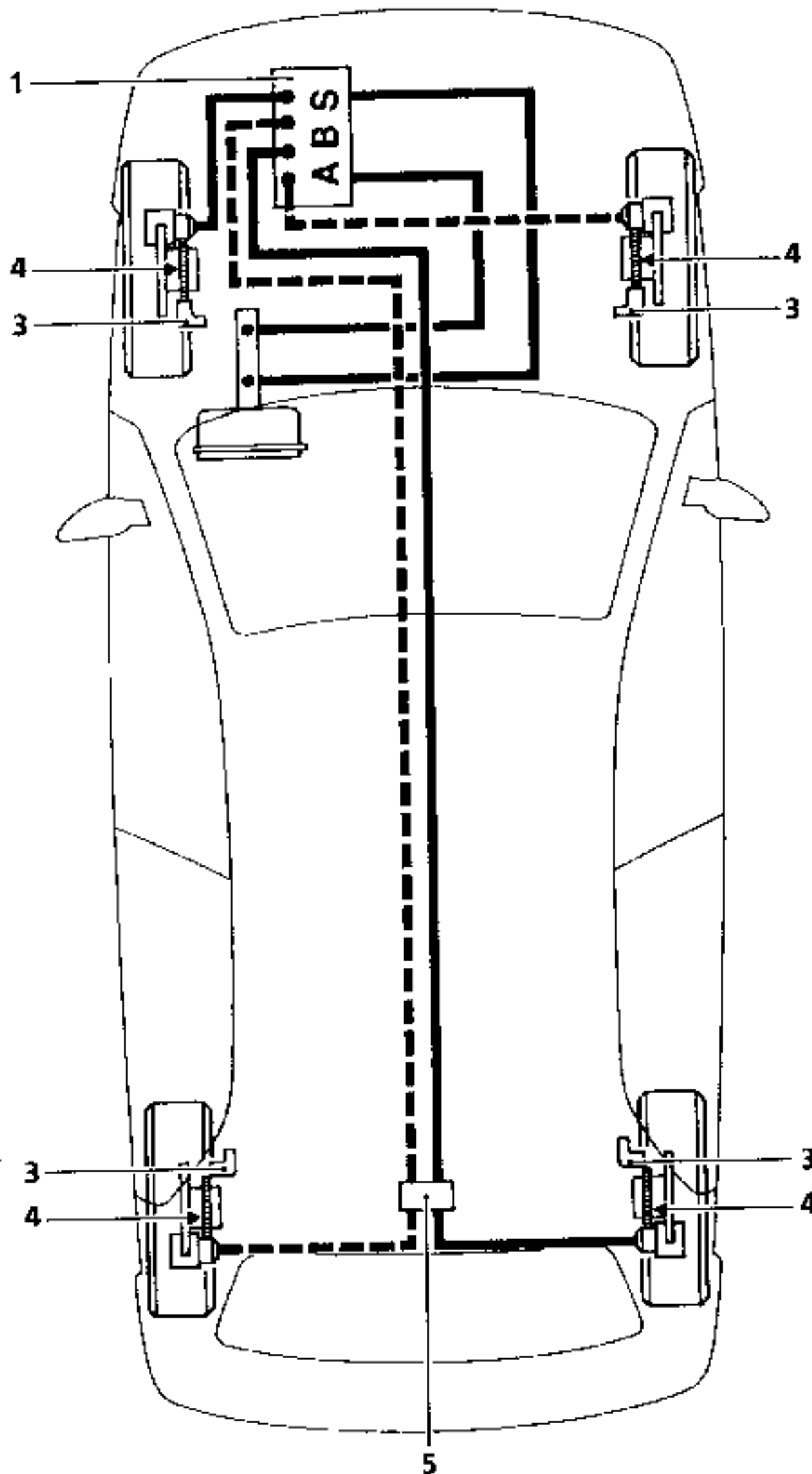


## LOCATION AND INSTALLATION



94917

**NOTE :** this diagram is for general reference only ; in no case should it be taken as a reference diagram for take off points and circuit allocations. When replacing one of the braking circuit components on a vehicle, always mark the pipes and hoses in order to replace them in their initial positions.

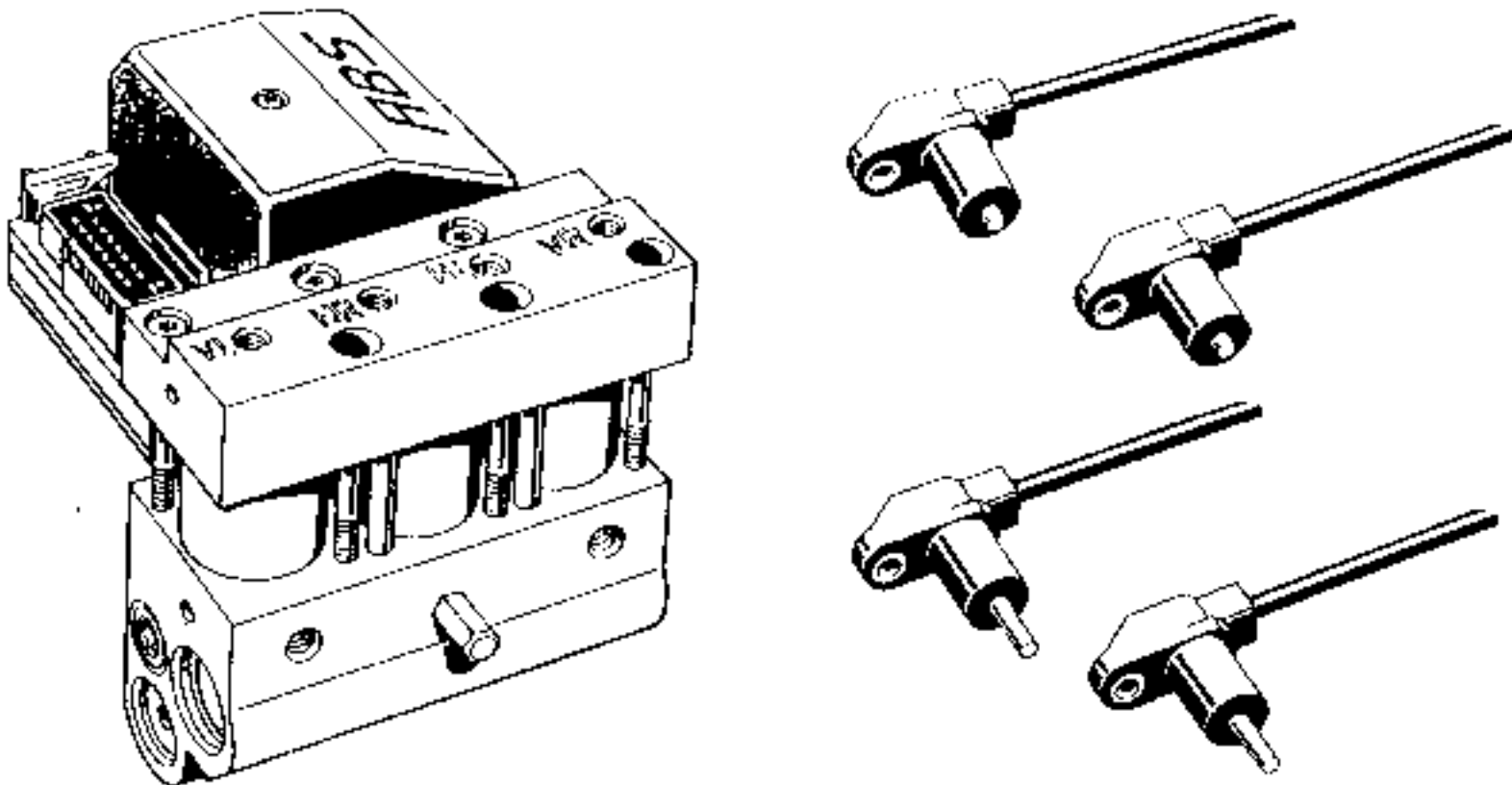
**LOCATION AND INSTALLATION (cont)**

In addition to the braking elements :

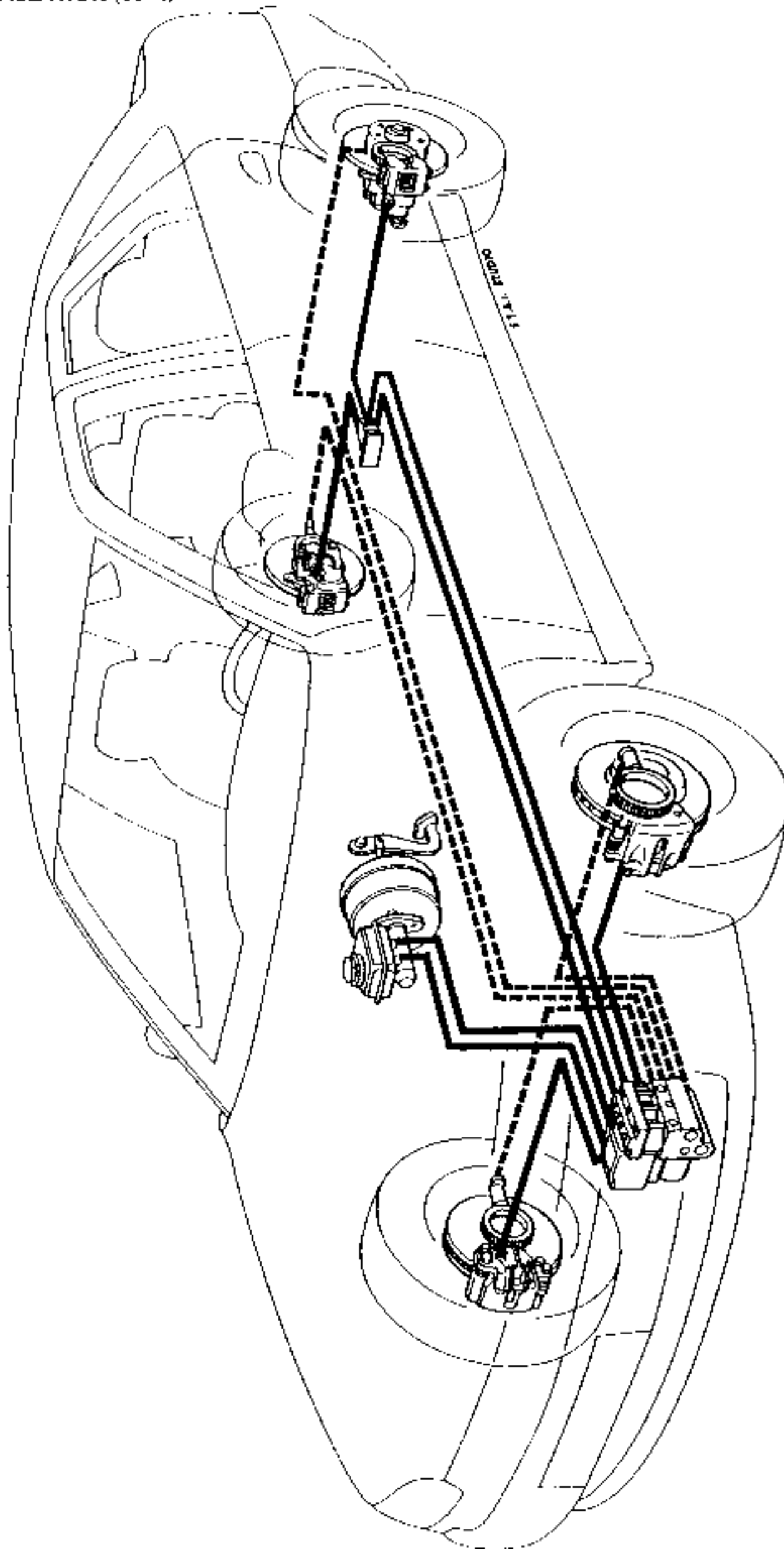
- brake calipers,
- tandem master cylinder (with central check valves),
- double load linked pressure limiter (5),

which are conventional, the ABS system comprises :

- a wheel speed sensor for each wheel (3),
- four fixed targets (4) :
  - at the front on the driveshafts,
  - at the rear on the hubs,
- an hydraulic assembly (1) comprising :
  - a regulating solenoid valve for each front wheel,
  - a solenoid valve and a piston plunger for the rear axle,
  - and an hydraulic pump,
- a computer (2) (part of the hydraulic assembly) with a self test function,
- a dashboard warning light,
- a diagnostic socket for connecting the XR 25.

**ABS 2 E - 4 channels - 4 sensors**

LOCATION AND INSTALLATION (cont)

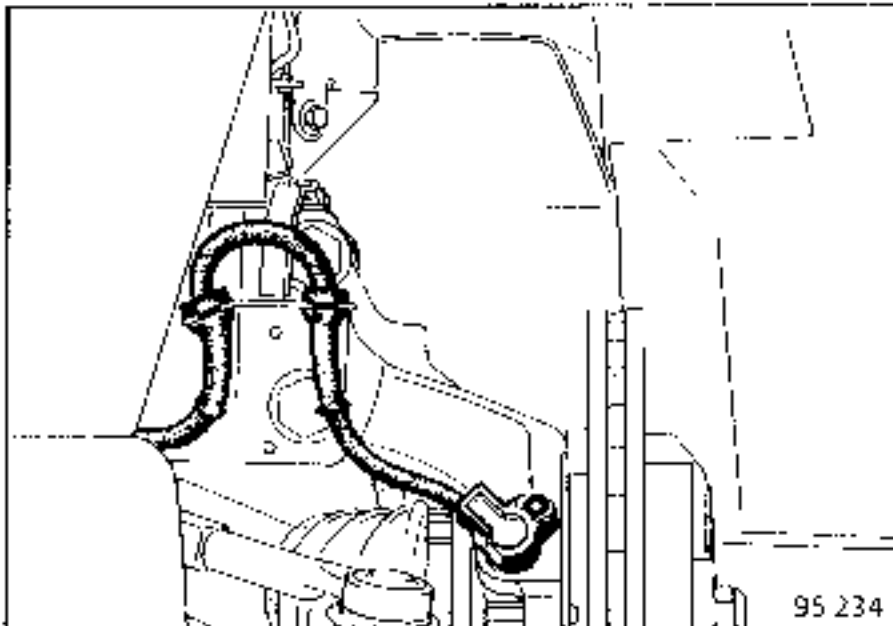


**LOCATION AND INSTALLATION (cont)****• SPEED SENSORS AND TARGETS**

The speed sensors are mounted on the stub axle carriers and receive information from the toothed targets (number of teeth : 30).

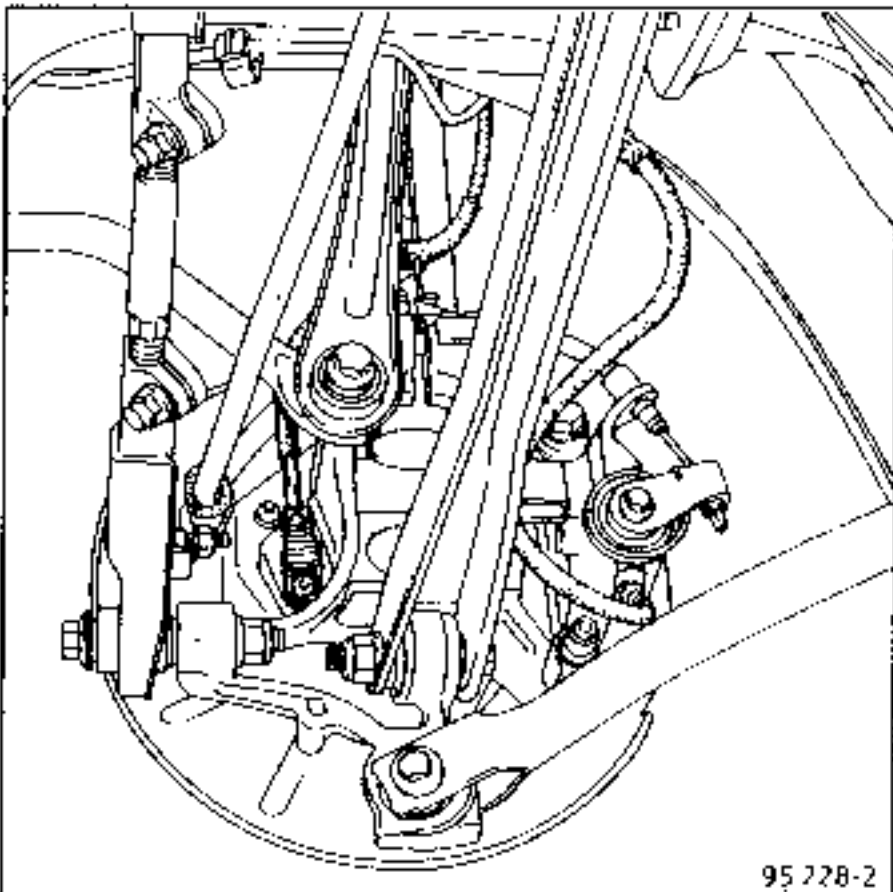
The targets are fixed on the drive shafts for the front wheels.

The front sensors are radial and are not able to be adjusted.



The targets are fixed on the hubs (cannot be removed) for the rear wheels.

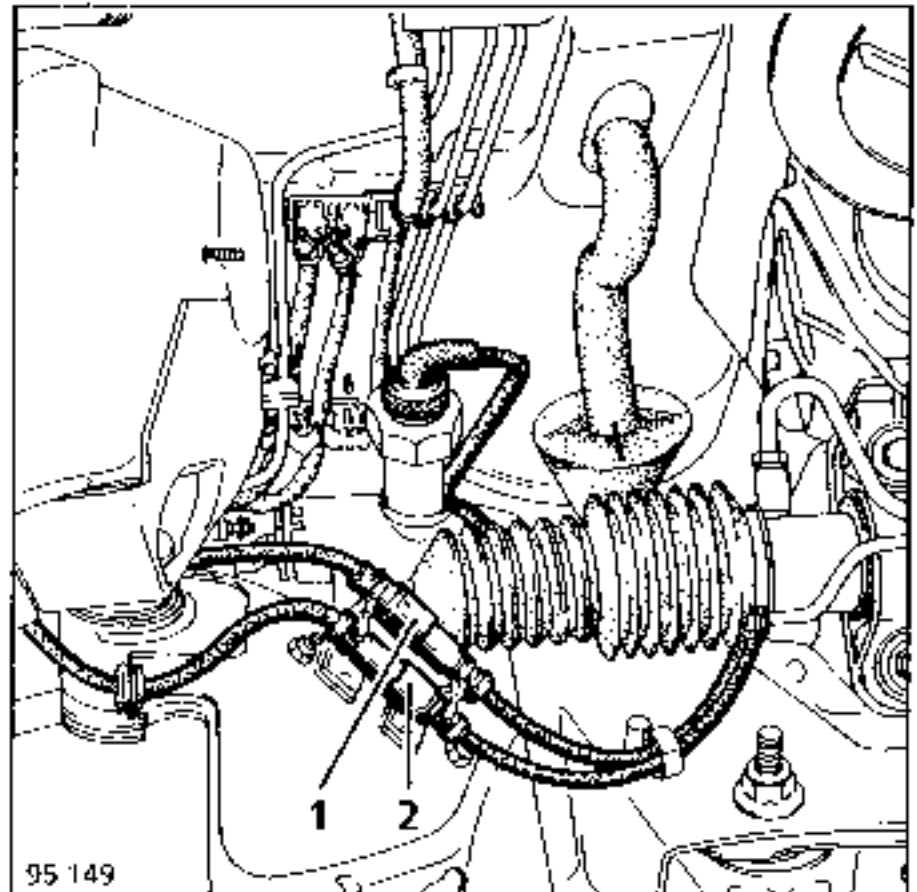
The rear sensors are radial and are not able to be adjusted.



The speed sensors are connected to the computer via connectors located:

For the front :

on the axle mounting, near the front mounting.

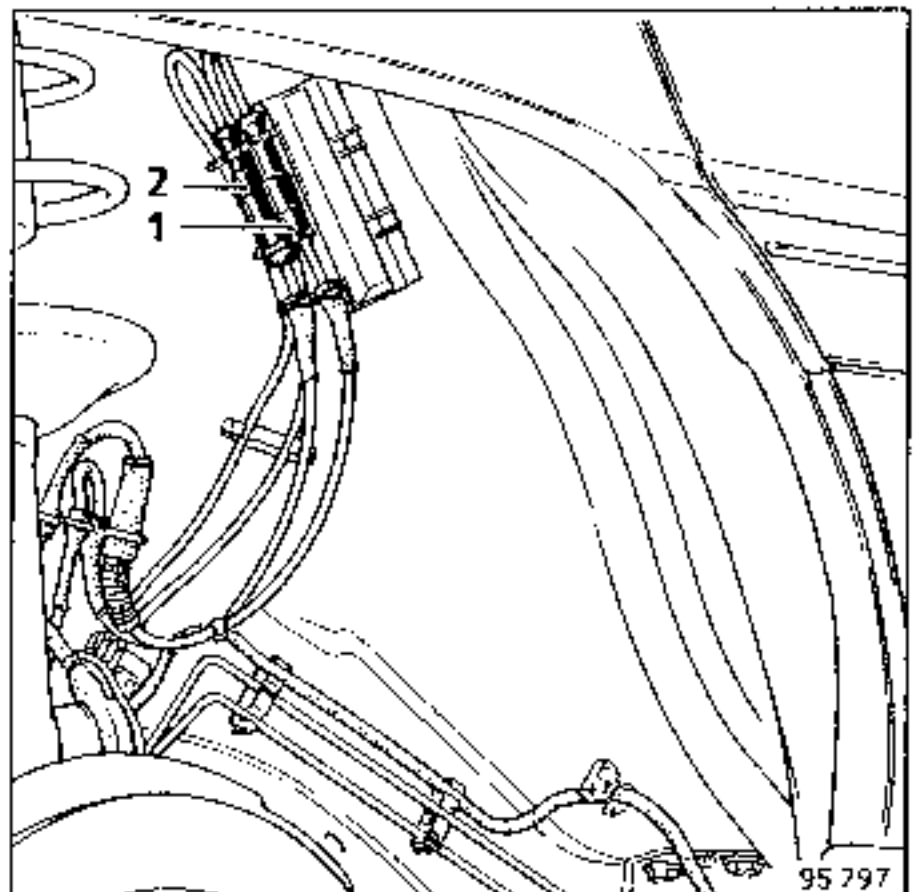


1 ABS

2 Variable shock absorbing

For the rear :

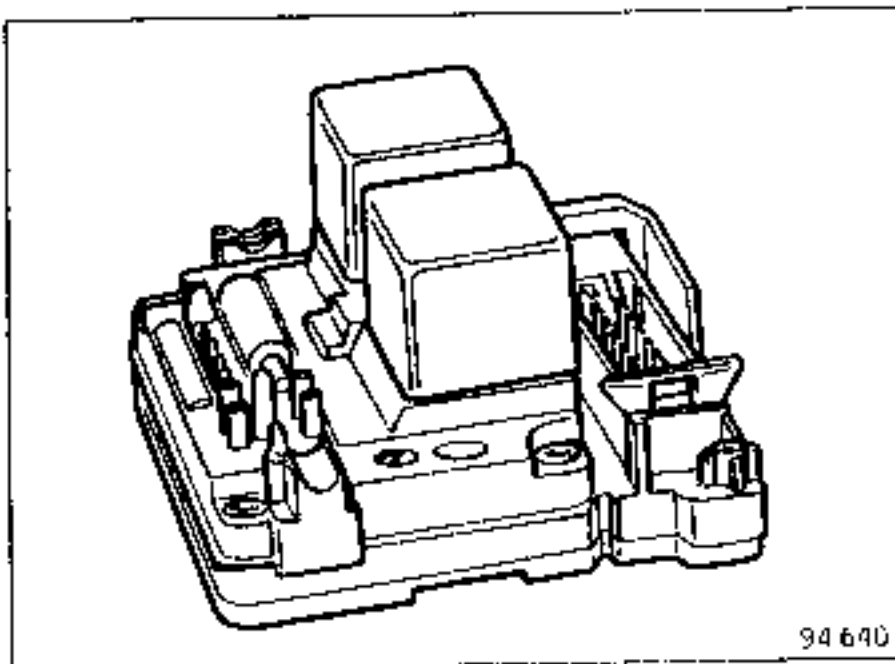
in a case in the wheel arch.



**NOTE :** the sensor head is identical.

**LOCATION AND INSTALLATION ( cont)****• THE COMPUTER**

The integrated computer is mounted on the pump motor for the hydraulic assembly.



The computer contains two microprocessors which both carry out the same function, in order to ensure maximum safety.

As soon as a wheel starts to lock, the solenoid valves are energised and the pump motor is activated by the two relays on the top of the computer.

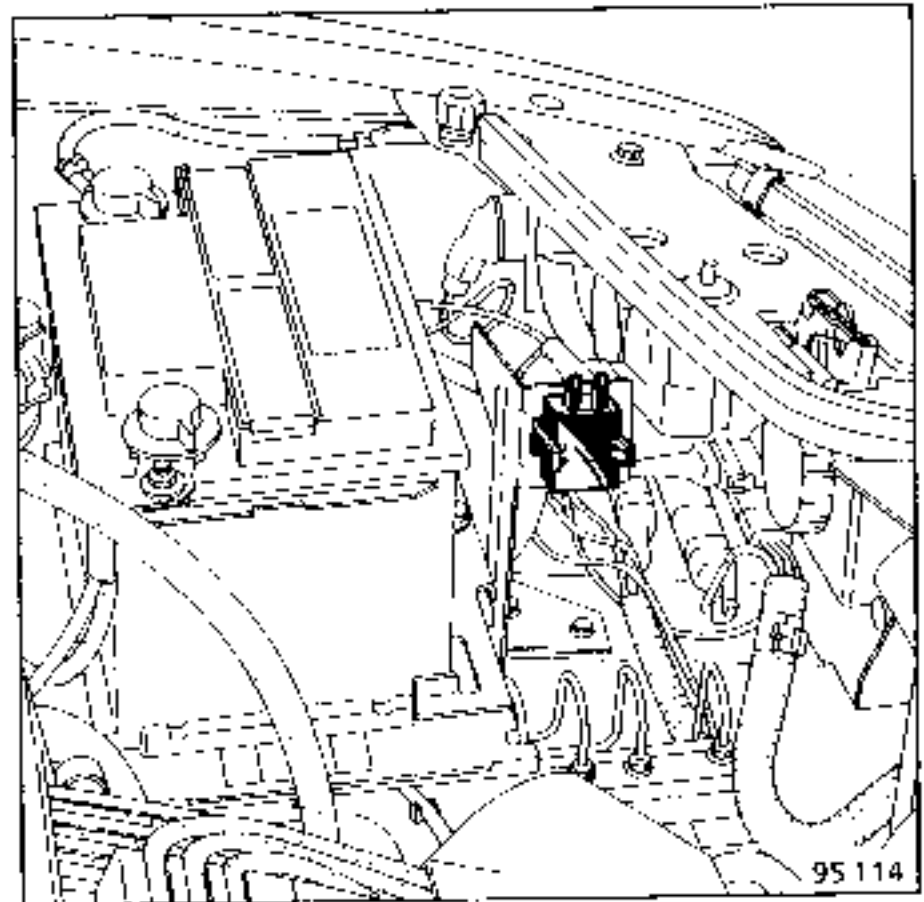
The inclusion of the electronic function into the hydraulic assembly and the reduction in weight have reduced the amount of wiring harness and the number of connectors required (giving greater reliability) and have made the unit easier to fit on the vehicle.

The computer carries out these main functions :

- signal processing,
- regulation,
- monitoring,
- fault finding.

It analyses the information from the wheel sensors and controls the regulating solenoid valves depending on this information.

**NOTE :** the diagnostic socket is located in the engine compartment, behind the front left hand headlight lens unit.



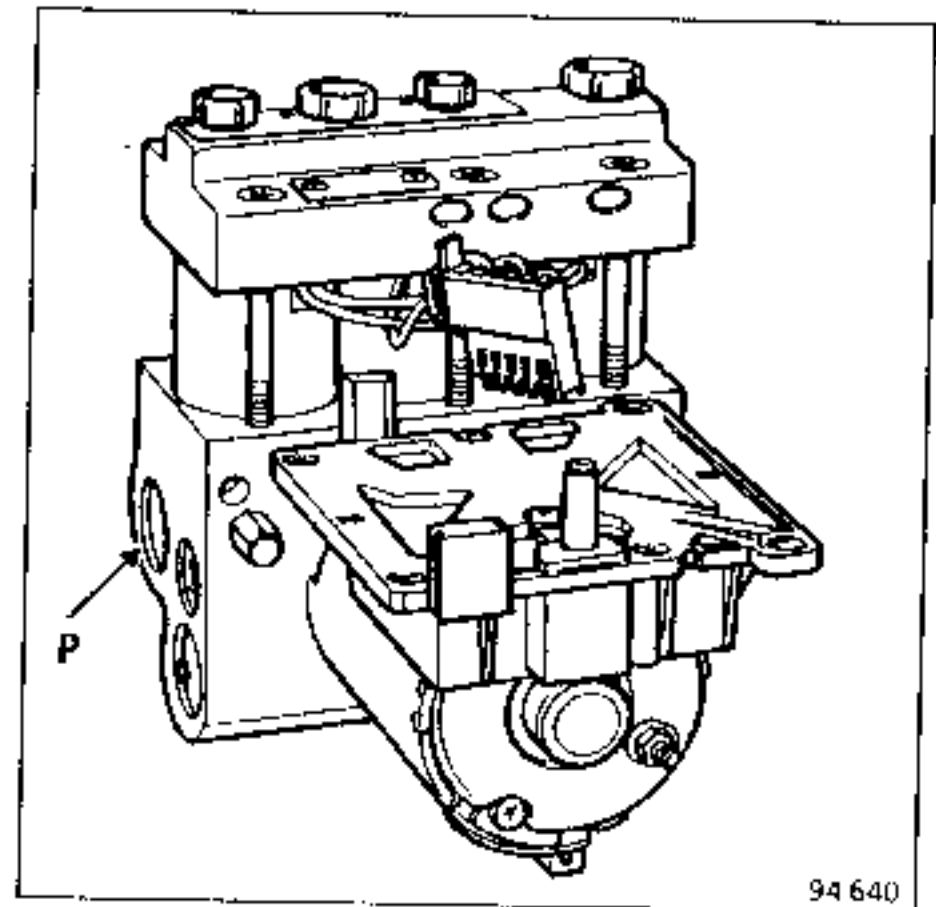
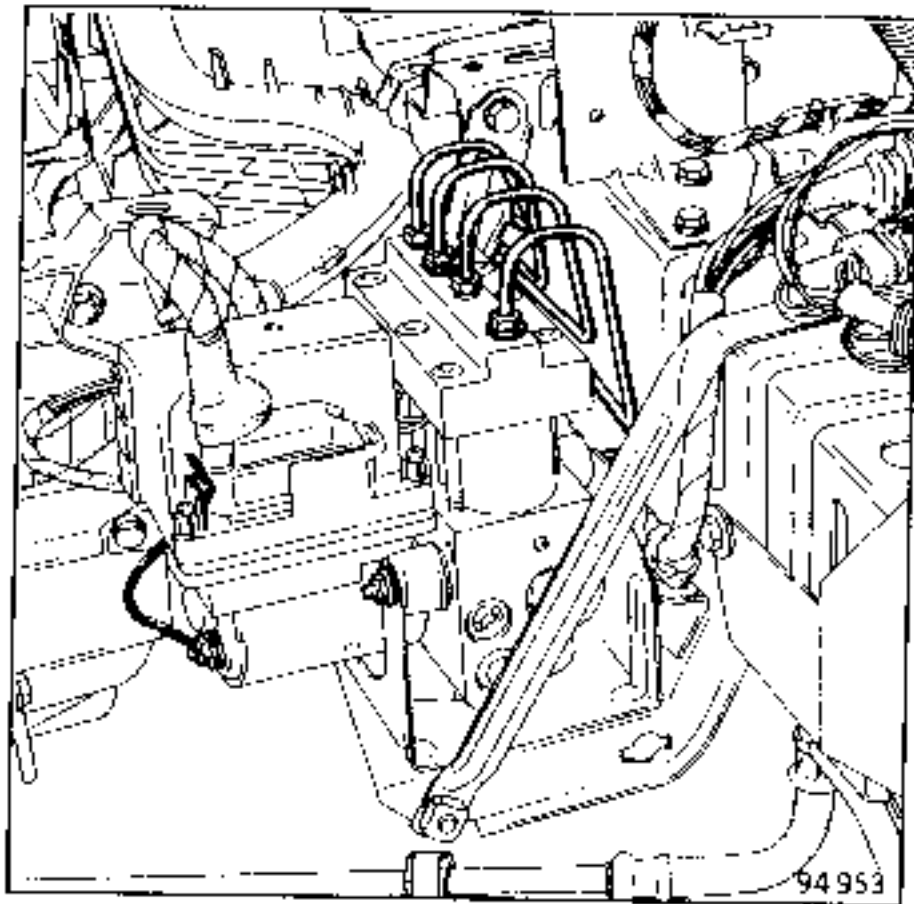
This is used for connecting the XR25 test case for microprocessor systems.

Communication between the XR25 fault finding equipment and the computer allows :

- the computer to be identified.
- memorised faults to be read.
- system parameters to be read (wheel speed, voltage )
- the solenoid valves to be controlled, as well as the pump motor and the warning light.
- the fault memory to be erased.

**LOCATION AND INSTALLATION (cont)**

The hydraulic assembly and integral computer are located in the engine compartment, on the left hand side.

**OPERATION****• The solenoid valves**

The hydraulic pressure delivered by the two master cylinder circuits during braking passes via three solenoid valves and a piston plunger, to ensure separate regulation of the front left hand, front right hand and rear channels.

The three way solenoid valves operate in the conventional manner ; transmitting a variable current to the coil depending on the regulation phase, allowing :

- the master and slave cylinders to be connected (normal braking),
- the master and slave cylinders to be separated, preventing the increase of pressure in the slave cylinder,
- the slave cylinder to be connected to a delivery pump, dropping the pressure in the slave cylinder and "unbraking" the wheel

This unit comprises :

- three regulating solenoid valves,
- a piston plunger (P) for ensuring hydraulic separation of the rear brakes,
- a pump driven by an electric motor (special note: reduced power - limitation of max. pressure). The pump supplies fluid during the "elimination" phase to the master cylinder to create the required pressure drop ; this causes the pedal movement which is characteristic of the function

## OPERATION (cont)

- **Rear circuits (Special notes)**

Rear wheel braking is according to the "select low" principle, meaning that the two rear channels operate at the same pressure ; regulation is applied identically to both wheels, based on the wheel with the poorest adhesion.

- **Hydraulic separation**

The vehicle has an X type braking circuit, so the rear wheel brakes are separated by a mechanical device known as the piston plunger (P).

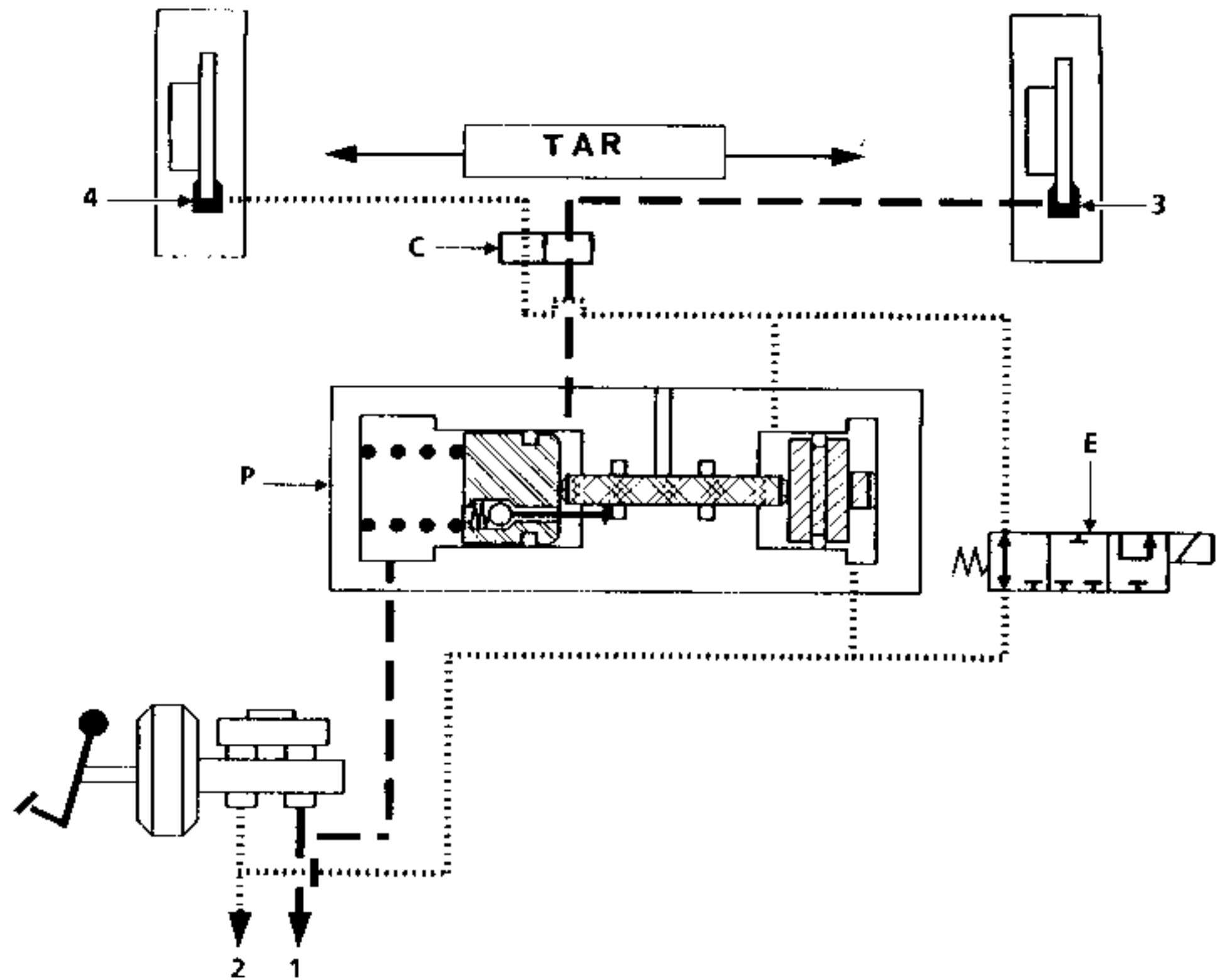
Together with the rear regulating solenoid valve (E), this piston plunger ensures equivalent regulation is applied to the other wheel. The slave cylinder pressures are identical for similar friction values.

### **Precaution :**

The sequence of operations for bleeding the brakes must be observed

If this sequence is not respected, air may leak into the piston which lengthens pedal travel.

OPERATION (cont)



**C** Compensator  
**E** Rear regulating solenoid valve  
**P** Piston plunger  
**T.Ar.** Rear axle assembly

**1** FR LH slave cylinder (via solenoid valve)  
**2** FR RH slave cylinder (via solenoid valve)  
**3** RR LH slave cylinder  
**4** RR RH slave cylinder



## **OPERATION (cont)**

As soon as the vehicle speed reaches 3.7 mph (6 km/h), the ABS system self tests and is ready to activate. This device ensures that all components are in correct working order before starting off and continuously while on the road.

During braking, if the computer is informed by one or more wheel sensors of sharp deceleration and that this wheel or wheels are starting to lock, the corresponding regulating solenoid valves are controlled to prevent any increase in braking pressure and even to reduce braking pressure. This action is continued until the wheel or wheels return to optimal deceleration.

As soon as this deceleration is obtained, the converse phase begins. Pressure is restored by connecting the master cylinder and slave cylinder/s in question.

During braking with ABS regulation, this cycle may be repeated from 4 to 10 times a second. The system reacts in only a few tenths of a second.

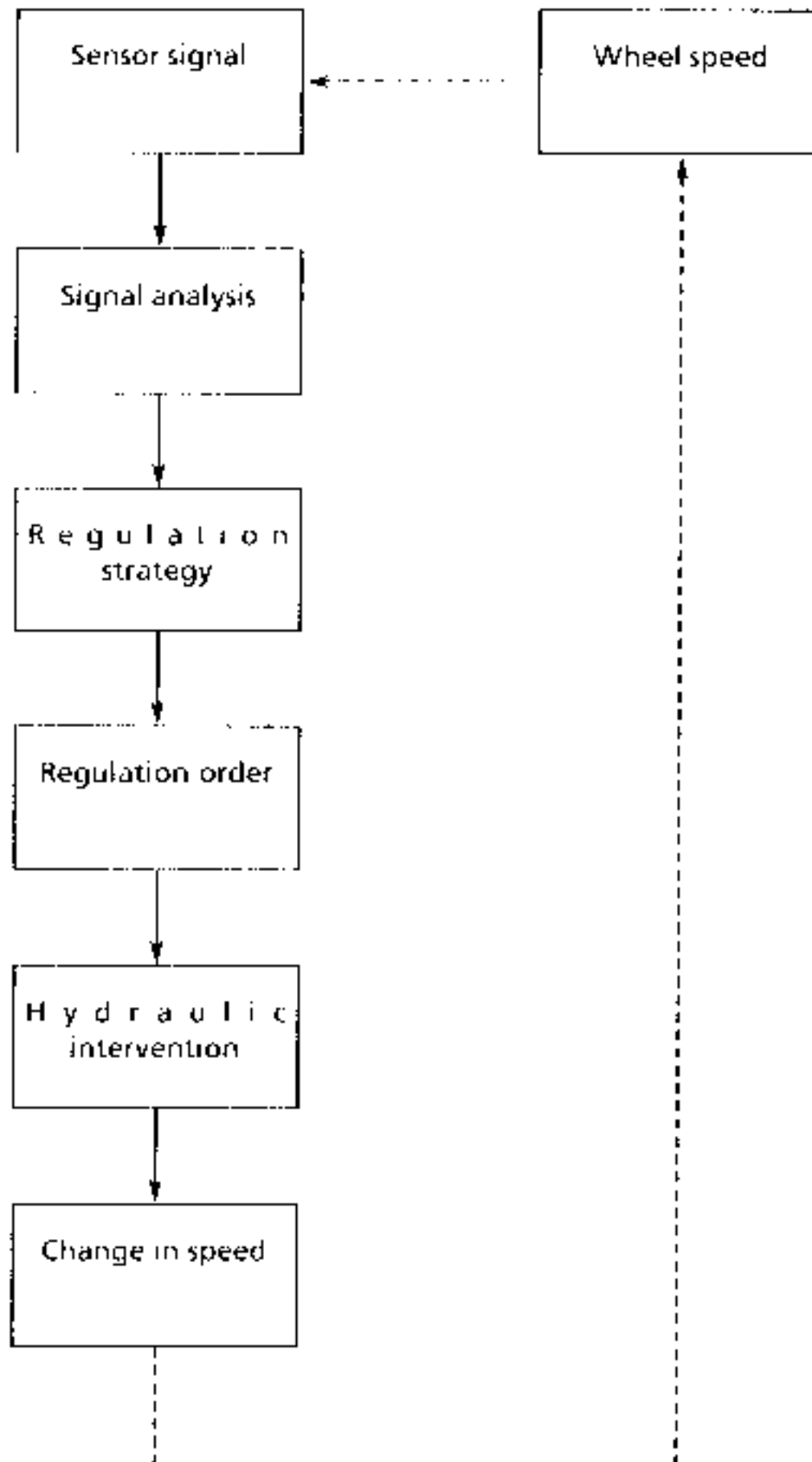
Each time the system operates, the brake pedal moves slightly, and the driver may hear the characteristic noise caused by the change in pressure between the hydraulic pump and the regulating solenoid valves, and the tyres may squeal.

### **Special note :**

When braking on uneven/slippery ground, the vehicle may swerve to the side with higher adherence. The driver must therefore correct this movement at the steering wheel. To avoid this, these vehicles are fitted with a system to delay swerving torque. In this case, the braking pressure at the wheel with high adherence is increased to the maximum. This reduces the steering wheel correction required to hold course and allows the driver to control the situation.

## REGULATION

### OPERATING PRINCIPLE



## MONITORING

### • Safety - monitoring

When the ignition is switched on the ABS system carries out a certain number of tests, which are also performed when the vehicle starts moving, under the following conditions :

#### 1) Test after the ignition has been switched on or initialisation test :

During this phase, the following points are tested :

- internal microprocessor tests
- connection tests (voltage supply, solenoid valve relays (de-connection) and solenoid valve connections)
- fault memory control system operation.

The ABS warning light extinguishes after two seconds if all these test are correct.

#### 2) Tests carried out when the vehicle starts moving :

- solenoid valve pressure drop function test (the solenoid valves are operated for a few ms\*).
- in this phase the system tests to ensure that the solenoid valves all operate identically and that their electrical resistance is within the permitted tolerance range.
- test for pump motor. in this phase the system tests to ensure that the return information from the pump motor is correct after operating the motor for a few ms.
- checking the speed sensor signals (monitoring after starting moving, the ABS system is disconnected at 7.5 mph (12 km/h) if a problem is detected, but monitoring will continue).

These tests are completed before reaching 9 mph (15 km/h).

(\*) **Note:** these test may cause slight brake pedal movement which is in no way to be considered as a fault.

#### 3) Tests carried out after driving :

These tests are performed after the vehicle starts moving , when the vehicle speed exceeds 3.5 mph (6 km/h), when the last time the vehicle started moving, it exceeded 12 mph (20 km/h).

- testing solenoid valve current values,
- testing pump motor,
- testing speed sensor signals (the ABS system is disconnected at 12 mph (20 km/h) if a problem is detected, but monitoring will continue)

These tests are completed before reaching 15 mph (25 km/h).

**MONITORING (cont)****4) Tests during driving**

The following tests are carried out in sequence :

- monitoring of the return info from the solenoid valve relays,
- monitoring of the pump motor,
- monitoring of the internal data memory,
- monitoring of the voltage (monitoring of the solenoid valve relay and sub-voltage),
- comparison of calculated speed values,
- comparison of calculated solenoid valve signals,
- monitoring of stop switch line (line cut).

**5) Additional tests during regulation**

Monitoring of the pump motor information return line. This function checks that the motor has actually operated by checking the voltage it generates while it is stopping.

**FAULTS**

A fault detected by the monitoring system either cuts the circuit immediately or after the ABS system has been regulated.

The driver is made aware of this by the **ABS warning light**.

List of components which could cause the warning light to be illuminated and de-activate the ABS system:

- **Sensor faults** (condition : speed other than 0)

***Front sensors during regulation :***

- maintains ABS function on other wheels until vehicle stops,
- increases the pressure to master cylinder pressure on the wheel in question,
- illuminates the warning light when starting off again (condition : vehicle speed > 12 mph (20 km/h)).

***Rear sensors during regulation :***

- maintains ABS function on front axle until vehicle stops,
- immediate drop in pressure for rear wheels and rear wheel pressure kept at 0,
- illuminates the warning light when starting off again (condition : vehicle speed > 12 mph (20 km/h)).

- **Battery voltage < 9.4 volts** (the warning light extinguishes after normal voltage has been restored and the ABS system has reset).
- **Faulty computer.**
- **Faulty rear or front solenoid valves.**
- **Relay.**
- **Pump motor.**
- **Stop switch.**
- **No target.**

## MONITORING (cont)

If there is a fault, after the ignition has been turned off, the computer memorises the fault.

This fault memory may be consulted at any time by using the XR25 and the correct cassette. Turning the ignition on and off again may alter the bar graphs. To avoid confusion, carry out a road test with the vehicle displaying the fault (ABS warning light illuminated permanently or temporarily) in order to read the diagnostic signals without turning the ignition off

The fault storage function operates as follows :

A maximum of three faults may be stored :

Type of fault :

**a) Permanent fault :**

A fault is declared permanent when it appears (ABS warning light illuminated) (seen on XR25 by permanent illumination of a bar graph other than 1 and 4).

**b) Temporary fault :**

A fault is declared temporary after it has been stored and has then disappeared (seen on XR25 by a bar graph flashing).

Operation:

A counter linked to each memory distinguishes a permanent fault from a temporary one.

When a fault appears, the counter is positioned on 20. If the fault is then recognised as temporary the counter decreases each time the ignition is switched on. This also happens if the fault no longer appears. The fault is automatically erased from the memory when the ignition has been switched on 20 times.

There is no fault hierarchy but when a permanent fault appears, it takes the place of the temporary fault with the lowest counter figure if all three memory places are filled.

If several faults appear at the same time, only one is stored. After this fault has been repaired, it is therefore essential that the vehicle is retested after a rolling road test.

Conditions for entering diagnostic mode:

- If no fault present → speed < 6 mph (10 km/h)
- If faults present → possible whatever the speed

The XR25 must be used for repairing the ABS system, whatever the origin of the faults

Communication between the computer and the XR25 allows :

- the computer to be identified.
- memorised faults to be read.
- system parameters to be read (wheel speed, voltage...).
- the solenoid valves to be controlled, as well as the pump motor and the ABS warning light.
- the fault memory to be erased.

#### Initialising the dialogue :

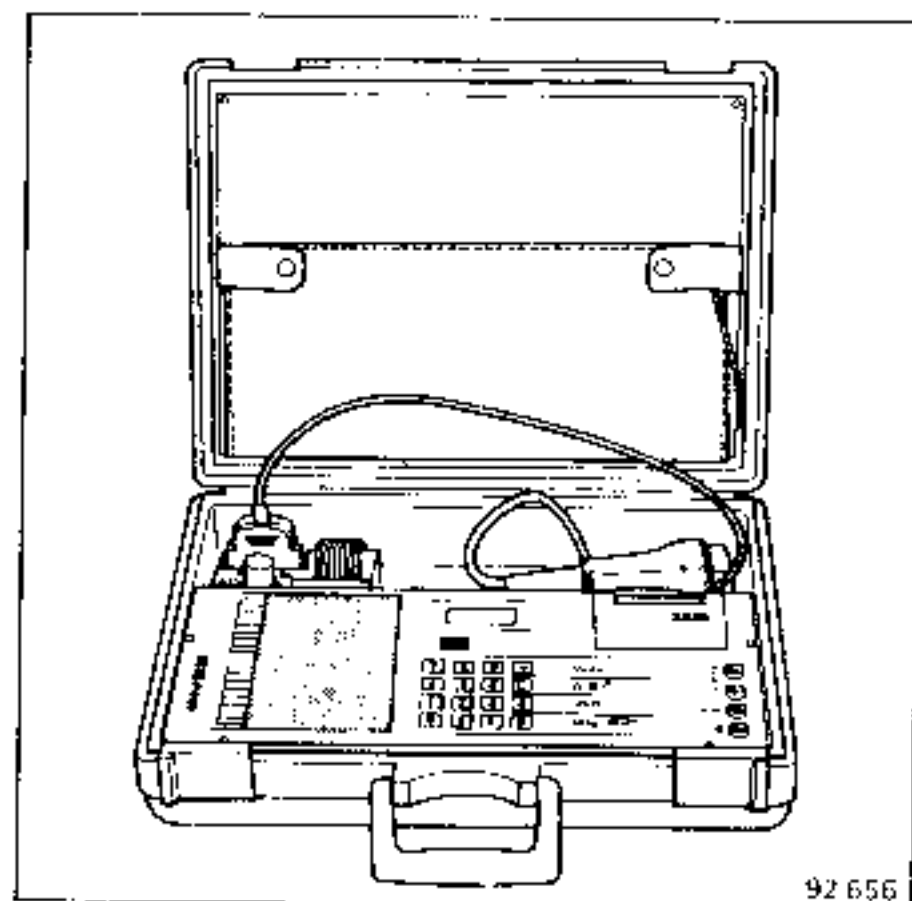
To be carried out after connecting the XR25 after a road test and without switching the ignition off after returning from the road test :

- Place the selector on **S8**.
- Contact the computer by :

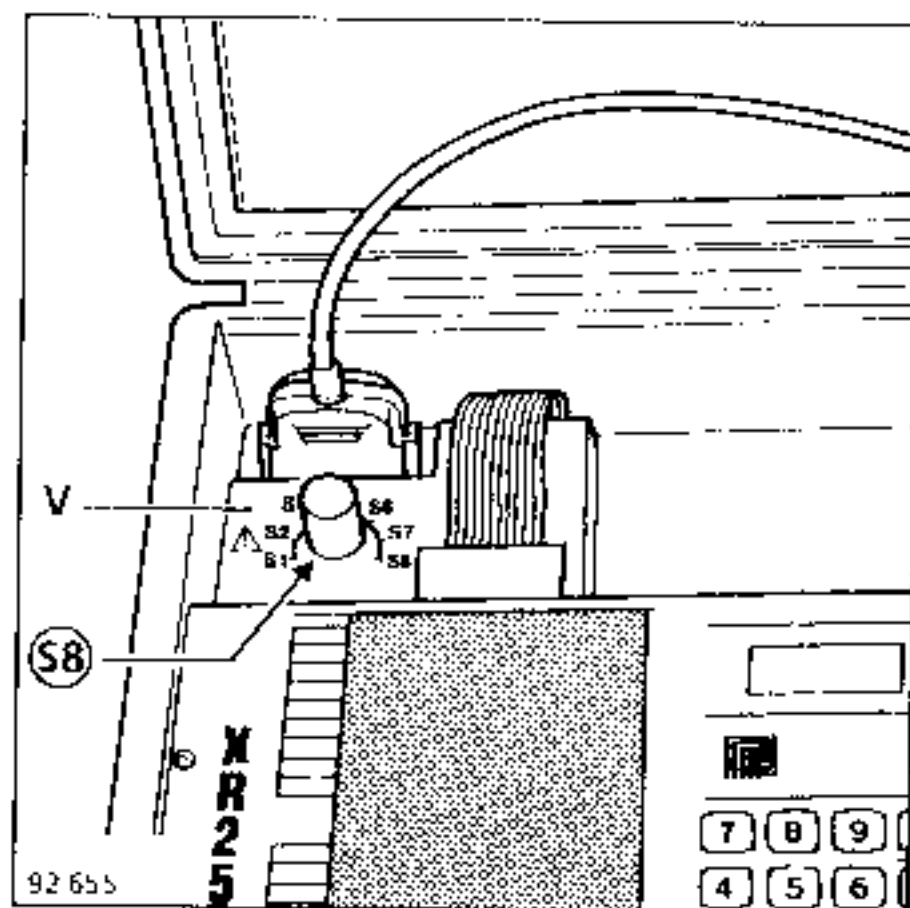
**D 1 1**

transmits info on both lines at the same time (K and L)

After initialising, the ABS warning light should illuminate to show the ABS system is in diagnostic mode. (The ABS warning light will be illuminated before entering the diagnostic mode if there is a permanent fault).



92 656



92 655

**NOTE :** Light "V" must be extinguished. If it is illuminated, disconnect and reconnect the diagnostic socket, if it remains illuminated, check the wiring of the XR25 and the battery voltage.

N° 11		FICHE 90 C		2XX.5	
1	CODE PRESENT			<input type="checkbox"/>	
2	COMPUTER FAULT			<input type="checkbox"/>	
3	FEED FAULT			<input type="checkbox"/>	
4	<input type="checkbox"/>	PF ← STOP CIRCUIT → PL	<input type="checkbox"/>	<input type="checkbox"/>	
5	PUMP MOTOR CIRCUIT FAULT			<input type="checkbox"/>	
6	SOLENOID VALVE RELAY CIRCUIT			<input type="checkbox"/>	
7	STOP SWITCH FAULT			<input type="checkbox"/>	
8	SOLENOID VALVE CONTROLLED FEEDS		FRLH	<input type="checkbox"/>	
9			FRRH	<input type="checkbox"/>	
10			RR	<input type="checkbox"/>	
<b>ABS BOSCH 4 x 2</b> CODE : D11 (S8) ERASE MEMORY : G0** END FAULT FINDING : G13*				<b>COMMAND MODES</b>  G3* SV FLH G4* SV FRH G5* SV RR G7* ABS WARN LIGHT G8* MOTOR/ P U M P RELAY	
11	LH SV	SOLENOID VALVE CIRCUIT FAULT			
12	RH SV				
13	RR SV	<input type="checkbox"/>			
14					
15					
16					
17	FLH	FRH	WHEEL SENSOR CIRCUIT (ROAD TEST)		
18	RLH	RRH			
19	TARGET INCORRECT			<input type="checkbox"/>	
20	MEMORY XR 25 (0)			<input type="checkbox"/>	

Analysis of system operation using XR25 and cassette N° 10 after a road test where the warning light illuminates

After the road test, without switching off the ignition, connect the XR25.

Enter code **D 1 1**

Position the ISO selector on 58.

The central display shows :

**ABS**

(1 second) then

**2 XX 5**

2 Bosch make  
XX Computer number  
5 ABS product tested

or

**— — — —**

Indicates contact has not been made

If the initialisation is correct :

- the ABS warning light on the instrument panel should be illuminated regardless of its previous state : illuminated(permanent fault) or extinguished (no permanent fault),

- the central display should show the following

**2 XX 5**

- ABS NOT FAULTY**  
(2 bar graphs illuminated)

Bar graph n° 1 right : code present

Bar graph n° 4 right: stop circuit no load

- ABS FAULTY**

IMPORTANT DEFINITIONS :

**Temporary fault :** (or intermittent fault) is a fault which occurs (illuminating the warning light on the instrument panel) and disappears by itself at any moment (after the ignition has been switched off and on again). this type of fault is shown by a flashing bar graph.

**Permanent fault :** is a fault which is present during diagnosis with the XR25. This type of fault is shown by a permanently illuminated bar graph.

**IMPORTANT :** if **D 1 1** is entered when the computer is in the test sequence, it may take up to 40 seconds for fault finding information to be displayed. To reduce this delay, enter : **G13\*** (beep), then **D 1 1**



## SIGNIFICATION OF THE BAR GRAPHS

The following fault finding information is only to be used after a road test where the ABS warning light illuminated. The XR25 should only be connected after the road test and without switching the ignition off.

**CODE PRESENT ; ILLUMINATED: CORRECT** (extinguishes if using key G).

If extinguished after entering D11, check:

- that the ISO interface selector is in the correct position : S8,
- that the correct XR25 cassette is being used and the correct code has been entered (D11),
- that battery voltage  $> 9,4 \pm 0,4$  volts,
- that the ABS fuses 10A and 40A on the accessory fuse board are not blown,
- that the computer is correct for the vehicle type,
- that connections R179 (FLH wing/ABS) and R150 (passenger compartment/FLH wing) are correctly connected (black connectors),
- that there is continuity and insulation of the diagnostic socket / computer lines :
  - . track 10 for diagnostic socket and 12 for computer,
  - . track 11 for diagnostic socket and 15 for computer (via track D5 of R150),
- that track 2 for the diagnostic socket is earthed ; track 6 to + battery,
- that the computer is correctly fed : earth on track 3 of 4 track connector , + APC on 1 and + AVC on 2 on the same connector.

If the fault persists after these tests, replace the computer.

**COMPUTER FAULT**

FLASHING : Erase the memory (GO\*\*) and confirm the fault.

ILLUMINATED : Check:

- 4 and 15 track connectors on the ABS board,
  - the ABS electronic earth (M19)
- Replace the computer.

**FEED FAULT**

Check:

- connection of 4 and 15 track connectors on ABS board,
- presence of earth on track 3 of 4 track connector,
- presence of + AVC between terminals 3 and 2 of 4 track connector,
- presence of + APC between terminals 3 and 1 of 4 track connector.

**STOP CIRCUIT**

LH SIDE ILLUMINATED : CORRECT IF PEDAL IS DEPRESSED

RH SIDE ILLUMINATED: CORRECT IF PEDAL IS NOT DEPRESSED

By pressing the brake pedal, check bar graph 4 illuminates on the left and right hand sides alternately

**IF INCORRECT:**

Check the stop lights illuminate when the brake pedal is pressed,

Check the condition and adjustment of the stop switch as well as the 15A lights fuse.

Check connection R181 (pedal support/passenger compartment), the presence of +APC on track C3 + continuity between this track and track 1 of stop switch

BAR GRAPH 4 ILLUMINATED ON LEFT HAND PERMANENTLY:

The stop lights are permanently illuminated.

Adjust the stop switch or replace if necessary

BAR GRAPH 4 EXTINGUISHED ON RIGHT HAND SIDE WITH NO LOAD + BAR GRAPHS 7, 8, 9 and 10 ILLUMINATED:

When the brake pedal is pressed, does bar graph 4 illuminate on the left hand side ?

**YES** : The stop lights are not illuminating :

- both bulbs are blown,
- there is a bad earth on the stop light bulbs,
- the connection is cut between the stop info shunt box and the stop lights.

**NO** : The stop lights are operating:

- the connection is cut between track 3 on the computer and track A2 on the stop info shunt box

**PUMP MOTOR CIRCUIT FAULT**

BAR GRAPHS 5 + 8/9 AND 10 ILLUMINATED

Check the pump motor earth.

Remove the hydraulic assembly cover.

Check tightness of Torx bolt marked + and its + 12 volts feed (use function G8\* to feed the motor and test).

**IF INCORRECT**, replace pump motor relay.

**IF CORRECT**, remove computer board and feed pump motor direct. (only terminal on board).

If the motor does not operate, replace hydraulic assembly

If the motor operates, replace the computer

# **SOLENOID VALVE RELAY CIRCUIT**

BAR GRAPH 6 ILLUMINATED ONLY OR BAR GRAPHS 6 + 8/9 AND 10 ILLUMINATED

Replace relay  
If the fault persists, replace the computer.

# **STOP SWITCH FAULT**

When the brake pedal is pressed, does bar graph 4 illuminate on the left hand side ?

**YES** : The stop lights are not illuminating :

- both bulbs are blown,
- there is a bad earth on the stop light bulbs,
- the connection is cut between the stop info shunt box and the stop lights.

**NO** : The stop lights are operating:

- the connection is cut between track 3 on the computer and track A2 on the stop info shunt box.

**PERMANENT CONTROL SOLENOID VALVES** (These bar graphs indicate a state, not a fault)

BAR GRAPH 8	FLH SOLENOID VALVE
BAR GRAPH 9	FRH SOLENOID VALVE
BAR GRAPH 10	RR SOLENOID VALVE

Bar graphs 8 - 9 - 10 never illuminate by themselves under the following test conditions :

- Bar graphs 8/9 and 10 illuminated with bar graph 5 :  
→ test bar graph 5.
- Bar graphs 8/9 and 10 illuminated with bar graph 6 :  
→ test bar graph 6.
- Bar graphs 8/9 and 10 illuminated with bar graph 7 :  
→ test bar graph 7
- Bar graphs 8/9 and 10 illuminated with bar graph 11 or 12 or 13 :  
→ test bar graph 11 or 12 or 13
- Bar graphs 8/9 and 10 illuminated with bar graph 17 or 18 :  
→ test bar graph 17 or 18

## CIRCUIT FAULTS

BAR GRAPH 11	FLH SOLENOID VALVE (tracks 1 and 2 on 6 track connector)
BAR GRAPH 12	FRH SOLENOID VALVE (tracks 3 and 4 on 6 track connector)
BAR GRAPH 13	RR SOLENOID VALVE (tracks 5 and 6 on 6 track connector)

11  
12  
13

Bar graph 11 or 12 or 13 + bar graphs 8, 9 and 10 :

Check connection of 6 track connector on hydraulic assembly and 15 track connector on computer

Check resistance of coil on faulty solenoid valve. Correct value : about 1  $\Omega$ .

**IF INCORRECT**, replace hydraulic assembly.

**IF CORRECT**, replace computer

17

FLH FRH

## WHEEL SENSOR CIRCUIT

18

RLH RRH

Check sensor connector for faulty sensor.  
If connector is OK, check sensor resistance at 20°C.  
If value is not 1K $\Omega$   $\pm$  0,5, replace sensor .

Check continuities between the faulty sensor and computer :

FLH sensor	: track 2 sensor / 7 computer track 1 sensor / 13 computer
FRH sensor	: track 2 sensor / 5 computer track 1 sensor / 10 computer
RRH sensor	: track 1 sensor / 6 computer track 2 sensor / 14 computer
RLH sensor	: track 2 sensor / 14 computer track 1 sensor / 4 computer

Check:

- the sensor mounting (torque tighten),
- the sensor/target gap for one wheel rotation :
 

FR wheel	: 0,3 mm < gap < 1,3 mm,
RR wheel	: 0,6 mm < gap < 1,6 mm.

After repairs, check sensor functions using #01, #02, #03 and #04 on XR25 :

#01 : FRH wheel speed

#02 : FLH wheel speed

#03 : RRH wheel speed

#04 : RLH wheel speed

BAR GRAPH 17 or 18 FLASHING

Check:

- the sensor mounting,
- the various connections

Check the wiring path and mountings

TARGET INCORRECT

Check gaps :

FR  $0,3 \text{ mm} < \text{gap} < 1,3 \text{ mm}$

RR  $0,6 \text{ mm} < \text{gap} < 1,6 \text{ mm}$

Check target conformity (condition and number of teeth).

Present when using XR25 memory functions.

The XR25 memory function freezes and stores the values of the different parameters which can be read using the # key (followed by two figures) so that they can be read off at a later date.

Once the communication between XR25 and the computer has been established, to obtain this function enter **0** at the required moment.

This memory may be erased by entering **0 1 1**

**BAR GRAPH DISPLAY ON XR25 AFTER ROAD TEST + IGNITION HAS BEEN TURNED OFF AND ON AGAIN**

Bar graphs 1, 2, 3 and 4	: same function as without ignition cut
Bar graph 5 flashing	: as for bar graphs 5 + 8/9 and 10 without ignition cut (ABS warning light extinguished)
Bar graph 6 only or bar graphs 6 + 8/9 and 10	: as for bar graphs 6 + 8/9 and 10 without ignition cut (ABS warning light illuminated)
Bar graph 7	: same function as without ignition cut
Bar graph 8 + 9 and 10	: shows ABS system is not operating and a road test is required to locate faulty component
Bar graph 11 or 12 or 13 flashing on right or left hand sides	: as for bar graph 8/9 and 10 + 11 or 12 or 13 (ABS warning light extinguished)
Bar graph 17 or 18 flashing on right or left hand sides	: as for bar graphs 17 or 18 + 8/9 and 10 (BS warning light extinguished)
Bar graph 19 flashing	: as for bar graph 19 without ignition cut

**AFTER REPLACING THE HYDRAULIC UNIT**

Test the system using the "G" function on XR25 :

- G3\* FLH SOLENOID VALVE
- G4\* FRH SOLENOID VALVE
- G5\* RR SOLENOID VALVE
- G7\* ABS WARNING LIGHT
- G8\* PUMP MOTOR RELAY

**AFTER ALL OPERATIONS ON THE ABS SYSTEM**

Carry out:


- system reinitialisation (turn ignition off then on again),
- a road test then test using XR25,
- erase the computer memory (G0\*\*)

Validate the end of the test : G13\*


## ADDITIONAL TESTS

After initialising the system enter :

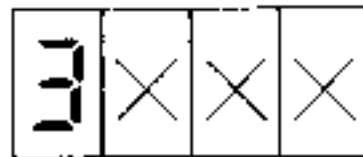
# 0 1 → FRH wheel speed (in km/h)



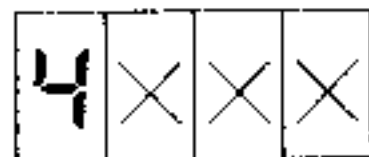
# 0 2 → FLH wheel speed



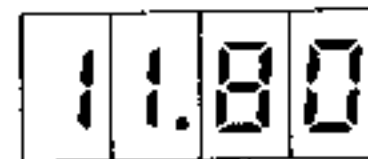
# 0 3 → RRH wheel speed



# 0 4 → RLH wheel speed



# 0 6 → Battery voltage (in volts) - example :



These tests allow :

- (1) the wheel speeds to be displayed and sensor allocation to be checked (testing target and sensor pair),
- (2) the solenoid valve feed voltage to be tested before the solenoid valve relay.

**ATTENTION :** when communication between the computer and XR25 is established, the ABS function is no longer ensured

# FAULT FINDING

Hydraulic test : key G (command mode allowing solenoid valves to be energised).

Lift the vehicle to ensure the wheels may be easily rotated and check they turn freely



Keep the brake pedal depressed to stop the wheel being tested from turning , when turned by hand (do not press the brake pedal too hard, to ensure the system is at the limit of unlocking )

Enter 

D	1	1
---	---	---

Then 

G	3	*
---	---	---

The central display shows:

	E	U	
--	---	---	--

0		93	
---	--	----	--

1		93	
---	--	----	--

0		93	
---	--	----	--

	F	1	n
--	---	---	---

	L	E	S
--	---	---	---

Temporary unlocking should be shown (5 times) for the FLH wheel

Ditto for

G	4	*
---	---	---

FRH wheel solenoid valve

and

G	5	*
---	---	---

Solenoid valves for rear LH and RH wheels



Testing ABS warning light

Enter

**G** **7** **\***



888

the warning light  
should extinguish for  
2 seconds

F, n

EE5

Testing relay and pump motor operation

Enter

**G** **8** **\***



888

the motor should  
operate for 2 seconds

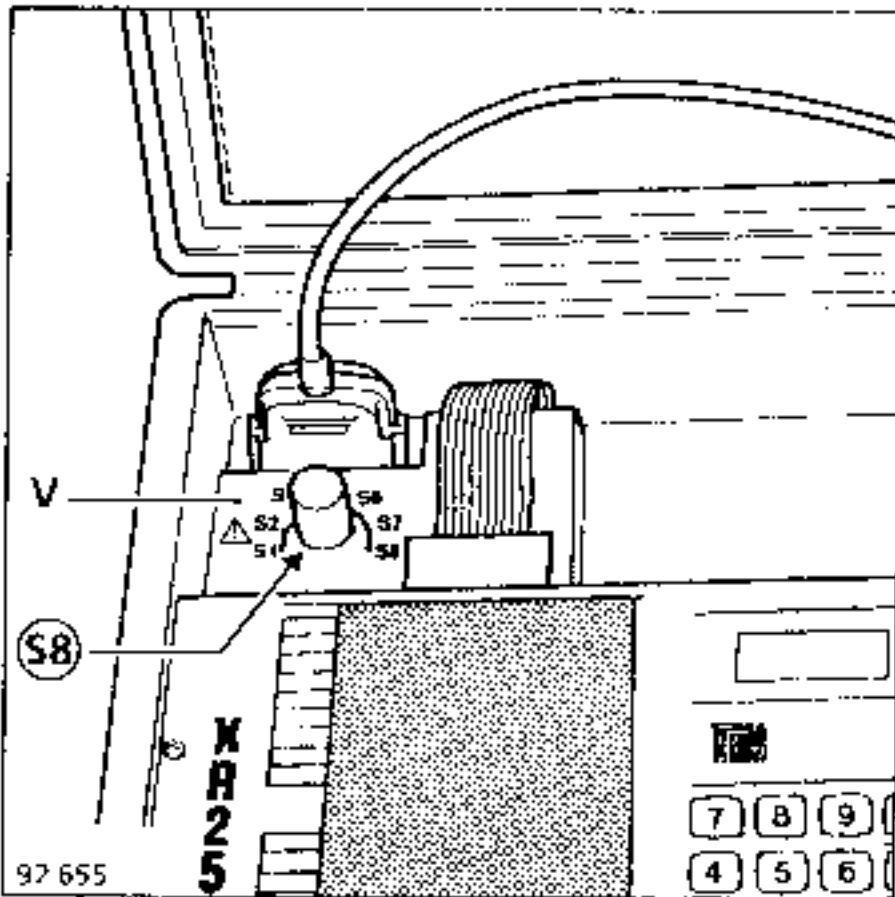
F, n

EE5

**ERASING THE MEMORY USING CASSETTE N° 10**

Connect the **XR25** to the vehicle's diagnostic socket.

Put the selector switch on **S8**



Turn the ignition on but do not start the engine

Enter :

**D 1 1**

The central display shows :

**A85**

Then:

**2 × × 5**

Enter :

**G 0 \***

The central display shows :

**EFF**

Validate the erase request with

**\***

The central display then shows :

**EE5**

The memory has been erased.

Validate the end of the test by entering :

**G 1 3 \***

The central display shows :

**Fin**

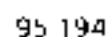
Then.

**EE5**

The ABS warning light should extinguish a moment later, :

(if there is no fault apparent)

- turn the ignition off,
- disconnect the XR25,
- refit the cover on the diagnostic socket



**KEY****Components:**

<b>118</b>	ABS computer
<b>125</b>	Hazard warning lights control
<b>150</b>	RRH wheel sensor
<b>151</b>	RLH wheel sensor
<b>152</b>	FRH wheel sensor
<b>153</b>	LH wheel sensor
<b>160</b>	Stop switch
<b>225</b>	Diagnostic socket
<b>247</b>	Instrument panel
<b>260</b>	Fuse box
<b>363</b>	Voice synthesiser
<b>435</b>	ABS solenoid valve block

**Connections:**

<b>R150</b>	Passenger compartment / FLH wing
<b>R179</b>	ABS/FLH wing
<b>R181</b>	Passenger compartment/pedal mounting

**Earth:**

<b>MH</b>	FLH wing earth
<b>ND</b>	ABS electronic earth

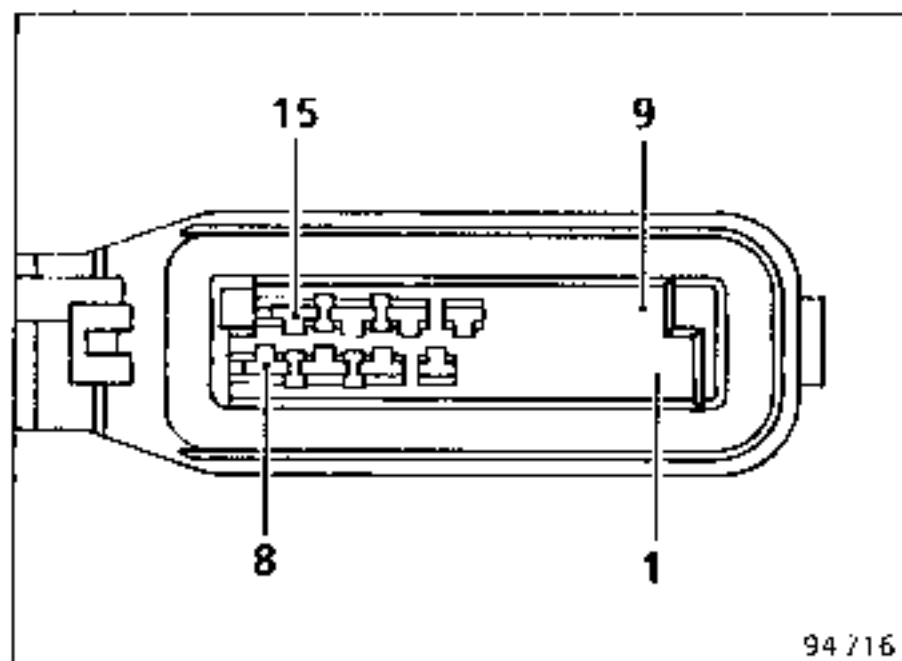
**Solenoid valve coil resistance :**approx. 1  $\Omega$ **Sensor resistance (at 20°C) :**approx. 1,13 k  $\Omega$ **NOTE:**

Never disconnect the computer when the circuit is under voltage.

Testing the earths and resistances should be carried out with the battery disconnected.

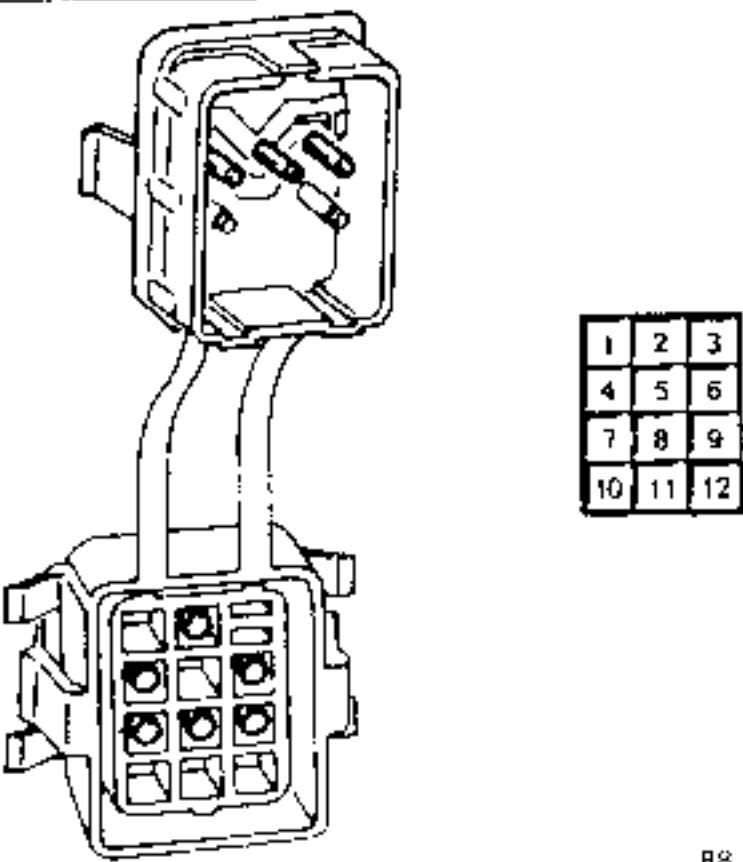
**Allocation of pins on computer 15 track connector**

<b>1</b>	ABS warning light
<b>2</b>	-
<b>3</b>	Stop switch
<b>4</b>	RLH sensor
<b>5</b>	FRH earth
<b>6</b>	RRH sensor
<b>7</b>	FLH earth
<b>8</b>	-
<b>9</b>	-
<b>10</b>	FRH sensor
<b>11</b>	-
<b>12</b>	Diagnostic line L
<b>13</b>	FLH sensor
<b>14</b>	RR earth
<b>15</b>	Diagnostic line K



94 716

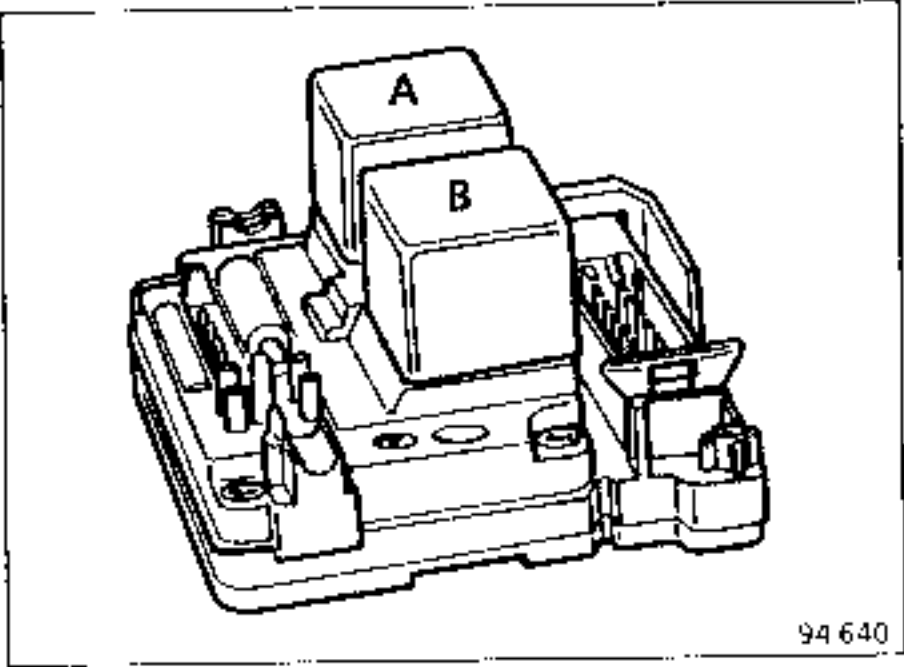
Allocation of diagnostic socket terminals



B8 113

- 1 Diagnostic link A.T. A4
- 2 Earth
- 3 Mechanical foolproofing
- 4 Not used
- 5 Not used
- 6 + 12 V after ignition
- 7 Not used
- 8 To electronic fault warning light
- 9 Injection fault finding information
- 10 Diagnostic line "L" (ABS)
- 11 Diagnostic line "K" (ABS)

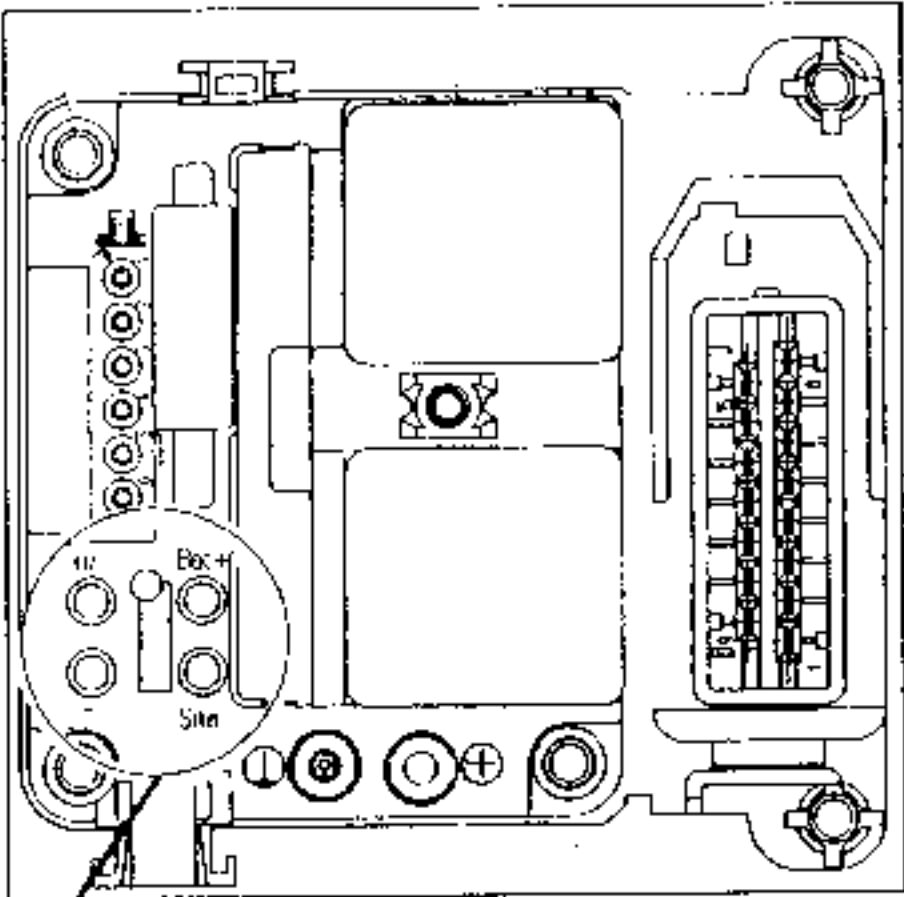
Relay positions on computer board



94 640

- A Solenoid valve relay
- B Motor/pump relay

4 track connector on computer board



- 1 + after ignition (UZ)
- 2 + before ignition (Bat +)
- 3 Earth(-)
- 4 ABS warning light (Sila)

## REMOVAL - REFITTING OF COMPONENT PARTS

## 1 - FRONT WHEEL SENSORS

## TIGHTENING TORQUES (in daN.m)

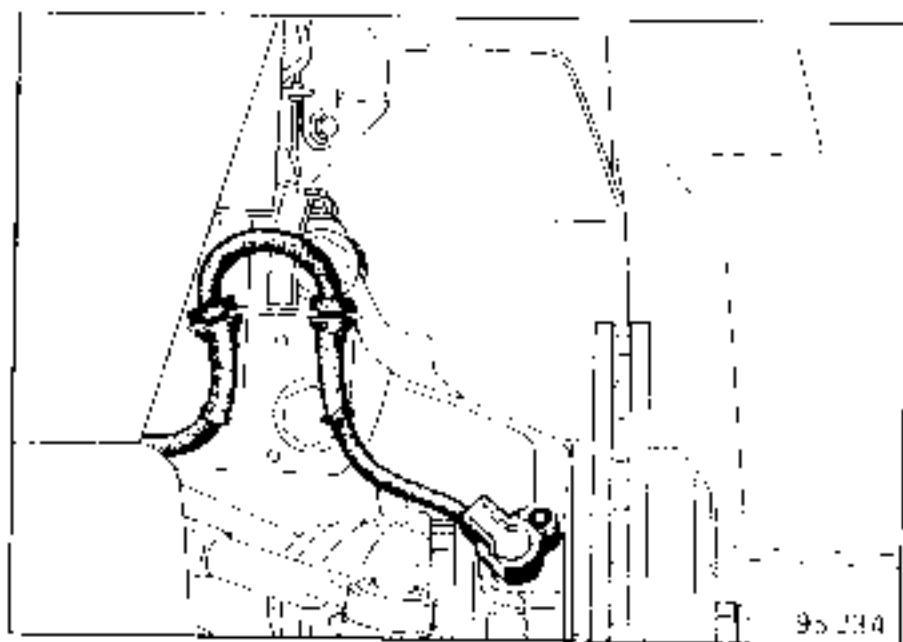


Wheel bolts	4 bolts	9
	5 bolts	10
Sensor mounting bolt		0,8 to 1

## REMOVAL

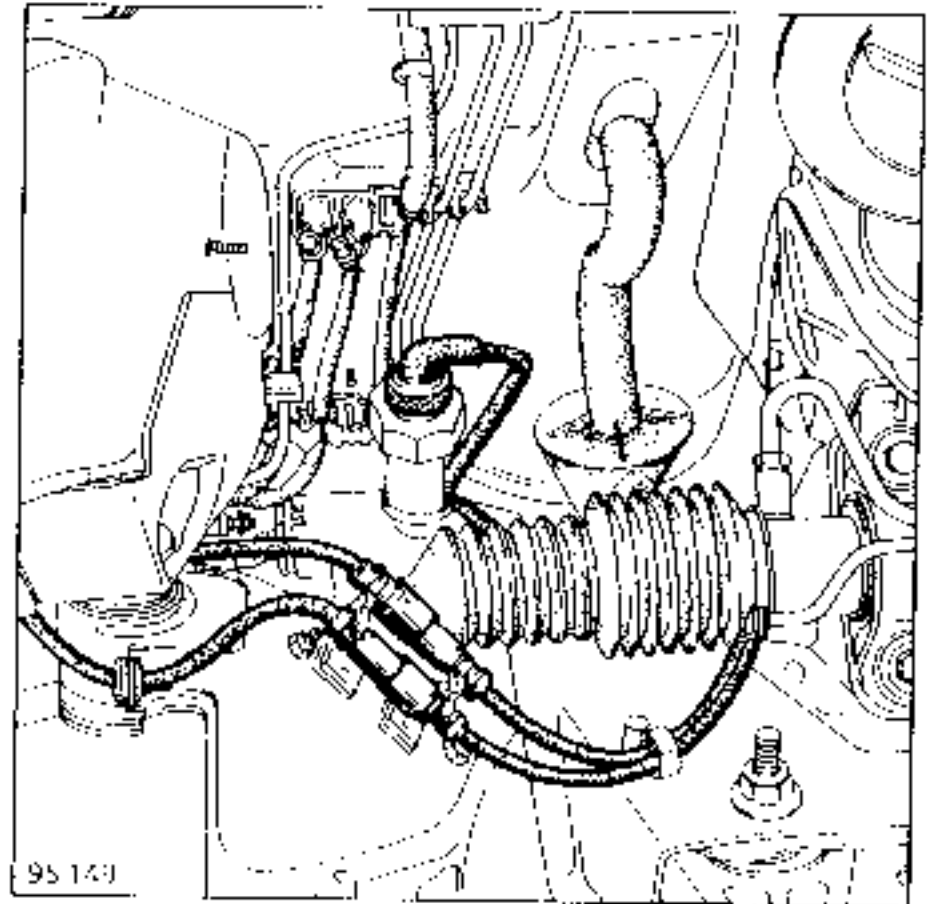
Remove:

- the wheel,
- the sensor mounting bolt ( Torx T30).



Unhook the wire from the supports.

Disconnect the connector located on the front axle mounting.



Remove the sensor

## REFITTING

Fit the sensor, having greased it with **Multifunction grease**, then hook the wire back into the supports and reconnect it.

Ensure the wire is correctly located and connected (the operation of the ABS system depends on this being correct).

The sensor must be fitted by hand. Do not hit the sensor when refitting.

Do not pull or push on the wiring

Use feeler gauges to check the recommended target gap while rotating the wheel one revolution.

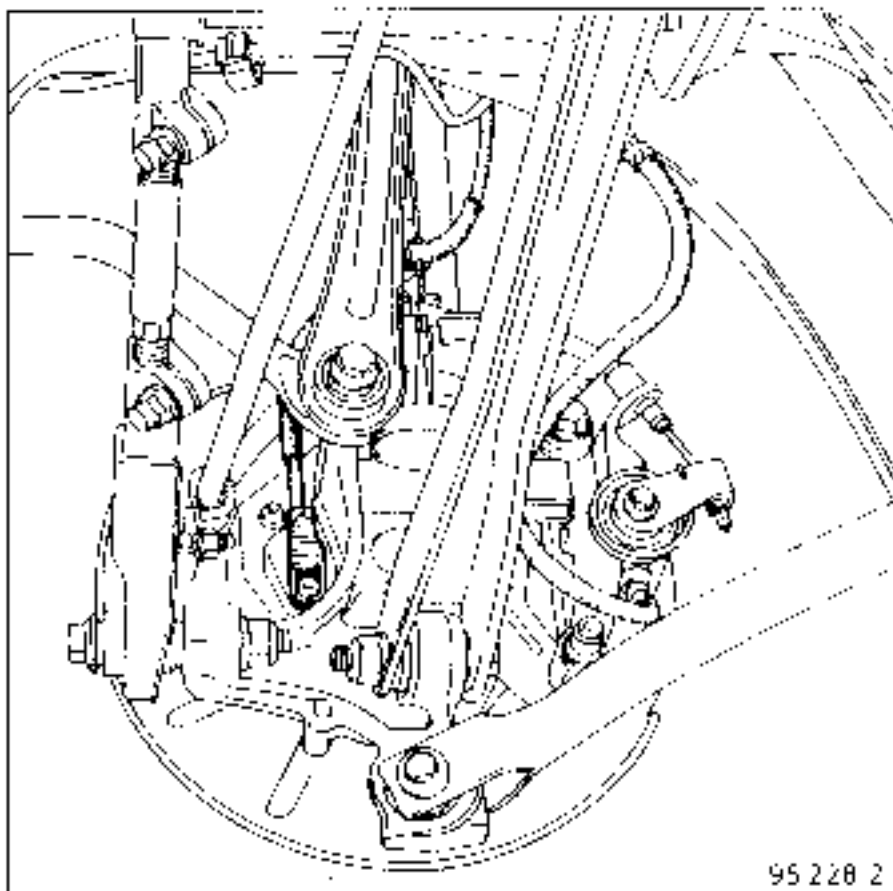
**REMOVAL - REFITTING OF COMPONENT PARTS  
(cont)****2 - REAR WHEEL SENSORS****TIGHTENING TORQUES (in daN.m)**

Wheel bolts	4 bolts	9
	5 bolts	10
Sensor mounting bolt		0,8 to 1

**REMOVAL**

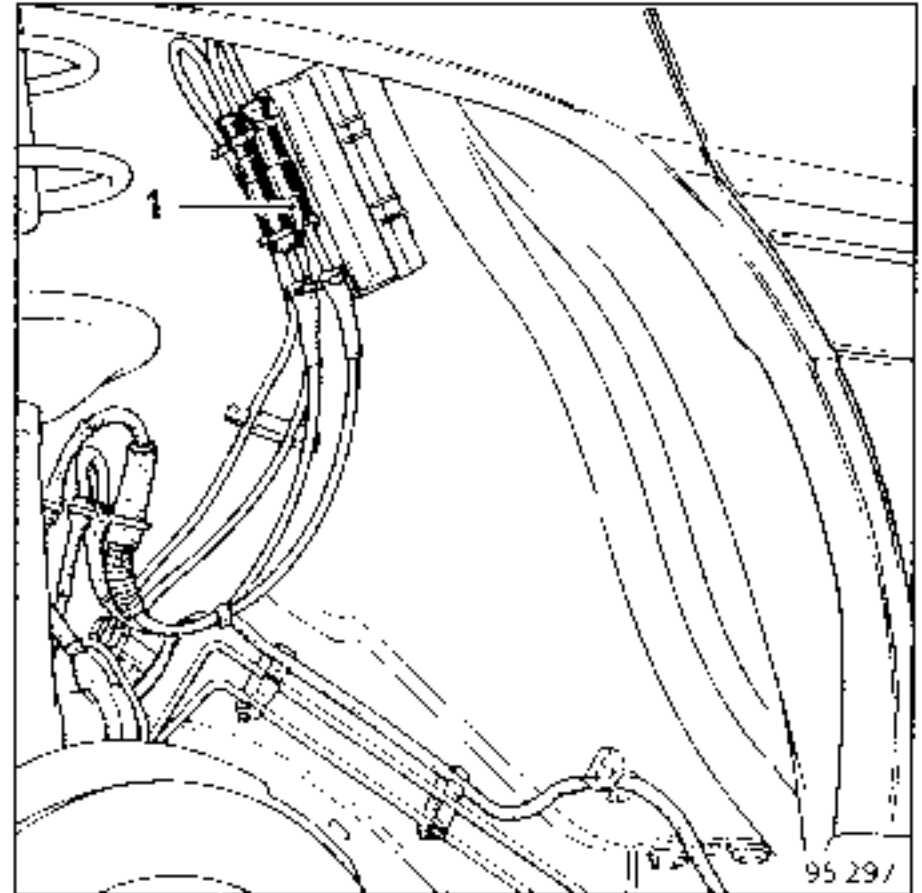
Remove:

- the wheel,
- the sensor mounting bolt (1) (Torx T30),
- the sensor from the support



Unhook the wire from the supports.

Disconnect the sensor from the connector located in a box in the wheel arch.

**REFITTING**

Fit the sensor, having greased it with **Multifunction grease**, then hook the wire back into the supports and reconnect it.

Use feeler gauges to check the recommended target gap while rotating the wheel one revolution.

**NOTE :** to avoid faults, it is essential to ensure the sensor is correctly reconnected.

The sensor must be fitted by hand. Do not hit the sensor when refitting.

Do not pull or push on the wiring

## TARGETS

SPECIAL TOOLING REQUIRED	
T.Av. 1239	ABS target fitting tool

## FRONT WHEEL TARGETS

## TIGHTENING TORQUES (in daN.m)

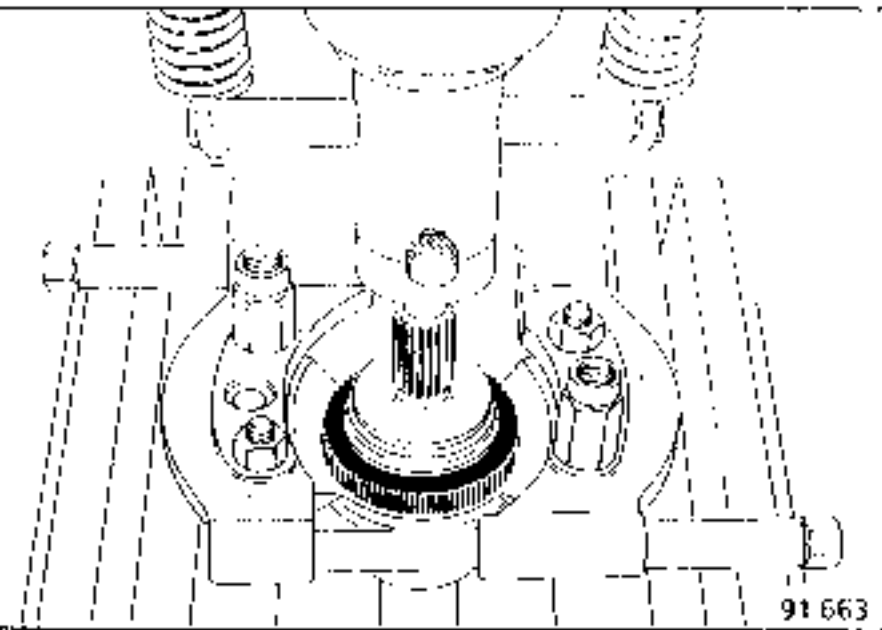


Wheel bolts	4 bolts	9
	5 bolts	10
Driveshaft nut		24 to 26

Since the target is fixed on the driveshaft, the driveshaft must be removed.

## REMOVAL

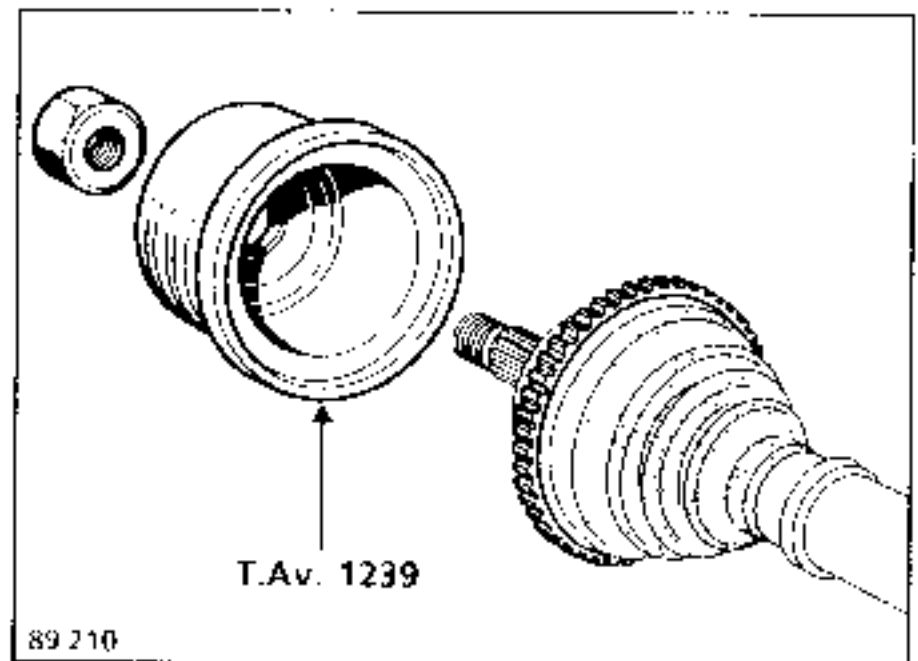
Extract the target on a press, using a tool of type FACOM U53T.



**NOTE :** driveshafts are supplied as a machined component without an ABS target. The target must be retained in order to realign the driveshafts. Single targets are available from the parts department.

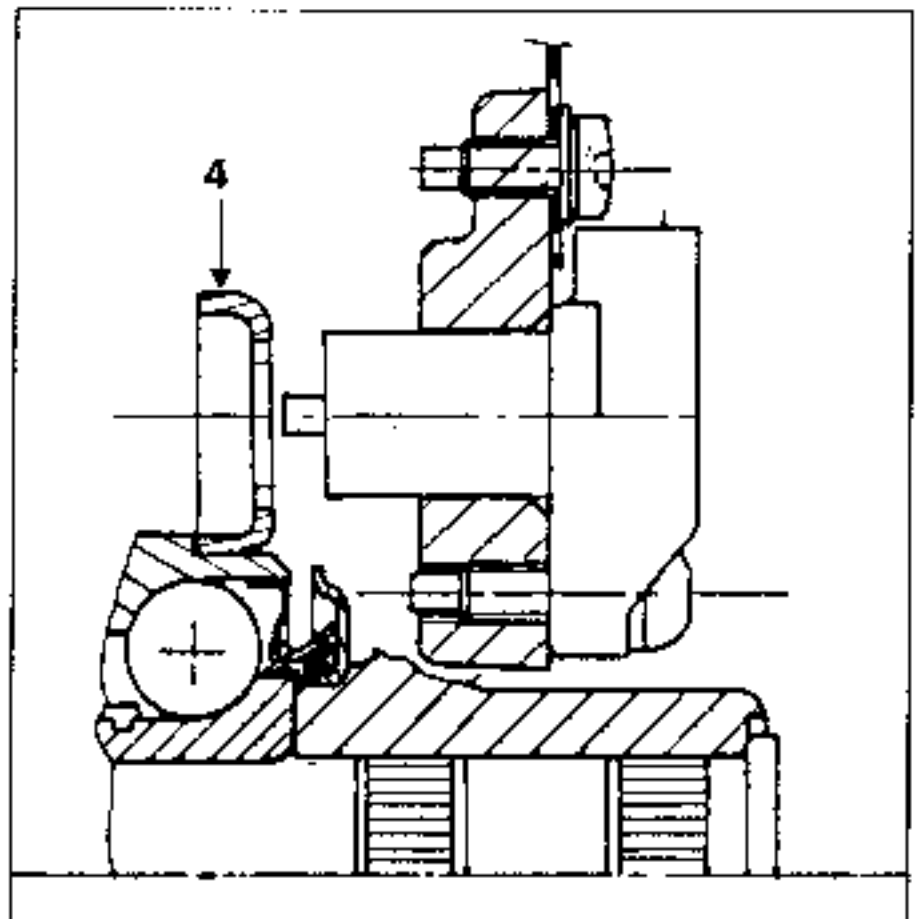
## REFITTING

Coat the target with Loctite SCELBOC and refit it using tool T.Av. 1239 and the old driveshaft nut.



## REAR WHEEL TARGETS

Target (4) is fixed on the hub (cannot be removed).

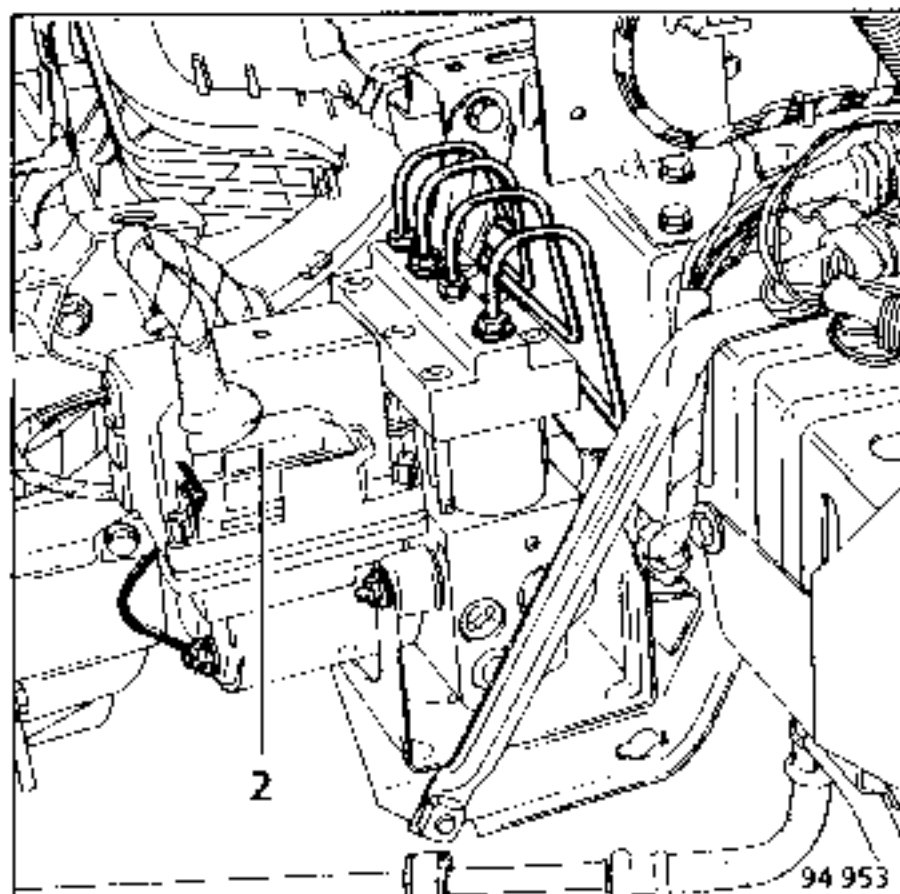




**REPLACEMENT****1 - COMPUTER****REMOVAL**

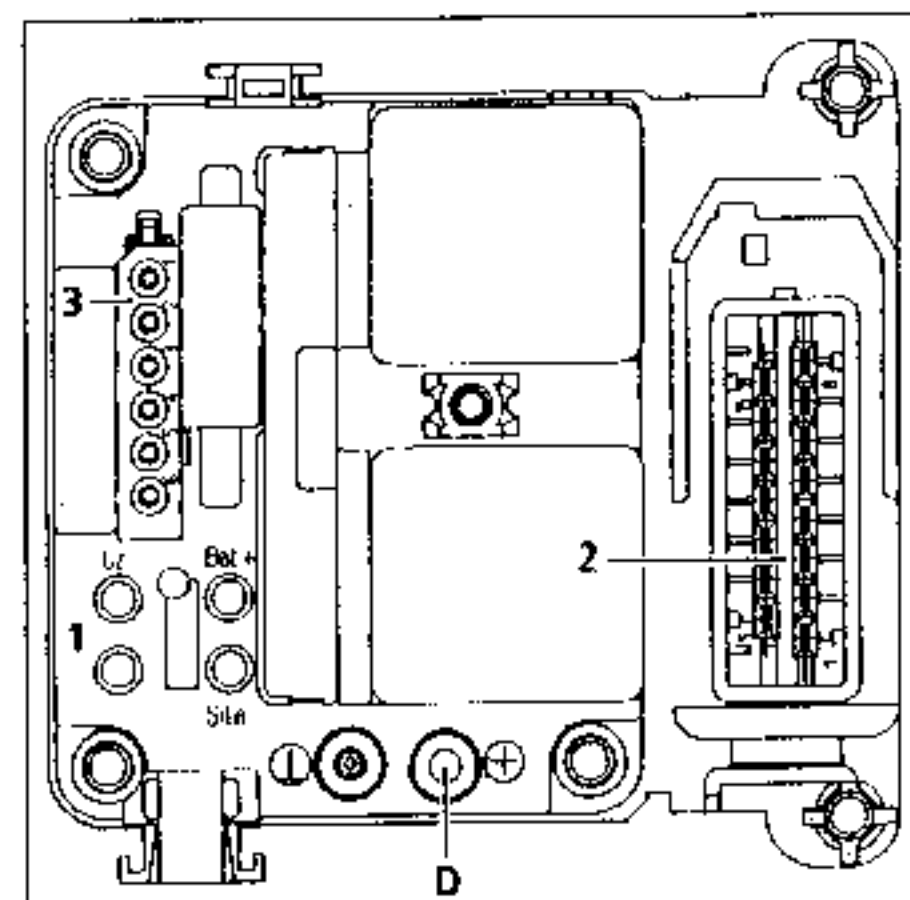
Disconnect the battery.

Remove the upper cover bolt Torx T15.

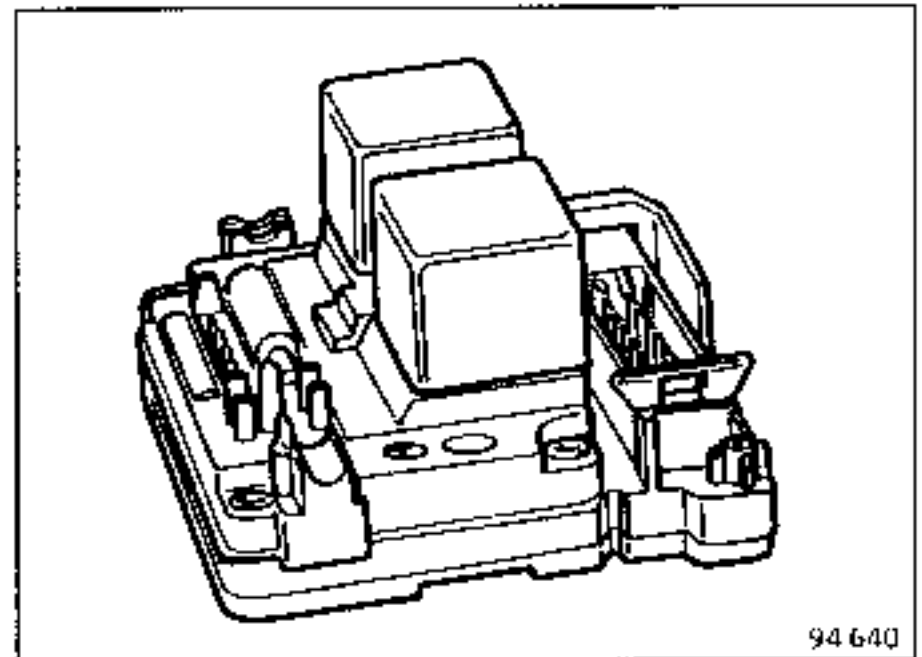



Disconnect:

- the 4 track connector (1),
- the 15 track connector (2),
- the 6 track connector (3).



Remove the 6 mounting bolts (Torx T20) and remove the computer relay board.

**REFITTING**

Ensure the board mounting bolts are correctly tightened, especially the bolt (D) marked  ensuring the + 12 Volts pump - motor feed is correct.

Take care to ensure the wires and connections are correctly fitted

Test the system using the G function on the XR25 (see page 38-24)

Carry out:

- a road test then test using XR25,
- erase the computer memory (G0\*\*).

Validate the end of the test : G13\*

## REPLACEMENT (cont)

### 2 - HYDRAULIC ASSEMBLY

#### TIGHTENING TORQUES (in daN.m)



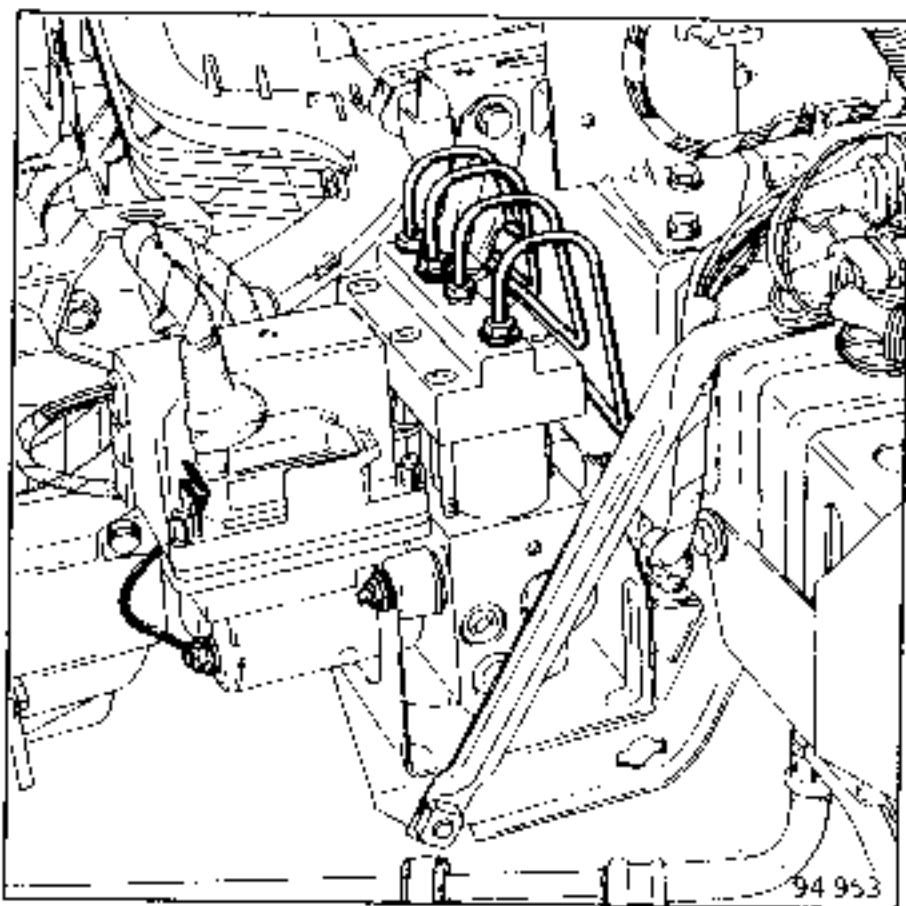
Pipe bolts

1,2 to 1,6

## REMOVAL

Remove:

- the battery,
- the air filter unit (depending on version),
- the diagnostic socket and mounting assembly.



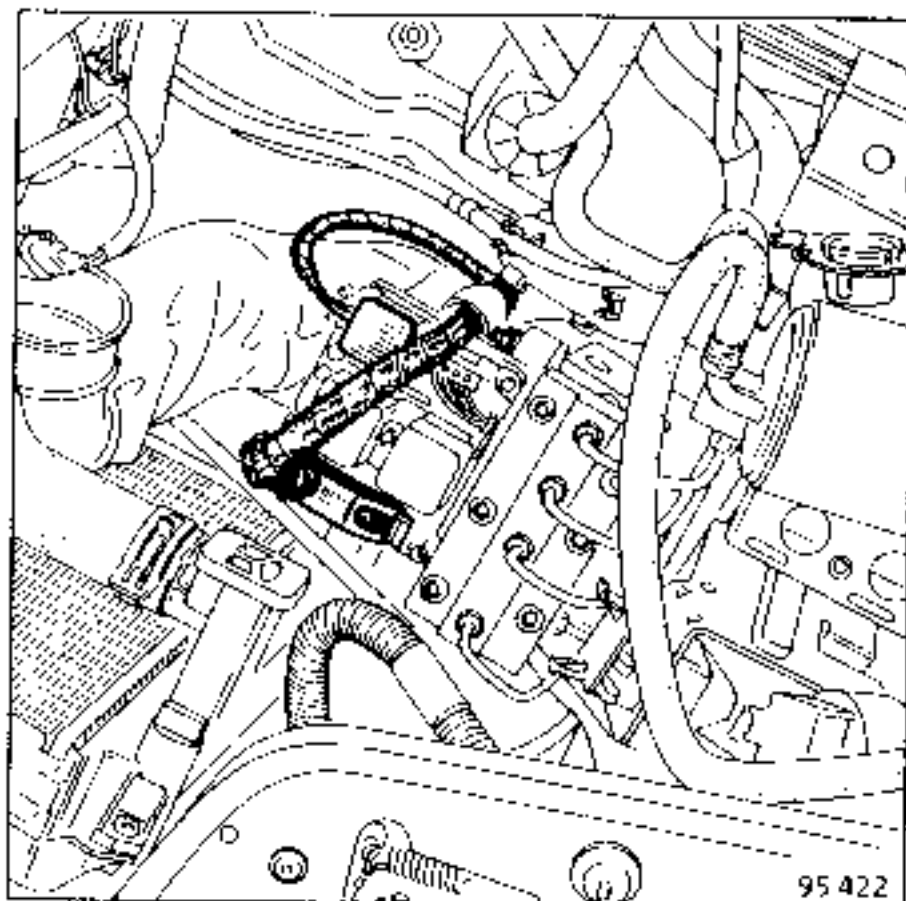
Loosen:

- the 6 pipe unions on the hydraulic assembly\*,
- the three hydraulic assembly mounting bolts.

(\*) a pipe spanner must be used

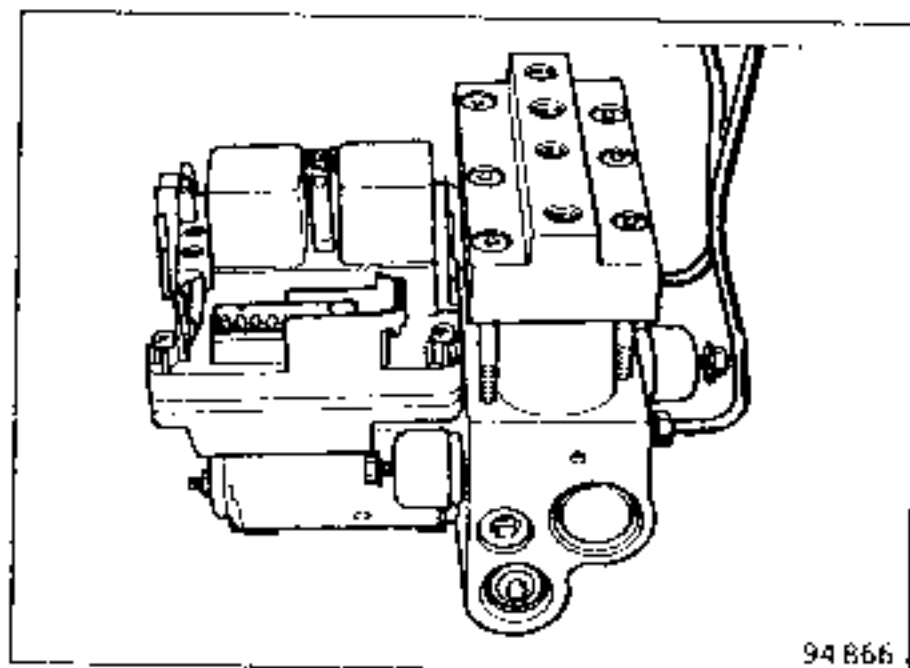
Disconnect:

- the 15 track connector and remove the upper cover,
- the 4 track connector,
- the pump motor earth wire,



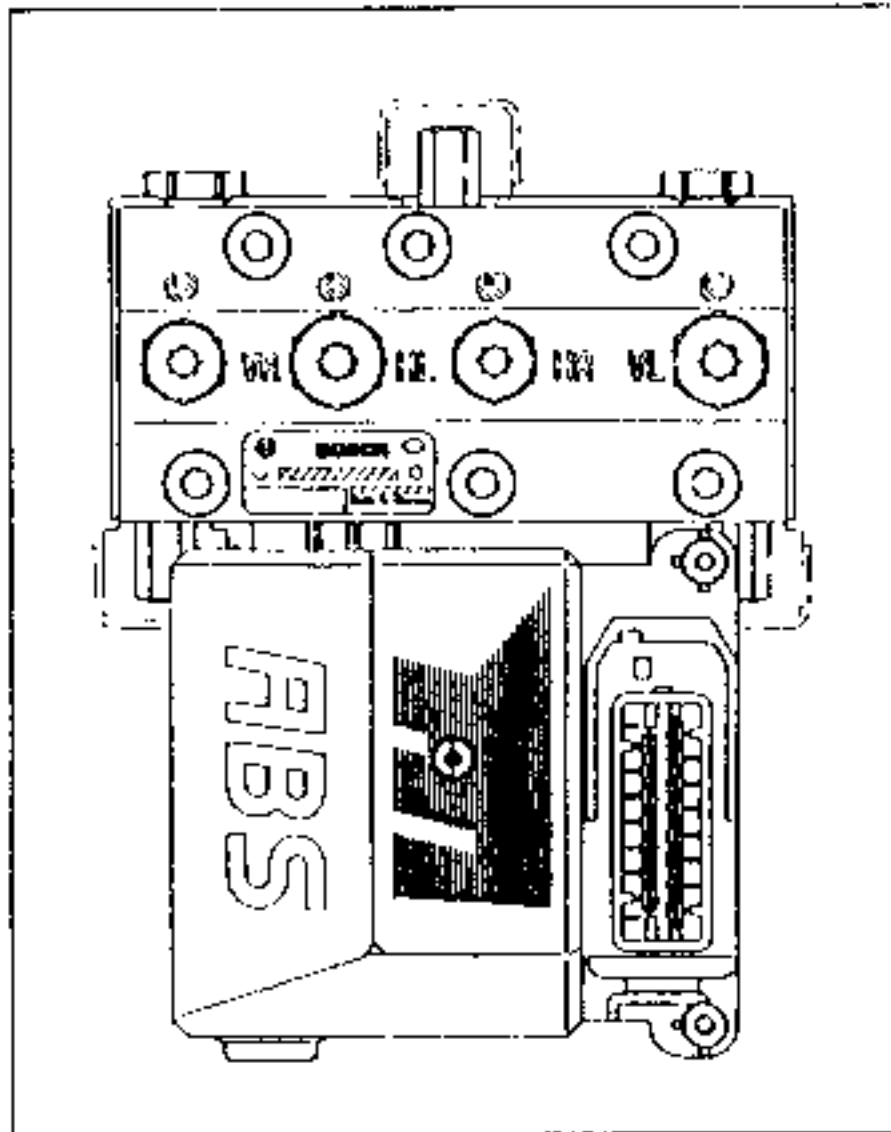
- the 4 outlet pipes (having marked their position) from the upper section of the hydraulic assembly

Remove the hydraulic assembly and disconnect the two side pipes.



**REPLACEMENT (cont)****2 - HYDRAULIC ASSEMBLY (cont)****REFITTING**

Refit the hydraulic assembly, ensuring the pipes are in the correct positions marked earlier.



- VL FLH (yellow)
- VR FRH (green)
- HL RLH (blue)
- HR RRH (red)

Connect the connectors.

Refit :  
- the upper cover,  
- the pump-motor earth wire.

Take care to ensure the wires and connectors are correctly refitted.

Bleed the hydraulic circuit according to the specified sequence of operations (see following page)

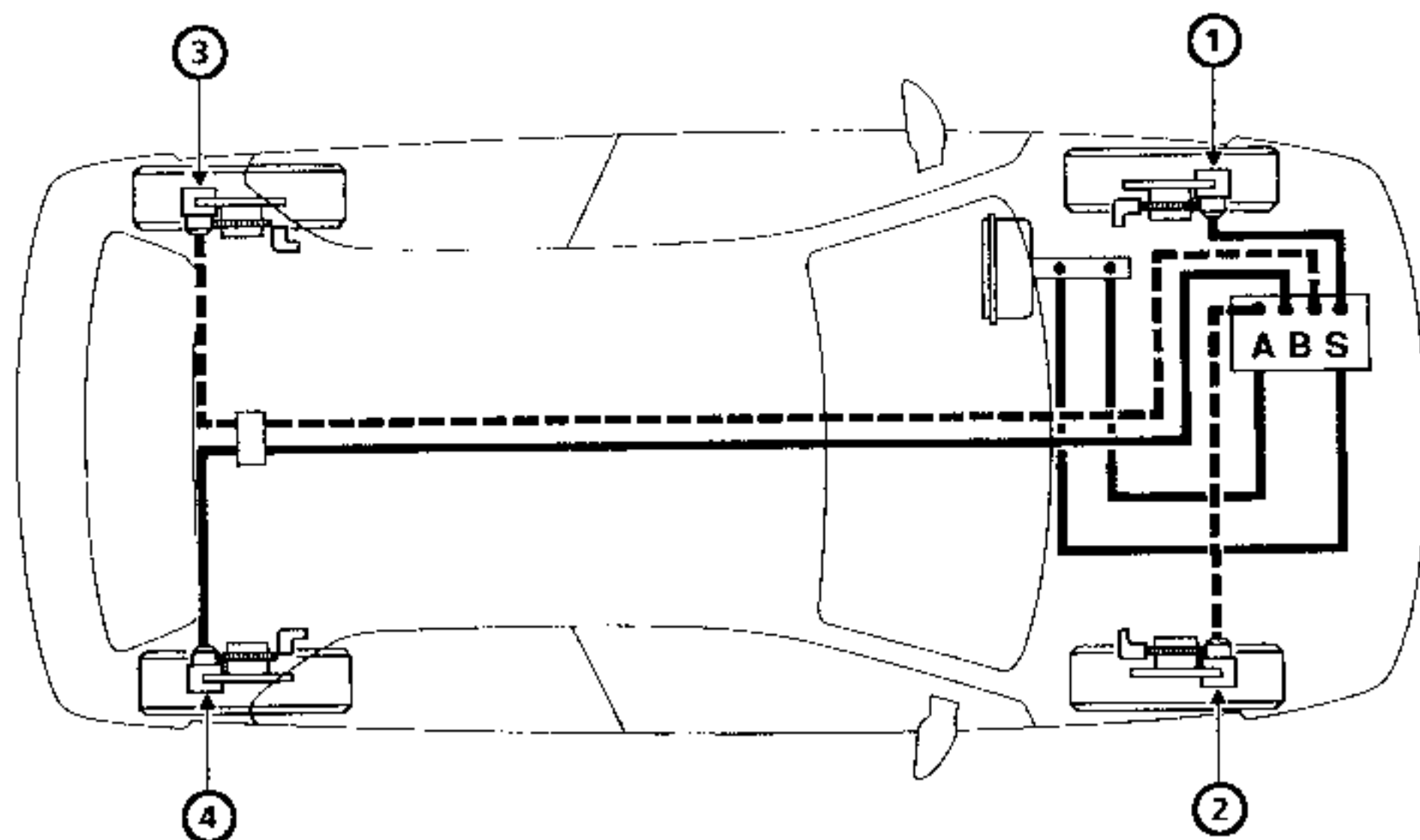
**NOTE :** do not reconnect the battery and turn the ignition on before completely bleeding the hydraulic circuit.

## BLEEDING

### ATTENTION

The following sequence for operations must be observed when bleeding an "ABS" braking circuit

- ① Front left hand wheel caliper
- ② Front right hand wheel caliper
- ③ Rear left hand wheel caliper
- ④ Rear right hand wheel caliper



94 917

Never operate the anti-lock system without bleeding the brakes. If the return pump pumps air, it is extremely difficult and in some cases impossible to bleed it.

The hydraulic assembly supplied from the parts department is already filled with brake fluid.

### **BLEEDING THE BRAKES WITH BLEED EQUIPMENT**

Connect the bleed equipment to the brake fluid reservoir.

- I - Fit the pipe on the bleed screw for the wheel in question

Open the bleed screw for the wheel in question and wait until the fluid runs out without any bubbles ( about 30 seconds)

Retighten the bleed screw

The following order of operations must be observed :

- 1 - master cylinder to front left hand side
- 2 - master cylinder to front right hand side
- 3 - master cylinder to rear left hand side
- 4 - master cylinder to rear right hand side

- II Continue the bleed operation using the pedal, ensuring that the level of fluid in the reservoir is always between the minimum and maximum marks

The sequence of operations in section (I) must be strictly observed

Connect the pipe to the bleed screw of the receiver in question

Open the bleed screw in question

Pump the pedal about 20 times.

Check the brake fluid level and top up where necessary.

### **BLEEDING THE BRAKES WITHOUT BLEED EQUIPMENT**

The sequence of operations is the same as before and **MUST** be strictly observed.

Connect the pipe to the bleed screw of the receiver in question

Open the bleed screw in question

Pump the pedal several times until the fluid appears in the pipe with no bubbles.

Ensure that the level of fluid in the reservoir is always between the minimum and maximum marks during this operation.

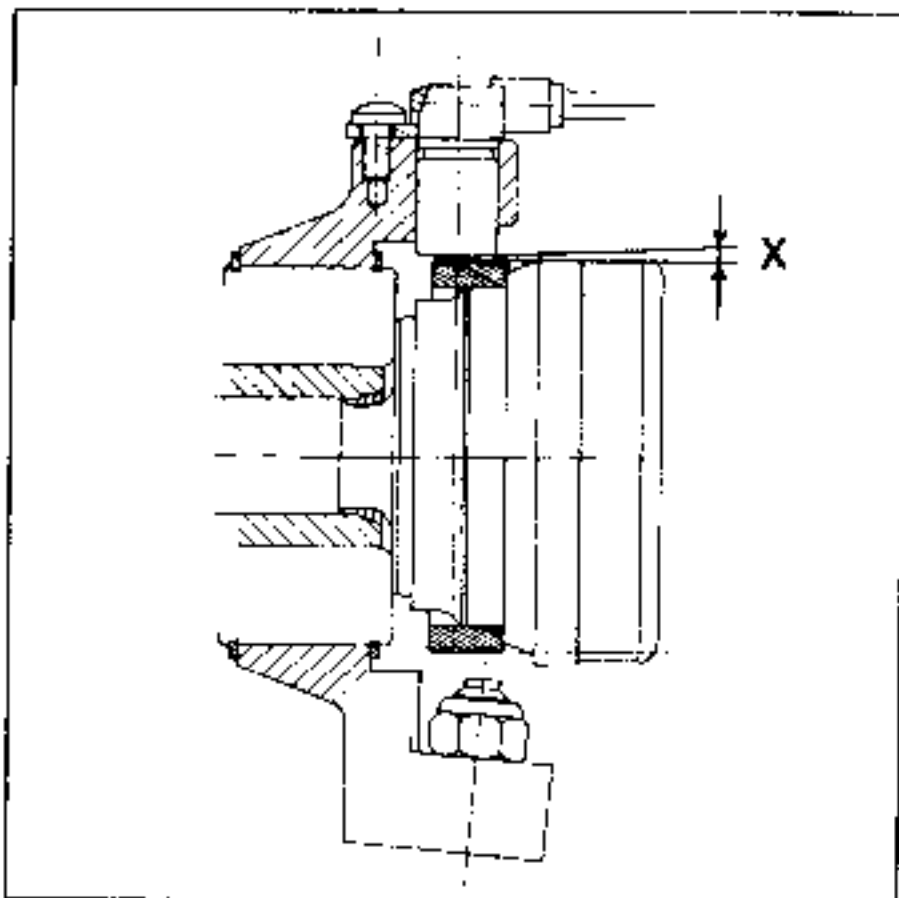
## ADDITIONAL TESTS

## 1 - TARGET / SENSOR GAP

(Position the target so that the top of one tooth is parallel to the sensor).

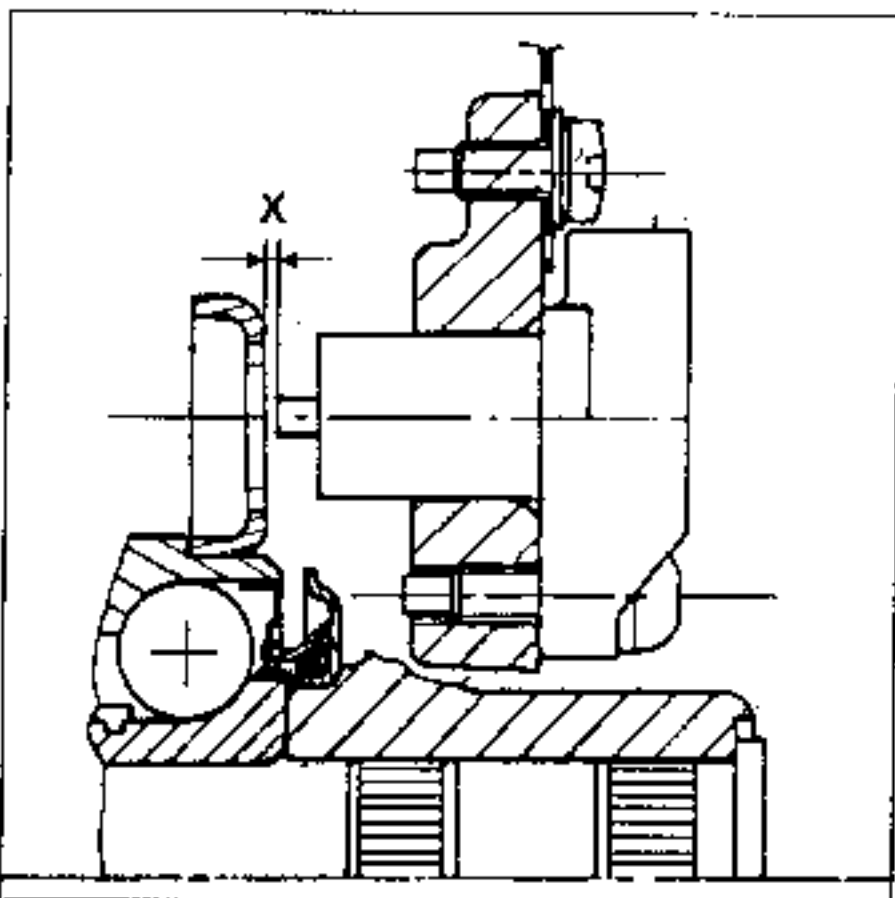
Front sensor :

$X = 0,3 \text{ mm to } 1,3 \text{ mm}$



Rear sensor :

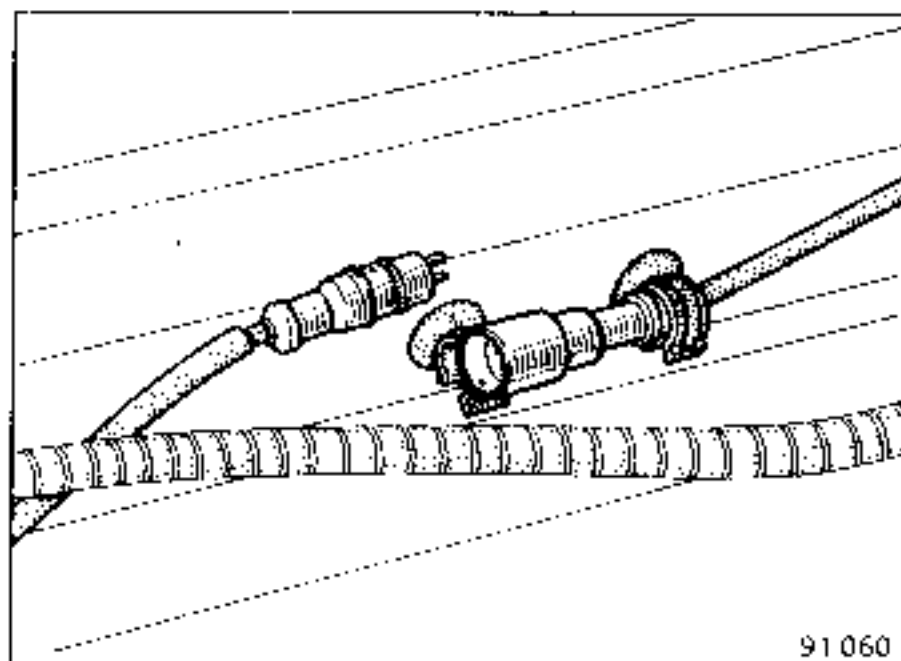
$X = 0,6 \text{ mm to } 1,6 \text{ mm}$



Sensor resistance : approx 1,13 k $\Omega$ .

## 2 - TESTING THE WHEELS SENSOR CONNECTORS

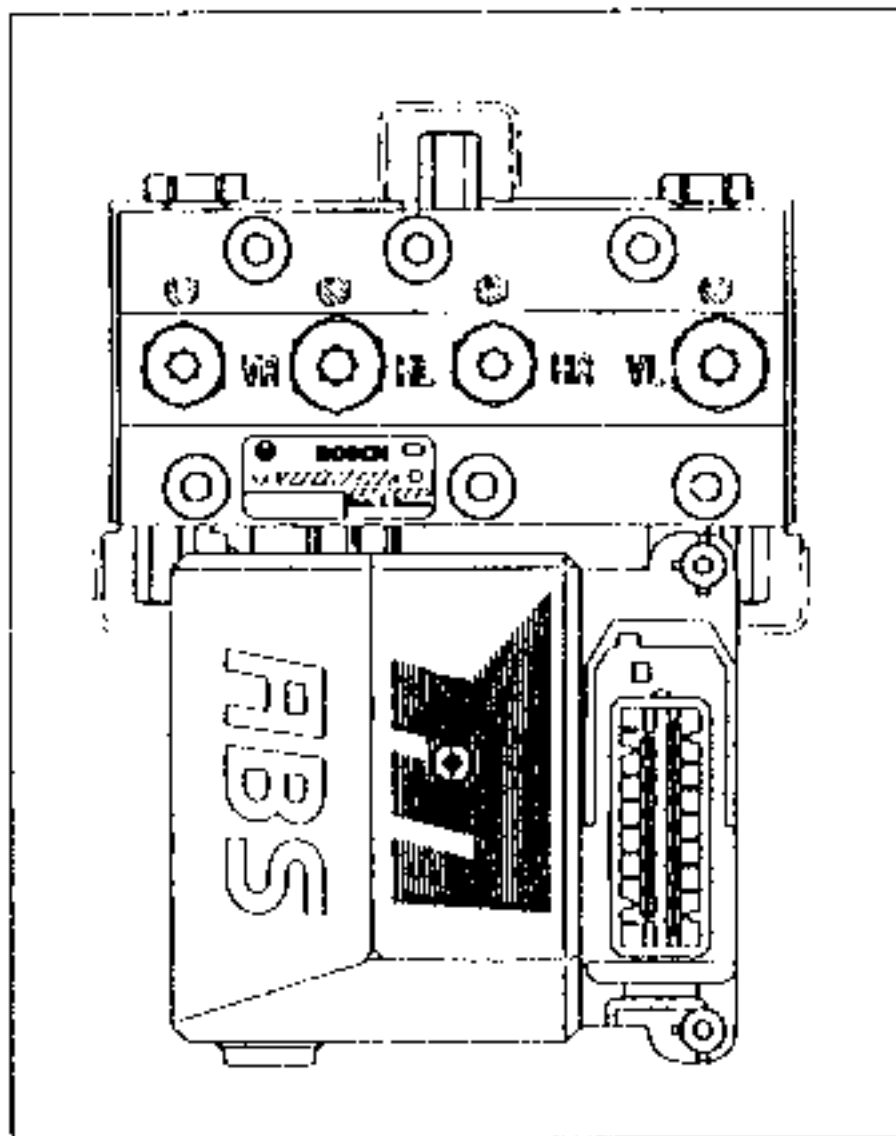
If the ABS warning light illuminates intermittently, check the wheel sensor connectors first, and clean them with **ELECTRONEX** part number 77 01 403 517.



## NOTE:

- when disconnecting the connectors, avoid using a sharp tool which could damage the retaining lugs on the two parts of the connector
- Take care to ensure the wiring and connectors are correctly refitted (ABS function reliability depends on this).

### Hydraulic assembly pipe reference marking



- VL FLH (yellow)
- VR FRH (green)
- HL RLH (blue)
- HR RRH (red)

For obvious safety reasons, never invert sensor connectors or hydraulic assembly pipes.

**FAULT CHART FOR ABS BOSCH 2E**

**1 FAULTS NOTED BY ILLUMINATION OF ABS WARNING LIGHT**

1 - When the ignition is switched on

- 1.1 - The warning light does not illuminate
- 1.2 - The warning light is permanently illuminated
- 1.3 - The warning light is dimly illuminated
- 1.4 - The warning light flashes
- 1.5 - The warning light illuminates after 5 seconds

2 - When the engine is started

- 2.1 - The warning light does not extinguish
- 2.2 - The warning light illuminates again
- 2.3 - The warning light flashes

3 - When the vehicle moves off for the first time

- 3.1 - The warning light illuminates when the vehicle starts moving
- 3.2 - The warning light flashes when the vehicle starts moving

4 - On braking with ABS regulation

- 4.1 - The warning light illuminates after ABS regulation
- 4.2 - The warning light flashes during ABS braking
- 4.3 - The warning light illuminates during ABS braking
- 4.4 - The warning light illuminates after a delay, after ABS regulation

5 - While driving

- The warning light illuminates

6 - Other cases



FAULT CHART FOR ABS BOSCH 2E

2

EFFECTS NOTED FOR ABS BRAKING OPERATION WITHOUT ILLUMINATION OF THE WARNING LIGHT

1 - One or more wheels locked

2 - Course affected

2.1 - Pulling

2.2 - Swerving

3 - Unexpected ABS operation

3.1 - When the vehicle first moves away at 3mph (6 km/h) (after starting the engine)

3.2 - While driving

3.2.1 - at low speed / low pedal pressure

3.2.2 - on bad road surfaces

3.2.3 - when using special equipment  
(radio telephone, CB...)

3.2.4 - other cases linked to the outside environment

4 - Reactions felt at the brake pedal

4.1 - Hard pedal

4.2 - Spongy pedal

4.3 - Soft pedal

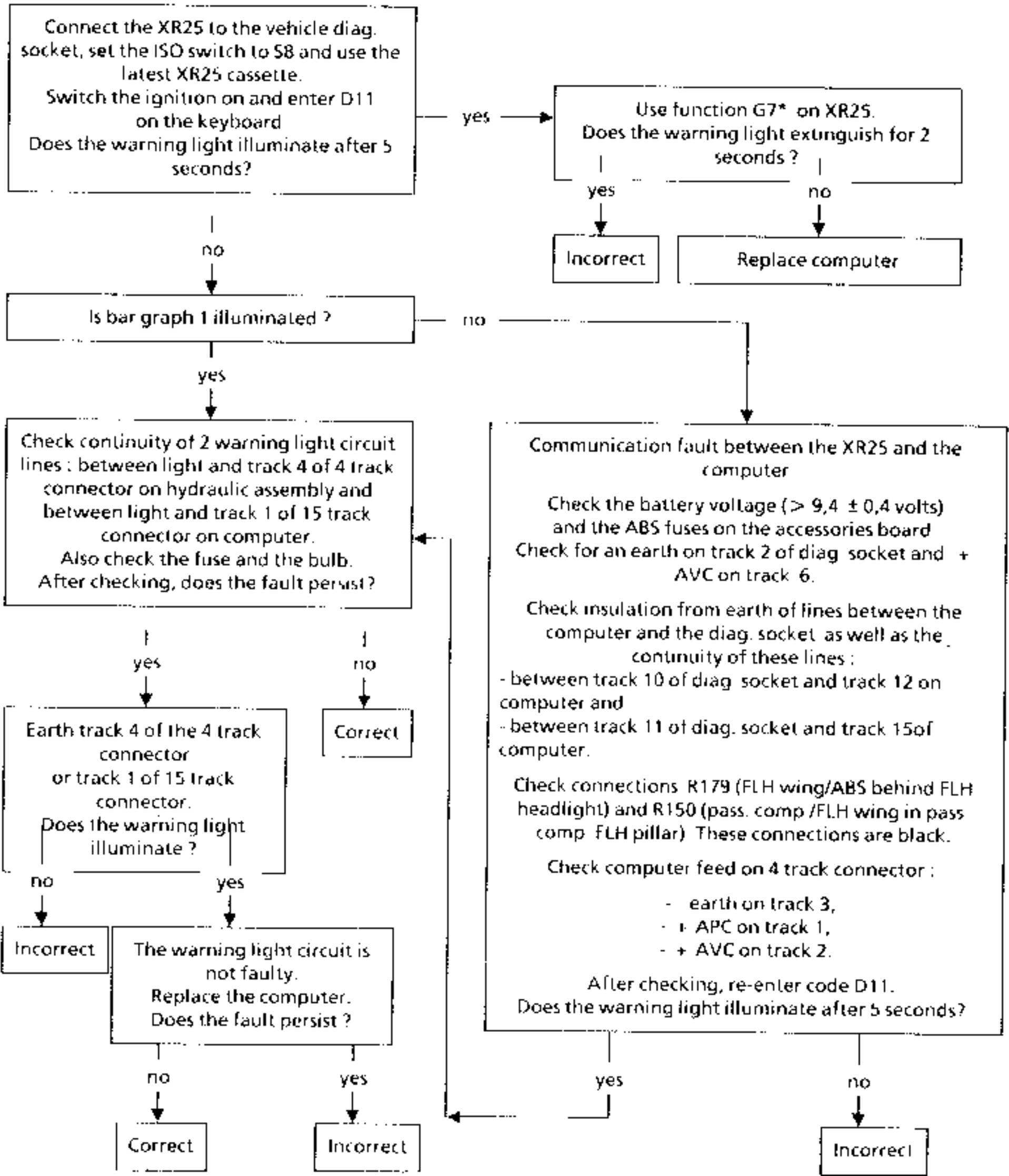
4.4 - Vibrations or jerks on the pedal

5 - Noises

From the pump, the hydraulic assembly or the pipes.

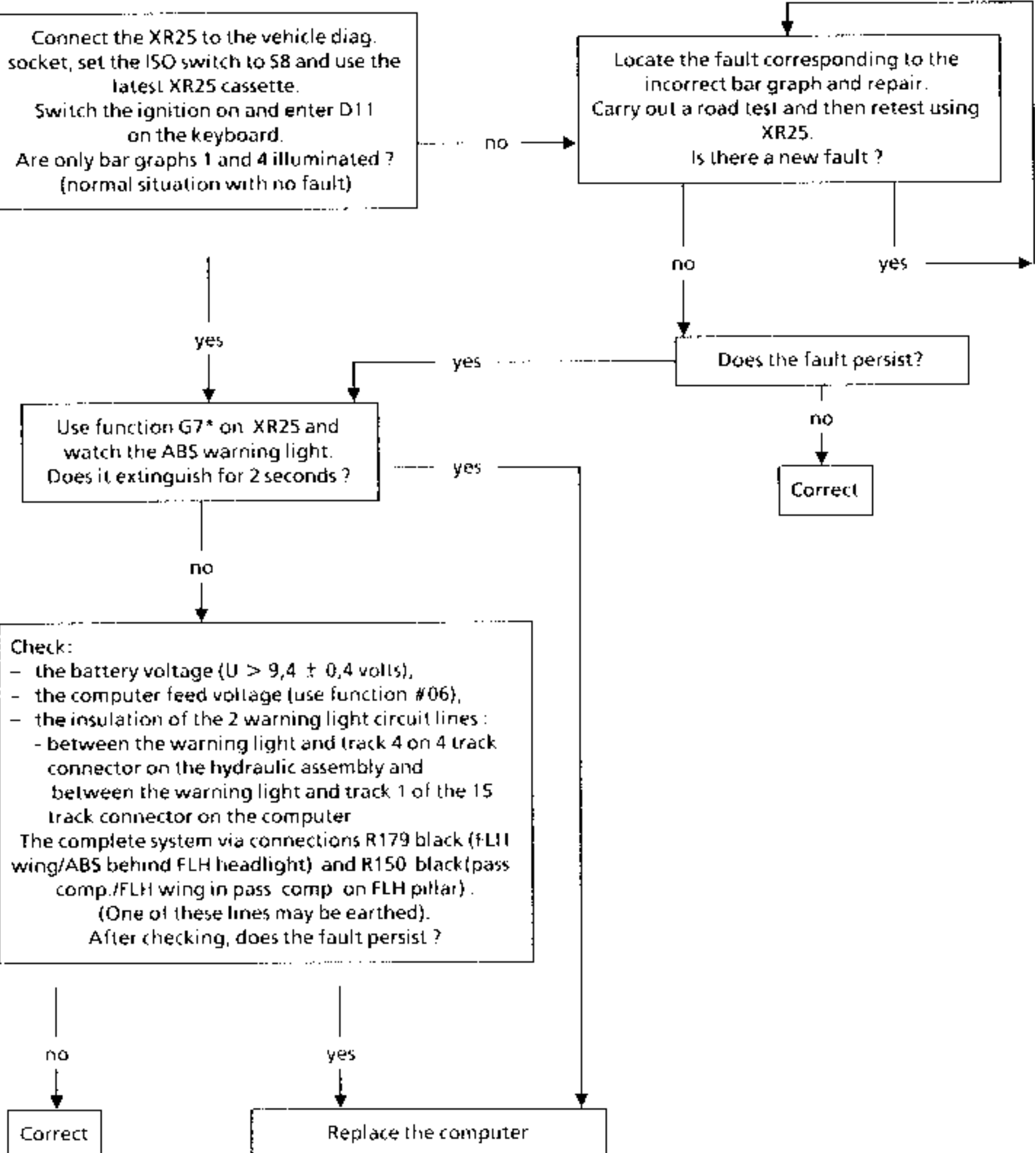
## 1 Faults noted by illumination of the ABS warning light

1 - When the ignition is switched on  
1.1 - The warning light does not illuminate



1 Faults noted by illumination of ABS warning light

1 - When the ignition is switched on  
1.2 - The warning light is permanently illuminated



1 Faults noted by illumination of the ABS warning light

1 - When the ignition is switched on  
1.3 - The warning light is dimly illuminated

Connect the XR25 to the vehicle diag. socket, set the ISO switch to S8 and use the latest XR25 cassette.  
Switch the ignition on and enter D11 on the keyboard.  
Are only bar graphs 1 and 4 illuminated?  
(normal situation with no fault)

Locate the fault corresponding to the incorrect bar graph and repair.  
Carry out a road test and then retest using XR25.  
Is there a new fault?

Does the fault persist

Check the insulation of the 2 warning light circuit lines :  
- between the warning light and track 4 on 4 track connector on the hydraulic assembly and  
- between the warning light and track 1 of the 15 track connector on the computer.  
(One of these lines may be earthed).  
Also check condition of ABS earths and the connections of the 4 and 15 track connectors on the ABS board.  
After checking, does the fault persist?

Correct

Correct

Replace the computer

no

yes

no

no

yes

yes

yes

no

## 1 Faults noted by illumination of the ABS warning light

1 - When the ignition is switched on  
1.4 - The warning light flashes

Connect the XR25 to the vehicle diag. socket, set the ISO switch to S8 and use the latest XR25 cassette.  
Switch the ignition on and enter D11 on the keyboard.  
Is bar graphs 1 illuminated?

yes

Are only bar graphs 1 and 4 illuminated  
(normal situation with no fault)?

yes

Locate the fault corresponding to the incorrect bar graph and repair.  
Carry out a road test and then retest using XR25  
Is there a new fault?

yes

Does the fault persist?

yes

no

Correct

no

Communication fault between the XR25 and the computer

Check the battery voltage ( $> 9,4 \pm 0,4$  volts) and the ABS fuses on the accessories board.  
Check for an earth on track 2 of diag. socket and + AVC on track 6.

Check insulation from earth of lines between the computer and the diag. socket as well as the continuity of these lines :

- between track 10 of diag. socket and track 12 on computer and
- between track 11 of diag. socket and track 15 of computer.

Check connections R179 (FLH wing/ABS behind FLH headlight) and R150 (pass. comp./FLH wing in pass. comp. FLH pillar). These connections are black.

Check computer feed on 4 track connector :

- earth on track 3,
- + APC on track 1,
- + AVC on track 2.

After checking does the fault persist?

yes

no

Correct

Check the insulation of the 2 warning light circuit lines :

- between the warning light and track 4 on 4 track connector on the hydraulic assembly and
- between the warning light and track 1 of the 15 track connector on the computer.

(One of these lines may be earthed).

Also check condition of ABS earths and the connections of the 4 and 15 track connectors.

After checking, does the fault persist?

no

yes

Correct

Replace the computer

1 Faults noted by illumination of the ABS warning light

1 - When the ignition is switched on  
1.5 - The warning light illuminates after 5 seconds

Connect the XR25 to the vehicle diag. socket, set the ISO switch to S8 and use the latest XR25 cassette.  
Switch the ignition on and enter D11 on the keyboard.  
Normally, bar graph 5 should be illuminated to show a fault on the pump motor circuit

2 - When the engine is started  
2.1 - The warning light does not extinguish

As for 1.2

2 - When the engine is started  
2.2 - The warning light illuminates again

Connect the XR25 to the vehicle diag. socket, set the ISO switch to S8 and use the latest XR25 cassette.  
Switch the ignition on and enter D11 on the keyboard  
Are only bar graphs 1 and 4 illuminated?  
(normal situation with no fault)

Locate the fault corresponding to the incorrect bar graph and repair.  
Carry out a road test and then retest using XR25.  
Is there a new fault?

Does the fault persist?

Incorrect connector contact.  
Insufficient battery voltage  
( $< 9,4 \pm 0,4$  volts).

Correct

yes

yes

no

no

no

yes

**1** Faults noted by illumination of the ABS warning light

**2 - When the engine is started**  
**2.3 - The warning light flashes**

As for 1.4

**3 - When the vehicle moves off for the first time**  
**3.1 - The warning light illuminates**

As for 1.3

**3 - When the vehicle moves off for the first time**  
**3.2 - The warning light flashes**

As for 1.4 and 2.3

**4 - On braking with ABS regulation**  
**4.1 - The warning light illuminates after ABS regulation**

**XR25** For checking the feed.

If the fault persists, check the battery voltage (min : 9,4 ± 0,4 volts) and the wiring.

**4 - On braking with ABS regulation**  
**4.2 - The warning light flashes during ABS braking**

As above

1 Faults noted by illumination of the ABS warning light

4 - On braking with ABS regulation

*4.3 - The warning light illuminates during ABS braking*

XR25

Checking the wiring (intermittent cut outs).

If the fault persists: probable external interference

4 - On braking with ABS regulation

*4.4 - The warning light illuminates after a delay, after ABS regulation*

XR25

5 - While driving

*The warning light illuminates*

XR25

If the fault persists: probable external interference



**2 Effects noted for ABS braking operation without illumination of the warning light****1 - One or more wheels locked**

Reminder: if the wheels on a vehicle fitted with ABS lock or the tyres squeal which is felt by the driver as the wheels locking, this may be normal system operation and should not be automatically considered as a fault :

- locking allowed below 17 mph ( 2.75 km/h) (system inactive),
- braking with ABS regulation on very bad road surface (loud tyre squeal)

On the other hand, if the wheels are locking, lift the vehicle so that the wheels can be turned and check:

- that the speed sensors have not been incorrectly connected (inverted). Use functions #1 #2 #3 and #4 while turning the wheel in question and check the correct readings are obtained.
- that the hydraulic assembly pipes have not been incorrectly connected (inverted). Use functions G3\* G4\* and G5\* while pressing the brake pedal and check the wheel concerned releases.

Also check the target / sensor gap for each wheel :

Front wheels : 0,3 mm < gap < 1,3 mm

Rear wheels : 0,6 mm < gap < 1,6 mm

If the fault persists, replace the hydraulic assembly.

**2 - Course affected**  
**2.1 - Pulling**

Remove the ABS fuse from the accessories board and carry out a road test with the ABS inactive.  
Does the fault persist under these conditions?

yes

If the brake pedal travel is relatively long, bleed the braking circuit.

If the pedal travel is normal, check the tyre pressures and the front axle and if necessary, check for leaks in the circuit.

no

Lift the vehicle so that the wheels can be turned and check:

- that the speed sensors have not been incorrectly connected (inverted). Use functions #1 #2 #3 and #4 while turning the wheel in question and check the correct readings are obtained.
- that the hydraulic assembly pipes have not been incorrectly connected (inverted). Use functions G3\* G4\* and G5\* while pressing the brake pedal and check the wheel/ concerned release

Also check the target / sensor gap for each wheel :

Front wheels : 0,3 mm < gap < 1,3 mm

Rear wheels : 0,6 mm < gap < 1,6 mm

If the fault persists, replace the hydraulic assembly.

2 Effects noted for ABS braking operation without illumination of the warning light

2 - Course affected  
2.2 - Swerving

Remove the ABS fuse from the accessories board and carry out a road test with the ABS inactive. Does the fault persist under these conditions?

yes

Roadholding fault not associated with ABS operation

no  
Normal operation associated with regulation phase mainly for dissimilar adherence or bad road surfaces

3 - Unexpected ABS operation

3.1 - When the vehicle first moves away at 3 mph (6 km/h) (after starting the engine)

System reaction felt at the brake pedal associated with self testing of certain components.  
(jerks/vibration) : normal behaviour

3 - Unexpected ABS operation

3.2 - While driving

3.2.1 At low speed / low pedal pressure

Connect the XR25 to the vehicle diag. socket, set the ISO switch to 58 and use the latest XR25 cassette.

Switch the ignition on and enter D11 on the keyboard.

Are only bar graphs 1 and 4 illuminated?  
(normal situation with no fault)

no

Locate the fault corresponding to the incorrect bar graph and repair. Carry out a road test and then retest using XR25. Is there a new fault?

yes

no

yes

Vibrations or jerks may be felt at the brake pedal which are associated with system reactions to particular situations :

- crossing speed ramps,
- tight cornering where the rear inner wheel lifts

If there is a different problem, check the targets are not bent, and check the speed sensor connectors (micro-cut outs) as well as the gaps for one wheel rotation :

Front wheels :  $0,3 \text{ mm} < \text{gap} < 1,3 \text{ mm}$   
Rear wheels :  $0,6 \text{ mm} < \text{gap} < 1,6 \text{ mm}$

**2** Effects noted for ABS braking operation without illumination of the warning light

**3 - Unexpected ABS operation**

**3.2 - While driving**

**3.2.2 On bad road surfaces**

On bad road surfaces, pedal vibrations and jerks are normal as well as louder tyre squeal than for good road surfaces.

There is a variation in efficiency which is normal.

**3 - Unexpected ABS operation**

**3.2 - While driving**

**3.2.3 When using special equipment (radio telephone, CB ...)**

Check that this equipment has been correctly installed, without altering any original wiring, especially ABS wiring.

**3 - Unexpected ABS operation**

**3.2 - While driving**

**3.2.4 Other cases linked to the outside environment**

When near radars, radio broadcasting towers or areas where there is a large amount of metal, the ABS system may be affected by interference. If the driver's foot is on the brake pedal, certain unexpected movements may be felt.

**2** Effects noted for ABS braking operation without illumination of the warning light**4 - Reactions felt at the brake pedal**  
**4.1 - Hard pedal**

Remove the ABS fuse from the accessories board and carry out a road test with the ABS inactive. Does the fault persist under these conditions?

yes

Diagnose for basic roadholding behaviour

no

Check the speed sensor connectors for micro cut-outs. Also check the target / sensor gap for one rotation of each wheel :

Front wheels :  $0,3 \text{ mm} < \text{gap} < 1,3 \text{ mm}$ Rear wheels :  $0,6 \text{ mm} < \text{gap} < 1,6 \text{ mm}$ **4 - Reactions felt at the brake pedal**  
**4.2 - Spongy pedal**

Air in the circuits. Bleed the circuits following the recommended procedure and the specified order of operations

After bleeding, does the fault persist, or has the pedal become soft ?

no

Correct

yes

Air in the piston plunger.

Carry out a specific bleeding operation. (refer to Technical Department for procedure) Does the fault persist after this second bleeding operation?

no

Correct

yes

Replace the hydraulic assembly

2

Effects noted for ABS braking operation without illumination of the warning light

**4 - Reactions felt at the brake pedal**

**4.3 - *Soft pedal***

Air in the primary brake circuit. Bleed according to recommendations

**4 - Reactions felt at the brake pedal**

**4.4 - *Vibrations or jerks on the pedal***

System reaction felt at the brake pedal associated with self testing of certain components at about 3 mph (6 km/h) or an ABS regulation phase

**5 - Noises**

*From the pump, the hydraulic assembly or the pipes.*

- Assembly vibration : check presence and condition of assembly rubber insulation mounting blocks.
- Pipe vibration : check all pipes are correctly clipped into their mounting clips and are not in contact with other pipes or metal surfaces.

To determine where the noise is coming from, functions G3\* G4\* and G5\* on the XR25 may be used.

The electronically managed suspension system on the X54 has two functions :

- Variable shock absorbing (AMV) allowing one of three shock absorbing levels to be selected depending on the conditions of use of the vehicle
- Self levelling suspension (COA) allowing the height of the vehicle to be adjusted depending on the conditions of use of the vehicle.

This system improves driving comfort, giving more flexibility for small journeys, while ensuring good road holding when required. The height of the vehicle may be kept constant irrespective of the on-board load.

These two functions are controlled by a single computer. This allows :

- more complex and more subtle functions to be managed,
- defect modes to be handled, where reduced operations are still available if a component fails.

## **ELECTRONICALLY MANAGED SUSPENSION SYSTEM = AMV + COA**

Functions :

### **VARIABLE SHOCK ABSORBING ON ALL 4 WHEELS (3 LEVEL HYDRAULIC SHOCK ABSORBING)\***

- MEDIUM : normal shock absorbing
- SPORT : firmer shock absorbing
- COMFORT : softer shock absorbing

### **"SLOW" SELF LEVELLING SUSPENSION ON ALL 4 WHEELS (3 LEVEL PNEUMATIC SYSTEM)\***

- NORMAL : load compensation
- HIGH : crossing obstacles
- MOTORWAY : improves drag factor

(\*) INTER-DEPENDANCY BETWEEN AMV AND COA

## **INSTALLATION AND COMPOSITION**

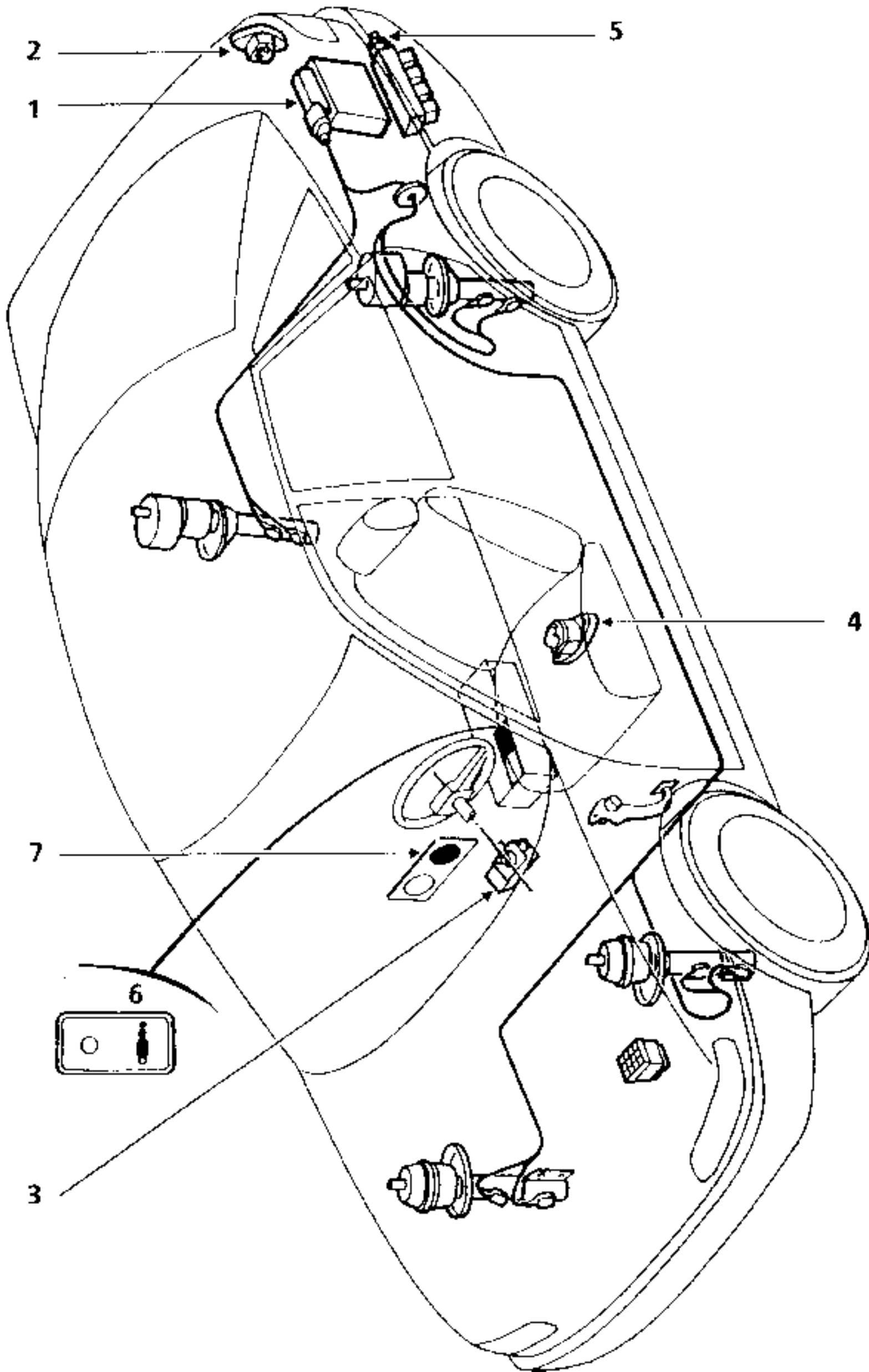
Variable shock absorbing (AMV) is comprised of the following sub-units :

- 4 specific hydraulic shock absorbers (each shock absorber has two solenoid valves),
- 1 computer (1) for testing and controlling the system, located in the rear luggage compartment ,
- 1 longitudinal body accelerometer (2) located in the rear luggage compartment on the LH side (rear light panel),
- 1 steering wheel angle sensor (3) located in the steering column,
- 1 vertical body accelerometer (4) located under the front LH seat,
- 1 load sensor (5) (pressostat) located on the pneumatic solenoid valve block in the rear luggage compartment,
- 1 connecting wiring harness,
- 1 driver/vehicle interface : control and signal unit (6) located on the centre console

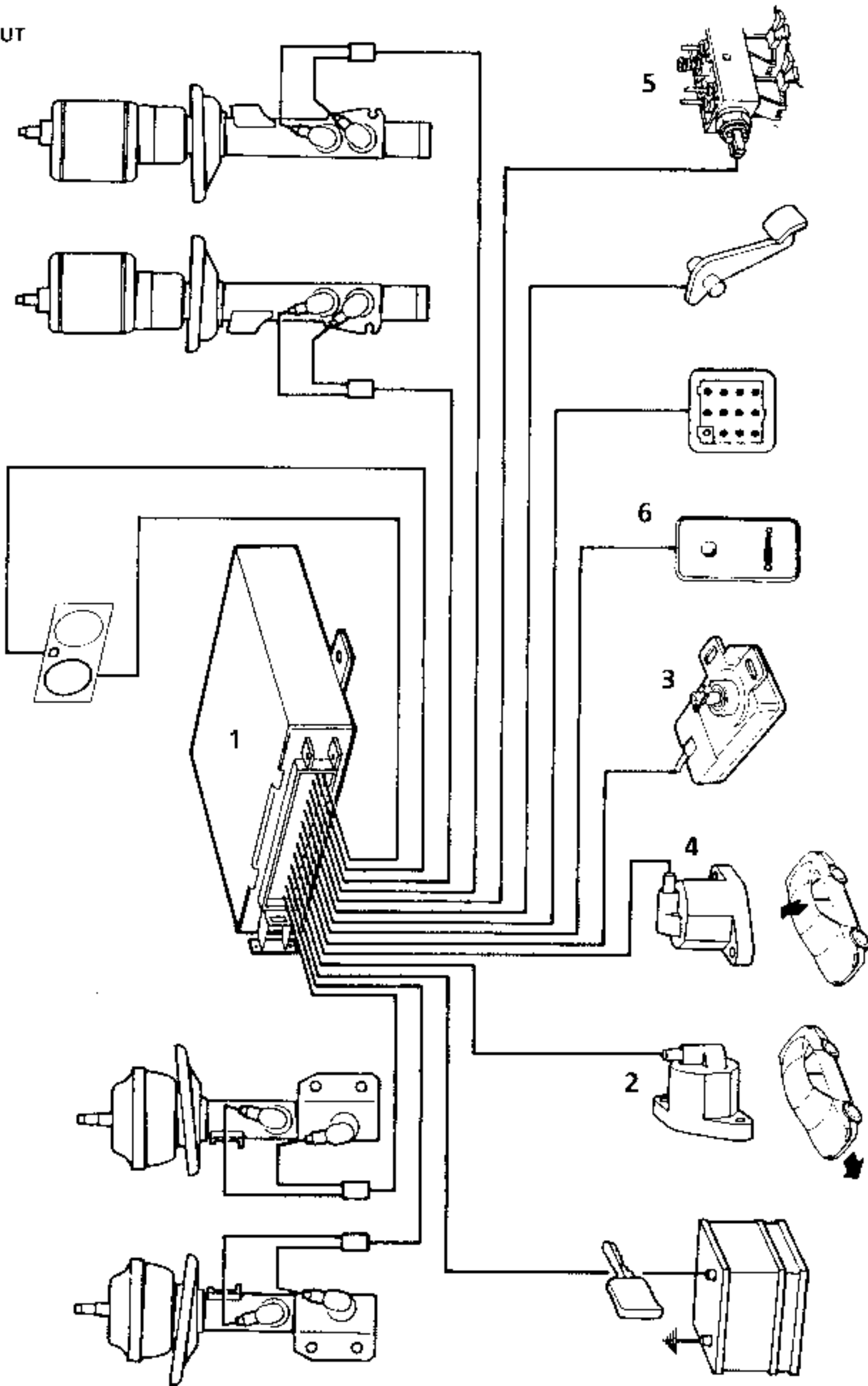
The following information is also used :

- vehicle speed (/),
- brake switch.

LOCATION AND COMPOSITION



LAYOUT





## LOCATION AND COMPOSITION

The self levelling suspension function (COA) is ensured by four pneumatic sleeves mounted in parallel with mechanical springs.

Regulation is carried out using three movement sensors and 5 pneumatic solenoid valves (13). The input parameters are :

- 1 front height sensor (9) located on the axle mounting,
- 1 rear right hand height sensor (10) located on the rear right hand tie rod bearing,
- 1 rear left hand height sensor (11) located on the rear left hand tie rod bearing,
- the brake switch,
- the vehicle speed,
- the control unit (6) located on the console,
- the oil pressure switch (8) (information engine running).

The function is controlled by :

- 1 motor compressor assembly (GMC) (12) located in the boot, behind the LH wheel arch \*,
- 4 control solenoid valves 2 front and 2 rear,
- 1 discharge solenoid valve (exhaust),
- 1 driver interface.

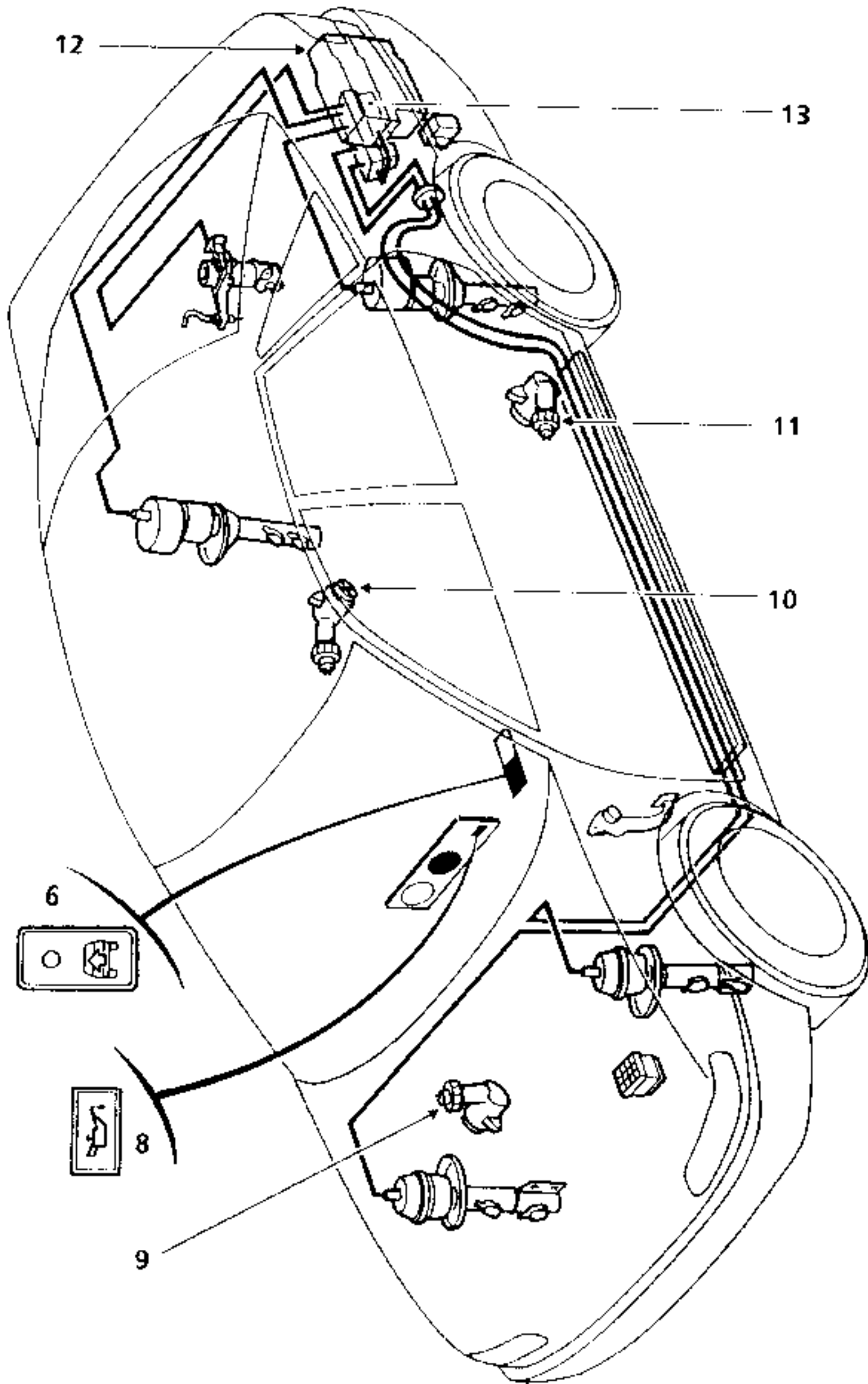
\* This is noise - insulated by a casing (polypropylene and polyurethane foam).

**NOTE:** The pneumatic wheel solenoid valves are controlled together on the front axle and individually on the rear axle

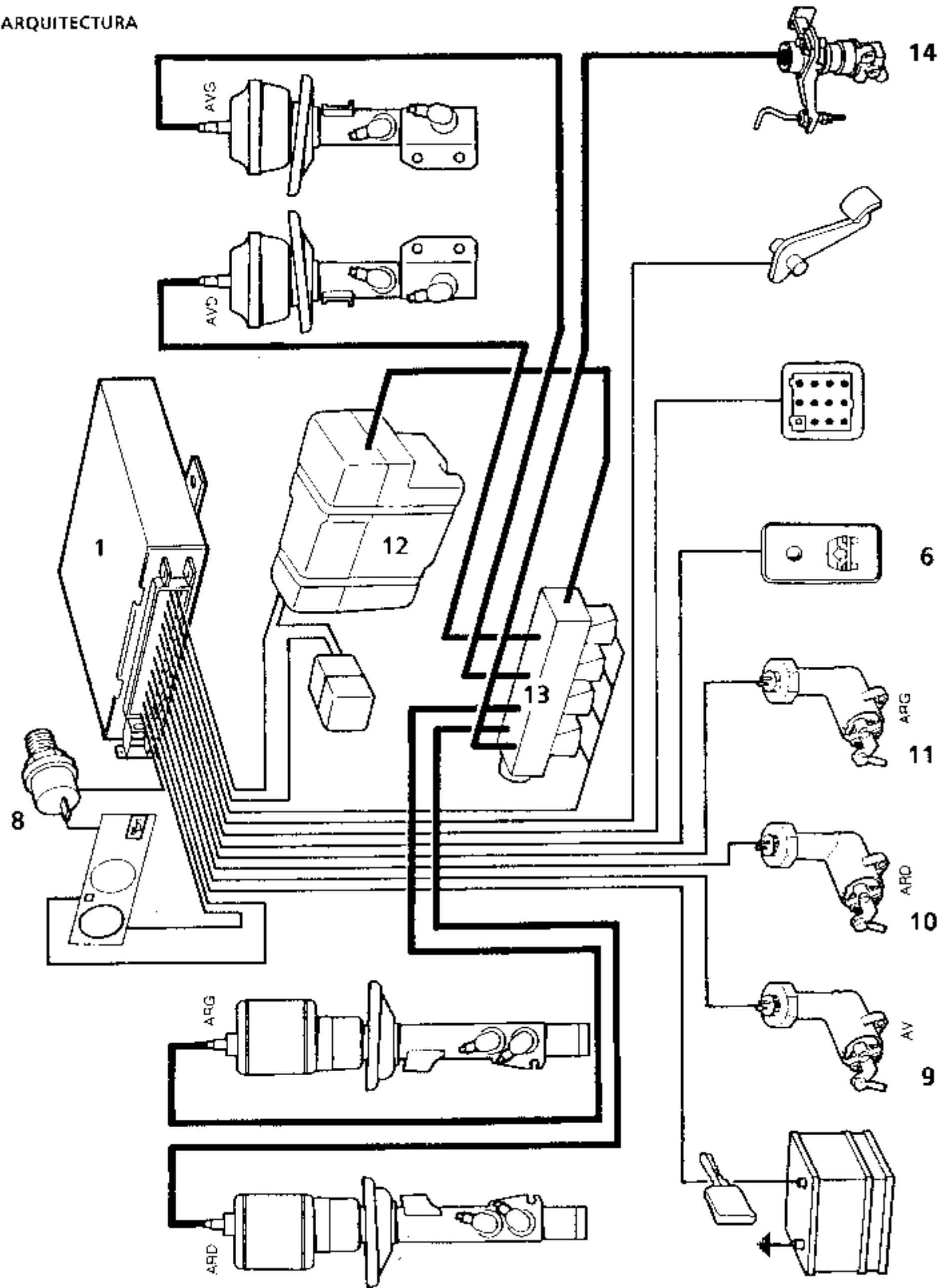
The brake pressure limiter (14) on these vehicle has two different functions :

- 1 conventional mechanical function,
- 1 pneumatic function, linked to the vehicle self levelling suspension system (rear RH circuit).

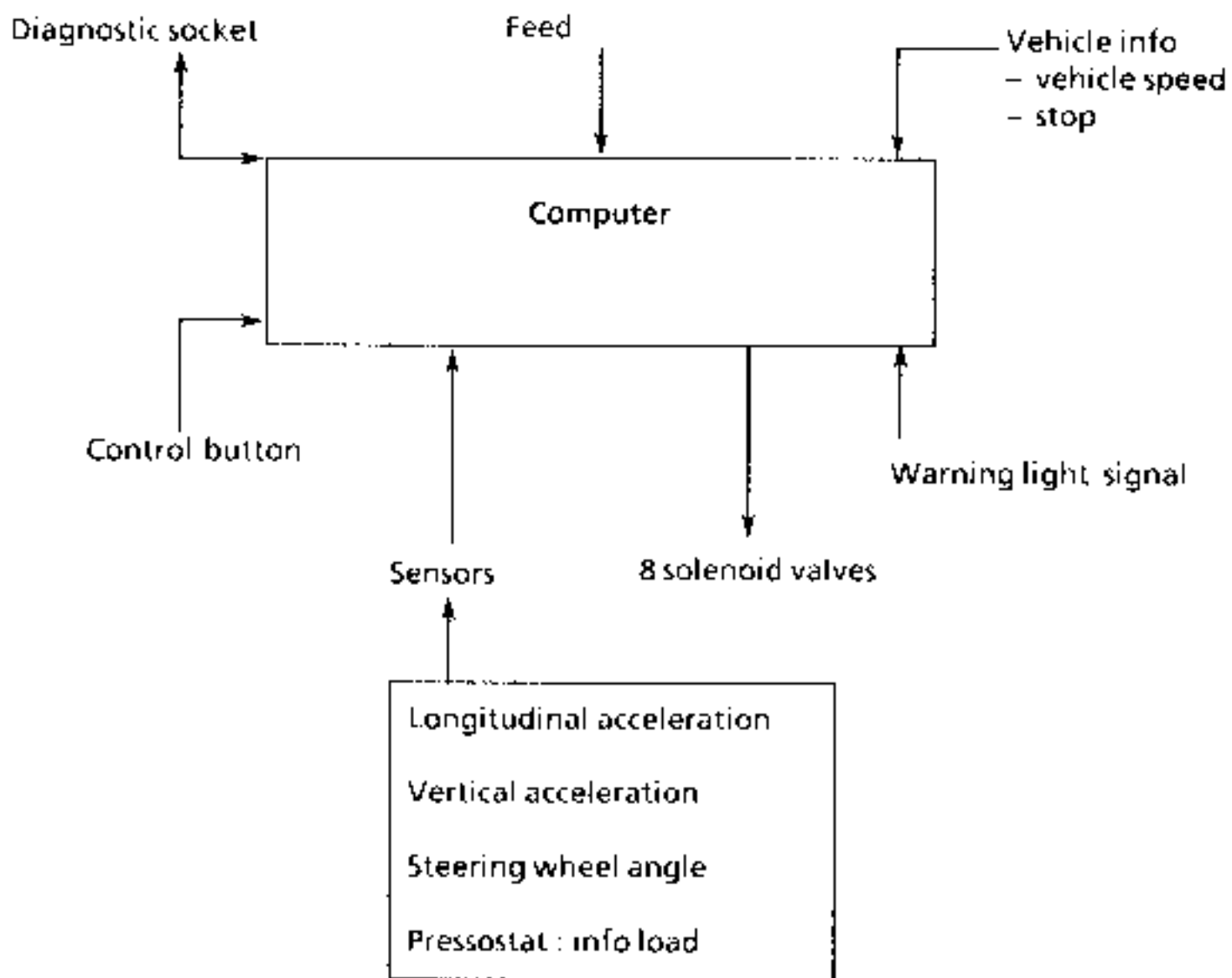
LOCATION AND COMPOSITION



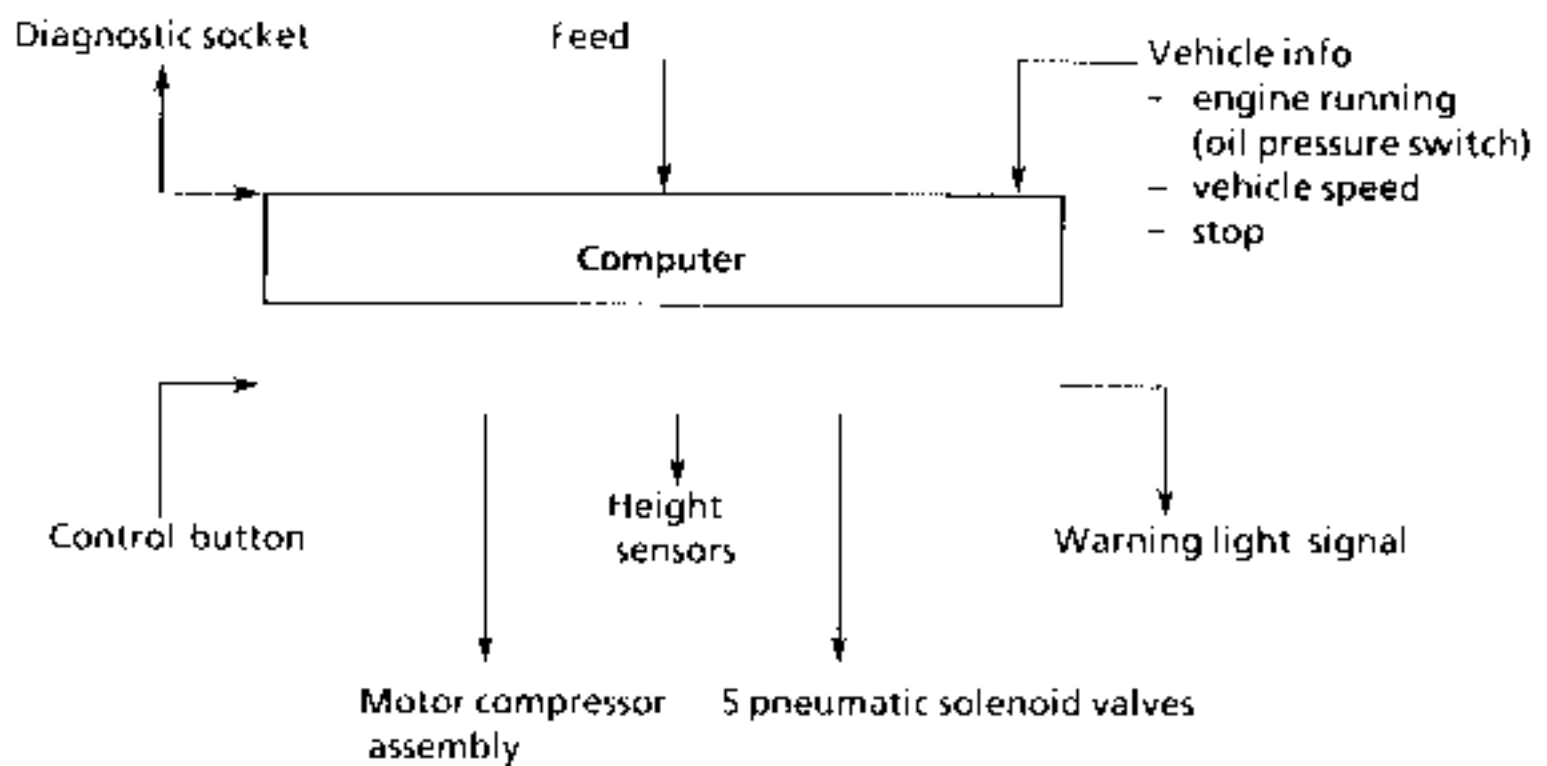
ARQUITECTURA



VARIABLE SHOCK ABSORBING FUNCTION PLAN



SELF LEVELLING SUSPENSION FUNCTION PLAN




## VARIABLE SHOCK ABSORBING - OPERATING PRINCIPLE

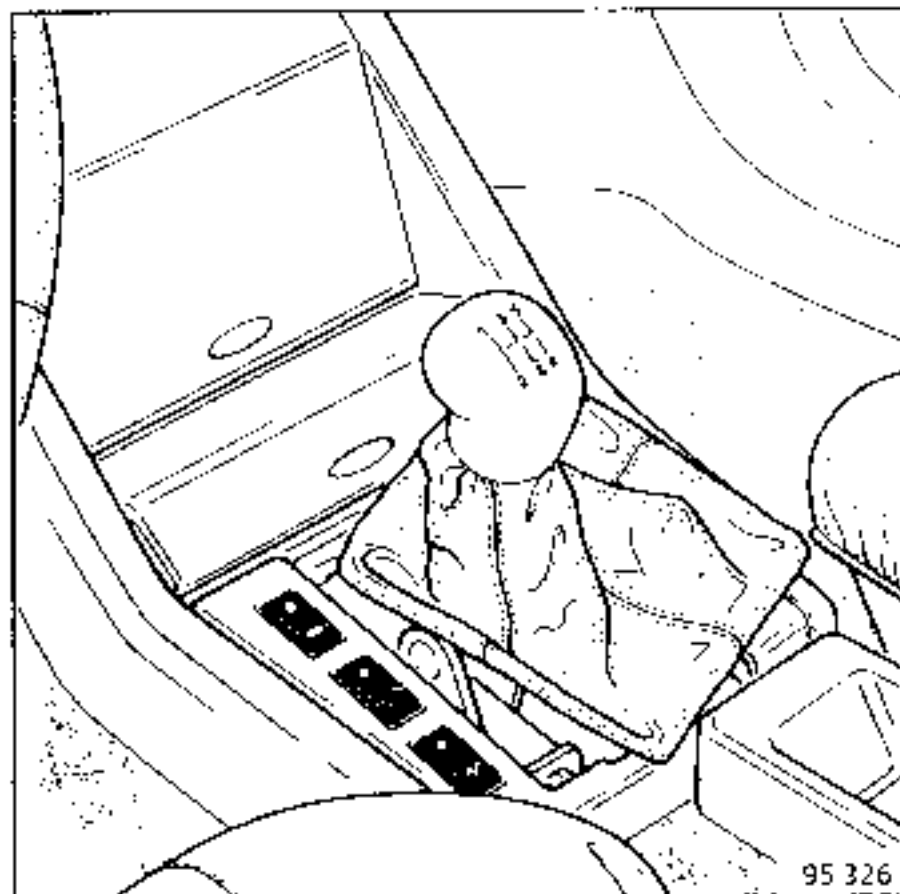
Two operating modes are possible :

### Automatic mode:

When the ignition is turned on, the system enters this mode and one of the three levels is selected to give comfort but also guarantee safety : "Comfort", "Medium" or "Sport" is selected depending on driving style and road surface.

### Manual mode:

To select this mode the switch  is pressed "Sport" mode is imposed. The tell-tale illuminates on the switch. To leave this mode, press the switch again and the tell-tale extinguishes.



The unit includes a light which illuminates when the side lights are switched on, and a resistance which then allows the "Sport" light to be dimmed.

When the suspension setting is altered, there is a delay, which prevents the system making unnecessary changes

To protect the suspension from large movements (example : going down a kerb) the automatic mode selects "Medium" for vehicle speeds above 3 mph ( 5 km/h)

## SELF LEVELLING SUSPENSION (COA) - OPERATING PRINCIPLE

The system is based on 3 level "slow correction"\* . This ensures that the vehicle compensates for loads being added or removed when the engine is running.

- Normal position (N).
- High position (H) (crossing obstacles), on driver request.
- Motorway position (B) giving improved drag factors by reducing aerodynamic drag at certain speed thresholds.

The variations in height/body are managed by a computer which authorises the appropriate correction according to the value assigned to the trim.

Variation is carried out by increasing or decreasing the pressure in the sleeves (increase or decrease in the amount of air).

\* Slow correction system : temporary height changes such as pitch, pumping and roll are not taken into consideration.

**Operation:**


- After starting the engine, the system enters automatic mode. This ensures a constant ground clearance whatever the on-board load may be.

When the vehicle exceeds 75 mph (120 km/h) for 7 minutes, the body is automatically lowered into the motorway position (- 15 mm) to improve the aerodynamics.

- The vehicle returns to "normal position " :


1. if the system detect a poor road surface which is incompatible with this position,
2. when the speed drops below 50 mph (80 km/h).

**Manual mode:**

This mode is selected by pressing button  and the high position (+ 30 mm) is imposed.

A light in the button shows the selection. This light flashes when the high position is selected.

This position is used for crossing obstacles or when driving on poor road surfaces to avoid damaging components under the body

In order to give optimum comfort, it is advisable to cancel this mode by pressing button  again (the warning light extinguishes) when the conditions return to normal.

The vehicle will automatically return to "normal position" if the vehicle speed exceeds 62 mph (100 km/h)

Below 15 mph (25 km/h) will return to the "high" position.

The following table shows speed as a control variable for the self levelling suspension system :

	Operation	
	Manual	Automatic
Normal → low		75 mph
Low → normal		50 mph
Normal → high	15 mph	
High → normal	62 mph	

**NOTE :** selecting manual mode prohibits the use of the motorway setting.

**OPERATING CHARACTERISTICS**

- Raising speed (from normal height) :  
Unladen : 3 mm/s  
Laden : 2 mm/s
- Lowering speed (from normal height) :  
Unladen : 1,5 mm/s  
Laden : 3 mm/s

Height retention < 4 mm in 48 hours.

**FAULTS:**

The FAULT warning light, in the instrument panel, is also used for the variable shock absorbing system. It is normally extinguished except when the ignition is switched on, when it is illuminated for 2.5 seconds to show it is operating correctly. If there is a fault, it is illuminated as long as the ignition is switched on :

- if the fault is not important and if the fault is not recognised immediately, when the ignition is turned on again the warning light illuminates for 2.5 seconds,
- if the fault is important, the warning light remains illuminated after the ignition is turned on again.

Each time the ignition is turned on, if there is no fault in the system, self levelling suspension operation is initialised in the automatic mode and normal position.

**SELF TESTING**

The self test is an automatic process allowing the computer to :

- check its environment,
- adopt the defect mode appropriate to each fault found,
- to store any faults found in a permanent memory for later examination.

Certain tests are carried out when the ignition is switched on and then later

**1) Test after switching the ignition on or initialisation test**

- Internal microprocessor tests.
- Memory verification.
- Illuminating the warning lights then extinguishing after 2 seconds.

**2) During operation**

There are several types of self test : some are carried out continually, and others require special conditions (vehicle speed above a certain level, for example) ; in all cases, the tests are carried out at the same time, continuously.

Only the electrical system parameters are tested (currents, voltages), with the exception of pneumatic leaks, which can be discovered indirectly. Wear or damage to the shock absorbers (hydraulic section) is not covered here, and should be tested in the conventional manner.

**• PERMANENT TESTS**

Output tests are permanent (solenoid valves, relays, warning lights) where faults are detected by measuring current :

- |  |  |   |                                  |
|--|--|---|----------------------------------|
| <ul style="list-style-type: none"><li>- short circuit</li><li>- open circuit</li><li>- permanent control</li></ul> | <table border="0"><tr><td>}</td><td>if the element considered is fed</td></tr></table> | } | if the element considered is fed |
| }  | if the element considered is fed   |   |                                  |

An open circuit on the height sensors is detected immediately (no pulse).

**• TESTS REQUIRING CERTAIN CONDITIONS**

Sensor tests are more difficult to perform and are more often carried out by correlating several phenomena, for a set length of time.

**Accelerometers:**

Faults tested : open circuit, short circuit at + 5 V or earth.

If the output voltage exceeds 4,5 V or is less than 0,5 V for 30 seconds, a fault is signalled.

**Steering wheel angle sensor:**

Faults tested : open circuit, short circuit at + 5 V or earth.

If the output voltage exceeds 4,5 V or is less than 0,5 V for 1 minute at a speed greater than 37 mph (60 km/h), a fault is signalled

**Speed signal :**

Faults tested : open circuit, short circuit at + 12 V or earth, intermittent or interference signal.

If the vertical acceleration frequency average factor is present for 30 seconds without a speed signal, a fault is detected.

If the signal frequency exceeds the corresponding value for 167 mph (270 km/h), a fault is detected.

**Pressure switch :**

Fault tested : short circuit to earth.

If the speed signal is present for 30 seconds when the pressure switch is closed, a fault is detected

**Stop switch :**

Faults tested : short circuit for + 12 V, intermittent or random signal.

If the information is present for more than 255 seconds at a speed other than zero, a fault is signalled

If the signal changes state more than 50 times in 10 seconds, a fault is detected.

**Push button :**

Faults tested : short circuit to earth, intermittent or random signal.

If the information is present for more than 30 seconds, a fault is signalled.

If the signal changes state more than 50 times in 10 seconds, a fault is detected.

**Level sensors :**

Fault tested : permanent height (open circuit : see permanent tests)

if the signal does not vary for 2 minutes at a speed above 15 mph (20 km/h), the sensor is considered faulty.

**Pneumatic leaks :**

If the vehicle does not reach the required height in 90 seconds, a fault is noted. This fault is noted for both raising and lowering the vehicle, so that the cause of the fault could be a pneumatic leak or a mechanical problem which prevents the vehicle from being lowered, or a level sensor problem.

If the compressor operates more than 12 times in a row (without deflation), this fault is also signalled.

**DEFECT MODES**

Defect modes are secondary operation modes which the system enters if a fault is confirmed.

The computer distinguishes between faults due to the variable shock absorbing system, those due to the self levelling suspension system and those concerning the complete system.

The defect operation triggered by these faults may be of varying type, depending on the case : reduction of AMV or COA operations or both.

**FOR AMV** the defect modes are (in increasing order of severity) :

- comfort level is prohibited on all shock absorbers,
- all shock absorbers set to medium,
- all shock absorbers set to sport.

**FOR COA**, these are :

- low and high positions prevented (normal position only),
- one axle isolated ; normal position for the other axle,
- both axles isolated.

Each time a defect mode is selected, the computer illuminates the fault warning light and the service light on the instrument panel. In most cases, the lights remain illuminated until the ignition is switched off, but for serious faults, the warning lights remain illuminated each time the ignition is switched on..

If there is a fault, after the ignition has been switched off, the computer memorises the fault in its permanent memory.



**Fault types :**

**a) Permanent fault :**

A fault is considered permanent when it appears (warning light illuminated) and is displayed on the XR25 by continuous illumination of a bar graph other than 1 or 5 (engine not running).

**b) Temporary fault :**

A fault is classed as temporary after it has been stored and has disappeared (shown on XR25 by flashing of the bar graph).

**Important notes :**

1) Any operations on the pneumatic circuit mean that :

- The pneumatic circuit must be drained of air using "command" G09\* on the XR25.
- The O rings must be replaced on the pipes
- The threaded pipe unions must be hand tightened on various elements
- The quick fastening joints and pneumatic pipes must be correctly clipped

2) When a fault is found with one of the system components, make sure that it has been corrected by using the fault finding procedure after repair

After repair, the memory must be erased by entering on the XR25 : GO\*\* and entering the repair date (see page 135)

Certain faults are only apparent after reaching a certain speed for a certain period, a road test must be carried out and then the XR25 test must be performed.

3) If an operation must be carried out which involves replacing a sensor (level sensor, longitudinal accelerometer, computer), the value for the sensor must be set.

Remember that accelerometer sensors are extremely fragile ; avoid subjecting them to shocks and ensure the longitudinal sensor is mounted correctly.

Ensure the wiring and connections are correct the reliability of the AMV and COA systems depends on this

When disconnecting the 3 track connector (AMV) avoid using a sharp tool which could damage the retaining lugs on the two parts of the connector.

Never pull or push shock absorber wiring.

4) Level sensors :

- **Never separate the ball joints from their rod** but remove the mounting nut for the ball joint on the tie-rod or lever.
- When replacing, check the fitting direction for the levers on the sensors (lever lug opposite sensor recess).

5) Do not operate the motocompressor assembly alone, (when the 4 solenoid valves are closed) or for a long time or too often (1 minute maximum every 5 minutes) If it must be operated frequently, open the cover on the compressor unit.

**IMPORTANT :** using the headlight adjustment control. For legal and safety reasons only use positions 0 and 1.

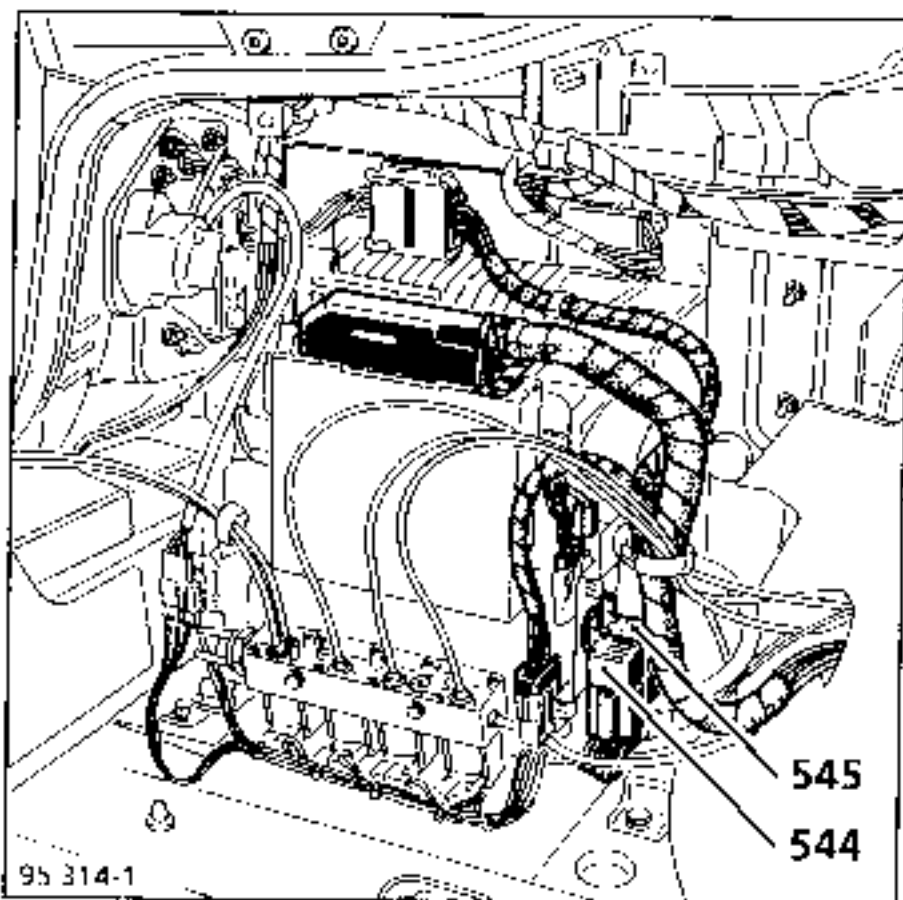
## COMPUTER

### REMOVAL

Remove the rear luggage compartment left hand side trim.

Remove the two computer mounting bolts and pull the computer out

Disconnect the 55 track connector.



### REFITTING

If the computer is replaced, the longitudinal accelerometer (AMV) and parameters (COA) must be reset (see pages 137 to 141).

## RELAYS

**Feed relay : (50 Amp) 544 violet**

This relay feeds the power required to the pneumatic compressor electric motor.

The relay coil is wired in series with the thermal cut out on the electric motor.

It is connected to track n° 38 on the computer.

## FEED FUSE

The fuse is located in the engine compartment



40 Amp →

It is tested when the compressor assembly is operated.

It is connected to track 16 on the computer.

## Thermal cut out

This prevents the compressor motor being used too often or for too long. The cut out temperature is 120 °C.

The relay coil is wired in series with the thermal cut out on the electric motor

## SAFETY RELAY 25 A (brown 545)

The safety relay is controlled by the computer to feed :

- the computer internal power regulator to supply the AMV solenoid valves,
- the power relay and the thermal cut out,
- the pneumatic pressostat,
- the 5 pneumatic COA solenoid valves.

The safety relay coil is connected to terminal n° 54 on the computer.

## FEED

The computer is fed with a fused + after ignition and a + battery feed across the safety relay (see operating diagram).

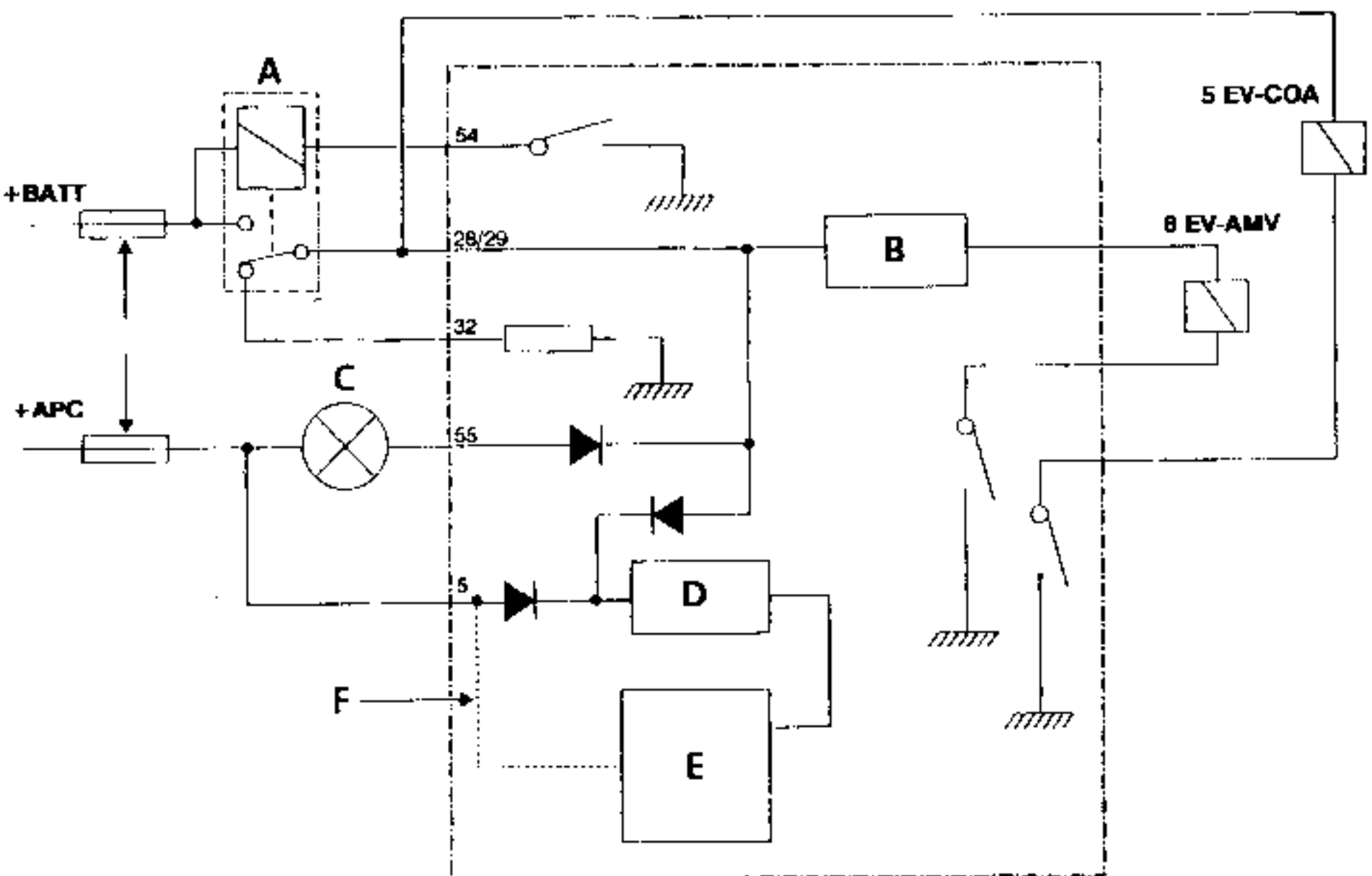
When the ignition is switched on (APC\*), the microprocessor is fed across the 5 V regulator via the input (track 5 on 55 track connector). Confirmation is given by "Info presence + APC"

After starting tests, the microprocessor controls the "safety relay" (track 54). The power regulator and the 5V regulator are then fed via tracks 28 and 29.

When the ignition is switched off (Info presence + APC disappear) the microprocessor continues to self feed for 30 seconds via the safety relay (tracks 28 and 29).

For certain serious faults the microprocessor opens the safety relay. When the safety relay is open, an internal loop in the system ensures the warning light is illuminated (tracks 55 - 28 - 29 and 32).

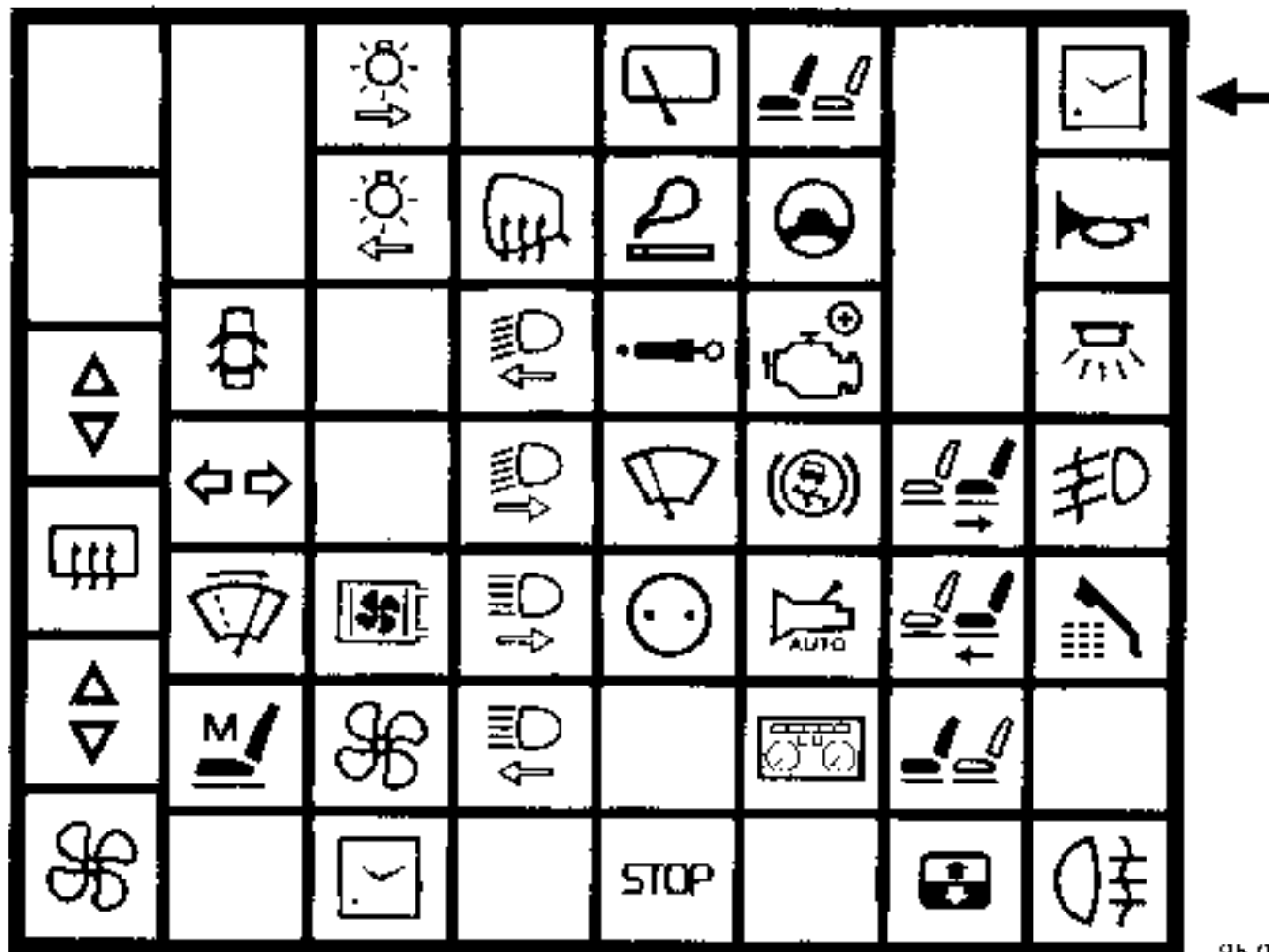
## COMPUTER ELECTRICAL FEED DIAGRAM



- A Safety relay
- B Power regulator
- C Warning light
- D 5 V regulator
- E Microprocessor
- F Info presence + APC

**FUSE BOX (passenger compartment side)**

This fuse box is located in the passenger compartment

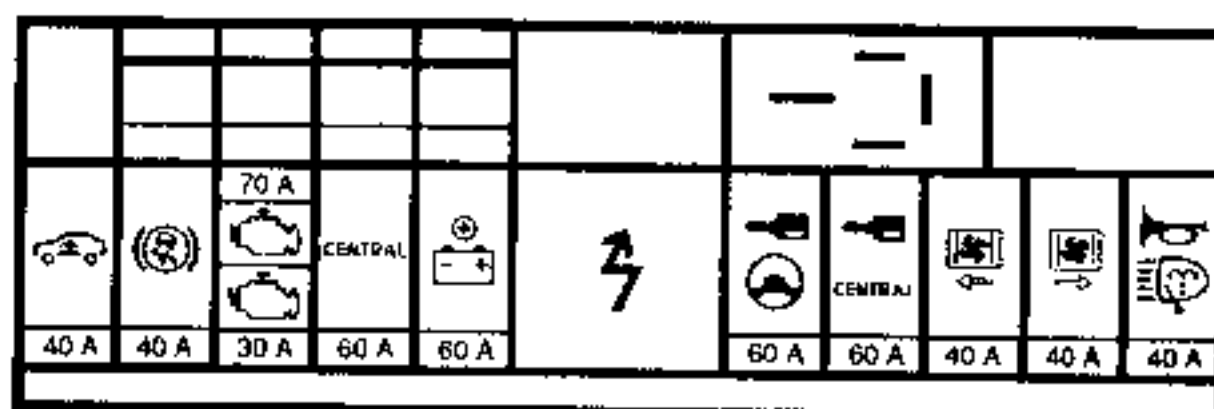


95 041-1

Symbols	Rating	Description
	10 A	Clock- Alarm - Computer or system memories - controlled suspension safety relay
	15 A	Self levelling suspension - Controlled suspension computer
	10 A	Instrument panel (warning lights)
	10 A	LH side lights - AMV - COA control switch lighting

**FUSE BOX (engine side)**

This fuse box is located in the engine compartment behind the battery



95 090

Controlled suspension 40 A - motocompressor assembly relay feed

**STEERING WHEEL ANGLE SENSOR**

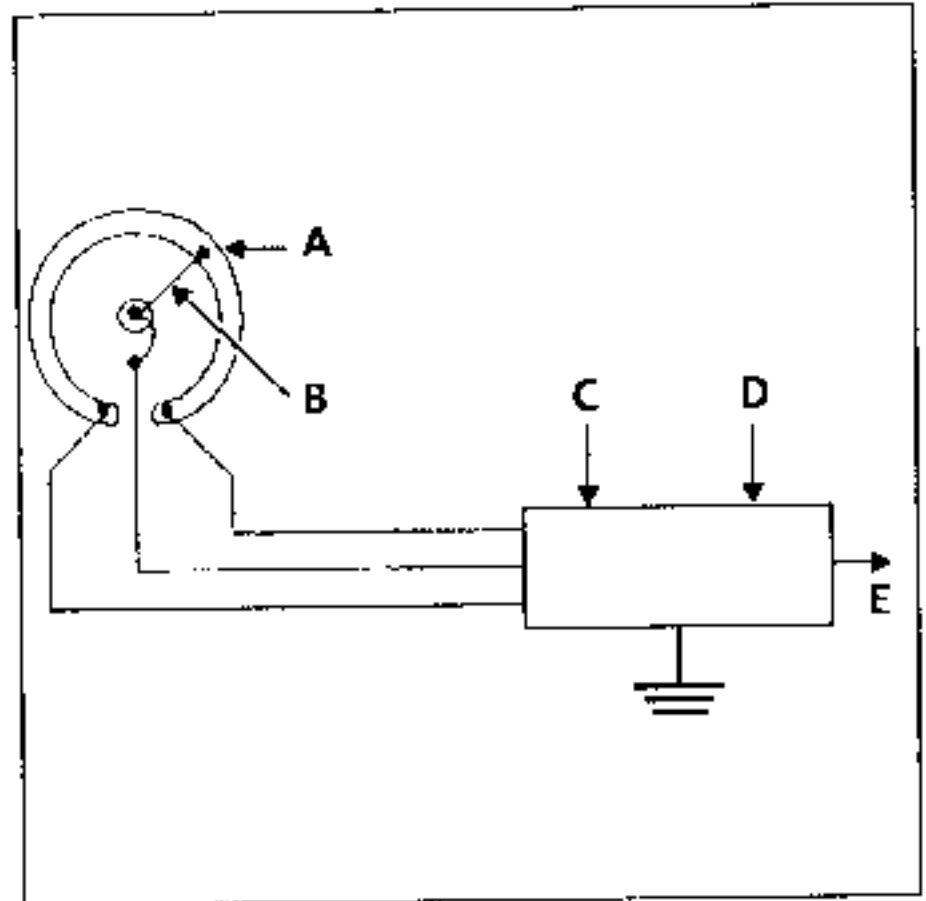
The operation of this sensor is identical to that of the longitudinal accelerometer sensor, but this sensor allows vehicle movement to be anticipated by measuring the steering angle.

Subject to environmental limitations and the need for increased sensitivity, a  $90^\circ$  gear which multiplies by 2 has been fitted with a sensor to the steering column. One revolution of the steering wheel corresponds to two rotations of the sensor.

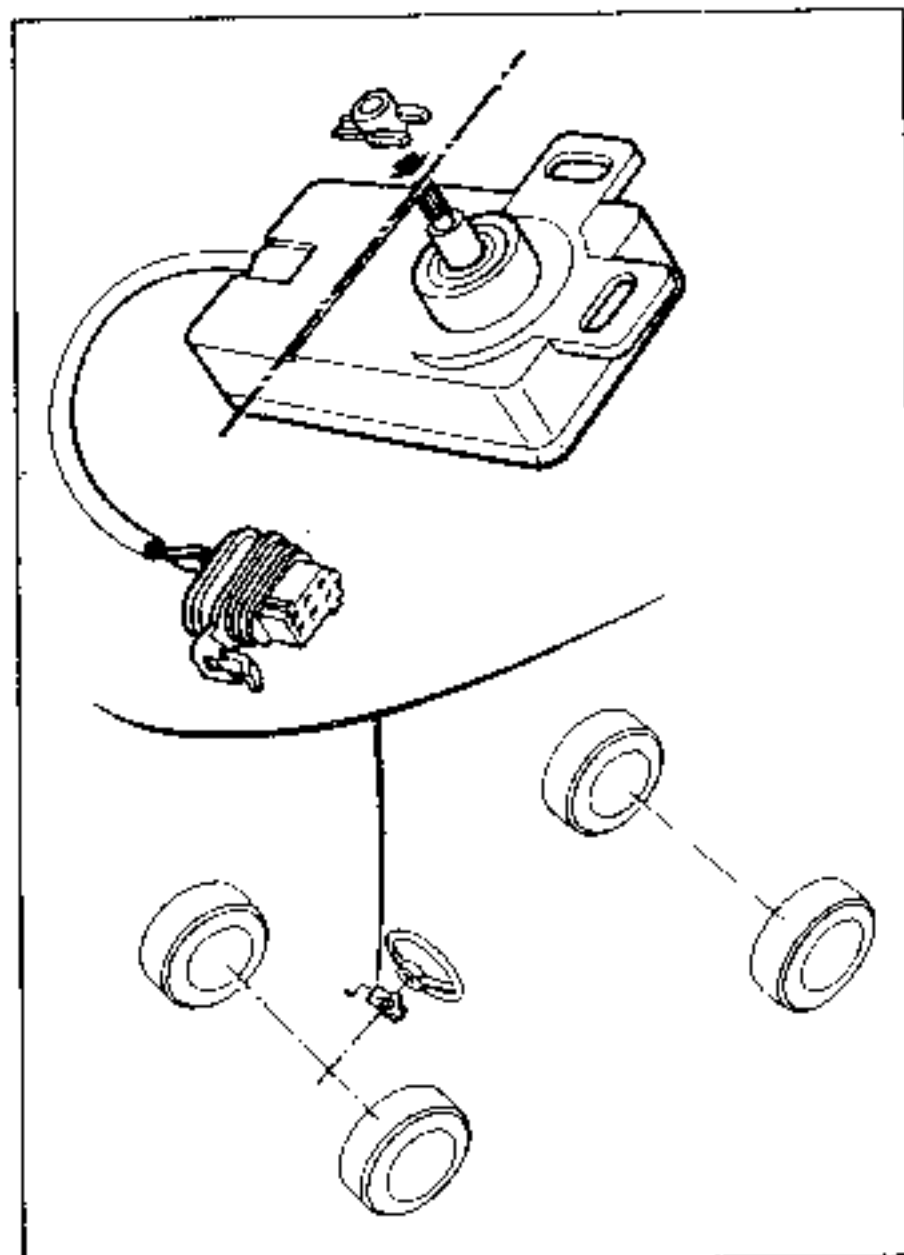
The sensor is a potentiometer type with a single revolution, but no rotation stop.

Integral electronics process the information from the sensor and provide a voltage curve depending on steering wheel angle. To know the total rotation angle, the number of rotations must be counted.

In the "Dead" zone, the sensor transmits no information which is proportional to the steering wheel angle; this corresponds to the position "wheels straight", this is statistically the most common position, and should be calibrated to be as far away as possible from this zone.



- A Resistant track
- B Slide
- C Computer reference voltage (5 V)
- D Process electronics feed (12 V)
- E Signal output



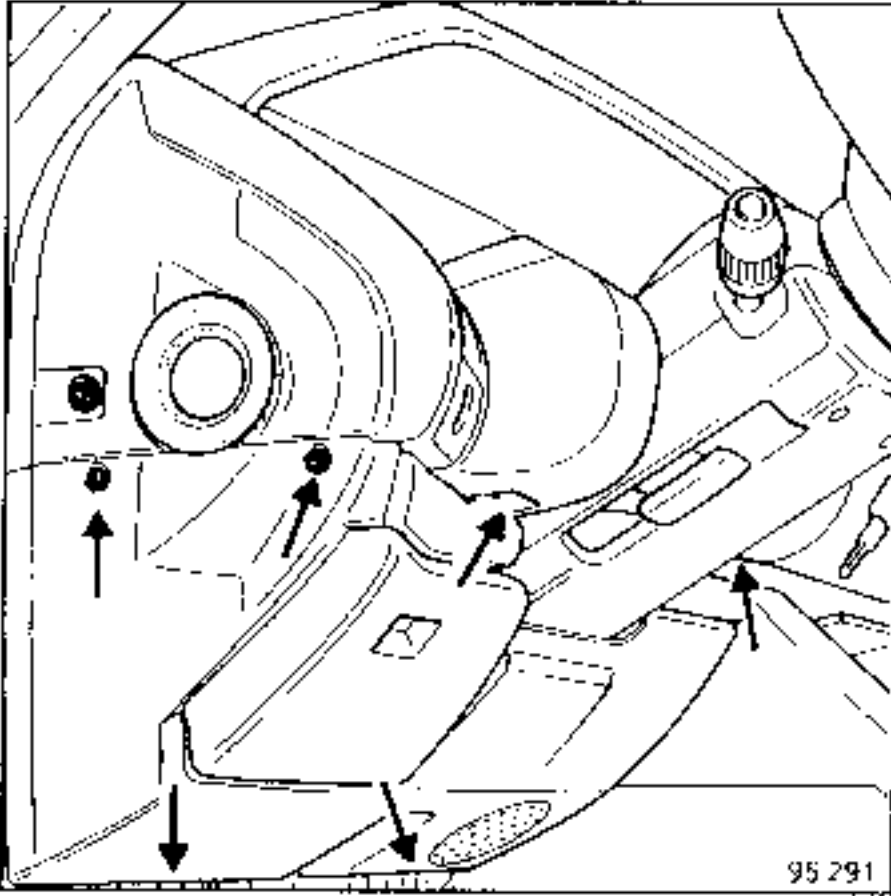
## STEERING WHEEL ANGLE SENSOR

With the wheel straight, lock the steering wheel at the centre point using the steering lock on the ignition switch.

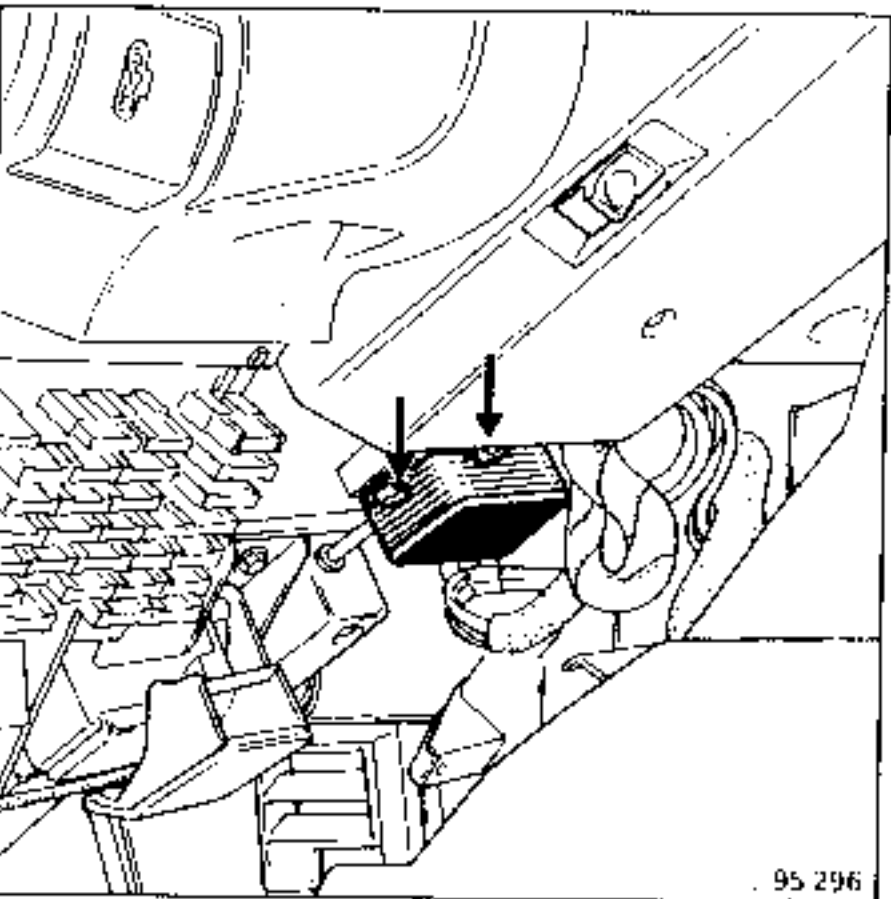
### REMOVAL

Remove:

- the lower steering column cover,



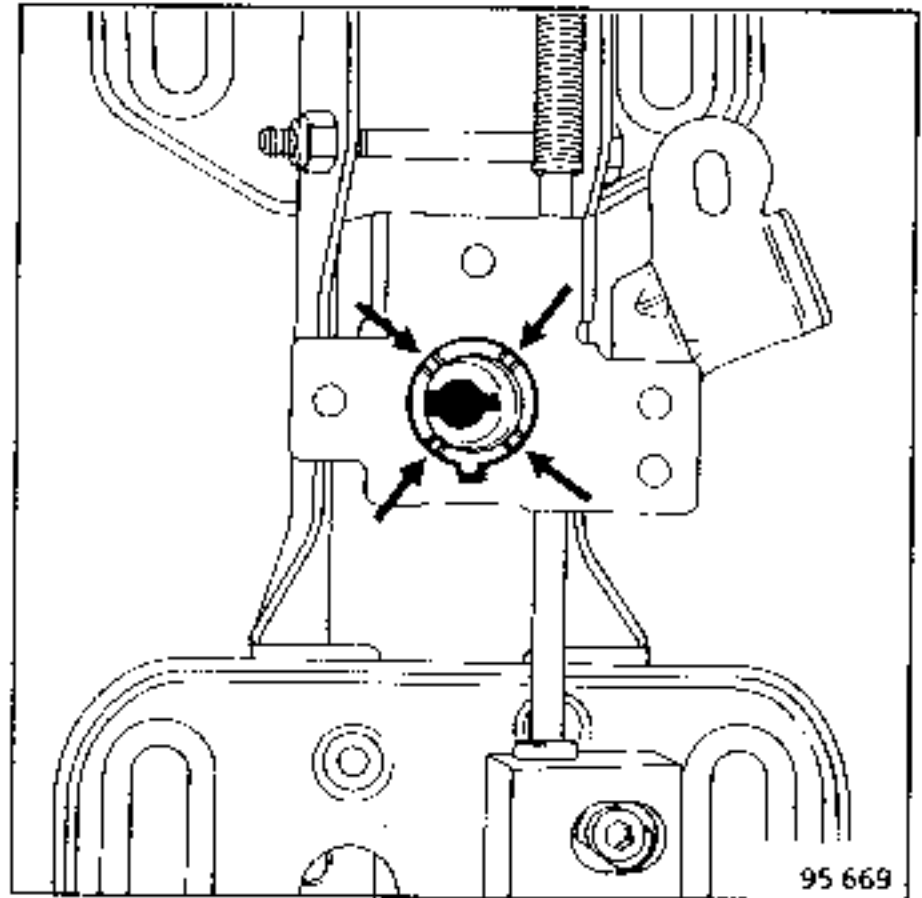
- the two sensor mounting bolts



Disconnect the connector and remove the sensor.

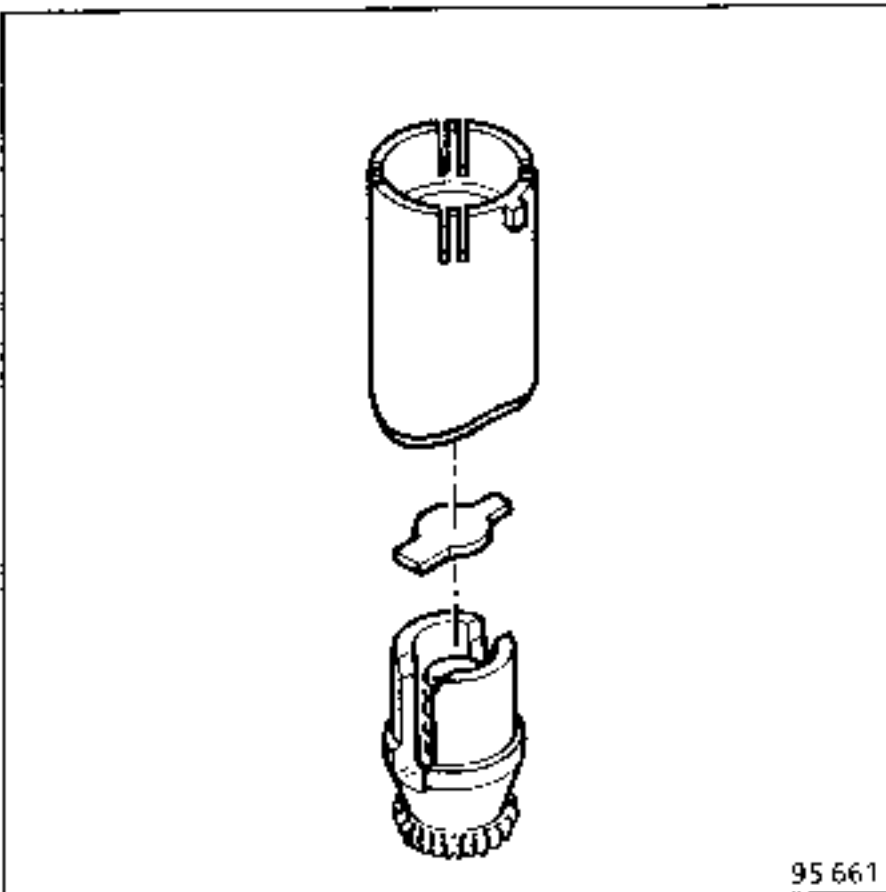
### REFITTING

Check the position of the drive pinion which should be in this position.



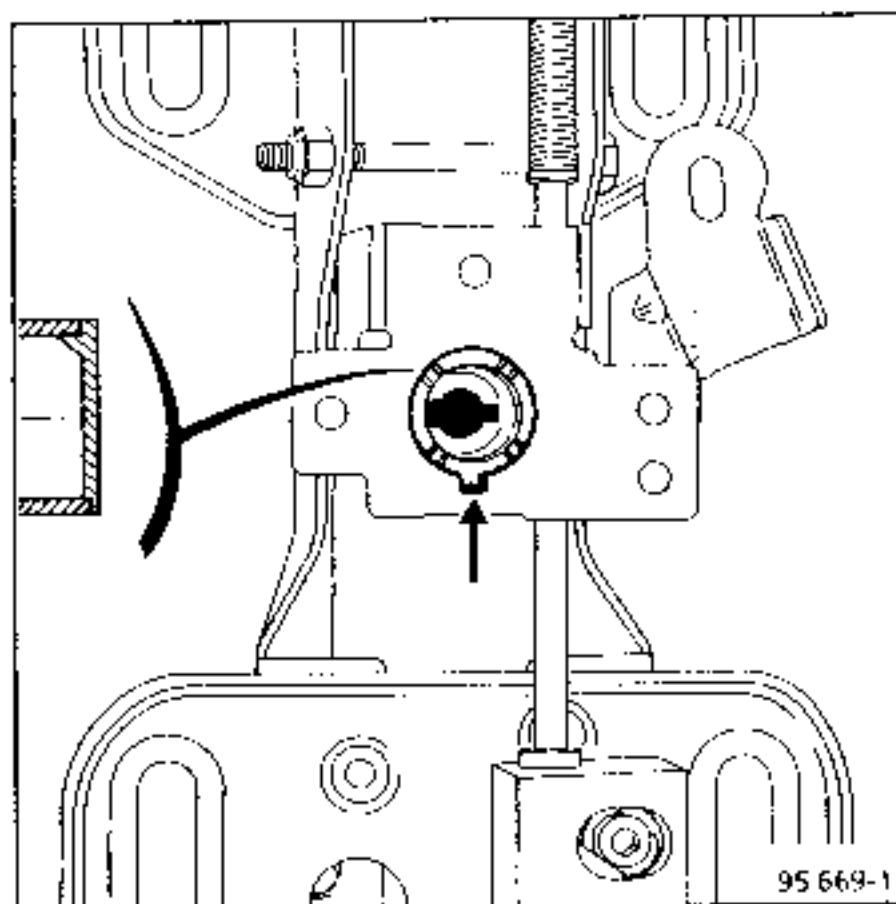
It may be that the pinion has slipped a few teeth. In this case, extract the sleeve using a screwdriver (arrows).

Check the condition of the parts and coat lightly with "ELF multi" grease.



Relocate the assembly ensuring the drive pinion and sleeve are correctly positioned.

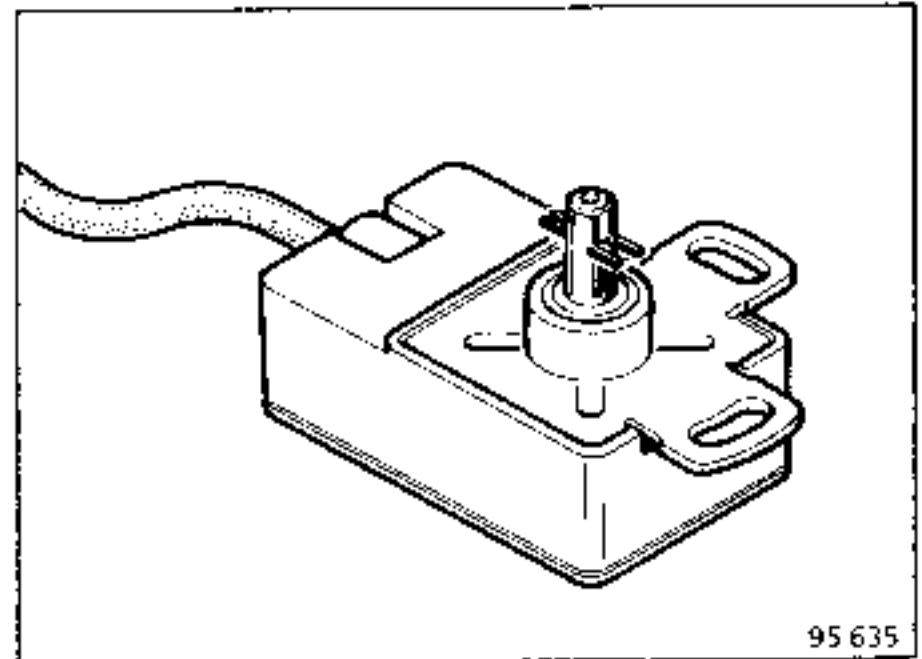
Check the sleeve is correctly clipped in



## REFITTING

### • Reusing a sensor:

So that the sensor is in the centre of the measuring range, the drive shaft should be in this position.



### • New sensor :

A reference mark (mechanical lock) marks zero degrees so that the sensor is in the centre of the measuring range when refitted.

With the steering column locked, fit the sensor in place ensuring the drive shaft is correctly positioned, then secure it.

### With the engine running :

Using XR25, and after initialising dialogue, use function # 03 and check the angle values by moving the steering gently from right lock to left lock.

The value should be between :

+  $580^\circ \pm 20^\circ$   
and -  $580^\circ \pm 20^\circ$ .

Refit the lower steering column cover.

**NOTE:** this sensor self calibrates after a certain period of driving

## ACCELEROMETERS

The accelerometers react to body positions and must be precisely located.

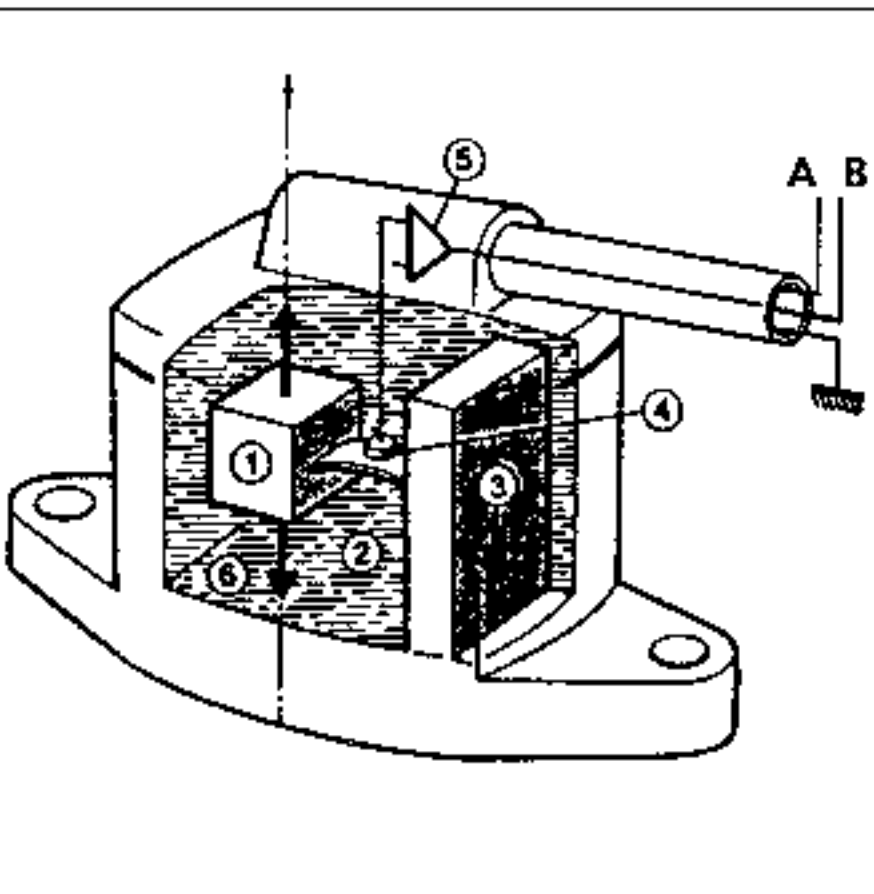
Longitudinal acceleration is the main variable factor in straight line "behaviour" for AMV operation. Its level determines the shock absorber setting selected.

Vertical acceleration is the main variable factor in the "comfort" strategy for the AMV function. Two types of information are deduced by numerical filtering (low frequency for body pumping and medium frequency for wheel movements).

## ACCELEROMETER SENSOR PRINCIPLE

Variation direction

- 1 Seismic mass
- 2 Flexible beam
- 3 Pillar
- 4 Gauge bridge
- 5 AMPLI + FILTER
- 6 Oil bath
- A + 5 V feed
- B Output signal



The acceleration sensor receives a regulated 5V feed from the computer. Depending on the movement of the sensitive element on the flexible beam, it returns a modified voltage output signal to the computer.

From the diagram, the importance of the correct positioning of the sensors can be recognised. The seismic mass must be correctly located and must be free to move without interference from the flexible beam sensitive element.

### ATTENTION :

- The sensor is fragile. Do not subject it to shocks. It may be destroyed if allowed to drop to the floor.
- When working on the longitudinal accelerometer or when replacing the computer the sensor value must be reset by transmitting a code to the computer using the XR 25 (see page 141)



## VERTICAL ACCELEROMETER

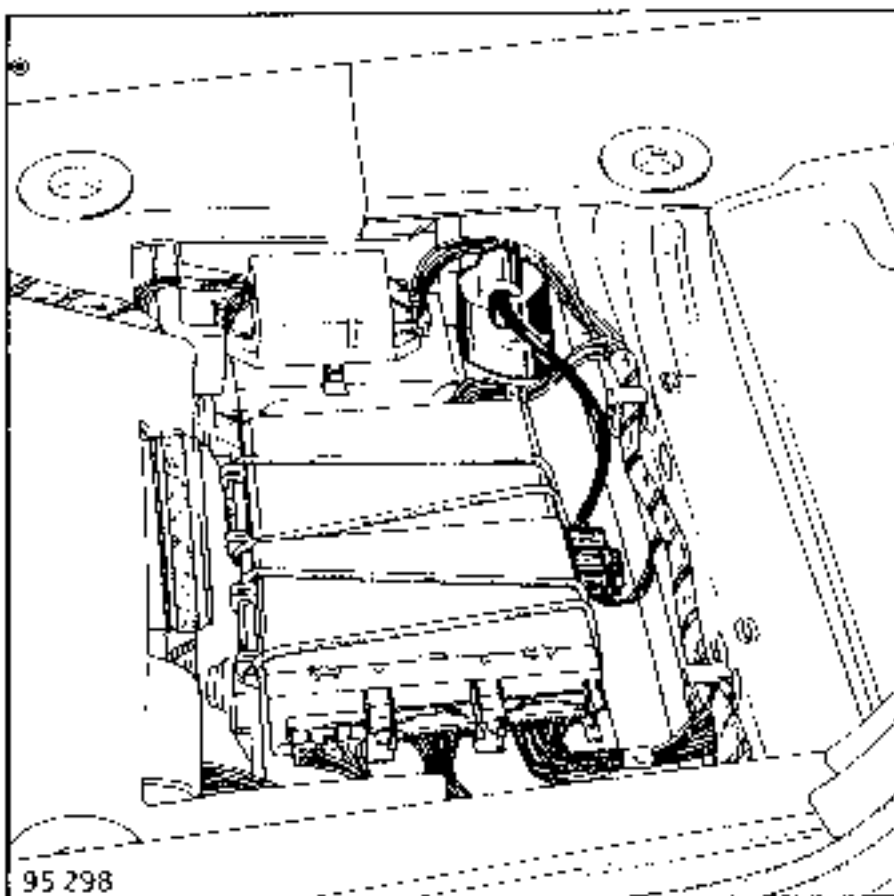
### REMOVAL

Push the front left hand seat forward as far as possible

Remove:

- the two mounting bolts on the plastic cover and remove the cover,
- the two sensor mounting bolts.

Disconnect the 3 track connector and remove the sensor.



### REFITTING

Handle the sensor with care.

Refitting is the reverse of removal ensuring that the connector is correctly connected.

**NOTE:** the value of this sensor does not need to be reset.

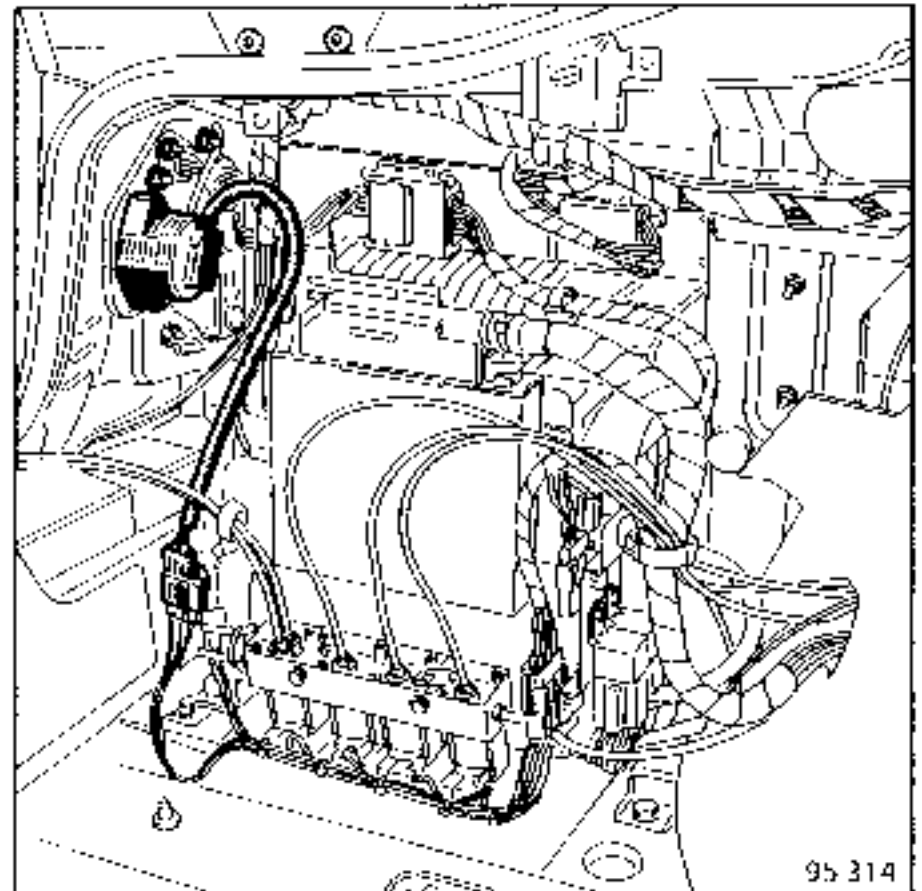
## LONGITUDINAL ACCELEROMETER

### REMOVAL

Remove the rear luggage compartment left hand side trim.

Disconnect the three track connector

Remove the accelerometer and mounting assembly.



### REFITTING

Ensure the sensor is fitted correctly → wire output at the top.

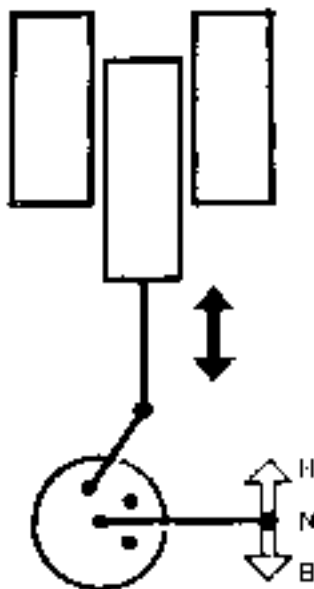
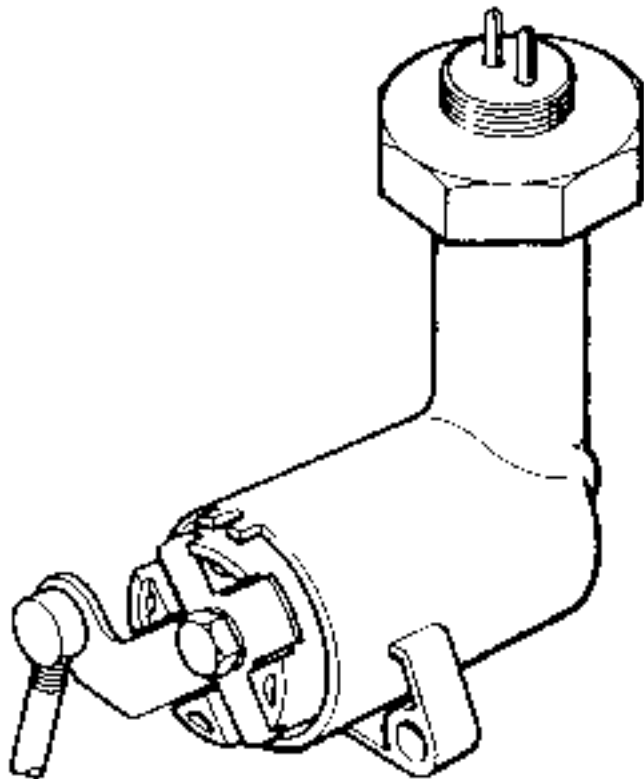
Ensure the connector is correctly connected.

Calibrate the value for this accelerometer (see page 141).

## LEVEL SENSOR

### Role :

Measures the variation in body height.



### Principle :

This sensor is inductive consisting of a plunger core and coil.

A crank system converts the rotary movement of an external lever to linear movement of the plunger core inside the coil.

Coil resistance : approx 120  $\Omega$ .

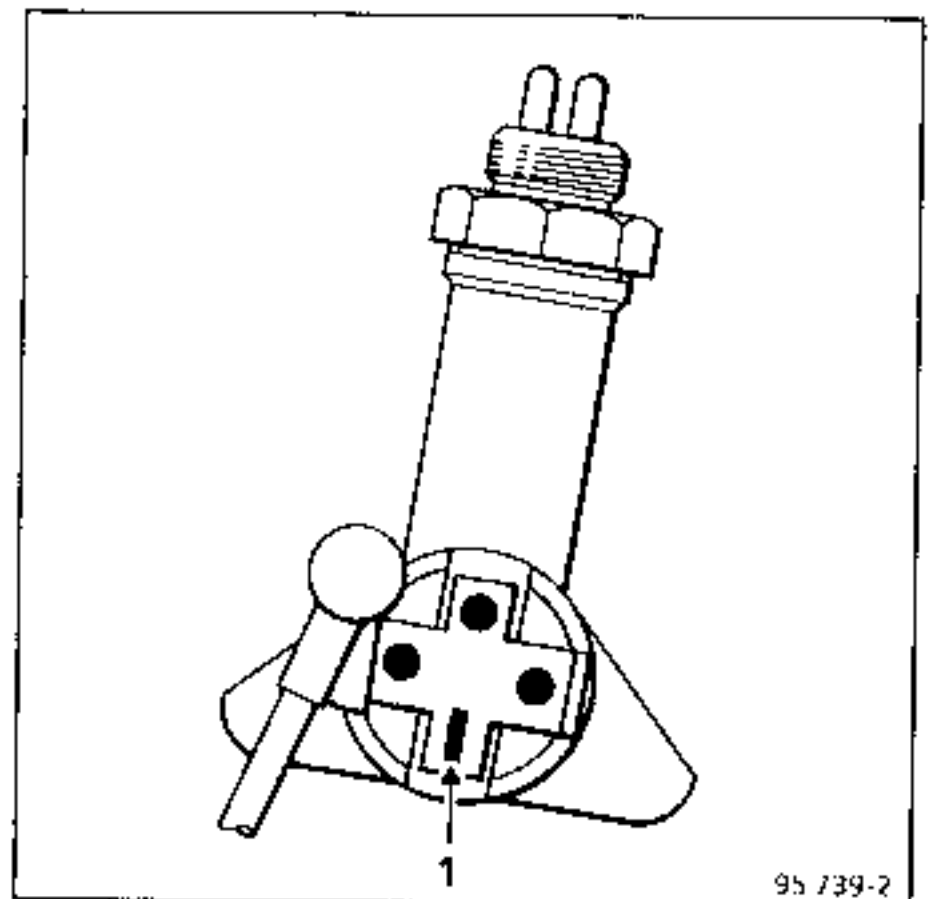
The measurement of the induction coefficient expresses the plunger core movement and thus the angle of rotation, which also contributes to variations in vehicle trim.

Measurement is carried out as follows :

- The computer generates very short pulses at the sensor coil input
- The characteristics of the inductance (due to the position of the plunger core) modifies the signal
- By comparing signals **before** and **after** inductance the computer determines the height of the vehicle.

## FRONT SENSOR

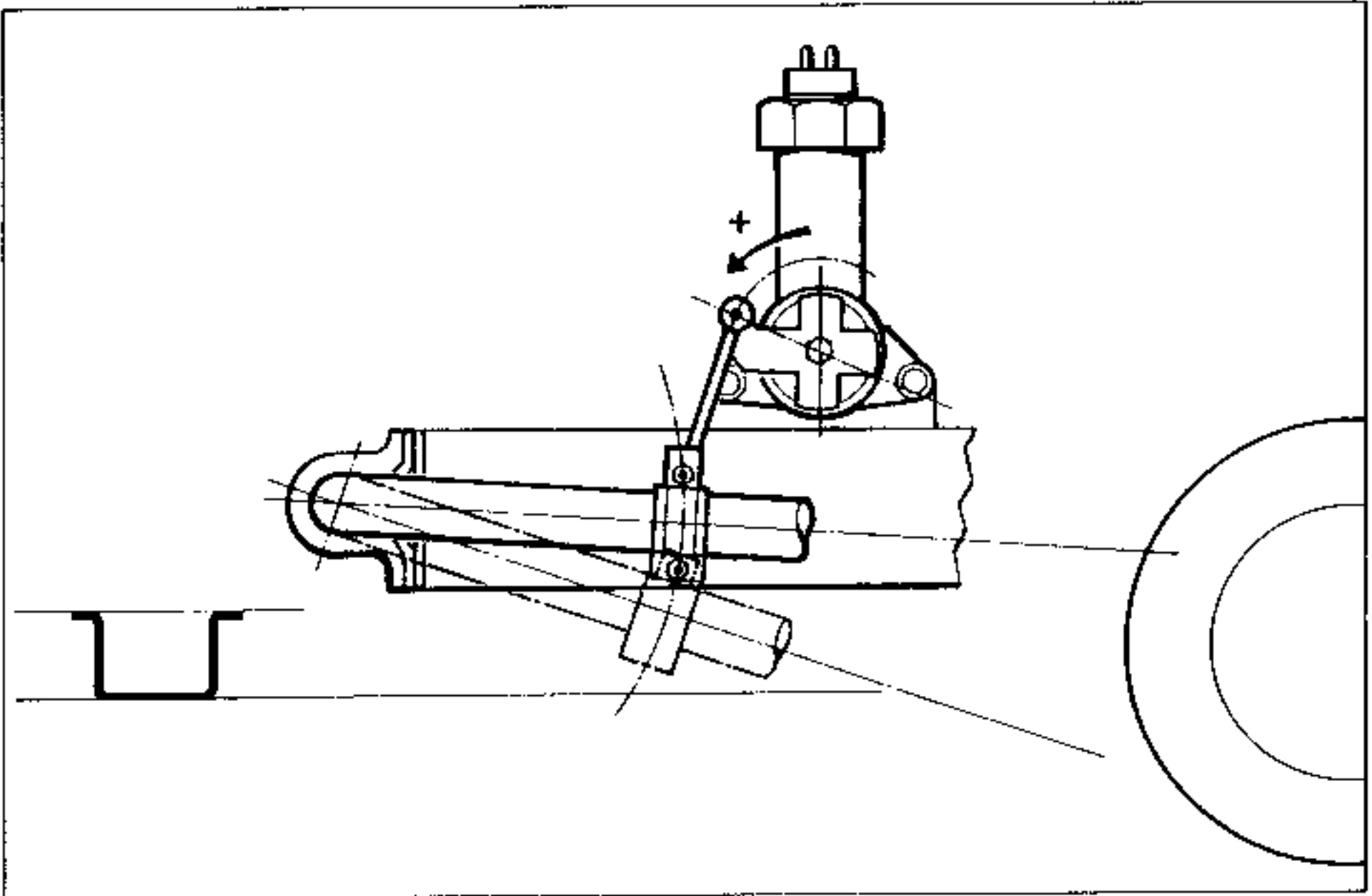
Foolproofing mark position (1).



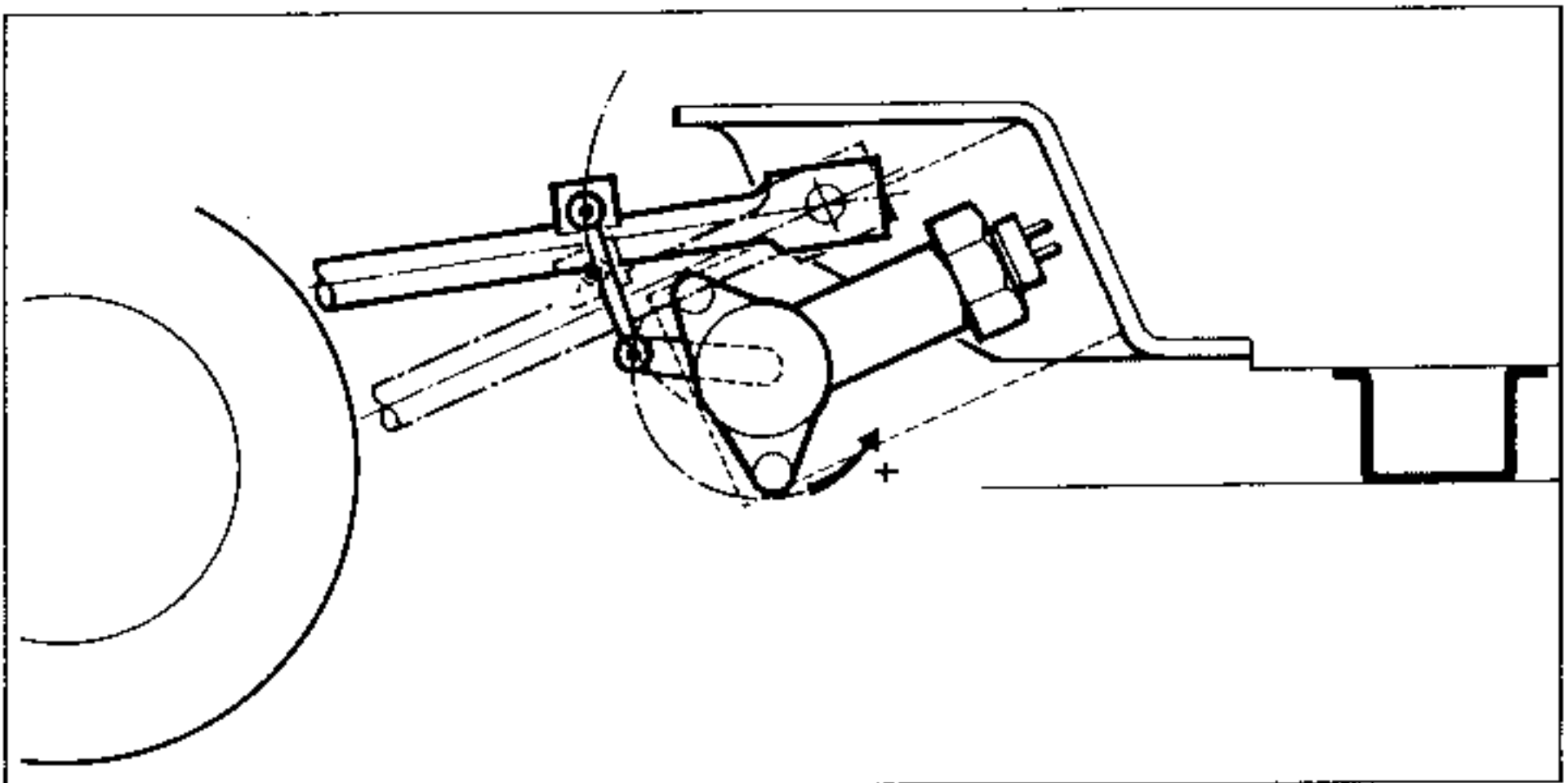
95 / 39-2

LOCATION ON VEHICLE

FRONT SENSOR



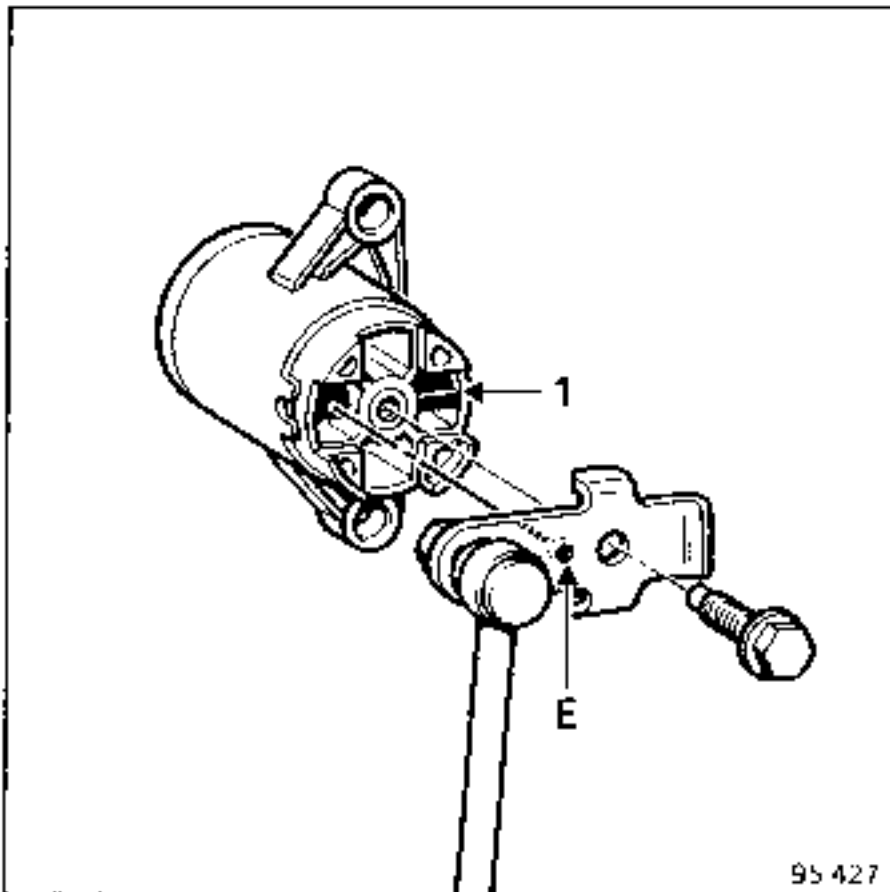
REAR SENSOR



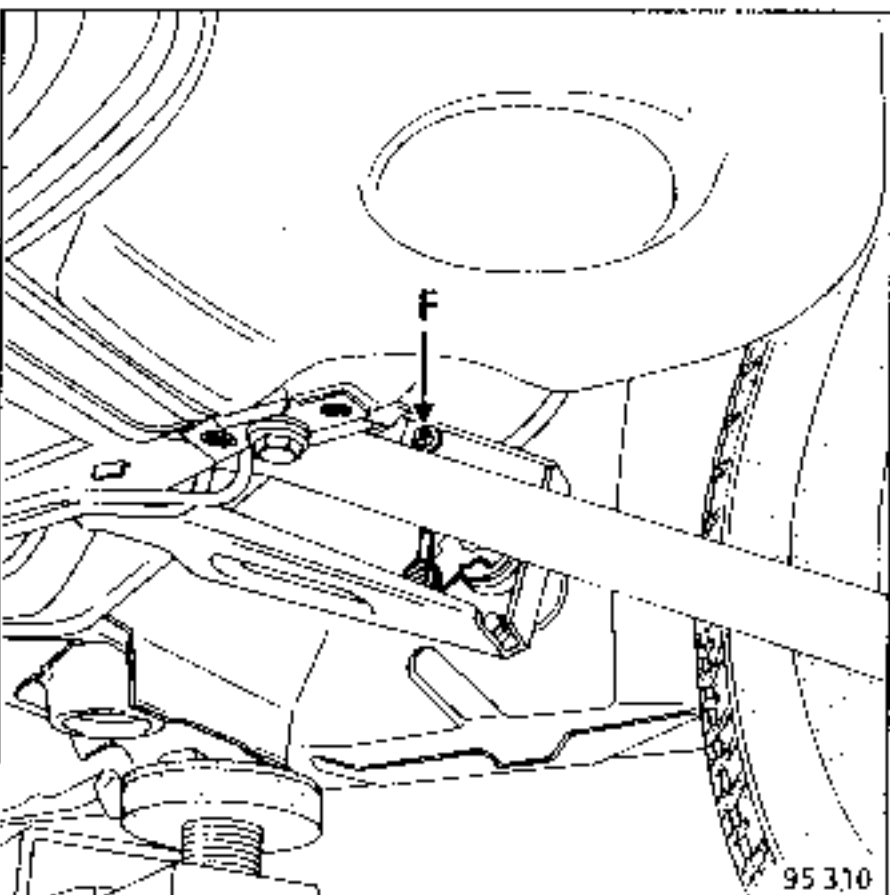
## REPLACEMENT (Special note)

The level sensors are identical but the three levers are different.

When fitting the lever on the sensor, ensure the foolproofing lug (E) is opposite the sensor recess (side opposite reference mark 1).

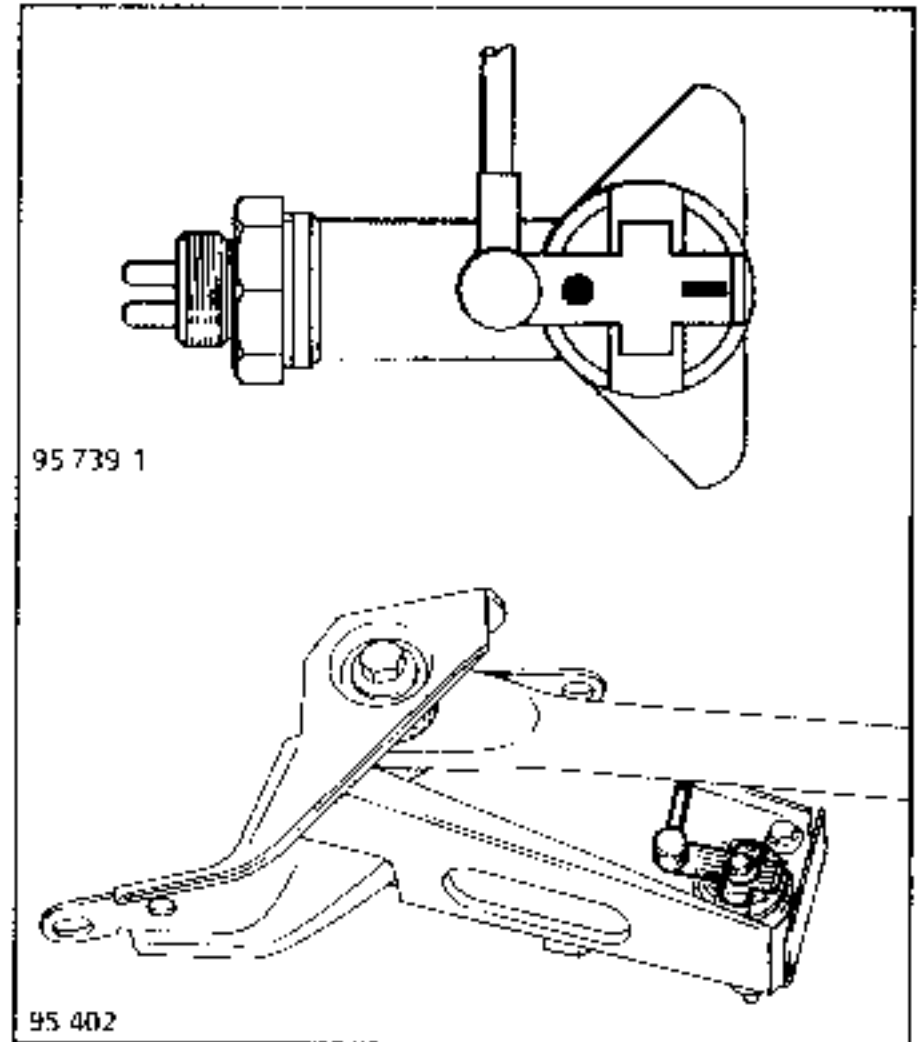


Do not separate the ball joint bars but undo the ball joint mounting nut (F)

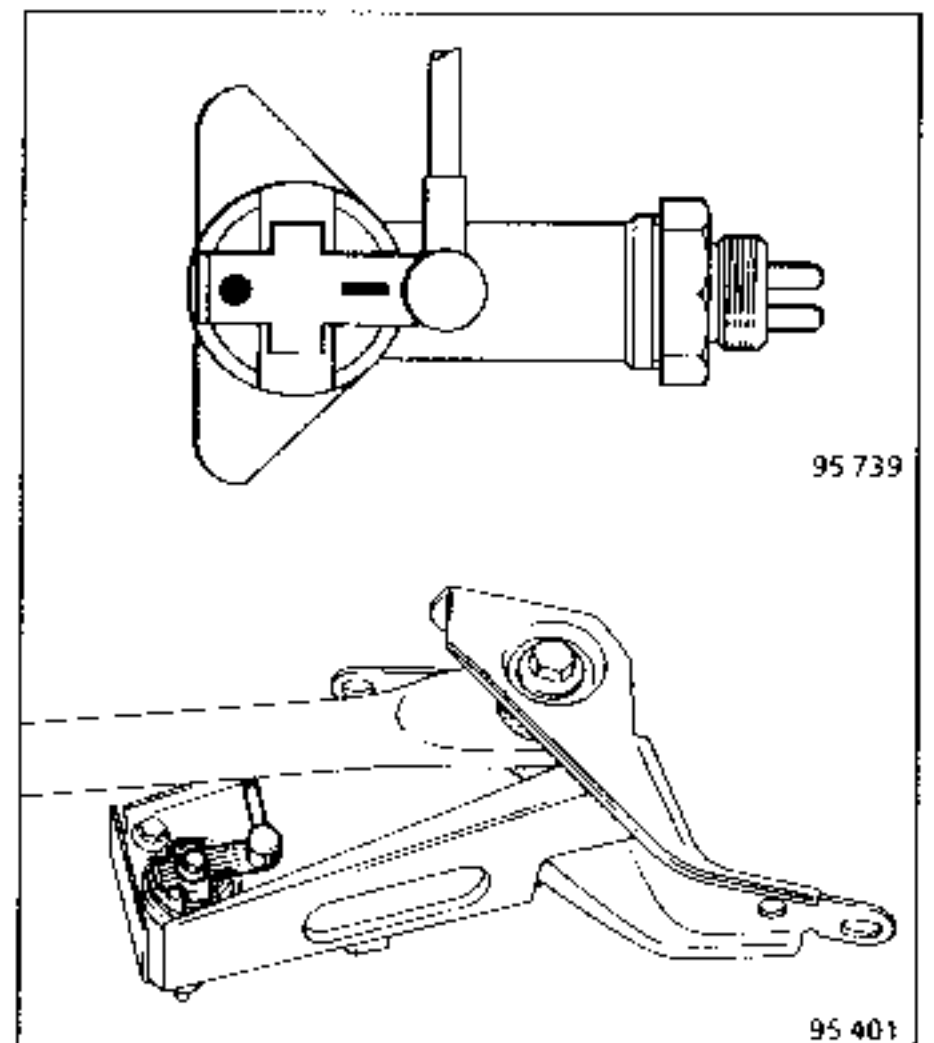


## FITTING

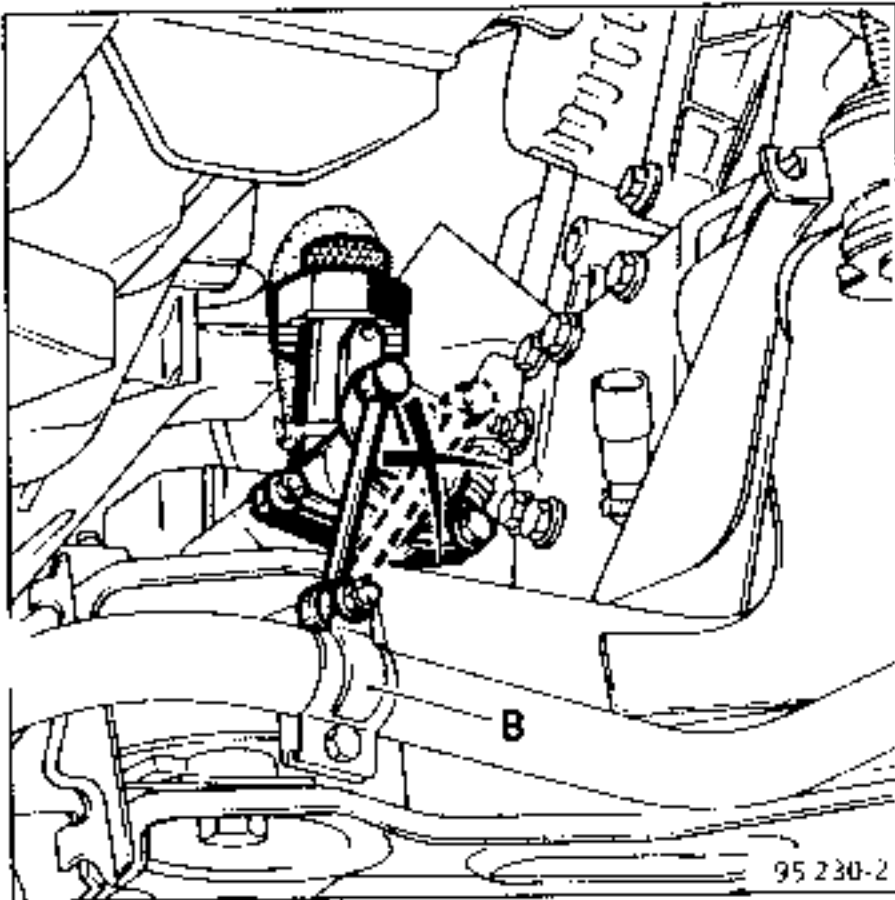
*On rear right hand tie rod bearing :*  
Lever with red mark



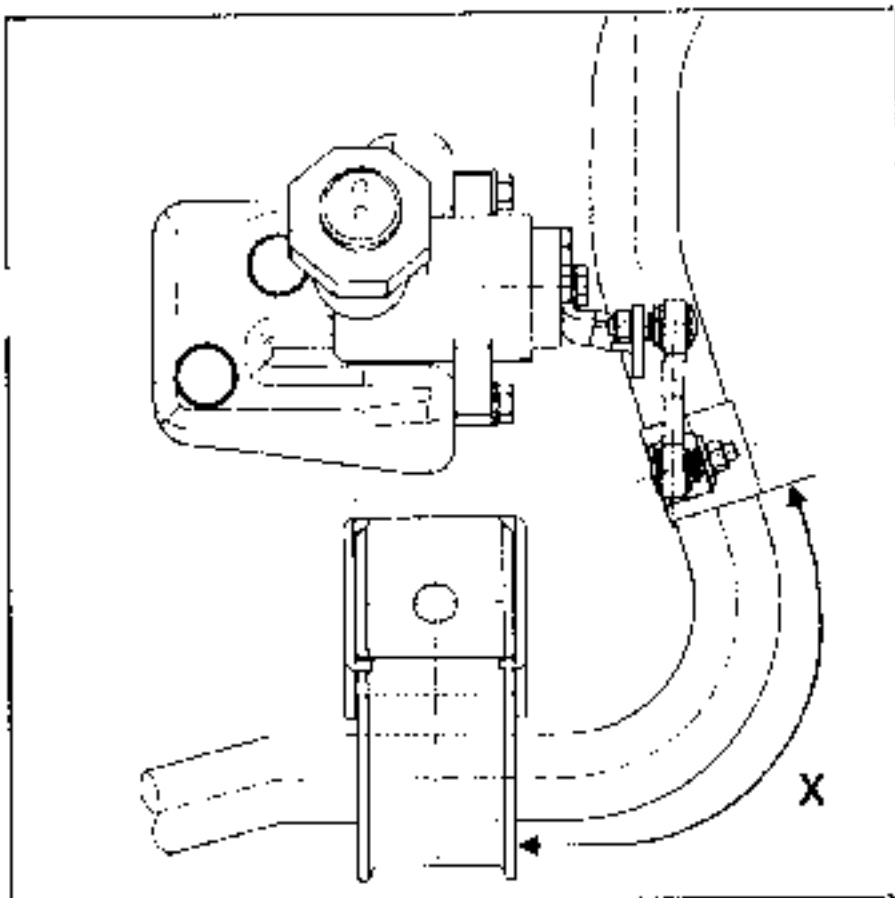
*On rear left hand tie rod bearing :*  
Lever with blue mark



Mounting on front right hand side of axle  
mounting :



**VERY IMPORTANT** : when replacing the anti-roll  
bar, position flange B at  $X = 132$  mm from the RH  
bearing



Ensure all wires and connectors are correctly  
fitted.

If one or more sensors are replaced, the  
parameters must be reset (see pages 137 to 141).

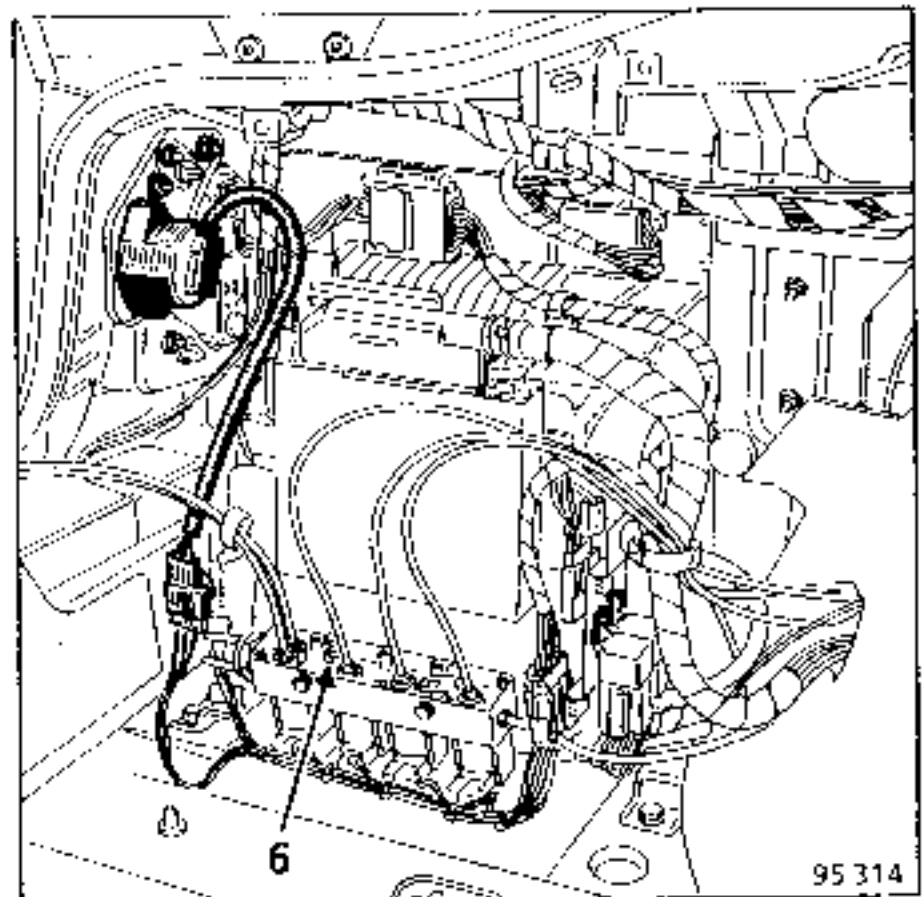
Erase the computer memory (GO\*\*).

Validate the end of the test (G13\*).

### SOLENOID VALVE UNIT

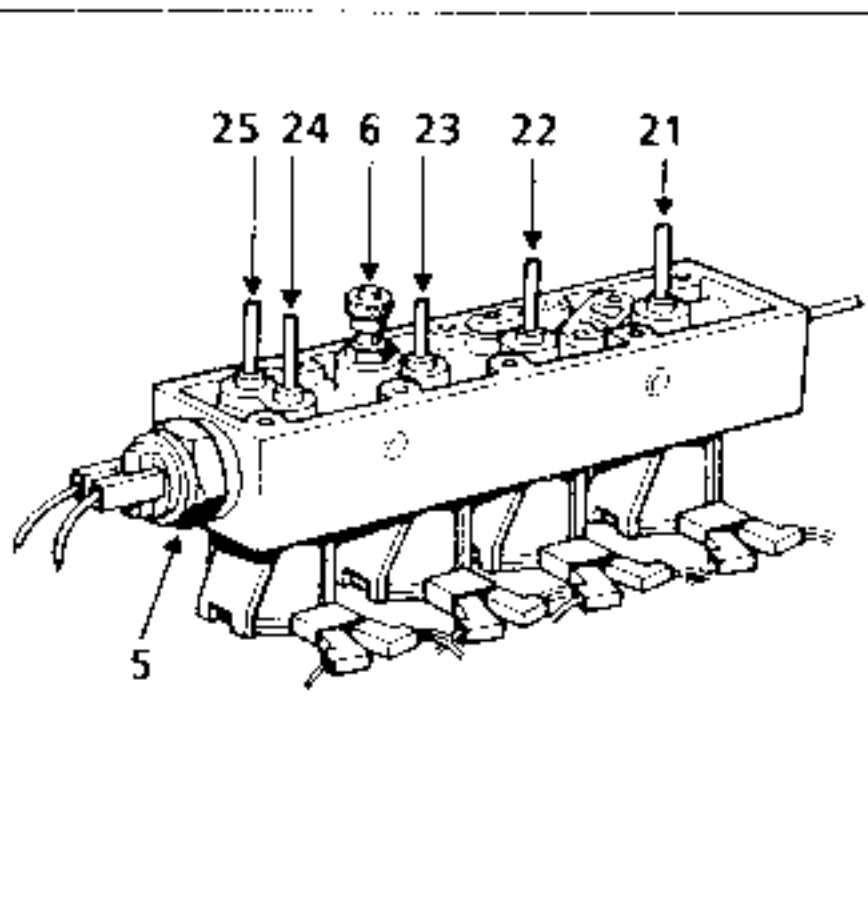
located at the bottom of the computer -  
motocompressor mounting plate, this comprises :

- 4 sleeve control solenoid valves,
- 1 pressostat for vehicle load information,
- 1 pressure test take off (6),
- 1 braking pressure limiter connection.



**Pneumatic pipe marking :**

- 21 —————> Front RH (green)
- 22 —————> Front LH (blue)
- 23 - - - - -> Rear LH (yellow)
- 24 - - - - -> Rear RH (red)
- 5 —————> Pressostat
- 6 - - - - -> Test take off
- 25 - - - - -> Brake pressure limiter  
No colour marking but larger diameter

**Consequence of signal on AMV operation**

For identical vertical movement, a higher setting may be requested (lower change-over thresholds).

**NOTE:** the solenoid valve block is sold as a unit, no element may be replaced separately

The wheel solenoid valves have a common feed point which is + BAT via the safety relay.

The control of each solenoid valve, which is carried out by earthing, is connected to the computer .

- Track 41 : Front LH solenoid valve
- Track 42 : Front RH solenoid valve
- Track 39 : Rear LH solenoid valve
- Track 40 : Rear RH solenoid valve

Solenoid valve coil resistance  
= 14 Ohms.

**PRESSOSTAT**

This converts a pneumatic pressure signal to an electrical signal when the circuit pressure exceeds the calibrated pressure, thus indicating the vehicle load condition

Vehicle	Pressure (bar)	Switch
Unladen	$< 4 \pm 0,4$	Closed
Laden	$> 4 \pm 0,4$	Open

## SOLENOID VALVE UNIT

### REMOVAL

Before any operation is carried out on the pneumatic system, drain the circuit of air using XR25 command : G09\* (see page 140).

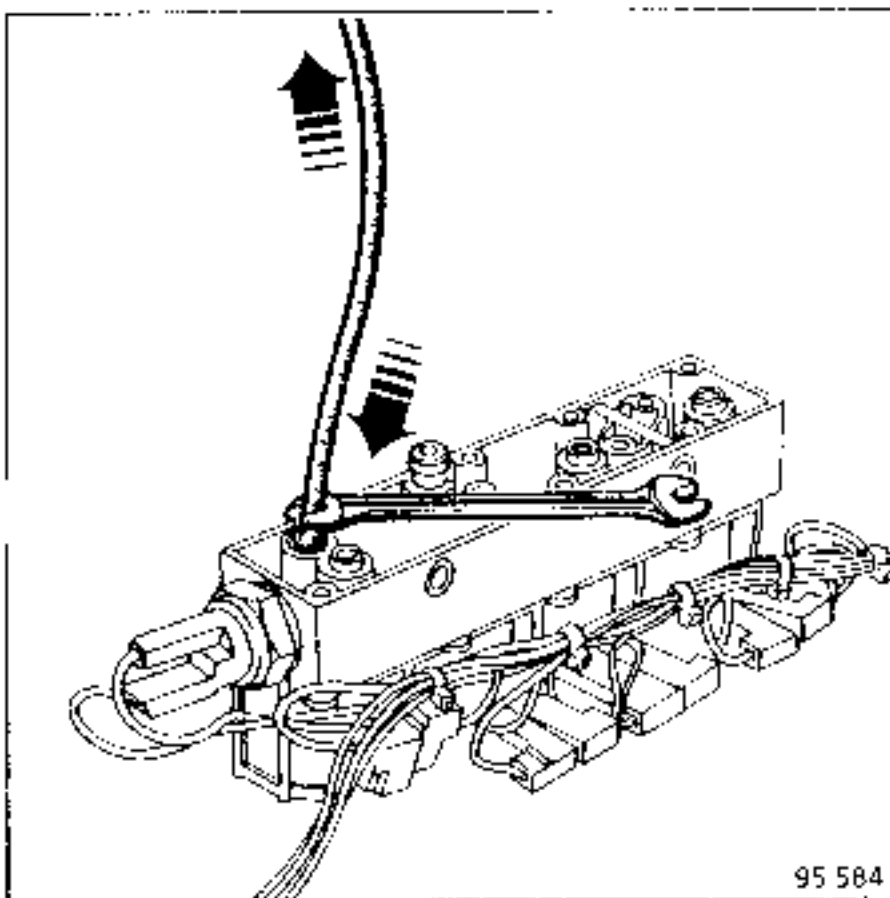
Remove the rear luggage compartment left hand side trim.

Disconnect:

- the 9 track solenoid valve feed connector,
- the pneumatic pipes (having marked their position).

To disconnect the pipes from the quick release unions, use spanner :

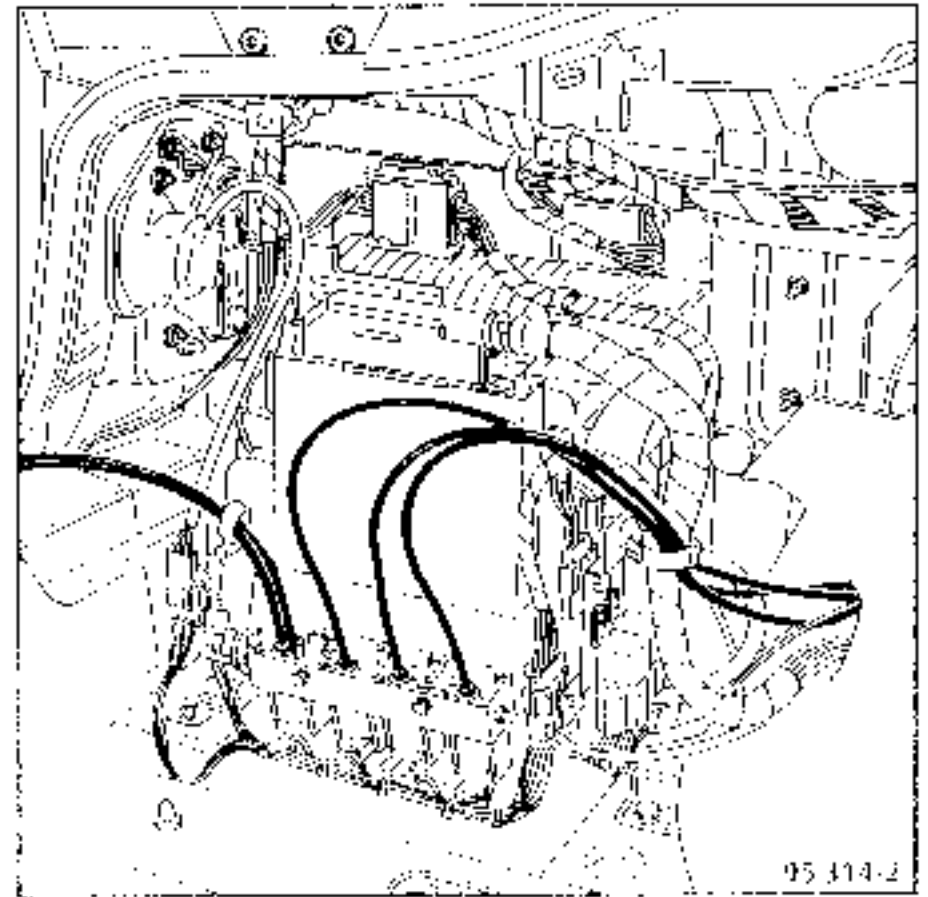
- 4,5 mm for Ø 4 tubes,
  - 5,5 mm for Ø 5 tubes,
- to compress the external ring and pull the pipe.



The solenoid valves, electric wiring (conductors and rings) and pneumatic pipes (rings) are marked by the colours :

Front LH :	blue
Front RH :	green
Rear LH :	yellow
Rear RH :	red

Remove the two block mounting bolts and remove the block.



### REFITTING

Fit the solenoid valve block, ensuring the pneumatic pipes are correctly repositioned.

Ensure the quick release joints are correctly connected.

Take care to ensure that the wiring and connectors are correctly refitted.

Test the system using the "G" functions on the XR25.

Check the joints are sealed.

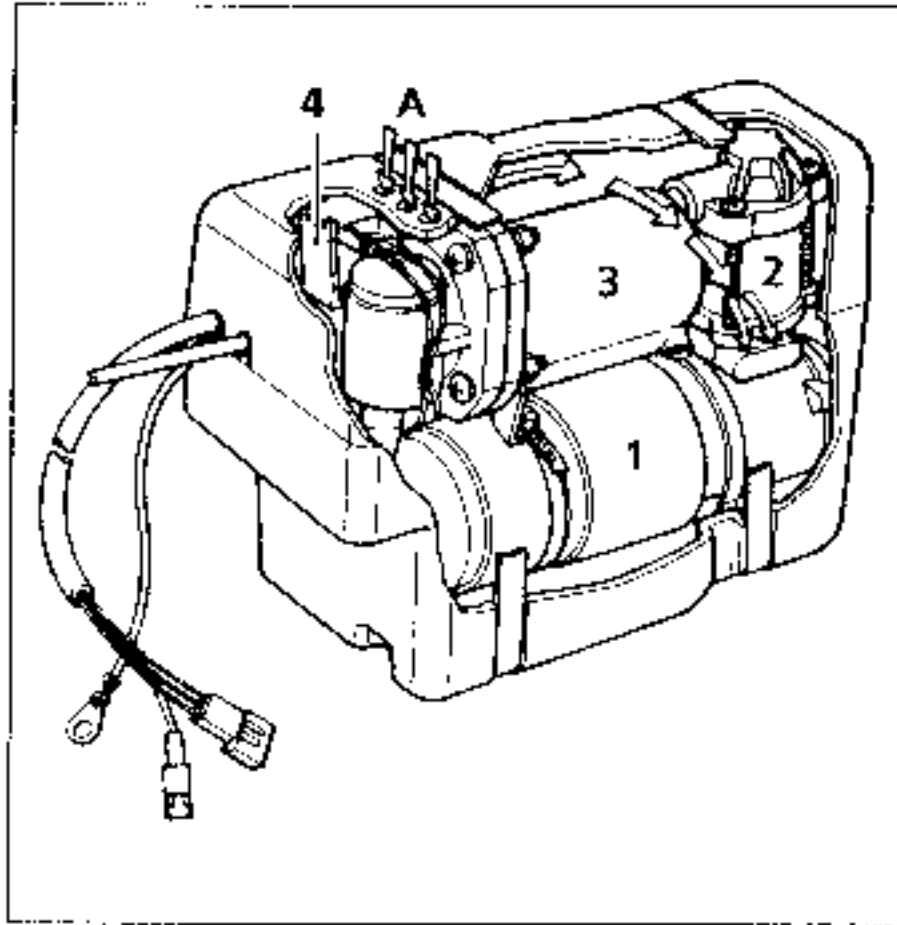
Erase the computer memory (G0\*\*)

Validate the end of the test (G13\*).

### MOTOCOMPRESSOR ASSEMBLY

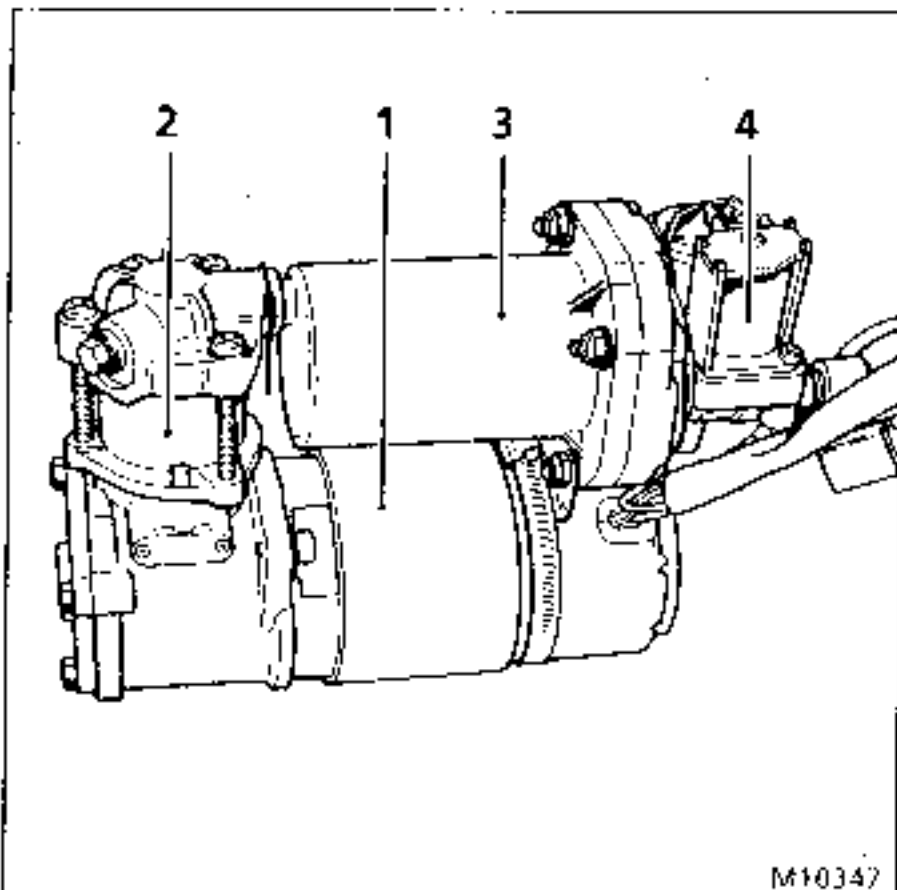
This is located in the rear luggage compartment against the rear left hand wheel.

The assembly is soundproofed by a cover



Component elements :

- (1) electric motor
- (2) compressor
- (3) dehydrating cartridge
- (4) exhaust solenoid valve



### MOTOCOMPRESSOR ASSEMBLY

**Motor:**

Operating voltage :  $12\text{ V} \pm 3\text{ V}$ .

Nominal current :  $25\text{ A} \pm 4$ .

Speed:  $2\,300\text{ rpm} \pm 300$ .

Thermal cut out :  $(+ 120^\circ\text{C})$ .

**Compressor :**

Capacity :  $22,6\text{ cm}^3$ .

Max. operating pressure : 13 bars.

Dry lubrication

**Exhaust solenoid valve :**

Operating voltage :  $12\text{ V} \pm 3\text{ V}$ .

Maximum current :  $0,825\text{ A}$ .

3 outlets - 2 positions.

### COMPRESSED AIR

Compressed air provided by the compressor is dehydrated, de-oiled and filtered.

Consequently, when air is drawn in from outside the system it must also conform to these conditions to avoid damaging the internal components.

External air is taken in through the upper openings (A) in the soundproofing cover. After the air has been compressed and passed through the dehydrating cartridge, it is ducted to the pneumatic sleeves.

5 solenoid valves control the volume of air taken in.

The system is protected by a pressure limiter set at 13 bars.

**THIS ASSEMBLY DOES NOT REQUIRE MAINTENANCE.**



## MOTOCOMPRESSOR ASSEMBLY

### REMOVAL

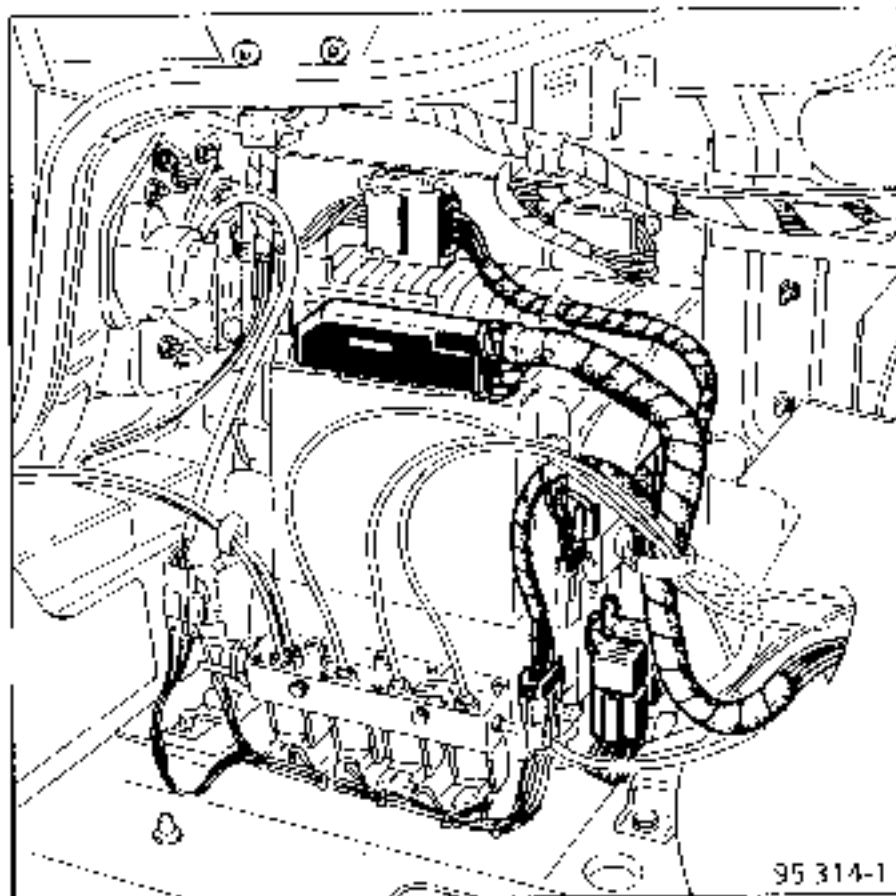
Disconnect the battery.

Remove the rear luggage compartment left hand side trim.

Remove the computer.

Disconnect:

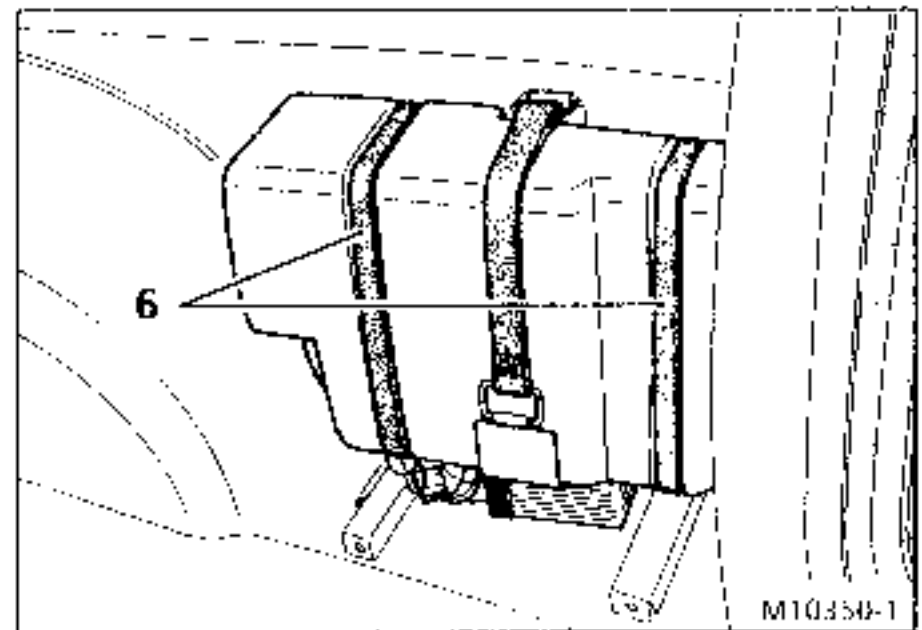
- the 55 track computer connector,
- the 9 track connector,
- the 3 track longitudinal accelerometers connector,
- the solenoid valve block pneumatic pipes (see page 79),
- the earth wire on the wheel arch (1 bolt).



Remove:

- the mounting bolts from the mounting plate and remove the assembly,
- the mounting strap on the mounting plate.

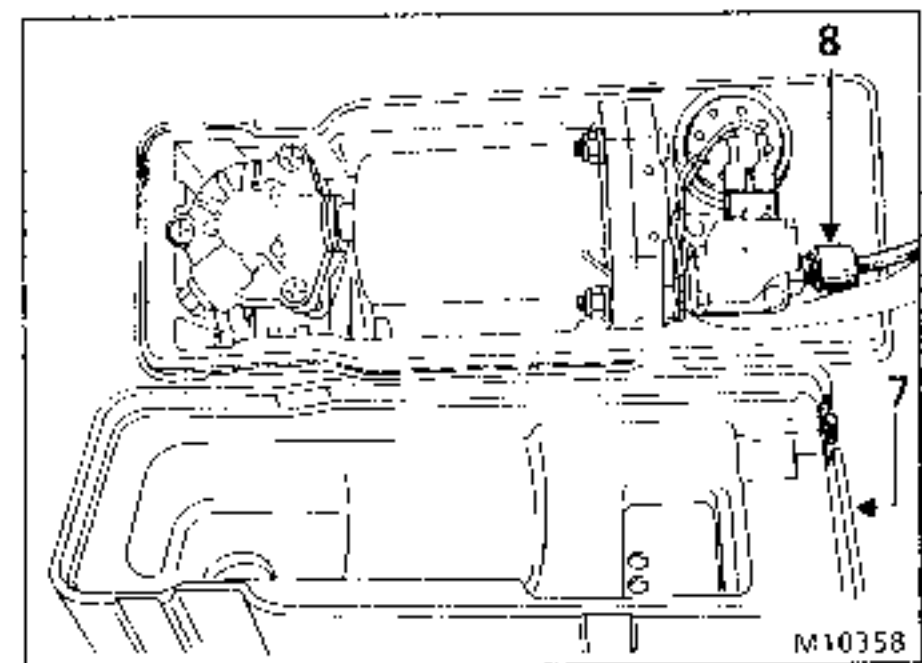
Remove the motocompressor assembly from the mounting plate.



Remove the two retaining straps (6) for the soundproofing cover.

Remove the upper section of the cover (7).

Unscrew the air inlet pipe mounting union (8).

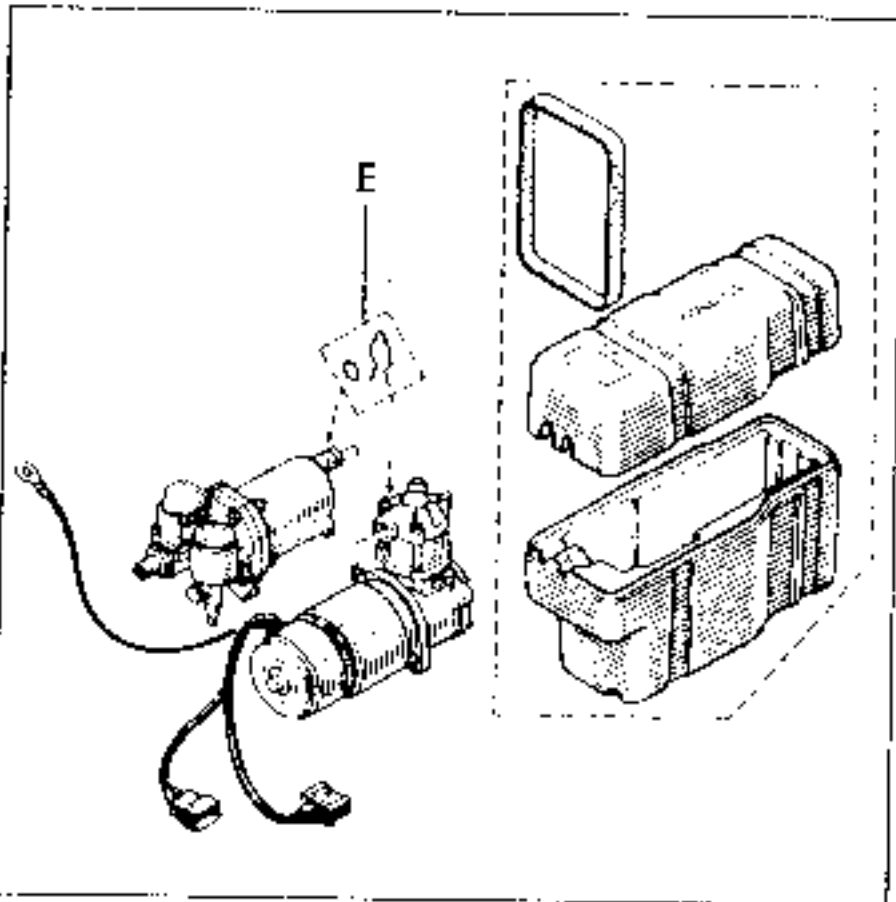


**NOTE :** block the compressor and pipe openings to stop foreign bodies entering the system which could damage the internal components .

Remove the motocompressor assembly from the lower cover section.

Remove the locking pin (E).

Loosen the mounting collar for the dehydrating cartridge, pressure limiter, exhaust solenoid valve and separate them from the motocompressor.



#### REFITTING

Refitting is the reverse of removal.

Renew all O rings.

Check the cover retaining straps are correctly positioned so that they do not block the air inlet openings

The pneumatic pipe positions must be respected and all quick release unions must be correctly connected.

Take care to ensure all wires and connectors are correctly refitted.

Test the system using the "G" functions on the XR25

Check the pneumatic circuit does not leak.

Erase the computer memory (GO\*\*).

Validate the end of the test (G13\*).

**NOTE :** in the diagnostic mode motocompressor assembly operation is stopped by the pressostat (which opens) or by a time limit (one minute).

**SHOCK ABSORBERS**

Each shock absorber has two solenoid valves. Depending on the position selected, the feed is as follows :

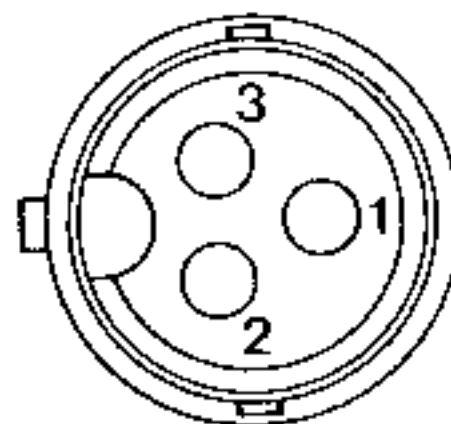
	COMFORT	MEDIUM	SPORT
COMFORT SOLENOID VALVE	Energised	Not energised	Not energised
MEDIUM SOLENOID VALVE	Not energised	Energised	Not energised

Mechanical faults in the shock absorbers cannot be seen in electrical terms. If a shock absorber is not fed electrically, it is in the "SPORT" setting which is a safety setting.

**Connectors (3 track)**

View from shock absorber cable pin side

- 1 + (Medium and comfort)
- 2 - Comfort
- 3 - Medium

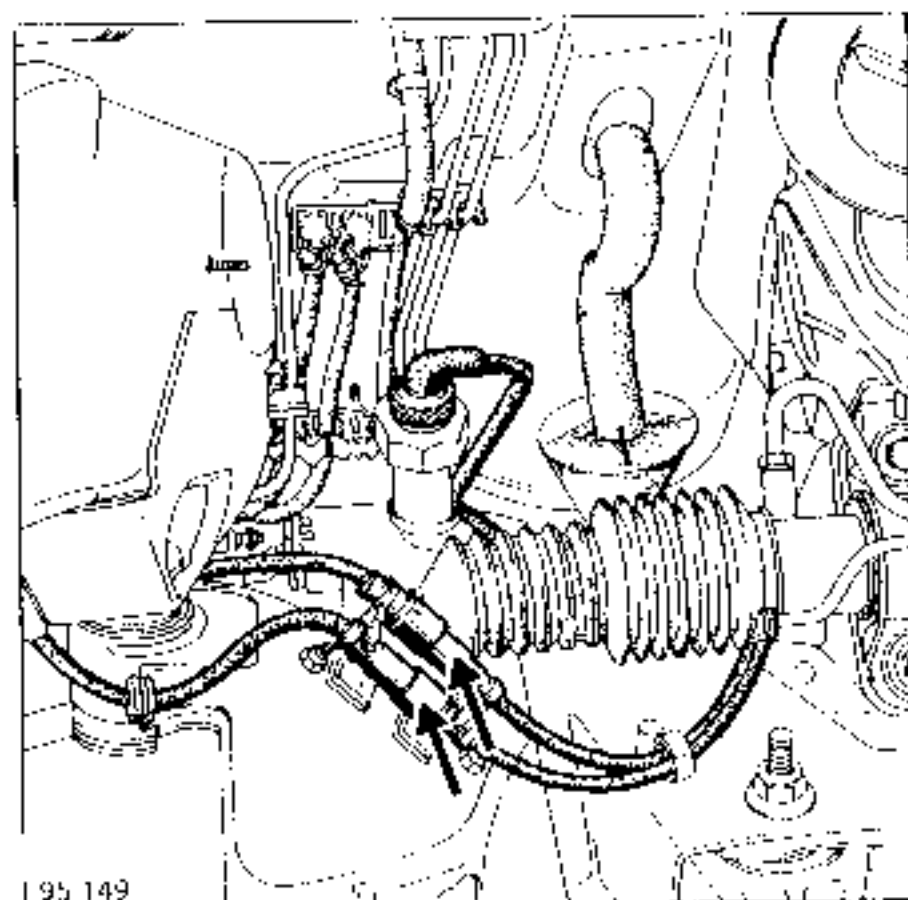


94 439

Solenoid valve coil resistance when cold (temperature 20 °C) : 4 to 5 Ω.

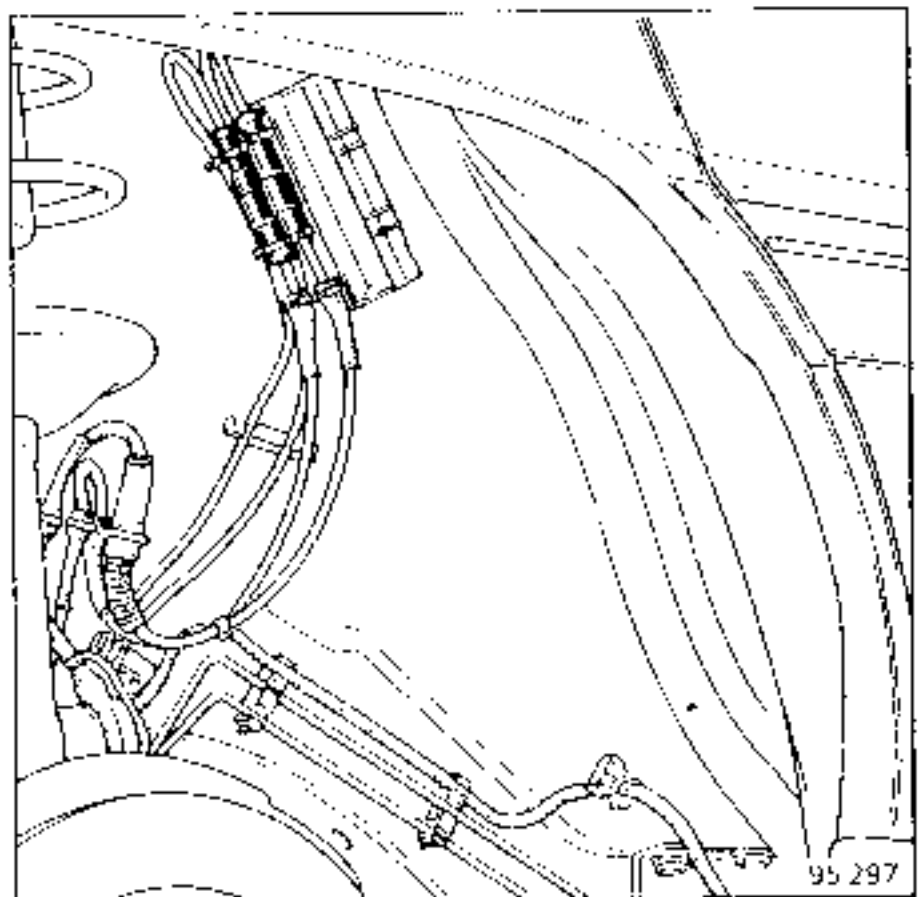
**CONNECTOR LOCATION**

Front shock absorber: on each side of the axle mounting.



95 149

Rear shock absorber : in a box in the wheel arch.



95 297

**FAULT FINDING**

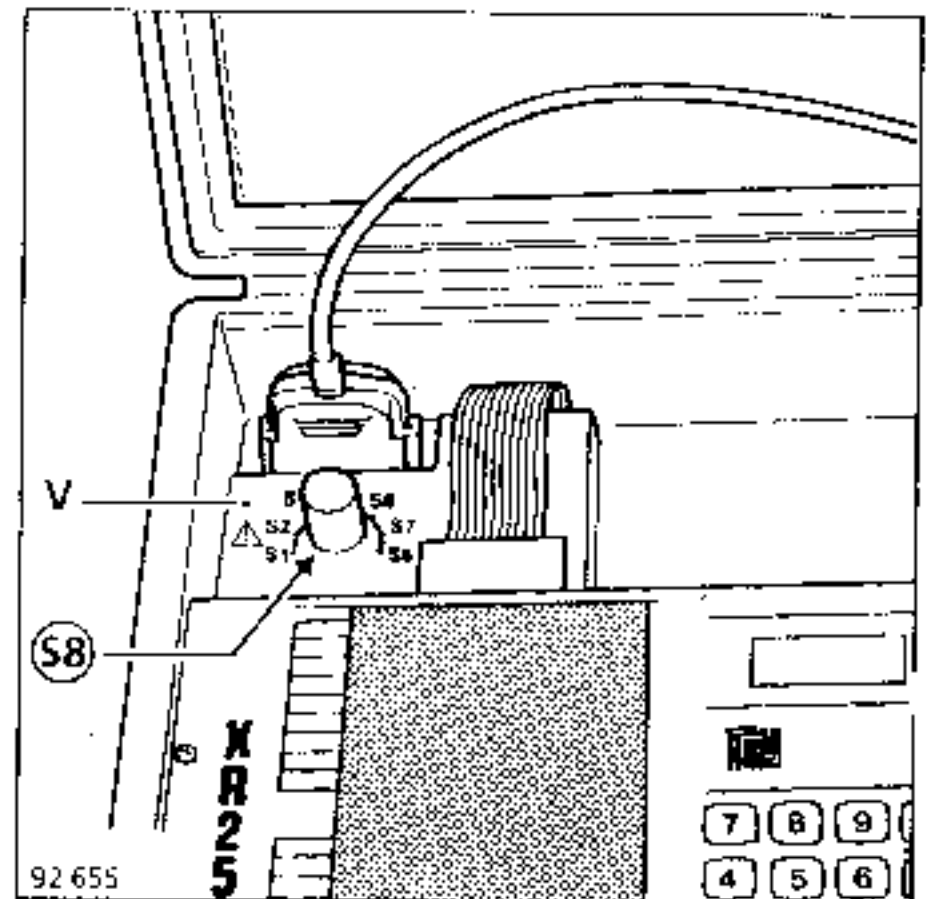
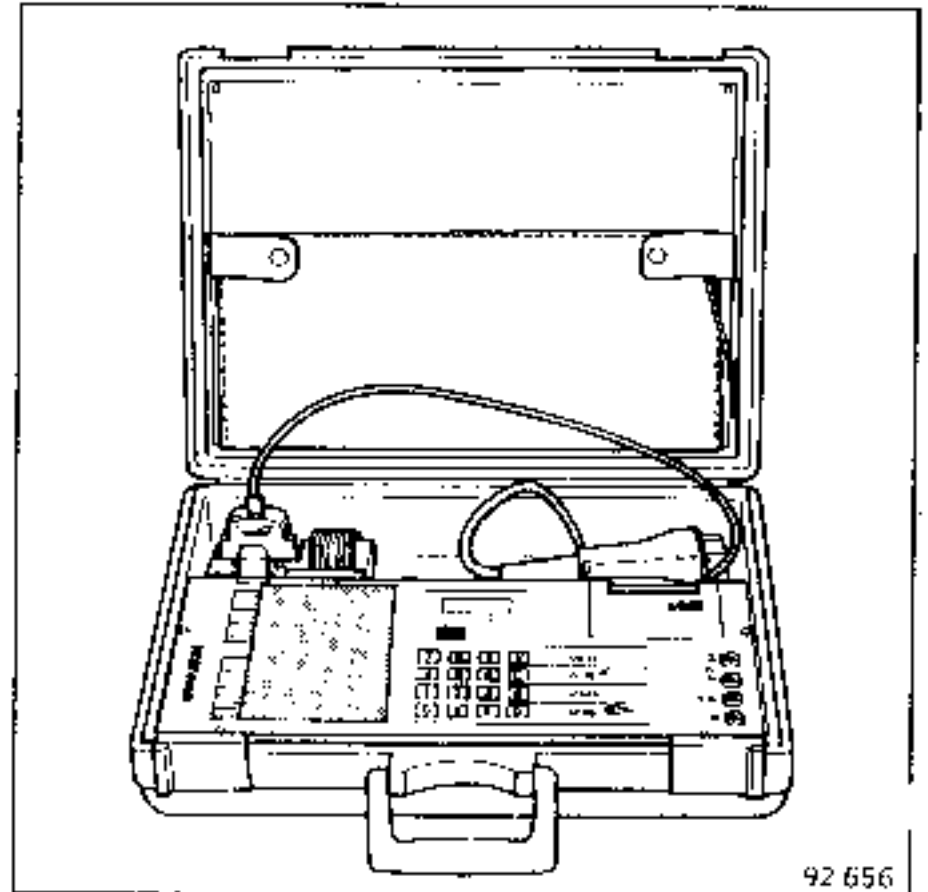
The XR25 test case must be used for all fault finding on the electronically managed suspension system whatever the cause of the fault.

Communication between the computer and the XR25 allows:


- the computer to be identified.
- memorised faults to be read
- the fabrication date of the vehicle and the date when the system was last examined to be read.
- system parameters to be read (speed, voltage,).
- solenoid valves, motocompressor assembly and warning lights to be operated
- the Fault memory to be erased (to be carried out after each operation on the electronically managed suspension system).
- the date of examination to be entered.
- sensors to be calibrated when the vehicle is in certain conditions.

After initialisation, the computer leaves its normal mode, and the system conditions are as follows :

- fault warning lights extinguished
- Shock absorbers on "SPORT".
- "SPORT" warning light extinguished.
- Power relay not activated.
- Pneumatic circuit isolated (5 solenoid valves closed).
- Safety relay activated.
- "COA" warning light on button extinguished.



**NOTE :** the "V" warning light must be extinguished. If it is illuminated, disconnect and reconnect the diagnostic socket. If it remains illuminated, check the XR25 wiring and battery voltage.

System operation analysis using XR25 and cassette N° 10 (fiche N° 18) after a road test where the controlled suspension fault warning light illuminates on the instrument panel. 

Initialisation of dialogue :

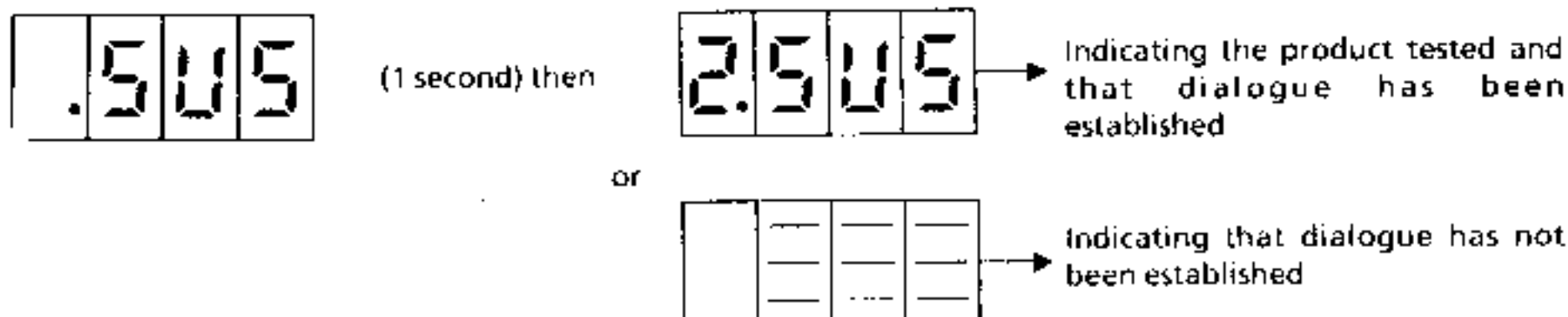
After the road test and without turning the ignition off connect the XR25.

Position the ISO selector switch on S8.

Enter code

**D 1 8**


The central display shows :



- Controlled suspension with no fault (bar graphs illuminated) :
  - bar graph N° 1 right: code present,
  - bar graph N° 5 left: if engine not running,
  - bar graph N° 5 right if pressostat open or not connected (pressure exceeds 4 bars).







































- Controlled suspension with fault/s

#### IMPORTANT DEFINITIONS

**Temporary fault** : a temporary (or intermittent) fault is a fault which appears (  warning light on instrument panel illuminated) and has disappeared by itself at any given moment (after the ignition has been turned off and on again). This type of fault is indicated by a flashing bar graph.

**Permanent fault** : a permanent fault is one which is present when testing using XR25 is started. This type of fault is indicated by a permanently illuminated bar graph.

**NOTE:** Do not disconnect the diagnostic socket during dialogue . Exit the fault finding mode first after entering G13\*

N° 18		CARD IDENTIFICATION : READ ON DISPLAY → 2. SUS	
1		COMPUTER DEF.	PRESENT CODE 
2		AMV BUTTON : ILLUMINATED IF PRESSED	FAULT * 22 
3		COA BUTTON : ILLUMINATED IF PRESSED	FAULT * 23 
4		BRAKE PEDAL : ILLUMINATED IF PRESSED	FAULT * 24 
5		ON PRESSURE SWITCH (ENGINE TURNING)	PRESSURE SWITCH OFF OR NOT CONNECTED 
6		* 05 SPEED DATA	
7		* 07 FRONT LH	AMV SOLENOID VALVES (COMFORT) FRONT RH * 27 
8		* 08 REAR LH	REAR RH * 28 
9		* 09 FRONT LH	AMV SOLENOID VALVES MEDIUM FRONT RH * 29 
10		* 10 REAR LH	REAR RH * 30 
		<b>CODE : D 1 8 (S8)</b> <b>SUSPIL</b> (MEM. DEF. : G 0 **) (END OF DIAGNOSTICS : G 13 * )	
11		* 11 VERT. ACCEL. (ACCELEROMETER)	LONGI. * 31 
12		LOAD DATA	STEERING ANGLE 
13		* 13 POWER RELAY	
14		SAFETY R.	HEIGHT NOT REACHED (COA) 
15		* 15 EXHAUST SOLENOID VALVE	OIL PRESSURE SWITCH 
16		* 16 FRONT HEIGHT SENSOR	5V FAULT * 36 
17		* 17 REAR LH	REAR LH * 37 
18		* 18 FRONT LH	COA SOLENOID VALVES FRONT LH * 38 
19		* 19 REAR LH	REAR LH * 39 
20		FAULTY WARNING LIGHT CIRCUIT	XR25 MEMORY (0) 
		ANG	
		<b>ADDITIONAL CHECKS #...</b> 01 VERTICAL ACC. m/s-2 02 LONGITUDINAL ACC. m/s-2 03 STEERING ANGLE ° 04 VEHICLE SPEED km/h 05 REAR LH HEIGHT DIFFERENCE 06 REAR RH HEIGHT DIFFERENCE 07 FRONT LH HEIGHT DIFFERENCE 08 REAR L/H AND SIDE HEIGHT 09 REAR R/H AND SIDE HEIGHT 10 HEIGHT AT FRONT	
		<b>CONTROL MODE</b> 00 * SPORT POSITION 002 * MEDIUM POSITION 003 * COMFORT POSITION 004 * SPORT WARNING LIGHT 005 * COA WARNING LIGHT 006 * FAULTY WARNING LIGHT 007 * GMC CONTROL 008 * 4 SOLENOID VALVES (COA) 009 * 4 SOLENOID VALVES (FAULTY) 010 * LED DATE OF MANUFACTURE 011 * ECU AFTER SALES DATE 012 * LED DATE OF MANUFACTURE 013 * ECU AFTER SALES DATE	

FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

**CODE PRESENT ; ILLUMINATED- CORRECT** (extinguishes when key G \* is used).

If it is extinguished after entering **D18**, check:

- the ISO interface selector is on position : **S8**,
- that you are using the correct **XR25** cassette and code **D18**,
- continuity/insulation of the lines for diag. socket / computer :
  - . track **10** diag. socket and **52** computer,
  - . track **11** diag. socket and **25** computer,
- that track **2** for the diag. socket is earthed ; track **6** + battery,
- check:

15 A fuse



10 A fuse



- that the computer is correctly fed : earths on tracks **1** and **2** of **55** track connector , + APC on track **5**.

**COMPUTER FAULT**

Erase the memory **GO\*\***. Retest **D18 S8**  
and check if the fault persists  
Does the fault persist ?

no

Correct

yes

Repeat the operation once more before  
replacing the computer.

## AMV CONTROL BUTTON FAULT

On XR25 enter \* 22  
to discover type of fault

SE

Erratic / intermittent signal

Ec

Short circuit

ban

No fault

Check the button operates correctly  
mechanically

Eg :

Button sticks in locked position  
Is this correct ?

yes

Check wire insulation and continuity  
(track 15 on computer) and electrical  
operation of button.  
Repair wiring or replace button.

no

Replace the control  
button

## ILLUMINATED IF AMV CONTROL BUTTON DEPRESSED

**ATTENTION** : This bar graph does not indicate a fault but the condition of the AMV control button

### COA CONTROL BUTTON FAULT

On XR25 enter \* 23  
to discover type of fault

SE

Erratic / intermittent signal

Ec

Short circuit

bon

No fault

Check the button operates correctly  
mechanically

Eg :

Button sticks in locked position  
Is this correct ?

yes

Check wire insulation and continuity  
(track 14 on computer) and electrical  
operation of button  
Repair wiring or replace button.

no

Replace the control  
button

### ILLUMINATED IF COA CONTROL BUTTON DEPRESSED

**ATTENTION** : This bar graph does not indicate a fault but the condition of the COA control button.



# STOP SWITCH FAULT

On XR25 enter \* 24  
to discover type of fault

5.E

Erratic or intermittent signal

Ec

Short circuit

ban

No fault

Press the brake pedal and check the stop  
lights operate correctly.  
Is this correct?

no

Check the stop switch  
adjustment, the fuse,  
wiring continuity, and stop  
lights.  
Repair.

yes

Check change in state of bar graph 4G  
when the brake pedal is pressed.  
Does the bar graph state change  
correctly?

yes

Fit bornier SUS1228 in place of the  
computer and check the voltage on track  
51 (brake pedal pressed, ignition on).  
You should read battery voltage.  
Is this correct?

no

Check the stop switch  
adjustment, the fuse,  
wiring continuity, and stop  
lights.  
Repair.

yes

Replace computer.  
Adjust parameters (COA) and  
calibration (AMV).

#### STOP CIRCUIT

4

Illuminated: Correct if brake pedal is depressed.  
Extinguished: Correct if brake pedal is not depressed

BG4 Permanently illuminated on left hand side : STOP lights permanently illuminated ;  
Adjust STOP switch or replace if necessary.

#### PRESSOSTAT ( COA pneumatic circuit)

5

Shows load condition of vehicle  
Illuminated if circuit open or not connected

Vehicle	Pressure (bar)	Switch
Unladen	$< 4 \pm 0,4$	Closed
Laden	$> 4 \pm 0,4$	Open

#### PRESSURE SWITCH Engine oil pressure (Info engine running)

5

Illuminated: Correct if engine not running (ignition on)  
Extinguished: Correct if engine running

SPEED INFORMATION

On XR25 enter \* 06  
to discover type of fault

Ca

Open circuit no signal

ban

EH

Pulse frequency too high

Check wiring between  
instrument panel and computer  
(track 53)  
Repair if necessary Does the  
fault persist?

no

On XR25 enter  
# 04 and check agreement with speed on  
XR25 and speedometer.  
Is this correct?

yes

Erase computer memory GO\*\*  
and retest

Correct

Check speedometer  
(See instrument panel fault  
finding)  
Repair if necessary Does the  
fault persist?

Correct

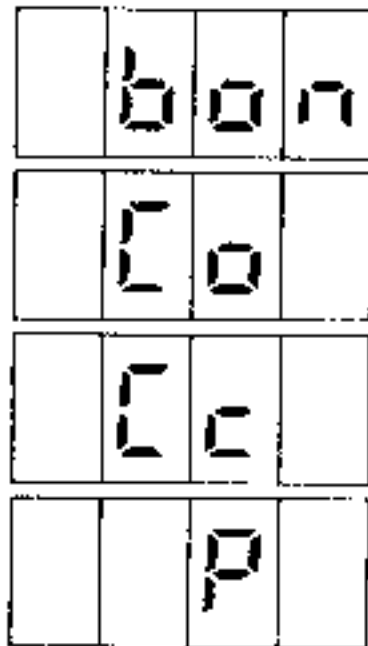
yes

Replace computer  
Adjust parameters (COA) and  
calibration (AMV).

6

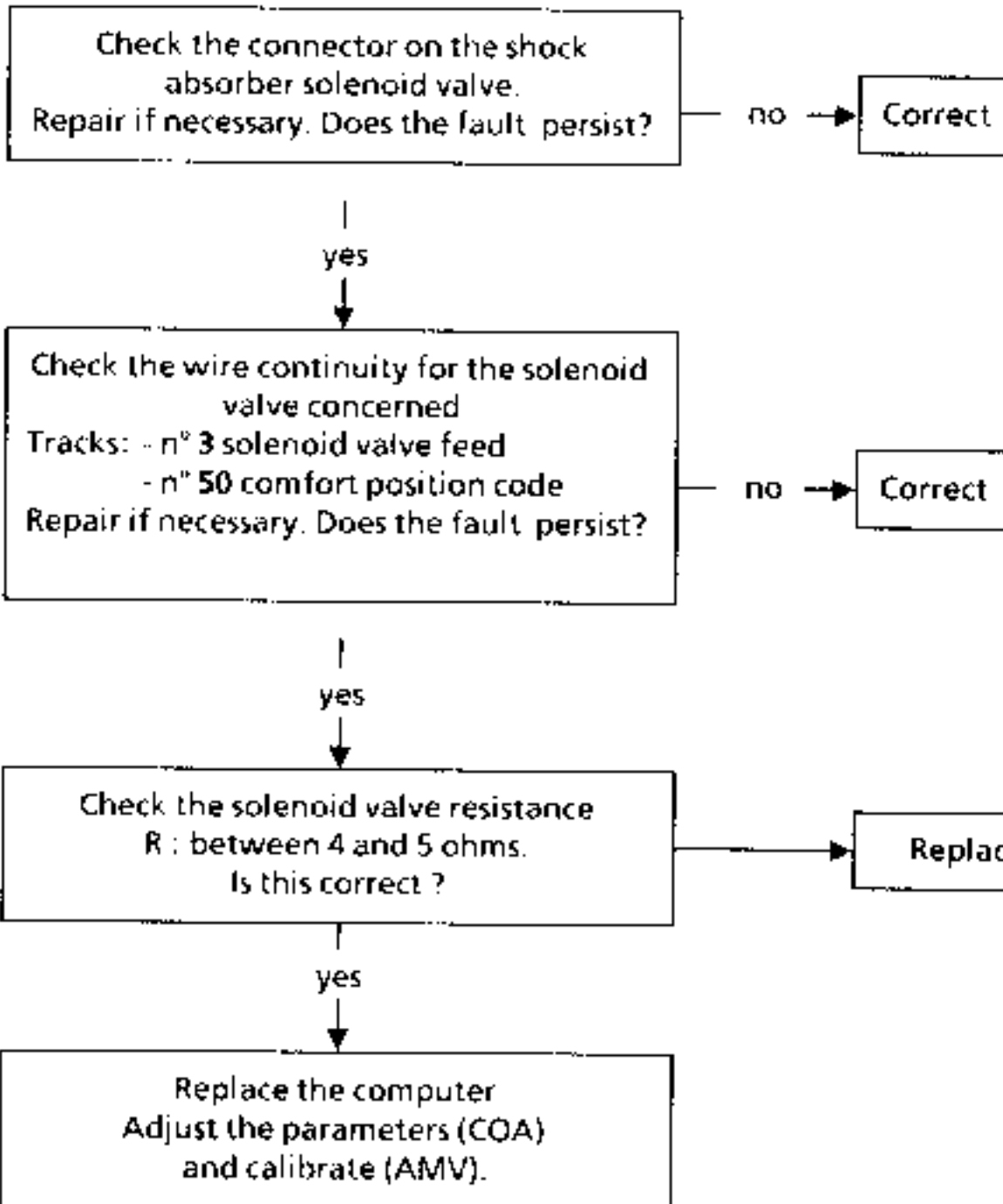
# AMV SOLENOID VALVE - FRH SHOCK ABSORBER

## COMFORT POSITION



On XR25 enter  
\*27 to discover type of fault.  
Open circuit.  
Short circuit.  
Permanent signal

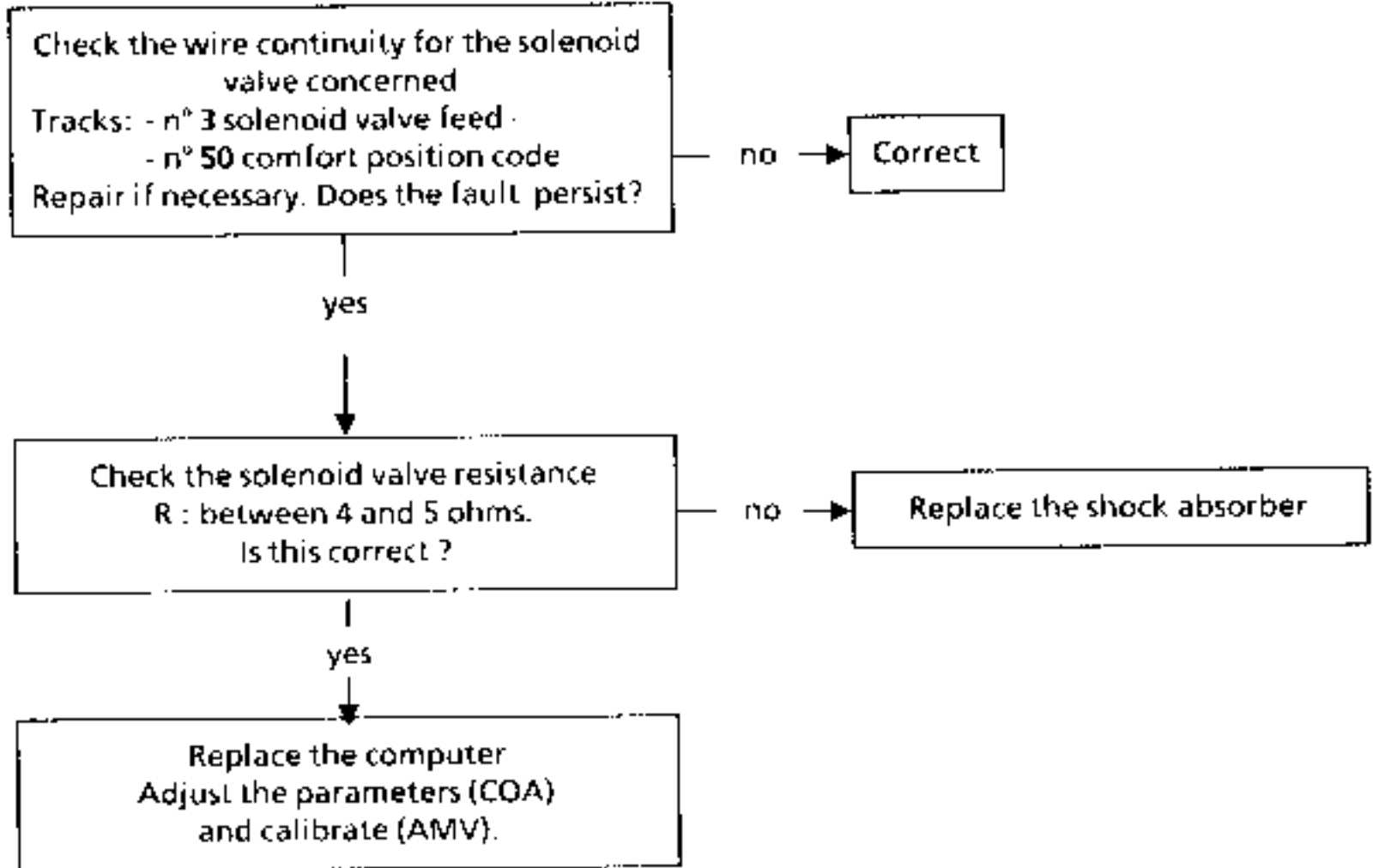
## OPEN CIRCUIT



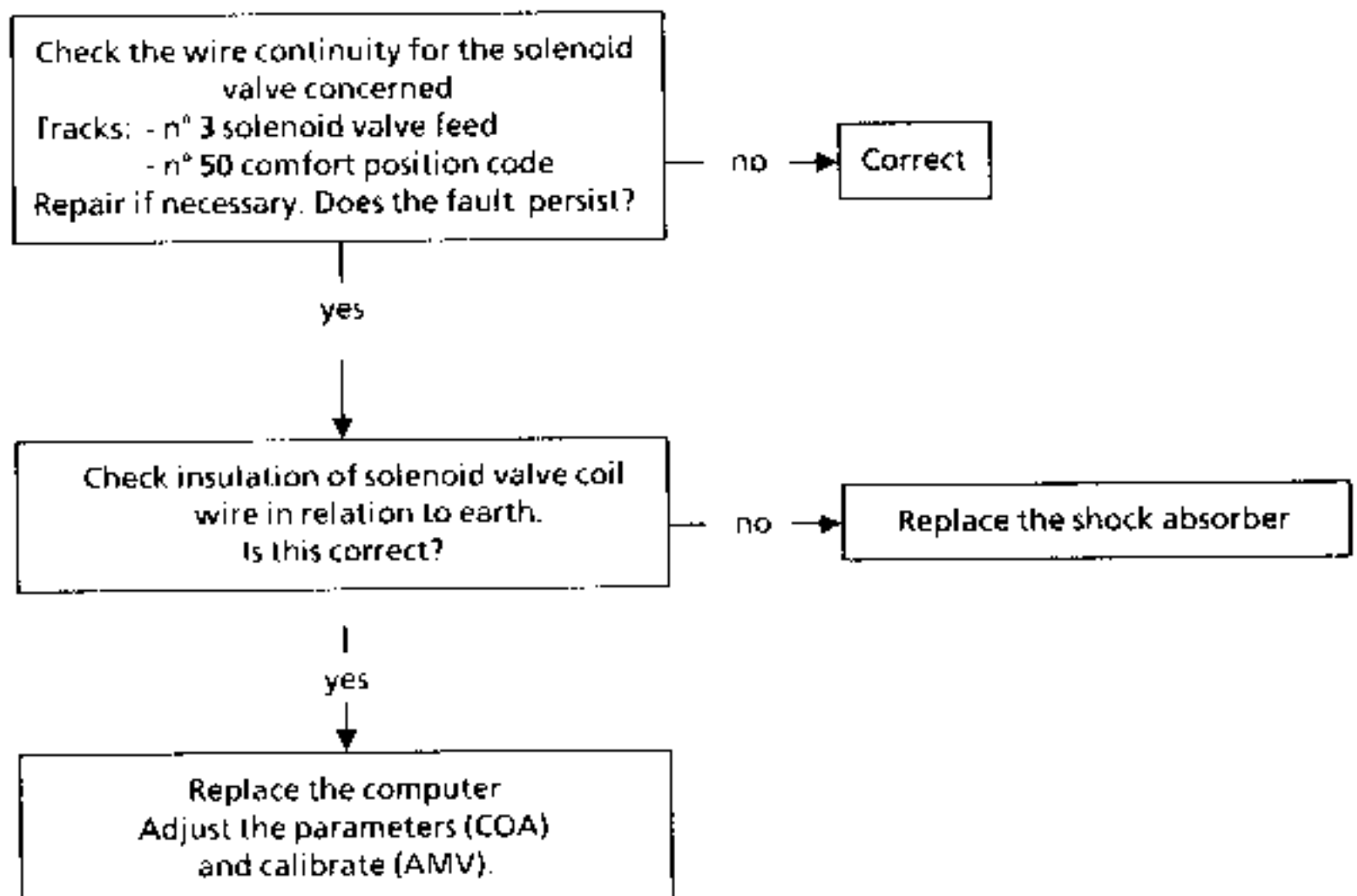
# AMV SOLENOID VALVE - FRH SHOCK ABSORBER

## COMFORT POSITION

### SHORT CIRCUIT



### PERMANENT CIRCUIT



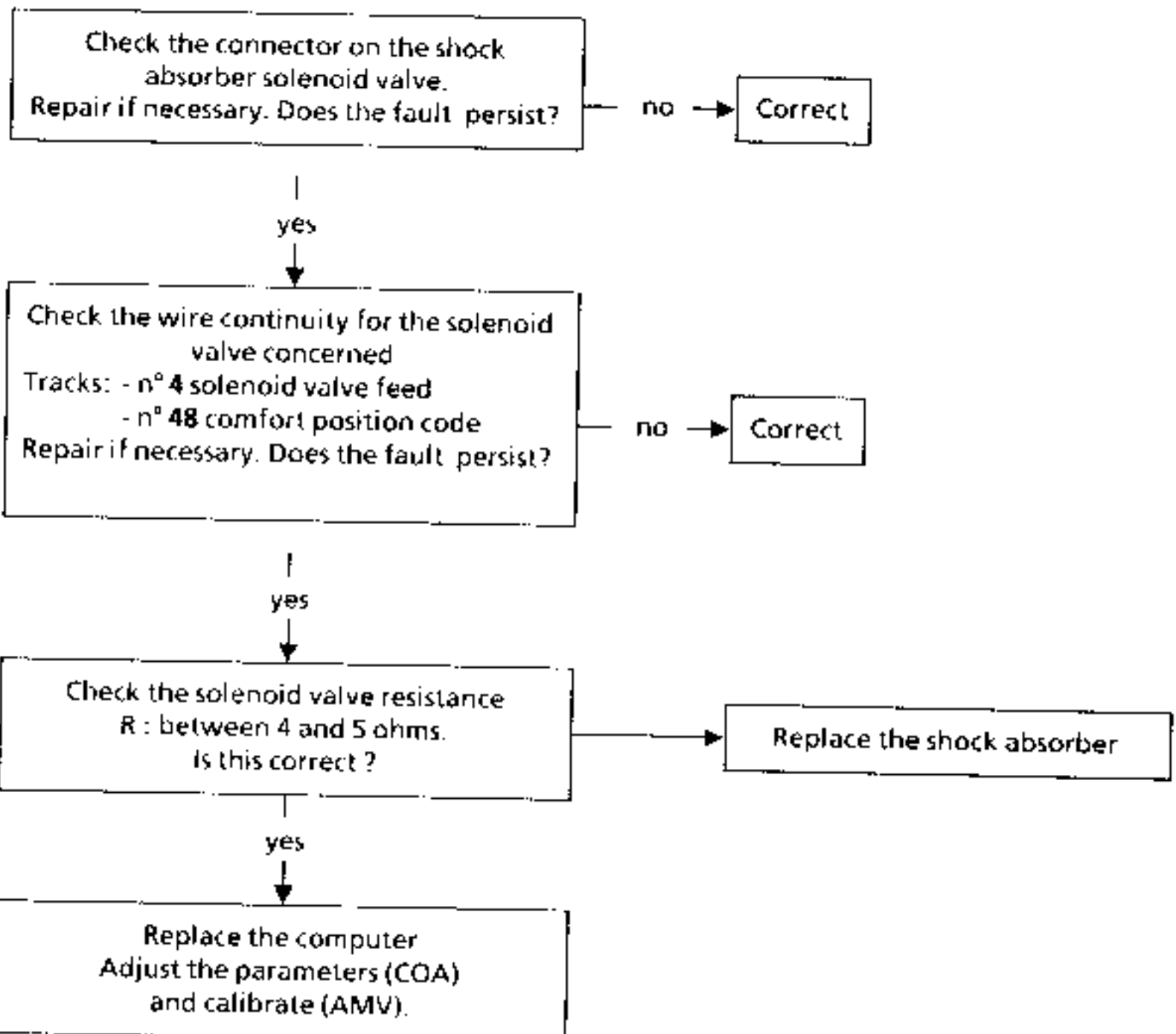
# AMV SOLENOID VALVE - FLH SHOCK ABSORBER

## COMFORT POSITION

	b	o	n
	[	a	
	[	c	
		p	

On XR25 enter  
\*07 to discover type of fault.  
Open circuit.  
Short circuit.  
Permanent signal

## OPEN CIRCUIT



# AMV SOLENOID VALVE - FLH SHOCK ABSORBER

## COMFORT POSITION

### SHORT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 4 solenoid valve feed  
- n° 48 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

### PERMANENT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 4 solenoid valve feed  
- n° 48 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check insulation of solenoid valve coil  
wire in relation to earth  
Is this correct?

no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

# AMV SOLENOID VALVE - RRH SHOCK ABSORBER

bon

COMFORT POSITION

Co

Cc

P

On XR25 enter  
\*28 to discover type of fault.  
Open circuit.  
Short circuit.  
Permanent signal

OPEN CIRCUIT

Check the connector on the shock  
absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the wire continuity for the solenoid  
valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 46 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).



## AMV SOLENOID VALVE - RRH SHOCK ABSORBER

## COMFORT POSITION

## SHORT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 46 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

## PERMANENT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 46 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check insulation of solenoid valve coil  
wire in relation to earth.  
Is this correct?

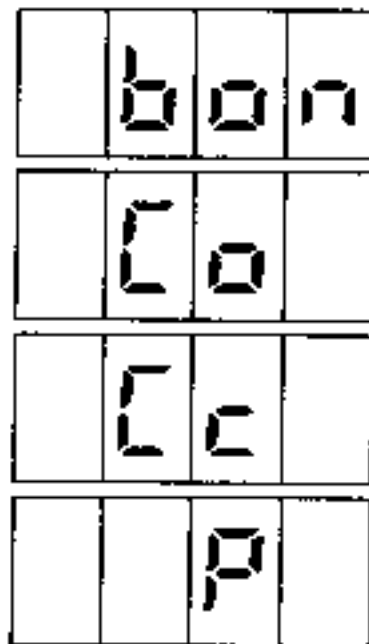
no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

# AMV SOLENOID VALVE - RLH SHOCK ABSORBER

## COMFORT POSITION



On XR25 enter  
\*08 to discover type of fault  
Open circuit  
Short circuit.  
Permanent signal

## OPEN CIRCUIT

Check the connector on the shock  
absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the wire continuity for the solenoid  
valve concerned  
Tracks: - n° 31 solenoid valve feed  
- n° 44 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV)

AMV SOLENOID VALVE - RLH SHOCK ABSORBER

COMFORT POSITION

SHORT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 31 solenoid valve feed  
          - n° 44 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV)

PERMANENT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 31 solenoid valve feed  
          - n° 44 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check insulation of solenoid valve coil wire in relation to earth.  
Is this correct?

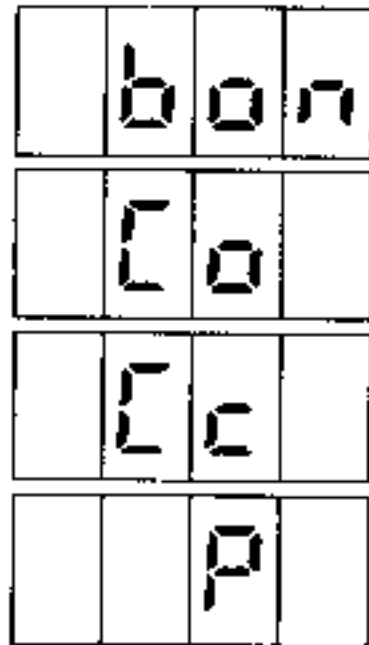
no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV)

# AMV SOLENOID VALVE - FRH SHOCK ABSORBER

## MEDIUM POSITION



On XR25 enter  
\*29 to discover type of fault.  
Open circuit.  
Short circuit.  
Permanent signal

## OPEN CIRCUIT

Check the connector on the shock  
absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no

Correct

yes

Check the wire continuity for the solenoid  
valve concerned  
Tracks: - n° 3 solenoid valve feed  
- n° 49 medium position code  
Repair if necessary. Does the fault persist?

no

Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

Replace the shock absorber

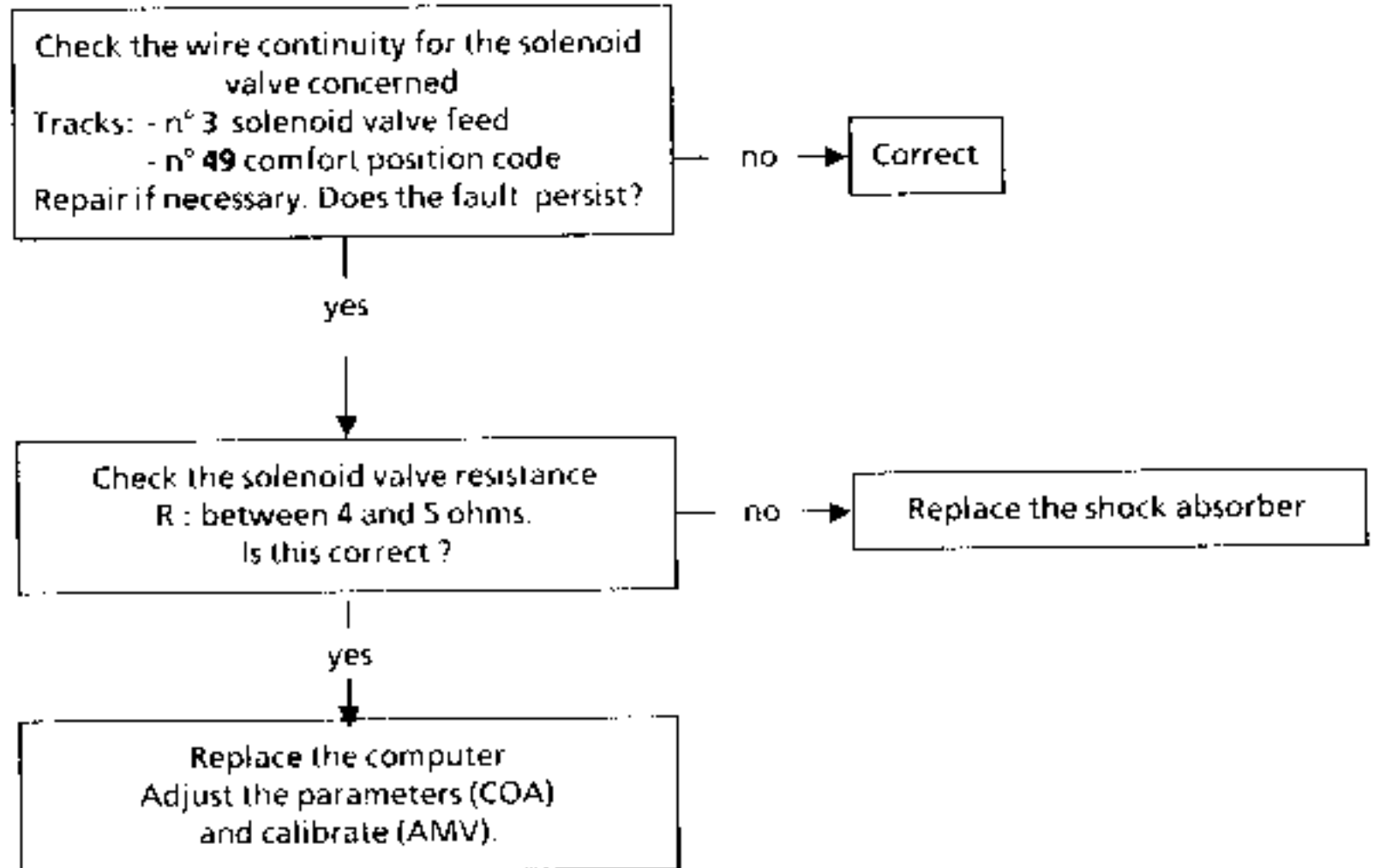
yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

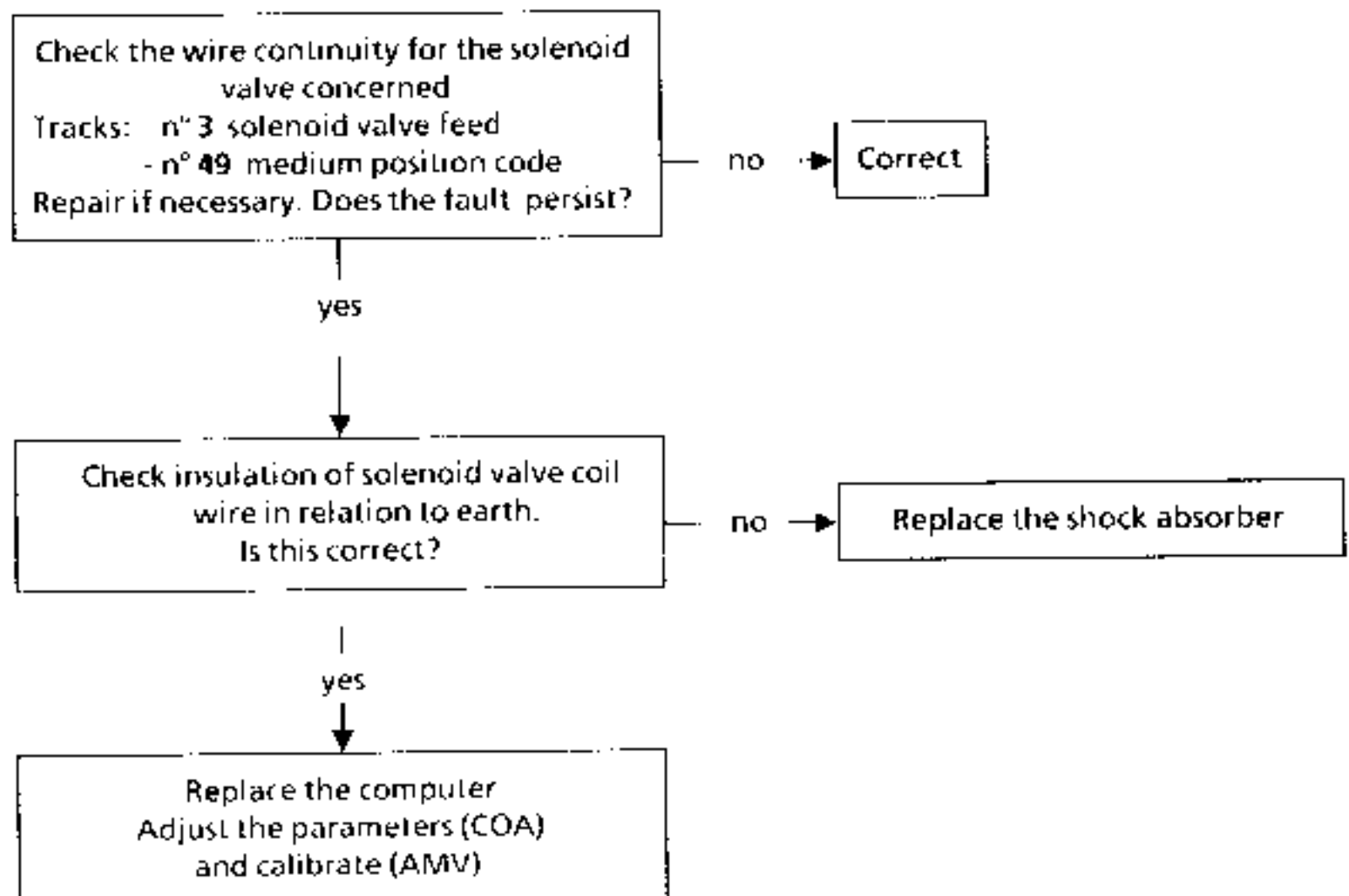
# AMV SOLENOID VALVE - FRH SHOCK ABSORBER

## MEDIUM POSITION

### SHORT CIRCUIT

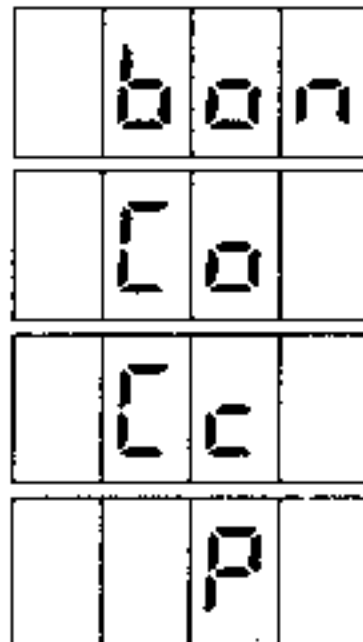


### PERMANENT CIRCUIT



# AMV SOLENOID VALVE - FLH SHOCK ABSORBER

## MEDIUM POSITION



On XR25 enter  
\*09 to discover type of fault.  
Open circuit.  
Short circuit.  
Permanent signal

## OPEN CIRCUIT

Check the connector on the shock  
absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the wire continuity for the solenoid  
valve concerned  
Tracks: - n° 4 solenoid valve feed  
- n° 47 medium position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

Replace the shock absorber

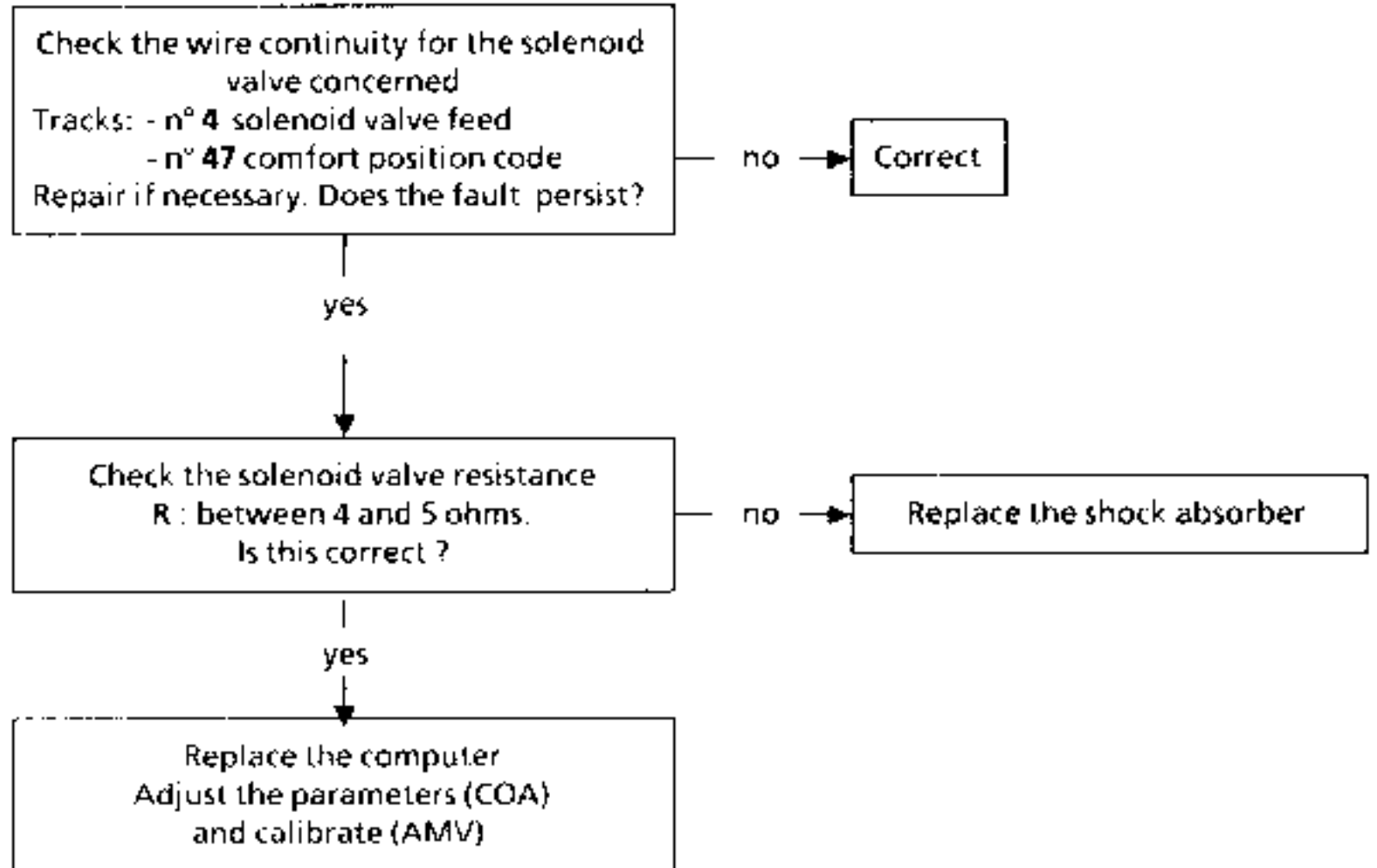
yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

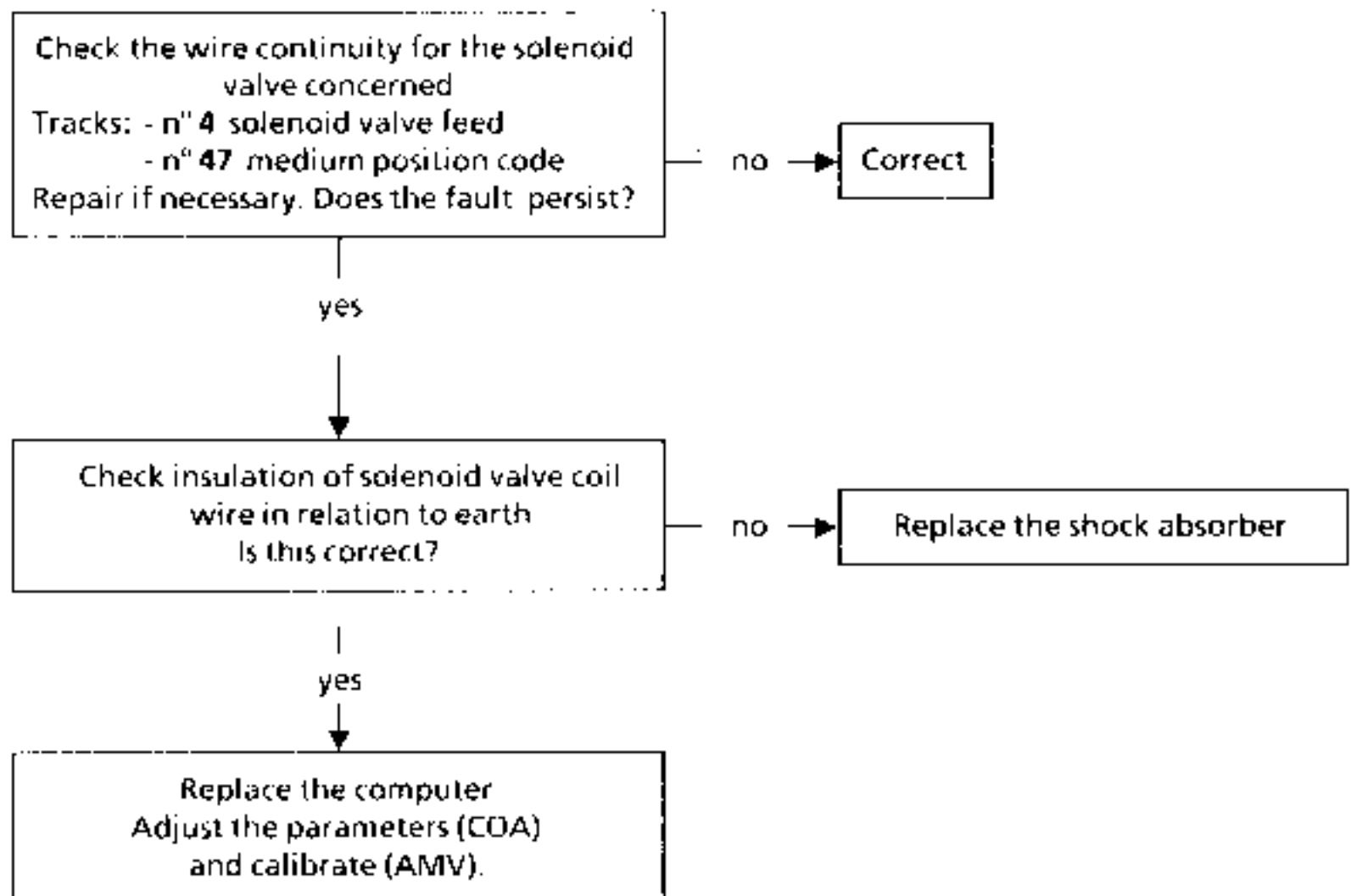
AMV SOLENOID VALVE - FLH SHOCK ABSORBER

MEDIUM POSITION

SHORT CIRCUIT



PERMANENT CIRCUIT



# AMV SOLENOID VALVE - RRH SHOCK ABSORBER

## MEDIUM POSITION



On XR25 enter  
\*30 to discover type of fault  
Open circuit.  
Short circuit.  
Permanent signal

## OPEN CIRCUIT

Check the connector on the shock absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 45 medium position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV)



AMV SOLENOID VALVE - RRH SHOCK ABSORBER

MEDIUM POSITION

SHORT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 45 comfort position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms.  
Is this correct ?

no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

PERMANENT CIRCUIT

Check the wire continuity for the solenoid valve concerned  
Tracks: - n° 30 solenoid valve feed  
- n° 45 medium position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check insulation of solenoid valve coil  
wire in relation to earth.  
Is this correct?

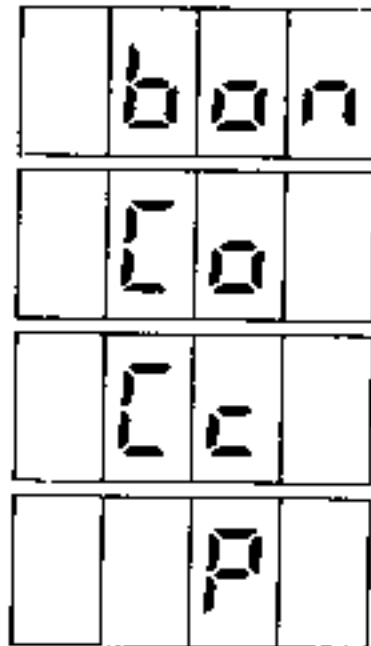
no → Replace the shock absorber

yes

Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV).

# AMV SOLENOID VALVE - RLH SHOCK ABSORBER

## MEDIUM POSITION



On XR25 enter  
\*10 to discover type of fault  
Open circuit.  
Short circuit.  
Permanent signal

## OPEN CIRCUIT

Check the connector on the shock  
absorber solenoid valve.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the wire continuity for the solenoid  
valve concerned  
Tracks: - n° 31 solenoid valve feed  
- n° 43 medium position code  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the solenoid valve resistance  
R : between 4 and 5 ohms  
Is this correct ?

Replace the shock absorber

yes

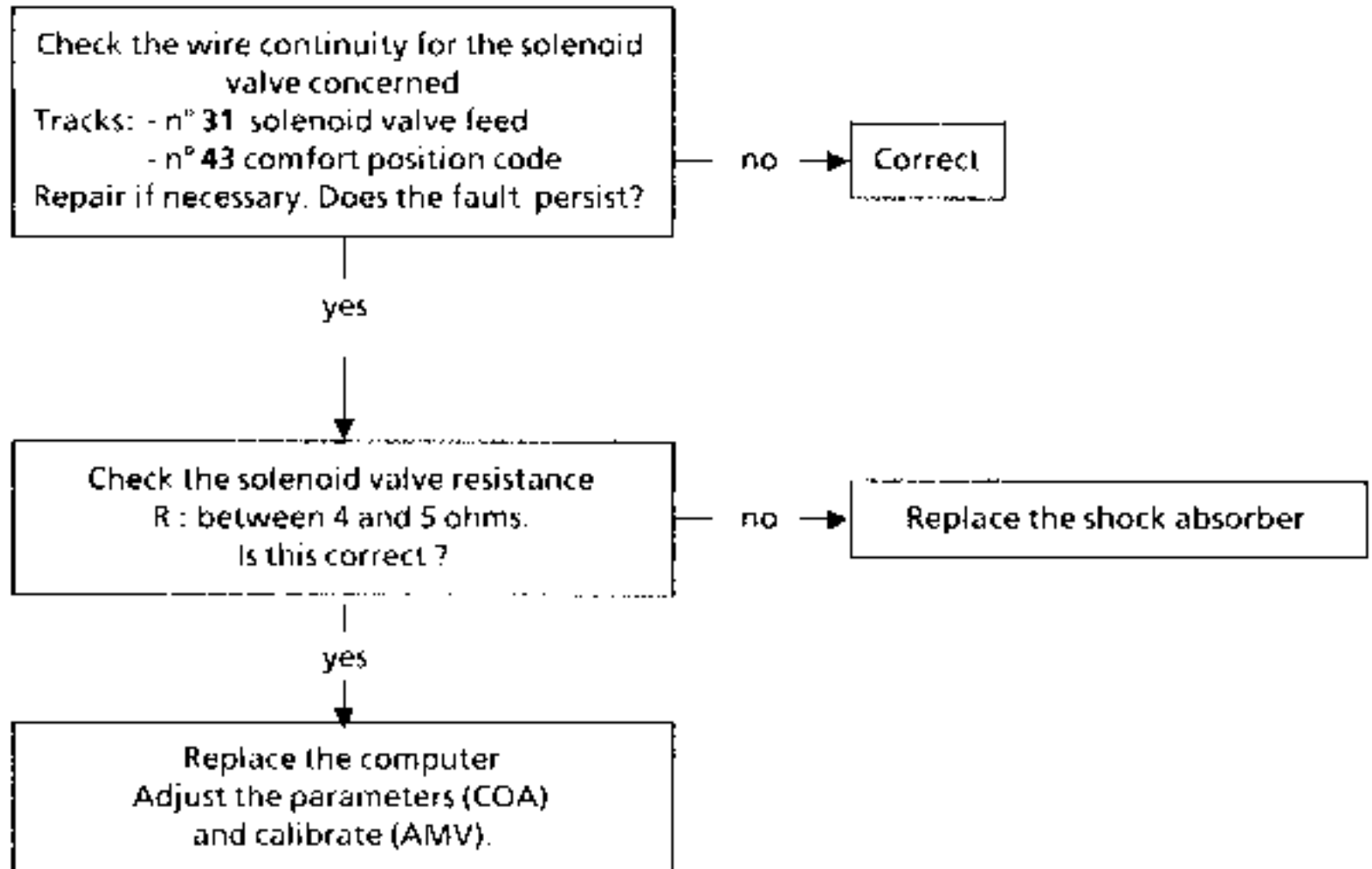
Replace the computer  
Adjust the parameters (COA)  
and calibrate (AMV)

10

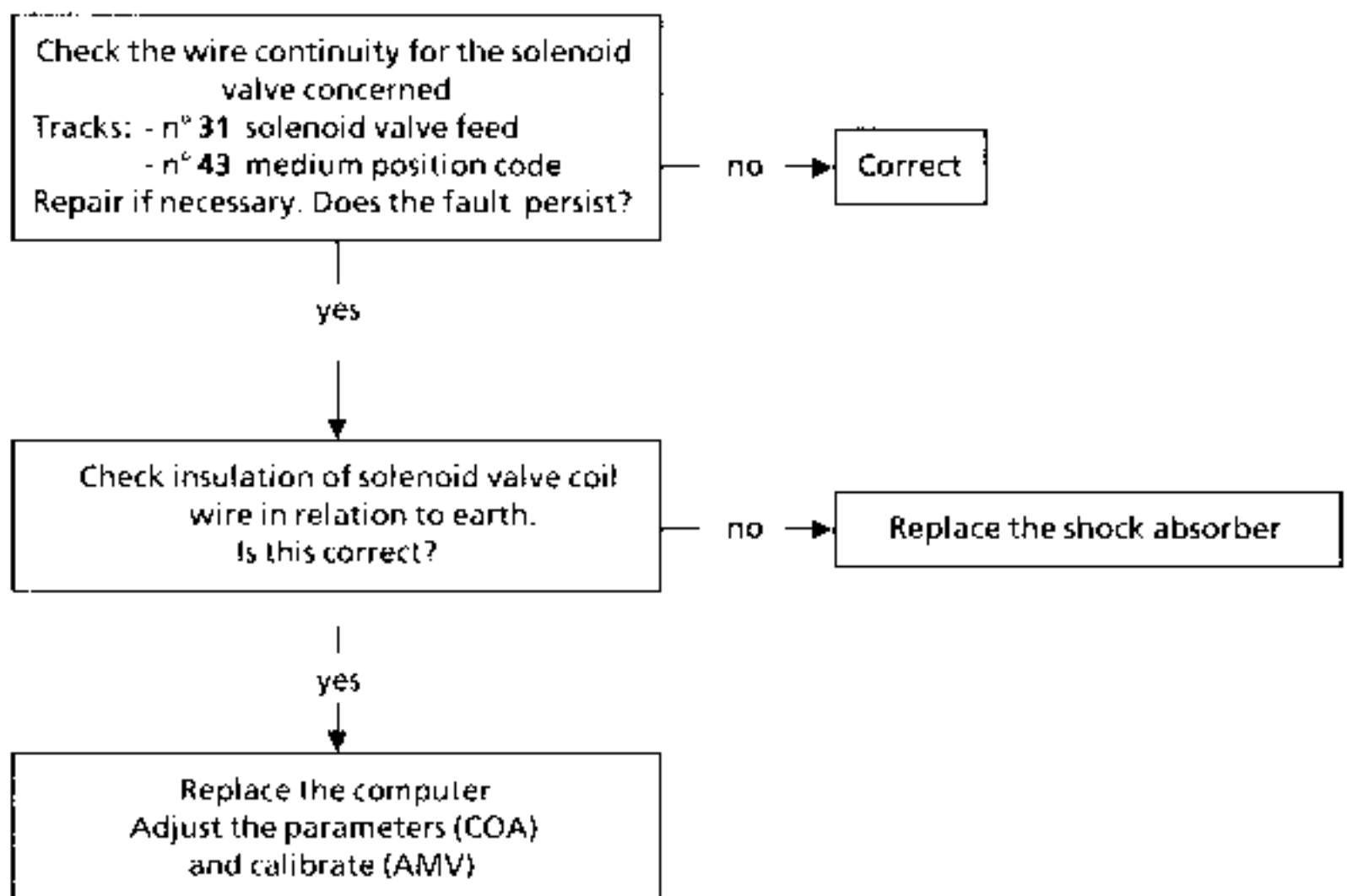
# AMV SOLENOID VALVE - RLH SHOCK ABSORBER

## MEDIUM POSITION

### SHORT CIRCUIT



### PERMANENT CIRCUIT



# VERTICAL ACCELEROMETER

	b	o	n
	E	b	P
	E	h	P

On XR25  
enter \*11 to discover type of  
fault.  
Permanent low.  
Permanent high.

## PERMANENT HIGH

Check for earth at the accelerometer  
(track n° 20  
from computer).  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the insulation of wires on tracks 6  
and 33 of computer.  
Repair if necessary. Does the fault persist?

no → Correct

yes

With accelerometer in place and  
connected, check feed voltage between  
tracks  
20 and 6 (= 5 volts).  
Repair wiring if necessary. Does the fault  
persist?

no → Correct

yes

Replace vertical accelerometer  
Does the fault persist?

no → Correct

yes

Replace the computer  
Adjust parameters (COA)  
and calibrate (AMV).

# VERTICAL ACCELEROMETER

	b	o	n
	E	b	P
	E	h	P

On XR25  
enter \*11 to discover type of  
fault  
Permanent low.  
Permanent high.

## PERMANENT LOW

Check for earth at the accelerometer  
(track n° 20  
from computer).  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the insulation of wires on tracks 20  
and 33 of computer and continuity on  
track 33.  
Repair if necessary. Does the fault persist?

no → Correct

yes

With accelerometer in place and  
connected, check feed voltage between  
tracks  
20 and 6 (= 5 volts).  
Repair wiring if necessary. Does the fault  
persist?

no → Correct

yes

Replace vertical accelerometer.  
Does the fault persist?

no → Correct

yes

Replace the computer  
Adjust parameters (COA)  
and calibrate (AMV).

11

# LONGITUDINAL ACCELEROMETER

	b	o	n
	E	b	P
	E	H	P

On XR25  
enter \*31 to discover type of  
fault.  
Permanent low  
Permanent high

## PERMANENT HIGH

Check for earth at the accelerometer  
(track n° 21  
from computer) and check the condition  
of the mounting plate.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the insulation of wires on tracks 7  
and 9 of computer.  
Repair if necessary. Does the fault persist?

no → Correct

yes

With accelerometer in place and  
connected, check feed voltage between  
tracks  
21 and 7 (= 5 volts).  
Repair wiring if necessary. Does the fault  
persist?

no → Correct

yes

Replace longitudinal accelerometer.  
Does the fault persist?

no → Correct

yes

Replace the computer  
Adjust parameters (COA)  
and calibrate (AMV)

# LONGITUDINAL ACCELEROMETER

On XR25  
enter \*31 to discover type of  
fault.

E b P

PERMANENT LOW

Check for earth at the accelerometer  
(track n° 21  
from computer) as well as condition of  
mounting plate.  
Repair if necessary. Does the fault persist?

no → Correct

yes

Check the insulation of wires on tracks 21  
and 9 of computer  
Repair if necessary. Does the fault persist?

no → Correct

yes

With accelerometer in place and  
connected, check feed voltage between  
tracks  
21 and 7 (= 5 volts).  
Repair wiring if necessary. Does the fault  
persist?

no → Correct

yes

Replace vertical accelerometer  
Does the fault persist?

no → Correct

yes

Replace the computer  
Adjust parameters (COA)  
and calibrate (AMV)

# STEERING WHEEL ANGLE SENSOR

## OPEN CIRCUIT

Check wire continuity and insulation, and presence of + 12 volts on sensor and + 5 volts (track n° 8).  
Repair if necessary. Does the fault persist?

no

Correct

yes

On XR25 enter # 03  
and check the value varies when turning  
the steering wheel.  
Does the value vary?

no

Check operation and condition  
of angle gear.  
If correct, replace steering  
wheel angle sensor.

yes

Reposition the sensor  
Put the wheels in a straight line, is the  
output voltage = 2,5 volts  
between tracks 35 and 22.  
Does the fault persist after repositioning  
the sensor?

no

Correct

yes

Replace steering wheel angle sensor. Does  
the fault persist?

no

Correct

yes

Replace the computer.  
Adjust the parameters (COA)  
and calibrate (AMV).

12

## VEHICLE LOAD INFORMATION

Ignore the illumination of this bar graph.

Check the pressostat is correctly connected.

Erase the memory GO\*\*.

12



FEED RELAY + CUT OUT + FUSE

On XR25  
enter \*13 to discover fault type.

Co

→ Open circuit

P

→ Permanent signal

Cc

→ Short circuit

ban

→ Open circuit

Check feed fuse,  
replace if necessary  
Does the fault persist?

no → Correct

yes

Check cut out resistance  
Should be  $R \approx 0$  ohm.  
Tracks n° 1 and 2 on motocompressor  
assembly connector. Is this correct?

no →

Check compressor  
temperature. Is it normal ?  
(cold or warm).  
**ATTENTION** : the  
temperature may be very  
high.

no

yes

Replace the compressor

yes

Check wiring continuity  
(tracks 16 and 38 on computer)  
and presence of + battery at relay. Repair  
if necessary. Does the fault persist?

no →

Correct

yes

Check motocompressor assembly relay  
operation.  
Replace the relay if necessary  
Does the fault persist?

yes →

Wait for the compressor to  
cool down, operate it again  
and check if all is correct. If  
NOT, replace the  
compressor.

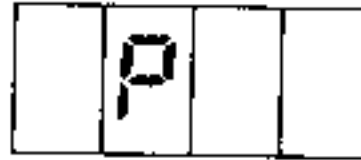
no

Correct

Replace the computer  
Adjust parameters (COA)  
and calibrate (AMV)

13

PERMANENT SIGNAL



Check wiring insulation and continuity between computer (tracks 16 and 38) and relay, and then between molocompressor assembly and relay.  
Repair wiring if necessary. Does the fault persist?

no → Correct

yes

Check the relay operation (switch opens and closes). Is this correct?

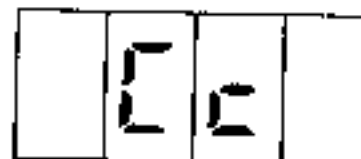
no → Replace the relay

yes

Replace the computer  
Adjust parameters (COA) and calibrate (AMV).

13

SHORT CIRCUIT



Check wiring insulation. Repair if necessary. Does the fault persist?

no → Correct

yes

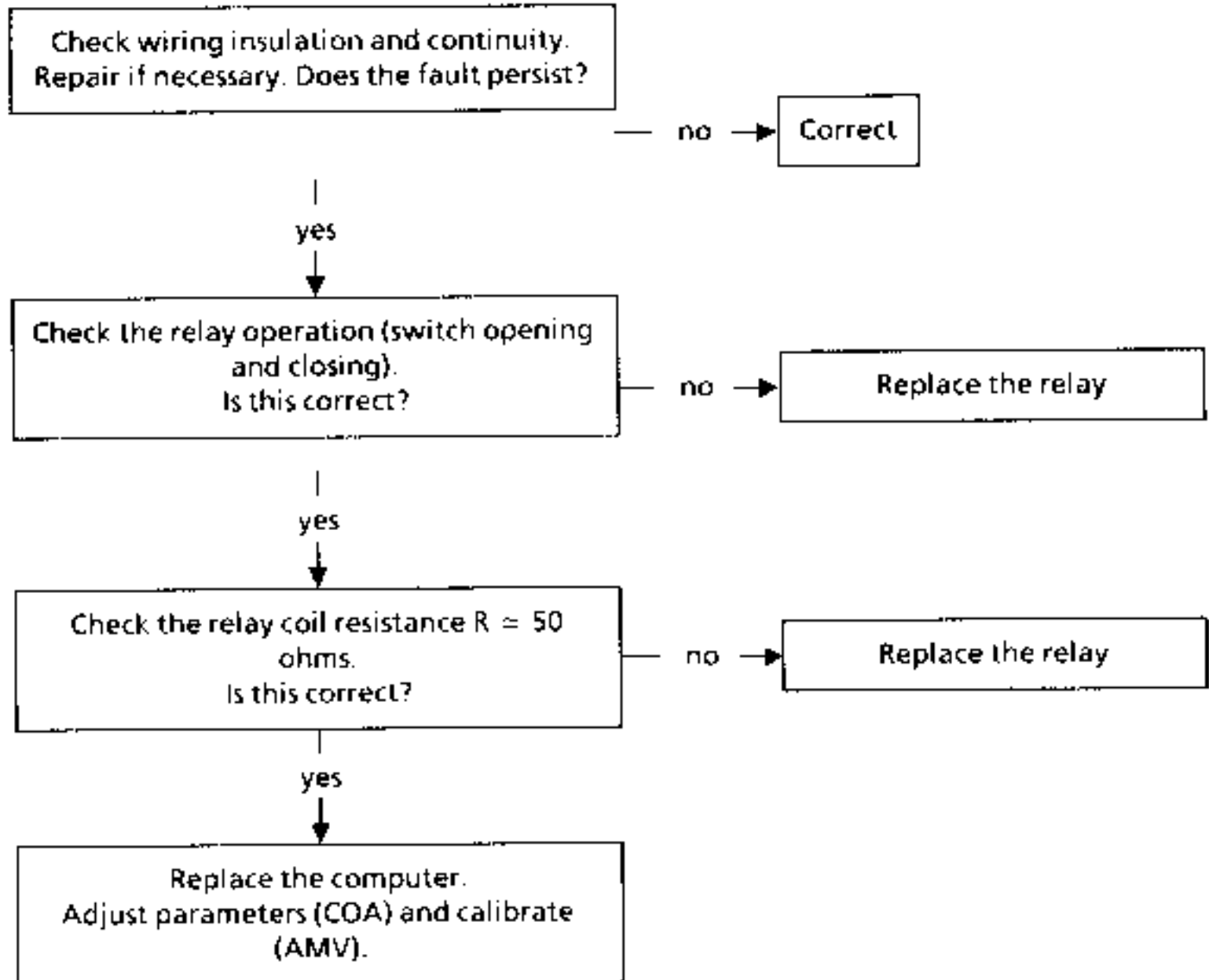
Check the relay coil resistance  $R = 60$  ohms.  
Is this correct?

no → Replace the feed relay

yes

Replace the computer  
Adjust parameters (COA) and calibrate (AMV).

SAFETY RELAY



## HEIGHT NOT REACHED

COA air leak or mechanical blockage.

Check :

- that a shock absorber is not subject to a high degree of friction or a mechanical blockage,
- the height sensor mountings, collar tightening and its position on the anti-roll bar
- that there is no damp in the connections.

Repair if necessary. Does the fault persist?

no

Correct

yes

Inflate the pneumatic circuit

**Note :** operate the solenoid valves and the motocompressor assembly using the XR25

G08\* (4 solenoid valves)

+ G07\* (motocompressor assembly)

and listen for leaks at the joints

(use foam for a more accurate inspection)

Repair if necessary. Does the fault persist?

no

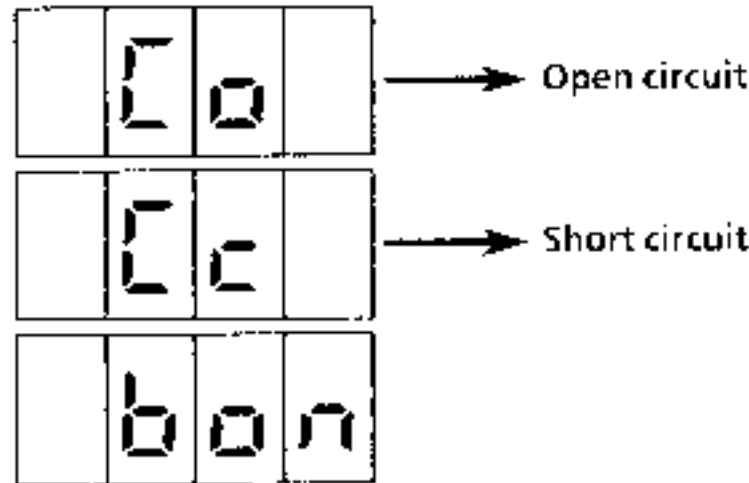
Correct

yes

Locate the faulty shock absorber (leak at the sleeve) and replace it.

## EXHAUST SOLENOID VALVE

On XR25  
enter \*15 to discover fault type



### OPEN CIRCUIT (or permanent control)

Check the solenoid valve wiring continuity and insulation.  
Check the solenoid valve coil resistance  $R \approx 14 \text{ ohms}$   
Repair the wiring or replace the motocompressor assembly\*.  
Does the fault persist?

no → Correct

yes

Replace the computer.  
Adjust parameters (COA) and calibrate (AMV).

(\*) Note : the solenoid valve cartridge assembly must be replaced if the solenoid valve is faulty

### SHORT CIRCUIT

Check the solenoid valve wiring continuity and insulation.  
Check the solenoid valve coil resistance  $R \approx 14 \text{ ohms}$   
Repair the wiring or replace the solenoid valve.  
Does the fault persist?

no → Correct

yes

Replace the computer  
Adjust parameters (COA) and calibrate (AMV)

15

OIL PRESSURE SWITCH

Check insulation of wire n° 18 (computer  
to pressure switch).  
Repair if necessary. Does the fault persist?

no

Correct

yes

Check the oil pressure switch.  
Is this correct?

no

Replace the pressure switch

yes

Replace the computer  
Adjust parameters (COA) and calibrate  
(AMV).

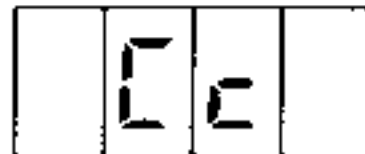
**Note :** this fault appears if the vehicle is  
moving for more than 30 seconds with the  
ignition off, and then the ignition is  
switched on again.

15

**5 VOLT REFERENCE FAULT**

Accelerometer feed and steering wheel angle sensor feed

On XR25 enter \*36 to discover  
fault type.



Short circuit to earth



Short circuit to + 12 volts

Check wire insulation on tracks 6 - 7 - 8 on  
disconnected computer connector in  
relation to earth  
(track 1) and in relation to + 12 volts  
(track 28)  
Is there a short circuit?

no

On computer check insulation  
of pins 6, 7, 8  
in relation to pins  
1 (earth) and 28 (+ 12 volts).  
Is this correct?

no

Replace the computer.  
Adjust parameters  
(COA) and calibrate  
(AMV).

Repair wiring,  
refit assembly  
and check  
# 01, 02, 03.

no

Disconnect the 3 sensors and  
check to see if short circuit is  
still present. Is this correct?

yes

yes

Reconnect sensors one by one to find  
which is faulty.  
Replace faulty sensor.  
**Note :** Recalibrate AMV for longitudinal  
accelerometer.  
Check sensor values  
# 01, 02, 03.

yes

Refit the computer.  
Erase faults in memory GO\*\*.  
Exit diagnostic phase.  
Does the fault persist?

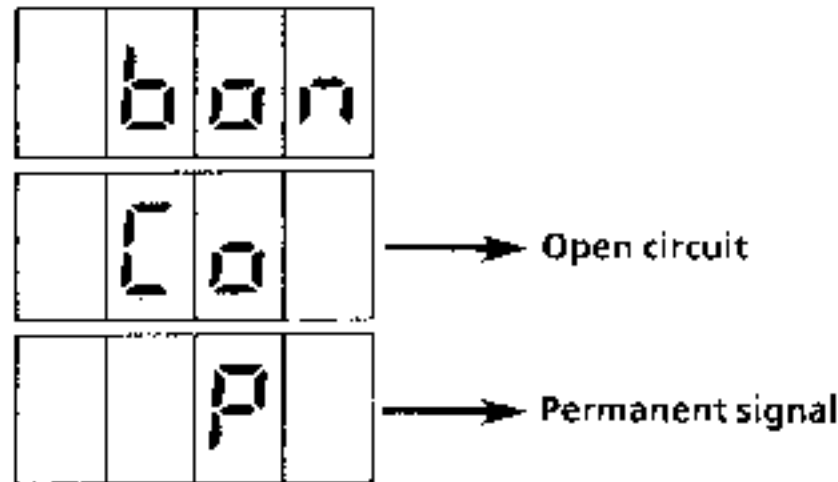
yes

no

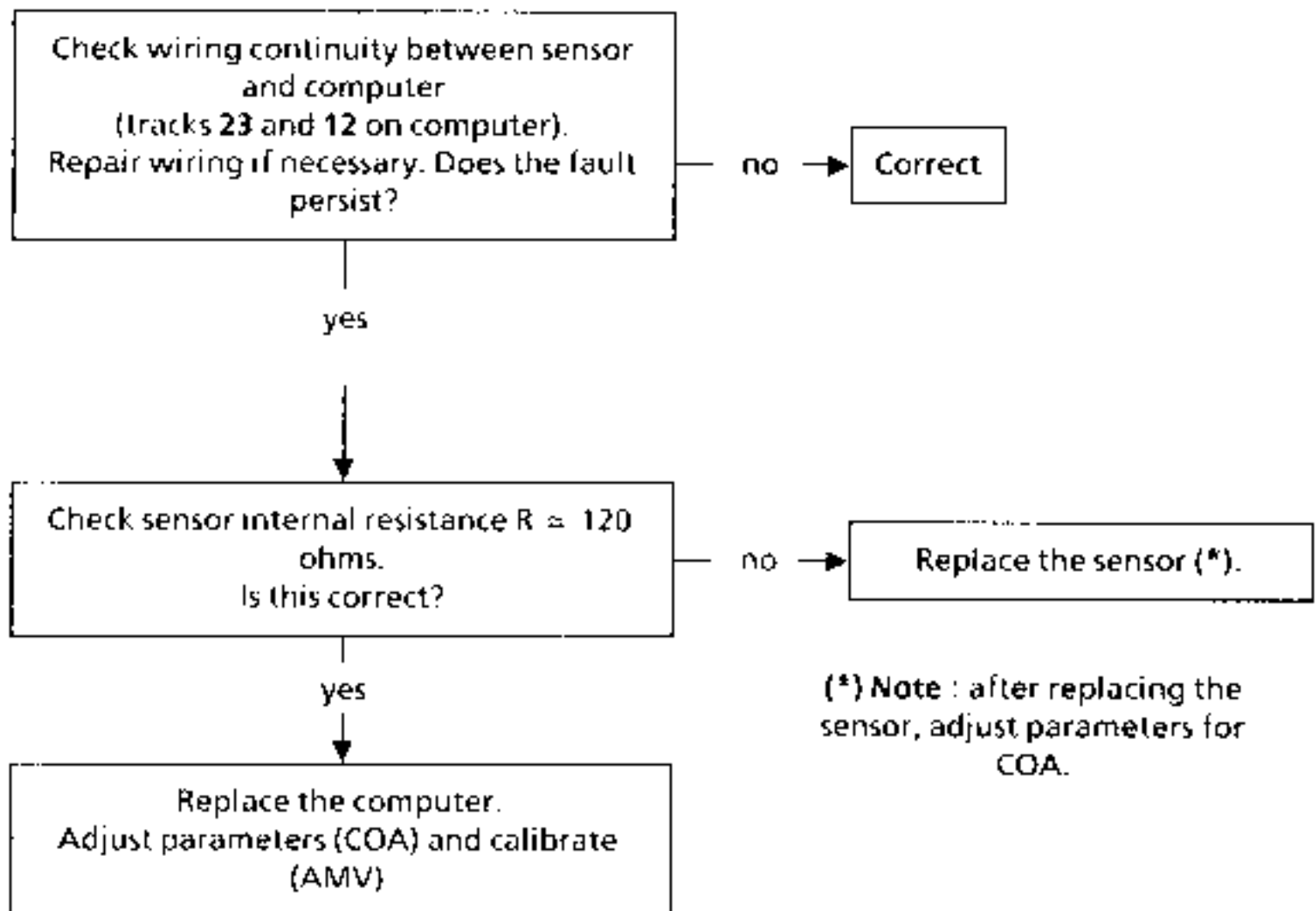
END  
Temporary fault

## FRONT HEIGHT SENSOR

On XR25  
enter \*16 to discover fault type.



## OPEN CIRCUIT



(\*) Note : after replacing the sensor, adjust parameters for COA.

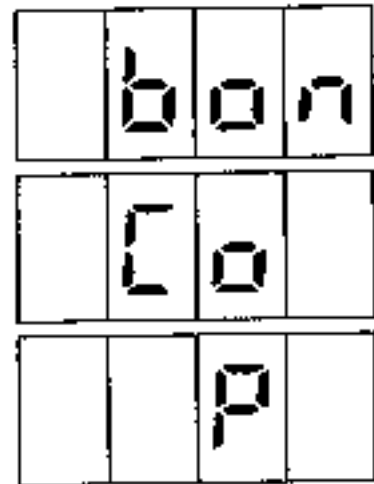
## PERMANENT SIGNAL

Check sensor mechanical mounting :  
linking bar connection.  
Repair if necessary



## REAR RIGHT HAND HEIGHT SENSOR

On XR25  
enter \*37 to discover fault type



→ Open circuit

→ Permanent signal

## OPEN CIRCUIT

Check wiring continuity between sensor  
and computer  
(tracks 24 and 11 on computer).  
Repair wiring if necessary Does the fault  
persist?

no → Correct

yes

Check sensor internal resistance  $R \approx 120$   
ohms  
Is this correct?

no → Replace the sensor (\*).

yes

Replace the computer  
Adjust parameters (COA) and calibrate  
(AMV).

(\*) Note : after replacing the  
sensor, adjust parameters for  
COA.

## PERMANENT SIGNAL

Check sensor mechanical mounting :  
linking bar connection.  
Repair if necessary

## REAR LEFT HAND HEIGHT SENSOR

On XR25  
enter \*17 to discover fault  
type.

b o n

[ o

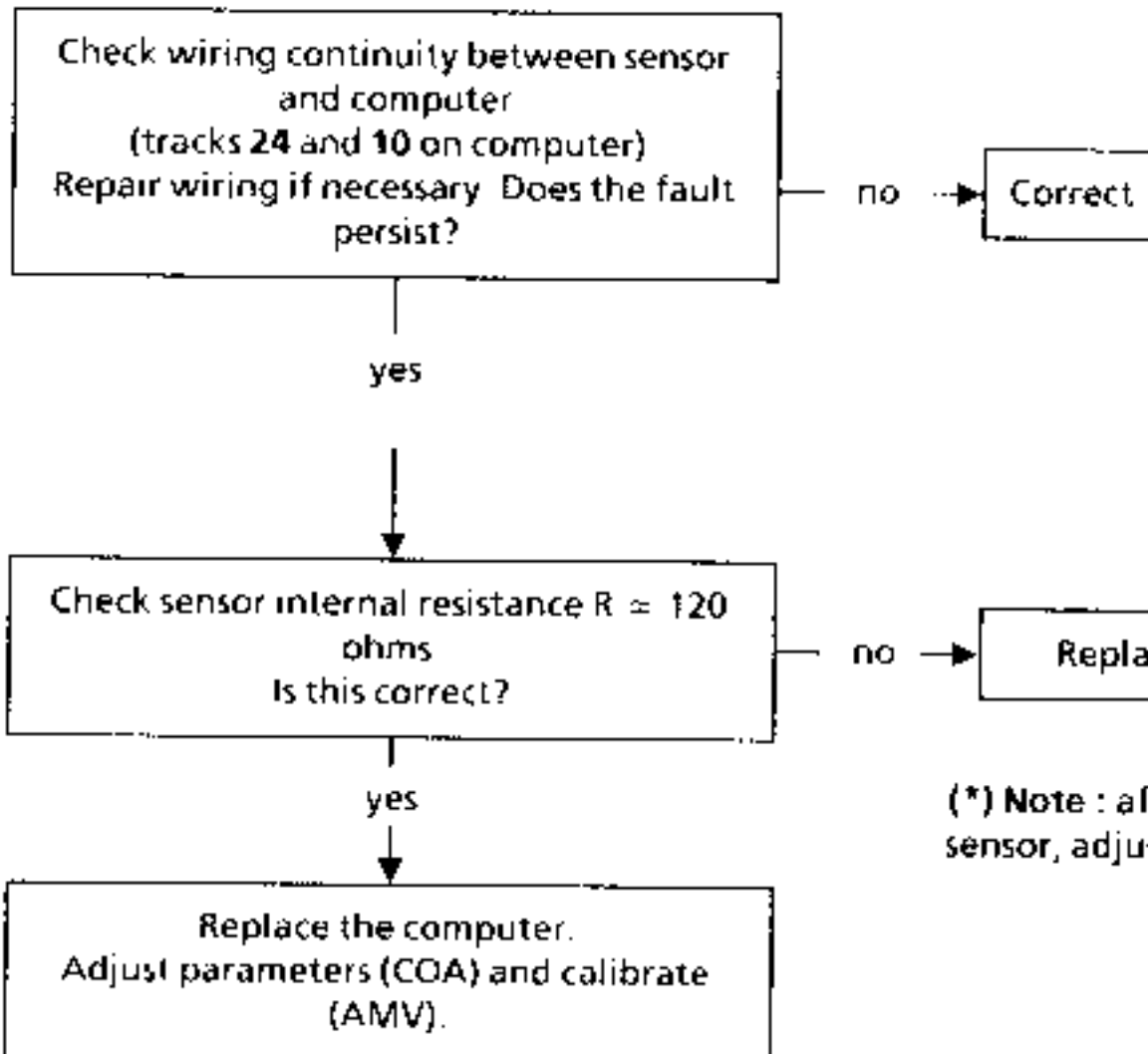
→ Open circuit

p

→ Permanent signal

## OPEN CIRCUIT

17



(\*) Note : after replacing the  
sensor, adjust parameters for  
COA.

## PERMANENT SIGNAL

Check sensor mechanical mounting :  
linking bar connection  
Repair if necessary.

## COA SOLENOID VALVE (FRONT RIGHT HAND)

Enter \*38 on  
XR25 to discover fault type

b o n

[ o

→ Open circuit or permanent signal

[ c

→ Short circuit

## OPEN CIRCUIT OR PERMANENT SIGNAL

Check wiring continuity and insulation for solenoid valve in question.

Tracks B3 on 9 track (from safety relay)

and B5 on 9 track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV)

## SHORT CIRCUIT

Check wiring continuity and insulation for solenoid valve in question

Tracks B3 on 9 track (from safety relay)

and B5 on 9 track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

## COA SOLENOID VALVE (FRONT LEFT HAND)

Enter \*18 on  
XR25 to discover fault type

	b	a	n
--	---	---	---

	[	a	
--	---	---	--

Open circuit or permanent signal

	[	c	
--	---	---	--

Short circuit

## OPEN CIRCUIT OR PERMANENT SIGNAL

Check wiring continuity and insulation for solenoid valve in question.

Tracks **B3** on **9** track (from safety relay)

and **B4** on **9** track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

## SHORT CIRCUIT

Check wiring continuity and insulation for solenoid valve in question

Tracks **B3** on **9** track (from safety relay)

and **B4** on **9** track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

18

# COA SOLENOID VALVE (REAR RIGHT HAND)

Enter \*39 on  
XR25 to discover fault type

b o n

[ o

Open circuit or permanent signal

[ c

Short circuit

## OPEN CIRCUIT OR PERMANENT SIGNAL

Check wiring continuity and insulation for solenoid valve in question

Tracks **B3** on **9** track (from safety relay)  
and **A5** on **9** track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R = 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

## SHORT CIRCUIT

Check wiring continuity and insulation for solenoid valve in question.

Tracks **B3** on **9** track (from safety relay)  
and **A5** on **9** track

Repair if necessary. Does the fault persist?

no → Correct

yes

Check the coil resistance  $R = 14$  ohms  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

## COA SOLENOID VALVE (REAR LEFT HAND)

Enter \*19 on  
XR25 to discover fault type

b o n

C o

Open circuit or permanent signal

C c

Short circuit

## OPEN CIRCUIT OR PERMANENT SIGNAL

Check wiring continuity and insulation for solenoid valve in question.

Tracks B3 on 9 track (from safety relay)  
and A4 on 9 track

Repair if necessary Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV).

## SHORT CIRCUIT

Check wiring continuity and insulation for solenoid valve in question.

Tracks B3 on 9 track (from safety relay)  
and A4 on 9 track

Repair if necessary Does the fault persist?

no → Correct

yes

Check the coil resistance  $R \approx 14$  ohms.  
Is this correct?

no → Replace the solenoid valve.

yes

Replace the computer. Adjust parameters (COA) and  
calibrate (AMV)

## WARNING LIGHT CIRCUIT FAULT

On XR25 enter  
G06\* to illuminate the warning light.  
Does the warning light illuminate?

yes

Check there are no incorrect contacts in  
the wiring and connectors.  
Re enter G06\* to extinguish the warning  
light

no

Fault on the warning light line.

Check:

- controlled suspension warning light bulb.
- tell-tale wiring :  
continuity between the warning light  
and track C4 of connection R180  
and between track C4 on R180 and  
track 55 of computer connector  
(Bornier Sus 1228).

20

20 Present if memory function is being used on XR25

The XR25 memory function allows different parameter values which are accessed by the # key (followed by two figures) to be frozen and stored in order to allow them to be read later

Once communication between the XR25 and the computer is established, to obtain this function enter at the required moment.

0

This memory is erased by entering

D 1 8

## ADDITIONAL CONTROLS

# 0 1 → Vertical accelerometer: value expressed in  $m/s^2$

The value should vary depending on vehicle movement

**Note :** The initial value (vehicle stationary) has little meaning, since the variation is the important factor (This sensor does not need to be calibrated).

# 0 2 → Longitudinal accelerometer: value expressed in  $m/s^2$

Vehicle stationary on a flat even surface.

(COA parameters adjusted and AMV calibration carried out) the value should be : zero

0.00

The value should vary with corresponding vehicle movement

# 0 3 → Steering wheel angle sensor : value expressed in degrees

Wheels straight, steering at centre point (locked position).

The value should be close to  $0^\circ \pm 10^\circ$

- 4

With the engine running, check the angular values by gently moving the steering wheel from right lock to left lock, the values should be between  $+ 580^\circ \pm 20^\circ$  and  $- 580^\circ \pm 20^\circ$ .

**Note:** This sensor self calibrates after several periods of driving.



# ADDITIONAL CONTROLS (after system initialisation)

# 0 4 → Vehicle speed : value expressed in km/h

Check and compare the speed shown with that on the instrument panel during a road test

# 0 5 → Rear left hand height difference \*:

In normal position the value should be close to zero

Select the high position \*\*, the value should be approx + 38.

38

Drain the circuit of air and use command G09\*, wait 2 minutes and read the value again, it should be a minimum of - 22.

- 22

# 0 6 → Rear right hand height difference\* :

Ditto # 05.

# 0 7 → Front height difference\* :

High position : + 42

Low position : minimum value - 25

\* Difference in relation to "zero" stored during parameter adjustment (calibration)

\*\* Conditions for obtaining high position :

- Exit fault finding mode by entering G13\*
- Engine running
- Impose the high position using the control button on the centre console
- Wait for the motocompressor assembly to stop operating.
- Re-enter the fault finding mode and use the # functions to rear and check the level sensor values.

## ADDITIONAL CONTROLS

#	0	8	→	Rear left hand height	<ul style="list-style-type: none"><li>• These are absolute values from the level sensors</li><li>• In normal position, these values should be between 140 and 200.</li></ul>
#	0	9	→	Rear right hand height	
#	1	0	→	Front height	

**NOTE :** if the values are not correct, check :

- the sensor and lever mountings
- lever and bar conformity
- the position of the flange on the front anti-roll bar

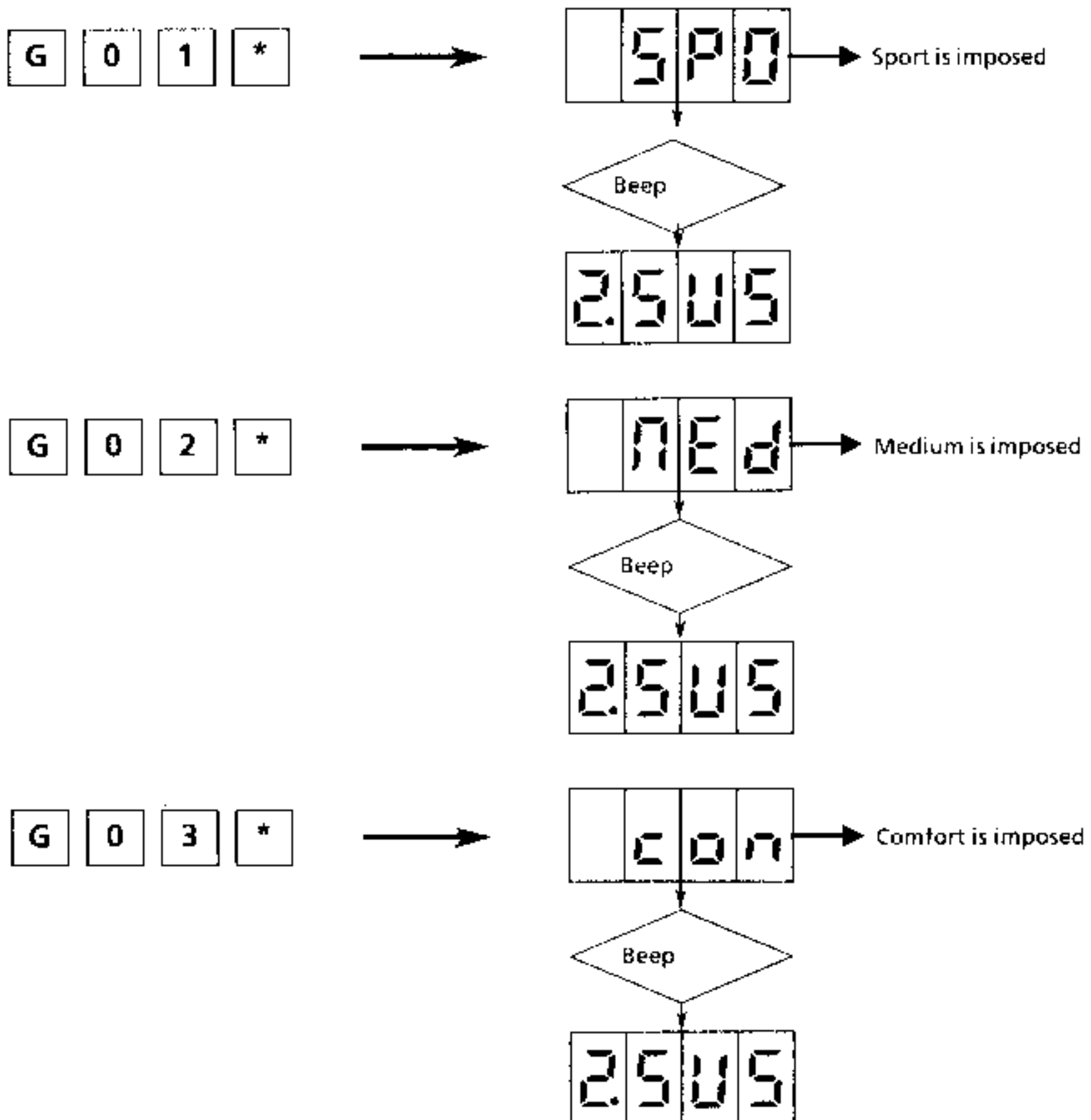
#	1	1	→	Difference between the calibrated value and the absolute value from the longitudinal accelerometer.
This value should be $0 \pm 1$ .				

If the value is not within this tolerance range, check :

- the accelerometer mounting,
- the condition of the mounting plate,
- wiring and connections,
- variation in the value using function # 02

**CONTROL MODES**

- Checking the efficiency of shock absorbing level changing (vehicle stationary).
- Commands G01\*, G02\*, G03\* allow the operation of the shock absorber solenoid valves to be checked (The four shock absorbers are activated together).
- To carry out this test, the solenoid valves for the shock absorbers must be fed, so check for faults beforehand (Bar graphs 7 to 10 extinguished).
- After initialisation, enter :

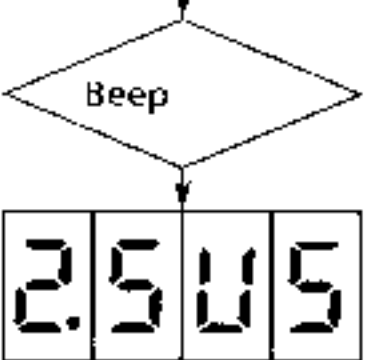
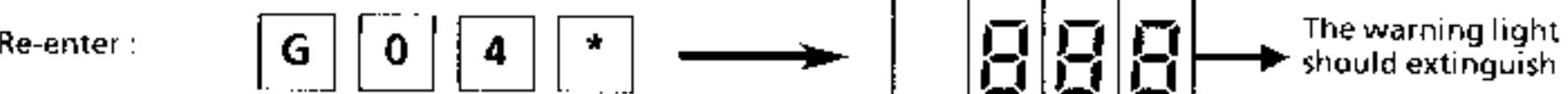
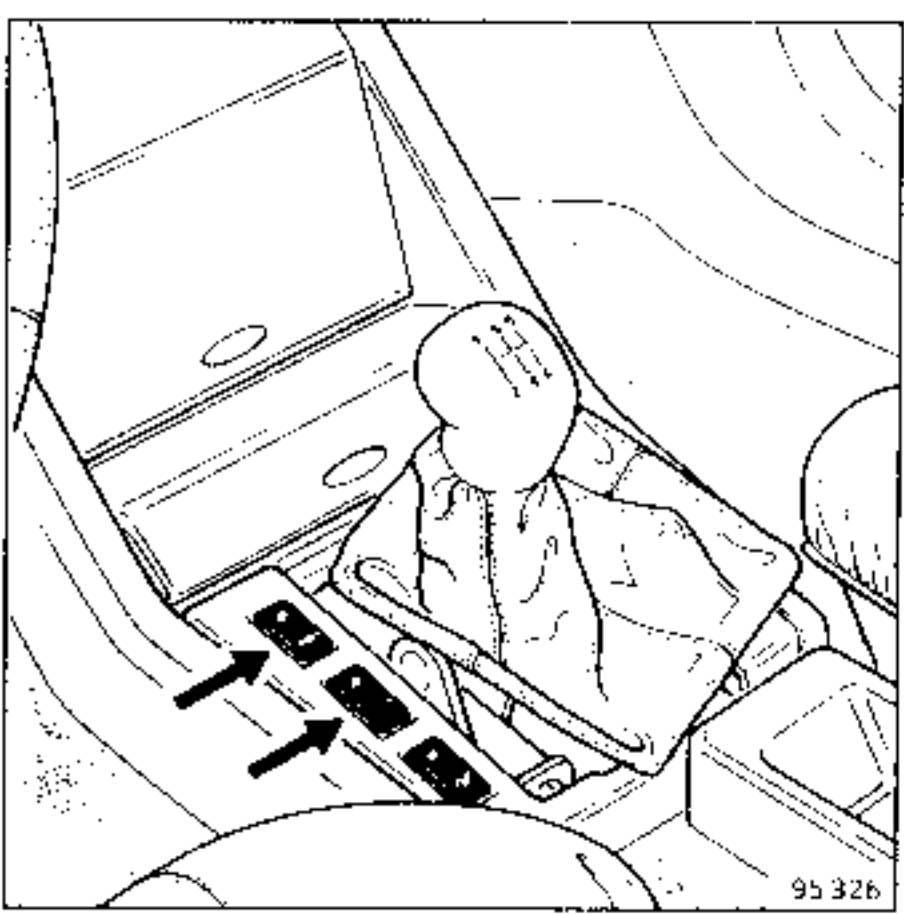
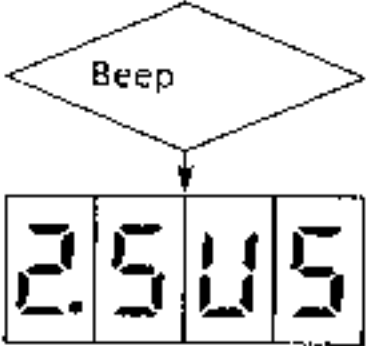
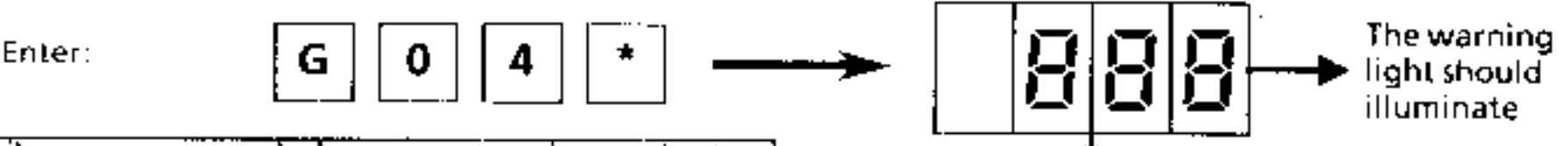


**NOTE:** to be able to appreciate the change-over more easily, start in SPORT and change to COMFORT, then change from SPORT to MEDIUM. The last used setting will be retained until the fault finding phase is left.

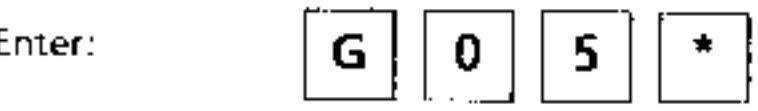
CONTROL MODES:


**NOTE:** functions G04\* to G10\* are permanent controls, which means that the same code must be re-entered to return to the initial setting

Warning light control  (Control button)



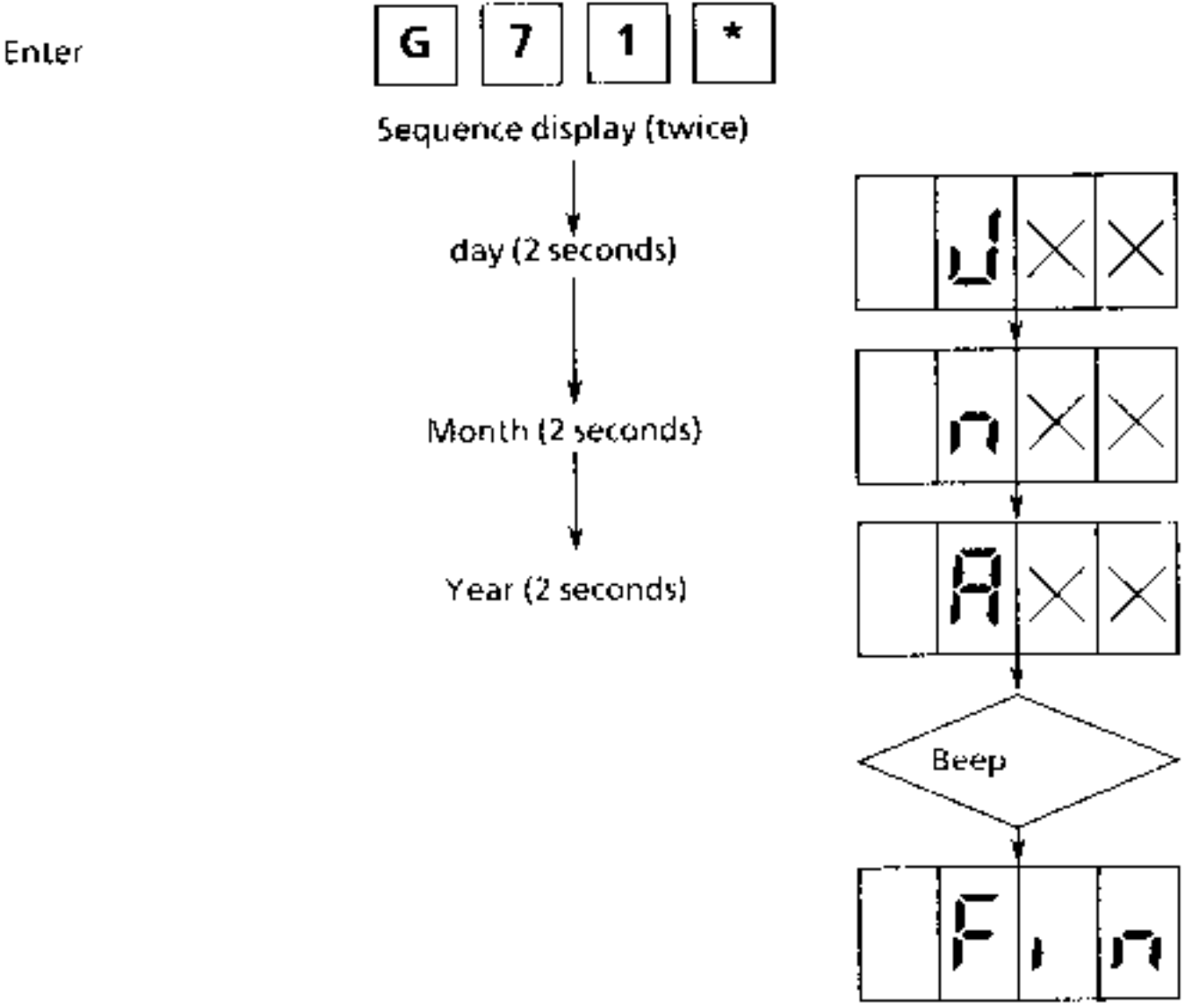
Ditto for "COA" warning light  (on control button)



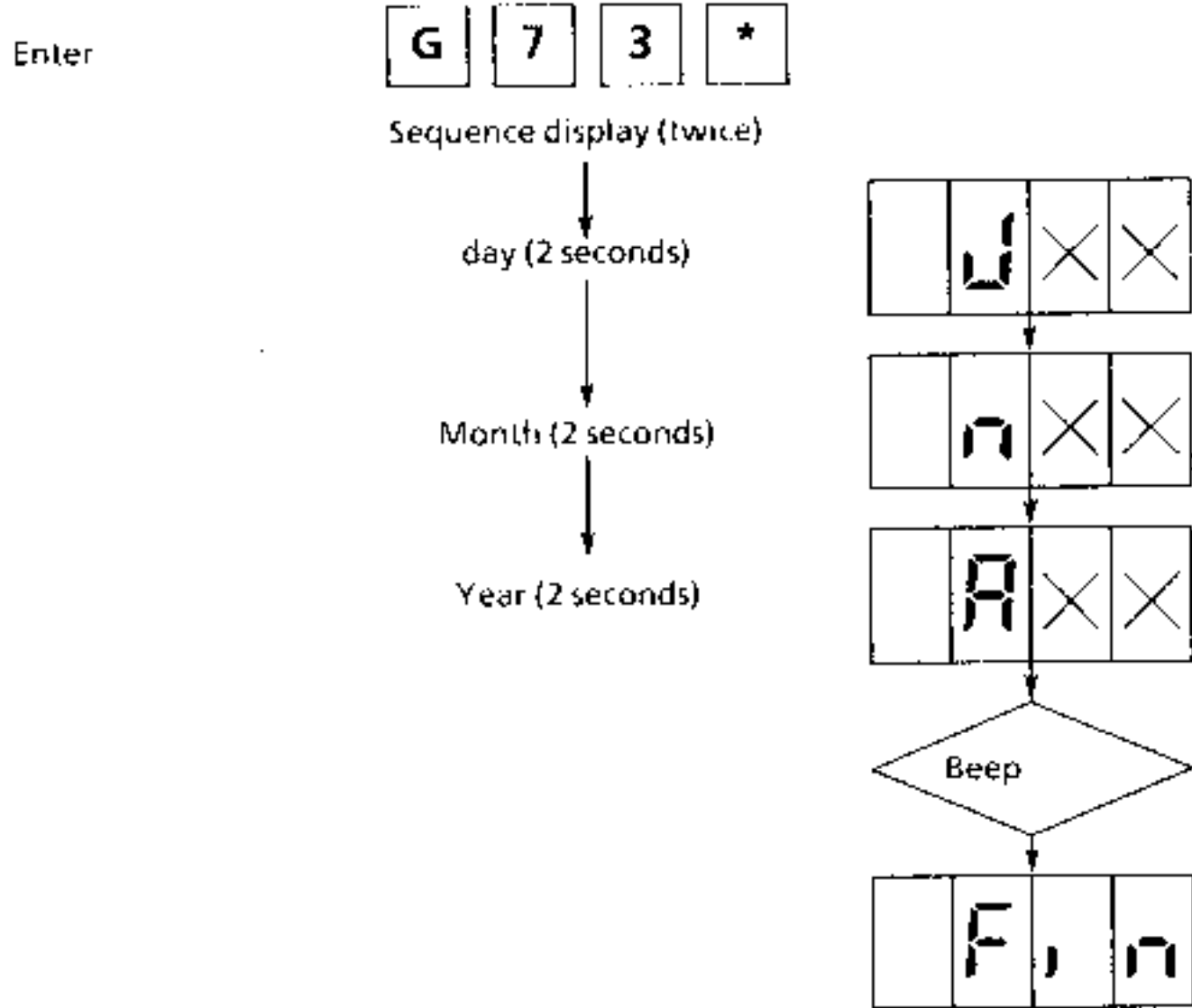
Ditto for controlled suspension "fault" warning light  (AMV + COA) on instrument panel.



CONTROL MODES  
READING THE FABRICATION DATE

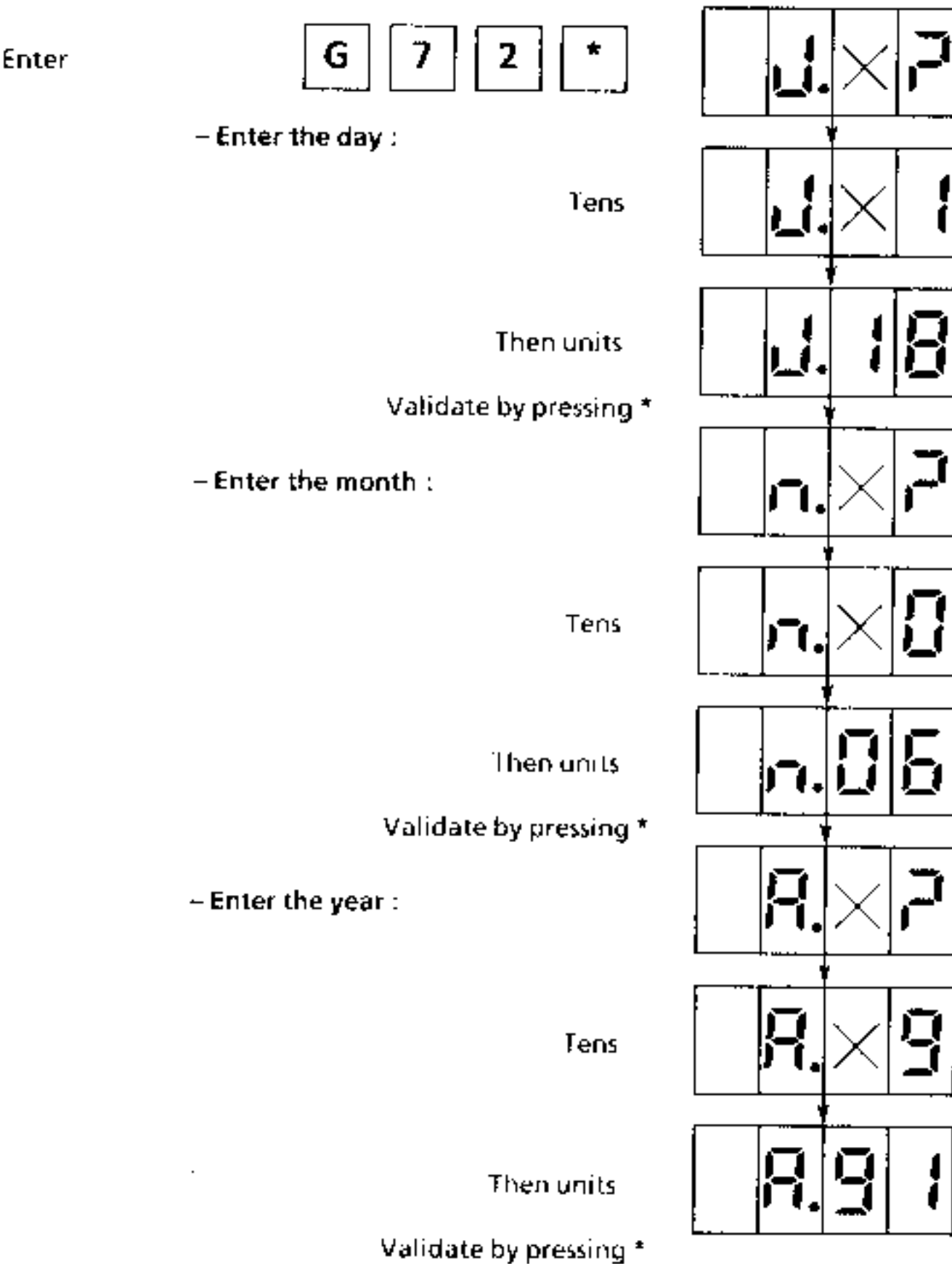


READING THE AFTER SALES OPERATION DATE



## CONTROL MODES

Entering the after sales operation date

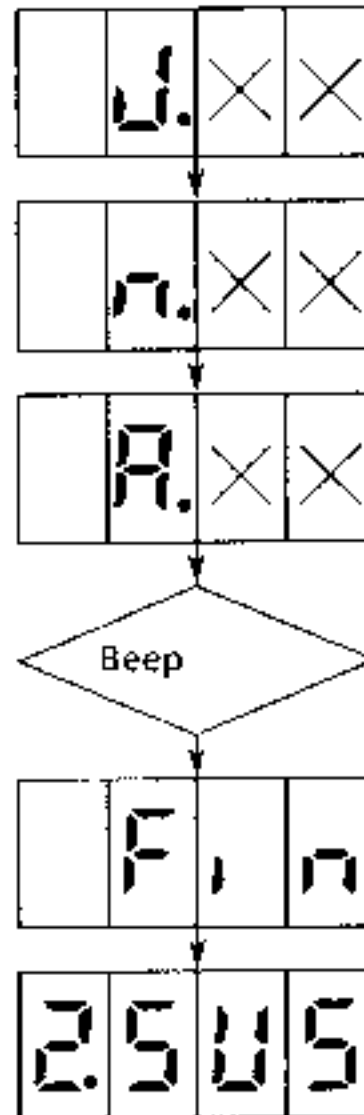


\* Note : you have a maximum of 15 seconds to enter this information.

Reading the date just entered

Sequence display (twice)  
Sequence

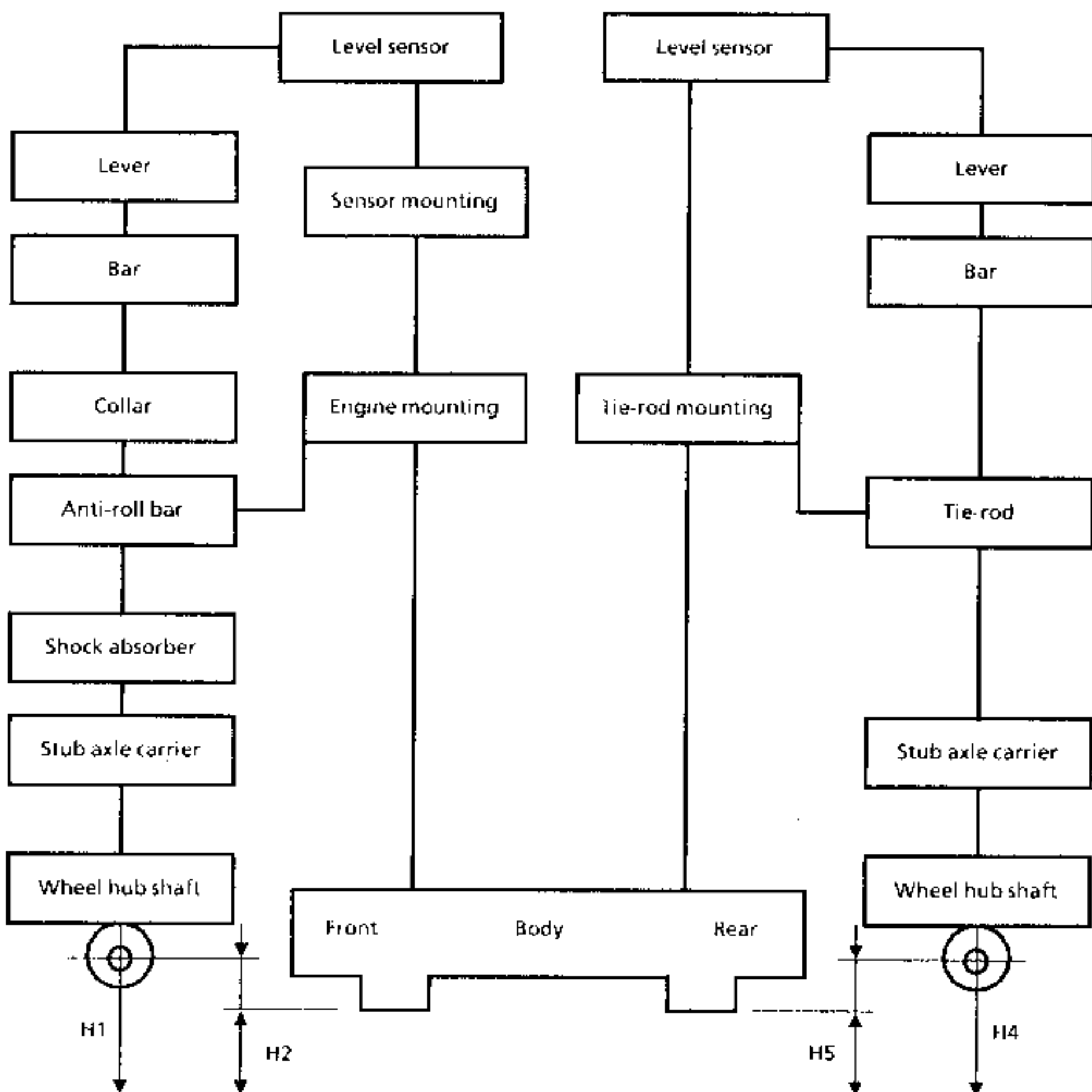
day  
↓  
month  
↓  
year



## PARAMETERS

## Aim of parameter adjustment

- To memorise the information given by the level sensors in a given position in order to account for all variations due to assembly and manufacture variables.
- The parameters must be adjusted after any operation involving the removal or replacement of one or more sensors, the lever, the anti-roll bar rod or any other element which could affect the vehicle suspension level (H1 - H2 for the front and H4 - H5 for the rear).





**Adjustment principle :**

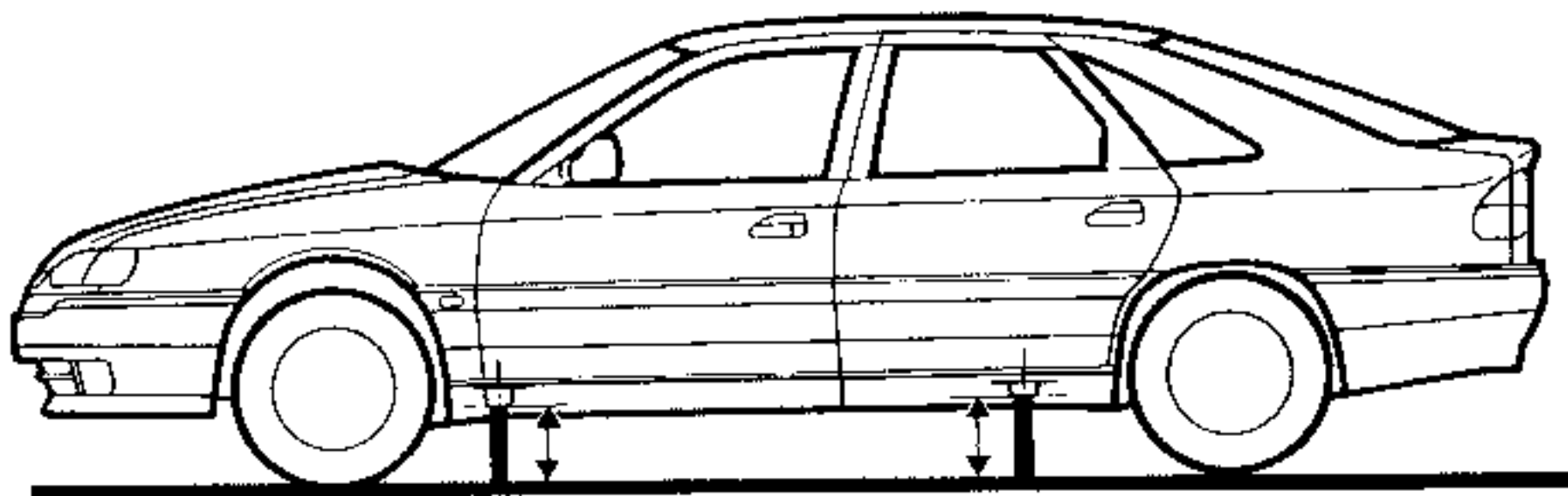
Adjust the vehicle to a known specified height

Use **XR25** to transmit an initialising command to adjust the parameters of the sensor in this position.

This operation should be carried out with the vehicle unladen and on a flat surface.

- fuel tank full,
- correct tyre inflation pressures.

The correct vehicle height is obtained by positioning blocks **Sus. 1247** under the body on the support points.



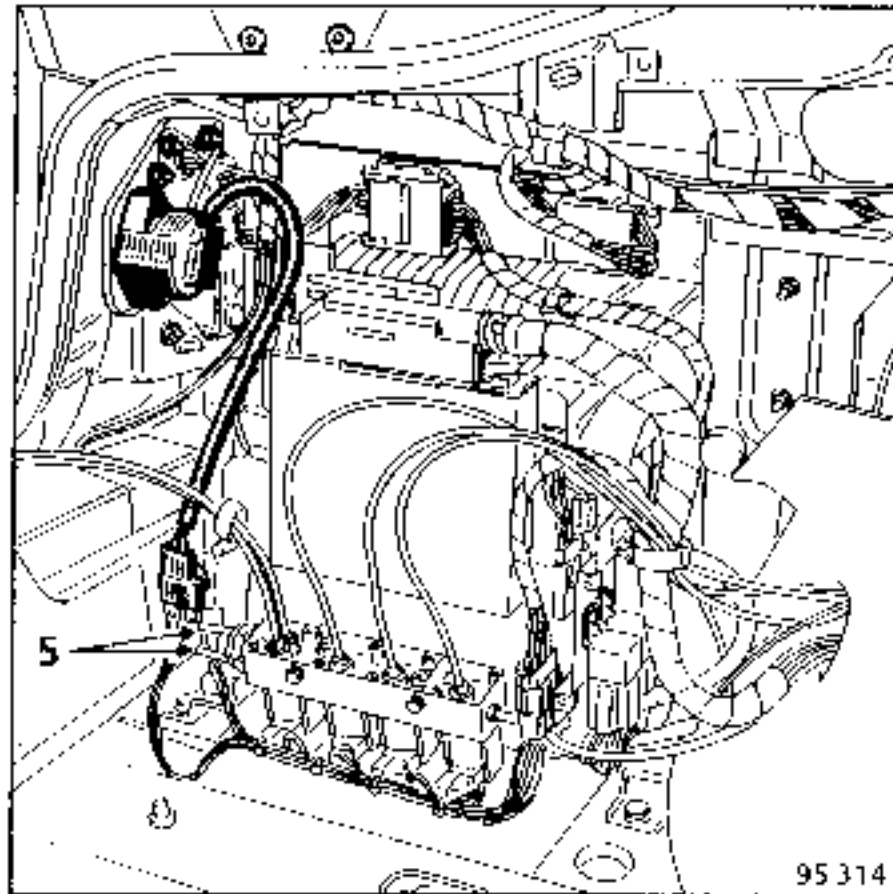
95 019-3

**IMPORTANT :** The height specified is different for different tyre sizes

Tyre size	Front blocks	Rear blocks
205/60 195/65	169,5 mm	181,5 mm
195/60	164,5 mm	176,5 mm

Blocks **Sus. 1247** include an additional 5 mm washer to be used for different tyre sizes.

In the fault finding mode, the moto-compressor assembly is stopped either by the pressostat or by a time limit (limited to one minute) . To obtain an underbody height which is sufficient to fit blocks Sus. 1247, the pressostat wire must be disconnected in order to fit a "shunt"



After initialisation of dialogue :

Enter:

G 0 8 \*



4 E U

The 4 solenoid valves are open

0 n

2.5 U 5

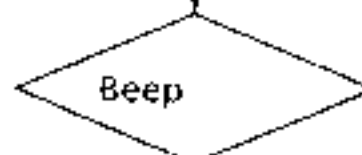
Enter:

G 0 7 \*



6 E 5

The moto-compressor  
assembly operates (1 minute)



2.5 U 5

If the vehicle does not reach a sufficient height to fit blocks Sus. 1247, wait a few minutes and :

Enter again :

G 0 7 \*



EE5

Beep

When the moto-compressor assembly stops

2.505

Enter:

G 0 8 \*



4E0

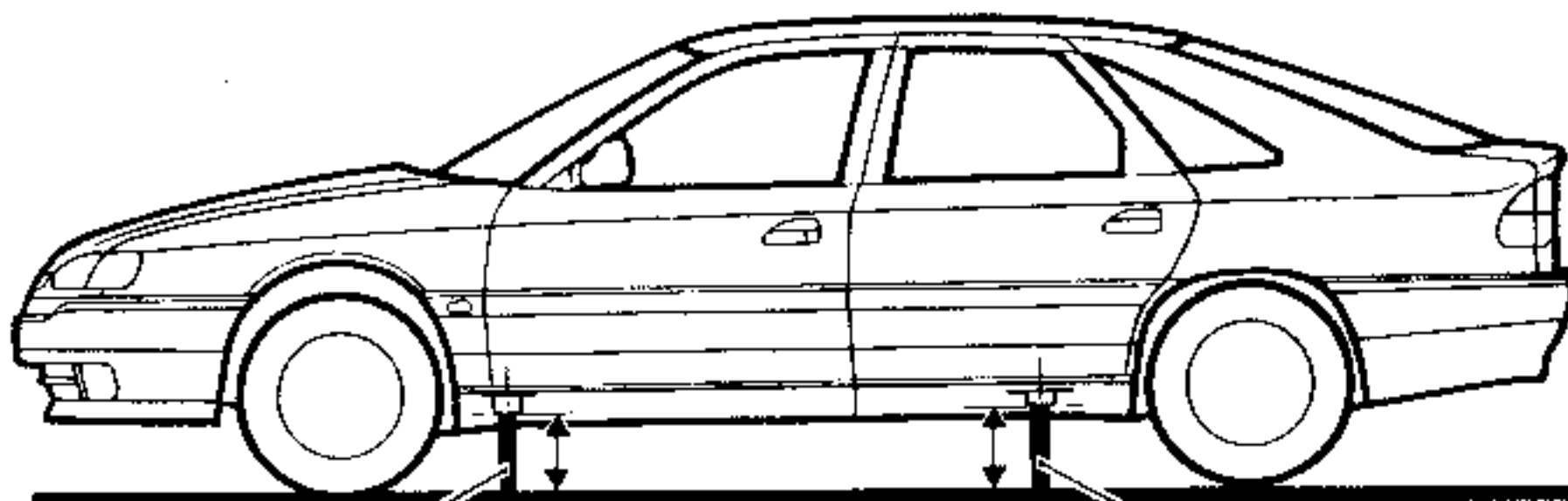
OFF

The 4 solenoid valves are closed

Beep

2.505

Position blocks Sus. 1247 on the right of the support points under the body (the longer ones at the rear).



Sus. 1247

Sus. 1247

95 019-3

**NOTE:** command G07\* (moto compressor assembly) must not be entered more than twice in a short space of time (moto-compressor assembly will overheat)

Enter:

G 0 9 \*



5 E W

The 5 solenoid valves are open

o n

Beep

2.5 U 5

The vehicle is lowered and rests on the blocks.

In this position, calibrate the level sensors by entering:

G 9 7 \*



0 F F 7

Validate the request : \*



Beep

The result is shown by

2.5 U 5

Enter G09\* again to close the 5 solenoid valves, then calibrate the variable shock absorbing longitudinal accelerometer (engine not running).

**CALIBRATING THE VARIABLE SHOCK ABSORBING LONGITUDINAL ACCELEROMETER**

In variable shock absorbing, the value of the longitudinal accelerometer is stored and used as a reference for the computer.

The steering wheel angle sensor is automatically calibrated by the computer after a certain period of driving.

The vertical accelerometer does not need to be calibrated. The initial value is not used as a reference value.

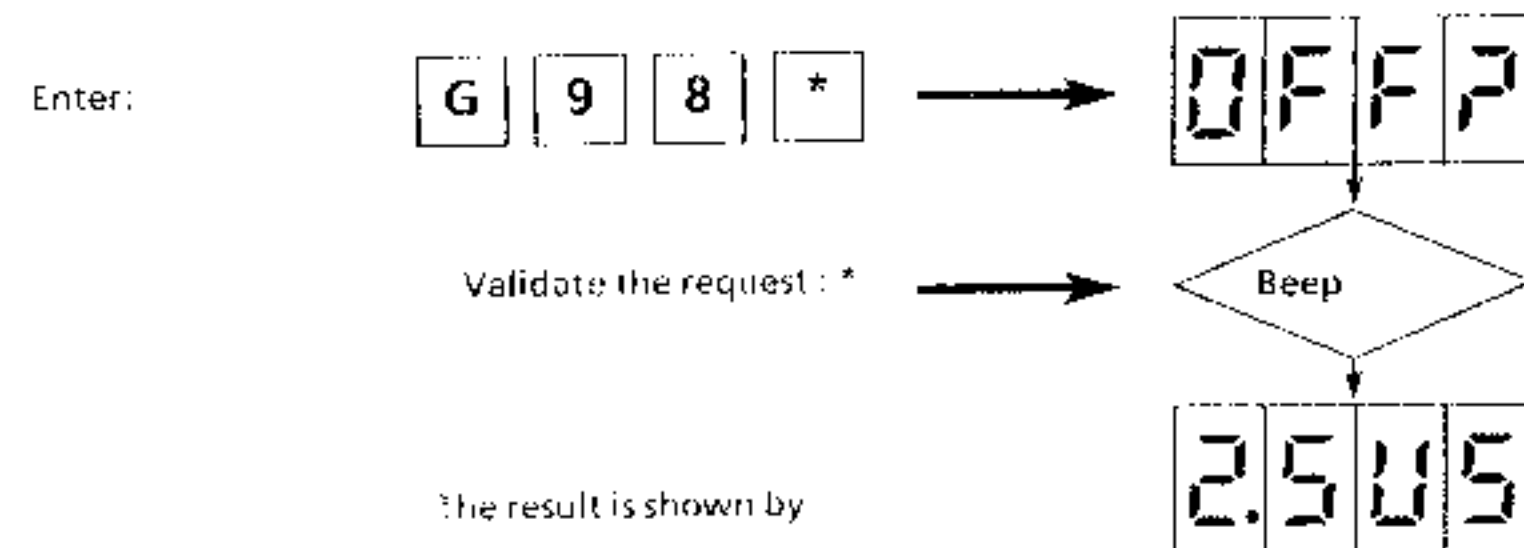
If the computer is replaced, this command is executed after adjusting the self levelling suspension parameters.

This command must be executed when replacing .

- the computer,
- the accelerometer or when working on its support board,
- after calibrating the level sensors (adjusting parameters).

The vehicle must be on horizontal ground, wheels in a straight line, "Normal" stable position, engine stopped.

After initialising dialogue:



Now remove the "shunt" and reconnect the pressostat.

Exit the fault finding mode (G13\*) and start the engine.

Impose the "high" position by pressing the switch on the console and remove the blocks Sus. 1247.

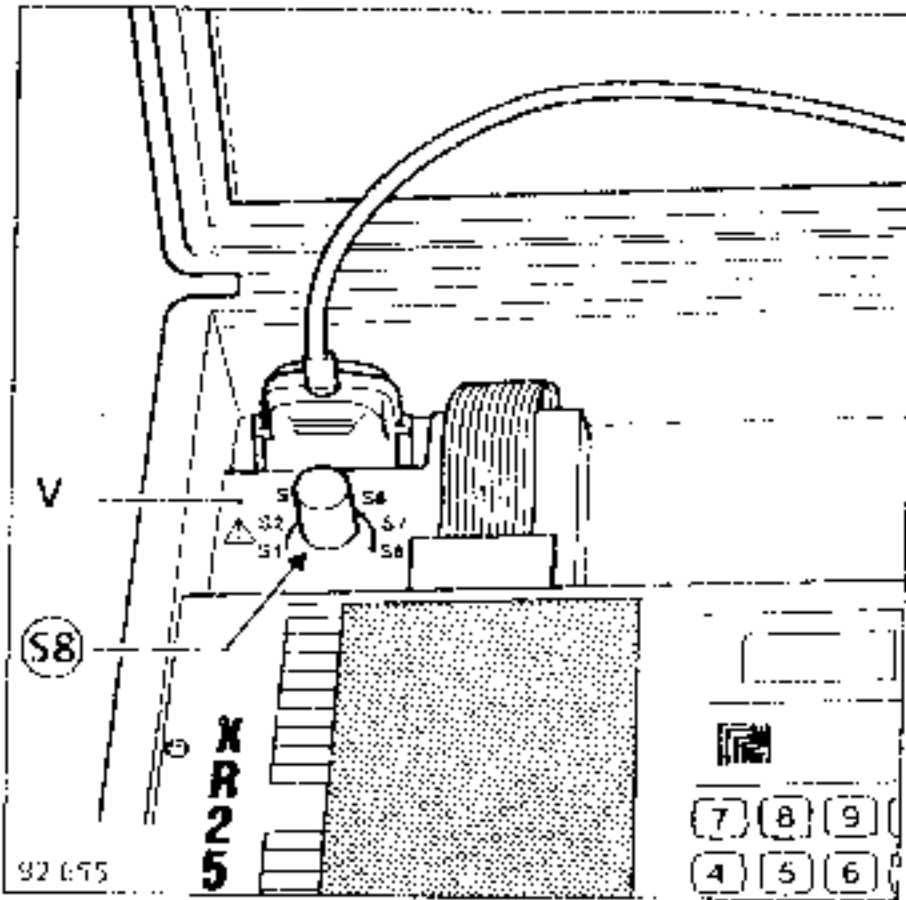
Press the switch again to return to "Normal".

Check the heights and variations using the # keys (see pages 129 and 130).

## COMMAND MODES

### ERASING THE MEMORY

Connect the XR25 to the vehicle's diagnostic socket and put the selector switch on S8



Turn the ignition on, but do not start the engine

Enter code :

D 1 8

The central display shows :

.505

2.505

Enter :

G 0 \*

The central display shows:

EFF

Validate the erase request by pressing \*

The central display now shows :

LES

The memory has been erased.

Validate the end of the test by pressing

G 1 3 \*

The display shows

F n

Then:

LES

Leaving the fault finding mode re-initialises the electronically managed suspension system and illuminates the warning light for 2.5 seconds (equivalent to starting the engine again)

## WIRING DIAGRAM KEY

160	Stop switch
205	Pressure switch
225	Diagnostic socket
247	Instrument panel
250	Speed sensor
260	Fuse box
498	Vertical accelerometer
499	Longitudinal accelerometer
533	Suspension correction control
534	Controlled suspension control (SPORT)
544	COA moto-compressor relay
545	COA safety relay
546	COA moto-compressor assembly
547	RLH shock absorber solenoid valve
548	RRH shock absorber solenoid valve
549	FLH shock absorber solenoid valve
550	FRH shock absorber solenoid valve
551	FRH vehicle level sensor
553	RRH vehicle level sensor
554	RLH vehicle level sensor
555	COA solenoid valves
583	Steering wheel angle sensor
585	Pneumatic pressure sensor
644	Controlled suspension computer

## Connections:

R149	Engine / FLH wing
R150	passenger compartment / LHH wing
R179	ABS / FLH wing
R180	Passenger compartment / PAS control and controlled suspension
R181	Passenger compartment / pedal support

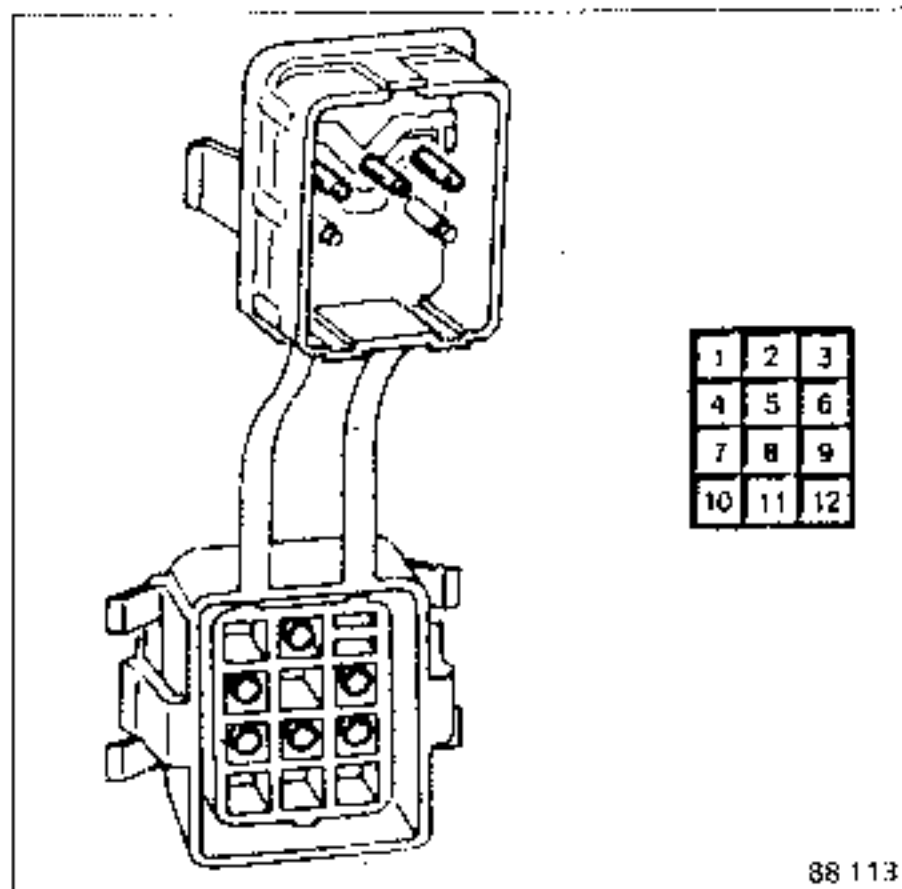
## Earth:

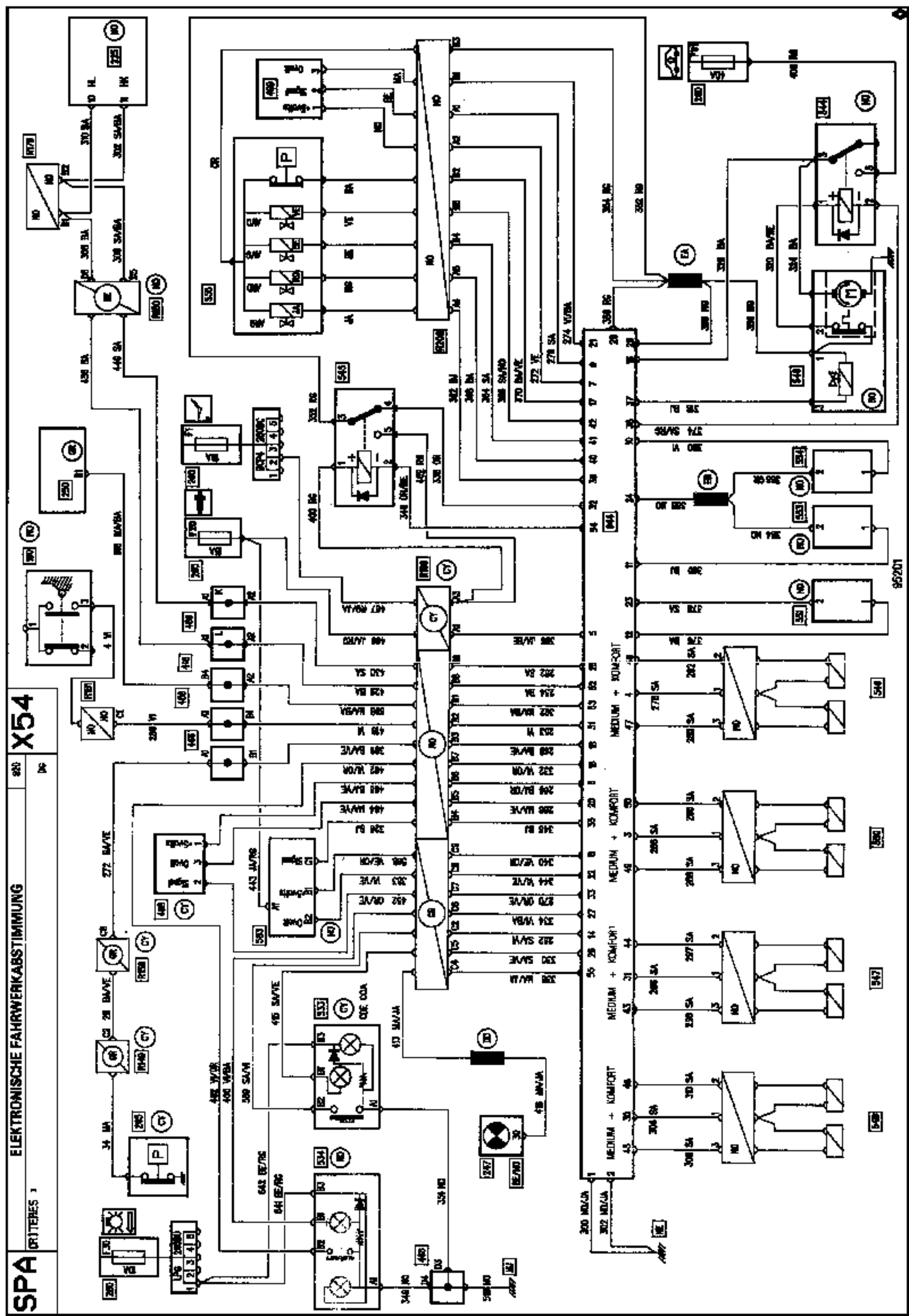
MJ	FRH pillar electrical earth
NE	RLH pillar electrical earth

## Allocation of diagnostic socket terminals

Track N°	Allocation
1	AT A4 fault finding
2	Electrical earth
3	Foolproofing
4	Not used
5	Not used
6	+ 12 V before ignition
7	Info erase AT faults memorised
8	Info erase injection faults memorised
9	Injection fault finding
10	Diagnostic line L
11	Diagnostic line K
12	Not used

The diagnostic socket is used for connecting the XR25 test kit for checking the microprocessors.

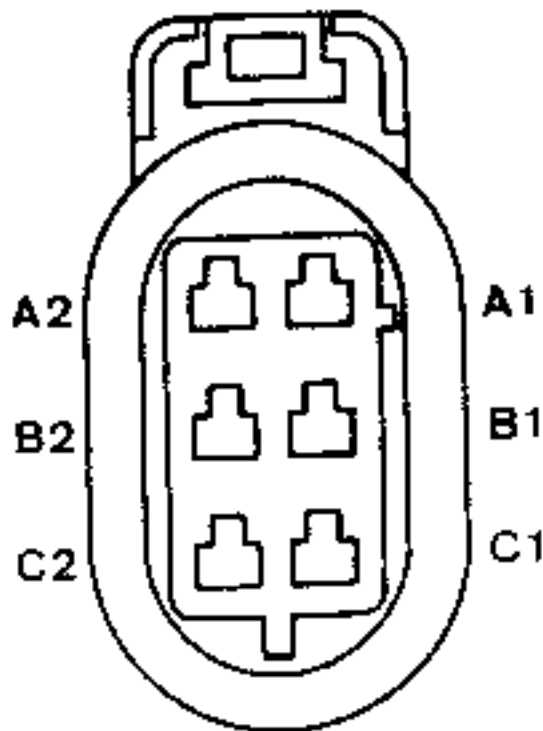






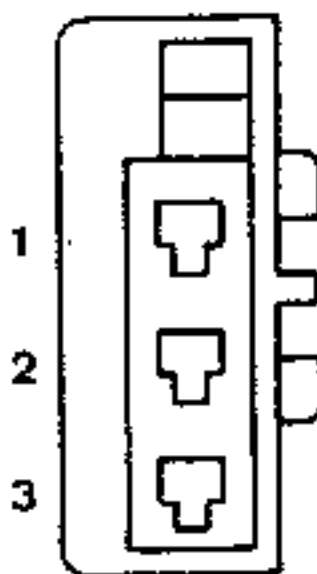
## ALLOCATION OF CONNECTOR TRACKS

### Steering wheel angle sensor (6 tracks)



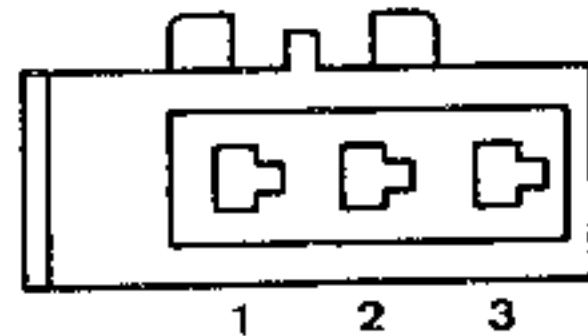
- A1 + 12 Volts
- A2 Not used
- B1 5 Volts (reference voltage)
- B2 0 Volts
- C1 Signal
- C2 Not used

### Accelerometers (longitudinal and vertical) 3 tracks



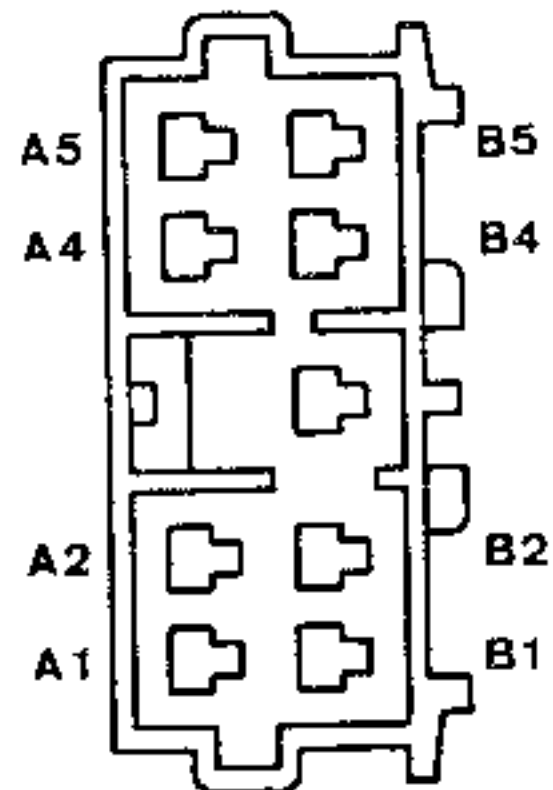
- 1 5 Volts
- 2 Signal
- 3 0 Volt

### Moto-compressor assembly (3 tracks)



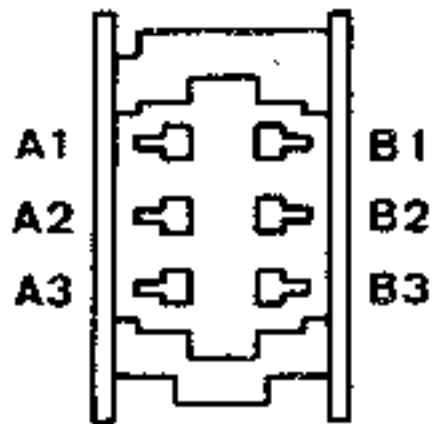
- 1 Common
- 2 Power relay coil
- 3 Exhaust solenoid valve control

### Solenoid valve block - longitudinal accelerometer



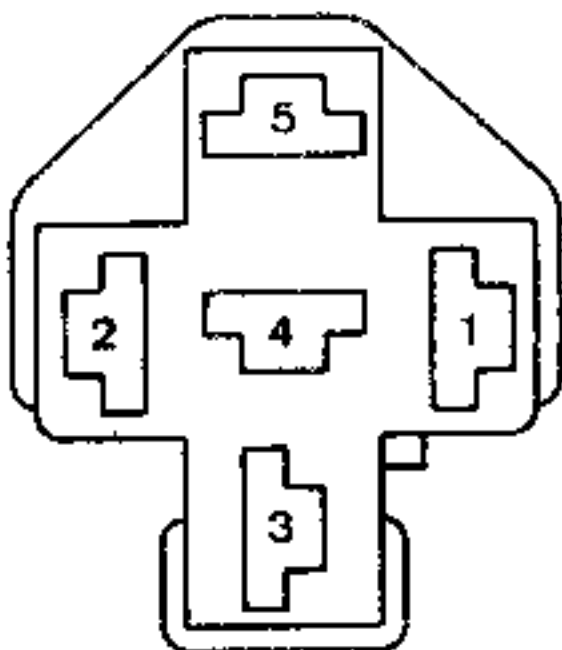
- A1 Signal
- A2 5 Volts
- A4 Solenoid valves/COA RLH
- A5 Solenoid valves/COA RRH
- B1 0 Volt
- B2 Pressostat
- B3 Feed (common)
- B4 Solenoid valves/COA FLH
- B5 Solenoid valves/COA FRH

Push button connector : AMV/COA



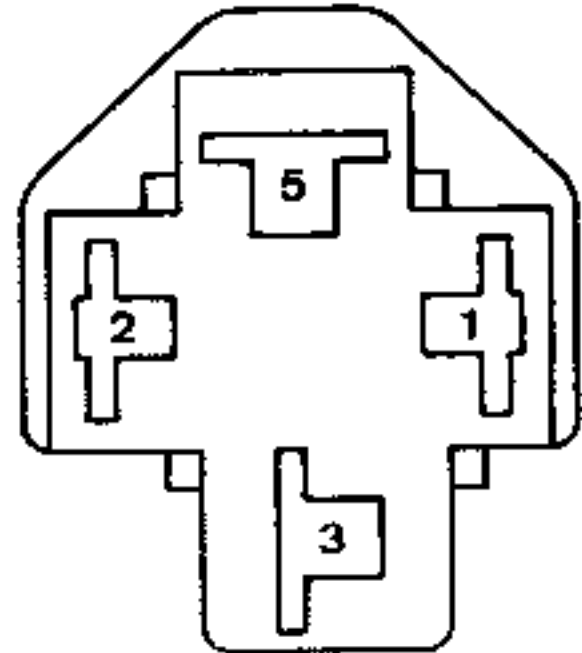
- A1 Earth
- A2 Not used
- A3 Not used
- B1 Illumination of warning light
- B2 Computer control
- B3 + light

Safety relay



- 1 + battery (fuse)
- 2 Coil control
- 3 Output
- 4 Opening control
- 5 + battery (fuse)

Power relay



- 1 Common
- 2 Coil control
- 3 Moto-compressor assembly feed
- 5 + battery (fuse)

## COMPUTER 55 TRACK CONNECTOR

N°	ALLOCATION
1	Earth
2	Earth
3	AMV solenoid valves common
4	AMV solenoid valves common
5	+ APC
6	Vertical accelerometer reference voltage
7	Longitudinal accelerometer reference voltage
8	Steering wheel angle sensor reference voltage
9	Longitudinal accelerometer (signal)
10	RLH level sensor
11	RRH level sensor
12	Front level sensor
13	Not used
14	"High position" button
15	"Sport" button
16	Moto-compressor assembly control return relay
17	Pressostat (vehicle load)
18	Pressure switch (engine running)
19	Not used
20	Vertical accelerometer earth
21	Longitudinal accelerometer earth
22	Steering wheel angle sensor earth
23	Front level sensor earth
24	Rear RH and LH level sensor earth
25	Diagnostic line K
26	"High position" control warning light
27	"Sport" control warning light
28	+ after relay
29	+ after relay
30	AMV solenoid valves common
31	AMV solenoid valves common
32	Safety relay return
33	Vertical accelerometer (signal)
34	Not used
35	Steering wheel angle sensor (signal)

## COMPUTER 55 TRACK CONNECTOR

N°	ALLOCATION
36	Not used
37	Exhaust solenoid valve control (COA)
38	Moto-compressor assembly relay control
39	RLH COA solenoid valve control
40	RRH COA solenoid valve control
41	FLH COA solenoid valve control
42	FRH COA solenoid valve control
43	RLH medium suspension solenoid valve control
44	RLH comfort suspension solenoid valve control
45	RRH medium suspension solenoid valve control
46	RRH comfort suspension solenoid valve control
47	FLH medium suspension solenoid valve control
48	FLH comfort suspension solenoid valve control
49	FRH medium suspension solenoid valve control
50	FRH comfort suspension solenoid valve control
51	Brake switch (stop lights)
52	Diagnostic line L
53	Speed info
54	Safety relay control
55	Fault warning light control

## TESTING WIRING

SPECIAL TOOLING REQUIRED	
Sus. 1228	Bornier for testing wiring using XR25 or a multimeter

The bornier has 55 contacts which are identical to the controlled suspension computer and a printed circuit with electrical contacts numbered 1 to 55

Each number corresponds to a vehicle wiring connection and is shown on the operating plan.

The bornier is used for quick and accurate identification and testing of all electrical connections on the main controlled suspension connector.

**NOTE:**

- Never disconnect the computer when the circuit is under voltage.
- Testing of earths and resistances should be carried out with the battery disconnected.

**Connection:**

With the ignition off, disconnect the controlled suspension computer from its mounting and connect the bornier Sus. 1228 in its place.

**Testing method principle :**

Put the XR25 or multimeter probe on the bornier number required.

**Testing equipment which may be used**

- **XR 25 :**
  - measuring continuity using the buzzer,
  - measuring voltage using the voltmeter.
- **Multimeter**
  - measuring resistance,
  - measuring voltage

**Variable shock absorbing**

Resistance of shock absorber solenoid valves (cold at 20 °C) 4 to 5  $\Omega$ .

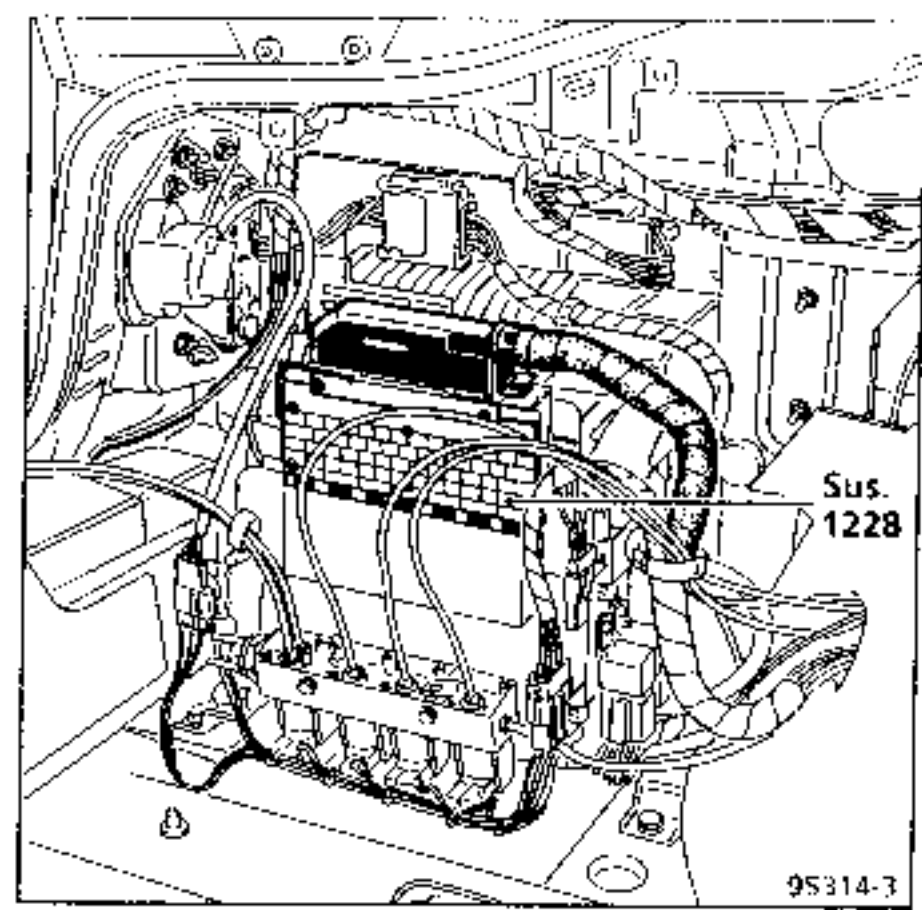
**COA :**

Level sensor coil resistance :  
approx 120  $\Omega$ .

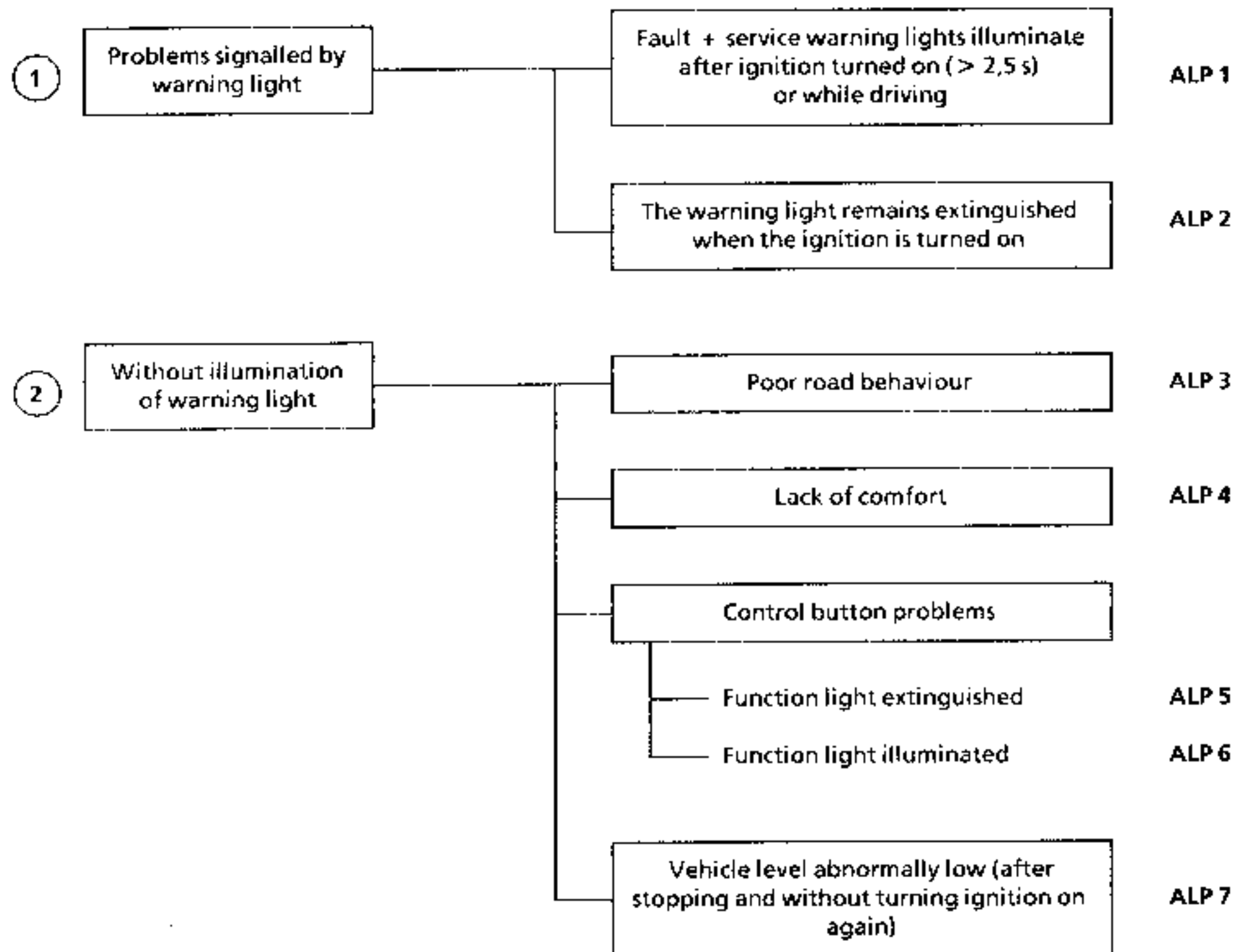
Solenoid valve coil resistance :  
approx 14  $\Omega$ .

Power relay coil resistance :  
approx 60  $\Omega$ .

Safety relay coil resistance :  
approx 50  $\Omega$ .



ELECTRONICALLY MANAGED SUSPENSION SYSTEM SYMPTOM CHART



ALP 1

PROBLEMS SIGNALLLED BY WARNING LIGHT

Fault + service warning lights illuminate after ignition turned on ( $> 2,5$  s)  
or while driving

Connect XR25 code D18 selector on 58.  
Check that bar graph 20 left is  
illuminated.  
Is it illuminated?

no but other BG  
illuminated

See chart for bar graph illuminated

yes

Check fault warning light line  
(track n° 55 on computer),  
for a short circuit to earth  
Repair.  
Does the fault persist?

no

Correct

yes

Replace the computer

ALP 2

### PROBLEMS SIGNALLED BY WARNING LIGHT

The warning light remains extinguished when the ignition is turned on

Connect XR25 code D18 selector on S8.  
Check that bar graph 20 left is  
illuminated.  
Is it illuminated?

yes

Disconnect the 55 track connector on the  
computer and earth track 55.  
Does the light on the instrument panel  
illuminate?

no

Check the bulb and continuity between  
the connector (track 55)  
and instrument panel bulb  
Repair.

yes

Check the computer earths  
(tracks 1 and 2).  
Repair if necessary  
Does the fault persist?

no

Correct

yes

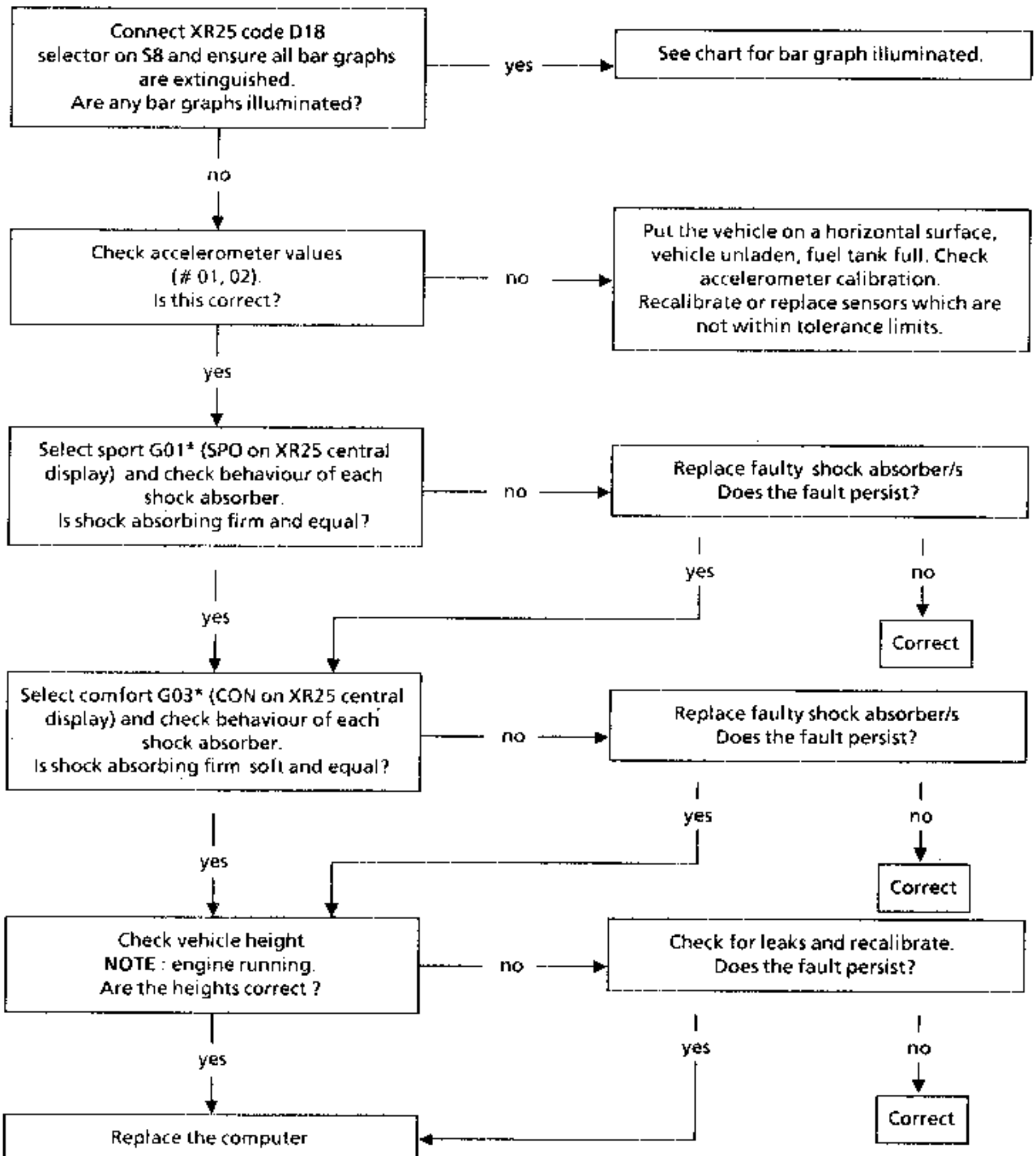
Replace the computer



ALP 3

WITHOUT ILLUMINATION OF WARNING LIGHT

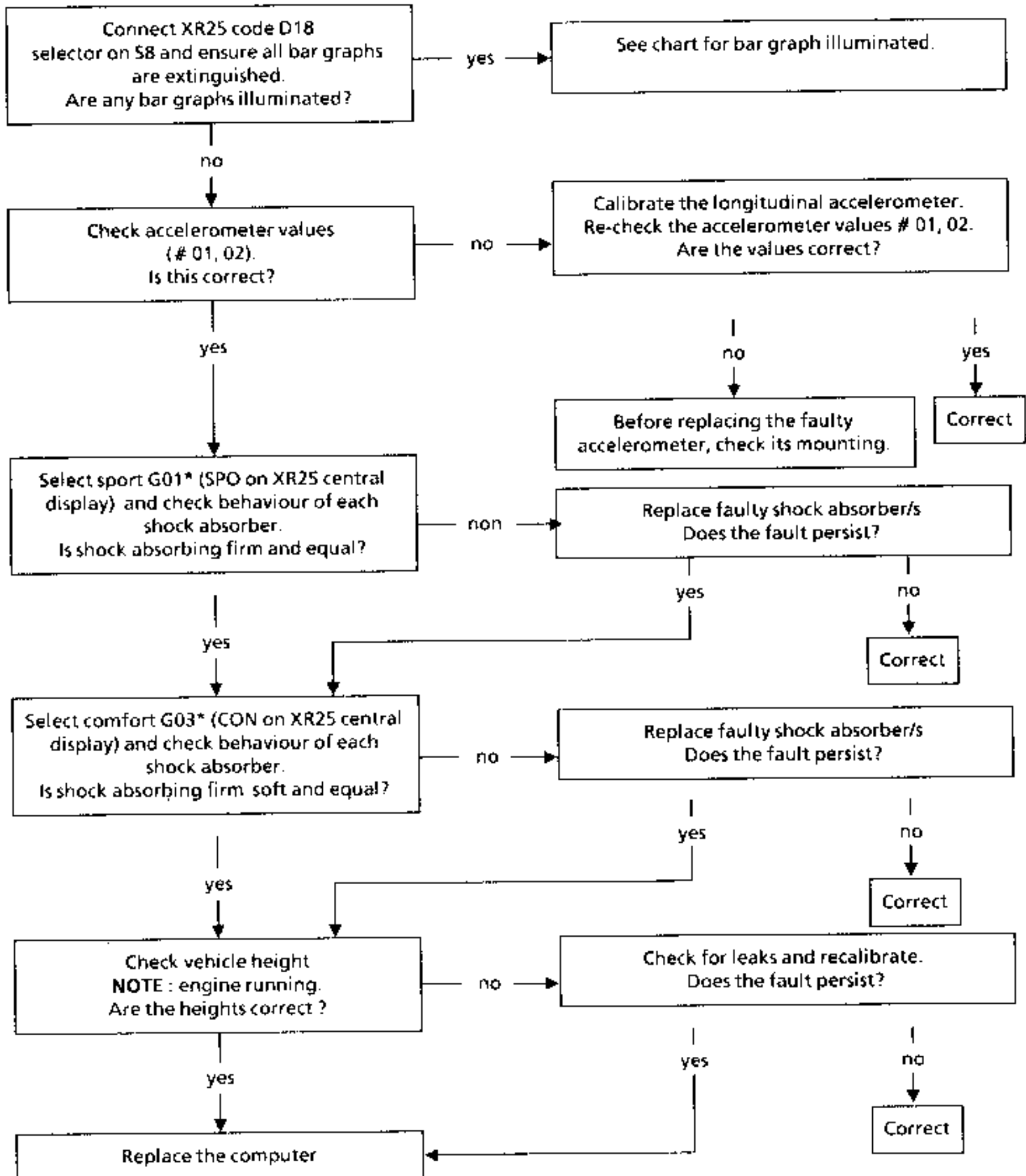
Poor road behaviour



ALP 4

WITHOUT ILLUMINATION OF WARNING LIGHT

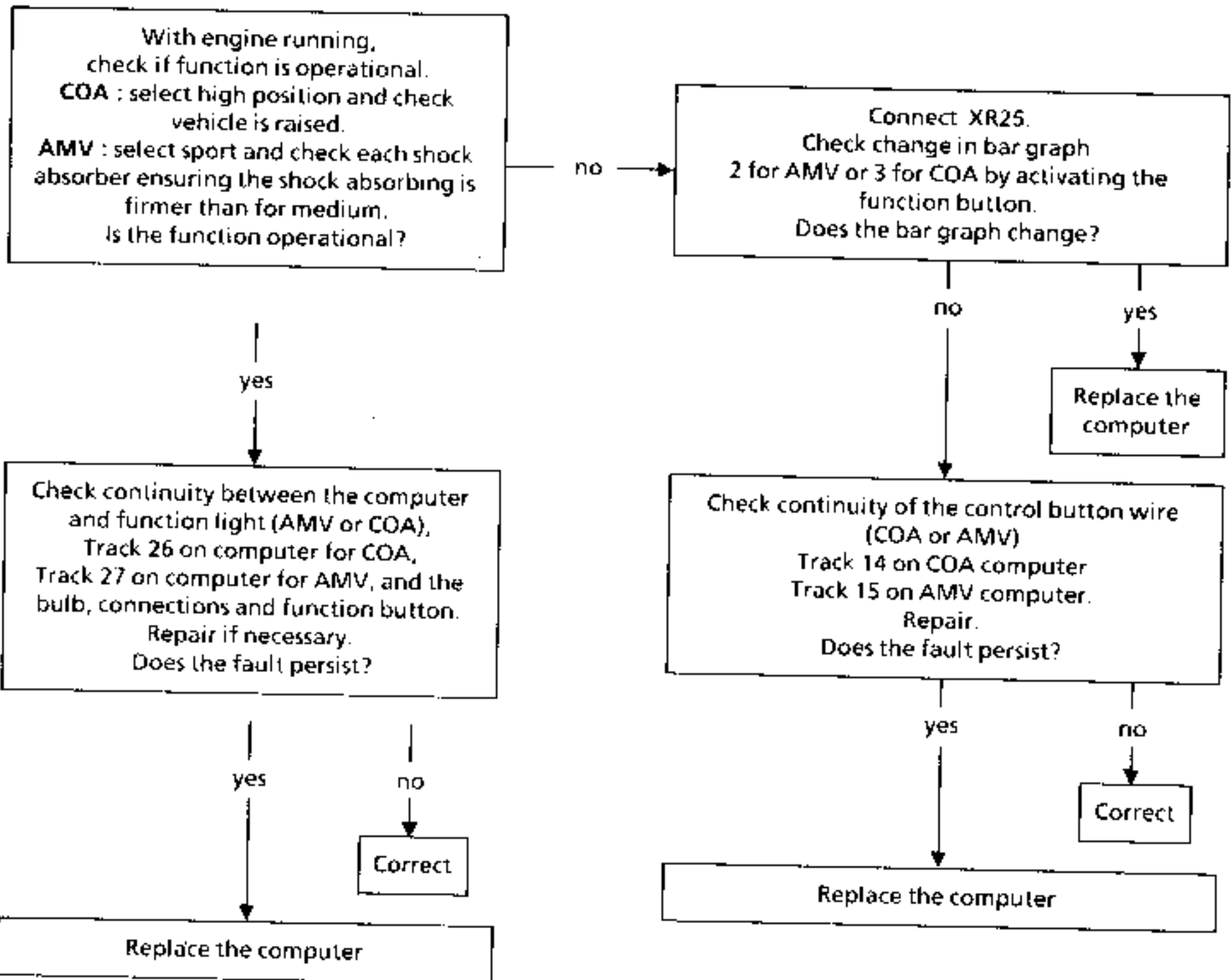
Lack of comfort



ALP 5

# CONTROL BUTTON PROBLEMS WITHOUT ILLUMINATION OF WARNING LIGHT

Function light extinguished

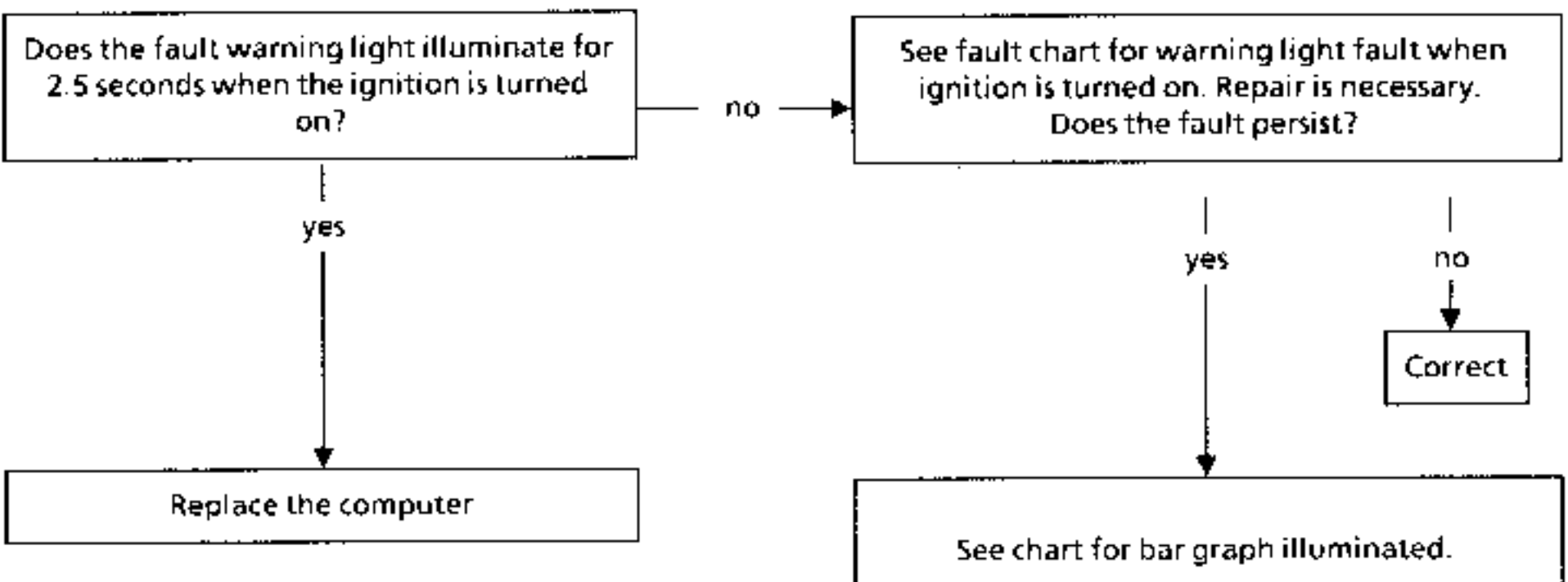


ALP 6

CONTROL BUTTON PROBLEMS WITHOUT ILLUMINATION OF WARNING LIGHT

Function light illuminated

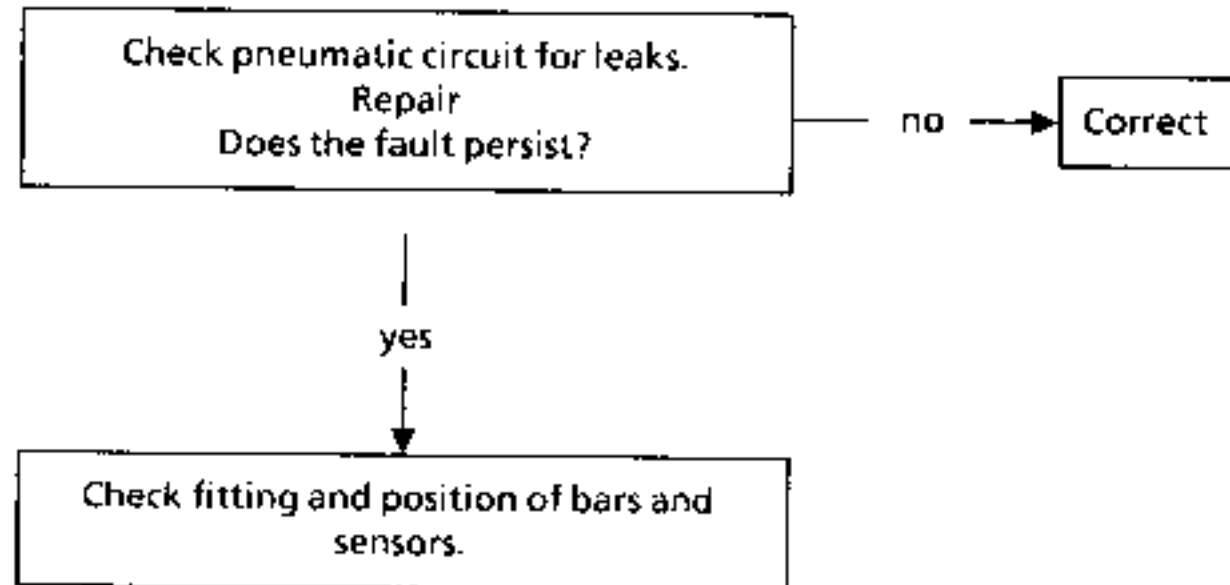
The function is not operational



ALP 7

**WITHOUT ILLUMINATION OF WARNING LIGHT**

Vehicle level abnormally low (after stopping and without turning ignition on again)



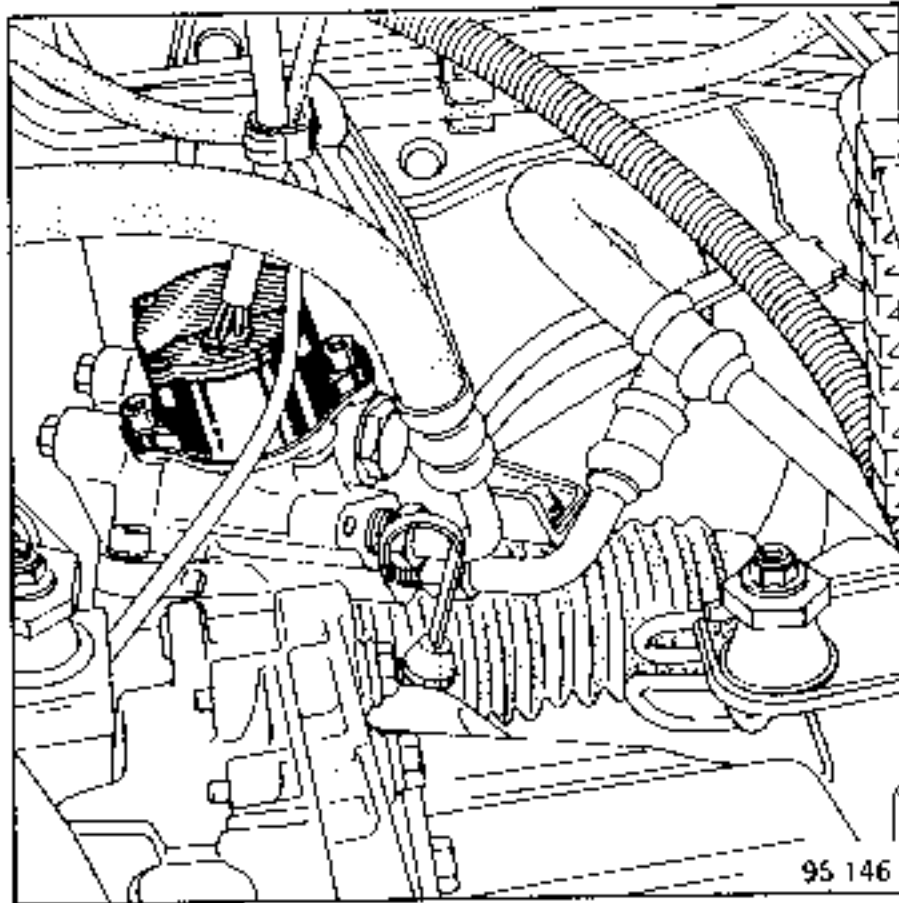
### LOCATION AND COMPONENTS

The system which varies steering power assistance depending on vehicle speed gives :

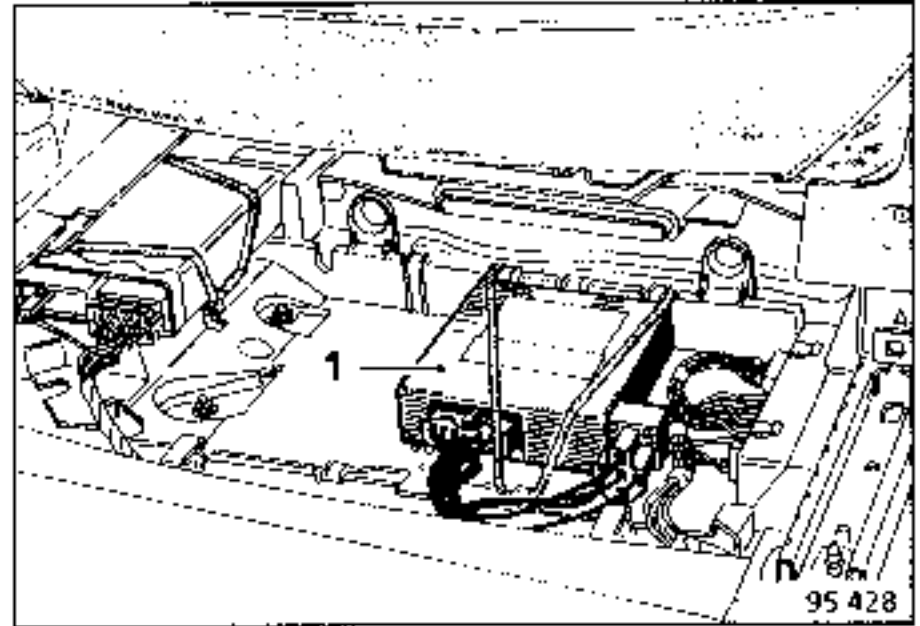
- increased assistance during parking manoeuvres,
- progressively reduced assistance while driving as speed increases, so that the steering is firm at high speeds.

The assembly comprises:

- A variable rotary hydraulic valve instead of the conventional power assisted steering valve. This is controlled by an electric actuator which is mounted on the valve (stepping motor).



- A computer, (1) under the passenger seat, controlling the actuator. This manages VPAS safety.

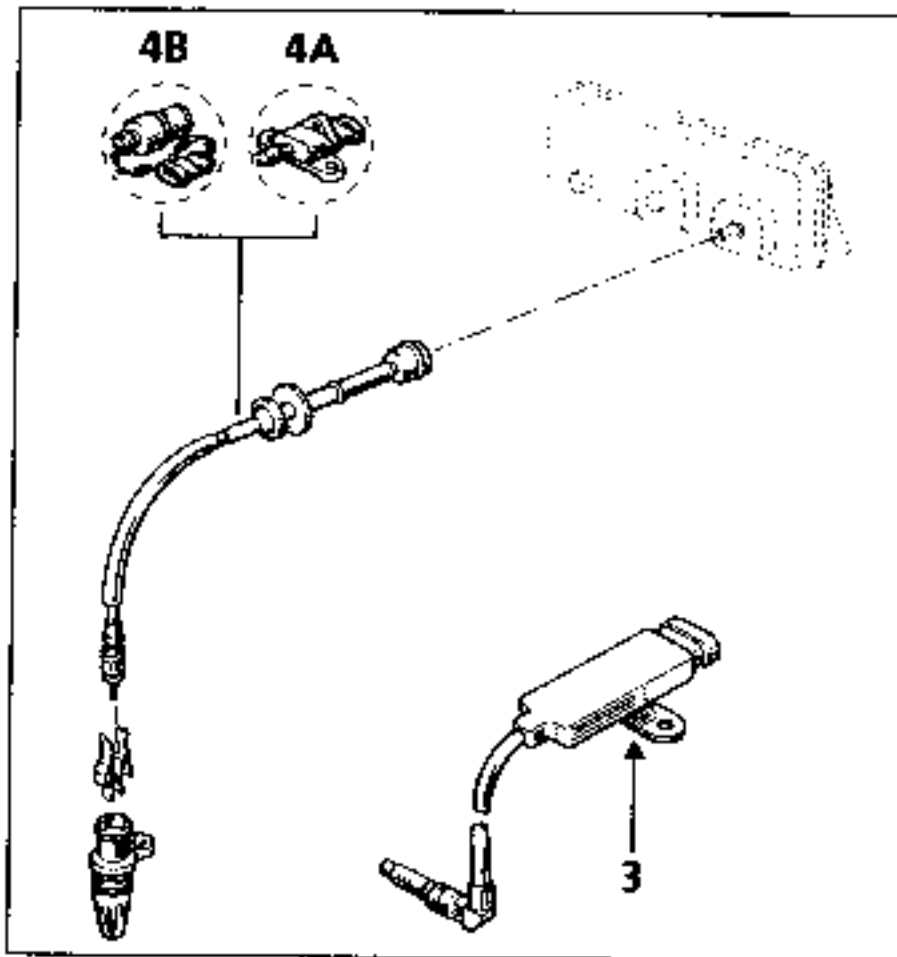


- A double measuring loop (two sensors) for measuring vehicle speed giving improved safety by using the back-up information principle.

### LOCATION AND COMPONENTS

a) Main speed information transmitted by an electro-magnetic sensor (3) located:

- on the front axle (PK1) → 4 X 2 vehicles,
- on the rear axle (OT2) → 4 X 4 vehicles.

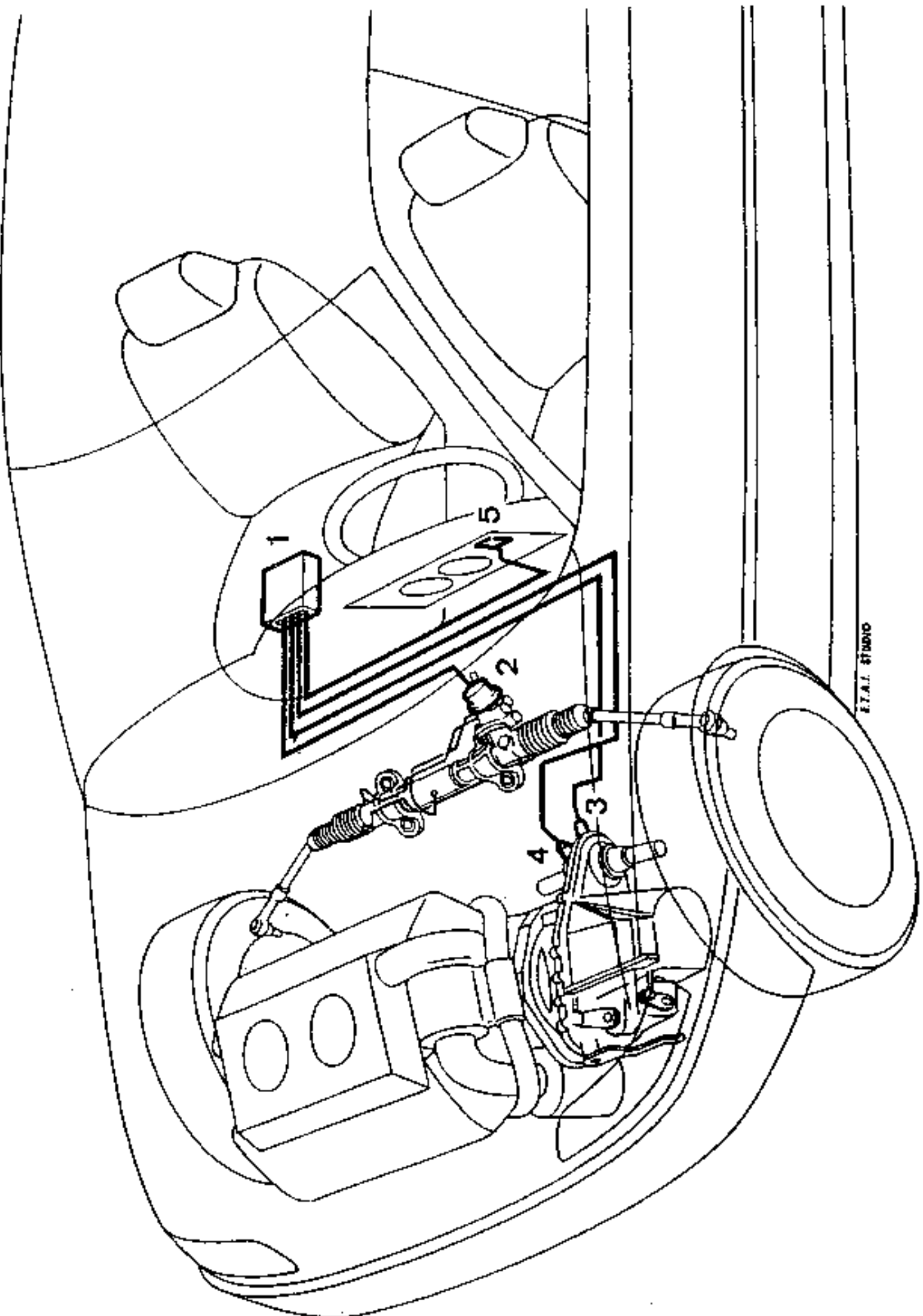


b) Secondary speed information transmitted by a different sensor depending on type of instrument panel fitted:

- electronic speedometer instrument panel sensor 4A,
- mechanical speedometer instrument panel sensor 4B.

**NOTE :** The speed information signals are identical regardless of vehicle type.

LOCATION AND COMPONENTS

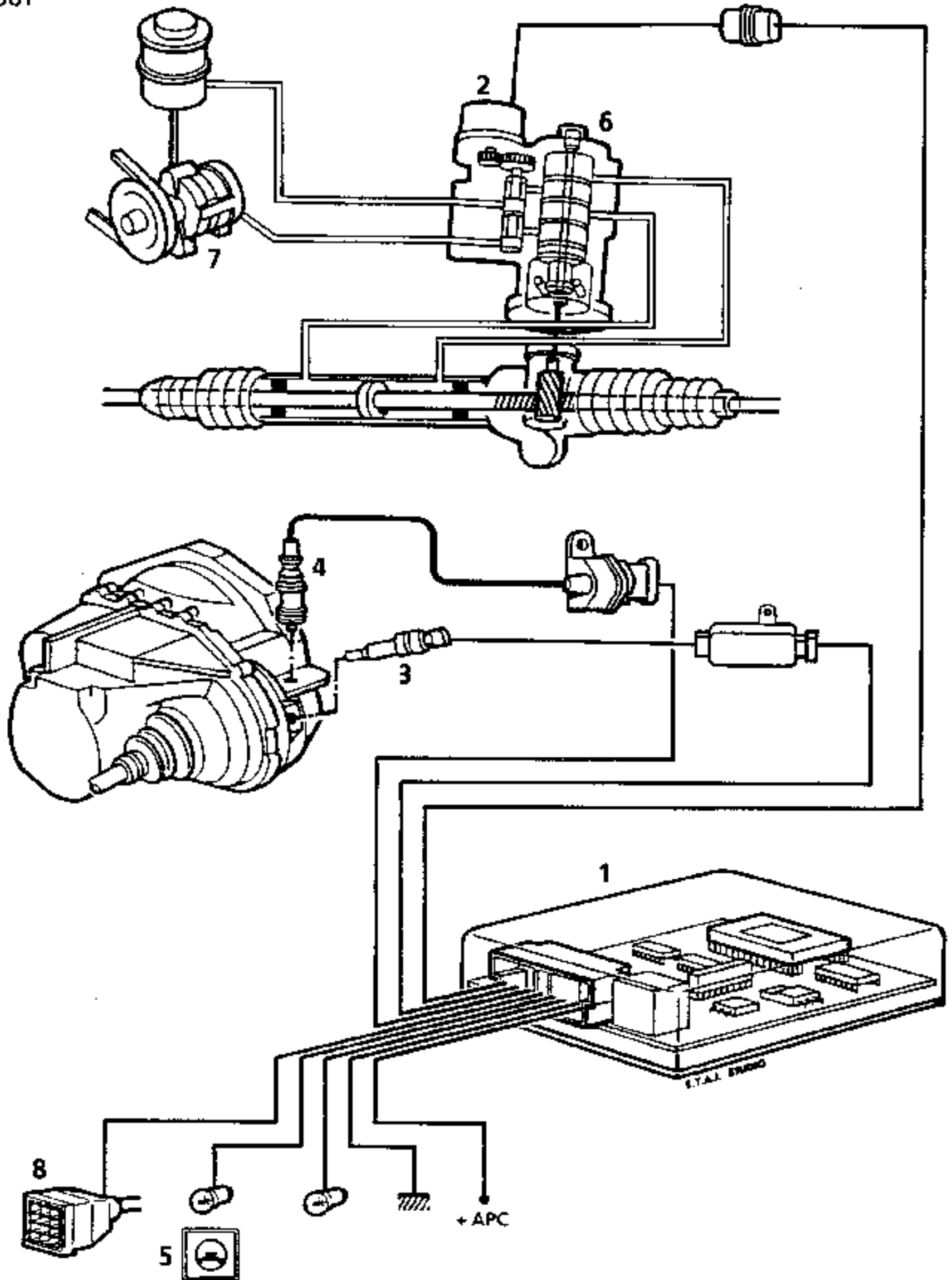


- 1 Computer
- 2 Stepping motor
- 3 Main speed sensor

- 4 Secondary speed sensor
- 5 Fault warning light



LAYOUT



- |   |                        |   |                     |
|---|------------------------|---|---------------------|
| 1 | Computer               | 5 | Fault warning light |
| 2 | Stepping motor         | 6 | Valve               |
| 3 | Main speed sensor      | 7 | High pressure pump  |
| 4 | Secondary speed sensor | 8 | Diagnostic socket   |

**DESCRIPTION OF OPERATION****CONVENTIONAL POWER ASSISTED STEERING VALVE**

The conventional power assisted steering valve system is the "open centre" type ; this means that the pump providing the power always provides a regulated flow, whatever the operating pressure in the circuit, whether assistance is used or not.

The rotary valve has two main parts :

- the sleeve (8) which is fixed to the steering pinion,
- the rotor (9) fixed to the steering column.

These two parts are mechanically connected to each other by a calibrated torsion bar (7) called a "valve bar".

The sleeve and rotor have longitudinal grooves which provide variable oil passageways.

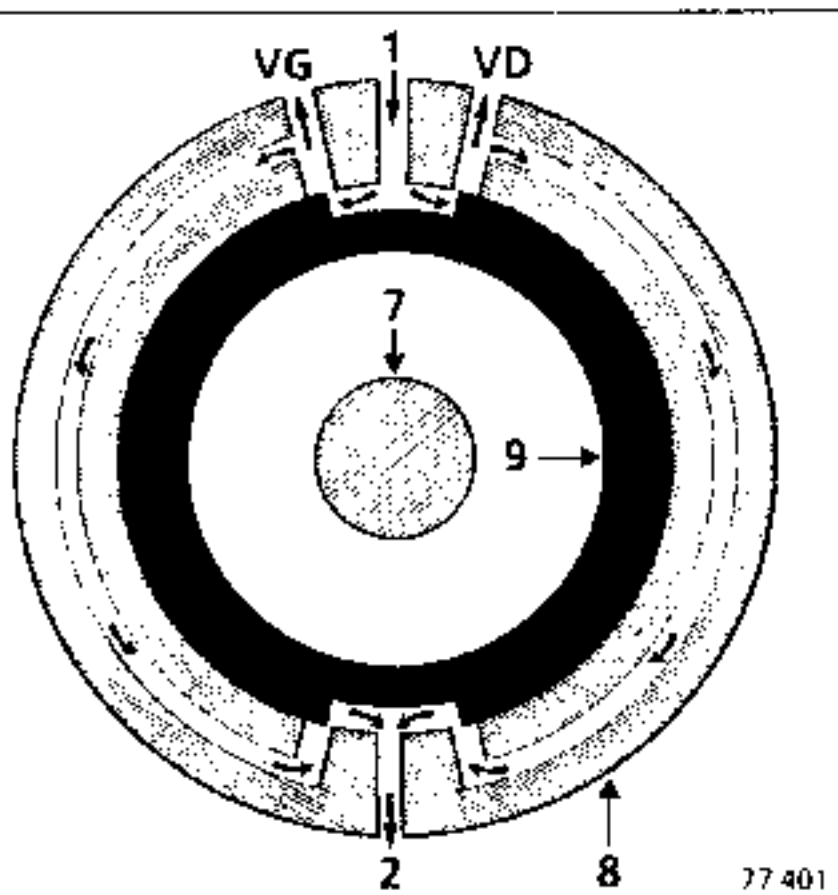
The rotor grooves are of two types :

- those for high pressure,
- those for low pressure.

The sleeve grooves are also of two types :

- those linked to the right hand steering valve (VD),
- those linked to the left hand steering valve (VG).

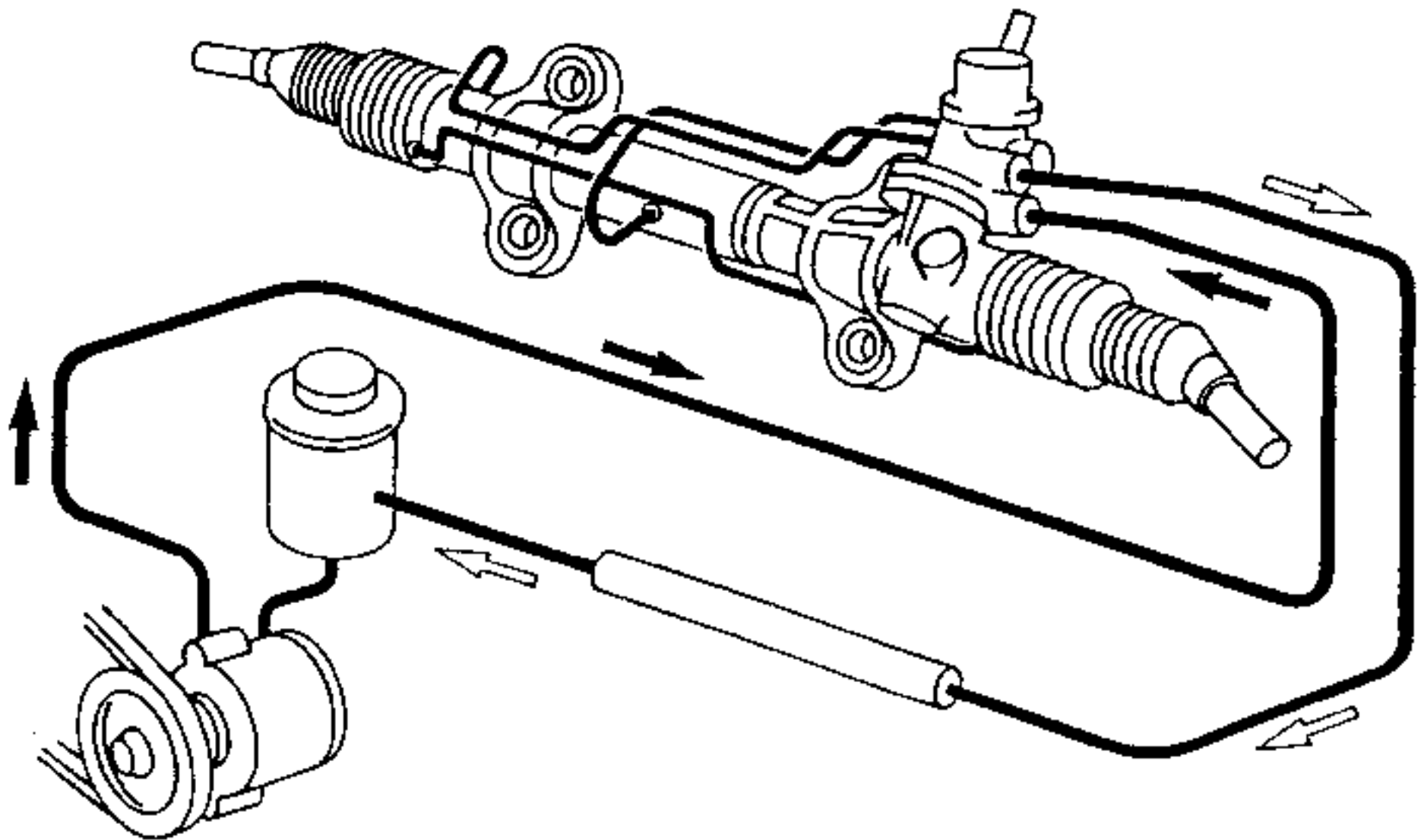
Rotation of the rotor relative to the sleeve is allowed by the elastic deformation of the valve bar (7) which transmits the torque applied by the driver at the steering wheel to the rotor (9) and the steering pinion.



**CONVENTIONAL POWER ASSISTED STEERING VALVE**

For the same sized hydraulic system elements, the more flexible the bar is, and the higher the driver torque applied is, the greater the movement of the rotor in relation to the sleeve will be and the greater assistance will be.

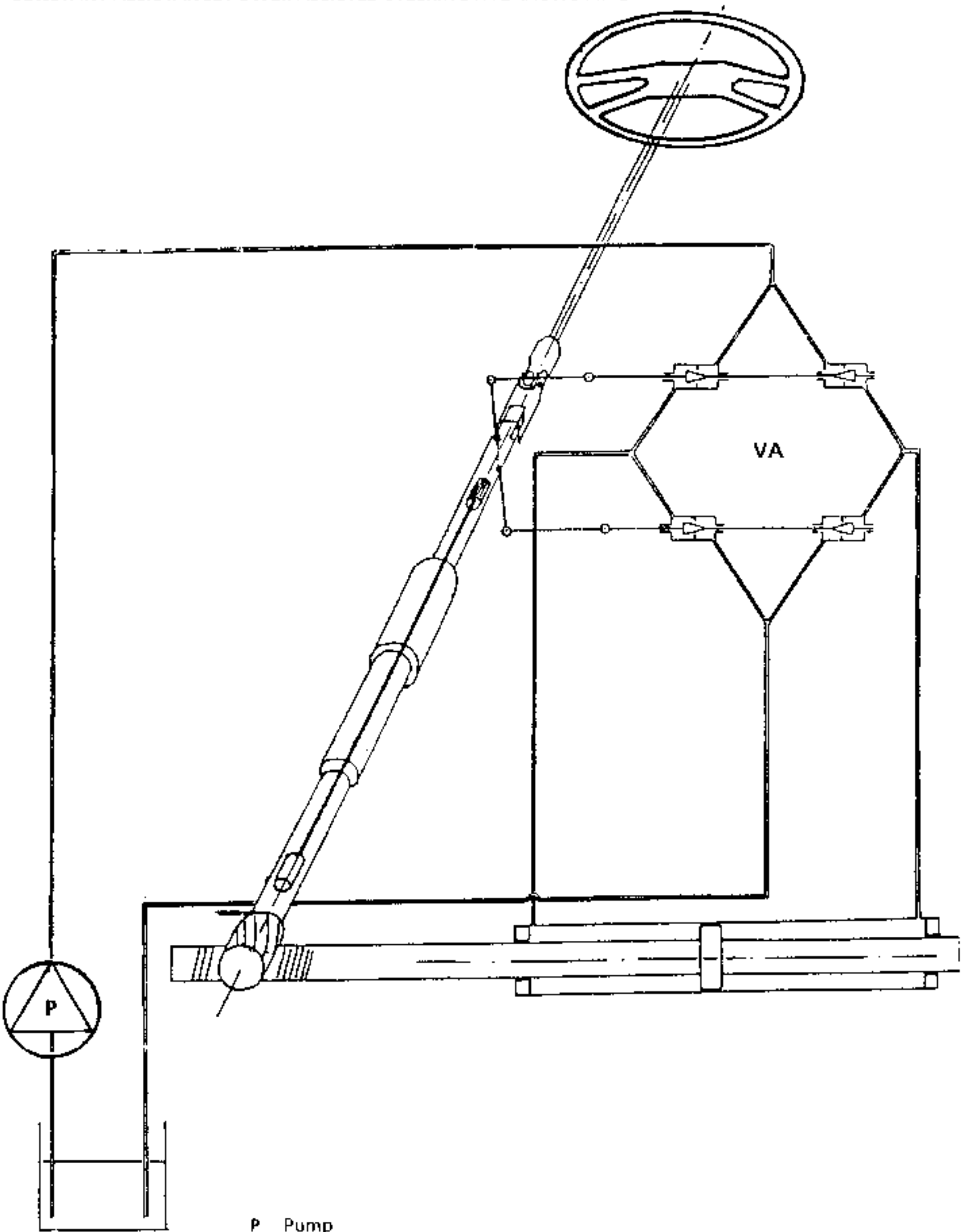
To construct a variable power assisted steering system, the flexible bar must twist easily, and must twist back with "reaction" torque to give the system apparent stiffness which can be increased as speed increases.



High pressure →

Low pressure →

CONSTANT ASSISTANCE POWER ASSISTED STEERING HYDRAULIC DIAGRAM



#### **VARIABLE POWER ASSISTED STEERING VALVE**

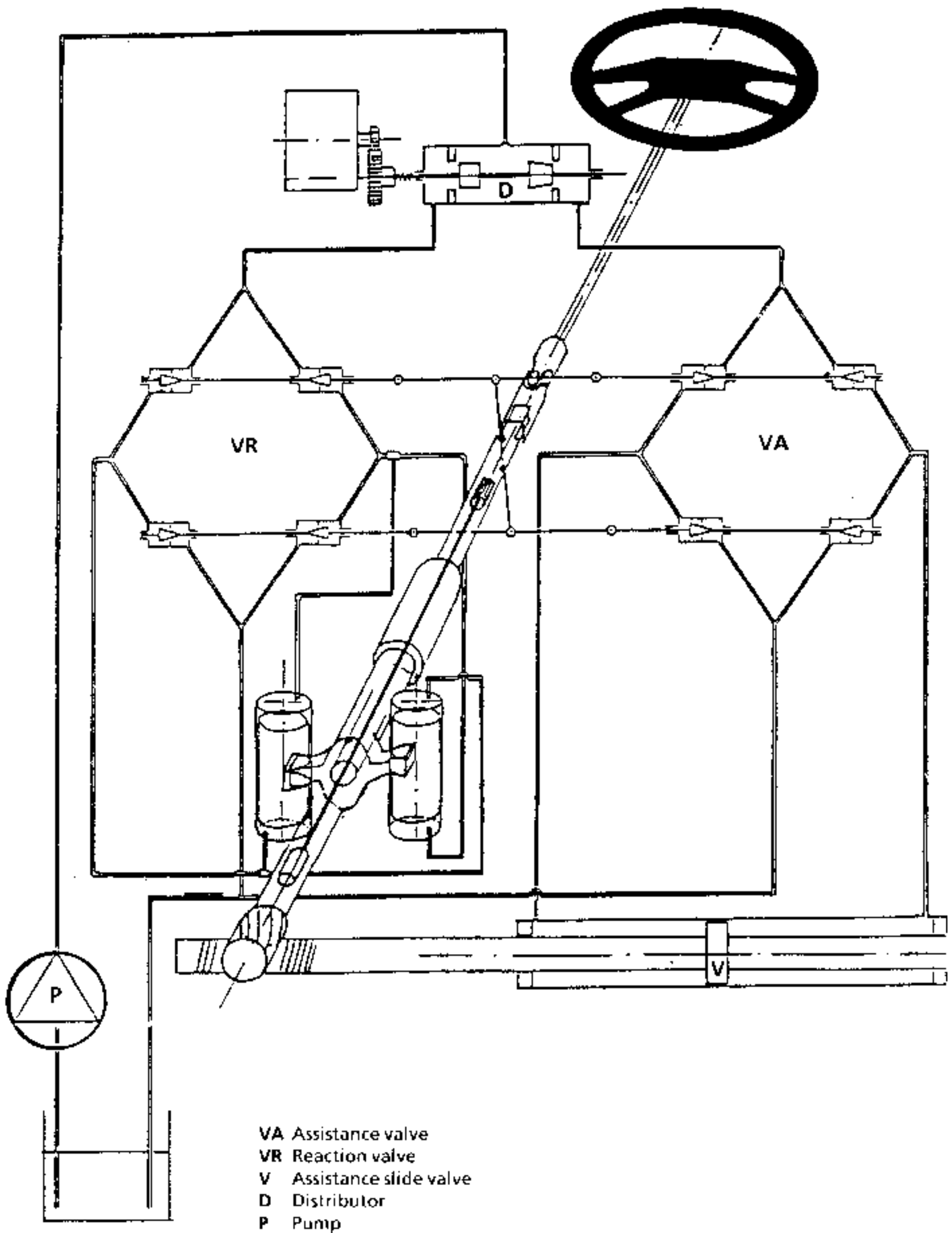
The valve has a distributor which divides the flow from the pump between the assistance valve which feeds the steering valve and a second "reaction" valve which supplies the "reaction" cylinders.

The hydraulic distributor has a slide valve which is actuated by a screw and nut mechanism, which is rotated by an electric stepping motor connected to a parallel axis worm gear drive. This ensures optimum oil distribution between the assistance and reaction valves.

For maximum assistance the reaction section is not supplied and the assistance valve receives all the oil flow from the pump.

For minimum assistance, the reaction valve receives a large part of the pump oil flow and the assistance valve flow is considerably reduced.

VARIABLE POWER ASSISTED STEERING SYSTEM HYDRAULIC DIAGRAM

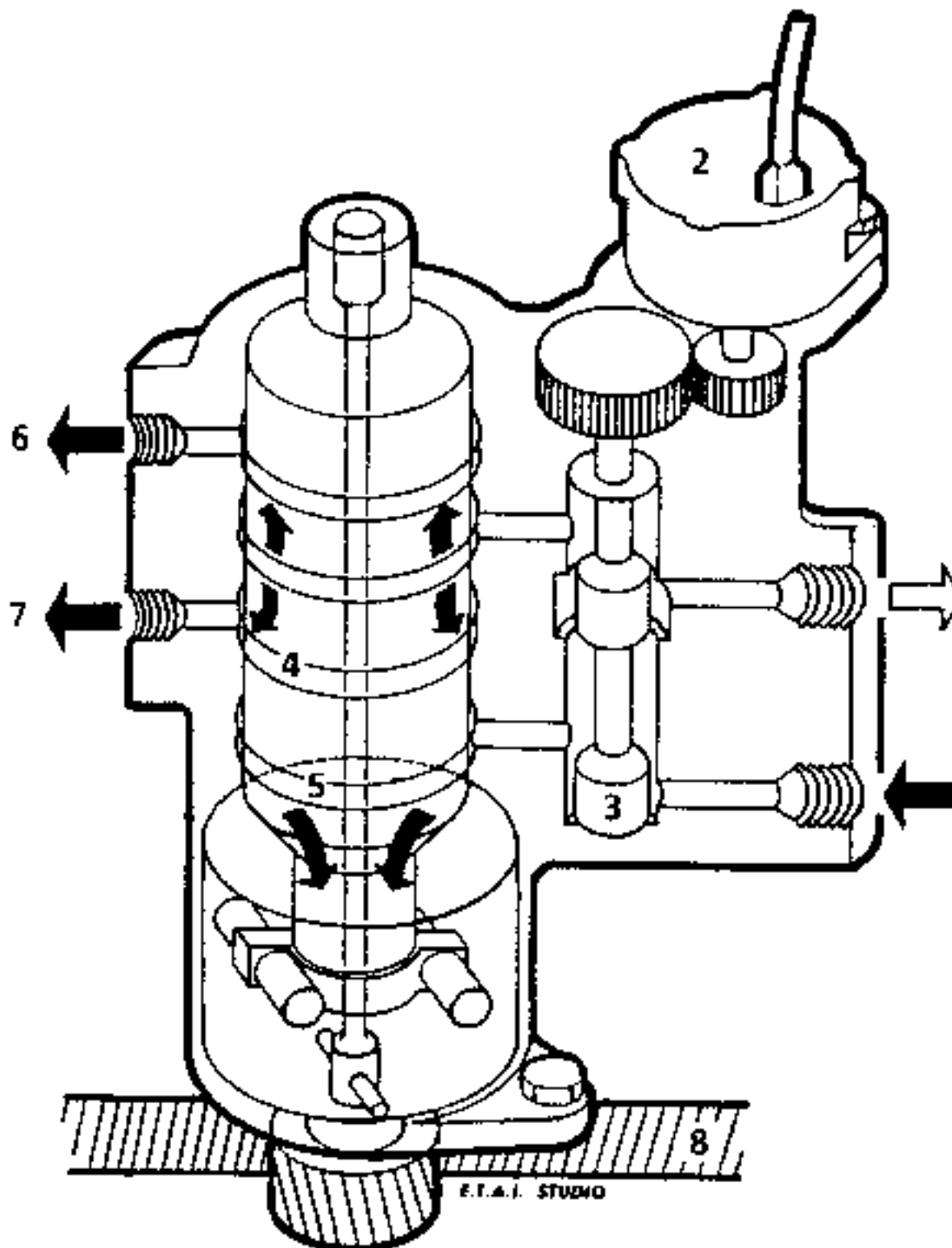


**VARIABLE POWER ASSISTED STEERING VALVE**

In contrast to a conventional valve which has 3 circular distribution grooves around the sleeve, there is an additional groove which receives oil from the distributor for supplying the reaction cylinders.

The variable valve is like two valves supplied in parallel by a distributor slide valve, one supplying the steering assistance valves and the other supplying the reaction section.

Upstream from each of these valves, the distributor adds a variable flow to each of the circuits fed

**TWO STAGE VALVE OPERATING PRINCIPLE.**

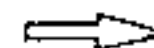
- 2 Stepping motor
- 3 Slide valve distributor
- 4 Assistance distribution groove
- 5 Reaction distribution groove
- 6 Right hand valve feed

- 7 Left hand valve feed
- 8 Rack

High pressure



Low pressure



## ACTUATOR

Comprises:

- a stepping motor
- a reducer linked to a screw - nut device which moves the distributor slide valve

## STEPPING MOTOR

This has four windings connected to a common winding

There are 5 wires connected ; 1 for each phase and 1 for the common winding ( + APC).

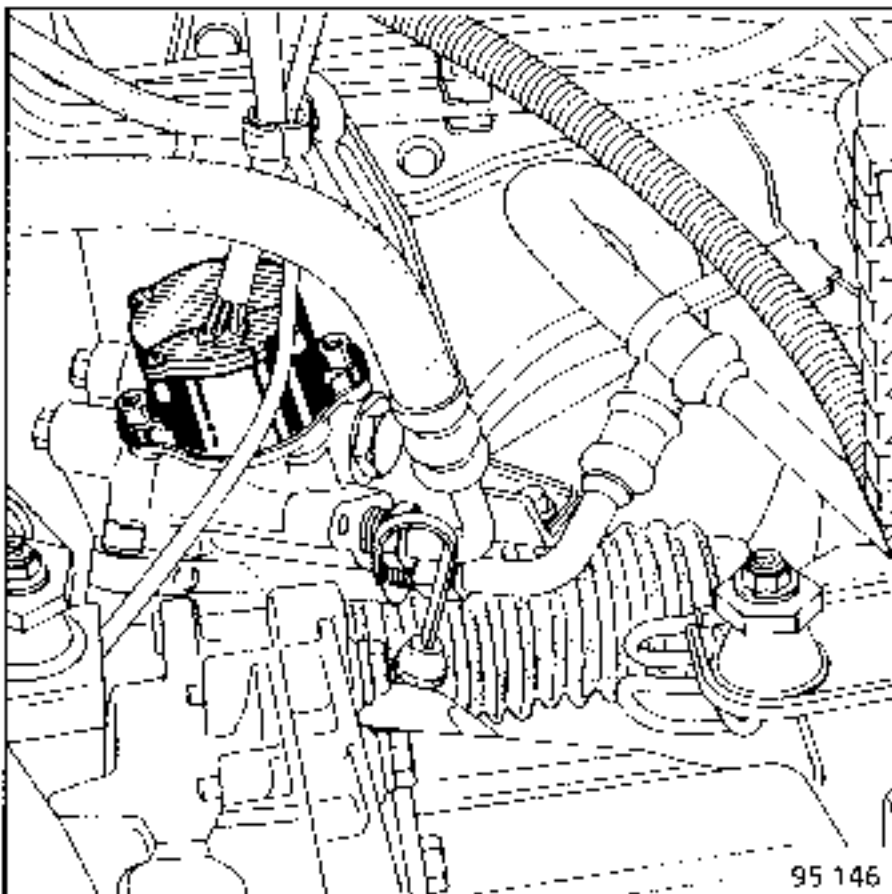
The resistance of each winding is  $40\ \Omega$  between the common winding and the phase input.

## REDUCER

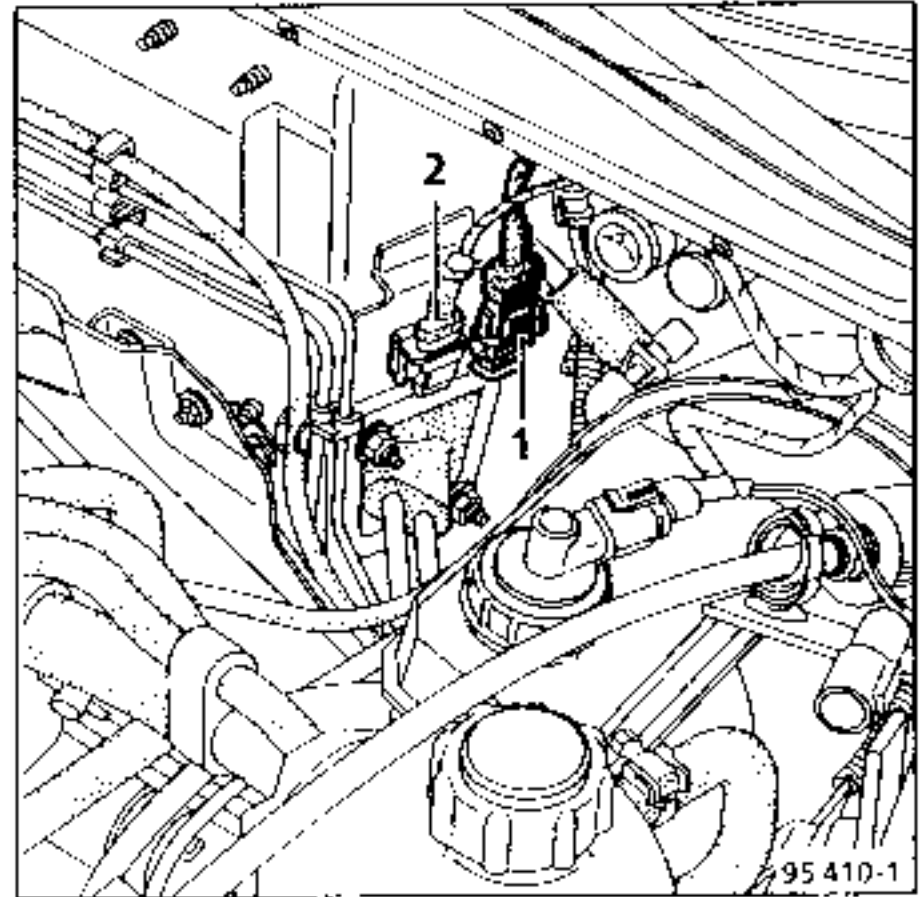
This is a gear on the end of the motor shaft and a coaxial wheel with a nut

Over its range of movement:

- the motor turns 4,2 times,
- the slide valve moves 3 mm



The stepping motor feed connectors (1) and the main speed sensor connectors (2) are located in the engine compartment on the right hand side of the brake servo.



## CONTROL STRATEGY

Steering assistance depends only on vehicle speed

To improve safety, speed information is transmitted to the steering assistance computer by two measuring channels which are independent.

The main channel provides the signal for assistance control.

The second channel provides a signal which is used to test the coherence of the first signal.

This coherence check is only possible above 10 km/h

Each vehicle speed has an associated level of steering assistance controlled by the movement of a servomotor which is controlled by the computer. The computer memory contains information on how assistance should vary in relation to vehicle speed.



## **SELF TESTING**

Each time the ignition is turned on the system carries out a self test

Permanent monitoring is carried out for :

- coherence of the two speed signals,
- coherence of controls, feed current (current in computer connections) for the stepping motor and correct computer electrical connections

## **FAULTS**

A fault is indicated by :

- illumination of the variable power assisted steering warning light on the instrument panel
- illumination of the service light on the instrument panel at the same time.

In all cases where the stepping motor is not faulty, the system passes into a "safety" mode : constant assistance is provided at a level which is suitable for driving in the town or on the open road

If the stepping motor is faulty or is not being fed, the assistance level prior to the fault is retained.

## **SAFETY MODE IDENTIFICATION**

The safety mode selects an average level of assistance. Sometimes this level cannot be obtained if the stepping motor is faulty. In this case the level of assistance prior to the fault is retained (see table on following page)


## SAFETY MODE SITUATIONS

Shown on XR25 by illumination of BG	Faults	Consequences	Actions
4 left	Voltage drop (condition : speed > 8 km/h) Time: 5 ms	Computer positions stepping motor according to 1st speed info received	Warning light remains extinguished
6 left	Speed signal incoherence conditions : > 10 km/h → 0 - 100 km/h > 20 km/h → 100 - 150 km/h > 30 km/h → 150 - 200 km/h	Assistance adopts safety mode	Warning light illuminates until ignition turned off
8 left	Erratic signal Main speed sensor	Stepping motor feed relay control cut.	
10 left	Secondary speed sensor		
12 right	Stepping motor circuit Short circuit	Stepping motor feed relay control cut.	Assistance prior to fault is retained
12 left	Open circuit		
3 left	Selection not made in computer	Stepping motor feed relay control cut.	Warning light illuminated even after ignition turned on again
7 left	No signal Main speed sensor	Assistance adopts safety mode	
9 left	Secondary speed sensor		
11 right	Warning light circuit fault Permanent activation	Computer continues to operate normally	Warning light remains illuminated
11 left	Open circuit		Warning light remains extinguished

## SAFETY MODE SITUATIONS


If there is a fault, after the ignition has been turned off the fault is stored in the computer memory.

This memory may be examined at any time using the XR25 and the appropriate cassette.

However, turning the ignition on and off again may alter some of the bar graphs. To avoid confusion, carry out a road test with the vehicle showing the fault (temporary or permanent illumination of warning light ) in order to be able to read the diagnostic signals without turning the ignition off (vehicle stationary).

## TYPES OF FAULT

### a) Permanent fault

A fault is permanent when it appears (warning light ) illuminated) which is shown on the XR25 by fixed illumination of a bar graph other than no. 1 1).

### b) Temporary fault

A fault is temporary if it has appeared, been memorised and then disappeared (shown on XR25 by a flashing bar graph).

## Entering fault finding mode

The fault finding mode must be entered when the vehicle is stationary. The computer must verify the lack of speed signals on both channels.

Speed incoherence will only be noted above 10 km/h.

## Leaving fault finding mode

Vehicle stationary, enter G13\*.


If dialogue is interrupted without entering G13\*, the ignition must be turned off and you must wait for one minute to allow the computer to return to operational mode.

The command G74\*\* must also be entered to store the assistance curve selection again.

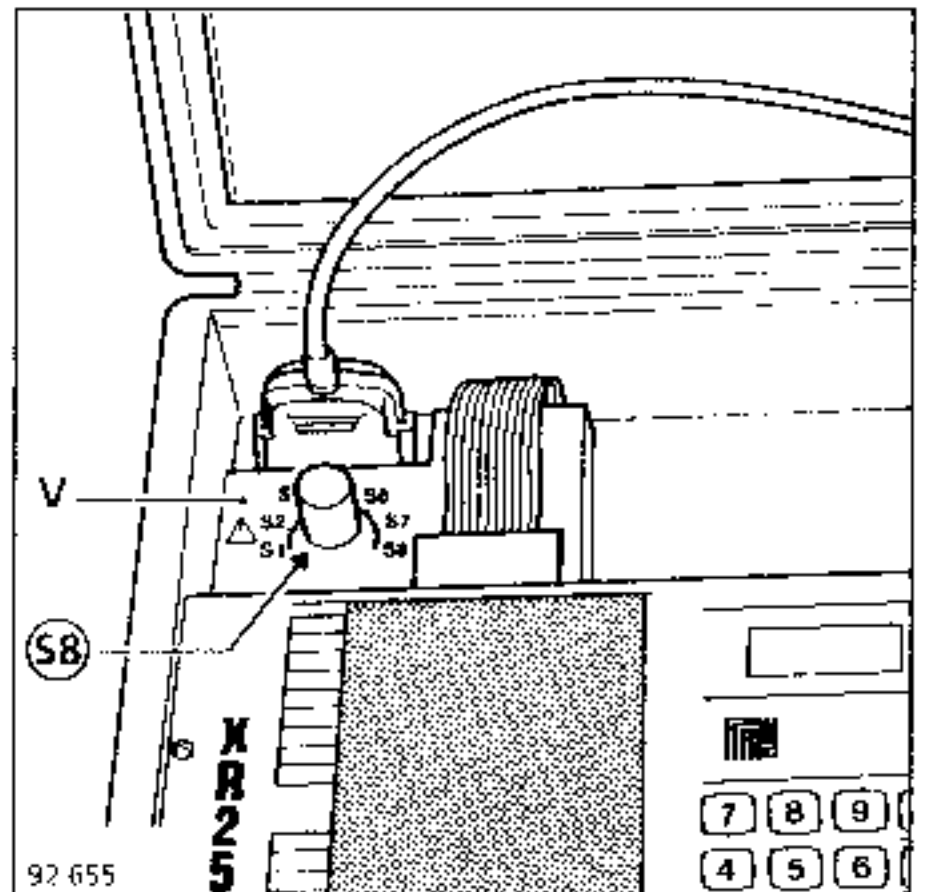
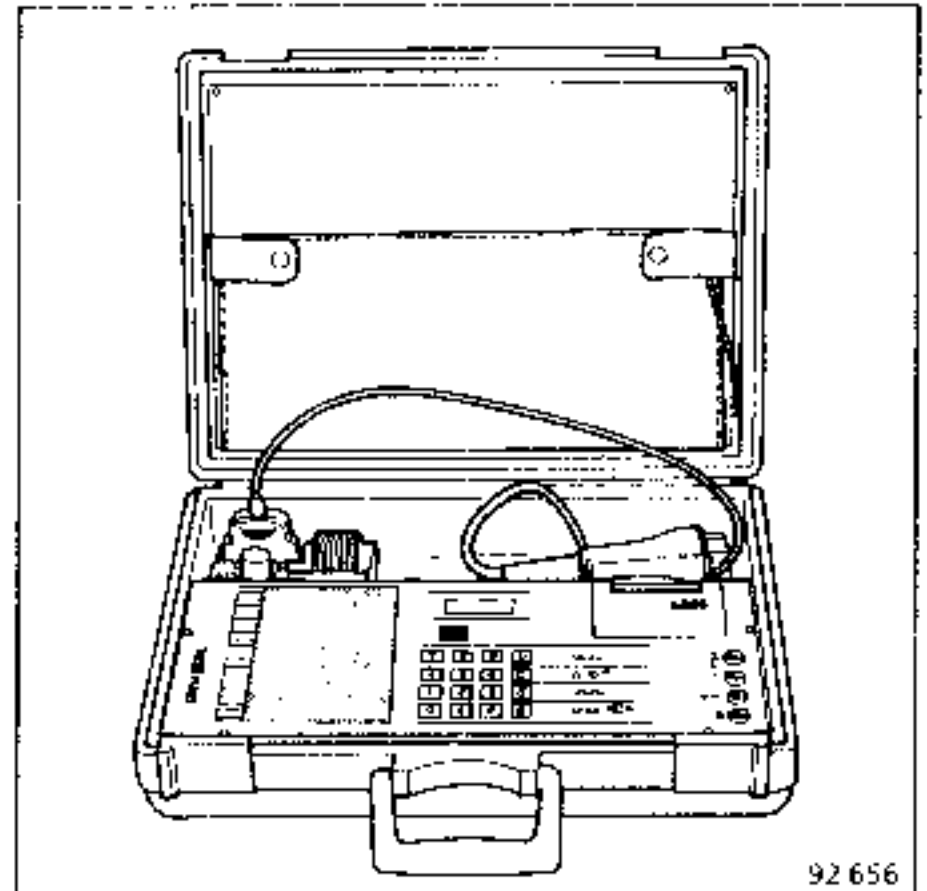
**FAULT FINDING**

The **XR25** must be used for fault finding for the variable assistance power steering system, whatever the origin of the faults noted.

Communication between the computer and **XR25** allows:


- memorised faults to be read,
- the vehicle manufacture date to be read and the date of the last operation on the vehicle,
- speed information to be read,
- the stepping motor and warning light  to be operated
- the fault memory to be erased (to be carried out after all operations on the variable power assisted steering system),
- the date of the operation on the steering system to be entered,
- the required assistance curve selection to be memorised (validation of selection).

**NOTE:** for safety reasons, the command modes G01\* and G02\* (min and max assistance) must only be used when the vehicle is stationary. Only other tests (reading speed information) may be carried out during a road test.



**NOTE :** warning light "V" must be extinguished. If it is illuminated disconnect and reconnect the diagnostic socket. If it remains illuminated, check the XR25 wiring and the battery voltage.

## FAULT FINDING

Analysis of system operation using XR25 and cassette N° 10 (fiche N° 19) after a road test where the warning light  on the instrument panel illuminated.

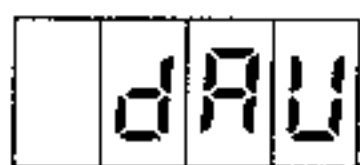
## Initialising dialogue

After the road test, without turning the ignition off, connect the XR25.

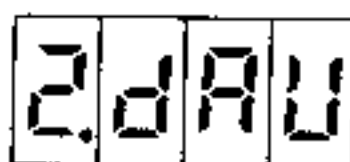
Position the ISO selector on S8.

Enter code **D 1 9**

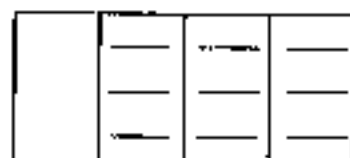
The central display shows :



1 second then



Indicates product tested and that dialogue is established



Shows dialogue has not been established


- VPAS without a fault :

bar graph N° 1 right : code present

- VPAS with fault/s :

## IMPORTANT DEFINITIONS

**Temporary fault :** a temporary (or intermittent) fault is one which appears

(warning light  on instrument panel illuminates) and disappears by itself at any given moment (after turning the ignition on and off again). This type of fault is shown by a flashing bar graph

**Permanent fault :** a permanent fault is one which is present during fault finding using XR25. This type of fault is shown by a fixed bar graph.

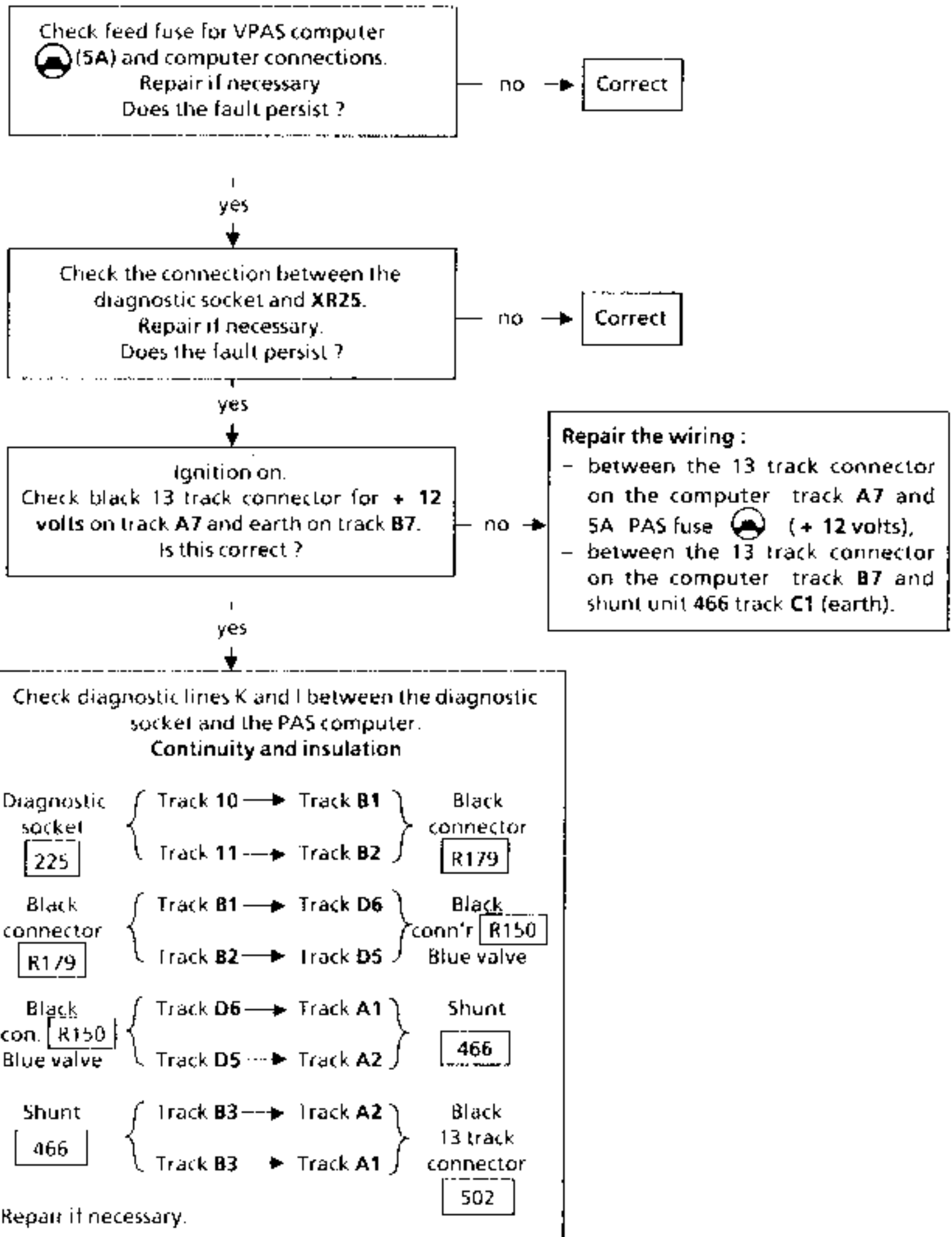
**NOTE:** do not disconnect the diagnostic socket during dialogue, but leave the fault finding mode after entering G13\*, with the vehicle stationary

N° 19		CARD IDENTIFICATION : READ ON DISPLAY → 2 DAV	
1	CODE PRESENT		
2	COMPUTER DEF.		
3	ILLUMINATED : REGULATION NON PROGRAMMED (SEE G74 *)		
4	TEMPORARY FALL IN BATTERY VOLTAGE		
6	INCOHERENCE OF SPEED SIGNALS		
7	NO SIGNAL	PRINCIPAL SPEED SENSOR	
8	ERRATIC SIGNAL		
9	NO SIGNAL	SECONDARY SPEED SENSOR	
10	ERRATIC SIGNAL		
CODE : D 1 9 (S8) VARIABLE PAS (MEM. DEF. : G0**) (END OF DIAGNOSTICS : G13*)			
11	CO WARNING LIGHT CIRC. CP		
12	CO ENGINE CIRC. DAV CC		
<b>ADDITIONAL CHECKS # ..</b> 01 SPEED READING <div style="border: 1px solid black; padding: 5px; display: inline-block;">             XX YY Km per hr           </div> XX : PRINCIPAL YY : SECONDARY			
<b>CONTROL MODE</b> 191 * MAXIMUM ASSISTANCE 60 * MINIMUM ASSISTANCE 62 * WARNING LIGHT CONTROL 64 * LEC DATE OF MANUFACTURE 67 * PC3 AFTER-SALES DATE 69 * IFC AFTER-SALES DATE 67 * CONFIRMATION OF REGULATION			
20	XR25 MEMORY (0)		
SEE REPAIR MANUAL			

FAULT FINDING: SIGNIFICATION OF THE BAR GRAPHS

CODE PRESENT : ILLUMINATED : CORRECT

If extinguished after entering D19 :



FAULT FINDING: SIGNIFICATION OF BAR GRAPHS

COMPUTER FAULT

FLASHING : Erase the memory (GO\*\*) and confirm the fault

FIXED : Replace the computer using XR25 code D19 (58)  
Enter G74\*\* to programme selection,  
then G13\* to leave fault finding.

SELECTION NOT PROGRAMMED

On XR25 enter  
G74\*\* to reprogramme.  
Erase memory GO\*\*.  
Is this correct?



yes

Correct.  
Enter G13\* to end fault finding.

no

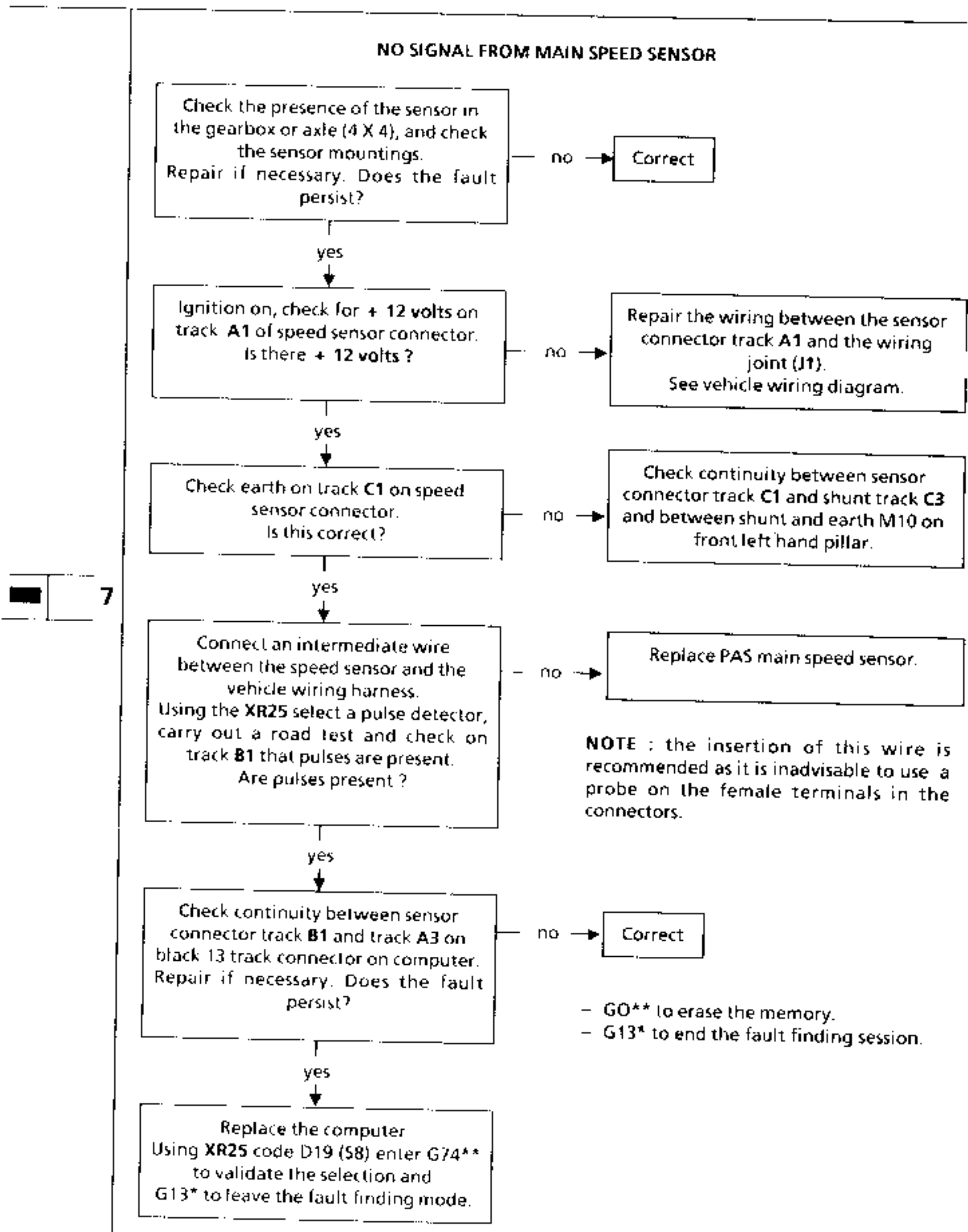
Replace computer  
Enter G74\*\* to programme then  
G13\* to end fault finding.

FAULT FINDING: SIGNIFICATION OF BAR GRAPHS

<div data-bbox="20 655 90 743"></div> <div data-bbox="201 667 231 718">4</div>	<div data-bbox="826 428 1330 478"><b>TEMPORARY VOLTAGE DROP</b></div> <div data-bbox="574 567 1643 844"><p>Check computer feed between tracks A7 on black 13 track connector and PAS feed fuse. After checking connections and wiring enter GO** to erase the memory then G13^ to leave the fault finding mode</p></div>
<div data-bbox="20 1360 90 1449"></div> <div data-bbox="201 1373 231 1423">6</div>	<div data-bbox="826 1058 1330 1108"><b>SPEED SIGNAL INCOHERENCE</b></div> <div data-bbox="322 1197 1915 1713"><p>Is one of bar graphs 7 - 8 9 or 10 illuminated?</p><p>yes → Refer to fault finding chart for bar graph illuminated.</p><p>no ↓</p><p>If the gear box has been changed ensure that the speedometer equipment is correct for the vehicle type.</p></div>



## FAULT FINDING : SIGNIFICATION OF BAR GRAPHS



FAULT FINDING : SIGNIFICATION OF BAR GRAPHS



MAIN SPEED SENSOR ERRATIC SIGNAL

Check connections and wiring for :

- speed sensor,
- computer.

Repair if necessary.

On XR25 enter GO\*\* to erase the memory then G13\* to end fault finding.

NOTE : this bar graph may illuminate because of outside interference (radar frequencies).



SECONDARY SPEED SENSOR ERRATIC SIGNAL

Check connections and wiring for .

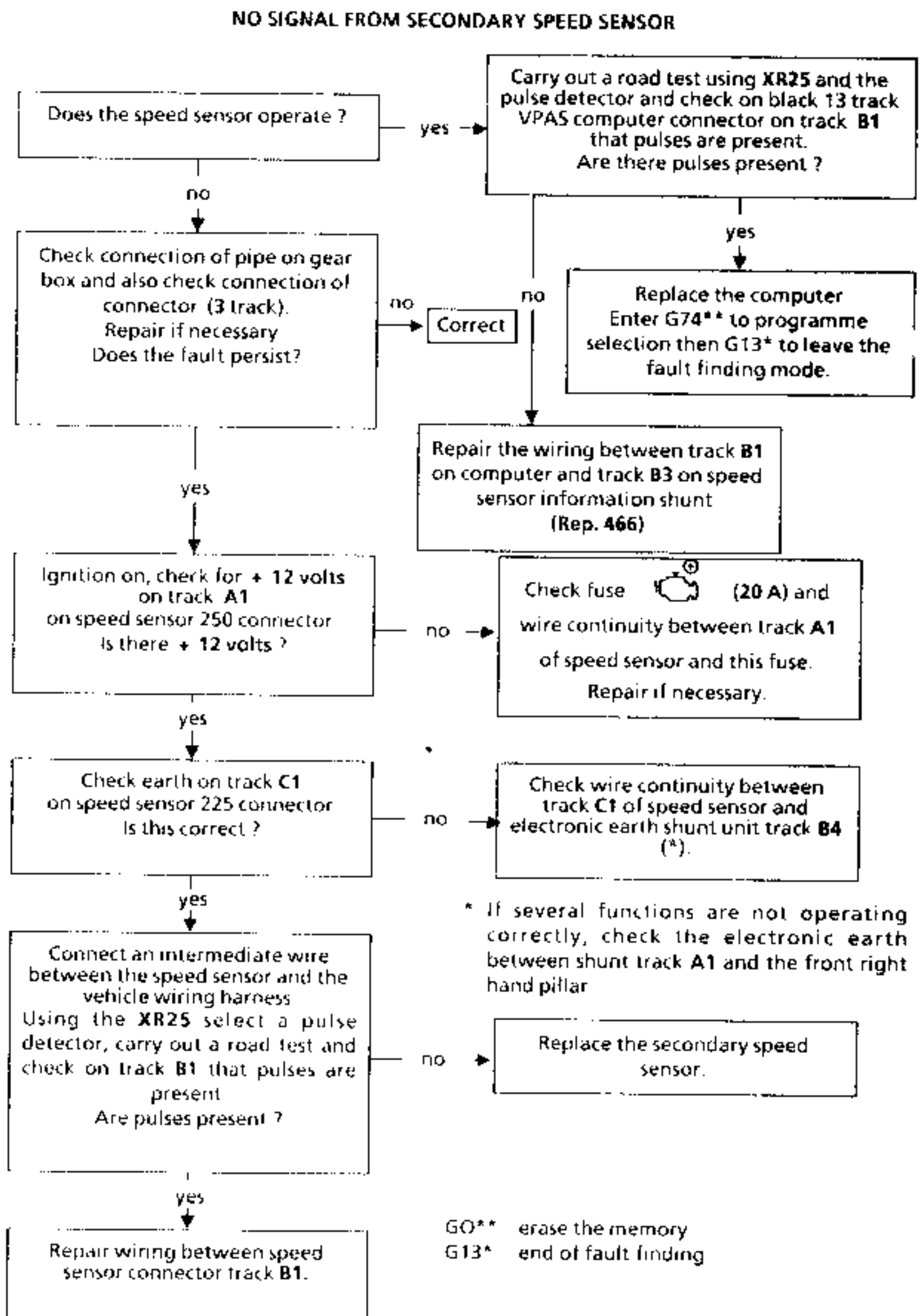
- speed sensor,
- computer

Repair if necessary.

NOTE. this bar graph may illuminate because of outside (radar frequencies), in which case erase them memory GO\*\* then enter G13\* to leave the fault finding mode.

## FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

--	--

 9


## FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

## WARNING LIGHT CIRCUIT

## PERMANENT CONTROL

Check there is no short circuit between track **B3** on computer black 13 track connector and track **28** on blue/white instrument panel connector  
Repair if necessary  
Does the fault persist?

no

Correct

yes

Check the safety relay 593, coil resistance  $R = 60 \Omega$  (possible short circuit). Turn ignition on, check relay is open between terminals 3 and 4.  
Replace the relay if necessary  
Does the fault persist?

no

Correct

yes

Check there is no short circuit between track **3** of safety relay 593 and track **B3** on VPAS computer black 13 track connector.  
Repair if necessary.  
Does the fault persist?

no

Correct

yes

Replace the computer  
With **XR25** enter **G74\*\*** to programme the selection then **G13\*** to leave fault finding mode

## FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

## WARNING LIGHT CIRCUIT

## OPEN CIRCUIT

1st Case : The VPAS warning light does not illuminate when the ignition is turned on.

On XR25 enter warning light control mode  
command GO3\*.  
Does the warning light illuminate?

no

Repair the VPAS warning  
light or the wire between  
the computer black 13 track  
connector track  
B3 and the instrument  
panel blue/white connector  
track 28

yes

Check computer black 13 track connector  
track B3 and wiring continuity between track  
B3 on computer and safety relay track 3 ref.  
593 (\*).  
Repair if necessary  
Does the fault persist?

no

Correct

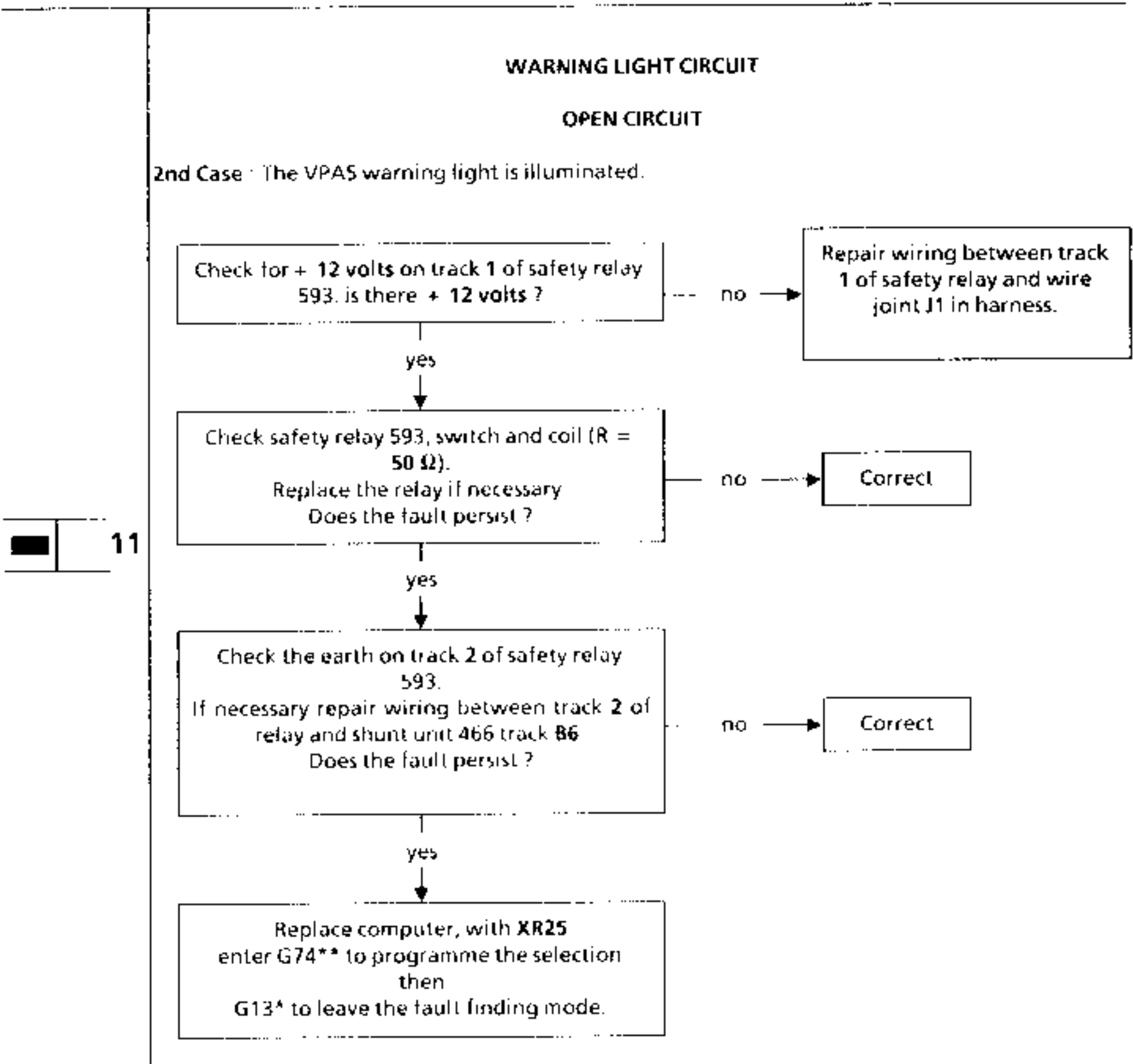
(\*) Also check safety relay connector

yes

Check wiring between safety relay 593 track 4  
and earth shunt unit 466 track C7.  
Repair.  
Enter GO\*\* on XR25 to erase the memory  
then G13\* to leave the fault finding mode.

NOTE : this bar graph may also illuminate if the VPAS and Service warning light bulbs are blown.

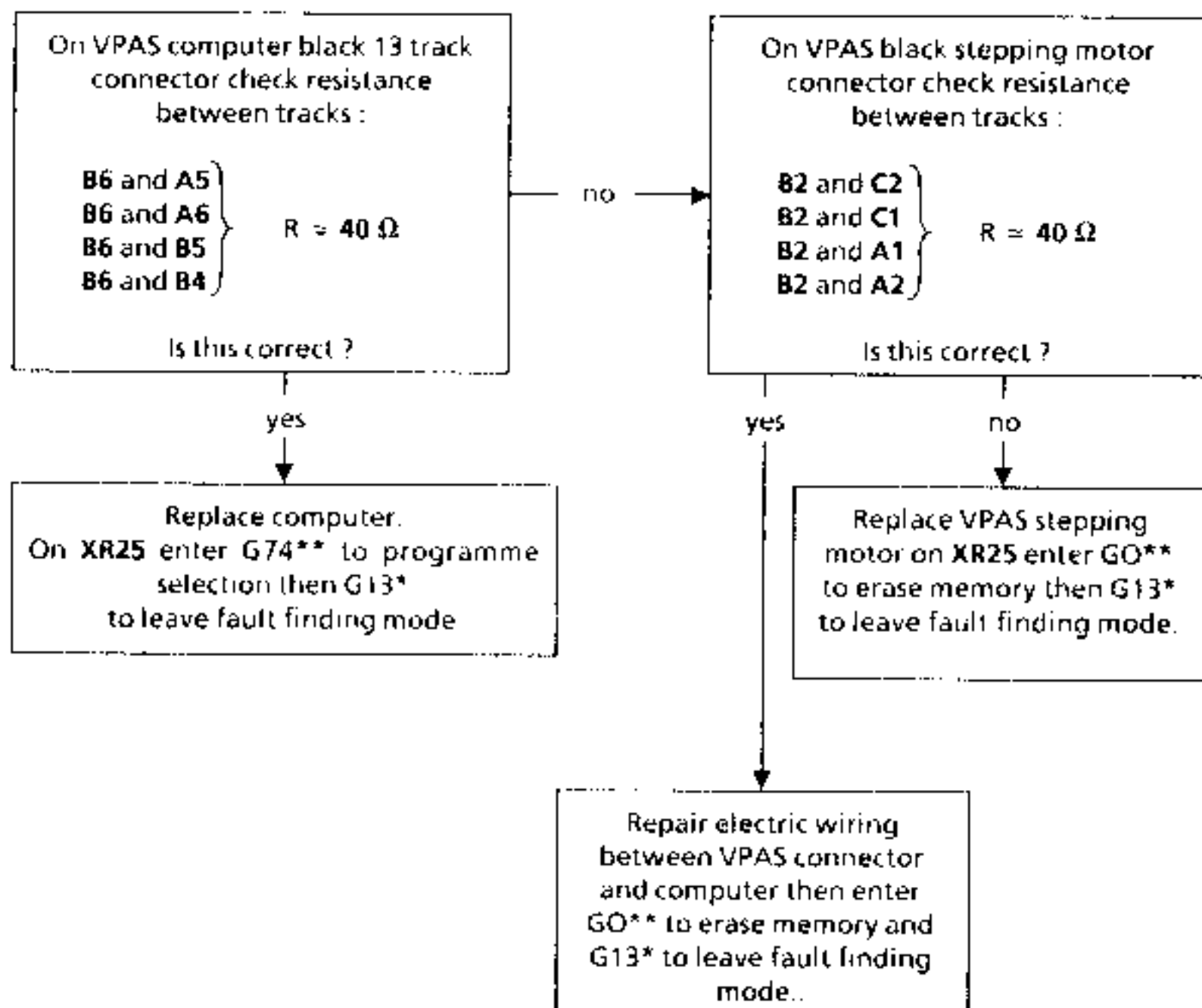
FAULT FINDING : SIGNIFICATION OF BAR GRAPHS



FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

VPAS MOTOR CIRCUIT

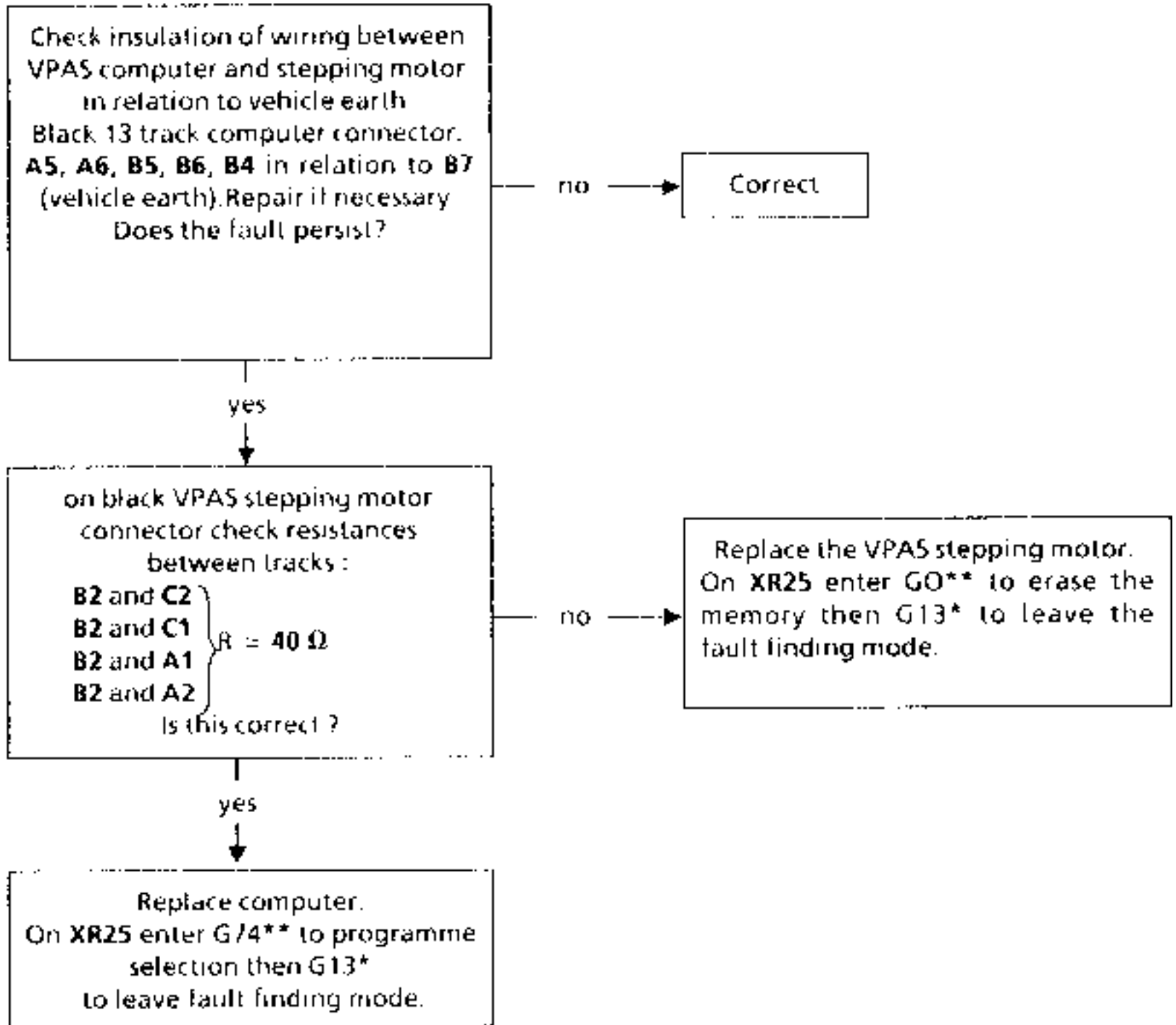
OPEN CIRCUIT



FAULT FINDING : SIGNIFICATION OF BAR GRAPHS

VPAS MOTOR CIRCUIT

SHORT CIRCUIT



12

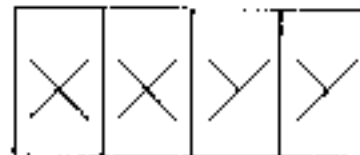


## OTHER FUNCTIONS

After the system has been initialised:

Enter :

# 0 1



Speed in km/h

XX : Main speed sensor

YY : Secondary speed sensor

This test allows the coherence of the signals from the two sensors to be checked.

### NOTE:

- If there is a permanent or stored fault, speed information cannot be read, the display will show :

0.00

- the speed information from the secondary speed sensor is common to other functions (eg : on board computer speedometer etc) Check the function of these other elements to ensure the sensor is operating correctly.

Other information available using key

# 9 6

Computer version



40

## COMMAND MODES

G	0	1	*
---	---	---	---



	A.	1	
--	----	---	--

	E	E	S
--	---	---	---

	F	,	n
--	---	---	---

Beep

2.	d	A	U
----	---	---	---

Move the steering at the same time, and the change in assistance should be seen (maximum) for 5 seconds.

G	0	2	*
---	---	---	---



	A.	0	
--	----	---	--

	E	E	S
--	---	---	---

	F	,	n
--	---	---	---

Beep

2.	d	A	U
----	---	---	---

Move the steering at the same time, and the change in assistance should be seen (minimum) for 5 seconds.


If no variation is seen, remove the stepping motor and retry the commands in order to check its operation :

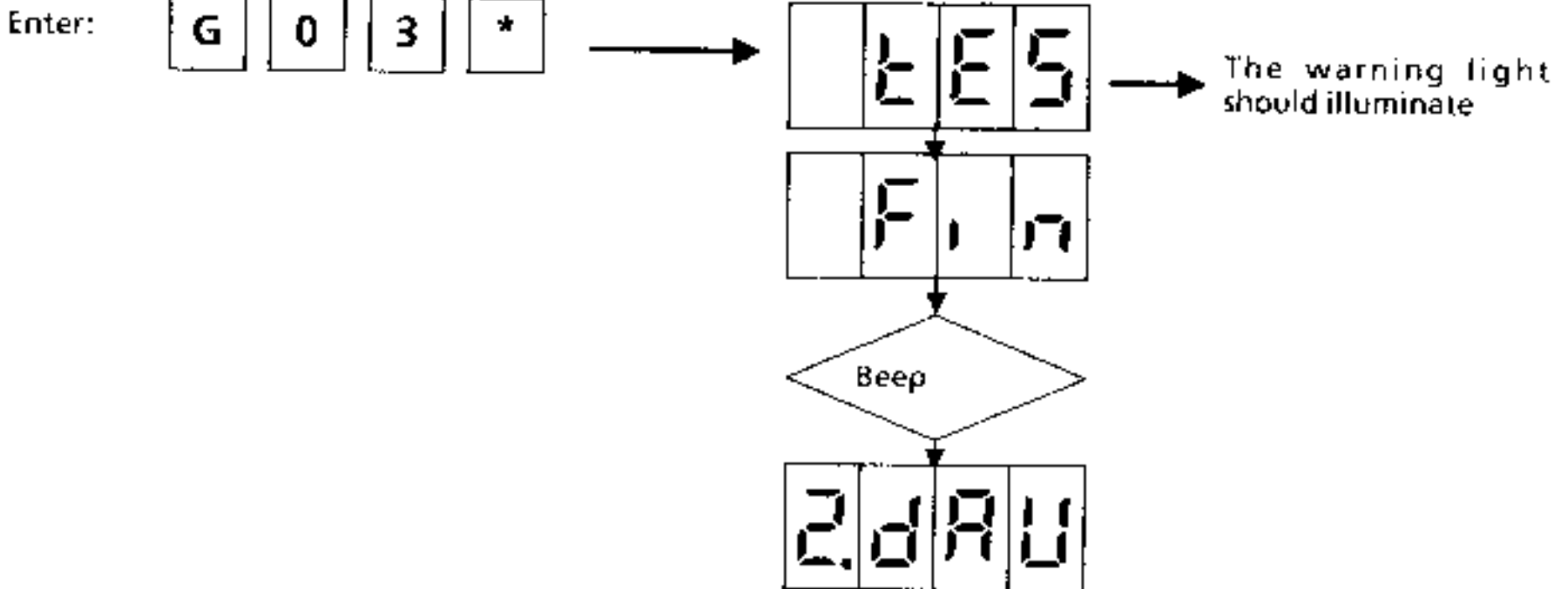
G01\* → the motor turns 1/4 turn + 1/4 turn (same direction)

G02\* → the motor turns 3/4 turn in one direction then 4 turns in the other direction.

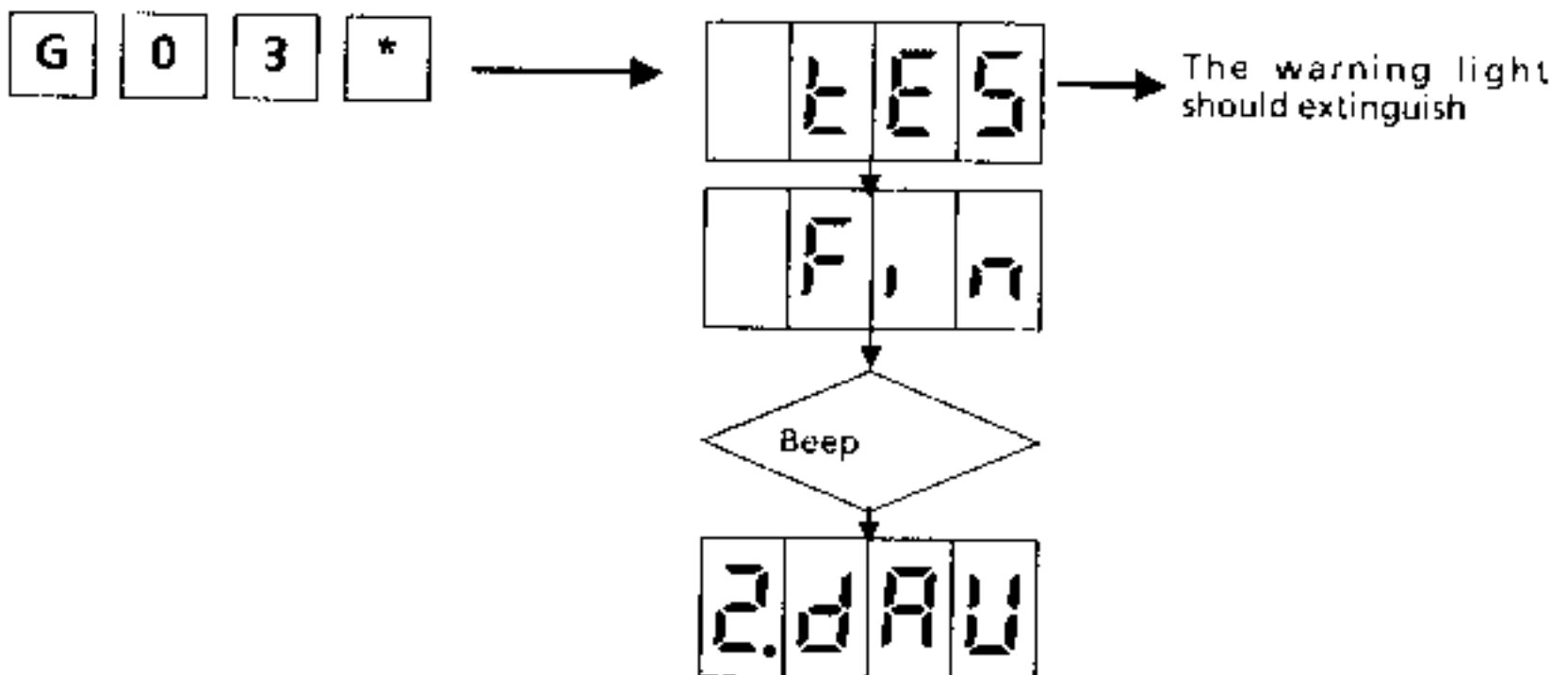
Then check the distributor valve drive pinion is not jammed and the condition of the teeth.

**COMMAND MODES**

The function G03\* (warning light control ) is a permanent control, which means that the code must be entered a second time to return to the original condition.

**WARNING LIGHT CONTROL**

Enter again :



# COMMAND MODES

## READING DATE OF MANUFACTURE

Enter :

**G** **7** **1** **\***

Sequence display ( twice)



day



month



year



**L E c**

**U . X X**

**n . X X**

**A . X X**

Beep

**F , n**

## READING DATE OF AFTER SALES OPERATION

Enter :

**G** **7** **3** **\***

Sequence display ( twice)



day



month



year



**L E c**

**U . X X**

**n . X X**

**A . X X**

Beep

**F , n**

**2 d A U**

## COMMAND MODES

Entering the date of an after sales operation

Enter

**G** **7** **2** **\***

– Enter the day :

Tens

then units

Validate by pressing \*

– Enter the month :

Tens

then units

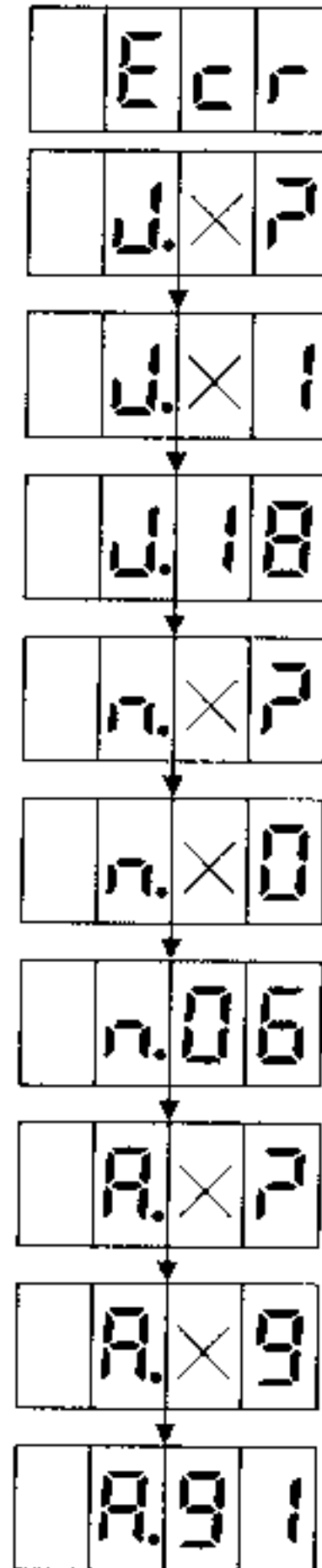
and validate by pressing \*

– Enter the year :

Tens

then units

then validate by pressing \*

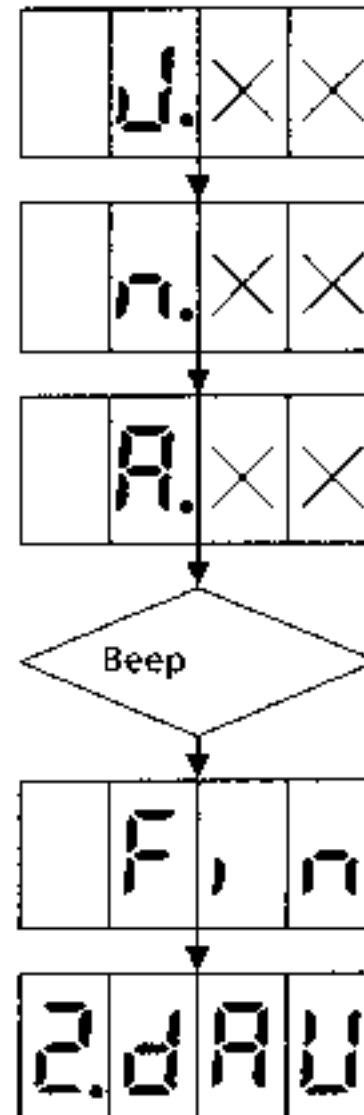


\* **NOTE** : you have a maximum of **15 seconds** to enter this information.

# Reading the date of an operation just entered

Sequence display (twice)  
Shows

day  
↓  
month  
↓  
year



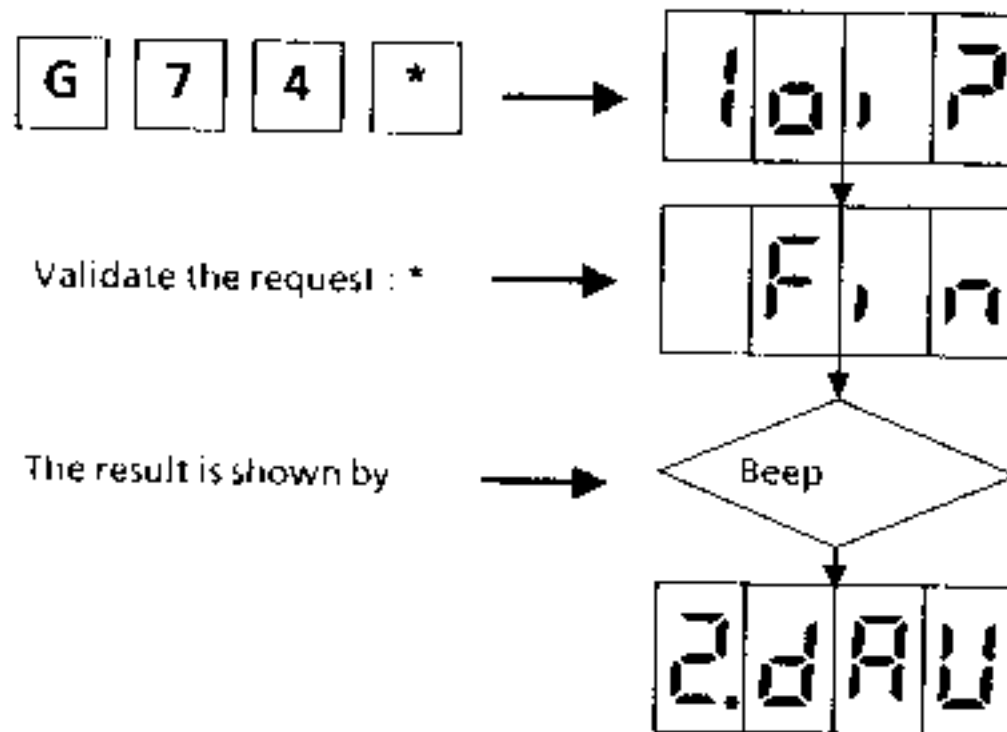
**COMMAND MODES****VALIDATION OF SELECTION**

The computer memorises the selection of the assistance curve required.

This command must be carried out if the computer is replaced or if bar graph 3 left hand side illuminates.

After dialogue has been initialised

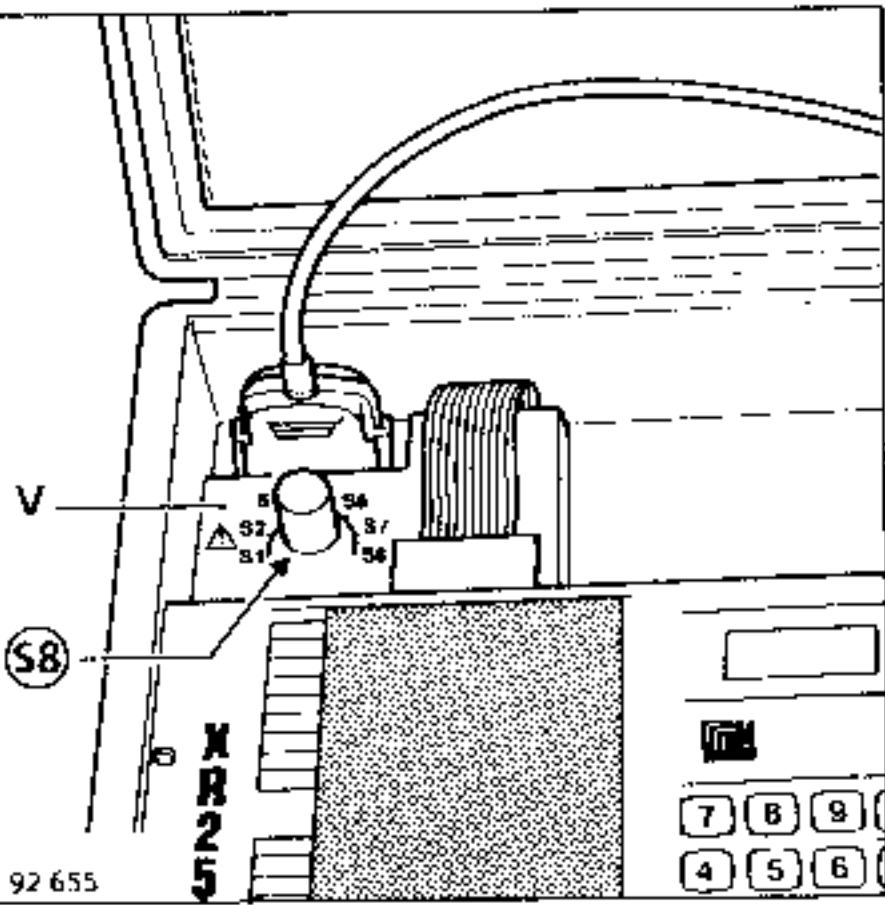
Enter:



# COMMAND MODES

## ERASING THE MEMORY

Connect the XR25 to the vehicle's diagnostic socket and put the ISO selector switch on S8.

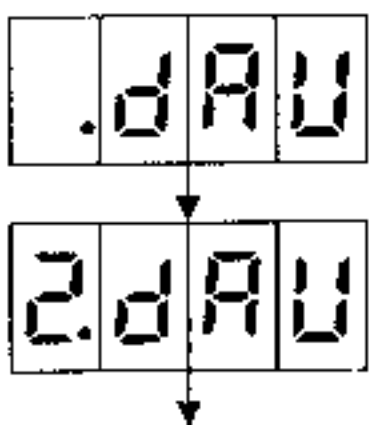


Turn the ignition on but do not start the engine.

Enter :

D 1 9

The central display shows:



Enter :

G 0 \*

The display shows :

EFF

Validate the erase command by pressing

\*

The display then shows :

LES

The memory has been erased.

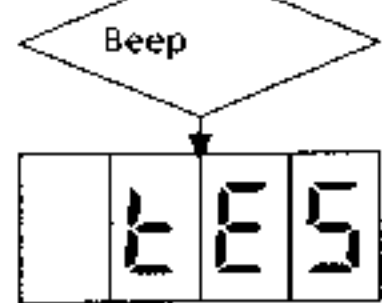
Validate the end of the test by entering:

G 1 3 \*

The display shows :

Fin

Then :



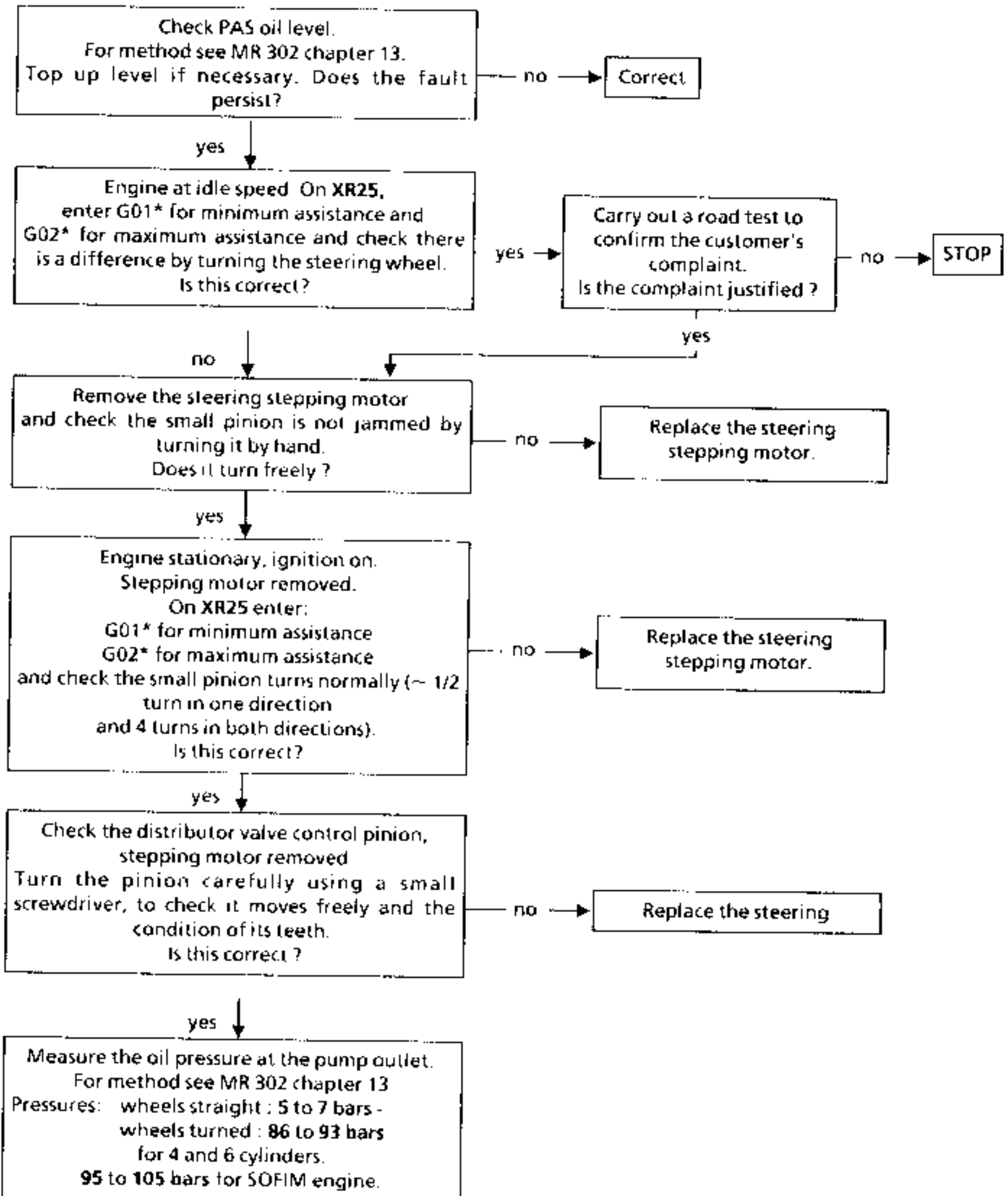
When leaving the fault finding mode, the system is reinitialised and the warning light is illuminated for 2,5 seconds (equivalent to starting off again).



## FAULT FINDING

## VPAS DOES NOT OPERATE CORRECTLY

(Warning light and bar graphs on XR25 are not illuminated)



## FAULT FINDING

### Looking for causes of faults

The two main faults are :

- lack of assistance when parking,
- excess assistance at high speed.

## CHECKING CONTROLS

Use the command modes G01\* and G02\* on the XR25 to check the variation in assistance.

If no fault is found on the XR25 and there is still a lack of assistance and no variation (or very little) when using the command modes, carry out a hydraulic test as for a conventional constant assistance steering unit

## HYDRAULIC TEST

The main fault is lack of assistance.

The causes of the lack of assistance can be determined by checking the oil pressure during the following operations :

- no action at the steering wheel,
- full lock on.

### 1 - No action at the steering wheel

Whatever the engine speed, the pressure should not exceed 5 to 7 bars.

- At idle speed : pressure too high  
➔ valve faulty.
- Under acceleration : pressure too low  
➔ regulator faulty.

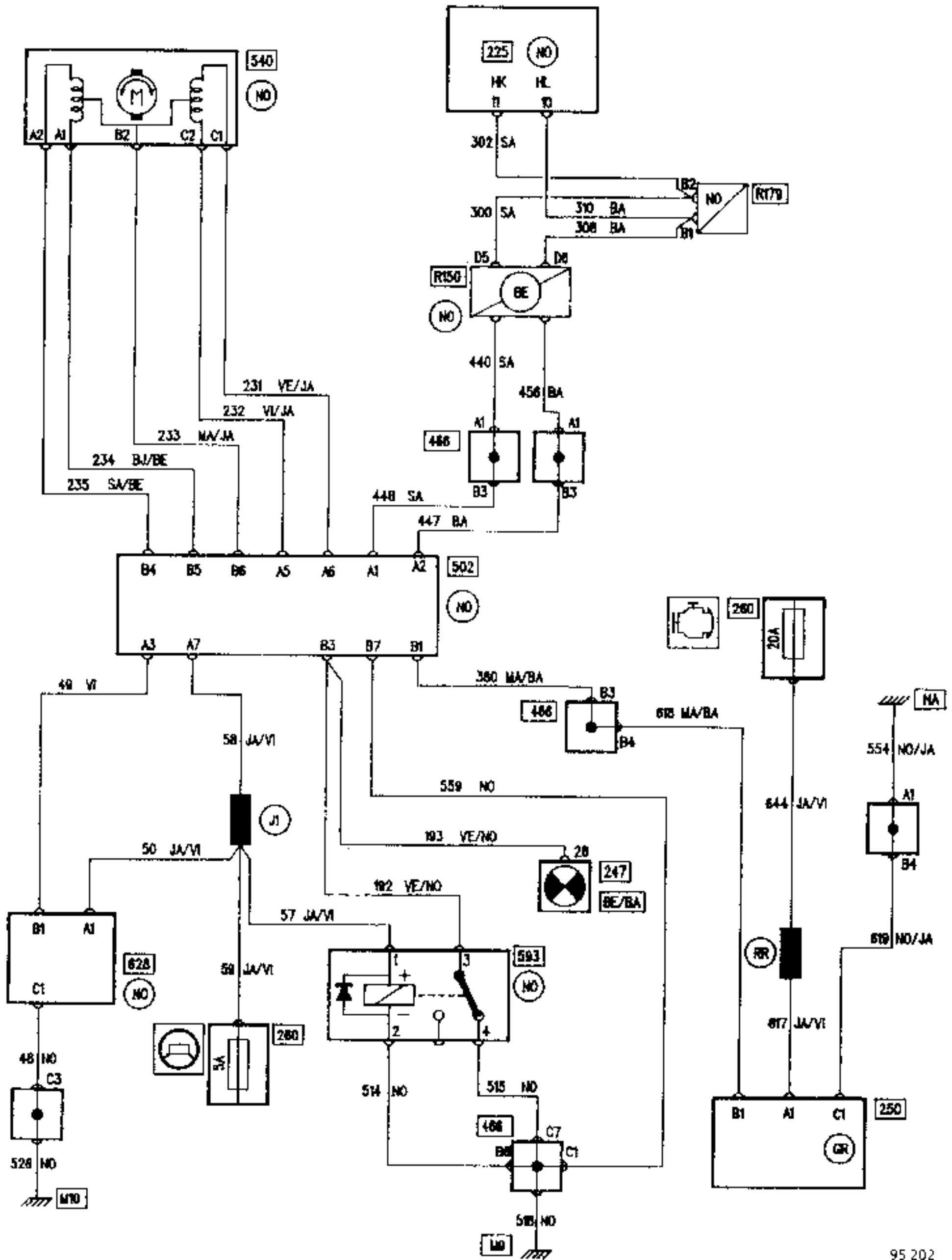
### 2 - Full lock on

This operation should not be carried out for too long to avoid overheating the oil.

Keeping pressure on the steering wheel the oil pressure should be within a certain range (see chapter 13).

When turning from one side to the other, the pressure should not vary by more than 5 bars.

- Pressure too low and pressure gauge needle unsteady :  
➔ regulator faulty.
- Pressure too low but pressure gauge needle steady :  
➔ belt slack,  
valve faulty,  
internal leak in valve.
- Difference in pressure for two sides :  
➔ valve faulty,  
➔ slide valve faulty



## WIRING DIAGRAM KEY

## COMPONENTS

225	Diagnostic socket
247	Instrument panel
250	Speed sensor (secondary)
466	Shunt unit
502	VPAS computer
540	VPAS motor
593	VPAS safety relay
628	Main speed sensor (VPAS)
260	Fuse box

## CONNECTIONS

R150	Passenger compartment / FLH wing
R179	ABS/FLH wing

## EARTHS

M9	FRH pillar earth
M10	FLH pillar earth
NA	FRH pillar electronic earth

Resistance of a stepping motor coil between common winding and phase input :  $\approx 40 \Omega$ .

Safety relay coil resistance :  $\approx 60 \Omega$

**NOTE:** never disconnect the computer when the circuit is under voltage.

Testing of earths and resistances should be carried out with the battery disconnected.

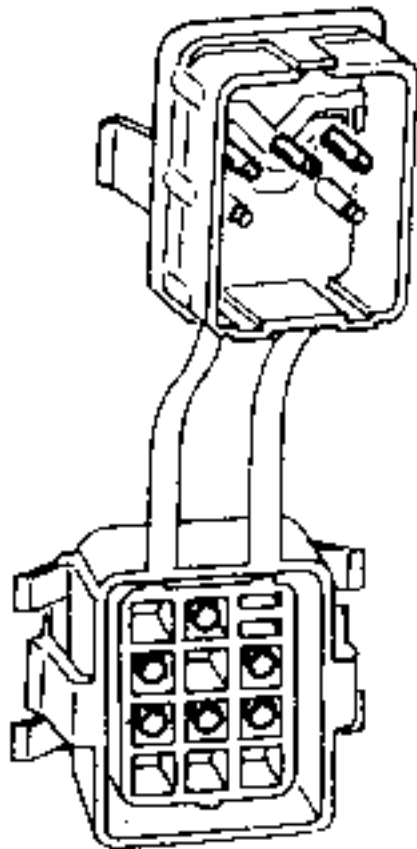
ALLOCATION OF COMPUTER CONNECTOR  
TERMINALS (13 TRACK)

N° track	Allocation
A1	Diagnostic line K
A2	Diagnostic line L
A3	Main speed signal
A5	Stepping motor phase
A6	Stepping motor phase
A7	+ feed
B1	Secondary speed signal
B2	Not used
B3	Fault warning light
B4	Stepping motor phase
B5	Stepping motor phase
B6	Stepping motor phase common
B7	Earth

## WIRING DIAGRAM KEY

## Allocation of diagnostic socket terminals

Track N°	Allocation
1	Fault finding for AT A4
2	Electric earth
3	Foolproofing
4	Not used
5	Not used
6	+ 12 V before ignition
7	AT memorised faults erasure info
8	Injection memorised faults erasure info
9	Fault finding for injection
10	Diagnostic line L
11	Diagnostic line K
12	Not used

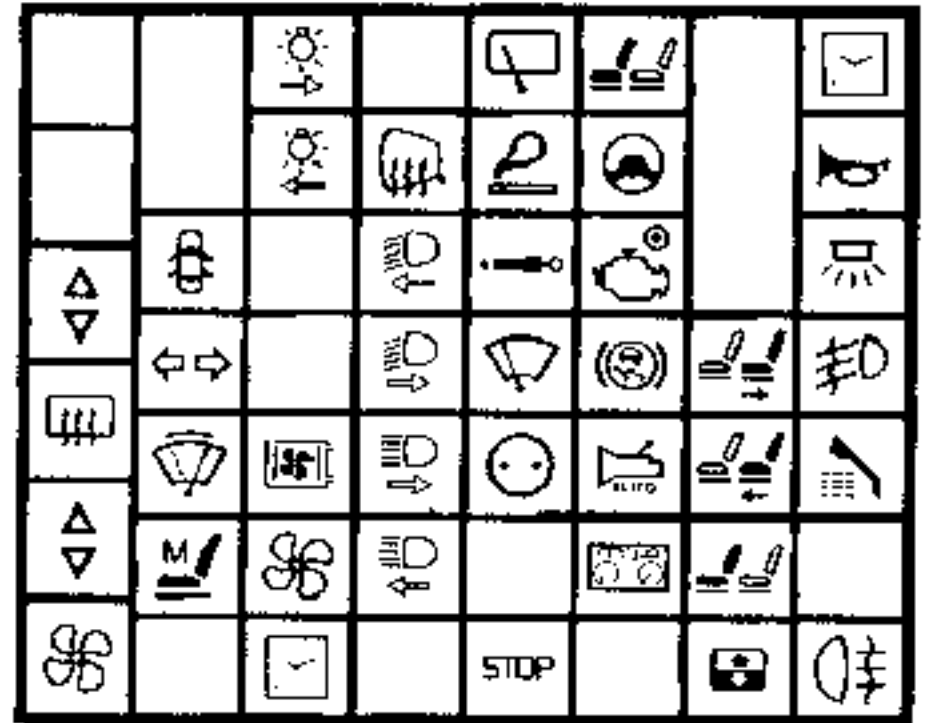


1	2	3
4	5	6
7	8	9
10	11	12

88 113

## FEED

The computer is fed + APC by a specific 5 A fuse located in the passenger compartment on the driver's side.

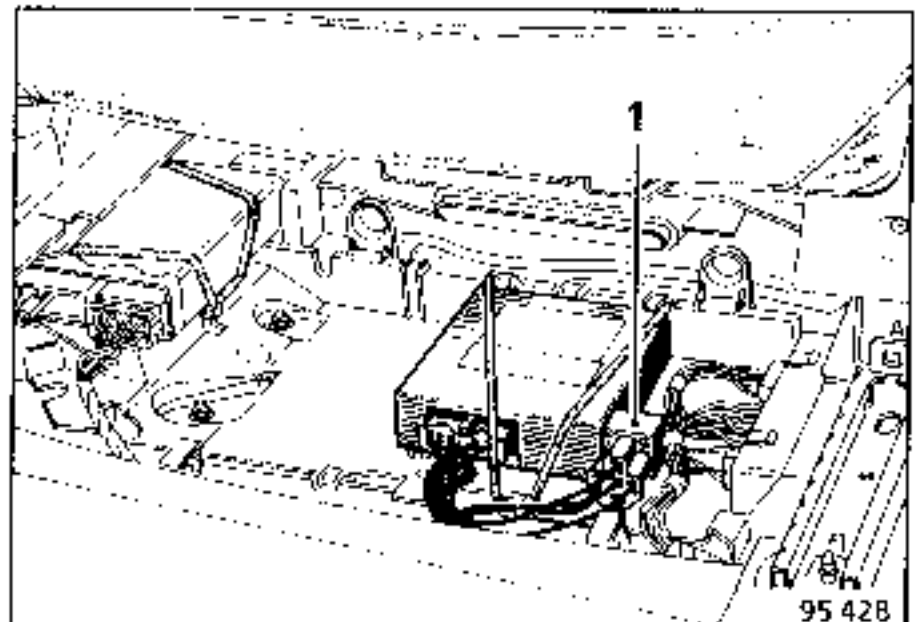


95 041-1



- 5 A Variable power assisted steering
- 10 A Instrument panel (warning lights)
- 20 A + after ignition motor

If the fuse is blown the computer and actuator are no longer fed : the assistance level remains at the level the moment the fault occurred. A safety relay(s) (1) allows the warning light to be illuminated (located next to the computer).



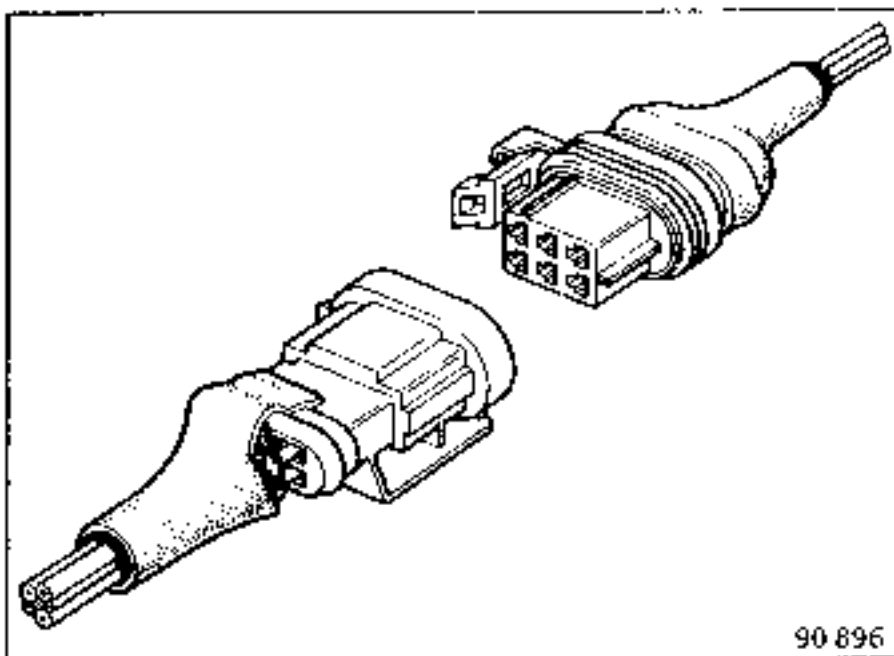
95 428

**ATTENTION :** never test continuity or resistances using a measuring probe on the clips of the connectors linking the vehicle wiring to the sensor wiring (main and secondary) and for the stepping motor.

An intermediate wire must be made.

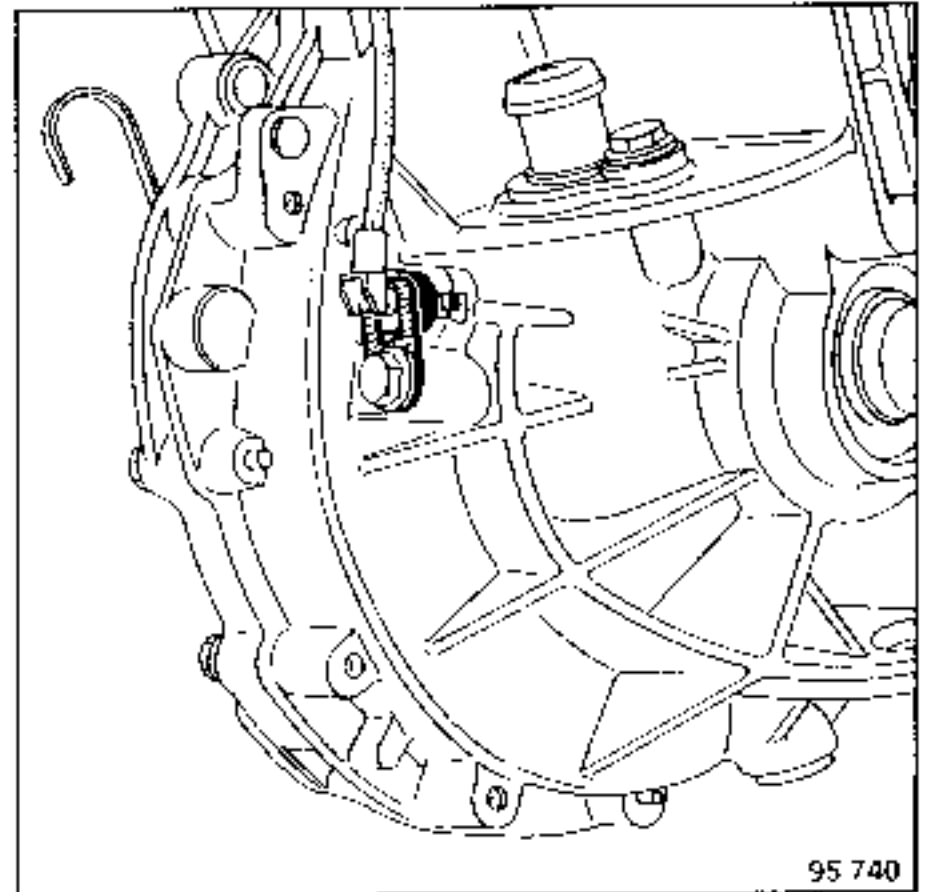
Connectors:

6 tracks	electrical connector 77 03 197 812
	electrical connector 77 03 197 259
3 tracks	electrical connector 77 03 197 810
	electrical connector 77 03 197 280

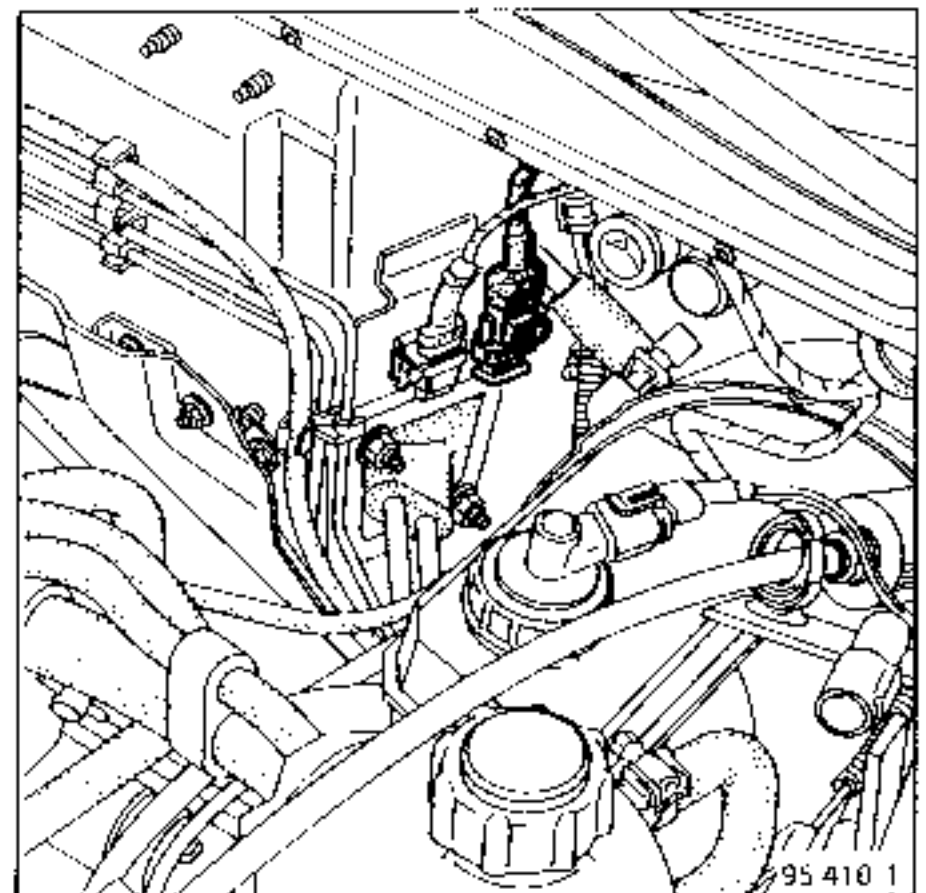


**NOTE:** if these recommendations are not observed, electrical connection problems may be caused.

When replacing the main speed sensor ensure the sensor is correctly positioned and the mounting fork is correctly mounted on the axle housing.



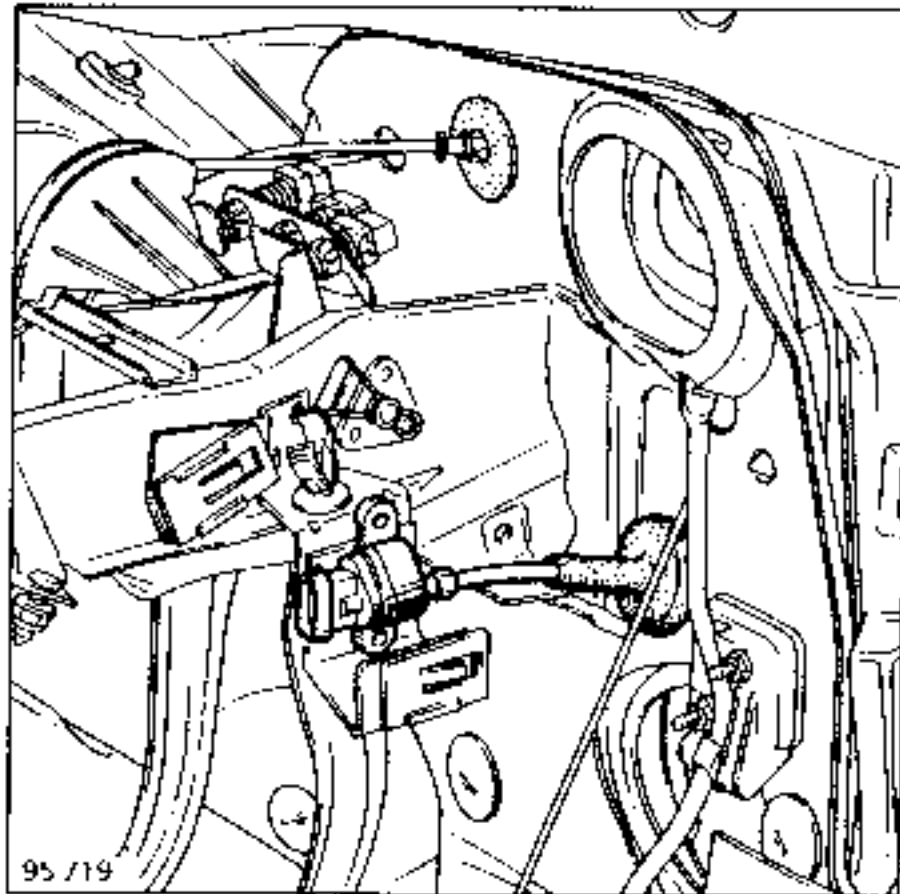
The main speed sensor connector is located on the right hand side of the brake servo.



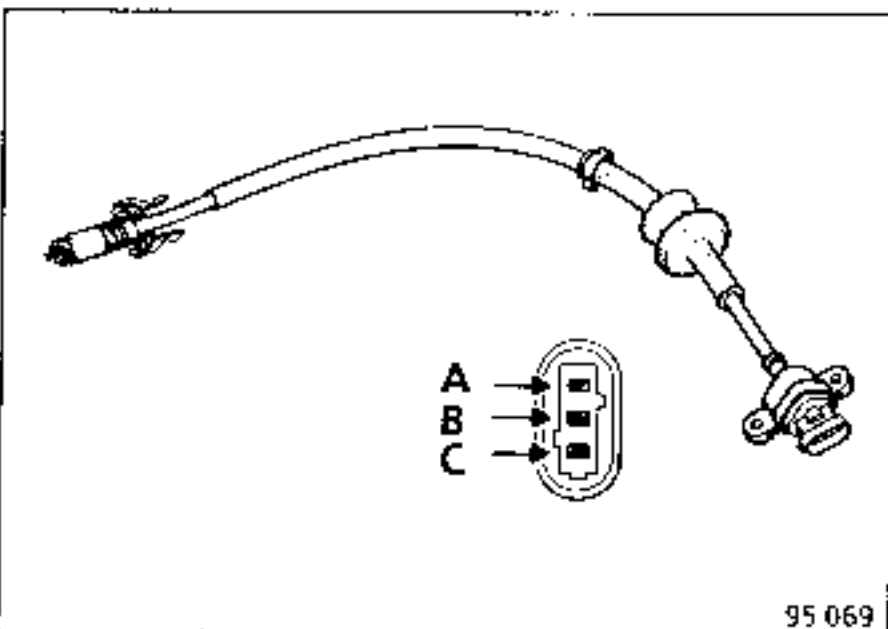
## FEED

The secondary speed sensor connector (250) which is different depending on the type of instrument panel fitted is located:

- a) on the right hand side of the steering column : electronic instrument panel speedometer



Allocation of connector tracks:



- A Feed  
B Signal  
C Earth

- b) At the end of a pipe connected to the instrument panel for mechanical speedometer

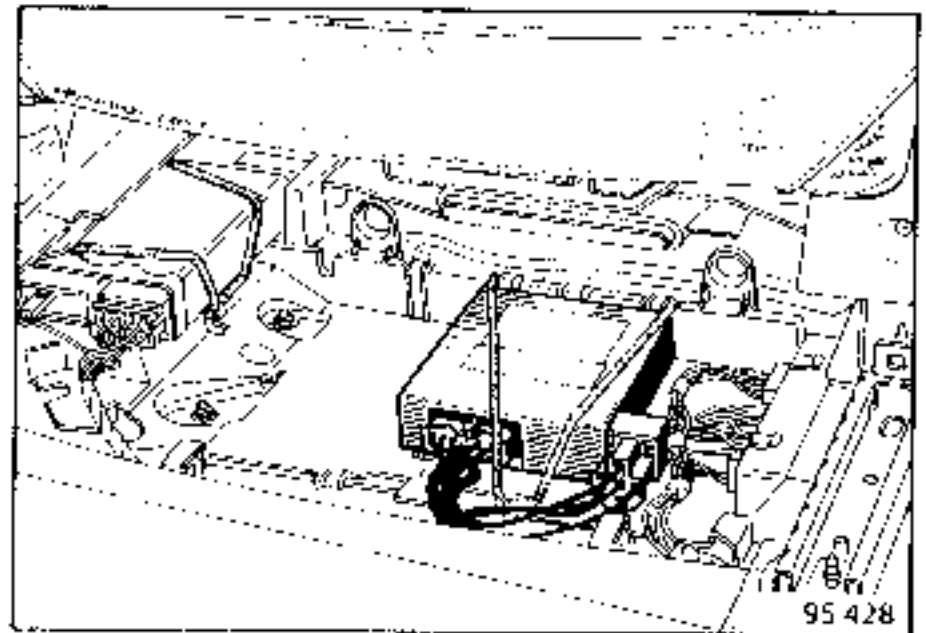
## COMPUTER

### REMOVAL

Move the right hand front seat as far forward as possible.

Remove the two mounting bolts from the plastic cover and remove the cover

Disconnect the connector and remove the computer



### REFITTING

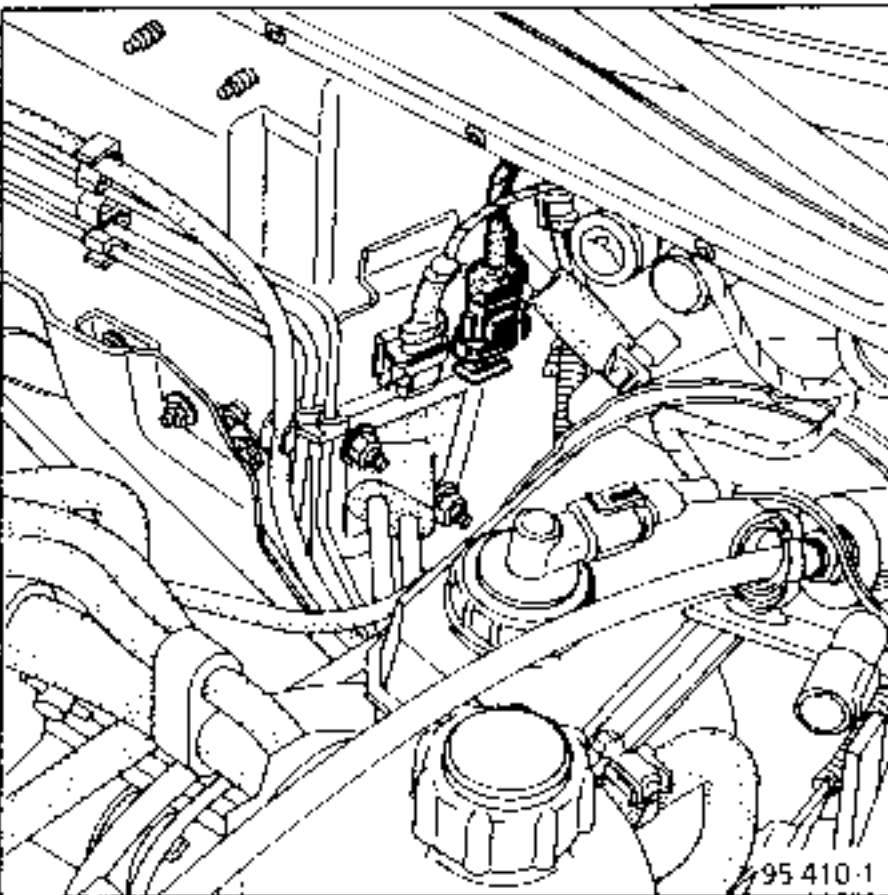
Refitting is the reverse of removal. Ensure the connector is correctly connected.

Enter **G74\*\*** to programme the selection then **G13\*** to leave the fault finding mode.

## STEPPING MOTOR

### REMOVAL

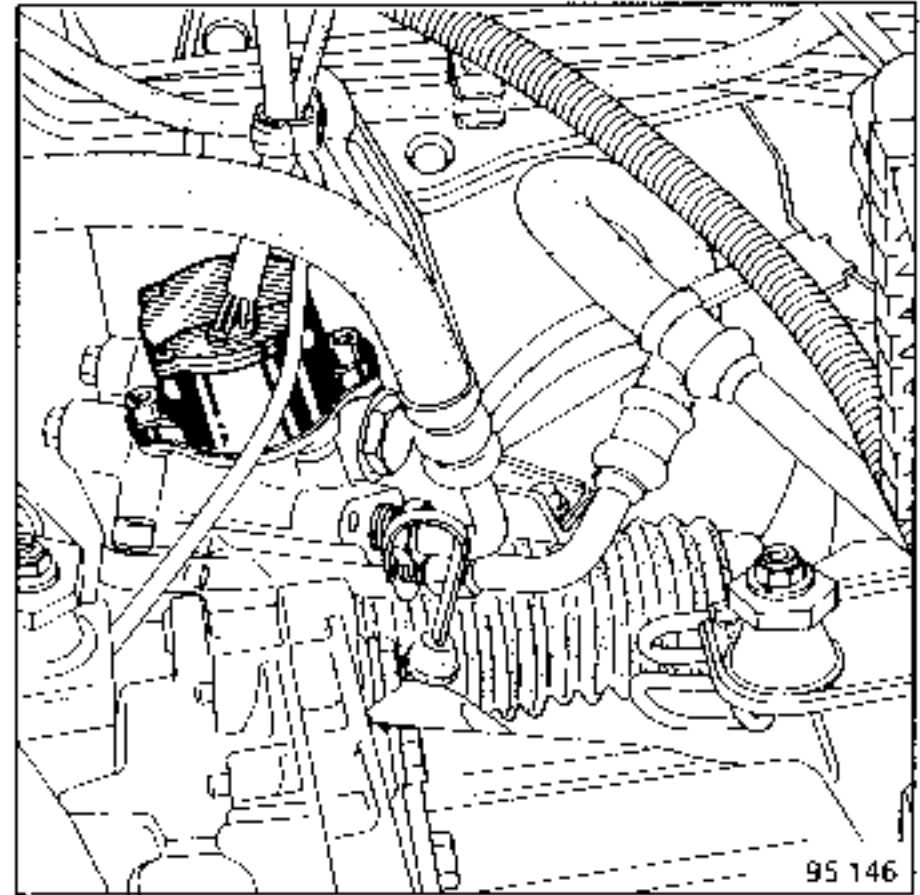
Disconnect the connector on the right hand side of the brake servo



Remove the two bolts mounting the motor on the valve and remove the motor.

### REFITTING

Check the 'O' ring is present and lubricate it. Refit the stepping motor ensuring no foreign bodies enter the valve during the operation. Take care to ensure the wiring and connections are properly positioned and connected.



Using XR25, engine at idle speed enter **G01\*** for minimum assistance and **G02\*** for maximum assistance, then check by turning the steering wheel that there is a variation in assistance.