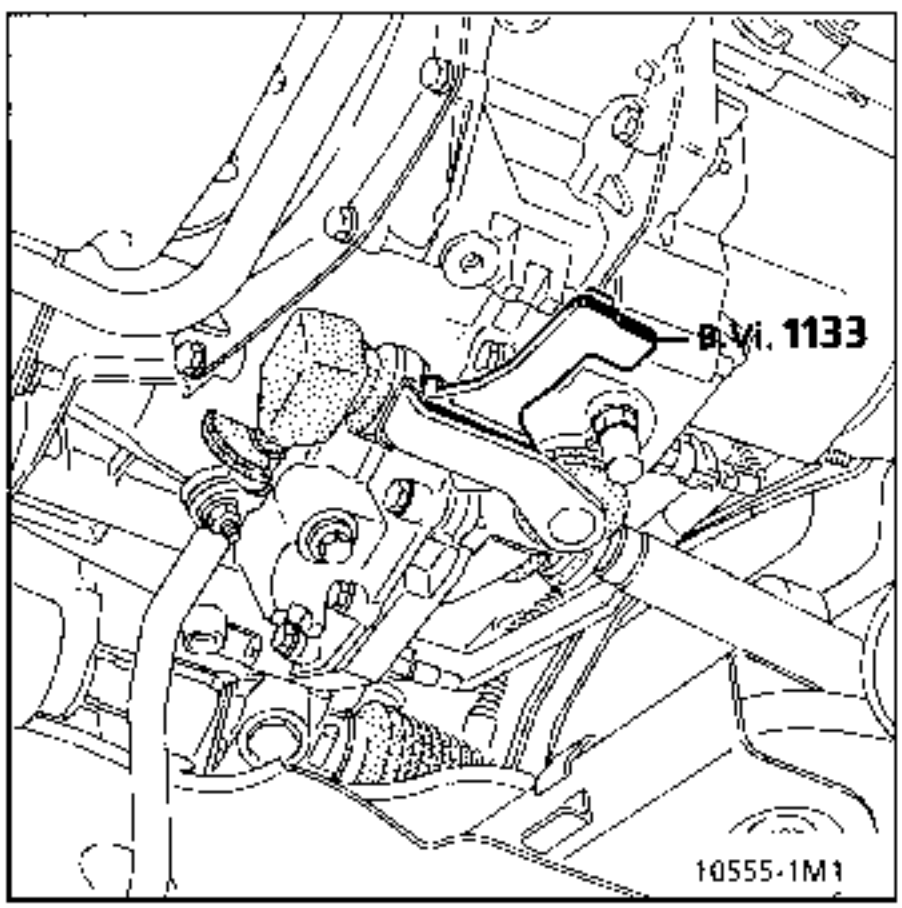


Slacken bolt (1).

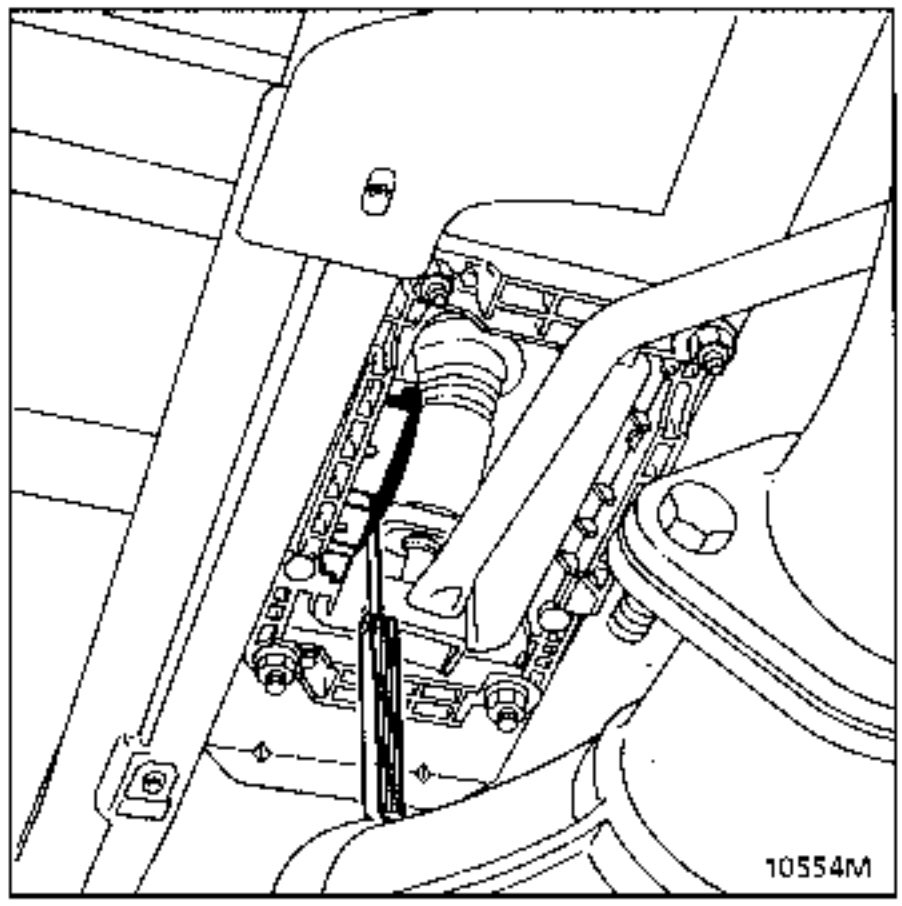
Fit tool **B.Vi. 1133** to compensate for any play.



At the same time, pull the end of the clevice down and pivot it through **45°until** it touches the lug on the housing.

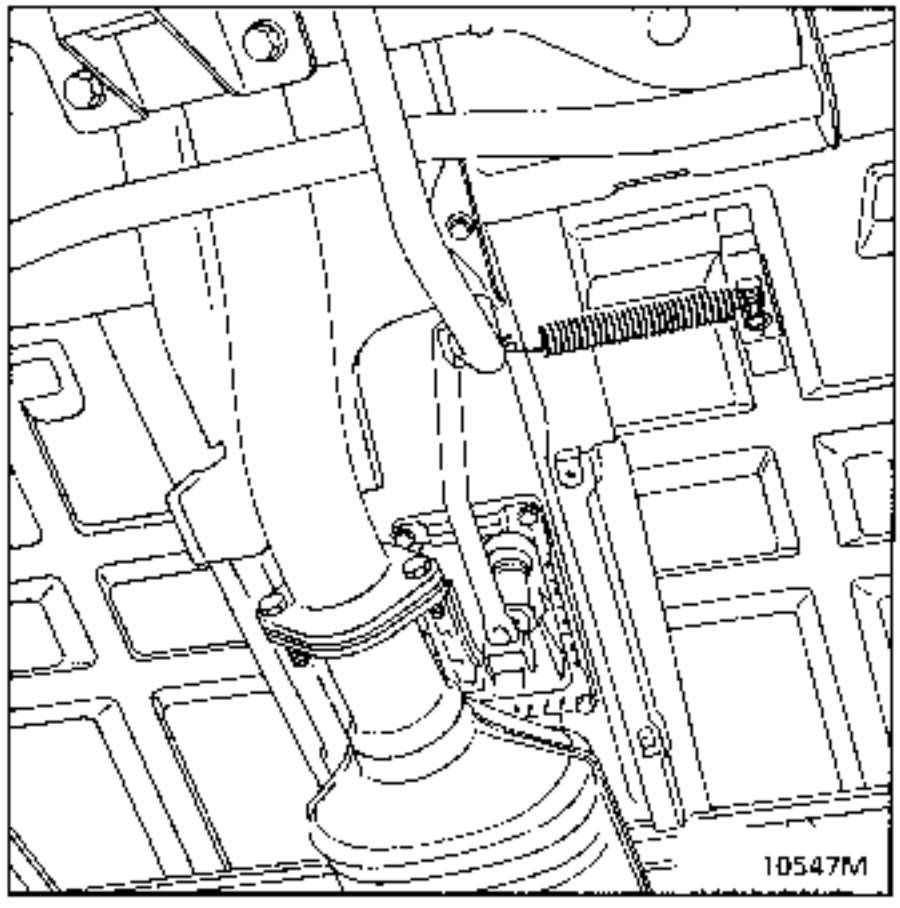


Put the lower lever locking ring against the gear unit wall, inserting a **2mm shim**.



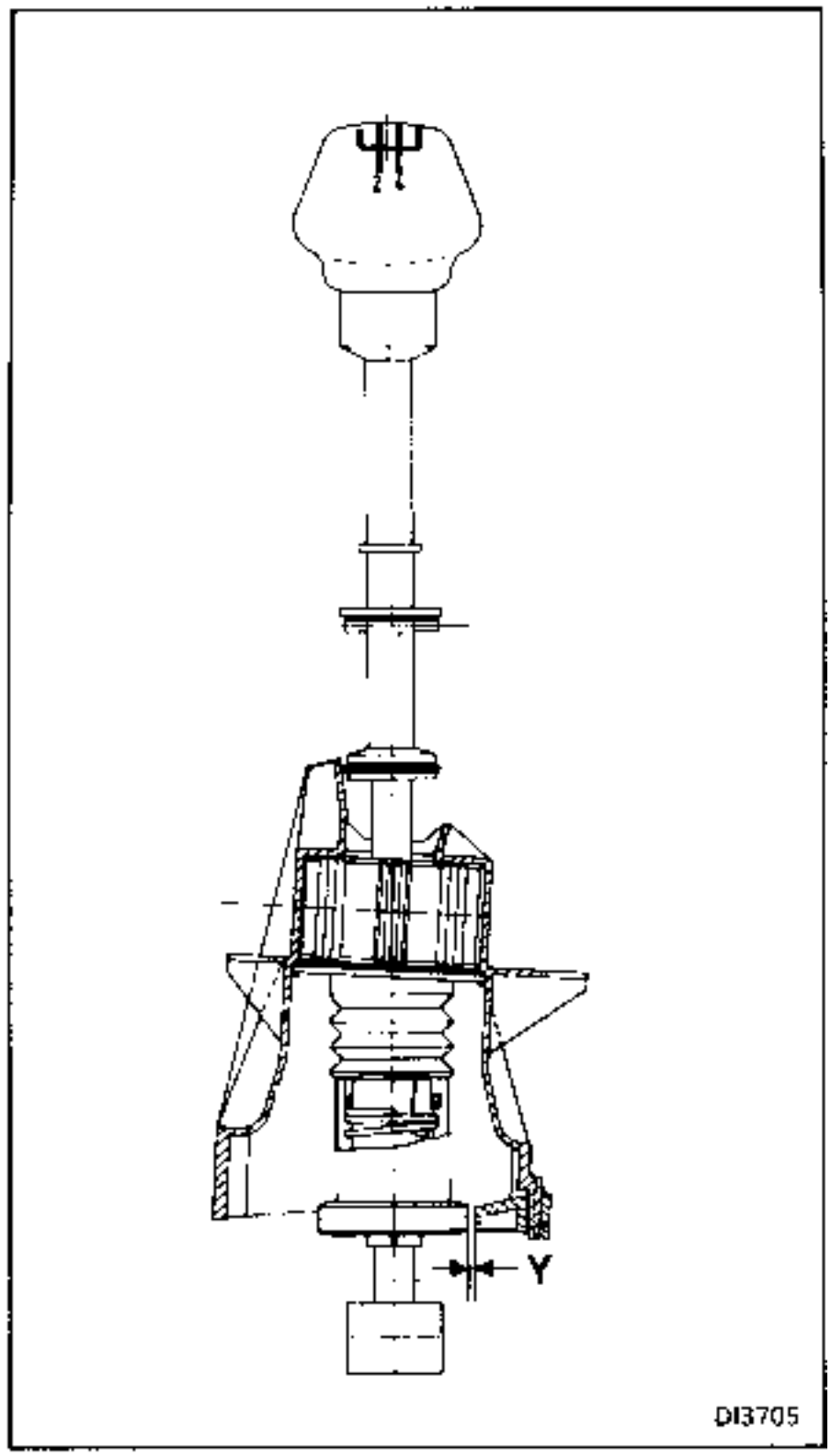
In this position, tighten bolt (1).

Remove the shim and replace the return spring on the retaining clip.



Remove tool **B.Vi. 1133** .

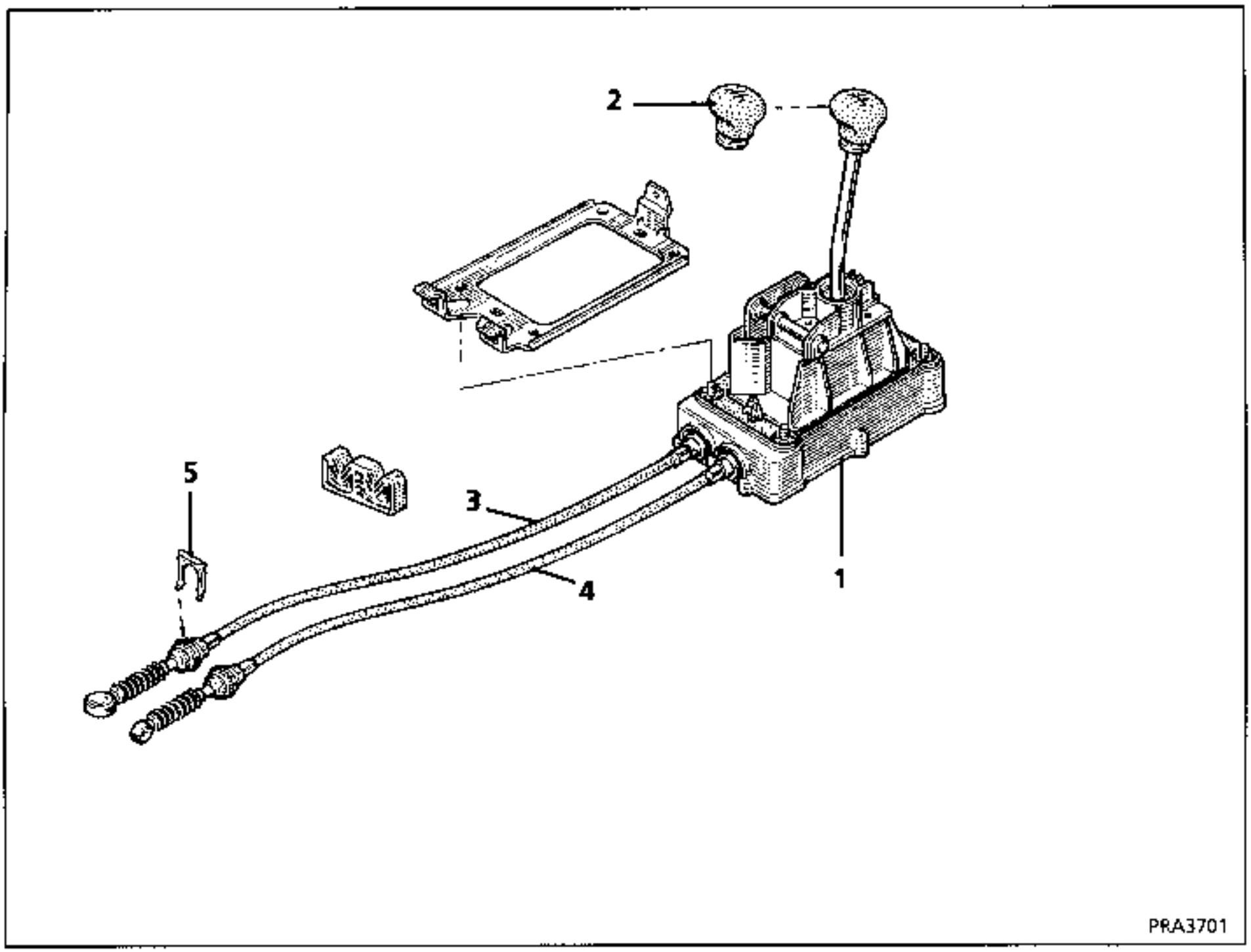
In 1st gear, check the resulting play "Y" which should be between **4** and **5 mm.**



Check the end play and that the gears engage correctly.

Refit the collector.

EXPLODED VIEW



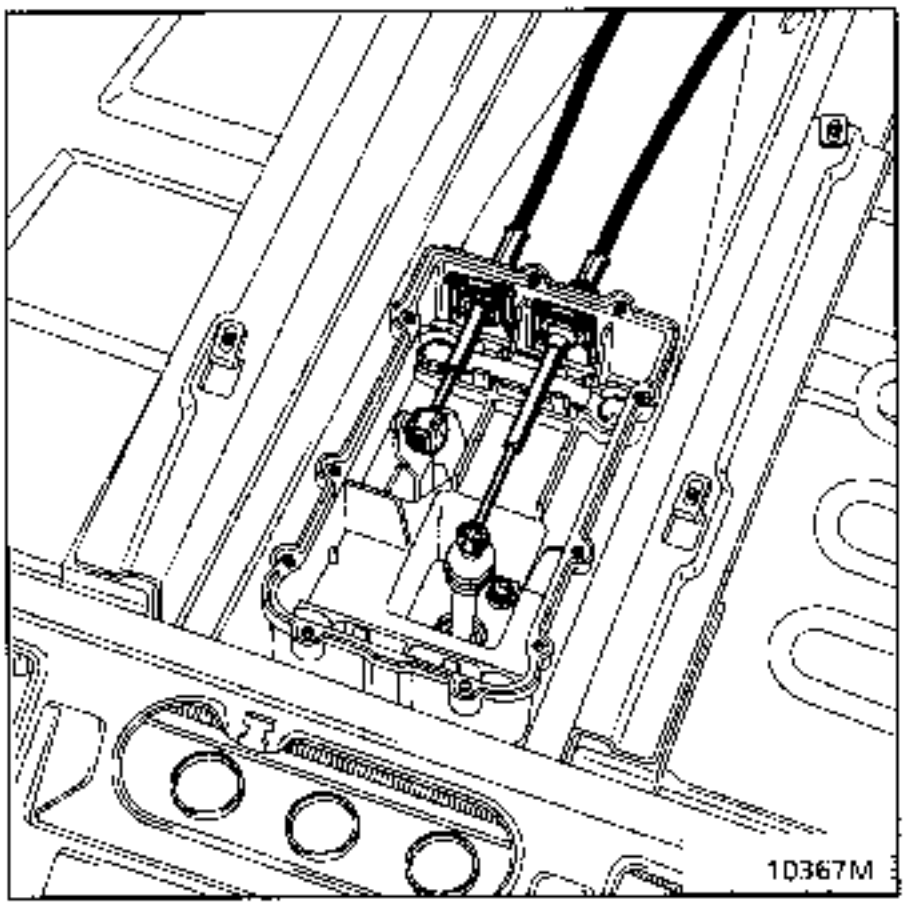
1 Gear control unit
2 Gear lever knob
3 Gear engaging cable
4 Gear selection cable
5 Cable retaining clip

REMOVING THE CONTROL UNIT (1)

Under the vehicle:

Remove:

- the catalytic converter,
- the heat shield,
- the control unit cover,

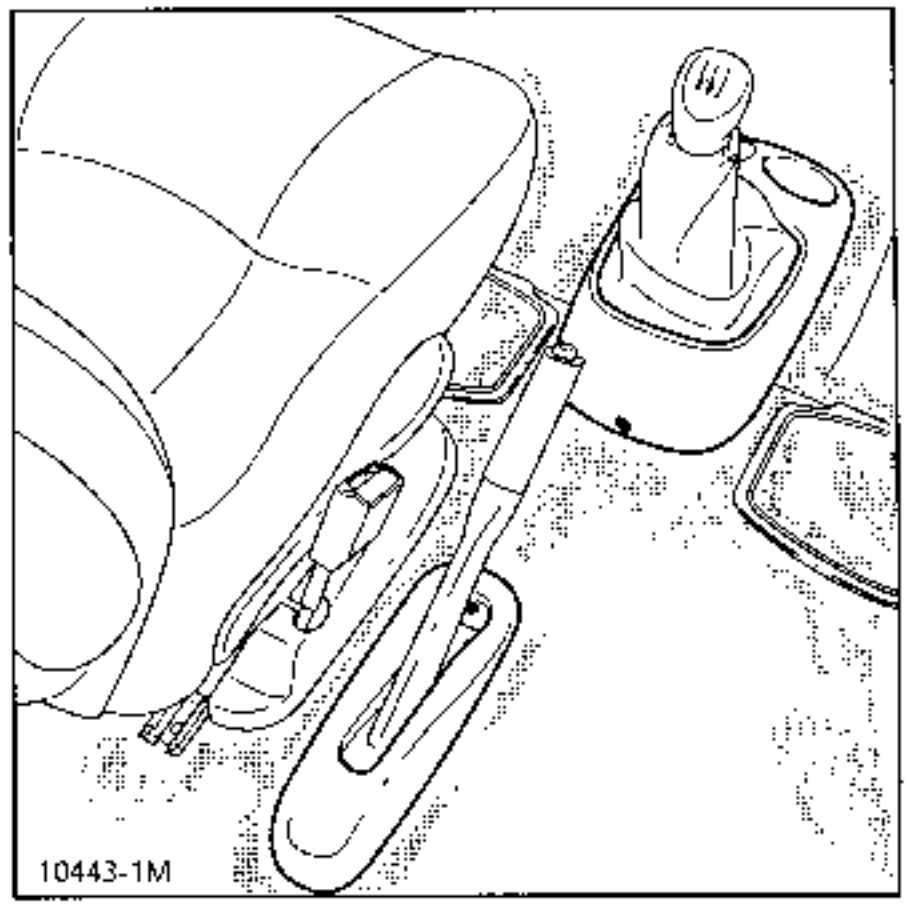


Unclip and release the control cables.

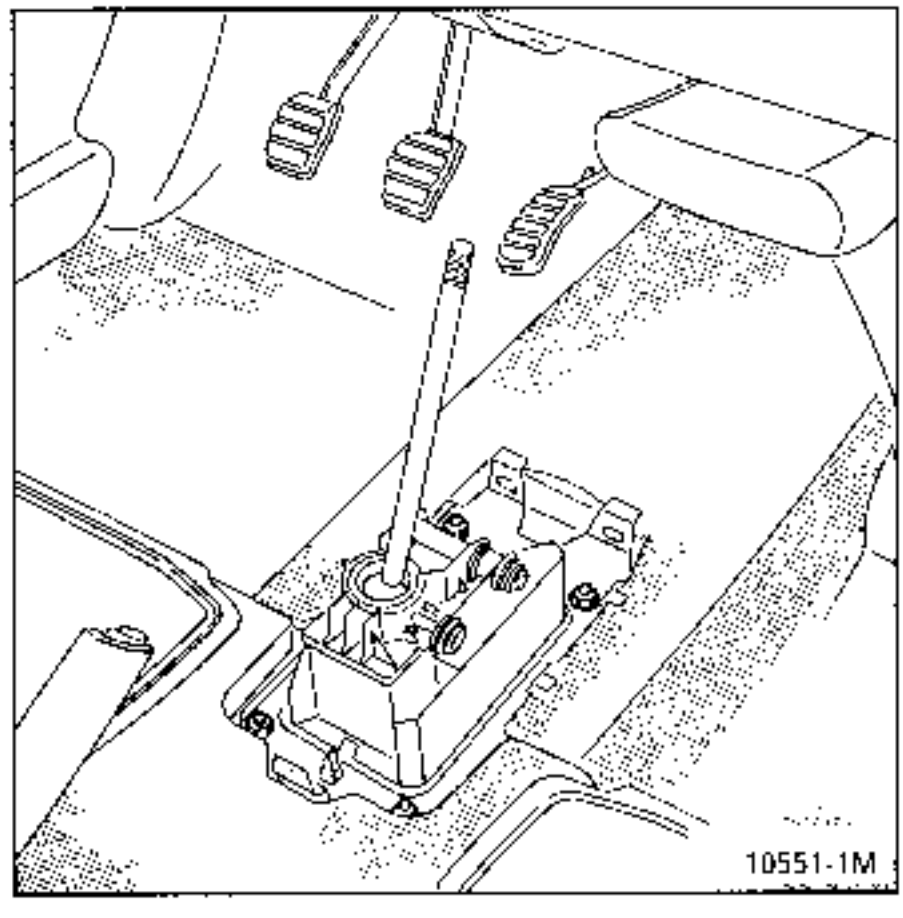
In the passenger compartment:

Unclip the gaiter from the console.

Remove:
- the console (1 bolt),



- the four mounting bolts for the control unit.



Remove the unit from below the vehicle.

REMOVING THE GEAR ENGAGING AND SELECTING CABLES

Disconnect the battery.

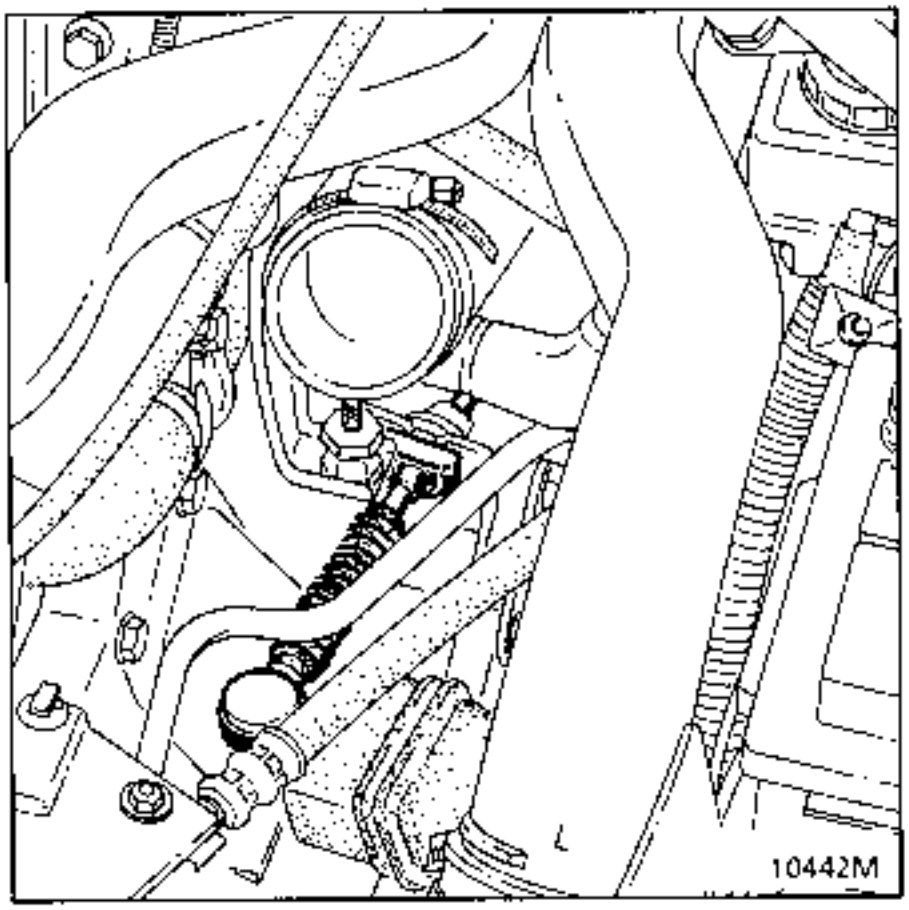
Under the vehicle:

Release the cables at the gear control unit (see previous section).

In the engine compartment:

Remove the air filter and its mounting.

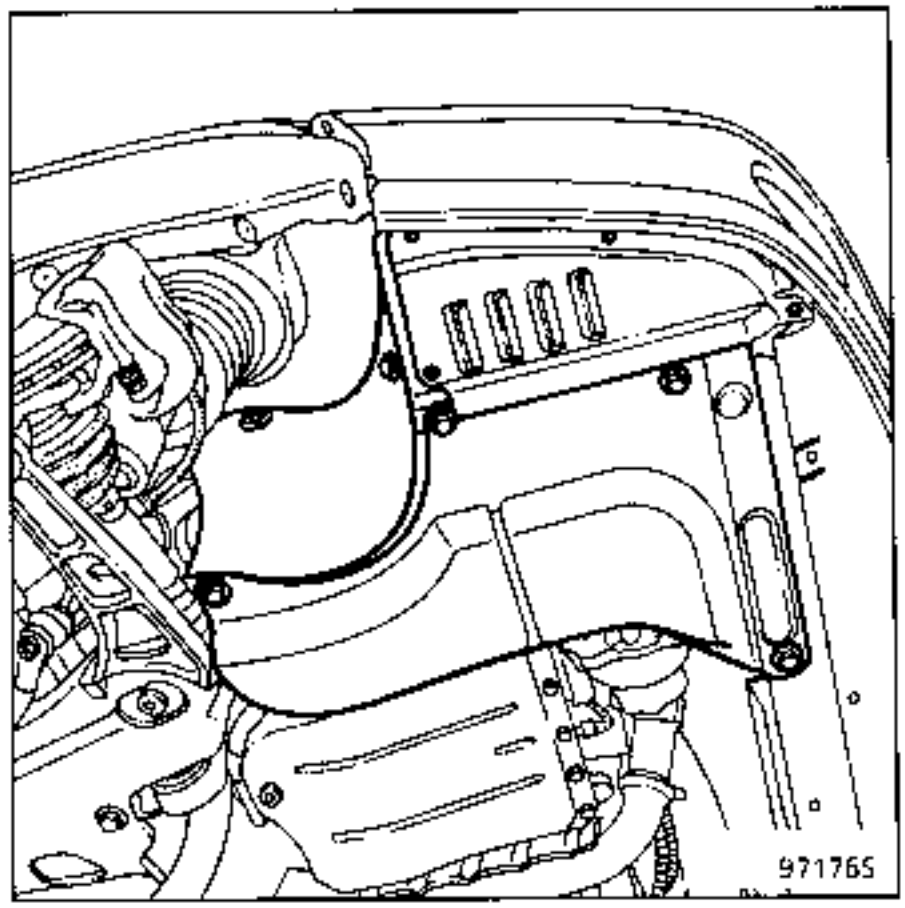
Remove the gear engaging cable clip.



Release the cable from the gearbox.

On the left hand side of the vehicle:

Remove:
- the wheel,
- the wheel arch protection to reach the gear selection cable.



Remove the clip.
Release the cable from the gearbox.

Mark the routing of the cables then remove them.

REFITTING

No adjustment is required on this type of control.

DESCRIPTION

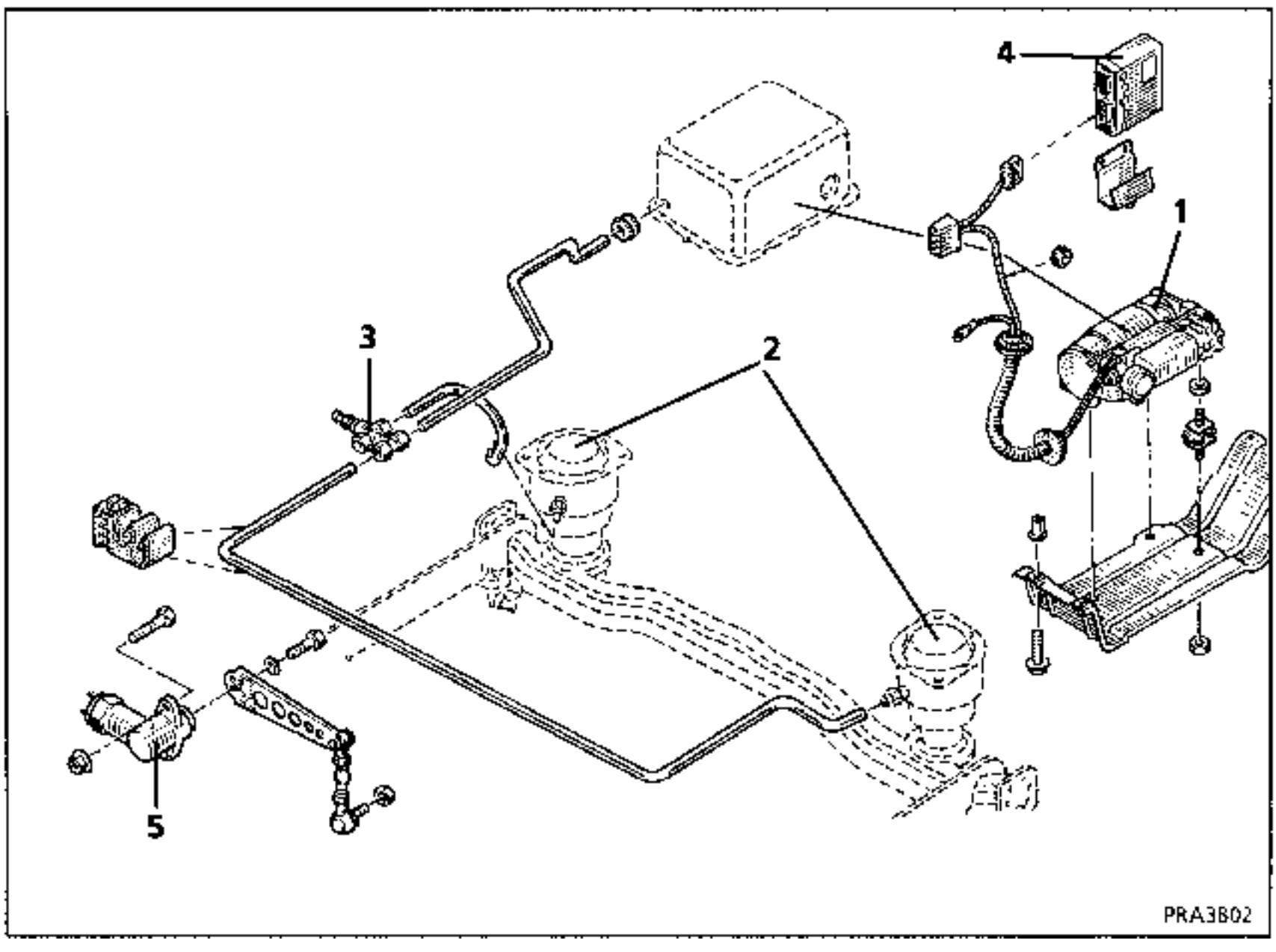
The system is a static trim correction system for a pneumatic suspension axle.

The pneumatic section comprises:
- 1 compressor assembly(1),
- 2 pneumatic springs(2),
- 1 3 way union (3) fitted with a valve,
- connecting pipes.

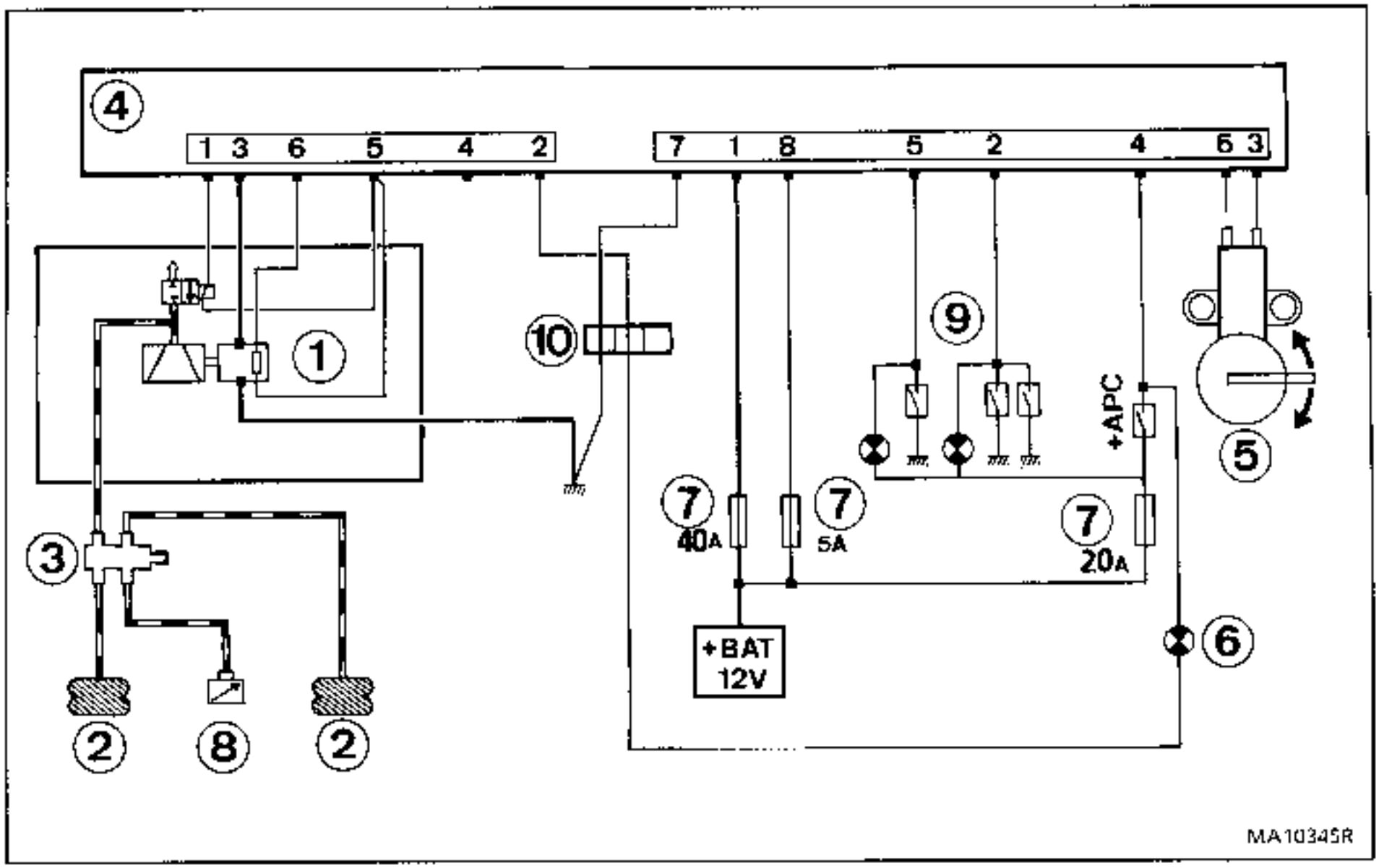
The electrical section comprises:
- 1 computer (4),
- 1 level sensor (5),
- 1 fault warning light on the instrument panel,
- 3 fuses located in the engine and passenger compartment connection units,
- connecting wiring.

The following components are specific to the system:

- Rear shock absorbers.
- Suspension cross member.
- Chassis (special spring cups).
- Guide bar rubber bushes.
- Wiring.



DESCRIPTION



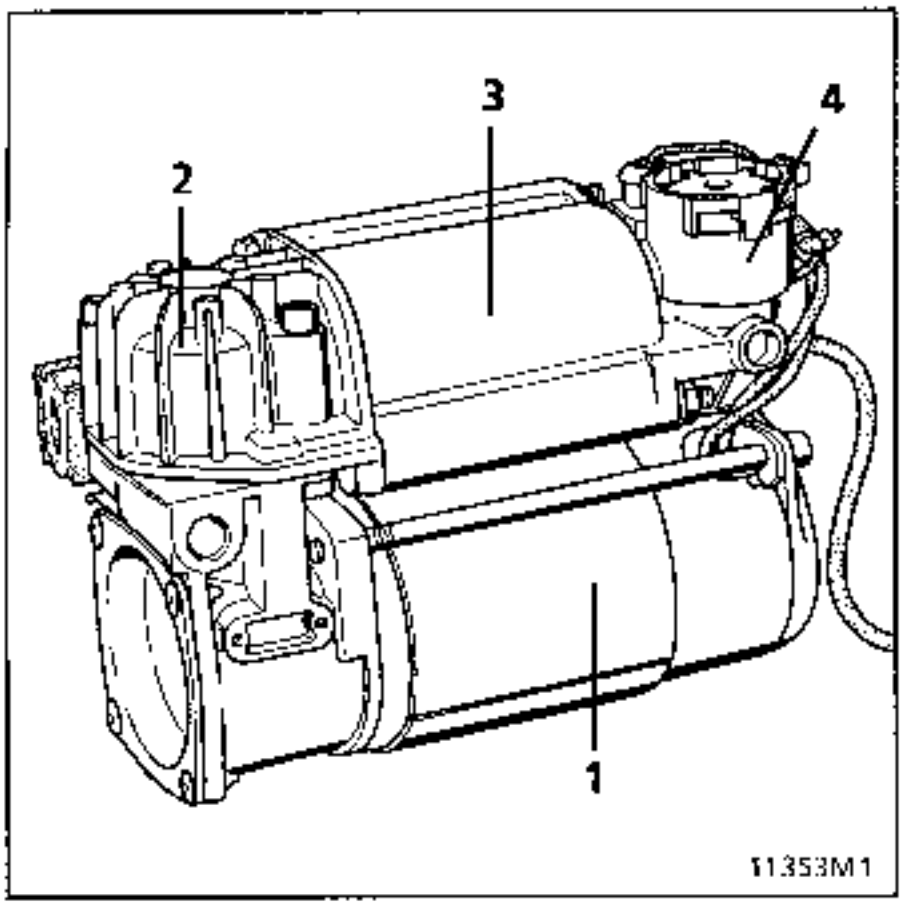
1 Compressor assembly
2 Pneumatic springs
3 3 way union
4 Computer
5 Level sensor
6 Fault warning light
7 Fuses
9 Doors and tailgate switches
10 3 track connector

DESCRIPTION

COMPRESSOR ASSEMBLY

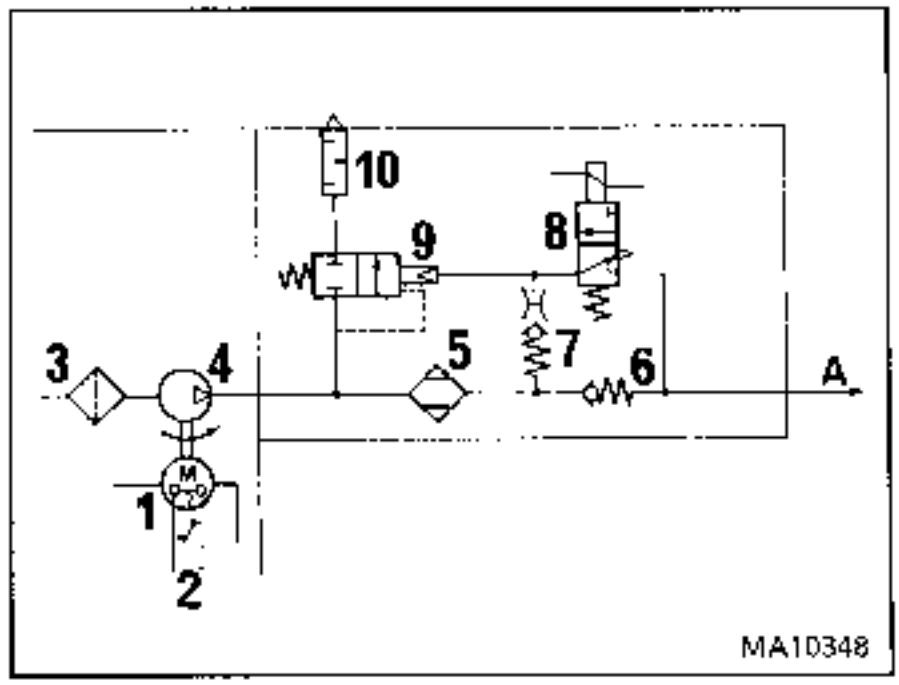
This is located under the vehicle at the right hand side of the emergency spare wheel.

The assembly is sound-insulated by a casing.



T1353M1

It comprises:
- an electric motor (1),
- a compressor (2),
- an air filter using granular dehumidification (3),
- an outlet solenoid valve (4).



MA10348

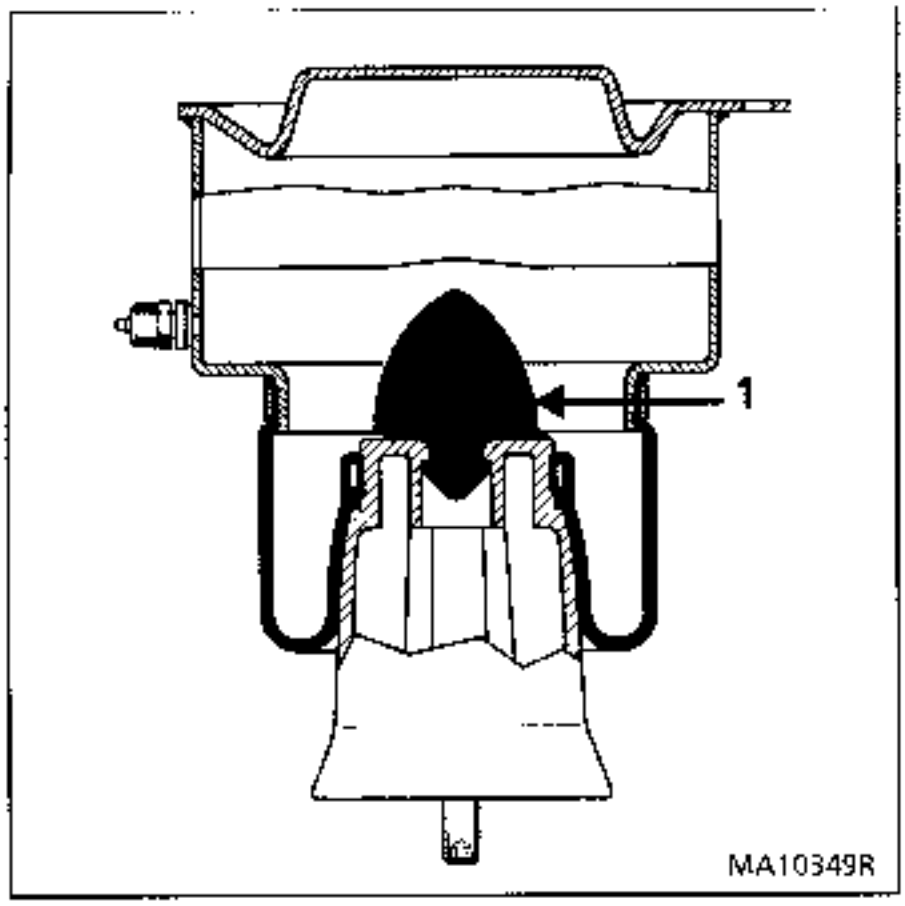
1 Electric motor
2 Thermal protection
3 Inlet filter
4 Compressor
5 Air filter using granular dehumidification
6 Non-return valve
7 Regulating non-return valve
8 Outlet solenoid valve
9 Outlet safety valve
10 Outlet filter
A to 3 way union

THIS ASSEMBLY REQUIRES NO SERVICING

DESCRIPTION

PNEUMATIC SPRINGS

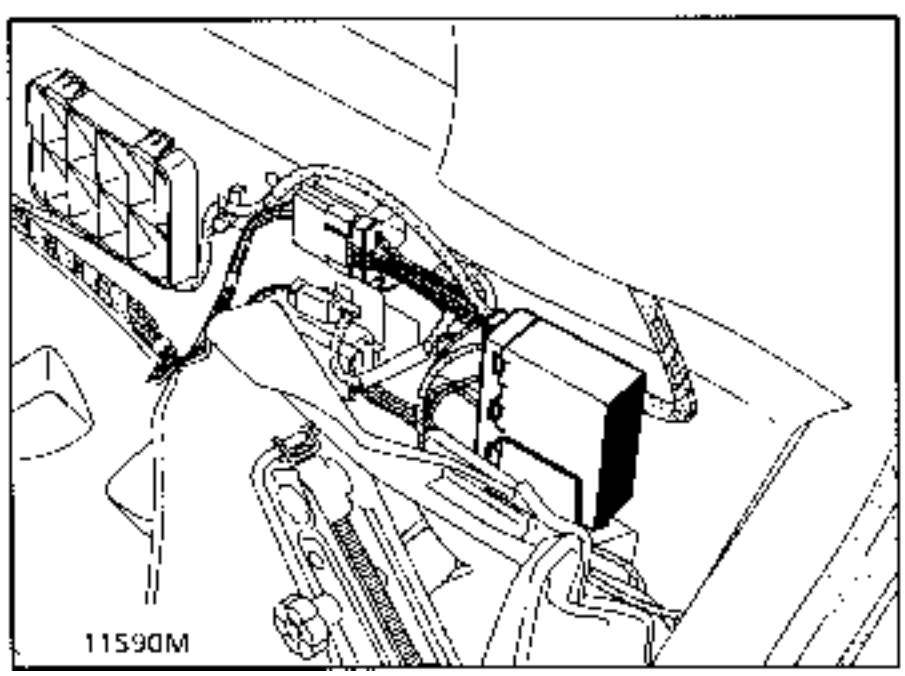
These replace the helical springs on a conventional vehicle and ensure the connection between the suspension cross member and the chassis.



They have a movable stop (1) which is used if there is a leak in the system.

COMPUTER

This is located in the passenger compartment, behind the rear right hand wheel arch, next to the 3rd row seat belt inertia system.



OPERATION

The level sensor sends the computer information on the rear height of the vehicle.

The computer then operates the compressor or the outlet solenoid valve to return the vehicle to the recommended height.

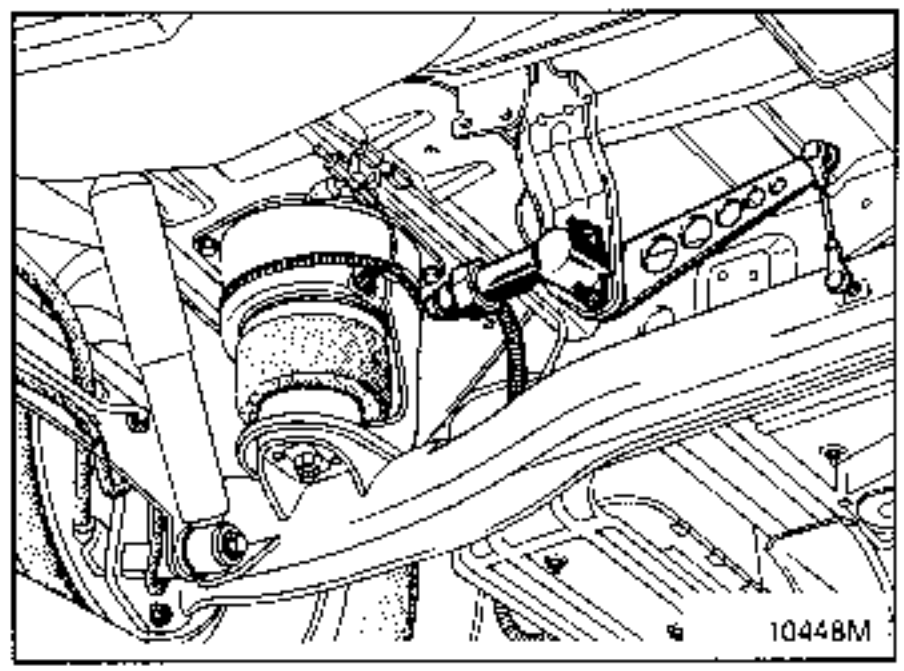
The computer ensures the safety of the system by locking it under certain circumstances and alerting the driver using the warning light on the instrument panel, especially if there is a leak in the pneumatic system.

LEVEL SENSOR

This is mounted to the chassis. The connection to the suspension cross member is ensured by the bar and lever assembly.

IMPORTANT: The bar is pre-set and its length should never be adjusted.

This transmits to the computer, the exact position of the vehicle body and detects if the vehicle is moving (vibrations caused when driving are detected).



SPECIFICATIONS

COMPRESSOR ASSEMBLY

Motor :
Operating voltage : 12V ± 3V
Maximum current: 24 A
Speed: 1700 to 2700 rpm

Compressor:
Capacity: 18.5 cm3
Maximum operating pressure: 11.5 bars
Lubrication: dry

Outlet solenoid valve :
Operating voltage: 12V ± 3V
Maximum current: 0.8 A

Level sensor:
Type: inductive

Compressed air:
The compressed air from the compressor is dehumidified, de-oiled and filtered.

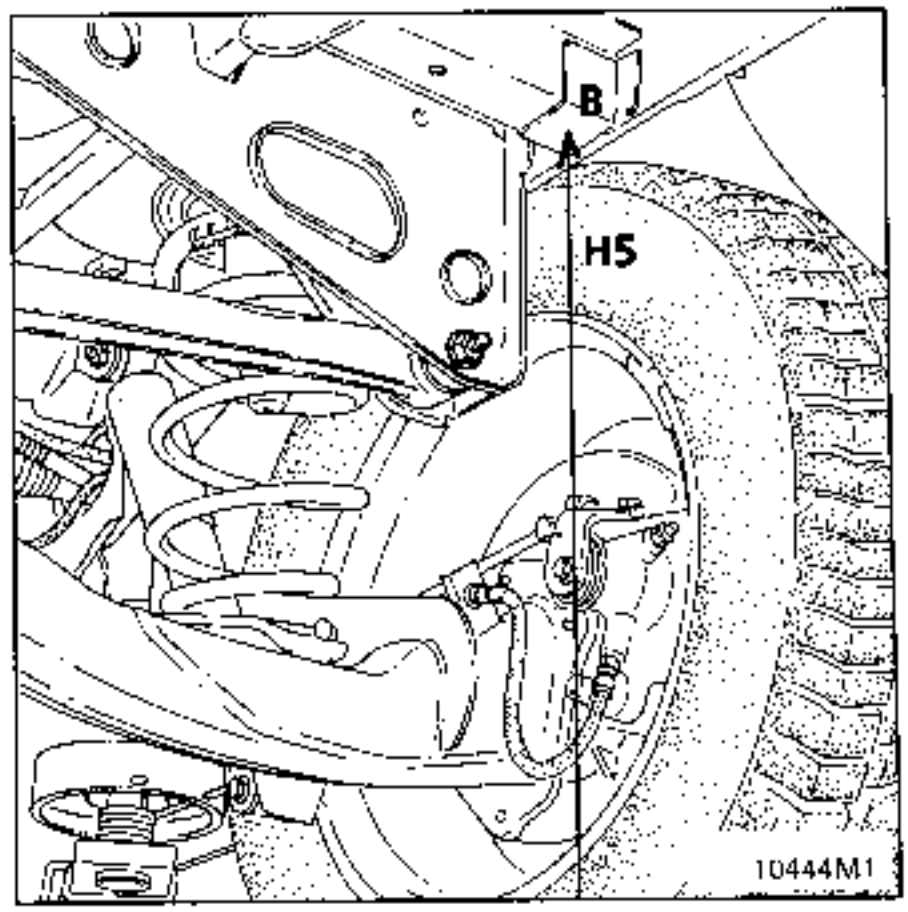
Air from outside the system must be processed in this way to avoid damage to the internal components of the system.

PRINCIPLE

The system is programmed to keep the rear height of the vehicle at a set level, i.e. a dimension (H5)of:

Tyre size	Dimension (H5)
195	412
205	422

measured between the 3rd row chassis cross member and the ground.
This dimension corresponds to the permanent trim level of the vehicle regardless of its loading (tyre inflation pressures correct).



Small variations in trim level when the vehicle is moving, due to the movement of the suspension, are not taken into account by the system.

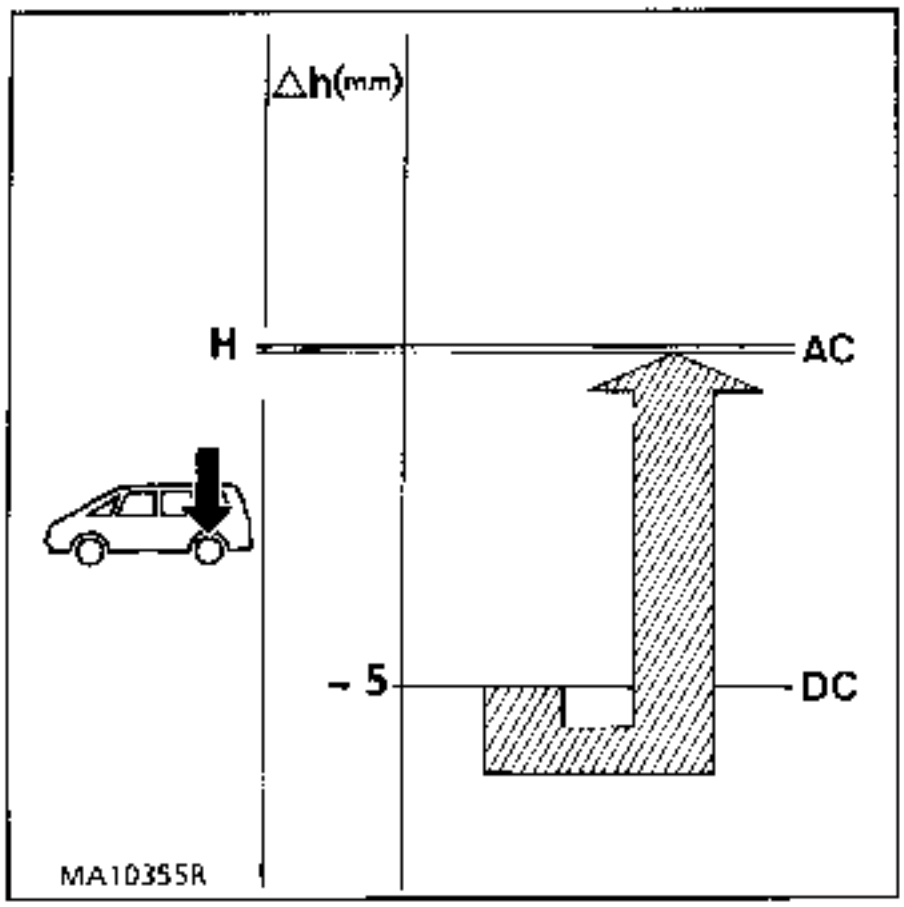
OPERATION

The system becomes operational:
- when a door or the tailgate is opened,
- or when the ignition is turned on (+ after ignition).

The compressor assembly feed is cut for 10 seconds when the vehicle starts.

LOADING THE VEHICLE

After opening a door or turning the vehicle ignition on (+ after ignition) :



h (mm)	variation in vehicle height (3rd row chassis cross member)
H	Normal level
DC	Compressor operates
AC	Compressor stops

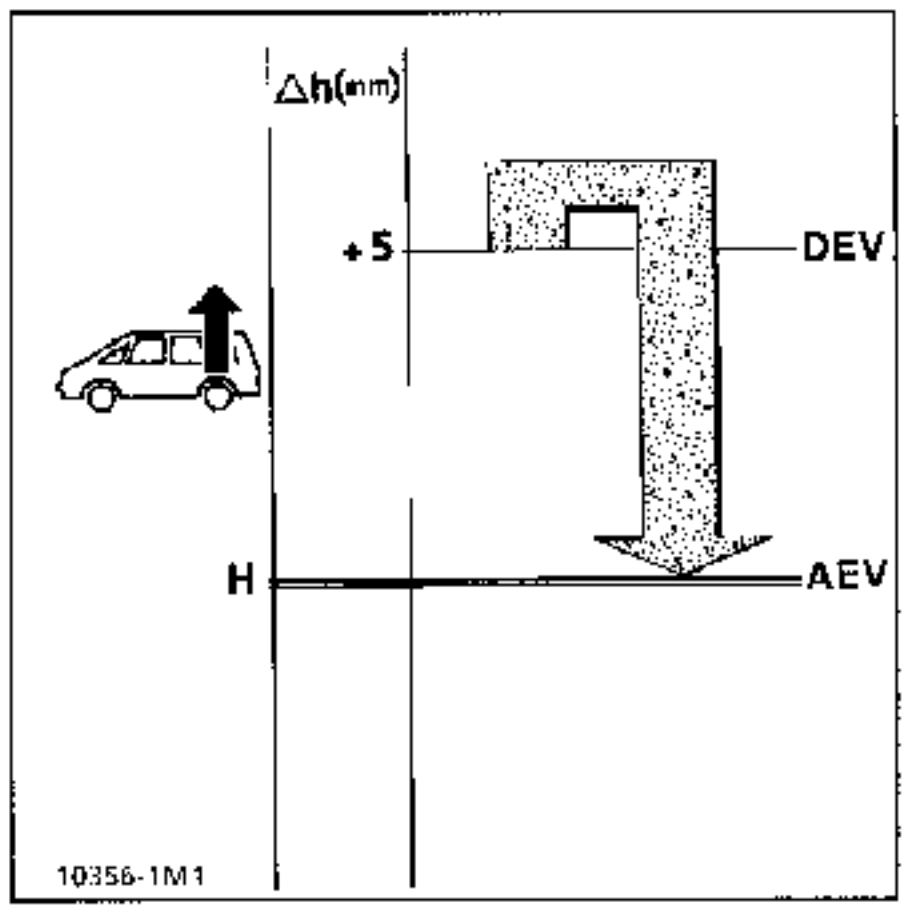
Level lowered by less than 5mm* :
No correction is made: the system is still within its tolerance thresholds (this prevents the system operating at the wrong moment).

Level lowered by more than 5mm* :
The compressor operates after 2 seconds, increasing the pressure in the circuit, returning the vehicle to its normal height.

Special case:
The system may adjust the height **WHEN THE VEHICLE IS MOVING** when the level has dropped by more than 5mm after 45 seconds (passengers may have moved).

UNLOADING THE VEHICLE

After opening a door or turning the vehicle ignition on (+ after ignition) :



h (mm)	variation in vehicle height (3rd row chassis cross member)
H	Normal level
DEV	Outlet solenoid valve operates.
AEV	Solenoid valve stops.

Level raised by less than 5mm* :
No correction is made: the system is still within its tolerance thresholds (this prevents the system operating at the wrong moment).

Level raised by 5mm or more* :
The outlet solenoid valve opens after 2 seconds and returns the vehicle to its normal height.

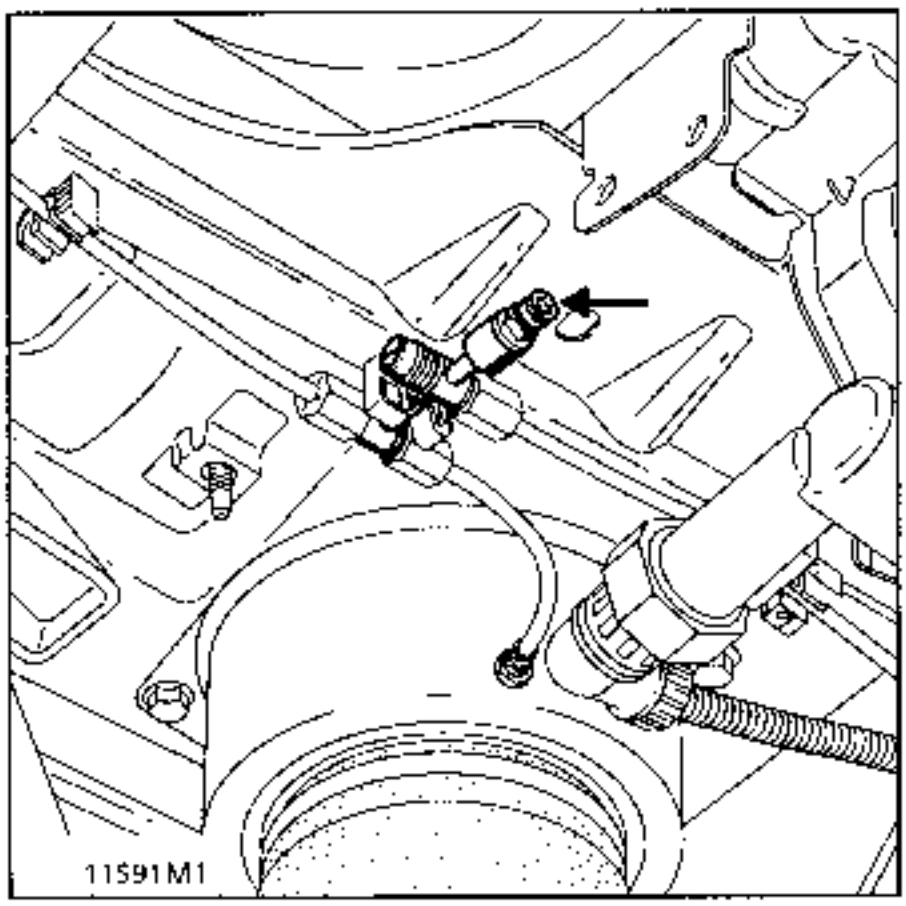
(*) value given for information only.

REMOVING - REFITTING THE MAIN COMPONENTS

IMPORTANT : any operations on the pneumatic circuit require:

- the O rings on the pipes to be renewed (except the pipe on the compressor) and the nuts to be renewed.
- the pipe mounting unions on the various components to be hand tightened.

Before any operation on the system, drain the circuit of air by the valve on the 3 way union.



COMPRESSOR ASSEMBLY

REMOVAL

Disconnect the battery.

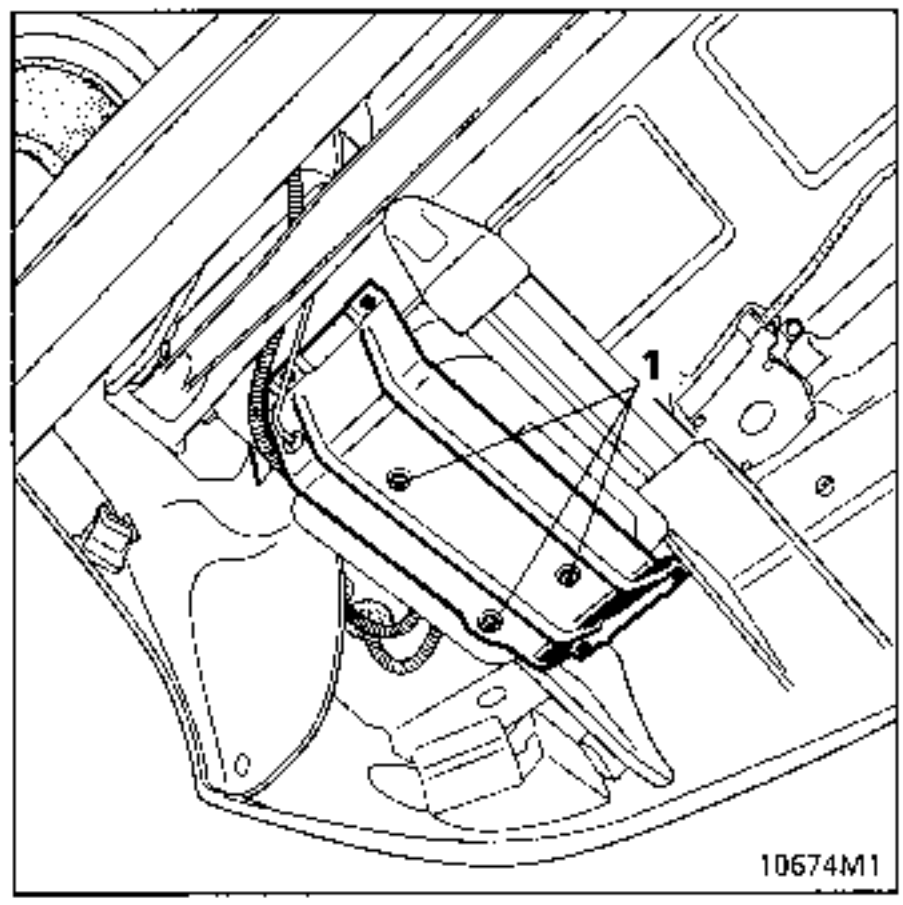
Drain the circuit by the valve.

Unscrew the compressed air pipe from the cross.

Disconnect the wiring harness behind the rear right hand wheel arch trim and release the wire guides.

Release the 3 retaining bolts (1) for the compressor.

Remove the compressor mounting.



Place the assembly on a bench.

Remove the 3 compressor retaining bolts and open the casing.

REFITTING

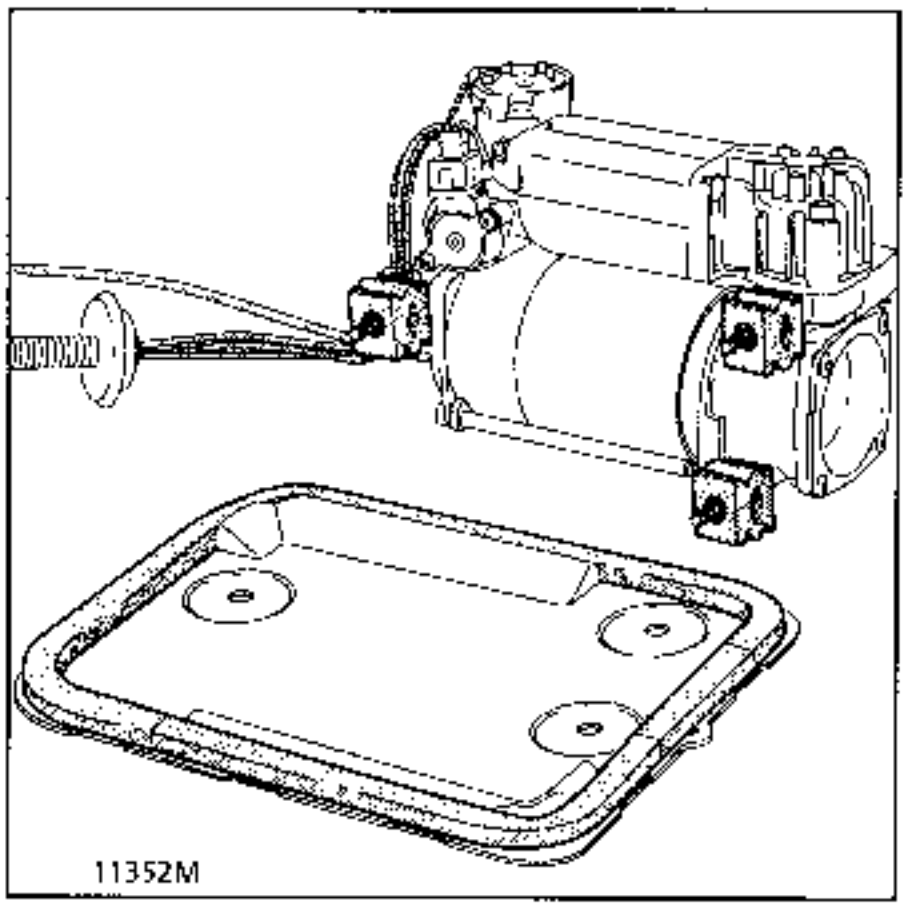
Refitting is the reverse of removal.

IMPORTANT :

Systematically renew :

- the O ring on the air pipe removed,
- the casing seal.

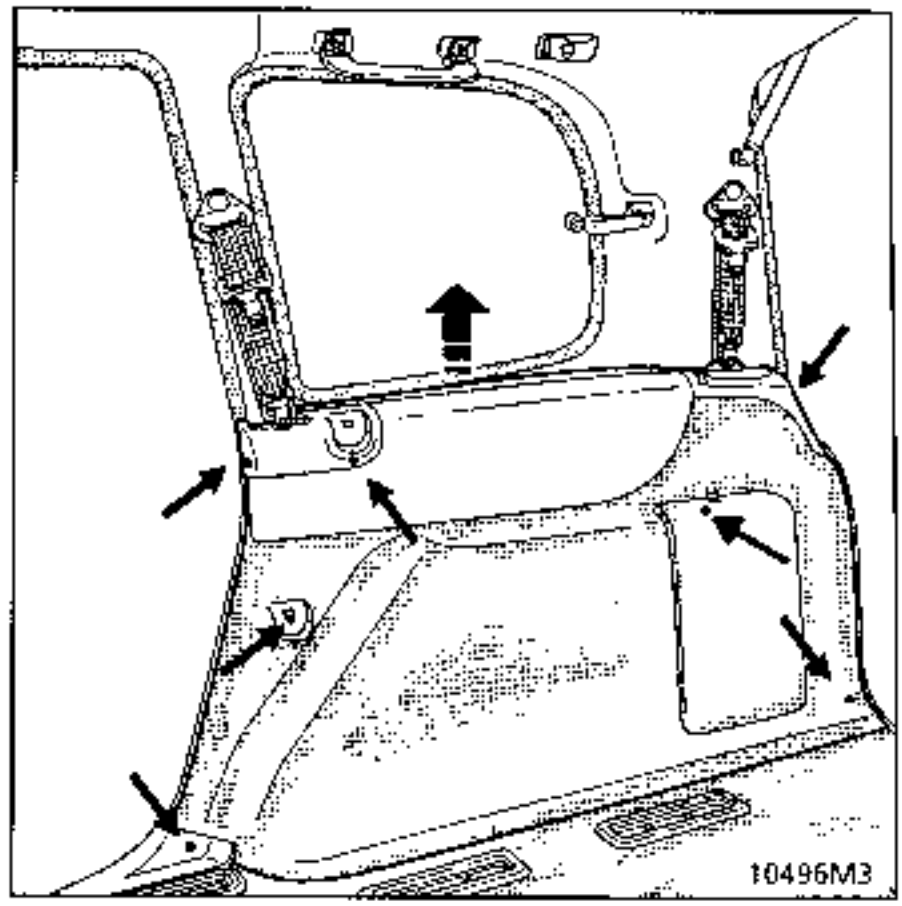
Ensure the compressor bushes are fitted correctly as shown in the diagram below.



COMPUTER

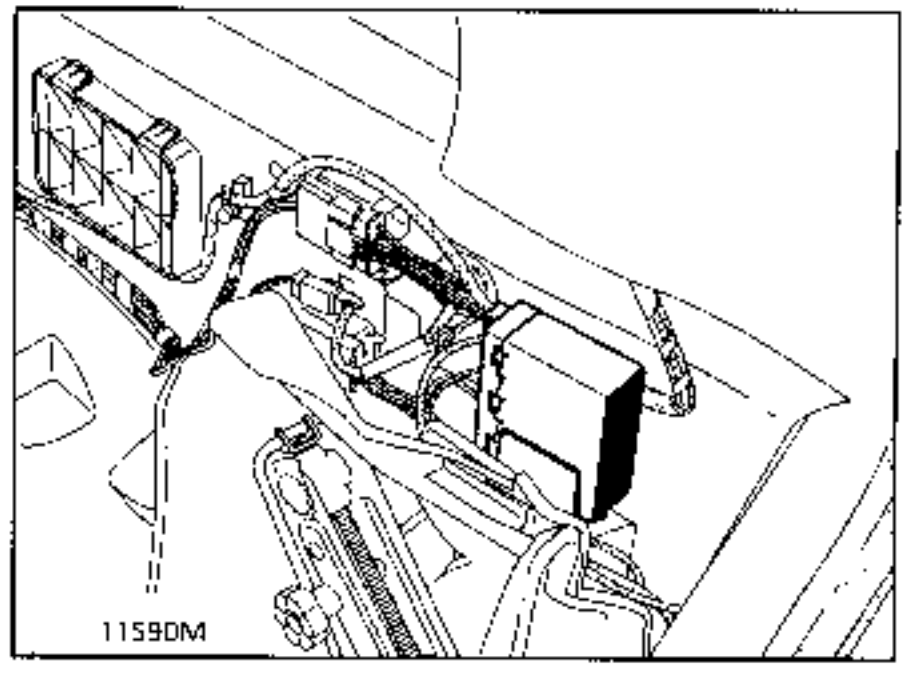
REMOVAL

Remove the right hand wheel arch trim.



Remove the computer from its mounting.

Disconnect the wiring harness.



REFITTING

Refit the computer ensuring the 2 connectors are correctly connected.

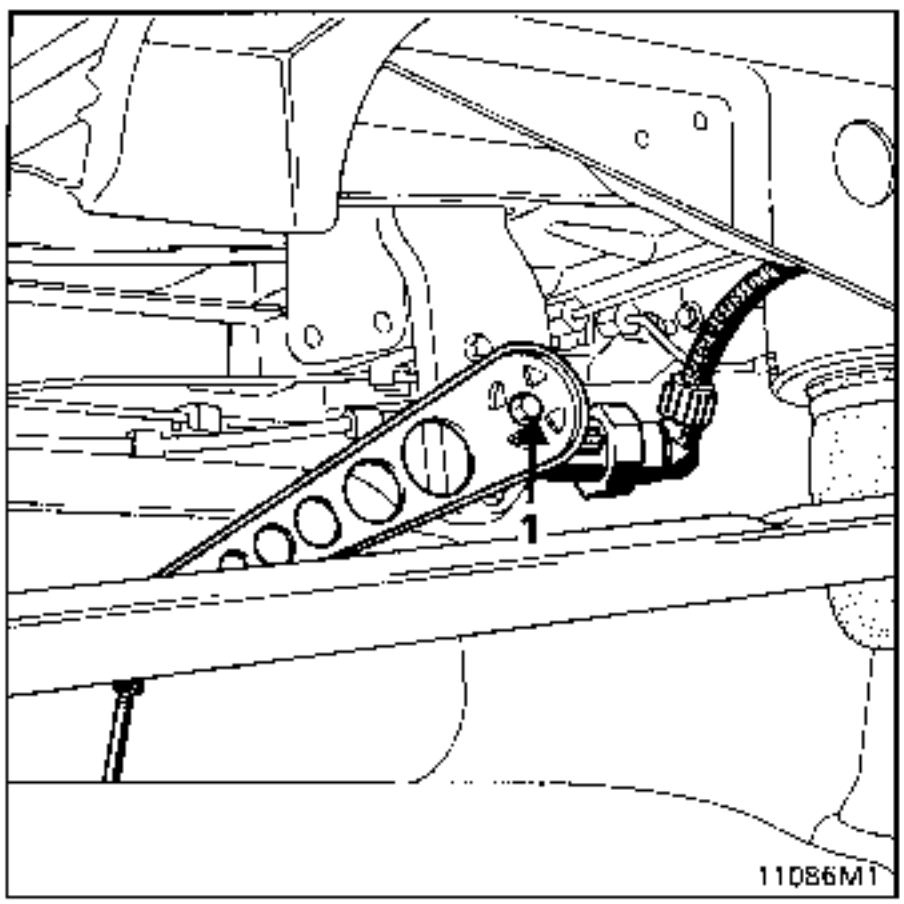
LEVEL SENSOR

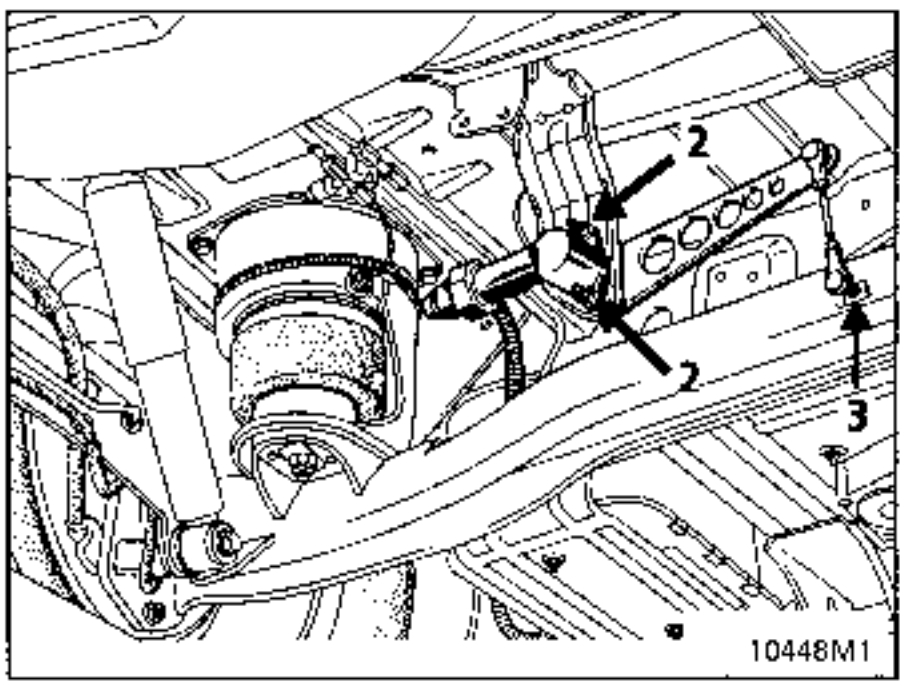
REMOVAL

Disconnect the battery.

Remove:
- bolt (1) for the lever - bar assembly,
- the 2 sensor mounting bolts (2).

Slacken the wiring mounting union and disconnect the sensor.

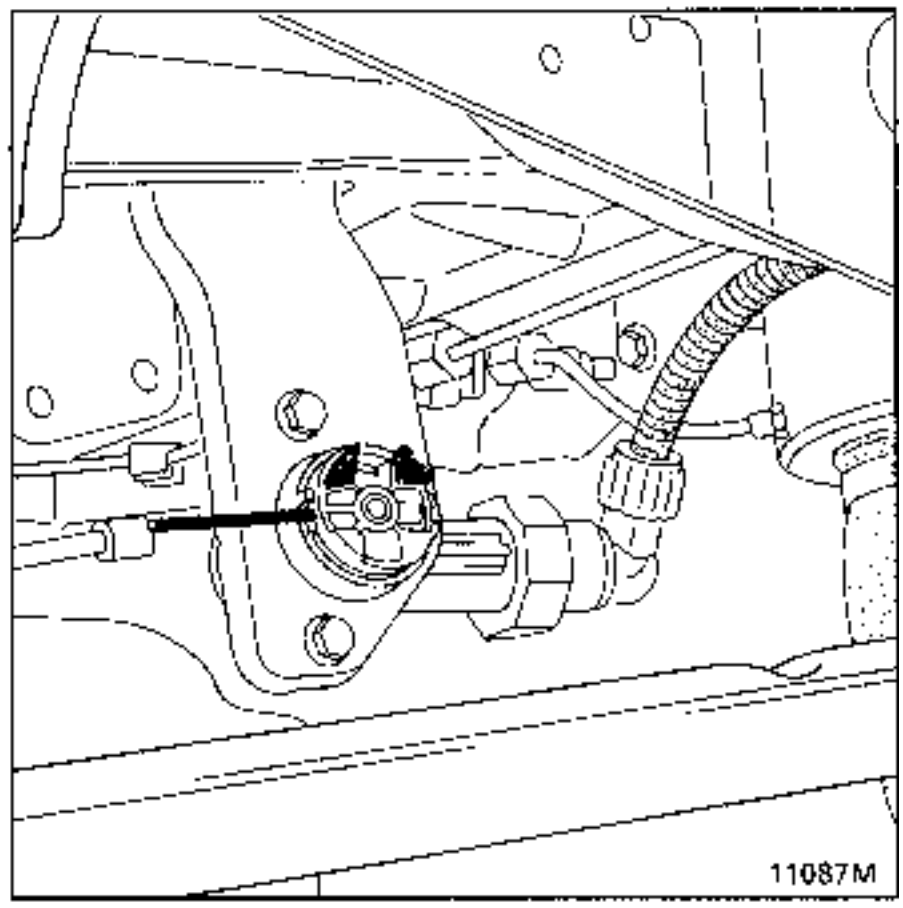




REFITTING

Position the sensor lugs in the upper position.

Pin the sensor using a 4mm pin.



Return the vehicle to its normal height if necessary.

Fit the lever on the sensor.

Coat the mounting bolt (1) with "blue" Loctite and torque tighten to **0.5 daN.m**.

CONTROL LEVER - BAR ASSEMBLY

REMOVAL

Disconnect the battery.

Remove:
- bolt (1) for the lever - bar assembly,
- bolt (3) for the ball joint on the cross member.

REFITTING

Refitting is the reverse of removal.
Carry out the operations required to adjust the sensor.
IMPORTANT: The bar is pre-set and its length should never be adjusted.

SAFETY DEVICE

The computer automatically limits:

- continuous operation:
  - of the compressor to 180 seconds,
  - of the outlet solenoid valve to 80 seconds.

- non-continuous operation:
  of the compressor to 20% of the first hour and 6% of the following hours if the ignition has not been turned off.

These limits are re-applied after the vehicle has been stopped, when the ignition is turned on again.

WARNING LIGHT ON INSTRUMENT PANEL

The warning lights illuminates to test the bulb when the ignition is turned on, for approximately 3 seconds.

It illuminates with the "service" symbol (depending on version) when :

- the outlet solenoid valve operates continuously for 80 seconds.

- the compressor operates for more than 20% of the first hour.

- the compressor operates for more than 6% of the following hours.

- an air leak is noted in the circuit (the compressor operates continuously for 180 seconds).

DRIVING ON THE MOVABLE STOPS

Precautions for use:

If there is a major leak, the vehicle rests on the pneumatic spring movable stops.

In this condition, do not exceed 25 mph (40 km/h).

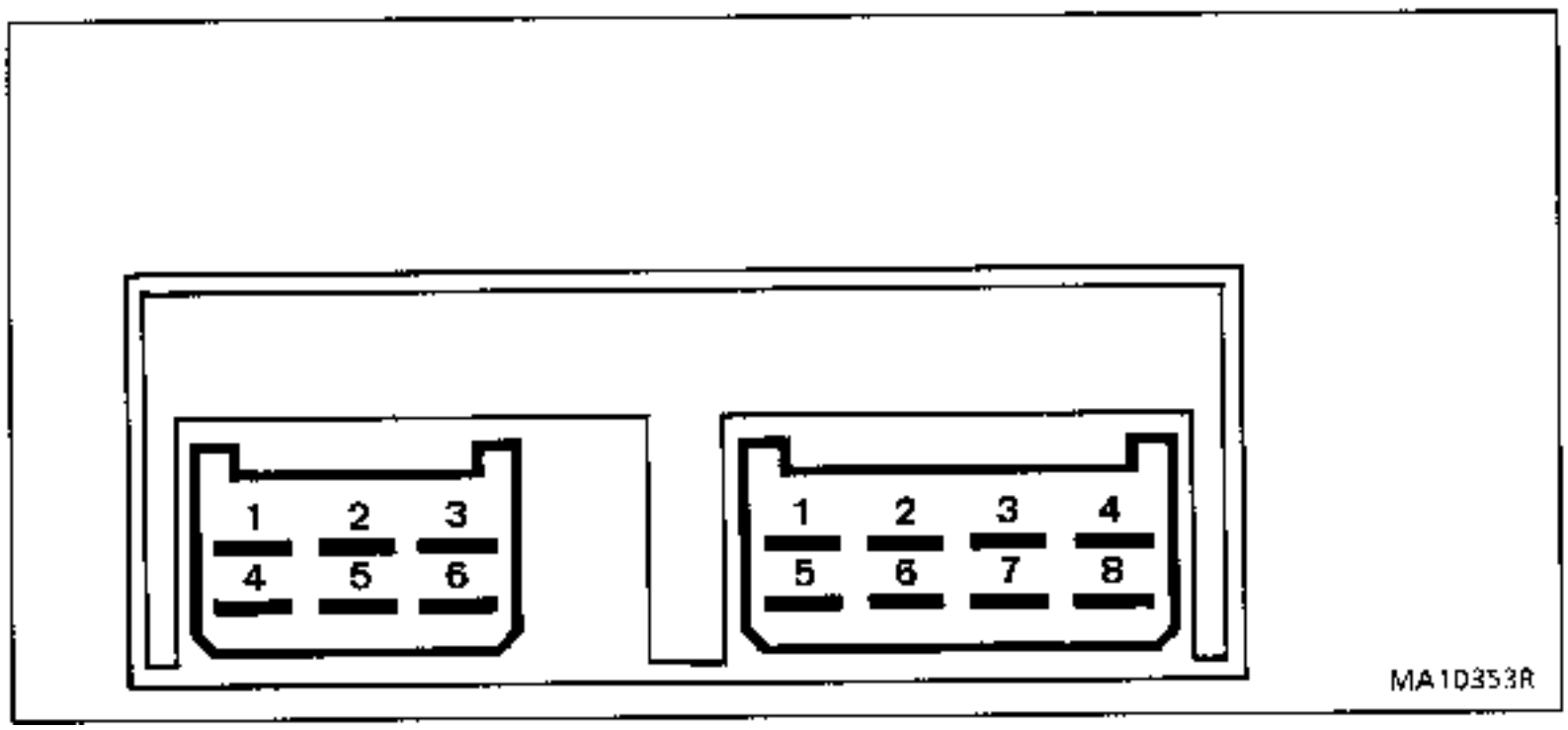
ALLOCATION OF COMPUTER CONNECTOR TRACKS

6 TRACK CONNECTOR (A)

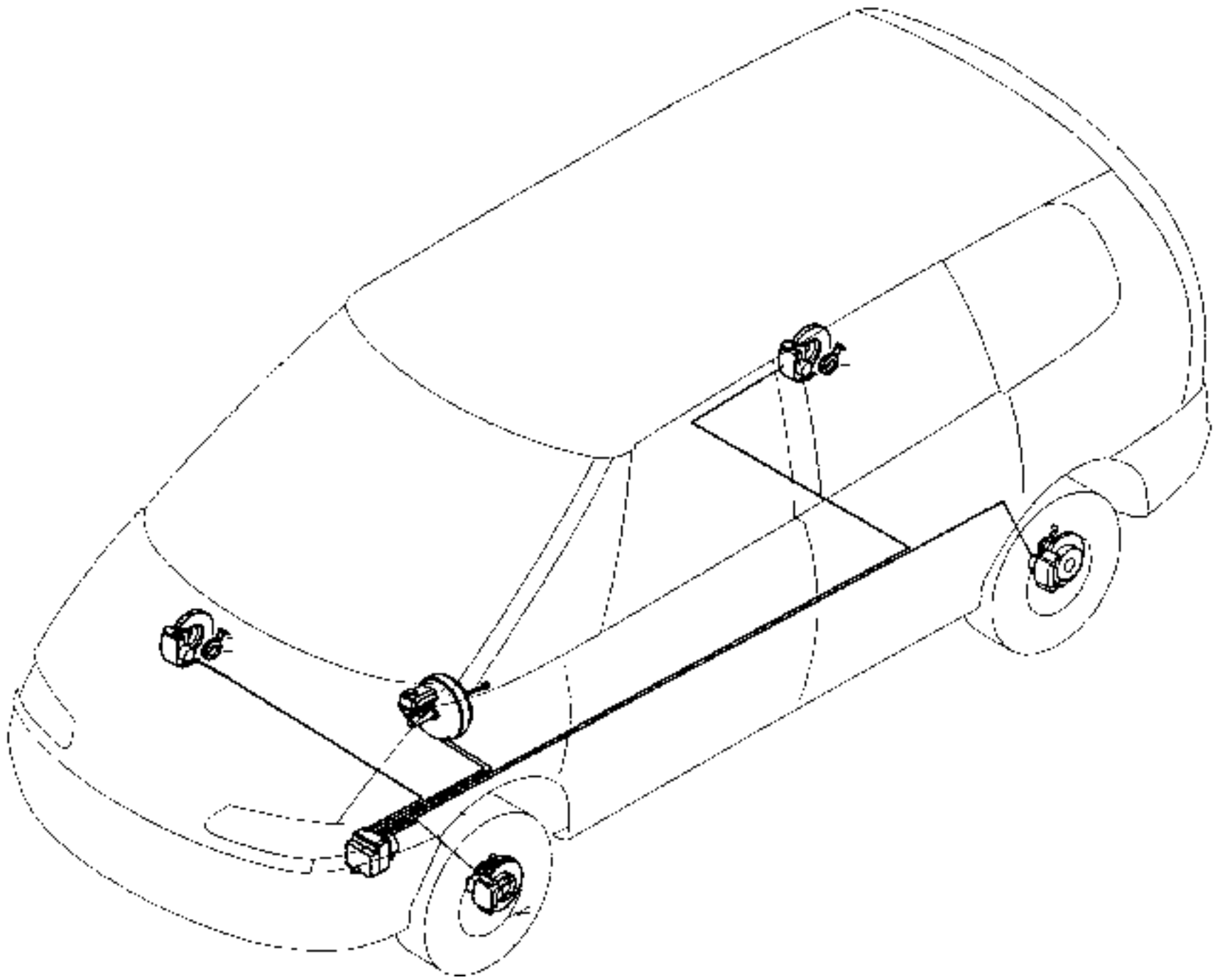
1 Solenoid valve control
2 Fault warning light
3 Compressor feed
4 Not used
5 + 12V solenoid valve and thermal protection
6 Thermal protection feed

8 TRACK CONNECTOR (B)

1 – before ignition feed
2 Tailgate switch
3 Level sensor
4 + after ignition feed
5 Door switches
6 Level sensor
7 Earth
8 + before ignition feed



LOCATION



DI3882

RECOMMENDATIONS FOR HANDLING THE BOSCH ABS SYSTEM COMPONENT PARTS

Vacuum amplifier (master cylinder + brake servo)

- Do not hold the component by the piston stem when transporting it.
- Do not hold the component by the vacuum socket.
- Remove the protectors only when the part is about to be fitted.
- Avoid all impacts (do not allow the part to fall).
- Store in a dry location (avoid humidity and pollution).
- Observe the recommended packaging position during transport.
- Do not stack the parts (individual package).
- Observe the usage recommendations in the case of draining or adding fluid.
- Do not use mineral fluids.

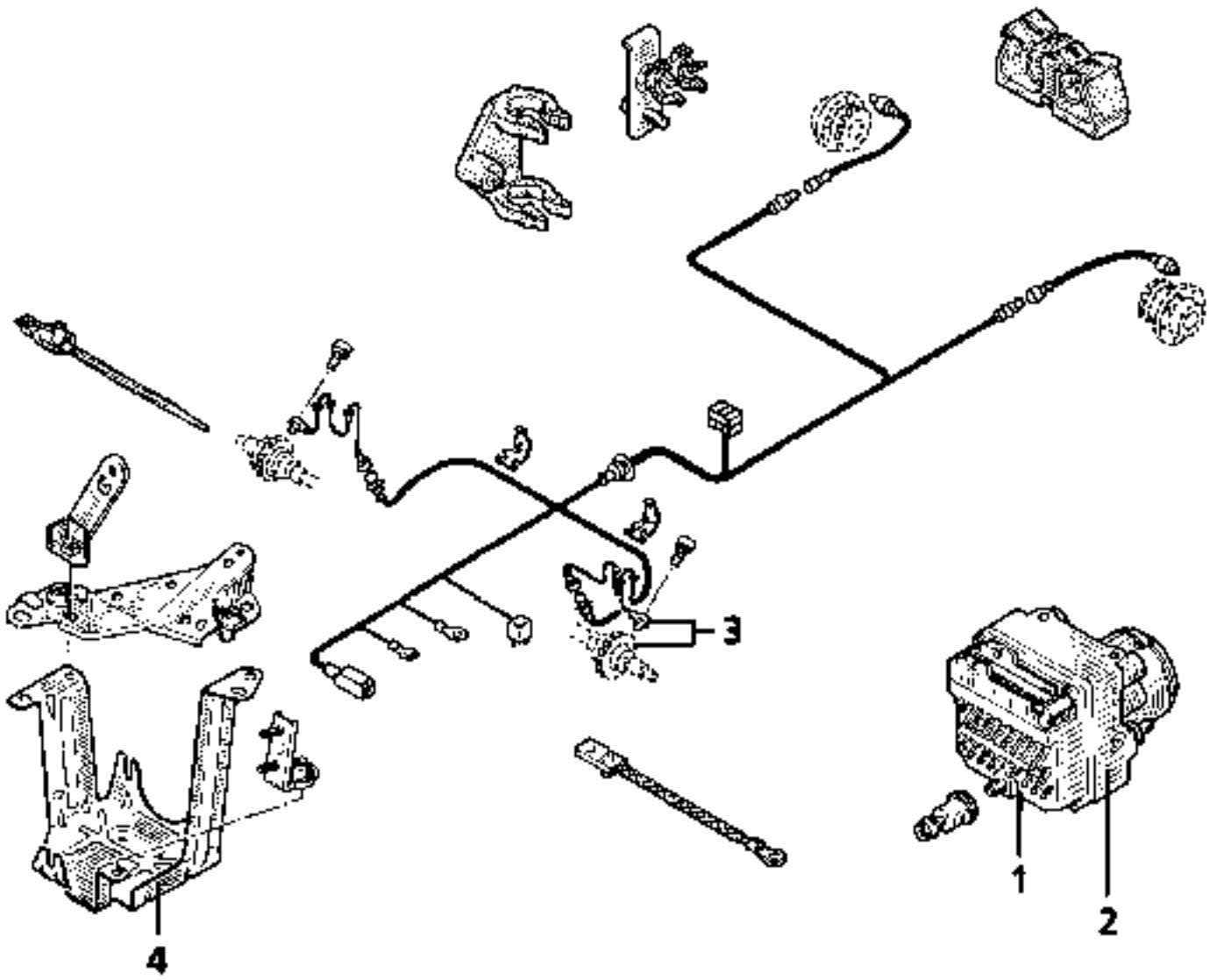
Hydraulic regulation unit with computer attached

- Observe the recommended packaging position during transport.
- Remove the protectors only when the part is about to be fitted.
- Avoid all impacts (do not allow the part to fall).
- Do not stack the parts (individual package).
- Store in a dry location (avoid humidity and pollution).
- Observe the storage period.
- Ensure the computer connector is correctly clipped in.
- Observe the correct tightening torques when connecting pipes.

Wheel sensors

- Do not twist the wiring when fitting.
- Do not pull on the wire guides.
- Do not subject the sensor to any impacts.
- Observe the tightening torques.

COMPOSITION



PRA3801

1 Computer.
2 Pump motor - solenoid valves assembly - relays.
3 Sensors - targets.
4 Mounting.

DESCRIPTION

The "BOSCH 5.0" system comprises the following components:

- a vacuum amplifier with tandem master cylinder and reservoir (1),
- a central hydraulic regulation unit (2) comprising :
  - a dual circuit electric pump assembly,
  - an inlet and outlet solenoid valve assembly.
- four target and sensor assemblies (3),
- a computer attached to a hydraulic unit (4).
- a warning light on the instrument panel,

The "BOSCH 5.0" ABS system is of the additional type.

The system comprises a hydraulic unit which is fitted in addition to the conventional braking system (master cylinder and brake servo).

OPERATING PRINCIPLE

As soon as the vehicle speed reaches 3 to 3.75 mph (5 to 6 km/h), the ABS system carries out a self-check and is ready to operate.

The wheel rotation speeds are registered by the target and sensor assemblies.

The speed information is processed by the computer and this analysis allows the system to immediately detect the beginnings of any wheel locking. This will immediately operate the corresponding solenoid valves and modify the braking pressure.

Several alternatives are possible:
- pressure maintained,
- pressure reduces,
- pressure increases.

Regulation is effective on all four wheels. Each front wheel is individually regulated. The 2 rear wheels are regulated according to the "select-low" principle: "loss of adhesion" on one of the wheels causes regulation at the other wheel, at the same time.

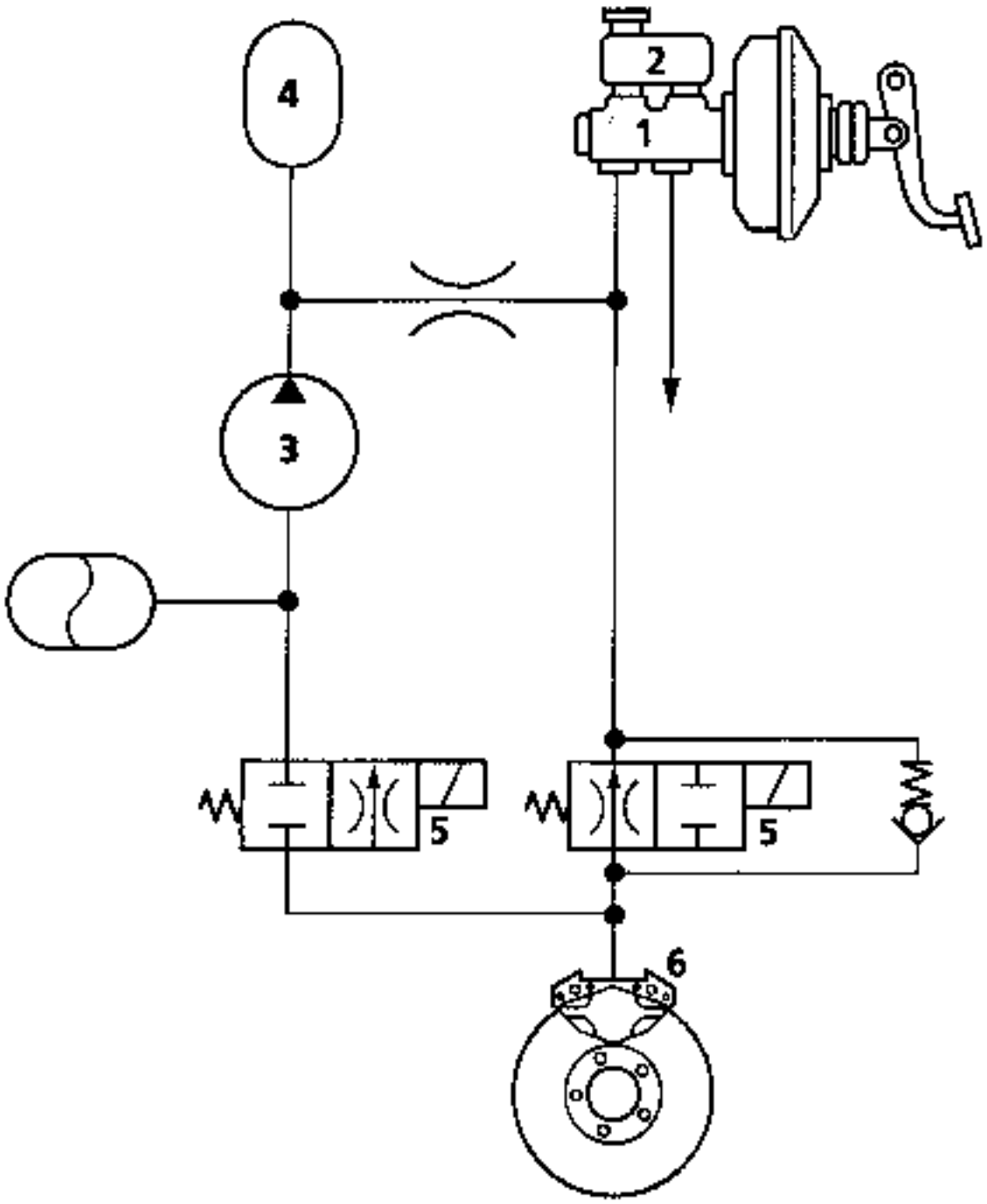
SPECIAL DETAILS

Thanks to the "EBV" (Electronic braking distribution) which is integral in the regulation programming, the braking limiter is no longer used.
This function allows:
- the distribution of the braking force on the rear axle to be increased (less thermal stress on the front brakes),
- stability during braking in corners to be increased,
- constant distribution of the braking force over the system's complete life.

If a fault puts the regulation system out of order, this is indicated to the driver by the illumination of the ABS warning light on the instrument panel.

In this case the vehicle will brake without front / rear distribution: no road testing should be carried out while the ABS is disconnected.

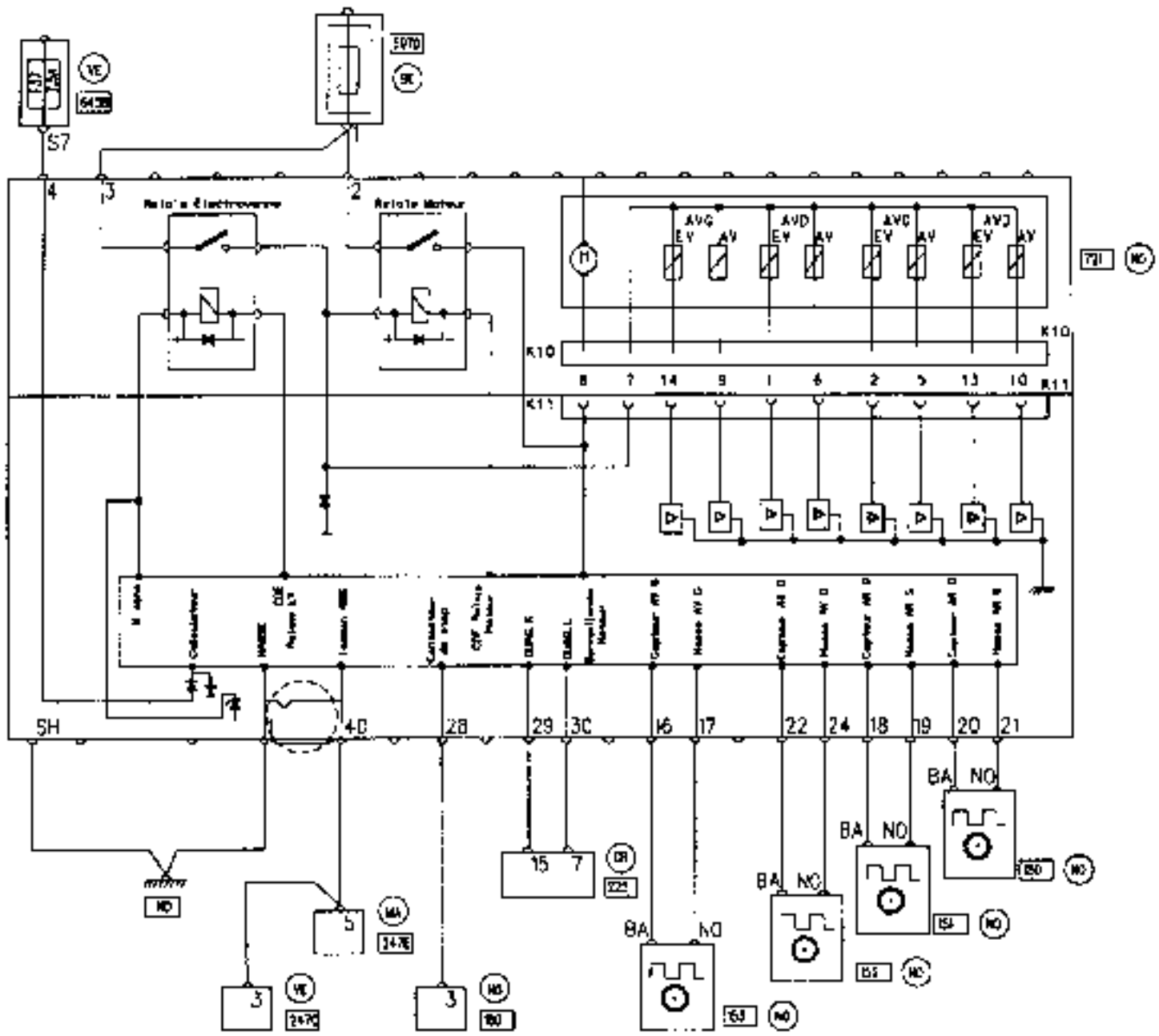
HYDRAULIC OPERATION



DI3881

1 Master cylinder
2 Reservoir
3 Pump
4 Accumulator
5 Solenoid valve (pressure maintained, reduced or increased)
6 Brake cylinder

ELECTRICAL DIAGRAM



DI3875

ELECTRICAL DIAGRAM KEY

Components:

721 Computer - ABS hydraulic unit
150 Rear right hand wheel sensor
151 Rear left hand wheel sensor
152 Front right hand wheel sensor
153 Front left hand wheel sensor
160 Stop switch
225 Diagnostic socket
247 Instrument panel warning light
597 Engine fuse box
645 Passenger compartment connection unit

NOTE: never disconnect the computer when voltage is applied to the circuit.
Earths and resistances should be checked when the battery is disconnected.

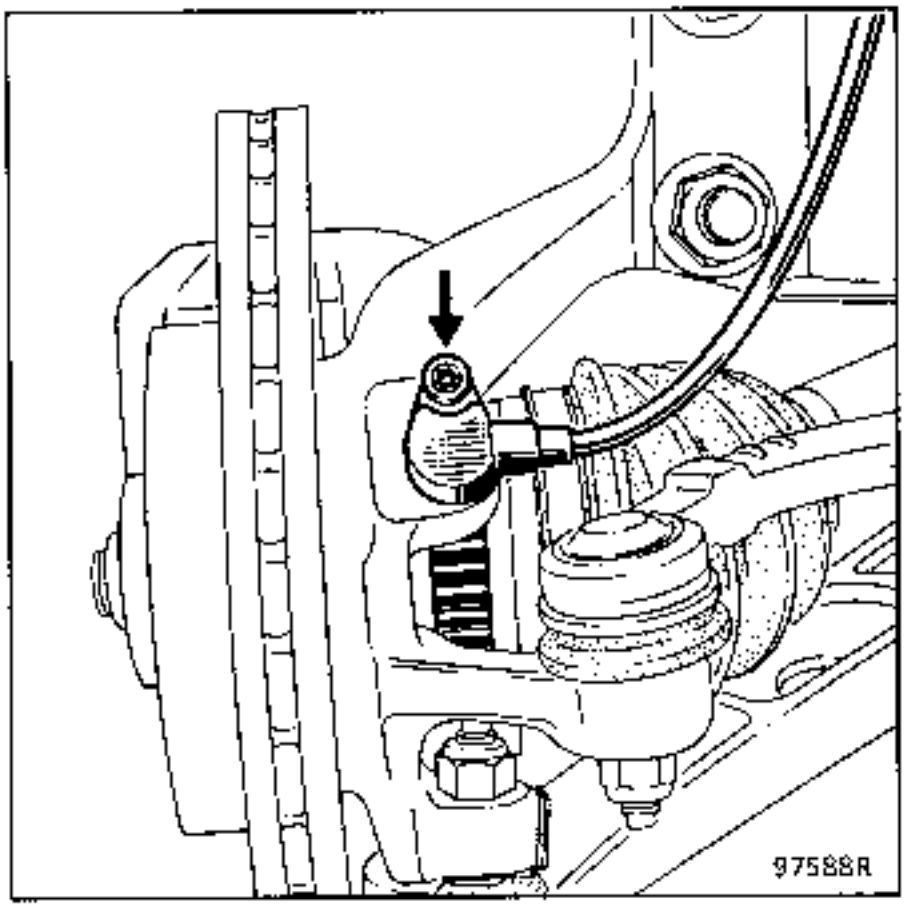
REMOVING - REFITTING THE MAIN COMPONENTS

1 - FRONT WHEEL SENSOR

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	10
Sensor mounting bolt	1

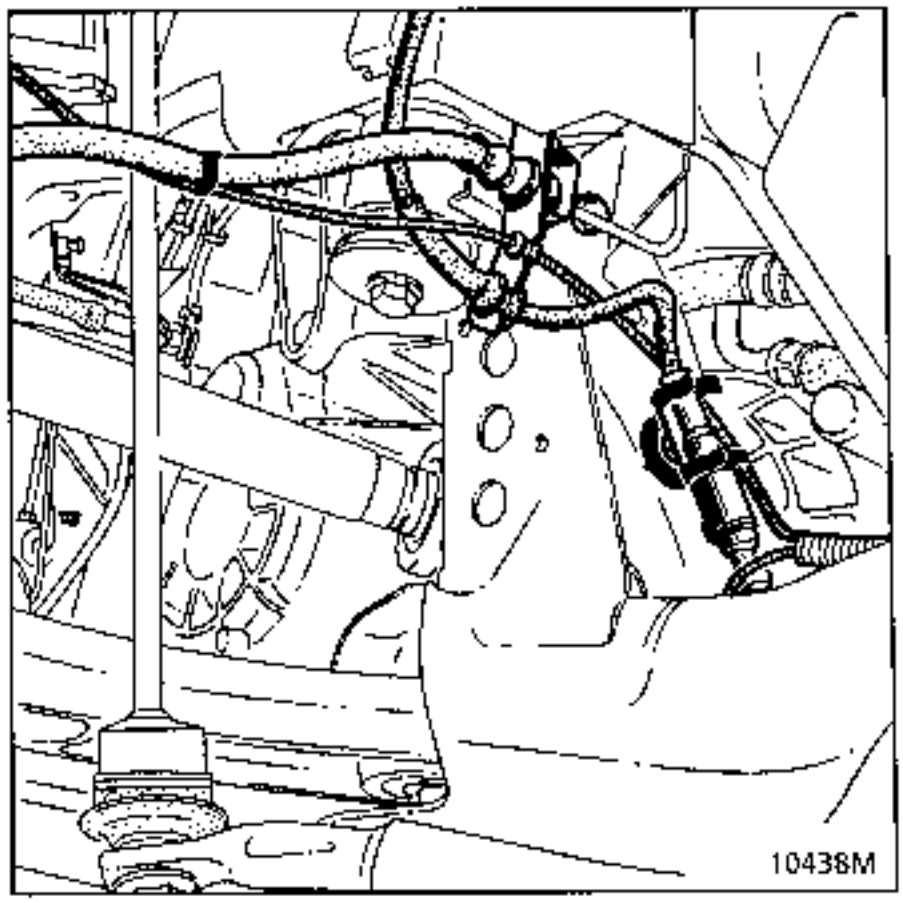
REMOVAL

Remove:
- the wheel,
- the sensor mounting bolt (Torx 30).



Release the wire from the mountings.

Disconnect the connector located next to the engine sub-frame front mounting.



Remove the sensor.

REFITTING THE SENSOR

Fit the sensor after coating it in **Multipurpose** grease, then clip the wire into its mountings and reconnect the sensor.

Check the recommended gap over 1 rotation of the target using a set of shims (non-adjustable).

NOTE : to eliminate the risk of faults, it is essential to ensure the connector is correctly connected.

2 - REAR WHEEL SENSOR

TIGHTENING TORQUES (in daN.m)	▽
Wheel bolt	10
Stub axle nut	17
Stub axle mounting bolt	3
Sensor mounting bolt	1

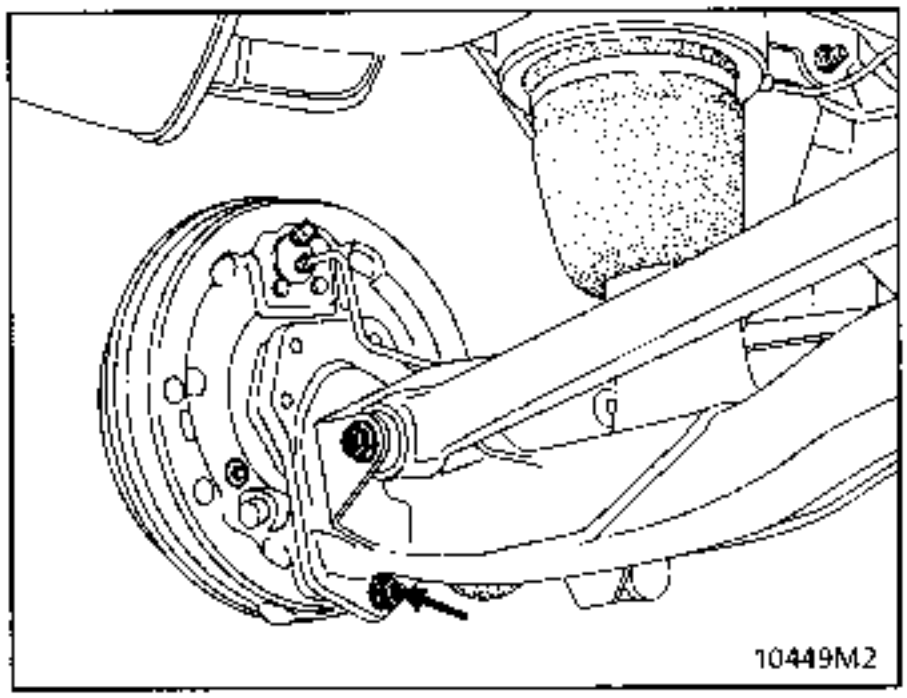
REMOVAL

Vehicle fitted with rear drum brakes:

Remove the hub - drum - nut assembly (see section concerned).

Disconnect the hydraulic union from the wheel cylinder.

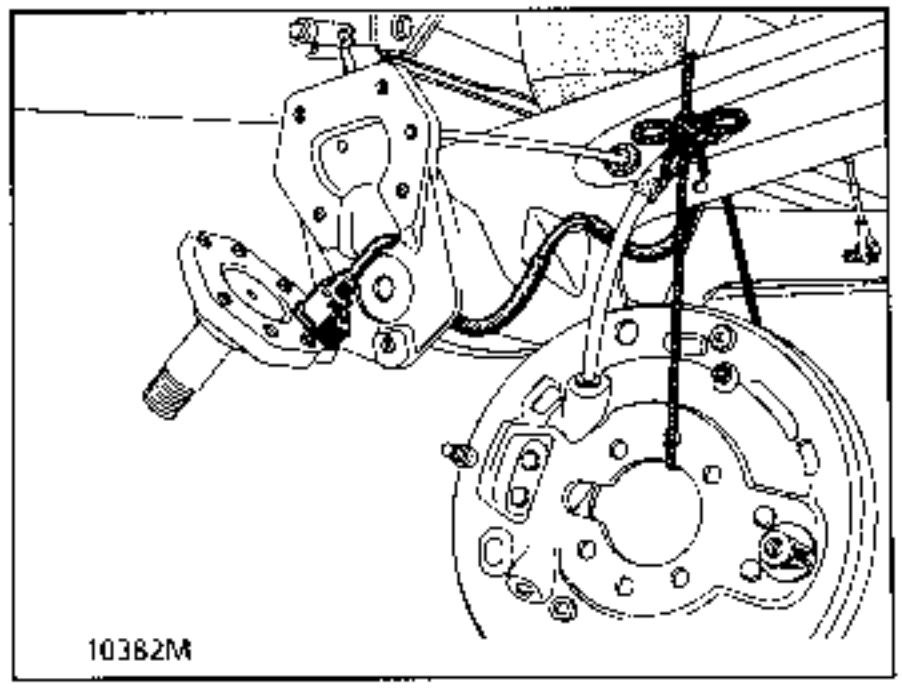
Remove:
- the backing plate tensioning nut.
  Mark its position for refitting.



- the six mounting bolts for the backing plate and stub axle.

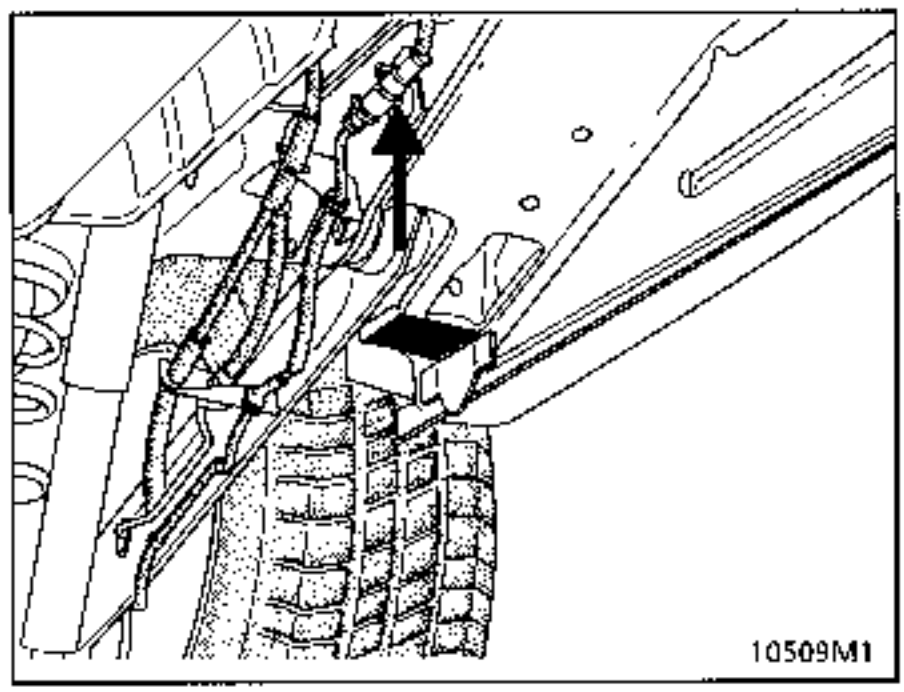
Attach the backing plate to the axle using string.

Remove the sensor bolt (Torx 30).



Release the wire from the mountings.

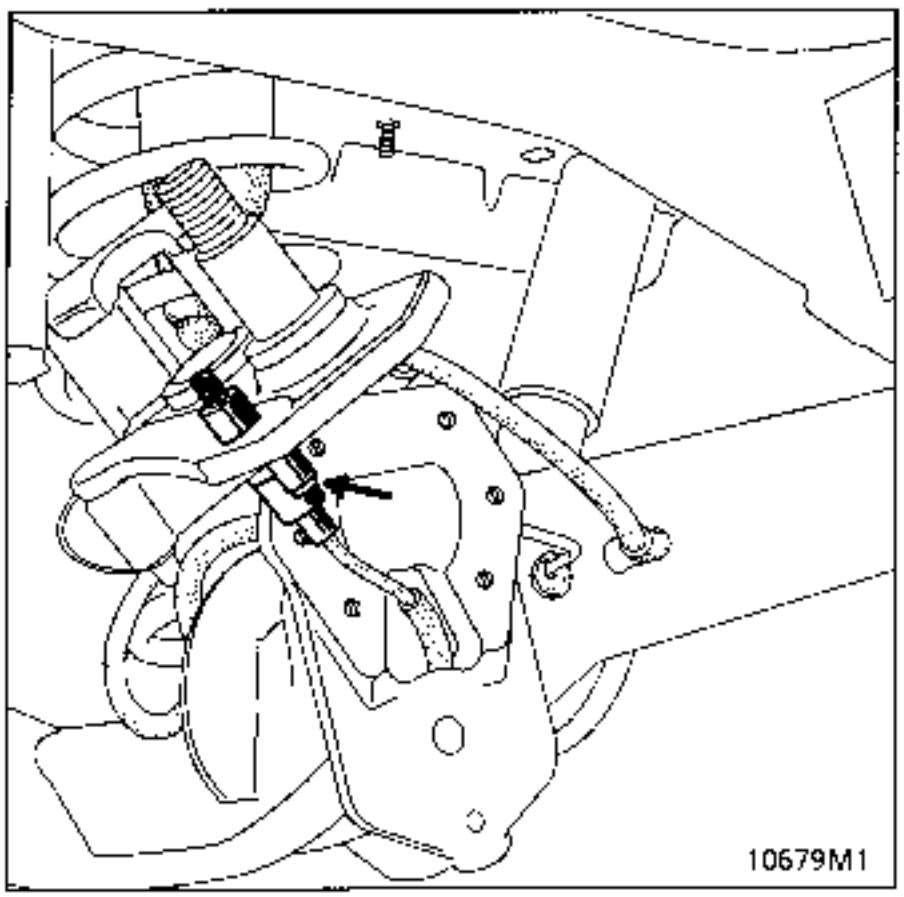
Disconnect the sensor from its connector located next to the suspension arm mounting.



Vehicle fitted with rear disc brakes (special notes):

Remove:

- the brake pads (see section concerned),
- the disc and the hub,
- the six mounting bolts on the stub axle,



- the sensor bolt (Torx 30).

Release the wire from the mountings.

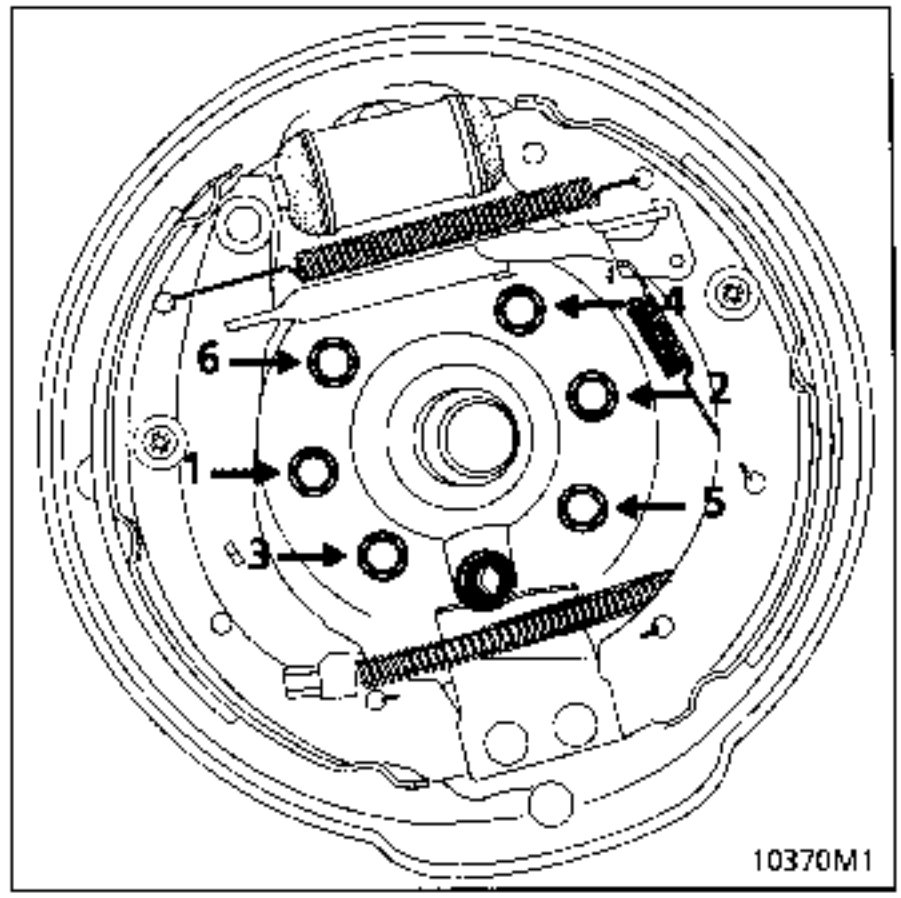
Disconnect the sensor from its connector located next to the suspension arm mounting.

REFITTING THE SENSOR

Fit the sensor after coating it in **Multipurpose** grease, then clip the wire into its mountings and reconnect the sensor.

If the stub axle mounting bolts are re-used, they must be coated with **Loctite FRENBLOC**.

Tighten the stub axle bolts in the order 1-2-3-4-5-6 to a torque of **3 daN.m**.



Check the recommended gap over 1 rotation of the target using a set of shims (non-adjustable).

Bleed the brake circuit (vehicle with drum brakes).

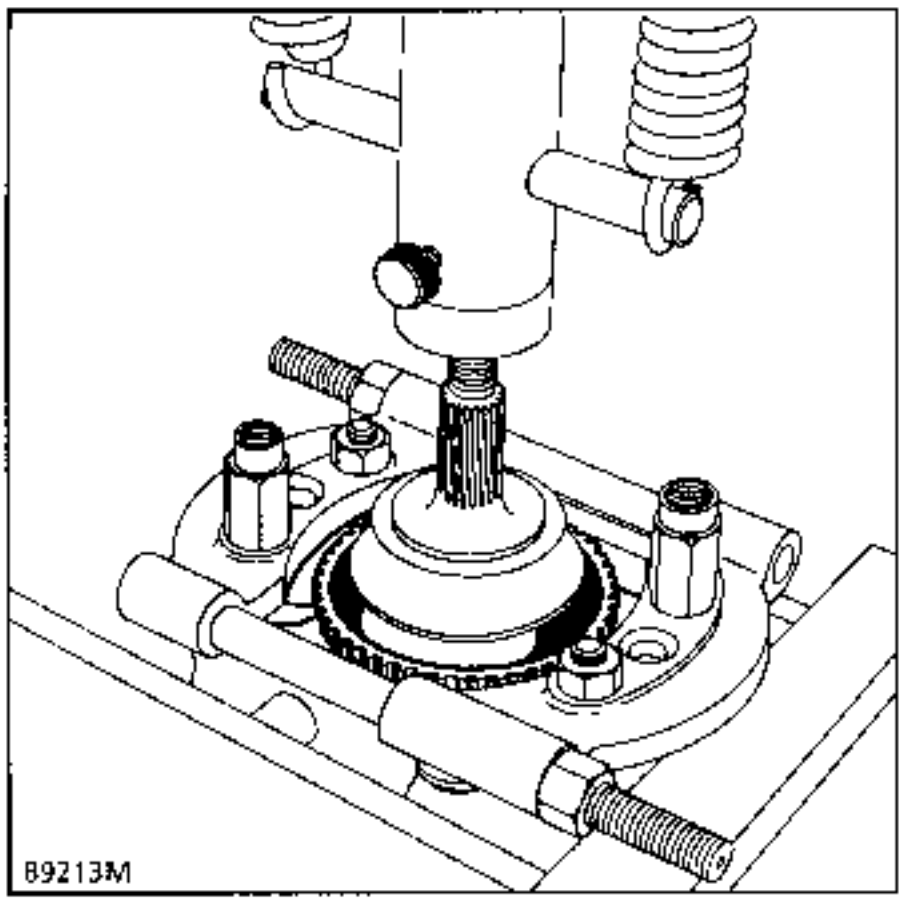
NOTE : to eliminate the risk of faults, it is essential to ensure the connector is correctly connected.

3 - FRONT WHEEL TARGET

SPECIAL TOOLING REQUIRED	
T.Av. 1239	Mandrel for fitting the ABS target

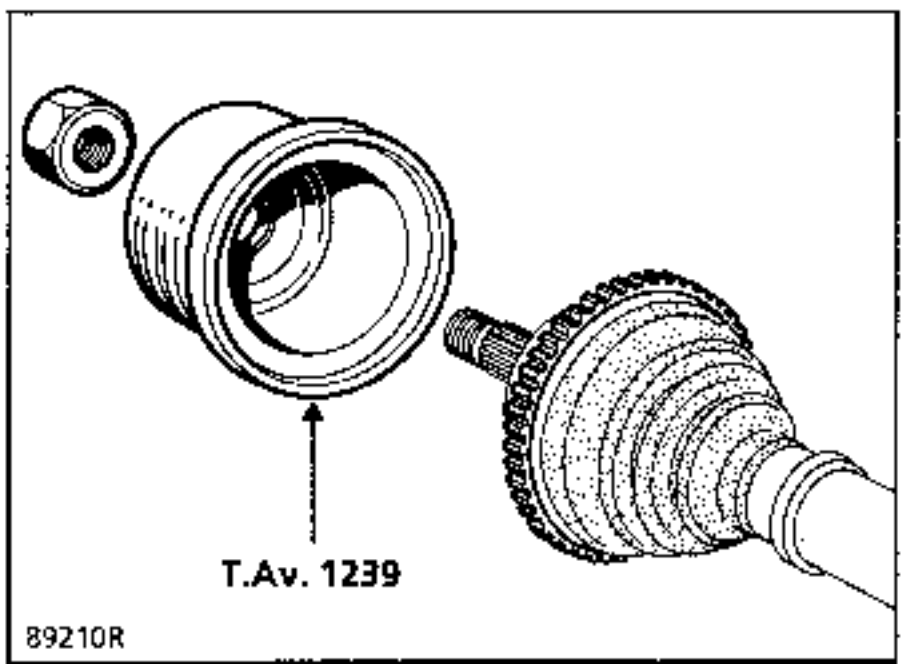
REMOVAL

Remove the target wheel using the press and an extraction tool.



REFITTING

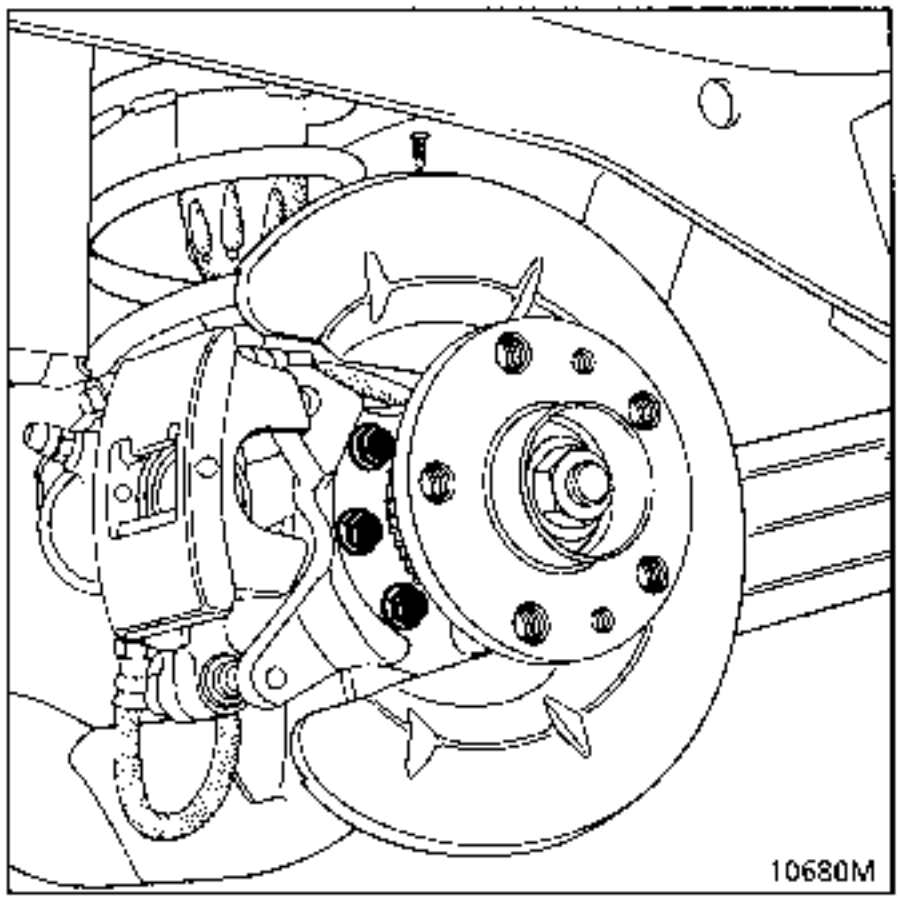
Coat the target with **Loctite SCELBLOC** and refit it using **tool T.Av. 1239** re-using the old driveshaft nut.



NOTE : the Parts Department supplies machined driveshafts which are not fitted with the ABS target. The old target must therefore be retained to fit to the new driveshaft. The target is available as a single part from the Parts Department however.

4 - REAR WHEEL TARGET

The target is embedded in the hub. It cannot be removed.



5 - COMPUTER - HYDRAULIC ASSEMBLY

The computer and the hydraulic assembly cannot be separated. if one of the parts is faulty, the complete assembly must be renewed.

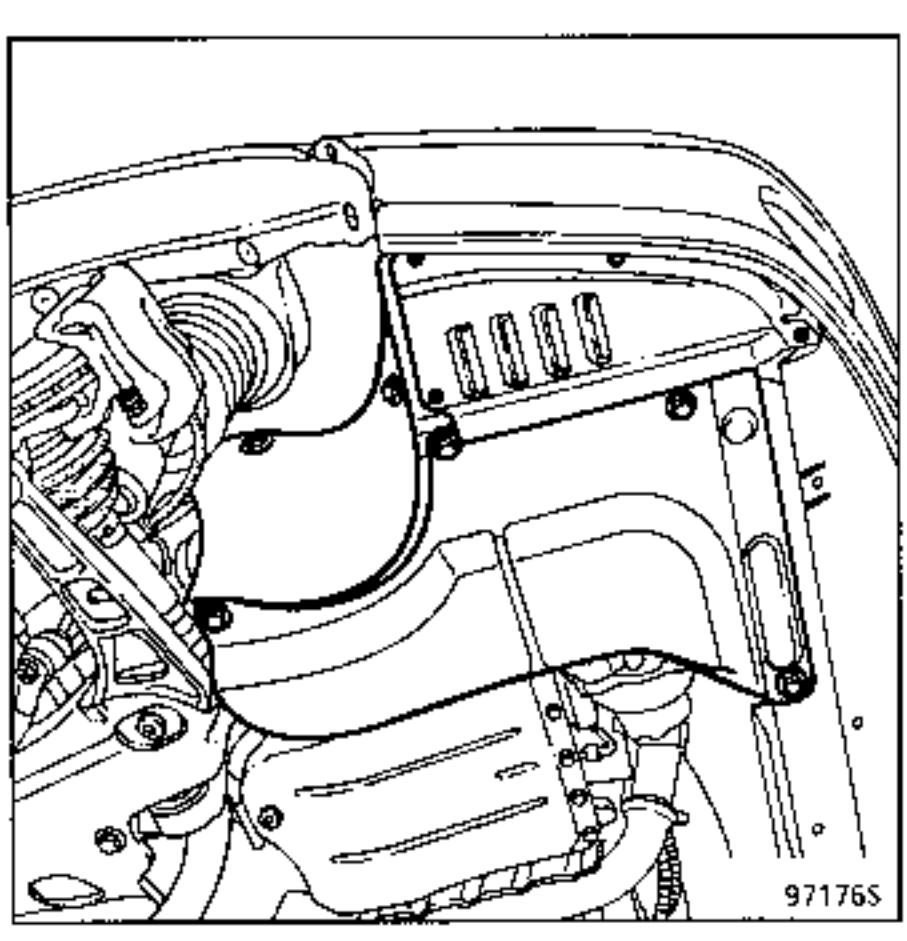
TIGHTENING TORQUES (in daN.m)		
Pipe unions	M10 × 100	1.7
	M12 × 100	1.7

REMOVAL

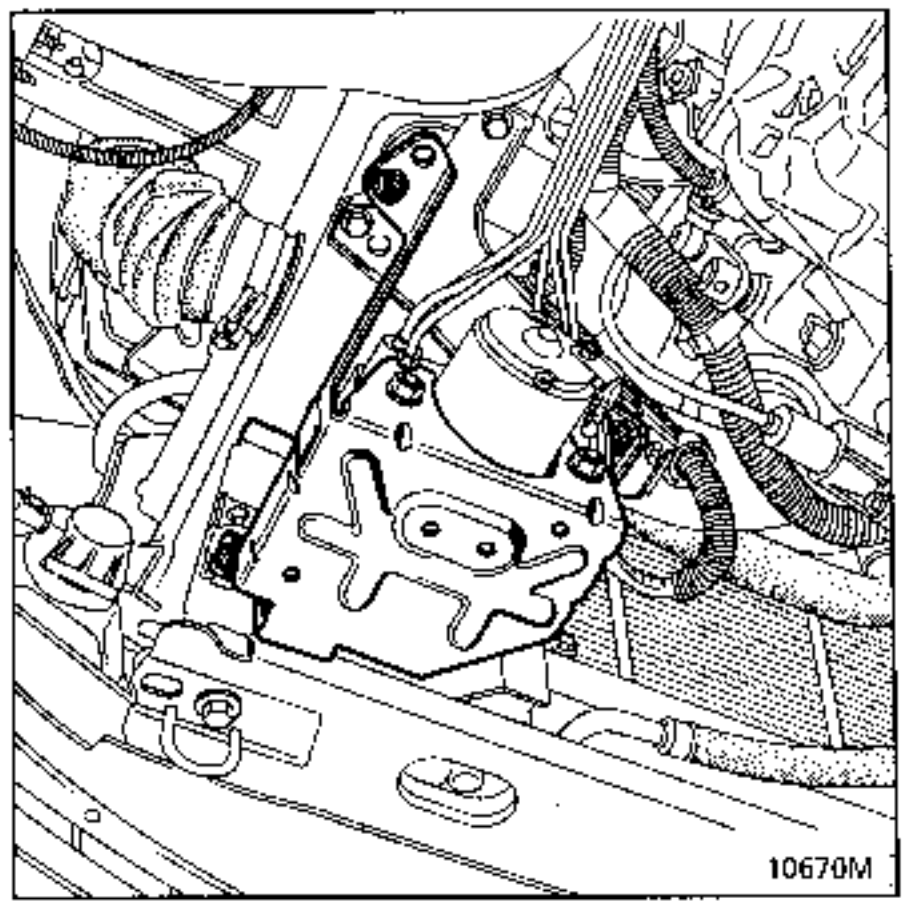
Fit a pedal press (limits the amount of fluid lost).

Disconnect the battery.

Remove:
- the plastic protectors,

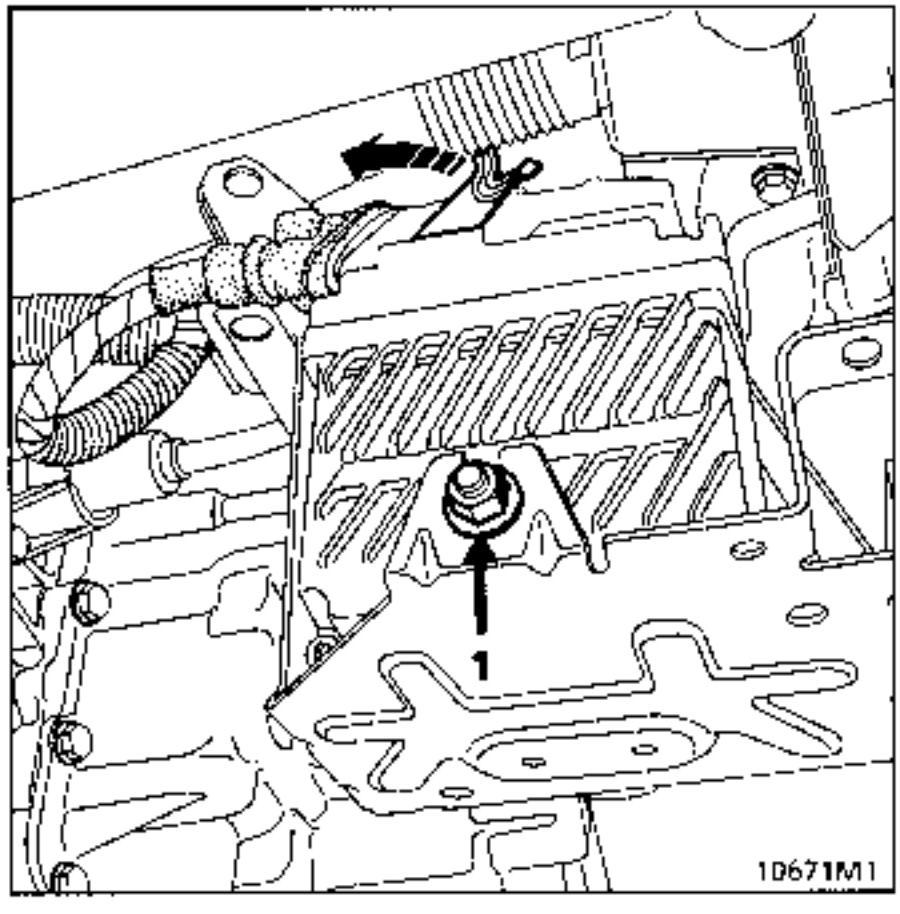


- bolt (1) then the rubber pad,
- the three ABS assembly mounting bolts.



Remove the mounting and attach the assembly with string to avoid leaving it hanging on the pipes.

Disconnect the 40 track connector.



Disconnect the brake pipes.
Use a ratchet pipe wrench.

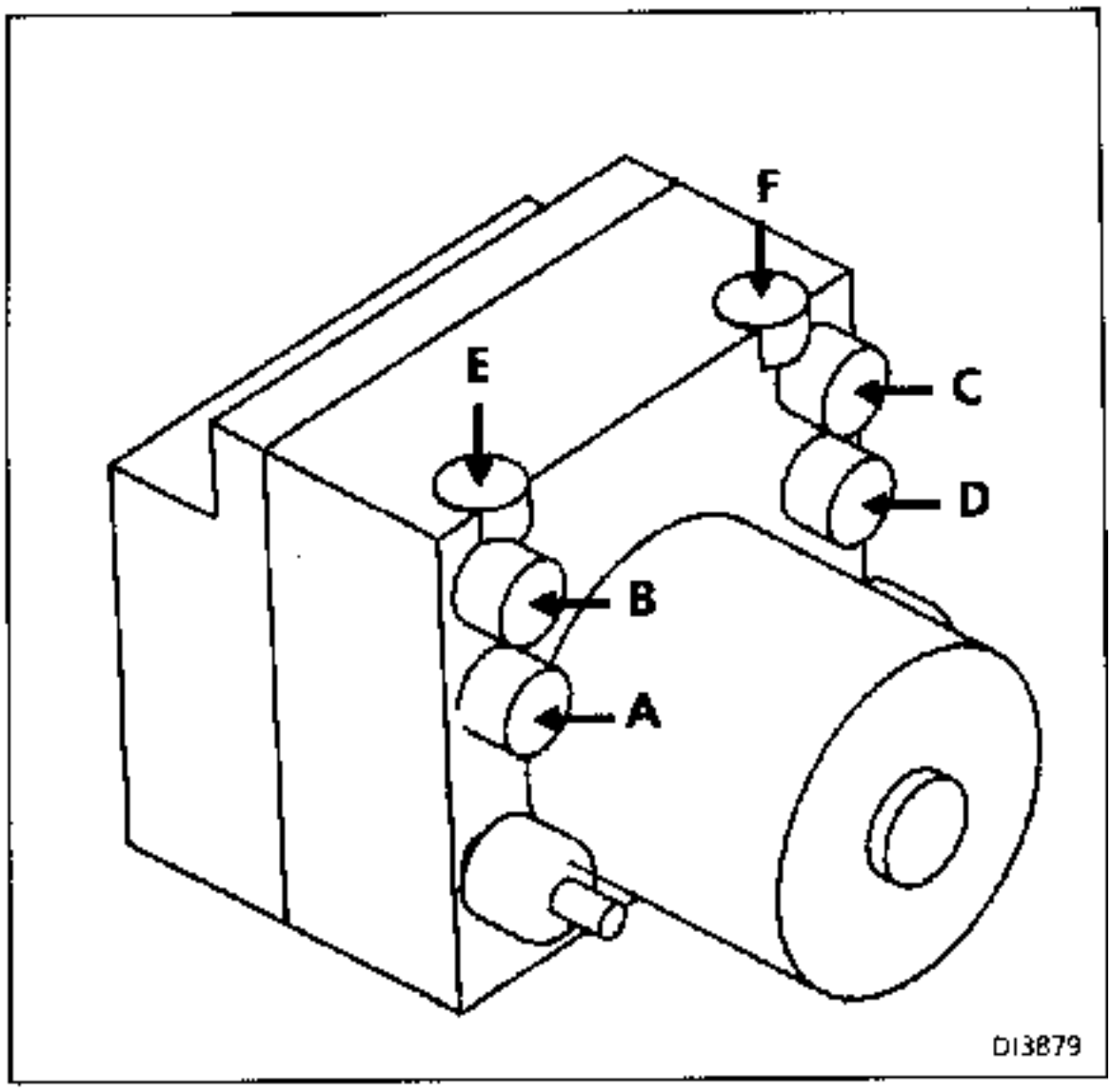
Plug the unions (prevents fluid loss).

Remove the computer and assembly.

REFITTING the computer and assembly.

Refitting is the reverse of removal.

Fit the ABS assembly taking care to ensure the pipes are correctly positioned.



A Front left hand outlet
B Rear right hand outlet
C Rear left hand outlet
D Front right hand outlet

E Primary inlet
F Secondary inlet

Bleed, following the order of operations - this is vital (see following pages).

Check the system using function G on the **XR25**.

After a road test (with ABS regulation), check the ABS function on the **XR25**.

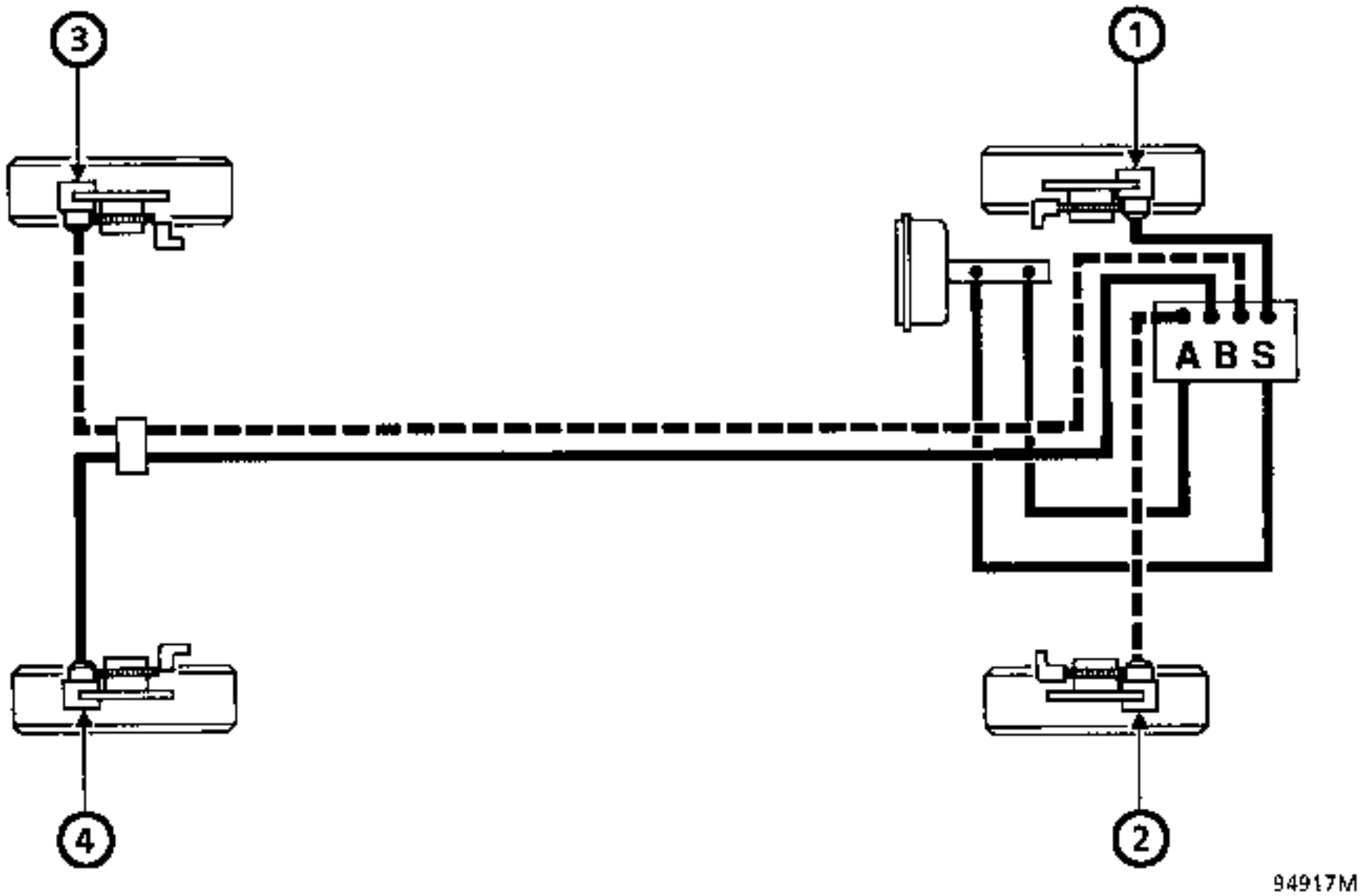
Validate the end of the test : G13*.

BLEEDING

IMPORTANT

The order of operations for bleeding the ABS hydraulic circuit **MUST** be observed:

1st	(1)	Rear right wheel caliper
2nd	(4)	Rear left wheel caliper
3rd	(2)	Front right wheel caliper
4th	(3)	Front left wheel caliper



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The ABS system must never be operated if it has not been bled. If the return pump takes in air it is extremely difficult, if not impossible, to bleed it.

For this reason, the hydraulic assembly supplied by the Parts Department is supplied ready filled with brake fluid.

We recommend that the system is bled under pressure using bleeding equipment, especially after removing the ABS hydraulic assembly and / or the master cylinder.

BLEEDING USING BLEEDING EQUIPMENT

Connect the bleeding equipment to the brake fluid reservoir and supply pressure (pressure 2 bars).

At each wheel

- Fit the pipe to the bleed screw.
- **Open the bleed screw and pump the pedal until the brake fluid runs out with no bubbles.**
- Close the bleed screw.

The order of operations specified below must be strictly observed.

The following order of bleeding operations must be observed:

a) master cylinder to rear right hand wheel,

b) master cylinder to rear left hand wheel,

c) master cylinder to front right hand wheel,

d) master cylinder to front left hand wheel.

Partial bleeding:
(after removing a caliper or wheel cylinder)
If a pedal press was fitted first, bleed the wheel concerned, following the same method.

BLEEDING WITHOUT BLEEDING EQUIPMENT

The order of operations is the same as before and should be observed.

At each wheel, bleed until the brake fluid runs out with no bubbles.

- Fit the pipe to the bleed screw.
- Press the brake pedal and hold it down.
- Open the bleed screw and let the fluid run out.
- Close the bleed screw.
- Release the brake pedal.
- Repeat the operations as many times as necessary.

During bleeding, ensure that the brake fluid level is always between the minimum and maximum marks on the reservoir.

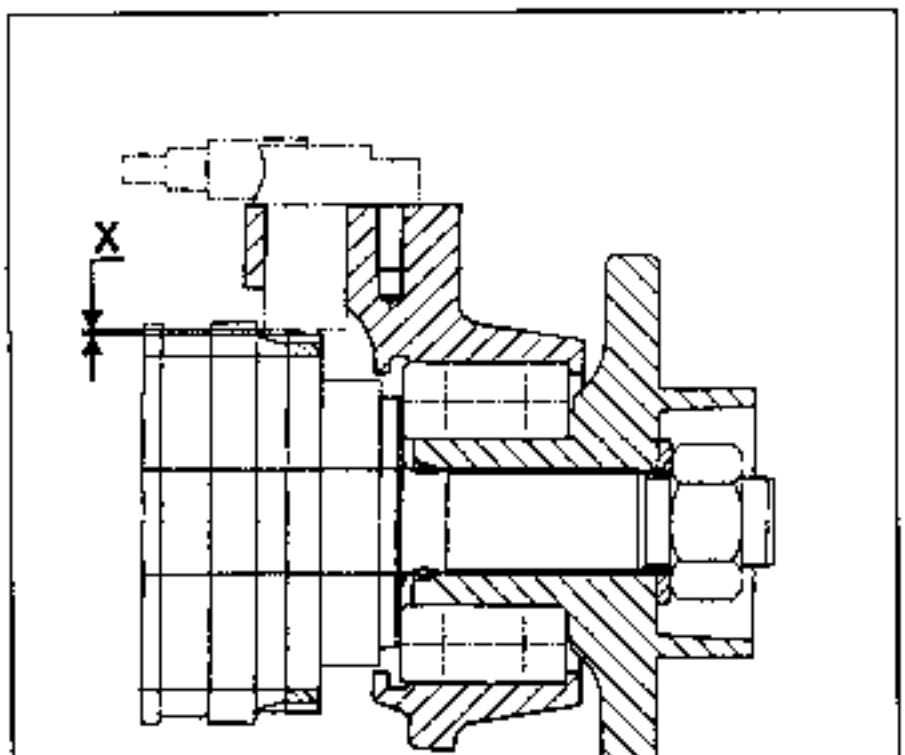
ADDITIONAL CHECKS

1 - TARGET / SENSOR GAP

Position the target so that the tip of one tooth is parallel with the sensor.

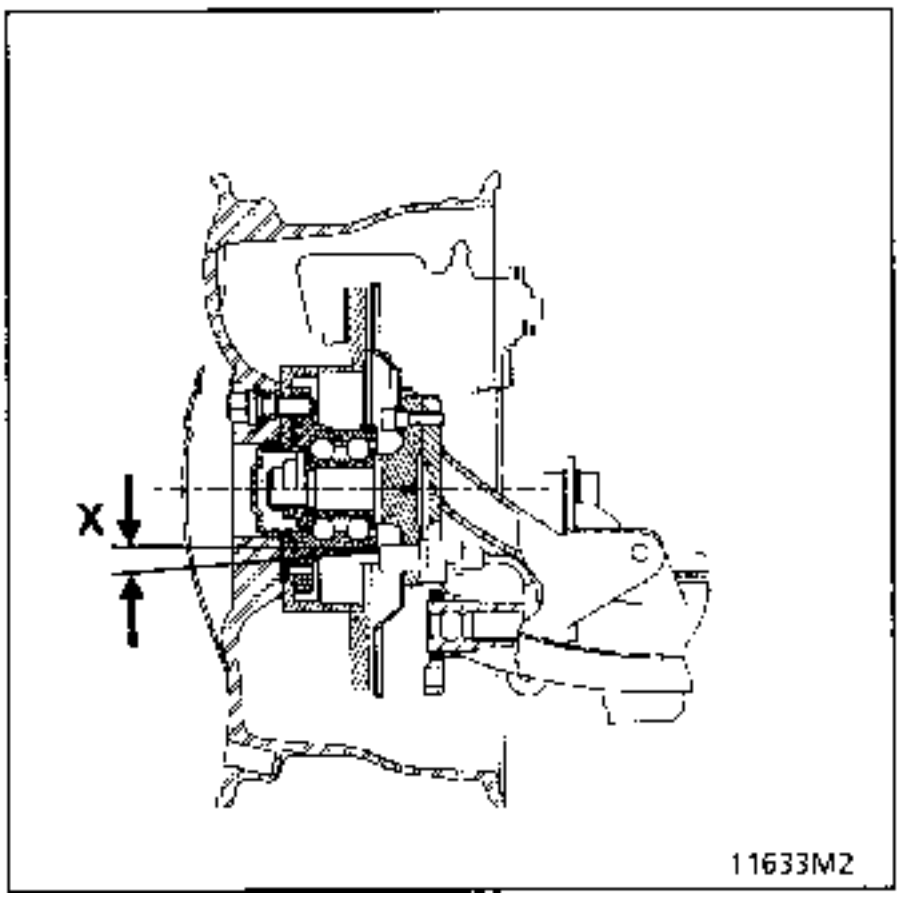
Front sensor:

X = 0.8 mm ± 0.6



Rear sensor:

X = 0.8 mm ± 0.5



2 - SENSOR RESISTANCE

front	:	1.1 kΩ
rear	:	1.6 kΩ

3 - CHECKING WHEEL SENSOR CONNECTORS

If the ABS warning light illuminates intermittently, check the wheel sensor connectors first; clean them using **NETELEC** Part Number **77 11 171 284**.