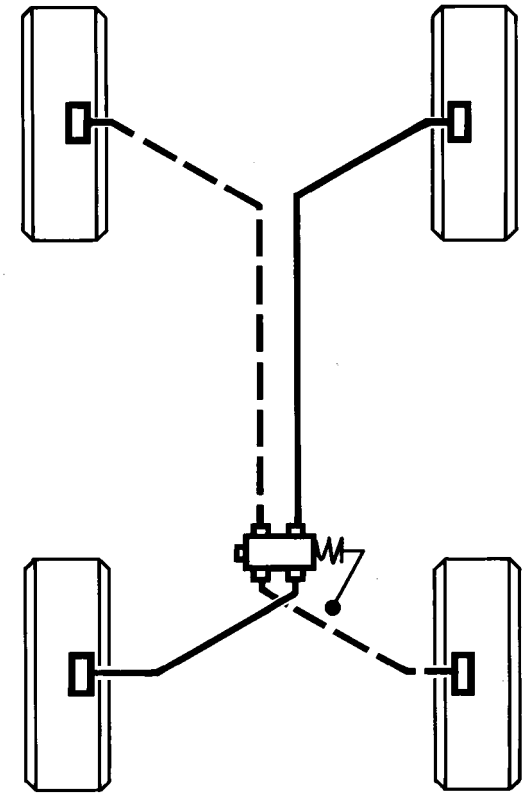
NOTE:
the diagram below shows the general principle; in no case should it be taken as reference for the circuit connections and allocations. When replacing one of the components of the brake circuit on a vehicle, always mark the pipes before removing them so that they can be connected back in their original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

"X" TYPE BRAKING

WITH load sensitive compensator



91563S

The connection of the pipes between the master cylinder, callipers, compensator, and hydraulic assembly is made by means of threaded unions with metric thread.

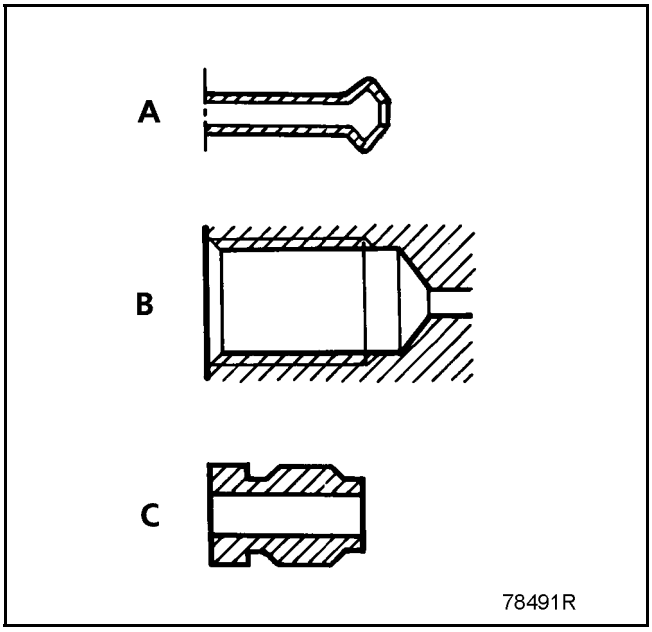
Consequently, only parts listed in the Parts Catalogue for this vehicle should be used.

Identification of parts:

– SHAPE of the steel or copper PIPE end piece (A),

– SHAPE of THREADED CASINGS on components (B),

– pipe UNIONS coloured GREEN or BLACK: external hexagon measuring **11 mm** or **12 mm** (C).



Brake fluid

BRAKE FLUID REPLACEMENT INTERVAL

Braking technology, in particular for disc brakes (hollow pistons which transfer little heat, low volume of fluid in the cylinder, sliding callipers 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 **Servicing booklet**).

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 essential to keep to brake fluids which have been checked and approved by our laboratories and which conform to Standard **SAE J 1703 dot 4**.

For optimized use of vehicles equipped with an Electronic Stability Program, Nissan recommends a brake fluid with low viscosity in cold conditions (maximum **750 mm^2/s at - 40°C**).

LUCAS FRONT BRAKES (mm)		
Slave cylinder diameter		40-45
Disc diameter		305
Disc thickness		28
Minimum disc thickness		24
Maximum run-out of discs		0.07
Brake pad thickness (including mounting)		18
Minimum thickness of brake pads (including mounting)		9
LUCAS REAR BRAKES (mm)		
Diameter of brake cylinders		41
Disc diameter		280
Disc thickness		12
Minimum disc thickness		10
Maximum run-out of discs		0.07
Brake pad thickness (including mounting)		17
Minimum thickness of brake pads (including mounting)		9
MASTER CYLINDER (mm)		
X stroke diameter	Left-hand drive	25.4 x 36
	Right-hand drive	20.6 x 52
	Electronic Stability Program	20.6 x 52

SPECIAL TOOLING REQUIRED
Brake circuit bleeding device

On vehicles fitted with a brake servo, it is important that the servo system is not actuated while the system is being bled, regardless of which method is being used to bleed the system.

The bleeding is done on a four-post lift, wheels on the ground.

Connect the bleeding device to the brake circuit bleed valves.

Start the bleeding device in accordance with its instruction manual.

Adjust the output pressure to **2 Bar**.

This vehicle is fitted with an X-type braking circuit, so proceed as follows:

Open:
- the bleed screw of the **rear right-hand wheel** and let the fluid flow out for around **20 seconds,**
- the bleed screw of the **front left-hand wheel** and let the fluid flow out for around **20 seconds.**

Ignore the air bubbles in the pipes of the bleeding device.

Open:
- the bleed screw of the **rear left-hand wheel** and let the fluid flow out for around **20 seconds,**
- the bleed screw of the **front right-hand wheel** and let the fluid flow out for around **20 seconds,**

Check the firmness of the brake pedal when depressed (press several times).

Repeat the bleeding operation if necessary.

Top up the brake fluid level in the reservoir having disconnected the bleeding device.

Check the tightness of the bleed screws and that the sealing caps are all present.

The effectiveness and balance of the vehicle braking system may be checked on a suitable brake test bench.

(Refer to Section 38 for information on bleeding a braking circuit equipped with an Anti-lock Braking System).

Rod diameter (mm)	Marking colour
22	none

BRAKE

CONTROL	
Servo mounting nuts	2.1
Master cylinder mounting nuts	2.5
Master cylinder outlet pipes	1.4
Compensator mounting bolt	1.8
Compensator inlet pipes	1.4
Compensator outlet pipes	1.4
Hydraulic assembly mounting bolt	0.9
Hydraulic assembly inlet pipes	1.4
Hydraulic assembly outlet pipes	1.4

FRONT	
Brake bleed screw,	0.9 to 1.1
Calliper inlet pipes	1.4
Brake calliper guide bolts	10.5
Calliper mounting bolt	3.5

REAR	
Brake bleed screw	0.9 to 1.1
Calliper inlet pipes	1.4
Brake calliper guide bolts	18.0
Calliper mounting bolt	3.3
Protective flange bolt	0.8

AXLE ASSEMBLY

FRONT	
Lower wishbone nut on sub-frame	10.5
Sub-frame rear mounting bolt on the shell	12
Sub-frame front mounting bolt on the angle frame	10.5
Angle frame mounting bolt on the shell	6.2
Lower wishbone bolt on sub-frame	18.0
Anti-roll bar bearing nuts	2.1
Lower ball joint nuts	10.5
Wheel bolt	14.2
Shock absorber base mounting bolt	18.0
Driveshaft nut	28.0
Shock absorber rod upper mounting bolts	6.2
Shock absorber linkage mounting bolts	4.4

REAR	
Shock absorber upper mounting bolt	18
Shock absorber lower mounting bolt	18
Fork mounting bolt on the shell	10.5
Fork mounting bolt on the axle	10.5
Wheel bolt	14.2
Hub mounting bolt	10.5
Hub nuts	28.0

STEERING

STEERING COLUMN	
Steering wheel mounting bolt	4.4
Steering column upper mounting bolt	2.1

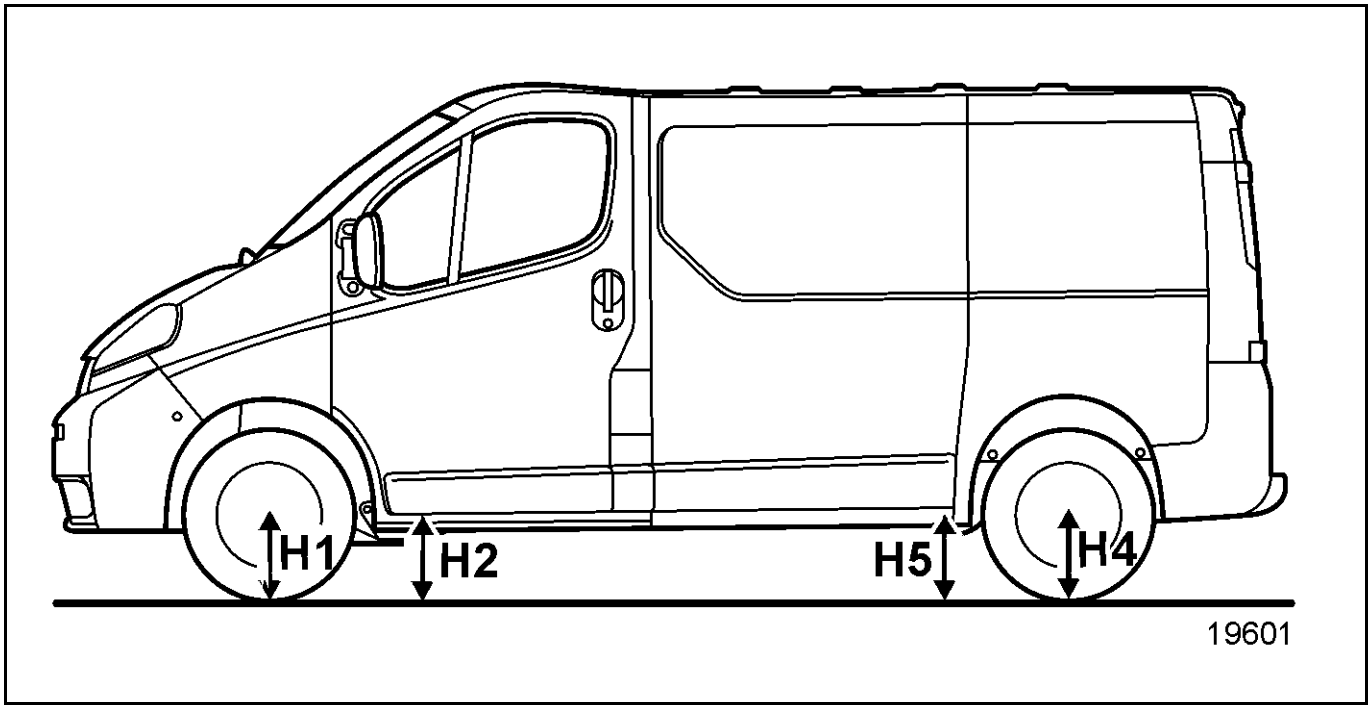
STEERING RACK	
Steering rack mounting bolt	18.0
Fork connection mounting bolt	2.1
Steering ball joint nuts	3.7

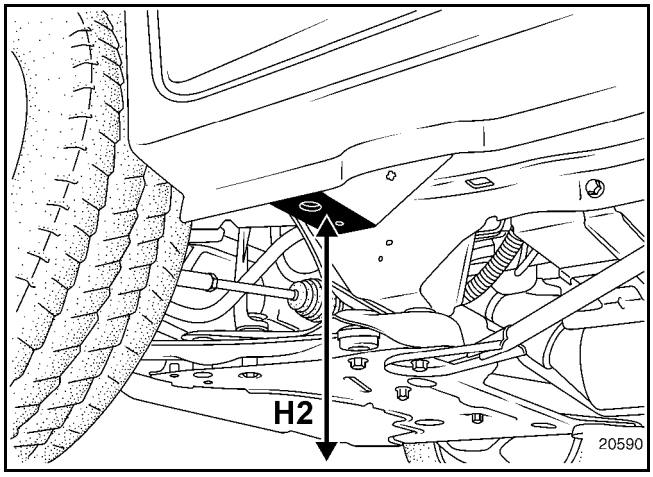
VEHICLE	At the front H1 - H2 =... mm	At the rear H4 - H5 =... mm	Dimension X (in mm) Left and right
FL0X	49	14	-
JL0X	52	30	-

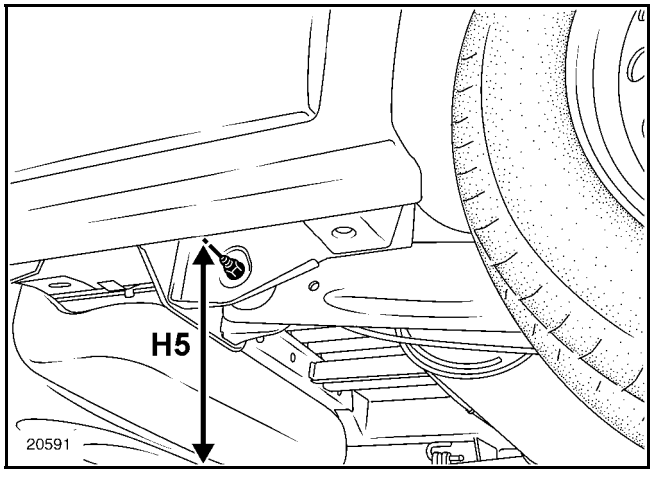
Tolerance: ± **7.5 mm**

The difference between the right-hand side and the left-hand side of the same axle of a vehicle must not exceed **5 mm,** the driver's side always being higher.
Any alteration to the underbody height also requires adjustment of the brake compensator and of the headlights.

MEASUREMENT POINTS







Measurements **H1** and **H4** are taken on the wheel shaft.
Measurement **H2** is taken under the jacking point.
Measurement **H5** is taken at the rear axle mounting shaft.

The influence of different geometry on tracking and vehicle tyre wear.

CAMBER

The comparison between the left and right-hand geometry is vital. A difference greater than one degree between the two sides will cause the direction to be offset, making steering wheel corrections necessary and causing excessive tyre wear.

The value of this geometry is usually small: in the region of **1**°.

CASTOR

The comparison between the left and right-hand geometry is essential. A difference greater than one degree between the two sides will cause the direction to be offset, making steering wheel corrections necessary and causing excessive tyre wear.

This is characterised by drifting with the speed being stabilised on the side where the angle is smallest.

STEERING HEIGHT

This travel affects the wheel alignment variation during suspension travel.

Variations in alignment between the right hand and left hand wheels will lead to the following (with the steering wheel remaining in the same position):

– drift to one side under acceleration,
– drift to the other side under braking,
– track changes on uneven road surfaces.

WHEEL ALIGNMENT

This adjustment has little effect on the road holding.

Note:

– a **significant toe-out excess** leads to symmetrical wear on the inside of both tyres,

– a **significant toe-in excess** leads to symmetrical wear on the outside of both tyres.

PRELIMINARY CHECKS

Before checking the axle geometry, you must check the following points and remedy them if necessary:

– symmetry of the tyres on the same axle:
  - dimensions,
  - pressures,
  - degree of wear.

– joints:
  - condition of cushions and elastic bearings,
  - ball joint gaps,
  - bearing gaps.

– run-out of wheels: must not exceed **1.2 mm** (it will be compensated for by the measuring equipment).

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

DETERMINING THE STEERING CENTRE POINT

The steering centre point must be set before checking and adjusting the front axle in order to avoid drifting problems.

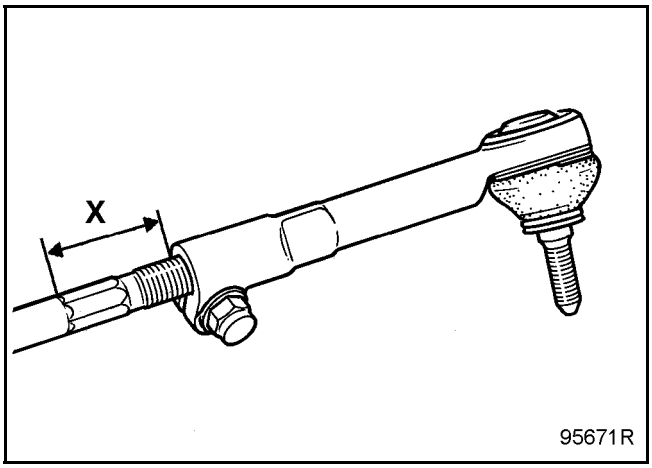
- Remove the ignition switch key.

- Straighten the wheels.

- Lock the steering: the centre point position is obtained.

Fit the measuring equipment with the wheels in this position and make the checks.

When adjusting the wheel alignment, **be aware of the symmetry of the ball joint box X lengths** with the steering links.

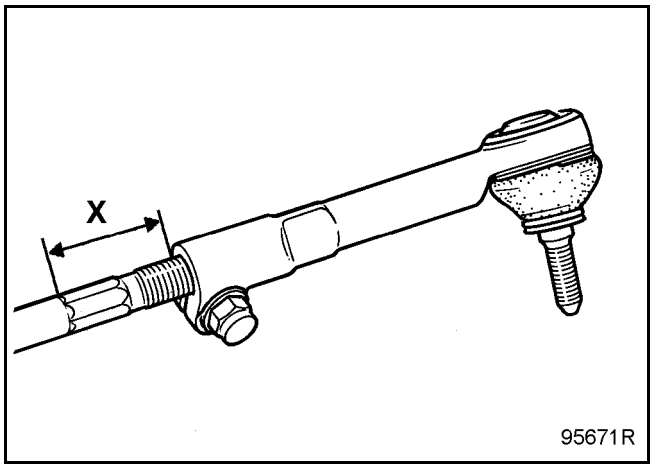


CHRONOLOGICAL SEQUENCE OF OPERATIONS

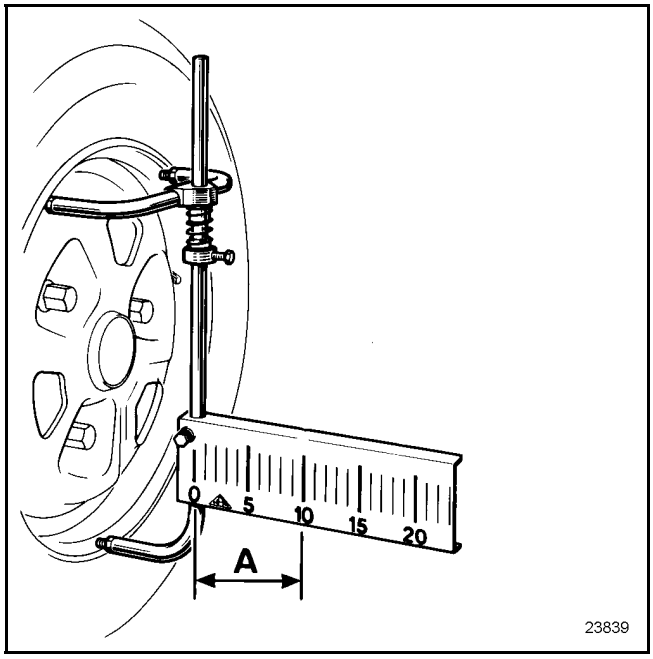
Due to the geometric arrangement of the front axles, a modification of one of the angles (castor, camber, pivot, alignment and variation) has repercussions to a greater or lesser extent on the values of the other angles. (The castor angle is the one which has the greatest effect).

It is therefore essential to work in the following order:

– fit the equipment on the vehicle according to the manufacturer's instructions,
– locate the steering centre point (see preceding paragraph) and lock the steering wheel,
– raise the vehicle underbody,
– compensate for wheel rim run-out,
– place the vehicle on pivoting plates,
– fit the brake pedal press,
– adjust the suspension to bring the vehicle to its maximum height,
– **check that the X lengths on the ball joint units are symmetrical with the** steering links,



– plot the A values on the reading scale.



(1) Correct symmetry of X lengths:

– the dimension (A) must be evenly distributed.

(2) Incorrect symmetry of X lengths:

– plot the dimensions (A) on the right-hand and left-hand side, subtract them from one another and distribute the result with half on each side.

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

Adjust the steering links in order to balance the values (A) of both sides:
A = 13

– once in this position, set the pivoting plates to zero,

– and check the following in sequence:
- castor,
- pivot,
- camber,
- wheel alignment.

ADJUSTING THE WHEEL ALIGNMENT

There are several situations that can arise:

	Alignment	Distribution	Correction to be made
(1)	OK	NOT OK	Make the same number of turns with the adjuster (or sockets) but in the opposite direction on the left and right to get the same value (A) on both sides.
(2)	NOT OK	OK	Set the alignment to the same value on the right and left, ensuring that the values (A) are always identical on both sides.
(3)	NOT OK	NOT OK	Carry out an initial distribution in order to equalize values (A) on each side, then adjust the alignment as shown in example **no.** (2)

Front axle fault finding

Faults	Possible causes
Incorrect castor	– Bent arm – Bent side member or axle sub-frame
Correct camber + pivot but Incorrect camber Incorrect pivot	– Bent arm – Bent side member or axle sub-frame
Correct camber but Incorrect pivot	– Stub-axle carrier twisted
Correct pivot but Incorrect camber	– Stub-axle carrier twisted
Alignment variation faults	– See castor Bent arm Bent side member
Incorrect alignment more than **6 mm**	– Right or left stub-axle carrier twisted

This fault finding procedure covers all types of circuit and braking components for the current range of vehicle not fitted with the **Anti-lock Braking System**.

For vehicles fitted with the **Anti-lock Braking System,** refer to **Section 38**.

Only those components belonging to the vehicles which are covered in this **Workshop Repair Manual** should be included in the fault finding procedure.

This fault finding procedure is produced in two separate parts, making it easier to find the relevant section.

I Symptom noted at the pedal
II Symptom noted in driving behaviour

I SYMPTOM NOTED AT THE PEDAL

Faults	Possible causes
Stiff pedal: substantial force produces poor deceleration	– **Servo-assistance failure** – **Brake shoes may be:** – dirty, – glazed, incorrect type – which heat up under prolonged braking with the pedal constantly depressed (descending a mountain), not in good order – **Piston seized** – **Crushed pipes**
Spongy pedal: **NOTE:** The level of assistance on current vehicles has been improved meaning that it gives the impression of a spongy pedal. In order to find out whether this has arisen as a result of a fault or normal use, two tests must be carried out. **1. Vehicle running** Subjective test: pedal travel / deceleration ratio **2. Vehicle stationary with the engine turned off** Additional test on pedal travel: press the brake pedal **5** times, to clear the brake servo, before taking account of the results of the test.	– **Presence of air in the circuit:** incorrect bleeding – **Internal leak in the brake circuit** – **Lack of fluid in the reservoir** (from the brake circuit leaking to the outside)

Spongy pedal Test to be performed on a stationary vehicle with the engine turned off **NOTE:** It is necessary to depress the brake pedal 5 times in order to clear the brake servo before taking account of the results of the test.	**– Incorrectly adjusted shoes** **Disc and drum brakes** Automatic adjustment: handbrake cable is too taut **NOTE:** Automatic compensation is operated via the brake pedal, if there is no abnormal tension in the handbrake cable when it is not in use. **– Significant asymmetrical wear of brake shoes** (convex or concave) **– Excessive clearance in the master cylinder** **– Fluid at boiling point or overheated.**
Pedal to the floor Test to be performed on a stationary vehicle with the engine turned off **NOTE:** It is necessary to depress the brake pedal 5 times in order to clear the brake servo before taking account of the results of the test.	**– Hydraulic leak** (check seal) **– Poor seal of the cup between two of the master cylinder circuits** **– Boiling fluid**

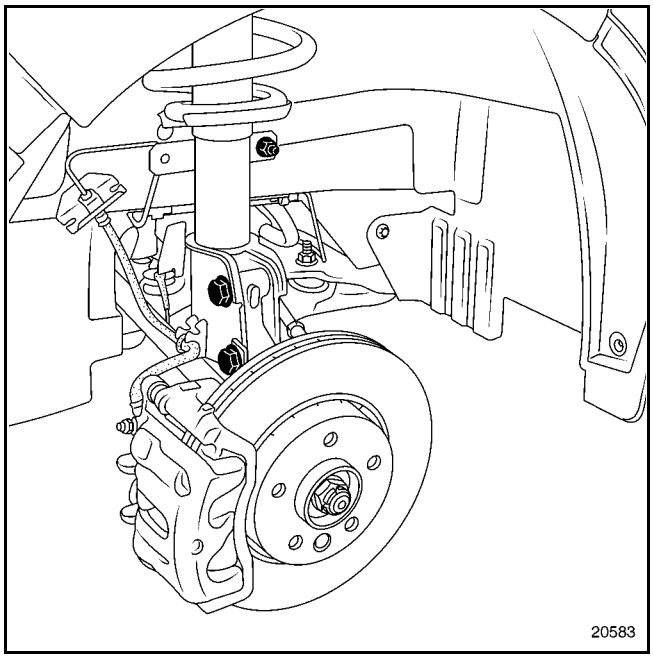
II SYMPTOM NOTED IN DRIVING BEHAVIOUR

Faults	Possible causes
Brakes engage	**– Lining needs grinding** **– Brake shoes are slightly dirty** **– Springs need to be changed**
Brakes judder	**– Drums out of round** **– Brake discs are too warped** **– Brake discs are not of even thickness** **– Abnormal deposit on the brake discs** (oxidization between the brake shoe and the brake disc)

Drifting on braking (front)	– Front axle **suspension**, check steering – **Piston seized*** – **Tyres** (wear - pressure) – **Crushed pipes*** ***IMPORTANT:** On vehicles with front axle with negative offset, pulling on one side affects the opposite circuit.
Braking offset (rear)	– **Compensator or brake limiter** (function control) – **Piston seized** – **Incorrectly adjusted shoes** Automatic adjustment: handbrake cable is too taut **NOTE:** Automatic compensation is operated via the brake pedal, if there is no abnormal tension in the handbrake cable when it is not in use – **Recall spring**
Brakes heat up	– **Insufficient master cylinder clearance, which does not allow the master cylinder to return to its rest position** – **Seized or slow piston** – **Crushed pipes** – **Seized handbrake control** – **Poor adjustment of the handbrake control**

SPECIAL TOOLING REQUIRED	
Fre. 823	Brake calliper piston return tool

TIGHTENING TORQUES (in daNm)	
Wheel bolt	14.2
Brake calliper mounting bolt (small column)	3.5



REMOVAL

Remove:
– the front wheels,
– the lower calliper mounting bolts.

Loosen the upper calliper mounting bolts.

Unclip the brake pipes.

Turn the callipers upwards.

Remove the pads.

Check:
– the condition of the brake pads (**if they need replacing, it is essential to change the pads on the opposite side as well**),
– the condition and fitting of the piston dust covers,
– the condition of the dust seals of the guides,
– the condition of the brake discs.

Clean the calliper mountings and callipers.

REFITTING

Reinsert the pistons in the callipers using tool **Fre. 823**.

Refit:
– the new brake pads,
– the callipers,
– the calliper mounting bolts,
– the brake pipes.

Tighten the calliper mounting bolts to the recommended torque.

Depress the brake pedal several times to bring the pistons into contact with the brake pads and discs.

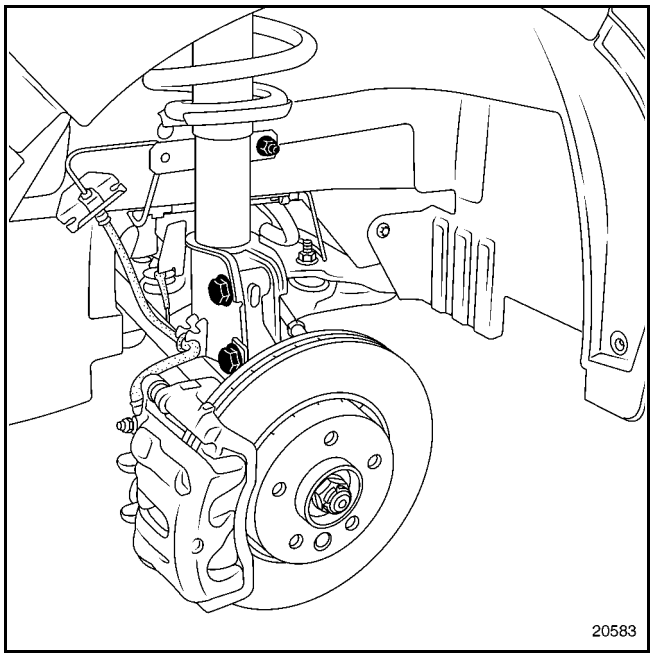
Check the brake fluid level.

Refit the wheels.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 823	Brake calliper piston return tool

TIGHTENING TORQUES (in daNm)	
Calliper brake pipe	1.4
Wheel bolt	14.2
Brake calliper mounting bolt (small column)	3.5



Depress the brake pedal using a pedal press (this has the effect of limiting the flow of brake fluid).

REMOVAL

Remove the front wheel.

Loosen the calliper brake pipe

Remove the calliper mounting bolts.

Disconnect the calliper and the brake pads.

Remove the calliper, turning it without twisting the hose.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to change the pads on the opposite side as well**),
– the condition and fitting of the piston dust covers,
– the condition of the dust seals of the guides,
– the condition of the brake discs.

Clean the calliper mounting and the calliper.

REFITTING

Reinsert the pistons in the callipers using tool **Fre. 823**.

Screw the calliper onto the hose without twisting the hose.

Refit:
– the brake pads,
– the calliper,
– the calliper mounting bolts,

Tighten to the recommended torque:
– the calliper mounting bolts,
– the hose.

Bleed the brake circuit (refer to the relevant procedure).

Depress the brake pedal several times to bring the pistons into contact with the brake pads and discs.

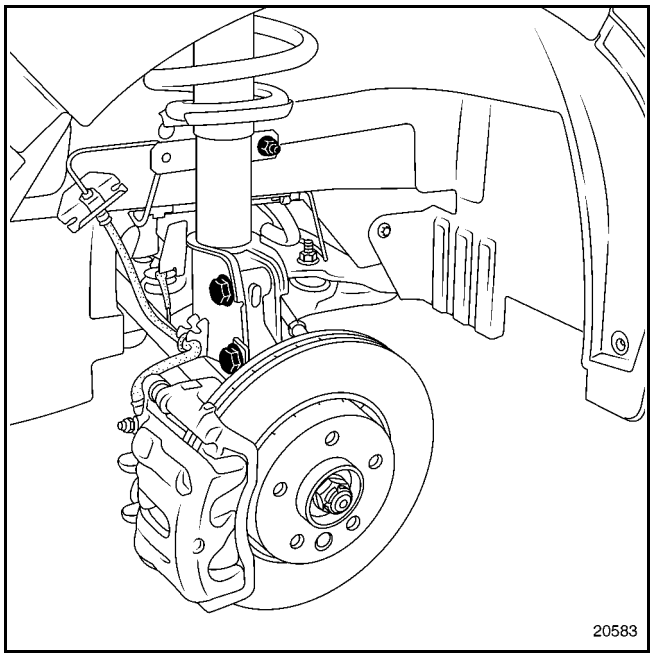
Check the brake fluid level.

Replace the front wheel.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 823	Brake calliper piston return tool

TIGHTENING TORQUES (in daNm)	
Wheel bolt	14.2
Brake calliper mounting bolt (small column)	3.5
Calliper mounting bolt	10.5



REMOVAL

Remove:
– the front wheel,
– the calliper mounting bolts,

Disconnect the calliper and the brake pads.

Suspend the calliper without bending the brake pipe.

Remove:
– the calliper mounting bolts,
– the calliper mounting.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to change the pads on the opposite side as well**),
– the condition and fitting of the piston dust covers,
– the condition of the dust seals of the guides,
– the condition of the brake discs.

Clean the calliper and the mounting.

REFITTING

Reinsert the pistons in the callipers using tool **Fre. 823**.

Refit:
– the calliper mounting,
– the brake calliper mounting bolts,
– the brake pads,
– the calliper,
– the calliper mounting bolts.

Tighten to the recommended torque:
– the brake calliper mounting bolts,
– the calliper bolts.

Depress the brake pedal several times to bring the pistons into contact with the brake pads and discs.

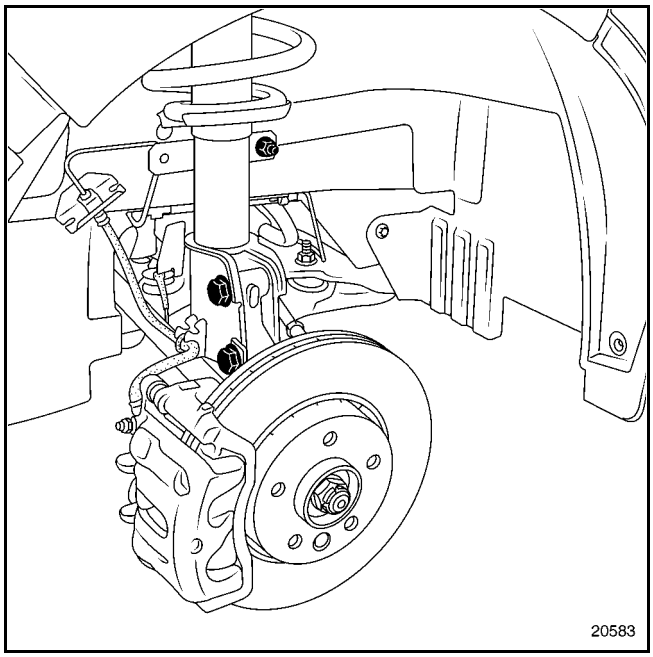
Check the brake fluid level.

Replace the front wheel.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre.823	Brake calliper piston return tool

TIGHTENING TORQUES (in daNm)	
Wheel bolt	14.2
Brake calliper mounting bolt (small column)	3.5
Brake calliper mounting bolt	10.5
Brake disc mounting bolt	2.1



REMOVAL

Remove:
– the front wheel,
– the calliper mounting bolts.

Disconnect the calliper and the brake pads.

Suspend the calliper without bending the brake pipe.

Remove:
– the calliper mounting bolts,
– the calliper mounting,
– the brake disc mounting bolt,
– the brake disc.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to change the pads on the opposite side as well**),
– the condition of the disc (**if it needs replacing, it is essential to change the disc on the opposite side as well, plus the pads**),
– the condition and fitting of the piston dust covers,
– the condition of the dust seals of the guides.

Clean the bearing surfaces of the brake disc, the calliper and the support.

REFITTING

Reinsert the piston in the callipers using tool **Fre. 823**.

Refit:
– the brake disc,
– the brake disc mounting bolt,
– the calliper mounting,
– the brake calliper mounting bolts,
– the brake pads,
– the calliper,
– the calliper mounting bolts.

Tighten to the recommended torque:
– the brake calliper mounting bolts,
– the calliper bolts.

Depress the brake pedal several times to bring the pistons into contact with the brake pads and discs.

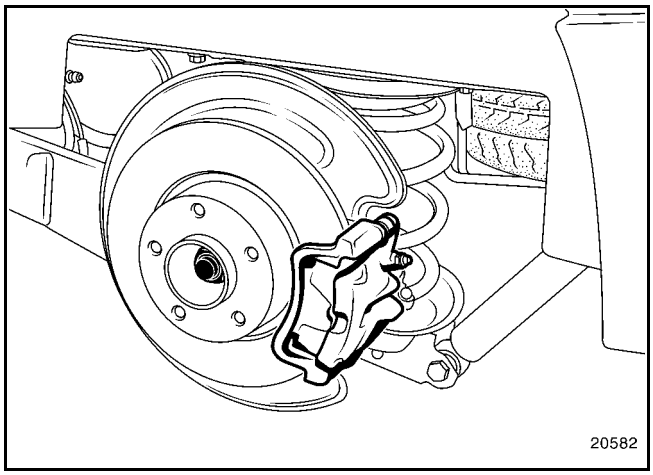
Check the brake fluid level.

Refit the front wheel.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 1190-01	Rear brake calliper piston return tool

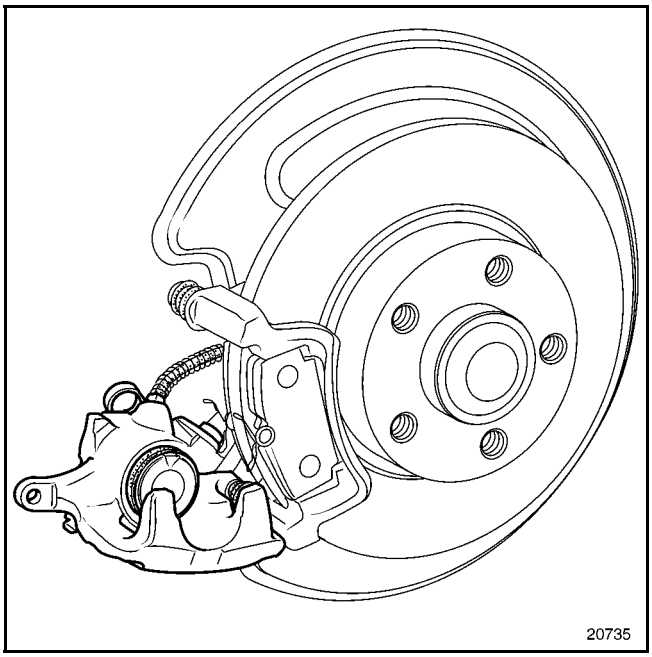
TIGHTENING TORQUES (in daNm)	
Wheel bolt	14.2
Brake calliper bolt	3.3



REMOVAL

Remove:
– the rear wheels,
– the upper calliper mounting bolts.

Unscrew the lower calliper mounting bolts.



Turn the callipers downwards.

Remove the brake pads from both sides of the vehicle.

Check:
– the condition and fitting of the piston dust covers,
– the condition of the guide dust covers,
– the brake discs.

Clean the calliper mountings and callipers.

REFITTING

Reinsert the pistons in the callipers using tool **Fre. 1190-01**.

Refit:
– the new brake pads,
– the callipers,
– the calliper mounting bolts,
– the brake hoses.

Tighten the calliper bolts to the recommended torque.

Depress the brake pedal several times so that the pistons make contact with the pads.
Check the brake fluid level.

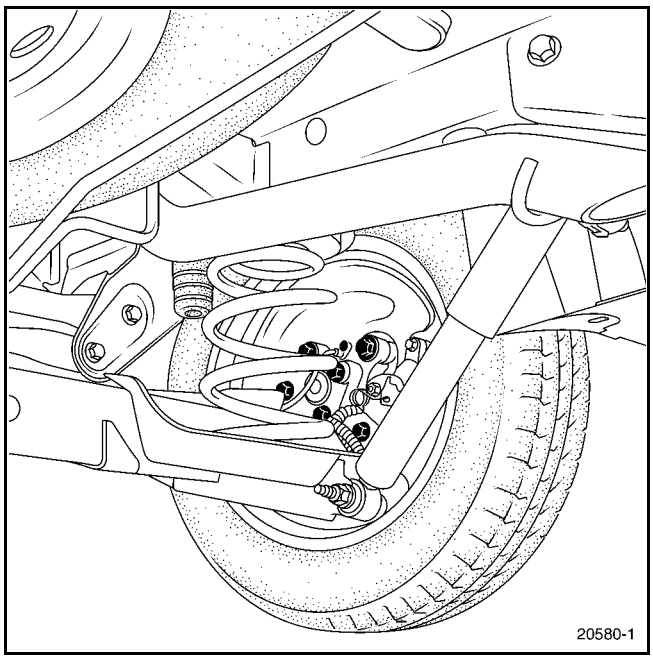
Refit the wheels.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 1190-01	**Rear brake calliper piston return tool**

TIGHTENING TORQUES (in daNm)	
Calliper brake pipe	**1.4**
Wheel bolt	**14.2**
Brake calliper bolt	**3.3**

Actuate the brake pedal using a pedal press (this has the effect of limiting the flow of brake fluid).



REMOVAL

Remove the rear wheel.

Separate the handbrake cable.

Loosen the brake pipe on the calliper side.

Unscrew the calliper mounting bolts.

Release the calliper and the brake pads.

Remove the calliper by turning it without twisting the hose.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to replace the pads on the opposite side as well**),
– the condition and fitting of the piston dust covers,
– the condition of the guide dust covers,
– the brake discs.

Clean the calliper mountings and callipers.

REFITTING

Reinsert the calliper pistons using tool **Fre. 1190-01**.

Screw the calliper onto the hose without twisting the hose.

Refit:
– the brake pads,
– the calliper,
– the calliper mounting bolts,
– the handbrake cable.

Tighten to the recommended torque:
– the calliper mounting bolts,
– the hose.

Bleed the brake circuit (refer to the relevant method).

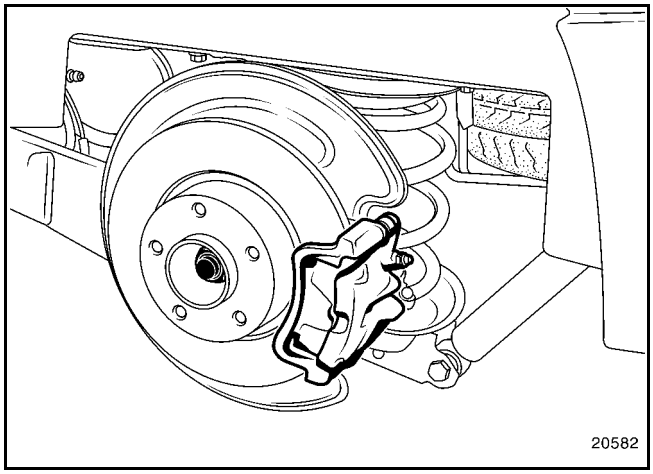
Check the travel of the handbrake control lever.

Refit the rear wheel.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 1190-01	**Rear brake calliper piston return tool**

TIGHTENING TORQUES (in daNm)	
Wheel bolt	**14.2**
Brake calliper bolt	**3.3**
Brake calliper mounting bolt	**18**



REMOVAL

Remove:
– the rear wheel,
– the calliper mounting bolts,

Disconnect the calliper and the brake shoes.

Suspend the calliper without bending the hose.

Remove the calliper mounting bolts.

Remove the calliper mounting.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to replace the pads on the opposite side as well**),
– the condition and fitting of the piston dust covers,
– the condition of the guide dust covers,
– the brake discs.

Clean the calliper mounting and the calliper.

REFITTING

Reinsert the calliper pistons using tool **Fre. 1190-01**.

Refit:
– the calliper support,
– the calliper support bolts,
– the brake shoes,
– the calliper,
– the calliper mounting bolts,

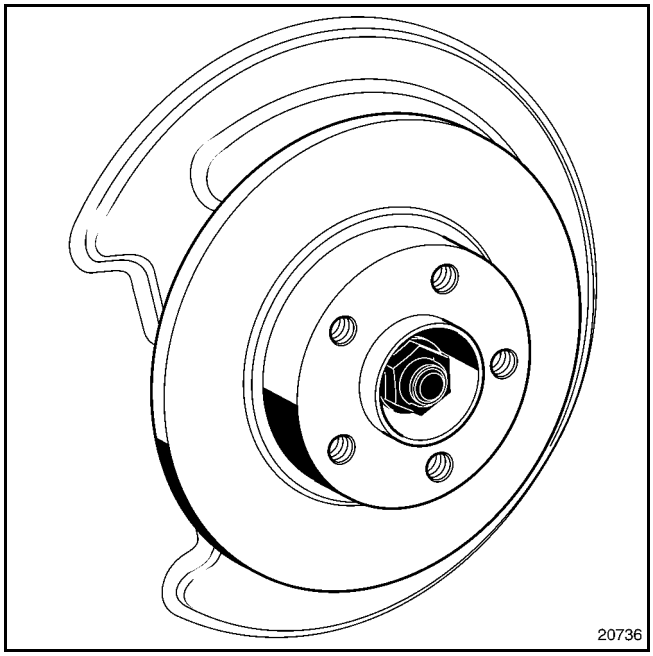
Tighten to the recommended torque:
– the calliper support bolts,
– the calliper support bolts,

Refit the rear wheel.

Tighten the wheel bolts to the recommended torque.

SPECIAL TOOLING REQUIRED	
Fre. 1190-01	Rear brake calliper piston return tool

TIGHTENING TORQUES (in daNm)	
Hub nut	28
Wheel bolt	14.2
Brake calliper bolt	3.3
Brake calliper mounting bolt	18



REMOVAL

Remove the calliper support (consult the relevant procedure).

Remove:
– the hub nut,
– the disc.

Check:
– the condition of the hose and replace it if necessary,
– the condition of the brake pads (**if they need replacing, it is essential to replace the pads on the opposite side as well**),
– the condition of the disc (**if it needs replacing, it is essential to replace the disc on the opposite side as well, plus the pads**),
– the condition and fitting of the piston dust covers,
– the condition of the guide dust covers.

Clean the bearing surfaces of the brake disc, the calliper and the support.

REFITTING

Reinsert the calliper pistons using tool **Fre. 1190-01**.

Refit:
– the disc,
– the calliper support,
– the calliper support bolts,
– the brake pads,
– the calliper,
– the calliper mounting bolts,

Tighten to the recommended torque:
– the hub nut,
– the calliper support bolts,
– the calliper support bolts,

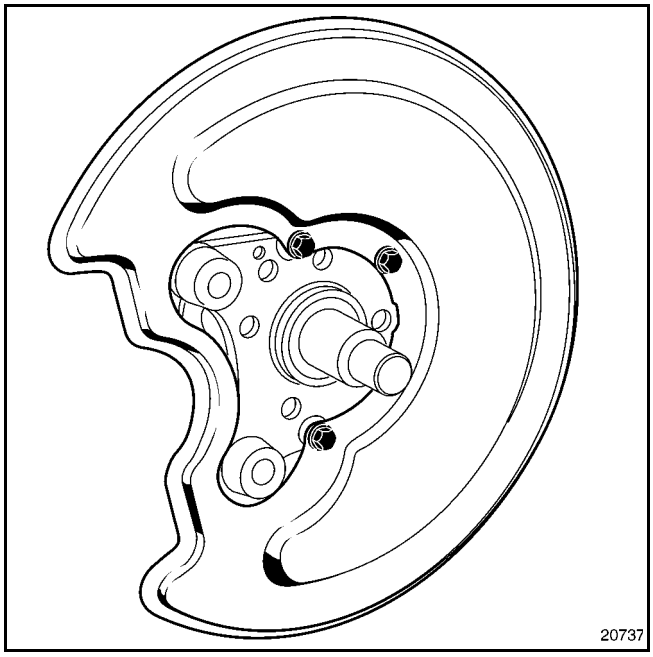
Refit the rear wheels.

Tighten the wheel bolts to the recommended torque.

TIGHTENING TORQUE (in daNm)	▽
Flange mounting bolt	**0.8**

REMOVAL

Remove:
– the brake disc (refer to the relevant procedure),



– the three flange mounting bolts,
– the flange.

REFITTING

Refit:
– the flange,
– the three flange mounting bolts.

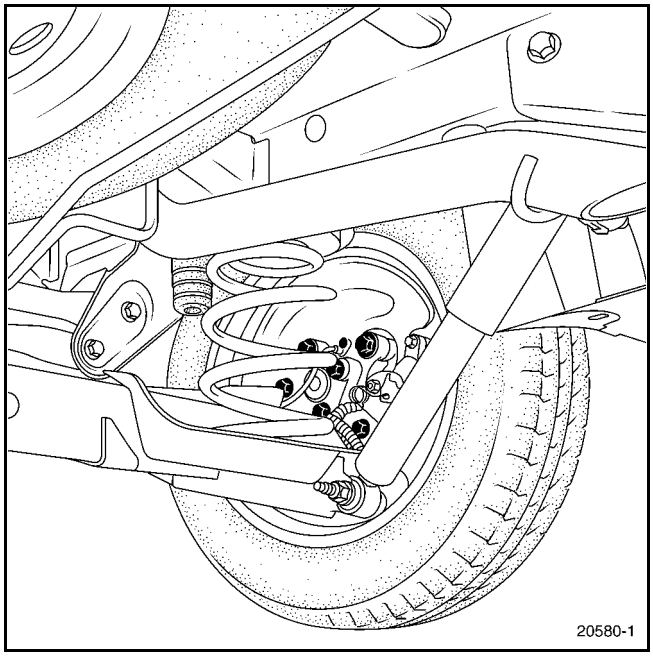
Tighten the three flange mounting bolts to the correct torque.

Refit the brake disc (refer to the relevant procedure).

TIGHTENING TORQUE (in daNm)	
Hub mounting bolt	10.5

REMOVAL

Remove:
– the brake disc protective flange (consult the relevant procedure),



– the four hub mounting bolts,
– the hub.

REFITTING

Refit:
– the hub,
– the four hub mounting bolts,

Tighten the four hub mounting bolts to the correct torque.

Refit the brake disc protective flange (consult the relevant procedure),

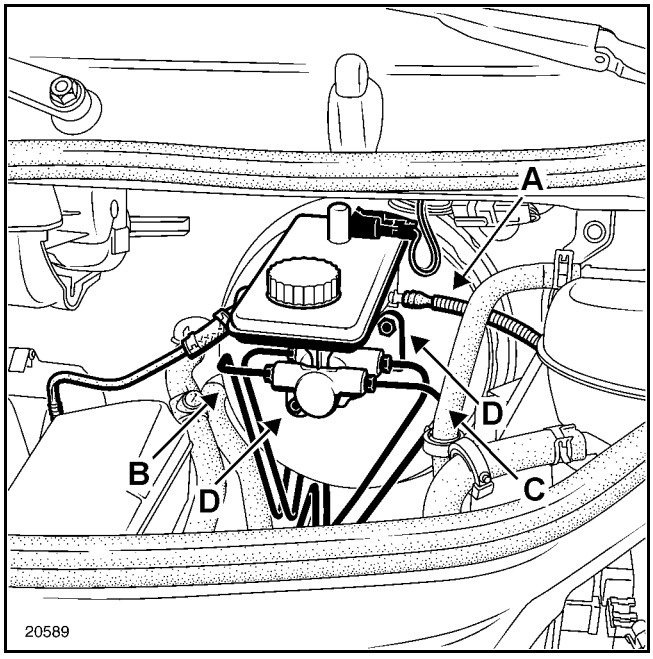
TIGHTENING TORQUES (in daNm)	
Pipe connections on the master cylinder	**1.4**
Reservoir mounting bolt	**0.8**
Master cylinder mounting nuts	**2.5**

REMOVAL

Remove:
– the brake fluid level connector,
– the brake fluid reservoir cap.

Place a container beneath the master cylinder to collect the used brake fluid.

Disconnect and collect the brake fluid:
– from the clutch master cylinder pipework (A),
– the brake pipes (B),
– the brake pipes (C) for vehicles without Anti-lock Braking System.



Remove:
– the reservoir mounting bolt,
– the reservoir,
– the master cylinder mounting nuts (D),
– the master cylinder.

REFITTING

WARNING:
The seal must be replaced between the master cylinder and the brake servo.

WARNING:
The clutch master cylinder pipe seal should be replaced in the pipe (not on the reservoir) before refitting. If the seal of the clutch master cylinder pipe is damaged, it must be changed.

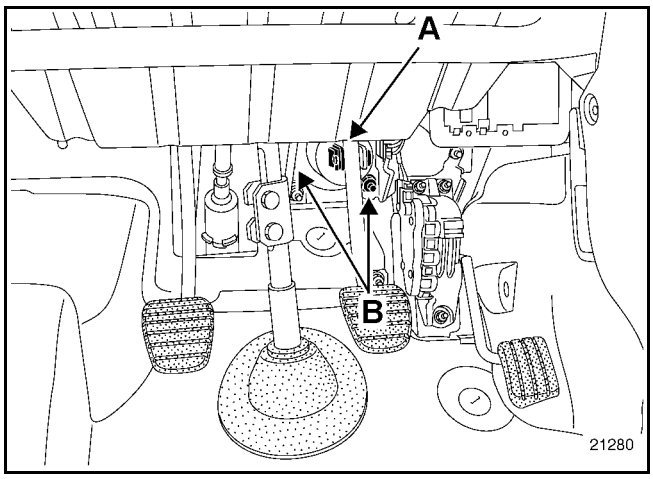
Proceed in the reverse order to removal.

Tighten the mounting bolts and nuts to the correct torque.

Bleed the brake and clutch circuits (consult the relevant procedure).

TIGHTENING TORQUES (in daNm)	▽
Pipe connections on the master cylinder	1.4
Reservoir mounting bolt	0.8
Master cylinder mounting nuts	2.5
Brake servo mounting nuts	2.1

REMOVAL



Remove:
– the master cylinder (consult the relevant procedure),
– the brake pedal shaft clip (A),
– the brake pedal shaft,
– the two brake servo mounting nuts (B),
– the brake servo.

REFITTING

IMPORTANT:
The brake servo mounting nuts must be replaced.

WARNING:
The seal must be replaced between the master cylinder and the brake servo.

WARNING:
The clutch master cylinder pipe seal should be replaced in the pipe (not on the reservoir) before refitting. If the seal of the clutch master cylinder pipe is damaged, it must be changed.

Proceed in the reverse order to removal.

Tighten the mounting bolts and nuts to the correct torque.

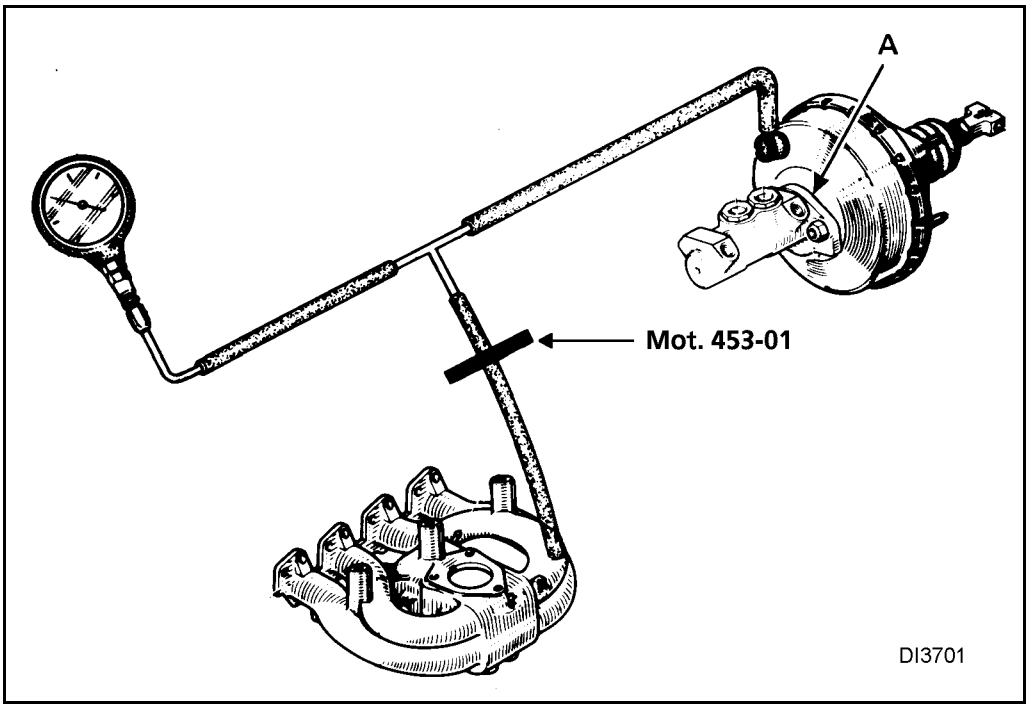
Bleed the brake and clutch circuits (consult the relevant procedure).

Check the sealing ring of the vacuum circuit (consult the relevant procedure).

CHECKING SEALING

SPECIAL TOOLING REQUIRED
Mot. 453-01 Set of hose clamps
EQUIPMENT REQUIRED
Vacuum pump

Check the sealing of the brake servo, ensuring a perfect seal between this and the master cylinder. If there is a leak, replace the seal (A).



The tightness of the brake servo seal should be checked on the vehicle, with the hydraulic circuit in perfect working order.

Connect the vacuum pump in the pneumatic circuit (between the brake servo and the vacuum source) using a three-way union and a hose as short as possible.

Run the engine at idling speed for one minute to establish a normal working vacuum.

Clip the hose (clip **Mot. 453-01**) between the three-way union and the vacuum source.

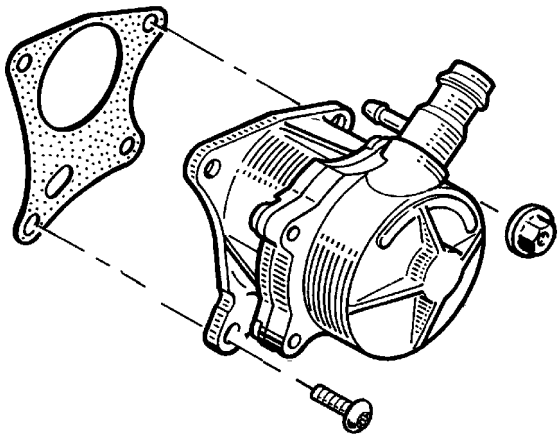
Turn the engine off.

If the vacuum falls quickly, one of the constituent components of the circuit and/or the assembly is faulty.

Check the sealing:
– of the unions,
– of the joints between components,
– of the components.

TIGHTENING TORQUES (in daNm)	▽
Vacuum pump mounting bolts	2.3
Vacuum pump mounting bolts	2.3

REMOVAL



Disconnect the vacuum pump hoses.

Remove:
– the mounting bolts and nuts,
– the vacuum pump.

REFITTING

Clean the surfaces of the seals.

WARNING:
Abrasive products or sharp tools must not be used when cleaning the surfaces of the seals.

Proceed in the reverse order to removal.

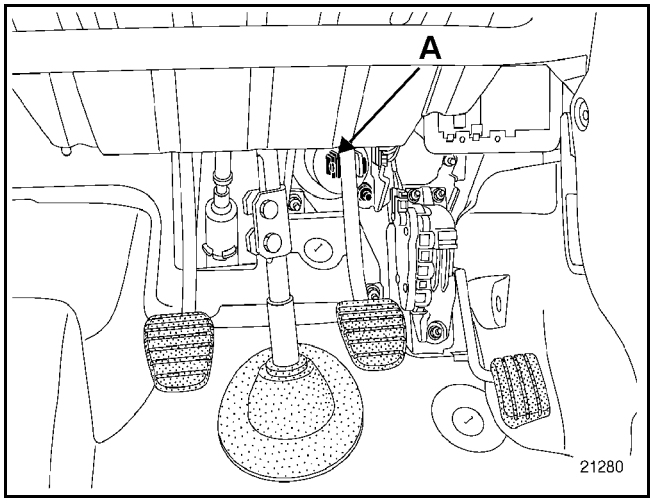
Tighten the mounting bolts and nuts to the correct torque.

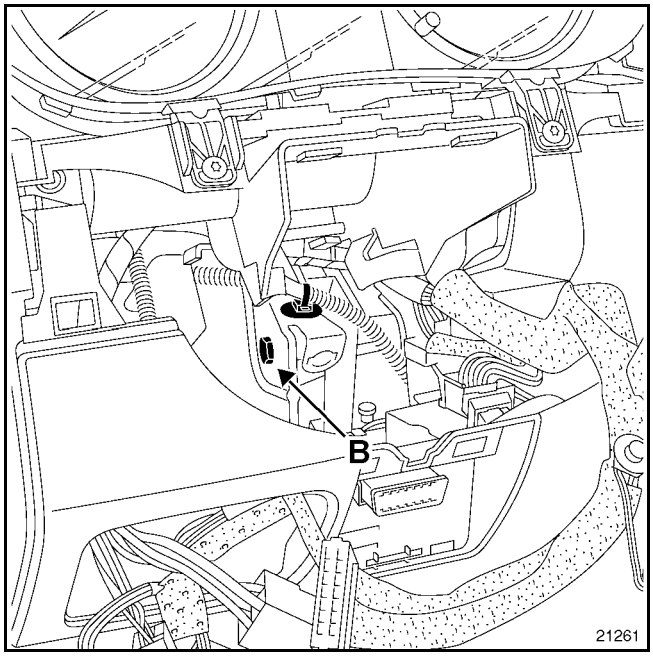
Connect the vacuum pump hoses.

TIGHTENING TORQUE (in daNm)	
Brake pedal shaft bolt	4.5

REMOVAL

NOTE:
It is not necessary to remove the steering column.





Remove:
– the brake pedal shaft clip (A),
– the brake pedal shaft,
– the brake pedal shaft bolt (B),
– the brake pedal.

REFITTING

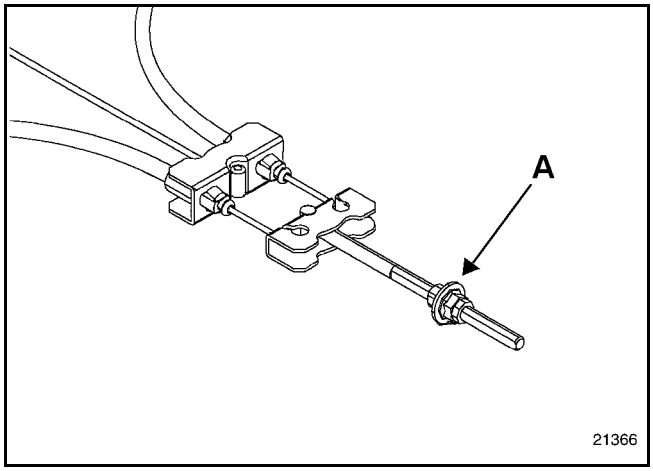
Proceed in the reverse order to removal.

Tighten the brake pedal shaft bolt to the correct torque.

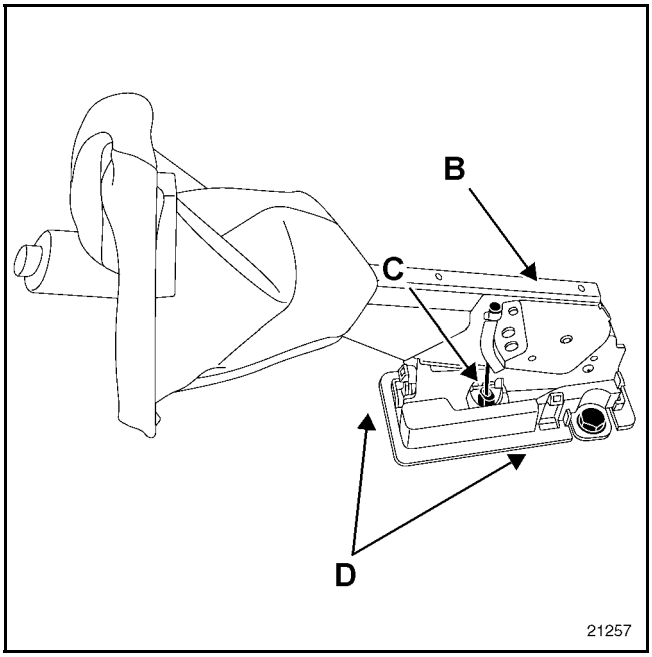
TIGHTENING TORQUE (in daNm)	
Handbrake control lever mounting bolt	4.4

REMOVAL

Put the vehicle on a lift.



Slacken the handbrake cable, turning the compensator adjusting nut (A).



Disconnect the cable (B).

Unclip the cable (C).

Remove:
– the handbrake control lever mounting bolts (D),
– the handbrake control lever.

REFITTING

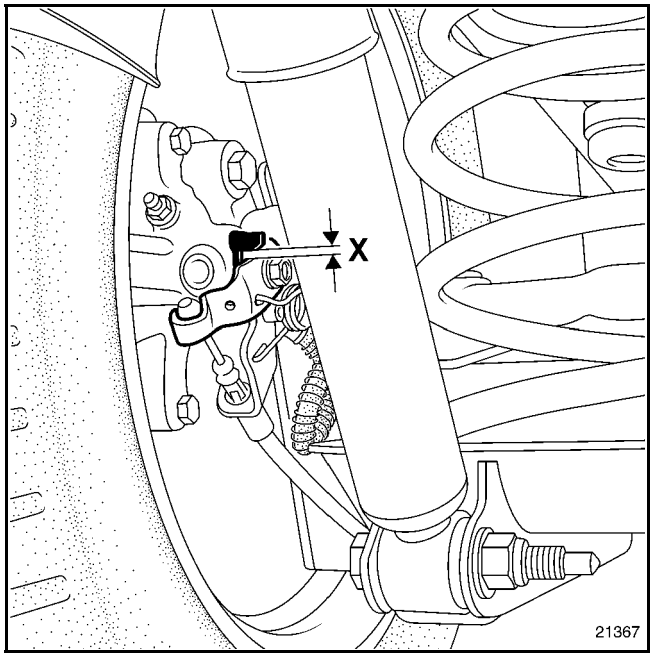
Proceed in the reverse order to removal.

tighten the handbrake control lever mounting bolts to the correct torque.

Adjust.

ADJUSTMENT

Apply the lever five times to bring the cables to normal conditions of use.



Measure the dimensions X on the right and left-hand callipers. The sum of the measurements should be between **0.1 and 0.5 mm**.

WARNING:
The sum of the measurements should not be greater than **0.5 mm**.

Adjust the dimensions by turning the compensator adjusting nut.

WARNING:
Always use a self-locking nut with a nylon ring.

Apply the lever five times to bring the cables to normal conditions of use.

Check the adjustment.

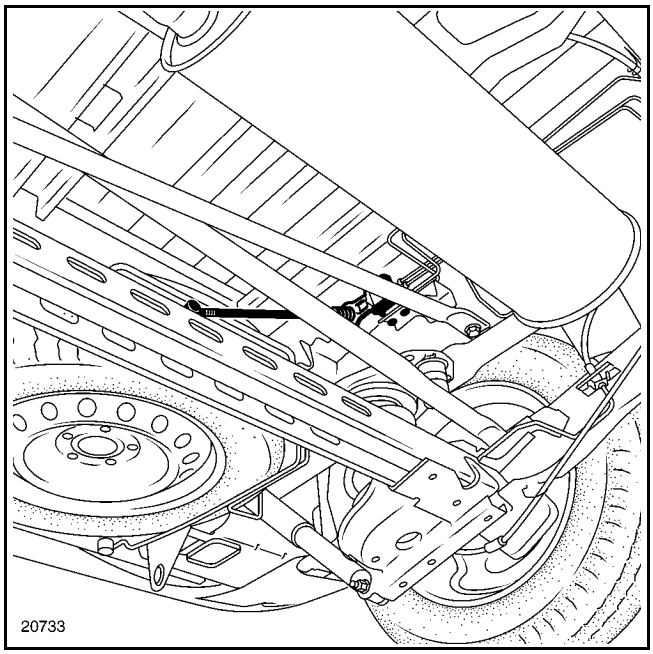
TIGHTENING TORQUES (in daNm)	
Hydraulic pipes	**1.4**
Compensator mounting bolt	**1.8**
Rod adjustment bolt	**1**
Rod ball joint nut	**1**

Vehicle with wheels suspended.

Depress the brake pedal using a pedal press (this has the effect of limiting the flow of brake fluid).

NOTE:
You must clean the compensator and its surroundings carefully to prevent foreign bodies entering the brake circuit.

REMOVAL



Remove the compensator rod ball joint nut.

Disconnect the brake pipes from the compensator.

Remove:
– the compensator mountings,
– the compensator.

REFITTING

Proceed in the reverse order to removal.

Bleed and check the brake circuit (consult the relevant procedure).

SPECIAL TOOLING REQUIRED	
Fre. 244-03 or Fre. 1085-01	Pressure gauge for checking the compensator rating

TIGHTENING TORQUES (in daNm)	
Rod adjustment bolt	1
Calliper bleed screw	0.9 to 1.1

Depress the brake pedal using a pedal press (this has the effect of limiting the flow of brake fluid).

CHECKS (vehicle unladen)

Connect the two pressure gauges **Fre. 244-03** or **Fre. 1085-01**:
– one on the front left-hand side,
– one on the rear right-hand side.

Bleed the pressure gauges.

Gradually depress the brake pedal until the pressure at the front wheels is at the setting pressure (see table of values). Then read the corresponding pressure on the rear wheel.

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

ADJUSTMENT

The procedure for adjusting the compensators currently used in After-Sales is simple and only involves using two pressure gauges which must be connected to the braking circuit (front right wheel and rear left wheel).

Checking and adjustment is carried out with the vehicle unladen, the fuel tank full and the driver on board.

After exerting a certain pressure at the front by depressing the brake pedal, simply read the pressure at the rear and compare it to the value given in **Section 07**. Next, loosen the rod adjusting bolt and then adjust the compensator rod.

This procedure is difficult to carry out when the vehicle is loaded, as is often the case for a utility vehicle fitted out with shelves full of spare parts and tools.

In the case of utility vehicles has led to the development of a different method for adjustment which uses a deflection calculation (index of crushing) for the tyres (this is inexpensive but must be carried out with care). Then, simply refer to the rear pressure graphs established in accordance with the load (on the rear axle) and the deflection of the tyres.

Tooling required:

– A tape measure on a support (used for measuring underbody heights).
– A precision pressure gauge.

1) Preparing the vehicle

The vehicle must remain loaded.

The operator whose job it is to press the brake pedal when the compensator is being adjusted must be in the vehicle when the **radius under load** of the rear wheels is measured.

The vehicle must be on a flat horizontal surface, which is smooth and clean (use a four-post lift if possible).

2) Marking the centre of the rear wheels

Lift the rear of the vehicle so that the rear wheels can be turned.

Place a piece of chalk on the hub cover or the trim at the point which seems as close as possible to the centre of the wheel.

Turn the wheel quite quickly by hand while pressing down on the chalk. This operation allows concentric circles to be marked around the true centre of rotation on the wheel.

Mark the centre with a pencil cross on the chalk.

Repeat the operation for the second rear wheel.

3) Correcting the pressure of the rear wheels

The pressure must be adjusted with the wheels on the ground and someone in the driver's seat.

Use a precision pressure gauge at the correct settings to deflate the two rear tyres until they are at a low pressure (**IMPORTANT:** consult the value of this pressure in the graph corresponding to the make and type of tyre fitted on the vehicle.

Wait a few minutes for the air in the tyres to return to ambient temperature as it is cooled during deflation and its pressure has thus been changed.

Readjust the pressure as precisely as possible.

4) Measuring the radius when unladen

Lift the rear wheel so that the tyres are no longer deformed by the axle load (as soon as the wheels leave the ground).

Measure the distance between the ground and the centre of the wheel using the tape measure.

5) Measuring the radius under load of the rear wheels

Place the vehicle on its wheels.

Measure the distance between the ground and the centre of the wheel using the tape measure.

6) Calculating the tyre deflection

Subtract the two measurements taken previously to obtain the deflection of the tyre.

7) Repeat stages 4, 5 and 6 for the other rear wheel

8) Calculating the average deflection of the two tyres

Add together the values of the two deflections measured for the two rear wheels and divide the value by two to determine the average deflection.

9) Reading the graphs

On the first graph read the load on the rear axle in accordance with the average deflection measured.

Refer to the second graph and read the output pressure **P2** (which corresponds to the pressure applied to each rear wheel) according to the load value measured on the first graph.

10) Adjusting the compensator

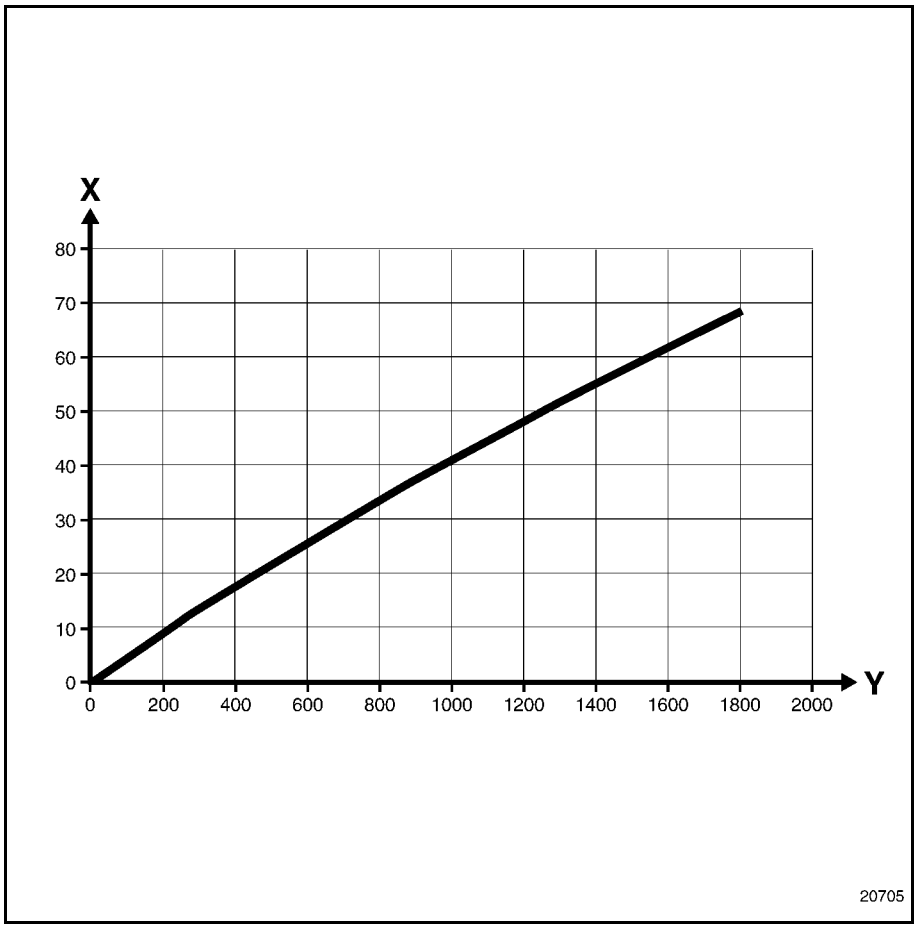
Follow the procedure currently described in After-Sales documentation if the adjustment is incorrect.

11) Preparing the vehicle

Restore the vehicle to its normal working conditions (tyre pressure, correct tightening torques).

Load on rear axle/tyre deflection (pressure 1 bar)

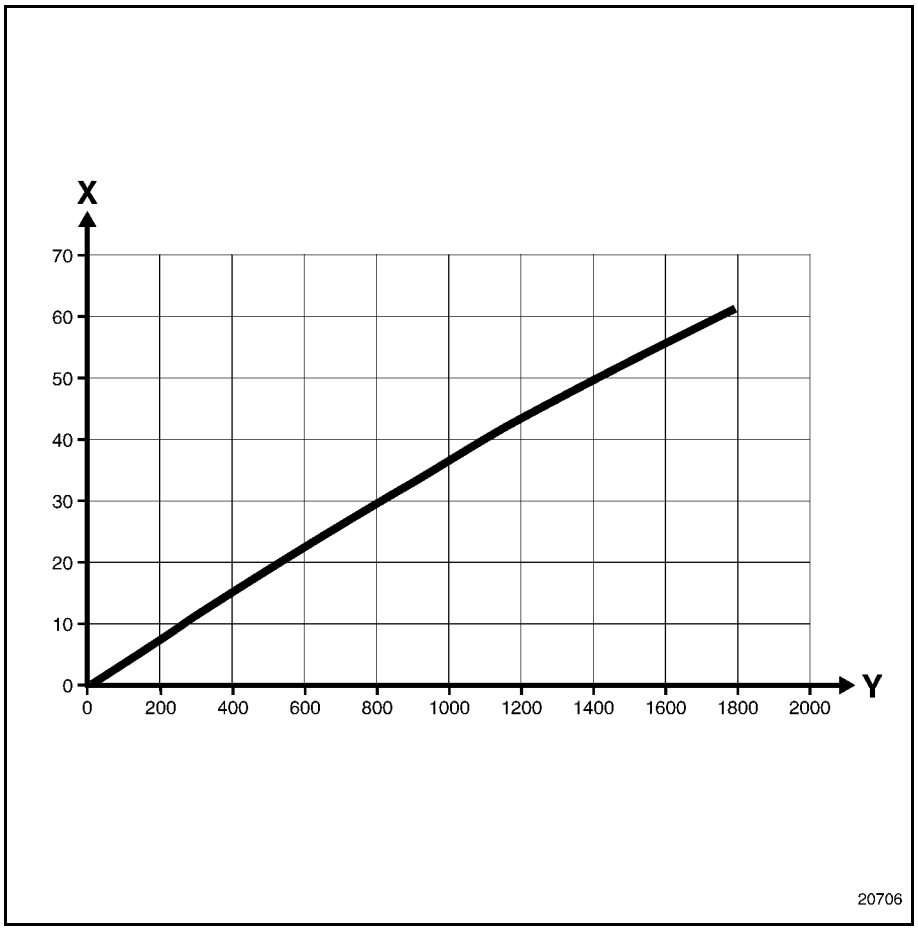
GOODYEAR 195/65 R 16 C



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

Load on rear axle/tyre deflection (pressure 1 bar)

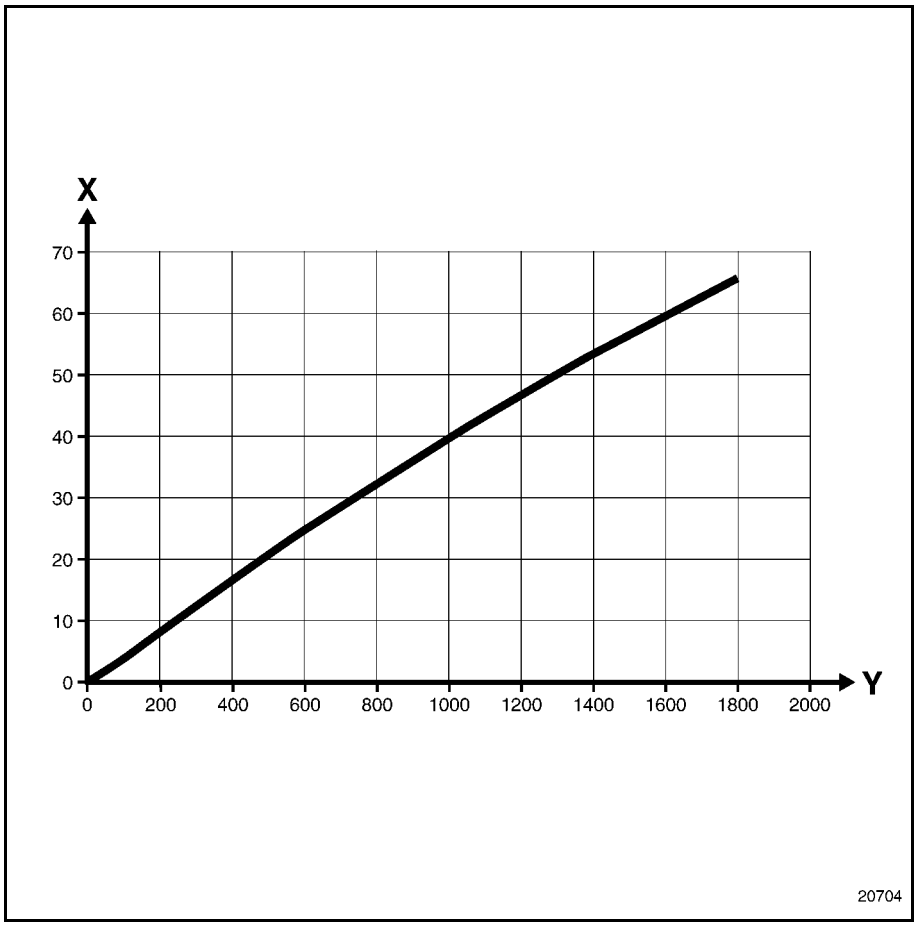
GOODYEAR 205/65 R 16 C



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

Load on rear axle/tyre deflection (pressure 1 bar)

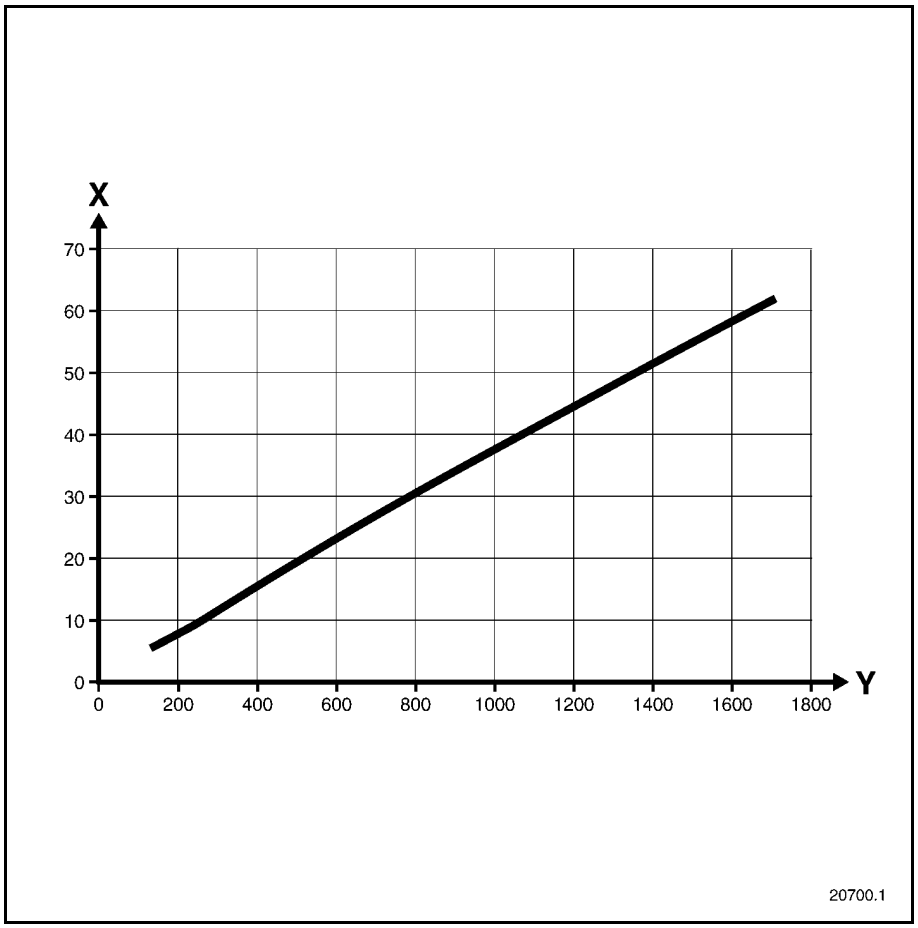
GOODYEAR 215/65 R 16 C



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

Load on rear axle/tyre deflection (pressure 1 bar)

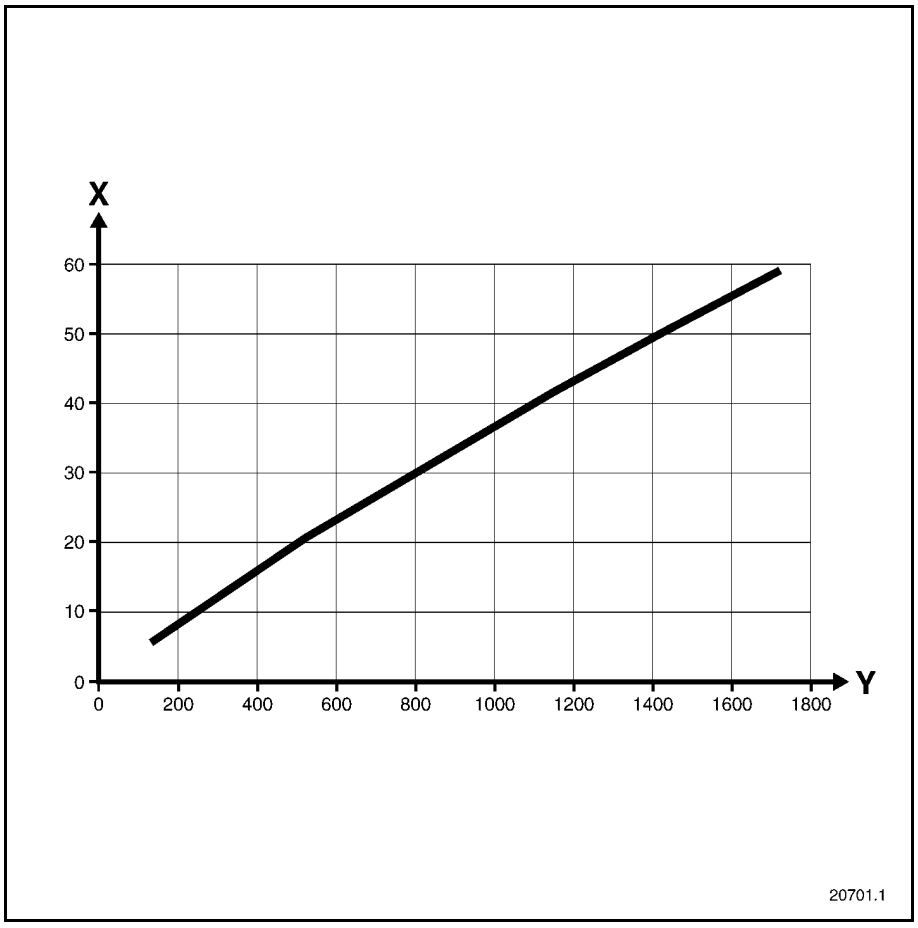
CONTINENTAL 195/65 R 16



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

Load on rear axle/tyre deflection (pressure 1 bar)

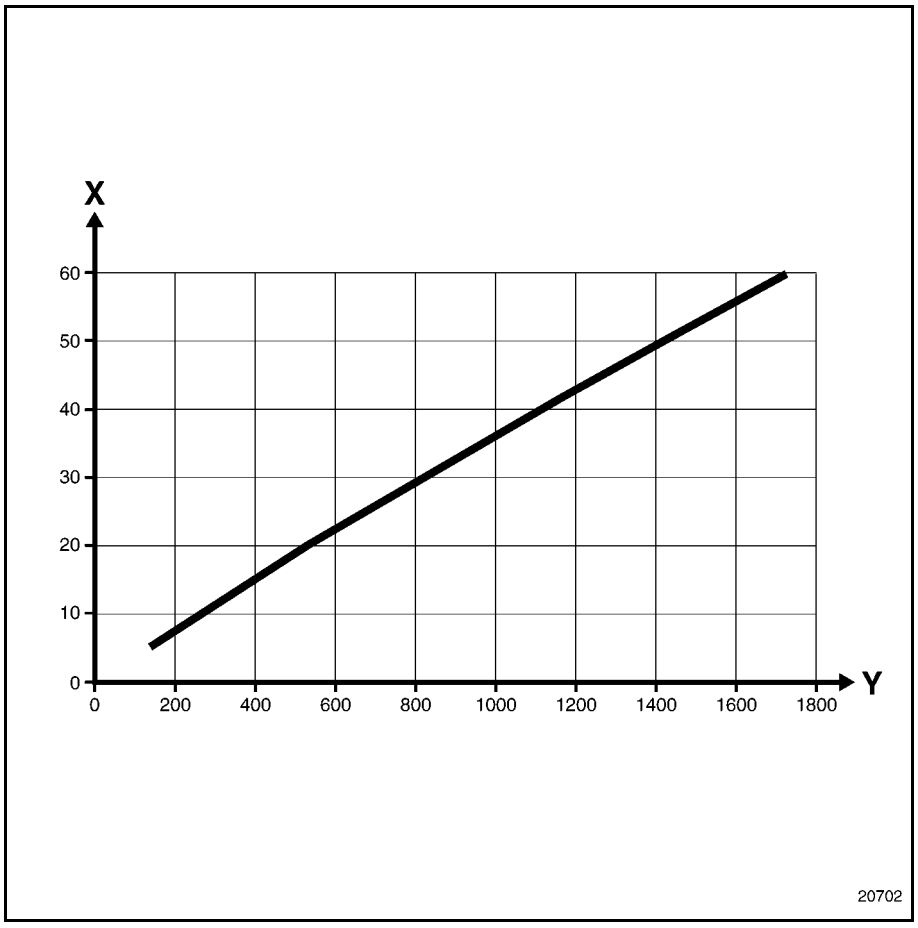
CONTINENTAL 205/65 R 16



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

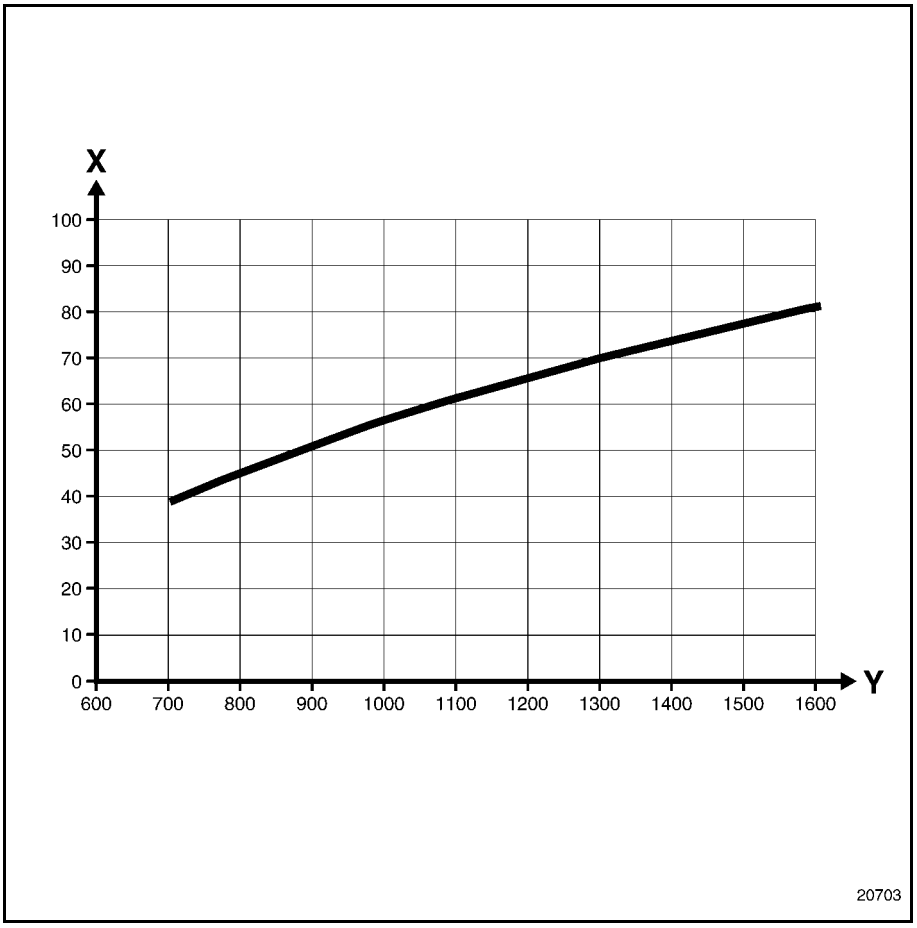
Load on rear axle/tyre deflection (pressure 1 bar)

CONTINENTAL 215/65 R 16



X = Deflection (**mm**)
Y = Load on rear axle (**kg**)

Adjustment of the compensator output pressure/load on the rear axle



X = Output pressure **P2** (**bar**) (for a pressure of **100 bar** at the front)
Y = Load on rear axle (**kg**)

SPECIAL NOTES

The system comprises four speed sensors. Each hydraulic braking channel is linked to a sensor on each wheel. This means that the pressure of each brake piston can be regulated separately. Compensation for the rear piston pressure on a loaded vehicle is controlled by the computer.

HYDRAULIC UNIT

TIGHTENING TORQUES (in daNm)	
Brake pipes on the unit	**1.4**
Unit mounting bolt	**0.9**

The unit is located under the vehicle, on the rear section of the battery tray.

It comprises eight solenoid valves.

REMOVAL

Disconnect the battery.

Fit a pedal press to limit fluid loss.

NOTE:
It is vital to clean the hydraulic unit and its surroundings carefully to prevent foreign bodies entering the braking circuit.

Disconnect:
– the **ABS** connector,
– the brake pipes on the unit.

Fit the protective plugs on the brake pipes and the hydraulic unit.

Remove:
– the upper mounting bolt,
– the lower mounting bolt,
– the hydraulic unit.

REFITTING

Carry out the removal procedure in reverse.

Tighten the brake pipes to torque.

Bleed the brake circuit.

Markings on the unit	Meaning of the unions	
MC1	Primary circuit	Master cylinder
RR		Rear right caliper
LF		Front left calliper
MC2	Secondary circuit	Master cylinder
RF		Front right caliper
LR		Rear left caliper

Bleeding the brake circuit

SPECIAL TOOLING REQUIRED
Brake circuit bleeding device

NOTE:
The hydraulic unit is pre-filled.
This bleeding procedure must be used when one of the following components has been removed:
– the hydraulic unit,
– the master cylinder,
– the pipes (between the hydraulic unit and the master cylinder).

NOTE:
The brake circuit fitted with **ABS** should be free from faults and must be working correctly. If this is not the case, repair the **ABS**, hydraulic and electronic circuits. If, after a road test with **ABS** regulation, the pedal travel is not correct, bleed the hydraulic unit.

1. Bleed the braking system conventionally (using the bleeding device).
IMPORTANT: follow the correct order for bleeding by starting with the right-hand rear brake, then the rear left, the front right and the front left.

2 a) Bleeding the hydraulic unit with the fault finding tool (primary and secondary circuits):
- open the brake bleed screw,
- pump the brake pedal (approximately 10 times),
- keep your foot on the brake pedal and enter the bleed command with the fault finding tool,
- **AC153:** Front left wheel bleed; **AC154:** Front right wheel bleed; **AC155:** Rear left wheel bleed,
- **AC156:** Rear right wheel bleed,
- pump the brake pedal during the diagnostic bleed phase,
- at the end of the bleed cycle using the fault finding tool, continue to pump the brake pedal and close the brake bleed screw.

b) Carry out the procedure described in 2a) for the left-hand rear, right-hand rear and left-hand front brakes.
c) Check the pedal travel and if it is incorrect, restart the bleeding procedure.

IMPORTANT:
Ensure that there is sufficient brake fluid in the reservoir.

NOTE:
If the brake circuit is an X-type, it is possible to bleed one wheel on its own (in the event of replacing a hose, calliper etc.).

FAULT FINDING - INTRODUCTION

This document contains special feature fault finding procedures applicable to all anti-lock braking system computers fitted to PRIMASTAR vehicles.

The following are thus required for carrying out fault finding on this system:

- **This section of the PRIMASTAR Fault finding Workshop Repair Manual.**
- **The wiring diagram for the function on the vehicle concerned.**
- **Bornier Elé. 1620.**

GENERAL APPROACH TO FAULT FINDING

– Use of one of the diagnostic tools for identifying the system fitted on the vehicle (reading of the electronic control unit type, programme number, Vdiag number etc.).
– Look in the Fault finding documents corresponding to the system identified.
– Refer to the information in the Introduction.

DESCRIPTION OF THE FAULT FINDING STAGES

1 - CHECKING THE FAULTS

It is essential to start with this stage before any work is done on the vehicle.

– Read the faults stored in the computer memory and use the "Interpretation of faults" section of the documents.
REMINDER:
Each fault is interpreted for a particular type of storage (fault present, fault stored, fault present or stored). The specified checks for dealing with each fault are therefore only to be performed if the fault declared by the diagnostic tool can be identified in the document by its type. The storage type should be considered when using the fault finding tool after the ignition has been switched off and switched back on.
If a fault is interpreted when it is declared as stored, the conditions for applying fault finding appear in the notes box. When these conditions are not satisfied, use the fault finding procedure to check the circuit of the faulty part, since the fault is no longer present on the vehicle. Perform the same operation when a fault is declared as stored by the diagnostic tool but is only interpreted in the documentation as a present fault.

2 - CONFORMITY CHECK

The conformity check is designed to check the states and parameters which do not display any faults on the diagnostic tool when they are outside the permitted tolerance values. This stage:
– Diagnoses faults that are not displayed which may correspond to a customer complaint.
– Checks the correct operation of the anti-lock braking system and eliminates the risk of faults reappearing after the repair.
This section gives the fault finding procedures for states and parameters and the conditions for checking them. If a state is not operating normally or a parameter is outside permitted tolerance values, you should consult the corresponding fault finding page.

3 - RECTIFYING THE CUSTOMER COMPLAINT

If the diagnostic tool check is correct, but the customer complaint is still present, the problem should be dealt with according to the customer complaint.
This section has fault finding charts, which suggest a series of possible causes of the problem. These lines of investigation must only be used in the following cases:
– No faults appear on the diagnostic tool.
– No faults are detected during the conformity check.
– The vehicle is not operating correctly.

FAULT FINDING - INTRODUCTION

	WARNING LIGHT STATE		
Name of fault	**Anti-lock braking system warning light**	**Brake fluid level warning light**	**Indicator lights**
No tyre circumference programmed			**X**
One faulty sensor (electric, target, speed comparator, consistency)	**X**		
Three faulty sensors (electric, target, speed comparator, plausibility)	**X**	**X**	
Faulty solenoid valve	**X**		
Faulty solenoid valve	**X**	**X**	
Faulty pump motor	**X**		
Faulty power relay (short circuit)	**X**		
Faulty power relay (open circuit)	**X**	**X**	
Faulty brake switch	**X**		
Open circuit or short circuit on ABS and brake fluid level lights			
Wheel speed inconsistency	**X**		
Faulty computer	**X**	**X**	
Solenoid valve activation time too long	**X**		
Excess voltage/undervoltage	**X**		

FAULT FINDING - INTRODUCTION

Bleeding procedure

NOTE:
The hydraulic unit is pre-filled.

This bleeding procedure must be used when one of the following components has been removed:
- the hydraulic unit,
- the master cylinder,
- the pipework (between the hydraulic unit and the master cylinder).

NOTE: The braking circuit fitted with **the anti-lock braking system must not have any faults and must operate correctly**, if it does not, the anti-lock braking system must be repaired from both a hydraulic **and an electrical point of view**. **If, after a road test with ABS regulation, the pedal travel is not correct, bleed the hydraulic assembly.**

1) Bleed the braking circuit **in a conventional way** using your foot or a bleeding kit

IMPORTANT:
Follow the correct order for bleeding by starting with the **rear right-hand brake**, then the **rear left** , the **front right, and the front left**

2 a) Bleeding the hydraulic assembly using the diagnostic tool (primary and secondary circuits):
- open the brake bleed screw,
- pump the brake pedal approximately **ten times**,
- keep your foot on the brake pedal and enter the bleed command **AC153:** with the fault finding tool: Left-hand front wheel bleed; **AC154:** Right-hand front wheel bleed; **AC155:** Left-hand rear wheel bleed **AC156:** Right-hand rear wheel bleed,
- pump the brake pedal during the fault finding bleed phase,
- at the end of the bleed cycle using the diagnostic tool, continue to pump the brake pedal and close the brake bleed screw.

b) Follow the procedure as described in **2a)** for the **left-hand rear brake,** the **right-hand rear brake** and the **front left-hand brake**.

c) Check the pedal travel and, if it is incorrect, restart the bleeding procedure.

IMPORTANT: ensure there is sufficient brake fluid in the reservoir.

NOTE: the brake circuit is an X-type, it is therefore possible to bleed one wheel on its own (in the case of replacing a hose, calliper etc.).

FAULT FINDING - INTERPRETATION OF FAULTS

DF008 PRESENT OR STORED	FRONT LEFT-HAND WHEEL SPEED SENSOR SIGNAL 1. DEF : Inconsistent signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)** under acceleration).

Check **the connection and condition** of the front left-hand speed sensor connector. Repair if necessary.
Check that the sensor is **correctly positioned**. Repair if necessary.
Check that the target is **clean** (look for traces of mud etc.). Clean if necessary.
Connect the bornier (**Elé. 1620**) in place of the computer and check **the insulation, continuity and absence of interference resistance** of the following connections: Computer **track 19** ⟶ **Track 2** of the front left-hand speed sensor Computer **track 20** ⟶ **Track 1** of the front left-hand speed sensor Repair if necessary.
Ensure that there is no **interference from the mechanical or electrical systems** that could generate a speed signal. E.g. bearing play, sensor vibrations, iron filings, etc.
Swap the two axle sensors and road test the vehicle to **confirm that there is a wheel sensor fault**. If the fault disappears, the sensor is faulty. If the fault persists, return the sensors to their original positions and exchange the targets.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF009 PRESENT OR STORED	REAR LEFT-HAND WHEEL SPEED SENSOR SIGNAL 1. DEF : Inconsistent signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)** under acceleration).

Check **the connection and condition** of the rear left-hand speed sensor connector. Repair if necessary.
Check that the sensor is **correctly positioned**. Repair if necessary.
Check that the target is **clean** (look for traces of mud etc.). Clean if necessary.
Connect the bornier (**Elé. 1620**) in place of the computer and check **the insulation, continuity and absence of interference resistance** of the following connections: Computer **track 21** ⟶ **Track 2** of the rear left-hand speed sensor Computer **track 22** ⟶ **Track 1** of the rear left-hand speed sensor Repair if necessary.
Check that there is no **interference from the mechanical or electrical systems** that could generate a speed signal. E.g. bearing play, sensor vibrations, iron filings, etc.
Swap the two axle sensors and road test the vehicle to **confirm that there is a wheel sensor fault**. If the fault disappears, the sensor is faulty. If the fault persists, return the sensors to their original positions and exchange the targets.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF010 PRESENT OR STORED	PUMP MOTOR CIRCUIT

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**).

Switch the ignition off and on **three times in succession,** to make sure that no **electronic interference is interfering with the anti-lock braking system**.
Check the condition of the wiring and **tracks 24** and **25** of the ABS computer connector. Repair or replace the wiring if necessary.
Check that there is **+ 12 V on track 25 and an earth on track 24** of the ABS computer connector.
Disconnect the computer and **check the resistance** of the motor between **tracks 25 and 24**. Replace the ABS unit if necessary.
If no fault is found, replace the ABS unit.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF011 **PRESENT**	SOLENOID VALVE SUPPLY 1. DEF : Computer internal electrical fault

NOTES	None.

Clear the faults with the fault finding tool.
Switch the ignition off and on **three times in succession** to make sure that no electronic interference **is interfering with the anti-lock braking system**.
If the fault **persists**, replace the ABS unit (**internal** computer fault).

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF014 **PRESENT**	MAIN RELAY

NOTES	None.

Switch the **+ after ignition feed on and off three times** in succession, to make sure **no external electronic interference** is interfering with the ABS, or switch the ignition off and disconnect the various computers.
Check the condition of **tracks 11** and **12** of the ABS computer connector. **Use bornier** (**Elé. 1620**) to check **the insulation and continuity** on **tracks 11 and 12**. Repair or replace the wiring if necessary.
Check that there is **+ 12 V on track 12** and an **earth on track 11** of the ABS computer connector. Repair or replace the wiring if necessary.
If no fault is found, replace the ABS unit.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF017 **PRESENT**	COMPUTER

NOTES	None.

Turn the ignition on and off **three times** to make sure that **the electronic systems are not interfering with the computer**.
If the fault persists, replace the ABS unit.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF028 **PRESENT** **OU** **MEMORISE**	FRONT RIGHT-HAND WHEEL SPEED SENSOR SIGNAL 1. DEF : Inconsistent signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)** under acceleration).

Check **the connection and condition** of the front right-hand speed sensor connector. Repair if necessary.
Check that the sensor is **correctly positioned**. Repair if necessary.
Check that the target is **clean** (look for traces of mud etc.). Clean if necessary.
Connect the bornier (**Elé. 1620**) in place of the computer and check **the insulation, continuity and absence of interference resistance** of the following connections: Computer **track 7** ⟶ **Track 2** of the front right-hand speed sensor Computer **track 8** ⟶ **Track 1** of the front right-hand speed sensor Repair if necessary.
Ensure that there is no **interference from the mechanical or electrical systems** that could generate a speed signal. E.g. bearing play, sensor vibrations, iron filings, etc.
Swap the two axle sensors and road test the vehicle to **confirm that there is a wheel sensor fault**. If the fault disappears, the sensor is faulty. If the fault persists, return the sensors to their original positions and exchange the targets.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF029 PRESENT OR STORED	REAR RIGHT-HAND WHEEL SPEED SENSOR SIGNAL 1. DEF : Inconsistent signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)** under acceleration).

Check **the connection and condition** of the rear right-hand speed sensor connector. Repair if necessary.
Check that the sensor is **correctly positioned**. Repair if necessary.
Check that the target is **clean** (look for traces of mud etc.). Clean if necessary.
Connect the bornier (**Elé. 1620**) in place of the computer and check **the insulation, continuity and absence of interference resistance** of the following connections: Computer **track 9** ⟶ **Track 2** of the rear right-hand speed sensor Computer **track 10** ⟶ **Track 1** of the rear right-hand speed sensor Repair if necessary.
Check that there is no **interference from the mechanical or electrical systems** that could generate a speed signal. E.g. bearing play, sensor vibrations, iron filings, etc.
Swap the two axle sensors and road test the vehicle to **confirm that there is a wheel sensor fault**. If the fault disappears, the sensor is faulty. If the fault persists, return the sensors to their original positions and exchange the targets.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF046 PRESENT OR STORED	BRAKE LIGHTS AND SWITCH CIRCUIT

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **18 mph (30 km/h)** under acceleration).

Look to see if the brake lights are working properly. If the brake lights **do not light up**, check **the bulbs** and the condition of the brake lights **fuse**. Replace the fuse and bulbs if necessary.
Check **the condition of the ABS computer connector** and confirm the condition of **track 17**. Repair the connector if necessary.
Check on **track 17** of the ABS computer connector that the voltage increases from **0 V** to **12 V when the pedal is depressed**. Replace the brake switch if necessary.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF048 PRESENT OR STORED	LEFT-HAND FRONT WHEEL SENSOR CIRCUIT 1. DEF : No signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **24 mph (40 km/h)**).

Check that the sensor is properly **attached** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the **bearing position and play**. Replace the bearing if necessary.
If you replace the bearing, make sure that the target (magnetic part) **is facing the sensor side**. Repair if necessary.
If the results **of the tests are correct** and the **fault persists**, clear the faults, **swap the two axle sensors** and road test the vehicle. If the fault remains present, replace the target. If not, the sensor is faulty.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF049 PRESENT OR STORED	RIGHT-HAND FRONT WHEEL SENSOR CIRCUIT 1. DEF : No signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **24 mph (40 km/h)**).

Check that the sensor is properly **secured** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the **bearing position and play**. Replace the bearing if necessary.
If you replace the bearing, make sure that the target (magnetic part) **is facing the sensor side**. Repair if necessary.
If the results **of the tests are correct** and the **fault persists**, clear the faults, **swap the two axle sensors** and road test the vehicle. If the fault remains present, replace the target. If not, the sensor is faulty.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF050 PRESENT OR STORED	LEFT-HAND REAR WHEEL SENSOR CIRCUIT 1. DEF : No signal

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **24 mph (40 km/h)**).

Check that the sensor is properly **secured** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the **bearing position and play**. Replace the bearing if necessary.
If you replace the bearing, make sure that the target (magnetic part) **is facing the sensor side**. Repair if necessary.
If the results **of the tests are correct** and the **fault persists**, clear the faults, **swap the two axle sensors** and road test the vehicle. If the fault remains present, replace the target. If not, the sensor is faulty.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF051 PRESENT OR STORED	RIGHT-HAND REAR WHEEL SENSOR CIRCUIT 1. DEF: Signal absent

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **24 mph (40 km/h)**).

Check that the sensor is properly **secured** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the **bearing position and play**. Replace the bearing if necessary.
If you replace the bearing, make sure that the target (magnetic part) **is facing the sensor side**. Repair if necessary.
If the results **of the tests are correct** and the **fault persists**, clear the faults, **swap the two axle sensors** and road test the vehicle. If the fault remains present, replace the target. If not, the sensor is faulty.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF059 **PRESENT**	FRONT RIGHT-HAND SPEED SENSOR 1. DEF : Open circuit or short circuit

NOTES	None.

Check **the condition of the switches and the connection** of the ABS computer connectors and the front right-hand speed sensor. Repair or replace the wiring if necessary.
Connect **bornier Elé. 1620** in place of the computer and check **the insulation, continuity and absence of interference resistance of the connections between:** Computer **track 7** ⟶ **Track 2** of the front right-hand speed sensor Computer **track 8** ⟶ **Track 1** of the front right-hand speed sensor
If the wiring and switches are sound, **swap the two axle sensors** and road test the vehicle to confirm that a sensor is at fault.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF060 **PRESENT**	FRONT LEFT-HAND SPEED SENSOR 1. DEF : Open circuit or short circuit

NOTES	None.

Check **the condition of the switches and the connection** of the ABS computer connectors and the front left-hand speed sensor. Repair or replace the wiring if necessary.
Connect **bornier Elé. 1620** in place of the computer and check **the insulation, continuity and absence of interference resistance of the connections between:** Computer **track 19** → **Track 2** of the front left-hand speed sensor Computer **track 20** → **Track 1** of the front left-hand speed sensor
If the wiring and switches are sound, **swap the two axle sensors** and road test the vehicle to confirm that a sensor is faulty.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF061 **PRESENT**	REAR RIGHT-HAND SPEED SENSOR 1. DEF : Open circuit or short circuit

NOTES	None.

Check **the condition of the switches and the connection** of the ABS computer connectors and the rear right-hand speed sensor. Repair or replace the wiring if necessary.
Connect **bornier Elé. 1620** in place of the computer and check **the insulation, continuity and absence of interference resistance of the connections between:** Computer **track 9** → **Track 2** of the rear right-hand speed sensor Computer **track 10** → **Track 1** of the rear right-hand speed sensor
If the wiring and switches are sound, **swap the two axle sensors** and road test the vehicle to confirm that a sensor is at fault.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF062 **PRESENT**	REAR LEFT-HAND SPEED SENSOR 1. DEF : Open circuit or short circuit

NOTES	None.

Check **the condition of the switches and the connection** of the ABS computer connectors and the rear left-hand speed sensor.
Repair or replace the wiring if necessary.

Connect **bornier Elé. 1620** in place of the computer and check **the insulation, continuity and absence of interference resistance of the connections between:**
Computer **track 21** ⟶ **Track 2** of the rear left-hand speed sensor
Computer **track 22** ⟶ **Track 1** of the rear left-hand speed sensor

If the wiring and switches are sound, perform a test **with both axle sensors swapped**, in order to confirm the sensor fault.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF063 PRESENT OR STORED	WHEEL SPEED INCONSISTENCY

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**). **If there is more than one fault**, deal with **DF048; DF049; DF050 and DF051** first.

Check that the vehicle does not have **different wheel sizes**. Fit matching wheels if necessary.
Check **the condition of the bearing** (target) and **the sensor mounting**.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF090 PRESENT OR STORED	FRONT RIGHT-HAND WHEEL TARGET

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**).

Check that the sensor is properly **secured** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the bearing **play**. Replace the bearing if necessary.
Check that the **target is clean** (look for traces of mud and filings etc.).
If you replace the bearing, make sure that the target (magnetic part) is facing the **sensor side**. Repair if necessary.
Use the fault finding tool to check **that a speed signal is present** while turning the front right-hand wheel. Check the wheel sensor wiring if necessary.
If the results of the checks are correct, **reconnect the computer and the sensors then clear the computer fault memory**. Exit the fault finding procedure and carry out a road test. If the fault recurs, it may be caused by a solenoid valve operational fault. It is therefore **necessary** to carry out the solenoid valve hydraulic test with the diagnostic tool commands (refer to the **Help** section). If the ten locking/unlocking cycles do not occur on one of the wheels, replace the hydraulic unit.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF091 PRESENT OR STORED	FRONT LEFT-HAND WHEEL TARGET

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**).

Check that the sensor is properly **attached** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the bearing **play**. Replace the bearing if necessary.
Check that the **target is clean** (look for traces of mud and filings etc.).
If you replace the bearing, make sure that the target (magnetic part) is facing the **sensor side**. Repair if necessary.
Use the fault finding tool to check **that a speed signal is present** while turning the front left-hand wheel. Check the wheel sensor wiring if necessary.
If the results of the checks are correct, **reconnect the computer and the sensors then clear the computer fault memory**. Exit the fault finding procedure and carry out a road test. If the fault recurs, it may be caused by a solenoid valve operational fault. It is therefore **necessary** to carry out the solenoid valve hydraulic test with the diagnostic tool commands (refer to the **Help** section). If the ten locking/unlocking cycles do not occur on one of the wheels, replace the hydraulic unit.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF092 PRESENT OR STORED	REAR RIGHT-HAND WHEEL TARGET

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**).

Check that the sensor is properly **attached** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the bearing **play**. Replace the bearing if necessary.
Check that the **target is clean** (look for traces of mud and filings etc.).
If you replace the bearing, make sure that the target (magnetic part) is facing the **sensor side**. Repair if necessary.
Use the fault finding tool to check **that a speed signal is present** while turning the rear right-handwheel. Check the wheel sensor wiring if necessary.
If the results of the checks are correct, **reconnect the computer and the sensors then clear the computer fault memory**. Exit the fault finding procedure and carry out a road test. If the fault recurs, it may be caused by a solenoid valve operational fault. It is therefore **necessary** to carry out the solenoid valve hydraulic test with the diagnostic tool commands (refer to the **Help** section). If the ten locking/unlocking cycles do not occur on one of the wheels, replace the hydraulic unit.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF093 PRESENT OR STORED	REAR LEFT-HAND WHEEL TARGET.

NOTES	**Conditions for applying the fault finding procedure to stored faults:** The fault is declared present during: – road test (speed over **6 mph (10 km/h)**).

Check that the sensor is properly **secured** to its mounting.
Check that the sensor is not **scraping against the target**. If necessary replace the sensor.
Check the bearing **play**. Replace the bearing if necessary.
Check that the **target is clean** (look for traces of mud and filings etc.).
If you replace the bearing, make sure that the target (magnetic part) is facing the **sensor side**. Repair if necessary.
Use the fault finding tool to check **that a speed signal is present** while turning the rear left-hand wheel. Check the wheel sensor wiring if necessary.
If the results of the checks are correct, **reconnect the computer and the sensors then clear the computer fault memory**. Exit the fault finding procedure and carry out a road test. If the fault recurs, it may be caused by a solenoid valve operational fault. It is therefore **necessary** to carry out the solenoid valve hydraulic test with the diagnostic tool commands (refer to the **Help** section). If the ten locking/unlocking cycles do not occur on one of the wheels, replace the hydraulic unit.

AFTER REPAIR	Follow the instructions to confirm that the fault has been repaired.

FAULT FINDING - INTERPRETATION OF FAULTS

DF094 **PRESENT**	COMPUTER SUPPLY VOLTAGE TOO HIGH

NOTES	None.

Check the voltage at the battery terminals. If the voltage is too high, check that the battery **is to specification**. Replace the battery if necessary.
Check the voltage supplied by **the regulator** and **the connection between the alternator and the battery**. Replace the regulator if necessary.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF095 **PRESENT**	COMPUTER SUPPLY VOLTAGE TOO LOW

NOTES	None.

Check **the condition of the connector** on the ABS computer (water ingress, ozidation on the terminals, etc.).
Ensure that **the battery terminals** are not **oxidized**. Clean the terminals if necessary.
Check the voltage at the battery **terminals**. Recharge the battery if necessary.
Check the wiring between **the alternator and the battery**.
Check the voltage supplied by the **regulator**. Replace the regulator if necessary.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF156 **PRESENT**	ABS / BRAKE FAULT WARNING LIGHT CIRCUIT 1. DEF : Open circuit or short circuit

NOTES	None.

Disconnect the ABS computer connector and check that the **ABS and Electronic Brake Distribution warning lights come on when the ignition is switched on**. Check the instrument panel fuses if necessary.
Check the **continuity**, **insulation** from **earth and + before ignition, on tracks 3 and 15 of the ABS computer connector**.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - INTERPRETATION OF FAULTS

DF157 **PRESENT** **OR** **STORED**	SOLENOID VALVE ACTIVATION TIME TOO LONG 1. DEF : Protection has been activated

NOTES	None.

The solenoid valves have been operated for too long a period and **protection has been activated**.
– **Wait ten minutes without operating the solenoid valves. There is a risk that the valves will overheat.**

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - CONFORMITY CHECK

NOTES	Only check the conformity after a **complete check** with the diagnostic tool. **Test conditions:** engine off, ignition on, **air conditioning off**.

Order	Function	Parameter or state Check or action	Display and notes	Fault finding
1	Computer voltage supply	**PR005:** Computer supply voltage	**8 V < X < 14.5 V**	**In the event of a fault:** run the fault finding test **DF094:** Computer supply voltage **too high** **DF095:** Computer supply voltage **too low**
2	Tyre indexing	**PR030:** Speed sensor index	195-65R 16 = **85** 205-65R 16 = **127** 215-65R 16 = **170**	**In the event of a problem:** refer to the Interpretation of parameters section **PR030:** Tachometric index
3	Vehicle speed	**PR038:** Vehicle speed	**X** = Value of vehicle speed in **mph / Km/h**	**In the event of a fault:** run the fault finding test **DF063:** Wheel speed consistency
4	Wheel speed	**PR001:** Front right-hand wheel speed **PR002:** Front left-hand wheel speed **PR003:** Rear right-hand wheel speed **PR004:** Rear left-hand wheel speed	**X** = Value of wheel speed in **mph / Km/h**	**In the event of a fault:** run the fault finding test: **DF008:** Front left-hand wheel signal **DF009:** Rear left-hand wheel signal **DF028:** Front right-hand wheel signal **DF029:** Rear right-hand wheel signal
5	Brake lights switch	**ET006:** Brake switch	**STATE 1:** brake pedal released **STATE 2:** brake pedal depressed	**In the event of a fault:** run the fault finding test: **DF046:** Brake lights and switch circuit

FAULT FINDING - CONFORMITY CHECK

NOTES	Only check the conformity after a **complete check** with the diagnostic tool. **Test conditions:** engine off, ignition on, **air conditioning off**.

Order	Function	Parameter or state Check or action	Display and notes	Fault finding
6	Pump motor	**ET015:** Pump motor command	**ACTIVE**	Pump motor command active when engine running **In the event of a fault,** run the fault finding test: **DF010:** Pump motor circuit
7	ABS	**ET018:** ABS function	**ACTIVE**	**ABS** function is active when there are no present or stored faults. **In the event of a problem:** fully research all present and stored faults.
8	Electronic Braking Distribution	**ET019:** Braking regulation function	**ACTIVE**	**Electronic Braking Distribution** function is active when there are no present or stored faults on: **– 3 wheel sensors** **– solenoid valves** **– power relay** **– computer** **In the event of a problem:** fully research all present and stored faults.

FAULT FINDING - INTERPRETATION OF PARAMETERS

PR030	TACHOMETRIC INDEX

NOTES	None.

Tyre circumference has to be **programmed** into the memory of a **new computer**.
New replacement tyres also need to be programmed into the computer if they are a different size from the original ones.
The ABS computer calculates the vehicle speed from the speed of the wheels and the circumference of the tyres fitted on the vehicle.
This consists of entering an **"X"** index using the **TACHOMETRIC INDEX command** of the diagnostic tool.

Tyre part number	Value of the index (in mm)
195-65R 16	**85**
205-65R 16	**127**
215-65R 16	**170**

After entering the index, **check** parameter **PR030** to **confirm** that the index has been recognised.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - HELP

Allocation of tracks on the speed sensor connector

Facing the speed sensor connector (foolproofing device pointing upwards), position:
- **track 1** (on the right): **Sensor signal**
- **track 2** (on the left): **Sensor supply**

FAULT FINDING - HELP

USE OF COMMAND MODES:

Control of the wheel solenoid valves in order to check the hydraulic system:

Lift the vehicle so that the wheels can be turned and check that they turn freely. Keep the brake pedal depressed to prevent the wheel from being turned by hand (do not brake so firmly that full brake power is reached).

Select and confirm the command of the wheel being examined (e.g. Front left-hand wheel solenoid valve, etc.).

⟶ The wheel being examined should go through ten locking/unlocking cycles.

If the ten cycles do not occur on a wheel, check the other components, such as the sensors, targets, pipes etc.

FAULT FINDING - CUSTOMER COMPLAINTS

NOTES	Only consult the customer complaints after a complete check using the diagnostic tool.

FAULTS DETECTED FOR BRAKING WITH BRAKING REGULATION / ABS

LOCKING OF ONE OR MORE WHEELS	CHART 2
DRIFT	CHART 3
UNEXPECTED ABS OPERATION AT LOW SPEEDS AND WHEN BRAKE PEDAL IS DEPRESSED SLIGHTLY	CHART 4
UNEXPECTED ABS OPERATION ON A POOR ROAD SURFACE	CHART 5
UNEXPECTED ABS OPERATION WHEN USING SPECIAL EQUIPMENT (RADIO, TELEPHONE, CB, ETC.)	CHART 6
SPONGY PEDAL	CHART 7
BRAKE PEDAL VIBRATION	CHART 8
PULLING	CHART 9
THE ABS INDICATOR WARNING LIGHT DOES NOT LIGHT UP WHEN THE IGNITION IS SWITCHED ON	CHART 10
THE ABS AND EBD WARNING LIGHTS FLASH	CHART 11
THE ABS AND EBD WARNING LIGHTS REMAIN LIT AFTER REPAIR AND THE FAULTS ARE CLEARED	CHART 12
NOISE FROM THE PUMP, THE PIPES OR THE HYDRAULIC UNIT	CHART 13
BRAKE PEDAL TRAVEL LENGTHENED FOLLOWING REGULATION PHASE (IRREGULAR PEDAL WHEN ENTERING REGULATION)	CHART 14

OTHER CASES

NO DIALOGUE WITH THE ABS COMPUTER	CHART 1

FAULT FINDING - FAULT FINDING CHARTS

CHART 1	**No dialogue with the ABS computer**

NOTES	None.

Try to establish dialogue with a computer on another vehicle **to make sure that the fault finding tool is not faulty**. If the tool is not faulty and dialogue cannot be established with any other computer on the same vehicle, it may be that a faulty computer is disrupting diagnostic line **K**.
Disconnect the computers one at a time to locate the fault.
Check the voltage of the battery and carry out the operations necessary to obtain the correct voltage:
(**8 V** < Battery voltage < **14.5 V**).

Check that the ABS fuses (**BP14** in the passenger compartment fuse box and **AP5** in the passenger compartment are present and sound).
Check that the computer connector is properly connected and check the condition of its wiring.
Check the (**N26** and **N27** ABS earths under the body next to the battery).
Check that the computer is correctly supplied:

- **Earth on tracks 11 and 24** of the ABS computer connector
- **+ before ignition on tracks 12 and 25** of the ABS computer connector
- **+ after ignition on track 23** of the ABS computer connector

Check that the diagnostic socket is correctly supplied:

- **+ before ignition feed on track 16** of the diagnostic socket
- **Earth on track 5** of the diagnostic socket

Check and ensure the continuity and insulation of the connection between:
Track 6 of the ABS computer ⟶ **Diagnostic socket track 7**

If dialogue **is still not established** after these various checks, replace the ABS computer.

AFTER REPAIR	Clear the computer memory, road test the vehicle and test again with the fault finding tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 2	Locking of one or more wheels

NOTES	Only consult this customer complaint after a complete check using the diagnostic tool.

Reminder: Locking of the wheels on a vehicle fitted with ABS or **squealing of tyres**, interpreted by the customer as locking, **could be linked to a normal reaction of the system** and should not be automatically considered to be a fault:

- Locking is allowed below **4 mph (6 km/h)** (the system will not provide regulation).
- Braking with ABS regulation on very **poor road surfaces** (significant squealing).

However, if the wheel(s) is/are **actually locking,** lift the vehicle so that you can turn the wheels and check to see if:

- The wheel sensors have been **incorrectly connected**.

Using parameters **PR001, PR002, PR003 and PR004**, turn the wheels slowly and check the **consistency of the results obtained**.

- The pipes on the hydraulic unit have been **reversed**.

Use the front left-hand wheel solenoid valves, front right-hand wheel solenoid valves, rear left-hand wheel solenoid valves and rear right-hand wheel solenoid valves commands **while depressing the brake pedal and check for the occurrence of ten locking/unlocking cycles on the wheel**. If the ten cycles do not occur on the wheel tested, see if they occur on another wheel (repair the fault if an incorrect connection is confirmed). If the ten cycles do not occur on a wheel and **the pipes are correctly connected**, replace the hydraulic unit.

Check the sensor mounting.
If the fault persists following these checks, replace the hydraulic unit.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 3	**Drift**

NOTES	Only consult this customer complaint after a complete check using the diagnostic tool.

Disconnect one wheel speed sensor.
Start the engine and **check that only the ABS fault warning light is lit**. If the **brake fault warning light is also lit, do not drive the vehicle** as the **electronic braking distribution** function is no longer operational. **Only** perform a test with the ABS out of service.

Does the fault persist under these conditions?

yes →

Road holding fault **not associated** with the ABS. Check the condition and conformity of the brake pads, **check the tyre pressures, the front axle**, etc.

no ↓

Normal behaviour linked to the operation of the system during the **regulation** phase, in particular on surfaces with uneven grip or which are poorly coated.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 4	**Unexpected ABS operation at low speed and with light pedal pressure**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool. **WARNING:** ABS regulation is sensitive on slippery surfaces (ice, wet road surfaces, etc.).

It is possible to feel brake pedal vibrations which are linked to reactions of the system in **particular situations**:

- Crossing rumble strips.
- Tight cornering with lifting of the inside rear wheel.

These vibrations may be simply associated with the activation of the **braking distributor** when pressure on the rear axle is limited.

If the problem is different, check the speed sensor connectors (micro-breaks).

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 5	**Unexpected ABS operation on a poor road surface**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

On poor road surfaces it is **normal** to feel hesitation and vibrations of the pedal as well as grating which is more significant than on good surfaces. The result is the **impression of a variation in efficiency which should be considered normal**.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 6	**Unexpected ABS operation with use of special equipment** (radio, telephone, CB, etc.)

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

Check that the equipment which is causing the problem is **approved**.

Check that the equipment has been **correctly installed with no alteration to the original wiring,** in particular that of the ABS **(unauthorised connections to ABS earth and + after ignition / before ignition feed)**.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 7	**Spongy pedal**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

Air in the brake circuits.
Carry out **a conventional bleed** of the circuits, starting with the **rear right-hand brake, followed by rear left, front left and finally front right**. Repeat the operation if necessary.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 8	**Brake pedal vibration**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

Normal reaction of the brake pedal during an **ABS regulation phase** or **limitation of pressure on the rear axle** (**braking distribution** function).

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 9	**Pulling**

NOTES	Only consult this customer complaint after a complete check using the diagnostic tool.

Disconnect one wheel speed sensor.
Start the engine and **check that only the ABS fault warning light is lit**. If the **brake fault warning light is also lit**, **do not drive the vehicle** as the **electronic braking distribution** function is no longer operational. **Only** perform a test with the ABS out of service.

Does the fault persist under these conditions?

yes →

If the brake pedal travel is **relatively spongy**, bleed the brake circuit.
If the travel is **normal**, check the tyre pressures, the front axle or look for any leaks in the circuit.

no ↓

Lift the vehicle so that you can turn the wheels and check:
- the speed sensors have been **incorrectly connected**,
- the pipes on the hydraulic unit have been **reversed**.

For these two tests, refer to and apply the methods described in **CHART 2**.
If the fault persists, replace the hydraulic unit.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 10	**The ABS warning light does not light up when the ignition is switched on**

NOTES	Only refre to this customer complaint after a complete check using the diagnostic tool.

Check the instrument panel fuses on the passenger compartment fuse board (if the problem affects all instrument panel operations).

Switch off the ignition. Disconnect the computer, then switch on the ignition again.

Does the ABS warning light come on?

yes → Test the connections on the computer connector.
Replace the computer **if the fault persists**.

no →

Check the condition of the ABS warning light bulb and its supply.
Check that there is insulation from earth on **track 15** of the computer connector and **the ABS warning light**.
If the fault persists, check the operation of the instrument panel.

AFTER REPAIR	Perform a road test followed by a test using the fault finding tool.

FAULT FINDING - FAULT FINDING CHARTS

CHART 11	**The ABS and Electronic braking distribution warning lights flash**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

The system is not **configured**, the tyre circumference **is not programmed** in the computer memory.

Use the **TACHOMETRIC INDEX** command to configure the computer **according to the tyre type**.

After entering the index, check parameter **PR030** to **confirm that it has been recognised**.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - FAULT FINDING CHARTS

CHART 12	**The ABS and Electronic braking distribution warning lights remain lit after repairing and erasing the faults**

NOTES	Only consult this customer complaint after a complete check using the diagnostic tool.

Check the instrument panel fuses on the passenger compartment fuse board.

Drive the vehicle at a speed above **6 mph (10 Km/h)**.

Do the warning lights come on?

yes → **Normal**, as long as the vehicle does not verify the system at a speed above **6 mph (10 km/h)**.

no →

Check that there is insulation and continuity on **tracks 15** and **3** of the computer connector and the warning lights (**ABS** and **electronic braking distribution**).
Check the ABS fuse on the passenger compartment fuse board.
Check the ABS earths (under the body next to the battery).
Check the wiring of the instrument panel connector.
If the fault persists, check the operation of the instrument panel.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - FAULT FINDING CHARTS

CHART 13	**Noise from the pump, the pipes or the hydraulic unit**

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

– **Vibration of the unit:** check that the unit mounting insulating silentbloc fittings are fitted and are in good condition.
– **Vibration of pipes:** check that all the pipes are correctly fitted in their securing clips and that there is no contact between the pipes and the body.

Use the solenoid valves commands: Front left-hand wheel solenoid valves, Front right-hand wheel solenoid valves, Rear left-hand wheel solenoid valves and Rear right-hand wheel while pressing the brake pedal to determine where the noise is coming from.

AFTER REPAIR	Road test the vehicle to confirm that the system is in good working order.

FAULT FINDING - FAULT FINDING CHARTS

CHART 14	**Lengthening of the brake pedal travel following ABS regulation** (with a pedal receding when entering ABS regulation phase)

NOTES	Only refer to this customer complaint after a complete check using the diagnostic tool.

Ingress of air from the unit assembly regulation channels to the brake circuits.
Bleed the circuits **in accordance with the procedure recommended in the introductory section** (use the command modes on the fault finding tool).
After performing the operation, carry out a road test with **ABS regulation**.

If the fault persists, **carry out the above operation again once or twice.**
If the customer complaint is particularly serious, and bleeding the circuit does not improve matters, replace the hydraulic unit.

AFTER REPAIR	Perform a road test followed by a test using the diagnostic tool.