599 GTB FIORANO



01.01 Consultation

Consulting the manual

The manual is divided into sections, with each section identified by a different letter.
Each section is divided into chapters, identified by the letter indicating the relative section followed by a sequential number.
Each chapter is, in turn, divided into paragraphs, identified by the letter indicating the relative section, the chapter number and a sequential number, separated from the former by a point.
This format is used for all references to chapters or paragraphs in other sections.
The chapter or paragraph containing the notes relative to a certain topic may be identified by consulting the table of contents at the beginning of each section.
To illustrate the topic more clearly, the text is supplemented by illustrations in which the elements described are highlighted and/or identified with numerical references.

01.02 Updates

Updating

The manual will be subject to periodic updates to incorporate any modifications made to the vehicle and the introduction of new versions.

01.03 Symbols

The safety symbols illustrated below are used to draw the attention of the operator to injury hazards, to indicate operations which may entail a risk of damage to the vehicle, or to provide useful information for a specific operation.

IMPORTANT
Failure to observe the instructions in this note may be dangerous and result in serious injury to the operator and/or to persons in the vicinity.

IMPORTANT
Failure to observe the instructions in this note may result in irreparable damage to the vehicle and/or its parts.

ENVIRONMENTAL SAFETY
This symbol indicates recommendations for environmental safety.

NOTE
Indicates a note of a generic nature providing the operator with useful information concerning the operation being performed.

REFERENCE
Refers to the paragraph or chapter in which the relative operation is described.

01.04 Glossary

N_2

Nitrogen

CO

Carbon Monoxide

CO_2

Carbon Dioxide

NO_x

Nitrogen Oxide

HC

Hydrocarbons

Standard

Indicates reference value

Service limit

Indicates the limit value beyond which a part or coupling must be serviced to bring it back within the prescribed tolerance range

Right hand and/or left hand

The terms right hand and/or left hand indicate the right hand and/or left-hand side of the vehicle with respect to the front of the vehicle

ABS

Anti Blockier System
ABS prevents wheel lock-up under braking to maintain directional control over the vehicle.

A.C.

Air conditioning

ASR

Antriebs Schlupf Regelung
Wheelspin control under acceleration.

AVH

Automatic Vehicle Holding
Supplementary function of the electric parking brake (EPB):releases the brake shoes and brake pads at different times. The result is optimised brake release behaviour, assisting the driver.

CAN

Controller Area Network
Communication line between ECUs.

CST

Control Stability Traction
Stability and traction control

DCT

Dual Clutch Transmission
Dual clutch transmission. Each of the two clutches is associated to a different part of the gearbox, with one part engaging even gears and the other engaging odd gears.

E-DIFF

Electronic Differential
Electronically controlled differential integrated with the EF1-Trac traction control system.

EBD

Electronic Brake Force Distribution

Electronic brake force distribution system.

ECU

Electronic Control Unit
Electronic control unit

EF1-TRAC

Traction control integrated with Hy-Kers system.
Excess torque produced by the engine is used by the Hy-Kers system to charge the high voltage battery. The system is self-adaptive and calculates the maximum grip available by constantly monitoring the relative speeds of the wheels.

EPB

Electric Parking Brake
Electric parking brake, with an electric motor actuating the rear brake shoes controlled by an electronic control unit.

ESC

Electronic Stability Control
The ESC function is implemented by the two systems: VDC and EF1-Trac

F1-Trac

Traction control system based on race technology.
The system is self-adaptive and calculates the maximum grip available by constantly monitoring the relative speeds of the wheels.F1-Trac correlates real data against a vehicle dynamics model stored in the control system and optimises the behaviour of the vehicle by controlling engine torque delivery.

FPB

Ferrari Brake Prefill
A system that eliminates the gap between the brake pads and discs by applying slight pressure to the brake system as soon as the accelerator pedal is released when imminent braking is expected. The result is improved brake response.

HV

High Voltage
High voltage electrical system.

HVB

High Voltage Battery
480 Volt high voltage battery situated under the passenger compartment, which accumulates the energy necessary to power the Hy-Kers hybrid system.

HPU

Hybrid Power Unit
Power unit of the Hy-Kers hybrid system, consisting of a DC-DC inverter and converter.

LC

Launch Control
Performance start strategy.

LV

Low Voltage
Low voltage electrical system.

PTU

Power Transfer Unit
Transmission power unit.

RHT

Retractable Hard Top
Retractable hard top.

TPMS

Tyre Pressure Monitoring System
System monitoring the pressure and temperature of the vehicle's tyres. An ECU receives data transmitted by special sensors installed on the interior of the wheel rims near the valves. Tyre pressure and temperature information and the relative messages are displayed on the instrument panel.

VDC

Vehicle Dynamic Control
Vehicle dynamics control using the brake system and engine torque.

4WD

4 Wheel Drive
4 wheel drive system.

02.01 Manual user

Manual user

This publication was produced by the FERRARI Technical Service Department as an informative support tool to assist the operator in performing work on FERRARI cars.
This manual is specifically intended for expert service staff, with the knowledge and skills necessary to perform all maintenance and repair operations on FERRARI vehicles correctly and safely.
Carrying out the aforementioned operations without the necessary knowledge and skills will cause damage to the vehicle and may expose the operator and the user of the vehicle to danger.

02.02 Operating procedures

Operating procedures

Service staff must observe all instructions and warnings, avoiding improper operating procedures or using unsuitable tools which may pose a risk to the safety of personnel and the vehicle.
In addition to the guided diagnostic procedures performable with the FERRARI SD-3 tester, each section of the manual contains diagnostic procedures for identifying failures of different vehicle components.
Evaluating the impressions of the user is of vital importance, formulating appropriate questions to clearly identify the symptoms of the problem.
Once the cause has been identified, plan the job by consulting the relative informative notes concerning the tools necessary, the reference data for servicing and disassembly and reassembly procedures given in the manual.
Following the methods described in this manual precisely for each job ensures the safety of the user and the quality of the vehicle.

02.03 Using tools and spare parts

Using tools and original spare parts

FERRARI supplies workshops authorised to repair its vehicles with specific tools to ensure that repair work is carried out correctly and safely.
Carrying out any work without using specific FERRARI tools, or using alternative tools, may cause damage to relative component and/or system, voiding the warranty.
Always use original FERRARI spare parts, consulting the relative spare parts catalogue.
In addition to voiding the warranty, using non original components may damage the vehicle and expose the user to danger.

02.04 Warranty

FERRARI guarantees its vehicles for 3 years from the date of delivery.
The warranty may be extended if required. For details, see the specific documents "Power brochure" and "Power warranty handbook". For more information, contact the Ferrari Technical Service Department.
Carrying out any work without using specific FERRARI tools, or using alternative tools, may cause damage to relative component and/or system, voiding the warranty. Always use original FERRARI spare parts, consulting the relative spare parts catalogue. In addition to voiding the warranty, using non original components may damage the vehicle and expose the user to danger.
During this period, the appropriate form must be filled out and the S.T. Schedule, which indicates the time specified by FERRARI for the operation, must be consulted for any work on the vehicle.

02.05 Tightening torques

For the fastening of main vehicle components, Ferrari has defined three tolerance classes relative to the rated torque value: The tolerance class is shown in the summary paragraphs concerning tightening torques, at the beginning of each section and/or at the beginning of each paragraph.

Class	
A	±5 %
B	±10 %
C	±20 %

03.01 Safety at work

Prevention measures and protection devices

When carrying out particularly hazardous or difficult service or repair operations, the service staff must take all precautions to prevent personal injury or damage to the vehicle.
Always wear protective gloves when working on sharp or hot parts, or when handling dangerous parts. In the latter case, we recommend protecting the eyes with appropriate safety goggles.
Prevent sparks or open flames when working on the fuel system as fuel and fuel vapours are highly flammable.

03.02 Hazards

Exhaust system and engine	
Danger	**Precautions**
As the vehicle is used, the components of the exhaust system and the engine itself reach very high temperatures and remain hot long after the engine is switched off.	Always wear insulating gloves when handling these components, or wait as long as necessary for the components to cool.

Electric cooling fans	
Danger	**Precautions**
After the vehicle is stopped with a warm engine, the electric cooling system fans may activate without warning.	Use particular caution when working near these components.

Petrol	
Danger	**Precautions**
The petrol contained in the fuel tank and the entire fuel system is highly flammable and, in certain conditions, potentially explosive.	Smoking, sparks and naked flame must not be allowed in the work area or the immediate vicinity. Keep out of reach of children! Always work in a well ventilated area. Never dispose of petrol into the environment!

Used oil	
Danger	**Precautions**
Prolonged skin contact with used oil may cause severe skin disease.	Keep out of reach of children! To prevent risks, always wear protective gloves and/or wash any areas that have come into contact with used oil thoroughly with soap and water. Never dispose of used oil into the environment!

Hydraulic fluid	
Danger	**Precautions**
The fluid contained in the brake, clutch and power steering systems is corrosive to plastic, rubber and paintwork and is extremely harmful in the event of contact with the eyes and skin.	In the event of contact, wash the affected area with plenty of running water. To prevent risks, always wear protective eyewear and gloves. Keep out of reach of children! Never dispose of used hydraulic fluid into the environment!

Coolant	
Danger	**Precautions**
The cooling circuit contains fluid at high temperature and pressure: contact with hot coolant may cause severe burns. Coolant may cause irritation in the event of skin contact and is poisonous if swallowed.	Keep out of reach of children! Never dispose of coolant into the environment!

03.03 Dangerous emissions

Exhaust gas	
Danger	**Precautions**
The engine must be kept running for certain maintenance procedures. Exhaust gases contain carbon monoxide, a highly toxic gas which may even cause death in the event of prolonged inhalation.	Never run the engine in a closed space; preferably work outdoors or use exhaust extraction systems.
The emissions control devices installed were necessary in order for the vehicle to obtain type approval allowing the vehicle to be driven legally on public roads in compliance with emissions and noise legislation. Removing or tampering with these devices is prohibited by law.	Never puncture the exhaust silencers or remove any of their internal elements. Never use the vehicle with any of these devices removed.
Each of these devices bears a marking or label indicating the type approval number obtained.	Never replace any of the original devices with devices without type approval. These devices must also be kept in proper working order, carrying out all the procedures indicated in the maintenance schedule.

Battery	
Danger	**Precautions**
As the battery is charged, gases are released which are potentially explosive in the event of contact with sparks or naked flame.	Always charge the battery in a well ventilated area.
The battery also contains sulphuric acid as an electrolyte, which may cause irritation in the event of skin contact.	Always wear appropriate protective garments and a face mask when handling electrolyte.

04.01 Identification label locations

Identification label locations



A - Assembly number label
B - Gearbox type and number plate
C - Punched engine type and number
D - Punched chassis number
E - Vehicle identification label
F - Chassis number label

04.02 Assembly number

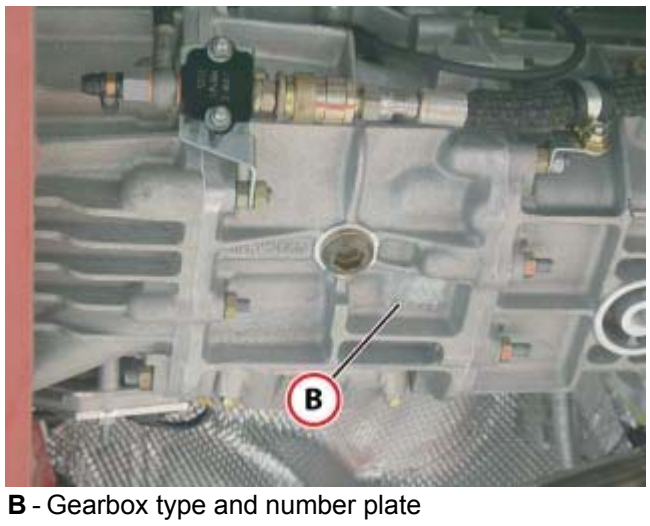
Assembly number



A - Assembly number label

04.03 Gearbox type and number

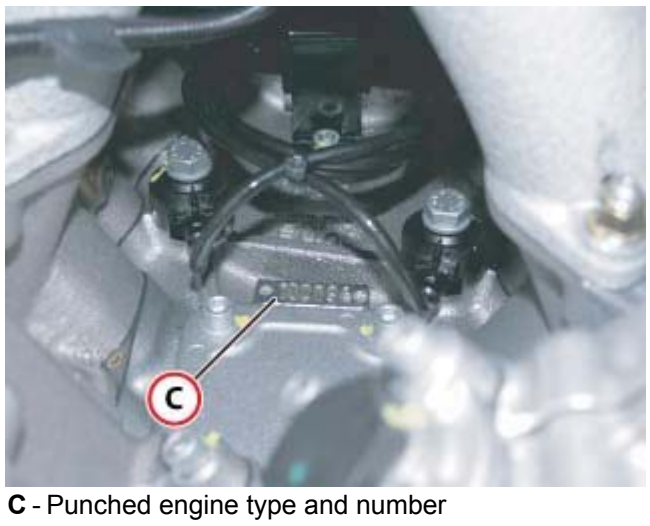
Gearbox type and number



B - Gearbox type and number plate

04.04 Engine type and number

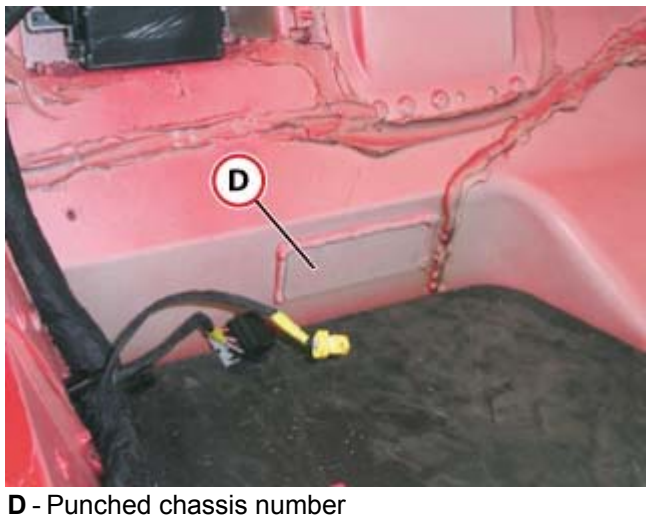
Engine type and number



C - Punched engine type and number

04.05 Punched chassis number

Punched chassis number



D - Punched chassis number

04.06 Vehicle identification

Vehicle identification



E - Vehicle identification label

04.07 Chassis number

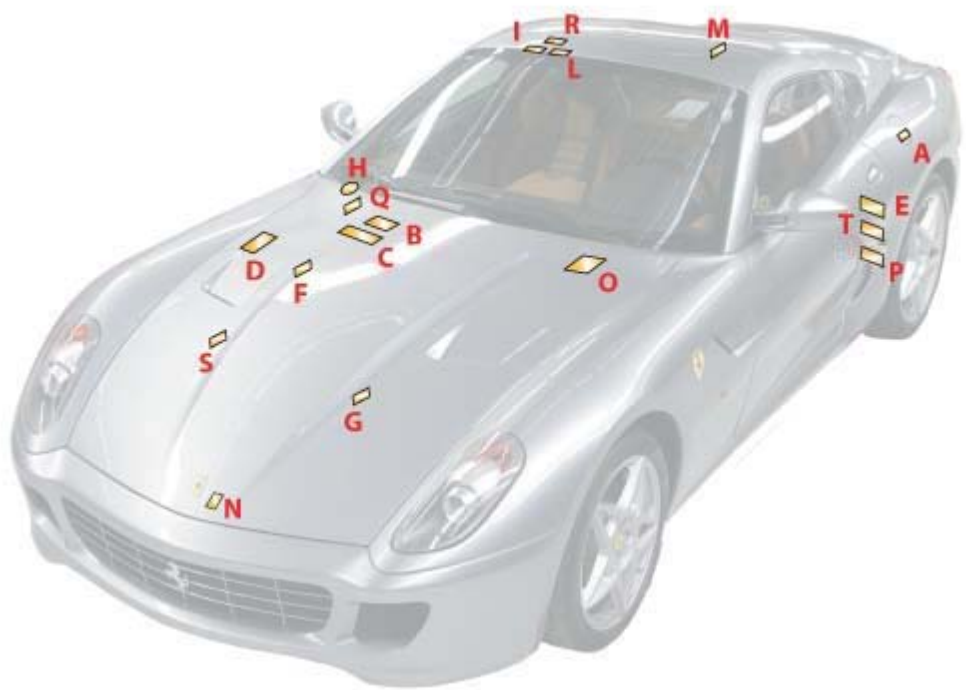
Chassis number



F - Chassis number label

04.08 Label locations

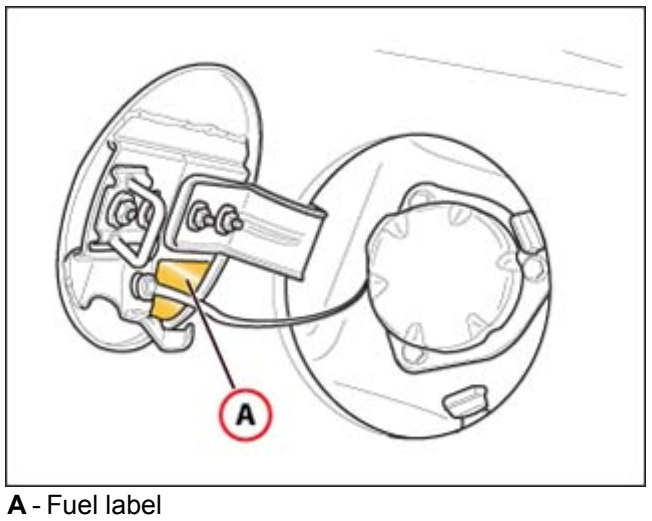
Label locations



A - Fuel label
B - Paintwork label
C - Engine oil level check label
D - Lubricant label
E - Tyre pressure label
F - Antifreeze label
G - "High voltage" label
H - 'No children allowed with airbag' warning label
I - Passenger airbag deactivation label
L - Airbag warning label
M - Battery master switch instruction label
N - Low beam type approval
O - EEC type approval
P - Tyre pressure monitoring system identifier label
Q - Airbag service interval label
R - Airbag warning label
S - Airbag identifier label
T - Reverse rim wheel warning label (for HGTE variant)

04.09 Fuel

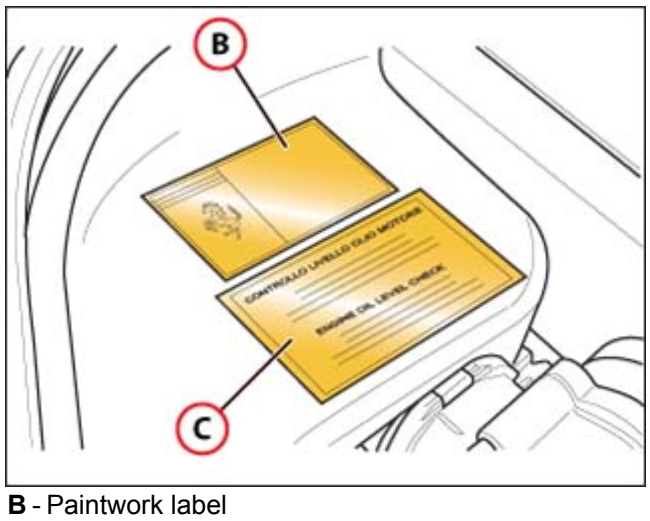
Fuel



A - Fuel label

04.10 Paintwork and engine oil level

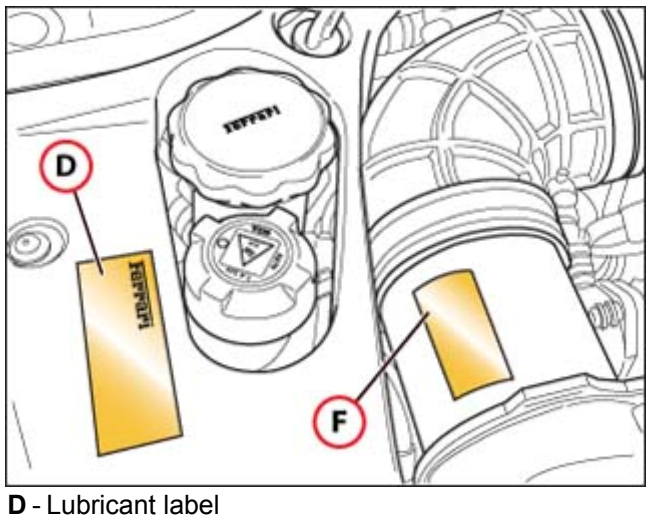
Paintwork and engine oil level



B - Paintwork label
C - Engine oil level check label

04.11 Lubricants and antifreeze

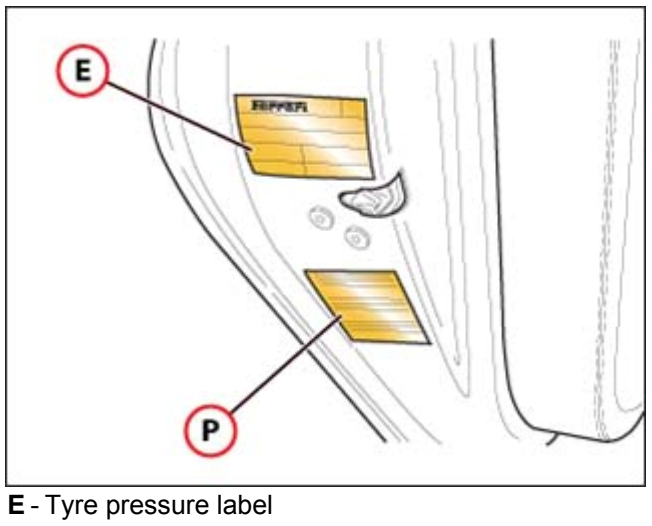
Lubricants and antifreeze



D - Lubricant label
F - Antifreeze label

04.12 Tyre pressure and tyre pressure monitoring system identifier

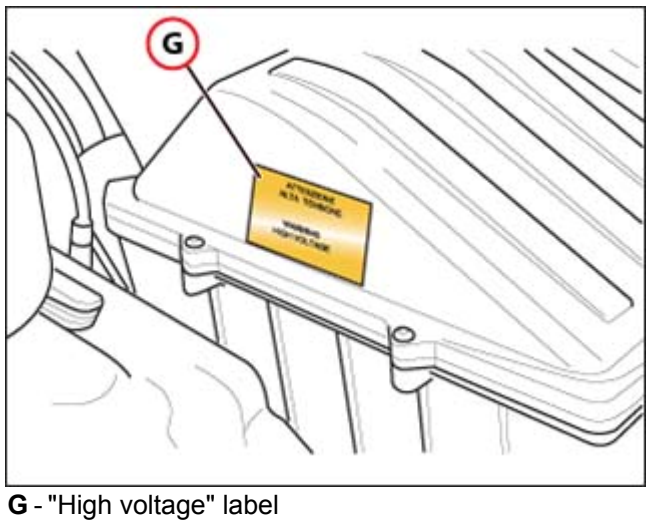
Tyre pressure and tyre pressure monitoring system identifier



E - Tyre pressure label
P - Tyre pressure monitoring system identifier label

04.13 High voltage

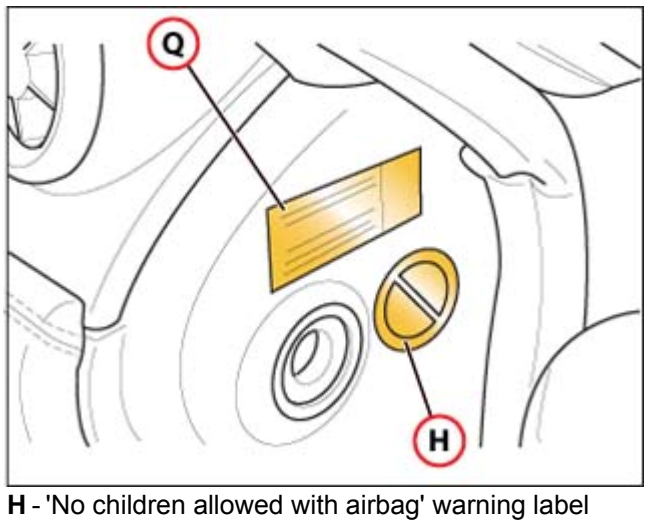
High voltage



G - "High voltage" label

04.14 'No children allowed with airbag' warning and airbag maintenance

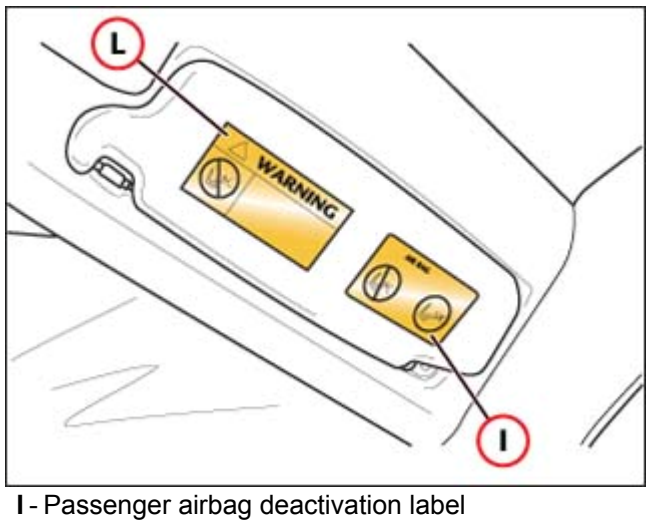
'No children allowed with airbag' warning and airbag maintenance



H - 'No children allowed with airbag' warning label
Q - Airbag service interval label

04.15 Passenger airbag deactivation and airbag warnings

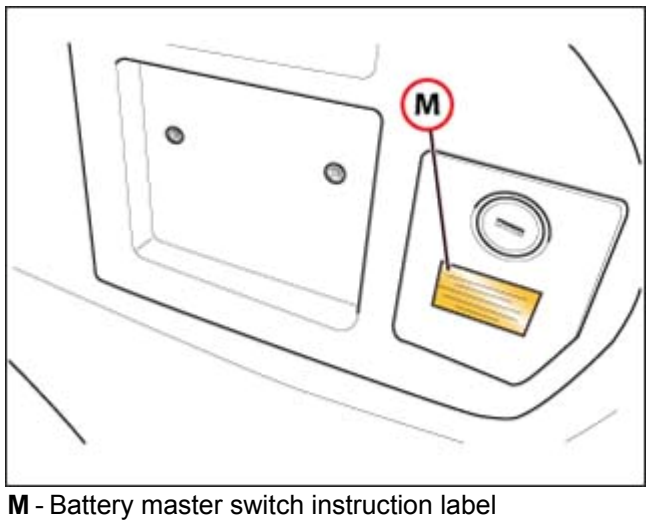
Passenger airbag deactivation and airbag warnings



I - Passenger airbag deactivation label
L - Airbag warning label

04.16 Battery master switch instructions

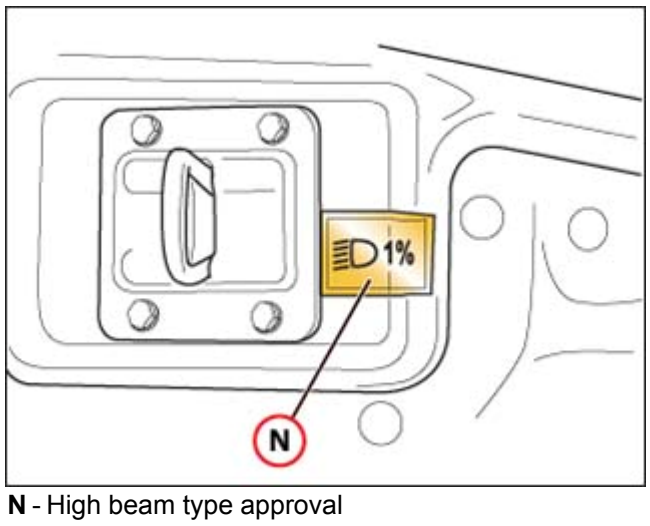
Battery master switch instructions



M - Battery master switch instruction label

04.17 High beam type approval

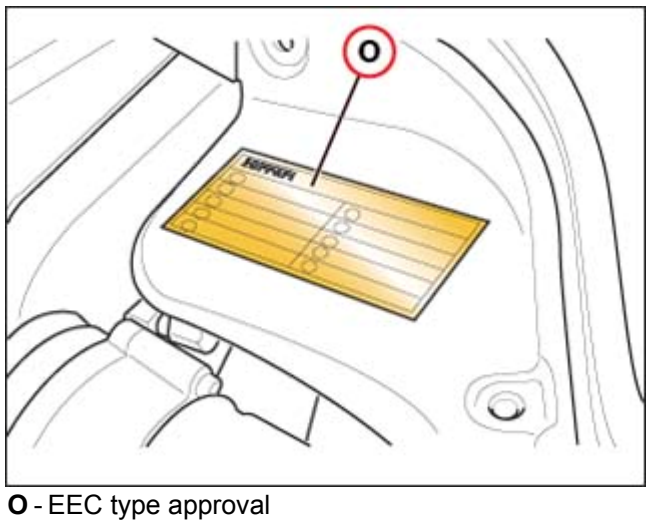
High beam type approval



N - High beam type approval

04.18 EEC type approval

EEC type approval



O - EEC type approval

04.19 Airbag warnings

Airbag warnings



R - Airbag warning label

04.20 Airbag identifier

Airbag identifier



S - Airbag identifier label

04.21 Reverse rim wheel warning (for HGTE variant)

Reverse rim wheel warning (for HGTE variant)



T - Reverse rim warning label

05.01 Performance and consumption

Performance

	0 to 100 Km/h	0 to 200 Km/h	Top speed
F1 gearbox	3.7 sec	11 sec	> 330 Km/h

Consumption and CO_2 emissions (Dir. 1999/100 CEE)

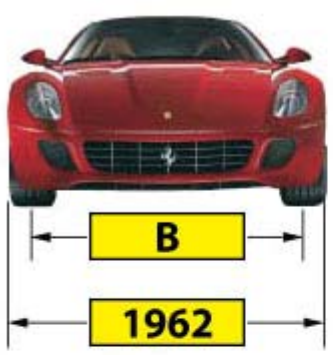
Urban cycle	32.7 l/100 Km 750 g/Km
Extraurban cycle	14.7 l/100 Km 337 g/Km
Combined cycle	21.3 l/100 Km 490 g/Km

REDUCED CONSUMPTION ENGINE

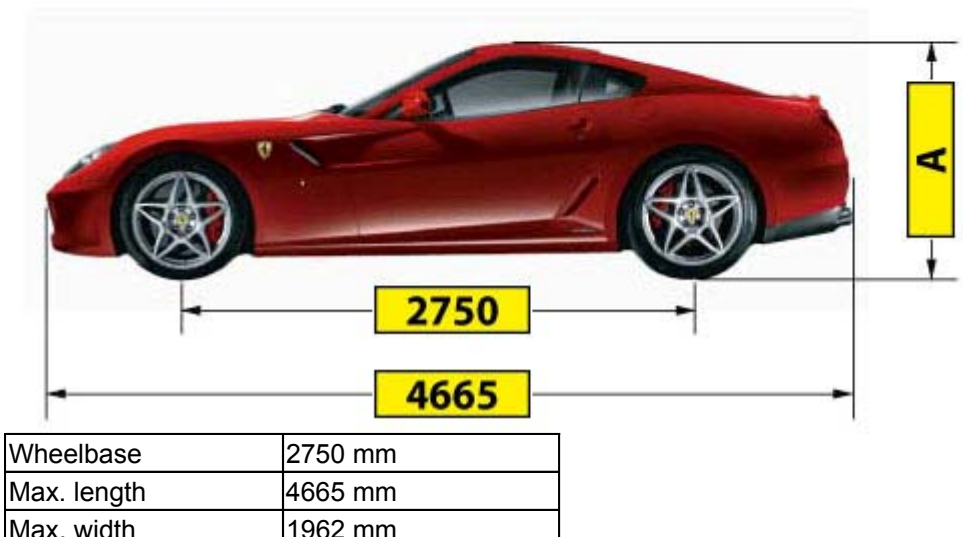
Urban cycle	27 l/100 Km 620 g/Km
Extraurban cycle	12.5 l/100 Km 290 g/Km
Combined cycle	17.9 l/100 Km 415 g/Km

05.02 Dimensions and weights

Dimensions and weights







Wheelbase	2750 mm
Max. length	4665 mm
Max. width	1962 mm
Max. height A	1324 mm
Max. height A (HGTE / 60 F1 variants)	1314 mm
Front track B	1690 mm
Front track B (HGTE / 60 F1 variants)	1697 mm
Rear track	1618 mm
Kerb weight	1715 Kg
Kerb weight (F1 gearbox)	1730 Kg

A1.01 Fluid properties

Cooling circuit (1)	
Protective fluid with antifreeze action for monoethylene glycol-based cooling systems.	50 %
Water	50 %

Windscreen washer/headlight washer system	
Mixture of water and denatured isopropyl alcohol	50 %
Glass cleaner	2 phial

A1.02 Fluids and lubricants table

Parts to be refilled	Product	Quantity
Engine (2) (4)	SHELL HELIX ULTRA SAE 10W-60	12.5 litres
Gearbox and differential (1)	SHELL TF 1055	4.7 litres
F1 gearbox system	SHELL DONAX TX / SHELL SPIRAX S4 ATF HDX	1 litres
Brake and clutch system	SHELL DONAX UB BRAKE FLUID DOT4 Ultra / SHELL BRAKE and CLUTCH DOT4 Ultra	1.5 litres
F1 brake system	SHELL DONAX UB BRAKE FLUID DOT4 Ultra / SHELL BRAKE and CLUTCH DOT4 Ultra	1.5 litres
Cooling circuit (1)	50% solution of SHELL GLYCOSHELL CONCENTRATE / 50% solution of KEMETYL CARIX PREMIUM G48 CONCENTRATE	19 litres
Cooling circuit (FROM Ass.ly Nr. 87867) (1)	50% solution of SHELL GLYCOSHELL LONGLIFE CONCENTRATE / 50% solution of KEMETYL CARIX PREMIUM G30 LONGLIFE CONCENTRATE	19 litres
Hydraulic power steering system (1)	SHELL DONAX TX / SHELL SPIRAX S4 ATF HDX	1 litres
Hydraulic power steering system (FROM Ass.ly No. 97930) (1)	PENTOSIN CHF 11S	1 litres
Fuel tank	95 RON unleaded fuel.	105 litres
Fuel tank - Reserve	95 RON unleaded fuel.	20 litres
A.C. system - Compressor	RL-897	200 ml
A.C. system - Refrigerant	R134a	750±50 g
Windscreen washer/headlight washer fluid tank (3)	Mixture of water and glass cleaner	6.5 litres

Certain products in the fluids and lubricants table are indicated with the names used both prior to and after the change in nomenclature of Shell fluid products.
The technical characteristics of the products themselves, however, have remained unchanged.

This vehicle is compatible with unleaded petrol/gasoline with a maximum ethanol content of 10% (E10).
Using fuels with an ethanol content between 10 and 25% may cause malfunctions.
Using fuels with an ethanol content exceeding 25% may cause permanent damage to the components of the fuel system.

- **(1)** Empty.
- **(2**) Between MIN and MAX **1.5 litres**.
- **(3**) To clean the windscreen, use one phial of glass cleaner in summer and two in winter.
- **(4)** Oil consumption **1.0 - 2.0 Litres/1,000 Km**.

A2.01 Maintenance schedule

Yearly maintenance

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
S1	Change the brake fluid (every 2 years or more frequently if the vehicle is used in heavy duty conditions)
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V1	Visual inspection of state of rubber elements
V7	Checking air filters
Z	Replace the pollen filter
Z3	Replace the airbag (every 15 years)
Z4	Replace seat belts and pretensioners (every 15 years)
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

20,000 Km (12,500 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)

I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

40,000 Km (25,000 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
G1	Replacing ancillary drive belts (if the vehicle is used in demanding conditions, such as city driving with long periods at idle speed or in particularly cold or hot climates, replace the ancillary drive belts more frequently)
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks (this operation must be performed when the oil is drained from the 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen

	washer tanks
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

60,000 Km (37,500 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q	Change the engine oil (replace more frequently if the vehicle is used in heavy duty conditions)
Q1	Cleaning the gearbox oil radiator
Q2	Change the F1 system oil (replace more frequently if the vehicle is used in heavy duty conditions)
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
T1	Checking and changing he hydraulic steering fluid (when the vehicle is in particularly dusty conditions, or on roads spread with sand and/or salt, preferably change more frequently)
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
Z1	Replace the spark plugs (replace more frequently if the vehicle is used in heavy duty conditions)

a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

80,000 Km (50,000 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
G1	Replacing ancillary drive belts (if the vehicle is used in demanding conditions, such as city driving with long periods at idle speed or in particularly cold or hot climates, replace the ancillary drive belts more frequently)
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks (this operation must be performed when the oil is drained from the 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle

c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

100,000 Km (62,500 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

120,000 Km (75,000 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel

E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
G1	Replacing ancillary drive belts (if the vehicle is used in demanding conditions, such as city driving with long periods at idle speed or in particularly cold or hot climates, replace the ancillary drive belts more frequently)
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q	Change the engine oil (replace more frequently if the vehicle is used in heavy duty conditions)
Q1	Cleaning the gearbox oil radiator
Q2	Change the F1 system oil (replace more frequently if the vehicle is used in heavy duty conditions)
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
T1	Checking and changing he hydraulic steering fluid (when the vehicle is in particularly dusty conditions, or on roads spread with sand and/or salt, preferably change more frequently)
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
Z1	Replace the spark plugs (replace more frequently if the vehicle is used in heavy duty conditions)
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

140,000 Km (87,500 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
G2	Replacing the rear oxygen sensors (the four sensors on the front exhaust manifolds and on the exhaust branching, working from underneath the vehicle)

H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks and checking belt (perform this operation while draining oil from 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
S2	Replacing the front oxygen sensors (the four sensors on the exhaust manifolds, working from the engine compartment)
T	Checking and changing he hydraulic steering fluid (when the vehicle is in particularly dusty conditions, or on roads spread with sand and/or salt, preferably change more frequently)
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
Z2	Replacing the active carbon filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

160,000 Km (100,000 Miles)

A	Vehicle reception - preparation
B	Indicator light check
C	External visual brake inspection (pads and discs)
D	Checking handbrake lever travel
E	Lifting the vehicle
F	Internal visual brake wear inspection
G	Removing front section of underfloor
G1	Replacing ancillary drive belts (if the vehicle is used in demanding conditions, such as city driving with long periods at idle speed or in particularly cold or hot climates, replace the ancillary drive belts more frequently)
H	Preparing for drainage from 1st drain cap and draining engine oil (if the vehicle is used in heavy duty conditions, change more frequently)
I	Visual inspection for leaks (this operation must be performed when the oil is drained from the 1st cap)
L	Preparing for drainage from 2nd drain cap and draining engine oil (change more frequently if the vehicle is used in heavy duty conditions)
M	Visual inspection of front and rear suspension components (perform this operation while draining oil from 2nd cap)
N	Replace the engine oil filter and drain the oil (change more frequently if the vehicle is used in heavy duty conditions)
O	Removing rear section of underfloor (this operation is necessary when draining

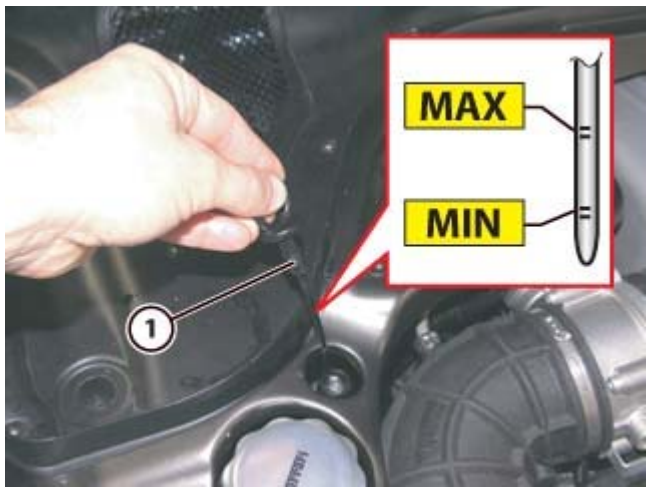
	oil via filters)
P	Visual inspection of the gearbox/differential assembly, fastener screws, mounting bushings and exhaust pipes
Q1	Cleaning the gearbox oil radiator
R	Setting the vehicle on the ground
S	Removing the upper side guards to allow access to brake, water and windscreen washer tanks
T	Filling with engine oil
U	Visual inspection of hydraulic steering, brake, water and windscreen washer fluid levels Visual inspection of lines
V	Replacing air filters (in the event of use on particular dusty roads or roads treated with sand and/or salt, replace more frequently)
V1	Visual inspection of state of rubber elements
Z	Replace the pollen filter
a	Starting the vehicle to check engine oil level
a1	Checking tyre pressure
a2	Checking wheel tightness
a3	Checking the A.C. system
a4	Visual inspection of oil and fluid tightness and of areas subject to contact wear (lines and hoses) Refitting the internal lid trim panels
a5	Carry out final checks (open/close doors, fuel filler cap and seat and seat belt functions)
a6	Check headlight and horn function
a7	Checking fluid level and function of windscreen wiper, windscreen washer and headlight washer systems
a8	Check and lubricate controls and adjustment mechanisms in general, including hinges, doors and lid strikers
b	Lifting the vehicle
c	Visual inspection for leaks
c1	Checking radiators for fouling; clean if necessary
d	Refitting the rear flat undertray section
e	Refitting the front flat undertray section
f	Setting the vehicle on the ground
g	Service counter reset
h	Road test (vehicle test)
i	Car wash and cleaning interiors (optional)

A3.01 Checking engine oil level and changing engine oil and filters

Checking the engine oil level

Check the level with the engine warm.

- A) Run the engine at idle until the oil reaches a temperature of **85 - 90 °C**.
- B) Run the engine at **4500 rpm** for **1 minute**.
- C) Run the engine at idle for **2 minutes** then check the oil level (without turning the engine off).



If 3 minutes elapse before checking the level (rather than 2 minutes, as specified above), repeat steps (B) and (C) before checking the oil level.

- D) Remove the dipstick **(1)** from the tank and check the level: the level must be between the **MIN** and **MAX** notches on the dipstick.

Difference between **MAX** - **MIN** = **1.5 l**.

- E) If level is low, top up with specified oil. Oil level must be between the **MIN** and **MAX** markings on the dipstick.
- F) Run the engine at **4500 rpm** for **1 minute**.
- C) Run the engine at idle for **2 minutes** then check the oil level (without turning the engine off).

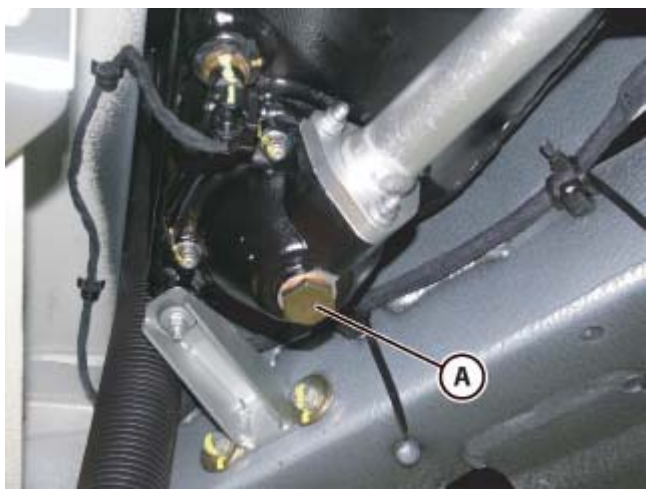
The first oil check was performed between the 2nd and 3rd minutes, therefore the second check must also be carried out at the same time interval.
e.g. If the first check was carried out at approx. 2 min. 30 sec. the second check must also be performed at approx. 2 min. 30 sec.

- H) Remove the dipstick **(1)** from the tank and check the level: the level must be between the **MIN** and **MAX** notches on the dipstick.

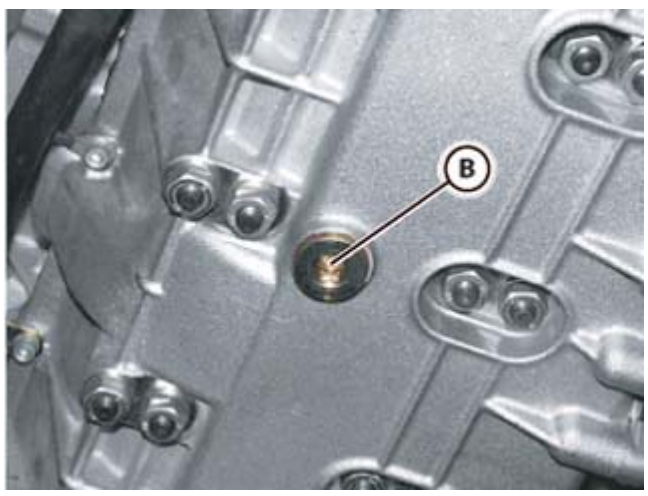
Draining the engine lubrication system

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

➢ Remove the front section of the underfloor (M2.12).



- Unscrew the oil draining cap **(A)** on the tank.



- Unscrew the cap **(B)** on the crankcase sump and drain all the oil.

Replacing the engine oil filter

Tightening torque		**Nm**	**Class**
Oil filter - connector union	Filter	30 Nm	B

The oil filter must be replaced at every oil change.

The engine oil filter is mounted on the oil-water pump, on the right hand side of the engine.

➢ Remove the front section of the underfloor (M2.12).
➢ Drain the engine lubrication system (A3.01).



- Fit the tool **(95971560)** on the filter **(A)** using the wrench (USAG D156).

To illustrate the operation more clearly, the photo was taken without the exhaust branching.

- Turning counterclockwise (as indicated by the arrow), unscrew the engine oil filter **(A)**.
- Remove the filter between the chassis bar and the clutch housing.
- Before refitting the new filter, clean the mating surface on the oil pump.



- Clean the mating surface of the oil filter cartridge.
- Check that the external body of the oil filter cartridge is intact.
- Ensure that the rubber filter cartridge gasket **(1)** seated perfectly, with the round part visible, and that it has no nicks and/or cracks.
- Lubricate the rubber filter cartridge gasket **(1)** with a thin film of engine oil.



- Fit the new oil filter cartridge **(A)** using the tool **(95971560)** and the torque wrench (USAG D156).

To illustrate the operation more clearly, the photo was taken without the exhaust branching.

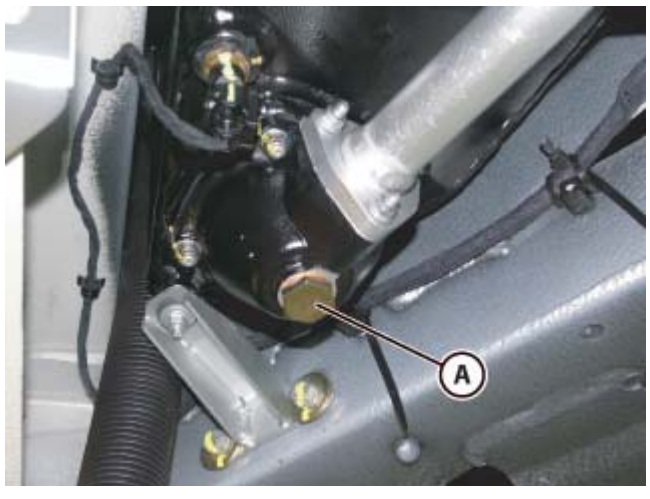
- Turning clockwise (as indicated by the arrow), screw in the engine oil filter **(A)**.
- Tighten the engine oil filter **(A)**.

Tightening torque	**Nm**	**Class**
Filter	30 Nm	B

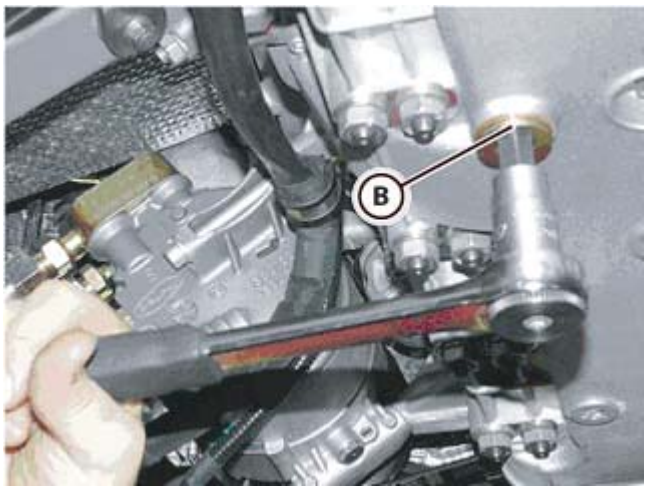
➢ Fill the engine lubrication system (A3.01).
➢ Refit the front flat undertray section (M2.12).

Filling the engine lubrication system

Tightening torque		**Nm**	**Class**
22 mm threaded cap for oil orifices on crankcase	Threaded cap	60 Nm	B



- Screw the lower cap **(A)** onto the engine oil tank.



- Always replace the cap seal **(B)** with a new one
- Tighten the cap **(B)** on the oil sump.

		
Tightening torque	**Nm**	**Class**
Threaded cap	60 Nm	B



- Unscrew the cap **(C)** on the oil tank and remove.

- Fill the system with **11.7 l** of the specified oil.

The quantity of oil required may vary slightly relative to the amount indicated for filling the tank when empty; this is due to unavoidable pooling within the system.

Refill slowly and do not exceed the reference notches on the dipstick.

- Fully tighten the oil filler cap on the tank.
- Start the engine and leave running at idle speed to reach a temperature of **95°C** (approx. 10 minutes after starting).

PAO additive must be added to the lubrication circuit at each engine oil change.

- Unscrew the oil tank cap and add, pouring slowly and in small quantities at a time, **800 g** of **PAO code No. 232571** additive to the tank (filling process should take about 10 minutes to complete).

- Check that there are no oil leaks from the draining caps and the filter cartridge.
- Check the engine oil level (A3.01).
- Fully tighten the oil filler cap on the tank.

A3.02 Visual inspection of gearbox/differential assembly

Visual inspection of gearbox/differential assembly

The procedure for “Checking level and replacing gearbox/differential oil, with top-up if necessary”, is no longer necessary (see Technical Circular Nr. 1598, December 2007).

➢ Remove the rear undertray section (☞ M2.12).

- Visually inspect the gearbox/differential assembly and note any damage or leakage.

Do not top up.

- Drain the gearbox-differential lubrication system (☞ A3.02).

Perform in the event of visual inspection revealing any faults which would cause the oil level to drop below the specified level.

- Fill the gearbox-differential lubrication system (☞ A3.02).

Perform only after draining the gearbox/differential lubrication circuit.

- Clean the gearbox oil radiator (☞ D2.09).

➢ Refit the rear underfloor section (☞ M2.12).

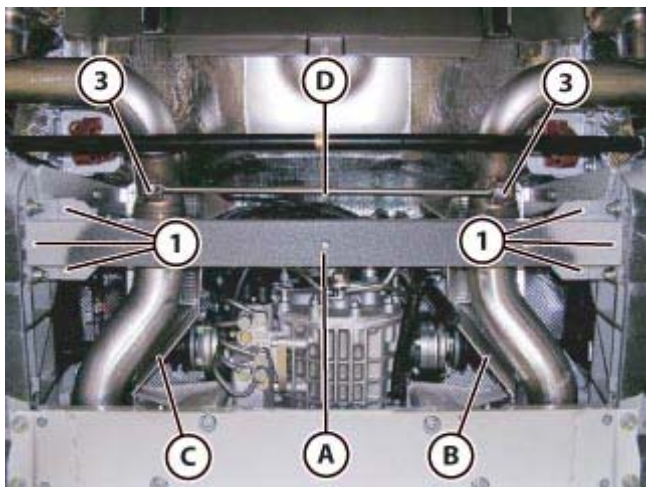
Draining the gearbox-differential lubrication system

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

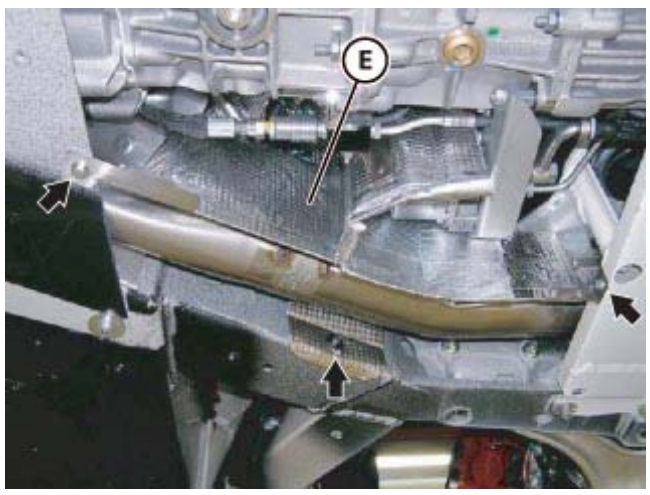
To facilitate and ensure complete oil drainage from the gearbox, perform the procedure with the transmission warm; drive the car for at least 20 minutes with frequent gearshifting.

➢ Remove the rear undertray section (☞ M2.12).
➢ Remove the wheel (☞ F2.08).

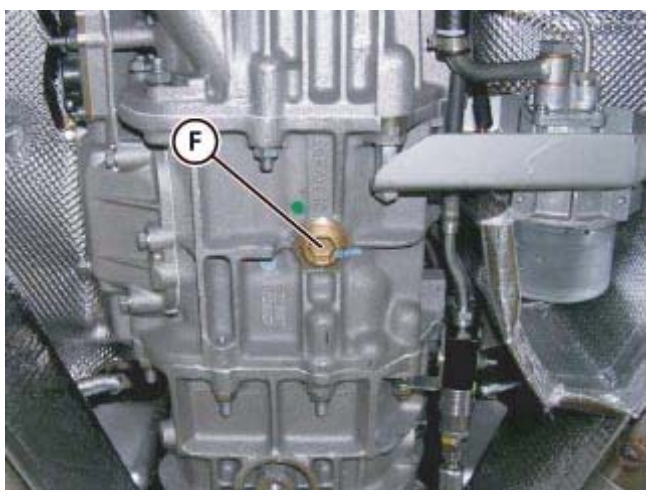
Remove the right rear wheel.



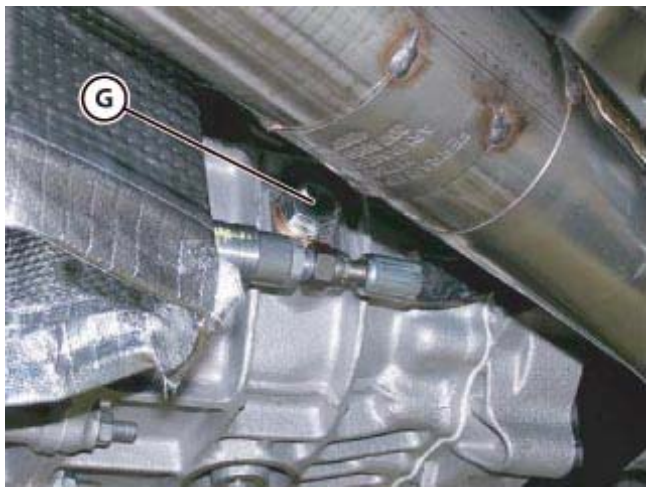
- Undo the six fastener screws **(1)** and remove the rear cross-member **(A)**.
- Undo the six fastener screws and remove the rear right hand **(B)** and left hand **(C)** heat shields.
- Undo the two nuts **(3)** fastening the cross-member to the exhaust pipe sections and remove the cross-member **(D)**.



- Undo the three fastener screws and remove the front right-hand heat shield **(E)** located over the central section of the right-hand exhaust pipe.



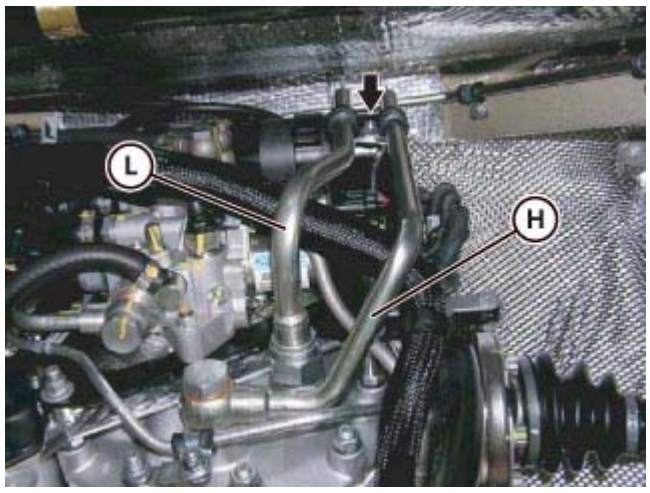
- Place a container under the oil drain plug **(F)**.
- Undo and remove the oil drain plug **(F)** with relative gasket, located under the third section of the gearbox housing.



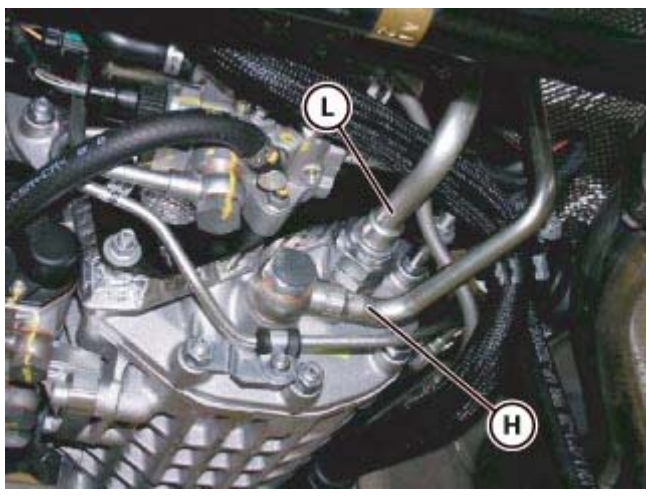
- Undo and remove the oil filler cap **(G)** with relative gasket, located on the right-hand side of the second section of the gearbox housing.

- Let the oil drain completely from the drain orifice.

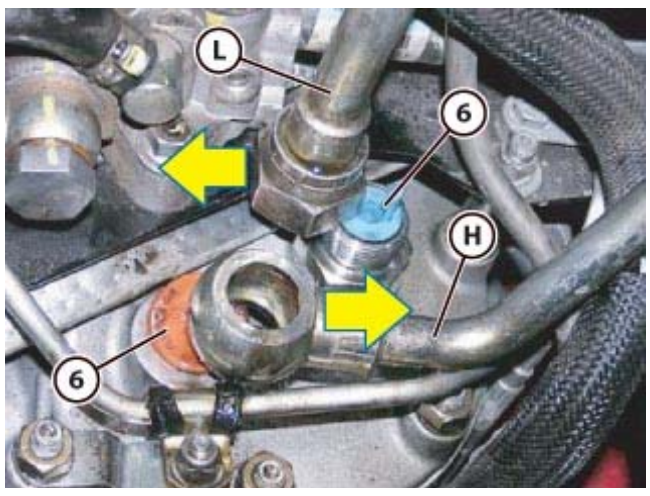
Do not refit the drain plug.



- Undo the nut fastening to the relative mounting bracket to release the brackets with retainer sleeves for the oil delivery **(H)** and return **(L)** pipes on the gearbox.



- Place a container under the unions for the oil delivery **(H)** and return **(L)** pipes on the gearbox.
- Undo the unions for the oil delivery **(H)** and return **(L)** pipes on the gearbox.



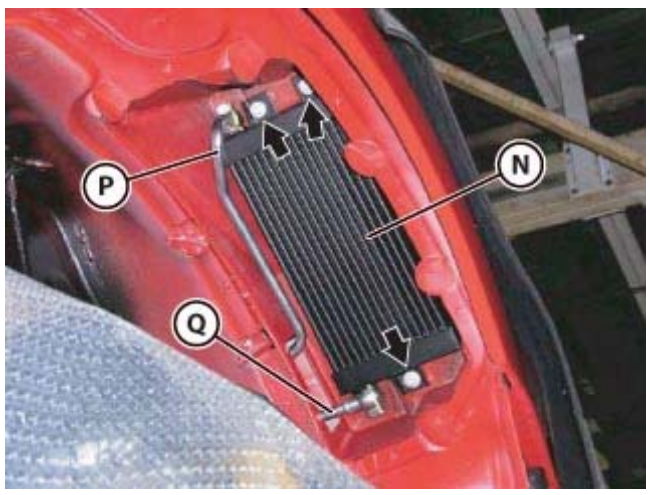
- Working with due caution, shift the delivery pipe **(H)** to the right and the return pipe **(L)** to the left to make room to fit plastic plugs of suitable diameter **(6)** into the respective orifices in the gearbox casing.



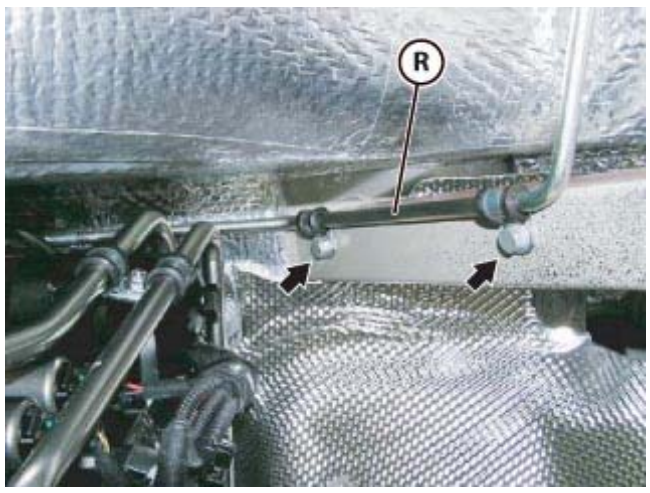
- Undo the eight fastener screws and remove the cover **(M)** protecting the gearbox oil radiator.
- Remove the rear right hand wheelhouse (M2.05).



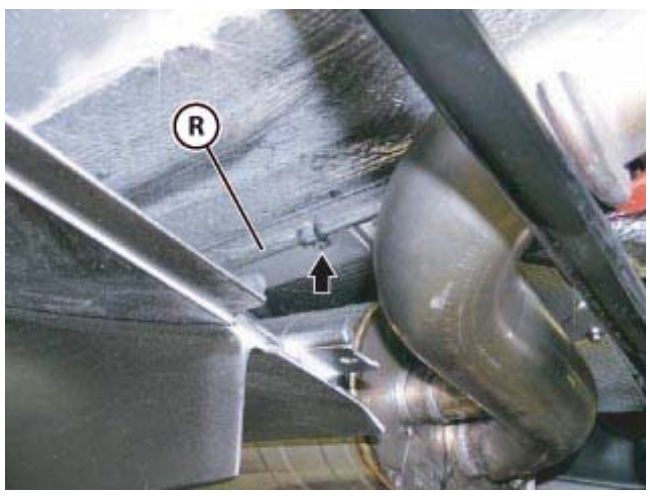
- Adequately protect the rear right-hand brake calliper and disc module with an impermeable material.



- Undo the unions for the oil delivery **(P)** and return **(Q)** pipes on the radiator.
- Undo the three screws fastening the radiator to the chassis and remove the radiator **(N)**.
- Completely drain pipes **(P)** and **(Q)** and the radiator **(N)**, blowing compressed air into the pipes and radiator to speed up the process.
- Plug the radiator orifices, then very carefully clean the radiator **(N)** with a pressure cleaner and compressed air.



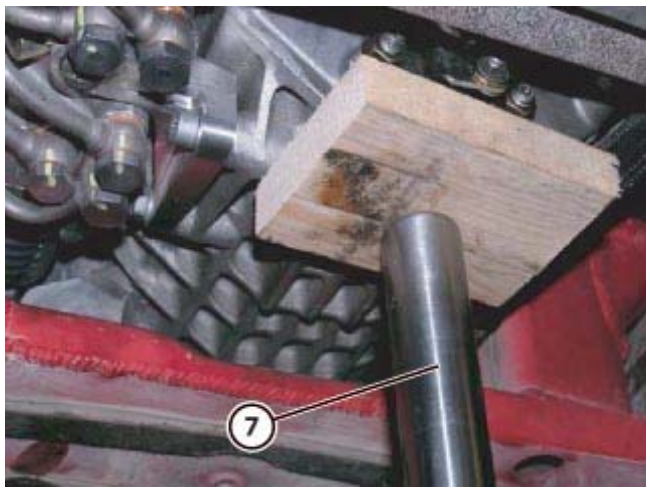
- Undo the four screws fastening the brackets with retainer sleeves on the right- and left-hand rear chassis pillars, then partially release the central rear pipe **(R)** of the secondary air system.



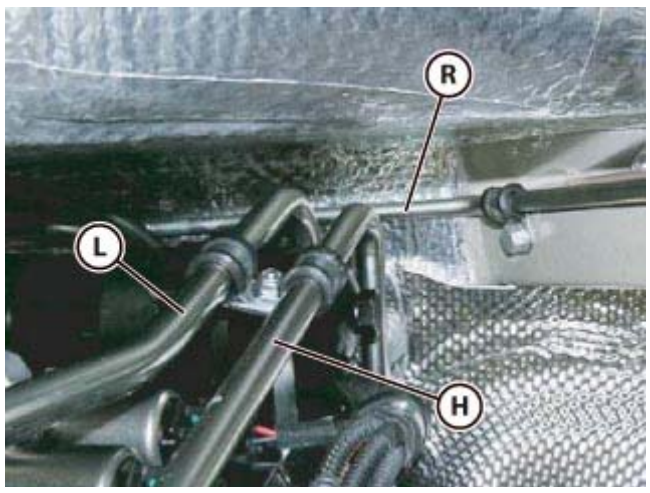
- Undo the two screws fastening the brackets with retainer sleeves located under the left- and right-hand sides of the luggage compartment, and completely release the central rear pipe **(R)**.



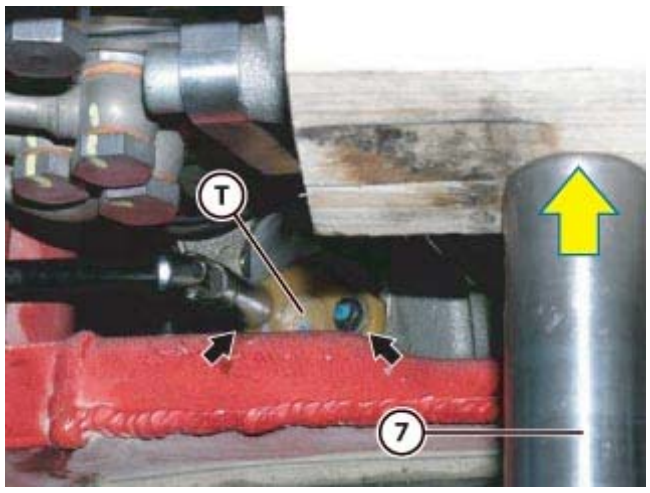
- Undo the four screws fastening the gearbox bushings to the undergearbox subframe **(S)**.



- Place a hydraulic jack **(7)** under the fourth section of the gearbox housing.

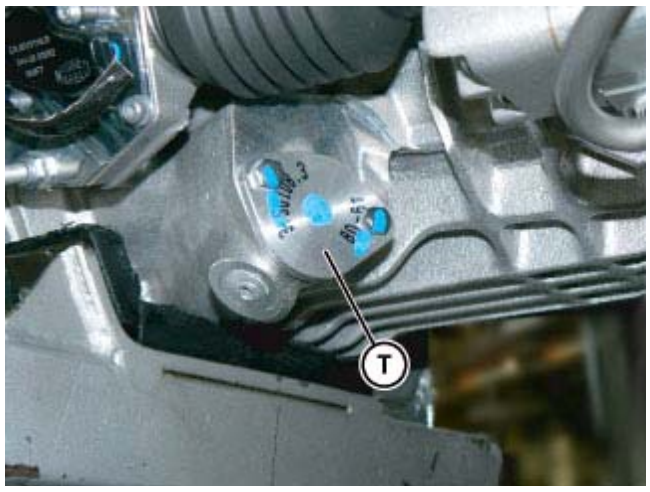


- Shift the central rear pipe **(R)** towards the rear of the car so that it does not interfere with the radiator oil delivery **(H)** and return **(L)** pipes.



- Place a container under the oil filter **(T)**.
- Undo the two screws fastening the oil filter **(T.)**
- Working with due caution, raise the gearbox with the hydraulic jack by just enough to enable the removal of the oil filter **(T)** from the relative seat, taking care that the top of the gearbox does not come into contact with the underside of the transmission tunnel.

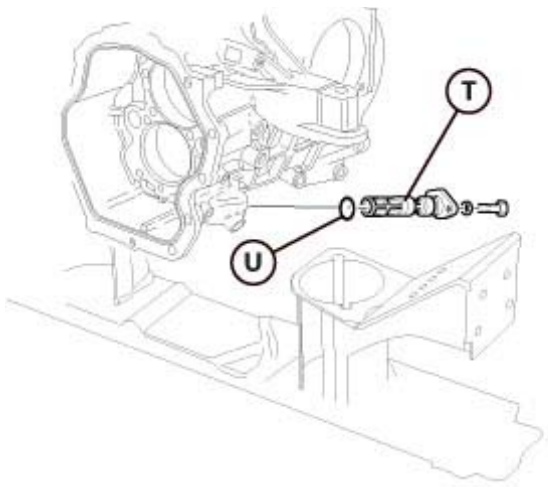
i Ensure that there is no contact with the central rear pipe.



FROM Ass.ly Nr. 82278

- A new aluminium filter has been introduced to replace the plastic one.

- Let the oil drain completely.



- Remove the O-ring **(U)** and clean the oil filter **(T)** by immersing in degreasing solution.

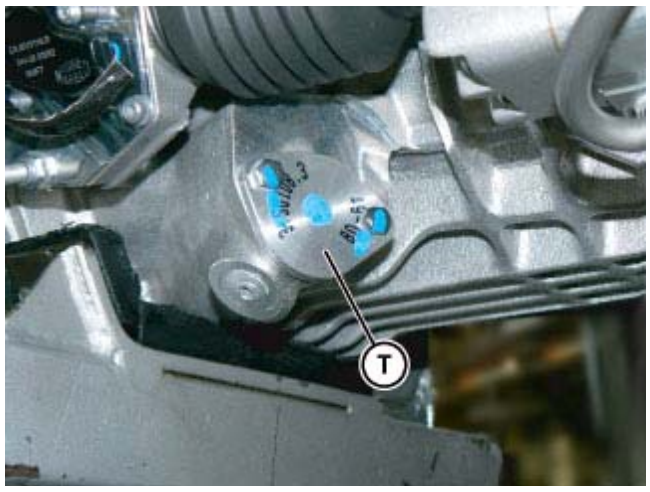
i Take care not to damage the mesh; if any tears in the filter element are noted, replace the entire filter.

- Dry the oil filter **(T)** with compressed air.

Filling the gearbox-differential lubrication system

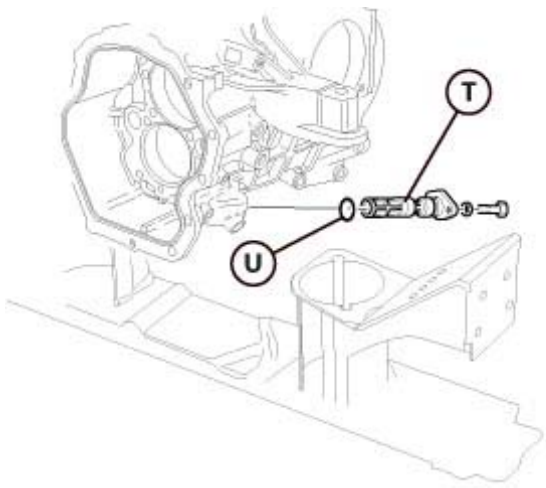
Tightening torque		Nm	Class
Gearbox oil filter	Screw	5 Nm	C
Pipes - F1 gearbox system hydraulic actuator	Pipe union	28 Nm	B
Gearbox mounting bushing - chassis	Screw	50 Nm	C
Oil delivery pipe to gearbox on radiator	Union	45 Nm	B
Oil return pipe from gearbox to radiator	Union	45 Nm	B
Oil return pipe from radiator on gearbox	Union	45 Nm	B
Oil delivery pipe to radiator on gearbox	Union	45 Nm	B
Rear crosspiece	Screw	25 Nm	B
Crosspiece - exhaust extensions	Nut	16 Nm	B
Threaded gearbox oil drainage plug	Plug	48 Nm	B
Threaded gearbox oil filler plug	Plug	60 Nm	B

- Clean the oil filter mounting seat on the gearbox.

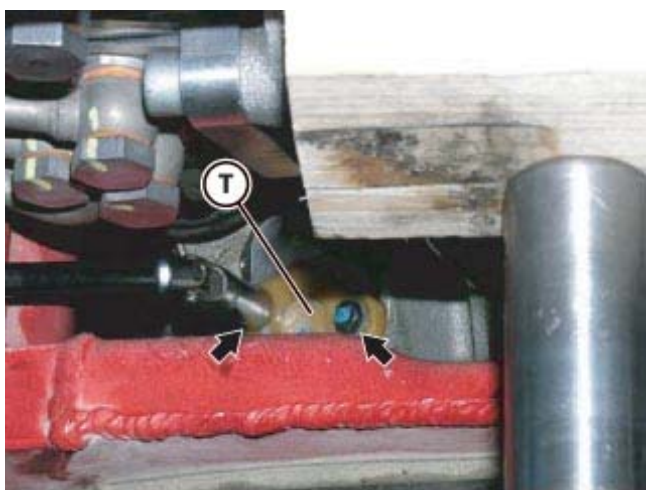


FROM Ass.ly Nr. 82278

- A new aluminium filter has been introduced to replace the plastic one.

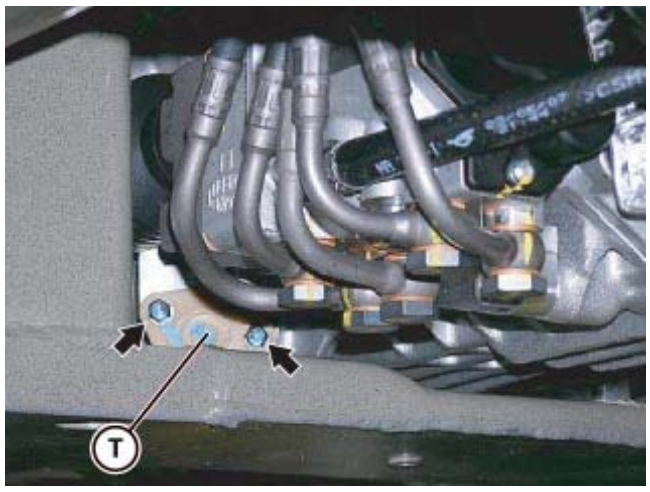


- Lubricate a new O-ring **(U)** with the specified gearbox oil, then fit onto the oil filter **(T)**.



- Lubricate the oil filter mounting seat with the specified oil, then fit the oil filter **(T)** into the mounting.
- Tighten the two fastener screws.

Tightening torque	Nm	Class
Screw	5 Nm	C



F1 gearbox

Take particular care not to knock any of the pipes on the hydraulic F1 gearbox system actuator.

- Lubricate the oil filter mounting seat with the specified oil, then fit the oil filter **(T)** into the mounting.
- Tighten the two fastener screws.

Tightening torque	Nm	Class
Screw	5 Nm	C

- Check that the pipes on the hydraulic F1 gearbox system actuator are correctly positioned and do not interfere with one another, using the yellow initial tightening marks made previously as reference.
- If necessary, reconnect correctly and tighten the relative neck unions, ensuring that the reference markings described are correctly aligned.

Tightening torque	Nm	Class
Pipe union	28 Nm	B

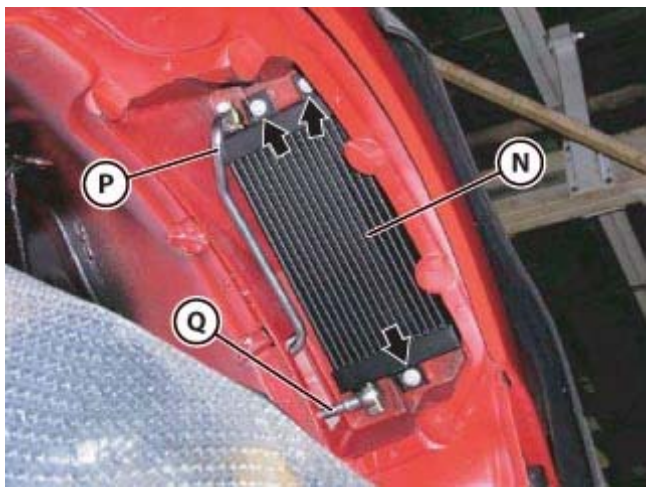


- Use a degreasing product to thoroughly clean the undergearbox subframe **(S)** of any oil spilt from the filter.
- Working with due caution, lower the gearbox with the hydraulic jack **(7)**, until the bushings are resting once again on the subframe **(S)**.



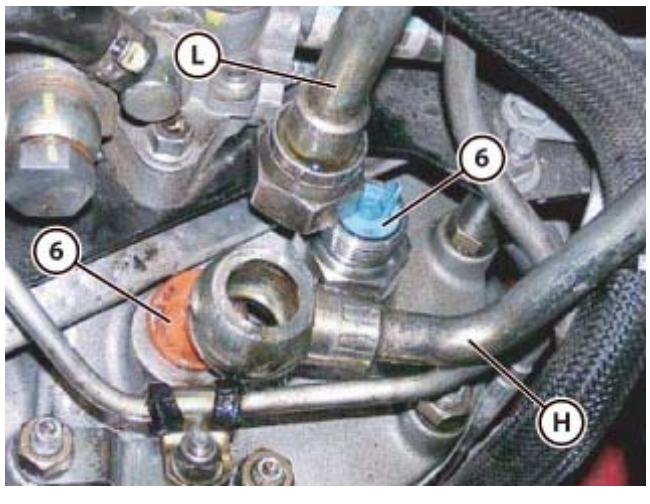
- Tighten the four screws fastening the gearbox bushings to the undergearbox subframe **(S)**.

Tightening torque	Nm	Class
Screw	50 Nm	C



- Clean the relative seat on the chassis thoroughly and fit the radiator **(N)**.
- Tighten the three screws fastening the radiator **(N)**.
- Replace the gaskets on the unions for the oil delivery **(P)** and return **(Q)** pipes on the radiator.
- Tighten the unions for the oil delivery **(P)** and return **(Q)** pipes on the radiator.

Tightening torque	Nm	Class
Union	45 Nm	B
Union	45 Nm	B



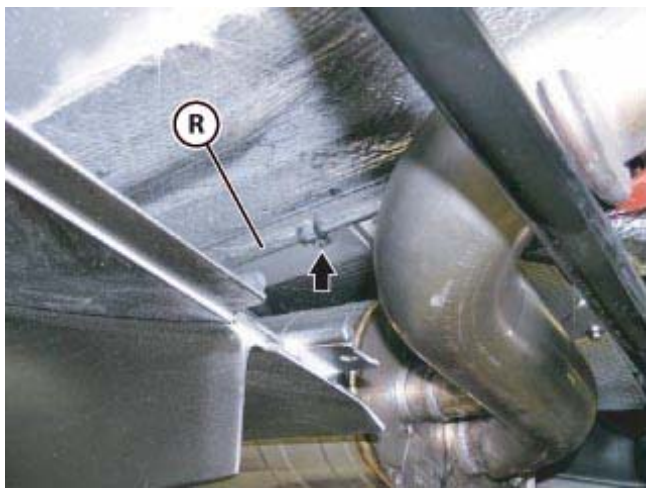
- Remove the plastic plugs **(6)**.
- Tighten the union for the oil return pipe **(L)**on the gearbox.

Tightening torque	Nm	Class
Union	45 Nm	B

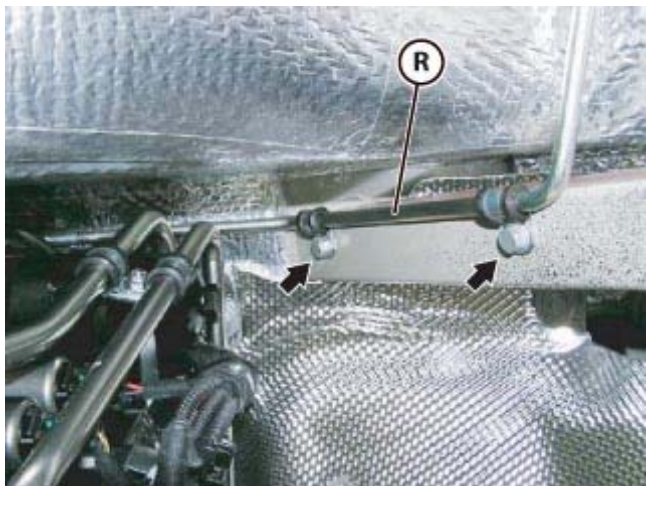
- Replace the gaskets on the union for the oil delivery pipe **(H)** on the gearbox.
- Tighten the union for the oil delivery pipe **(H)** on the gearbox.

Tightening torque	Nm	Class
Union	45 Nm	B

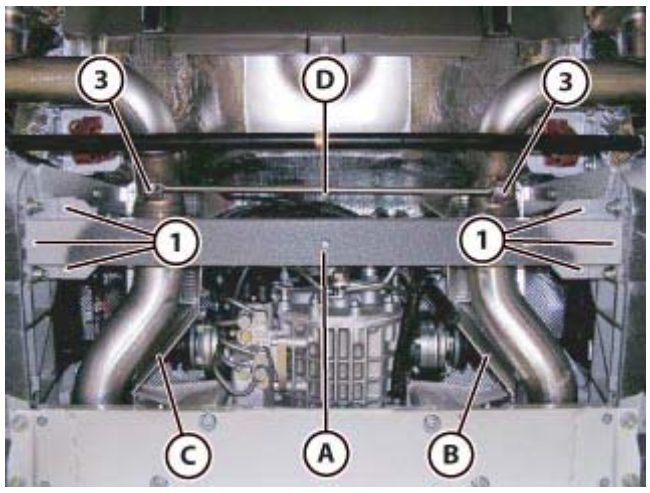
- Use a degreasing product to thoroughly clean all parts of the car soiled by gearbox oil during the draining procedure.



- Fit the central rear pipe **(R)**.
- Tighten the two screws fastening the brackets with retainer sleeves located under the left- and right-hand sides of the luggage compartment to partially fasten the central rear pipe **(R)** of the secondary air system.



- Tighten the four screws fastening the brackets with retainer sleeves on the right- and left-hand rear chassis pillars to completely fasten the central rear pipe **(R)**.

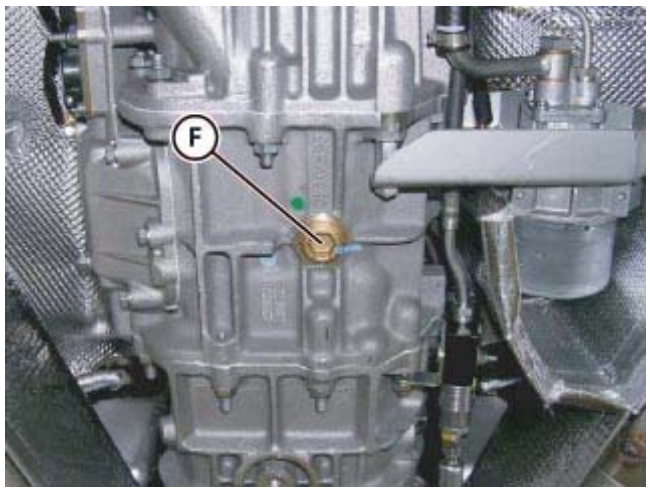


- Fit the rear right **(B)** and left **(C)** heat shields and tighten the six fastener screws.
- Fit the rear cross-member **(A)** and tighten the six fastener screws **(1)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

- Fit the cross-member **(D)** and tighten the two fastener nuts **(3)** to the exhaust pipe sections.

Tightening torque	Nm	Class
Nut	16 Nm	B

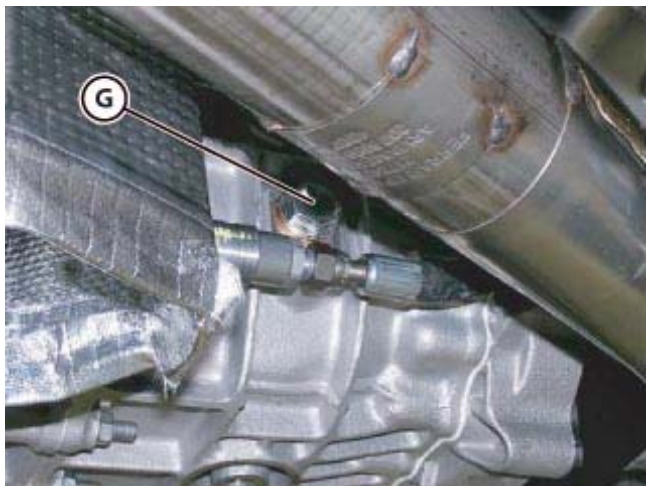


- Clean the oil drain plug **(F)** thoroughly and replace the gasket.
- Apply and tighten the oil drain plug **(F)** on the gearbox housing.

Tightening torque	**Nm**	**Class**
Plug	48 Nm	B

- Gradually add **3.5 litres** of the specified oil to the gearbox through the oil filler orifice.

If the oil change procedure was carried out before the mileage or time interval specified in the maintenance schedule for the car, the oil drained may be recovered and reused for gearbox repair purposes, adding new oil to reach a total of 3.5 litres.



- Thoroughly clean the oil filler plug **(G)**.
- Hand tighten the oil filler plug **(G)** onto the gearbox housing.

F1 gearbox

- Idle the engine with the gearbox in neutral for at least **15 minutes**.

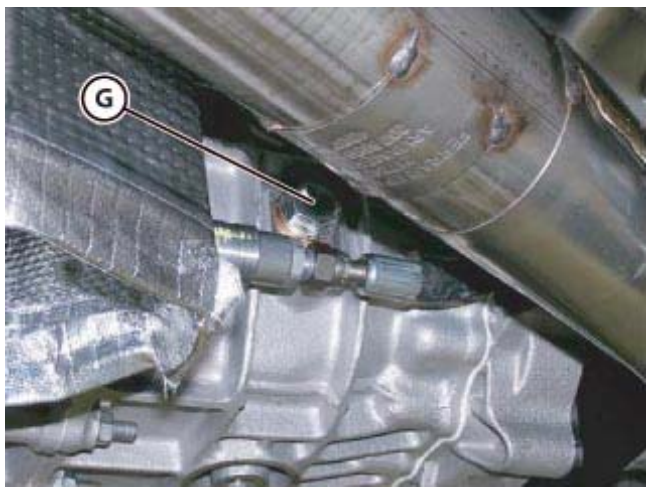
The clutch engages automatically 10 minutes after engine start, driving the transmission with the gearbox in neutral; the primary shaft drives the internal pump distributing oil to all gearbox/differential components and through the cooling circuit.

Mechanical gearbox

- Idle the engine with the gearbox in neutral for at least **5 minutes**.

Do not depress the clutch pedal.

- Switch off the engine.



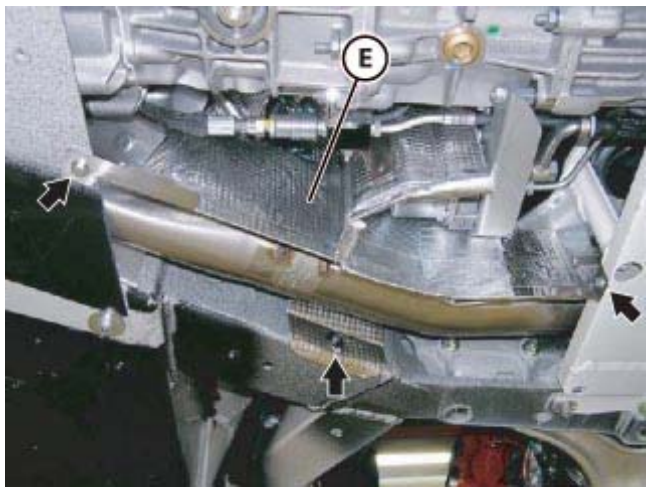
- Remove the oil filler plug **(G)** with relative gasket.
- Gradually add **1.2 litres** of the specified oil to the gearbox through the filler orifice.

The gearbox must be filled with a total quantity of precisely **4.7 litres** of the specified oil.

- Clean the oil filler plug **(G)** thoroughly and replace the relative gasket.
- Apply and tighten the oil filler plug **(G)**.

Tightening torque	**Nm**	**Class**
Plug	60 Nm	B

- Ensure that there is no leakage from the oil drain and filler plugs, the mesh filter and the unions for the radiator oil delivery and return pipes.



- Refit the rear right hand wheelhouse (M2.05).

➢ Refit the rear underfloor section (M2.12).
➢ Refit the wheel (F2.08).

- Fit the front right-hand heat shield **(E)**, located over the central section of the right-hand exhaust pipe, and tighten the three fastener screws.

A3.03 Checking the F1 gearbox system oil level

Checking the F1 gearbox system oil level

To check the oil level and, if necessary, top it up, the vehicle must be perfectly level, the engine cold and the circuit filled, completely bled and serviced in compliance with the intervals set out in the MAINTENANCE SCHEDULE.

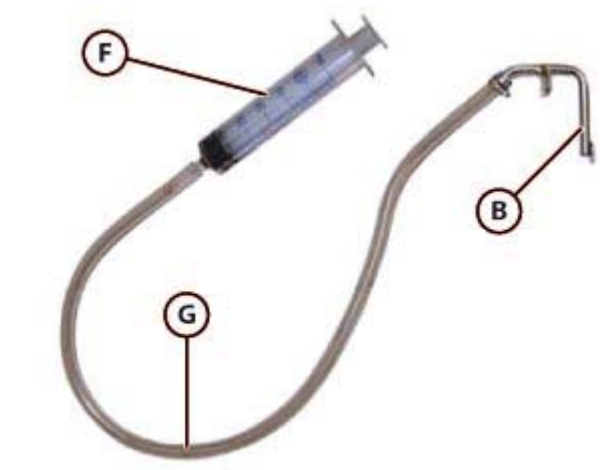
To illustrate the operation more clearly, the following illustrations show the procedure carried out with the F1 gearbox kit not installed in the vehicle.



- The oil level is monitored by the level sensor **(1)** in the tank **(2)**

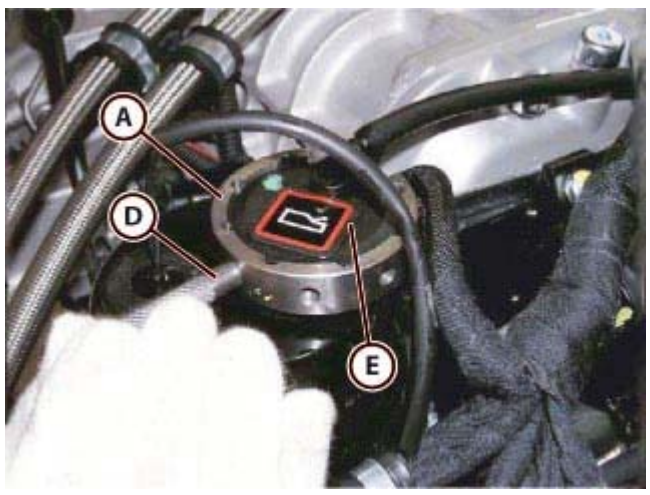


- In the event of low oil level, as indicated by the relative instrument panel warning light, top up using the following procedure.



- For this operation, you will need a **60 ml syringe (F)**, **approximately 1 metre of transparent rubber tubing (G) of a suitable diameter and the oil top up tool (AV 8065) (B)**.
- Connect one end of the tube to the syringe and the other end to the oil top up tool **(AV 8065) (B)**.

- Remove the rear undertray section (M2.12).
- The **F1** gearbox system oil tank is located on the rear left-hand side of the gearbox assembly.

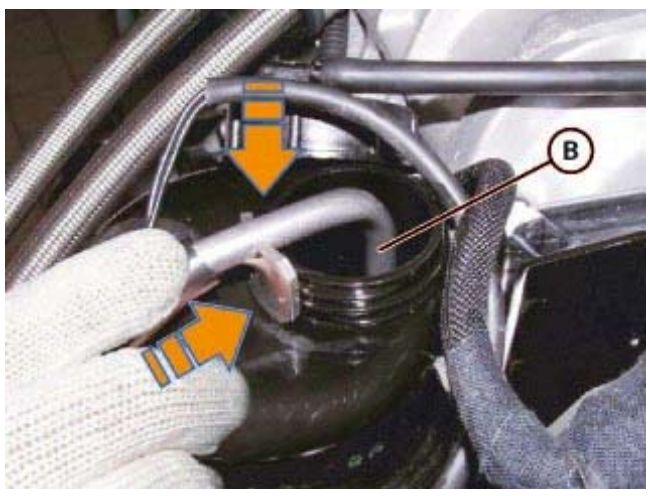


- Fit only the ring nut **(A)** of the tool **(AV 8066)** in the cap **(E)**, without the relative pin **(D)** and with the gap over the breather pipe.
- Screw the pin **(D)** of the tool **(AV 8066)** into one of the holes in the ring nut **(A)**.

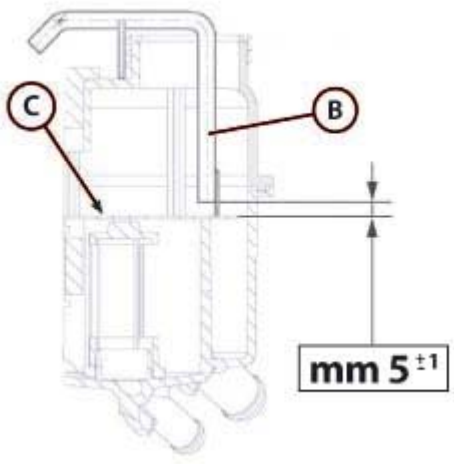
Before unscrewing the cap from the F1 kit oil tank, clean the area above the cap carefully with compressed air to prevent dirt from entering the tank and contaminating the oil during the check.

- Release the tank cap **(E)**, turning counterclockwise.
- Remove the ring nut **(A)** and completely unscrew the cap **(E)** by hand.

- Turn the ignition key to **II** (on) and wait until the **F1** system pump starts.



- Immediately after the pump switches off, when a hydraulic circuit pressure of **50 to 52 B**ar has been reached, fit the end of the tube of the tool **(AV 8065) (B)** inside the oil tank and hold against the outer edge of the cap retainer threading.



- In this position, the end of the tube of tool **(B)** must rest against the inner disc **(C)** of the oil tank.
- Now inject a very small quantity of the specified oil.
- Aspirate excess oil until only air is aspirated.

The oil level must be **5±1 mm** above the disc **(C)** inside the tank: the tool determines the correct level automatically with the indicator at the end of the tube.

- Close the cap tightly.

➢ Refit the rear underfloor section (M2.12).

A3.04 Checking the windscreen and headlight washer fluid level

Checking the windscreen and headlight washer fluid level



- The filler neck **(1)**for the window and headlight washer fluid tank is accessible by lifting the engine compartment lid.
- Refill the tank until fluid is visible from the filler neck.



- Low fluid level is detected by the sensor fitted on the tank and is indicated by the relative instrument panel warning light.

- In the event of windscreen washer or headlight washer system malfunction, check the pumps on the tank.

A3.05 Checking the brake and clutch system fluid level

Checking brake fluid tank level

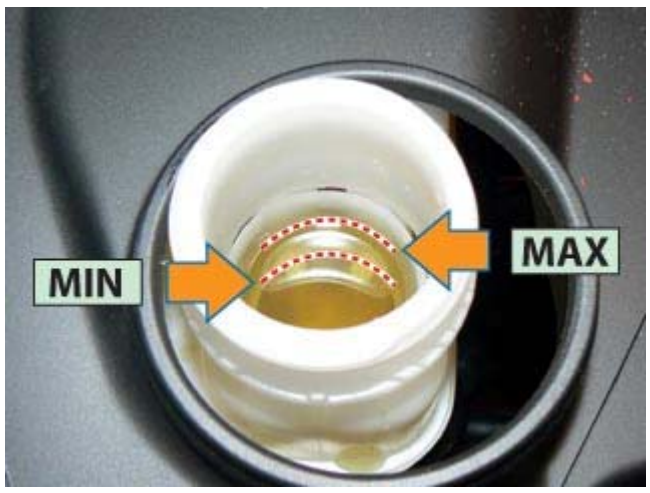


- The brake fluid tank is located on the left-hand side of the engine compartment, underneath the windscreen bulkhead.

On versions with mechanical gearbox, the brake fluid tank is shared with the clutch system.

- Undo the cap **(1)**.

The symbol **(1)** on the cap indicates that the circuit contains synthetic fluid. Using mineral fluid may cause irreparable damage to the rubber gaskets in the system.



The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

- Check that the fluid in the tank is always near the **MAX** level.

A low fluid level may be an indication of excessive oil consumption.

- If the level is low, top up to the **MAX** level with specified fluid from an unopened new container.



- Screw the cap **(1)** back on tightly.

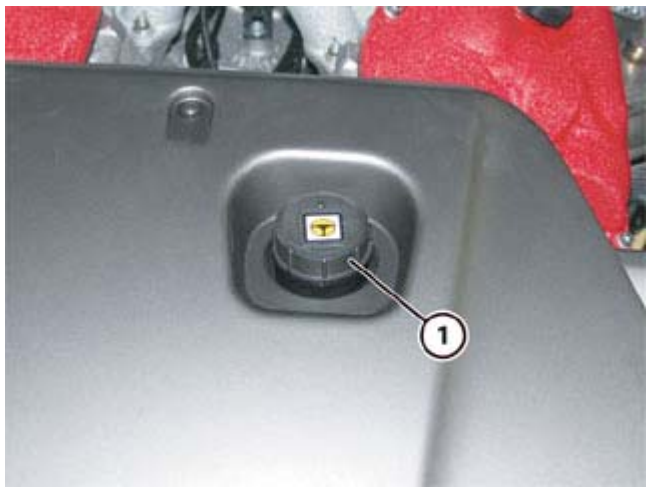
A3.06 Checking the hydraulic steering system fluid level

Checking the power steering system fluid level

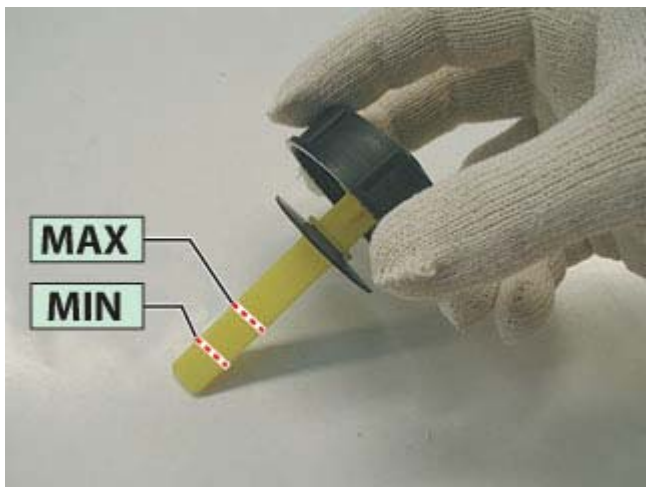
FROM Ass.ly No. 97930, a different power steering fluid is prescribed.
The power steering fluid specified FROM Ass.ly No. 97930 must be used following installation of the components of the RETROFIT KIT Part No. 279664.
Before topping up or filling the power steering system, always check which type of fluid should be used, as mixing the two different types of power steering fluid will damage the power steering system itself.

The power steering fluid level must be checked with the system warm, after driving for at least 15 Km.
If checked cold, the level may appear to be excessively low even with the correct amount of fluid in the system.

During the operations specified in the Maintenance Schedule, check the hydraulic steering system fluid level.



- The power steering system tank is located in the engine compartment under a protective shield; it is identifiable by the symbol on the cap **(1)**.



- Unscrew the tank cap.
- Check that the fluid level is between the **MIN** and **MAX** notches on the dipstick.
- If the level is low, top up with the recommended oil, taken from a sealed container, until **MAX** level.

➢ Too low fluid level may indicate a leak or the presence of air in the system.

A3.07 Checking coolant level and topping up

Checking the cooling system fluid level

CAUTION
The fluid in the cooling system reaches extremely high temperatures and pressures.
WORK ONLY WITH A COLD ENGINE.

The tank filler neck is accessible by lifting the engine compartment lid.



- Unscrew the filler cap **(A)** and check that the coolant level is approximately **40 mm** from the top edge of the filler neck.

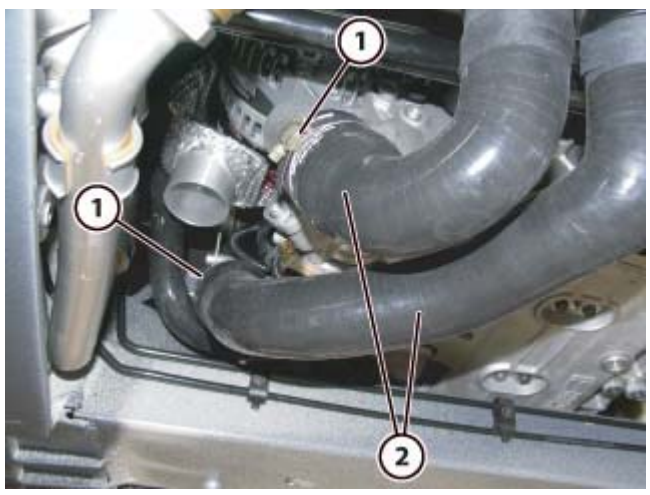
FROM Ass.ly No. 87867, a new coolant has been introduced. Carefully check which type of coolant has been used in the vehicle before topping up or filling the system. Do not mix different types of coolant as this may alter their properties.

- If not, top up with the recommended fluid until the above condition is met.
- Screw the filler cap **(A)** onto the expansion tank.

Draining the cooling system

CAUTION
The fluid in the cooling system reaches extremely high temperatures and pressures.
WORK ONLY WITH A COLD ENGINE.

➢ Remove the front section of the underfloor (M2.12).



- Loosen the two clamps **(1)** fastening the delivery and return pipes **(2)**.
- Remove the two pipes from the water pump.

Pour the fluid drained from the system into a container and seal it. DO NOT DISPOSE OF USED FLUID IN THE ENVIRONMENT.

- Let the coolant drain completely.

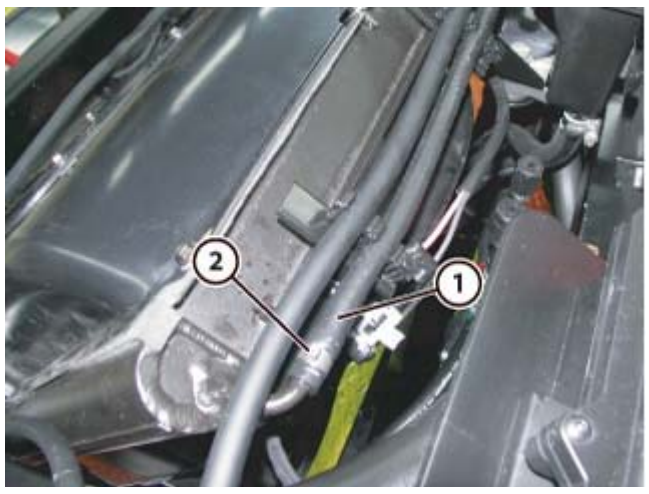
Filling the cooling system

CAUTION
The fluid in the cooling system reaches extremely high temperatures and pressures.
WORK ONLY WITH A COLD ENGINE.

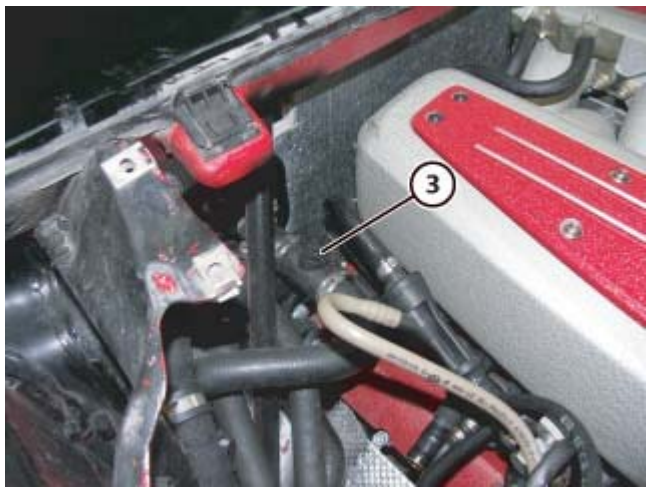
- Check that all the connection sleeve clamps are tight.

Static filling (engine off)

➢ Remove the central engine compartment shield (M2.17).
➢ Remove the central windscreen shield (M2.17).



- Detach the bleeder pipe **(1)** on the radiator and remove the clamp **(2)**, holding the pipe raised at the height of the header tank pipe union to prevent the coolant from leaking out.
- Turn on the instrument panel and select the maximum temperature for the air conditioning and heating system on the AC control panel.



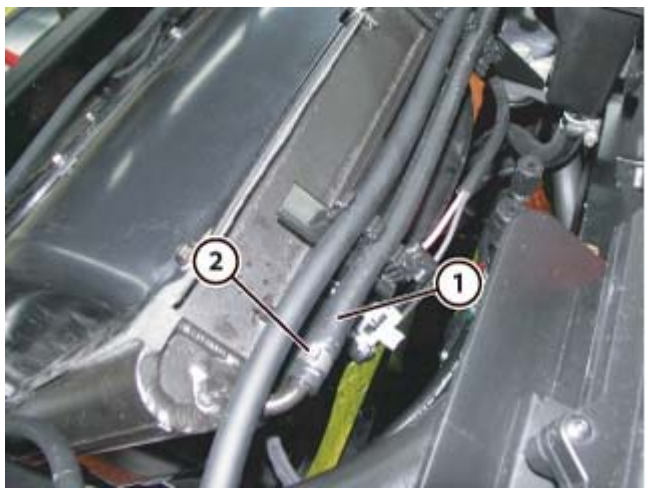
- Completely unscrew the bleeder cap **(3)** on the heater inlet pipe.



- Unscrew the filler cap **(A)** on the expansion tank.

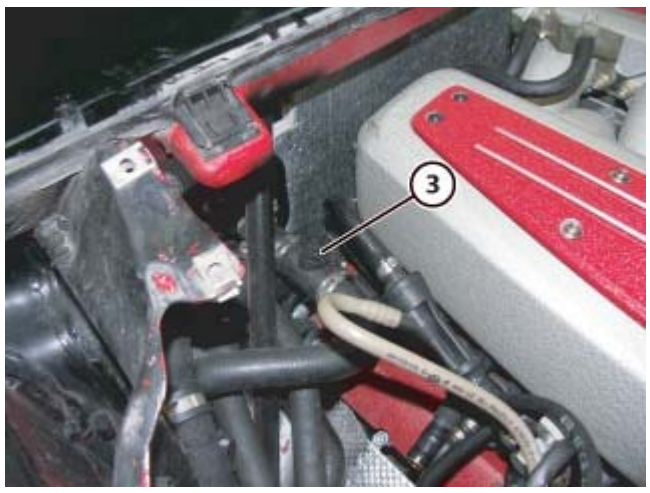
FROM Ass.ly No. 87867, a new coolant has been introduced. Carefully check which type of coolant has been used in the vehicle before topping up or filling the system. Do not mix different types of coolant as this may alter their properties.

- Slowly pour in the specified amount of coolant **(19 l)**, through the filler neck of the expansion tank, until fluid exits the open radiator bleeder pipe.



- Reconnect the radiator bleeder pipe **(1)**, securing with the clamp **(2)**, and complete the filling procedure until fluid is visible in the filler neck on the expansion tank.

In the event of coolant leaking from the heater pipe, close the bleeder cap.



- Close the bleeder cap **(3)** on the heater pipe.



- Screw the filler cap **(A)** onto the expansion tank.

Dynamic filling

- Start the engine and run at idle, turn on the heater and set to maximum temperature (so that the TGK valves are open and the idle pump is active). After **30 sec**, open the header tank cap and top up as much as necessary until the radiator cooling fan is activated (to ensure that the thermostat valve has opened).
- Check that all the vents blow hot air at the same temperature (about **50 °C**).
- After reaching a stable coolant level in the expansion tank, close the filler neck cap.
- Run the engine at **3000 RPM**, maintain this speed for **60 seconds** then let it drop to idle.
- Run the engine at **3000 RPM**, close the heater circuit, then the engine speed drop to idle after **60 seconds**.
- Stop the engine and let it cool down.
- Check the cooling system fluid level (A3.07).

Check the level **when the fluid is cold** and top up if necessary (without opening any of the bleeder pipes).

- If topping up is necessary, follow the same filling procedure used during **"Dynamic filling"**.



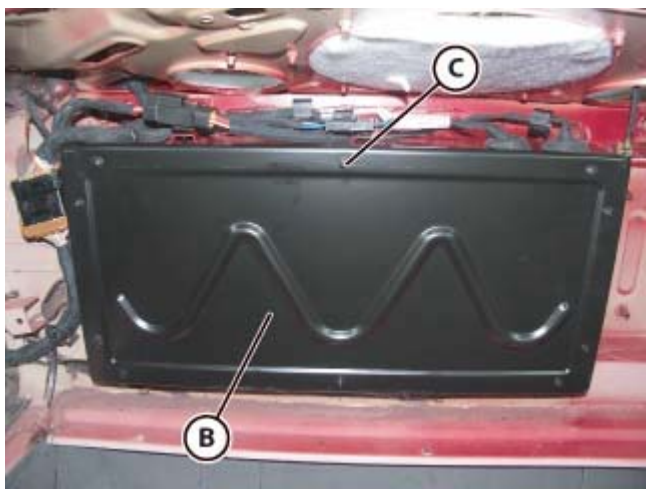
- Screw the filler cap **(A)** onto the expansion tank.

➢ Refit the central underwindscreen shield (M2.17).
➢ Refit the central engine compartment shield (M2.17).

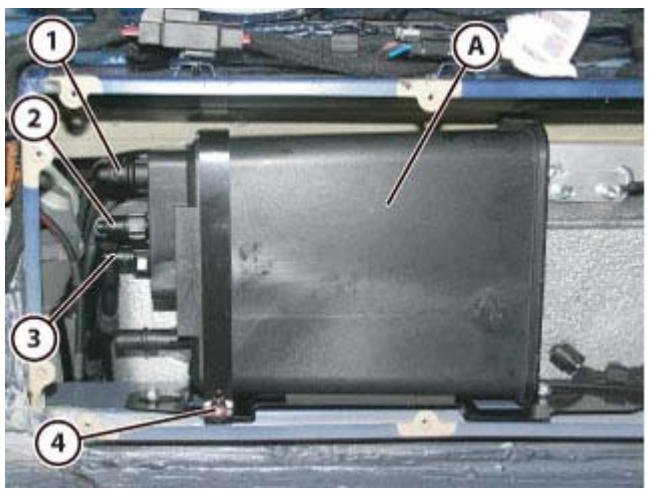
A3.08 Replacing the active carbon filter

Removing the active carbon filter

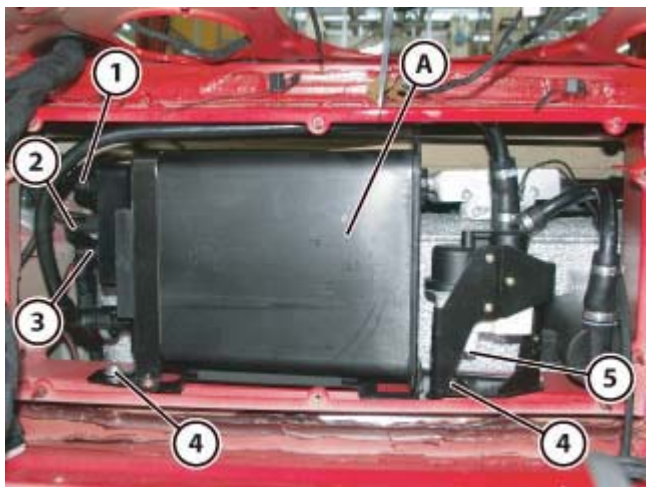
➢ Remove the tank panel trim panel from the luggage compartment (M2.23).



- Remove the protective metal tank guard **(B)** by undoing the ten screws **(C)**.

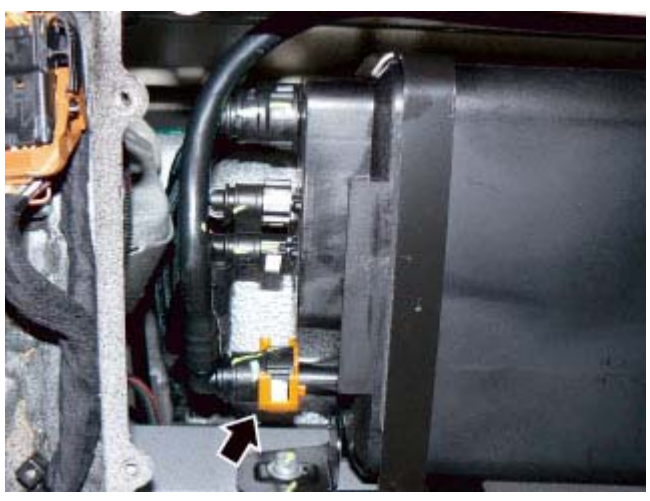


- Disconnect the unions **(1)**, **(2)** and **(3)** from the active carbon filter **(A)**.
- Undo the nut **(4)** and remove the active carbon filter **(A)**, complete with brackets, from the luggage compartment by shifting to the right.



FROM Ass.ly Nr. 71848

- Disconnect the unions **(1)**, **(2)** and **(3)** from the active carbon filter **(A)**.
- Disconnect the connector **(5)** from the diagnostic pump.
- Undo the screws **(4)** and remove the active carbon filter **(A)**, complete with diagnostic pump and pump filter.
- Detach the active carbon filter **(A)** from the relative bracket.



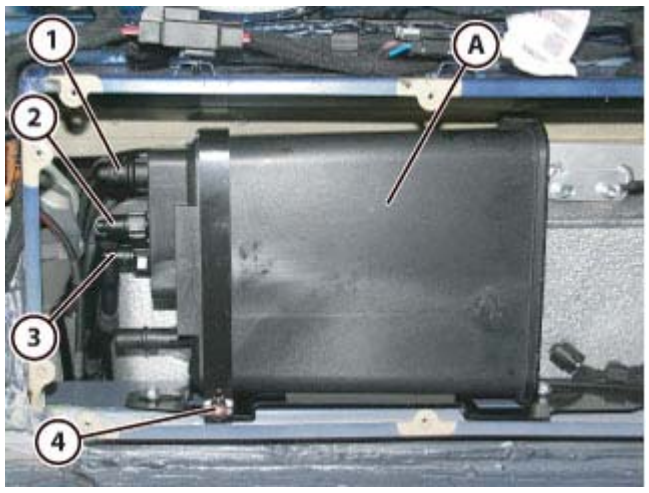
NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

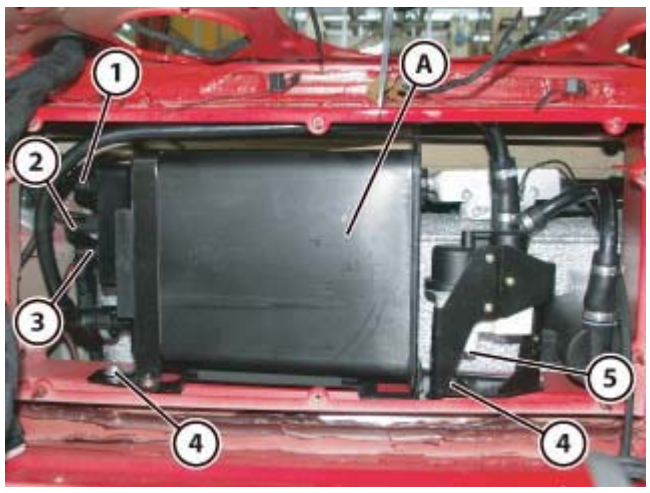
i The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

- Then press on both sides of the quick-coupling and remove the pipe.

Refitting the active carbon filter

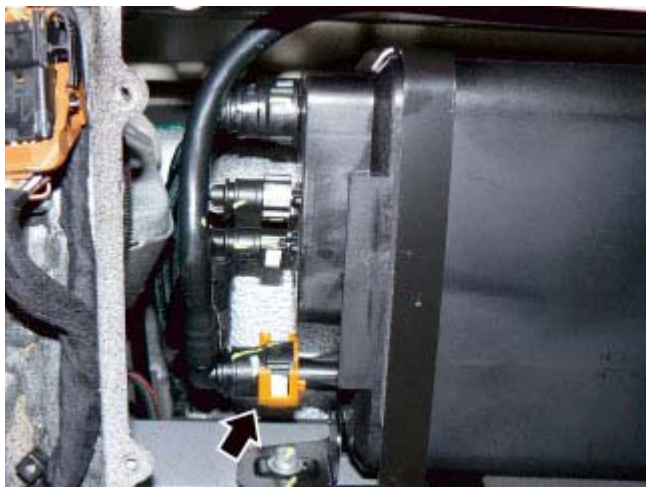


- Check the state of the rubber shim underneath the tank; replace if necessary.
- Fit the active carbon filter **(A)** in the relative seat in the luggage compartment.
- Tighten the nut **(4)** and connect the unions **(1)**, **(2)** and **(3)**, ensuring that they are properly connected.



FROM Ass.ly Nr. 71848

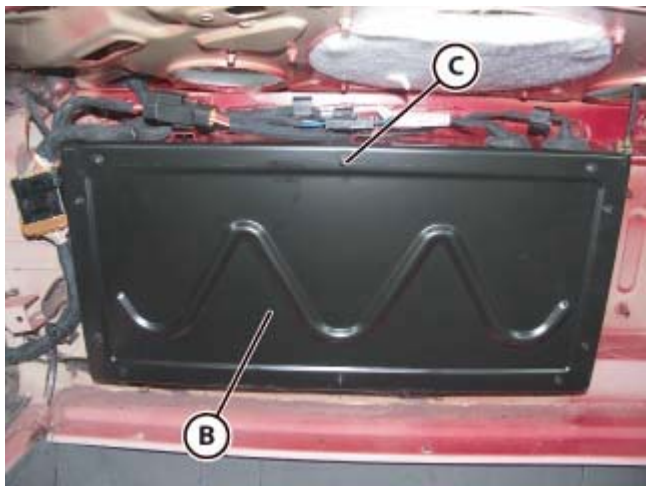
- Check the state of the rubber shim underneath the tank; replace if necessary.
- Assemble the active carbon filter **(A)** onto the relative mounting bracket.
- Fit the active carbon filter **(A)**, complete with diagnostic pump and pump filter, in the relative seat in the luggage compartment.
- Tighten the screws **(4)** and connect the unions **(1)**, **(2)** and **(3)**, ensuring that they are properly connected.
- Connect the connector **(5)** to the diagnostic pump.



NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.



- Fit the protective metal tank shield **(B)** and tighten the ten screws **(C)**.

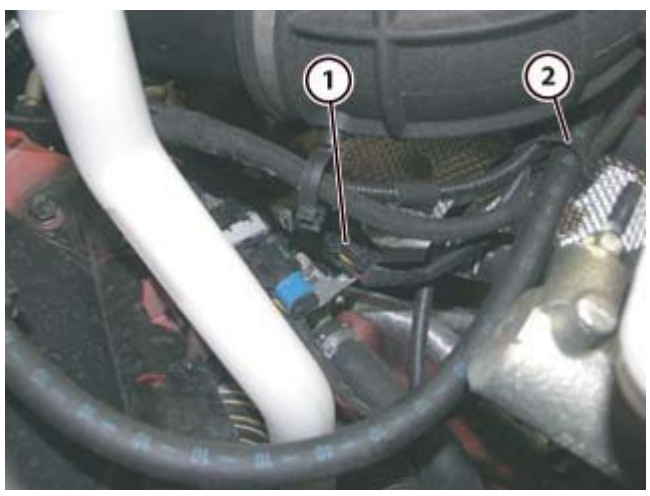
➢ Refit the luggage compartment tank panel trim (M2.23).

A3.09 Replacing the oxygen sensor

Removing the oxygen sensor on the front left hand manifold

- Set the battery master switch to OFF (L2.02).
- Remove the engine compartment shields on the fenders (M2.17).

Remove the left hand component.



- Disconnect connector **(1)** (S315) from the oxygen sensor and free the cable from the clamp **(2)**.



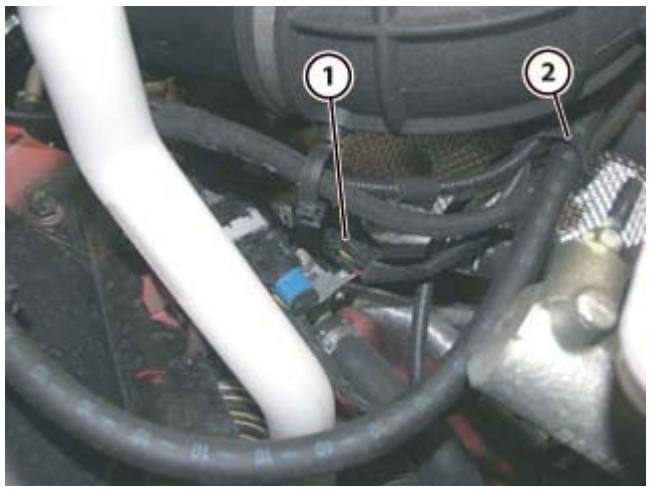
- Unscrew the oxygen sensor **(3)** from the front left hand front manifold and remove from the vehicle.

Refitting the oxygen sensor on the front left hand manifold

Tightening torque		**Nm**	**Class**
Oxygen sensor	Sensor	50 Nm	B

Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



- Connect the connector **(1)** (S315) and return cable to its original position, fastening with the clamp **(2)**.



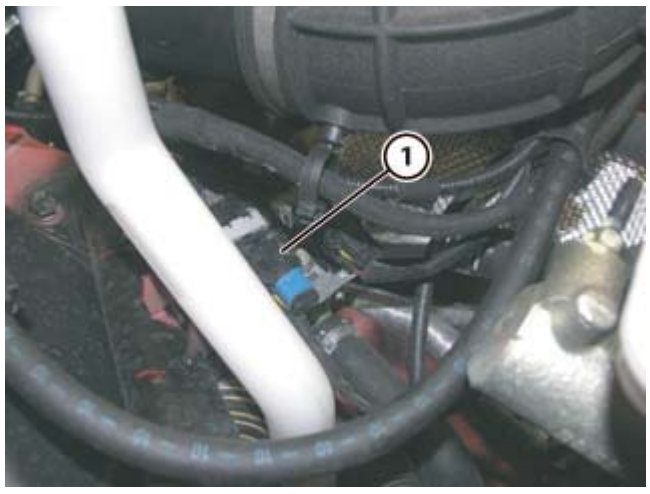
- Fit the oxygen sensor **(3)** in its respective mounting on the front left manifold and tighten.

Tightening torque	Nm	Class
Sensor	50 Nm	B

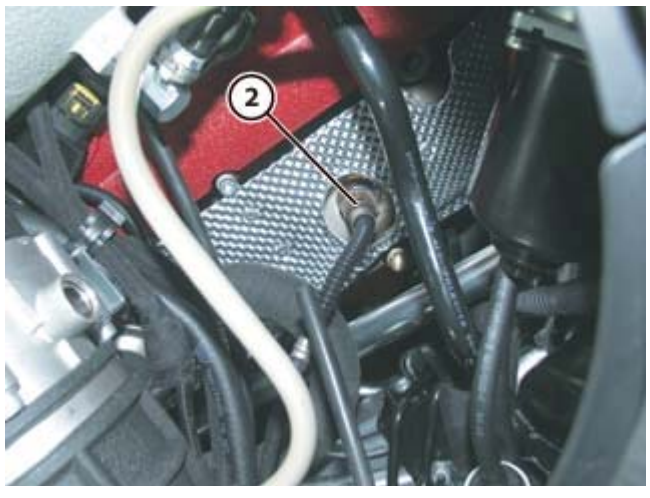
➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

Removing the oxygen sensor on the rear left hand manifold

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the engine compartment shields on the fenders (M2.17).
Remove the left hand component.



- Disconnect the oxygen sensor connector **(1)** (S316).



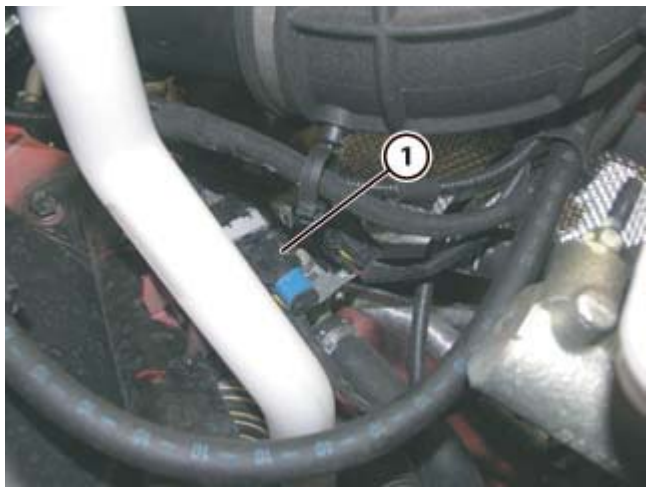
- Unscrew the oxygen sensor **(2)** on the rear left hand exhaust manifold and remove from the vehicle.

Refitting the oxygen sensor on the rear left hand manifold

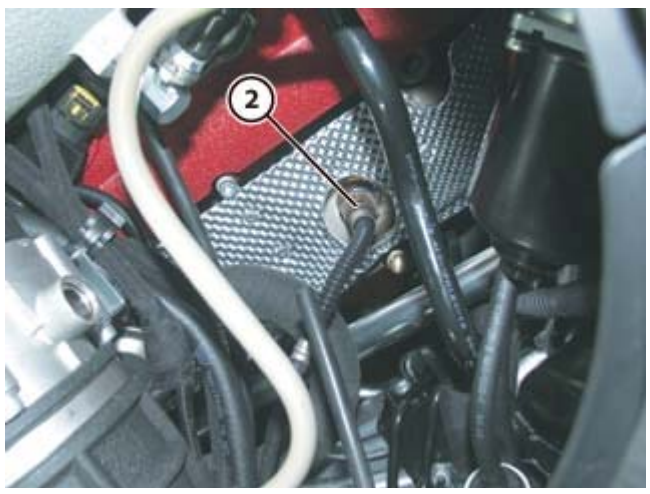
Tightening torque		Nm	Class
Oxygen sensor	Sensor	50 Nm	B

Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



- Connect the oxygen sensor connector **(1)** (S316).



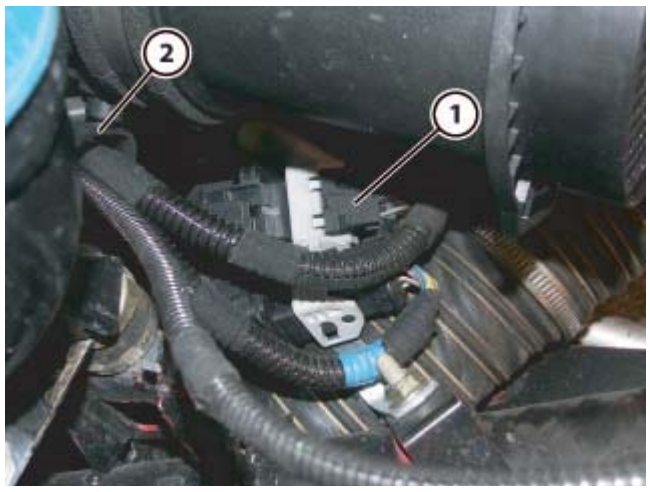
- Fit the oxygen sensor **(2)** in its respective seat on the rear left manifold and tighten.

Tightening torque	Nm	Class
Sensor	50 Nm	B

➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

Removing the oxygen sensor on the right front manifold

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the engine compartment shields on the fenders (M2.17).
Remove the right hand component.



- Disconnect the connector **(1)** (S072) and release the relative cable from the clamp **(2)**.



- Unscrew the oxygen sensor **(3)** from the front right hand exhaust manifold and remove from the vehicle.

Refitting the oxygen sensor on the front right hand manifold

Tightening torque		Nm	Class
Oxygen sensor	Sensor	50 Nm	B

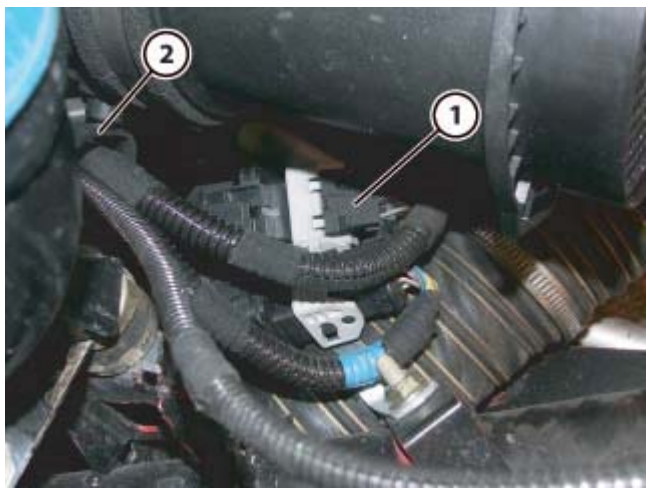
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



- Fit the oxygen sensor **(3)** in its respective mounting on the front right exhaust manifold and tighten.

Tightening torque	**Nm**	**Class**
Sensor	50 Nm	B

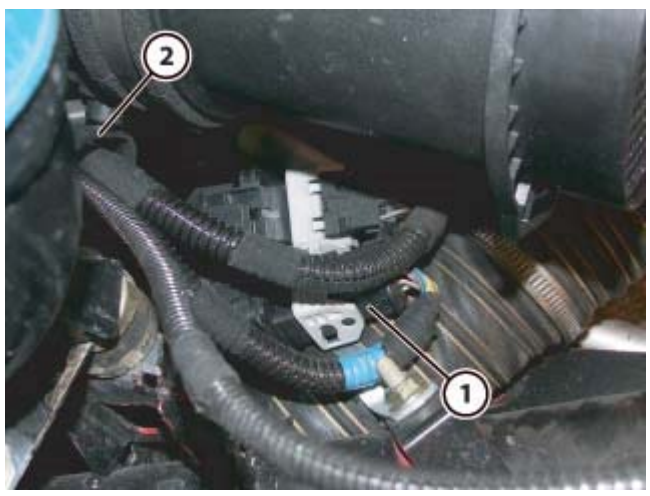


- Connect connector **(1)** (S072) and fasten the relative cable to the clamp **(2)**.

➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

Removing the oxygen sensor on the rear right hand manifold

➢ Remove the engine compartment shields on the fenders (M2.17).
Remove the right hand component.



- Disconnect connector **(1)** (S074) from the oxygen sensor and remove the relative cable from the clamp **(2)**.



- Move the blow-by system tubes as far as possible out of the way, unscrew the oxygen sensor **(3)** from the right rear exhaust manifold and remove from the vehicle.

Refitting the oxygen sensor on the rear right hand manifold

Tightening torque		Nm	Class
Oxygen sensor	Sensor	50 Nm	B

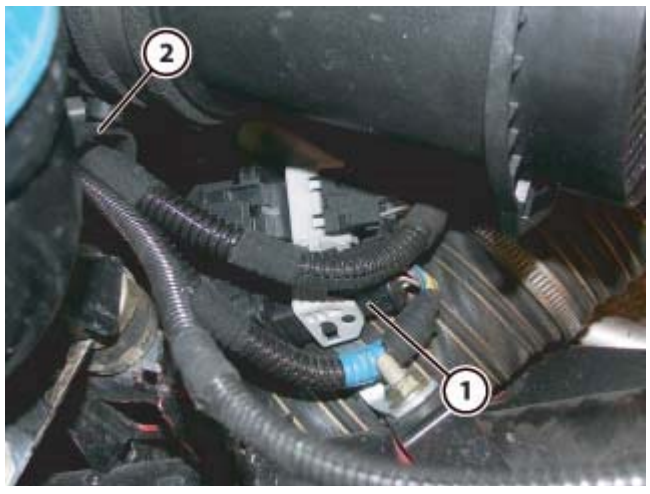
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



- Fit the oxygen sensor **(3)** in its respective seat on the rear right exhaust manifold and tighten.

Tightening torque	Nm	Class
Sensor	50 Nm	B

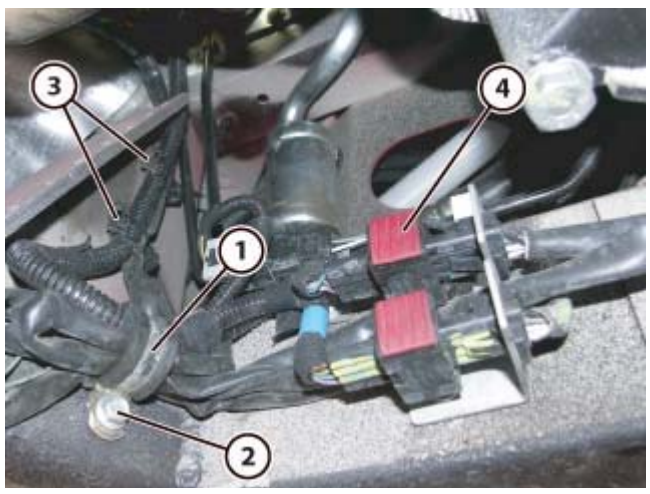


- Connect the connector **(1)** (S074) and fasten the relative cable to the clamp **(2)**.

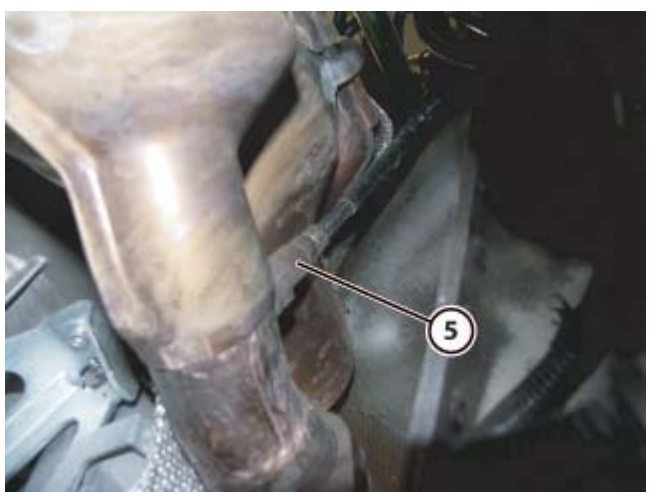
➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

Removing the rear oxygen sensor on the front left hand manifold

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the front section of the underfloor (M2.12).



- Remove the clamp **(1)** by undoing the screw **(2)**.
- Cut the sensor cable mounting clamps **(3)**, disconnect the connector **(4)** (S313) and remove from the mounting bracket.



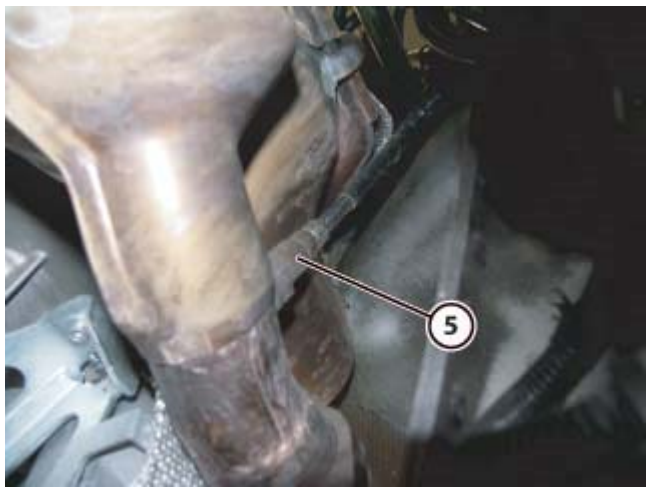
- Unscrew the oxygen sensor **(5)** from the front left hand exhaust manifold and remove from the vehicle.

Refitting the rear oxygen sensor on the front left hand manifold

Tightening torque		Nm	Class
Oxygen sensor	Sensor	50 Nm	B

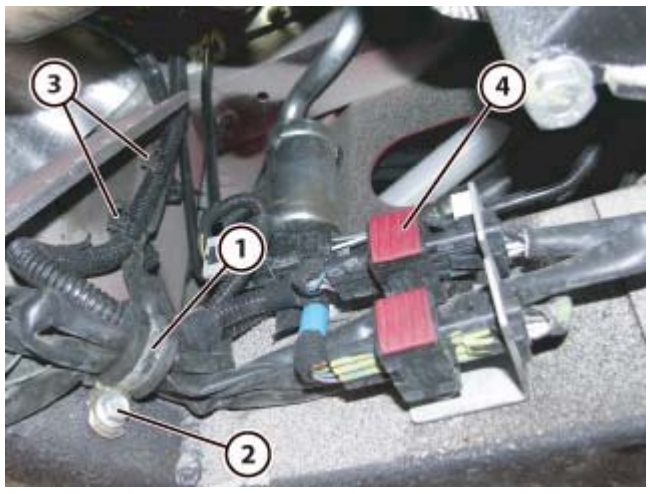
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



- Fit the oxygen sensor **(5)** in its respective seat on the front left exhaust manifold and tighten.

Tightening torque	Nm	Class
Sensor	50 Nm	B

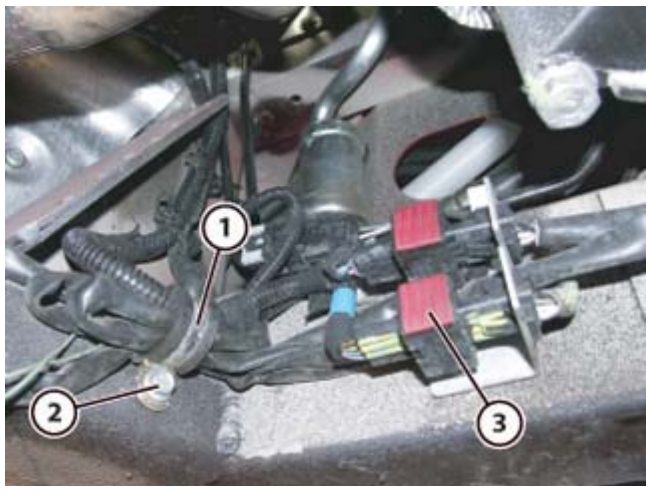


- Connect connector **(4)** (S313) and fasten to the mounting bracket.
- Refit sensor cable to its original position, fastening vertically with new clamps **(3)**.
- Fasten the cables, fitting and fastening the clamp **(1)** with the screw **(2)**.

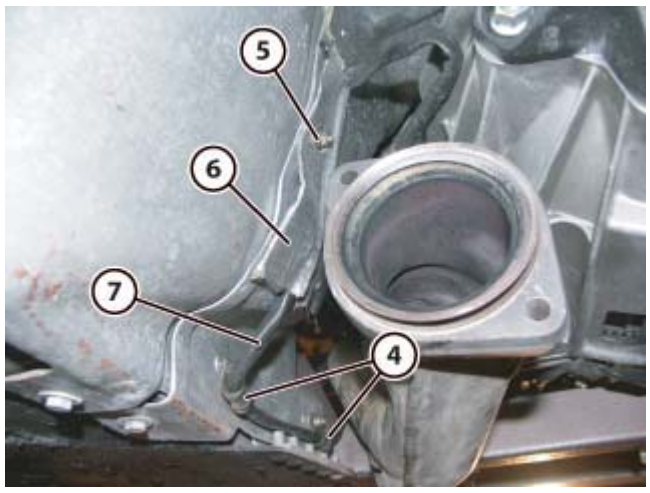
➢ Refit the front flat undertray section (M2.12).
➢ Set the battery master switch to ON (L2.02).

Removing the oxygen sensor on the left hand exhaust branching

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the front section of the underfloor (M2.12).

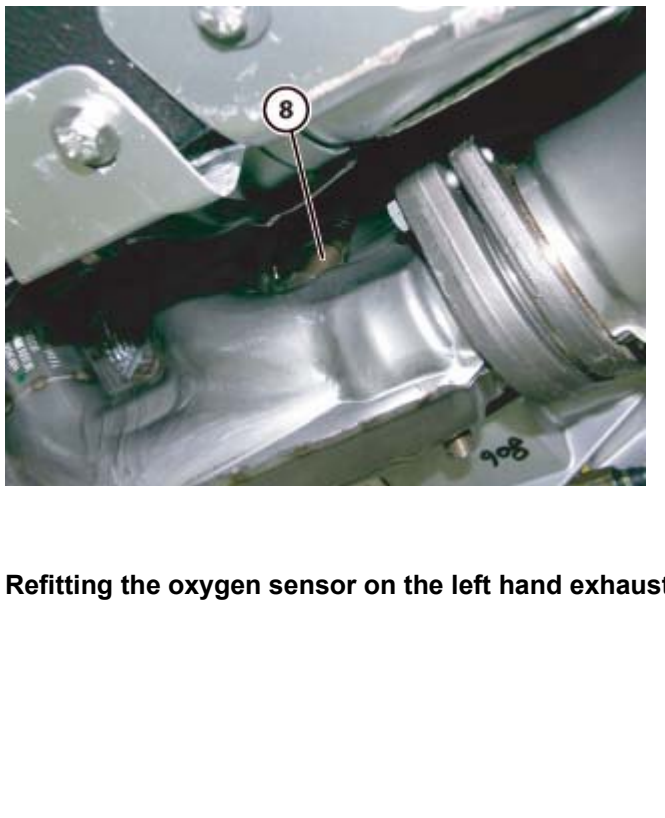


- Remove the clamp **(1)** by undoing the screw **(2)**.
- Disconnect the connector **(3)** (S314) and remove from the mounting bracket.



- Remove the two clamps **(4)** fastening the sensor cable **(7)** and undo the nut **(5)** fastening the heat shield **(6)** to the bodywork.
- Lift the heat shield **(6)** and pull out the cable **(7)**.

Note that the catalytic converter is not shown in the image to illustrate the operation more clearly.



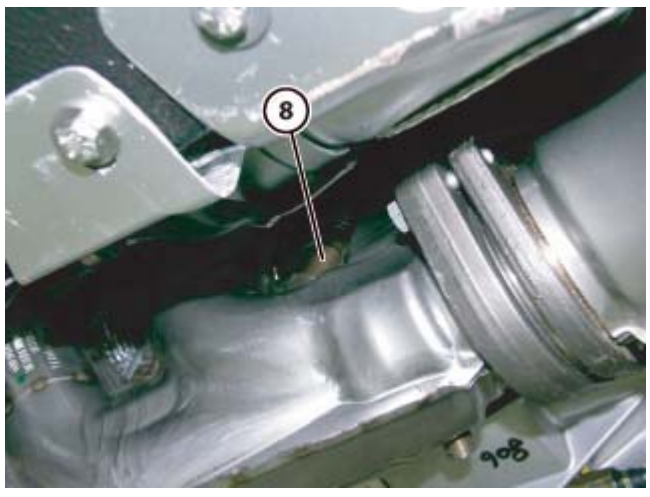
- Unscrew the oxygen sensor **(8)** from the left hand exhaust branching and remove from the vehicle.

Refitting the oxygen sensor on the left hand exhaust branching

Tightening torque		**Nm**	**Class**
Oxygen sensor	Sensor	50 Nm	B

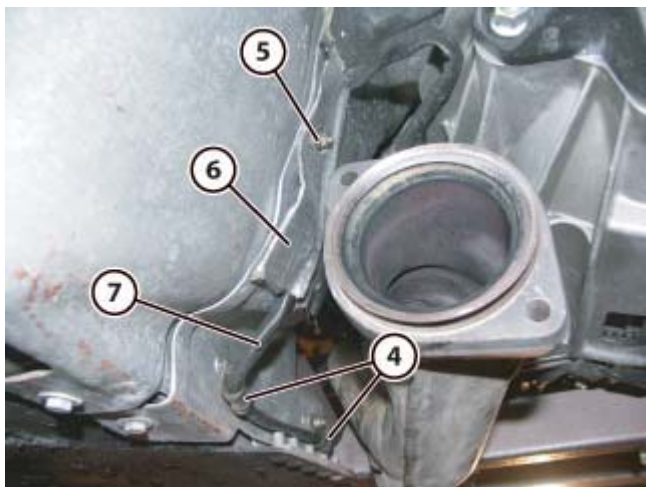
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.



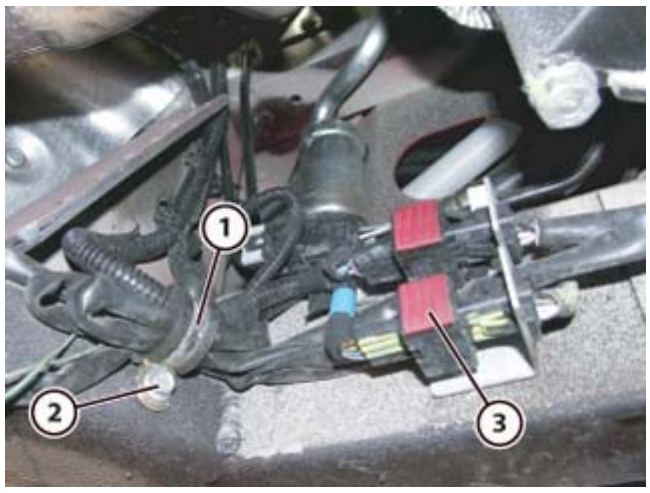
- Fit the oxygen sensor **(8)** in its relative mounting on the left exhaust branching and tighten.

Tightening torque	**Nm**	**Class**
Sensor	50 Nm	B



- Fit the oxygen sensor cable **(7)** under the heat shield **(6)** and fasten with the nut **(5)**.
- Fasten the oxygen sensor cable **(7)** to the bodywork with the two clamps **(4)**.

Note that the catalytic converter is not shown in the image to illustrate the operation more clearly.

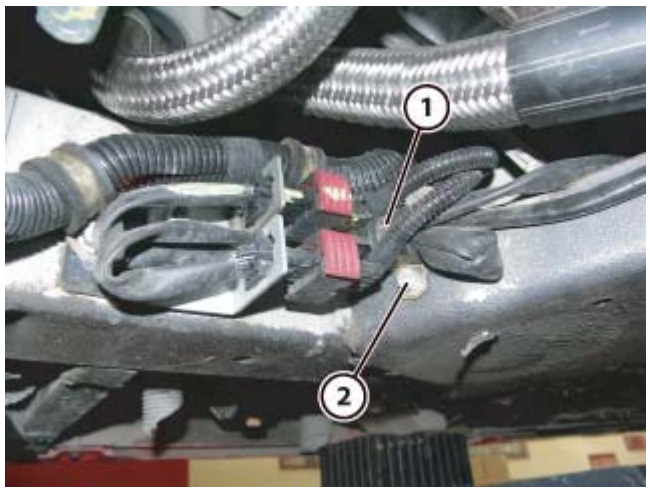


- Connect connector **(3)** (S314) and fasten to the mounting bracket.
- Fasten the cables, fitting and fastening the clamp **(1)** with the screw **(2)**.

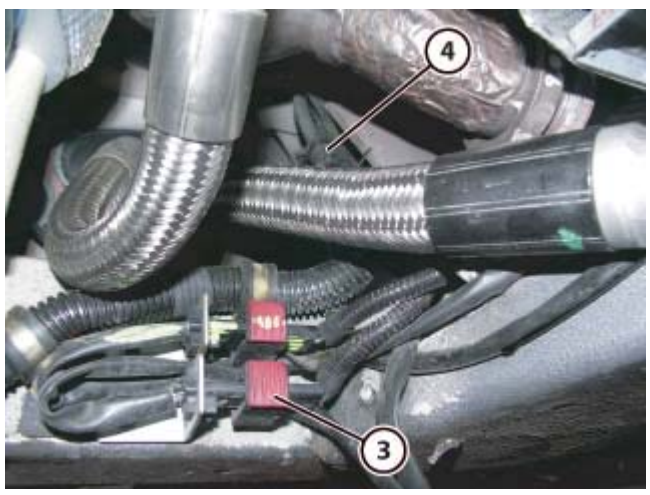
➢ Refit the front flat undertray section (M2.12).
➢ Set the battery master switch to ON (L2.02).

Removing the rear oxygen sensor on the front right hand manifold

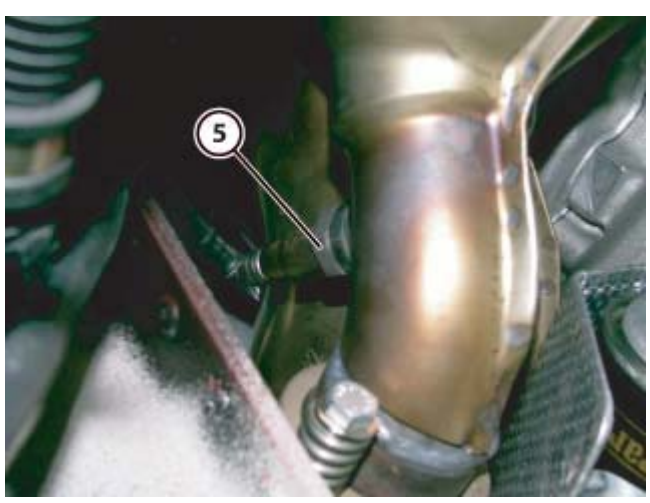
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the front section of the underfloor (M2.12).



- Remove the clamp **(1)** by undoing the screw **(2)**.



- Cut the sensor cable mounting clamps **(4)**, disconnect the connector **(3)** (S071) and remove from the mounting bracket.



- Unscrew the oxygen sensor **(5)** from the front right hand exhaust manifold and remove from the vehicle.

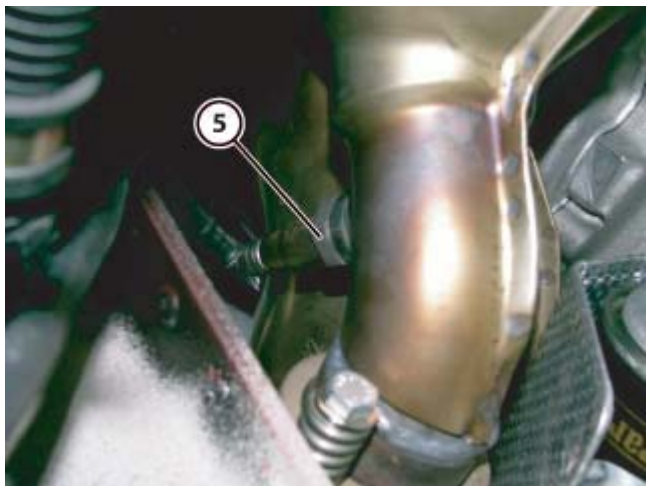
Refitting the rear oxygen sensor on the front right hand manifold



Tightening torque		**Nm**	**Class**
Oxygen sensor	Sensor	50 Nm	B

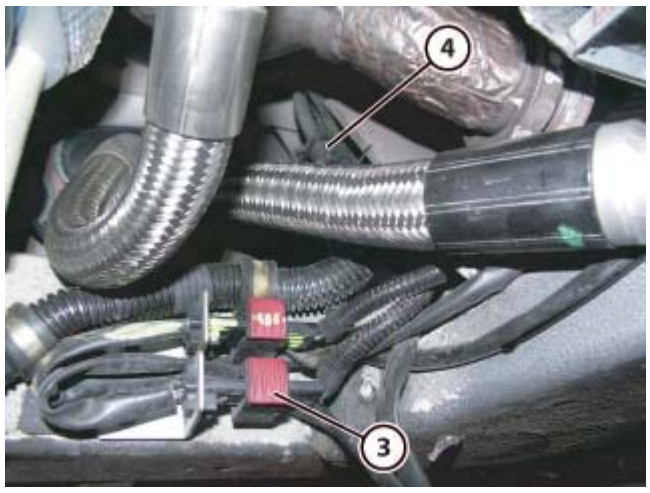
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.

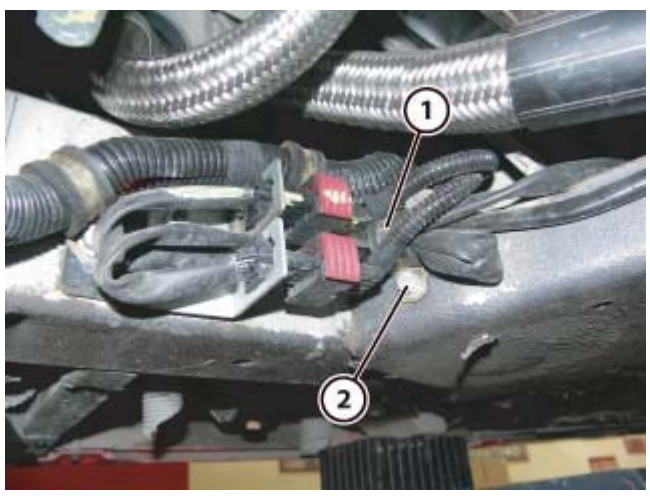


- Fit the oxygen sensor **(5)** in its respective mounting on the front right exhaust manifold and tighten.

Tightening torque	**Nm**	**Class**
Sensor	50 Nm	B



- Connect connector **(3)** (S071), fasten to the mounting bracket and fasten the cable in its original position with the clamps **(4)**.

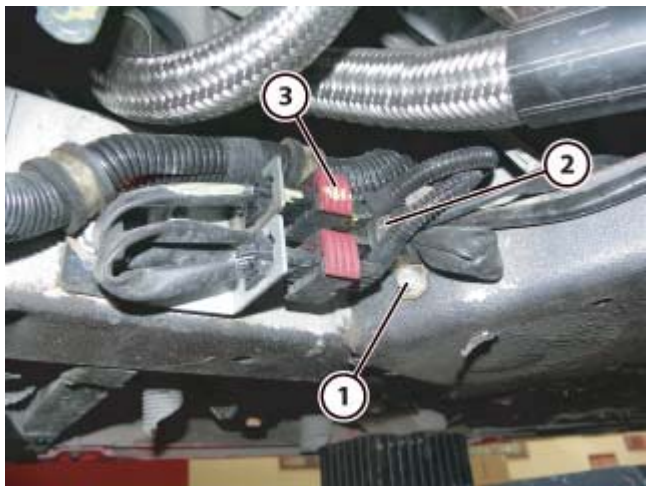


- Fasten the cables, fitting and fastening the clamp **(1)** with the screw **(2)**.

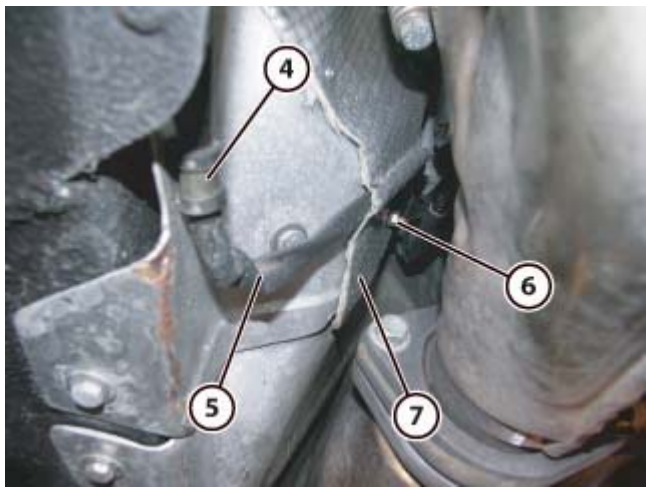
➢ Refit the front flat undertray section (☞ M2.12).
➢ Set the battery master switch to ON (☞ L2.02).

Removing the oxygen sensor on the right hand exhaust branching

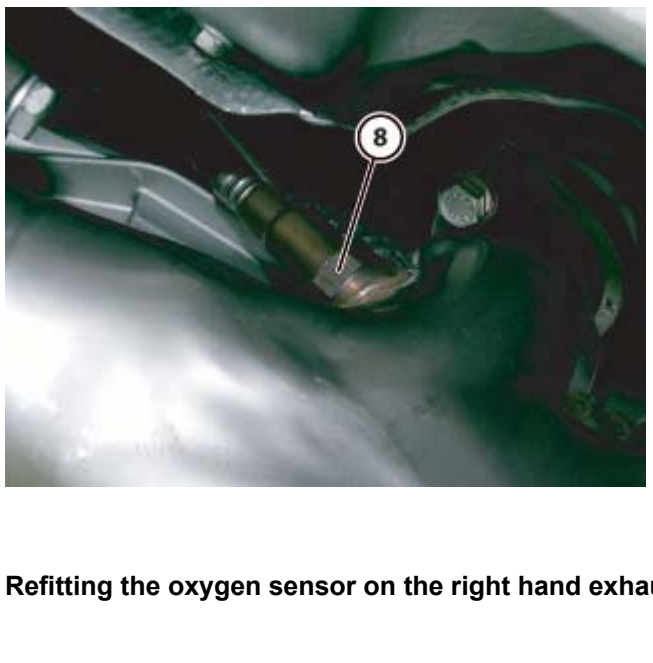
➢ Set the battery master switch to OFF (☞ L2.02).
➢ Remove the front section of the underfloor (☞ M2.12).



- Remove the clamp **(2)** by undoing the screw **(1)**.
- Disconnect the connector **(3)** (S073) and remove from the mounting bracket.



- Remove the two clamps **(4)** fastening the sensor cable **(5)** and undo the nut **(6)** fastening the heat shield **(7)** to the bodywork.
- Lift the heat shield **(7)** and pull out the cable **(5)**.



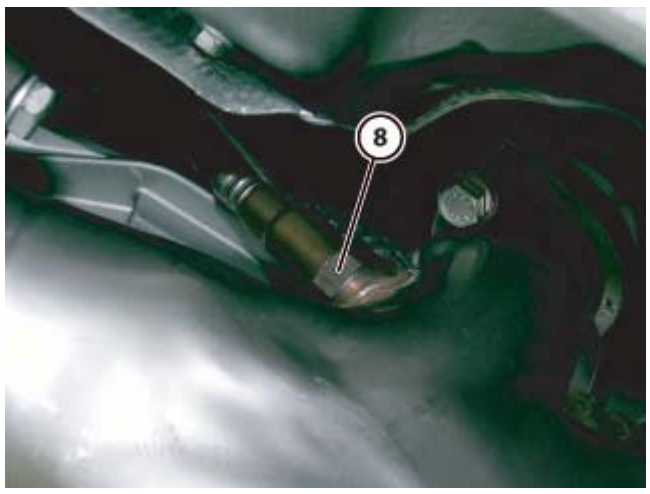
- Unscrew the oxygen sensor **(8)** from the right hand exhaust branching and remove from the vehicle.

Refitting the oxygen sensor on the right hand exhaust branching

Tightening torque		**Nm**	**Class**
Oxygen sensor	Sensor	50 Nm	B

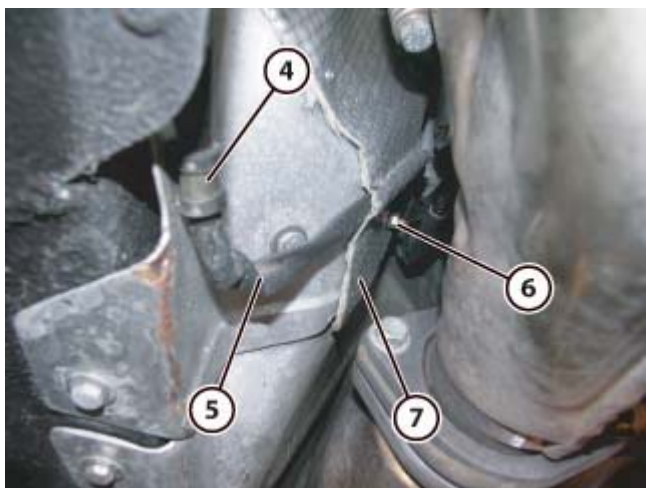
Do not clean or apply grease on the oxygen sensor thread.
Do not use solvents or thread locking products as they may impede correct sensor operation.
The oxygen sensor thread is pre-lubricated by the manufacturer with a specific product.

Whenever a sensor is replaced, the self-acquired parameters must be deleted from the ECU memory.

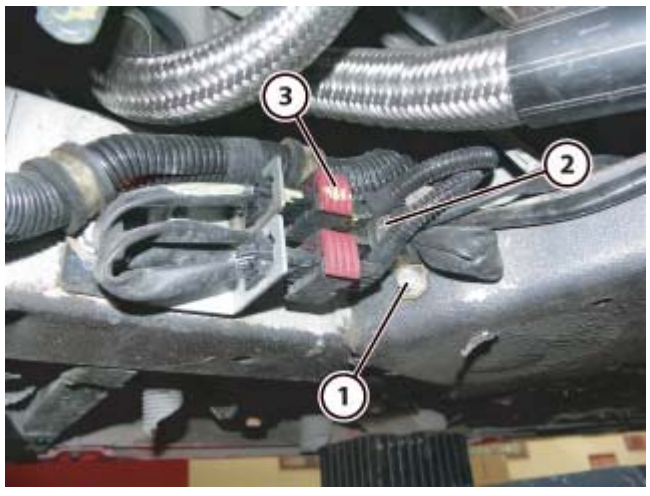


- Fit the oxygen sensor **(8)** in its relative mounting on the exhaust branching and tighten.

Tightening torque	**Nm**	**Class**
Sensor	50 Nm	B



- Fit the oxygen sensor cable **(5)** under the heat shield **(7)** and fasten with the nut **(6)**.
- Fasten the oxygen sensor cable **(5)** to the bodywork with the two clamps **(4)**.



- Connect connector **(3)** (S073) and fasten to the mounting bracket.
- Fasten the cables, fitting and fastening the clamp **(2)** with the screw **(1)**.

➢ Refit the front flat undertray section (M2.12).
➢ Set the battery master switch to ON (L2.02).

A3.10 Replacing the air filters

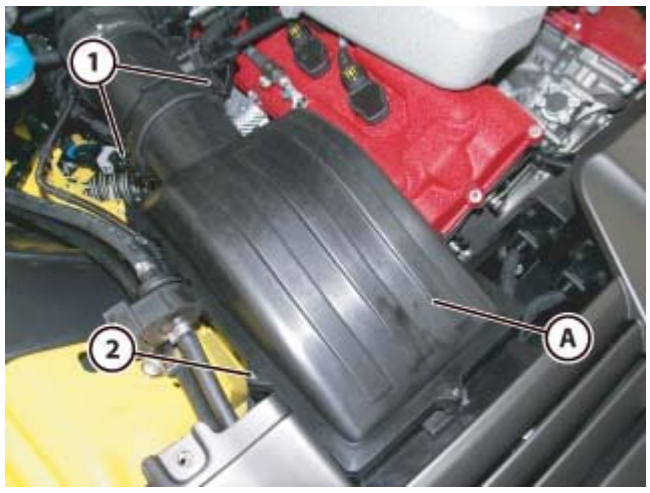
Replacing the air filters

The filters must be in good order to ensure optimum engine performance.

Replace the air filter cartridges at the intervals indicated in the Maintenance Schedule.



- There two air filter boxes **(A)** are accessible by lifting the engine compartment lid.



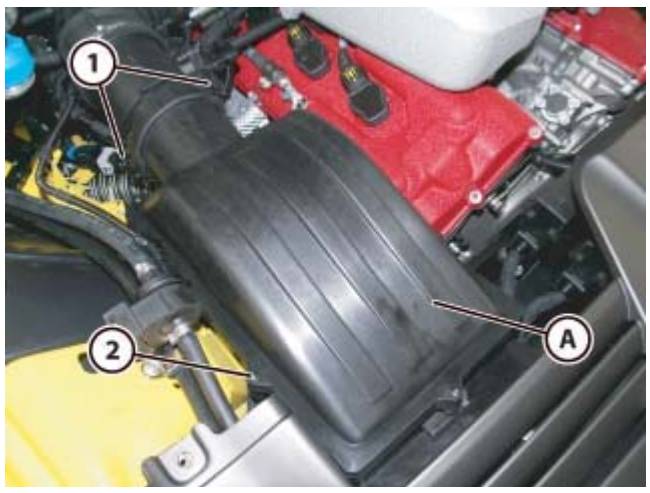
- Remove the two retainer clips **(1)** on the air flow meter and undo the screws **(2)** fastening the cover **(A)**.
- Lift the air intake cover **(A)** off the air flow meter and remove from the engine compartment.



- Remove the air filter cartridge **(B)** and replace.

Do not attempt to clean or wash air filter cartridges after removal. Always replace.

- Fit the air filter cartridge in its respective seat as originally installed.



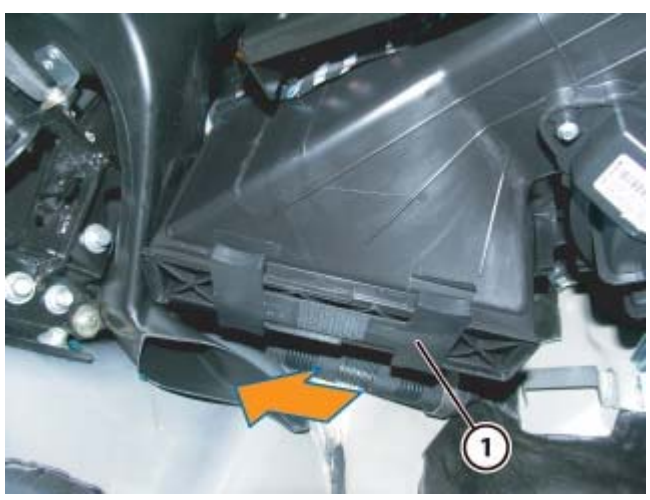
- Refit the cover **(A)** and connect to the air flow meter, then fasten with the screws **(2)**.
- Fasten the air intake cover **(A)** to the air flow meter and fit the two retainer clips **(1)**.

A3.11 Replacing the air conditioning and heating system filter

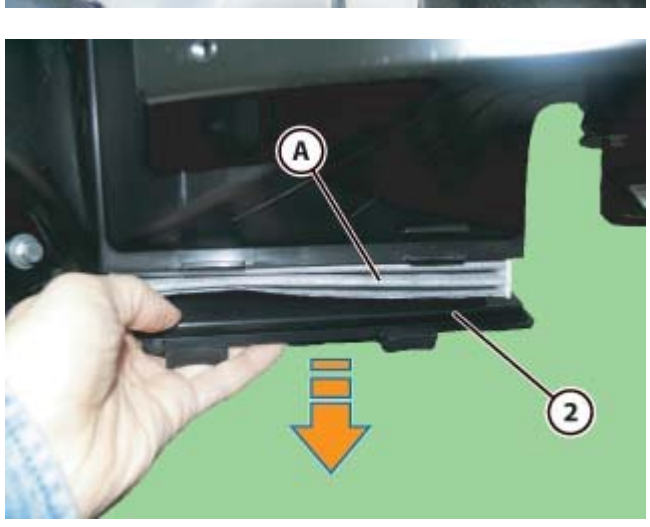
Replacing the air conditioning and heating system filter

A dirty filter impedes the flow of external air into the vehicle, compromising the functions of the air conditioning and heating system.
The air conditioning and heating system filter must be changed regularly.

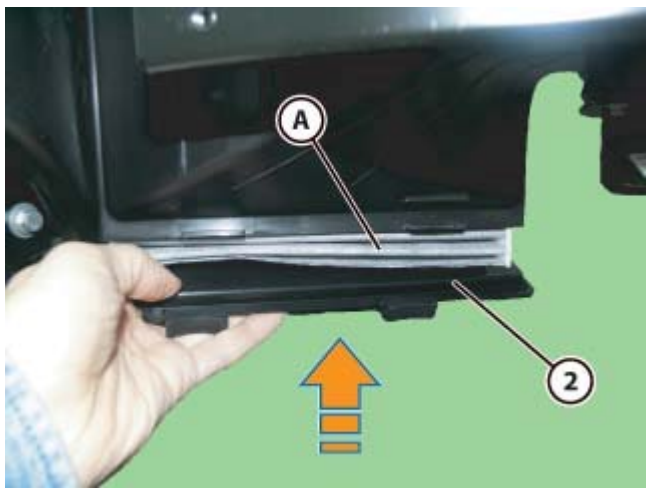
The air conditioning and heating system filter is located inside the passenger compartment, on the right hand side of the heater/evaporator. It is accessible from beneath the passenger side of the dashboard.



- Move the slider **(1)** in the direction indicated by the arrow.



- Lower the filter cover **(2)** then remove the filter **(A)** from the vehicle.



- Fit the new air conditioning and heating system filter **(A)** together with the cover **(2)**.



- Move the slider **(1)** in the direction indicated by the arrow to lock the cover on the duct.

A3.12 Checking tension and replacing auxiliary utilities belts

Checking the alternator drive belt tension

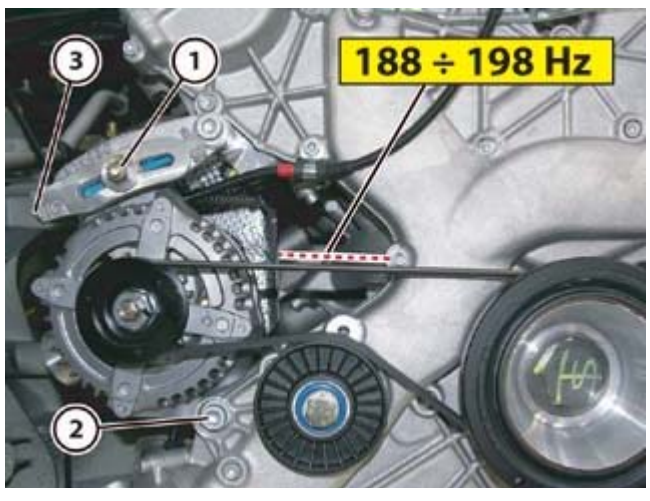
			
Tightening torque		**Nm**	**Class**
Lower alternator mounting - crankcase	Screw	49 Nm	B
Eccentric belt tensioner nut	Nut	50 Nm	B

Check belt tension with a cold engine.

FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779, a new procedure for setting the alternator belt tension was introduced. The belt tension is now set with the eccentric belt tensioner and no longer by adjusting the alternator mounting bracket.

➢ UP TO Engine No. 122778. Remove the air intake (B6.03).
Remove the right hand air intake.

➢ Remove the front section of the underfloor (M2.12).



- Apply the frequency probe of the measuring instrument **(95978151)** at the mid point of the upper section of belt, avoiding contact with the belt.
- Tap the belt near the probe with a screwdriver and read the value indicated by the instrument.
- The value measured must be **188 - 198 Hz**.
- If the tension value is incorrect, loosen the nut **(1)**, the screw **(2)** and use the adjuster screw **(3)** to set the correct tension value.

Tightening the screw **(3)** moves the alternator away from the engine, increasing the belt tension.

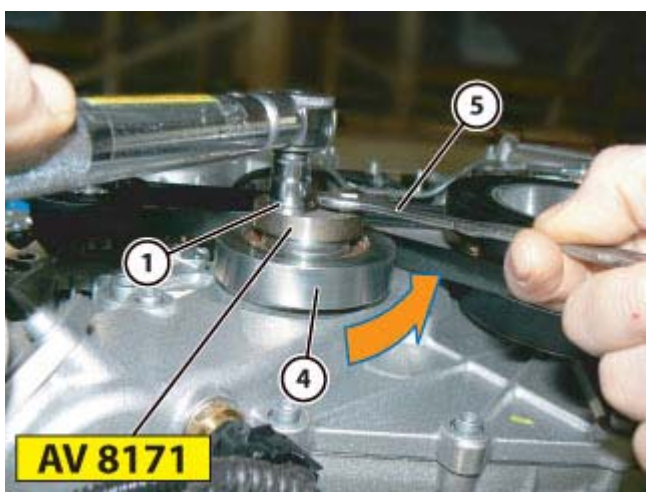
- Tighten the nut **(1)** fully.
- Tighten the lower screw **(2)** fastening the alternator.

		
Tightening torque	**Nm**	**Class**
Screw	49 Nm	B



FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779

- Apply the frequency probe of the measuring instrument **(95978151)** at the mid point of the upper section of belt, avoiding contact with the belt.
- Tap the belt near the probe with a screwdriver and read the value indicated by the instrument.
- The value measured must be **188 - 198 Hz**.



FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779

- If the tension value is incorrect, remove the tool **(AV 8171)** and insert the two pins into the respective slots on the eccentric belt tensioner **(4)**.
- Place an open-end spanner **(5)**, as shown in the photo, on the hexagonal pin of the tool. While holding the open-end spanner **(5)**, loosen the nut **(1)** fastening the eccentric belt tensioner **(4)**.
- Use the open-end spanner **(5)** to adjust the eccentric belt tensioner **(4)** until the correct tension value is reached.
- While holding the open-end spanner **(5)**, tighten the nut **(1)** fastening the eccentric belt tensioner and check that the tension values have not changed.

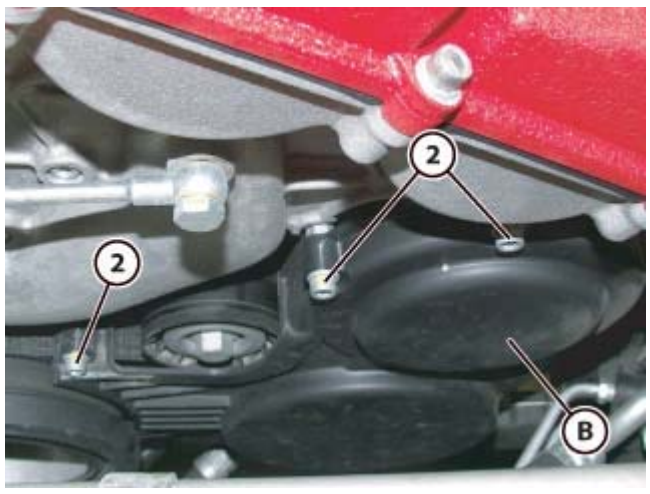
		
Tightening torque	**Nm**	**Class**
Nut	50 Nm	B

➢ Refit the front flat undertray section (M2.12).
➢ UP TO Engine No. 122778. Refit the air intake (B6.03).

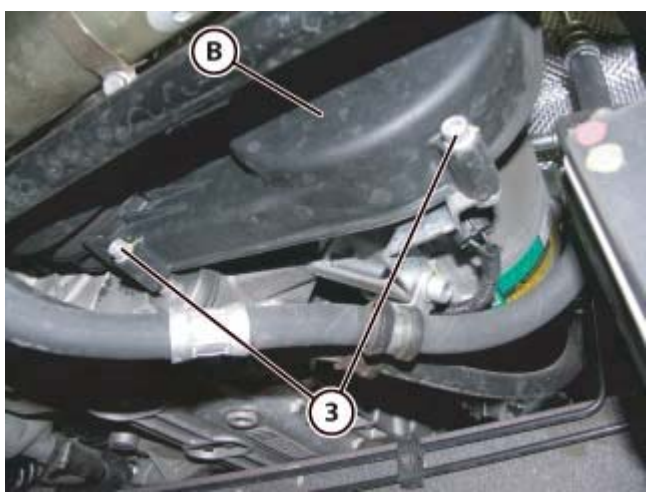
Checking hydraulic steering/compressor drive belt tension

Check belt tension with a cold engine.

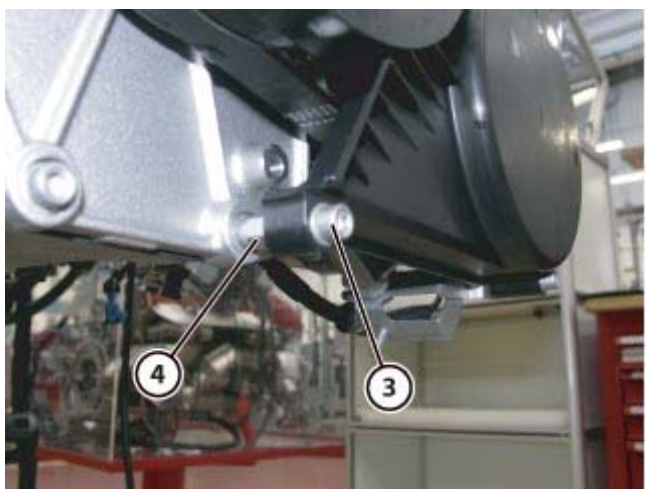
➢ Remove the front section of the underfloor (☞ M2.12).
➢ Remove the central engine compartment shield (☞ M2.17).



- Remove the protective casing **(B)** by undoing the upper screws **(2)**.

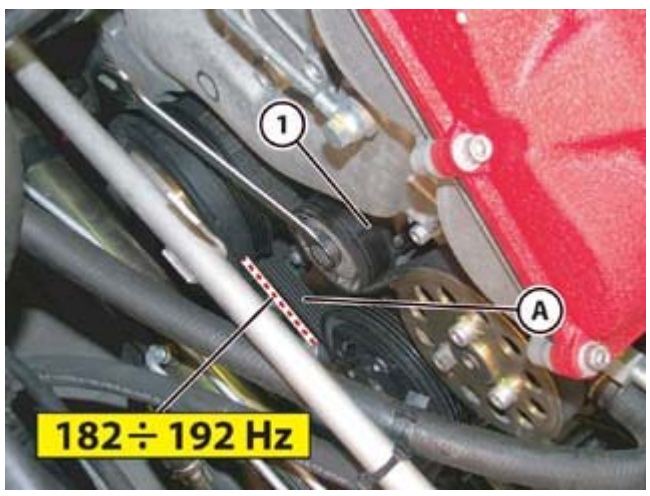


- Undo the lower screws **(3)** and remove the casing **(B)** from the engine compartment.

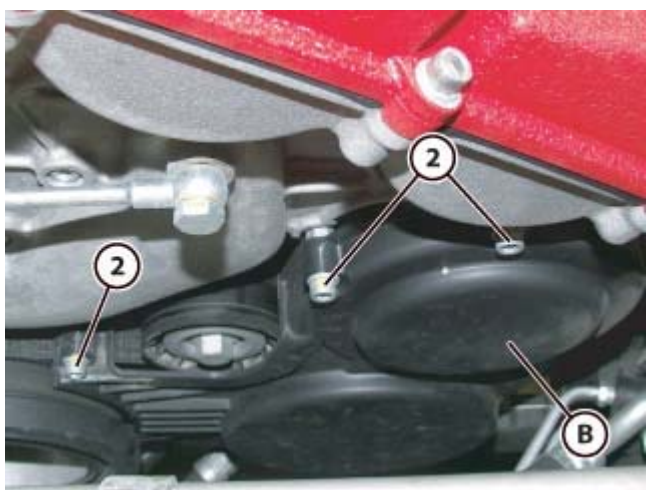


FROM ENGINE No. 128028

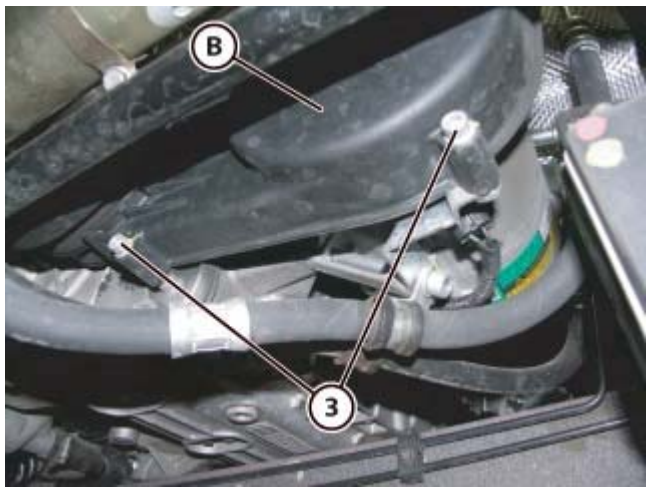
- A new casing was introduced, which is similar to the first version and with the lower right fastener consisting of a screw **(3)** that fastens onto a stud bolt **(4)** which, in turn, is fixed to the front engine cover.



- Apply the frequency probe of the tension measuring instrument **(95978151)** at the mid point of the lower section of belt, avoiding contact with the belt.
- Tap the belt near the probe with a screwdriver and read the value indicated by the instrument.
- The value measured must be **182 - 192 Hz**.
- The belt tension **(A)** is regulated by a precalibrated tensioner **(1)**. If the tension is not within the specified limits, check that the tensioner is properly fastened and functioning correctly, replacing if necessary.



- Fit the protective casing **(B)** and fasten by tightening the upper screws **(2)**.

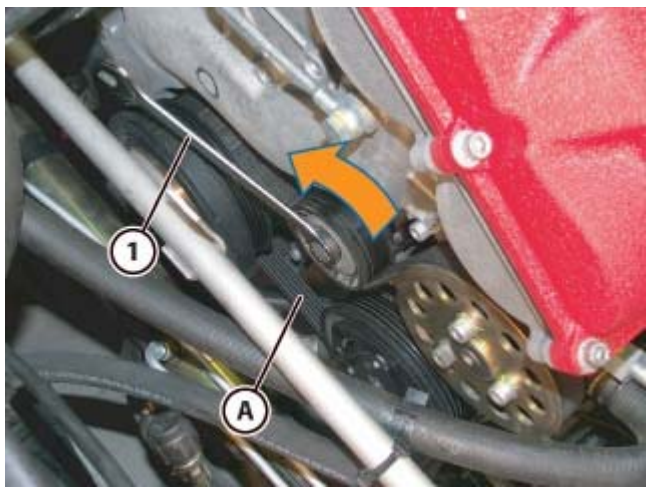


- Fasten the casing **(B)** by tightening the lower screws **(3)**.

➢ Refit the central engine compartment shield (M2.17).
➢ Refit the front flat undertray section (M2.12).

Removing the hydraulic steering pump/compressor drive belt

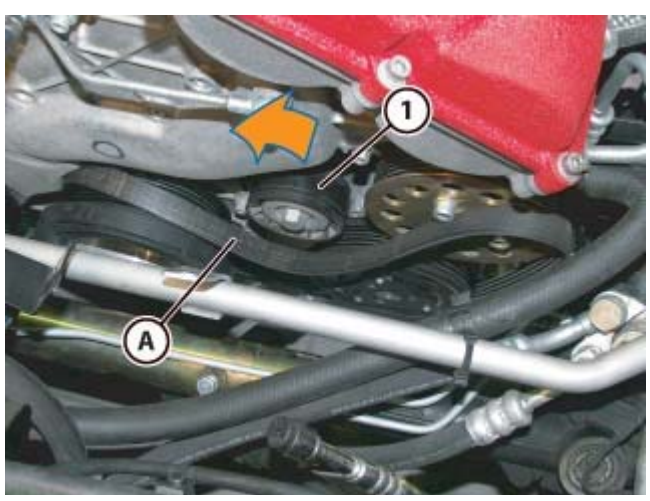
➢ Remove the alternator drive belt (A3.12).



- Apply a wrench **(1)** onto the belt tensioner pulley fastener screw and prise the belt tensioner to the left (in the direction indicated by the arrow) to release the belt **(A)** and enable its removal.

Refitting the hydraulic steering pump/compressor drive belt

To prevent belt damage, avoid tight bends and contact with oil or fuel.



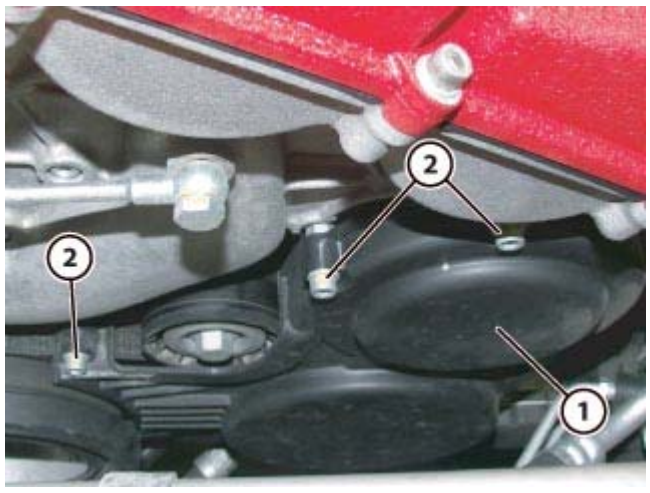
- Fit the belt **(A)** on the torsion damper, on the compressor pulley and on the hydraulic steering pump pulley, then lift the belt tensioner **(1)** in the direction indicated by the arrow, so that the back of the belt can be inserted under the belt tensioner pulley.

➢ Set the hydraulic steering/compressor drive belt tension (A3.12).
➢ Refit the alternator drive belt (A3.12).

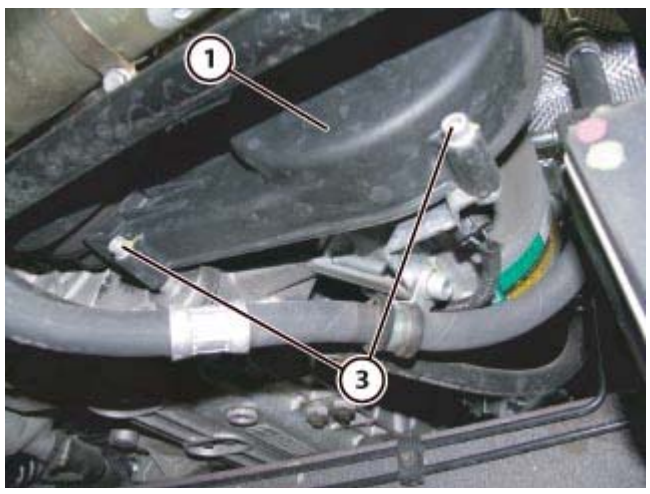
Removing the alternator drive belt

FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779 a new procedure for setting the alternator belt tension was introduced. Removing the belt now entails working on the eccentric belt tensioner and no longer involves the alternator mounting bracket and fastenings.

➢ Remove the central engine compartment shield (M2.17).
➢ Remove the front section of the underfloor (M2.12).
➢ UP TO Engine No. 122778. Remove the air intake (B6.03).
Remove the right hand air intake.



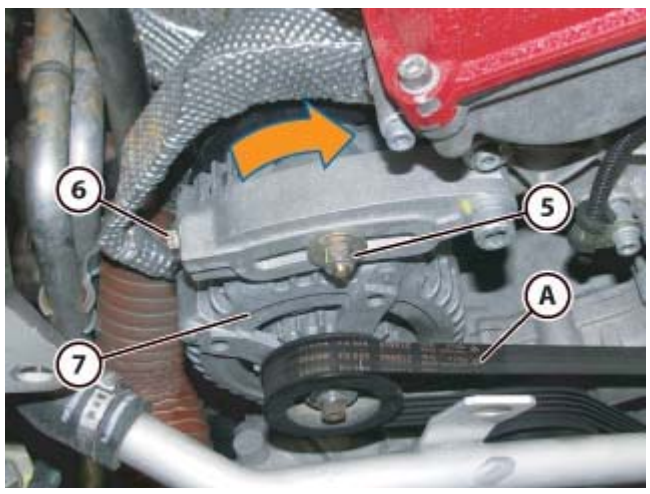
- Remove the casing **(1)** covering the hydraulic steering pump/compressor ancillary drive belt by undoing the screws **(2)** from above.



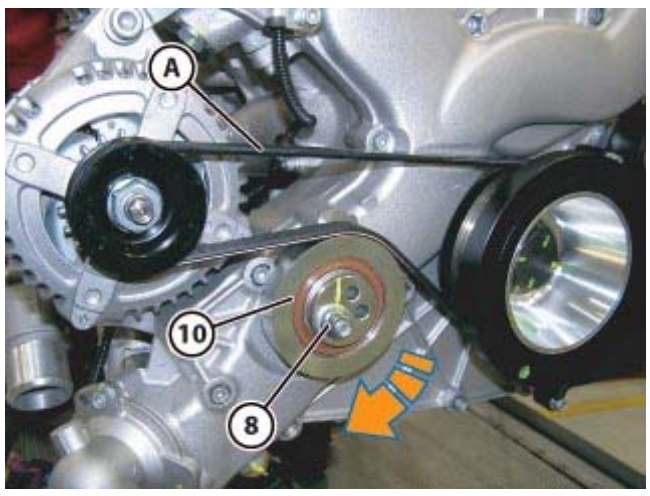
- Undo the lower screws **(3)** fastening the casing **(1)**.



- Working from below, loosen the lower screw **(12)** fastening the alternator.



- Loosen the nut **(5)** on the belt adjuster pin.
- Loosen the screw **(6)** so that the alternator **(7)** can be moved towards the engine (in the direction indicated by the arrow) and the alternator belt **(A)** can be removed from its seat.
- Remove the alternator drive belt **(A)** from the engine compartment.



FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779

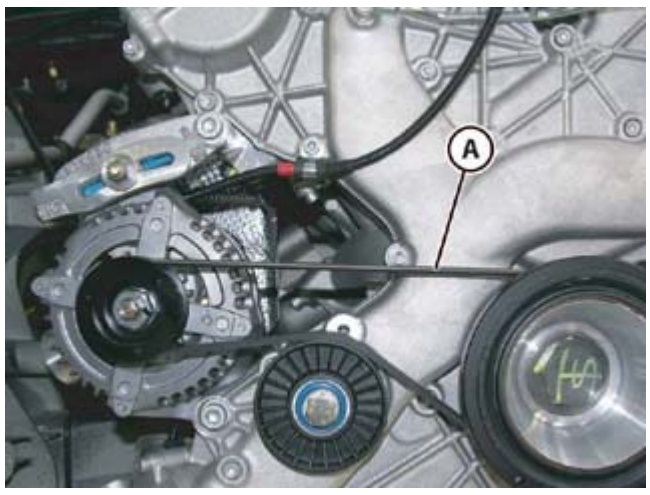
- Loosen the nut **(8)** and shift the eccentric belt tensioner **(10)** downwards to remove the alternator belt **(A)** from the engine compartment.

Refitting the alternator drive belt

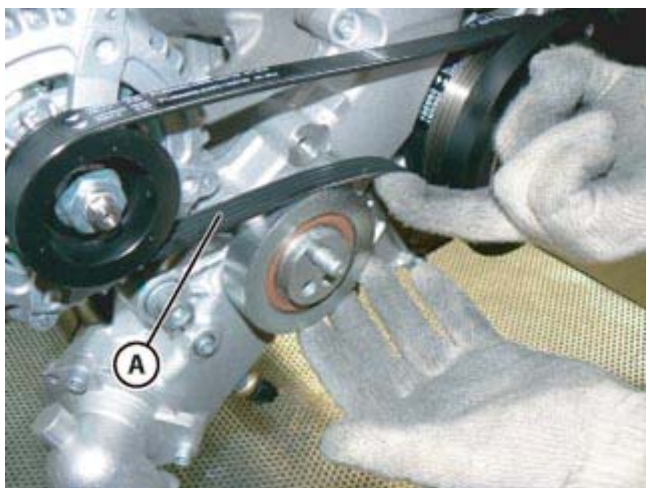
Tightening torque		Nm	Class
Lower alternator mounting - crankcase	Screw	49 Nm	B

To prevent belt damage, avoid tight bends and contact with oil or fuel.

FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779 a new procedure for setting the alternator belt tension was introduced. Refitting the belt now entails working on the eccentric belt tensioner and no longer involves the alternator mounting bracket and fastenings.

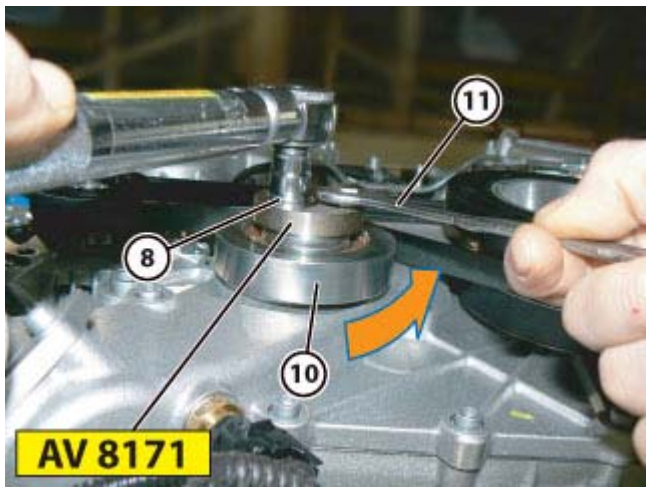


- Fit the alternator drive belt **(A)** in its seat on the torsion damper, on the belt tightener and on the alternator pulley.



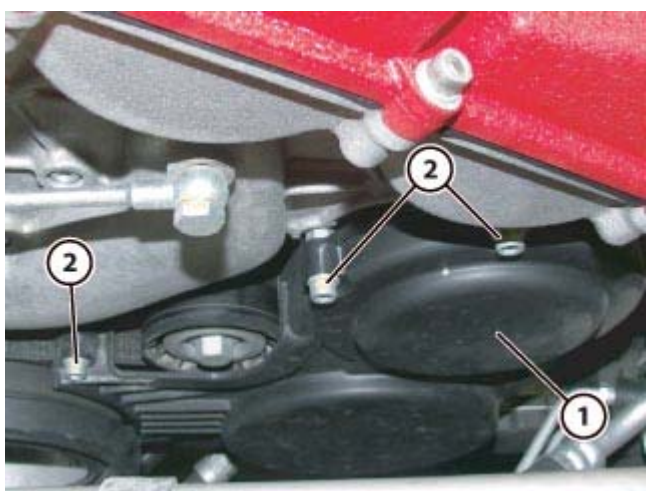
FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779

- Fit the alternator drive belt **(A)** in the relative seat on the torsion damper, onto the alternator pulley and lastly, onto the eccentric belt tensioner.

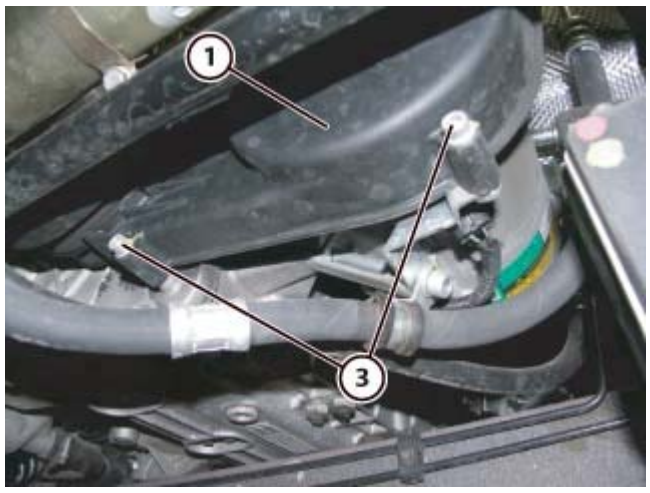


FROM REDUCED FUEL CONSUMPTION ENGINE No. 122779

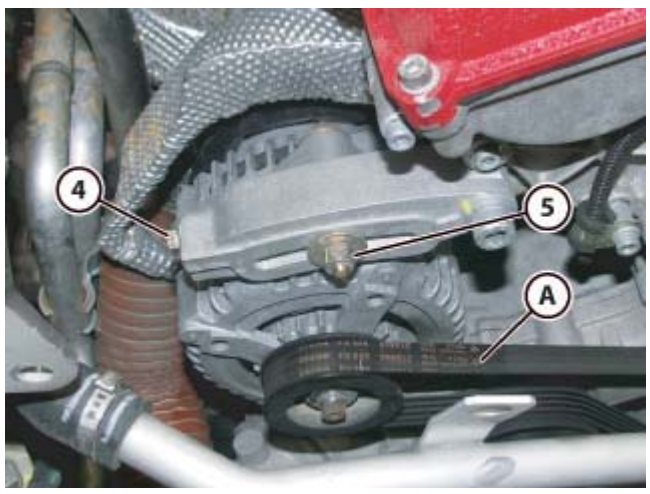
- Remove the tool **(AV 8171)** and insert the two pins into the respective slots on the eccentric belt tensioner **(10)**.
- Using an open-end spanner **(11)**, as shown in the photo, turn the eccentric belt tensioner **(10)** to tighten the belt and partially tighten the fastener nut **(8)**.



- Fit the protective guard **(1)** and tighten the upper screws **(2)**.



- Fasten the protective guard **(1)** by tightening the lower screws **(3)**.



- Tighten the adjustment screw **(4)** to tauten the alternator drive belt **(A)** then tighten the nut **(5)**.



- Tighten the lower screw **(12)** fastening the alternator.

		
Tightening torque	**Nm**	**Class**
Screw	49 Nm	B

- Set the alternator drive belt tension (A3.12).
- Refit the front flat undertray section (M2.12).
- UP TO Engine No. 122778. Refit the air intake (B6.03).
- Refit the central engine compartment shield (M2.17).

A3.13 Checking and replacing spark plugs

Removing the spark plugs

➢ Set the battery master switch to OFF (L2.02).



- Ease out the coil **(1)** and remove from its seat on the engine head without disconnecting it from the system.



- Using an articulated wrench, unscrew and remove the spark plug **(2)**.

Refitting the spark plugs

Tightening torque		**Nm**	**Class**
Spark plug - engine head	Spark plug	11 Nm	A

Before refitting the spark plugs, check that they are in good condition and replace if necessary.

Check that the spark plug electrode gap is between 0.6 and 0.7 mm. Oil the threaded part of the spark plug with very little oil.



- When refitting the original spark plugs, clean them with compressed air to remove any dirt.
- Fit the spark plug **(1)** in its seat on the engine head.
- Use an articulated wrench to hand tighten the spark plug until the gasket sits up against the support seat.
- Loosen slightly.
- Use a torque wrench to tighten the spark plug.

Tightening torque	**Nm**	**Class**
Spark plug	11 Nm	A



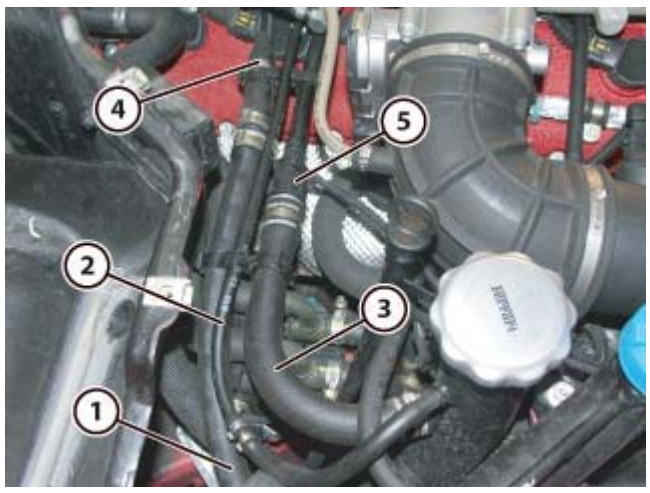
- When refitting the original coils, clean them with compressed air to remove any dirt.
- Check that the coil seat on the head is clean.
- Fit the coil **(2)** on its seat in the engine head cover and push it into place.
- Check that the coil is fastened correctly.

➢ Set the battery master switch to ON (L2.02).

A3.14 Checking Blow-by system pipes and connections

Checking blow-by system lines and connections

- Remove the engine compartment shields on the fenders (M2.17).
- Remove the right hand side windscreen shield (M2.17).



- Check the condition of the lines **(1)**, **(2)** and **(3)**, and check that the relative clamps on the engine oil tank are securely fastened.
- Check the connections **(4)** and **(5)**; if any leakage or sweating is noted, replace the relative pipe and/or clamp.



- Check the connection **(6)** on both throttle bodies.

A3.15 Checking cooling system pipes and connections

Checking the cooling system

➢ Remove the front section of the underfloor (M2.12).

- Check that the pipes and pipe unions on the water pump, the radiator and the expansion tank are undamaged.
- Replace any worn pipe unions or loose clamps.

A3.16 Checking injection and ignition system pipes and connections

Checking injection and ignition system lines and connections

- Working inside the engine compartment, check the connection pipes between the tank and the injector rails on the intake manifold.
- In the event of leakage, replace the pipe and check the system.
- Remove the mats (M2.24).

Follow the disassembly procedure up to the removal of **the driver-side floor mat** fastener and **the passenger-side floor mat** fastener.

- Check the state of the cables and connectors for the Motronic ECUs and the coils. If the outer casing or the connector locks are damaged, replace the cable.
- In the event of malfunction, check the spark plugs. Replace the spark plugs at the intervals indicated in the maintenance schedule.

A3.17 Checking exhaust system connections

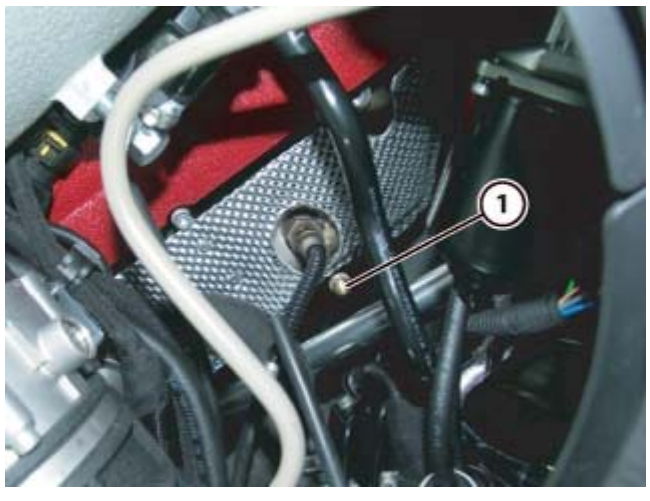
Checking exhaust system connections

- Remove the front section of the underfloor (M2.12).
- Remove the rear undertray section (M2.12).

- Check that the system components, the connections between the manifolds and the centre silencer and between the centre silencer and the rear silencer are undamaged, then check that all fastenings are properly tightened.

A3.18 Checking exhaust emissions

Checking exhaust emissions



- Check CO, HC and NOx levels by connecting the tester to the exhaust manifold unions, after removing the four nuts **(1)**.
- After completing the procedure, tighten the four nuts **(1)**.

A3.19 Checking service brakes for wear

Checking service brakes for wear

- At the intervals indicated in the Maintenance Schedule, check the state of wear of the brake pads and discs..
- Remove the wheels (F2.08).
- If excessive wear or surface roughness is noted, grind or replace the brake disc.
- The front brake pads are fitted with a wear indicator connected to the brake failure warning light on the dashboard. Should this warning light illuminate, check the thickness of the pads and the state of the braking surfaces on the discs.
- In the event of excessive wear, even of just one pad, replace all the pads on the axle.

A3.20 Checking service/parking brake operation and control play

Checking service/parking brake operation and pedal play

- Check the brake pedal travel and **STOP** light switch function.
- Road test the vehicle to check braking performance.
- Check handbrake lever operation and the state of the parking brake cables

A3.21 Checking suspension components

Checking suspension components

- Road test the vehicle to check shock absorber performance and to check for suspension noise.
- Remove the wheels (F2.08).
- Check tightness of suspension components.
- Check that all protective gaiters are in good order and that the ball joints on the stub axle and on the rear hub holder have sufficient play.
- Check that the bushings at the arm and shock absorber mounting points on the chassis have sufficient play.
- Check that the arms are not deformed and exhibit no signs of failure.
- Check the state of the upper rebound stop bushes on the shock absorbers.
- Check front and rear stabiliser bar alignment and the state of the rubber mounts and tie rod ball joints.

A3.22 Checking vehicle set-up

Checking vehicle setup

The following operations must be performed beforehand to ensure that vehicle setup parameters are checked correctly

- Check that the tyre pressure is correct.
- Check the steering and transmission system components.
- Ensure that there is no backlash between the ball tie-rod of the steering box and the stub axle, and between the ball tie-rod and the rear hub holder.
- Check the state of the protective gaiters on the steering box tie-rods, on the toe-in tie-rod and on the axle shaft tie-rods.
- Check that all suspension components are in proper working order.
- Check the set-up data.

A3.23 Checking proper installation and function of seats and seat belts

Checking proper installation and function of seats and seat belts

- With the seat adjustment controls, check that the electrical seats move through their entire adjustment travel without impediment.
- Check that the seat guides are securely fastened to the floor mounts.
- Lubricate the guide connections and sliding surfaces with waterproof lithium grease.
- Check that the seat belt anchor screws are properly tightened.

A3.24 Checking and recharging battery

Checking and recharging the battery

CAUTION
The batteries contain sulphuric acid (corrosive) and, in certain conditions, release explosive gas, especially during charging; Take the precautionary measures prescribed by the instructions and by Law Decree 626/94 – sections 40 and 46, requiring the use of personal protection devices (gloves, goggles etc.) when working with batteries.
Do not smoke near the battery and keep all sources of flames and sparks away from the battery.
Keep your face out of the area directly above the battery during installation and removal.

To recharge the battery on vehicles with the socket for the Ferrari battery charger (optional), no additional maintenance is necessary for the battery.

A Ferrari battery charger or a "stabilised" battery charger is necessary for this procedure.

- Set the battery master switch to OFF (L2.02).
- Remove the luggage compartment side trim panels (M2.23).
  Remove the right-hand side component only.

- Ensure that the terminals and terminal clamps are perfectly clean and securely fastened.
- Visually inspect the outer surface for cracks.
- Disconnect the terminals from the battery poles and detach the breather pipe.
- Remove the battery (L2.01).

If the vehicle is not used for extended periods, remove the battery from the vehicle and recharge at least once every 3 months.
If you intend to leave the battery connected to the electrical system, to keep certain connected devices operating (car radio channel memory, antitheft system etc.), recharge at least once a month.

- If in doubt or with signs of poor battery function, check the state of charge of the battery and/or the current absorption of the vehicle's electrical system

CAUTION
The battery must be charged in a well ventilated place away from sources of heat and/or naked flame.

- Clean the battery poles thoroughly with a brush or other appropriate tool.
- Measure the battery voltage with a digital multimeter.
- Use an IU type battery charger (max. constant voltage **16 V**) with charge current limiter.

Preferably use a battery charger with adjustable current in relation to nominal capacity.

- Charge intensity: **3 to 5 A** (Amperes)
- Duration of charging may vary from a few hours to a maximum of 24 hours.

Check the battery temperature (max. 50 - 55°C). If necessary, interrupt the charging process or reduce the charge current.

- If the car must be started sooner, a quick charge may be performed using a maximum charge intensity of **20 A** and reducing the charge time to approximately **20 to 30 minutes**.

Bear in mind that this does not charge the battery completely and that the alternator will complete charging while the vehicle is driving.

- When recharging has been completed, refit the battery in its seat, fastening with the relative bracket and reconnecting the breather pipe.

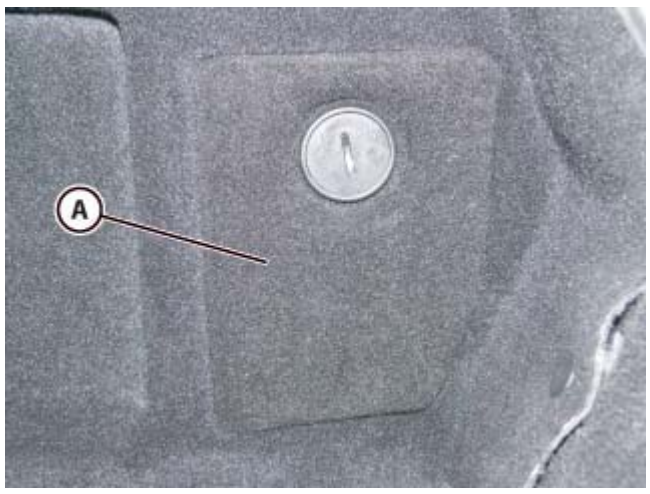
Check the breather pipe for kinks or obstructions which could raise the pressure and cause damage within the battery.

- Apply water repellent lubricant to the electrical system cable terminal clamps and reconnect to the battery poles.
- Tighten the terminal clamp screws.

- Refit the luggage compartment side trim panels (M2.23).
- Set the battery master switch to ON (L2.02).

Battery conditioner

Ferrari vehicles are equipped with a battery conditioner representing the state of the art in battery maintenance technology.
Using the battery conditioner contributes to prolonging battery life.
The device is stored in a pocket in the car dust cover bag, which is located in the luggage compartment.

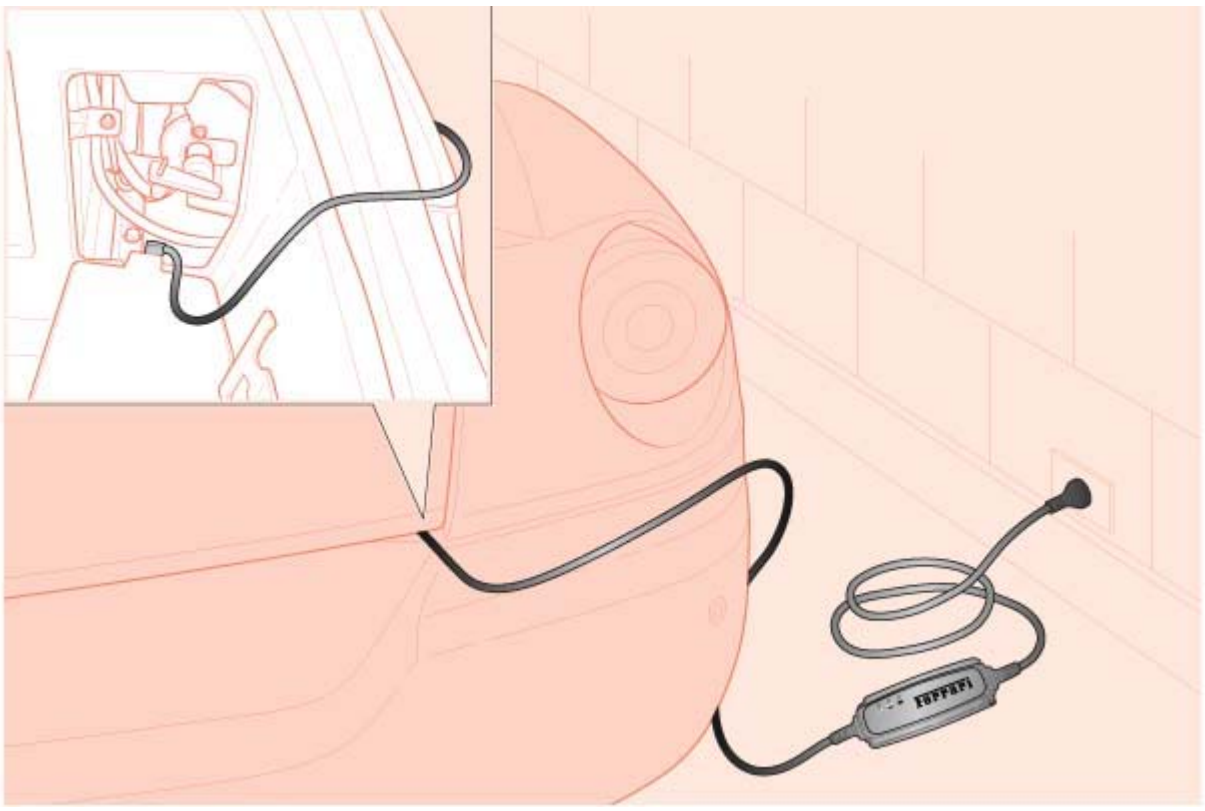


A quick connector socket is located in a protected, concealed position on the car for connecting the device.
The image above indicates the position of the socket for connecting the battery conditioner: the socket is located behind a cover panel **(A)** on the right hand side of the luggage compartment.

CAUTION
Ensure that all lids and doors are closed correctly.
Place the battery conditioner in an easily visible location, away from heat sources and out of the reach of children.

Whenever the car will not be used for periods of a week or longer, we recommend connecting the battery conditioner to keep the battery in perfect working order.

Instructions for use: active mode and passive mode

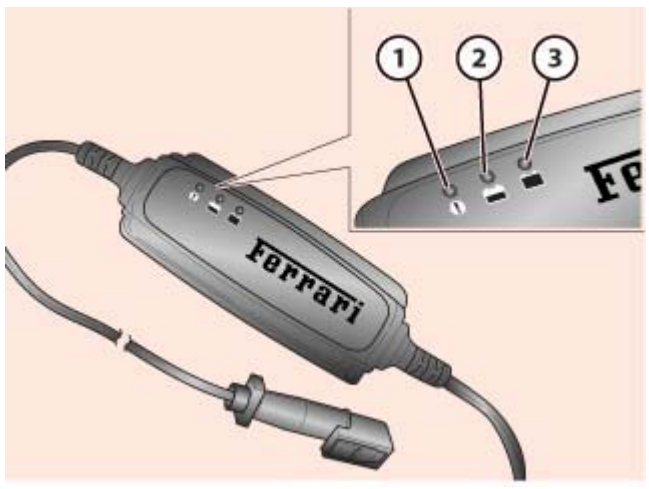


Connect the battery conditioner first to the in-car socket and then to a mains power socket: this enables the “Active” cycle, allowing the battery conditioner to be left connected to the car for months without any adverse effects.
Position the device in a safe place outside the car, taking care not to crush the connector cable and/or damage the seal strip when closing the luggage compartment lid.

CAUTION
Ensure that all lids and doors are closed correctly.
Place the battery conditioner in an easily visible location, away from heat sources and out of the reach of children.

The battery conditioner may be turned off at any time by simply disconnecting the power lead from the mains socket.
Always disconnect the power lead from the mains socket before disconnecting the battery conditioner from the in-car socket.

Engine start is inhibited as long as the battery conditioner is connected to the vehicle socket (even if the battery conditioner is disconnected from mains power).



- 1 - Error indicator lamp
- 2 - Active mode indicator: active mode on
- 3 - Charge maintenance indicator: charge maintenance in progress

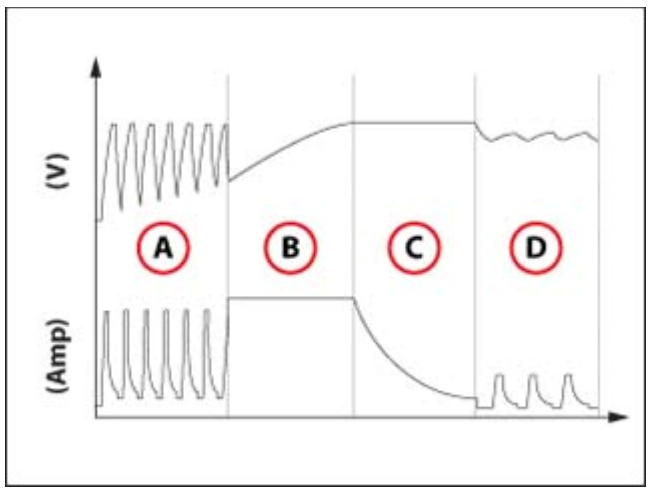
Indicator lamp **(1)** lit constantly: car electrical system or battery fault.
Indicator lamp **(2)** lit constantly: battery conditioner in “Active” mode. This conditioner charges the battery to an optimal charge level from a lower charge level.
Indicator lamp **(3)** lit constantly: battery is completely charged and battery conditioner is in “Passive” mode. The device maintains the battery at an optimal charge level.
Indicator lamps **(2)** and **(3)** flashing alternately:
- if the lights flash several times a second, the battery is probably sulphatated;
- if the alternating flashing continues for more than **60 minutes**, the battery must be replaced;

- if the lamps flash at intervals of a few minutes, the battery discharge rate is high and the battery may need to be replaced.

If neither of the lamps is lit, any of the following may be true:
- the battery conditioner cables are disconnected;
- the battery is not be correctly connected to the electric system in the car;
- the battery is defective;
- insufficient battery voltage or no mains voltage.

After verifying that the battery conditioner is correctly connected to the mains and in-car connector and that there is mains voltage, if the lamps **(2)** and **(3)** (Active and Passive mode) do no light within a few seconds of connecting the conditioner, contact the Ferrari Technical Service Department to check the car's electrical system.

Recharging cycle



A - Desulphating
B - Ground
C - Absorption
D - Impulse

Precautions and warnings

- Ensure that the cables are not pinched and do not come into contact with hot surfaces or sharp edges.
- Never cover the battery conditioner.
- Ensure that the mains socket is not exposed to water.
- Never recharge a frozen battery.
- Never recharge a damaged battery.
- Connections to mains electricity must comply with national law concerning high voltages.
- Always check the battery conditioner cables before use: there must be no cracks in the cables or the outer insulation.
- Never use a battery conditioner with damaged cables.
- Store and use the battery conditioner out of the reach of children; never let children play with the battery conditioner.

Overheating protection

The battery conditioner is equipped with protection against overheating.
Output power is reduced in the event of increased ambient temperature.

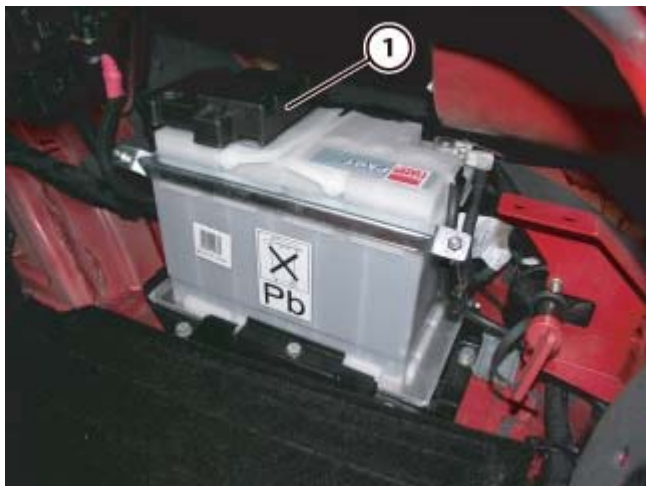
Maintenance

The battery conditioner is maintenance-free.
Do not disassemble the battery conditioner.
The battery conditioner casing may be cleaned with a moistened soft cloth or with neutral detergent.
Always disconnect the battery conditioner from the mains before cleaning.

A3.25 Checking alternator absorption and recharging function

Checking alternator absorption and recharging function

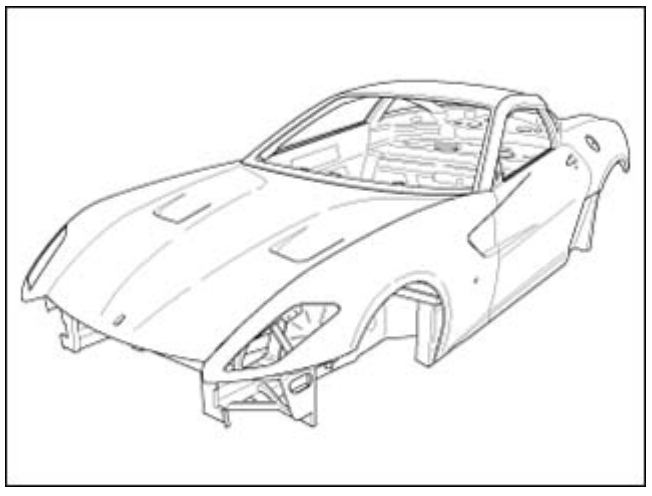
➢ Remove the luggage compartment side trim panels (M2.23).
Remove the right-hand component only.



- Disconnect the alternator positive cable from the battery (located under the cover **(1)**), then connect a suitably calibrated (Beckman T11 OB) digital multimeter between the cable and the battery.
- To measure the voltage and maximum current generated by the alternator, preferably use a digital multimeter and a HALL-effect clamp-on ammeter.
- Fit the clamp-on ammeter onto the cable connected to the alternator.
- Start the engine and maintain an engine speed of **3000-4000 rpm**.
- Switch on all of utilities, one at a time, and read the current delivered on the multimeter. If the current is more that **5A** less that the specified value, replace the alternator.

A3.26 Checking the state of chassis and box elements

Checking the state of the chassis and box elements



The vehicle chassis, box sections and outer components are entirely made of aluminium: all repairs and/or replacements of chassis parts or bodywork components must be performed by skilled personnel using suitable tooling and equipment.

- Check that the chassis structures, box elements and outer skins are in perfect condition. Repair if any deformation or failure is noted.

A3.27 Checking wheels and tyres

Checking the wheels and tyres

Tyre replacement is recommend after 4 years of normal use. Frequent use in maximum load conditions and at high temperatures may lead to premature deterioration.

- Check the condition of the wheel rims and tyres, after having removed the wheels.
- Check that the tyre pressure corresponds to the indicated pressure
- Check the location and proper fitting of the balancing weights on the inside of the wheel rims.
- In case of excessive tyre wear, check the wheel alignment data and perform a static and dynamic wheel balancing procedure

A3.28 Inspecting the air conditioning and heating system

Check the air conditioning and heating system

➢ Remove the front section of the underfloor (M2.12).

- Check the unions on the pipes leading to the condenser, the dehydrator filter, the evaporator and compressor for gas leakage.
- Check that there is no gas leakage from the system hoses.
- Check that there is no refrigerant leakage from the recirculation pump, the evaporator or the oil-water pump.

A3.29 Inspecting the braking system

Inspecting the braking system

➢ Remove the wheels (F2.08).

- Check the connector lines leading to the callipers and to the unions on the rigid lines.
- Check that there is no leakage near the brake master cylinder unions or on the electro-hydraulic unit.
- Check that the unions are properly tightened.
- Check that the instrument panel warning lights function correctly.
- If any leakage is found, replace the defective unions or pipes.
- Fill and bleed the braking system (G2.10).

A3.30 Tightening bolts, unions and clamps

Tightening the bolts, unions and clamps

- At the intervals given in the Maintenance Schedule, check the tightness of the major mechanical fittings.
- Refer to the tightening torque tables given at the beginning of each section.
- Also check that all hydraulic hose fittings and clamps are correctly tightened.
- Replace only with the clamp types specified.

A3.31 Checking and lubricating hinges and adjusters

Checking and lubricating hinges and adjusters

- Check that the hinges of the doors, of the engine compartment lid and of luggage compartment are correctly secured, exhibit no free play and operate quietly.
- Check that the door locks and the locking mechanisms of the engine compartment lid and luggage compartment function correctly.
- Check the state of the engine compartment lid and fuel filler flap release cables.
- Check that the gas struts of the engine compartment and luggage compartment lids function correctly.
- Lubricate all friction surfaces with lithium based waterproof grease.

A3.32 Treating interior leather upholstery

Treating interior leather upholstery

- Proper and regular treatment (at least once a year) will preserve the natural qualities and softness of Ferrari leather trim.
- For this precise purpose, a range of specific leather care products (Cleaner and Cream), developed and tested by Ferrari, is also available. These products may be ordered through the Ferrari Spare Parts Department, either individually or as part of the "Care Kit", which includes a complete set of car cleaning products.
- For the instructions on how to use the products contained in the "Care Kit", see the "User's Manual, Carrozzeria Scaglietti Programme" and the instructions included with the Kit.
- Never use acidic detergents, turpentine, liquid stain removers, petrol, solvents or domestic cleaning products to clean leather as these will damage the natural material.

A3.33 Checking radiators for fouling

Checking radiators for fouling

Detritus from the road may enter the vehicle front air intake and foul the radiators; over time, this may compromise the functionality of the cooling systems so that they are no longer capable of providing sufficient cooling.

It is therefore VITAL that the radiator cores are checked for fouling at each scheduled service and cleaned, if necessary, using the following procedure.

- Check the radiator cores for fouling.
- In the event of fouling, clean with a pressurised water jet or equivalent method.

Check for any dirt accumulated between the water radiator and the AC condenser.

Remove the front bumper ONLY in the event of very heavy fouling.

- ONLY in the event of very stubborn dirt, which may be possible with particularly high mileage vehicles, remove the radiator assembly and remove the dirt by blowing air from the rear of the radiators.

A3.34 Cleaning and maintaining matt paints (optional)

Cleaning and maintaining matt paints (optional)

NEVER polish the paintwork with any product.

DO NOT lean on the vehicle, especially if wearing garments with buttons, belts, rings, necklaces etc., as you may cause irreparable damage to the bodywork.

For information on the correct products to be used, contact the Ferrari Service Network.

Proper care by the owner is essential for keeping vehicles with matt paintwork (optional) in pristine condition.

The following is a list of the most important precautions necessary:

- Wash the vehicle exclusively with **Steam cleaner**, and rinse with demineralised water only.
- The vehicle must only be dried with an automatic blower or with compressed air. The vehicle may ONLY be hand dried using a clean **Yellow 3M microfibre cloth (Ferrari p/n 571.400.022)** moistened with demineralised water and using **Glass cleaning solution** in areas with remaining limescale residue. Keep the cloth in a specific clean container.
- To remove grease stains, use a clean **Yellow 3M microfibre cloth (Ferrari p/n 571.400.022)** moistened in **R107/S solvent (heptane)**. Use a new cloth only, or a cloth that has never been used with demineralised water or **Glass cleaning solution**.
- Do not wash the vehicle in direct sunlight or when the bodywork is still hot.
- Never apply adhesive stickers to the bodywork.
- Cracks or exposed areas of underlying bodywork caused by stones, scratches, parking damage etc. must be repaired immediately by the Ferrari Service Network.

A3.35 Service counter reset

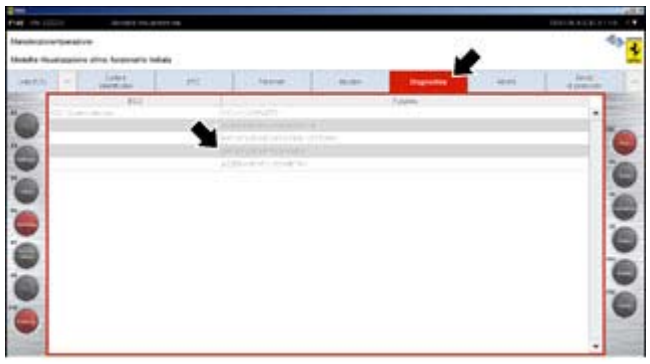
Service counter reset

➢ Connect the DEIS tester to the diagnostic socket.

- Switch on the DEIS tester.
- Click the DEIS button.



- Select "**NQS - Instrument panel**".



- Click "**Diagnostics**"
- Select "**SET SERVICE**"

B1.01 Technical specifications - System layout

Engine specifications

- Four hydraulically adjustable valves per cylinder.
- The engine is equipped with the **Bosch ME7.1.1** integrated ignition and injection system .
- Four overhead camshafts (two per bank), with direct valve operation and hydraulic tappets.
- Chain driven timing system with central chain transmission via triple pinion.
- Continuously variable intake and exhaust camshaft timing via four hydraulic actuators powered by a high pressure hydraulic system.
- Ignition sequence: 1 - 12 - 5 - 8 - 3 - 10 - 6 - 7 - 2 - 11 - 4 - 9.
- The air conditioner compressor and the hydraulic steering pump are mounted on the engine and driven by the crankshaft via a belt.

Main engine data

Type	F140C - F140CB (FROM ENGINE Nr. 122779)
Number of cylinders	12
Cylinder diameter	92 mm
Piston stroke	75.2 mm
Total displacement	5999 cm³
Compression ratio	11.2:1
Max. engine speed	8250 rpm
Rev. limit	8400 rpm
Max. power (Dir. 1999/99/CE)	456 kW
Max. power (Dir. 1999/99/CE)	620 HP
Corresponding rpm	7600 rpm
Max. torque (Dir. 1999/99/CE)	608 Nm
Corresponding rpm	5600 rpm

B1.02 Tightening torques



Tightening torque		Nm	Class
Rubber bushing - chassis	Screw	50 Nm	B
Engine - rubber bushing	Screw	103 Nm	B
Engine earth braid - chassis	Screw	18 Nm	B
Intake timing adjuster - camshaft	Pretightening torque for screw	50 Nm	A
	Screw	180 ÷ 200 Nm	A
Exhaust timing adjuster - camshaft	Pretightening torque for screw	50 Nm	A
	Screw	180 ÷ 200 Nm	A
Temperature sensor - front engine cover	Sensor	16 Nm	B
22 mm diameter threaded cap - crankcase	Threaded cap	22 Nm	B
16 mm diameter threaded cap - crankcase	Threaded cap	22 Nm	B
M14 stud bolt - crankcase	Stud bolt	34 Nm	B
Cooling nozzles - crankcase Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw	3 Nm	B
Fastening connecting rod	Pretightening torque for screw	30 Nm	A
	Screw	60 ÷ 90 Nm	A
22 mm threaded cap for oil orifices on crankcase	Threaded cap	60 Nm	B
Engine mounting bracket - crankcase	Nut	53 Nm	A
	Screw (FROM Ass.ly No. 62963)	45 Nm	A
Knock sensor - crankcase	Screw	20 Nm	B
Timing drive gear mounting Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw (pretightening)	5 Nm	A
	Screw	16 Nm	A
Crankcase - lower crankcase shell M6x40	Stud bolt	10 Nm	B
Crankcase - lower crankcase shell M6x25	Stud bolt	10 Nm	B
Lower crankcase shell - crankcase M6x40	Screw	10 Nm	B
Lower crankcase shell - crankcase M6x20	Screw	10 Nm	B
Front camshaft mountings - heads	Pretightening torque for screw	6 Nm	B
	Screw	9 ÷ 13 Nm	B
Fastening variable timing adjuster solenoid valve	Screw	10 Nm	B
Camshaft cap - head	Pretightening torque for screw	5 Nm	A
	Screw	8 ÷ 12 Nm	A
Timing chain drive shoe	Screw	25 Nm	B
Pump drive pinion - shaft	Screw	10 Nm	B
Fixed shoe for pump drive system - engine	Screw	10 Nm	B
Mounting - crankcase	Screw	25 Nm	B
Mobile shoe for timing system - engine	Nut	25 Nm	B
Upper fixed shoe - cylinder heads	Pretightening torque for screw	6 Nm	B
	Screw	9 ÷ 13 Nm	B
Hydraulic timing chain tensioner - engine	Tensioner	40 Nm	B
Hydraulic timing chain tensioner bushing	Screw	10 Nm	B
Head covers - cylinder heads	Screw	11 Nm	A
Head covers - cylinder heads	Stud bolt	11 Nm	A
Electric pressure sender - crankcase	Sender	40 Nm	B
Timing sensor - head cover	Screw	8 Nm	B
Pipe from head cover - water pump Products to use: SEGO	Screw	10 Nm	B
Oil/water pump - crankcase	Screw	25 Nm	A
Oil filter - crankcase	Union	60 Nm	A
Oil filter - connector union	Filter	30 Nm	B
Belt tensioner pulley - engine	Screw	50 Nm	B
Pressure switch/thermostat - crankcase Products to use: SEGO	Screw	10 Nm	B
Water inlet union - water/oil pump	Screw	10 Nm	B
Upper alternator bracket - crankcase	Screw	59 Nm	B
Lower alternator mounting - crankcase	Screw	49 Nm	B
Fastening torsion damper to crankshaft Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw (UP TO Engine No. 175088)	300 Nm	A
	Screw (FROM Engine	450 Nm	A

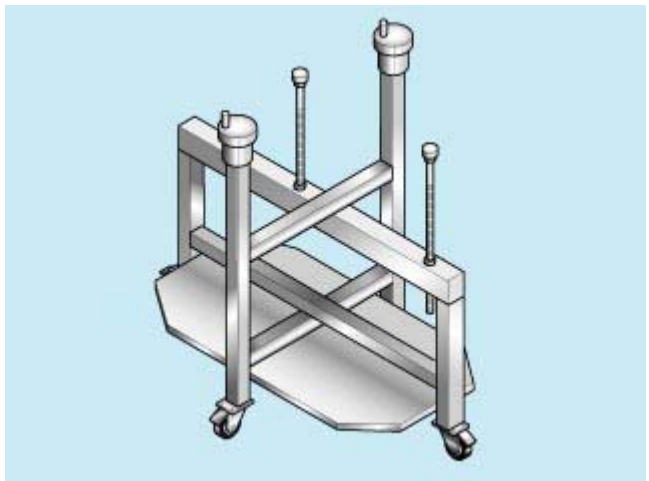


Tightening torque		Nm	Class
Products to use: Loctite 242	No. 175089)		
Belt tensioner for compressor and hydraulic steering pump	Screw	25 Nm	B
Hydraulic steering pump - crankcase	Screw	25 Nm	B
Intake manifold - engine	Nut	10 Nm	B
Fuel line - intake manifold	Screw	25 Nm	B
A.C. compressor - crankcase	Screw	25 Nm	B
Fuel lines - mounting bracket/fuel rails	Nut	40 Nm	B
Fuel pipe bracket - engine	Nut	10 Nm	B
Intake plenum - manifold	Nut	10 Nm	B
Starter motor mounting bracket - crankcase	Screw	25 Nm	B
Exhaust manifold - crankcase	Nut	25 Nm	B
Flywheel - crankshaft	Screw	91 Nm	A
Earth braid - engine	Nut	25 Nm	B
Fastening earth plate to chassis	Screw	18 Nm	B
Spark plug - engine head	Spark plug	11 Nm	A
Transmission shaft pipe - clutch housing	Nut	60 Nm	A
Engine speed sensor - crankcase	Screw	8 Nm	B
Fastening lower crankcase shell to crankcase	Internal nut pretightening	30 Nm	A
	Internal nut	60 Nm	A
Fastening lower crankcase shell to crankcase	External nut pretightening	25 Nm	A
	Nut	55 Nm	A
Fixed shoe for crankshaft drive system Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw	10 Nm	B
Cylinder heads	Nut pretightening torque	60 Nm	A
	Nut	80 Nm	A
Water hoses - cylinder heads	Filler neck	40 Nm	B
Front engine cover	Screw	10 Nm	B
Front engine cover	Stud bolt	10 Nm	B
Cylinder heads, timing side	Screw	10 Nm	B
M18 threaded cap - water/oil pump spindle Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Threaded cap	28 Nm	B
Eccentric belt tensioner nut	Nut	50 Nm	B
Fastening the reed valve	Screw	10 Nm	B
Fastening water circuit inspection cover on crankcase	Screw	10 Nm	B
Tank belt retainer bracket - bodywork	Screw	25 Nm	B
Tank mounting strap - adjustment pin	Nut	18 Nm	B
Lateral fuel tank mounting bracket - body	Nut	20 Nm	B
Fuel pump cover	Ring nut	60 Nm	B
Fuel tank adjustment bracket - body	Nut	20 Nm	B
Adjustment bracket - lateral fuel tank mounting bracket	Nut	20 Nm	B
Lateral rear fuel tank mounting bracket - body	Screw	20 Nm	B
Lower fuel tank mounting bracket - body	Screw	20 Nm	B
Multifunctional valve	Valve	8 Nm	B
Ventilation valve	Valve	8 Nm	B
Duct - radiator	Screw	5 Nm	B
Fan - radiator duct	Screw	5 Nm	B
Engine oil radiator - duct	Screw	5 Nm	B
A.C. condenser - engine coolant radiator	Screw	5 Nm	A
Hydraulic steering coil - A.C. condenser	Screw	5 Nm	B
Oil delivery pipe - radiator	Union	70 Nm	B
Oil return pipe - radiator	Union	70 Nm	B
Lateral radiator mounting bracket - bodywork	Screw	10 Nm	B
Complete cooling system - mounting bracket	Screw	20 Nm	B
Central radiator mounting bracket - bodywork	Screw	10 Nm	B
Coolant inlet pipe - radiator	Clamp	4 Nm	B
Coolant outlet pipe - radiator	Clamp	4 Nm	B
Oil/water pump - crankcase	Screw	25 Nm	A
Water inlet union - pump	Screw	25 Nm	A
Engine oil radiator - duct	Screw	5 Nm	A
Oil delivery pipe - radiator Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Connection for radiator oil delivery pipe to tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Connection for radiator oil return pipe to tank	Union	70 Nm	B

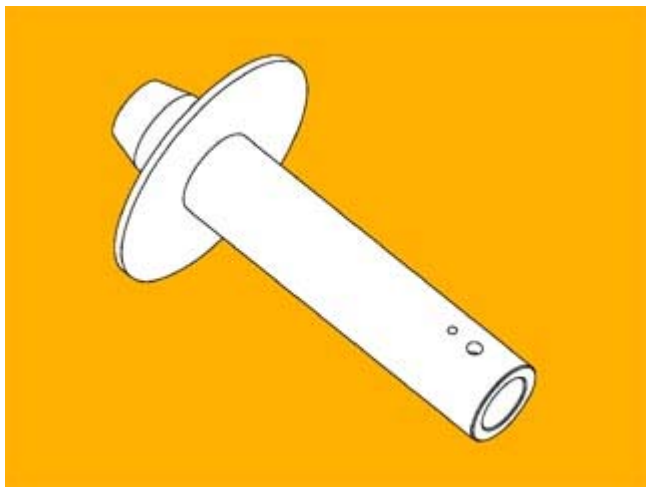


Tightening torque		Nm	Class
Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE			
Connection for oil return pipe to tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Oil pipe - engine Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Screw / Nut	20 Nm	B
Intermediate engine oil pipe connections Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	78 Nm	B
Fastening for oil pipe from pump to oil tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B
Fastening for oil pipe from tank to pump Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B
Oil/water pump - crankcase	Screw	25 Nm	A
Oil filter - crankcase	Union	60 Nm	A
Oil pipe on tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Spacer between throttle bodies	Screw	25 Nm	B
Clamp - exhaust extensions	Nut	43 Nm	A
Thermocouple - exhaust branching	Thermocouple	45 Nm	B
Catalytic converter - exhaust extension	Clamp	50 Nm	B
Exhaust mounting brackets - bodyshell	Nut	16 Nm	B
Exhaust pipe vibration damper - bodyshell	Nut	16 Nm	B
Exhaust manifold - branching	Screw	25 Nm	B
Catalytic converter - mounting bracket	Screw	16 Nm	B
Extension pipe vibration damper mounting - bodyshell	Nut	16 Nm	B
Silencer - mounting hooks	Nut	25 Nm	B
Silencers - connector crosspiece	Nut	16 Nm	B
Silencer - extension pipe	Screw	16 Nm	B
Catalytic converter - branching	Screw	16 Nm	B
Oxygen sensor	Sensor	50 Nm	B
Exhaust extensions - vibration damper mounting bracket	Nut	16 Nm	B
Vibration damper mounting - bodyshell	Nut	16 Nm	B
Unions - condenser	Screw	7.4 Nm	B

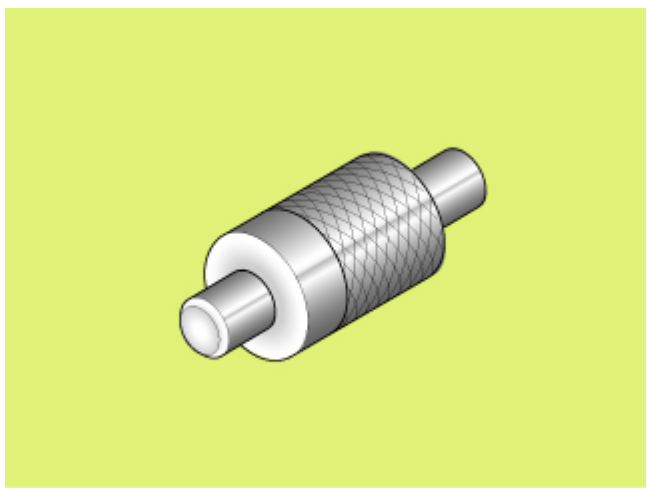
B1.03 Specific tooling and equipment



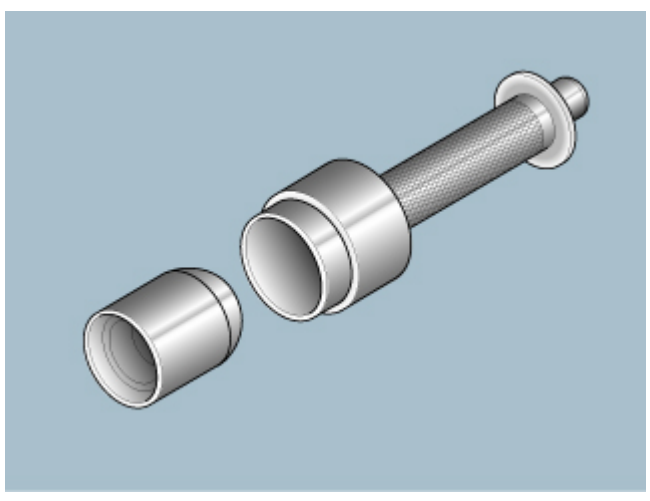
- Trolley (900026230)
  for transporting and handling engine-gearbox assemblies



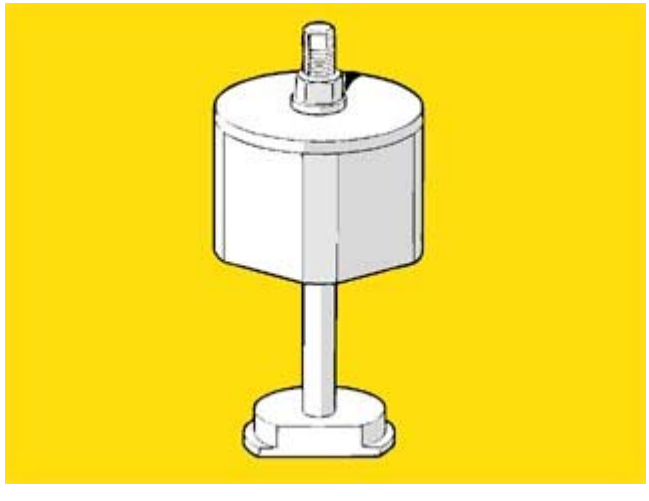
- Handle (900026300)
  punches.



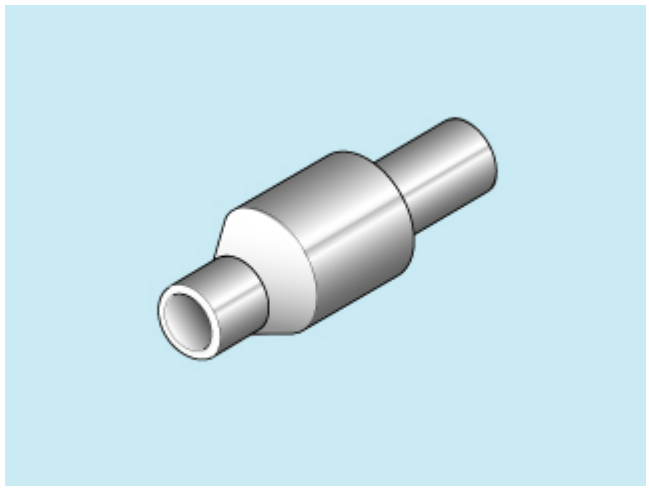
- Punch (900026550)
  for installing crankshaft bearing, clutch side.



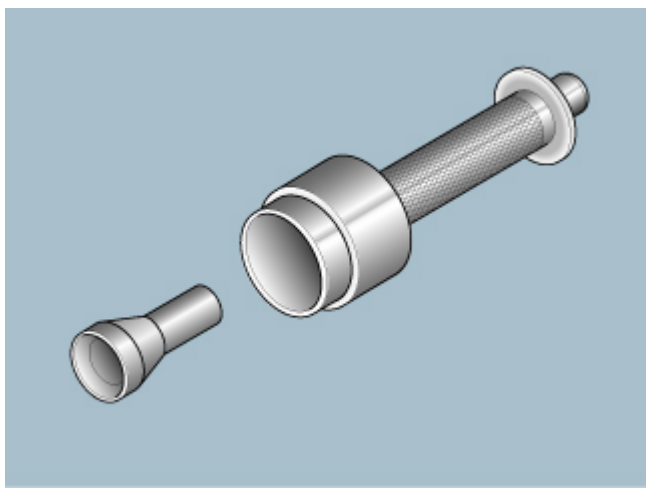
- Punch (900026590)
  for mounting oil seal on front crankcase cover.



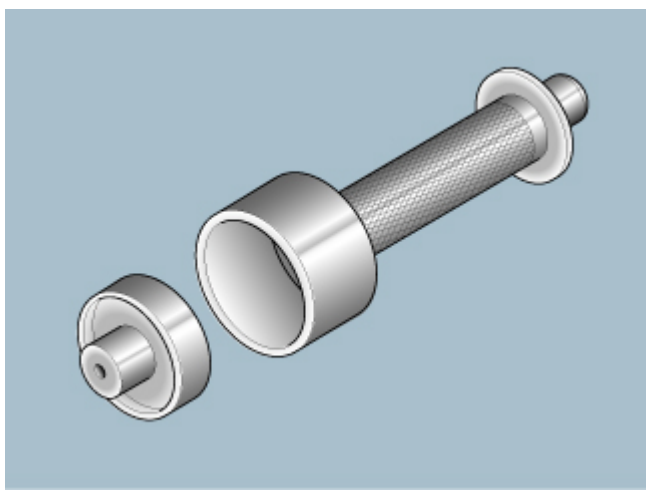
- Tool (900026610)
  cylinder sleeve extractor.



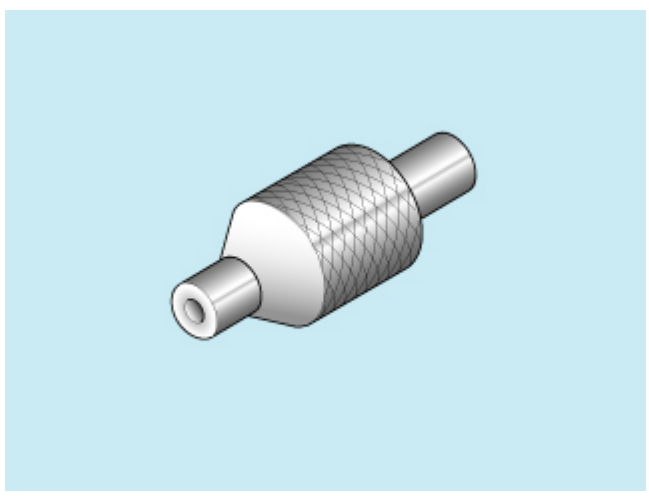
- Punch (900027000)
  for mounting cylinder head alignment dowel.



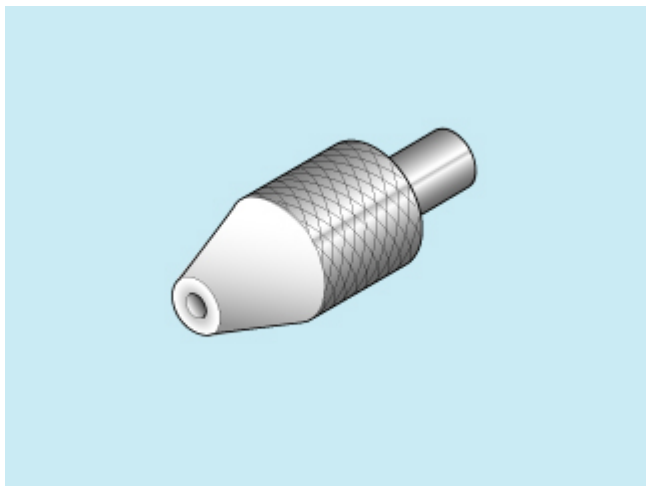
- Punch (900027050)
  for mounting pump assembly Corteco seal ring on lower crankcase shell.



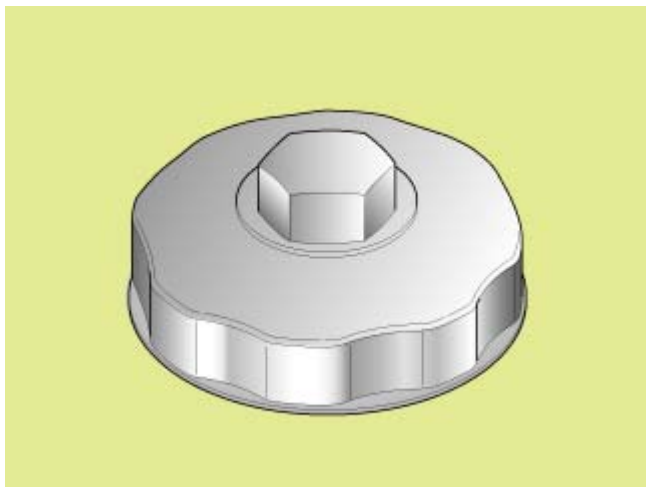
- Punch (900027060)
  for mounting Corteco seal ring on flywheel side of crankshaft.



- Punch (900027260)
  for mounting 6 mm diameter centring dowel.



- Punch (900027270)
  for mounting 13 mm diameter centring dowel.



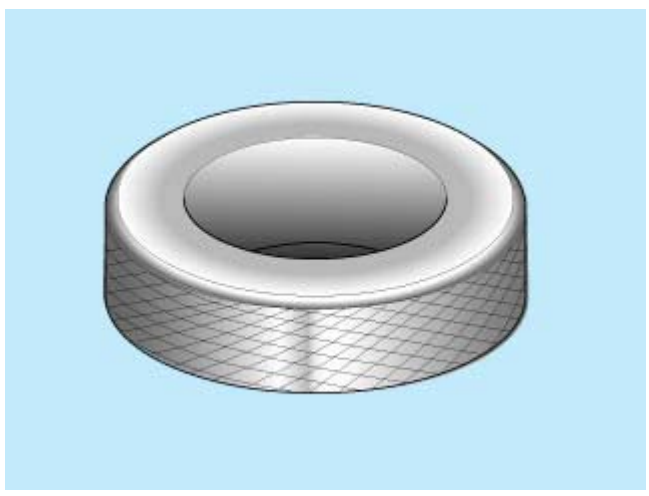
- Wrench USAGD156 (95971560)
  for tightening oil filter.



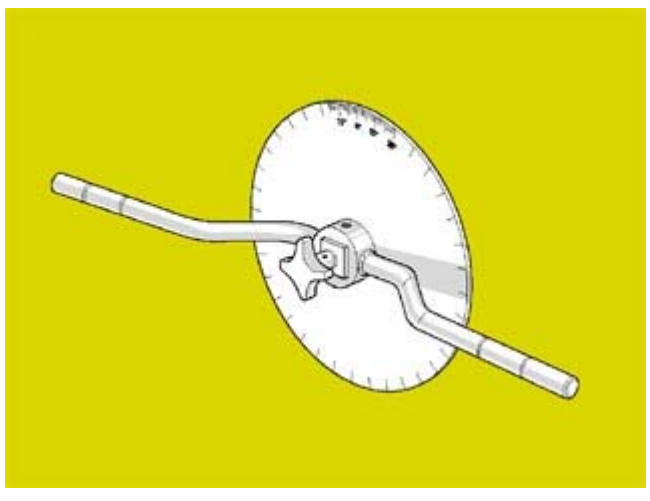
- Tensiometer (95978151)
  Seem DIAPAZ.



- Tool (1870736000)
  for removing fuel pump ring nut.



- Calibre (ALZF 09206)
  92 mm diameter for cylinder sleeves.



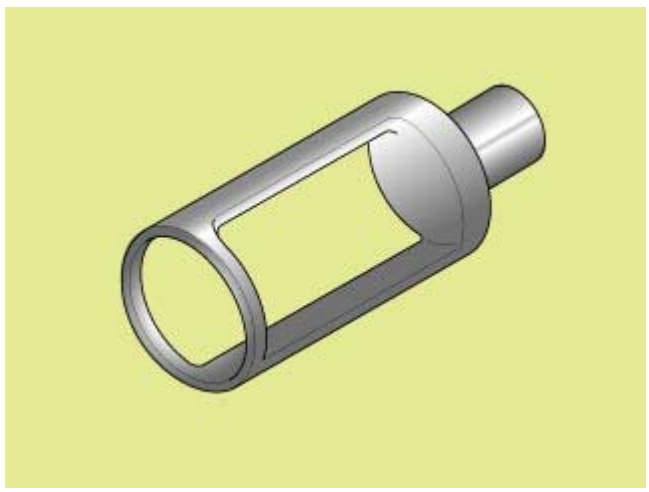
- Goniometer 95975784_2 (AM 105784)
  for setting engine timing



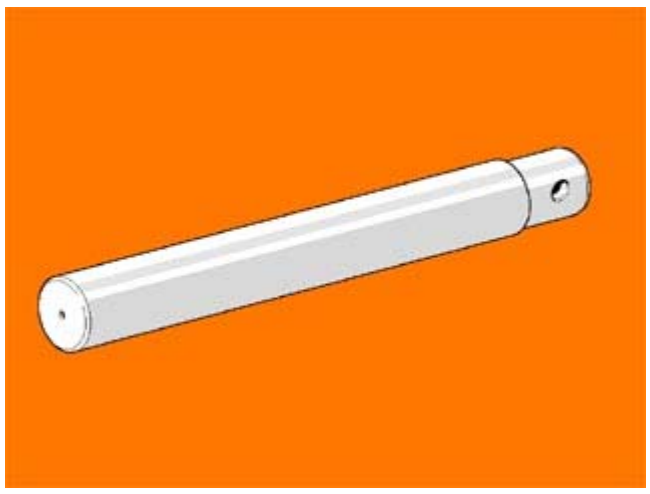
- Tool 95977231 (AM 107231)
  for installing cylinder sleeves.



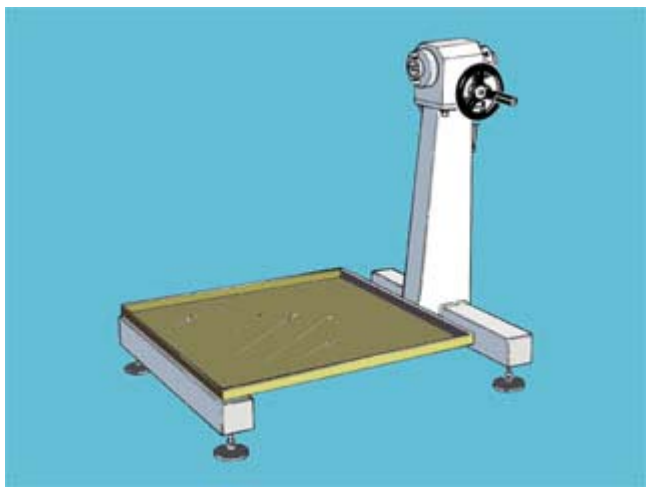
- Tool 95977232 (AM 107232)
  mounting for crankcase on AV 2621 trolley.



- Tool (AM 107256)
  for installing half cones.



- Boring bar 95977233 (AS 107233)
  cylinder bank.



- Trolley 95972621 (AV 2621)
  for overhauling engine-gearbox assemblies



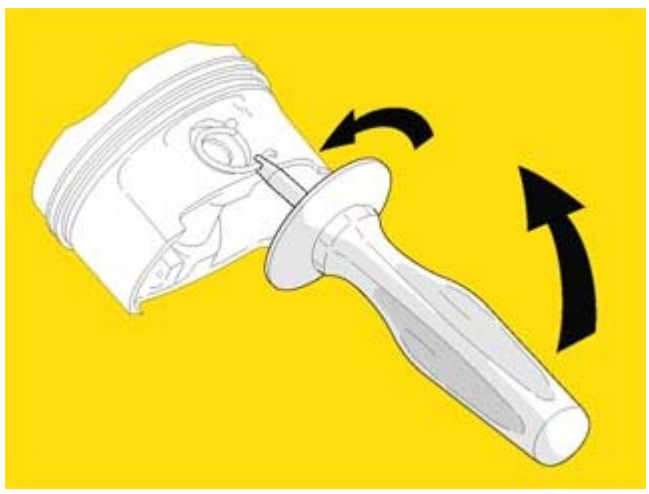
- Extractor 95972734 (AV 2734)
  oil seal for valve.



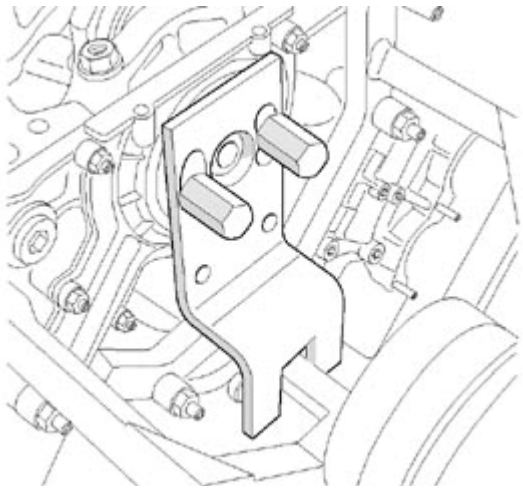
- Tool 95972885 (AV 2885)
  for fitting oil sump bearing.



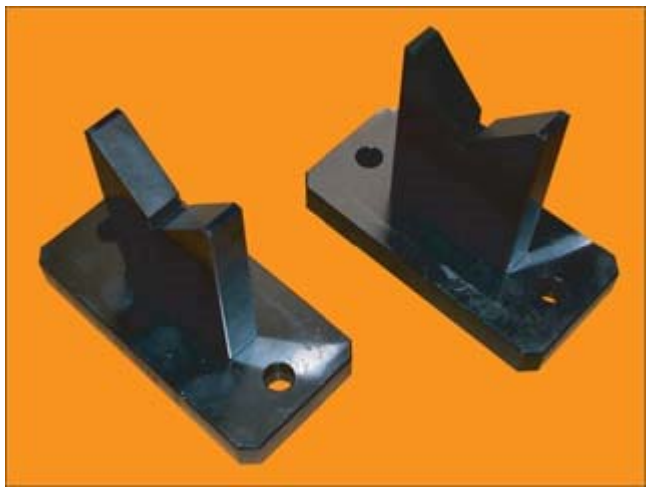
- Tool 95972926 (AV 2926)
  for extracting valve guides.



- Screwdriver 95973002 (AV 3002)
  for installing piston pin rings.



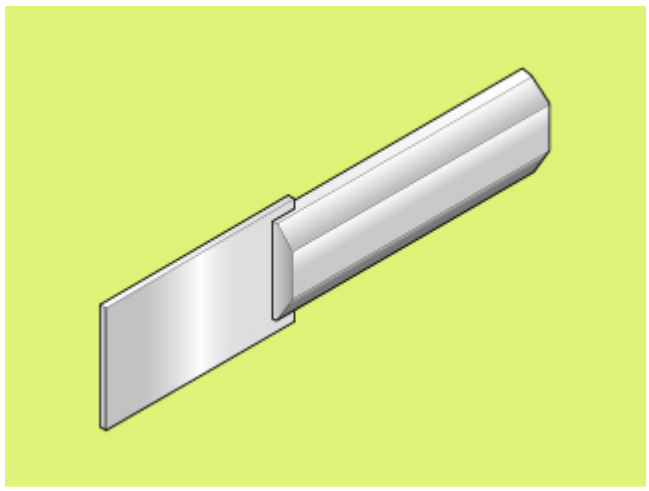
- Tool 95973122 (AV 3122)
  for immobilising crankshaft



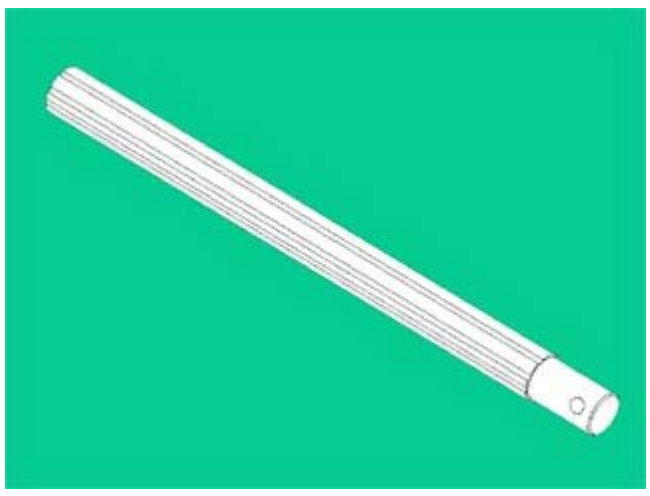
- Supports 95973135 (AV 3135)
  for checking camshaft (concentricity).



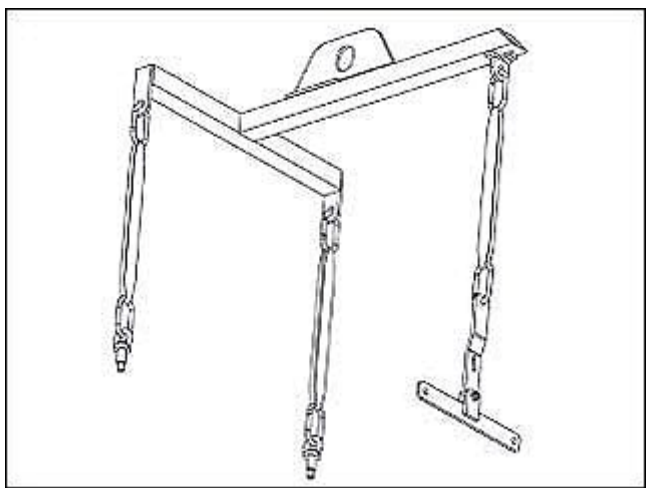
- Tool (AV 3374)
  for installing oil seal on valve.



- Wrench (AV 3390)
  for installing oil filters for timing adjusters.



- Lapper 95973429 (AV 3429)
  cylinder bank.



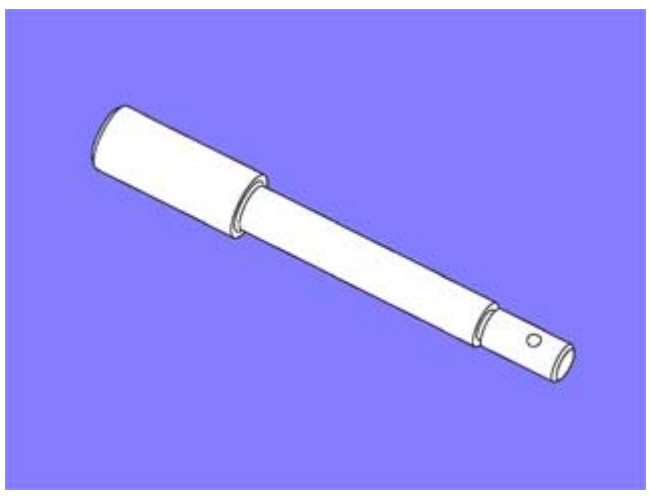
- Hook 95973432 (AV 3432)
  for hoisting engine.



- Lever 95973433 (AV 3433)
  for fitting timing chain



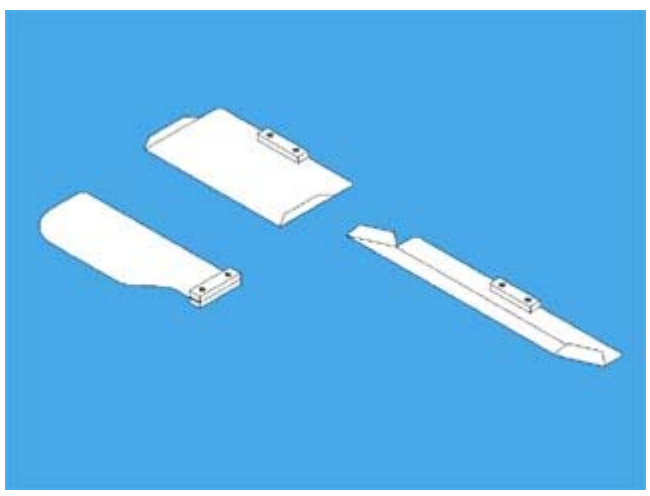
- Tool 95973434 (AV 3434)
  for fitting O-rings on crankcase and lower crankcase shell fastener stud bolts.



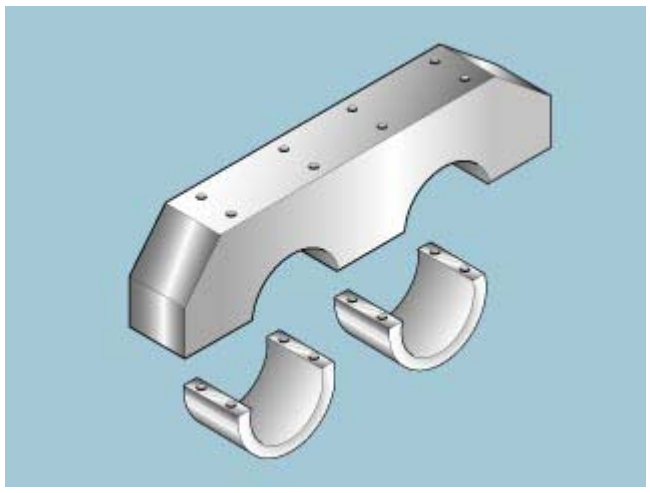
- Screw 95973435 (AV 3435)
  goniometer connector hub (AM 105784).



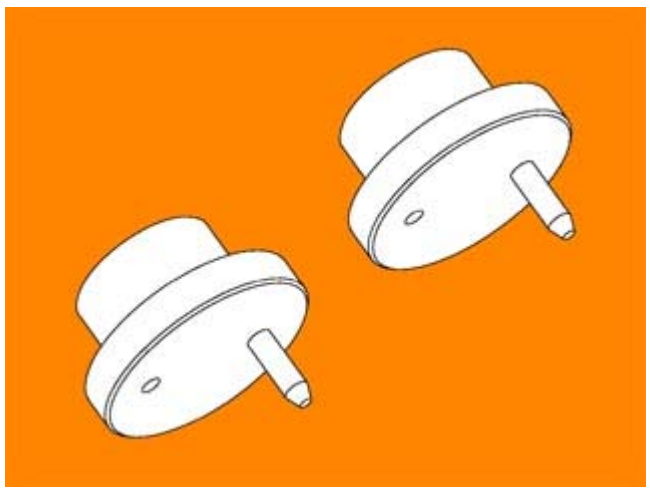
- Adaptor 95973537 (AV 3537)
  valve seat guide installer punch.



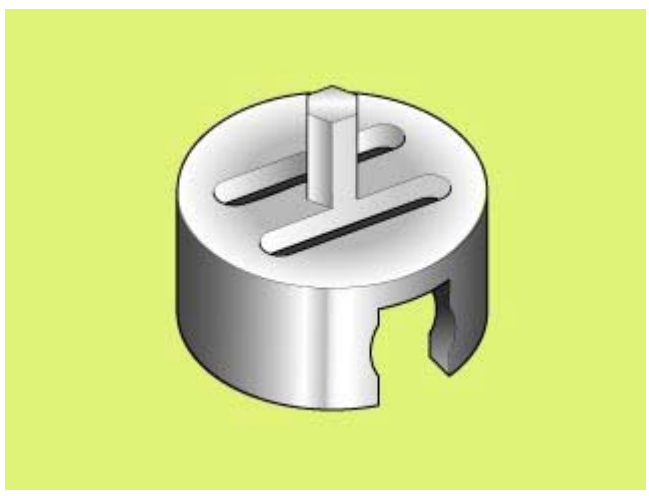
- Tools 95973602 (AV 3602)
  for installing water-oil pump.



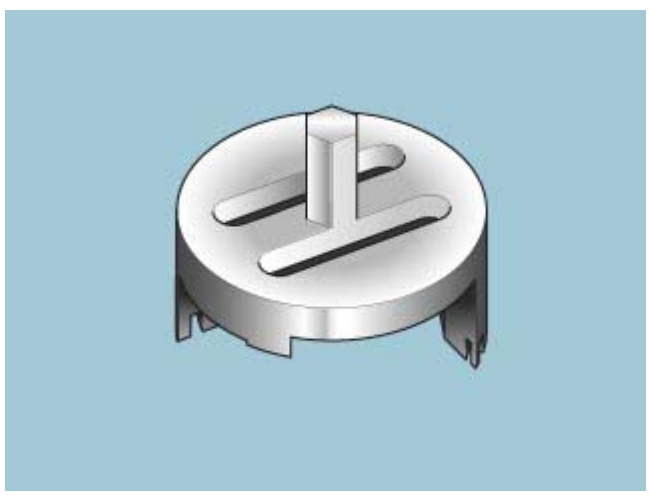
- Tool 95973603 (AV 3603)
  for immobilising camshafts



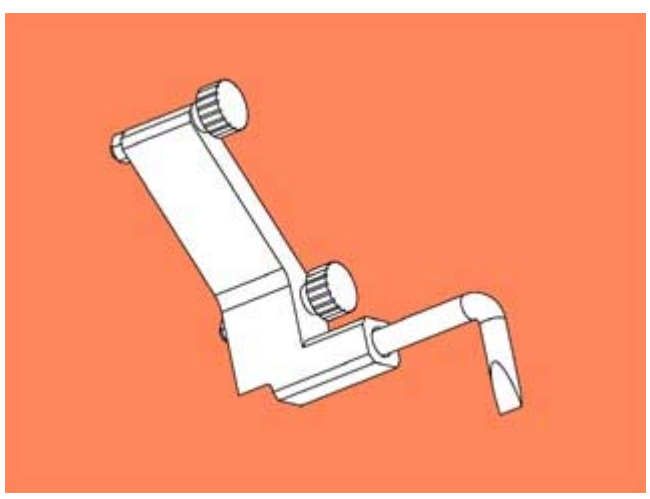
- Adaptor 95973606 (AV 3606)
  for trolley (900026230) for transporting and handling engine-gearbox assembly.



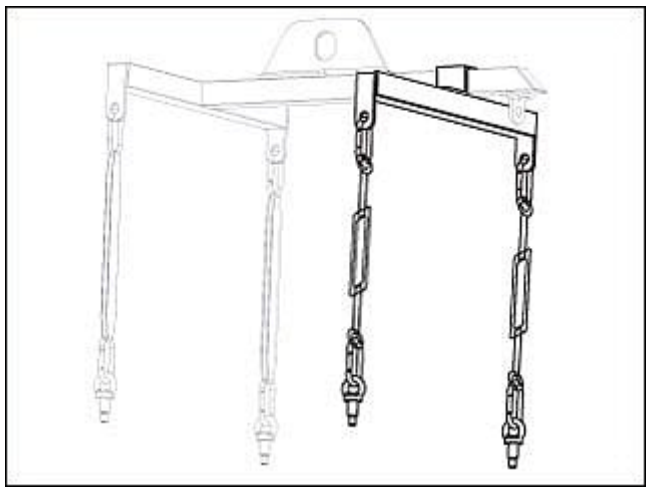
- Tool 95973844 (AV 3844)
  for fitting right hand float valve.



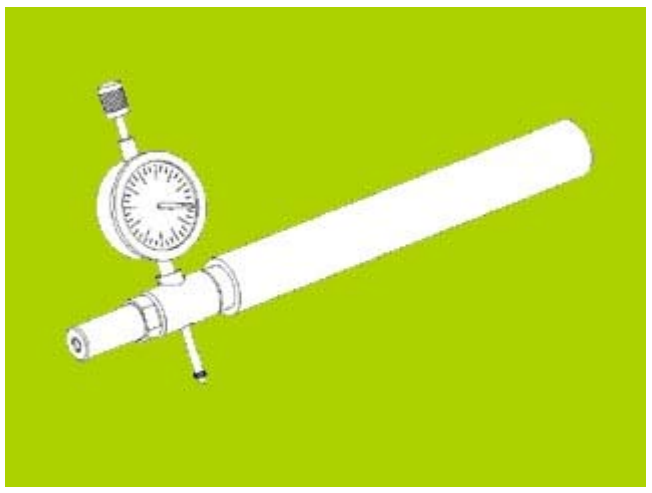
- Tool 95973845 (AV 3845)
  for fitting left hand float valve.



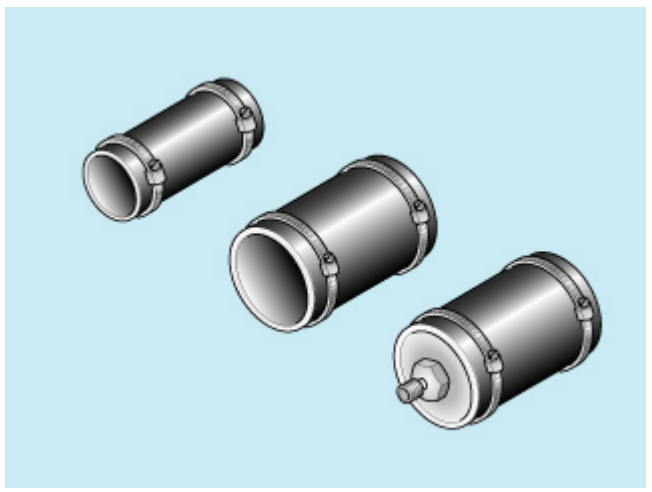
- Tool (AV 3978)
  for timing reference



- Hook (AV 3979)
  for hoisting engine.



- Adapter (AV 3980)
  support for valve seat wear measurement dial gauge.



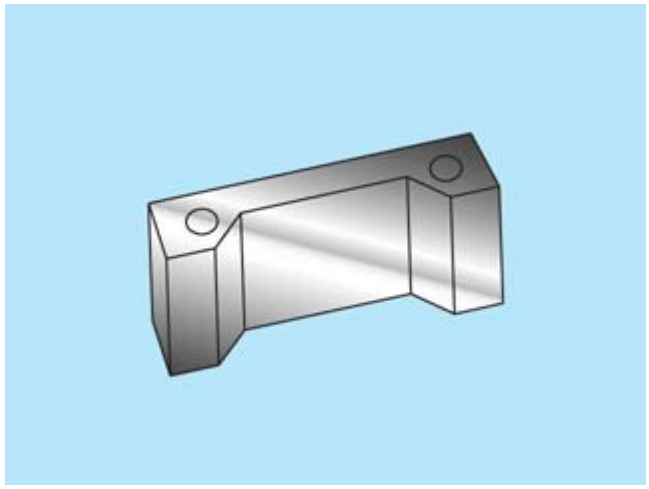
- Kit (AV 3981)
  press-fitting water pipes on engine.



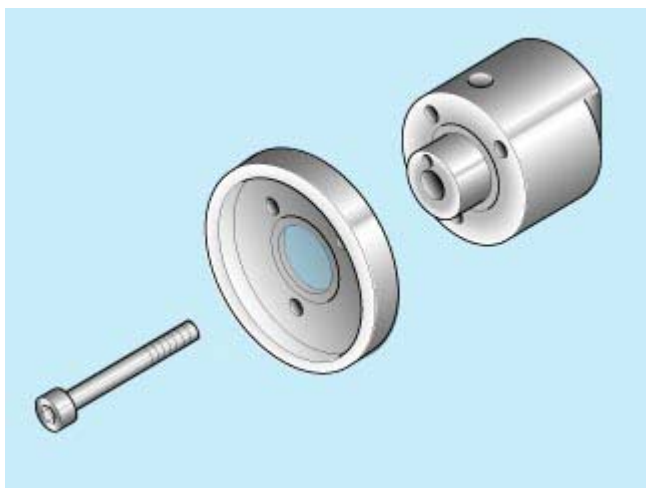
- Kit (AV 3982)
  press-fitting oil pipes on engine.



- Shield (AV 3983)
  intake header cover.



- Tool (AV 3984)
  for aligning cylinder sleeves (used together with tool AM 107231).



- Tool (AV 3985)
  for checking variable valve timing adjuster.



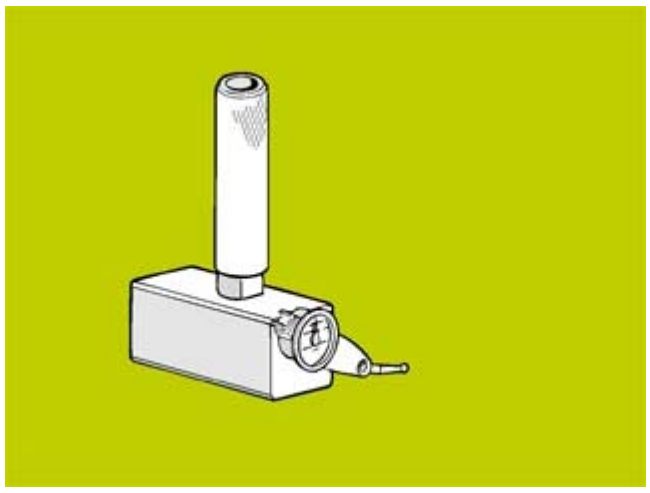
- Engine bushing installation template (AV 8169)
  for checking alignment of rubber engine bushings.



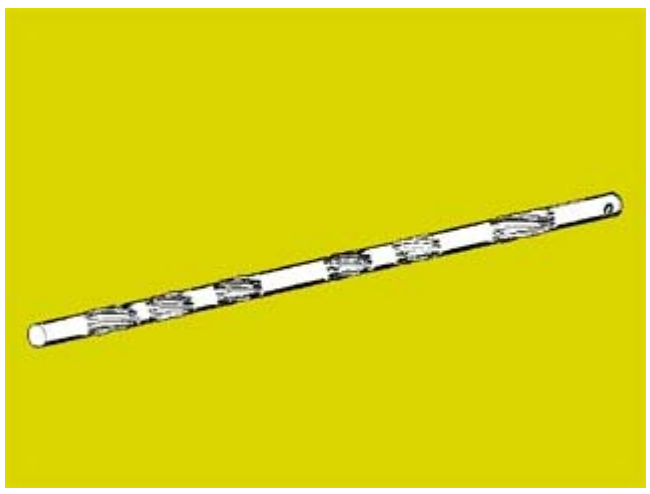
- Belt tensioner (AV 8171)
  setting the alternator belt tension.



- Torque wrench 95978172 (AV 8172)
  (Replaces torque wrench USAG 815F)



- Tool 95972916 (CS 102916)
  cylinder sleeve projection measurement dial gauge.



- Reamer (US 19000)
  hand reamer for ø26 mm camshaft seats

B2.01 Disassembly

Removing the engine

Protect the bodywork appropriately against possible damage during work.

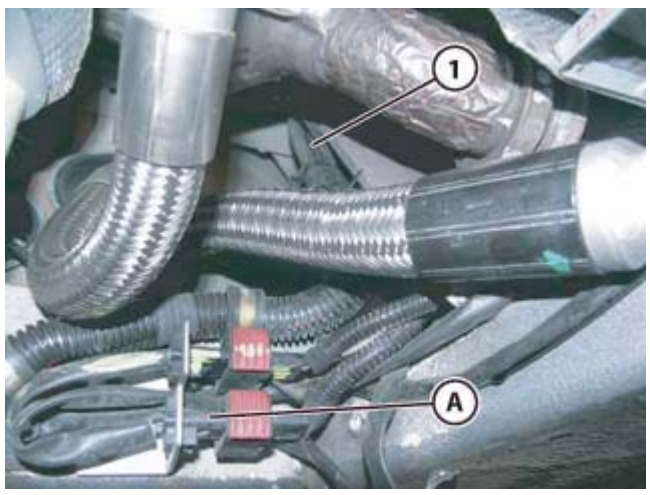
The engine must be lifted out of the engine compartment: this procedure requires a mobile hydraulic jack or bridge crane with a minimum load capacity of 300 Kg, and the hoisting tool complete with safety belts.

- Set the battery master switch to OFF (L2.02).
- Remove the front section of the underfloor (M2.12).
- Remove the rear undertray section (M2.12).
- Remove the wheels (F2.08).
- Remove the engine compartment lid (M2.01).
- Remove the central engine compartment shield (M2.17).
- Remove the engine compartment shields on the fenders (M2.17).
- Remove the underwindscreen shields (M2.17).
- Remove the air intake (B6.03).
  Remove both.

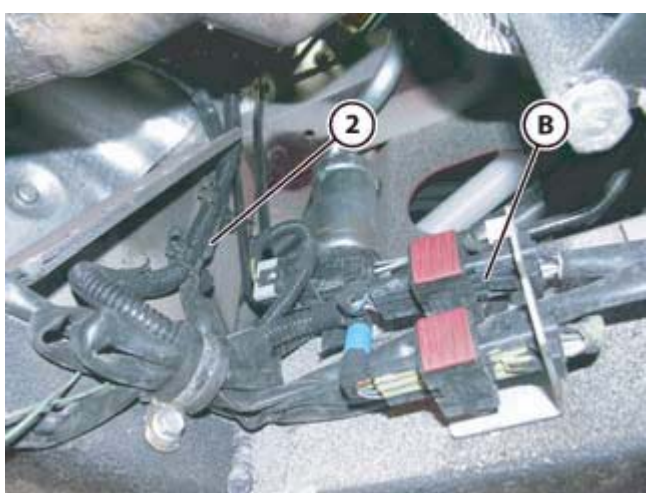
- Remove the air flow meter (C1.03).
- Drain the engine cooling system (A3.07).
- Drain the engine lubrication system (A3.01).
- Drain the hydraulic steering system (E2.07).
- Empty the air-conditioning system (I3.01).
- Remove the engine compartment subchassis stiffener bar (M2.17).
- Remove the front stabiliser bar (F2.07).
- Remove the steering box (E2.02).
- Remove the silencer and exhaust extension (B6.05).
  Remove both.

- Remove the catalytic converter (B6.04).
  Remove both.

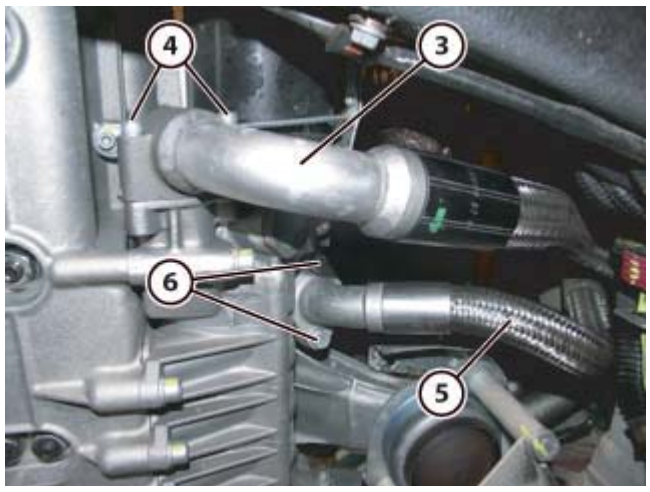
- Remove the exhaust branching (B6.06).
  Remove both.



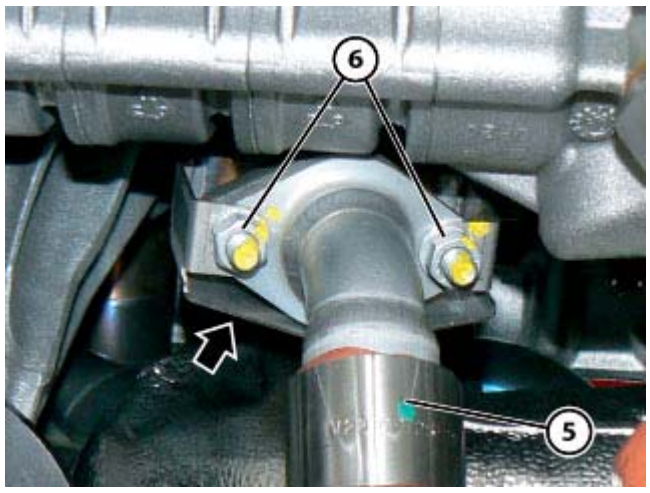
- Disconnect the connector **(A)** for the rear oxygen sensor on the front right hand exhaust manifold and cut the clamps fastening the relative cable **(1)** to the bodywork.



- Disconnect the connector **(B)** for the rear oxygen sensor on the front right hand exhaust manifold and cut the clamps fastening the relative cable **(2)** to the bodywork.

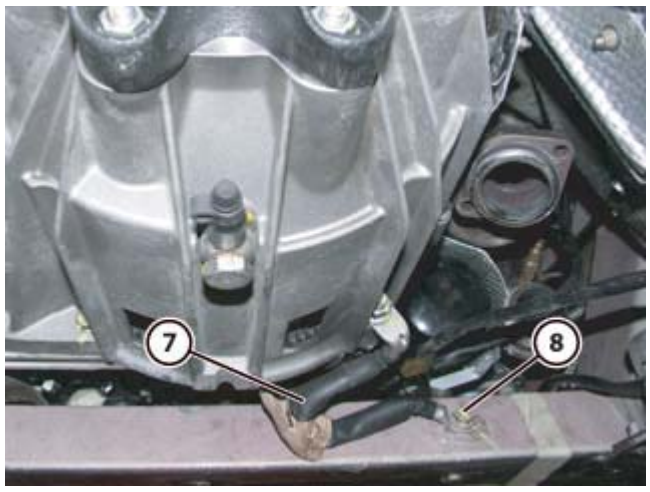


- Remove the oil delivery pipe **(3)** leading to the tank by undoing the two screws **(4)**.
- Remove the oil delivery pipe **(5)** leading to the engine by undoing the two screws **(6)**.

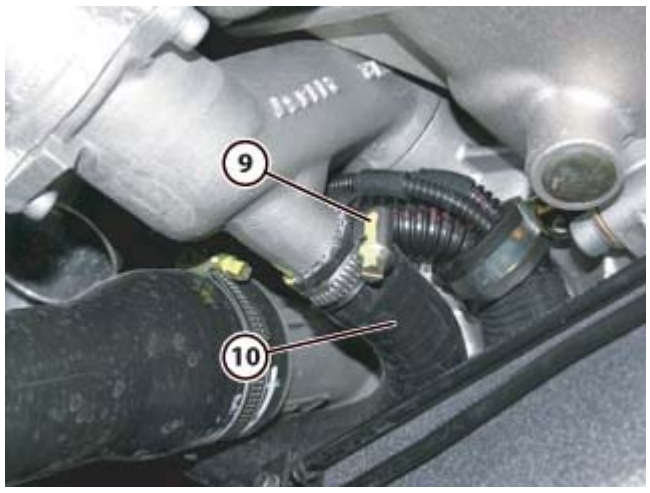


NEW SOLUTION

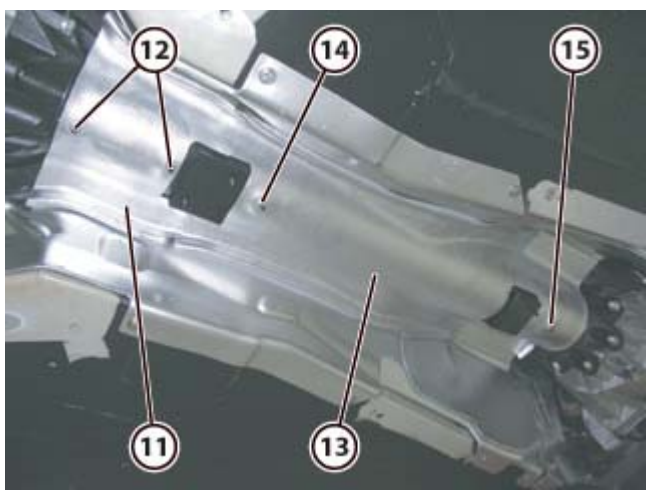
- **FROM Ass.ly No. 64841** remove the oil delivery pipe **(5)** leading to the engine, undoing the two nuts **(6)**.
- **FROM Ass.ly No. 68541** retrieve the indicated shield.



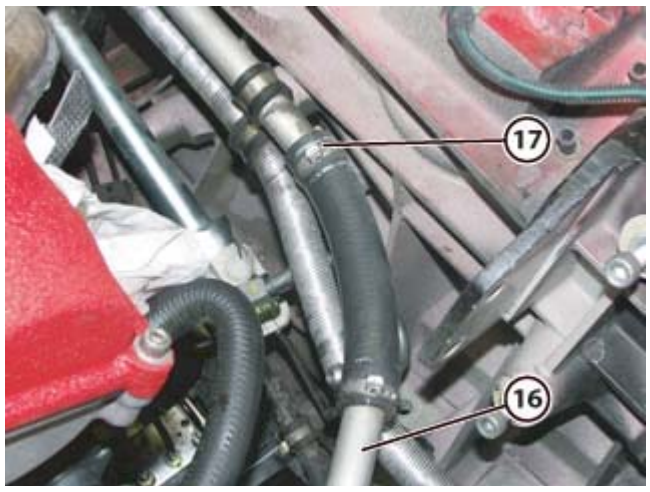
- Remove the earth braid **(7)** from the chassis by undoing the screw **(8)**.



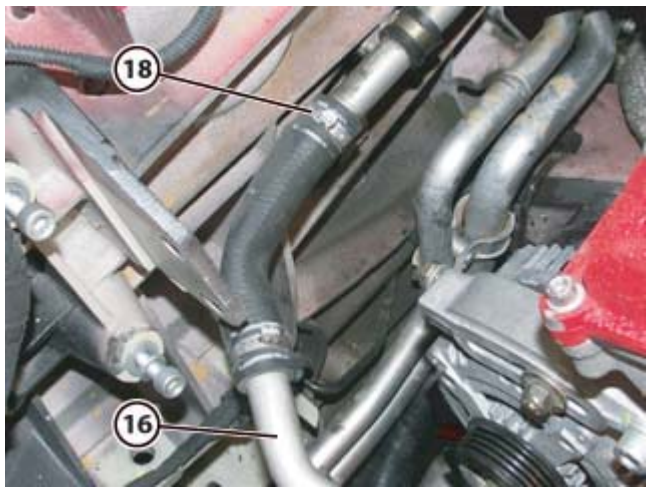
- Remove the clamp **(9)** and disconnect the coolant pipe **(10)**.



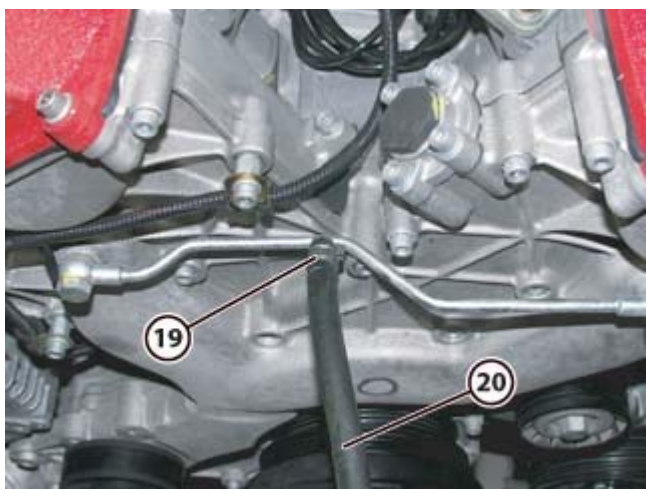
- Remove the rear heat shield **(11)** by unscrewing the two nuts **(12)**.
- Remove the front heat shield **(13)** by unscrewing the nuts **(14)** and **(15)**.



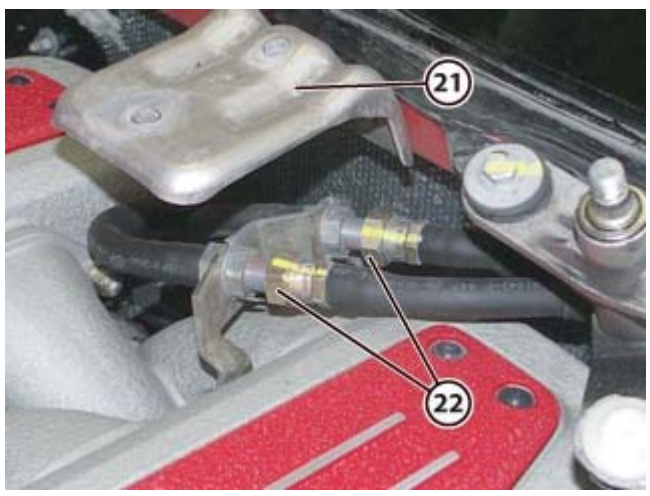
- Remove the clamp **(17)** on the secondary air pipe **(16)**.



- Remove the clamp **(18)** and remove the secondary air pipe **(16)** from the vehicle complete with the two rubber elbows.



- Remove the clamp **(19)** and disconnect the coolant pipe **(20)** from the engine.



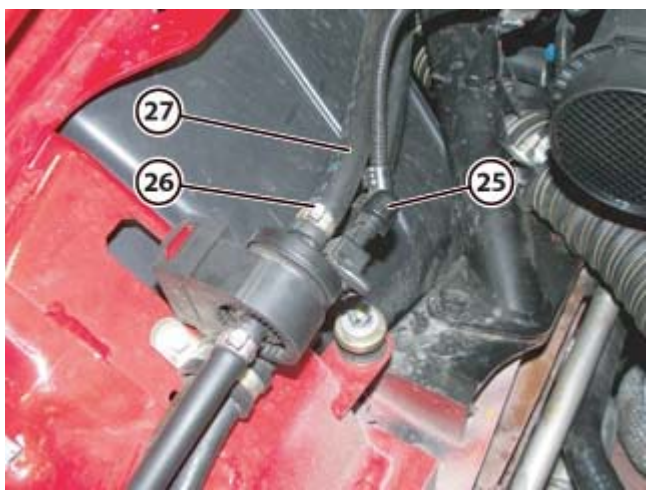
- Remove the mounting bracket **(21)** for the centre underwindscreen shield, undoing the two screws, and undo the two unions **(22)** on the fuel pipes.
- Plug the two fuel pipes and move them out of the way so that they do not interfere with the subsequent operations.



- Disconnect the two oxygen sensor connectors **(23)** from the right hand side exhaust manifolds, removing them from the mounting brackets, and releasing the relative cables from the clamps.



- Disconnect the two oxygen sensor connectors **(24)** from the left hand side exhaust manifolds, removing them from the mounting brackets, and releasing the relative cables from the clamps.

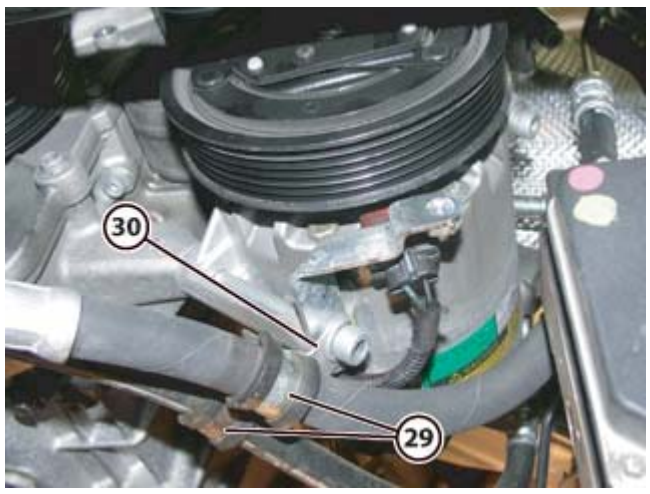


- Disconnect the connector **(25)** on the vapour cut-off valve and remove the clamp **(26)** on the pipe **(27)**.

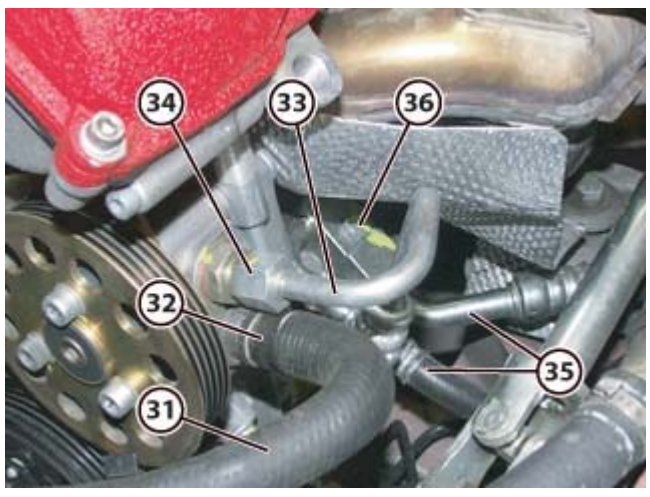
Repeat the procedure on the other vapour cut-off solenoid valve.



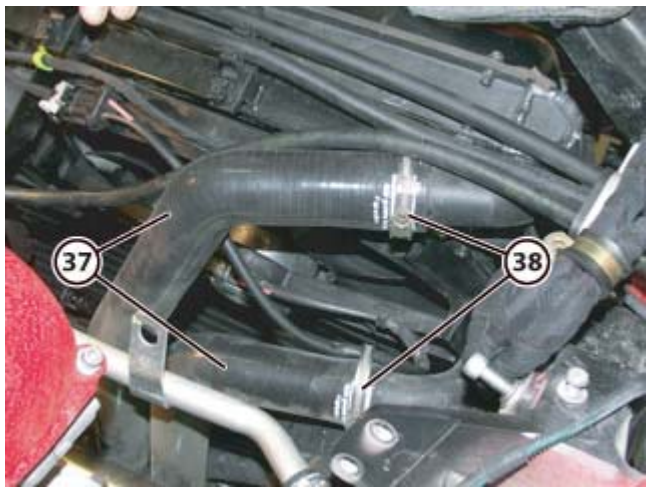
- Disconnect the pipe **(28)** on the brake servo.



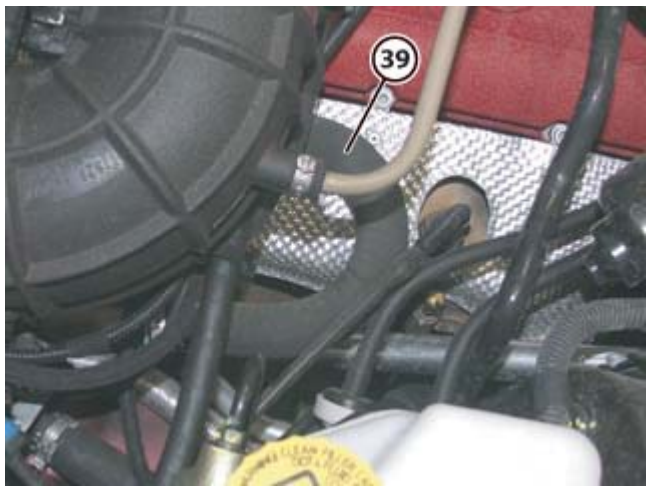
- Remove the two clamps **(29)** from the mounting bracket **(30)**, releasing the two pipes.



- Disconnect the return pipe **(31)** leading to the hydraulic steering pump and remove the clamp **(32)**.
- Unscrew the union **(34)** on the delivery pipe **(33)** leading to the hydraulic steering box.
- Move the pipes out of the way so that they do not interfere with the subsequent operations.
- Remove the two pipes **(35)** on the AC compressor by undoing the screw **(36)**.
- Move the pipes out of the way so that they do not interfere with the subsequent operations.

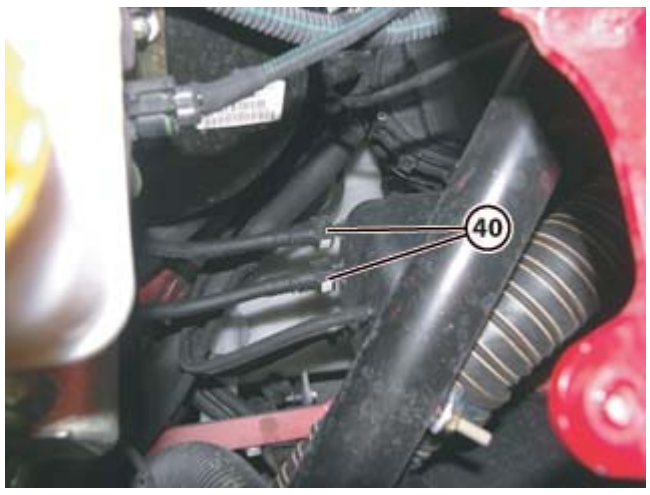


- Remove the two coolant pipes **(37)** on the radiator by unscrewing the two clamps **(38)**.

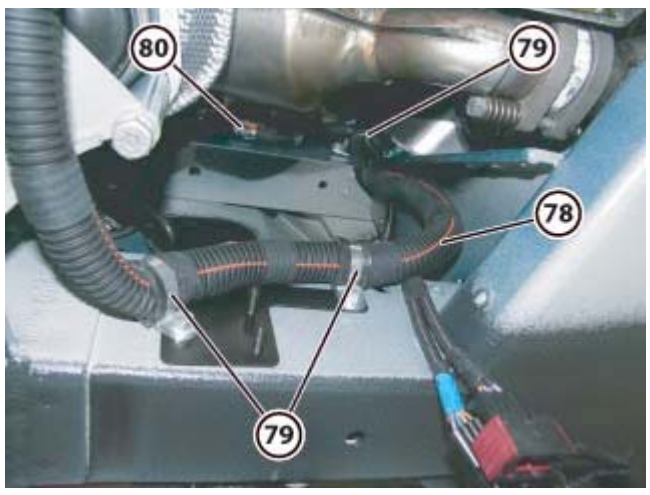


- Detach the secondary air pipe **(39)** from the relative valve.

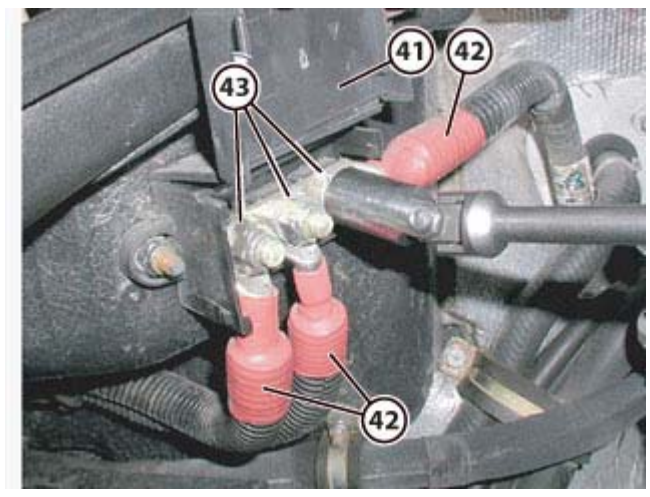
i Repeat the procedure on the other side of the engine.



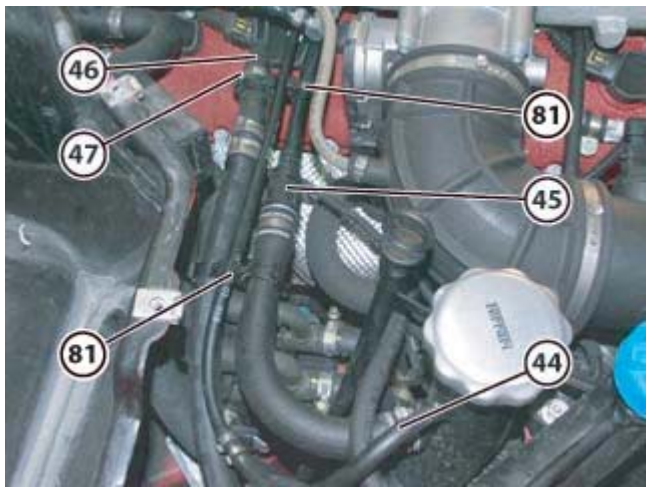
- Disconnect the two quick-couplings **(40)** on the connector pipes leading to the accumulator tank.
- Detach the pipe for the pneumatic actuator solenoid valve connected to the intake manifold.



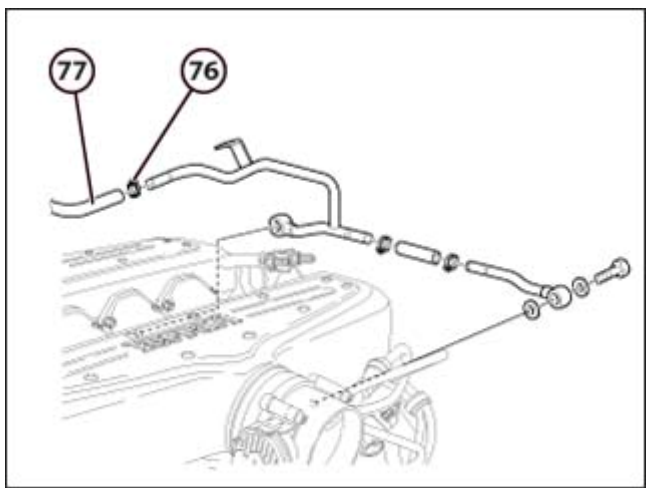
- Remove the three clamps **(79)** fastening the engine services cable **(78)** to the body and disconnect the connector **(80)** (Y351) located next to the TGK valve.



- Lift the protection cover **(41)** located on the right hand side of the engine compartment and remove the power cables **(42)** leading to the branching node by unscrewing the three nuts **(43)**.



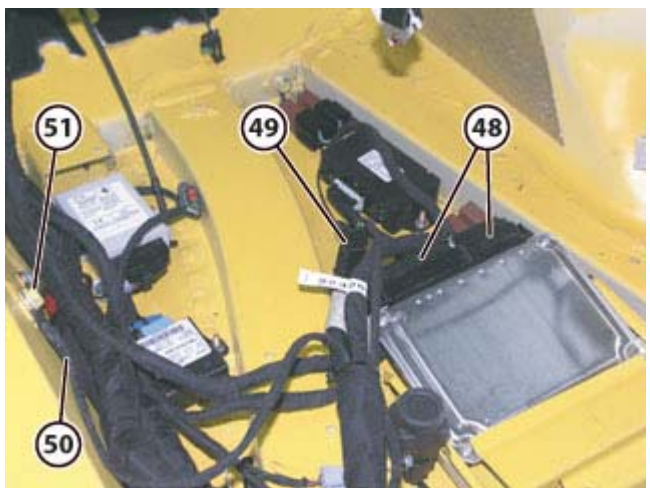
- Release the pipes from the two clamps **(81)**.
- Detach the oil vapour recirculation pipe **(44)** from the tank.
- Detach the quick-coupling union **(45)** on the oil vapour intake pipe.
- Remove the clamp **(47)** on the oil vapour pipe **(46)**.



- At the rear right hand side of the engine, remove the clamp **(76)** and detach the water delivery pipe **(77)**.

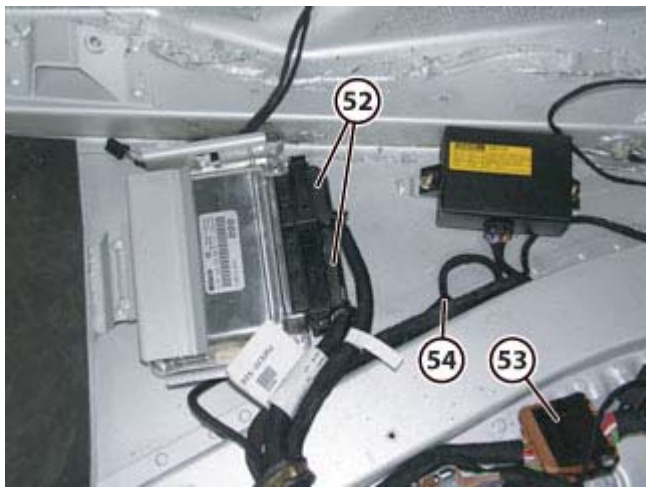
- Remove the mats (M2.24).

Follow the procedure up to the removal of the **driver side and passenger side footrests**.



- Disconnect the two connectors **(48)** on the left hand injection ECU and the connector **(49)**, and remove the earth cable **(50)** by undoing the screw **(51)**.

- Disconnect the connector linking the injection and passenger compartment wiring harnesses.
- Remove the wiring harness fastener clamps from the bodywork.
- Remove the cable grommet from the chassis and feed the left hand bank injection wiring harness through the hole, pushing it towards the engine compartment and taking care not to damage the harness.

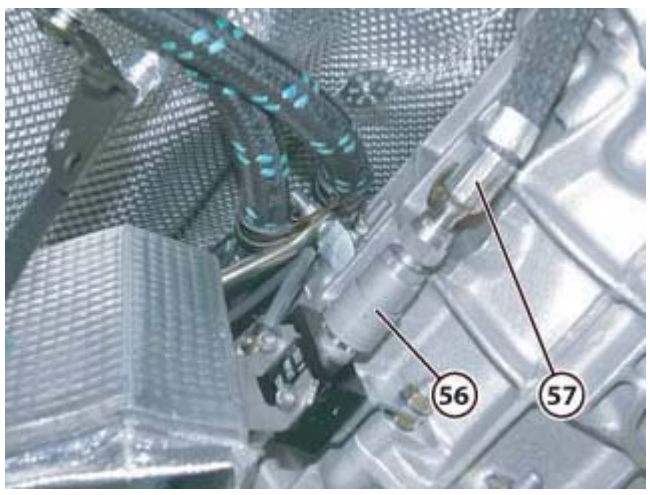


- Disconnect the two connectors **(52)** on the right hand injection ECU, the connector **(54)** and the connector **(53)** on the junction connector between the right hand bank injection and the passenger compartment cable.
- Remove the earth cable from the chassis by undoing the retaining screw.

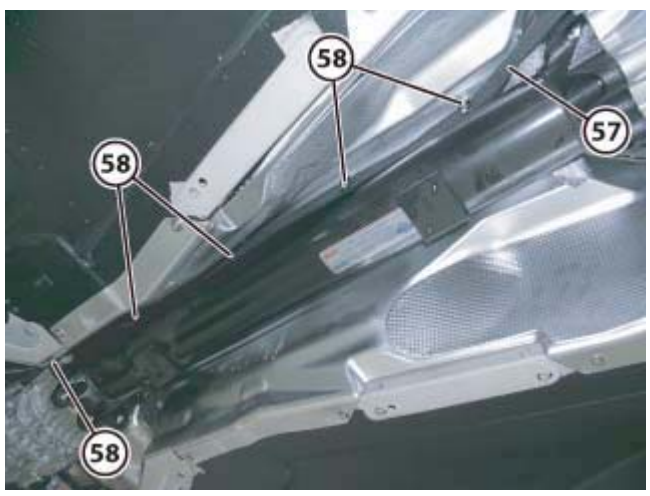
- Disconnect the connector linking the injection and engine compartment wiring harnesses.
- Remove the wiring harness fastener clamps from the bodywork.
- Remove the cable grommet from the chassis and feed the right hand bank injection wiring harness through the hole, pushing it towards the engine compartment and taking care not to damage the harness.



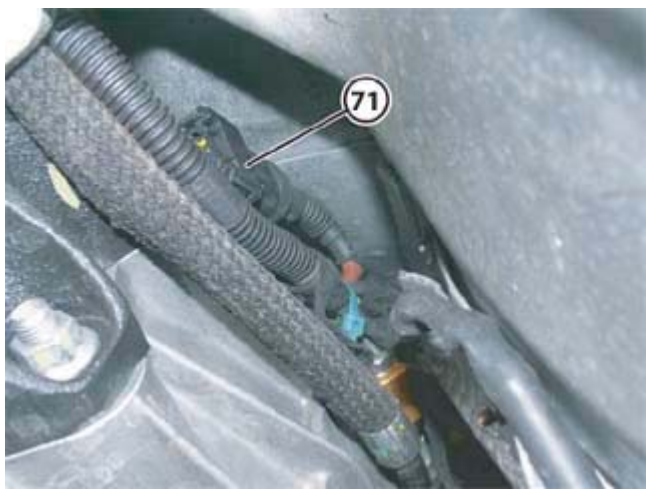
- Remove the heat shield **(55)** complete with bracket by unscrewing the two nuts on the clutch housing.



- Disconnect the clutch pipe **(57)** quick-coupling **(56)** from the union.



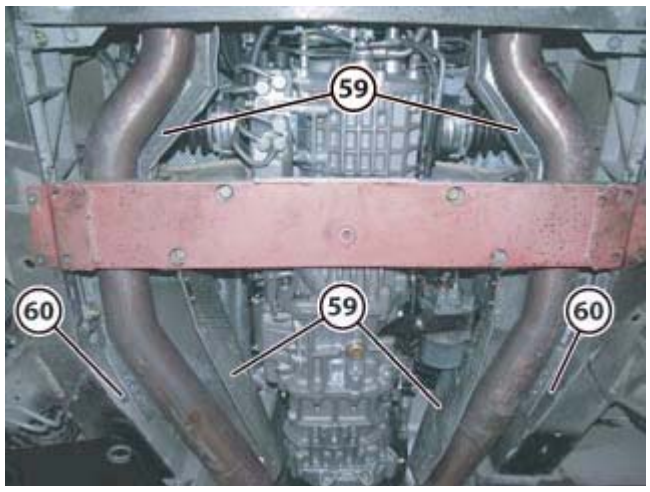
- Remove the clamps **(58)** fastening the F1 gearbox clutch pipe **(57)** and the clutch sensor cable to the transmission shaft.
- Move the clutch pipe **(57)** out of the way so that it cannot be damaged or hinder the following operations.



- Disconnect the clutch position sensor connector **(71)** (S062).

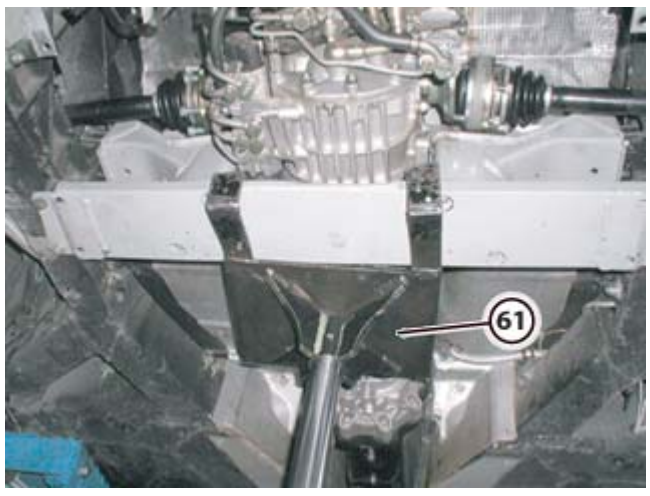


- Disconnect the clutch pressure sensor connector **(72)** (Z303).

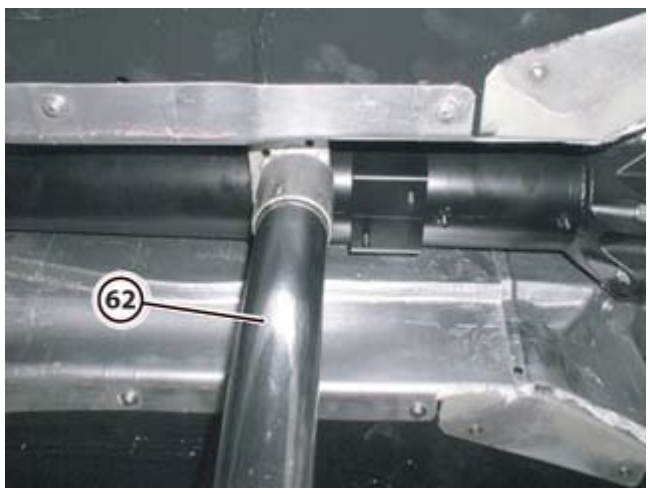


- Remove the four heat shields **(59)** by undoing the twelve screws **(60)**.

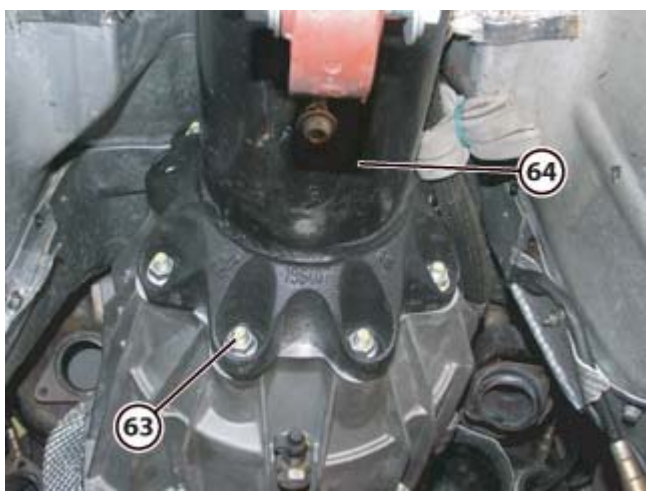
Note that the photograph was taken with the exhaust extension pipes fitted.



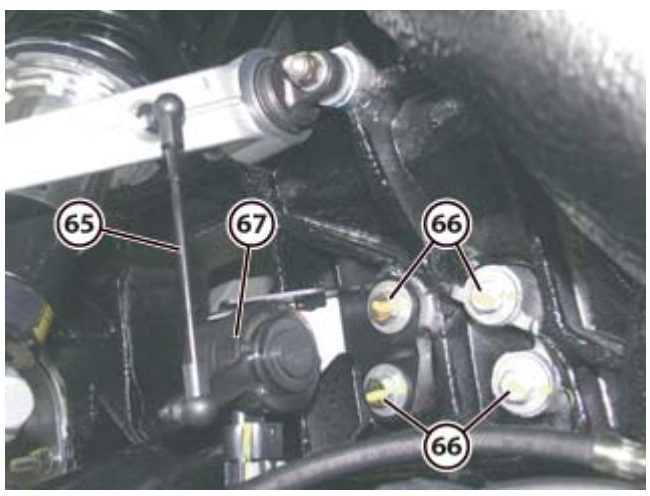
- Place a hydraulic jack **(61)** underneath the gearbox, raising to bring it into contact with the gearbox.



- Place a hydraulic jack **(62)** underneath the transmission shaft pipe and place a rubber pad between the jack and the pipe.



- Unscrew the eight nuts **(63)** fastening the transmission shaft pipe **(64)** onto the clutch housing.



- Detach the tie-rod **(65)** from the upper arm and undo the four screws **(66)** fastening the sides of the gearbox mounting cross member to the chassis, retrieving the sensor **(67)**.

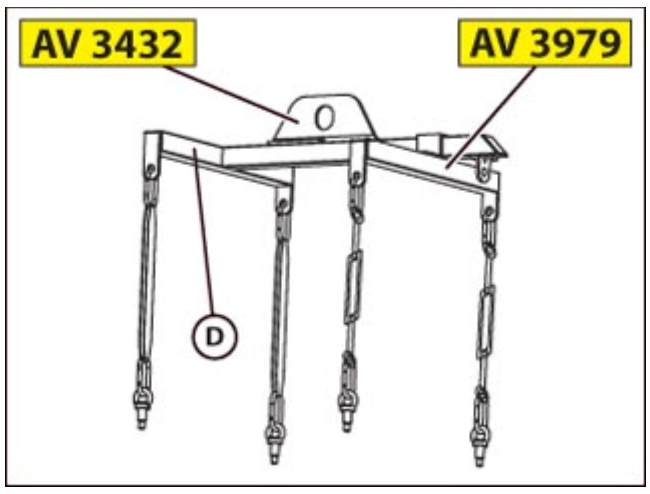
Repeat the procedure on the other side of the vehicle.



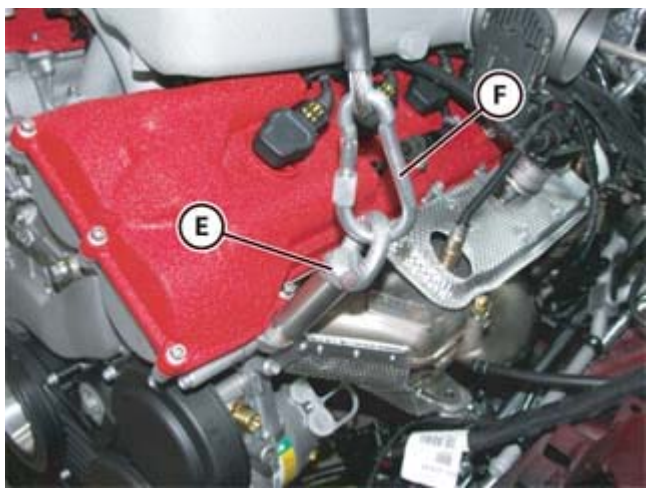
- Undo the two lower screws **(68)** fastening the gearbox mounting cross member **(69)** to the chassis.

Repeat the procedure on the other side of the vehicle.

- Supporting the weight of the gearbox-transmission shaft pipe assembly with the hydraulic jacks, shift it back by a few centimetres to allow the assembly to be eased off the stud bolts on the clutch housing.



- The engine must be lifted out of the engine compartment: this requires the use of a mobile hydraulic jack or a bridge crane with a minimum capacity of **300** Kg and the lifting tools **(AV 3432)** (also used for the Enzo) and **(AV 3979)**.
- Fit the tool **(AV 3432)** onto the hook of the bridge crane, with the fixed axis **(D)** pointing towards the front of the car, and position the tool over the centre of the engine.



- Tighten the four elements **(E)** of the lifting tools into the respective mountings on the engine.
- Fasten the elements **(F)** of the lifting tools to the elements **(E)**.

- Lift the hook to tension the belts.



- Remove the two heat shields **(73)** from the rubber engine bushings, unscrewing the four screws **(74)** from above.



- Undo the two screws **(70)** fastening the engine to the vehicle chassis.

- Slowly lift the engine out of the engine compartment, watching out for any electrical connectors that are still connected and taking care not to damage any other components.
- Remove the complete engine taking care not to knock the exhaust manifolds against the chassis side cross members, or the clutch housing against the central brace.
- Remove the engine from the compartment and set it down in safe place and in a stable position.

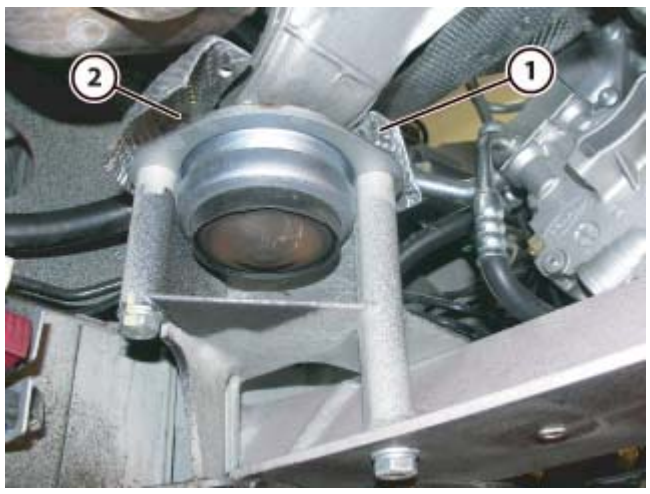
Replacing the rubber engine bushings



Tightening torque		Nm	Class
Rubber bushing - chassis	Screw	50 Nm	B
Engine - rubber bushing	Screw	103 Nm	B

➢ Remove the front section of the underfloor (M2.12).

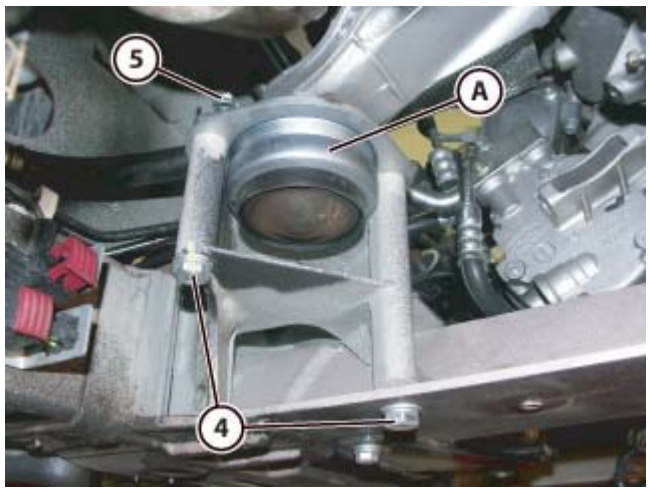
➢ Remove the engine compartment shields on the fenders (M2.17).



- Remove the two heat shields **(1)** by undoing the four screws **(2)** from above.



- Undo the two screws **(3)** fastening the engine mounting strut to the rubber engine bushing.



- Undo the four screws **(4)** fastening the engine mounting strut **(A)** to the chassis and retrieve the two brackets **(5)**.

- Place a hydraulic jack under the engine.

Take particular care during the following operation not to damage the components connected to (pipes, cables etc.) and surrounding the engine.

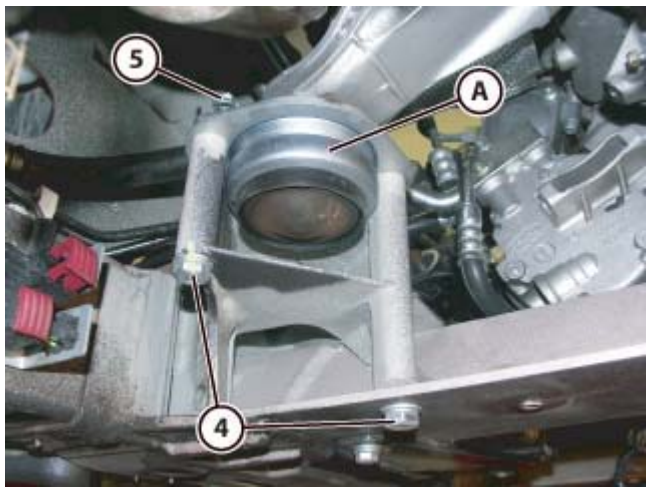
- Raise the engine by a few millimetres, then remove and replace the rubber engine bushings.

- Fit the new rubber engine bushings in their relative seats on the chassis.



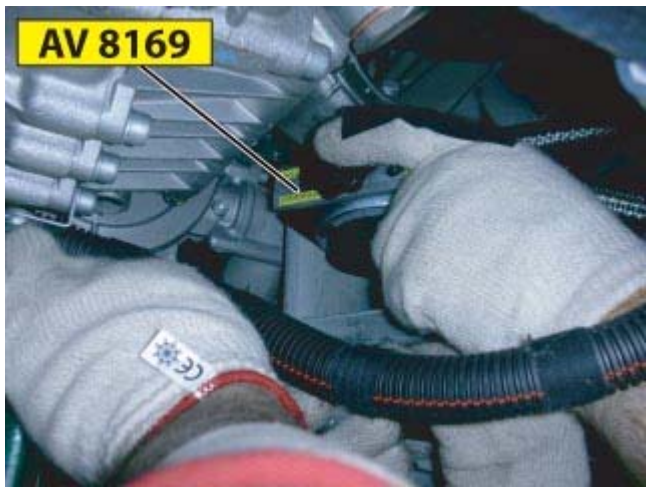
- Working from underneath the engine, use the tool **(AV 8169)** to centre the rubber bushings with the chassis.

- Lower the hydraulic jack under the engine until the engine mounting struts rest against the rubber engine bushings.
- Remove the hydraulic jack and tool **(AV 8169)**.



- Fit and align the two brackets **(5)** on the rubber engine bushings **(A)**.
- Fit the few screws **(4)** fastening the rubber engine bushings **(A)** to the chassis.
- Tighten the four screws **(4)**.

Tightening torque	Nm	Class
Screw	50 Nm	B



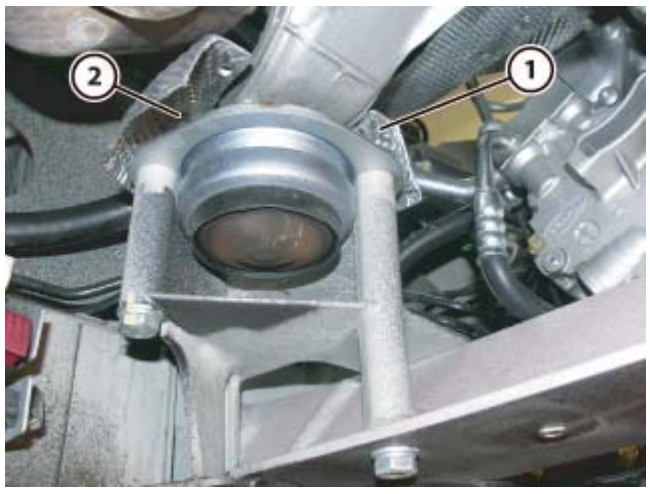
- Refit the tool **(AV 8169)** to check for interference between the engine bushings and the chassis.

In the event of interference, loosen the bushing, centre with the chassis using the same tool, then retighten.



- Fit the two screws **(3)** fastening the engine mounting strut to the rubber engine bushing and tighten.

Tightening torque	Nm	Class
Screw	103 Nm	B



- Fit the two heat shields **(1)**, by hand tightening the four screws **(2)** from above.

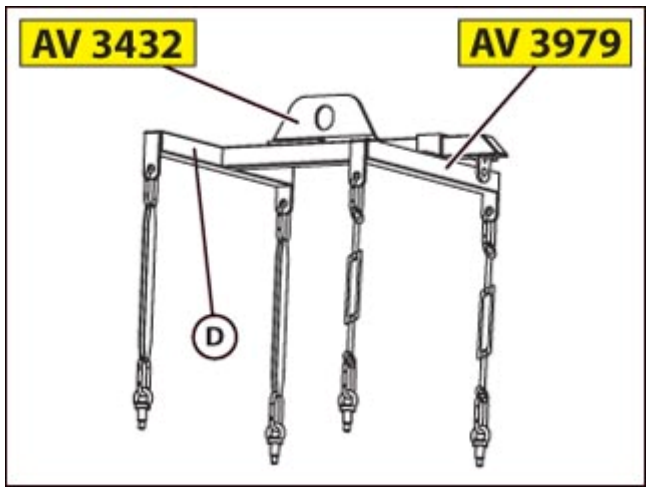
➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Refit the front flat undertray section (M2.12).

B2.02 Reassembly

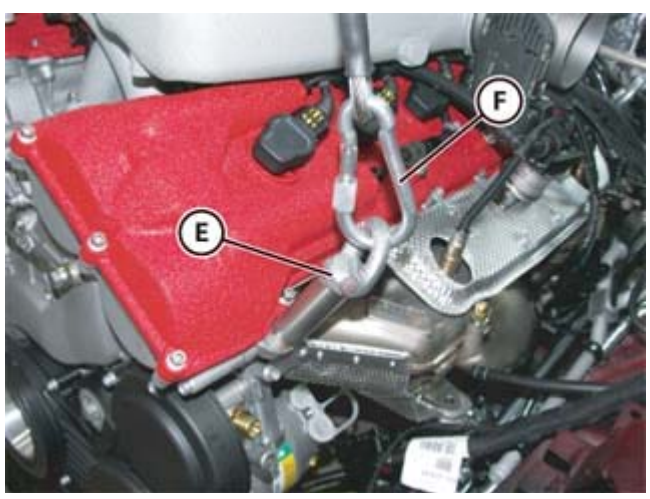
Refitting the engine

Tightening torque		**Nm**	**Class**
Engine - rubber bushing	Screw	103 Nm	B
Gearbox subframe - chassis	Screw	25 Nm	B
Transmission shaft pipe - clutch housing	Nut	60 Nm	A
Fastening earth plate to chassis	Screw	18 Nm	B
Coolant inlet pipe - radiator	Clamp	4 Nm	B
Coolant outlet pipe - radiator	Clamp	4 Nm	B
Engine earth braid - chassis	Screw	18 Nm	B
Oil pipe - engine Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Screw / Nut	20 Nm	B
Fastening for oil pipe from pump to oil tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B

Protect the bodywork appropriately against possible damage during work.



- To refit the engine in the vehicle, use a mobile hydraulic jack or a bridge crane with a minimum capacity of **300** Kg and the lifting tools **(AV 3432)** (also used for the Enzo) and **(AV 3979)**.
- Fit the tool **(AV 3432)** onto the hook of the bridge crane, with the fixed axis **(D)** pointing towards the front of the car, and position the tool over the centre of the engine.



- Tighten the four elements **(E)** of the lifting tools into the respective mountings on the engine.
- Fasten the elements **(F)** of the lifting tools to the elements **(E)**.
- Lift the engine.

Check that there are no loose wires or pipes in the engine compartment; if necessary, move them out of the way so that they cannot interfere with or be damaged during the subsequent operations.

- If the gearbox-transmission shaft pipe assembly is in the vehicle, shift it backward by a few centimetres from its original position, supporting its weight with two hydraulic lifts positioned under the gearbox and under the transmission shaft pipe.

- Position the engine over the engine compartment, keeping it sufficiently raised to allow easy manoeuvring without hitting any part of the car.
- Lower the engine into the compartment, setting down on the rubber engine bushings as well aligned as possible.



- Fit the two screws **(1)** on the engine mounting struts and tighten.

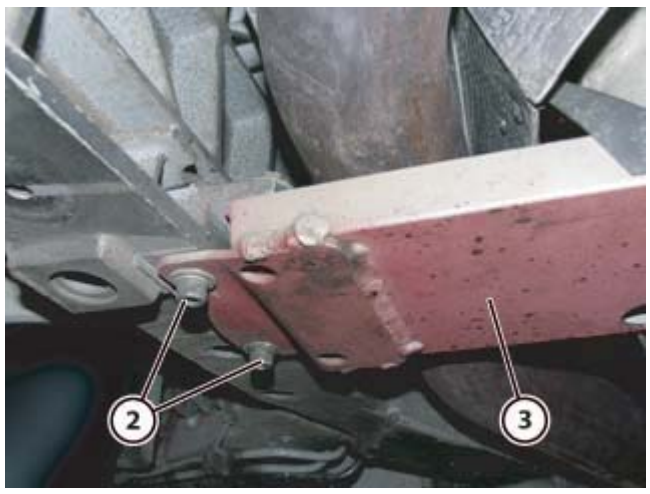
Tightening torque	**Nm**	**Class**
Screw	103 Nm	B

- Remove all the lifting tools from the engine.

- Support the weight of gearbox-transmission shaft pipe assembly with the hydraulic lifts and shift it forward, fitting onto the clutch housing stud bolts.



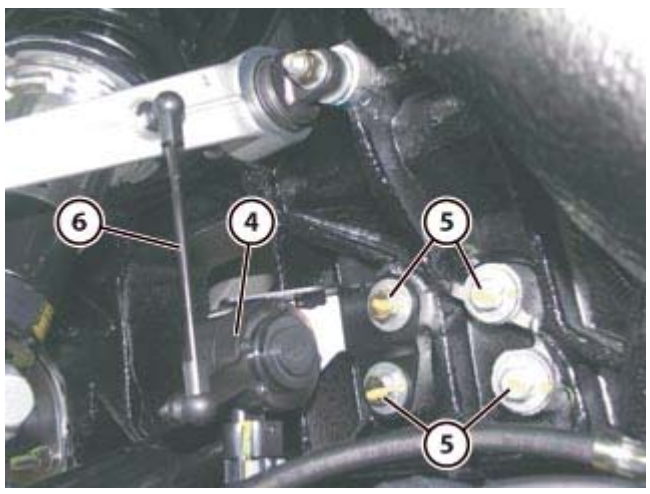
- Fit the two heat shields **(73)** in their respective seats on the rubber engine bushings and tighten the four screws **(74)**.



- Fasten the lower side of the gearbox mounting cross member **(3)** to the chassis by tightening the two screws **(2)**.

Repeat the procedure on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



- Fasten the gearbox mounting cross member **(3)** laterally to the chassis, after fitting the sensor **(4)**, tightening the four screws **(5)**. Connect the sensor tie-rod **(6)** to the upper arm.

Repeat the procedure on the other side of the vehicle.

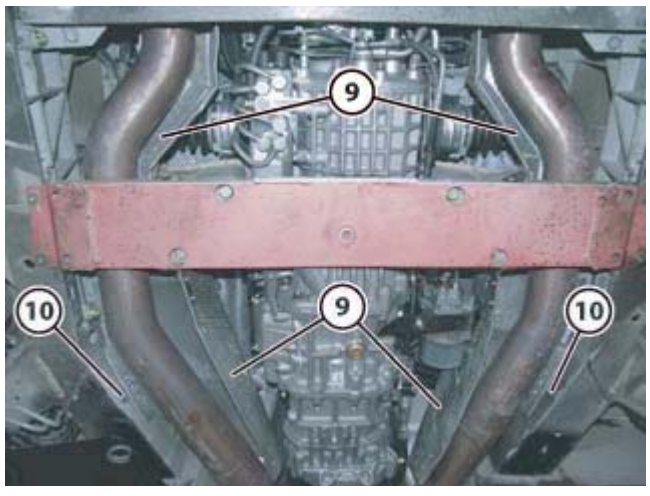
Tightening torque	Nm	Class
Screw	25 Nm	B



- Fit and tighten the eight nuts **(7)** fastening the transmission shaft pipe **(8)** to the clutch housing.

Tightening torque	Nm	Class
Nut	60 Nm	A

- Remove the hydraulic lifts.

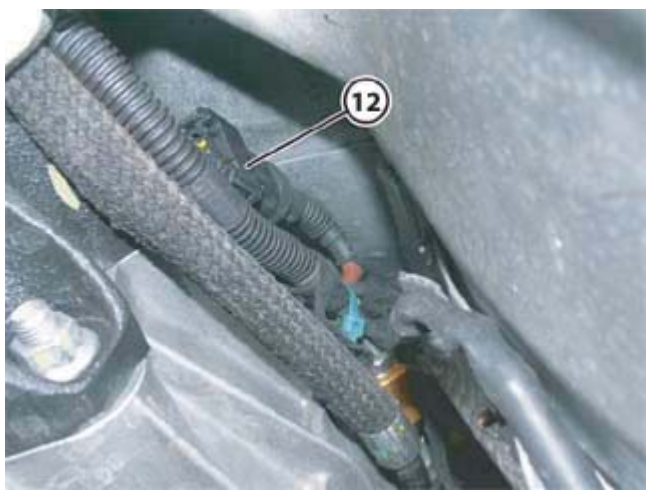


- Fit the four heat shields **(9)**, tightening the twelve screws **(10)**.

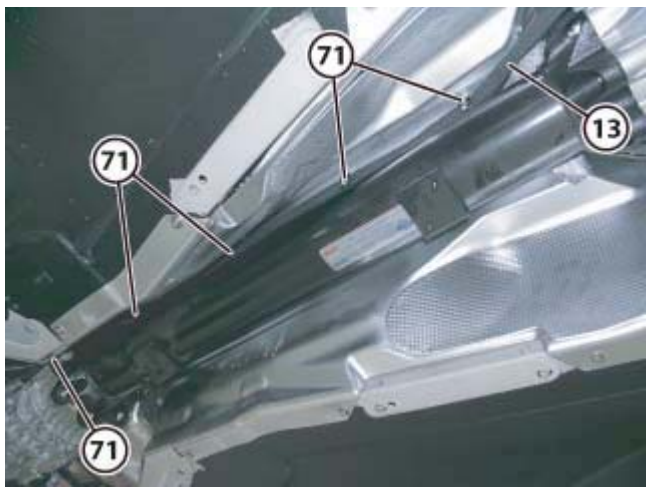
Note that the photograph was taken with the exhaust extension pipes already fitted.



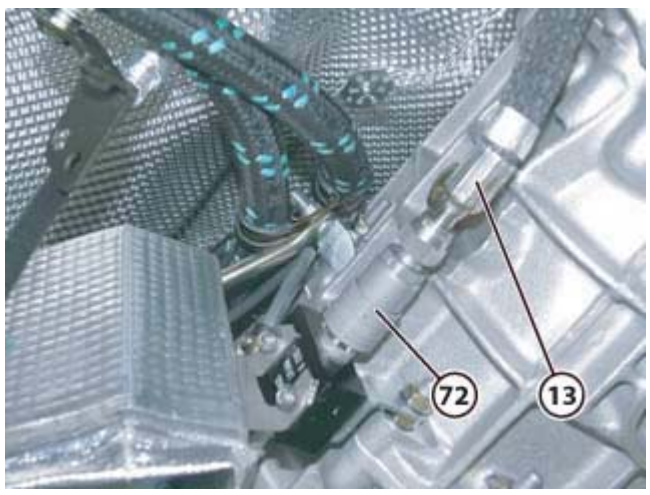
- Connect the clutch pressure sensor connector **(11)** (Z303).



- Connect the clutch position sensor connector **(12)** (S062).



- Fasten the tube **(13)** and the clutch sensor cable as originally mounted on the drive shaft tube with the clamps **(71)**.

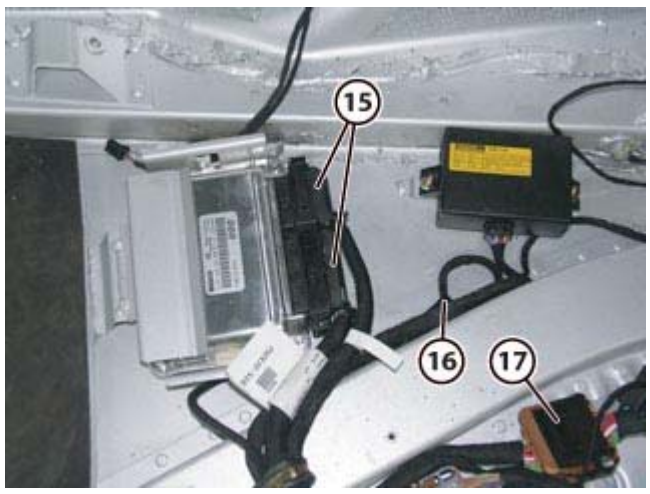


- Connect the quick-connector **(72)** for the clutch pipe **(13)** on the connector block.
- Fasten the clutch pipe **(13)** onto the gearbox housing with the relative clamps as originally fitted.



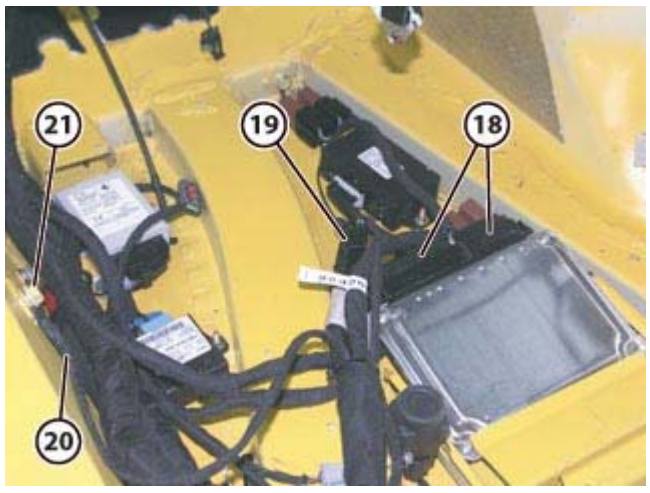
- Fit the heat shield **(14)**, complete with bracket, and fasten by tightening the two nuts on the clutch housing.

- Fit the cable grommet on the chassis and feed the right hand bank injection wiring harness through the hole, pushing it towards the passenger compartment and taking care not to damage the harness.
- Connect the connector linking the injection wiring harness and the engine compartment wiring harness.



- Connect the two connectors **(15)** on the right hand injection ECU, the connector **(16)** and the connector **(17)** to the junction connector between the right hand bank injection and the passenger compartment cable.
- Refit the earth cable on the chassis as originally installed and fasten with the screw.
- Refit all the wiring harness fastener clamps on the bodyshell as originally installed.

- Fit the cable grommet on the chassis and feed the left hand bank injection wiring harness through the hole, pushing it towards the passenger compartment and taking care not to damage the harness.
- Connect the connector linking the injection wiring harness and the passenger compartment wiring harness.



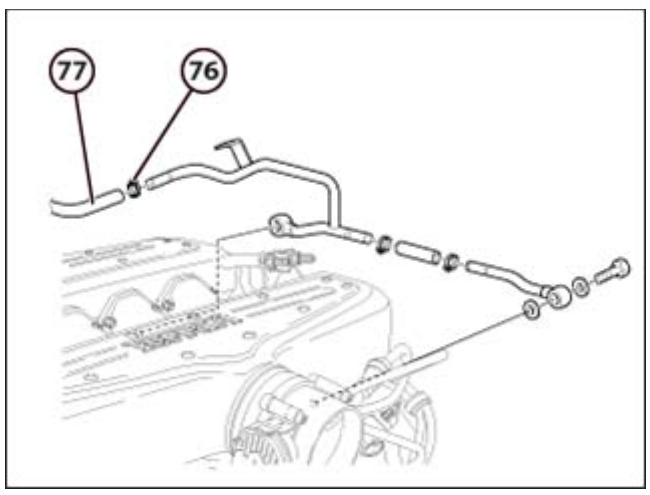
- Connect the two connectors **(18)** on the left hand injection ECU and the connector **(19)**, and refit the earth cable **(20)**, tightening the screw **(21)**.



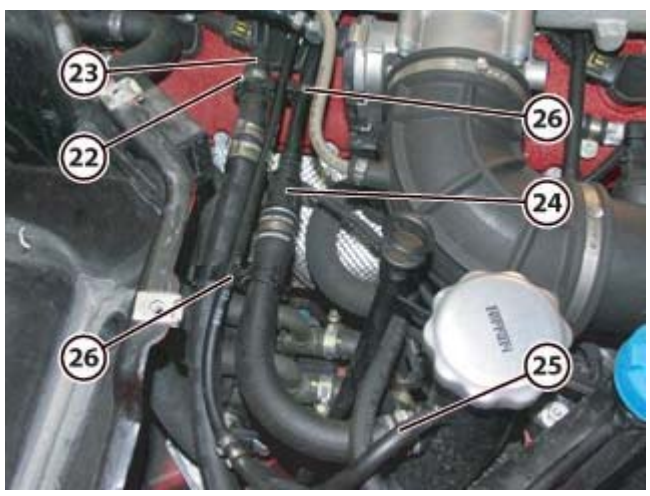
Tightening torque	Nm	Class
Screw	18 Nm	B

- Refit all the wiring harness fastener clamps on the bodyshell as originally installed.

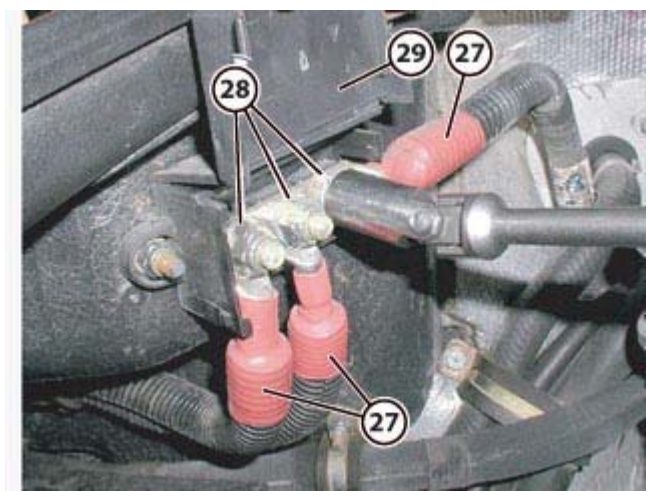
- Refit the mats (M2.24).



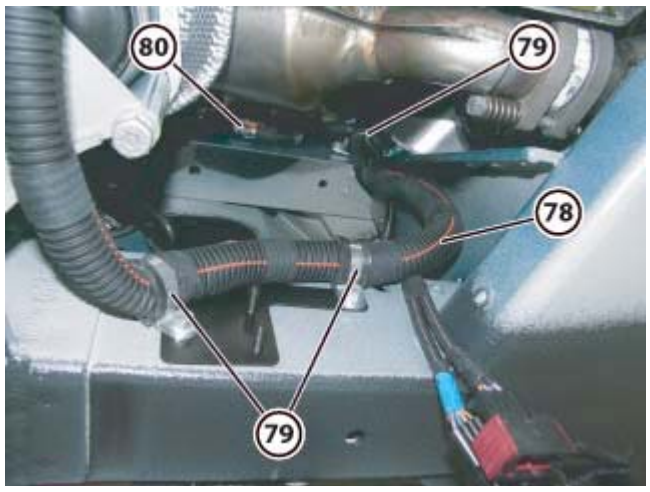
- At the rear right hand side of the engine, connect the water delivery pipe **(77)** and fasten with the clamp **(76)**.



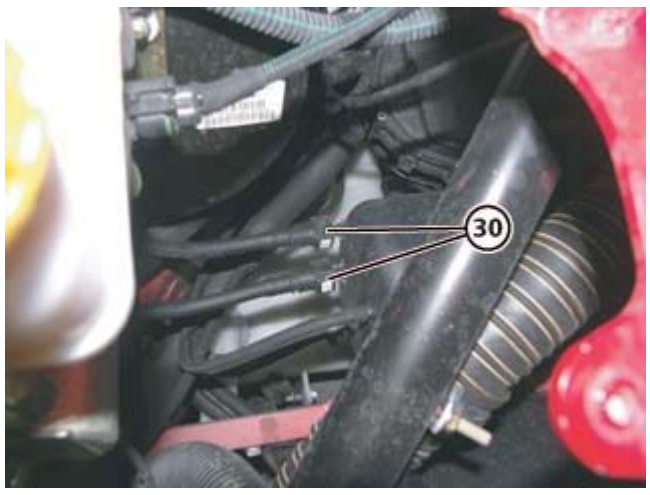
- Fit the clamp **(22)** and fit the oil vapour pipe **(23)**.
- Connect the quick-connector union **(24)** on the oil vapour aspiration pipe.
- Connect the oil vapour recirculation pipe **(25)** on the tank.
- Fit the pipes onto the two clamps **(26)**.



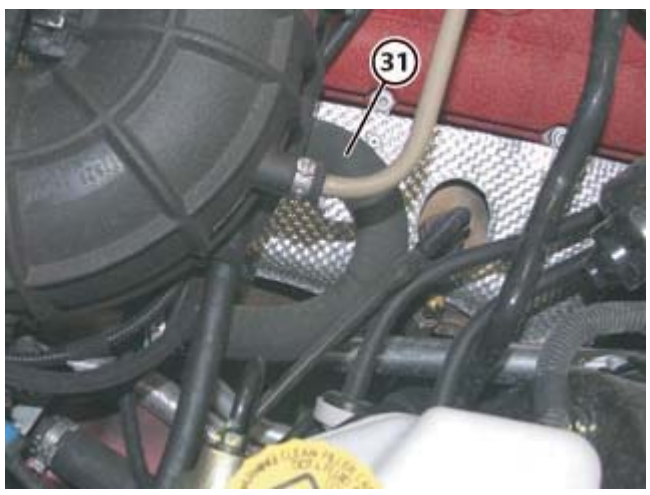
- Fit the power cables **(27)** and fasten by tightening the nuts **(28)**.
- Lower and close the protection cover **(29)**.



- Fasten the engine services cable **(78)** to the body with the three clamps **(79)**, and connect the connector **(80)** (Y351) located next to the TGK valves.

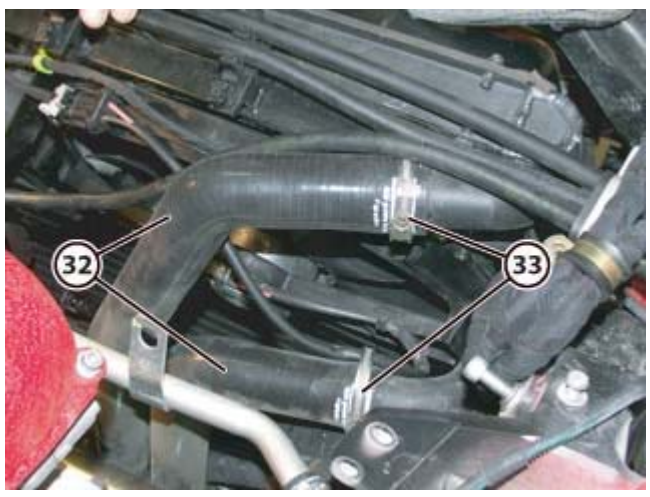


- Connect the solenoid valve pipe for the pneumatic actuators to the intake manifold.
- Connect the two quick-couplings **(30)** on the connection pipes to the accumulator tank.



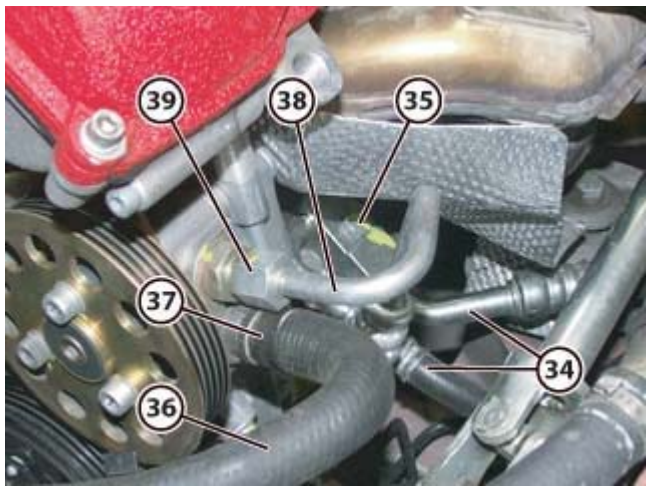
- Connect the secondary air pipe **(31)** to the relative valve.

Repeat the procedure on the other side of the engine.

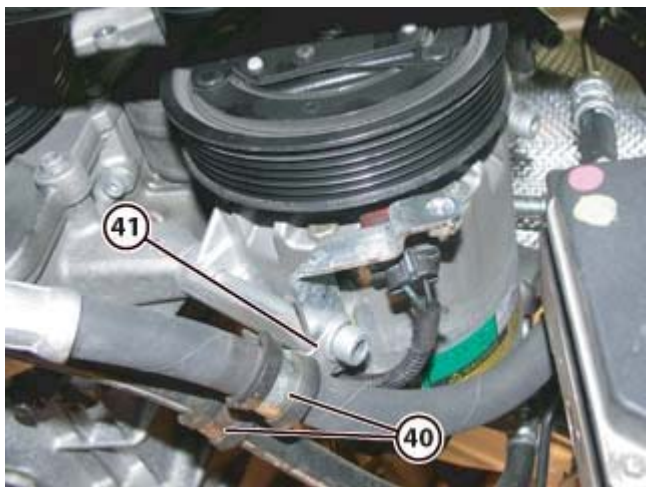


- Fit the two coolant pipes **(32)** on the radiator and tighten the two clamps **(33)**.

Tightening torque	Nm	Class
Clamp	4 Nm	B
Clamp	4 Nm	B



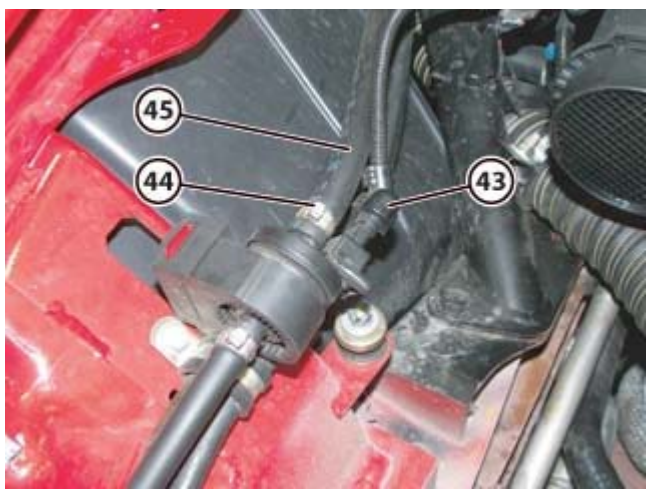
- Fit the pipes **(34)** on the AC compressor, after replacing the gaskets, and fasten by tightening the screw **(35)**.
- Fit the return pipe **(36)** on the hydraulic steering pump and fasten with the clamp **(37)**.
- Fit the delivery pipe **(38)** on the hydraulic steering pump and fasten by tightening the union **(39)**.



- Fit the two clamps **(40)** on the mounting bracket **(41)** and fasten with the nut.



- Fit the pipe **(42)** on the brake servo.



- Connect the connector **(43)** on the vapour cut-off solenoid valve and refit the clamp **(44)** on the pipe **(45)**.

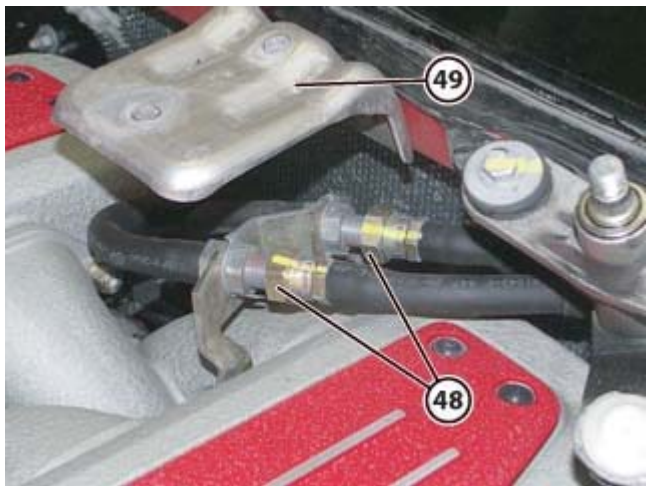
Repeat the procedure on the other side of the vehicle.



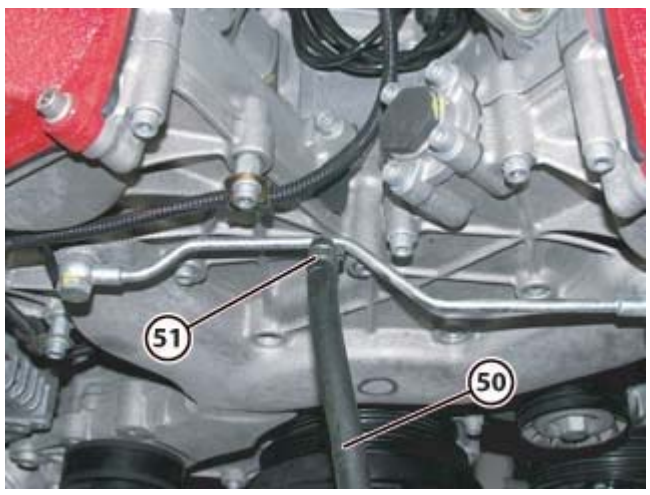
- Connect the two oxygen sensor connectors **(46)** on the left hand side exhaust manifolds, fastening to the mounting brackets, and refit the relative cables in the clamps.



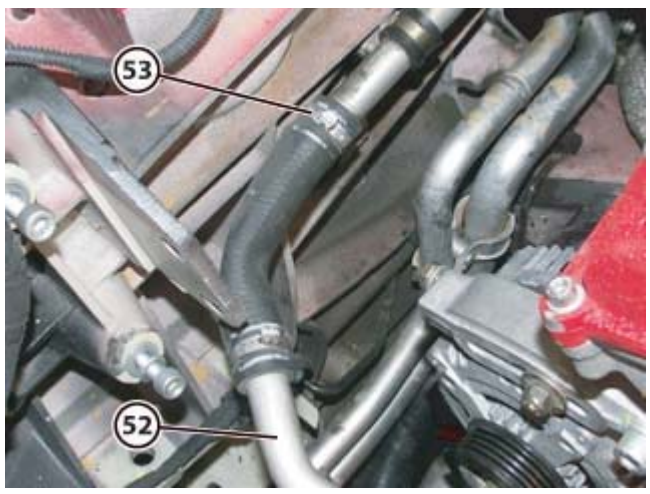
- Connect the two oxygen sensor connectors **(47)** on the right hand side exhaust manifolds, fastening to the mounting brackets, and refit the relative cables in the clamps.



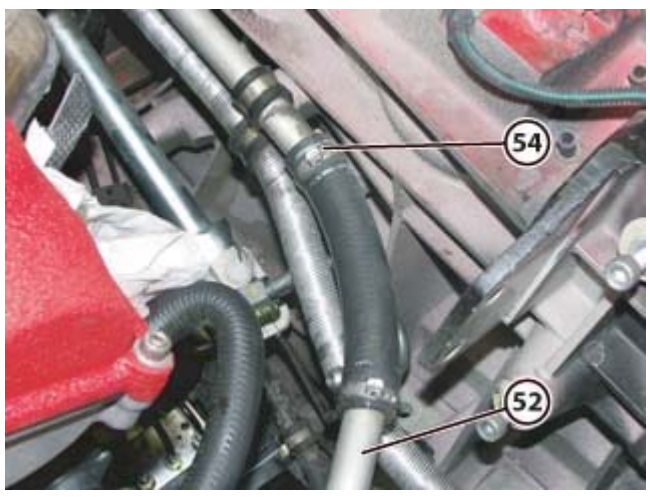
- Fit the fuel pipes and tighten the two unions **(48)**.
- Fit the mounting bracket **(49)** for the central underwindscreen shield and fasten with two screws.



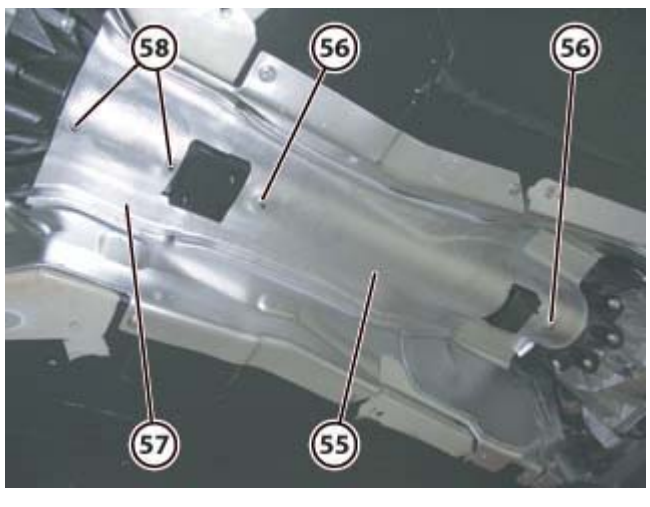
- Fit the coolant pipe **(50)** on the engine and fasten with the clamp **(51)**.



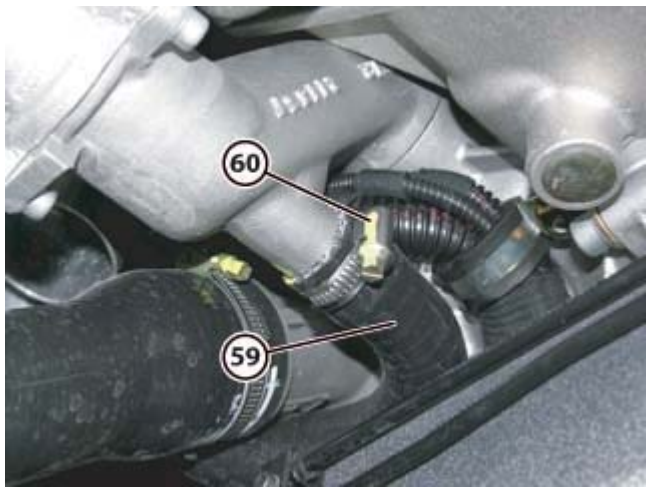
- Fit the front secondary air pipe **(52)** in the engine compartment and connect on the left hand side using the clamp **(53)**.



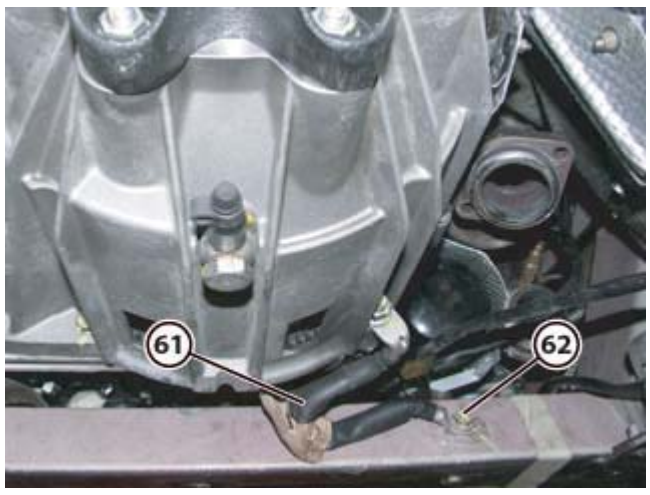
- Connect the front secondary air pipe **(52)** on the right hand side using the clamp **(54)**.



- Working from underneath the vehicle, fit the front heat shield **(55)** and fasten by tightening the two nuts **(56)**.
- Working from underneath the vehicle, fit the rear heat shield **(57)** and fasten by tightening the two nuts **(58)**.

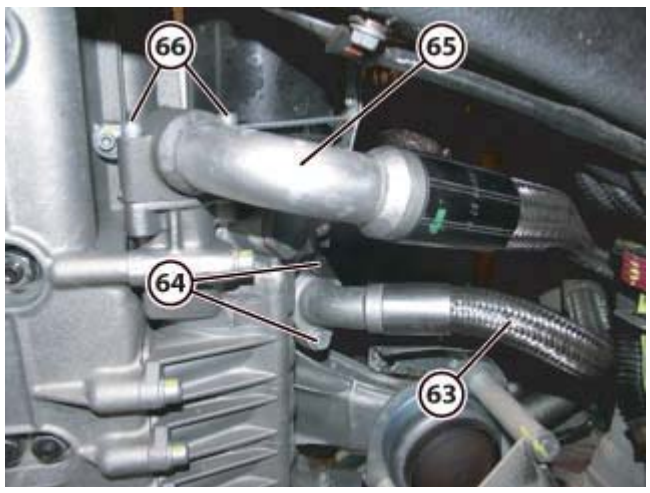


- Fit the coolant pipe **(59)** on the engine and fasten by tightening the clamp **(60)**.



- Fasten the earth braid **(61)** on the chassis by tightening the screw **(62)**.

Tightening torque	Nm	Class
Screw	18 Nm	B

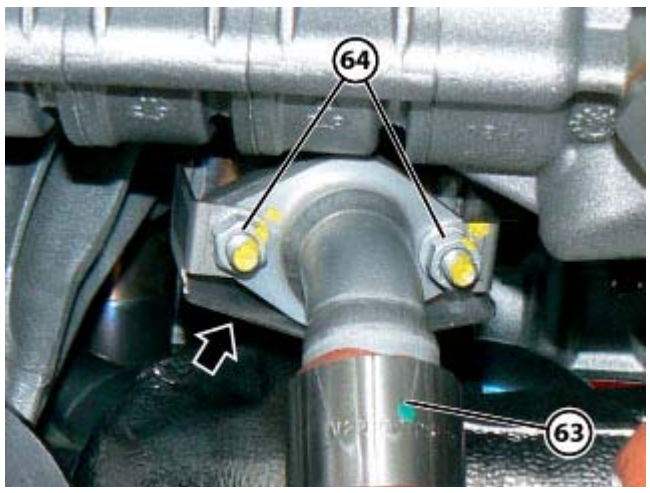


- Replace the O-rings on the two oil pipes **(63)** and **(65)** with new rings after wetting with oil.
- Fit the oil delivery pipe **(63)** leading to the engine and fasten by tightening the two screws **(64)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B

- Fit the oil delivery pipe **(65)** leading to the tank and fasten by tightening the two screws **(66)**.

Tightening torque	Nm	Class
Nut	10 Nm	B



NEW SOLUTION

- **FROM Ass.ly No. 68541** fit the indicated shield.
- **FROM Ass.ly No. 64841** fit the oil delivery pipe **(63)** leading to the engine and fasten by tightening the two nuts **(64)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B



- Connect the connector **(67)** for the rear oxygen sensor on the front left hand exhaust manifold and fasten the relative cable **(68)** to the chassis as originally installed using new clamps.



- Connect the connector **(69)** for the rear oxygen sensor on the front right hand exhaust manifold and fasten the relative cable **(70)** to the chassis as originally installed using new clamps.

- Refit the exhaust branching (B6.06).
- Refit the catalytic converter (B6.04).
- Refit the silencer and exhaust extension (B6.05).
- Refit the steering box (E2.02).
- Refit the front stabiliser bar (F2.07).
- Refit the engine compartment chassis stiffener bar (M2.17).
- Fill the air-conditioning system. (I3.01).
- Fill the power steering system (E2.07).
- Fill the engine lubrication system (A3.01).
- Fill the cooling system (A3.07).
- Bleed the clutch system (D2.14).
- Refit the air flow meter (C1.03).
- Refit the air intake (B6.03).
- Refit the underwindscreen shields (M2.17).
- Refit the engine compartment shields on the fenders (M2.17).
- Refit the central engine compartment shield (M2.17).
- Refit the engine compartment lid (M2.01).
- Refit the wheels (F2.08).
- Refit the front flat undertray section (M2.12).
- Refit the rear underfloor section (M2.12).
- Set the battery master switch to ON (L2.02).

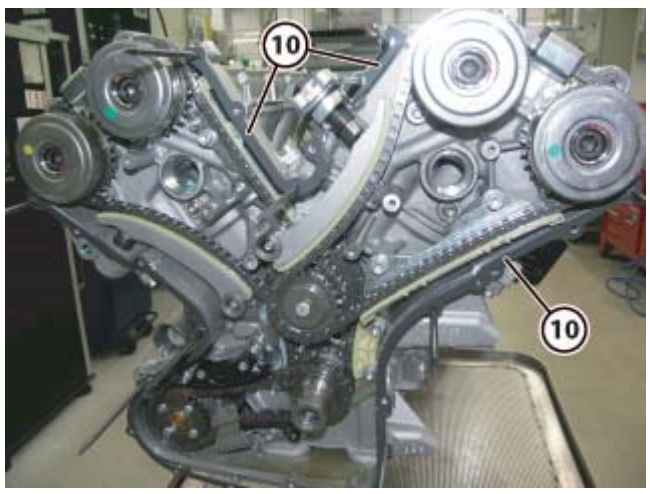
B2.03 Engine overhaul - Disassembly

Replacing the front timing system cover gasket with engine in vehicle

- Set the battery master switch to OFF (L2.02).
- Drain the engine lubrication system (A3.01).
- Drain the engine cooling system (A3.07).
- Drain the hydraulic steering system (E2.07).
- Remove the steering box (E2.02).
- Remove the intake manifold (B6.02).
  Remove the right and left lung only.

- Remove the cylinder head covers (B2.03).
  Remove both.

- Remove the engine compartment subchassis stiffener bar (M2.17).
- Remove the alternator (L2.03).
- Remove the AC compressor (I2.01).
- Remove the power steering pump (E2.01).
- Remove the front cover (B2.03).



- Remove the three gasket sections **(10)** from the front cover.

Note that the photo aside shows the engine removed from the vehicle to illustrate the operation more clearly.

- Refit the front cover (B2.05).

Refit the new front timing system cover gasket.

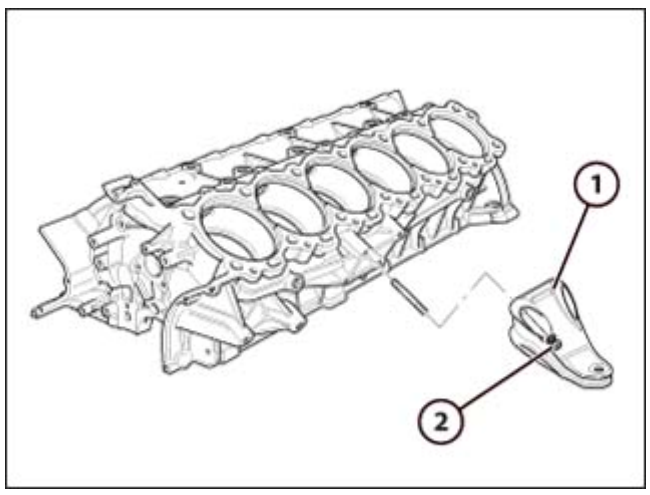
- Refit the power steering pump (E2.01).
- Refit the A.C. compressor (I2.01).
- Refit the alternator (L2.03).
- Refit the engine compartment chassis stiffener bar (M2.17).
- Refit the cylinder head covers (B2.05).
  Refit both.

- Refit the intake manifold (B6.02).
  Refit the right and left lung.

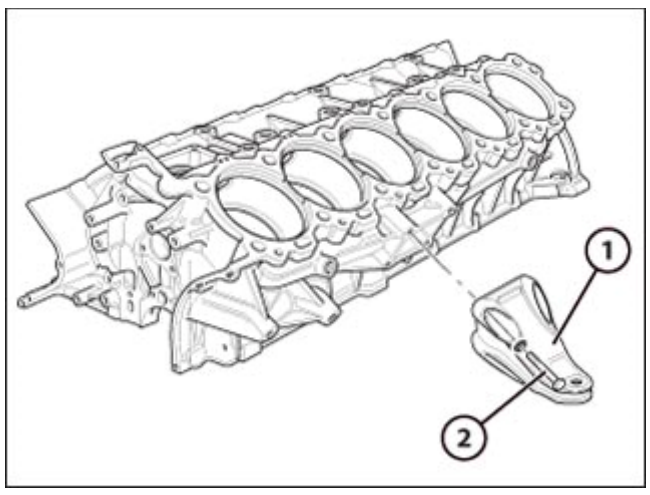
- Refit the steering box (E2.02).
- Fill the power steering system (E2.07).
- Fill the cooling system (A3.07).
- Fill the engine lubrication system (A3.01).
- Set the battery master switch to ON (L2.02).

Preparing for engine overhaul

- Remove the engine from the vehicle (B2.01).
- Remove the clutch housing (D2.04).
- Remove the complete clutch (D2.04).
- Remove the flywheel (D2.04).
- Remove the front left exhaust manifold (B6.06).
- Remove the front left exhaust manifold (B6.06).
- Remove the rear right exhaust manifold (B6.06).
- Remove the rear left exhaust manifold (B6.06).

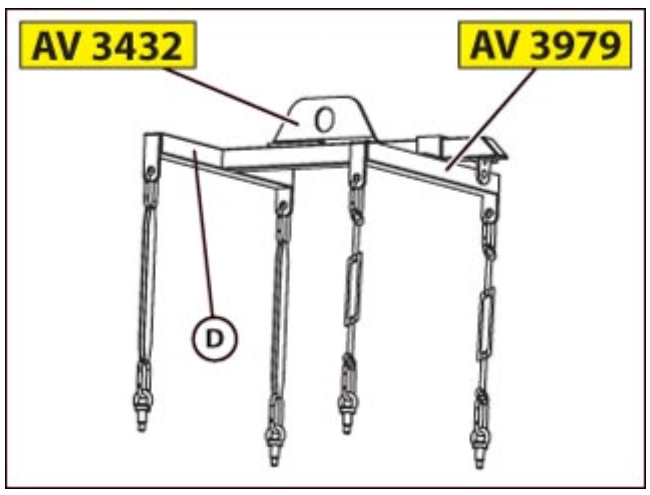


- Remove the left hand engine strut **(1)**, undoing the four nuts **(2)** and retrieving the relative washers.

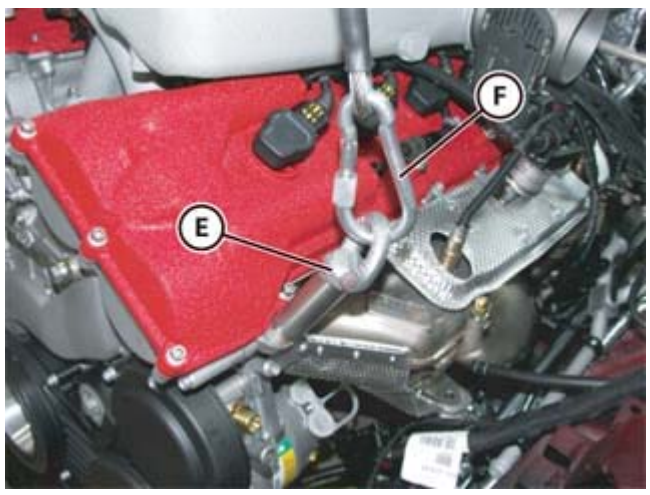


FROM Ass.ly No. 62963

- Remove the left hand engine strut **(1)**, undoing the four screws **(2)** and retrieving the relative washers.

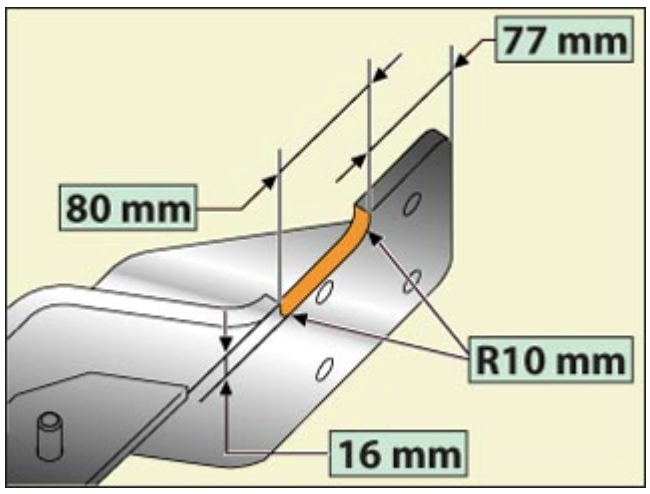


- The engine must be lifted out of the engine compartment: this requires the use of a mobile hydraulic jack or a bridge crane with a minimum capacity of **300** Kg and the lifting tools **(AV 3432)** (also used for the Enzo) and **(AV 3979)**.
- Fit the tool **(AV 3432)** onto the hook of the bridge crane, with the fixed axis **(D)** pointing towards the front of the car, and position the tool over the centre of the engine.



- Tighten the four elements **(E)** of the lifting tools into the respective mountings on the engine.
- Fasten the elements **(F)** of the lifting tools to the elements **(E)**.

- Lift the engine, taking care that no lines or cables are crushed by the hoisting straps, and transfer the engine to the workbench.



- Modify the mounting tool **(AM 107232)**, bending the top part as shown in the figure, taking care not to damage the tool.



- Secure the engine to the mounting tool **(AM 107232)**, tightening the four nuts **(3)**.



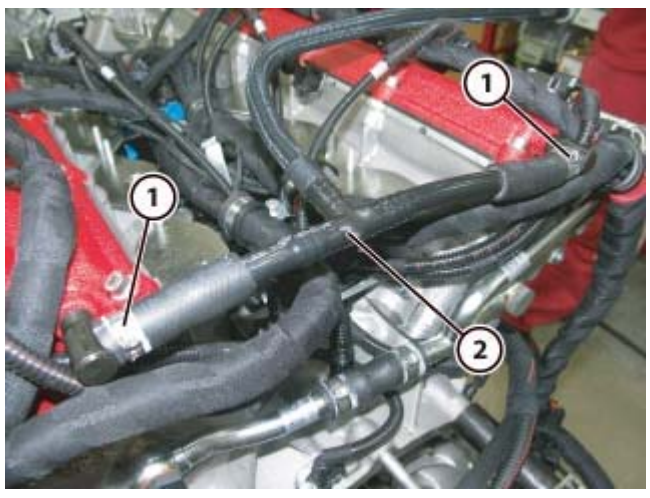
- Fit the screw **(4)** of tool **(AM 107232)** onto the stud bolt on the flywheel side of the engine, using the element **(5)** as spacer.

- Remove the lifting tools.

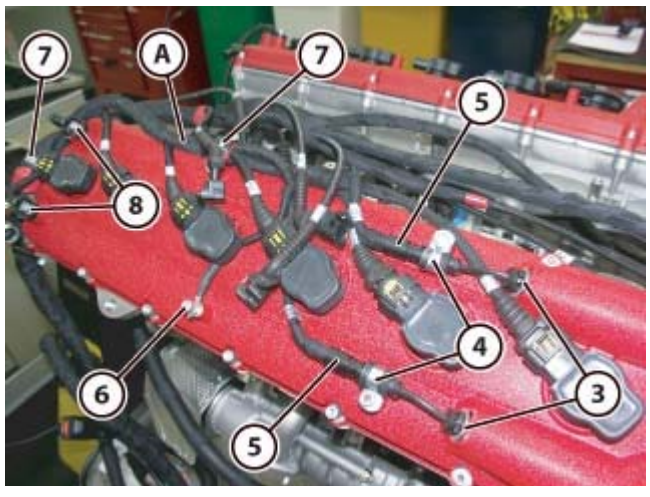
Removing the cylinder head covers

The following procedure may also be carried out with the engine in the vehicle.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the intake manifold (B6.02).

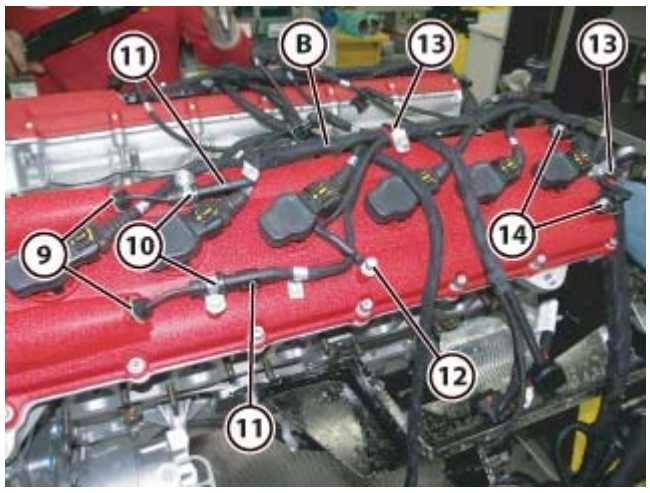


- Remove the two clamps **(1)** securing the vapour pipe **(2)** onto the cylinder head covers.



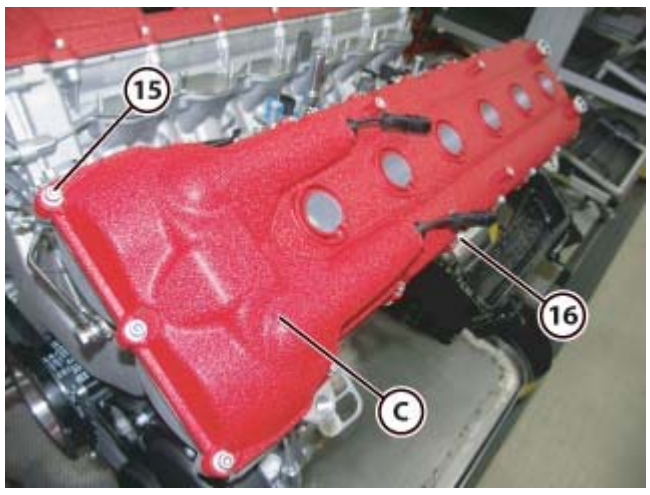
- Remove the two seeger rings **(3)** fastening the timing adjuster solenoid valve to the right hand cylinder bank head cover.
- Remove the clamps **(4)** and disconnect the connectors **(5)** (L318) (L321).
- Undo the screw **(6)** fastening the earth cable (G007).
- Remove the clamps **(7)** fastening the right hand cylinder bank injection cable **(A)** and the two timing sensors **(8)** from the right hand cylinder bank head cover.

- Remove the coils (C1.12).
- Remove the right hand cylinder bank injection cable from the right hand cylinder bank head cover.



- Remove the two seeger rings **(9)** fastening the timing adjuster solenoid valve to the left hand cylinder bank head cover.
- Remove the clamps **(10)** and disconnect the connectors **(11)** (L317) (L322).
- Undo the screw **(12)** fastening the earth cable (G315).
- Remove the clamps **(13)** fastening the left hand cylinder bank injection cable **(B)** and the two timing sensors **(14)** from the left hand cylinder bank head cover.

- Remove the coils (C1.12).
- Remove the left hand cylinder bank injection cable from the left hand cylinder bank head cover.



- Remove the left hand cylinder bank head cover **(C)**, undoing the thirteen screws **(15)** and the five stud bolts **(16)**.

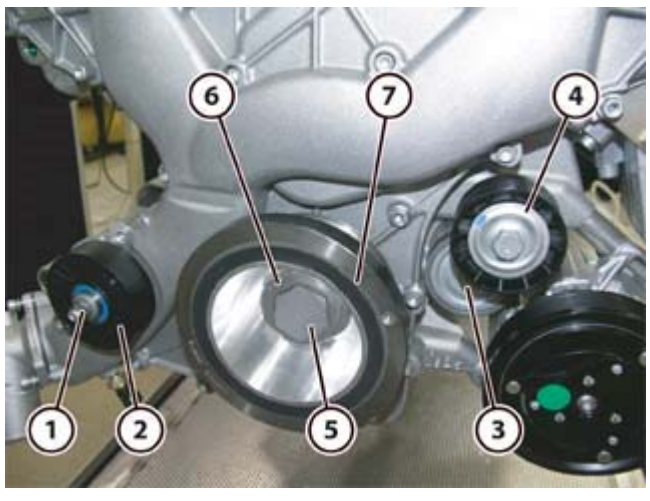
Repeat the same procedure to remove the right hand cylinder bank head cover.

Removing the front cover

- Remove the alternator drive belt (A3.12).
- Remove the hydraulic steering pump/compressor drive belt (A3.12).



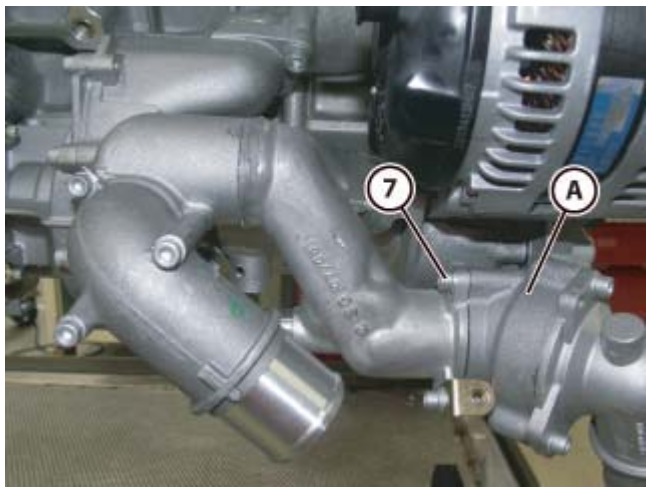
- Fit the tool **(AV 3122)** onto the flywheel side of the crankshaft to immobilise the shaft.



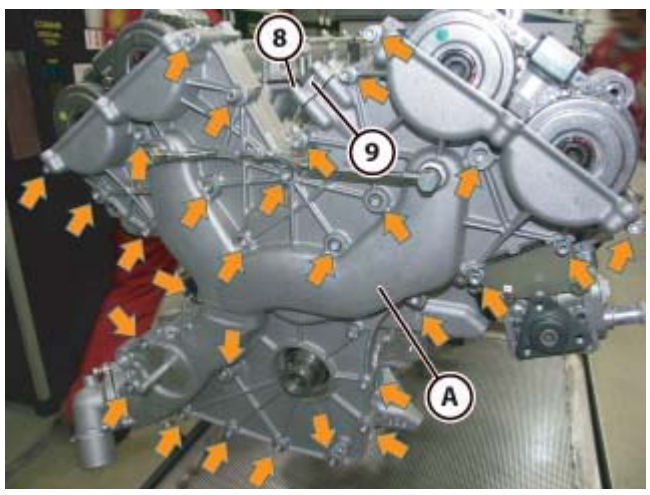
- Undo the nut **(1)** fastening the tensioner pulley **(2)** and the screw **(3)** fastening the compressor and hydraulic steering pump belt tensioner **(4)**.
- Undo the screw **(5)**, retrieving the washer **(6)**, and remove the torsion damper **(7)**.

- Remove tool **(AV 3122)**.
- Remove the power steering pump (E2.01).
- Remove the AC compressor (I2.01).
- Remove the alternator (L2.03).
- Replace the engine services cable (L2.14).

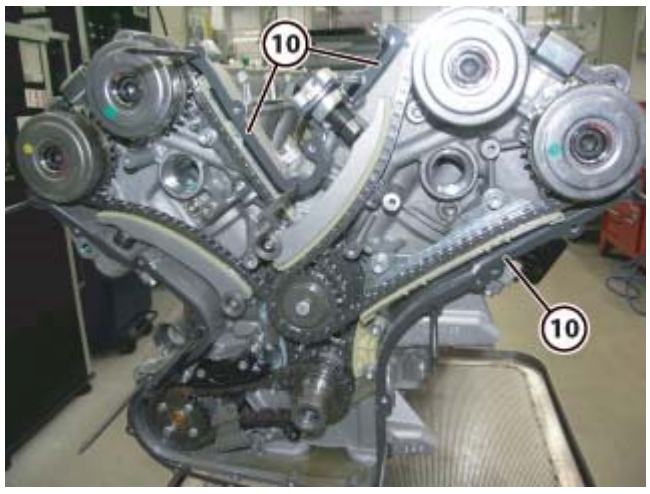
Remove.



- Undo the three screws **(7)** fastening the hose from the oil-water pump to the front cover **(A)**.

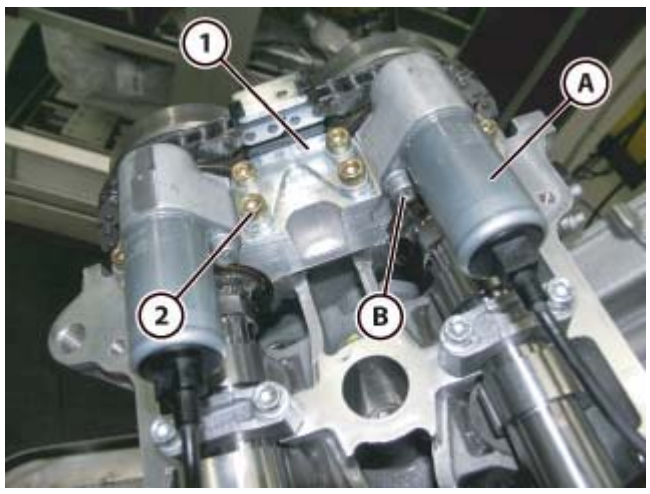


- Loosen the four screws **(8)** on the tensioner bushing **(9)** and remove the two outer screws fastening the component to the front cover **(A)**.
- Undo the fastener screws indicated in the figure and remove the front cover **(A)** from the engine.



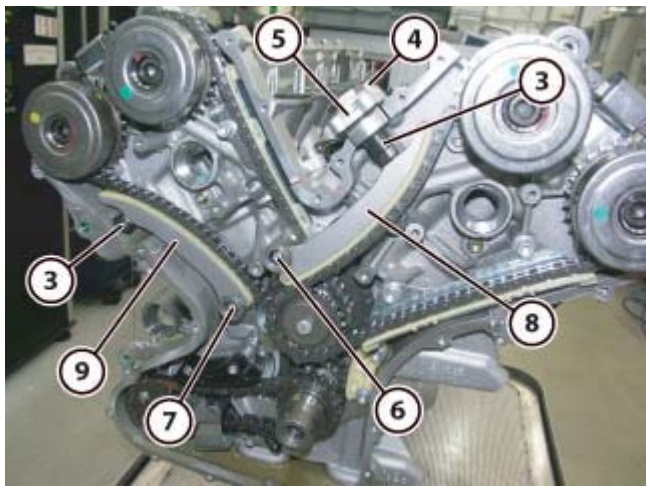
- Remove the three gasket sections **(10)** from the front cover.

Removing the timing chains



- Remove the upper fixed shoe **(1)** undoing the four screws **(2)** and remove the two timing adjuster solenoid valves **(A)** by undoing the two screws **(B)**.

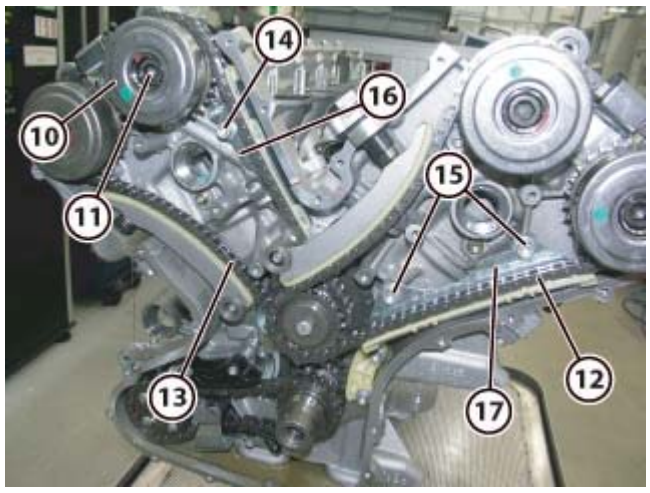
Repeat the procedure for the other cylinder bank.



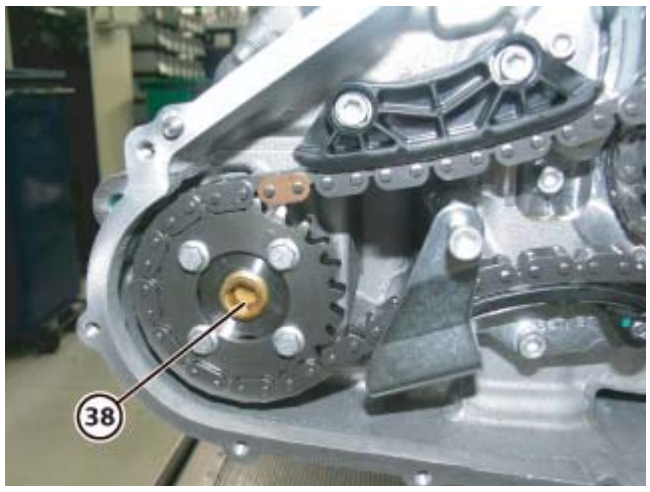
Hydraulic tensioners must be stored in a well aired place, away from moisture and dust. To prevent the risk of corrosion, only open the plastic wrapping just before use. Do not store for more than 6 months.
Do not install tensioners with signs of corrosion on the body or piston.
Once a tensioner has been installed, it may NOT be removed and reused.

- Undo the two tensioners **(3)** and undo the two screws **(4)** fastening the tensioner bushing **(5)**.
- Undo the two nuts **(6)** and **(7)** and remove the two mobile timing shoes **(8)** and **(9)**.

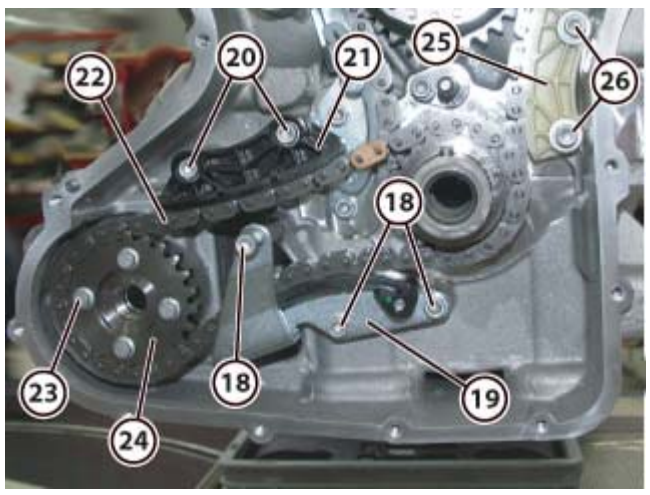
- Immobilise the camshafts.



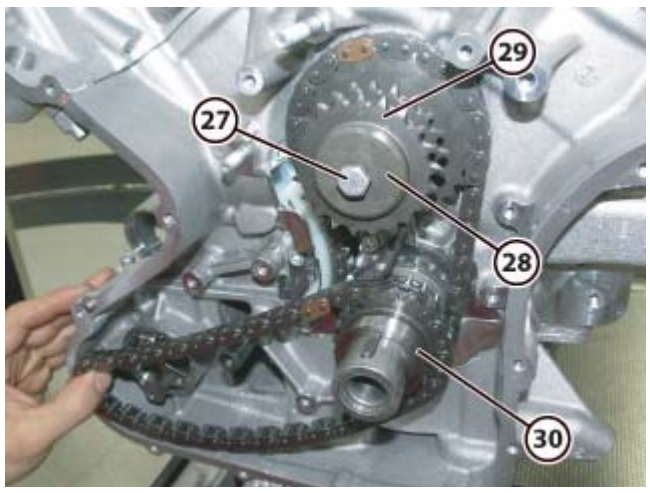
- Remove the timing adjusters **(10)** by undoing the screw **(11)** fastening the camshafts.
- Remove the two timing chains **(12)** and **(13)**.
- Undo the fastener screws **(14)** and **(15)** and remove the fixed timing shoes **(16)** and **(17)**.



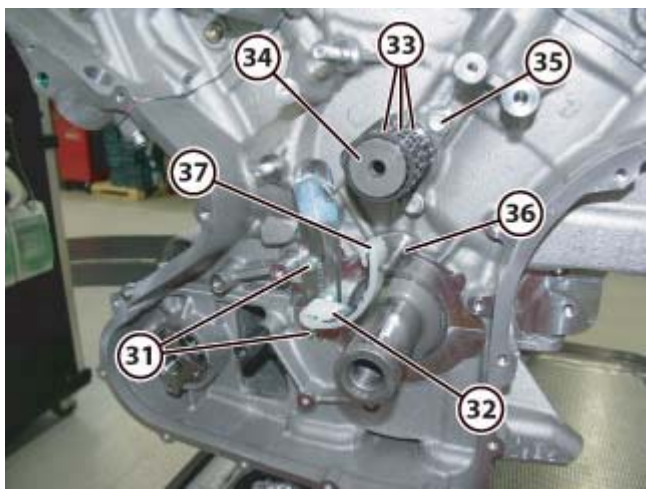
- Undo the cap **(38)** from the oil-water pump shaft.



- Remove the mounting **(19)** undoing the three screws **(18)**.
- Remove the fixed shoe **(21)** undoing the two screws **(20)**, then remove the oil-water pump drive chain **(22)**.
- Undo the screws **(23)** fastening the crown wheel **(24)** and remove from the oil-water pump shaft.
- Remove the shoe **(25)** undoing the two screws **(26)**.

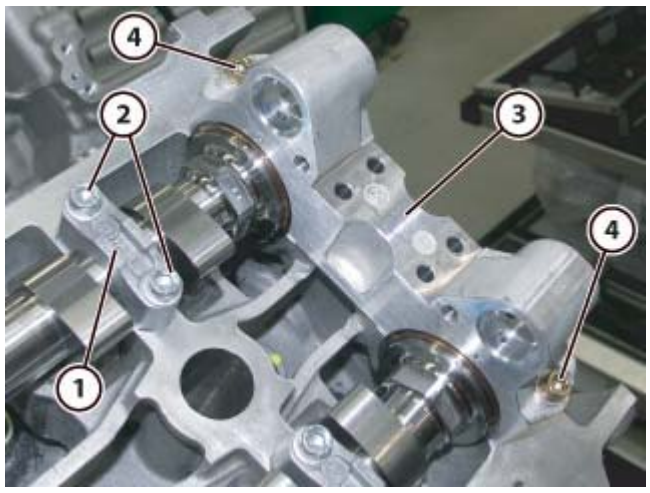


- Remove the screw **(27)**, retrieving the washer **(28)**, and remove the crown wheels **(29)** and **(30)**complete with chain.



- Undo the screw **(31)** and remove the sprung drive pinion journal shoe **(32)**.
- Remove the three roller bearings **(33)** and remove the pinion mounting **(34)** by undoing the three screws **(35)**.
- Remove the nozzle **(36)** by unscrewing the screw **(37)**.

Removing the camshafts



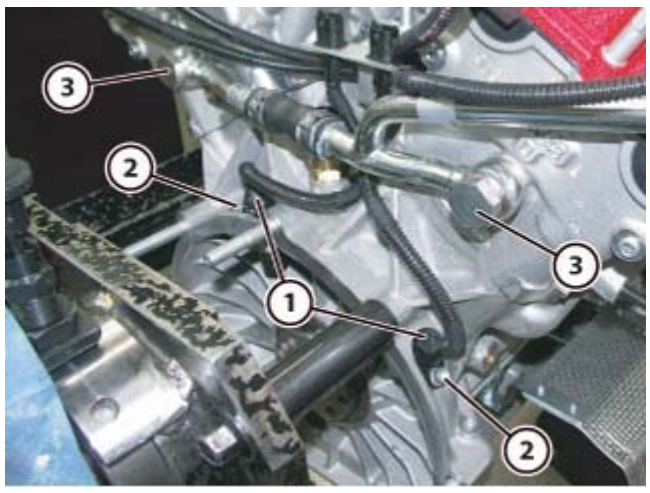
- Remove the caps **(1)** undoing screws **(2)**, and remove the front cap **(3)** undoing the two screws **(4)**.

Repeat the same procedure for all camshafts.

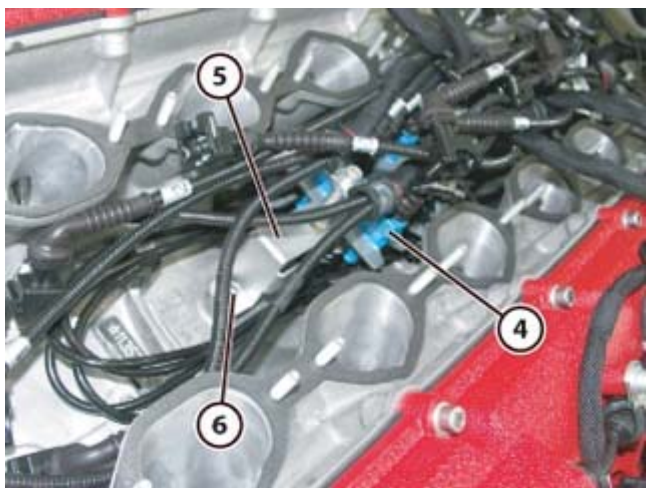
- Remove the camshafts from the cylinder heads.

Removing the cylinder heads

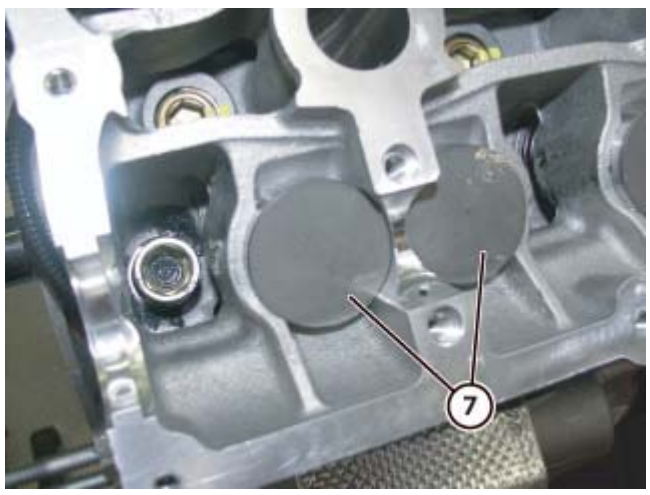
➢ Remove the spark plugs (A3.13).



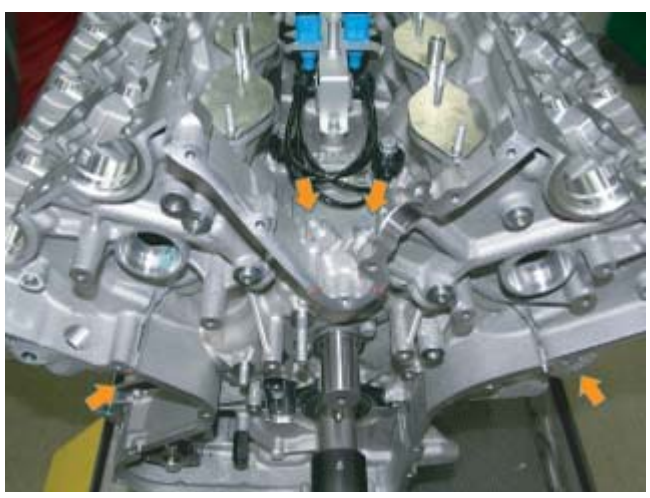
- Remove the two engine speed sensors **(1)** from the crankcase by undoing the screws **(2)**, and disconnect the two unions **(3)** fastening the water hoses to the heads.



- Disconnect the connectors **(4)** (S303) (S302) (S301) (S300) (S310) (S311) for the six knock sensors and remove the respective connections from the connector mounting bracket **(5)**.
- Undo the three screws **(6)** fastening the connector mounting bracket **(5)**.
- Remove the connector mounting bracket **(5)**, complete with right and left hand cylinder bank injector cables, from the engine.



- Remove all tappets **(7)** from both cylinder heads.



- Undo the four screws indicated in the figure fastening the cylinder heads to the crankcase on the timing side.



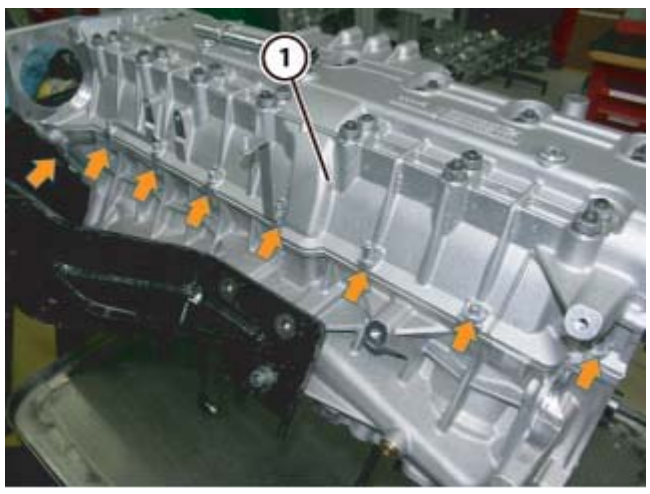
- Undo the 28 nuts **(8)** (fourteen per cylinder bank) and remove the cylinder heads **(9)** from the crankcase.



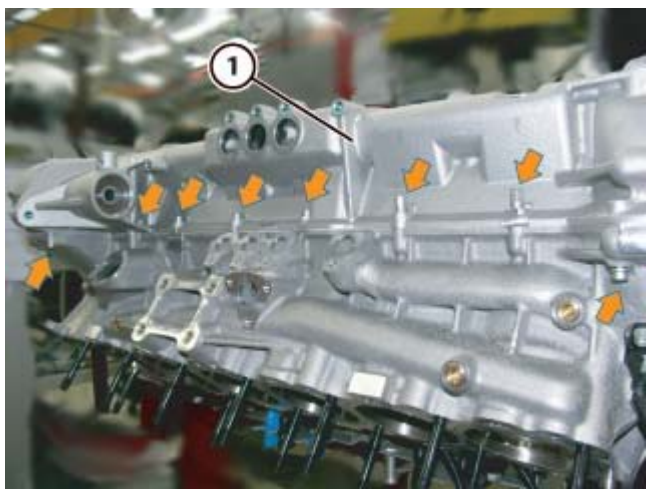
- Recover the two cylinder head gaskets **(10)** from the crankcase.

Removing the lower crankcase shell

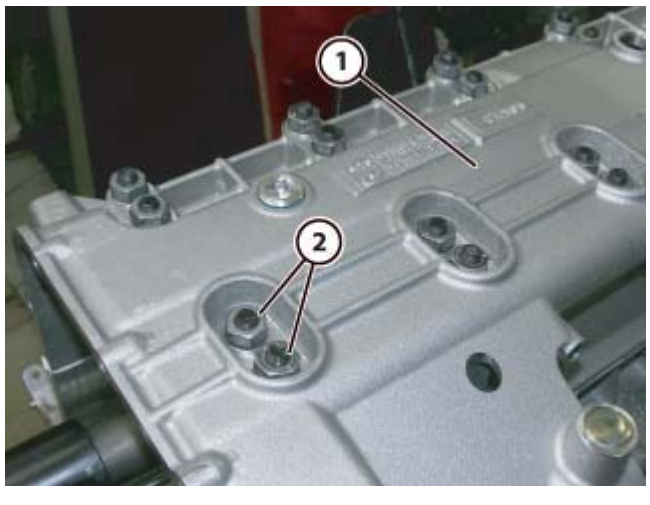
- Remove the engine oil-water pump (B3.02).
- Remove the starter motor (L2.04).



- Undo the eight screws on the left side outer seam indicated in the figure, fastening the lower crankcase shell **(1)** to the crankcase.

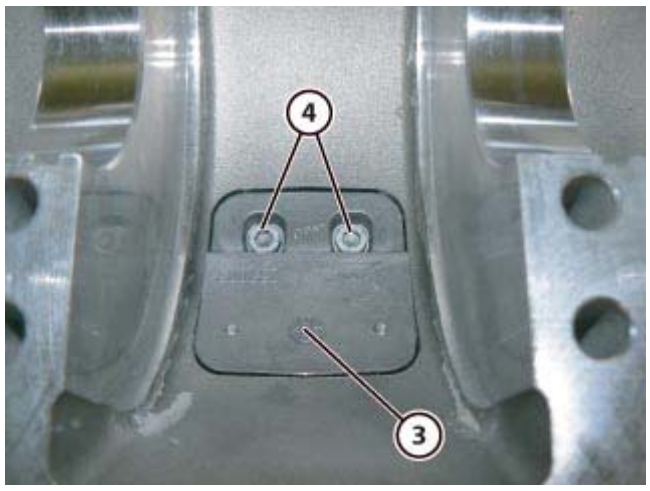


- Undo the eight screws on the right side outer seam indicated in the figure, fastening the lower crankcase shell **(1)** to the crankcase.



- Undo the 28 lower nuts **(2)** fastening the lower crankcase shell **(1)** to the crankcase.

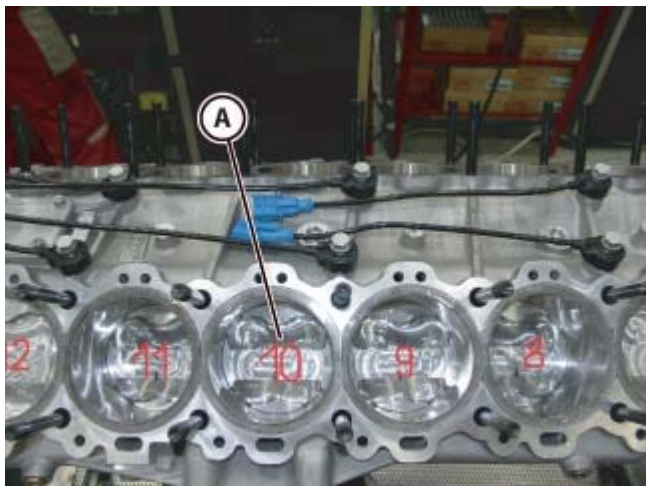
- Detach the lower crankcase shell from the crankcase, retrieving the Corteco seal ring from the flywheel side.



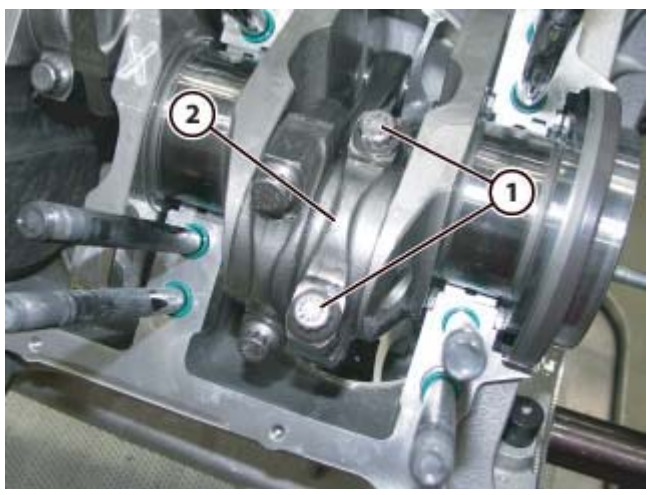
FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

- Remove the six complete valve holders **(3)** from the lower crankcase shell, undoing the twelve fastener screws **(4)**.

Removing the piston-connecting rod assembly

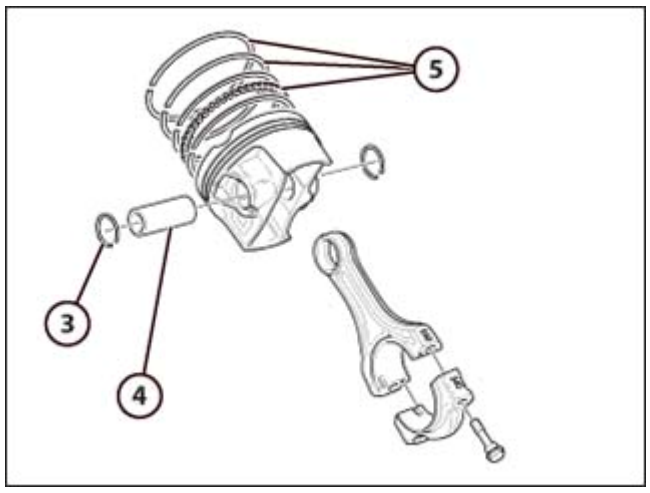


- To ensure that each piston is correctly reinstalled in its respective sleeve, mark each piston with a number **(A)**, starting from the timing side of the right hand cylinder bank and numbering clockwise.



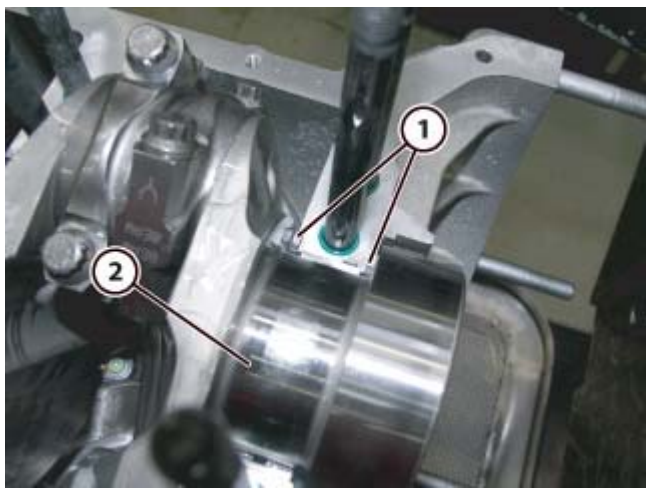
- Undo the connecting rod screws **(1)** and remove the connecting rod caps **(2)**.

- Using a rubber peg, push the connecting rod complete with piston towards the top of the sleeve. Take care not to damage the piston cooling oil jet. To facilitate access to the screws, rotate the crankshaft with the tool **(AM 105784)**.
- Extract the piston complete with connecting rod from the sleeve.
- Reassemble the connecting rod by mounting the cap to the rod with the respective fastener screws.



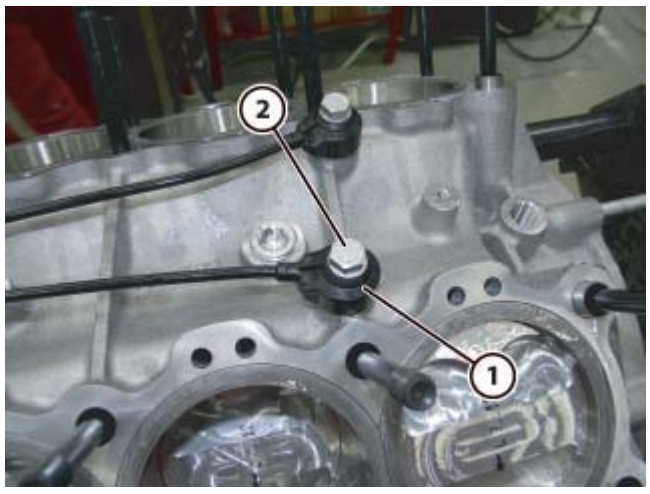
- To prevent mismatches during subsequent reassembly, mark each connecting rod with the number of its corresponding piston.
- Remove the circlip **(3)** and remove the piston pin **(4)** to disengage the small end of the connecting rod from the piston.
- Remove the piston rings **(5)** from the grooves in the piston.

Removing the crankshaft

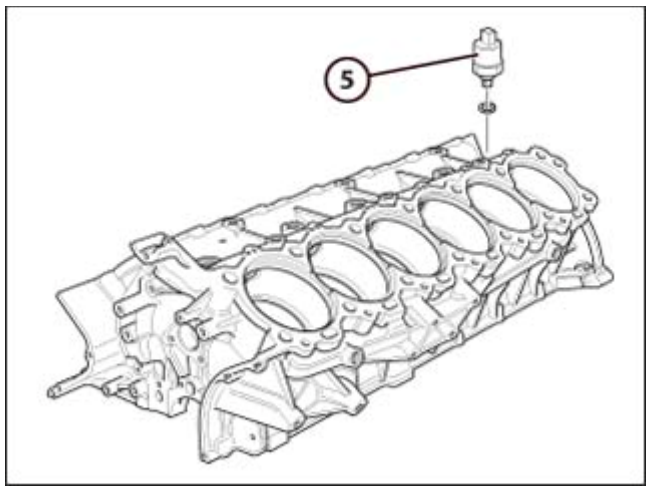


- After removing all the connecting rods, complete with pistons, from the engine, remove the crankshaft **(2)**, retaining the crankcase half bearings **(1)**.

Removing the crankcase



- Remove the six knock sensors **(1)** from the crankcase, undoing the respective fastener screws **(2)**.



- Unscrew the pressure transmitter **(5)** from the crankcase.

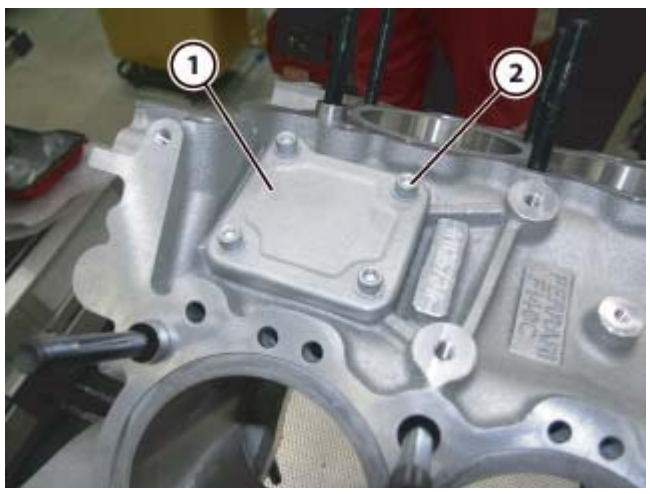
B2.04 Engine overhaul - Inspections

Cleaning and checking the crankcase

Tightening torque		**Nm**	**Class**
Cooling nozzles - crankcase Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw	3 Nm	B
16 mm diameter threaded cap - crankcase	Threaded cap	22 Nm	B
Fastening water circuit inspection cover on crankcase	Screw	10 Nm	B



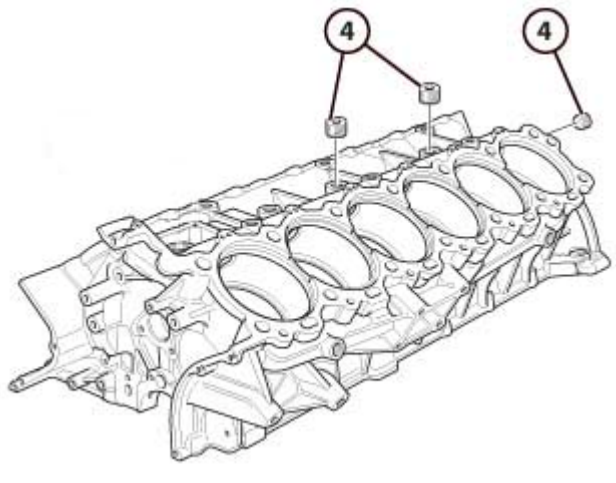
- Mount the crankcase onto tool **(AM 107232)**, anchored to the trolley **(AV 2621)**.



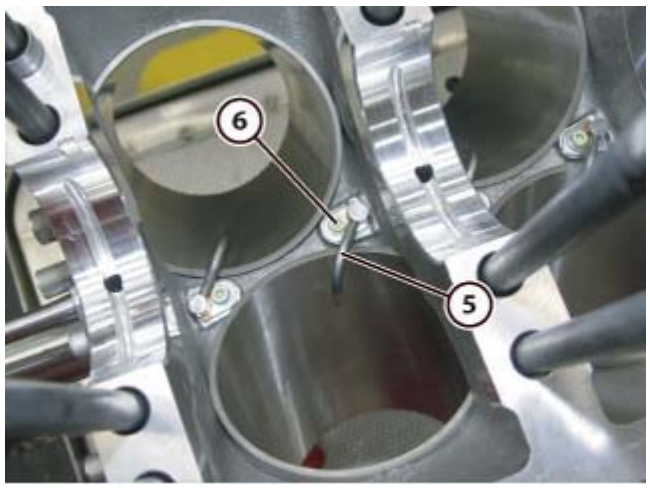
- Remove the inspection cover **(1)** by undoing the four screws **(2)** and recover the relative gasket.



- Undo the lubricant cap **(3)** under the inspection cover.

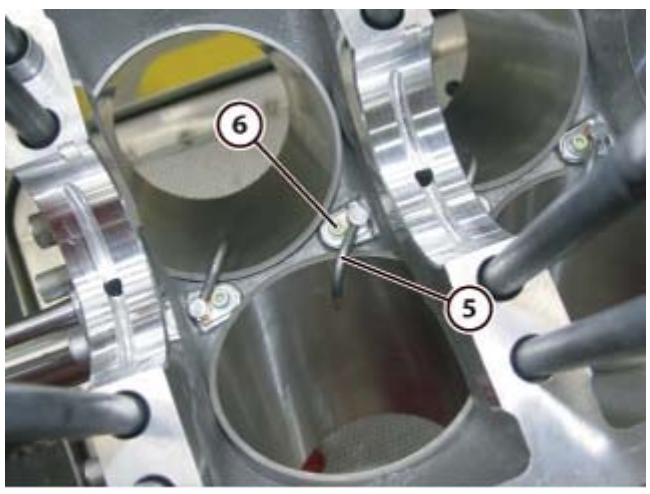


- Unscrew the three lubricant caps **(4)** from the crankcase.



- Remove the cooling nozzles **(5)** by undoing the securing screw **(6)**.

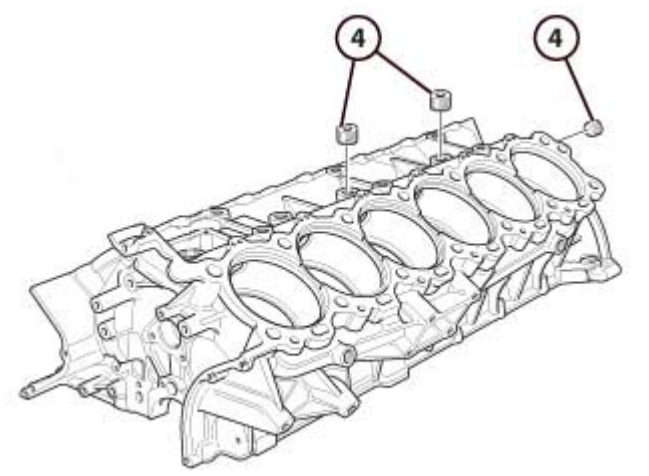
- Inject pressurised petroleum through all the lubricant ports.
- Dry the crankcase with compressed air.



- Fit the cooling nozzles **(5)** after replacing the relative O-rings and applying **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the threads of the screws.
- Tighten the cooling nozzle securing screws **(6)**.



Tightening torque	Nm	Class
Screw	3 Nm	B



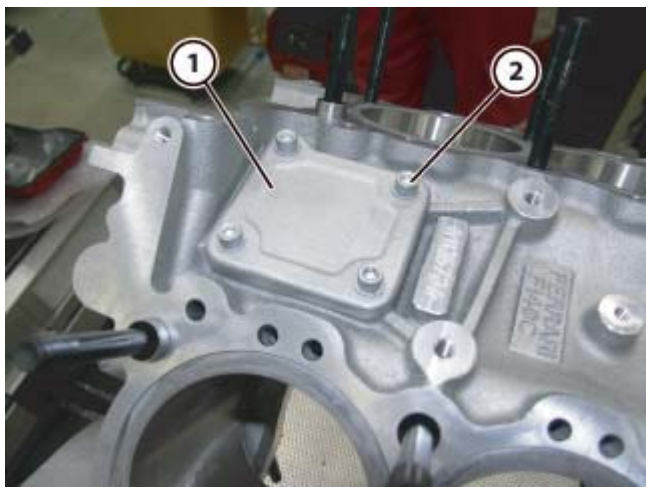
- Fit the three lubricant caps **(4)** on the crankcase.



- Fit and tighten the lubricant cap **(3)** under the inspection cover.



Tightening torque	Nm	Class
Threaded cap	22 Nm	B



- Fit the inspection cover **(1)**, replacing the respective seal, and fasten by tightening the four screws **(2)**.



Tightening torque	Nm	Class
Screw	10 Nm	B

- Remove the main half bearings from the crankcase and lower crankcase shell.
- Refit the cylinder heads (B2.05).

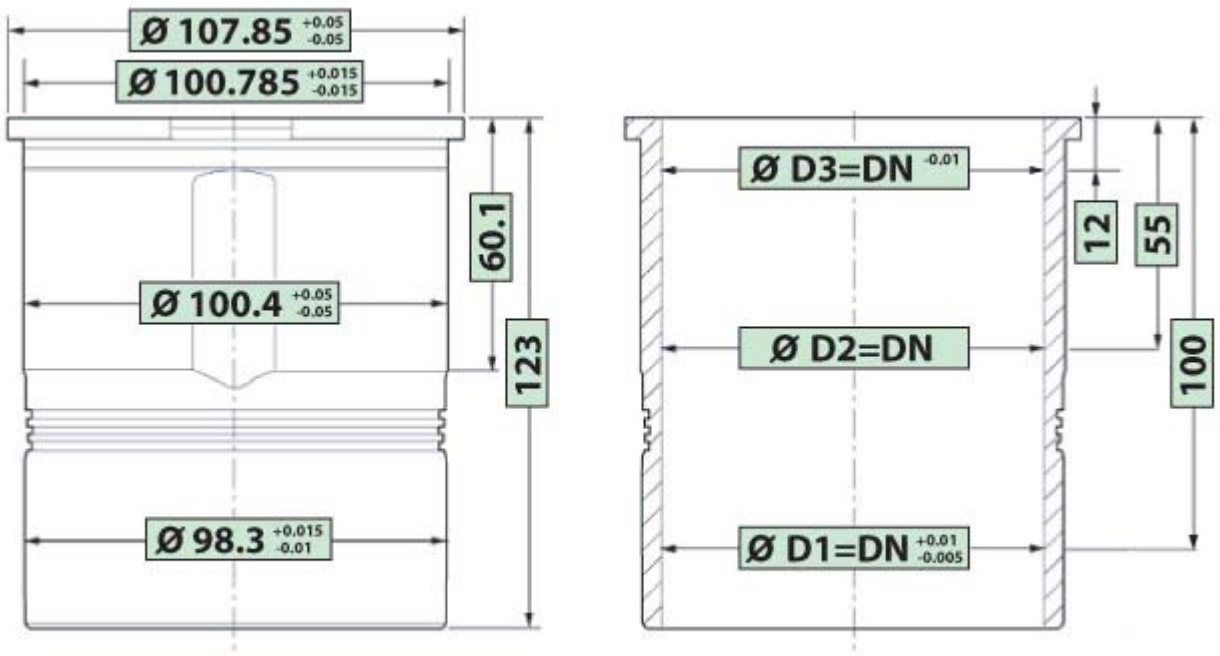
Mount the cylinder heads alone, using used gaskets and without applying sealant, tightening the fastener screws to the correct tightening torque.

- Refit the lower crankcase shell (B2.05).

Assemble without applying sealant, tightening the fastener screws to the correct tightening torque.

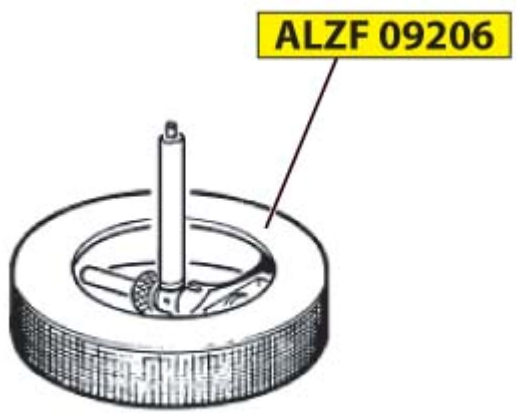
- Coat the boring bar **(AS 107233)** with Prussian blue and check the alignment of the main bearings.
- Check that the contact surface, as marked with Prussian blue, is evenly distributed over the entire seat of the half bearings.
- If some force is needed to turn the boring bar **(AS 107233)**, manually lap the seats of the half bearings with the tool **(AV 3429)**.
- Repeat the procedure with the crankcase turned by **180°**.

Main cylinder sleeve data



Maximum sleeve diameter wear	0.05 mm
Min. coaxiality	0.03 mm
Nominal diameter (DN)	92 mm±0.008
Max. ovalisation at D3	0.015 mm
Max. ovalisation at D2	0.015 mm
Max. ovalisation at D1	0.02 mm

Checking cylinder sleeves



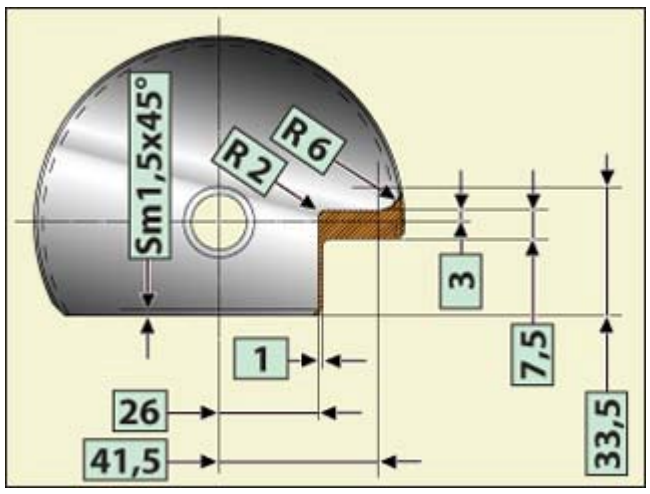
- Carefully check the dimensions of the cylinder sleeves with a dial gauge, zeroing the gauge with tool **(ALZF 09206)**.
- Take three crossed measurements for each diameter at the heights indicated in **" Main cylinder sleeve specifications"**.
- If any of the diameters measured has increased by more than the tolerance specified in **"Main cylinder sleeve specifications"**, replace the cylinder sleeve.

Handle the cylinder sleeves with extreme caution so as not to chip or scratch the mating surfaces.

- Visually inspect the internal cylinder sleeve surface: the surface must be smooth with no signs of scoring or seizing. Replace the cylinder sleeve if any signs of damage are noted.

Removing the cylinder sleeves

Handle the cylinder sleeves with extreme caution so as not to chip or scratch the mating surfaces.

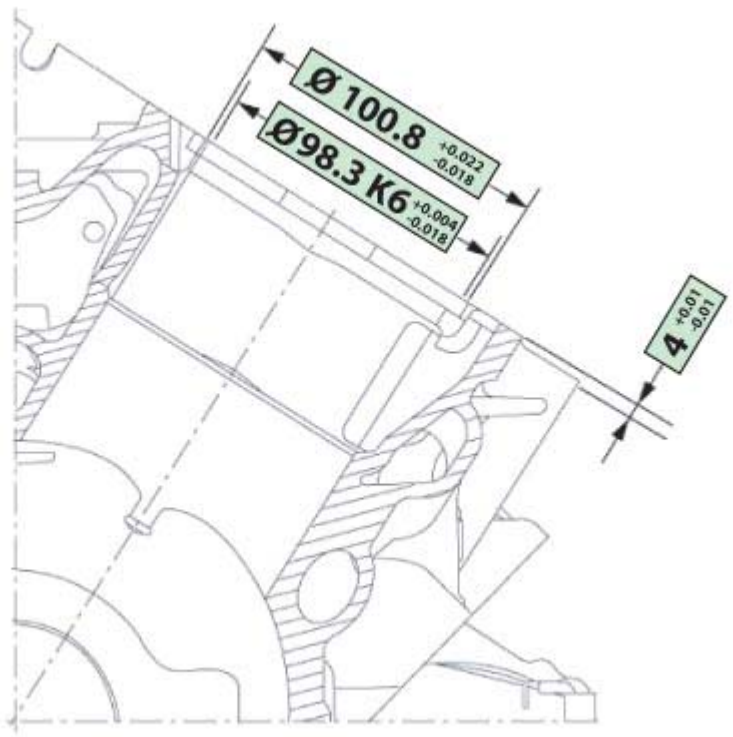


- Modify the washer on the cylinder sleeve extractor tool **(900026610)**, removing the part indicated with the dotted line in the figure, taking care not to damage the component.



- Tool **(900026610)** must be used to remove the cylinder sleeves.
- Fix the tool to the sleeve, then tighten the nut on the central pin to extract the sleeve completely.

Installing cylinder sleeves in crankcase



Carefully clean the contact surfaces on the crankcase with fine emery paper.
Check the dimensions of the sleeve (see **"Main data for cylinder sleeves"**) to be installed, and of the respective seat in the crankcase, using the values given above as reference.



Fit the sleeve upside down into the crankcase and, using a dial gauge with tracer pin **(CS 102916)**, measure the projection of the cylinder sleeve from the crankcase.
The above value must be between **0.01 and 0.05 mm**.
If not, replace either the seat installed in the crankcase or the sleeve so that the two components mate correctly.

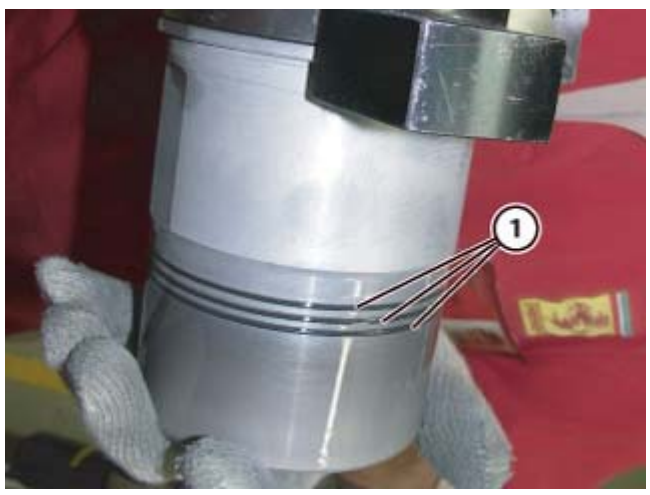
It is extremely important that all cylinder sleeves in a single cylinder bank protrude by exactly the same amount.

Refitting the cylinder sleeves

- After mating the cylinder sleeves with their respective seats, number them to prevent mismatches during the following procedures. Start numbering from the first cylinder sleeve in the right hand cylinder bank and continue up to **U**.
- Heat the cylinder block in the oven for **30 minutes** at **90°C ± 5°C**.



- Lubricate the seat with engine oil to facilitate insertion of the cylinder sleeves. Do not use sealant.

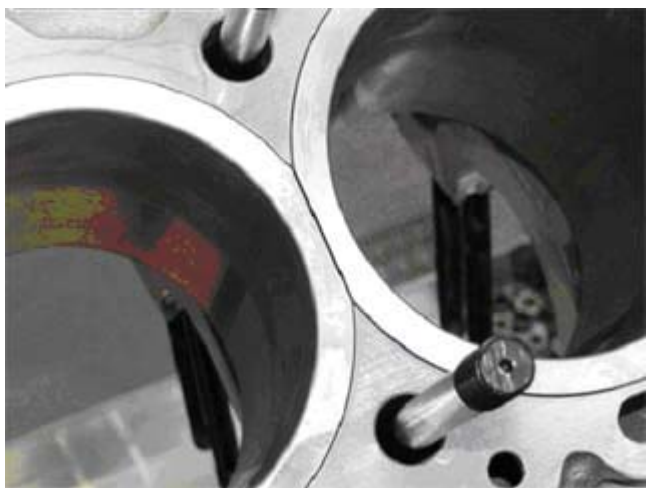


- Lubricate the three O-rings **(1)** with engine oil and fit onto the cylinder sleeve.

The cylinder sleeve insertion operation must be completed within 2 minutes of removing the crankcase from the oven.

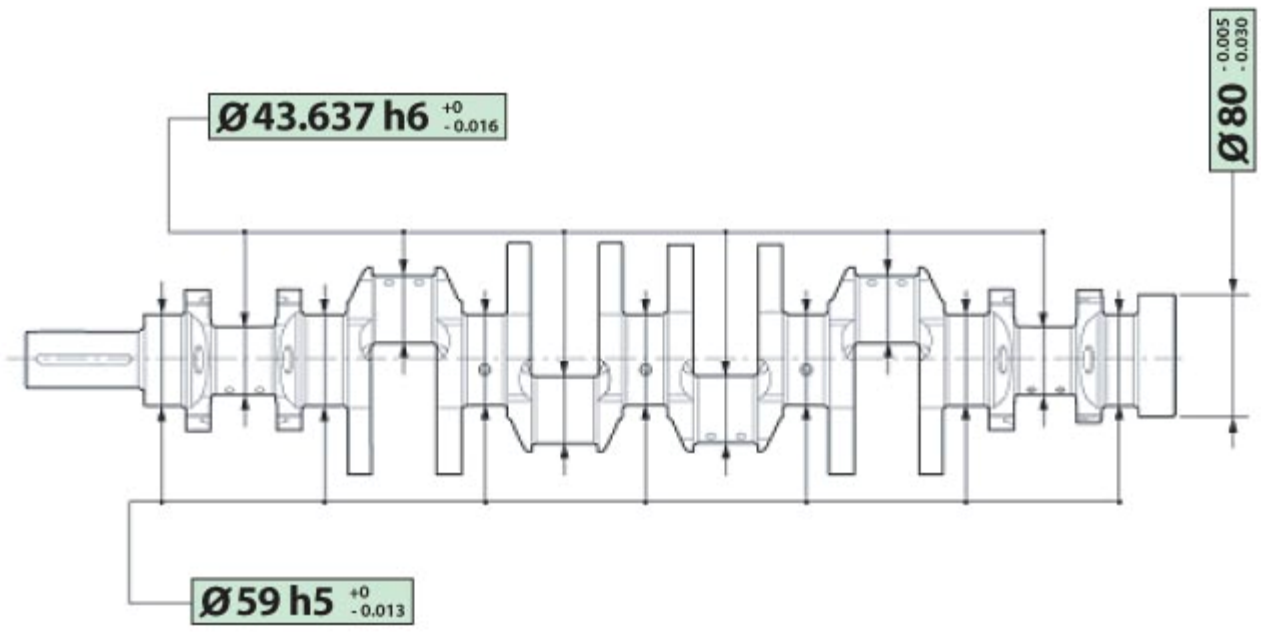
- Fit the cylinder sleeves, at room temperature, into their respective seats in the crankcase using tool **(AM 107231)**, and using tool **(AV 3984)** to ensure that the sleeves are positioned correctly.

Proceed with particular care when installing the first cylinder sleeve in each cylinder bank, as this may influence the assembly of the remaining sleeves.



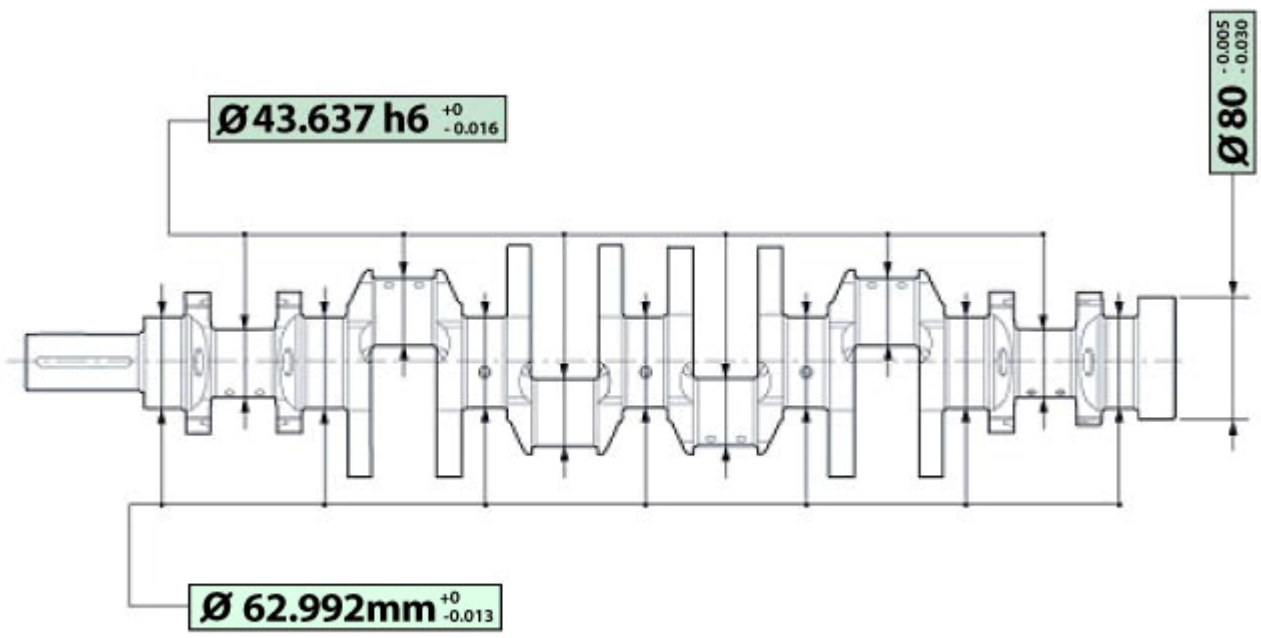
- To ensure correct assembly, check that the cylinder sleeves do not touch near the flattened area, as shown in the figure.

Main data for the crankshaft (UP TO Engine 179088)



Crankshaft endfloat with shims	0.08 ÷ 0.18 mm
Maximum main journal alignment tolerance	0.035 mm

Main data for the crankshaft (UP TO Engine 179089)



Crankshaft endfloat with shims	0.08 ÷ 0.18 mm
Maximum main journal alignment tolerance	0.035 mm

Cleaning and checking the crankshaft

- During overhaul, thoroughly clean the internal lubricant channels with pressurised petroleum.
- test the crankshaft penetrating liquids if in any doubt about its condition.
- Check the dimensions of the shaft, comparing the values measured with those given in **"Main crankshaft data"**.

- Fit the main half bearings on the crankcase and lower crankcase shell.
- Fit the lower crankcase shell on the crankcase.
- Tighten the nuts to the specified torque (see **"Refitting lower crankcase shell"**).
- Use a micrometer to measure the diameter of the main journals and reset the bore gauge at this value.
- Measure the diameter of the bushings with the two crossed relief markings and check that radial play and ovalisation are within the values given in (see **"Main crankshaft data"**).

- Normally, after the first reduction procedure, the surface hardness of the main journals and connecting rod pins is still above the minimum value requested; after a second reduction procedure, the shaft must be nitrided.
- Check after completion that ovalisation and tapering are within the limits specified.
- Place the crankshaft on the relative mountings **(AV 3135)** and check, with a dial gauge, that the deviation in alignment of the main journals does not exceed **0.035 mm**.

Main connecting rod and piston data

Vertical free play of 1st oval ring in piston recess	0.02 ÷ 0.06 mm
Vertical free play of 2nd conical ring in piston recess	0.02 ÷ 0.06 mm
Vertical free play of 3rd oil scraper ring in piston recess	0.04 ÷ 0.08 mm
Seal ring wear limit (measured with tool ALZF 09206)	0.8 ÷ 1 mm
Endfloat for paired connecting rods	0.2 ÷ 0.339 mm
Piston diameter (D1)	91.947 ÷ 91.963 mm
Piston diameter (D2)	91.917 ÷ 91.933 mm
Piston diameter (D3)	91.467 ÷ 91.483 mm
Radial free play between gudgeon pin and small end	0.015 ÷ 0.03 mm
Wear limit between contact surfaces of gudgeon pin and small end	0.05 mm
Interference between gudgeon pin bushing and relative seat in connecting rod	0.04 ÷ 0.09 mm
Radial free play between big end bearings and crankshaft	0.015 ÷ 0.048 mm
Wear limit between contact surfaces of big end bearings and crankshaft	0.12 mm

Cleaning and inspecting the piston

- During each overhaul, clean the pistons thoroughly: remove all encrustation from the crown and the piston ring seats.

Do not use scrapers or sharp objects as these may damage the mating surfaces.
Never grip the piston in a vice.

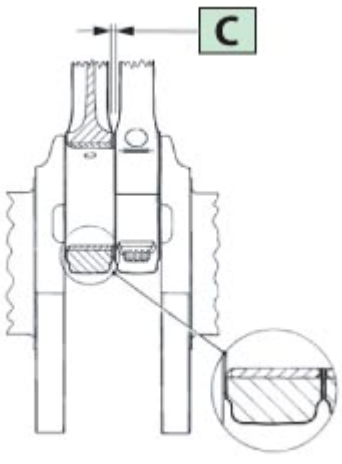
- Clean the lubricant orifices.
- Check the dimensions of the piston (see **"Main connecting rod and piston data"**) and the relative cylinder sleeve (see **"Main cylinder sleeve data"**).

If in any doubt about the state of a piston, replace.

- Visually inspect the skirt thoroughly and check for wear (see **"Main connecting rod and piston data"**).

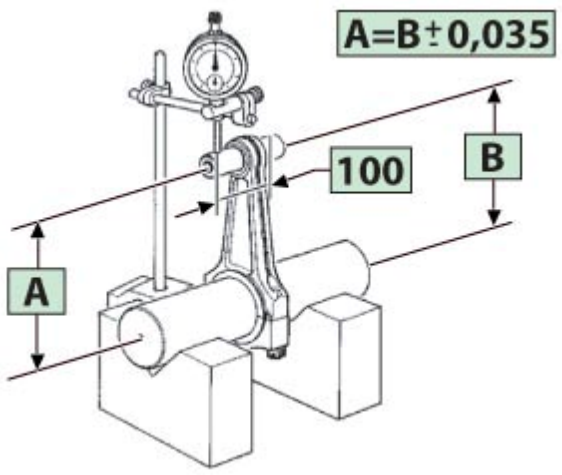
Checking the connecting rod

At each engine overhaul, check the small end bushing for wear.



- Measure total endfloat **(C)** for paired connecting rods.

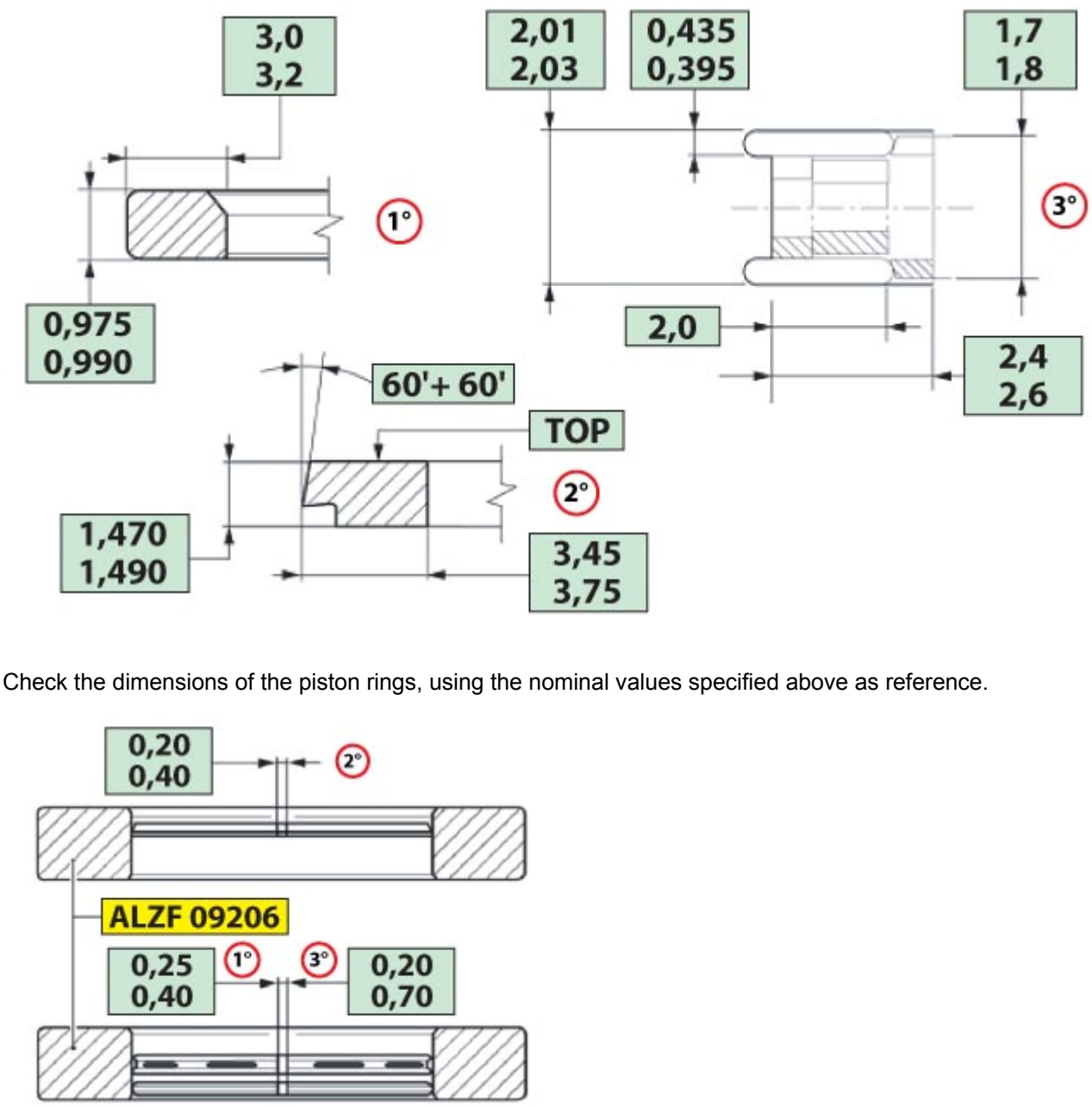
- If the values measured exceed limits for wear, replace the bushing.
- Use the punch to fit the new bushing, ensuring that the lubricant orifices on the bushing and on the small end are aligned correctly.



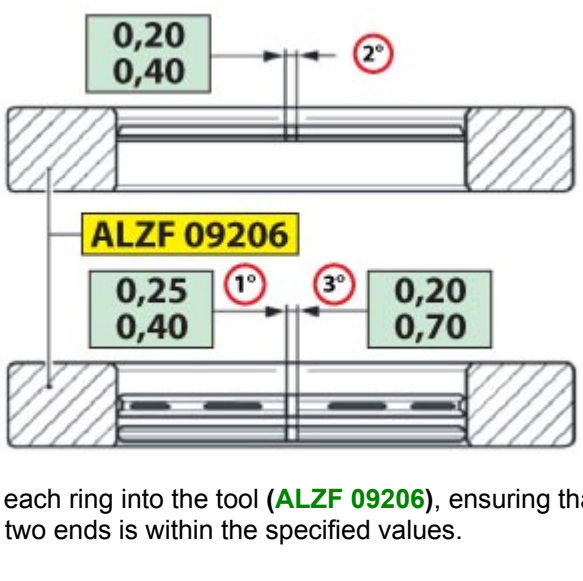
- Check parallel alignment between the axes of the small and big ends of the connecting rod, using the pins shown in the figure.
- If in doubt about the state of the connecting rods, check with a penetrating liquid.

Checking the piston rings

Inspect the piston rings carefully after removing from the piston and removing any encrustations: replace if any scoring, cracks or abnormalities are found.



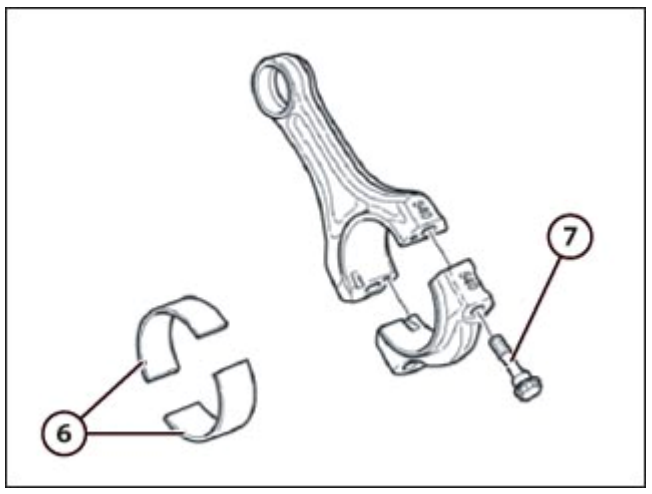
Check the dimensions of the piston rings, using the nominal values specified above as reference.



Fit each ring into the tool **(ALZF 09206)**, ensuring that they are perfectly perpendicular with the centreline of the tool, and check that the size of the gap between the two ends is within the specified values.

Checking connecting rod pins and bearings

- During overhaul, carefully check the connecting rod bearings: replace if any scoring or signs of abnormal wear are noted.



- If the connecting rod bearings **(6)** are in good condition, refit in their respective seats in the piston crown and the connecting rod cap, and tighten the screws **(7)** to the torque specified (see **"Refitting the piston-connecting rod assembly"**).
- Measure the internal diameter of the bearings **(6)** and the diameter of the crankshaft pins with a bore gauge.

- If the crankshaft pin diameters measured are within the tolerance range and the bearing wear is within the maximum limit, no replacement is necessary.

As the connecting rod bearings are very thin shelled components, they must not be ground or machined, as this may remove the layer of anti-friction material.

- If excessive wear is noted, replace the bearings with larger components (see following table) and reduce the dimensions of the crankshaft pins to the specified values.

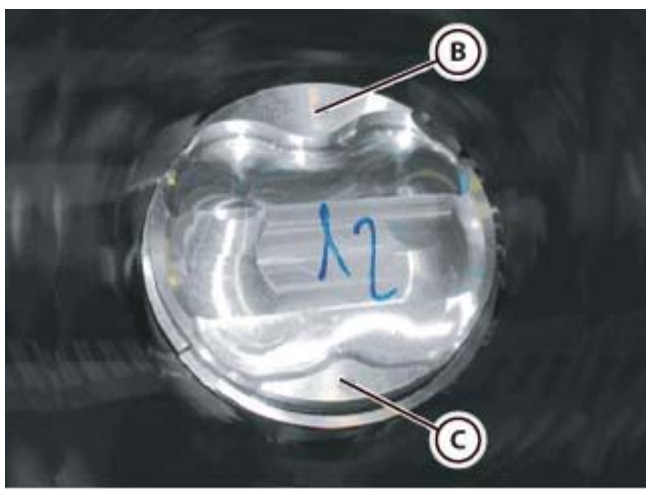
Main journal half-bearing selection table (UP TO Engine No. 175088)

	CLASS X connecting rod (47.129 to 47.135)	**CLASS Y connecting rod (47.136 to 47.142)**
CLASS X crankshaft (43.630 to 43.637)	RED	BLUE
CLASS Y crankshaft (43.621 to 43.629)	BLUE	BLACK

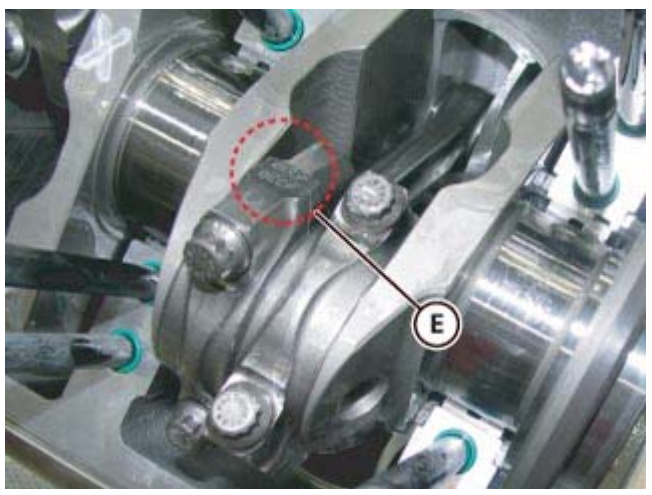
Main journal half-bearing selection table Lead Free / NOT Lead Free (FROM Engine No. 175089)

	CLASS X connecting rod (47.129 to 47.135)	**CLASS Y connecting rod (47.136 to 47.142)**
CLASS X crankshaft (43.630 to 43.637)	RED	BLUE
CLASS Y crankshaft (43.621 to 43.629)	BLUE	BLACK

Assembling the piston with connecting rod



- The intake and exhaust sides are identified by two different machined markings in the crown of the piston. When refitting, note that the exhaust side **(C)** must face towards the exterior of the crankcase and the intake side **(B)** must face towards the interior of the crankcase.

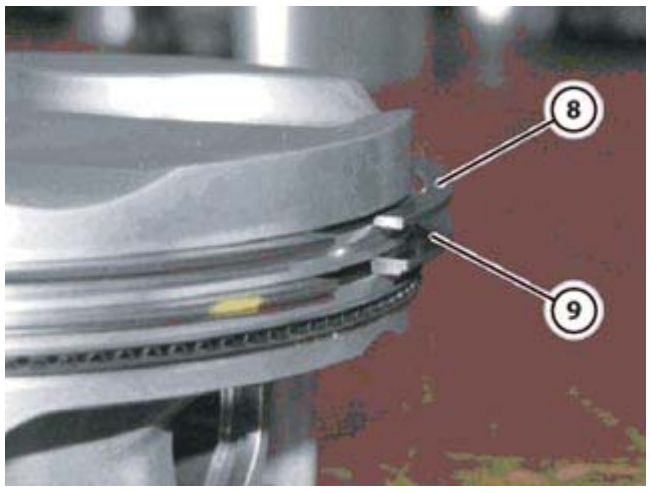


- When mating the piston to the connecting rod, ensure that the markings **(E)** on the rod and cap always face the exhaust side.

- Ensure that the gudgeon pin retainer snap ring is correctly installed on one side of the piston.
- Lubricate the gudgeon pin and the bushing on the small end with engine oil, then install, pushing the gudgeon pin completely against the snap ring.

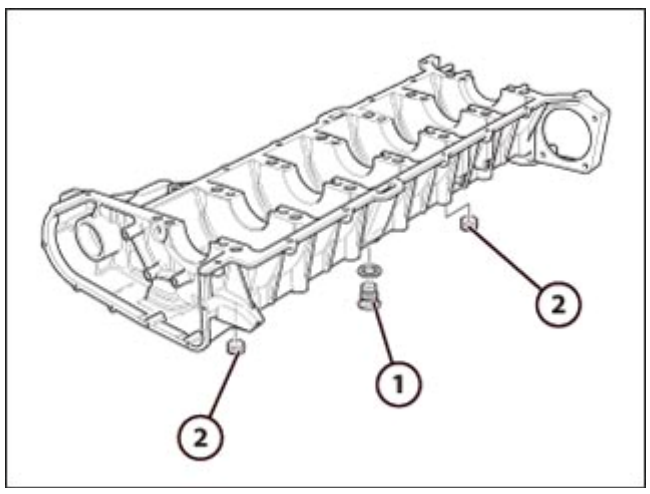
To prevent engine damage, after installing each component, ensure that the two snap rings securing the gudgeon pin are seated correctly in their respective recesses on the piston.

- Use tool **(AV 3002)** to fit the retainer ring in the recess on the piston.

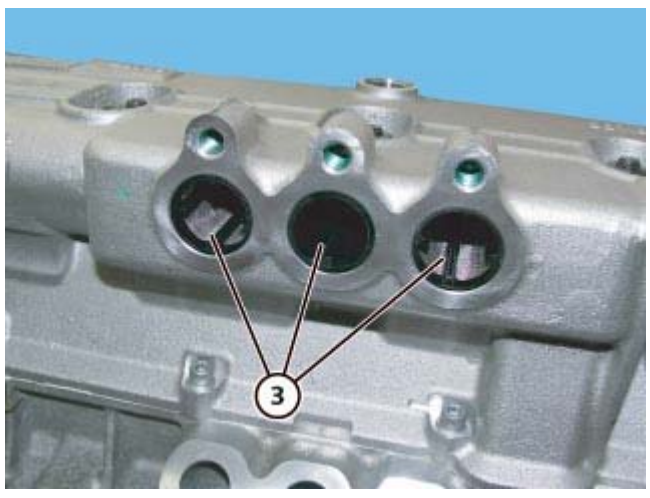


- Use a commercially available specific tool to install the piston rings on the piston.
- Check that the rings are mounted correctly: the countersunk surface of the upper ring **(8)** should face upwards, while the countersunk surface of the lower ring **(9)** should face downwards.

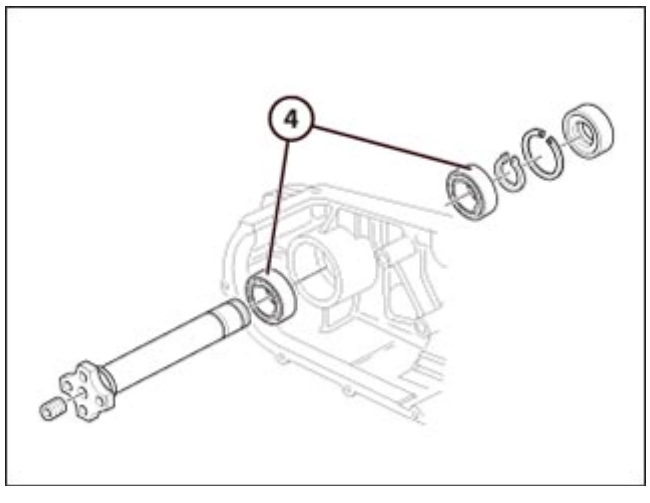
Preparing the lower crankcase shell



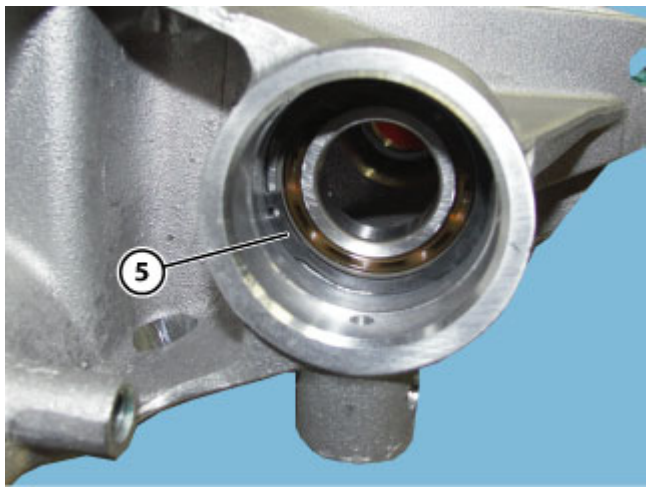
- Fit the threaded oil drainage cap **(1)** and the two caps **(2)** on the lower crankcase shell.



- Fit the three new filters **(3)** on the oil-water pump using a rubber mallet.



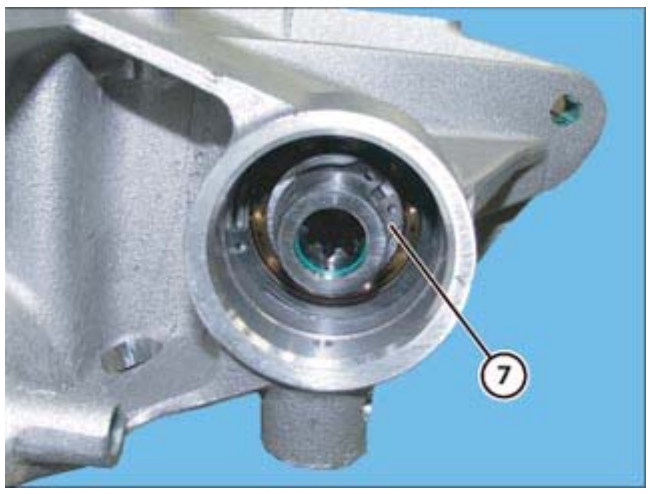
- Working from both sides, lubricate the seats of the oil-water pump bearings with **SEGO** grease.
- Fully insert the bearings **(4)** from both side of the cover with the punch **(AV 2885)**.



- Working from the oil-water pump side, fit the seeger ring **(5)** in its respective seat.

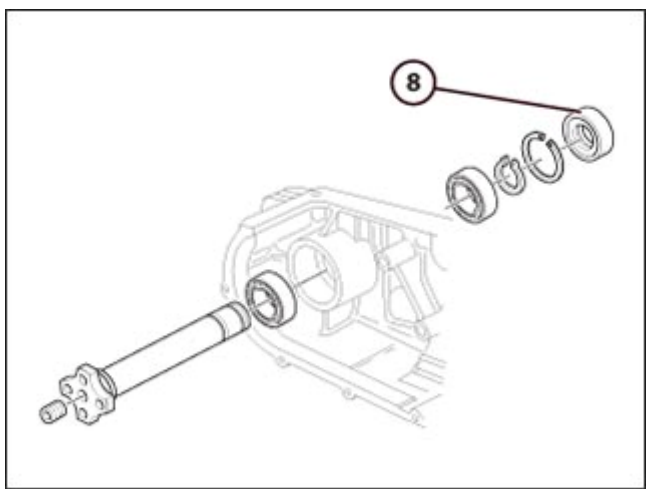


- Working from the timing side, use a plastic mallet to fit the oil-water pump drive spindle **(6)**.



Take particular care when installing the seeger ring not to scratch the drive spindle. Take all due precautions.

- Working from the oil-water pump side, fit the relative seeger ring **(7)** on the drive spindle.



- Working from the oil-water pump side, use the punch **(900027050)** fit a new corteco ring **(8)**.

Replace the corteco ring each time the oil-water pump is removed.

Main cylinder head data

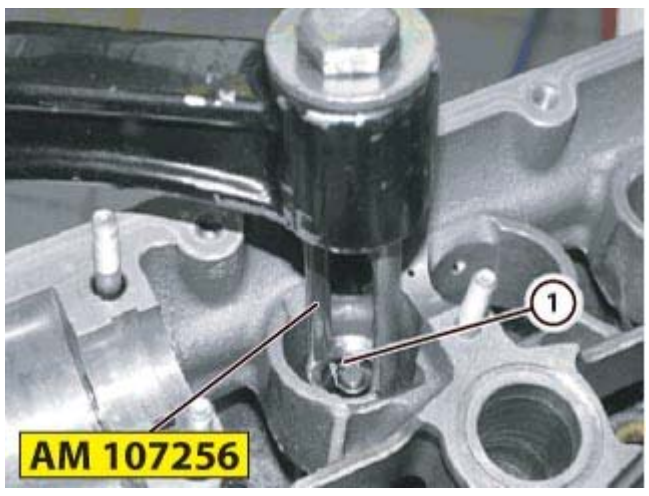
Interference between valve guide and orifice in head	0.032 ÷ 0.068 mm
Interference between valve seat and orifice in head (intake)	0.08 ÷ 0.12 mm
Interference between valve seat and orifice in head (exhaust)	0.08 ÷ 0.12 mm
Free play between valve stem and respective guide (intake)	0.03 ÷ 0.059 mm
Free play between valve stem and respective guide	0.035 ÷ 0.064 mm

(exhaust)	
Wear limit between contact surfaces of valve stem and respective guide	0.08 mm
Free play between tappet cup and respective seat	0.025 ÷ 0.057 mm
Wear limit between contact surfaces of tappet cup and respective seat	0.1 mm

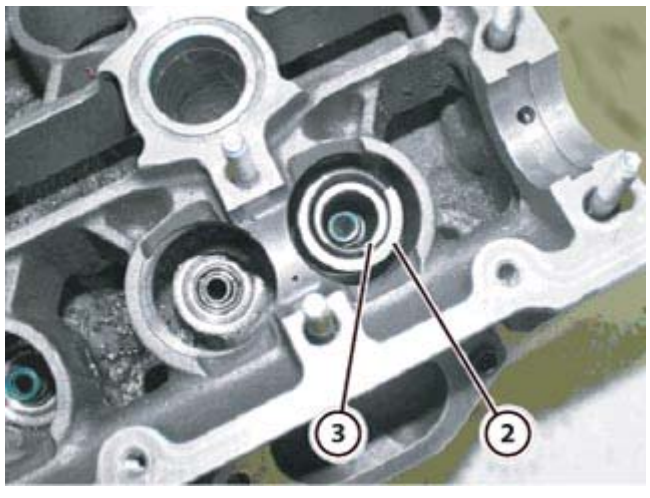
Inspecting and cleaning the cylinder heads

- After removing the hydraulic tappets and before removing the valves, check the seats for wear with tool **(AV 3980)**.
- To check for wear, place the tool on the seat of the camshaft and zero the dial gauge with the probe in contact with the camshaft seat.
- Then centre the probe rod at the centre of the top surface of the valve stem.

- If the valve seats need to replaced, proceed as follows:



- Remove the valves with a specific, commercially available pneumatic valve remover tool, used in conjunction with tool **(AM 107256)**.
- Remove the half-cones **(1)** and retrieve the upper cap.



- Remove the outer **(2)** and inner **(3)** valve return springs.

- Clean the heads thoroughly, removing all encrustation from the combustion chambers and from the oil and water channels. For best results, inject pressurised petroleum into the oil channels and inject a commercially available descaling liquid into the water channels.
- Check the state of the spark plug seats.
- Check that the mating surfaces with the cylinder block are perfectly flat with a surface plate.

Inspecting valve seats and guides

- Should inspection reveal that the valve seats need to be replaced, they must be machined out to prevent damage to the head.
- Check the dimensions of the orifices and seats to ensure that the required mechanical interference is achieved upon installation (see **"Main cylinder head data"**).
- To install the new seats, heat the head in an oven to **190°C for 6 minut**es and cool the seats in liquid nitrogen for approximately **5 minut**es.

The above operation may only be performed by a specialist workshop.

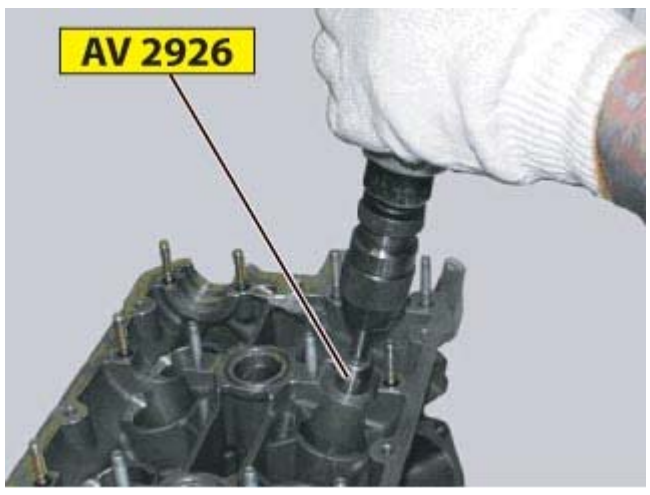
- Fit the seat in the head with the appropriate punch, taking care not to knock out previously installed seats with the recoil. Check all seats to ensure that they are all correctly installed.

- Check the wear of the valve guides with a plug gauge.

- If excessive free play is noted between the plug gauge and the bores of the valve guides, replace with new guides to achieve the specified mechanical interference upon installation (see **"Main cylinder head data"**).
- Extract the valve guides as follows.



- Use tool **(AV 2734)** to remove the seal rings **(4)** from the valve guides..



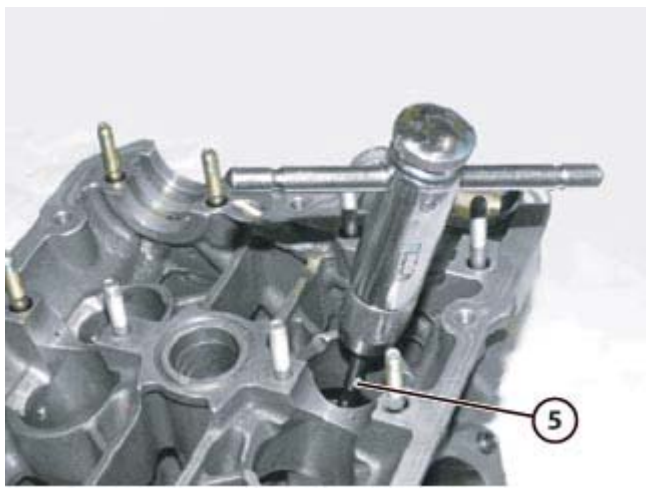
- Using the **Ø 10 mm** reamer with a **Ø 6 mm** pilot bit supplied with tool **(AV 2926)**, ream the seal ring side of the valve guide over approximately **25 mm** of the edge, lubricating the reamer to prevent breakage and holding the tool in perfect alignment with the valve guide.

- Heat the head in an oven to approximately **100°C** for approximately **30 minut**es to facilitate removal; then place on two rubber spacers.



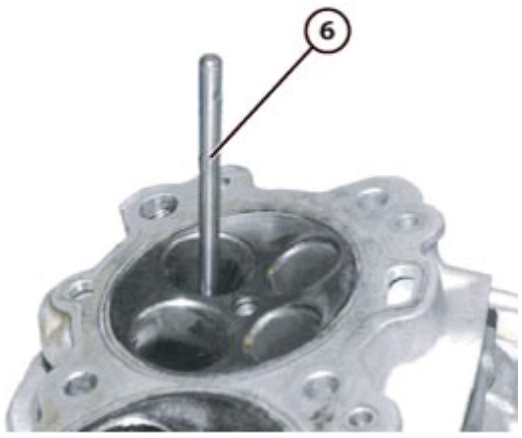
- Extract the valve guide using the punch supplied with tool **(AV 2926)**.

- To install new guides, heat the head to approximately **100°C** for approximately **1 hour and cool the guides in liquid nitrogen**.
- To install the new guide, use the appropriate punch with the respective centring stem and the spacer **(AV 3537)**.



- After installing, dry ream the guides with a reamer **(5)** with a diameter of **Ø 6 H7 mm**, mounted on the relative hand chuck. Check that the reamer teeth are well sharpened before starting.

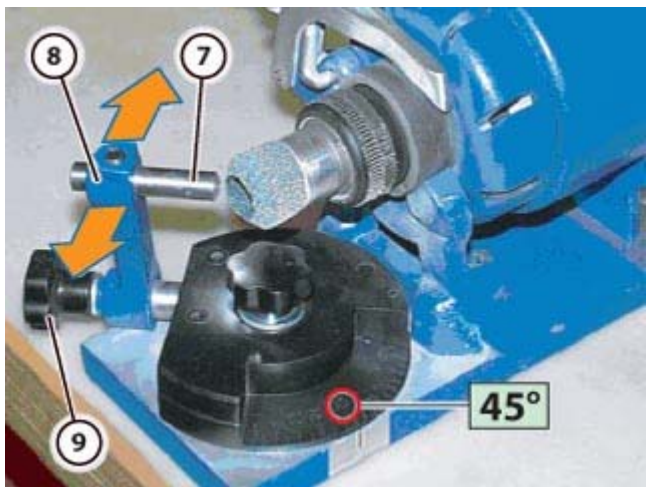
- Then check that the guide has been reamed correctly with the **"P"** side of the plug gauge.
- After replacing the valve guides, the valve seats must be lapped to the seat angle specified, to ensure perfect mating between the valve face and the valve seat surfaces. Use the recommended valve seat lapper with relative accessories.



- To allow access to both sides of the head, place the head on the mountings, cover side down.
- Fit the centring stem **(6)** with a diameter of **6 mm** in the valve guide, from the side with the retainer screw.
- Secure the centring stem **(6)** in the guide by tightening the retainer screw.

- Fit the correct lapping head for the valve guide on the lapping tool: use a **37 mm** diameter lapping head for intake valves and a **33 mm** diameter head for exhaust valves.

The outer diameter of the lapping head must be slightly larger than the valve diameter.



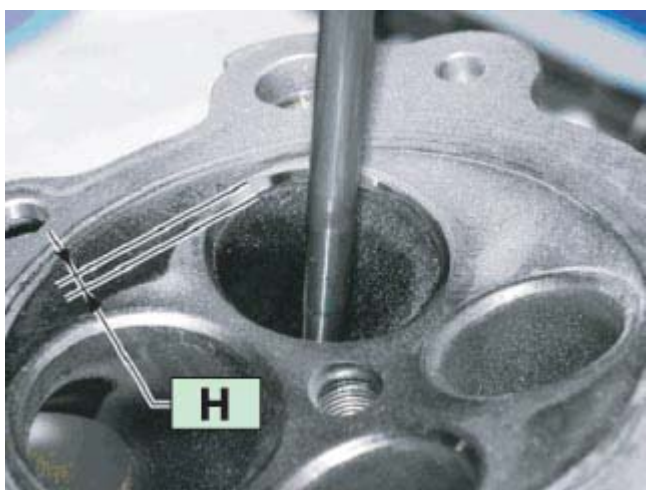
- Set the angle of the diamond tip **(7)** to **45°** relative to the fixed index of the base.

To prevent abrasive from entering the central hole of the camshaft, seal the hole first, then clean with compressed air once complete.

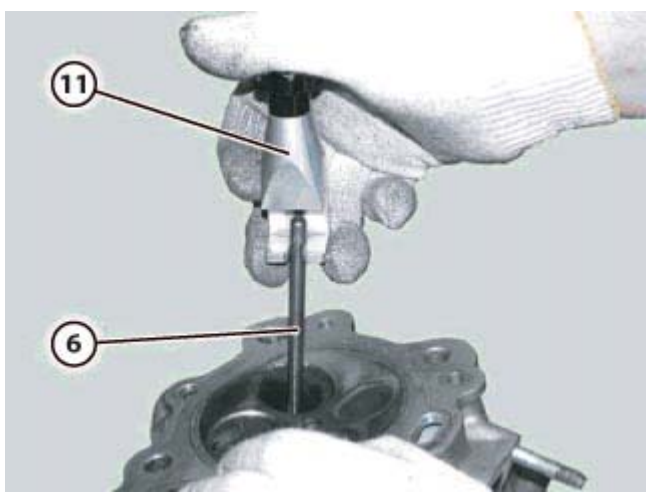
- Sharpen the lapper by wiggling the diamond tip mounting rod **(8)** while simultaneously turning the advancer knob **(9)**.



- Grease the centring stem positioned previously on the head, and insert the lapper.
- Bring the lapper just into contact with the valve seat and tighten the screw securing the cutting depth adjuster knob **(10)**.



- Tighten the lapping tool and lap the valve seat, increasing the lapping depth gradually by turning the knob described above.
- Lap the entire surface **(H)** of the valve seat, allowing the machine to run freely for a few seconds.
- Check the lapping depth and alignment relative to the seat, correcting the lapping machine position if necessary.



- Once complete, lift the lapper head by turning the knob, then remove from the centring stem.
- Release the centring stem **(6)** by undoing the lower retainer screw.
- Using tool **(11)**, supplied with the lapping machine, remove the centring stem **(11)** from the valve guide.

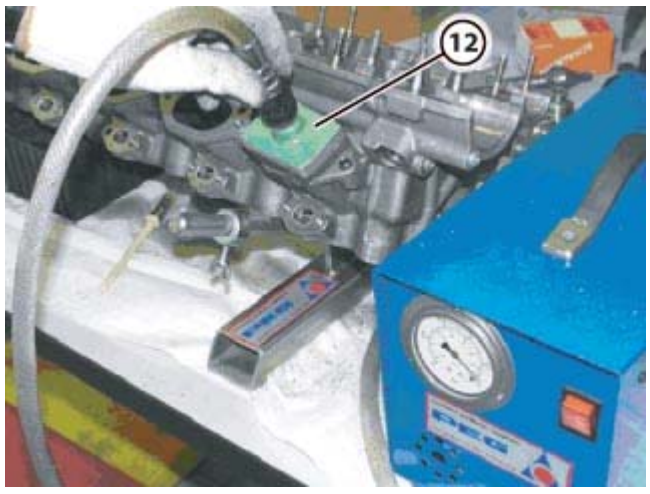
After grinding the valve seats as described, polish the valves before refitting.

- There are two alternative methods for checking if the valve seat has been lapped correctly: using Prussian blue or with the Vacutest water tightness test.
- CHECKING WITH PRUSSIAN BLUE



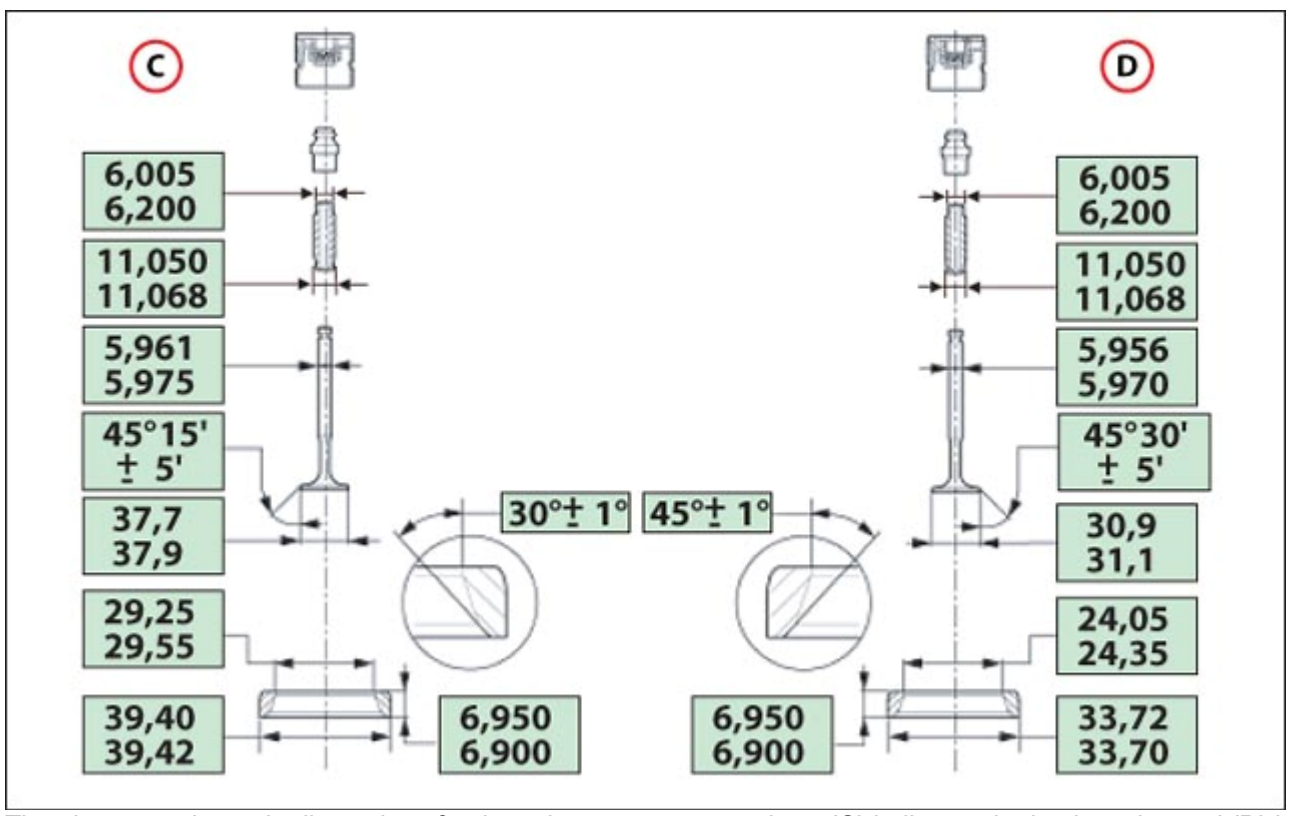
- Apply a thin, uniform layer of Prussian blue over the entire valve contact surface with a brush.
- Fit the valve into its guide, pushing against the valve seat.
- Turn the valve by hand, remove the valve and check that Prussian blue has been evenly distributed over the entire seat. If not, lap the valve seat again.

- VACUTEST WATER TIGHTNESS TEST



- Fit the seal rings on the guides of the valves being tested.
- Fit all the valves for the respective (intake or exhaust) manifold branch and install the plug **(12)**, supplied with the tool, to seal the branch. Use the rectangular plug for an intake manifold branch and the round plug for an exhaust manifold branch.
- Start the Vacutest unit and check that the depression reading on the manometer is between **0.94** and **0.86 bar**.
- If the value is lower, check valve seats with Prussian blue to identify which valve seat must be lapped again.

Main dimensions for the intake and exhaust valves



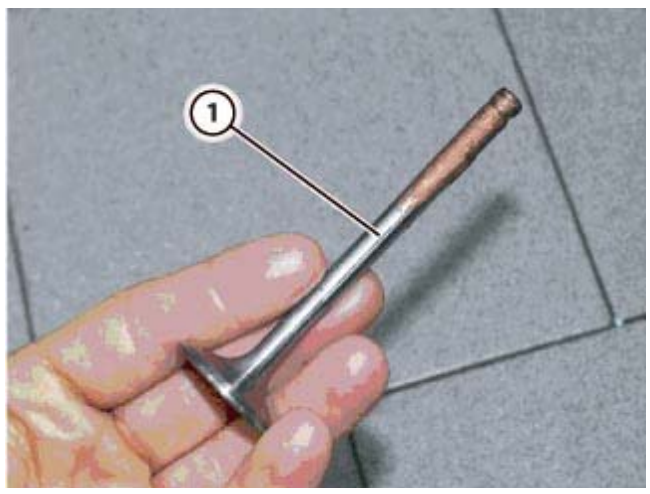
The above are the main dimensions for the valve components, where **(C)** indicates the intake valve and **(D)** indicates the exhaust valve.

Refitting the valves

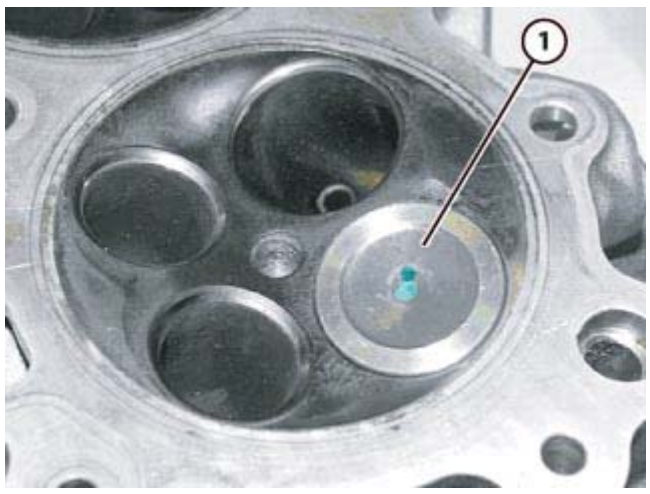
- During overhaul, inspect the valves thoroughly and replace if necessary.



- Before installation, lubricate the valve oil seal with engine oil.
- Fit the oil seal on the valve using the punch **(AV 3374)** and a plastic mallet.



- Remove the valves **(1)** and apply high temperature copper based grease **COPASLIP** to the stem, as shown in the figure.

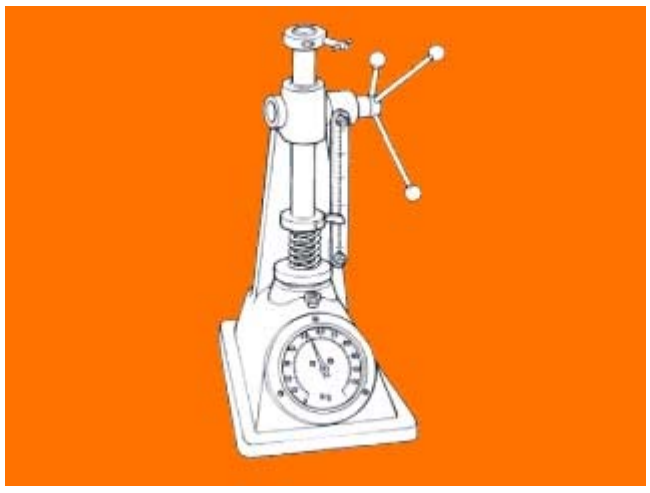


- Then install the valves **(1)** in their respective seats.



- Visually check the state of the lower pan; replace if necessary.
- Fit the lower cotters **(2)**, seating completely.

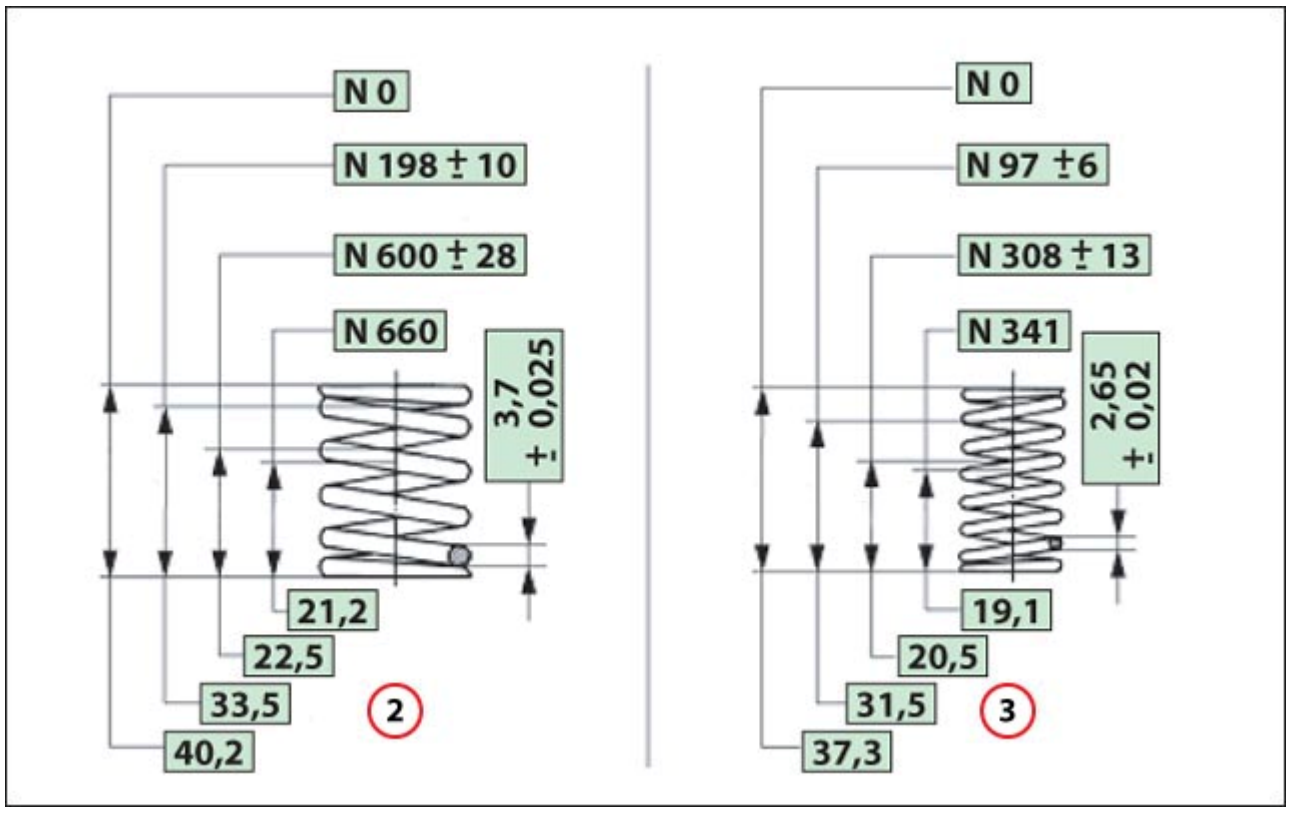
Checking springs



- Check the state of the springs: measure the load and elastic deformation with a commercially available instrument such as the example shown in the figure.

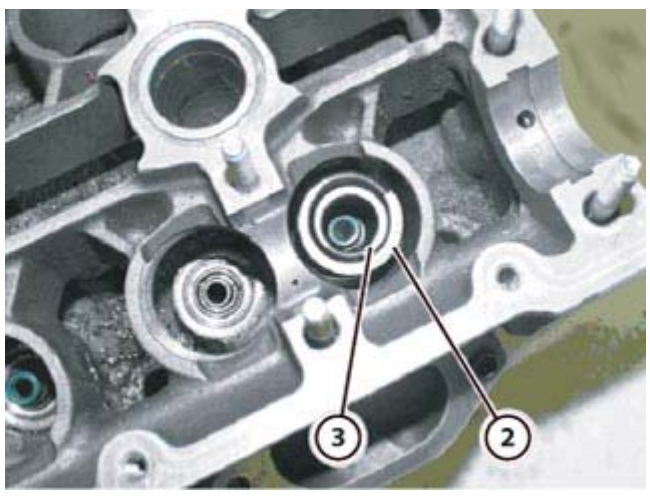
- Compare the values measured with the instrument against the nominal values for new springs.
- The following figure gives the nominal lengths **(L)** that should be measured for the spring at given loads **(N)** applied with the test instrument.

(2) indicates the outer valve spring and **(3)** indicates the inner spring.

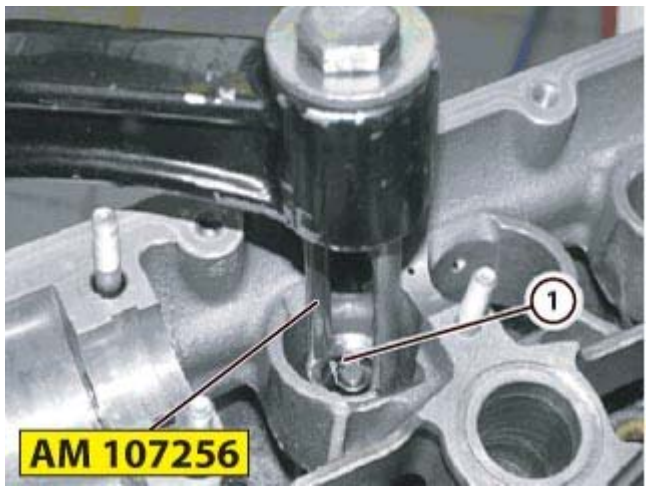


Ll - Free length
Ls - Static length
Ld - Dynamic length
Lp - Pack length

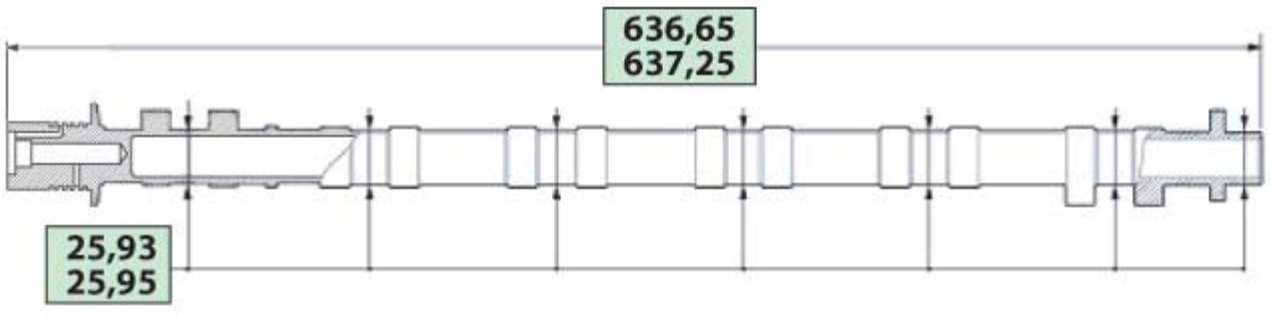
- Replace any springs that are deformed with a static load of **30 to 50 N**.



- Fit the outer **(2)** and inner **(3)** valve return springs.
- Visually inspect the state of the upper cap; replace if necessary.
- Fit the upper cap **(1)** and the relative half-cones. Then secure the entire assembly with a specific, commercially available pneumatic tool used in conjunction with tool **(AM 107256)**.



Main camshaft data



Radial free play between shafts and relative seats	0.04 ÷ 0.08 mm
Wear limit of contact surfaces between shafts and respective seats	0.1 mm
Maximum pin eccentricity	0.04 mm
Intake valve lift (measured along centreline, no free play)	10.94 ÷ 10.97 mm
Exhaust valve lift (measured along centreline, no free play)	9.97 ÷ 10 mm

Overhauling camshafts

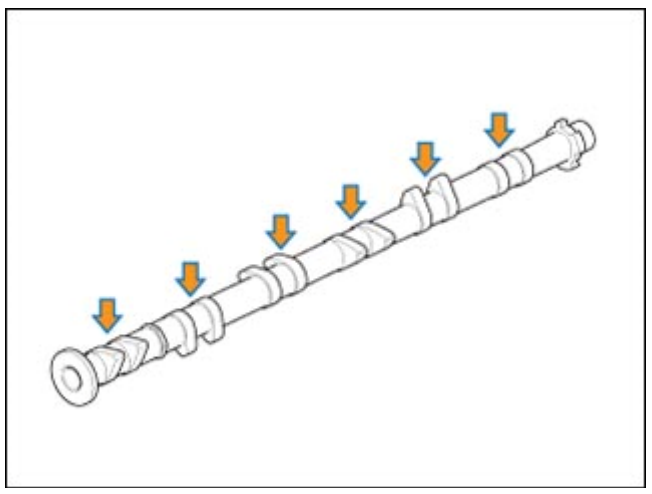
During overhaul, check the state of the camshafts; replace if even minimal cracks or superficial abrasion are noted.

- Clean the lubricant conduits thoroughly, injecting pressurised petroleum through the timing adjuster mounting orifice.
- Check the state of the camshaft seats in the head; if they prove to be worn, they must be bored.

To perform the procedures described above, the cylinder heads must be fitted to the cylinder block, with used gaskets and with the nuts tightened to the torque specified (see **"Refitting the cylinder heads"**).

- Insert the boring tool **(US 19000)** in the shaft seat, lubricating the cutting edges generously.
- Fit the caps, tightening in stages to the specified torque (see **"Refitting the camshafts"**), while simultaneously turning and advancing the boring tool to prevent jamming.
- Once this operation is complete, the heads must be removed (see **"Removing the cylinder heads"**) and washed thoroughly, injecting pressurised petroleum through the lubricant conduits.

- During each overhaul, check the dimensions and state of wear of the camshafts.



- To verify dimensions, place the pins at the ends of the shafts on the respective mountings **(AV 3135)** on a surface plate.
- To check the variation in eccentricity of the intermediate camshaft pins, position the probe of a dial indicator on the pins and verify that the variations in eccentricity do not exceed **0.04 mm**.

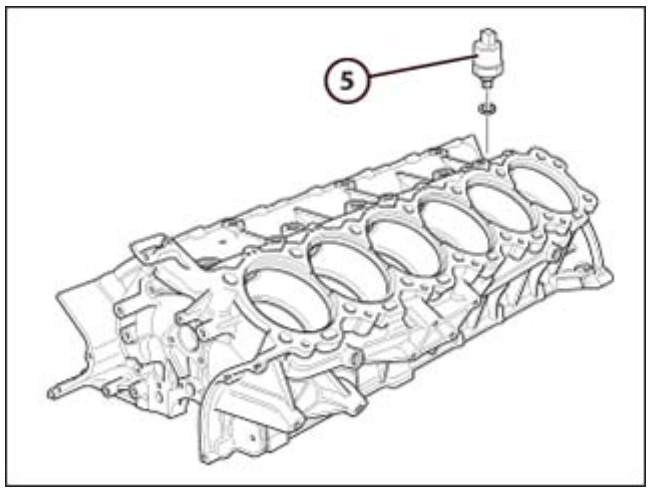


- Check the cam profiles: if the tappet contact patch on any of the cams is unevenly or excessively worn, replace the shaft.
- Measure the intake camshaft cam profiles: the dimension measured must be between **44.140 and 44.170 mm**.
- Measure the exhaust camshaft cam profiles: the dimension measured must be between **43.170 and 43.200 mm**.

B2.05 Engine overhaul - Complete reassembly

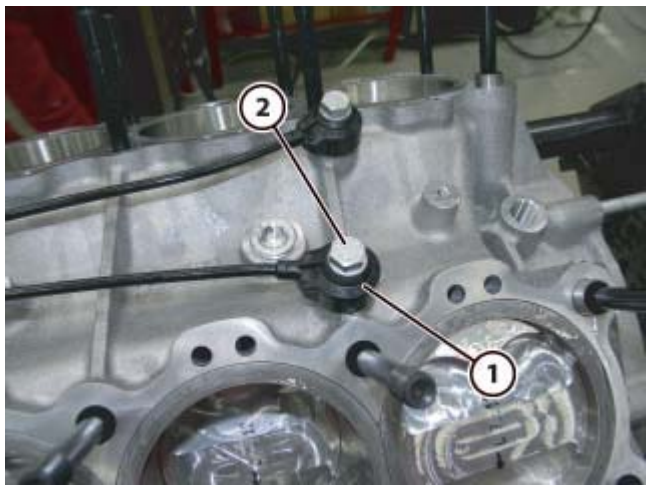
Refitting the crankcase

Tightening torque		Nm	Class
Electric pressure sender - crankcase	Sender	40 Nm	B
Knock sensor - crankcase	Screw	20 Nm	B



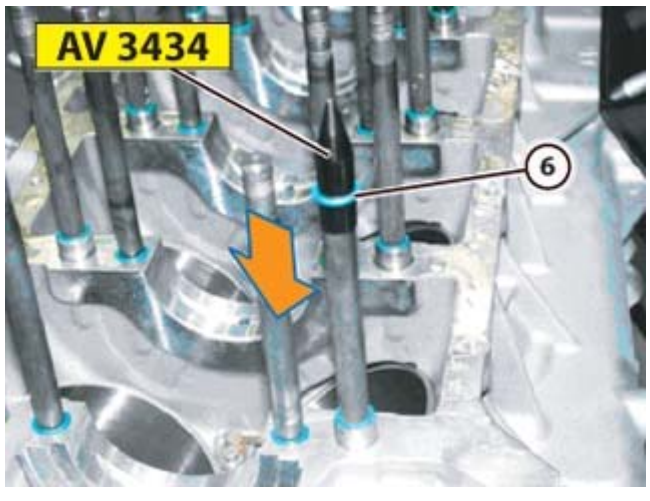
- Fit and tighten the pressure sender **(5)** on the crankcase.

Tightening torque	Nm	Class
Sender	40 Nm	B



- Fit the six knock sensors **(1)** on the crankcase, tightening the respective fastener screws **(2)**.

Tightening torque	Nm	Class
Screw	20 Nm	B



- Fit the tool **(AV 3434)** onto the crankcase stud bolts and fit the 28 O-rings **(6)**.

Refitting the crankshaft

- The main half-bearings are identified according to thickness by three different colours. Identify which main half-bearings to install, using the dimensions measured previously and the following table as reference.

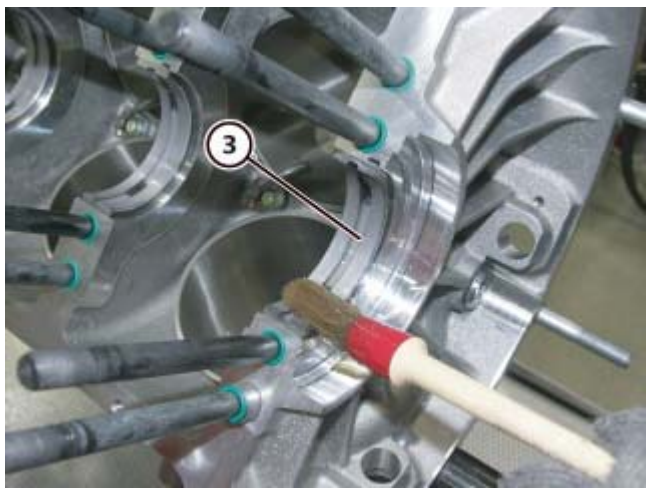
Main journal half-bearing selection table (UP TO Engine No. 175088)

	CLASS A crankcase (66.675 ÷ 66.681)	CLASS B crankcase (66.682 ÷ 66.688)
CLASS A crankshaft (58.994 ÷ 59.000)	RED	BLUE
CLASS B crankshaft (58.987 ÷ 58.993)	BLUE	YELLOW

Main journal half-bearing selection table Lead Free / NOT Lead Free (UP TO Engine No. 175089)

	CLASS A crankcase (66.675 ÷ 66.681)	CLASS B crankcase (66.682 ÷ 66.688)
CLASS A crankshaft (62.986 to 62.992)	BLUE	YELLOW

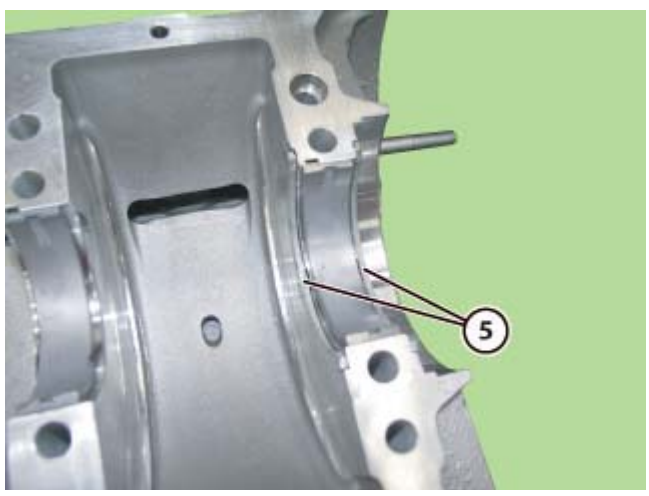
	CLASS A crankcase (66.675 ÷ 66.681)	CLASS B crankcase (66.682 ÷ 66.688)
CLASS B crankshaft (62.979 to 62.985)	YELLOW	GREEN



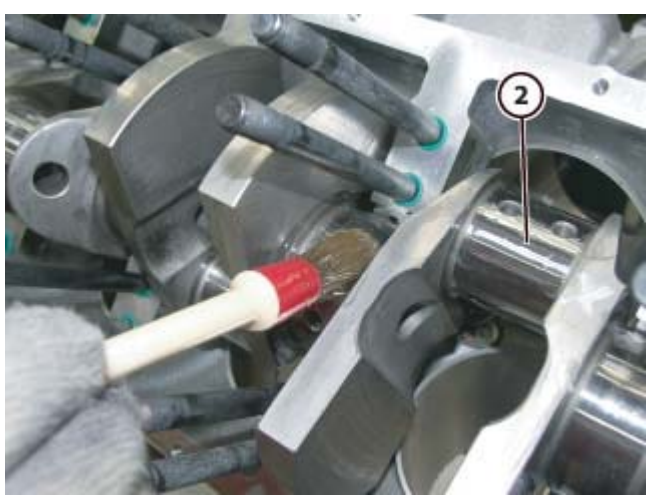
- Fit the half-bearings **(3)** on the crankcase and lubricate with engine oil.



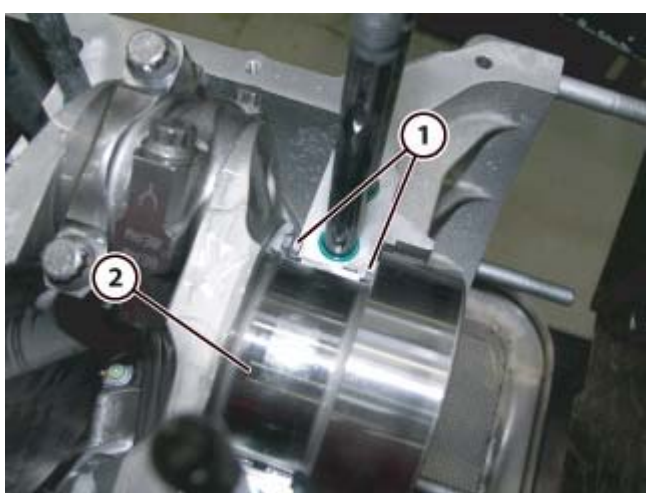
- Fit the half-bearings **(4)** on the lower crankcase shell and lubricate with engine oil.



- Apply grease **MOLYKOTE BR2**to the internal surfaces of the two shims **(5)** and fit onto the flywheel side of the lower crankcase shell, ensuring that they are correctly positioned: with the flanged part facing outward.



- Fit the crankshaft **(2)** on the crankcase and lubricate with engine oil at the height of the main bearings.



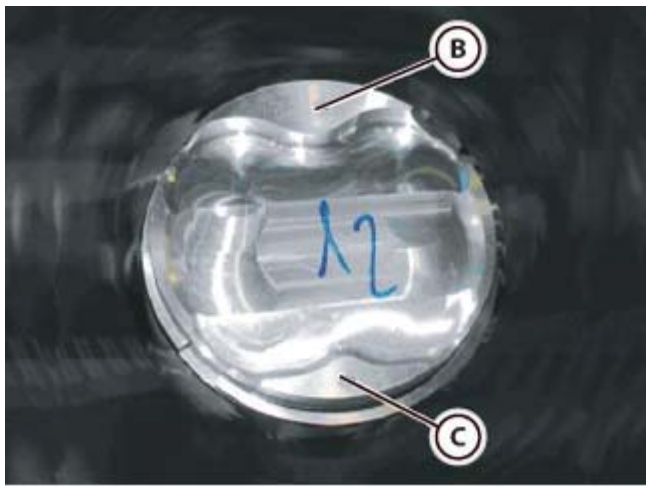
- Apply grease to the internal face of the two shims **(1) MOLYKOTE BR2** and fit them on the flywheel side of the crankcase, below the crankshaft **(2)**, ensuring that they are correctly positioned: with the flanged part facing outward.



- Check crankshaft endfloat with a dial gauge. Move the crankshaft axially and ensure that the value measured on the dial gauge is between **0.1 ÷ 0.22 mm**.
- If the endfloat measured exceeds acceptable tolerance values, replace shims with components one size larger.

Refitting the piston-connecting rod assembly

Tightening torque		**Nm**	**Class**
Fastening connecting rod	Pretightening torque for screw	30 Nm	A
	Screw	60 ÷ 90 Nm	A



- The intake and exhaust sides are identified by two different machined markings in the crown of the piston. When refitting, note that the exhaust side **(C)** must face towards the exterior of the crankcase and the intake side **(B)** must face towards the interior of the crankcase.



- Lubricate the piston rings with engine oil and position with the splits at **180°** from each other.



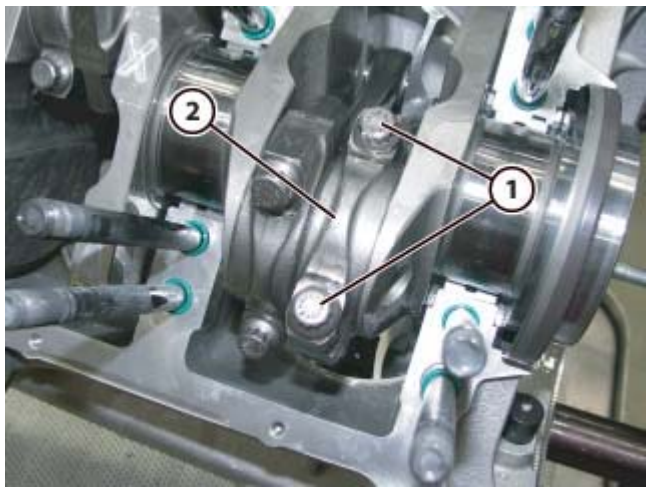
- Lubricate the cylinder sleeve, connecting rod half-bearing and crankshaft journals with engine oil.

- Use a commercially available installer tool to compress the piston rings without altering their position on the piston, then push the piston decisively into the sleeve, ensuring that the piston is facing the correct direction as described above.

Refit each piston as originally fitted in its respective sleeve, using the number marked on the piston during removal as reference.

The connecting rod screws may only be used once and must therefore be replaced after removal.

- Lubricate the thread and under the head of the connecting rod screws with **MOLYKOTE 1000** grease.



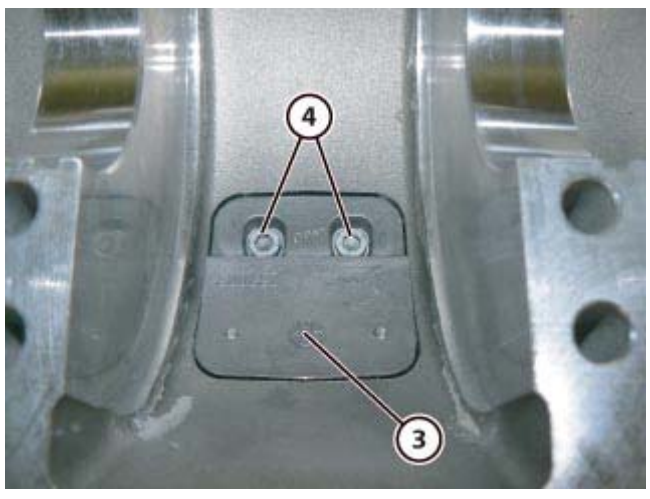
- Lubricate the half-bearings of the connecting rod caps with engine oil, then mount onto the connecting rod caps **(2)**, ensuring that the numbers stamped on the components match.
- Snug the screws **(1)** then, using a control angle of **63°±1°** (for connecting rod with p/n**219158**) and **65° ±1°** (for connecting rod with phosphatised screw with p/n **225808**), check the definitive tightening torque.

Tightening torque	**Nm**	**Class**
Pretightening torque for screw	30 Nm	A
Screw	60 ÷ 90 Nm	A

- After fitting the connecting rod caps, check axial play with feeler gauges: the value measured must be between **0.200 and 0.339 mm**.

Refitting lower crankcase shell

Tightening torque		**Nm**	**Class**
Fastening the reed valve	Screw	10 Nm	B
Fastening lower crankcase shell to crankcase	Internal nut pretightening	30 Nm	A
	Internal nut	60 Nm	A
Fastening lower crankcase shell to crankcase	External nut pretightening	25 Nm	A
	Nut	55 Nm	A
Crankcase - lower crankcase shell M6x40	Stud bolt	10 Nm	B
Lower crankcase shell - crankcase M6x40	Screw	10 Nm	B
Crankcase - lower crankcase shell M6x25	Stud bolt	10 Nm	B
Lower crankcase shell - crankcase M6x20	Screw	10 Nm	B



FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

- Fit the six complete valve holders **(3)** on the crankcase, applying **SEGO**.
- Apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the fastener screws **(4)**.
- Tighten the fastener screws **(4)**.

Tightening torque	**Nm**	**Class**
Screw	10 Nm	B

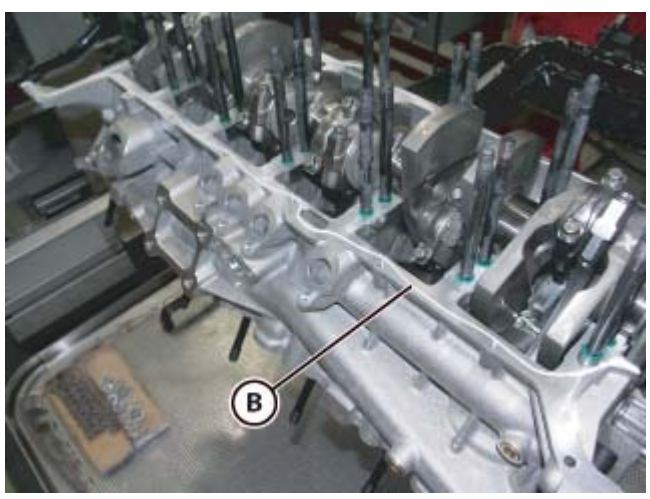
- Carefully clean the contact surfaces on the crankcase and lower crankcase shell.



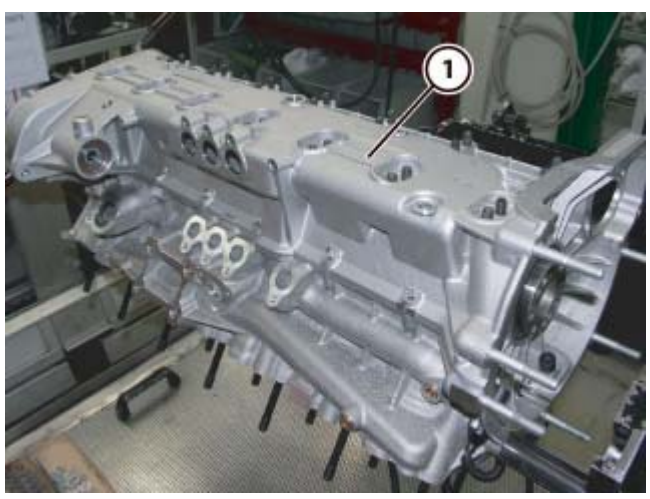
- Fit the Corteco seal ring **(3)** onto the flywheel side of the crankshaft using the punch **(900027060)**.



- Apply a continuous bead **(A)** of paste **CAF 4** to the left hand side lower crankcase shell mating edge.



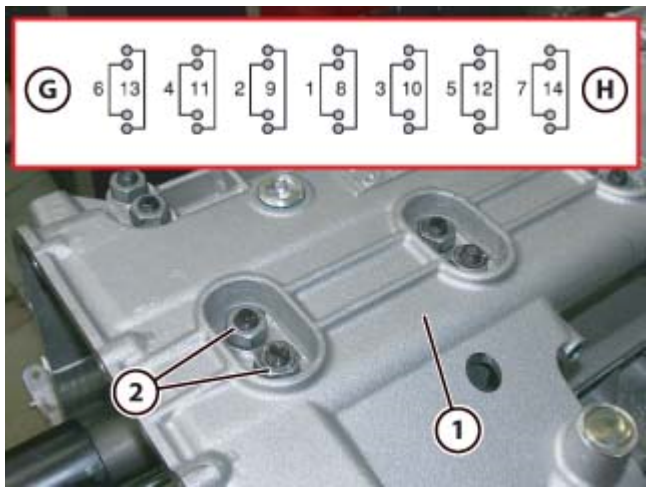
- Apply a continuous bead **(BA)** of paste **CAF 4** to the right hand side lower crankcase shell mating edge.



Mount the lower crankcase shell no later than 10 minutes after applying the CAF 4 paste.

- Fit the lower crankcase shell **(1)** onto the crankcase, tapping gently into place with a plastic hammer.

- Apply **MOLYKOTE 1000** grease to the main bearing stud bolts, the underside and to the threads of the six fastener nuts.



The lower crankcase shell must always be mounted and tightened in a single, uninterrupted session. Tighten the lower crankcase shell securing nuts no later than 2 minutes after mounting to the crankcase.

- Fit the washers dry with the machined side against the lower crankcase shell **(1)**, then fit the securing nuts **(2)** with the stamped code facing upwards.
- The nuts must be pre-tightened and definitively tightened in precisely the order given here. Note that **(G)** is the flywheel side and **(H)** is the timing side.
- Pre-tighten the internal nuts.

Tightening torque	Nm	Class
Internal nut pretightening	30 Nm	A

- Pre-tighten the external nuts.

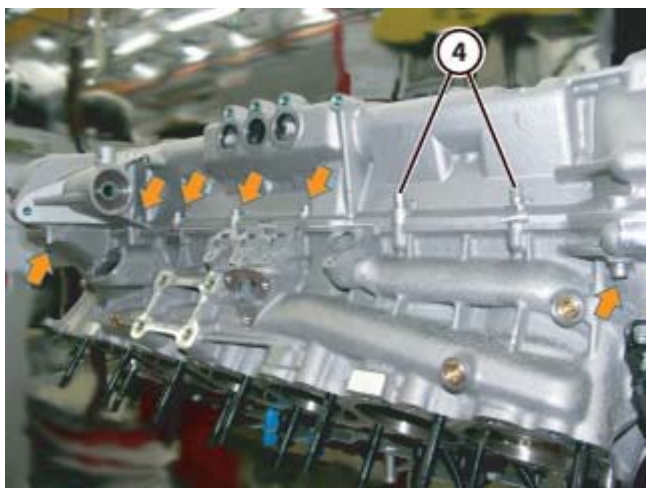
Tightening torque	Nm	Class
External nut pretightening	25 Nm	A

- Tighten the internal nuts to the definitive torque.

Tightening torque	Nm	Class
Internal nut	60 Nm	A

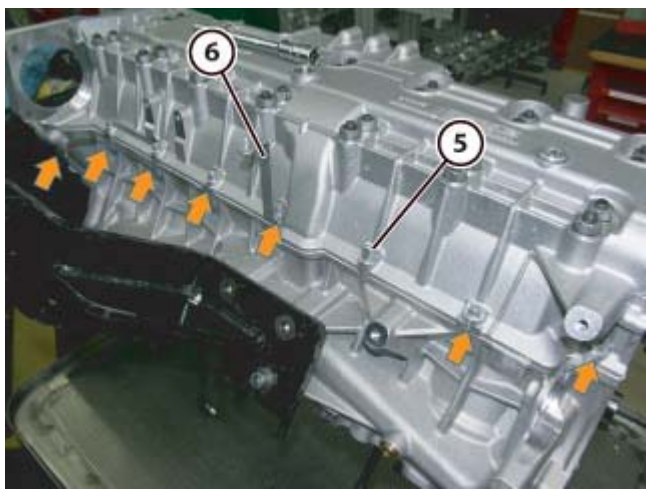
- Tighten the external nuts to the definitive torque.

Tightening torque	Nm	Class
Nut	55 Nm	A



- Fasten the lower crankcase shell to the crankcase along the right hand outer seam, tightening the eight fasteners indicated, including the two stud bolts **(4)**.

Tightening torque	Nm	Class
Stud bolt	10 Nm	B
Screw	10 Nm	B



- Fit the bracket **(6)** and fasten the lower crankcase shell to the crankcase along the left hand outer seam, tightening the eight fasteners indicated, including the one stud bolt **(5)**.

Tightening torque	Nm	Class
Stud bolt	10 Nm	B
Screw	10 Nm	B

- After definitively securing the lower crankcase shell, check that the crankshaft rotates freely and remove any excess paste **CAF 4**.

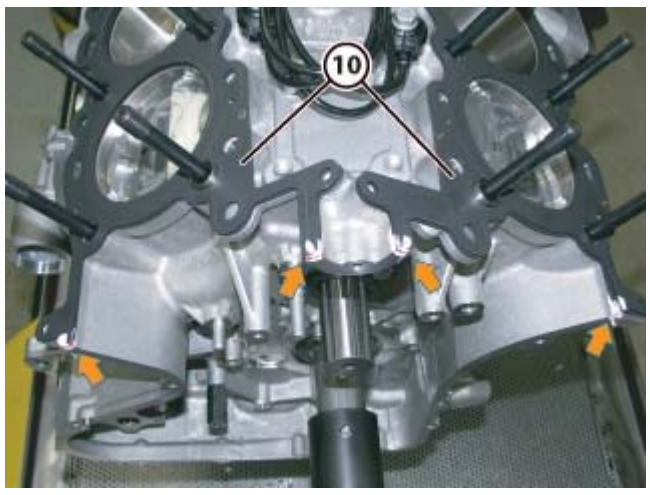
➢ Refit the starter motor (L2.04).
➢ Refit the engine oil-water pump (B3.02).

Refitting cylinder heads

Tightening torque		Nm	Class

Tightening torque		Nm	Class
Cylinder heads	Nut pretightening torque	60 Nm	A
	Nut	80 Nm	A
Cylinder heads, timing side	Screw	10 Nm	B
Engine speed sensor - crankcase	Screw	8 Nm	B
Water hoses - cylinder heads	Filler neck	40 Nm	B

- Move cylinder No.**1**, on crankcase to **TDC**.
- Carefully clean the contact surfaces between the head and the crankcase.



To prevent engine damage, the surfaces of the heads and crankcase must be thoroughly cleaned. Always replace the gasket when refitting an engine head.

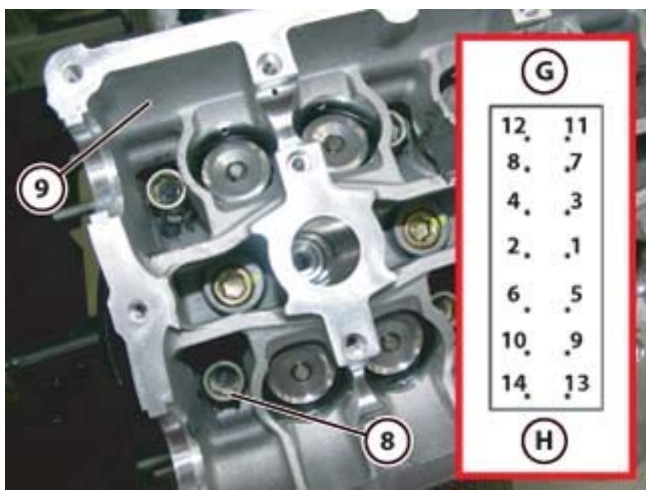
- Fit the head gaskets **(10)**, ensuring that gaskets are in good condition.
- Apply paste **CAF 4** to the gasket joints indicated in the figure.



- Remember to apply paste **CAF 4** both on top of and underneath each gasket layer.

- Apply grease **MOLYKOTE BR2** to the crankcase stud bolt threads, on the washers and on the head fastener nuts.

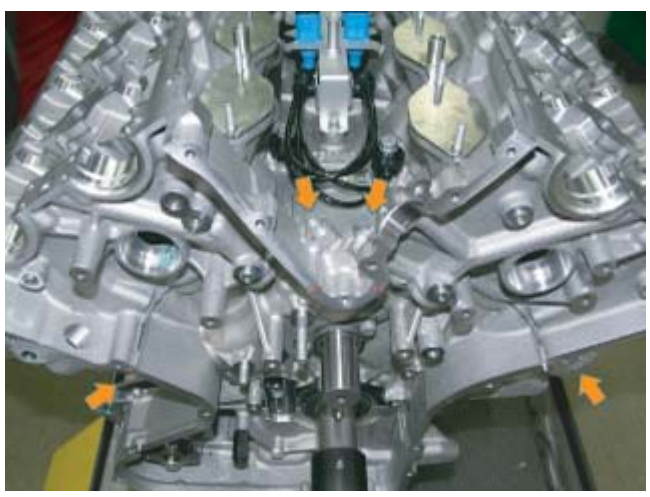
- Fit the two cylinder heads on the crankcase and tap with a plastic hammer to bring into contact with the gasket.
- Fit the tool **(AV 3983)** onto the cylinder heads to seal the intake ports.



- Pre-tighten the fourteen fastener nuts **(8)** for each cylinder head **(9)** then tighten to the definitive tightening torque with an angle of **90°**.

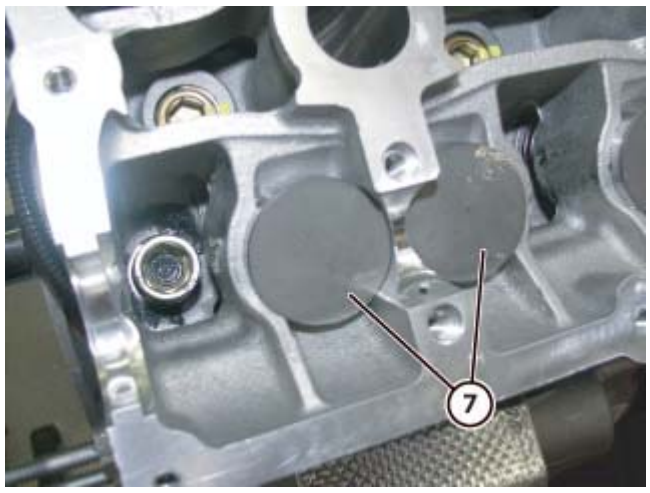
The nuts must be pre-tightened and definitively tightened in precisely the order given here. Note that **(G)** is the flywheel side and **(H)** is the timing side.

Tightening torque	Nm	Class
Nut pretightening torque	60 Nm	A
Nut	80 Nm	A

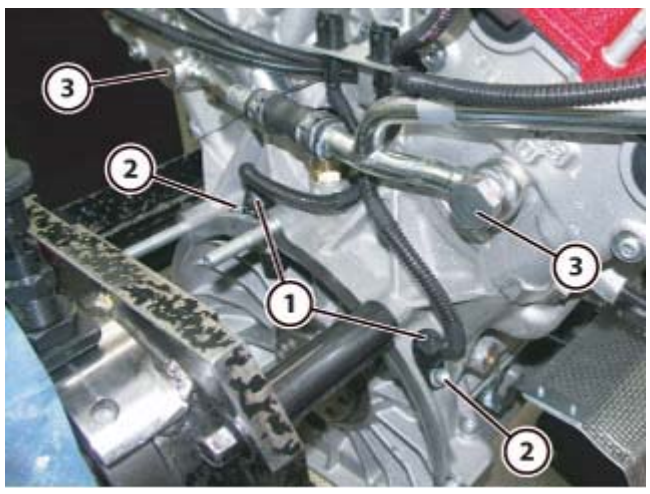


- Fasten the two cylinder heads to the crankcase at the timing side with the four screws indicated and remove any excess paste **CAF 4**.

Tightening torque	Nm	Class
Screw	10 Nm	B

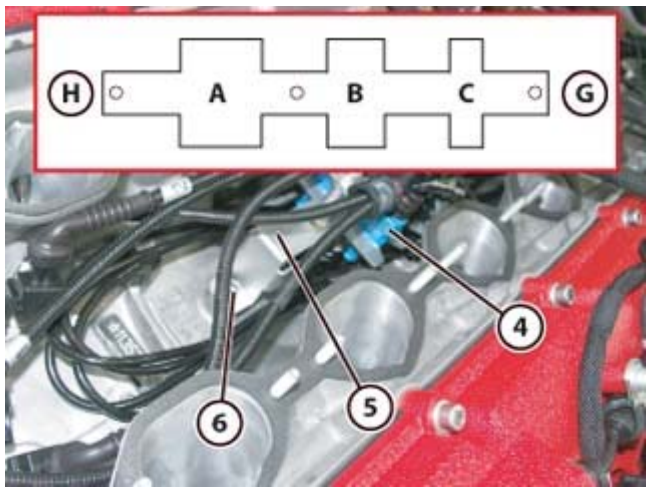


- Lubricate the tappets **(7)** with engine oil and fit onto the valves.



- Mount the two engine speed sensors **(1)** onto the crankcase, by hand tightening the screws **(2)**, and fasten the two water hose unions **(3)** to the heads.

Tightening torque	Nm	Class
Screw	8 Nm	B
Filler neck	40 Nm	B



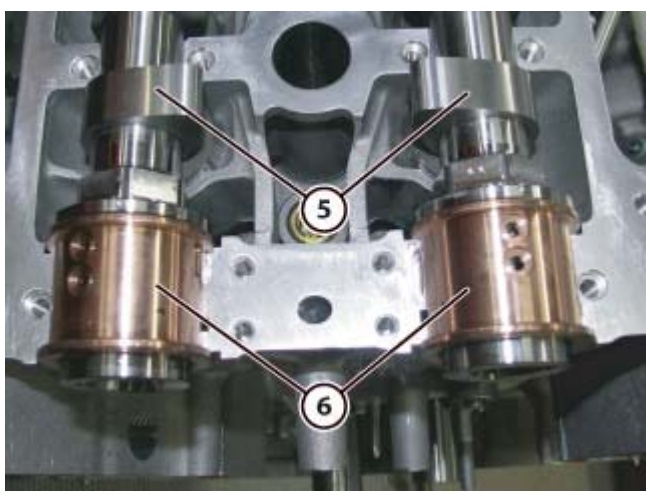
- Fit the connector mounting bracket **(5)**, complete with right hand and left hand cylinder bank injection cables, in its relative seat on the crankcase.

The connector mounting bracket **(5)** is divided into three segments: **(A)** knock sensors, **(B)** timing sensors and **(C)** engine speed sensors. Ensure that each connection is correctly positioned following the indications given on the connector mounting bracket itself. Note that **(H)** is the timing side and **(G)** is the flywheel side.

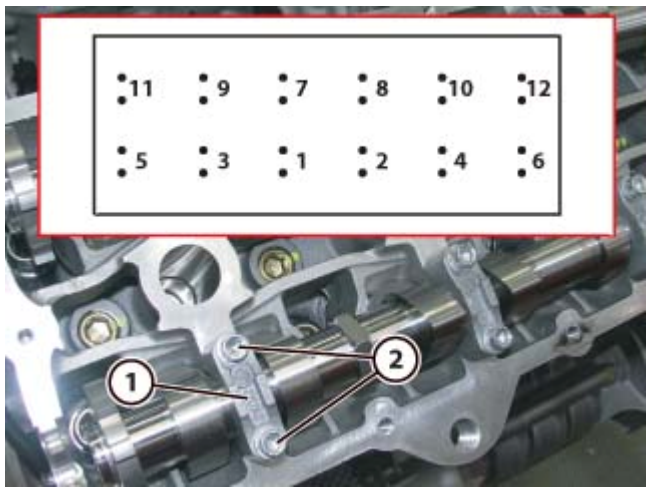
- Connect the connectors **(4)** (S303) (S302) (S301) (S300) (S310) (S310) (S311) for the six knock sensors and fit the respective connections on the connector mounting bracket **(5)**.
- Hand tighten the three connector mounting bracket **(5)** fastener screws **(6)** and position the cables so that they will not hinder the following procedures.

Refitting the camshafts

Tightening torque		Nm	Class
Camshaft cap - head	Pretightening torque for screw	5 Nm	A
	Screw	8 ÷ 12 Nm	A
Front camshaft mountings - heads	Pretightening torque for screw	6 Nm	B
	Screw	9 ÷ 13 Nm	B



- Ensure that piston **No. 1** is at **TDC** and position the intake and exhaust camshafts **(5)** of the right hand cylinder bank so that the two reference markings on the shafts point upwards; in this position, the cams of the first piston do not press on the respective tappet.
- Turn the two bushings **(6)** until the two lug recesses are facing inward.



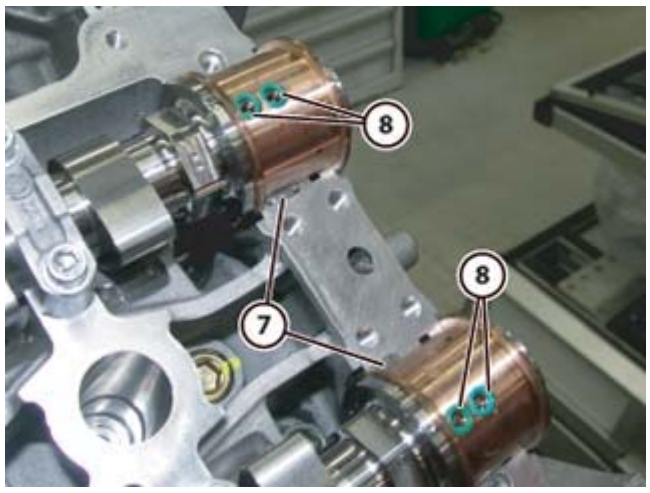
- Position the caps **(1)** in their respective mountings. After positioning the respective washers, fit and hand-tighten the screws **(2)** in the tightening order specified then, setting an angle of **30**° set the final tightening torque.

The caps **(1)** are machined together with the heads and are not interchangeable; reference numbers are therefore stamped into the heads and their respective caps.

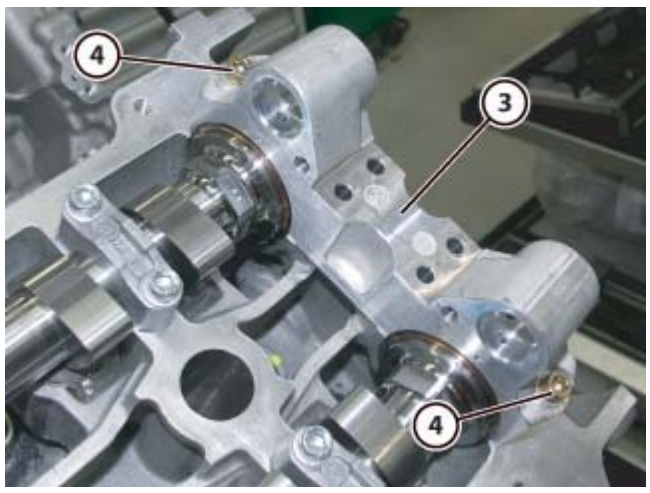
Tightening torque	**Nm**	**Class**
Pretightening torque for screw	5 Nm	A
Screw	8 ÷ 12 Nm	A



- Apply **SEGO** grease to the lug recesses.

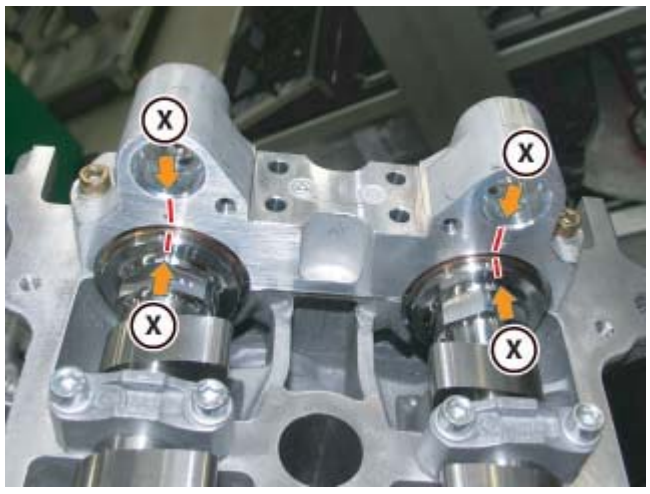


- Insert the two lugs **(7)** and fit the new O-rings **(8)** lubricated with engine oil.



- Fit the front cap **(3)**, fasten by hand-tightening the screws **(4)** then, setting an angle of **30°**, set the final tightening torque.

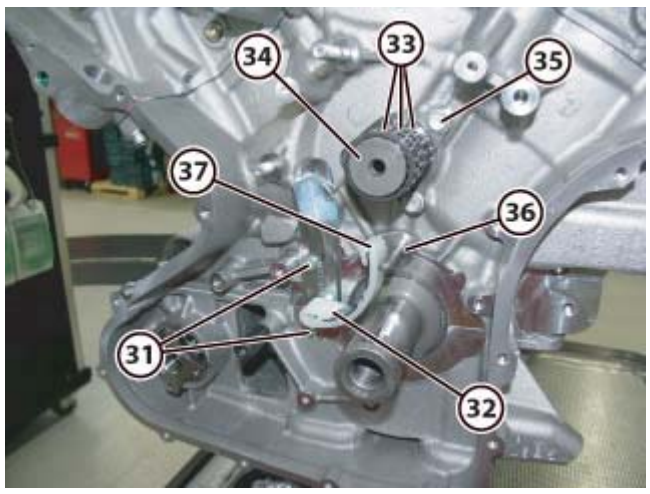
Tightening torque	**Nm**	**Class**
Pretightening torque for screw	6 Nm	B
Screw	9 ÷ 13 Nm	B



- As mentioned previously, a reference marking **(X)** is stamped into each camshaft near the front cap to facilitate timing adjustment.
- With the piston of cylinder **No. 1** at **TDC** for the combustion stroke, the reference markers **(X)** on the four camshafts must be aligned with those on the front caps.

Refitting timing chains

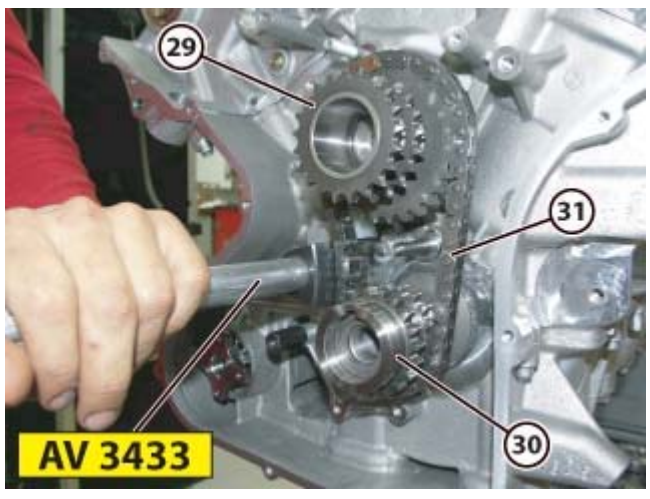
Tightening torque		Nm	Class
Timing drive gear mounting Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw (pretightening)	5 Nm	A
	Screw	16 Nm	A
Pump drive pinion - shaft	Screw	10 Nm	B
Fixed shoe for pump drive system - engine	Screw	10 Nm	B
Mounting - crankcase	Screw	25 Nm	B
Fixed shoe for crankshaft drive system Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Screw	10 Nm	B
M18 threaded cap - water/oil pump spindle Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK	Threaded cap	28 Nm	B
Timing chain drive shoe	Screw	25 Nm	B
Mobile shoe for timing system - engine	Nut	25 Nm	B
Hydraulic timing chain tensioner bushing	Screw	10 Nm	B
Hydraulic timing chain tensioner - engine	Tensioner	40 Nm	B
Upper fixed shoe - cylinder heads	Pretightening torque for screw	6 Nm	B
	Screw	9 ÷ 13 Nm	B



- Apply engine oil to the internal surface of the pinion mounting **(34)** and, after replacing the relative O-ring, fit in its respective mounting on the crankcase.
- Apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the threads of the three screws **(35)**.
- Pretighten and tighten the three screws **(35)**.

Tightening torque	Nm	Class
Screw (pretightening)	5 Nm	A
Screw	16 Nm	A

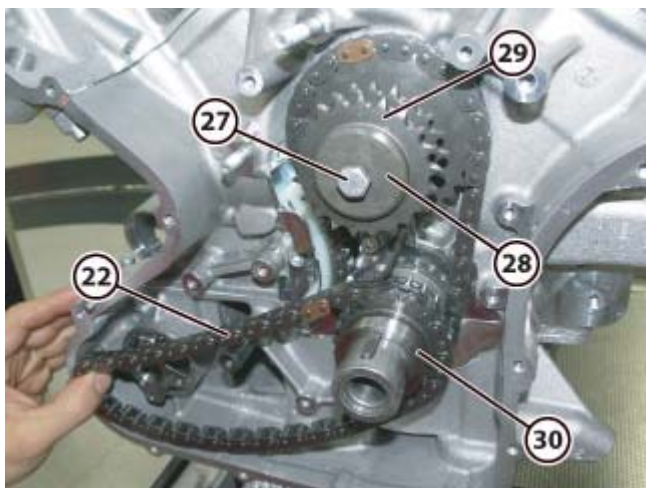
- Fasten the nozzle **(36)** after replacing the relative O-ring, tightening the screw **(37)**.
- Apply engine oil to the pinion mounting and fit the three new roller bearings **(33)**.
- Fit the sprung drive pinion journal shoe **(32)** onto the crankshaft and fasten with the two screws **(31)**.



- Check the state of the chain **(31)** before fitting. Replace if necessary.
- Fit the two crown wheels **(29)** and **(30)** with the chain **(31)** already meshed.

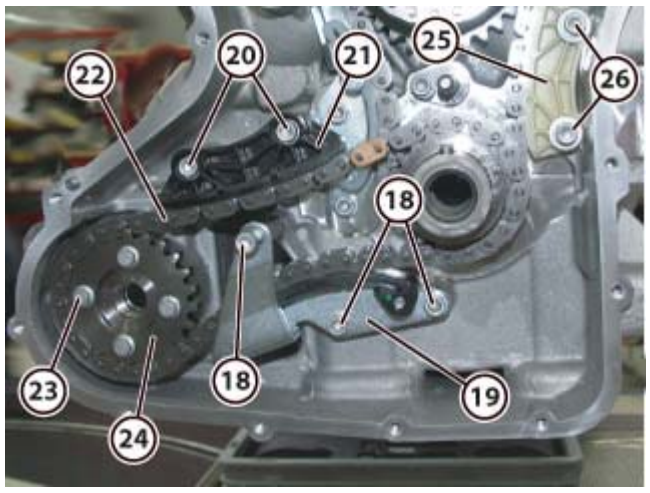
When fitting the chain, ensure that the bronze coloured link remains visible.

- Push the crown wheels, together with the chain, into their respective mountings and, using the tool **(AV 3433)** to apply leverage, fit the chain onto the sprung drive pinion journal shoe.



- Fit the washer **(29)** onto the crown wheel **(28)** and fasten with the screw **(27)**.
- Check that the endfloat between the timing chain drive pinion mounting and the crown wheel **(29)** is between **0.10 and 0.20 mm**.
- Check the state of the chain **(22)** before fitting. Replace if necessary.
- Fit the chain **(22)** onto the crown wheel **(30)**.

When fitting the chain, ensure that the bronze coloured link remains visible.



- Fit the crown wheel **(24)** onto the oil-water pump shaft, engaging with the chain **(22)**.
- Apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the threads of the four screws **(23)** fastening the crown wheel **(24)**, and tighten.

Tightening torque	Nm	Class
Screw	10 Nm	B

- Fit the fixed shoe **(21)** and fasten with the screws **(20)**.

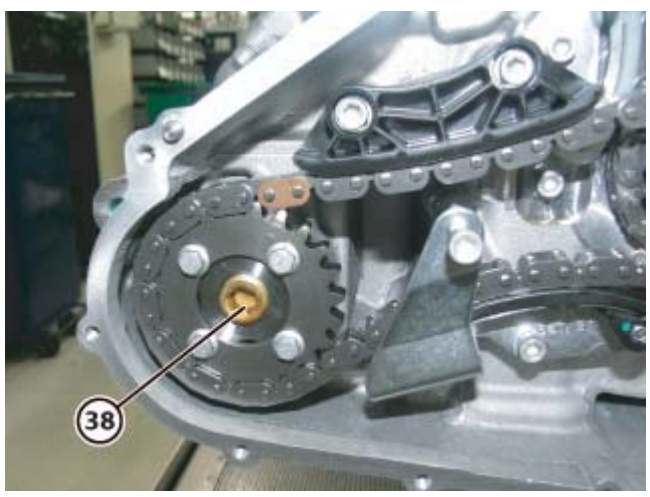
Tightening torque	Nm	Class
Screw	10 Nm	B

- Fit the mounting **(19)** and fasten with the screws **(18)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

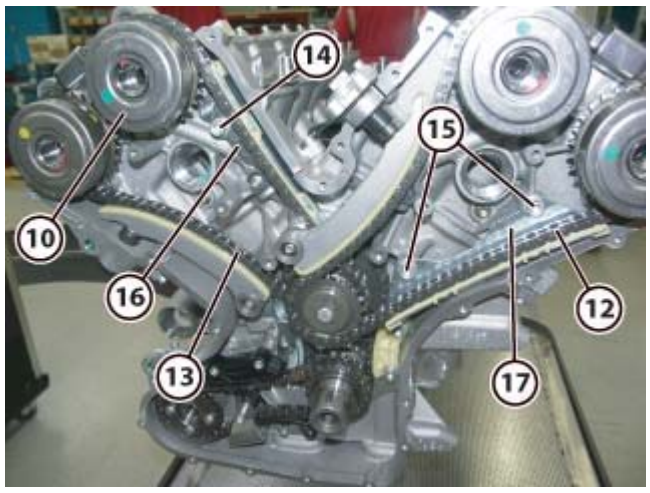
- Fit the fixed shoe **(25)** and fasten by tightening the two screws **(26)** after applying **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the threads.

Tightening torque	Nm	Class
Screw	10 Nm	B



- Apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the cap **(38)** and screw onto the oil-water pump shaft.

Tightening torque	Nm	Class
Threaded cap	28 Nm	B

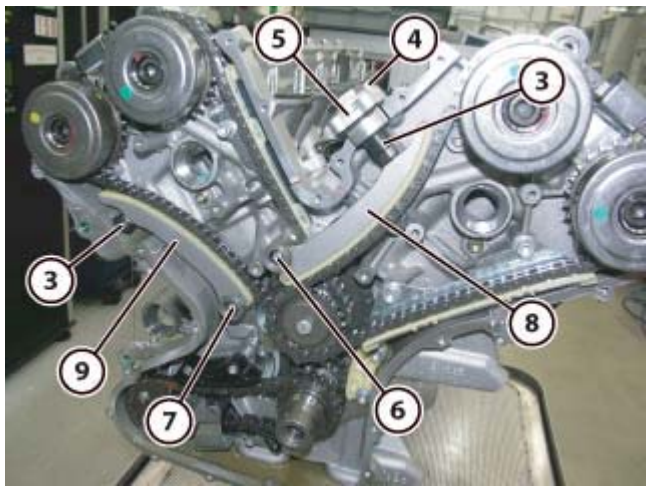


- Fit the fixed timing chain shoes **(16)** and **(17)**, fastening by tightening screws **(14) (15)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

- Fit the two timing chains **(13)** and **(12)** and the timing adjusters **(10)** onto their respective camshafts.

Check that the timing adjusters are correctly mounted by ensuring that the adjusters marked with the code **SCR** are installed onto the **exhaust camshaft** and the adjusters with the code **ASP** are mounted onto the '**intake camshaft**.



- Fit the two mobile timing chain shoes **(8)** and **(9)** with the respective bushings and spacers, and fasten by tightening the nuts **(6)** and **(7)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	B

- Fit the tensioner bushing **(5)**, with relative new seal, and fasten to the cylinder head by tightening the two screws **(4)**.

Tightening torque	**Nm**	**Class**
Screw	10 Nm	B

Hydraulic tensioners must be stored in a well aired place, away from moisture and dust. To prevent the risk of corrosion, only open the plastic wrapping just before use. Do not store for more than 6 months.
Do not install tensioners with signs of corrosion on the body or piston.
Once a tensioner has been installed, it may NOT be removed and reused.

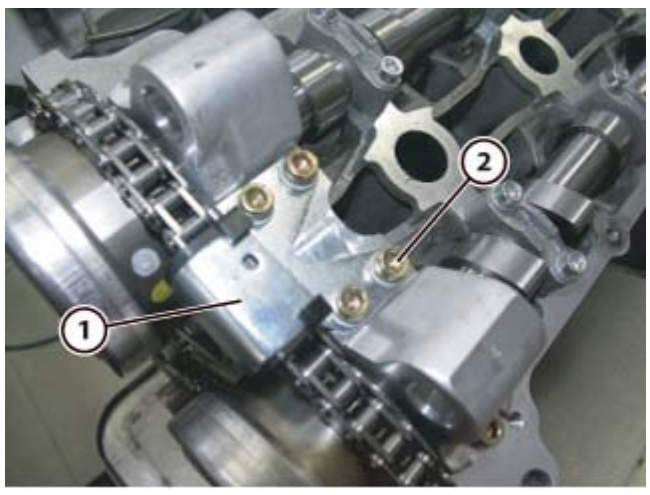
- Fit the new hydraulic tensioner **(3)** on the left hand cylinder bank and tighten.

Tightening torque	**Nm**	**Class**
Tensioner	40 Nm	B

Hydraulic tensioners must be stored in a well aired place, away from moisture and dust. To prevent the risk of corrosion, only open the plastic wrapping just before use. Do not store for more than 6 months.
Do not install tensioners with signs of corrosion on the body or piston.
Once a tensioner has been installed, it may NOT be removed and reused.

- Fit the new hydraulic tensioner **(3)**, with relative new spacer and new O-ring, on the left hand cylinder bank and tighten.

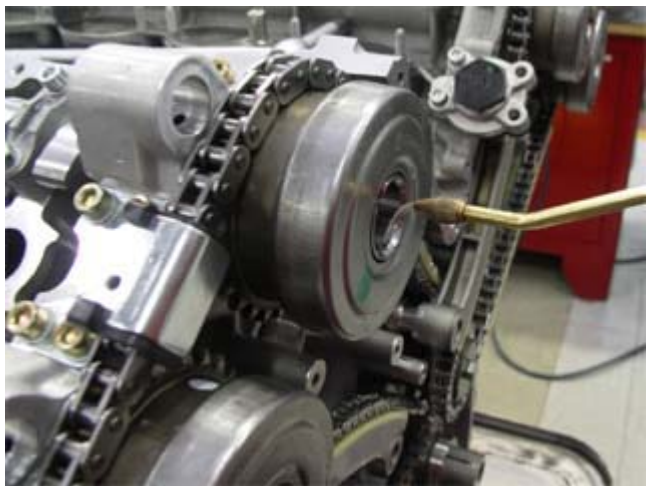
Tightening torque	**Nm**	**Class**
Tensioner	40 Nm	B



- Fit the upper fixed shoe **(1)** in its relative mounting on the cylinder head and fasten by hand-tightening the four screws **(2)**. then, setting an angle of **30°**, set the final tightening torque.

Repeat the procedure for the other cylinder bank.

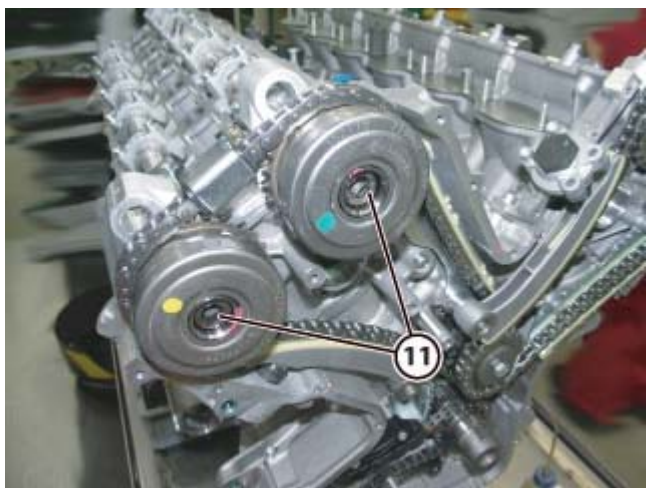
Tightening torque	**Nm**	**Class**
Pretightening torque for screw	6 Nm	B
Screw	9 ÷ 13 Nm	B



- Use a rapidly evaporating solvent for degreasing metal to clean the timing adjusters, the threads of the camshafts and the timing adjuster fastener screws. After cleaning, blow with compressed air.



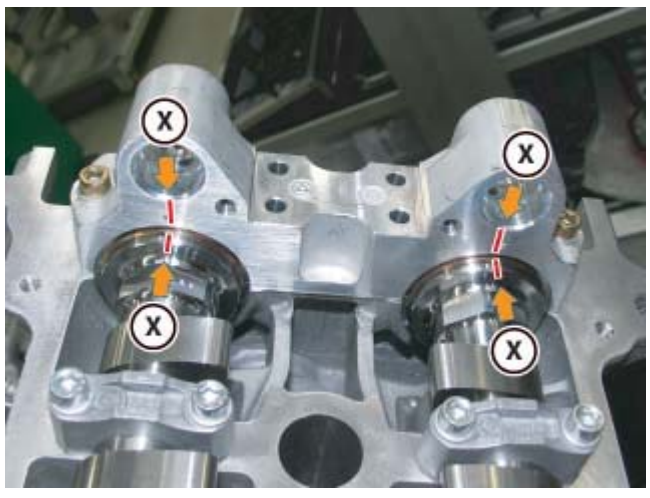
- Lubricate the interior of the camshafts with engine oil.



- Holding the camshafts with a wrench fitted to the specific mounting point, fit and tighten the four timing adjuster fastener screws **(11)** to a provisional torque of **35 Nm**.

Engine timing

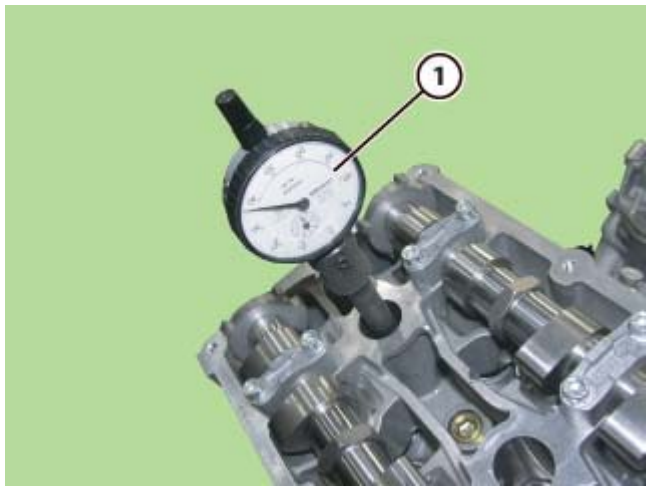
Tightening torque		**Nm**	**Class**
Intake timing adjuster - camshaft	Pretightening torque for screw	50 Nm	A
	Screw	180 ÷ 200 Nm	A
Exhaust timing adjuster - camshaft	Pretightening torque for screw	50 Nm	A
	Screw	180 ÷ 200 Nm	A



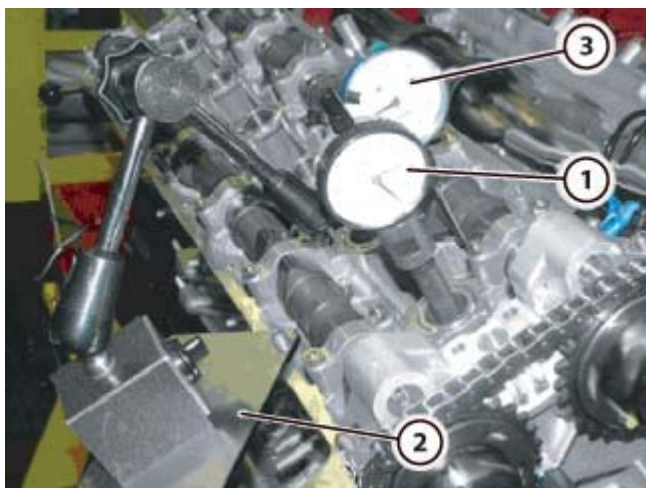
- Ensure that the **(X)** reference markings on the camshafts and front caps are aligned.



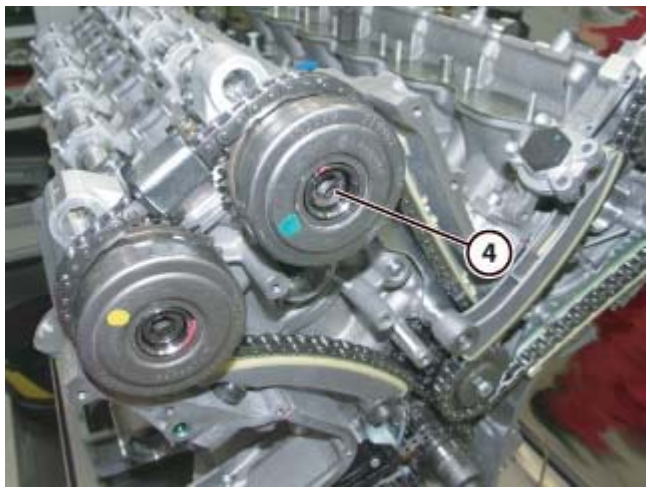
- Fit the goniometer **(AM 105784)** and relative fastener screw **(AV 3435)** onto the crankshaft.
- Fit the timing indicator **(AV 3978)**.



- Fit the dial gauge **(1)** in the tool, insert the tool complete with gauge into the spark plug orifice of cylinder **No. 1** and identify **TDC** for the combustion stroke.



- Fit the dial gauge **(3)** base **(2)** with magnetic mounting onto the intake side of the head.
- Position the dial gauge tracer pin as perpendicularly as possible against the top surface of the tappet cup of one of the intake valves of cylinder **No. 1**, measure the valve lift and zero the dial gauge **(3)** at **TDC**. In this position, the tappet cups can rotate freely in their respective seats.
- Rotate the crankshaft clockwise by **360°** to approach the valve overlap phase and check that the dial gauge needle **(3)** still indicates **zero** before the camshaft initiates valve aperture.
- Rotate the crankshaft until the dial gauge **(1)** indicates **TDC**. In this position, the dial gauges **(1)** and **(3)** and the goniometer on the crankshaft should indicate **zero**.
- Rotate the crankshaft clockwise until the dial gauge **(1)** indicates a value of **4.72 mm** (corresponding to **26°** after TDC.).
- In this position, the dial gauge **(3)** should indicate a value between **0.50 and 0.70 mm**.
- With a wrench fitted at the relative mounting point, adjust the position of the camshaft to achieve the correct reference values.

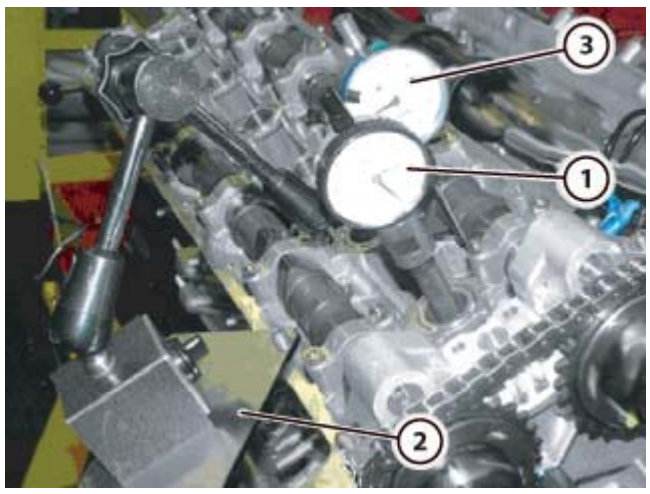


- Immobilise the crankshafts, tighten the screw **(4)** then, setting an angle of **85°**, check final tightening torque.

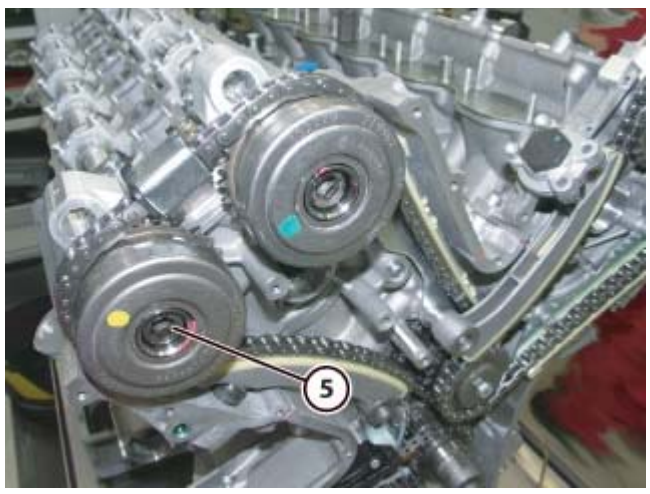


Tightening torque	Nm	Class
Pretightening torque for screw	50 Nm	A
Screw	180 ÷ 200 Nm	A

- Check that the timing parameters for the intake camshaft have remained within the correct tolerances.



- With the dial gauge **(1)** still installed in the spark plug orifice of cylinder **No 1**, measure **TDC**.
- Anchor the base of the dial gauge onto the exhaust side of cylinder **No.1**, with the tracer pin resting against the top surface of the tappet cup of one of the exhaust valves.
- Starting from **TDC** , turn the crankshaft first anticlockwise, moving the piston by **5 mm**, then clockwise by **4.25 mm** to reach a total value of **0.75 mm** (corresponding to **10°** before TDC.).
- Zero the dial gauge **(3)** used to measure valve lift.
- Turn the crankshaft clockwise until the exhaust valve is completely closed.
- In this position, dial gauge **(3)** should indicate a value between **0.50 and 0.70 mm**.
- With a wrench fitted at the relative mounting point, adjust the position of the camshaft to achieve the correct reference values.



- Immobilise the crankshafts, tighten the screw **(5)** then, setting an angle of **85°**, check final tightening torque.



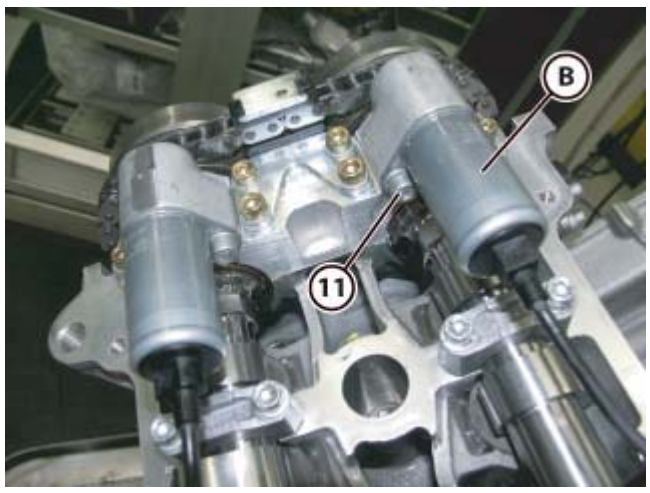
Tightening torque	Nm	Class
Pretightening torque for screw	50 Nm	A
Screw	180 ÷ 200 Nm	A

- Check that the timing parameters for the exhaust camshaft have remained within the correct tolerances.

Refitting the front cover

Tightening torque		Nm	Class
Fastening variable timing adjuster solenoid valve	Screw	10 Nm	B
Front engine cover	Screw	10 Nm	B
Front engine cover	Stud bolt	10 Nm	B
Hydraulic timing chain tensioner bushing	Screw	10 Nm	B
Pipe from head cover - water pump Products to use: SEGO	Screw	10 Nm	B
Belt tensioner pulley - engine	Screw	50 Nm	B
Belt tensioner for compressor and hydraulic steering pump	Screw	25 Nm	B
Fastening torsion damper to crankshaft Products to use: AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK Products to use: Loctite 242	Screw (UP TO Engine No. 175088)	300 Nm	A
	Screw (FROM Engine No. 175089)	450 Nm	A

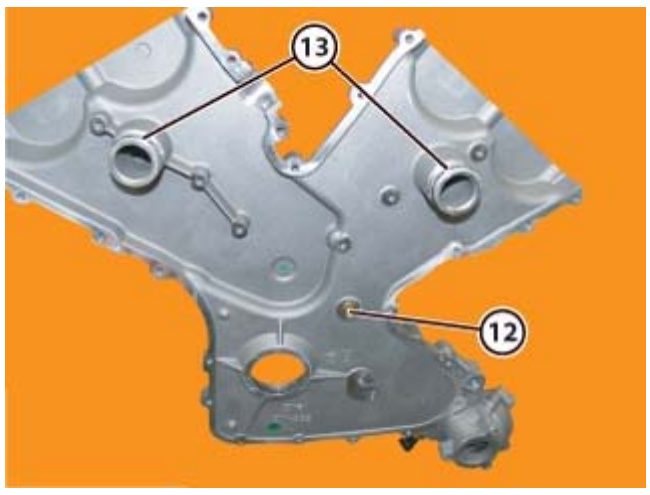
➢ Refit the spark plugs (A3.13).



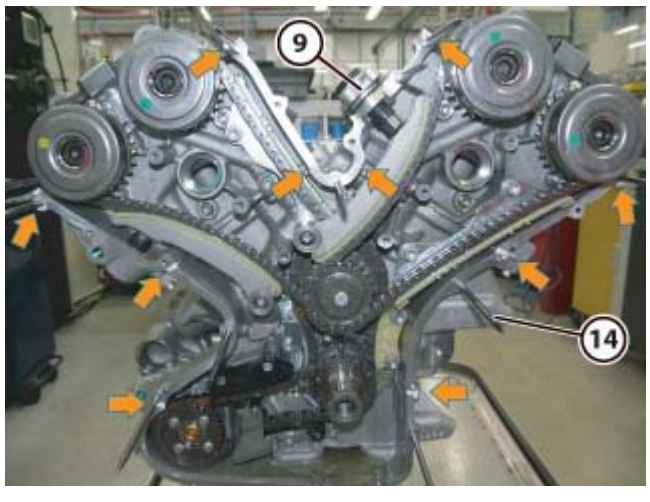
- Fit the four timing adjuster **(B)** solenoid valves after replacing and lubricating the relative O-rings.
- Fasten the four timing adjuster **(B)** solenoid valves by tightening the four screws **(11)**.

Tightening torque	Nm	Class
Screw	10 Nm	B

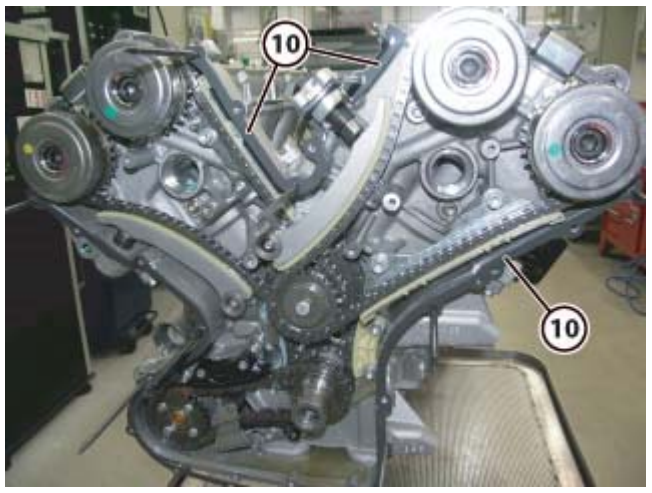
- Carefully clean the contact surfaces on the engine and the front cover.



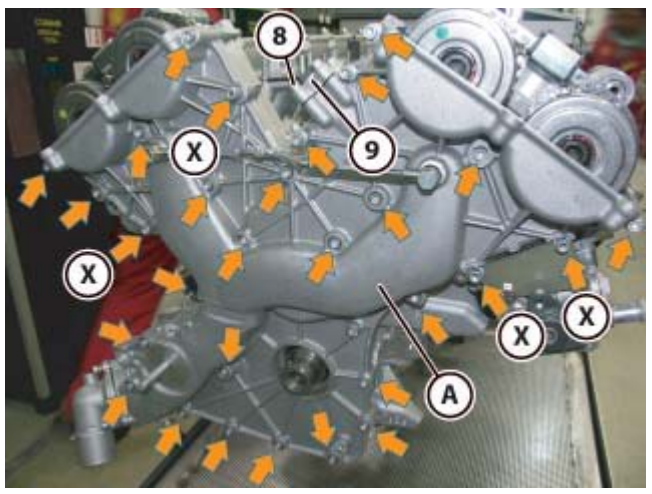
- Check if the threaded cap **(12)** is fitted to the front cover; if not, apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the thread and fit.
- Replace the two O-rings **(13)** and apply **SEGO** grease to the two inlets.



- Loosen the two screws securing the tensioner bushing **(9)** to the cylinder head.
- Fit the centring pins **(14)** and apply a little **CAF 4** paste at the positions indicated in the figure.



- Using the centring pins, mount the three new gasket sections **(10)** onto the timing side of the engine.



- Fit the front cover **(A)** on the engine.
- Remove the centring pins and fit the cover fasteners **(A)** as shown in the figure.

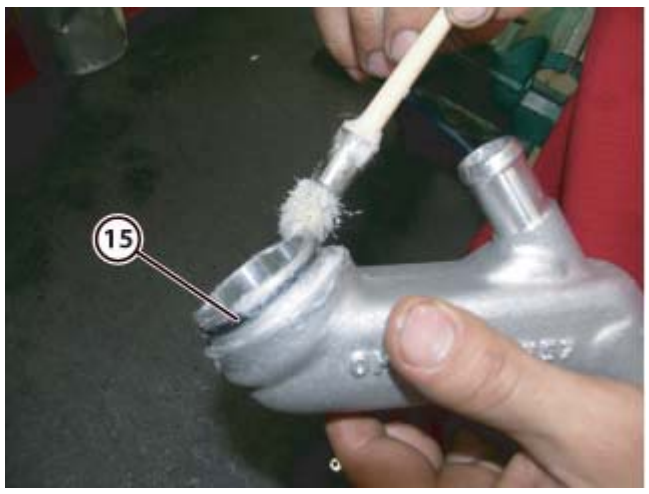
(X) indicates the stud bolts.

- Tighten all fasteners as shown in the figure.

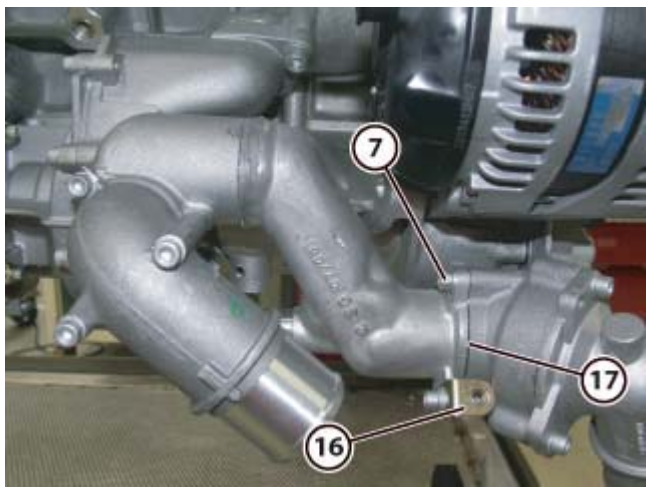
Tightening torque	Nm	Class
Screw	10 Nm	B
Stud bolt	10 Nm	B

- Fasten the tensioner bushing **(9)** by tightening the four screws **(8)**.

Tightening torque	Nm	Class
Screw	10 Nm	B

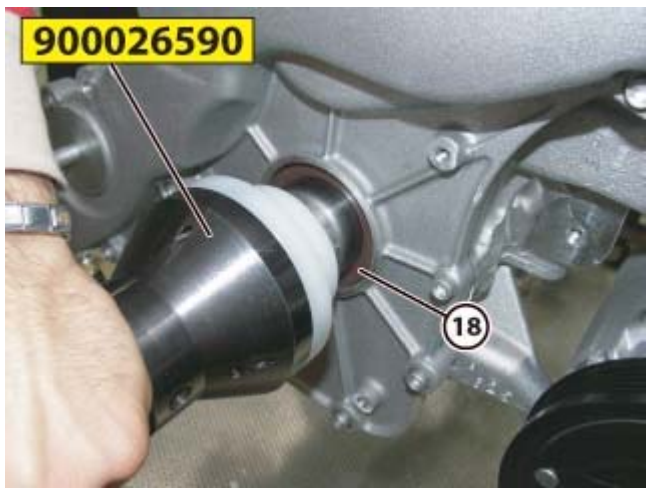


- Replace the O-ring **(15)** on the water pump tube leading to the front cover and apply grease **SEGO**.



- Fit the tube leading from the pump to the front cover in the relative seat after fitting a new seal **(17)**.
- Fit the bracket **(16)** and fasten the entire assembly by tightening the three screws **(7)**.

Tightening torque	Nm	Class
Screw	10 Nm	B

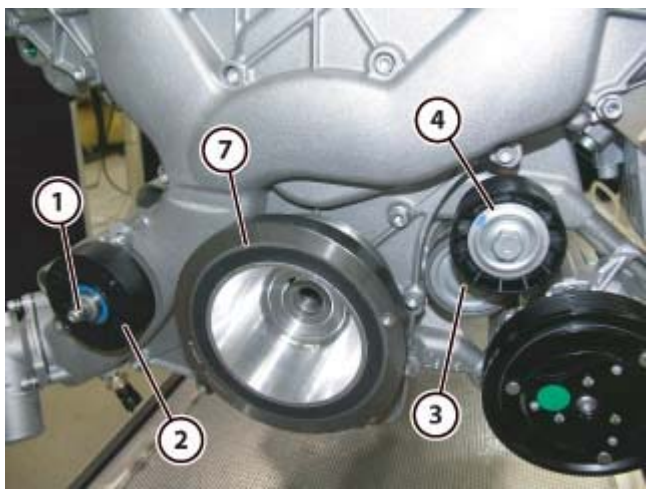


- Use a punch **(900026590)** to fit the oil seal **(18)**onto the timing side of the crankshaft.

- Replace the engine services cable (L2.14).

Refit.

- Refit the alternator (L2.03).
- Refit the A.C. compressor (I2.01).
- Refit the power steering pump (E2.01).



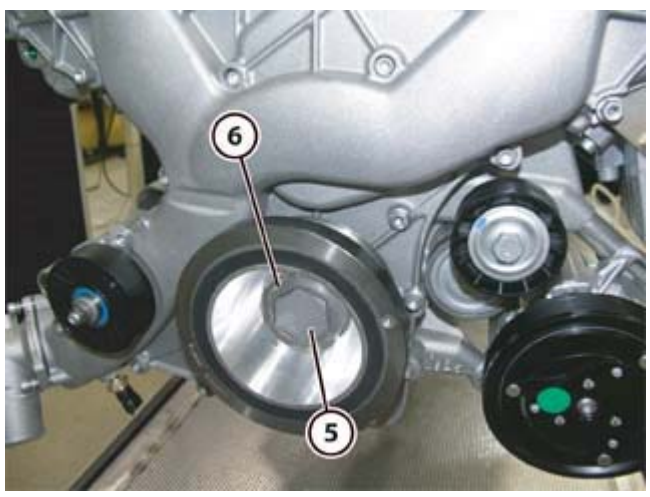
- Tighten the nut **(1)** fastening the tensioner pulley **(2)** and the screw **(3)** fastening the compressor and hydraulic steering pump belt tensioner **(4)**.

Tightening torque	Nm	Class
Screw	50 Nm	B
Screw	25 Nm	B

- Fit the torsion damper on the **(7)** crankshaft.



- Fit the tool **(AV 3122)** onto the flywheel side of the crankshaft to immobilise the shaft.



- UP TO Engine No. 175088, apply **AREXONS SYSTEM 52A43 - MEDIUM STRENGTH THREAD LOCK** to the thread of the screw fastening the torsion damper.
- FROM Engine No. 175089, apply **Loctite 242** to the thread of the screw fastening the torsion damper.
- Fit the washer **(6)** and fasten the torsion damper by tightening the screw **(5)**.

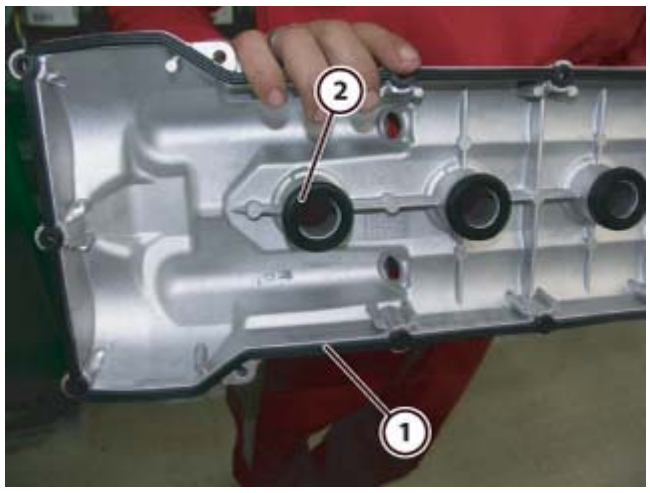
Tightening torque	Nm	Class
Screw (UP TO Engine No. 175088)	300 Nm	A
Screw (FROM Engine No. 175089)	450 Nm	A

- Remove tool **(AV 3122)**.

Refitting cylinder head covers

Tightening torque		Nm	Class
Head covers - cylinder heads	Screw	11 Nm	A
Head covers - cylinder heads	Stud bolt	11 Nm	A

- Carefully clean the contact surfaces between the cylinder heads and their respective covers.



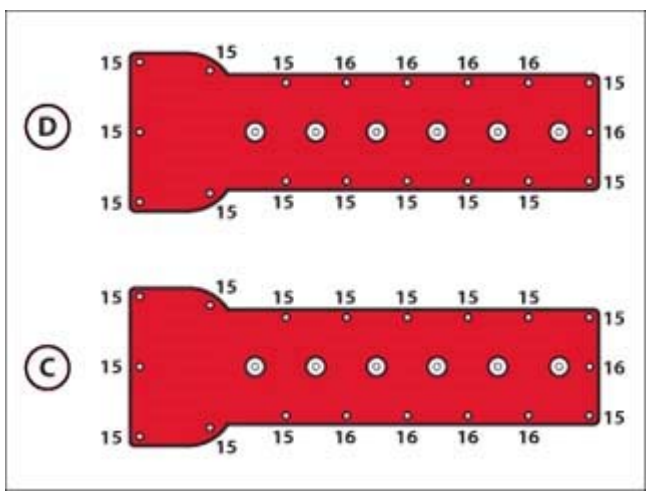
- Fit a new cover gasket **(1)** and new spark plug orifice gaskets **(2)** on the cylinder head covers.



- Apply a small amount of paste **CAF 4** at the positions on the timing side indicated in the figure.



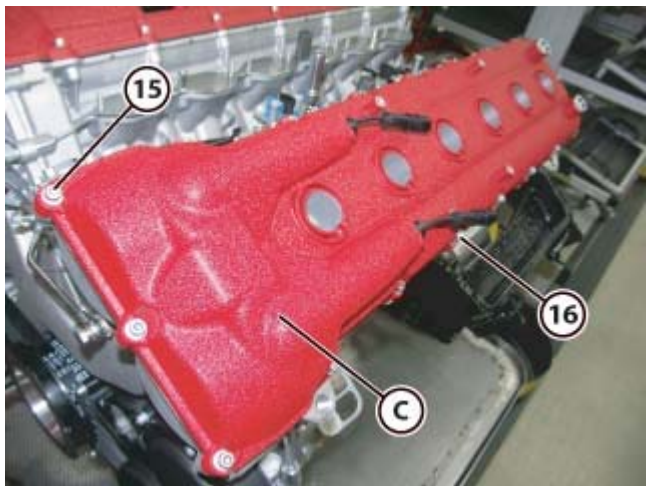
- Apply a small amount of paste **CAF 4** at the positions on the flywheel side indicated in the figure.



- Fit the left hand cylinder bank cover **(C)**, inserting the timing adjuster control solenoid valve cables, and fit the thirteen screws **(15)** and the five stud bolts **(16)** following the correct assembly sequence as indicated in the figure.

(C) indicates the left hand cylinder bank head cover and **(D)** indicates the right hand cylinder bank head cover.

Repeat the same procedure to refit the right hand cylinder bank head cover.

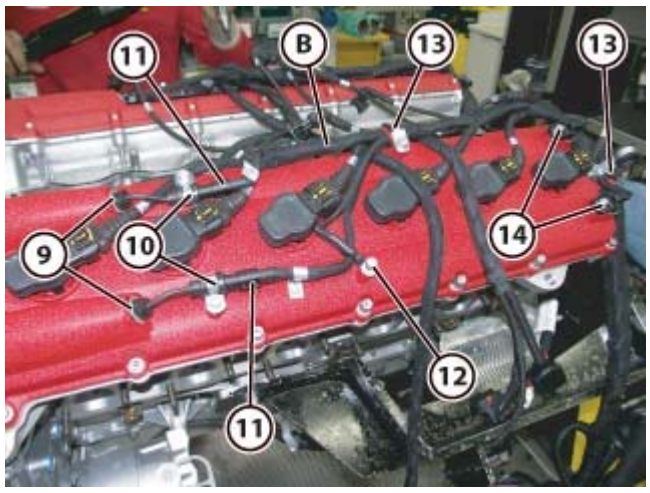


- Fasten the left cylinder bank head cover, by tightening the screws **(15)** and the stud bolts **(16)**.

Repeat the same procedure to refit the right hand cylinder bank head cover.

Tightening torque	**Nm**	**Class**
Screw	11 Nm	A
Stud bolt	11 Nm	A

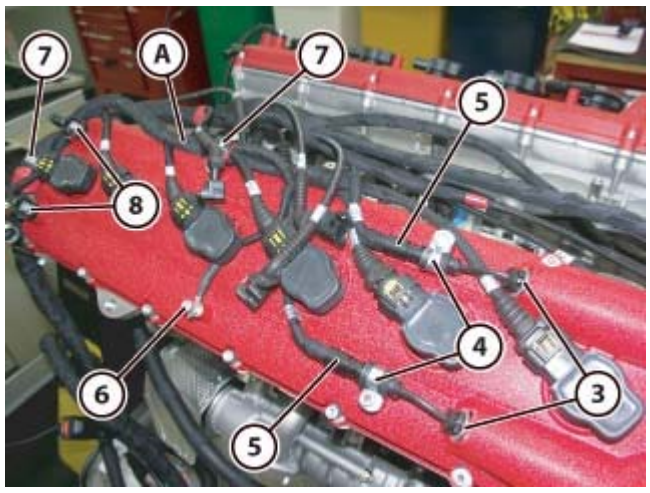
- Fit the terminals of the left hand cylinder bank injection cable on the left hand cylinder bank head.



- Fit the clamps **(13)** fastening the left hand cylinder bank injection cable **(B)** and the two timing sensors **(14)** on the left hand cylinder bank head cover.
- Hand tighten the screw **(12)** fastening the earth cable (G315).
- Apply UNIFLOR 8917 grease to the variable timing adjuster control solenoid valve connectors (C1.16).
- Fit the clamps **(10)** and connect the connectors **(11)** (L317) (L322)(L322).
- Fit the two Seeger rings **(9)** fastening the timing adjuster solenoid valve to the left hand cylinder bank head cover.

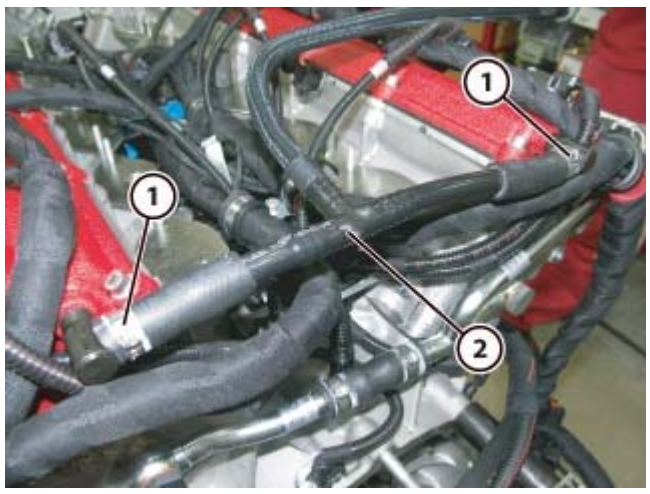
- Refit the coils (C1.12).

- Fit the terminals of the right hand cylinder bank injection cable on the right hand cylinder bank head.



- Fit the clamps **(7)** fastening the right hand cylinder bank injection cable **(A)** and the two timing sensors **(8)** on the right hand cylinder bank head cover.
- Hand tighten the screw **(6)** fastening the earth cable (G007).
- Apply UNIFLOR 8917 grease to the variable timing adjuster control solenoid valve connectors (C1.16).
- Fit the clamps **(4)** and connect the connectors **(5)** (L318) (L321).
- Fit the two Seeger rings **(3)** fastening the timing adjuster solenoid valve to the right hand cylinder bank head cover.

- Refit the coils (C1.12).



- Fit the two clamps **(1)** fastening the vapour pipe **(2)** onto the cylinder head covers.

- Refit the intake manifold (B6.02).
- Set the battery master switch to ON (L2.02).

Cooling circuit tightness test

- After an engine service, preferably carry out a cooling circuit tightness test.
- Pressure drop over **20 seconds** must not exceed **50 pa**.

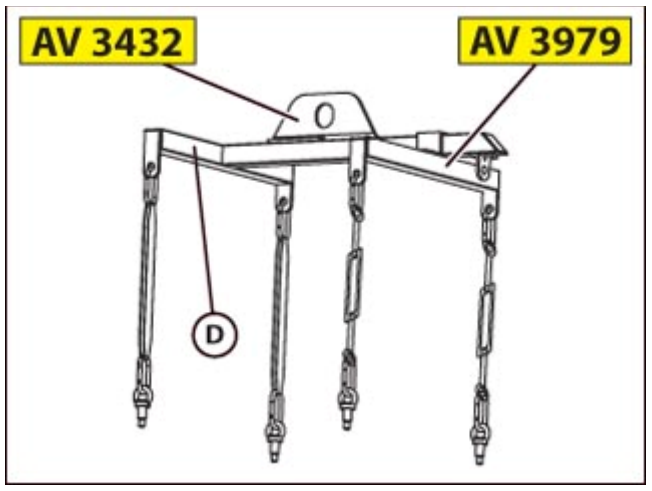
Lubricant circuit tightness test

- After an engine service, preferably carry out a lubricant circuit tightness test.
- Pressure drop over **20 seconds** must not exceed **150 pa**.

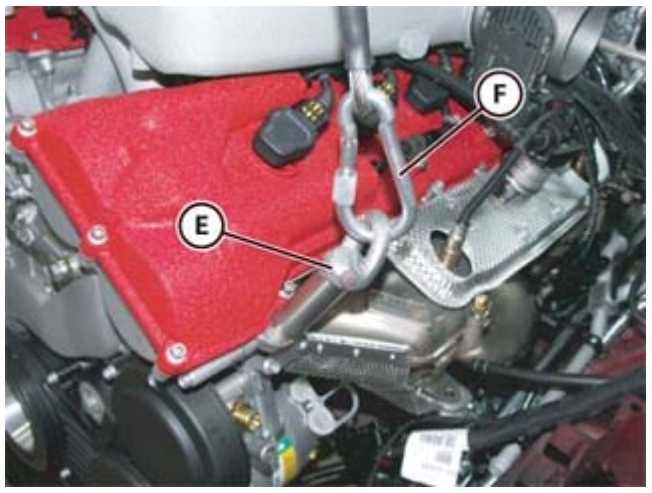
Preparing for installation in car



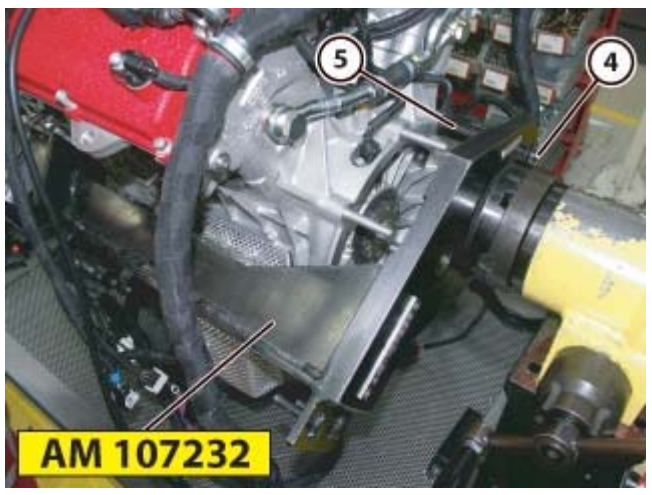
Tightening torque		**Nm**	**Class**
Engine mounting bracket - crankcase	Nut	53 Nm	A
	Screw (FROM Ass.ly No. 62963)	45 Nm	A



- To refit the engine in the vehicle, use a mobile hydraulic jack or a bridge crane with a minimum capacity of **300** Kg and the lifting tools **(AV 3432)** (also used for the Enzo) and **(AV 3979)**.
- Fit the tool **(AV 3979)** onto the hook of the bridge hoist, with the fixed axis **(D)** pointing towards the timing system, and position tool over the centre of the engine.



- Tighten the four elements **(E)** of the lifting tools into the respective mountings on the engine.
- Fasten the elements **(F)** of the lifting tools to the elements **(E)**.
- Lift the hook to tension the belts.

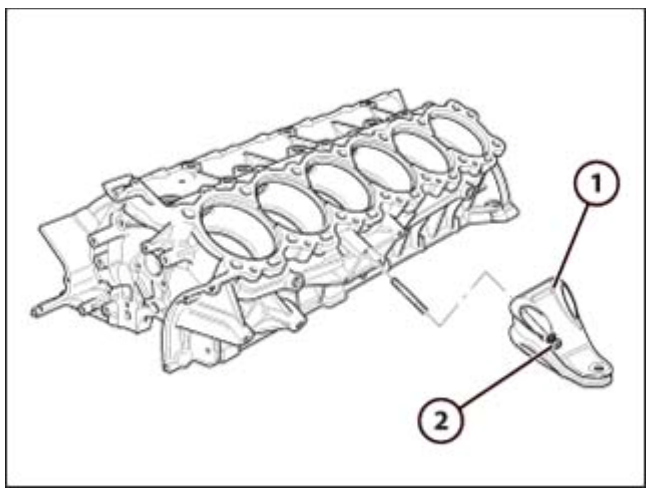


- Undo the screw **(4)** from the tool **(AM 107232)** in the stud bolt on the flywheel side and recover the spacer **(5)**.



- Remove the engine from the mounting tool **(AM 107232)**, undoing the four nuts **(3)**.

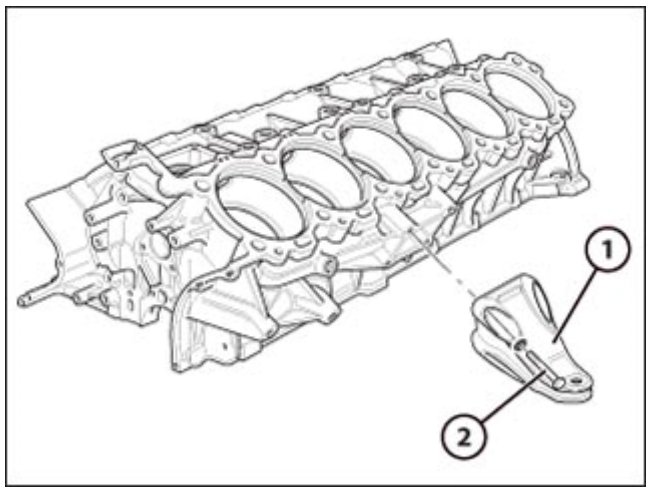
- Lift the engine and, taking care not to crush any cables with the hoisting belts, transfer the engine to a safe place, ensuring that it is perfectly stable.
- Remove the lifting tools.



- Fit the left hand engine mounting strut **(1)**, tightening the four nuts **(2)** after fitting the relative washers.



Tightening torque	Nm	Class
Nut	53 Nm	A



FROM Ass.ly No. 62963

- Fit the left hand engine mounting strut **(1)**, tightening the four screws **(2)** after fitting the relative washers.

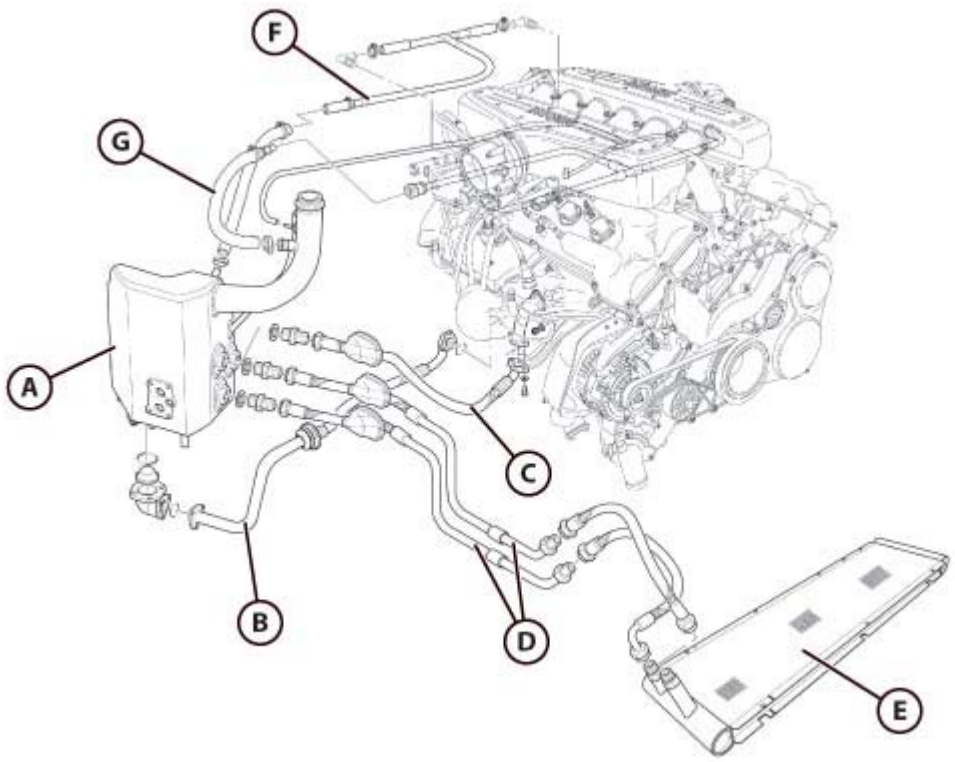


Tightening torque	Nm	Class
Screw (FROM Ass.ly No. 62963)	45 Nm	A

- Refit the rear left exhaust manifold (B6.06).
- Refit the rear right exhaust manifold (B6.06).
- Refit the front left exhaust manifold (B6.06).
- Refit the front right exhaust manifold (B6.06).
- Refit the flywheel (D2.04).
- Refit the complete clutch (D2.04).
- Refit the clutch housing (D2.04).
- Refit the engine in the vehicle (B2.02).

B3.01 System layout

Engine lubrication system diagram



A - Engine oil tank
B - Oil pipe from pump
C - Oil pipe from engine to tank
D - Oil pipes from tank to radiator
E - Engine oil radiator
F - Oil vapour pipe
G - Oil vapour aspiration pipe

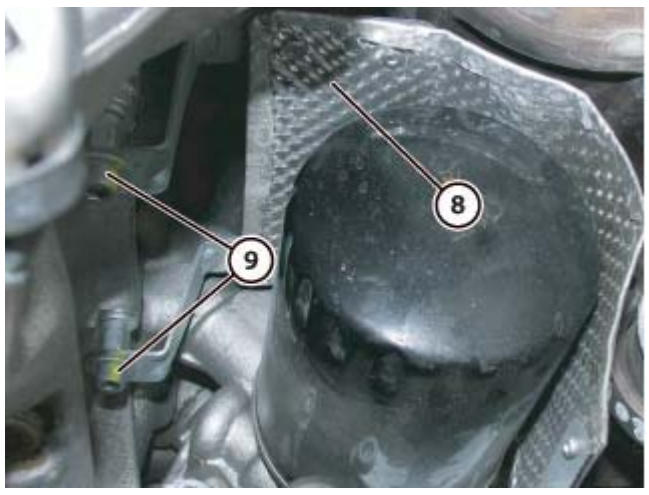
B3.02 Oil pump

Removing the engine oil-water pump

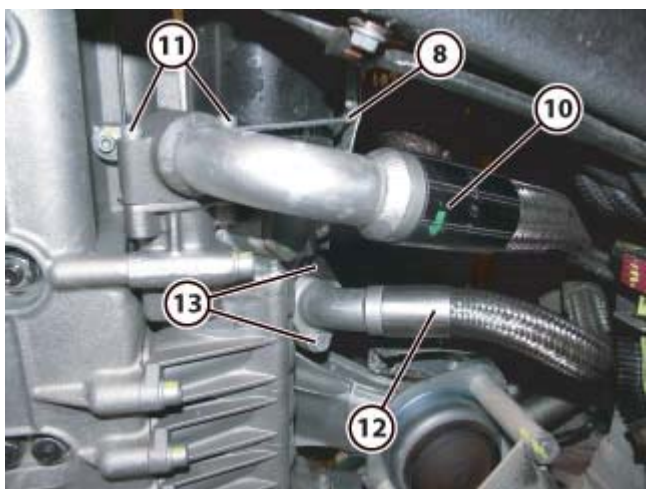
The engine water pump forms a single assembly with the engine oil pump; it is installed on the right hand side of the crankcase.

Some of the following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.

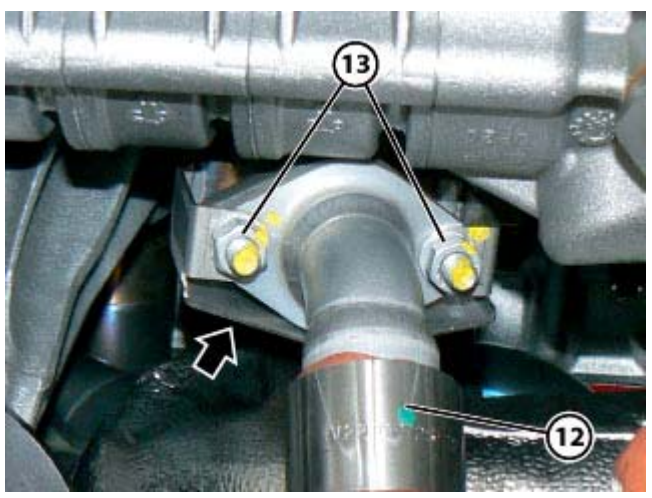
- Remove the front section of the underfloor (M2.12).
- Drain the engine lubrication system (A3.01).
- Drain the engine cooling system (A3.07).



- Undo the two screws **(9)** fastening the heat shield **(8 to the engine)**.



- Remove the oil delivery pipe **(10)** leading to the tank by undoing the three screws **(11)** and retrieving the heat shield **(8)**.
- Remove the oil delivery pipe **(12)** leading to the engine by undoing the two screws **(13)**.

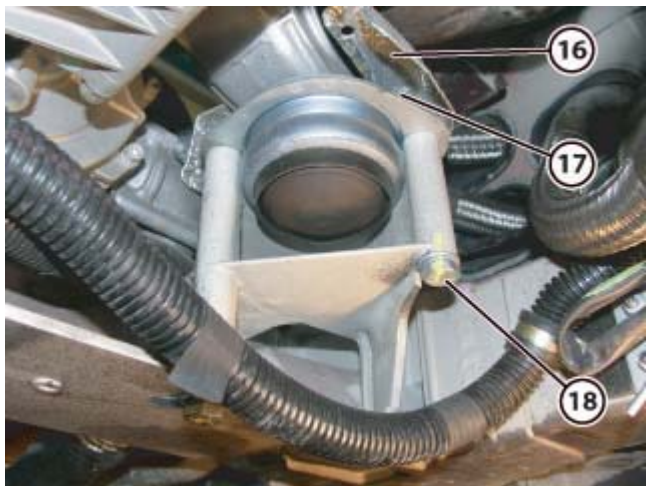


NEW SOLUTION

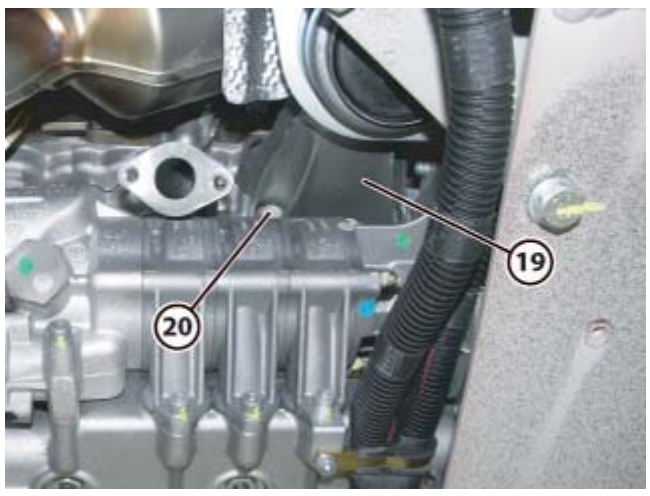
- **FROM Ass.ly No. 64841** remove the oil delivery pipe **(12)** leading to the engine, undoing the two nuts **(13)**.
- **FROM Ass.ly No. 68541** retrieve the indicated shield.



- Remove the clamp **(14)** and detach the coolant pipe **(15)**.



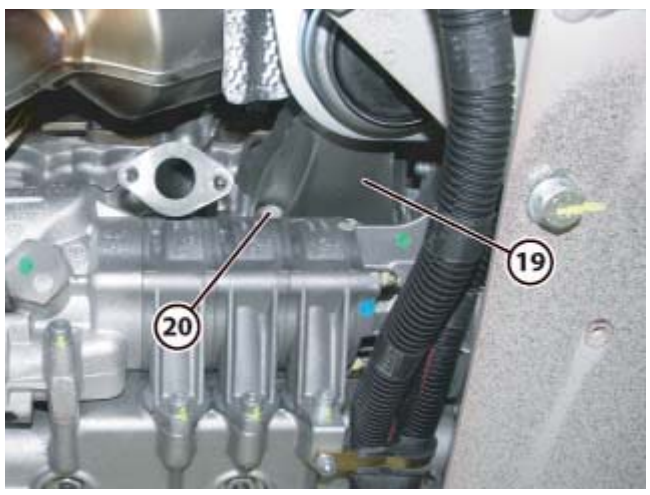
- Remove the heat shield **(16)** from the rubber bushing travel restrictor bracket, undoing the two screws **(17)** from above.
- Undo the two screws **(18)** securing the engine mounting bushing, recovering the rubber bushing travel restrictor bracket.



- Place a hydraulic jack under the engine so that it supports the weight of the engine and prevents it from tipping. Undo the four nuts **(20)** fastening the right hand engine mounting strut **(19)**.

Take particular care during the following operation not to damage the components connected to (pipes, cables etc.) and surrounding the engine.

- Raise the engine by a few millimetres to enable the removal of the right hand engine mounting strut **(19)** complete with engine mounting bushing.

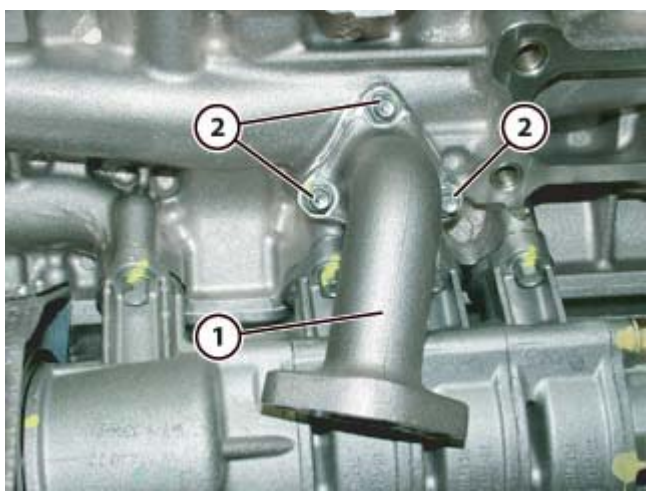


FROM Ass.ly No. 62963

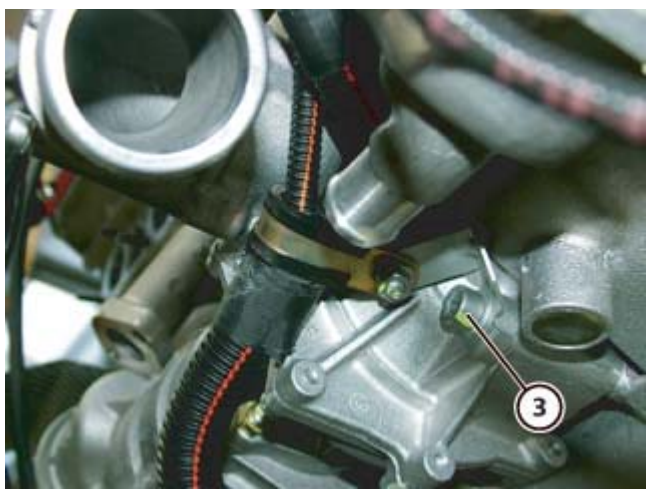
- Place a hydraulic jack under the engine so that it supports the weight of the engine and prevents it from tipping. Undo the four screws **(20)** fastening the right hand engine mounting strut **(19)**.

Take particular care during the following operation not to damage the components connected to (pipes, cables etc.) and surrounding the engine.

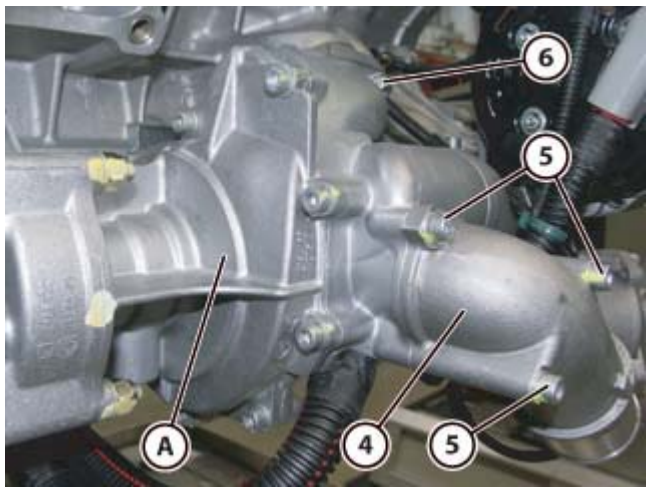
- Raise the engine by a few millimetres to enable the removal of the right hand engine mounting strut **(19)** complete with engine mounting bushing.



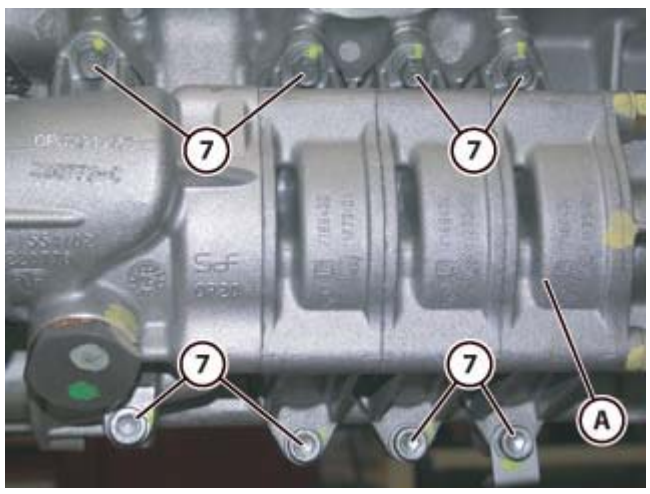
- Remove the engine oil pipe union **(1)** by undoing the three nuts **(2)**.



- Undo the lower front screw **(3)** of the pump on the crankcase.



- Remove the **(4)** union for the coolant inlet pipe leading to the pump **(A)** undoing the three screws **(5)** and retrieve the heat shield on the alternator.
- Undo the upper front screw **(6)** of the pump **(A)** on the crankcase.



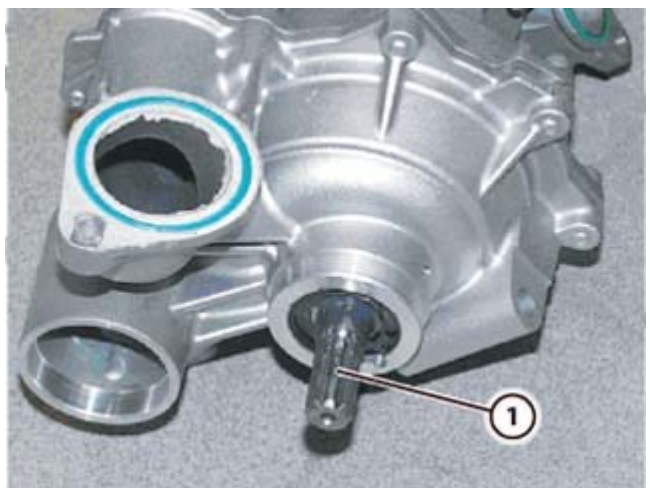
- Undo the eight screws **(7)** fastening the pump **(A)** onto the crankcase.

- Shift the pump a few centimetres backwards towards the clutch housing to allow the removal of the splined shaft from the pump drive shaft connected to the timing system.
- Remove the complete engine oil-water pump from the crankcase.

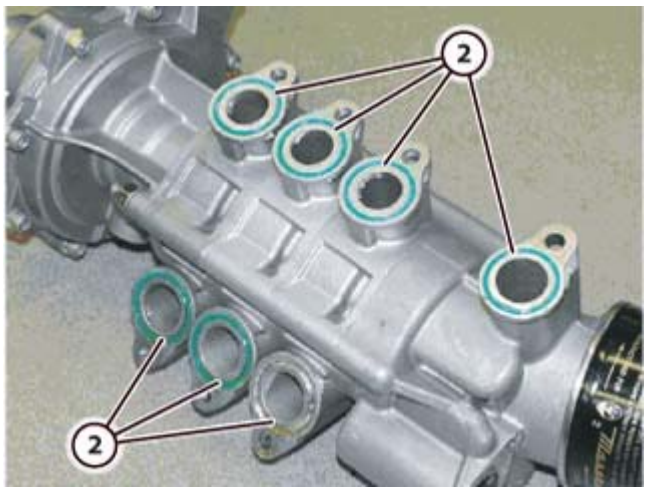
Refitting the engine oil-water pump

Tightening torque		**Nm**	**Class**
Oil/water pump - crankcase	Screw	25 Nm	A
Water inlet union - water/oil pump	Screw	10 Nm	B
Engine mounting bracket - crankcase	Nut	53 Nm	A
	Screw (FROM Ass.ly No. 62963)	45 Nm	A
Rubber bushing - chassis	Screw	50 Nm	B
Coolant outlet pipe - radiator	Clamp	4 Nm	B
Oil pipe - engine Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Screw / Nut	20 Nm	B
Fastening for oil pipe from pump to oil tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B

Some of the following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.



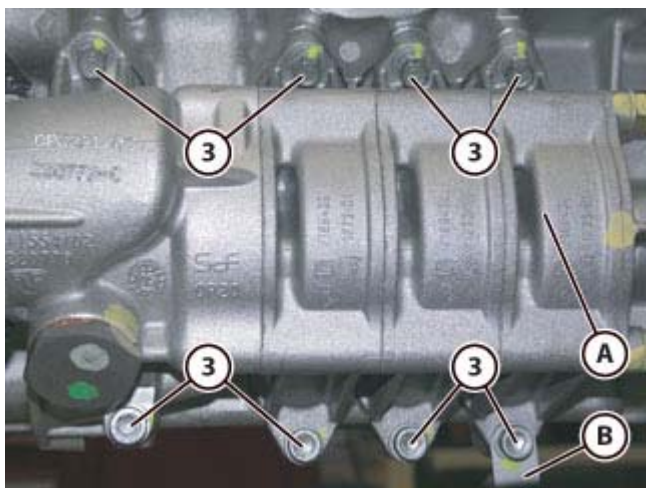
- With the oil-water pump on the bench, check that there are no leaks from the drain holes.
- When refitting the same water-oil pump, check the groove on the shaft **(1)** for wear.
- Apply a thin film of **MOLYKOTE BR2** to the shaft **(1)**.



- Apply a thin film of **SHELL ALVANIA RL3** to the O-rings and the respective seats on the pump and crankcase.

Always replace O-rings with new components.

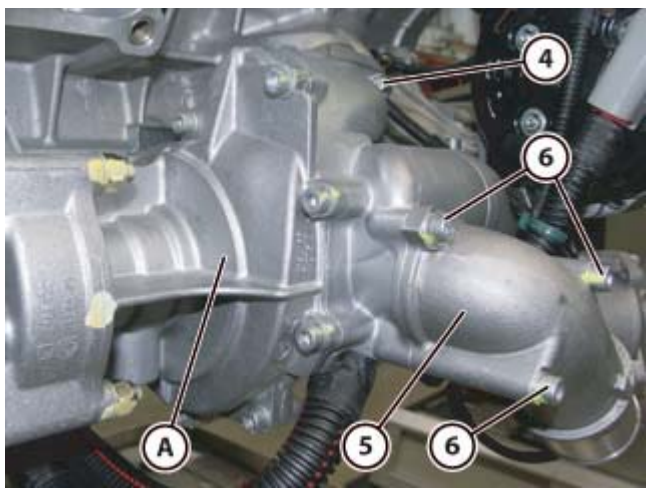
- Fit the O-rings **(2)** on the inlets of the oil-water pump.



When fitting the water-oil pump onto the engine, take particular care not to pinch the new O-rings or push them out of their respective seats.

- Fit the complete oil-water pump on the crankcase, inserting the grooved shaft into the pump drive shaft.
- Fasten the water-oil pump **(A)** by tightening the eight screws **(3)** and fitting clamp mounting bracket **(B)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

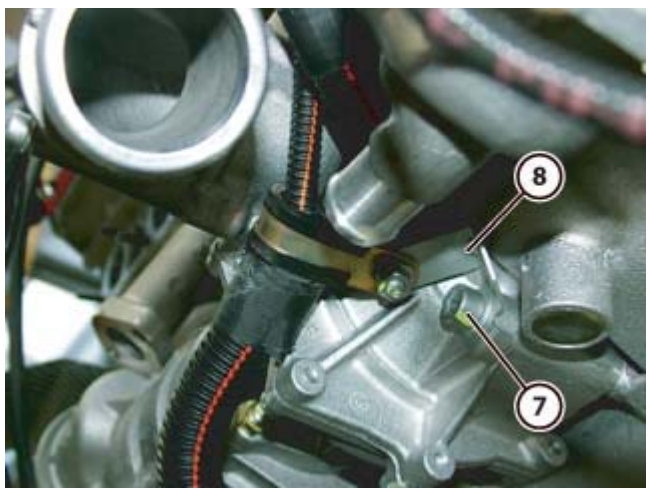


- Fasten the oil-water pump **(A)** by tightening the upper front screw **(4)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

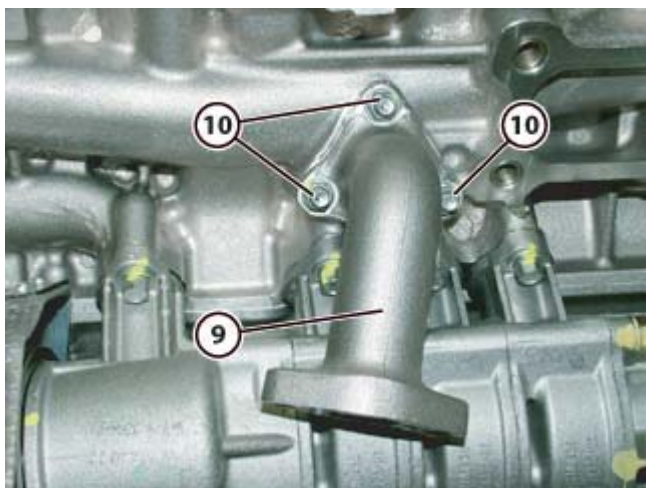
- Replace the O-ring on the inlet union **(5)** of the oil-water pump after applying a thin film of grease **SEGO**. Fit the heat shield onto the alternator as originally mounted and fasten the union **(5)** onto the pump, tightening the three screws **(6)**.

Tightening torque	Nm	Class
Screw	10 Nm	B

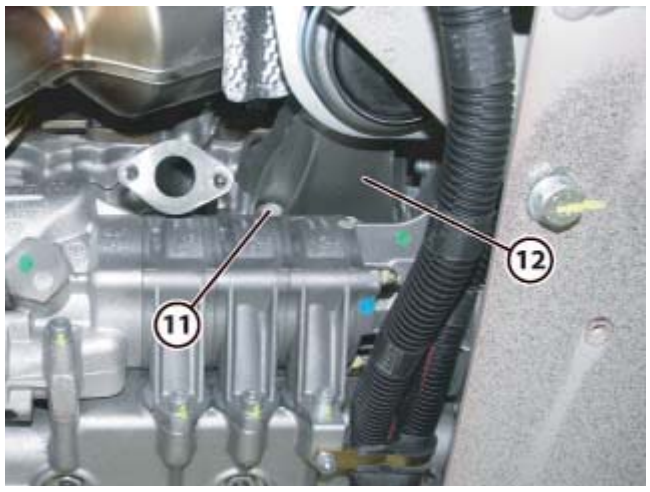


- Apply the lower front screw **(7)** of the oil/water pump and tighten after fitting the bracket **(8)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

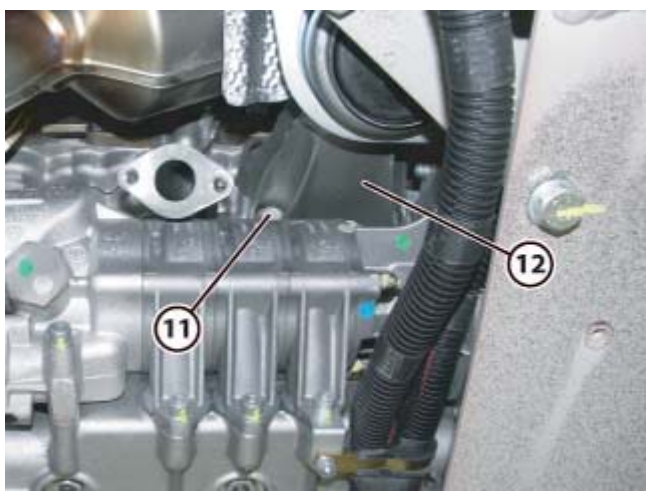


- Fit the oil pipe union **(9)** onto the crankcase after replacing the O-ring with a new component and applying a thin film of grease to the ring **SEGO**.
- Tighten the three nuts **(10)**.



- Fit the right hand engine support strut **(12)**, complete with engine mounting bushing, in its respective mounting on the crankcase and fasten by tightening the four nuts **(11)**.

Tightening torque	Nm	Class
Nut	53 Nm	A



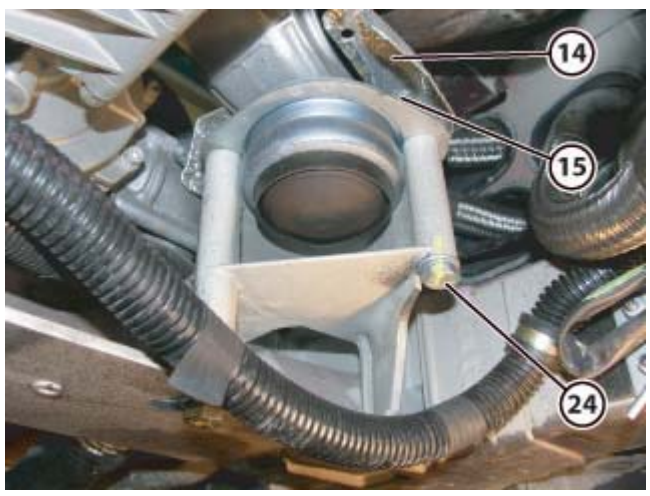
FROM Ass.ly No. 62963

- Fit the right hand engine mounting strut **(12)**, complete with engine mounting bushing, in its relative seat on the crankcase and fasten by tightening the four screws **(11)**.

Tightening torque	Nm	Class
Screw (FROM Ass.ly No. 62963)	45 Nm	A



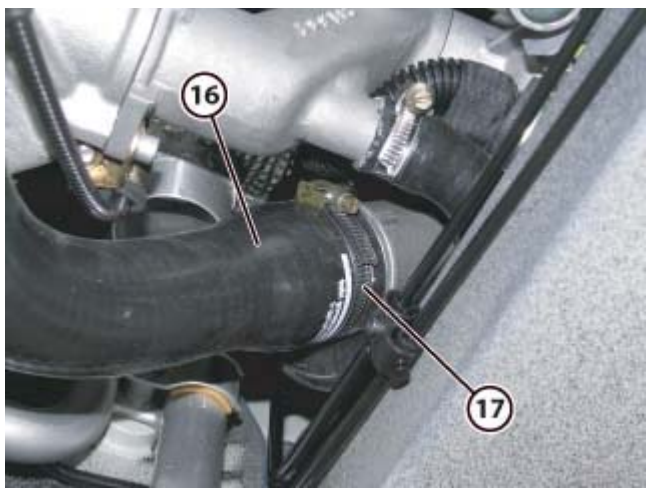
- Lower the hydraulic lift slowly until the engine mounting bushing rests on and aligns with the chassis.
- Fit the rubber bushing travel restrictor bracket **(13)**, aligning with the engine mounting bushing.



- Fit the engine mounting bushing to the chassis, tightening the two screws **(24)**.

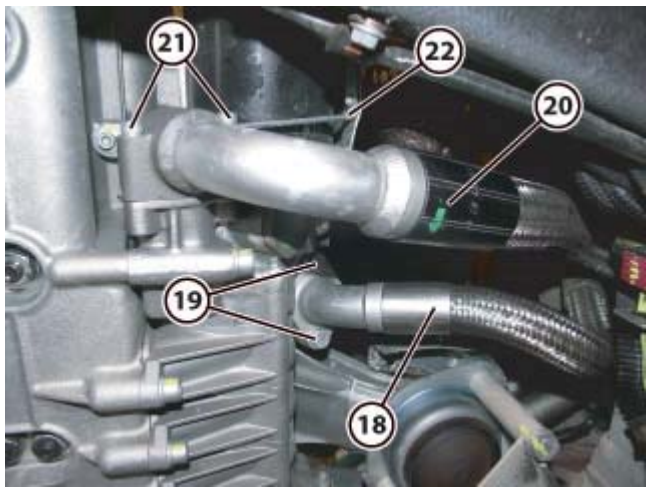
Tightening torque	Nm	Class
Screw	50 Nm	B

- Fit the heat shield **(14)** in its relative mounting on the rubber bushing travel restrictor bracket and tighten the two screws **(15)**.



- Fit the coolant pipe **(16)** onto its relative union and fasten by tightening the clamp **(17)**.

Tightening torque	Nm	Class
Clamp	4 Nm	B

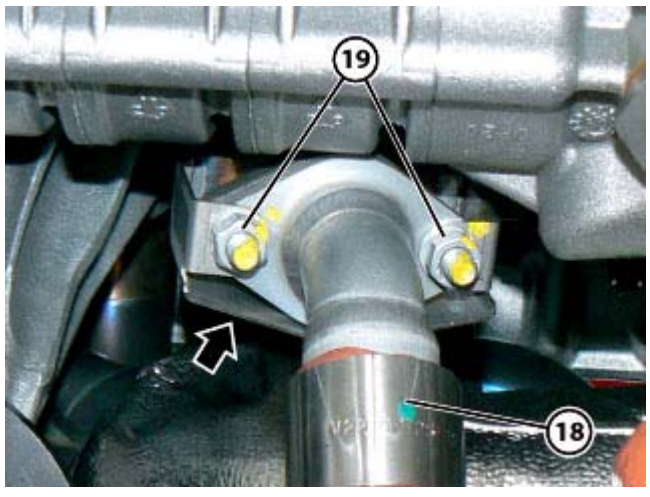


- Replace the O-rings on the two oil pipes **(18)** and **(20)** with new rings after moistening the rings with engine oil.
- Fit the oil delivery pipe **(18)** to the engine and fasten by tightening the two screws **(19)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B

- Fit the oil delivery pipe **(20)** leading to the oil tank and fasten by tightening the three screws **(21)** after fitting the heat shield **(22)** between the two parts.

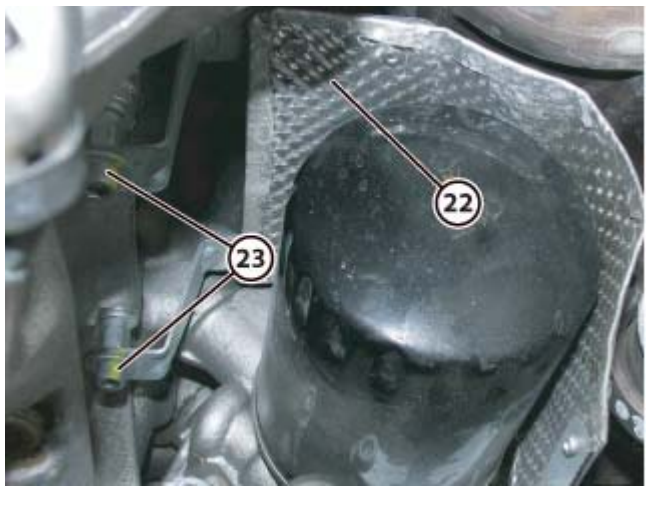
Tightening torque	Nm	Class
Nut	10 Nm	B



NEW SOLUTION

- **FROM Ass.ly No. 68541** fit the indicated shield.
- **FROM Ass.ly No. 64841** fit the oil delivery pipe **(18)** leading to the engine and fasten by tightening the two nuts **(19)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B



- Fit the heat shield **(22)** and fasten by tightening the two screws **(23)**.

- Fill the cooling system (A3.07).
- Fill the engine lubrication system (A3.01).
- Refit the front flat undertray section (M2.12).

B3.03 Oil tank

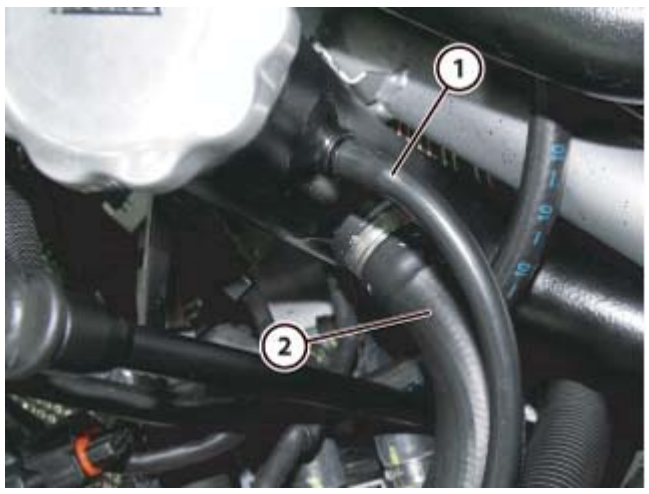
Removing the engine oil tank

The tank is fitted in the engine compartment, on the right hand side of the vehicle, and has a filler neck with cap and dipstick for checking the oil level.

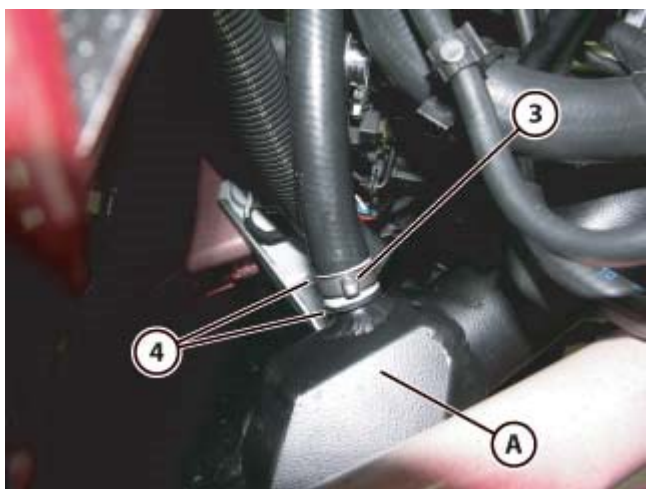
- Remove the engine compartment shields on the fenders (M2.17).
  - Remove the right hand component.

- Remove the right hand side windscreen shield (M2.17).
- Remove the front section of the underfloor (M2.12).
- Remove the front right hand wheelhouse (M2.05).
  - Remove the rear section only.

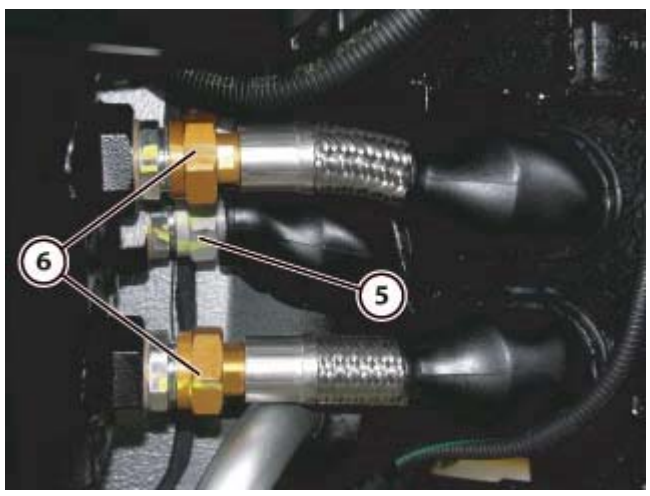
- Drain the engine lubrication system (A3.01).



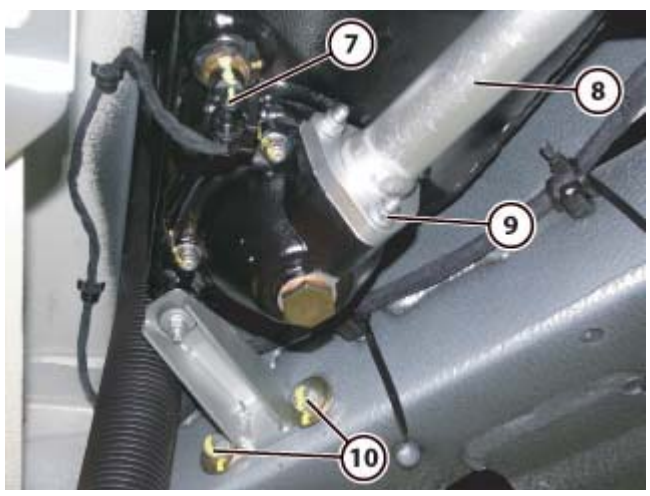
- Remove the breather pipe **(1)** and loosen the pipe clamp **(2)**.



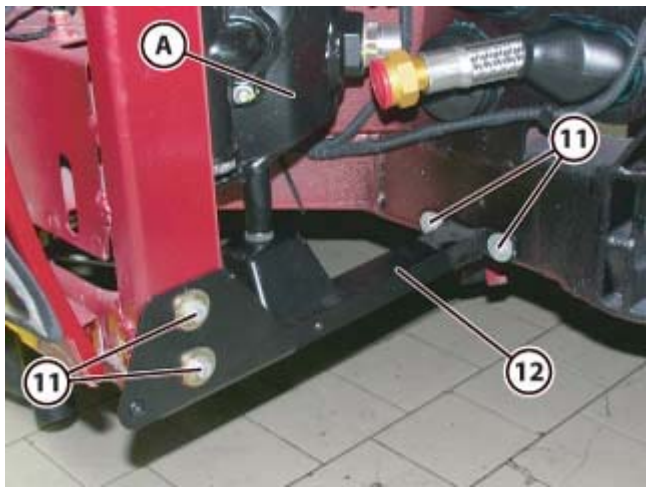
- Detach the oil vapour recovery pipe **(3)** from the crankcase and undo the upper screws **(4)** fastening the tank mounting bracket **(A)**.



- Remove the two delivery and return pipes **(6)** leading to the radiator.
- Remove the oil return pipe **(5)** leading to the tank.



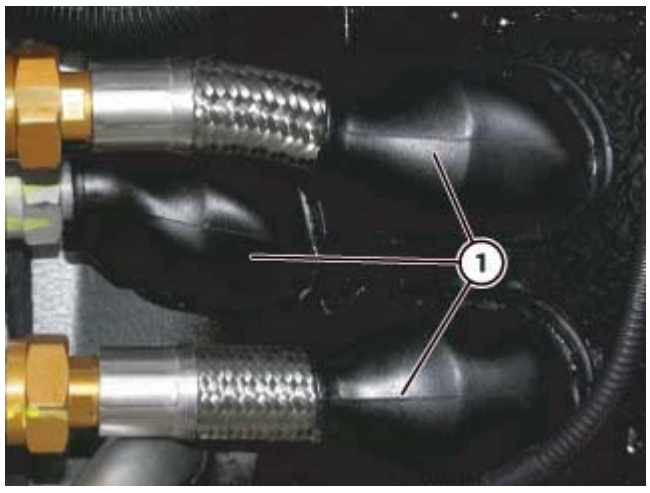
- Detach the connector pipe **(8)** between the tank and the pump, by unscrewing the three nuts **(9)**.
- Remove the thermistor connector **(7)** (S060) and undo the two screws **(10)** fastening the lower tank mounting bracket to the bodywork.



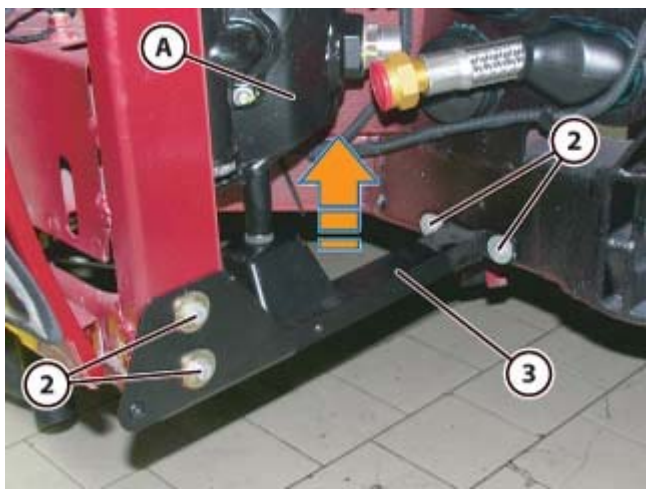
- Support the weight of the tank and undo the four screws **(11)** fastening the lower bracket **(12)** to the bodywork.
- Remove the tank **(A)**, easing out from underneath the vehicle.

Refitting the engine oil tank

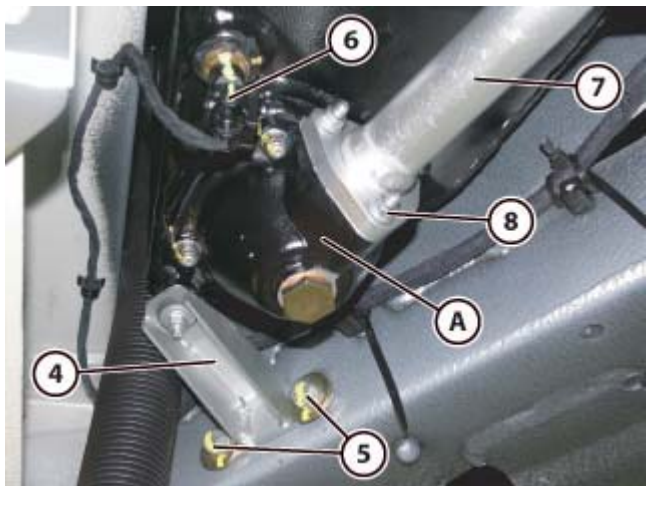
Tightening torque		Nm	Class
Fastening for oil pipe from pump to oil tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B
Connection for oil return pipe to tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Connection for radiator oil delivery pipe to tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B
Connection for radiator oil return pipe to tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B



- Check that the rubber tank mounting bushings, the pipe gaskets and the three splash guards **(1)** on the engine oil pipes are in good condition. Replace any damaged components, refitting as originally installed.

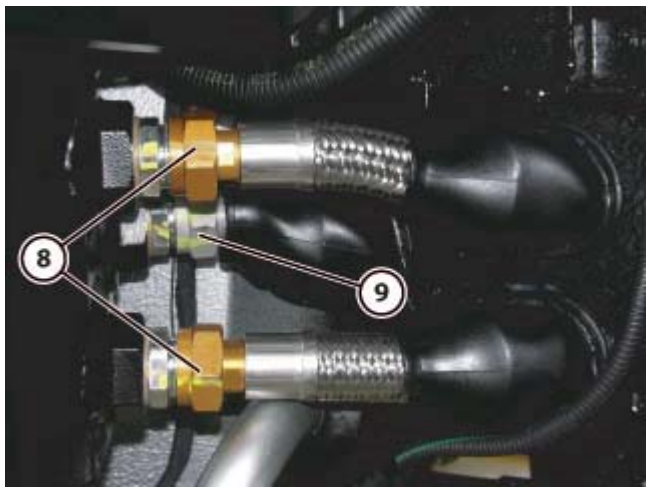


- Fit the tank **(A)**, complete with brackets, in its respective seats, introducing the tank from underneath the chassis and taking care not to damage any surrounding pipes, gaskets or components.
- Fasten the bracket **(3)** tightening the four screws **(2)** to the bodywork



- Fasten the bracket **(4)**, mounted on the tank **(A)**, to the chassis, tightening the two screws **(5)**.
- Refit the connector **(6)** (S060) on the thermistor.
- Apply grease **TUTELA MR3** to the flange of the pipe **(7)** leading to the oil pump.
- Tighten the nuts **(8)** fastening the pipe **(7)** to the tank.

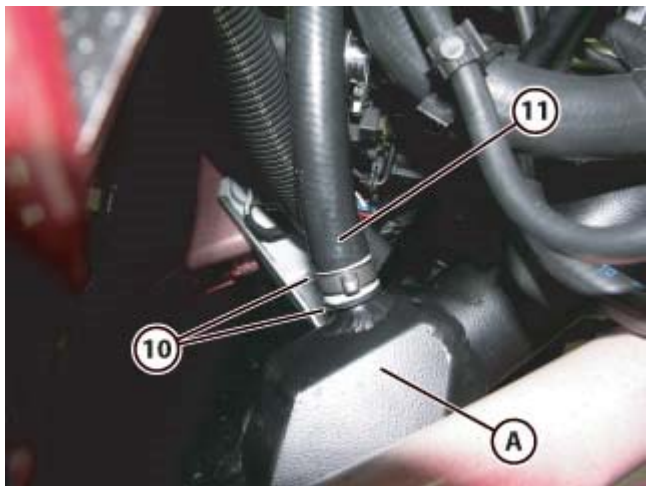
Tightening torque	Nm	Class
Nut	10 Nm	B



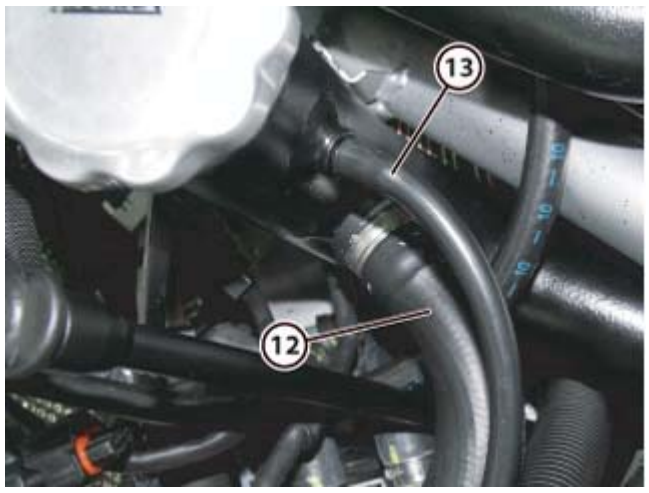
- Tighten the unions of the pipes **(8)** and of the pipe **(9)**.



Tightening torque	Nm	Class
Union	70 Nm	B
Union	70 Nm	B
Union	70 Nm	B



- Tighten the two screws **(10)** fastening the upper bracket to the tank.**(A.)**
- Fit the oil vapour recovery pipe **(11)** leading from the crankcase to the tank.**(A)**



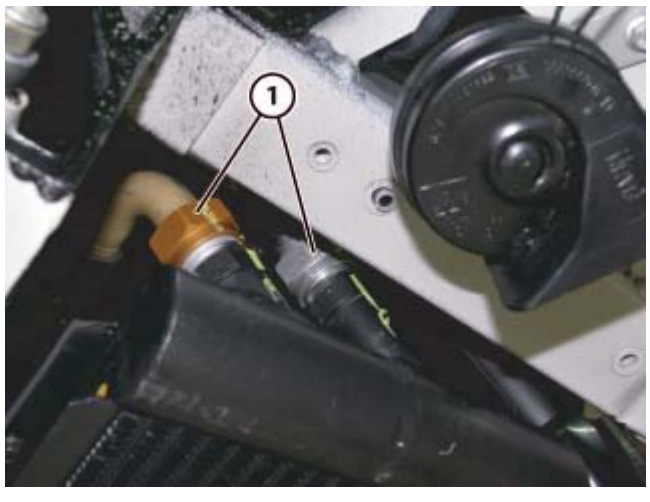
- Reconnect the pipes **(12)** and **(13)** to the tank with the clamps.

- Fill the engine lubrication system (A3.01).
- Refit the front right hand wheelhouse (M2.05).
- Refit the front flat undertray section (M2.12).
- Refit the right hand side underwindscreen shield (M2.17).
- Refit the engine compartment shields on the fenders (M2.17).

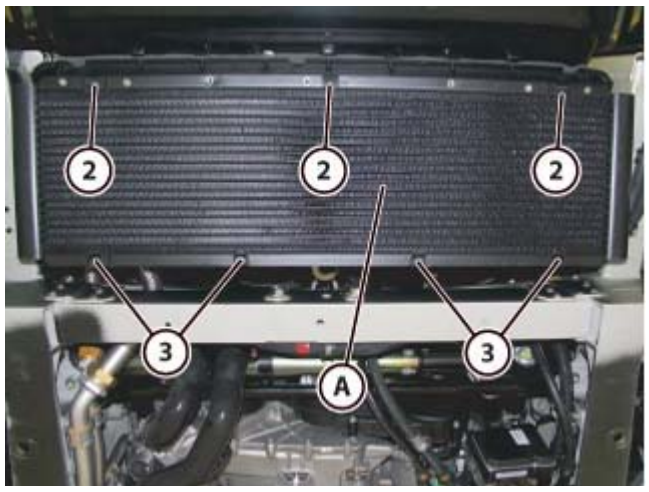
B3.04 Engine oil radiator

Removing the engine oil radiator

- The engine oil radiator is located in the engine compartment, near the bottom the vehicle, installed on the coolant radiator mounting brackets.
- Remove the front section of the underfloor (M2.12).
- Remove the front bumper (M2.03).
- Drain the engine lubrication system (A3.01).



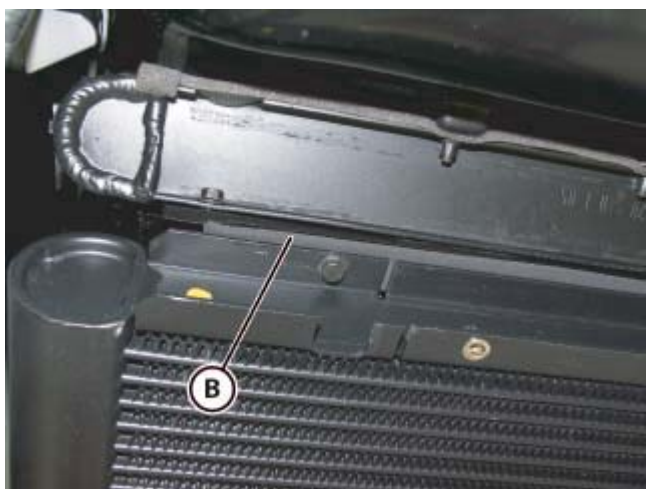
- Working from underneath the vehicle, unscrew the unions for the oil delivery and return pipes **(1)**.



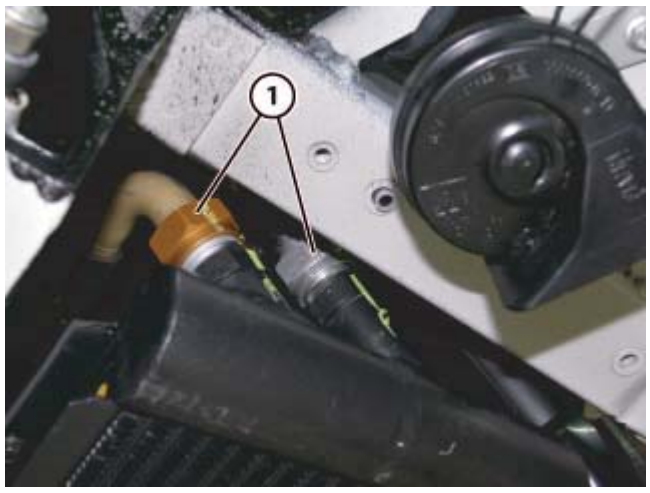
- Supporting the weight of the engine oil radiator **(A)**, undo the three screws **(2)** fastening it to the coolant radiator.
- Undo the four screws **(3)** fastening the oil radiator to the coolant radiator brackets and remove the oil radiator **(A)**.

Refitting the engine oil radiator

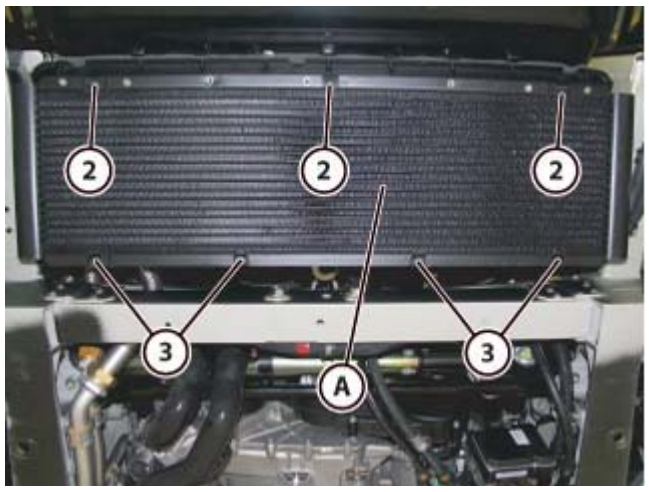
Tightening torque		**Nm**	**Class**
Engine oil radiator - duct	Screw	5 Nm	A
Oil delivery pipe - radiator Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	70 Nm	B



- Check the state of the noise damper foam rubber **(B)** between the oil and coolant radiator. Replace if necessary, refitting as originally installed.



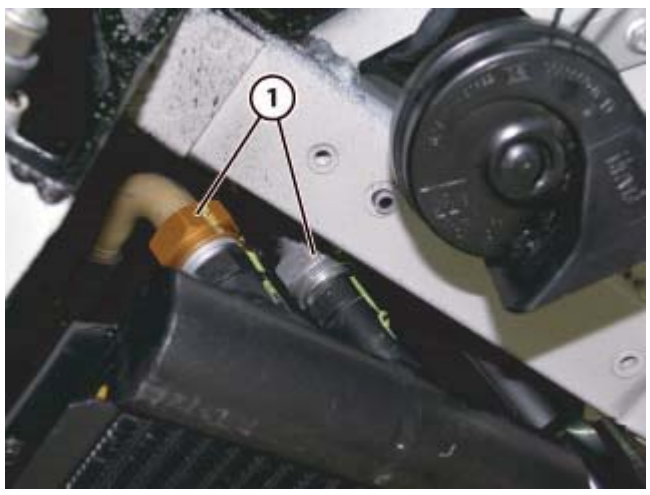
- Support the oil radiator and fit in the vehicle, aligning the oil pipe inlet and outlet.
- Tighten the oil delivery and return pipe unions **(1)**.



- Supporting the weight of the radiator **(A)**, tighten the screws **(2)** and **(3)**.



Tightening torque	Nm	Class
Screw	5 Nm	A



- Tighten the unions on the pipes **(1)**.

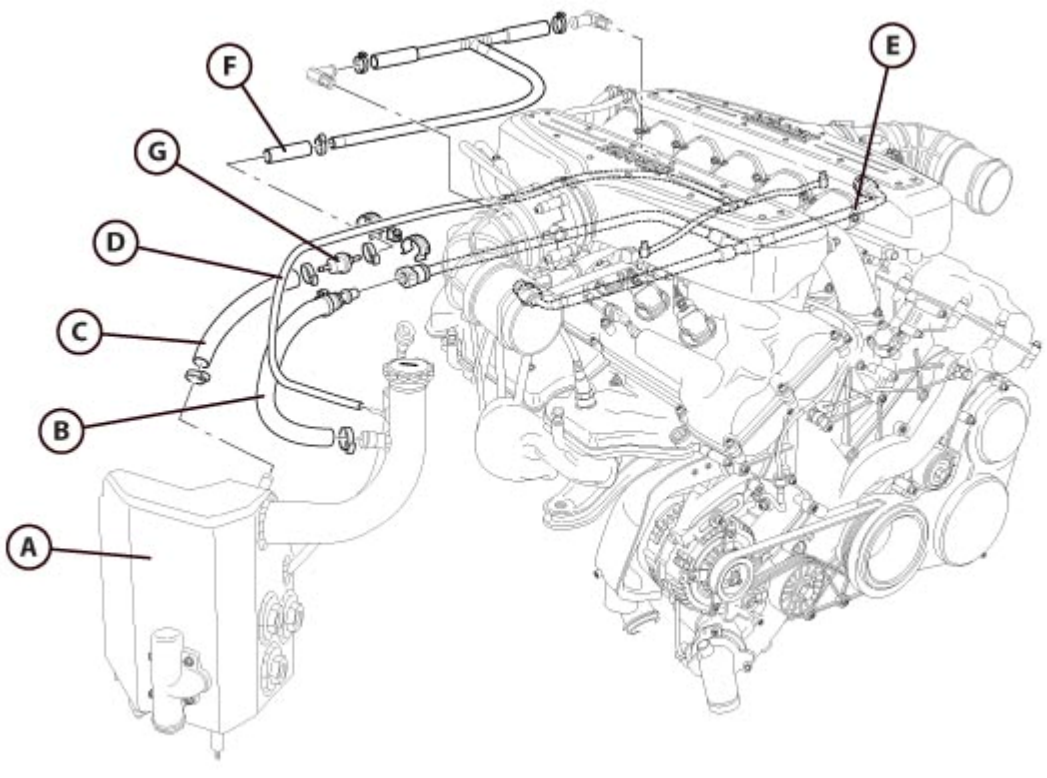


Tightening torque	Nm	Class
Union	70 Nm	B

- Fill the engine lubrication system (A3.01).
- Refit the front bumper (M2.03).
- Refit the front flat undertray section (M2.12).

B3.05 Oil vapour separator

Blow-by system



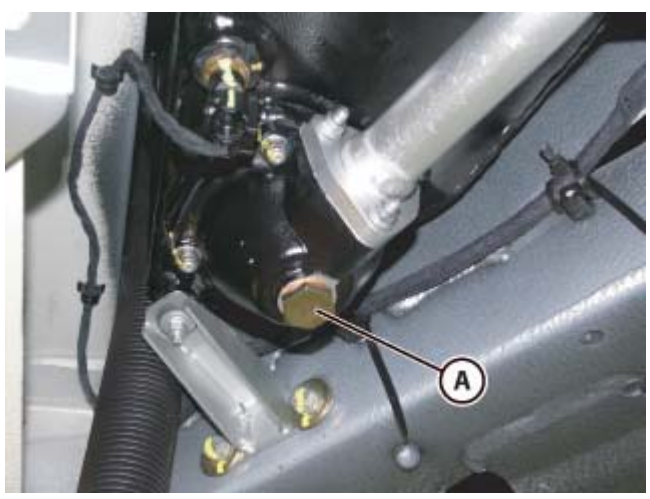
A - Engine oil tank
B - Oil vapour aspiration pipe
C - PCV pipe leading to tank
D - Oil vapour bleeder pipe
E - Blow-by pipe
F - Vapour pipe
G - Check valve

B3.06 Draining and filling

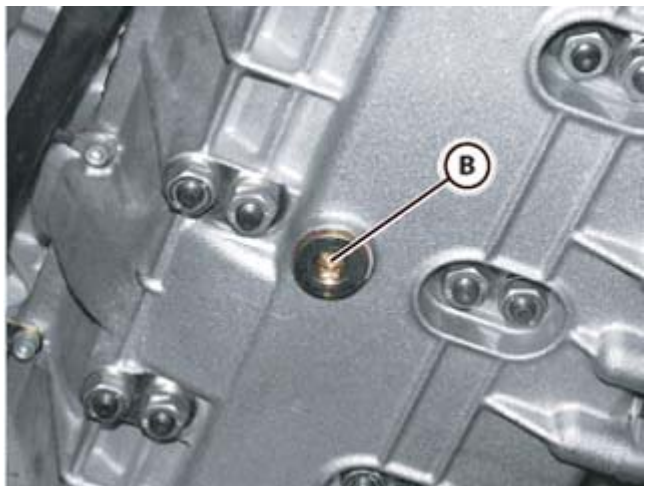
Draining the engine lubrication system

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

➢ Remove the front section of the underfloor (M2.12).



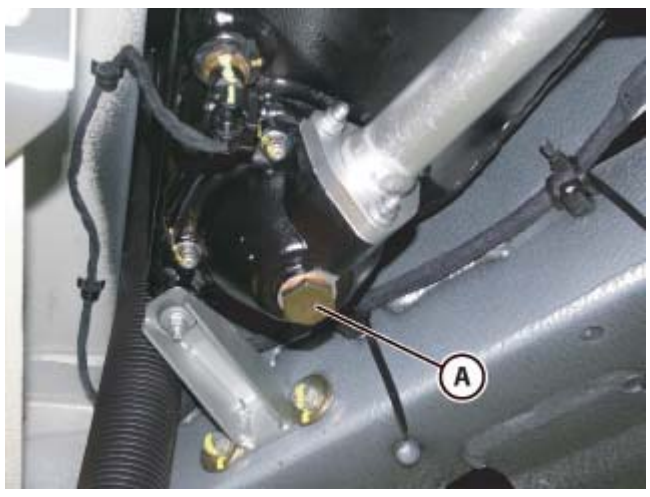
- Unscrew the oil draining cap **(A)** on the tank.



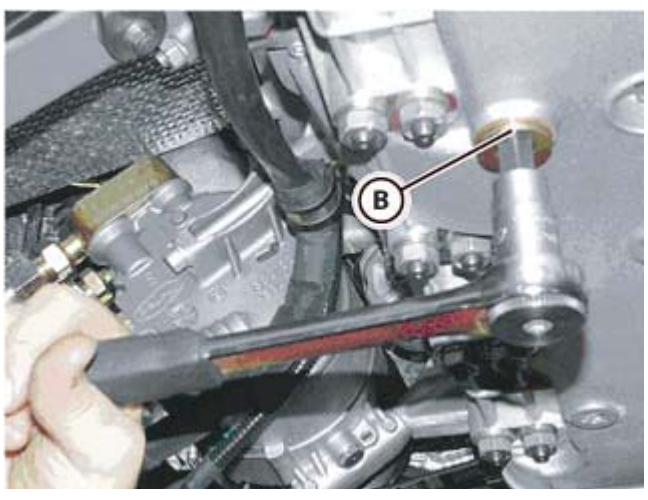
- Unscrew the cap **(B)** on the crankcase sump and drain all the oil.

Filling the engine lubrication system

Tightening torque		**Nm**	**Class**
22 mm threaded cap for oil orifices on crankcase	Threaded cap	60 Nm	B



- Screw the lower cap **(A)** onto the engine oil tank.



- Always replace the cap seal **(B)** with a new one
- Tighten the cap **(B)** on the oil sump.

Tightening torque	**Nm**	**Class**
Threaded cap	60 Nm	B



- Unscrew the cap **(C)** on the oil tank and remove.

- Fill the system with **11.7 l** of the specified oil.

The quantity of oil required may vary slightly relative to the amount indicated for filling the tank when empty; this is due to unavoidable pooling within the system.

Refill slowly and do not exceed the reference notches on the dipstick.

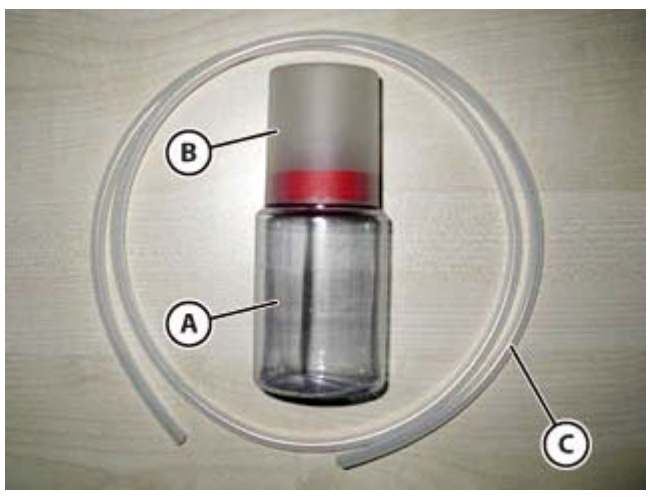
- Fully tighten the oil filler cap on the tank.
- Start the engine and leave running at idle speed to reach a temperature of **95°C** (approx. 10 minutes after starting).

PAO additive must be added to the lubrication circuit at each engine oil change.

- Unscrew the oil tank cap and add, pouring slowly and in small quantities at a time, **800 g** of **PAO code No. 232571** additive to the tank (filling process should take about 10 minutes to complete).

- Check that there are no oil leaks from the draining caps and the filter cartridge.
- Check the engine oil level (A3.01).
- Fully tighten the oil filler cap on the tank.

Taking engine oil samples



The bottle contains a vacuum (-950 mbar depression).
DO NOT remove the outer cap or turn the valve before use.
The following sampling procedure must be performed with the engine warm: run the engine to reach normal operating temperature.

- To take an engine oil sample, use the **"Vacuum bottle with tube" KIT, Part No. 070001988**, consisting of:
- Bottle **(A)**;
- Outer cap **(B)**;
- Tube **(C)**.



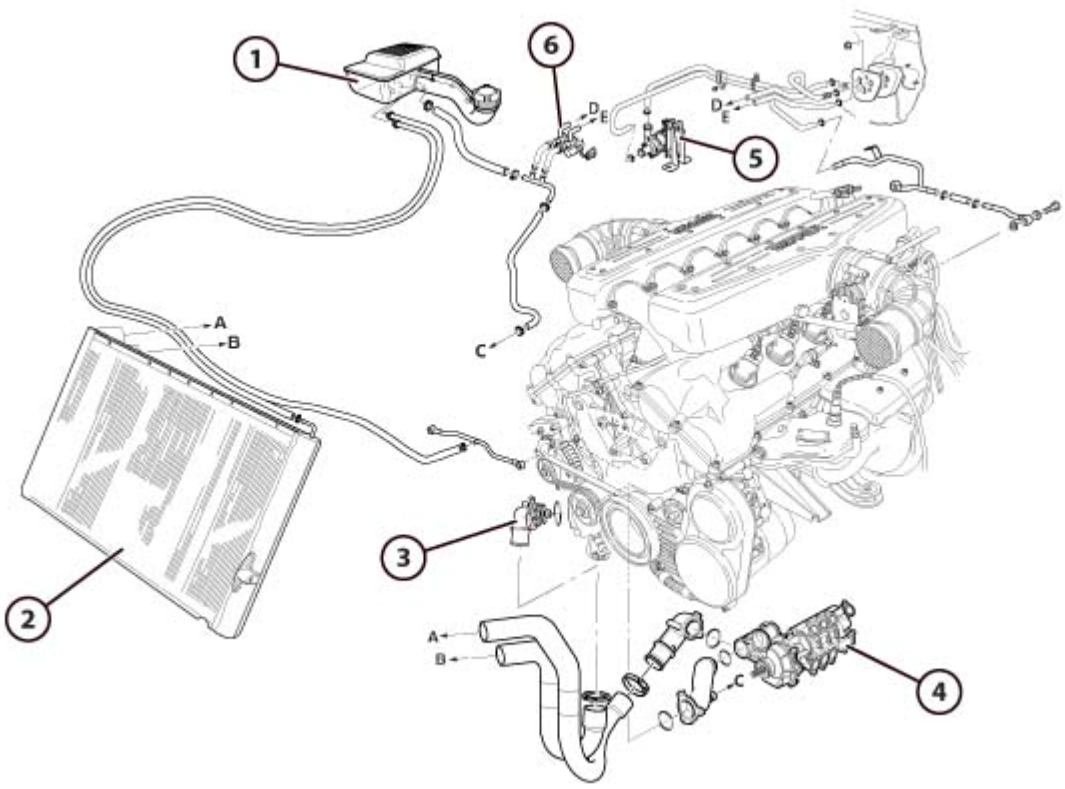
- Remove the outer cap from the bottle.
- Unscrew the engine oil tank cap and insert one end of the sample tube into the tank to reach the oil.

Only insert the length of tube necessary to immerse the end in the oil.

- Connect the bottle to the end of the tube.
- Turn the valve by **90°**.
- Once the bottle is filled, close the valve by turning back **90°**.
- Disconnect the bottle from the tune and refit the outer cap.
- Tighten the cap fully onto the engine oil tank.
- Print out the specific label (annexed with Technical Information) on adhesive paper, compile the label with the information requested and apply to the bottle.

B4.01 System layout

Cooling system diagram



1 - Coolant tank
2 - Coolant radiator
3 - Pressure switch/thermostat
4 - Engine oil-water pump
5 - Recirculation pump
6 - TGK valves

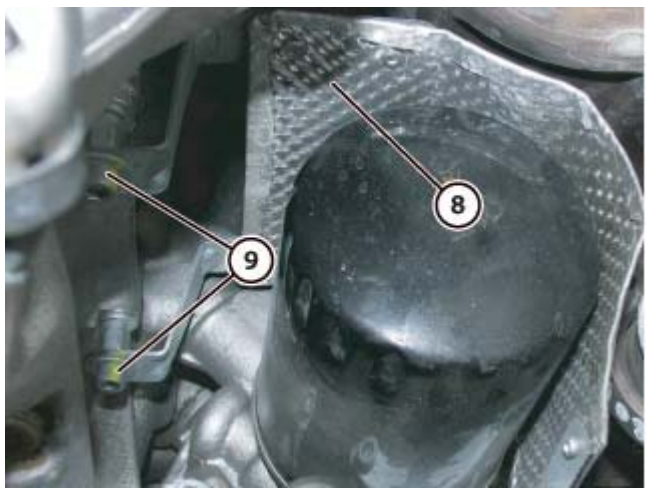
B4.02 Water pump

Removing the engine oil-water pump

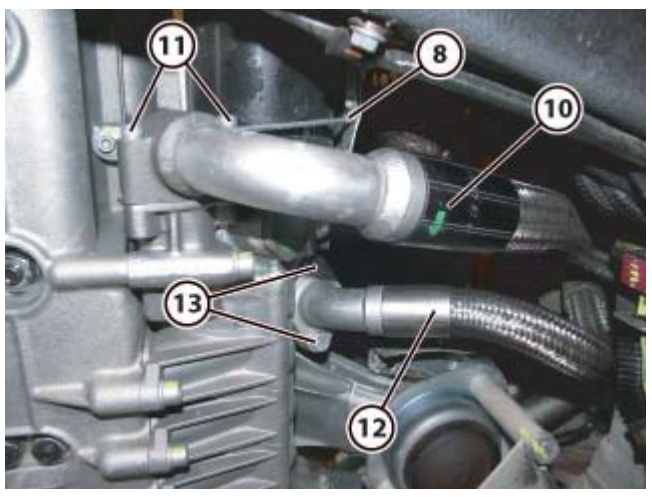
The engine water pump forms a single assembly with the engine oil pump; it is installed on the right hand side of the crankcase.

Some of the following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.

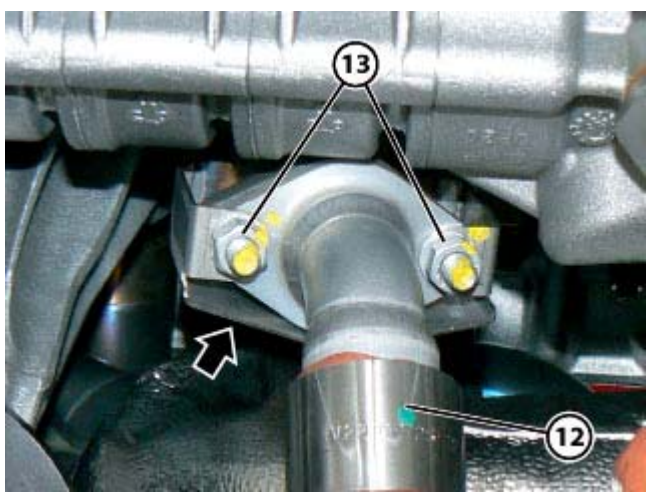
- Remove the front section of the underfloor (☞ M2.12).
- Drain the engine lubrication system (☞ A3.01).
- Drain the engine cooling system (☞ A3.07).



- Undo the two screws **(9)** fastening the heat shield **(8 to the engine)**.

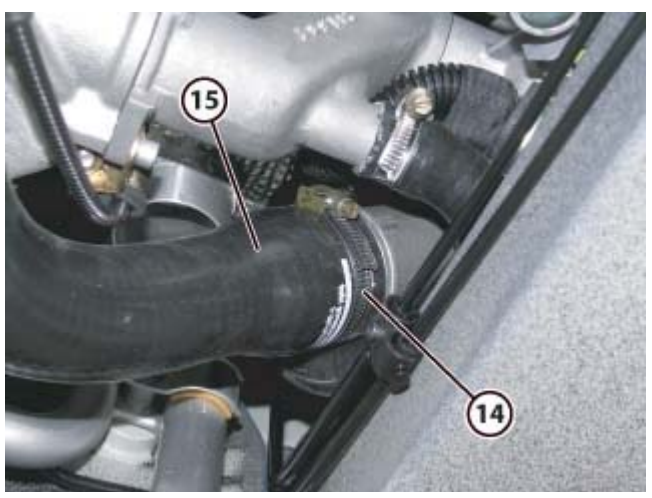


- Remove the oil delivery pipe **(10)** leading to the tank by undoing the three screws **(11)** and retrieving the heat shield **(8)**.
- Remove the oil delivery pipe **(12)** leading to the engine by undoing the two screws **(13)**.

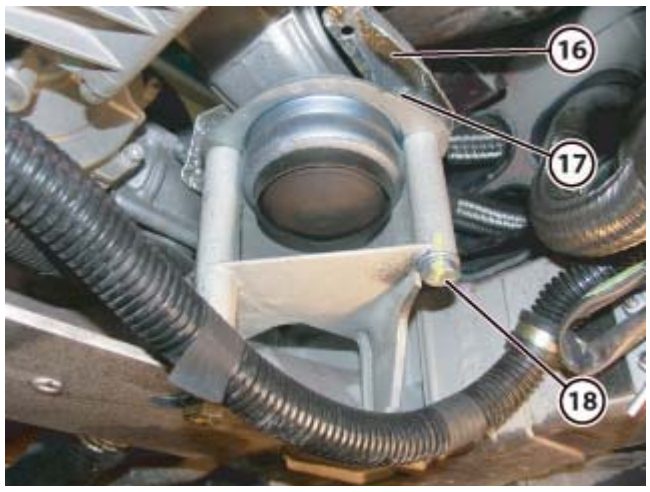


NEW SOLUTION

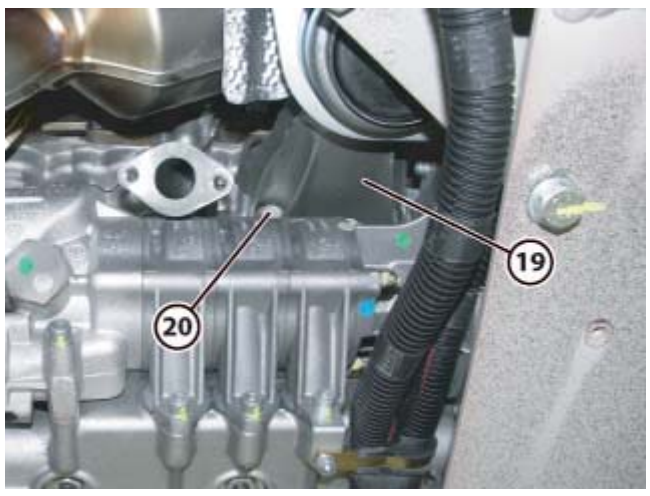
- **FROM Ass.ly No. 64841** remove the oil delivery pipe **(12)** leading to the engine, undoing the two nuts **(13)**.
- **FROM Ass.ly No. 68541** retrieve the indicated shield.



- Remove the clamp **(14)** and detach the coolant pipe **(15)**.



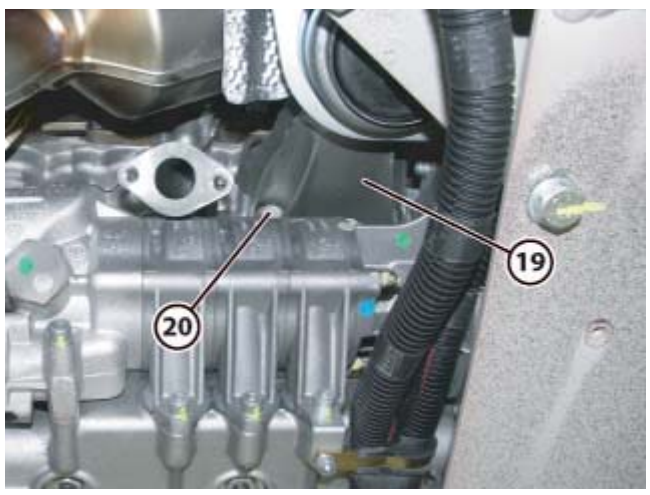
- Remove the heat shield **(16)** from the rubber bushing travel restrictor bracket, undoing the two screws **(17)** from above.
- Undo the two screws **(18)** securing the engine mounting bushing, recovering the rubber bushing travel restrictor bracket.



- Place a hydraulic jack under the engine so that it supports the weight of the engine and prevents it from tipping. Undo the four nuts **(20)** fastening the right hand engine mounting strut **(19)**.

Take particular care during the following operation not to damage the components connected to (pipes, cables etc.) and surrounding the engine.

- Raise the engine by a few millimetres to enable the removal of the right hand engine mounting strut **(19)** complete with engine mounting bushing.

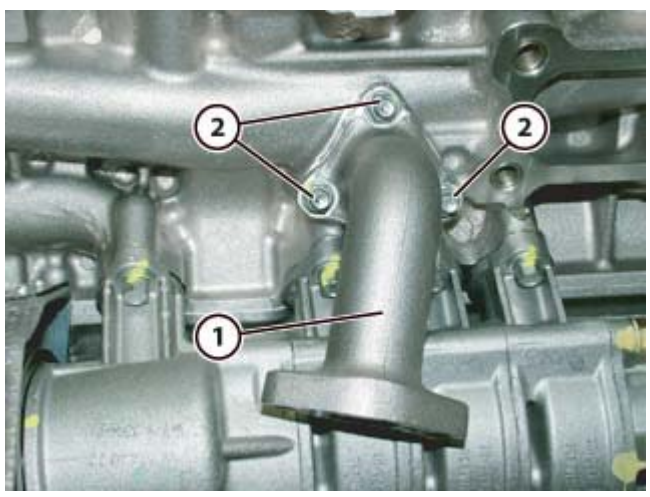


FROM Ass.ly No. 62963

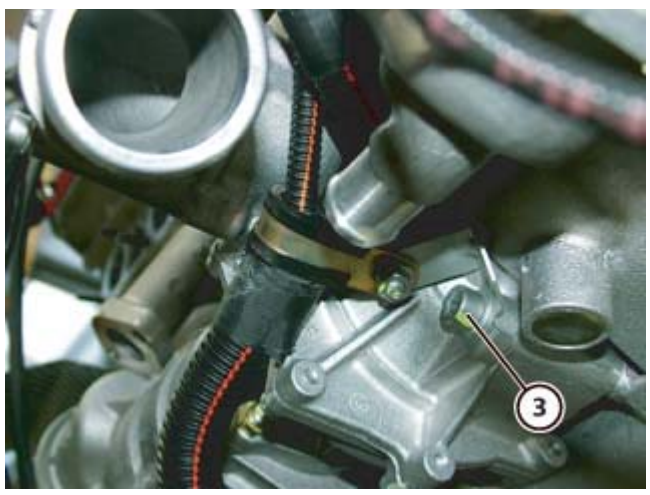
- Place a hydraulic jack under the engine so that it supports the weight of the engine and prevents it from tipping. Undo the four screws **(20)** fastening the right hand engine mounting strut **(19)**.

Take particular care during the following operation not to damage the components connected to (pipes, cables etc.) and surrounding the engine.

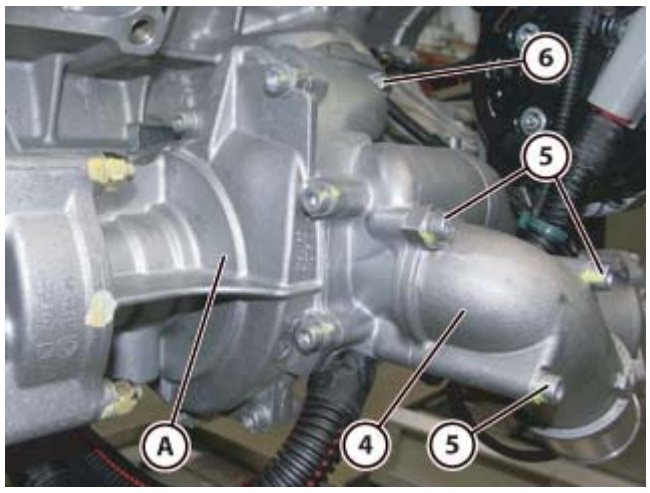
- Raise the engine by a few millimetres to enable the removal of the right hand engine mounting strut **(19)** complete with engine mounting bushing.



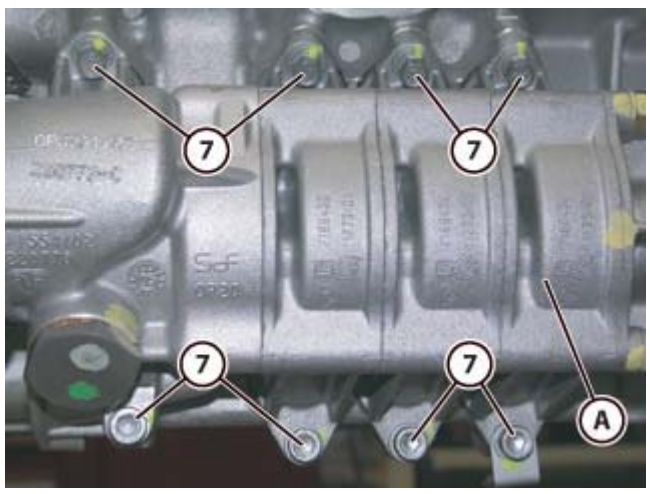
- Remove the engine oil pipe union **(1)** by undoing the three nuts **(2)**.



- Undo the lower front screw **(3)** of the pump on the crankcase.



- Remove the **(4)** union for the coolant inlet pipe leading to the pump **(A)** undoing the three screws **(5)** and retrieve the heat shield on the alternator.
- Undo the upper front screw **(6)** of the pump **(A)** on the crankcase.



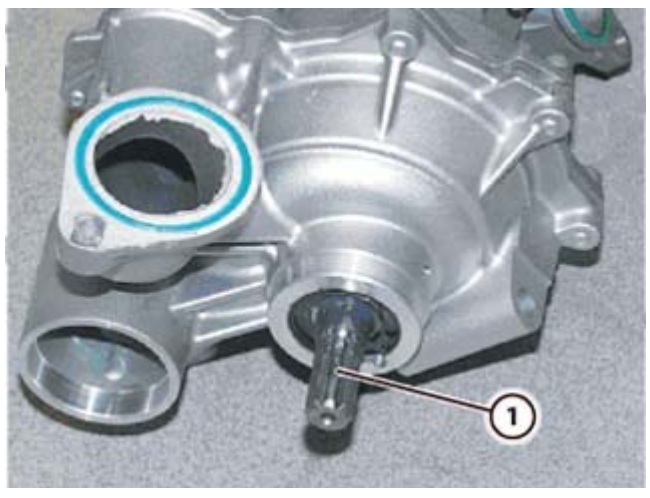
- Undo the eight screws **(7)** fastening the pump **(A)** onto the crankcase.

- Shift the pump a few centimetres backwards towards the clutch housing to allow the removal of the splined shaft from the pump drive shaft connected to the timing system.
- Remove the complete engine oil-water pump from the crankcase.

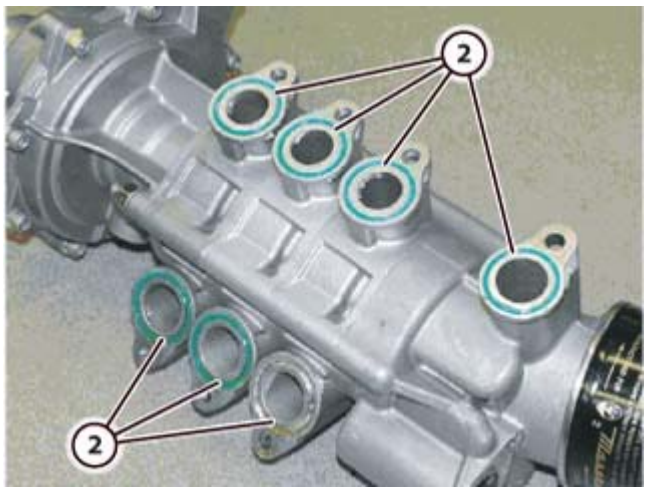
Refitting the engine oil-water pump

Tightening torque		**Nm**	**Class**
Oil/water pump - crankcase	Screw	25 Nm	A
Water inlet union - water/oil pump	Screw	10 Nm	B
Engine mounting bracket - crankcase	Nut	53 Nm	A
	Screw (FROM Ass.ly No. 62963)	45 Nm	A
Rubber bushing - chassis	Screw	50 Nm	B
Coolant outlet pipe - radiator	Clamp	4 Nm	B
Oil pipe - engine Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Screw / Nut	20 Nm	B
Fastening for oil pipe from pump to oil tank Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Nut	10 Nm	B

Some of the following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.



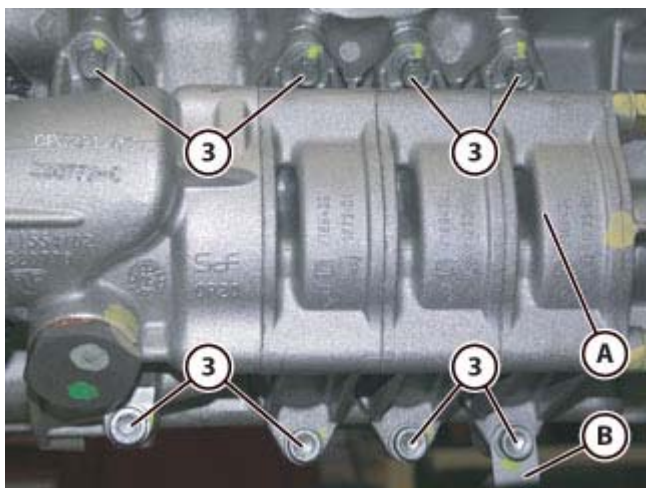
- With the oil-water pump on the bench, check that there are no leaks from the drain holes.
- When refitting the same water-oil pump, check the groove on the shaft **(1)** for wear.
- Apply a thin film of **MOLYKOTE BR2** to the shaft **(1)**.



- Apply a thin film of **SHELL ALVANIA RL3** to the O-rings and the respective seats on the pump and crankcase.

Always replace O-rings with new components.

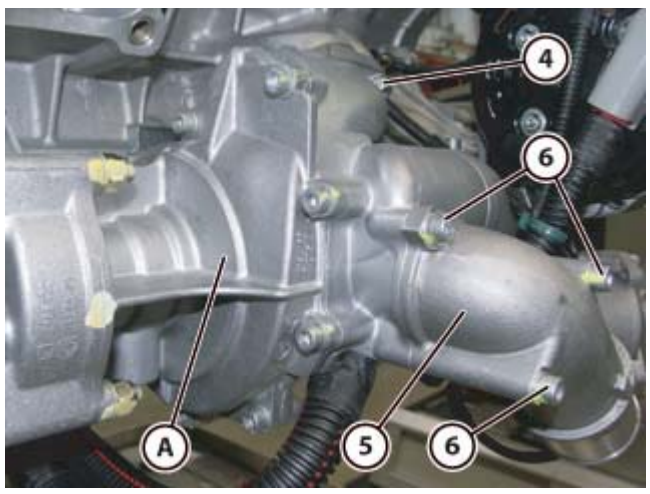
- Fit the O-rings **(2)** on the inlets of the oil-water pump.



When fitting the water-oil pump onto the engine, take particular care not to pinch the new O-rings or push them out of their respective seats.

- Fit the complete oil-water pump on the crankcase, inserting the grooved shaft into the pump drive shaft.
- Fasten the water-oil pump **(A)** by tightening the eight screws **(3)** and fitting clamp mounting bracket **(B)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

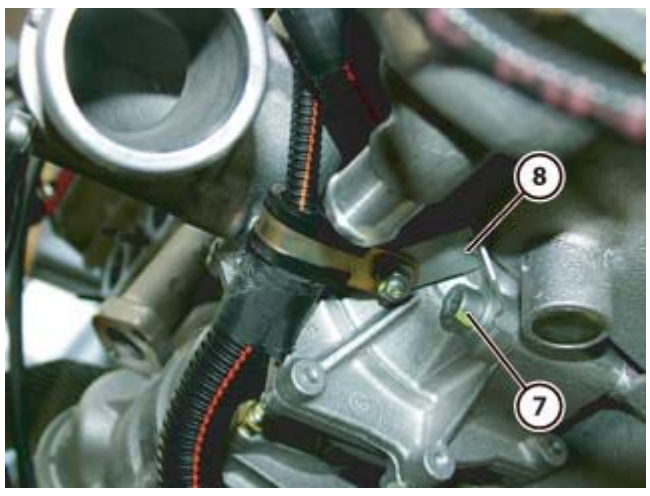


- Fasten the oil-water pump **(A)** by tightening the upper front screw **(4)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

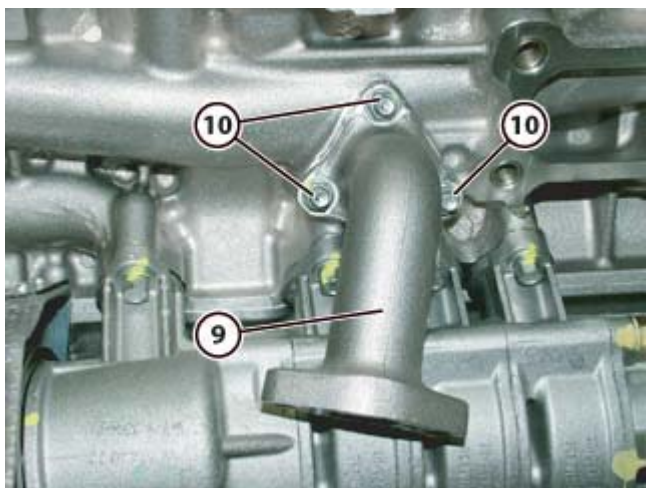
- Replace the O-ring on the inlet union **(5)** of the oil-water pump after applying a thin film of grease **SEGO**. Fit the heat shield onto the alternator as originally mounted and fasten the union **(5)** onto the pump, tightening the three screws **(6)**.

Tightening torque	Nm	Class
Screw	10 Nm	B

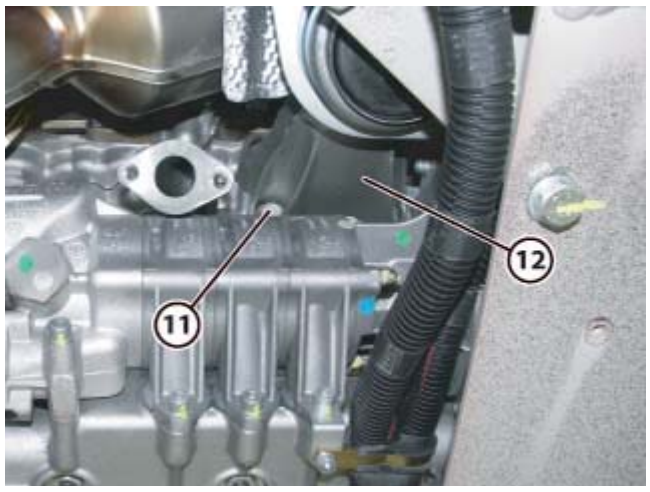


- Apply the lower front screw **(7)** of the oil/water pump and tighten after fitting the bracket **(8)**.

Tightening torque	Nm	Class
Screw	25 Nm	A

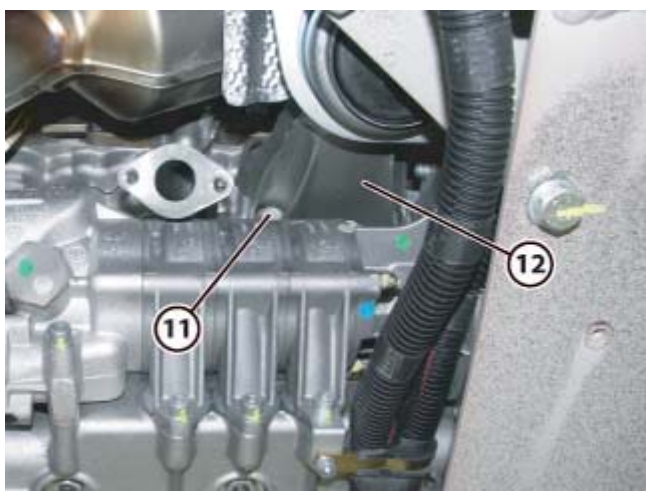


- Fit the oil pipe union **(9)** onto the crankcase after replacing the O-ring with a new component and applying a thin film of grease to the ring **SEGO**.
- Tighten the three nuts **(10)**.



- Fit the right hand engine support strut **(12)**, complete with engine mounting bushing, in its respective mounting on the crankcase and fasten by tightening the four nuts **(11)**.

Tightening torque	Nm	Class
Nut	53 Nm	A



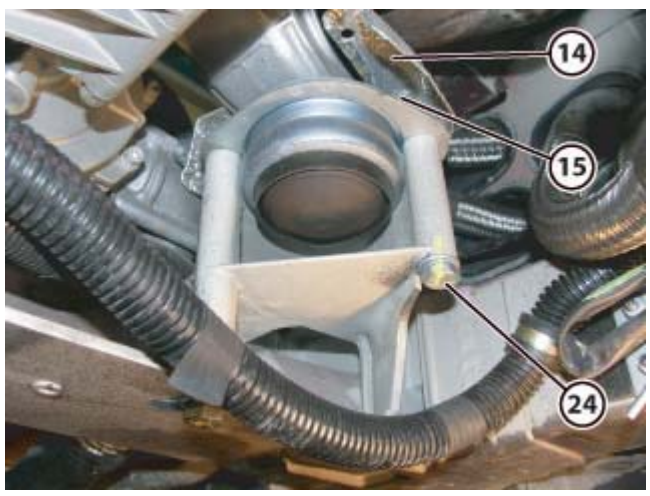
FROM Ass.ly No. 62963

- Fit the right hand engine mounting strut **(12)**, complete with engine mounting bushing, in its relative seat on the crankcase and fasten by tightening the four screws **(11)**.

Tightening torque	Nm	Class
Screw (FROM Ass.ly No. 62963)	45 Nm	A



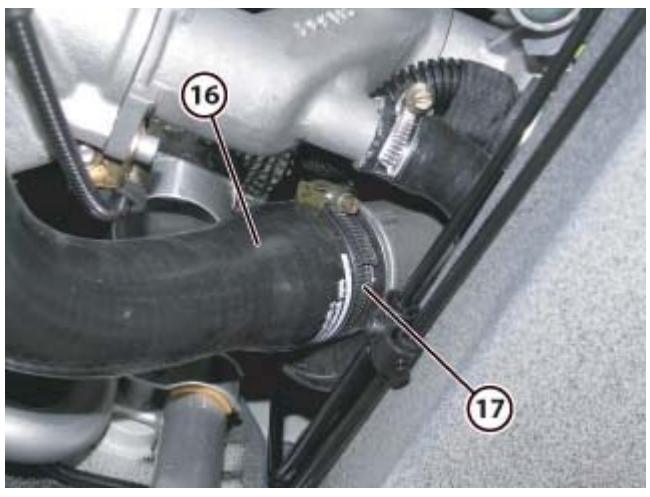
- Lower the hydraulic lift slowly until the engine mounting bushing rests on and aligns with the chassis.
- Fit the rubber bushing travel restrictor bracket **(13)**, aligning with the engine mounting bushing.



- Fit the engine mounting bushing to the chassis, tightening the two screws **(24)**.

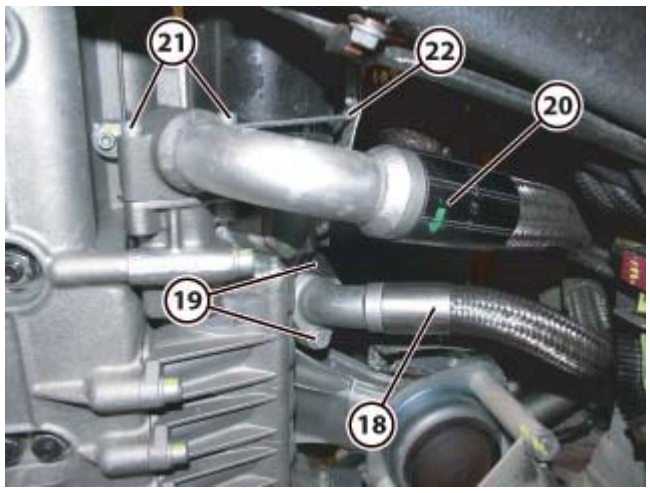
Tightening torque	Nm	Class
Screw	50 Nm	B

- Fit the heat shield **(14)** in its relative mounting on the rubber bushing travel restrictor bracket and tighten the two screws **(15)**.



- Fit the coolant pipe **(16)** onto its relative union and fasten by tightening the clamp **(17)**.

Tightening torque	Nm	Class
Clamp	4 Nm	B

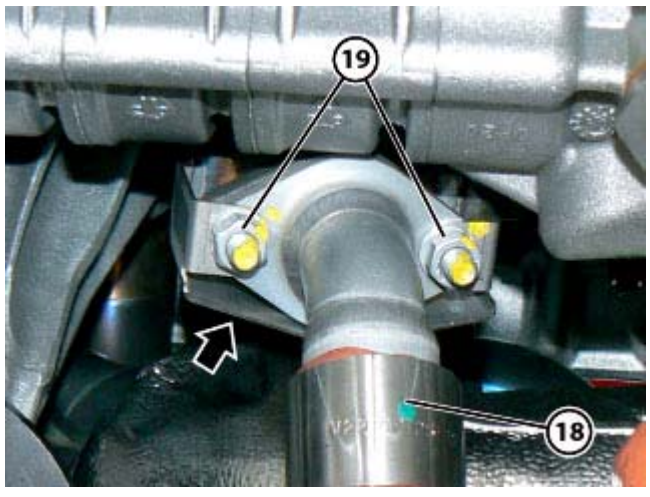


- Replace the O-rings on the two oil pipes **(18)** and **(20)** with new rings after moistening the rings with engine oil.
- Fit the oil delivery pipe **(18)** to the engine and fasten by tightening the two screws **(19)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B

- Fit the oil delivery pipe **(20)** leading to the oil tank and fasten by tightening the three screws **(21)** after fitting the heat shield **(22)** between the two parts.

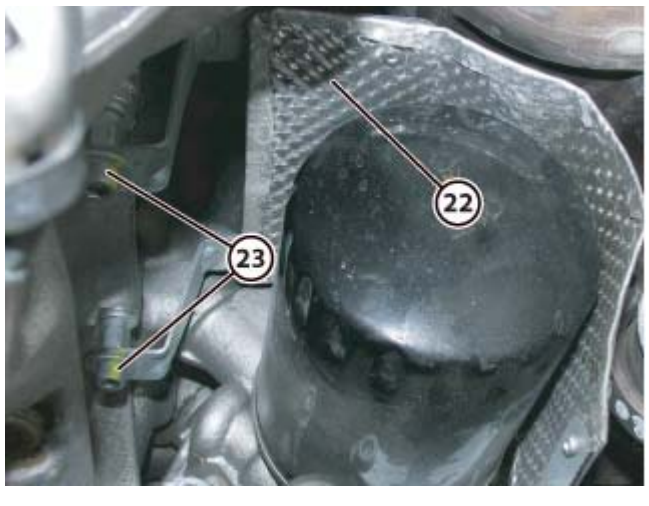
Tightening torque	Nm	Class
Nut	10 Nm	B



NEW SOLUTION

- **FROM Ass.ly No. 68541** fit the indicated shield.
- **FROM Ass.ly No. 64841** fit the oil delivery pipe **(18)** leading to the engine and fasten by tightening the two nuts **(19)**.

Tightening torque	Nm	Class
Screw / Nut	20 Nm	B



- Fit the heat shield **(22)** and fasten by tightening the two screws **(23)**.

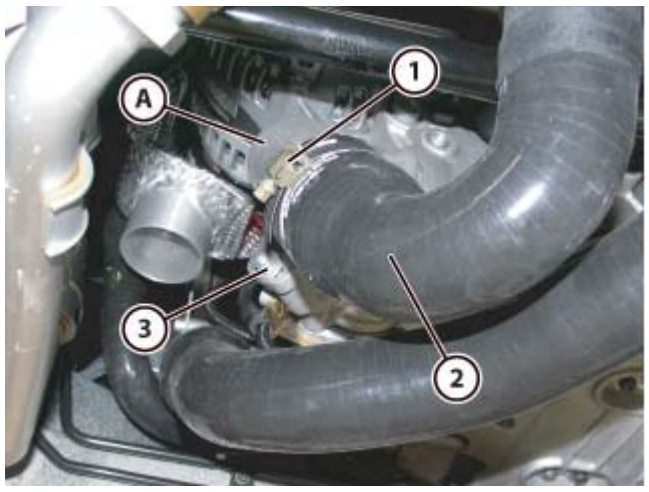
- Fill the cooling system (A3.07).
- Fill the engine lubrication system (A3.01).
- Refit the front flat undertray section (M2.12).

B4.03 Pressure switch/thermostat

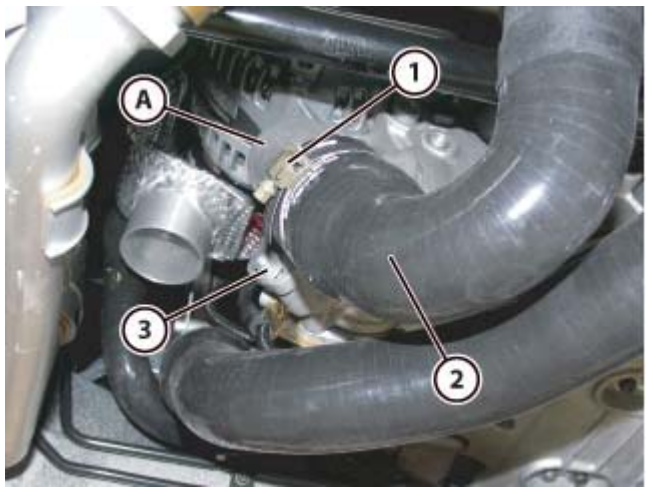
Replacing the pressure switch/thermostat

			
Tightening torque		**Nm**	**Class**
Pressure switch/thermostat - crankcase Products to use: SEGO	Screw	10 Nm	B

- Remove the front section of the underfloor (M2.12).
- Drain the engine cooling system (A3.07).



- Remove the retainer clamp **(1)** for the delivery pipe **(2)**.
- Undo the three fastener screws **(3)**.
- Remove the pressure switch/thermostat **(A)** from the engine.



- When refitting, replace the gasket between the cover and the pressure switch/thermostat after applying a film of grease onto the new gasket **SEGO**.
- Fit the pressure switch/thermostat **(A)** on the cover and tighten the three screws **(3)**.

		
Tightening torque	**Nm**	**Class**
Screw	10 Nm	B

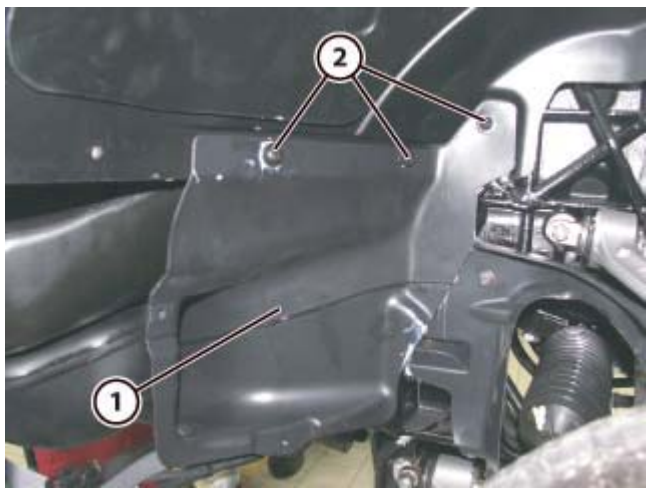
- Fit the delivery pipe **(2)** and fasten with the clamp **(1)**.

- Fill the cooling system (A3.07).
- Refit the front flat undertray section (M2.12).

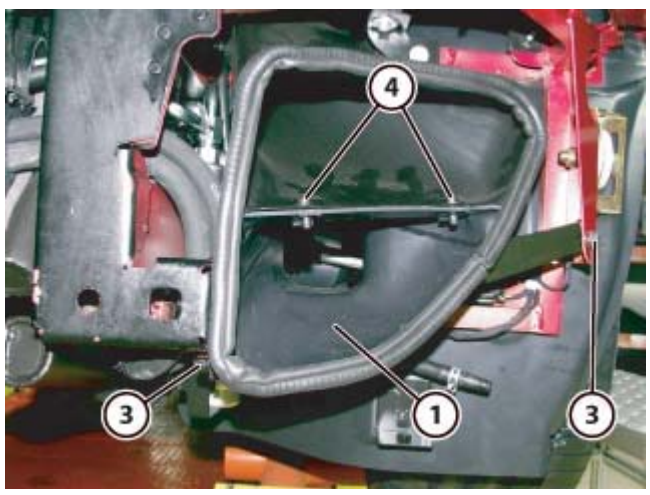
B4.04 Water radiator

Removing the coolant radiator

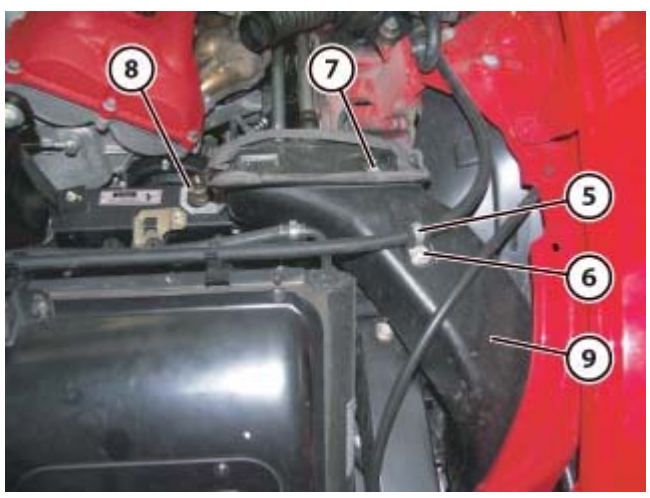
- Set the battery master switch to OFF (L2.02).
- Remove the front section of the underfloor (M2.12).
- Remove the central engine compartment shield (M2.17).
- Remove the front bumper (M2.03).
- Remove the air intake (B6.03).
- Drain the engine cooling system (A3.07).
- Drain the engine lubrication system (A3.01).
- Drain the hydraulic steering system (E2.07).
- Empty the air-conditioning system (I3.01).



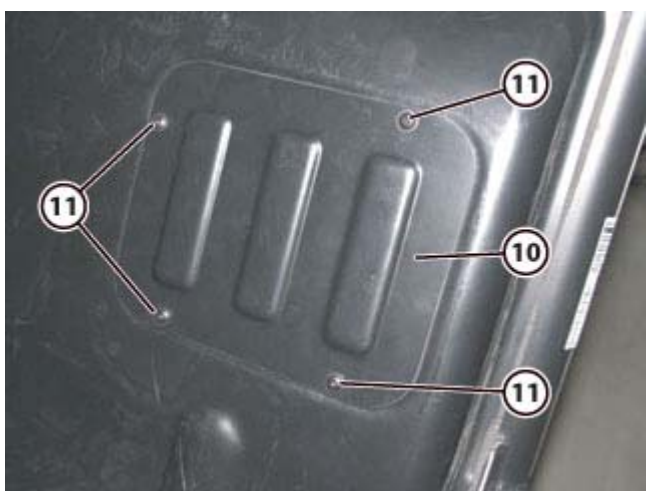
- Undo the three screws **(2)** fastening the lower air duct **(1)** to the bodywork.



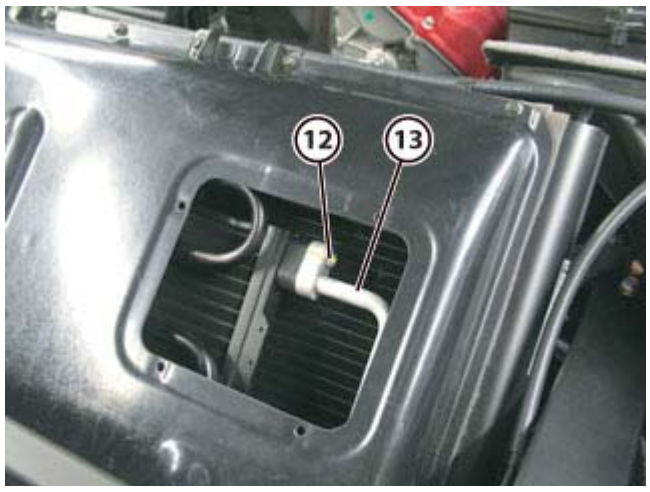
- Remove the air duct gasket.
- Undo the fastener screws **(3)** and the fastener screws **(4)** on the bodywork and the upper left hand air duct respectively.
- Remove the lower duct **(1)** from the wheel bay.



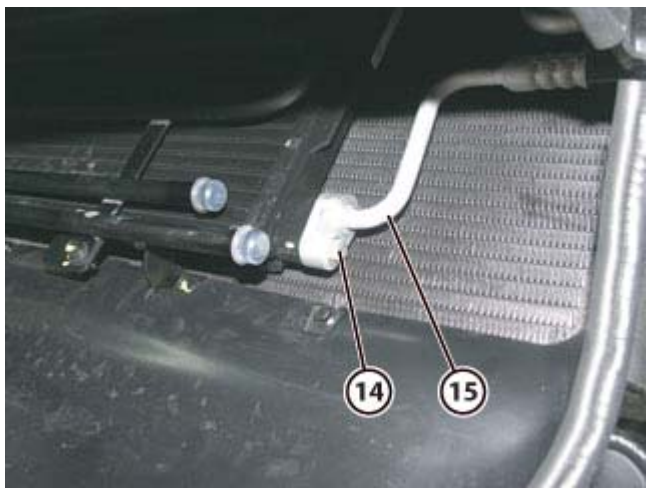
- Remove the clamp **(5)** by unscrewing the nut **(6)**, and release the pipe.
- Undo the screw **(7)** and the rubber bushing **(8)**, then move the upper left hand air duct **(9)** out of the way, so that it does not hinder the subsequent operations, without removing it from the vehicle.



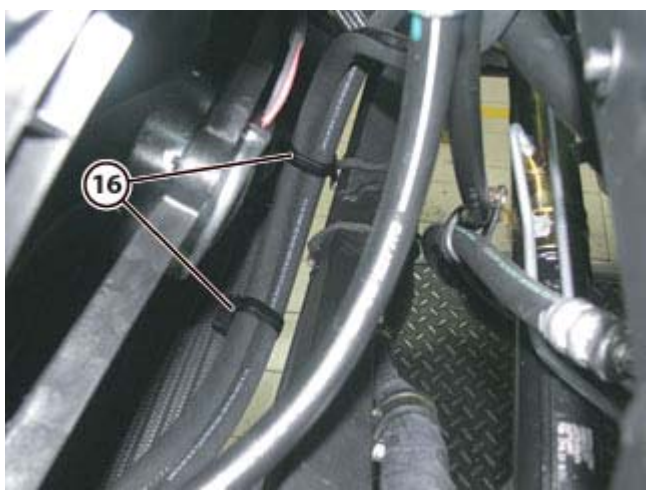
- Remove the inspection cover **(10)** by undoing the four screws **(11)**.



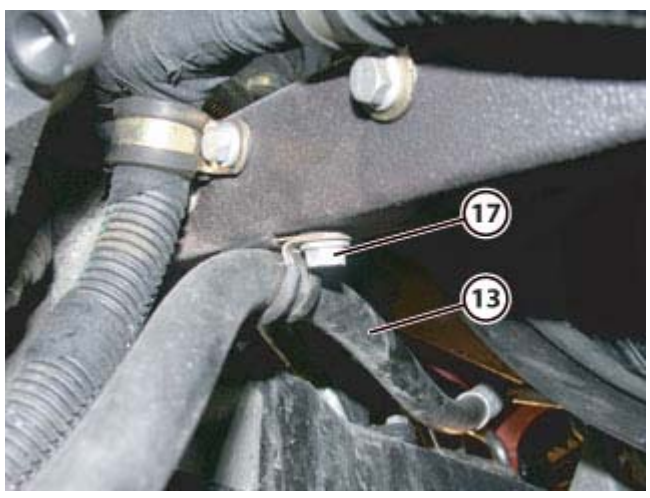
- Remove the pipe **(13)** from the condenser by undoing the screw **(12)**.



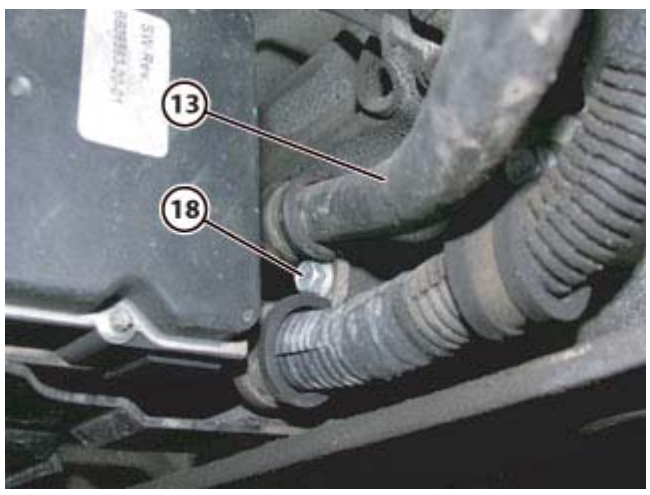
- Remove the pipe **(15)** from the condenser by undoing the screw **(14)**.



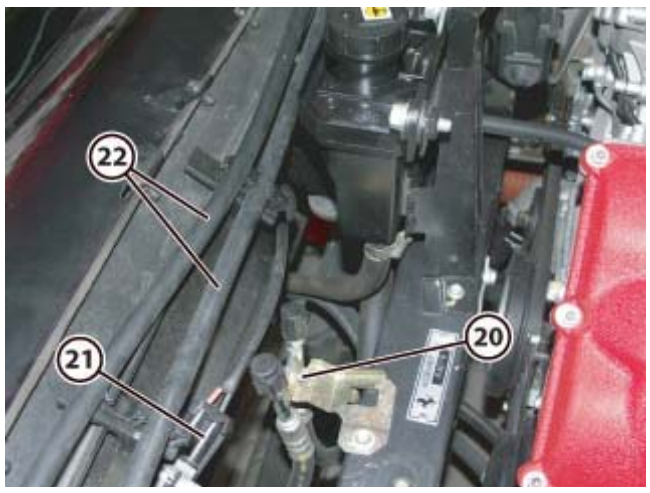
- Release the power steering coil delivery and return pipes from the clamps **(16)**.



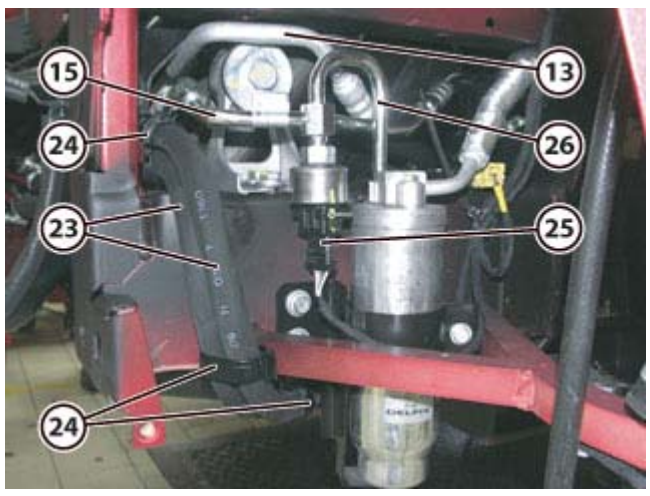
- Undo the nut **(17)** fastening the clamp on the AC system pipe **(13)**.



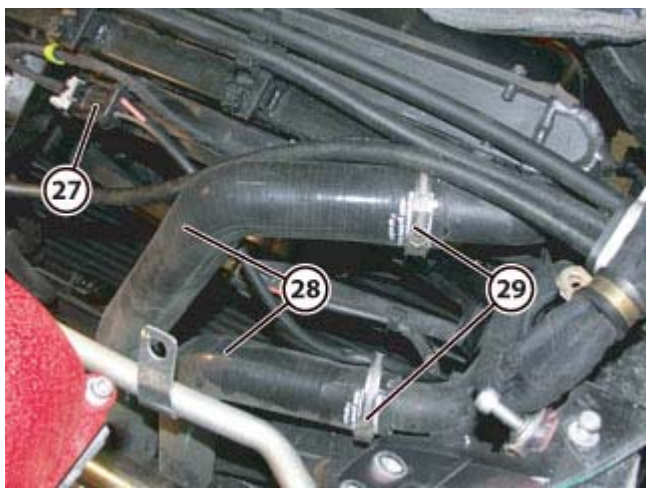
- Undo the nut **(18)** fastening the clamp on the A.C. system pipe **(13)**.



- Undo the screw **(20)** fastening the two A.C. system filling/draining pipes to the bracket.
- Remove the pipes **(22)** from the radiator and disconnect the detach the left hand electric fan connector **(21)**.

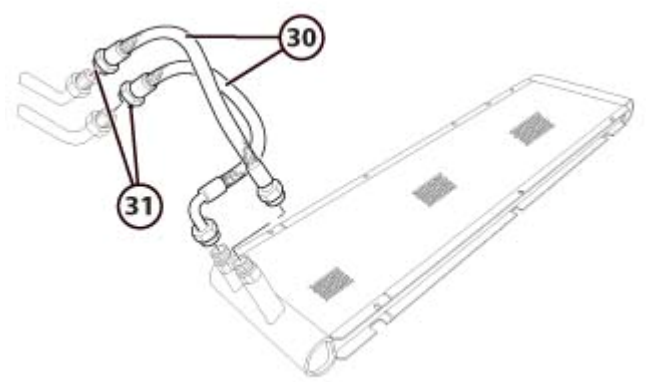


- Slip the power steering coil pipes **(23)** off the radiator unit by removing them from the clamps **(24)**.
- Disconnect the connector **(25)** (S005) from the pressure switch and remove the pipe **(26)** from the dehydrator filter by undoing the relative fastener screw.
- Slide the pipes **(15)** and **(13)** off the radiator unit.

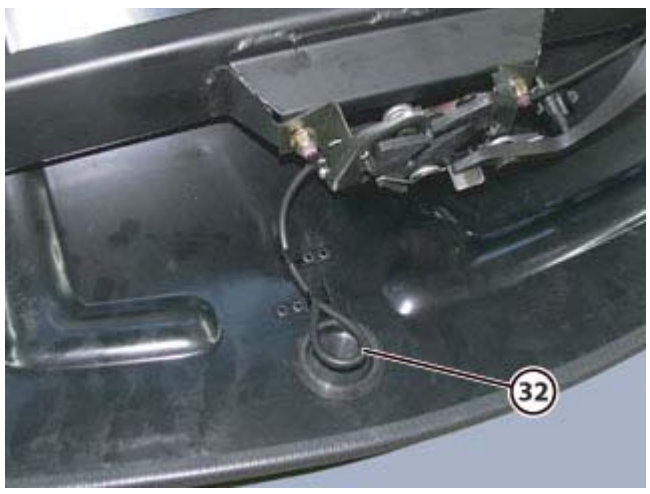


- Disconnect the right hand electric fan connector **(27)** (M017).
- Detach the two coolant delivery and return pipes **(28)** leading to the radiator by removing the clamps **(29)**.

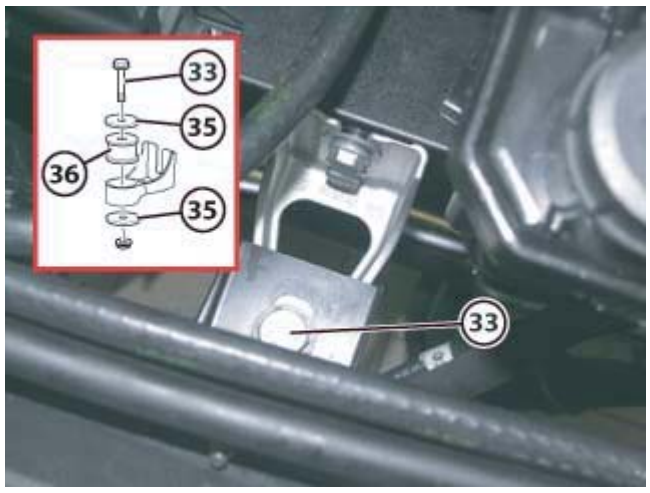
i Note that the photograph was taken with the chassis stiffener bar removed.



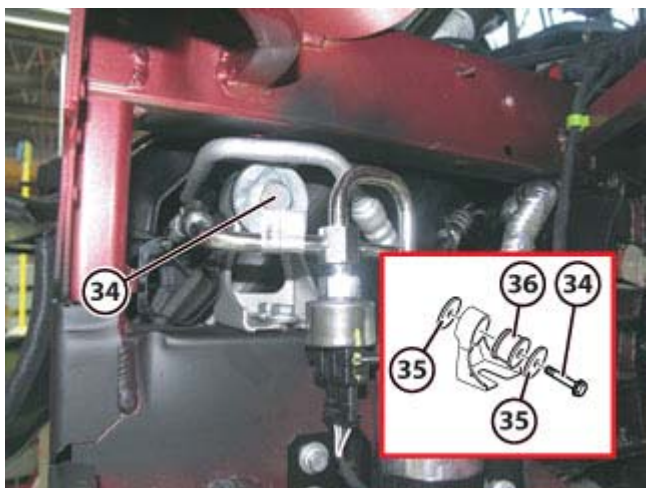
- Detach the two engine oil delivery and return pipes **(30)** from the pipes connected to the tank by unscrewing the unions **(31)**.



- Remove the engine compartment lid emergency release cable **(32)** from the retainer tabs on the duct.



- Undo the upper screw **(33)** fastening the radiator unit to the chassis and retrieve the spacers **(35)** and the rubber bushing **(36)**.

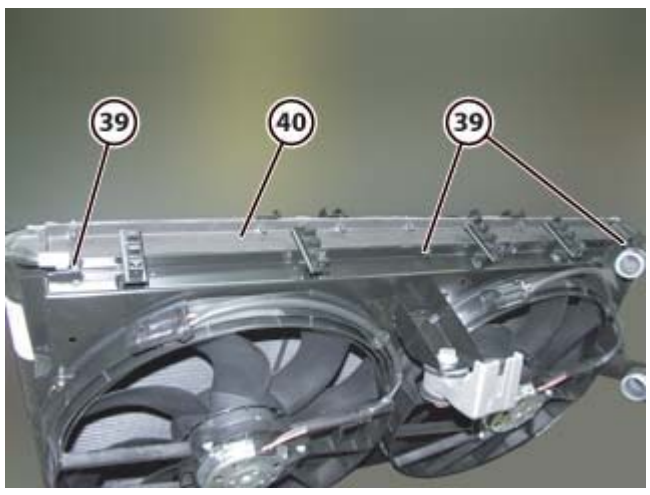


- Support the weight of the radiator unit and undo the lateral screw **(34)**, retrieving the spacers **(35)** and the rubber bushing **(36)**.



- Disconnect the coolant temperature sensor connector **(37)** (S014) on the radiator.
- Undo the lateral screw **(38)** and retrieve the relative spacers and rubber bushing, as done in the previous operation.
- Ease the radiator unit out downwards and set down in a safe place to prevent damaging or bending the radiator cooling fins.

- Remove the engine oil radiator (B3.04).
- Remove the front air duct from the radiator (B4.04).
- Remove the air conditioning and heating system condenser (I2.02).

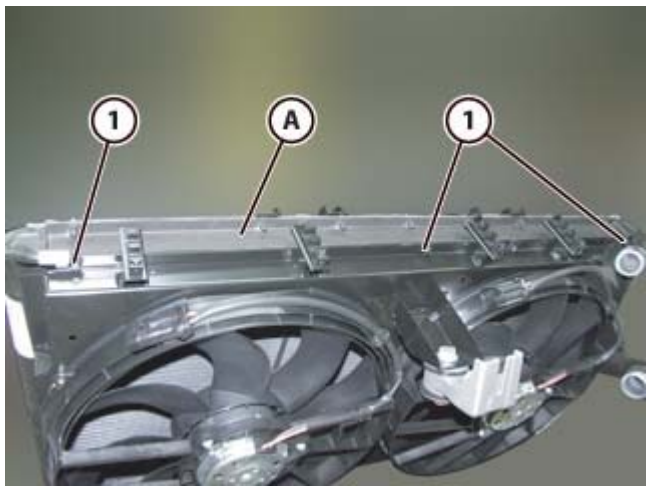


- Undo the six screws **(39)** and remove the coolant radiator **(40)**.

Refitting the coolant radiator

Tightening torque		**Nm**	**Class**
Duct - radiator	Screw	5 Nm	B
Complete cooling system - mounting bracket	Screw	20 Nm	B
Intermediate engine oil pipe connections Products to use: AREXONS SYSTEM TG248 - ADHESIVE GREASE	Union	78 Nm	B
Coolant inlet pipe - radiator	Clamp	4 Nm	B
Coolant outlet pipe - radiator	Clamp	4 Nm	B

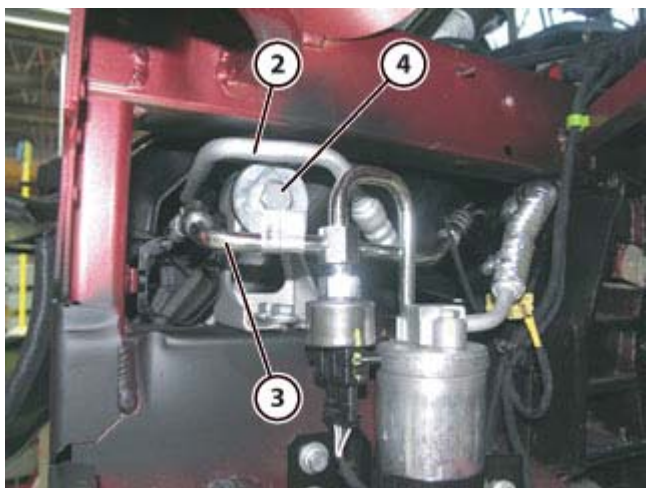
- Check that the rubber bushings on the side and upper chassis mounting brackets are in good condition and replace if necessary.
- Check that the gaskets on the fan air duct are intact. Replace if damaged.



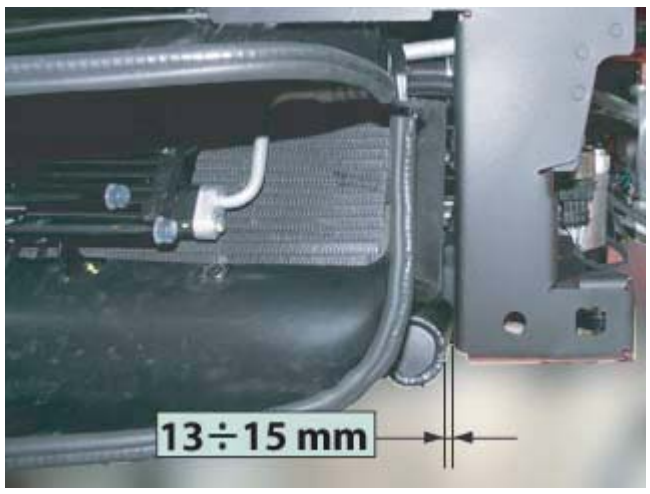
- Refit the coolant radiator **(A)** on the fan air duct and tighten the screws **(1)**.

Tightening torque	Nm	Class
Screw	5 Nm	B

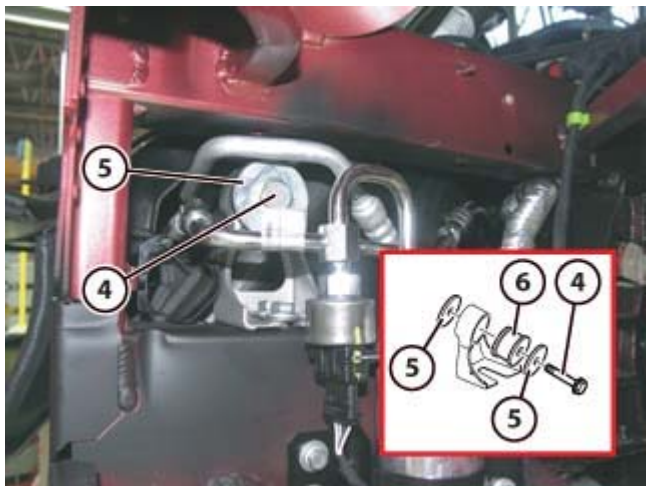
- Refit the air conditioning and heating system condenser (I2.02).
- Refit the front air duct on the radiator (B4.04).
- Refit the engine oil radiator (B3.04).



- Move the complete radiator unit closer to the vehicle and fit, from below, into its seat on the chassis, fitting the AC system pipes **(2)** and **(3)** into the front air duct.
- When the radiator is at the correct height, loosely tighten the side screws **(4)** to fasten to the chassis.

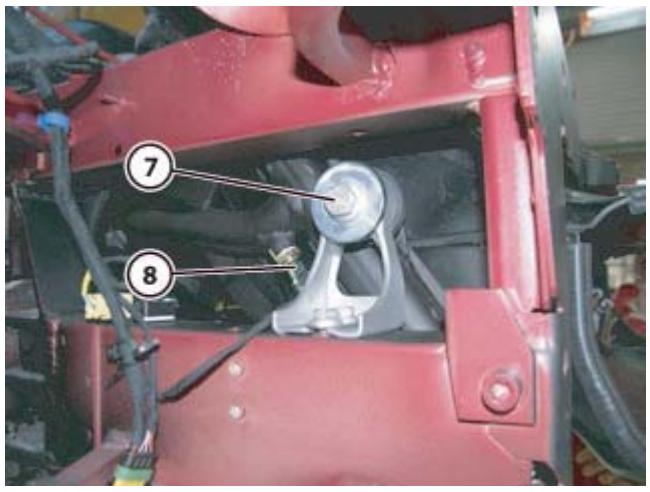


- For the radiator assembly to be correctly aligned laterally, there must be a gap of **13 - 15 mm** between the left hand side of the engine oil radiator and the vehicle chassis.



- Fit the spacers **(5)** and the rubber bushing **(6)**, retrieved during removal, and tighten the screw **(4)**.

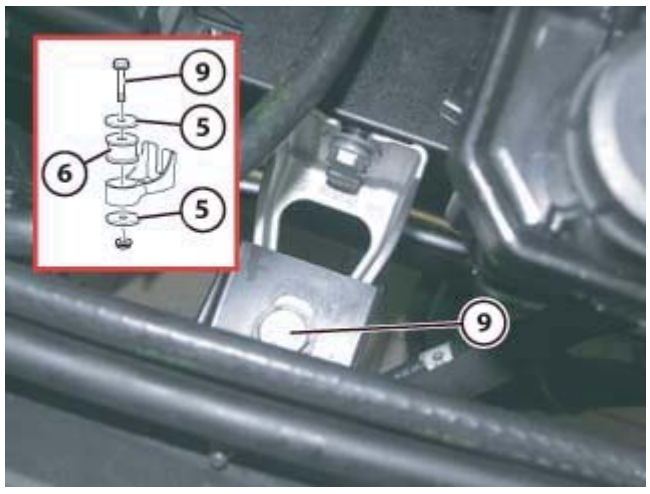
Tightening torque	Nm	Class
Screw	20 Nm	B



- Repeat the procedure on the right hand side of the cooling unit and tighten the screw **(7)**.

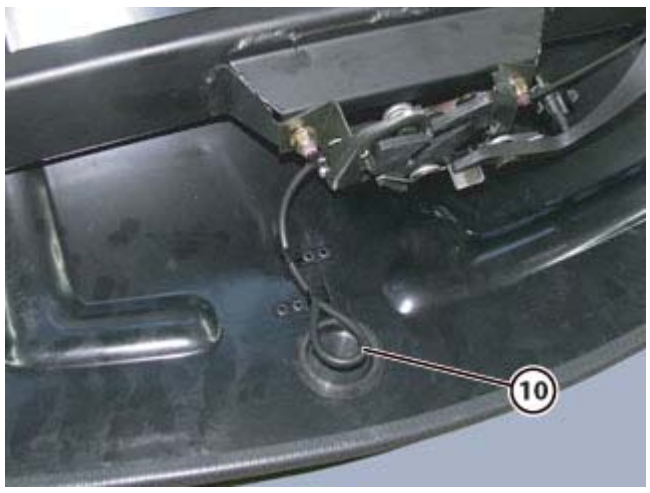
Tightening torque	Nm	Class
Screw	20 Nm	B

- Connect the connector **(8)** on the radiator coolant temperature sensor.

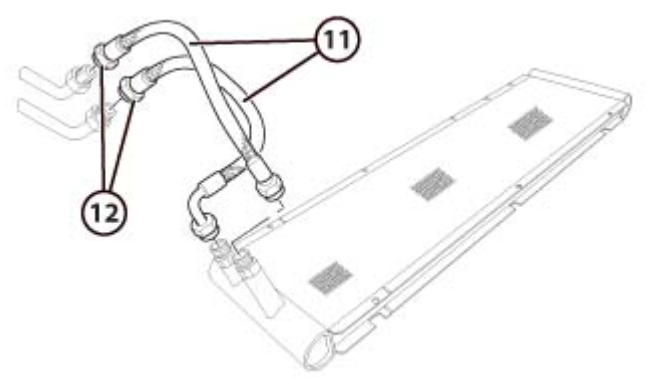


- Fit the spacers **(5)** and the rubber bushing **(6)**, retrieved during removal, on the upper mounting bracket and tighten the screw **(9)**.

Tightening torque	Nm	Class
Screw	20 Nm	B

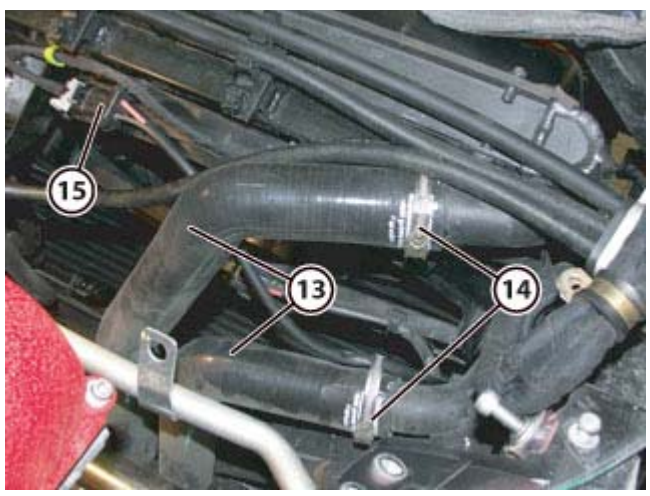


- Fit the engine compartment lid emergency release cable **(10)**, attaching to the relative retainer tabs on the front air duct.



- Fit the oil delivery and return pipes **(11)** leading from the radiator onto the respective engine oil tank connector pipes and tighten the unions **(12)**.

Tightening torque	Nm	Class
Union	78 Nm	B

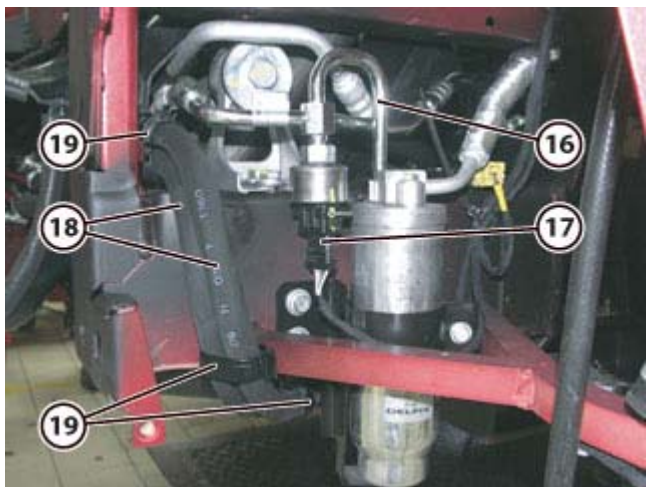


- Fit the coolant delivery and return pipes **(13)** on the relative unions on the radiator and tighten the clamps **(14)**.

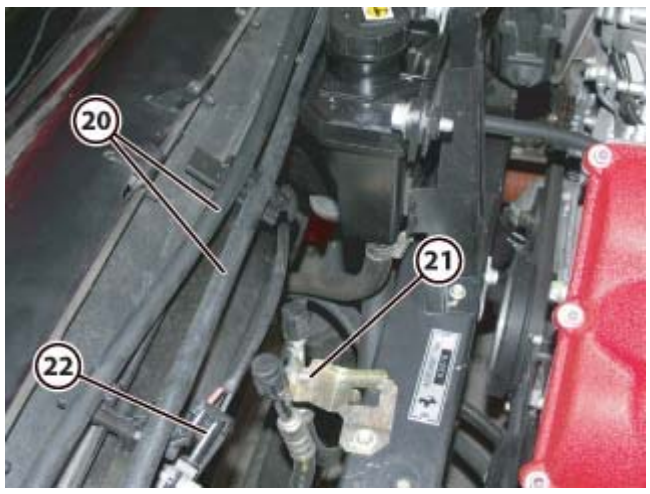
Tightening torque	Nm	Class
Clamp	4 Nm	B
Clamp	4 Nm	B

- Connect the connector **(15)** (M017) for the right hand electric fan.

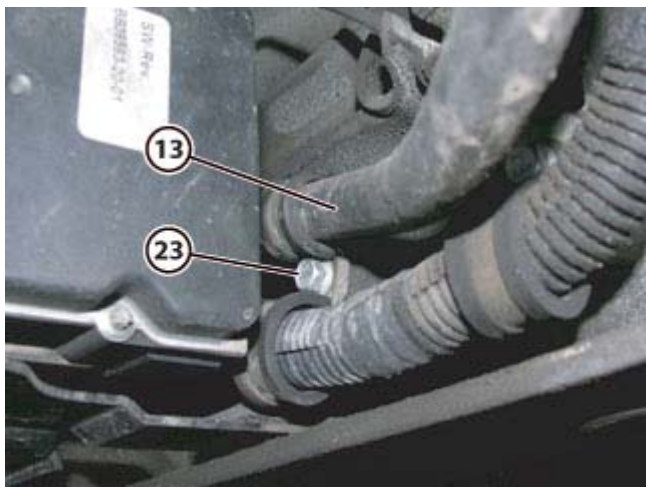
Note that the photograph was taken with the chassis stiffener bar removed.



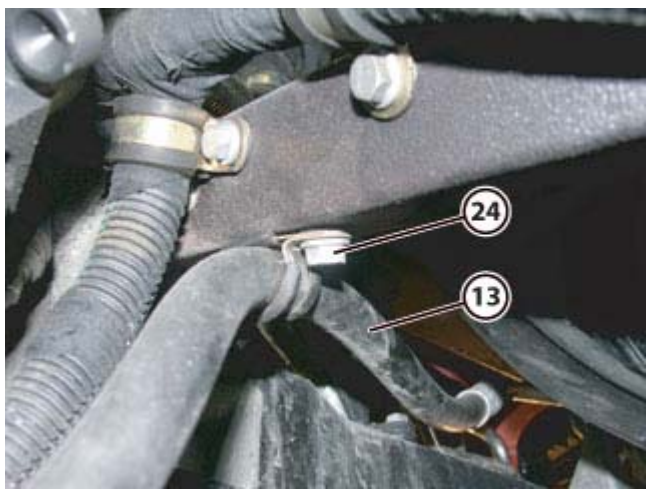
- Fasten the pipe **(16)** on the dehydrator filter, by hand tightening the relative fastener screw.
- Connect the connector **(17)** (S005) for the pressure switch.
- Fit the two delivery and return pipes **(18)** to the power steering coil inside the front air duct and fasten to the chassis using the clamps **(19)**.



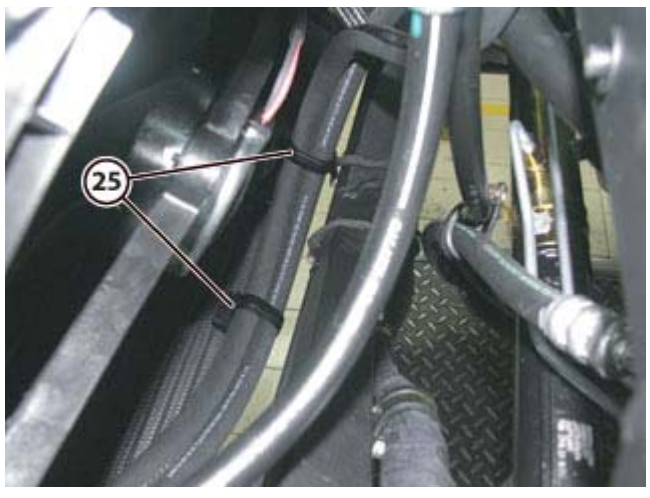
- Fit the pipes **(20)** on the coolant radiator.
- Fasten the AC system drainage/filling connector pipes to the mounting bracket by hand tightening the screw **(21)**.
- Connect the connector **(22)** (M018) for the left hand electric fan.



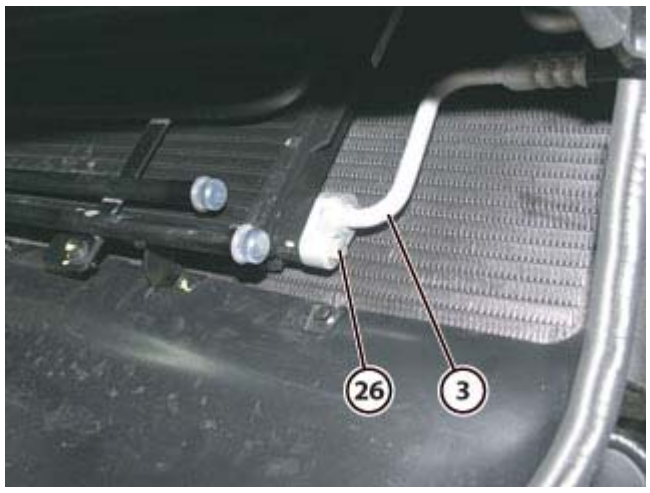
- Fasten the AC system pipe **(13)** to the chassis by securing the clamp with the screw **(23)**.



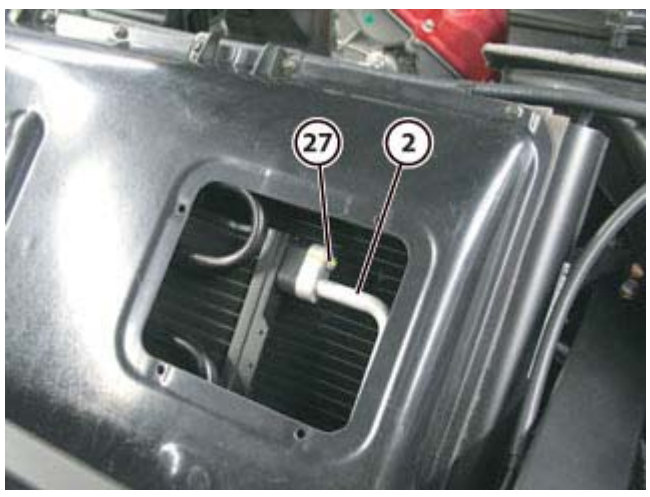
- Fasten the AC system pipe **(13)** to the chassis by securing the clamp with the screw **(24)**.



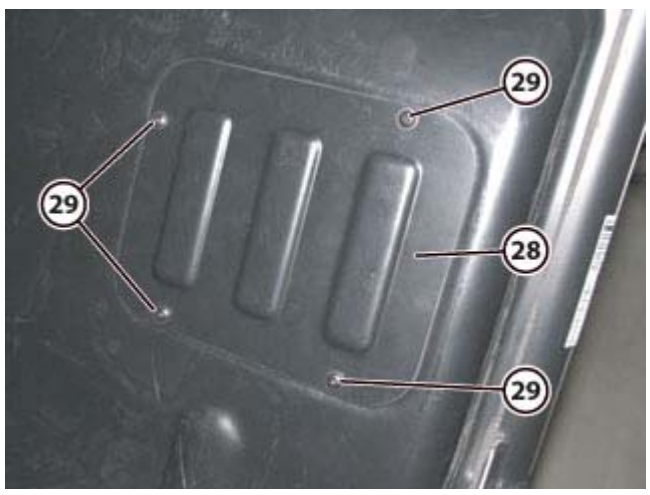
- Fasten the pipes leading from the coil using the clamps **(25)**.



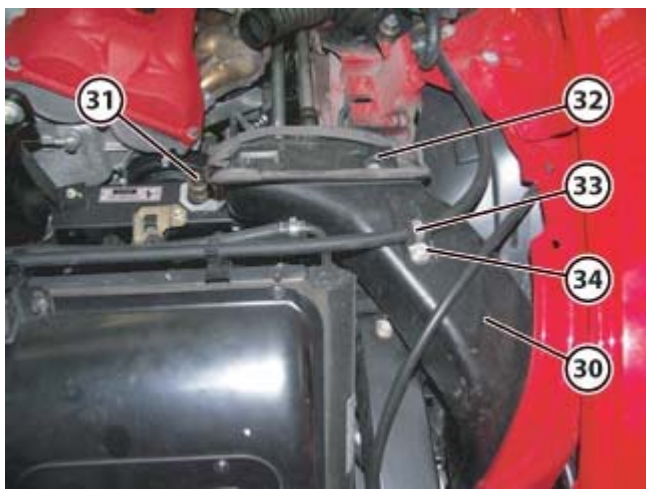
- Fasten the pipe **(3)** on the AC condenser by hand tightening the screw **(26)**.



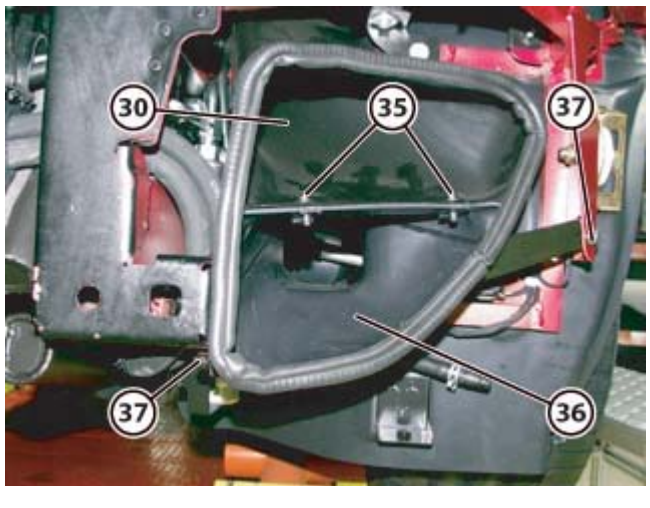
- Fasten the pipe **(2)** on the AC condenser by hand tightening the screw **(27)**.



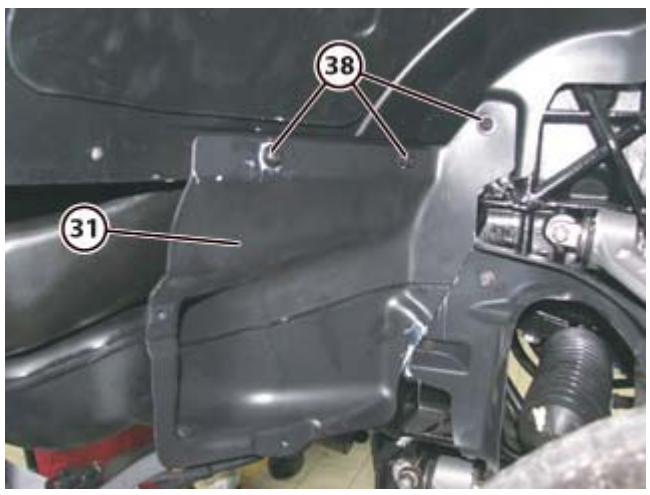
- Fit the inspection cover **(28)** on the front air duct and fasten by hand tightening the screws **(29)**.



- Fit the upper air duct **(30)** in its seat and fasten to the bar with the bushing **(31)** and the screw **(32)**.
- Fit the clamp **(33)** and fasten with the screw **(34)**.



- Fit the lower duct **(36)**, introducing from the wheel bay.
- Fit the upper air duct **(30)** to the lower duct **(36)** with the two screws **(35)**.
- Fit the lower air duct **(36)** to the bodyshell with the two screws **(37)**.
- Fit the perimeter gasket on the air ducts.

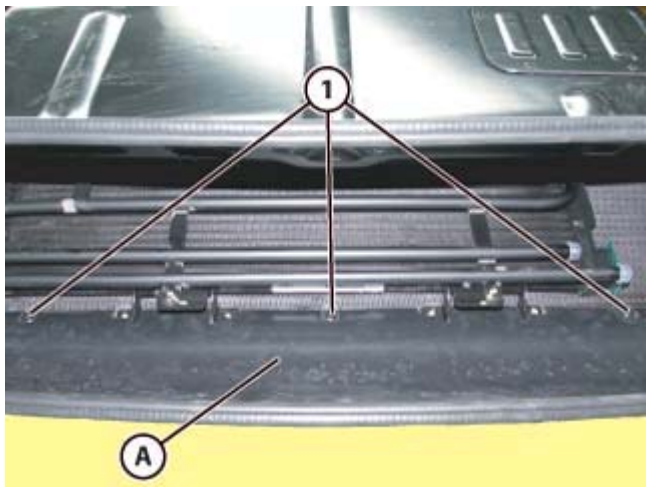


- Fasten the lower air duct **(31)** definitively with the screws **(38)**.

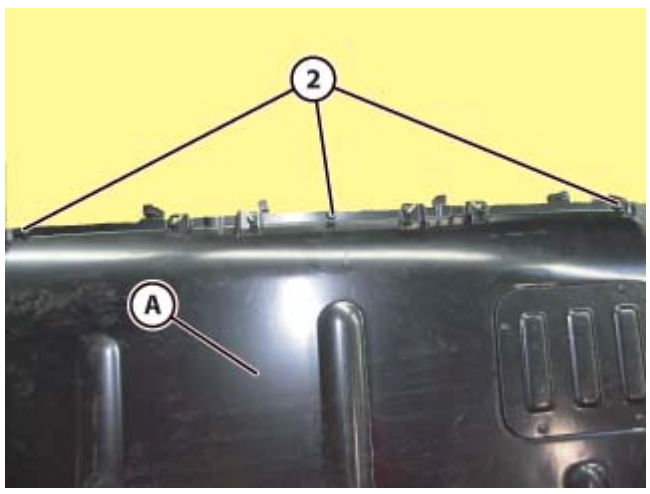
- Refit the air intake (B6.03).
- Fill the power steering system (E2.07).
- Refit the front bumper (M2.03).
- Refit the central engine compartment shield (M2.17).
- Refit the front flat undertray section (M2.12).
- Set the battery master switch to ON (L2.02).
- Fill the air-conditioning system. (I3.01).
- Fill the cooling system (A3.07).
- Fill the engine lubrication system (A3.01).

Removing the front air duct

- Remove the coolant radiator (B4.04).
  The entire radiator unit must be removed from the vehicle.



- Undo the three lower screws **(1)** fastening the duct **(A)** onto the coolant radiator.

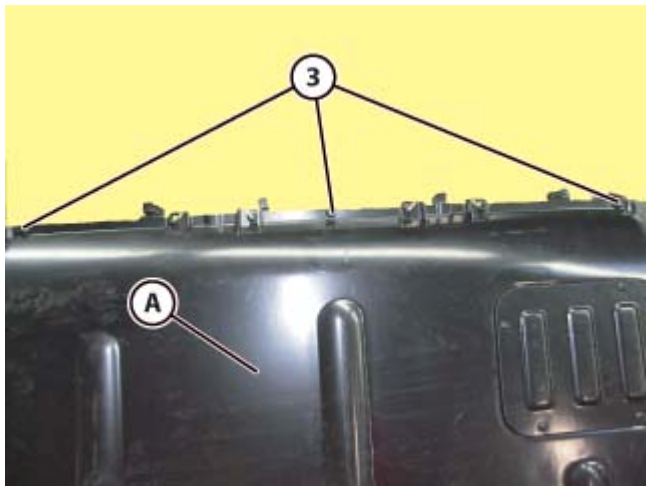


- Undo the three upper screws **(2)** fastening the duct **(A)** onto the coolant radiator.
- Remove the duct **(A)**

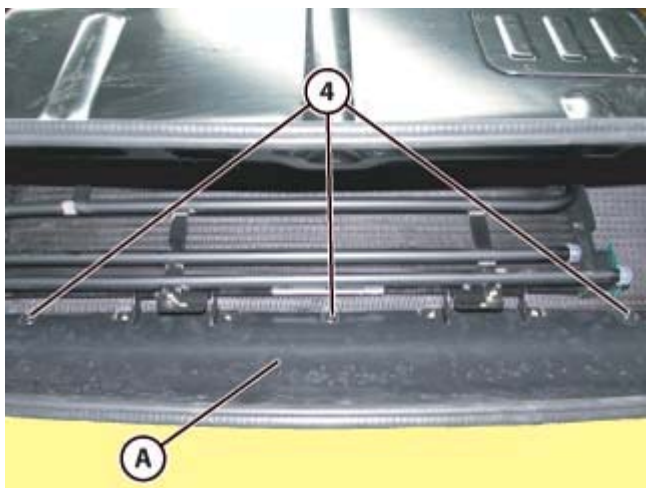
Refitting the front air duct



- Check the state of the gasket **(1)** fitted on the duct. If necessary, replace with a new component, refitting as originally installed.
- Check the condition of the contact foam rubber **(2)** between the radiator and the duct; if necessary, replace with a new component, refitting as originally installed.



- Fasten the duct **(A)** to the coolant radiator, tightening the three upper screws **(3)**.

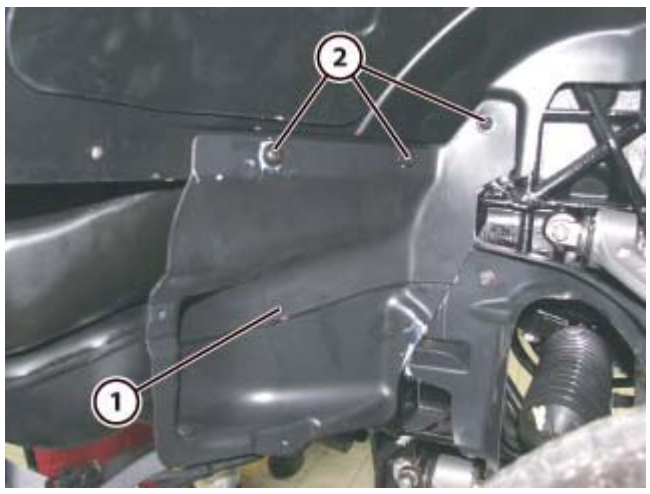


- Fasten the air duct **(A)**, tightening the three lower screws **(4)**.

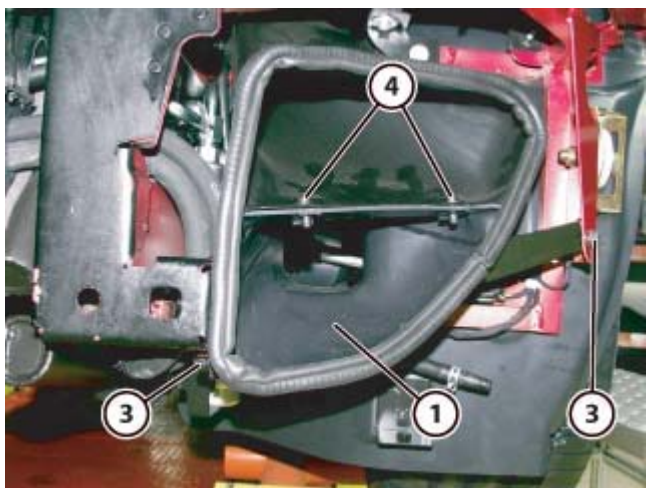
➢ Refit the coolant radiator (B4.04).

Removing the left hand electric radiator fan

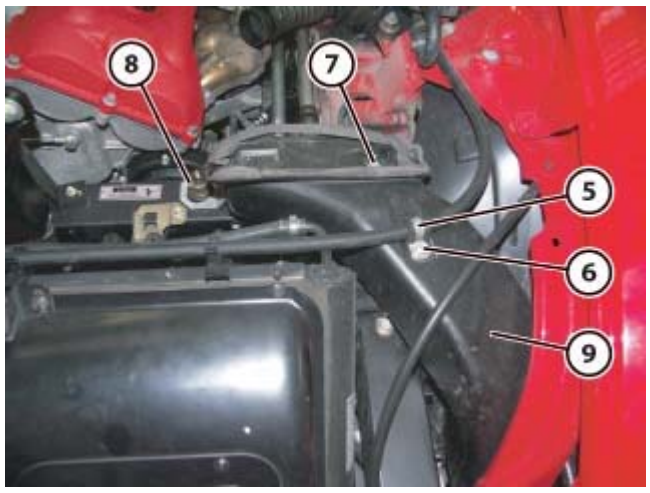
➢ Remove the air intake (B6.03).
➢ Remove the central engine compartment shield (M2.17).
➢ Remove the front bumper (M2.03).



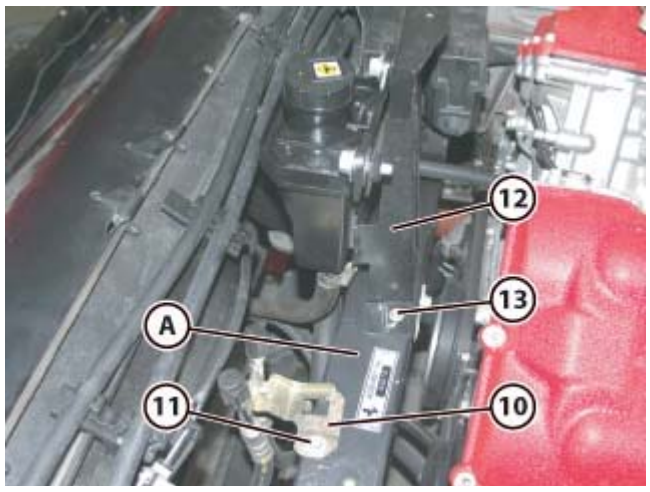
- Undo the three screws **(2)** fastening the lower left hand air duct **(1)** to the bodywork.



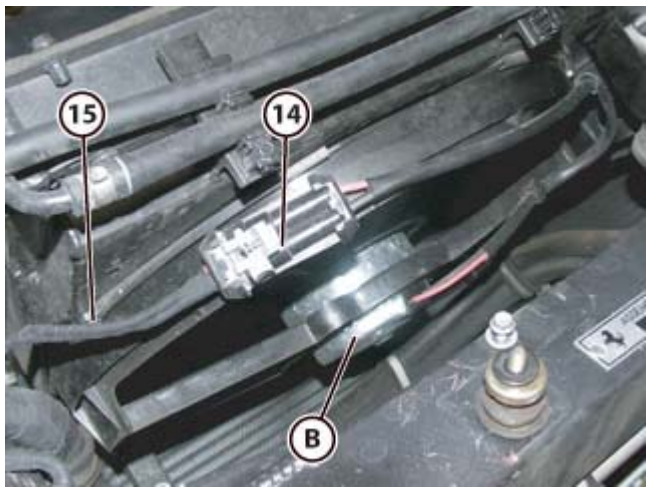
- Remove the gasket on the ducts.
- Undo the fastener screws **(3)** and the fastener screws **(4)** on the bodywork and the upper left hand air duct respectively.
- Remove the lower duct **(1)** from the wheel bay.



- Remove the clamp **(5)** by unscrewing the nut **(6)**, and release the pipe.
- Undo the screw **(7)** and the rubber bushing **(8)**, then move the upper left hand air duct **(9)** out of the way, so that it does not interfere with the subsequent operations, without removing it from the vehicle.



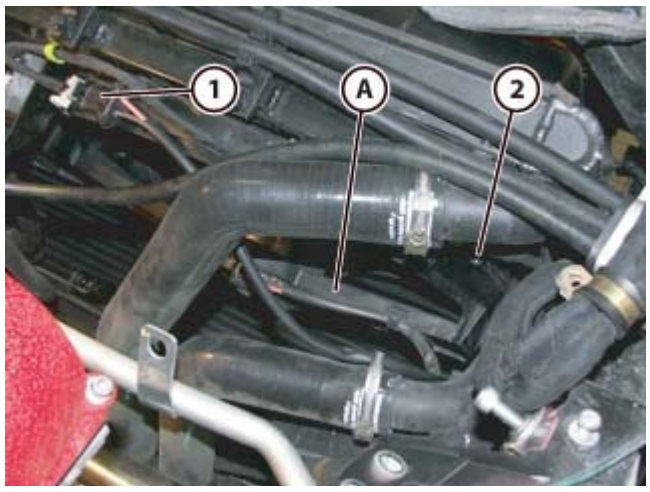
- Remove the air-conditioning filler pipe mounting bracket **(10)** from the bar **(A)**, undoing the screw **(11)**, and move it out of the way so that it does not interfere with the subsequent operations.
- Remove the bracket **(12)** complete with hydraulic steering oil tank by undoing the two screws **(13)** and move it out of the way so that it does not interfere with the subsequent operations.



- Disconnect the connector **(14)** (M018) for the electric fan **(B)** and undo the four retaining screws **(15)**.
- Lift out the left hand electric fan from above **(B)**.

Removing the right hand electric radiator fan

➢ Remove the engine compartment subchassis stiffener bar (M2.17).



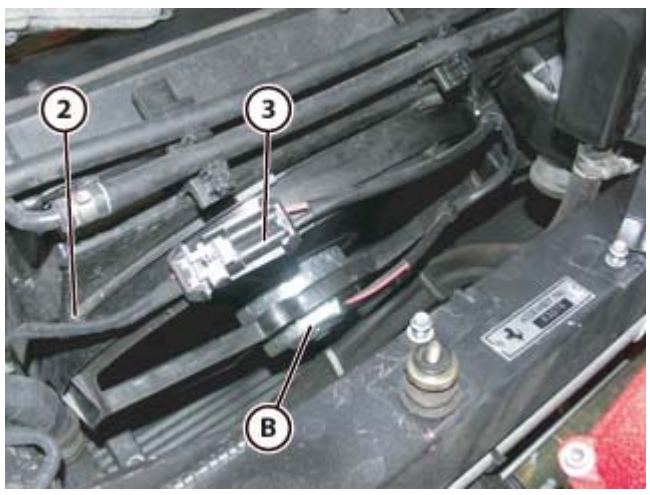
- Disconnect the electric fan connector **(1)** (M017).
- Undo the four screws **(2)**; move the electric fan **(A)** to the left hand side of the vehicle, placing over the other electric fan and then lift out from above.

Refitting the left hand electric fan on the radiator

Tightening torque		**Nm**	**Class**
Fan - radiator duct	Screw	5 Nm	B

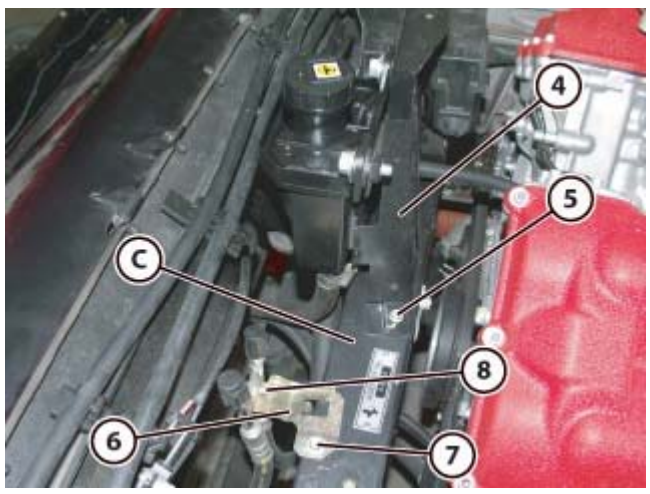


- Before fitting the fan on the air duct, fit the four vibration-damping pads **(1)** fixing them to the fan with cyonoacrylate adhesive **AREXONS SYSTEM C666 - CYANOACRYLATE ADHESIVE FOR RUBBER**.

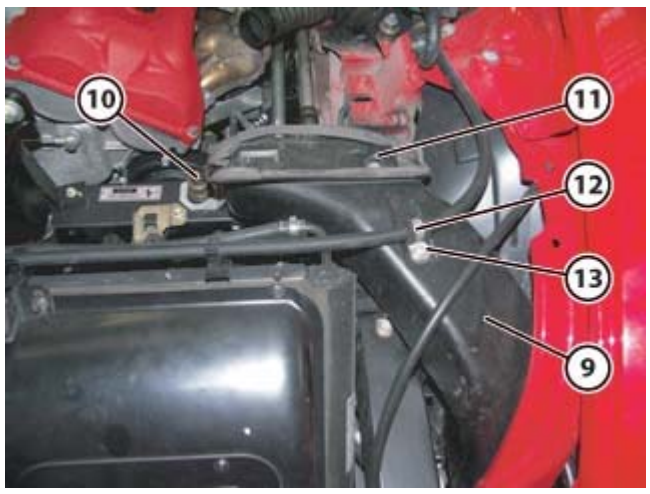


- Fit the electric fan **(B)** on the duct, fasten by tightening the four screws **(2)**, and attach the connector **(3)** (M018).

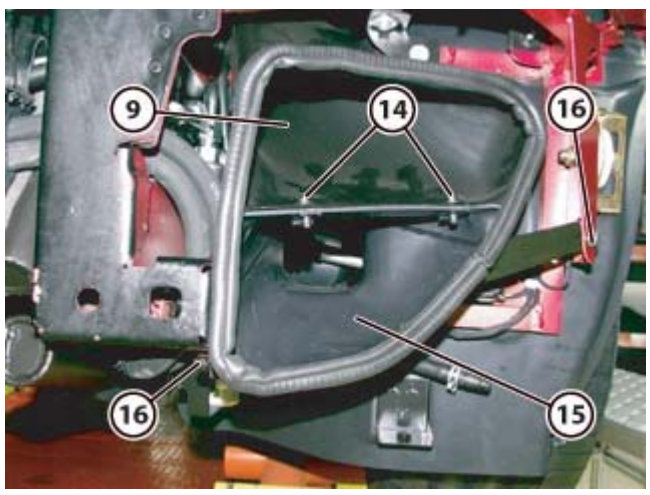
		
Tightening torque	**Nm**	**Class**
Screw	5 Nm	B



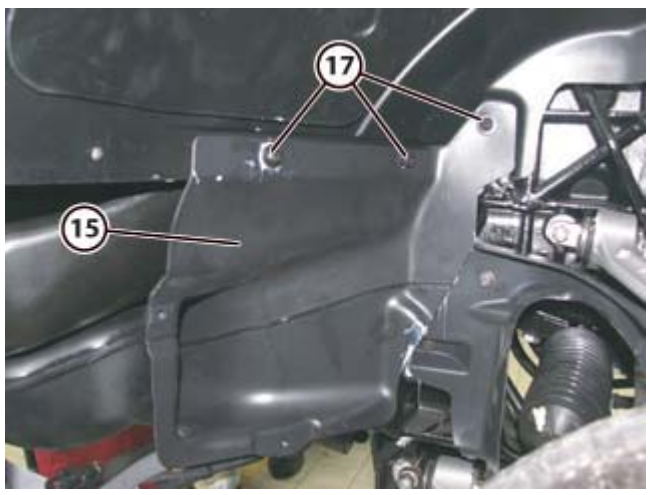
- Fit the bracket**(4)** complete with hydraulic steering oil tank, onto the stiffener bar**(C)** and fasten with the two screws**(5)**.
- Fasten the air-conditioning filler pipe bracket **(6)** with the screw **(7)**.
- Fasten the two filler pipes to the bracket **(6)** with the screw **(8)**.



- Fit the upper air duct **(9)** in its seat and fasten to the bar with the bushing **(10)** and the screw **(11)**.
- Fit the clamp **(12)** and fasten with the nut **(13)**.



- Working from the wheel bay, fit the lower duct **(15)**.
- Fasten the upper air duct **(9)** to the lower duct **(15)** with the two screws **(14)**.
- Fasten the lower air duct **(15)** to the bodyshell with the two screws **(16)**.
- Fit the gasket onto the ducts.



- Fasten the lower air duct **(15)** definitively, using the screws **(17)**.

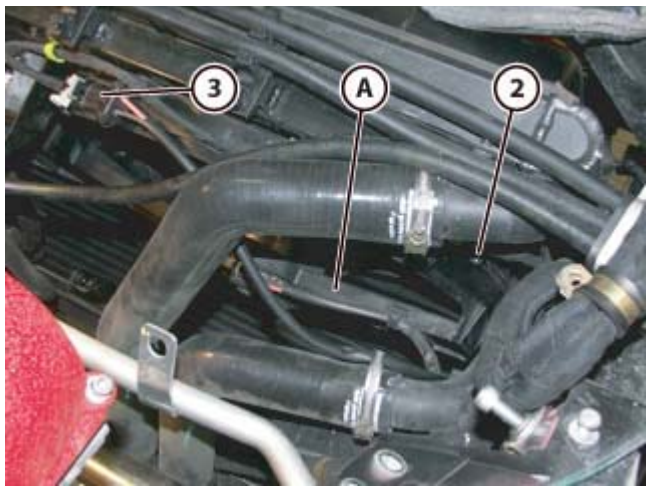
➢ Refit the front bumper (M2.03).
➢ Refit the central engine compartment shield (M2.17).
➢ Refit the air intake (B6.03).

Refitting the right hand electric fan on the radiator

Tightening torque		Nm	Class
Fan - radiator duct	Screw	5 Nm	B



- Before fitting the fan on the air duct, fit the four vibration-damping pads **(1)** fixing them to the fan with cyonoacrylate adhesive **AREXONS SYSTEM C666 - CYANOACRYLATE ADHESIVE FOR RUBBER**.



- Fit the electric fan **(A)** on the duct, fasten by tightening the four screws **(2)**, and attach the connector **(3)** (M017).

Tightening torque	Nm	Class
Screw	5 Nm	B

➢ Refit the engine compartment chassis stiffener bar (M2.17).

B4.05 Expansion tank

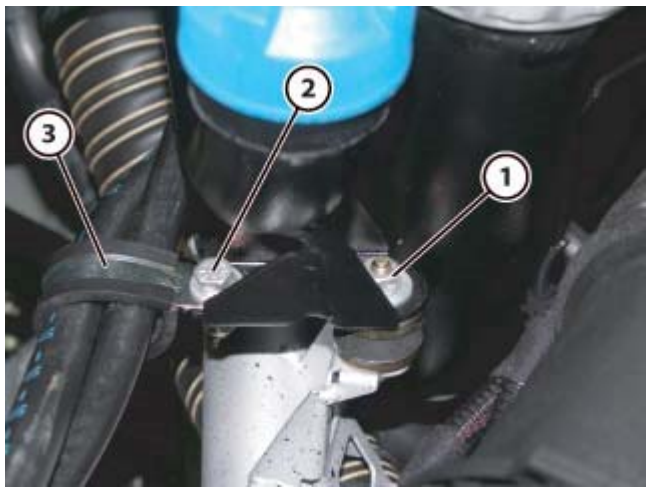
Removing the expansion tank

Partially drain the cooling system.

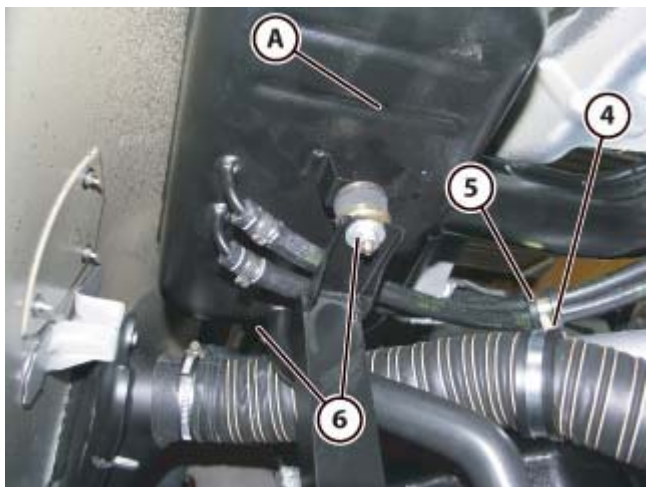
➢ Remove the engine compartment shields on the fenders (M2.17).
Remove the right hand component.

➢ Remove the front right hand wheelhouse (M2.05).

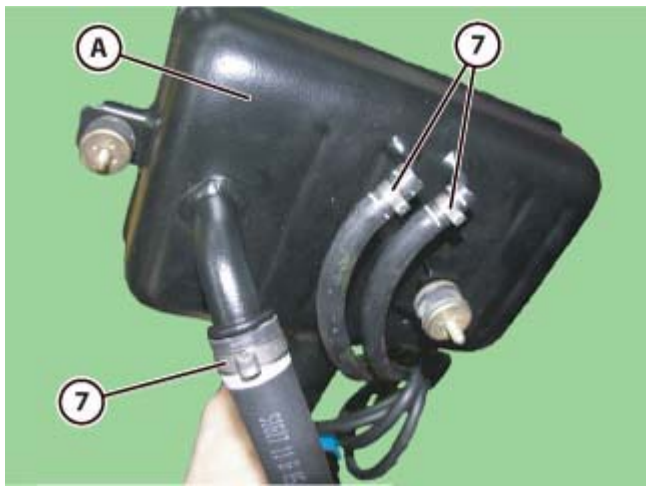
- Drain the coolant from the tank by aspirating it from the filler neck.



- Unscrew the bodywork fastener nut **(1)**, remove the screw **(2)** to release the coolant pipes and loosen the clamp **(3)**.

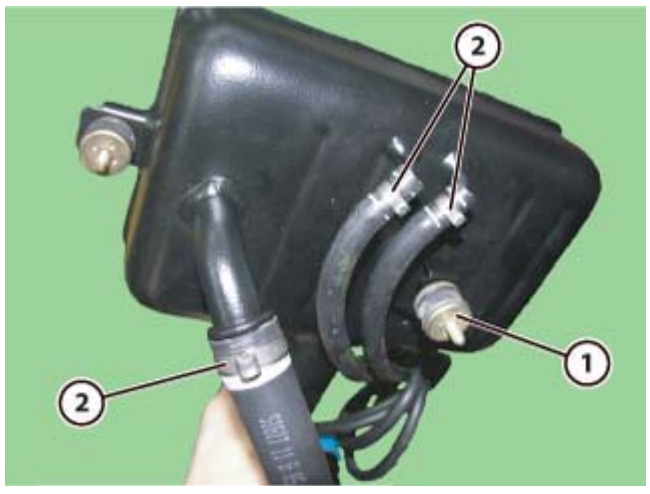


- Unscrew the nut **(4)** fastening the clamp **(5)**.
- Unscrew the two nuts **(6)** fastening the expansion tank **(A)** to the bodywork.

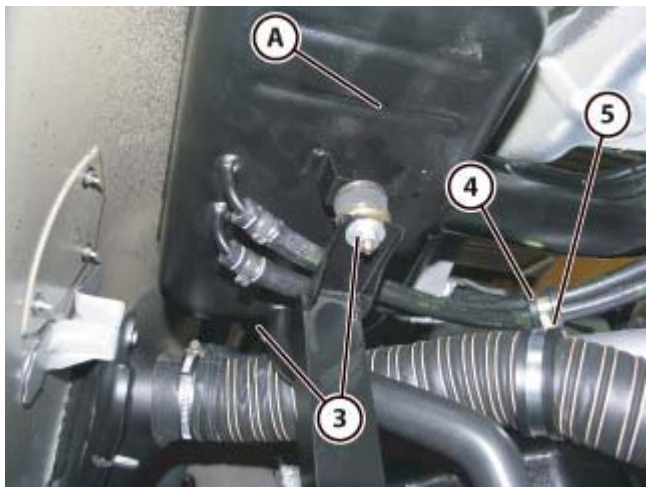


- Remove the tank **(A)** from its mountings and move it towards the wheelhouse as far as necessary to remove the clamps **(7)**, then remove the connector pipes.
- Remove the tank from the engine compartment, taking it out from the wheel bay.

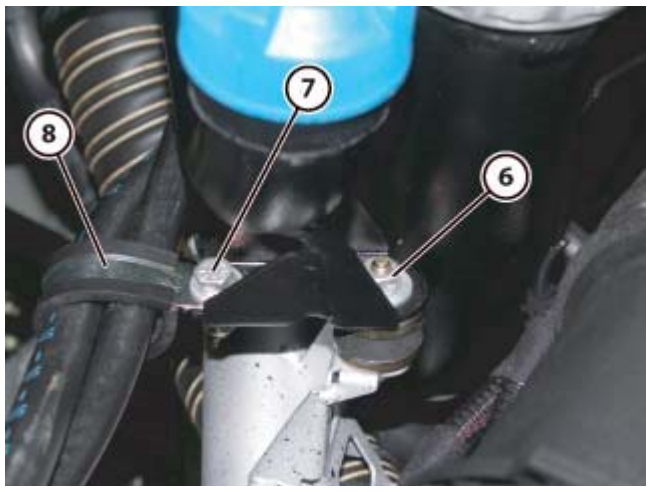
Refitting the expansion tank



- Check that the rubber mounts **(1)** fastening the expansion tank to the chassis are in good condition and replace if necessary.
- Fit the tank on the mounts, introducing into the vehicle through the front right hand wheel bay.
- Refit the tank inlet and outlet pipes, fastening with the clamps **(2)**.



- Fit the tank **(A)** in its seat on the chassis and tighten the two fastener nuts **(3)**.
- Fasten the connector pipes with the clamp **(4)**, tightening nut **(5)**.



- Tighten the nut **(6)** on the chassis.
- Fasten the clamp **(8)** to the chassis by tightening the screw **(7)**.

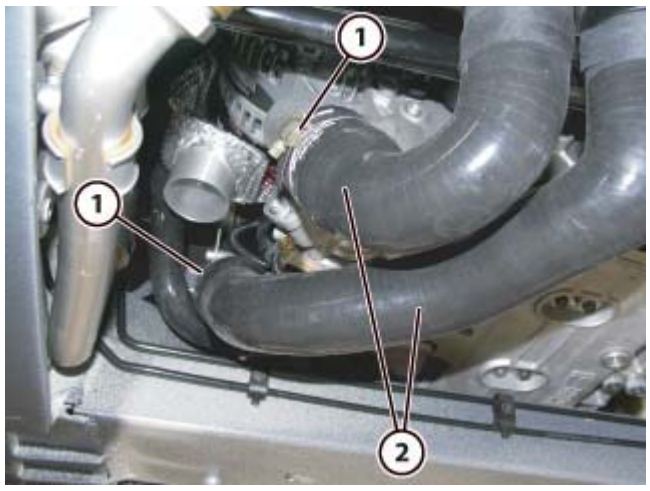
- Refit the front right hand wheelhouse (☞ M2.05).
- Refit the engine compartment shields on the fenders (☞ M2.17).
- Fill the cooling system (☞ A3.07).

B4.06 Draining and filling

Draining the cooling system

CAUTION
The fluid in the cooling system reaches extremely high temperatures and pressures.
WORK ONLY WITH A COLD ENGINE.

➢ Remove the front section of the underfloor (M2.12).



- Loosen the two clamps **(1)** fastening the delivery and return pipes **(2)**.
- Remove the two pipes from the water pump.

Pour the fluid drained from the system into a container and seal it. DO NOT DISPOSE OF USED FLUID IN THE ENVIRONMENT.

- Let the coolant drain completely.

Filling the cooling system

CAUTION
The fluid in the cooling system reaches extremely high temperatures and pressures.
WORK ONLY WITH A COLD ENGINE.

- Check that all the connection sleeve clamps are tight.

Static filling (engine off)

➢ Remove the central engine compartment shield (M2.17).
➢ Remove the central windscreen shield (M2.17).



- Detach the bleeder pipe **(1)** on the radiator and remove the clamp **(2)**, holding the pipe raised at the height of the header tank pipe union to prevent the coolant from leaking out.
- Turn on the instrument panel and select the maximum temperature for the air conditioning and heating system on the AC control panel.



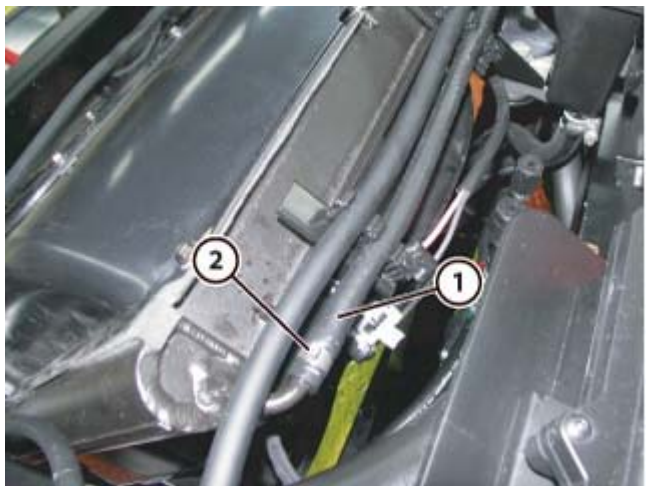
- Completely unscrew the bleeder cap **(3)** on the heater inlet pipe.



- Unscrew the filler cap **(A)** on the expansion tank.

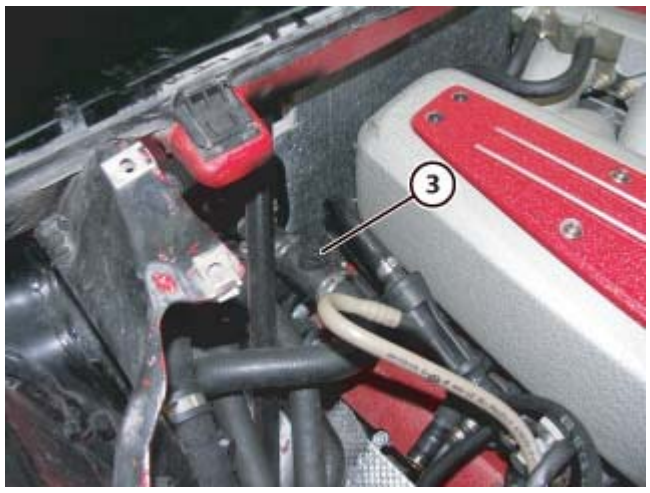
FROM Ass.ly No. 87867, a new coolant has been introduced. Carefully check which type of coolant has been used in the vehicle before topping up or filling the system. Do not mix different types of coolant as this may alter their properties.

- Slowly pour in the specified amount of coolant **(19 l)**, through the filler neck of the expansion tank, until fluid exits the open radiator bleeder pipe.



- Reconnect the radiator bleeder pipe **(1)**, securing with the clamp **(2)**, and complete the filling procedure until fluid is visible in the filler neck on the expansion tank.

In the event of coolant leaking from the heater pipe, close the bleeder cap.



- Close the bleeder cap **(3)** on the heater pipe.



- Screw the filler cap **(A)** onto the expansion tank.

Dynamic filling

- Start the engine and run at idle, turn on the heater and set to maximum temperature (so that the TGK valves are open and the idle pump is active). After **30 sec**, open the header tank cap and top up as much as necessary until the radiator cooling fan is activated (to ensure that the thermostat valve has opened).
- Check that all the vents blow hot air at the same temperature (about **50 °C**).
- After reaching a stable coolant level in the expansion tank, close the filler neck cap.
- Run the engine at **3000 RPM**, maintain this speed for **60 seconds** then let it drop to idle.
- Run the engine at **3000 RPM**, close the heater circuit, then the engine speed drop to idle after **60 seconds**.
- Stop the engine and let it cool down.
- Check the cooling system fluid level (☞ A3.07).

Check the level **when the fluid is cold** and top up if necessary (without opening any of the bleeder pipes).

- If topping up is necessary, follow the same filling procedure used during **"Dynamic filling"**.

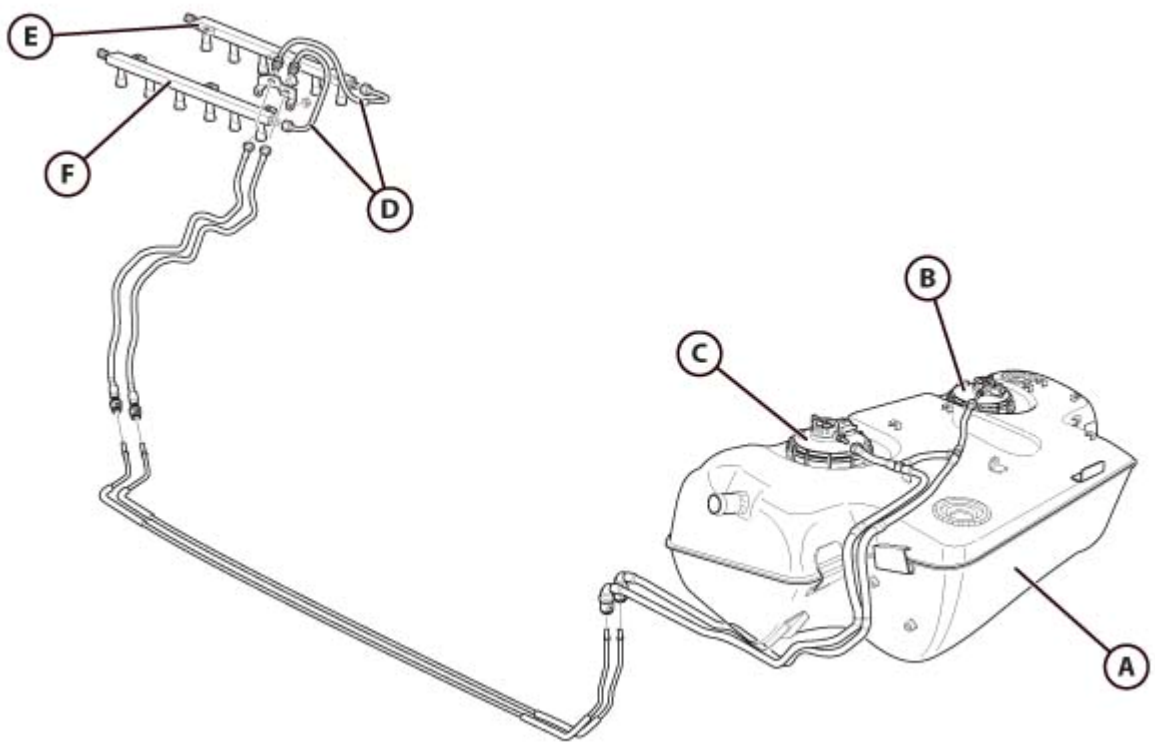


- Screw the filler cap **(A)** onto the expansion tank.

➢ Refit the central underwindscreen shield (M2.17).
➢ Refit the central engine compartment shield (M2.17).

B5.01 System layout

Fuel system diagram

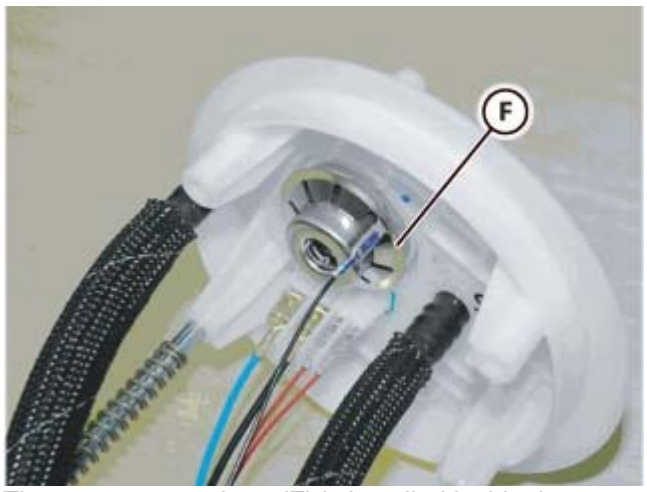


A - Fuel tank
B - Right-hand fuel pump (with incorporated fuel level gauge)
C - Left-hand fuel pump
D - Fuel pipes to injector rails
E - Right-hand bank electro-injector rail
F - Left-hand bank electro-injector rail

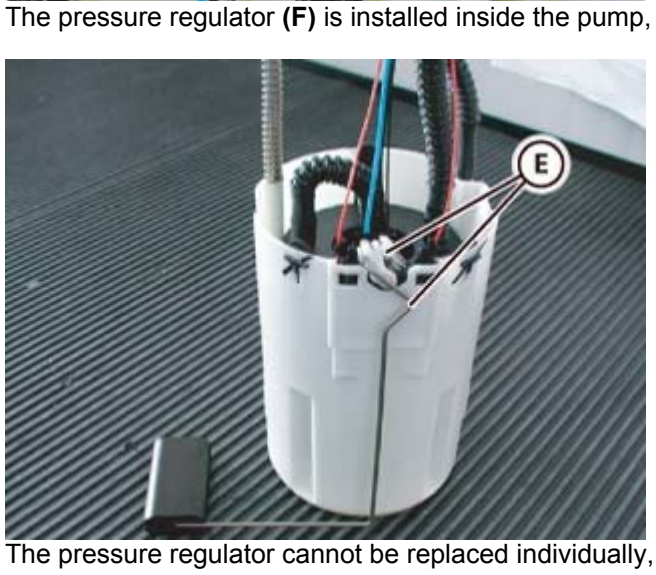
B5.02 Fuel pump assembly

Fuel pump assembly

The pumps feeding each engine cylinder bank are installed within the pickup screens at the bottom of the fuel tank.
If in any doubt whether the fuel pump is working correctly, check pump function only after inspecting the fuel system pipes for leaks.

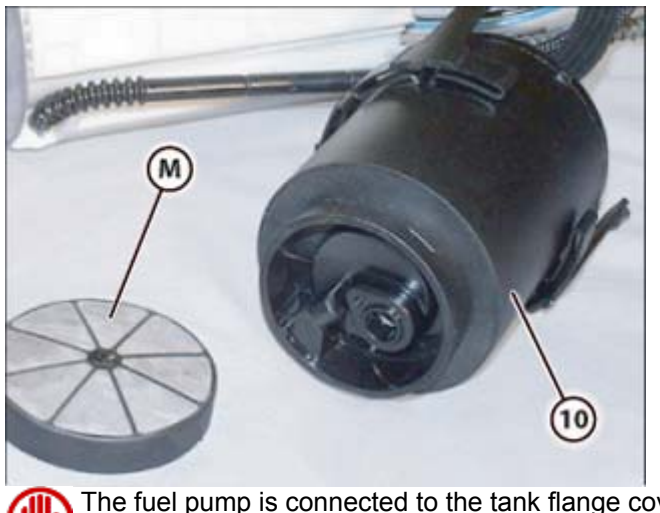


The pressure regulator **(F)** is installed inside the pump, while the level gauge is installed on the edge of the right hand pump pickup screen **(E)**.



The pressure regulator cannot be replaced individually, as it is a part of the pump assembly, which is supplied as a complete spare part.

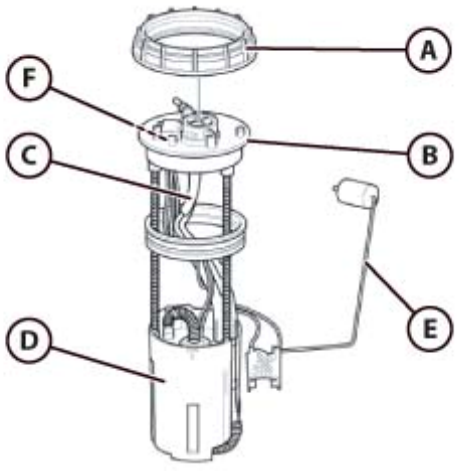
The fuel pump **(BOSCH EKP 14)** is a roller displacement type suction pump driven by a permanent magnet electric motor.



The fuel pump is connected to the tank flange cover by lines and electrical cables which must not be disconnected.

There is a pump installed in each tank, inside a special casing **(10)** which also houses the fuel filter, at the pump inlet. On the lower end there is a meshed suction screen **(M)**.
The pump motor is activated at engine speeds above **40 RPM** and runs constantly after engine start.
If the injection system is activated when the engine is not running, a safety circuit cuts out the fuel pump.
The pump is capable of operating at low voltages and low temperatures to enable cold starts.
The pump has a pressure relief valve which short-circuits delivery to the intake chamber when the pressure exceeds **8 bar**, as in the case of clogging. The pump is also equipped with a check valve that opens at **1.5 bar** and closes when the pump is off, to keep the operating pressure at approximately **3.6 bar**.

Fuel pump unit components



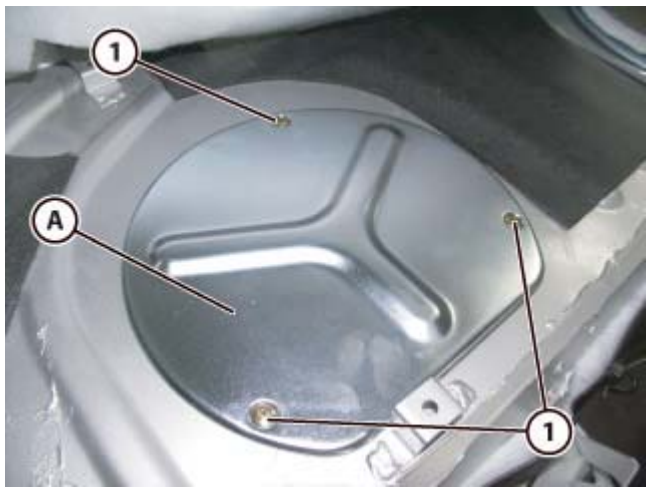
A - Cover clamping ring nut
B - Pump cover
C - Lines
D - Fuel pump
E - Level gauge
F - Pressure regulator

Removing the fuel pump

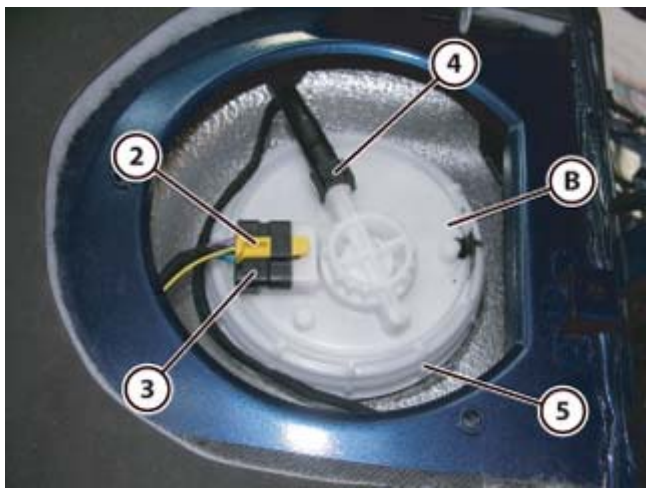
CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.
To prevent fire risks, work only on a cold engine and with the fuel tank almost empty.

➢ Remove the rear trim panels (M2.24).
Follow the removal sequence up to the removal of the **luggage shelf**.

➢ Remove the firewall panel under the luggage shelf.



- Lift the passenger compartment soundproofing panel and the **rear shelf insulating material**.
- Undo the three screws **(1)** fastening the cover **(A)** to the bodywork.



CAUTION
Always plug the fuel pipes to prevent residual fuel from leaking.
When disconnecting a fuel system line, bear in mind that the line may be pressurised and that there is a risk of fuel spraying onto the operator. Proceed with extreme caution and do not work near naked flame.

- Detach the safety tab **(2)** and the connector **(3)** (M302) (M303) from the pump cover.
- Detach the fuel pipe **(4)**.
- Unscrew the ring nut **(5)** counterclockwise with the tool **(1870736000)**, and remove.
- Place rags around the pump housing to absorb any fuel spilled during the removal of the pump assembly **(B)**.

Dry off any leakage of residual fuel immediately.

- Start lifting lift the pump assembly **(B)** slowly and carefully, spilling as little fuel as possible.
- Remove the pump unit **(A)**, easing outward.

When removing the right hand fuel pump, remove the pump from its seat with extreme caution, as the pump comes complete with level gauge float.

Protect the tank aperture adequately to keep foreign bodies out.

When handling the pump assembly, protect against bumps and contamination.

The fuel pump is connected to the tank flange cover by lines and electrical cables which must not be disconnected.

- The new assemblies are supplied in a special plastic package which must always be used for storage or handling.

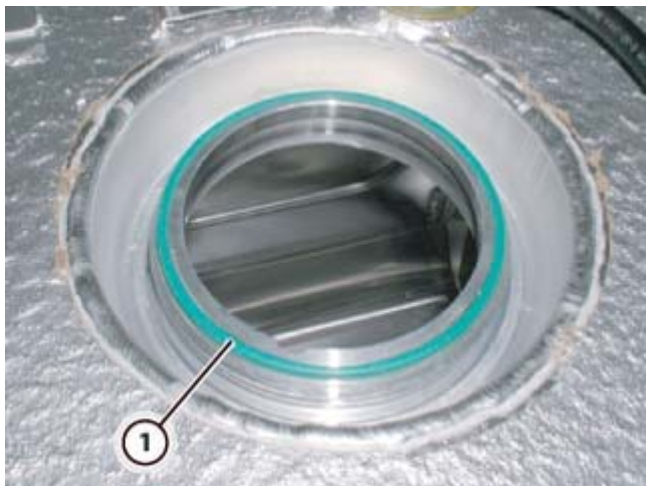
Store the new pump assemblies in a closed area providing protection against the weather.

The maximum permissible storage period is four years; after this period, the assembly must be tested to ensure correct operation.

Refitting the fuel pump

Tightening torque		**Nm**	**Class**
Fuel pump cover	Ring nut	60 Nm	B

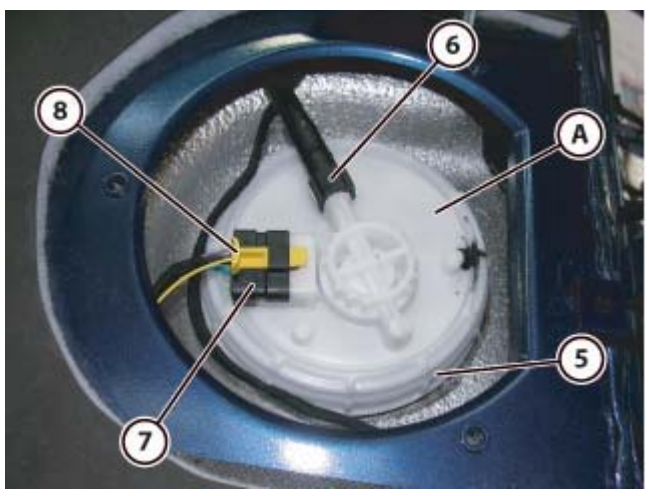
- Before refitting, thoroughly clean all the parts removed and dry with compressed air.



- ALWAYS replace the O-ring **(1)** each time the pump screw ring is loosened.



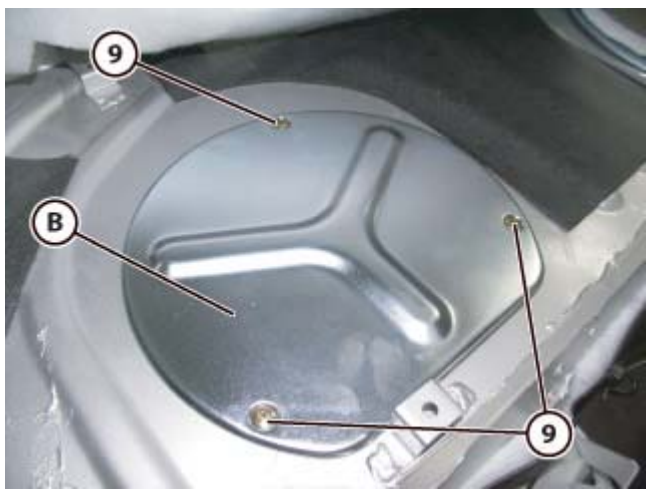
- Fit the pump body, aligning the groove **(2)** with the seat in the tank.
- Fasten the pump cover in its seat on the tank inlet.



- Fasten the cover **(A)**, fitting the ring nut **(5)**, and tighten the nut with the special tool **(1870736000)**.

Tightening torque	**Nm**	**Class**
Ring nut	60 Nm	B

- Connect the fuel pipe **(6)**.
- Connect the connector **(7)** (M302) (M303) and insert the safety tab **(8)**.



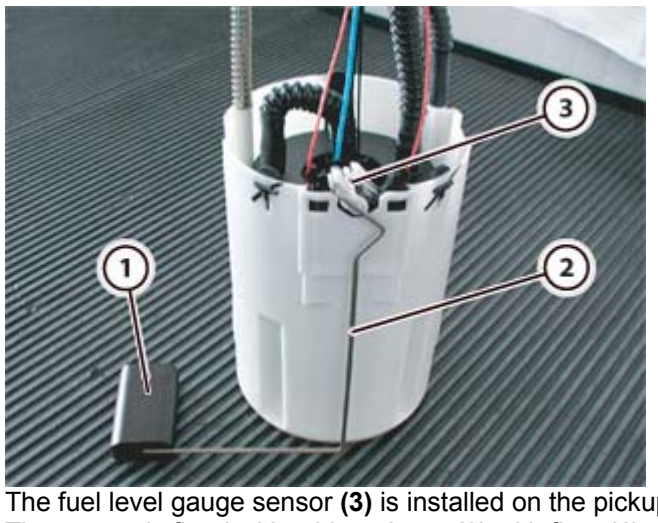
- Refit the cover **(B)** to the bodywork using the three screws **(9)**.
- Refit the passenger compartment soundproofing panel and the **rear shelf insulating material**.

Refit the firewall panel under the luggage shelf.

- Refit the rear trim panels (M2.24).
- Fill the fuel tank.

B5.03 Fuel level gauge

Fuel level gauge

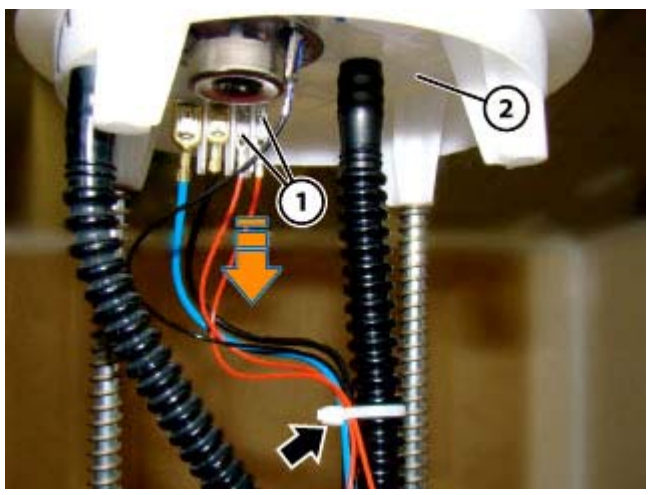


The fuel level gauge sensor **(3)** is installed on the pickup screen in the right hand pump.
The sensor is fitted with a hinged arm **(2)** with float **(1)** and sends an electrical signal to the gauge instrument on the TFT display in relation to the position of the float.

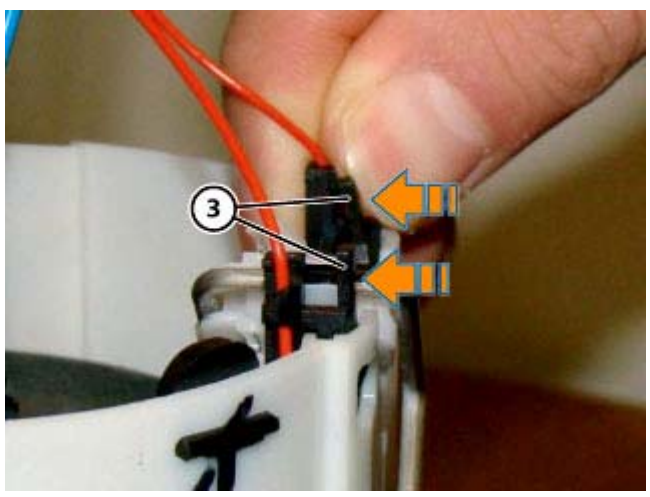
Replacing the fuel level sensor

CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.
To prevent fire risks, work only on a cold engine and with the fuel tank almost empty.

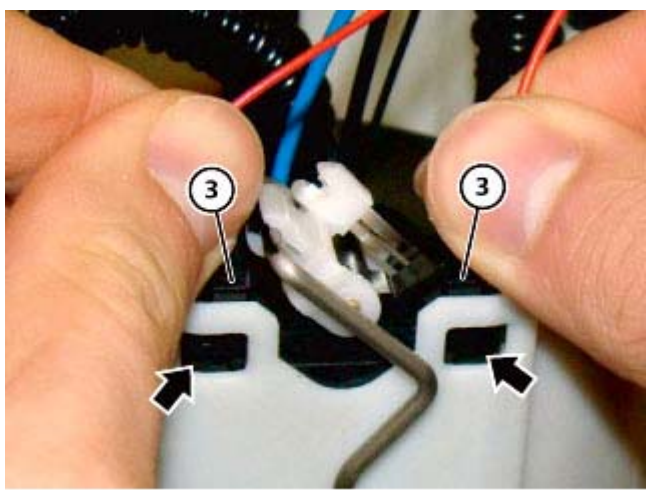
➢ Remove the fuel pump (B5.02).
i Remove the right hand fuel pump.



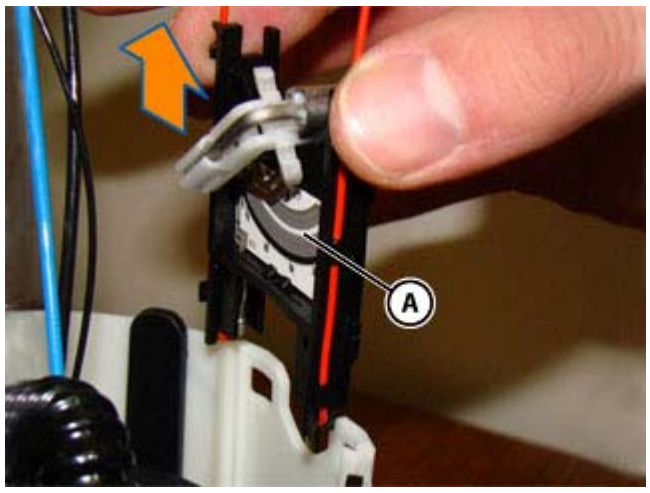
- Cut the indicated cable tie fastening the pipes, taking care not to damage any of the surrounding components.
- Disconnect the connectors **(1)** for the red cables from the flange **(2)**, pulling by hand perpendicularly relative to the flange itself, as shown in the photo aside.



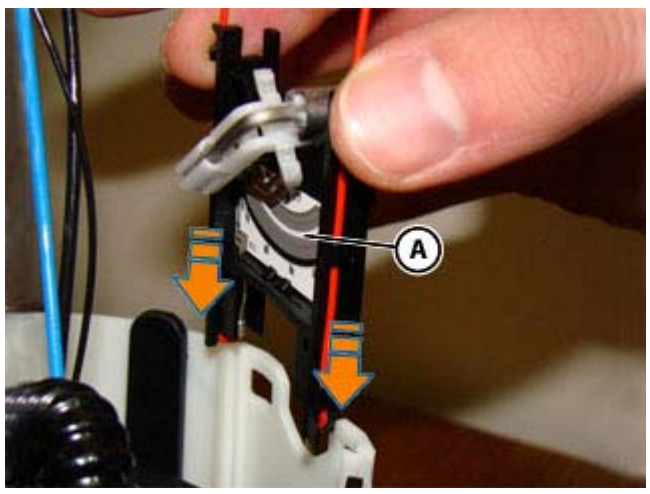
- Press the two snap fasteners **(3)** toward the centre of the module.



- Both snap fasteners **(3)** must be clear of the indicated apertures on the module, as shown in the photo aside.

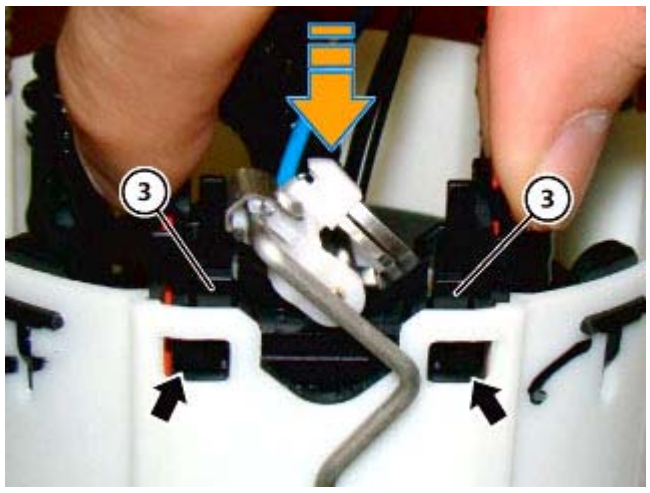


- Remove the fuel level sensor **(A)** from the fuel pump assembly, lifting upward.

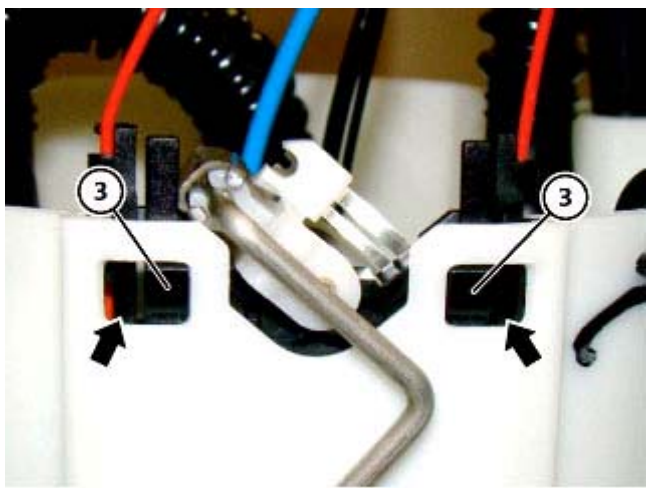


Do not touch the contact elements and the mobile section with the hands during installation; hold the fuel level sensor by the sides only.

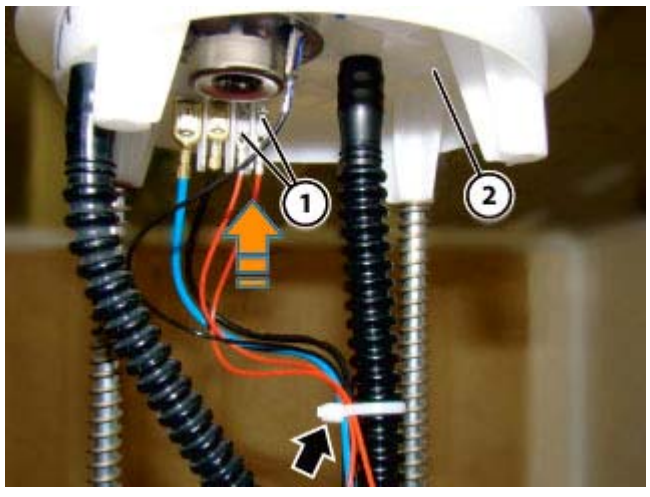
- The new fuel level sensor **(A)** (with clips) slides into the module. The protruding elements must be fitted correctly into the relative lateral guides.



- Press the fuel level sensor until both snap fasteners **(3)** fit into the relative apertures on the module.



- Ensure that the snap fasteners **(3)** are securely fixed into the relative apertures on the module.



- Press both fuel level sensor connectors **(1)** onto the relative pins on the flange **(2)**.

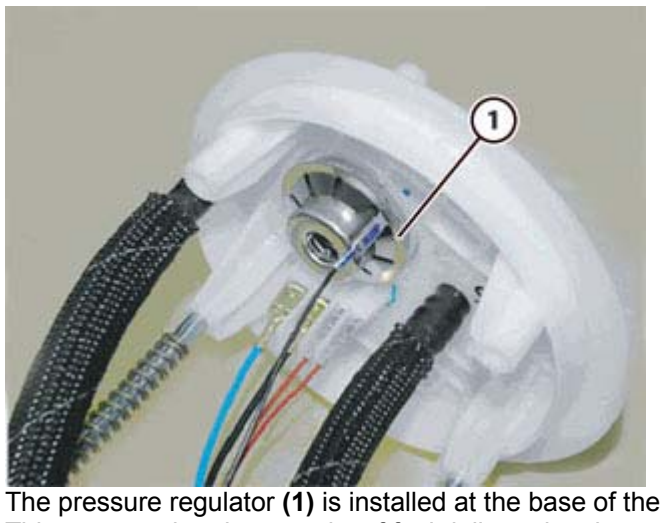
The connectors must be correctly connected and must not be damaged.

- Fasten the electric cables onto the black pipe as originally fitted with a new cable tie, as indicated.
- Once fastened, the electric cables between the fuel level sensor and the cable tie must be taut, while the cables between the cable tie and the flange must be slack.

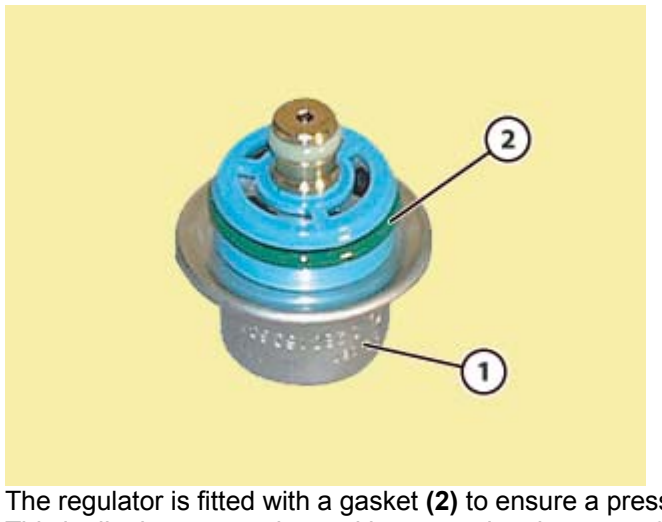
➢ Refit the fuel pump (B5.02).

B5.04 Pressure regulator

Pressure regulator



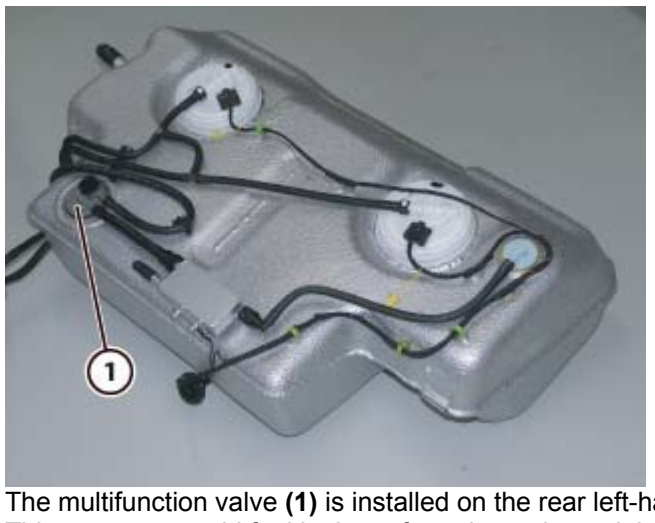
The pressure regulator **(1)** is installed at the base of the pump cover and maintains a constant pressure difference between fuel pressure and atmospheric pressure. This ensures that the quantity of fuel delivered to the combustion chambers depends solely on the electro-injector aperture period, as determined by the ECU.



The regulator is fitted with a gasket **(2)** to ensure a pressure-tight seal with the pump cover.
This is diaphragm regulator with a control spring set to **3.6 bar**.
The fuel pump flange must be removed too gain access to the regulator.
The pressure regulator is supplied as spare part with the complete pump assembly.

B5.05 Multifunction / ventilation valve

Multifunction valve

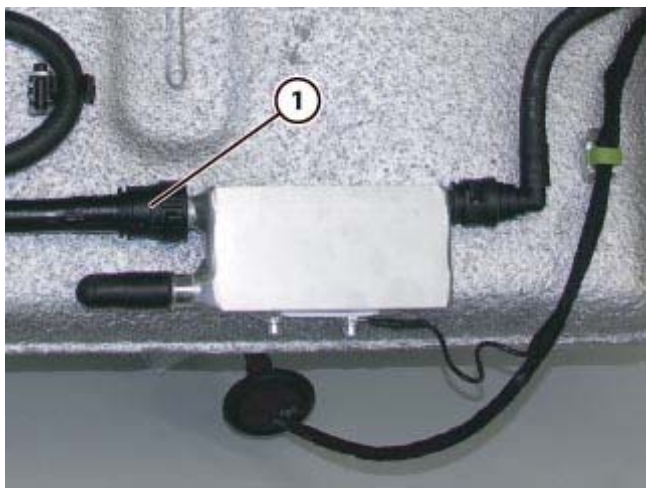


The multifunction valve **(1)** is installed on the rear left-hand side of the fuel tank.
This serves to avoid fuel leakage from the tanks and the fuel system if the car overturns.
For proper operation, it is essential that this valve is installed in a vertical position as it may close if tilted.

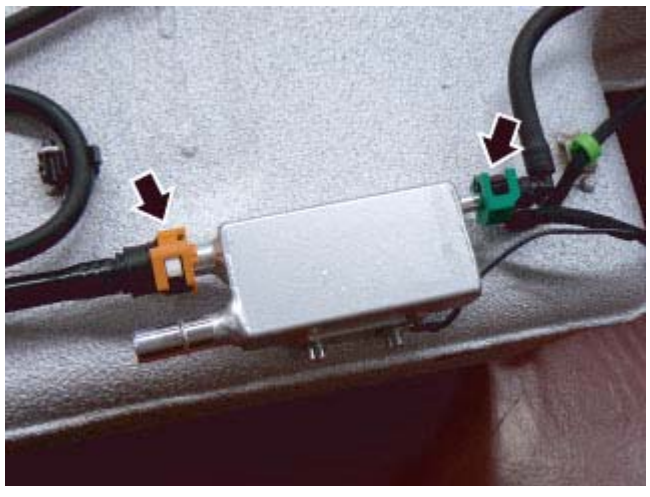
Replacing the multifunctional valve and ventilation valve

Tightening torque		**Nm**	**Class**
Multifunctional valve	Valve	8 Nm	B
Ventilation valve	Valve	8 Nm	B

- Remove the tank panel trim panel from the luggage compartment (M2.23).
- Remove the fuel tank (B5.06).



- To disconnect the multifunctional valve, disconnect the union **(1)** from the separator.

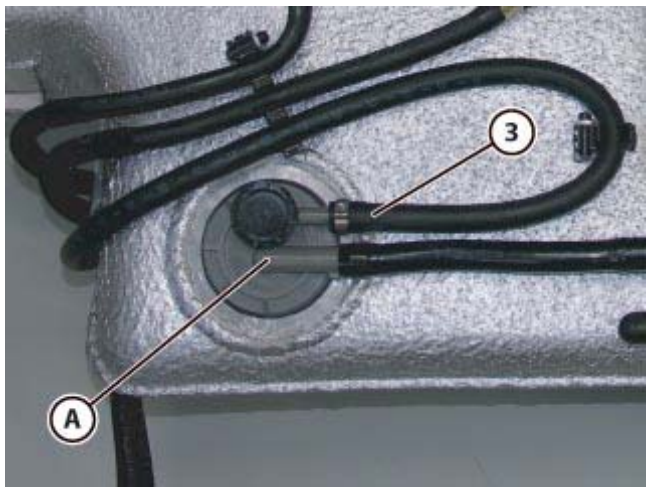


NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

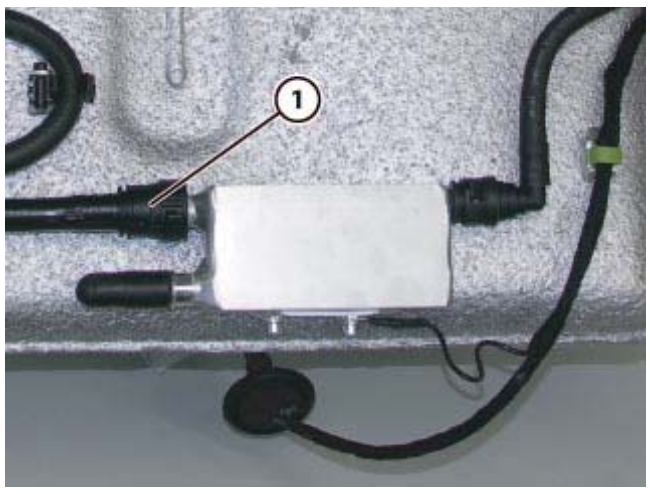
- Then press on both sides of the quick-coupling and remove the pipe.



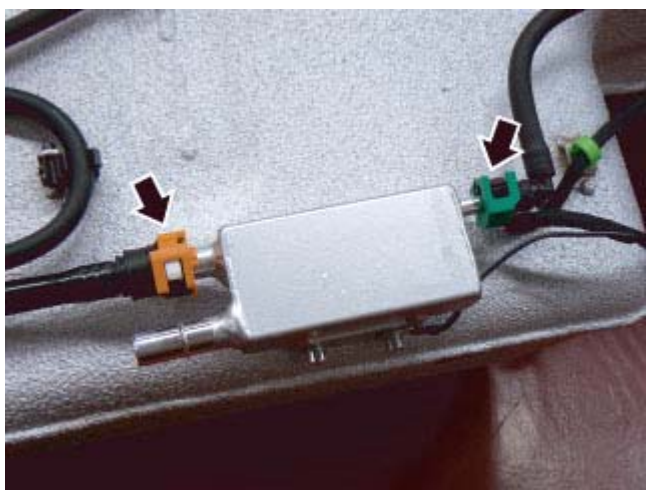
- Disconnect the pipe **(A)** from the multifunctional valve **(3)**.
- To remove the multifunctional valve **(A)** from its seat, push and turn clockwise, then remove from the tank and replace.
- To facilitate installation, grease the seat on the tank and the gasket on the valve.
- Fit the multifunctional valve **(A)** in its seat and fasten by turning counterclockwise by hand.
- To definitively fasten the multifunctional valve, use the wrench **(AV 3845)** together with a **6 mm** socket wrench.
- Applying a torque wrench to the tools, tighten the multifunctional valve **(A)**.

Tightening torque	**Nm**	**Class**
Valve	8 Nm	B

- Attach the pipe **(3)**.



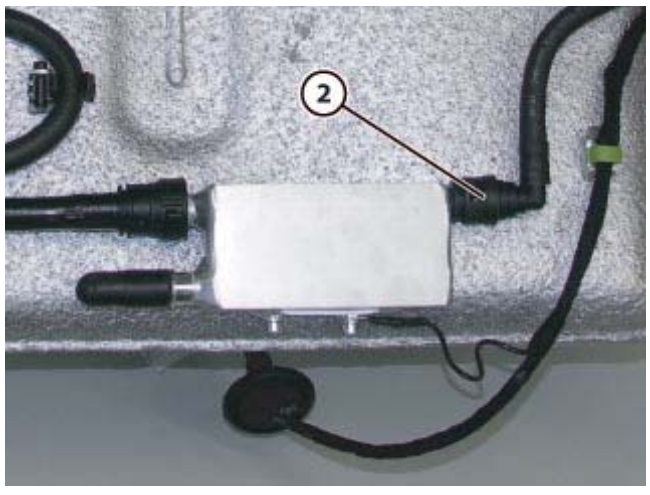
- Connect the union **(1)** to the separator.



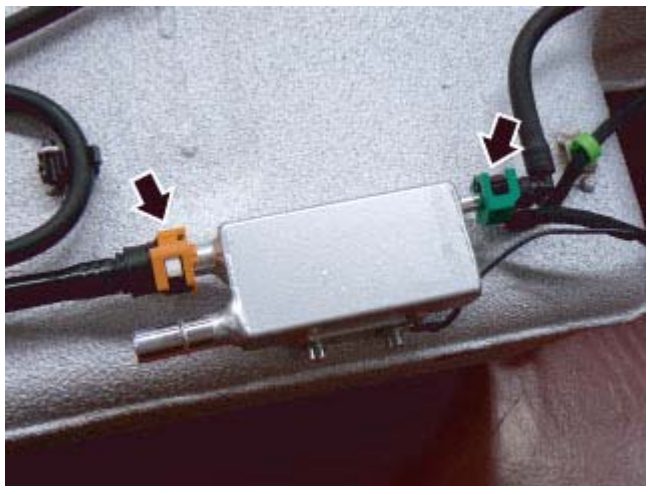
NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.



- To replace the ventilation valve, disconnect the union **(2)** from the separator.

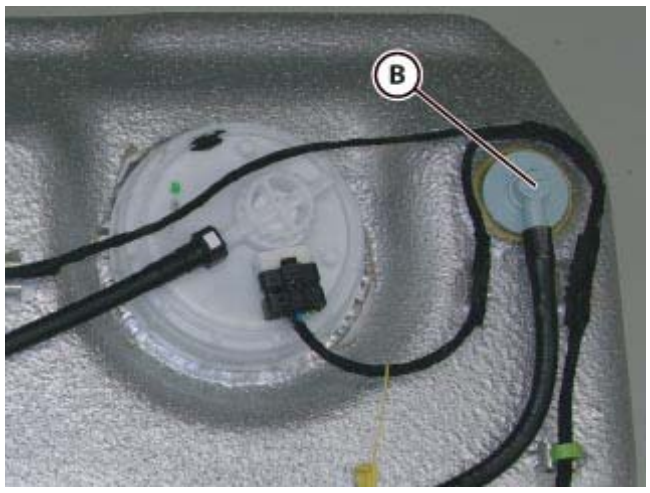


NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

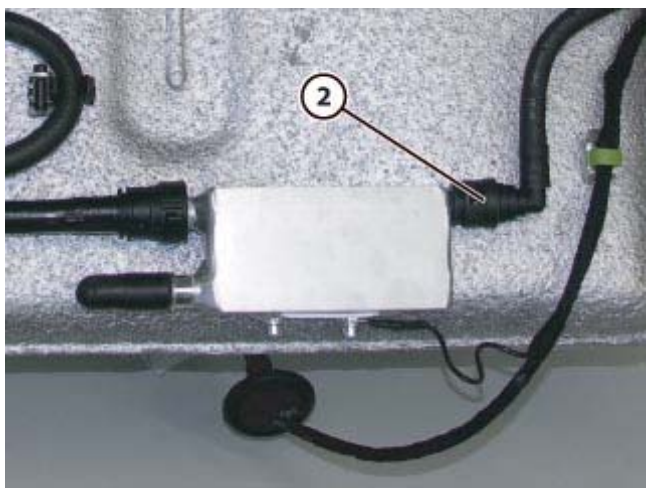
The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

- Then press on both sides of the quick-coupling and remove the pipe.

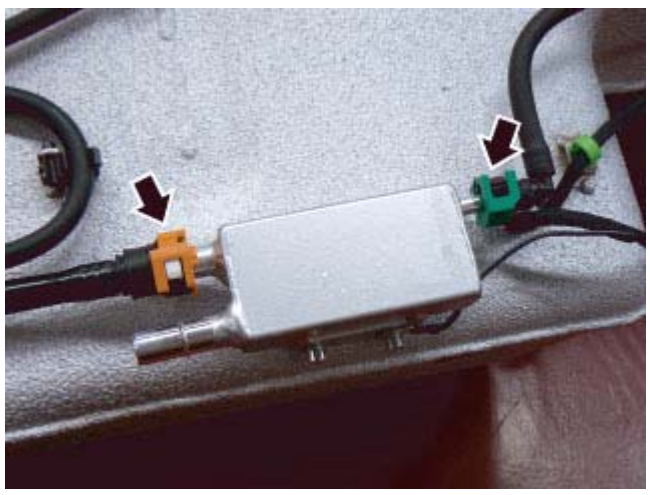


- To remove the ventilation valve **(B)** from its seat, push and turn counterclockwise, then remove from the tank and replace.
- To facilitate installation, grease the seat on the tank and the gasket on the valve.
- Install the ventilation valve **(B)**and fasten by turning clockwise by hand.
- To definitively fasten the ventilation valve, use the wrench **(AV 3844)** together with a **6 mm** socket wrench.
- Applying a torque wrench to the tools, tighten the ventilation valve **(B)**.

		
Tightening torque	**Nm**	**Class**
Valve	8 Nm	B



- Connect the union **(2)** to the separator.



NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

- Refit the fuel tank (B5.06).
- Refit the luggage compartment tank panel trim (M2.23).

B5.06 Fuel tank

Draining the fuel system

CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.
To prevent fire risks, work only on a cold engine and with the fuel tank almost empty.

➢ Remove the fuel pump (B5.02).
Preferably remove the left hand assembly with no level indicator arm.

- This procedure requires the use of an aspirator pump compliant with **EEC standards**.

Dry off any leakage of residual fuel immediately.

- Aspirate as much fuel as possible from the tank and collect in a container.

Removing the fuel tank

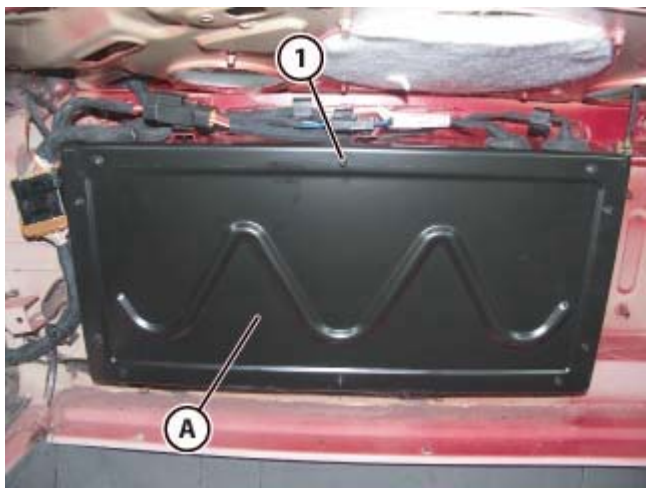
CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.
To prevent fire risks, work only on a cold engine and with the fuel tank almost empty.

Dry off any leakage of residual fuel immediately.

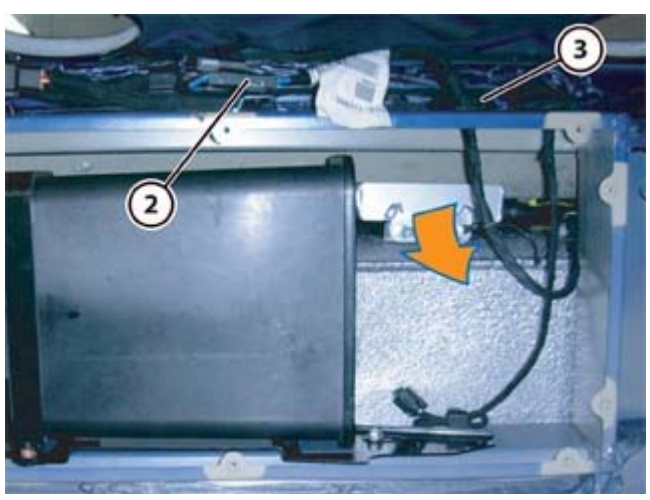
The tank consists of a single element and is inserted in the chassis frame in the front of the luggage compartment. The two fuel pumps are mounted in the tank; the fuel gauge is mounted on the right pump.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the gearbox-differential assembly (D2.01).
➢ Remove the tank panel trim panel from the luggage compartment (M2.23).
➢ Remove the rear trim panels (M2.24).
Follow the removal sequence up to the removal of the **luggage shelf**.

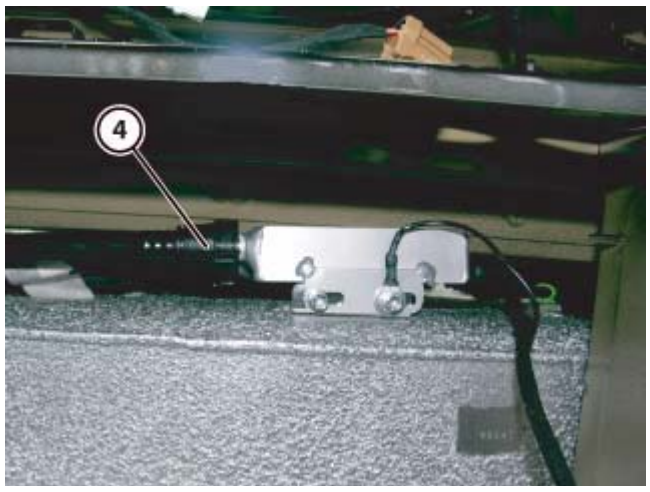
➢ Drain the engine fuel system (B5.06).
➢ Remove the rear right hand wheelhouse (M2.05).



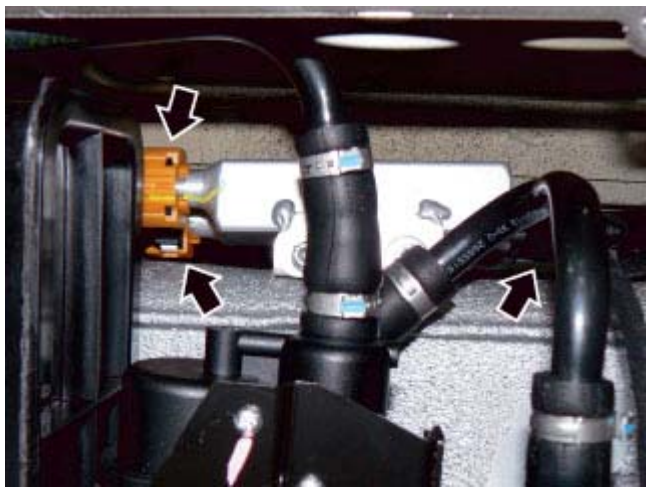
- Remove the protective metal tank guard **(A)** by undoing the ten screws **(1)**.



- Remove the connector **(2)** (Y307) of the two fuel pumps and, together with its cable guide **(3)**, remove it through the hole on the bodyshell ribbing.



- Disconnect the quick coupling pipe **(4)** on the fuel vapour separator.

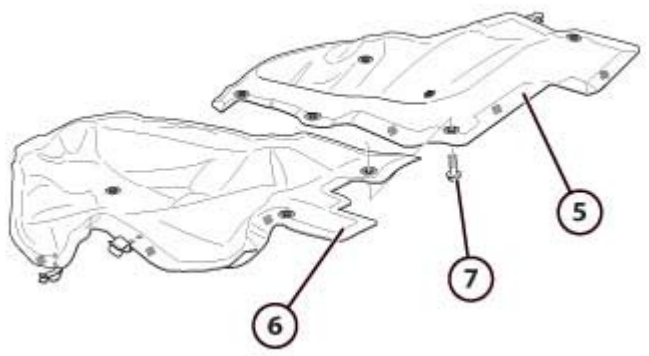


NEW SOLUTION

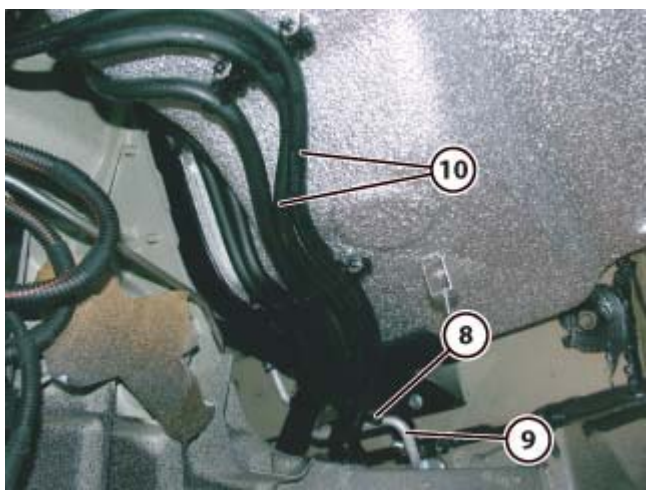
- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

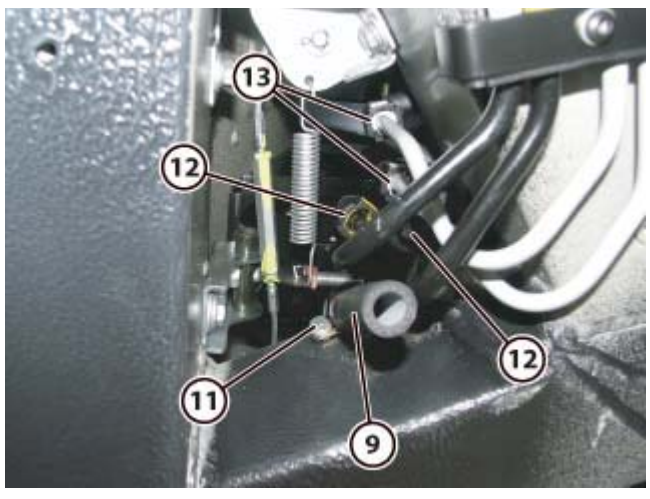
- Then press on both sides of the quick-coupling and remove the pipe.



- Working from underneath the vehicle, remove the right-hand **(5)** and left-hand **(6)** heat shields by undoing the seven screws **(7)** and removing the retainer clips on the stud bolts.



- Disconnect the pipe **(8)** leading from the multifunctional valve on the drain pipe **(9)**.
- Remove the two pipes **(10)** leading from the active carbon filter from the clamps on the tank.

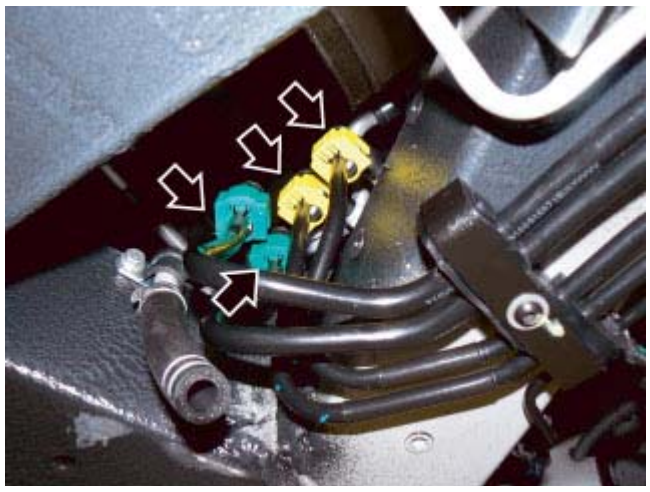


- Undo the screw **(11)** fastening the clamp onto the drain pipe **(9)**.

CAUTION

Always plug the fuel pipes to prevent residual fuel from leaking.
When disconnecting a fuel system line, bear in mind that the line may be pressurised and that there is a risk of fuel spraying onto the operator. Proceed with extreme caution and do not work near naked flame.

- Disconnect the quick couplings **(12)** for the fuel pipes leading from the pumps and the quick couplings **(13)** for the evaporative emissions control system.

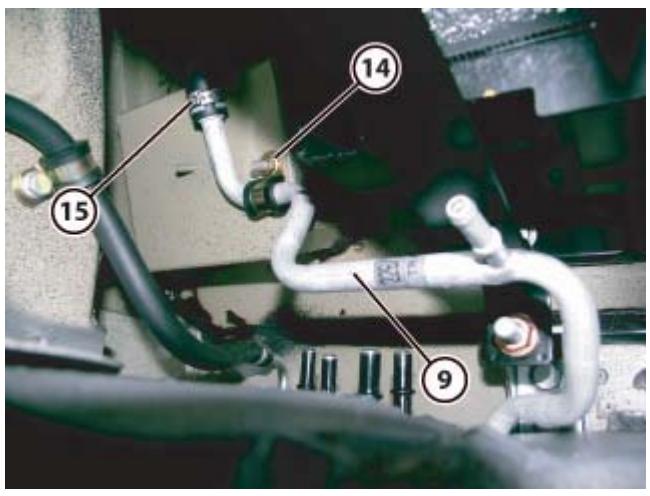


NEW SOLUTION

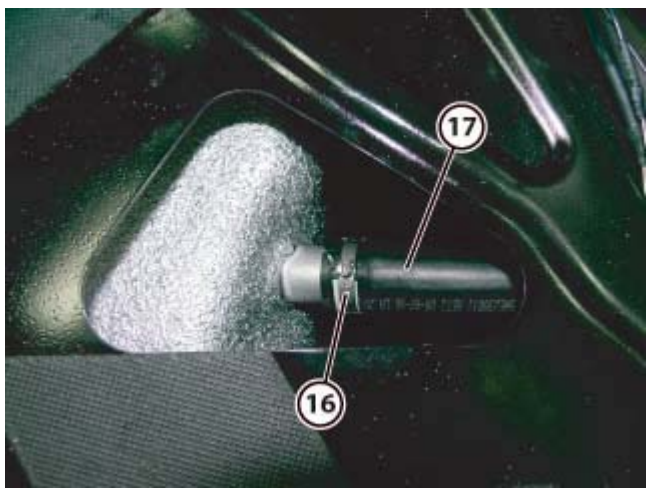
- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

i The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

- Then press on both sides of the quick-coupling and remove the pipe.



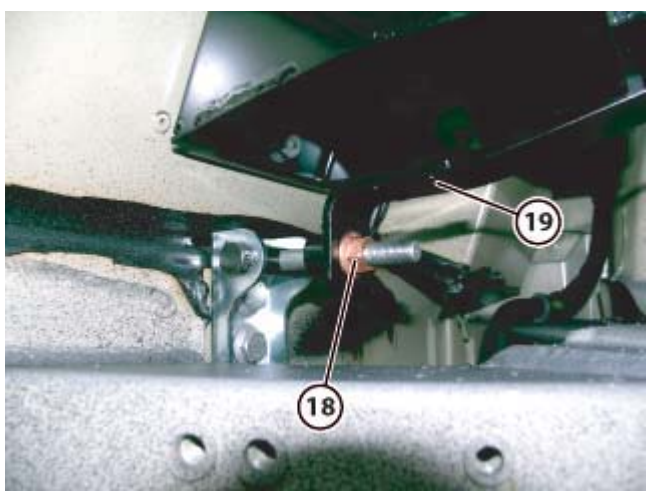
- Undo the nut **(14)** fastening the clamp on the drain pipe leading from the filler compartment.
- Remove the clamp **(15)** and remove the drain pipe **(9)** from the vehicle.



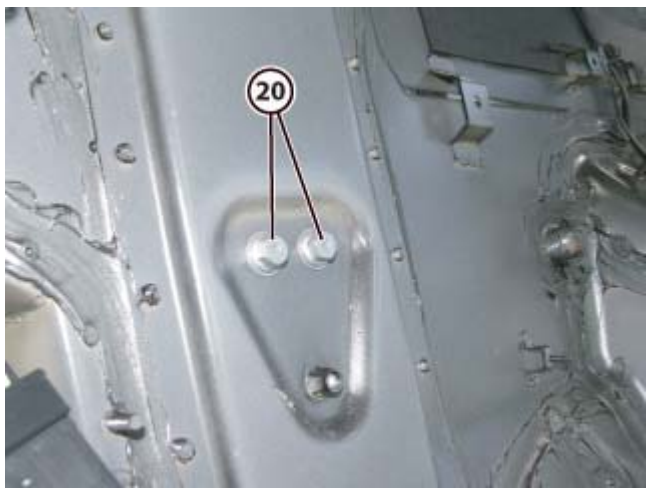
- Lift the passenger compartment soundproofing trim and **rear shelf insulating trim panel**.
- Remove the clamp **(16)** and detach the filler neck pipe **(17)** from the tank.



- Place a hydraulic jack under the central part of the tank, as shown in the figure, and be careful not to damage the tank.



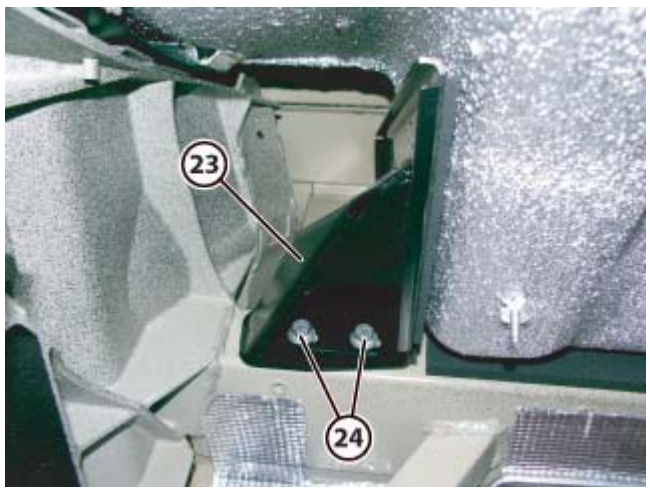
- Undo the two nuts **(18)** fastening the two mounting straps **(19)** (one on each side).



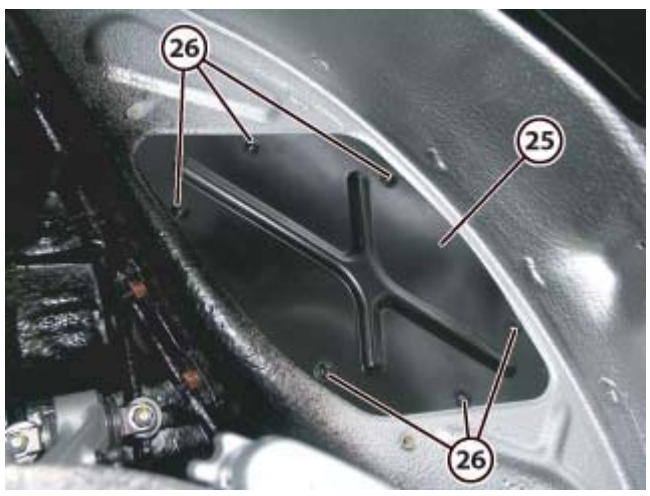
- From the passenger compartment, undo the four screws **(20)** fastening the two lower mounting brackets of the tank.



- From underneath the vehicle, undo the two screws **(22)** and remove the two lower mounting brackets (one on each side) **(21)** from the vehicle.

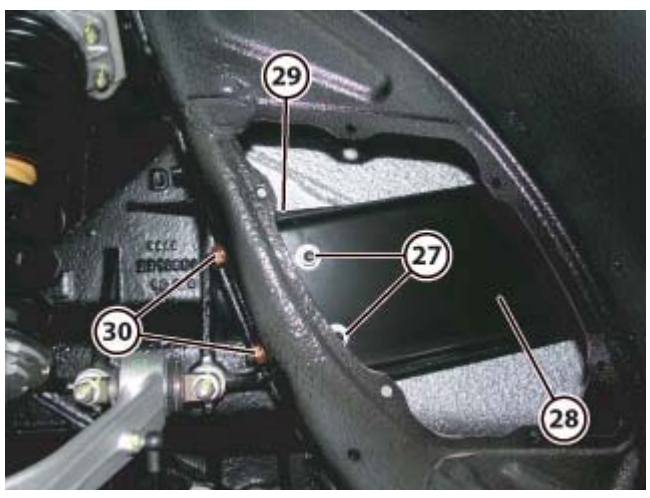


- Continuing to work from underneath the vehicle, on the rear right-hand side, remove the rear lateral mounting bracket **(23)** by undoing the screws **(24)**.

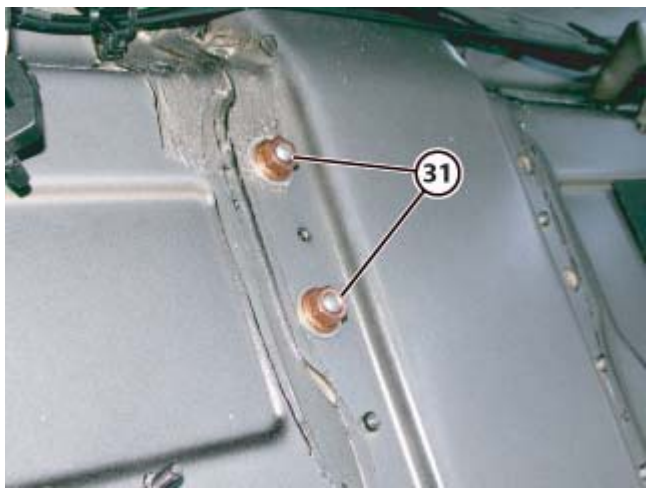


- Remove the hydraulic jack from underneath the vehicle and remove the metal plate **(25)** by undoing the screws **(26)**.

i When the hydraulic jack is removed, the tank drops a few centimetres and continues to rest on the chassis.



- Undo the nuts **(27)** fastening the right-hand lateral mounting bracket **(28)** to the adjuster bracket **(29)**.
- Undo the nuts **(30)** fastening the adjuster bracket **(29)** to the bodyshell.

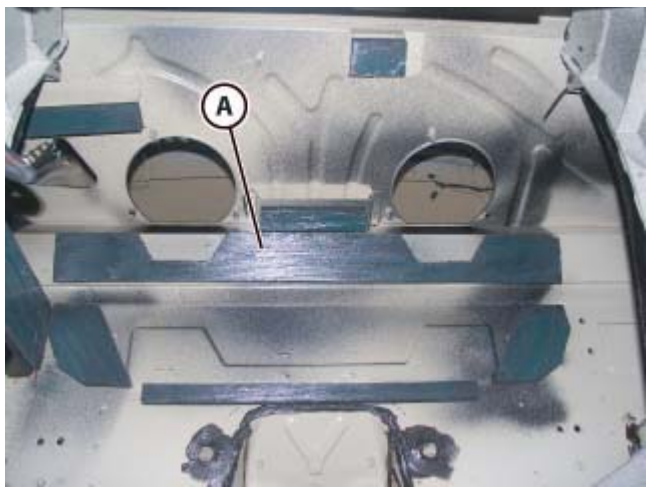


- Undo the nuts **(31)** fastening the lateral mounting bracket.
- Remove the adjuster bracket and lateral mounting bracket from the vehicle.

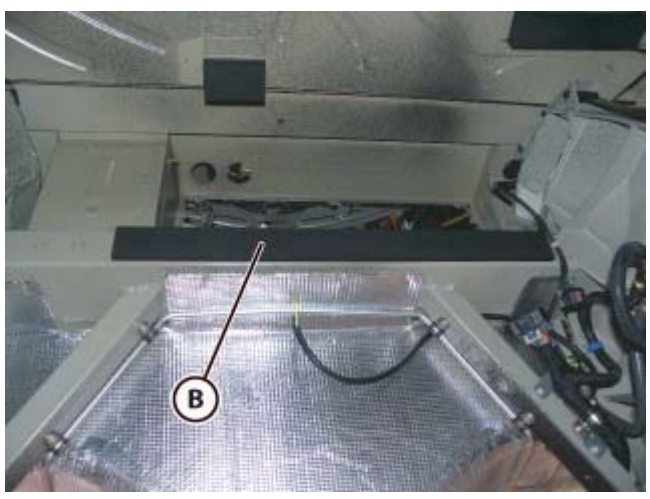
- Working from underneath the vehicle, remove the tank by moving it completely to the right, slowly lower the left-hand part and remove it from its seat taking care not to damage the pipes and any surrounding parts.

Checking the state of the tank shields

Heat shields and shims are installed in the fuel tank compartment to insulate the fuel tank from heat and vibration.



- Check that the rubber shims **(A)** applied to the walls of the fuel tank compartment are in good condition and securely fixed to the chassis. Replace if necessary.
- If necessary, apply a layer of grease **TUTELA MR3** to the shims.



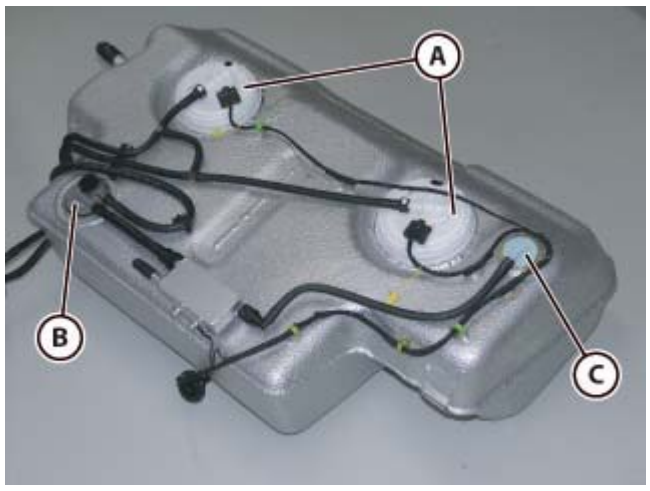
- Check that the rubber shim **(B)** applied to the rear cross member of the fuel tank compartment is in good condition and securely fixed to the chassis. Replace if necessary.

Refitting the fuel tank

Tightening torque		**Nm**	**Class**
Fuel tank adjustment bracket - body	Nut	20 Nm	B
Lateral fuel tank mounting bracket - body	Nut	20 Nm	B
Adjustment bracket - lateral fuel tank mounting bracket	Nut	20 Nm	B
Lateral rear fuel tank mounting bracket - body	Screw	20 Nm	B
Lower fuel tank mounting bracket - body	Screw	20 Nm	B
Tank mounting strap - adjustment pin	Nut	18 Nm	B

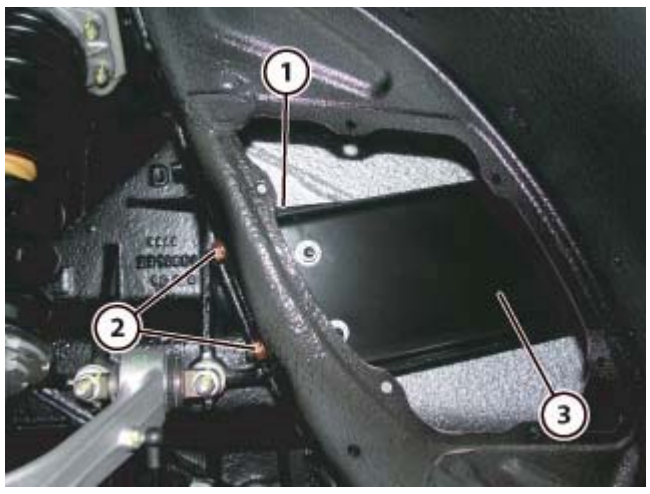
CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.
To prevent fire risks, work only on a cold engine and with the fuel tank almost empty.

Dry off any leakage of residual fuel immediately.



- Before fitting a new tank or refitting a previously removed component, check that it is in good condition and is not dented.
- Also check, during installation, that none of the following components are missing: pumps **(A)**, multifunctional valve **(B)** and breather valve **(C)**.

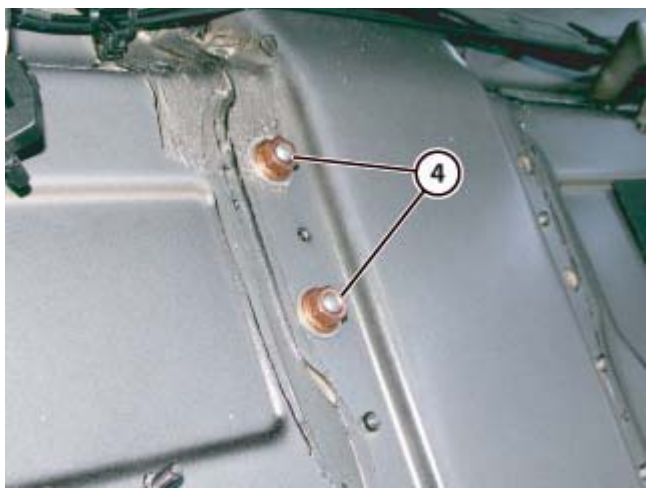
- Ease the tank into the relative seat in the vehicle, taking care not to damage the pipes, the rubber shims and any other surrounding parts.
- Tilt the tank, insert the right-hand part first, lift the left-hand part and then move towards the left, resting the tank in position.



- Working from the right rear wheelhouse, fit the adjuster bracket **(1)** in the relative seat and tighten the nuts **(2)**.

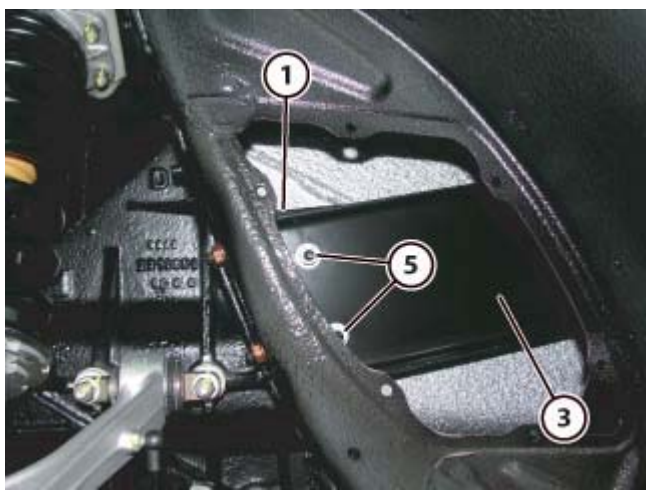
Tightening torque	Nm	Class
Nut	20 Nm	B

- Fit the right-hand lateral mounting bracket **(3)** on the stud bolts of the adjuster bracket **(1)**.



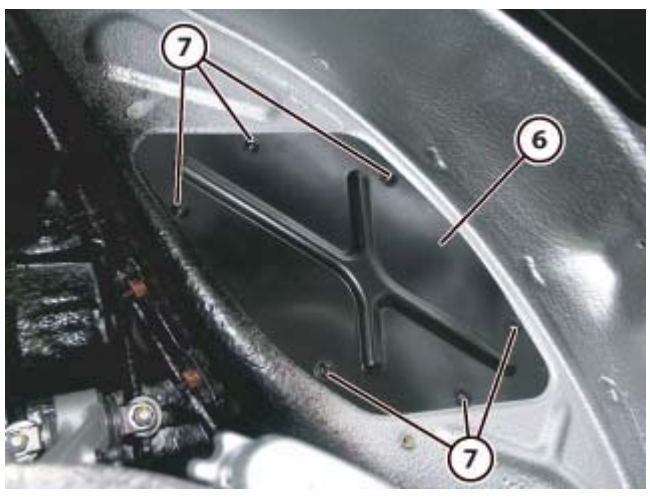
- Fasten the right-hand lateral mounting bracket by tightening the nuts **(4)**.

Tightening torque	Nm	Class
Nut	20 Nm	B



- Fasten the right-hand lateral mounting bracket **(3)** to the adjuster bracket **(1)** by tightening the nuts **(5)**.

Tightening torque	Nm	Class
Nut	20 Nm	B

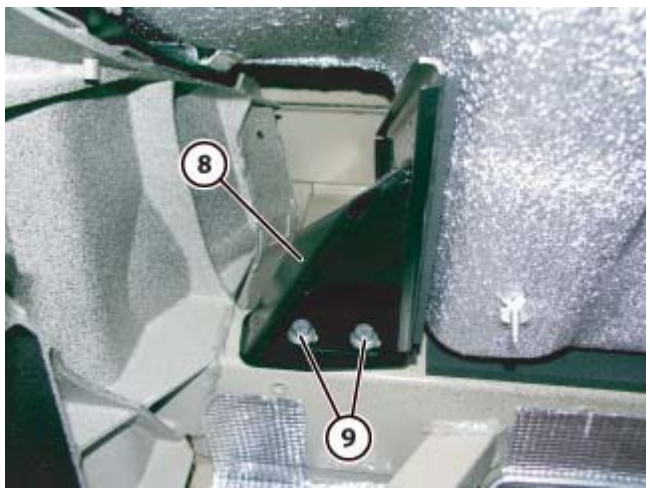


- Fit the metal plate **(6)** and tighten the screws **(7)**.



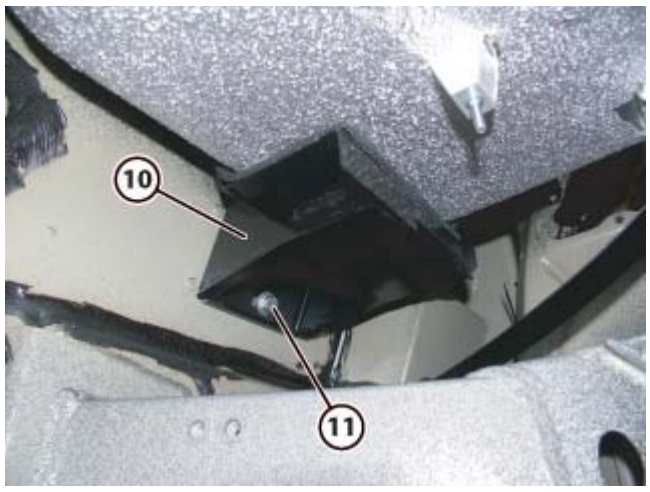
- Fit a hydraulic jack under the centre of the tank as shown in the figure and lift the tank.

i During this procedure, take care not to damage the walls of the tank.



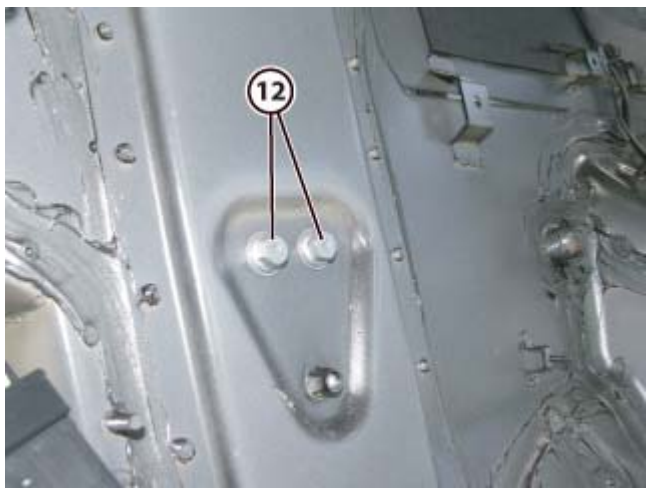
- Working from under the right-hand part of the vehicle, fit the rear lateral mounting bracket **(8)** and fasten by tightening the nuts **(9)**.

Tightening torque	Nm	Class
Screw	20 Nm	B



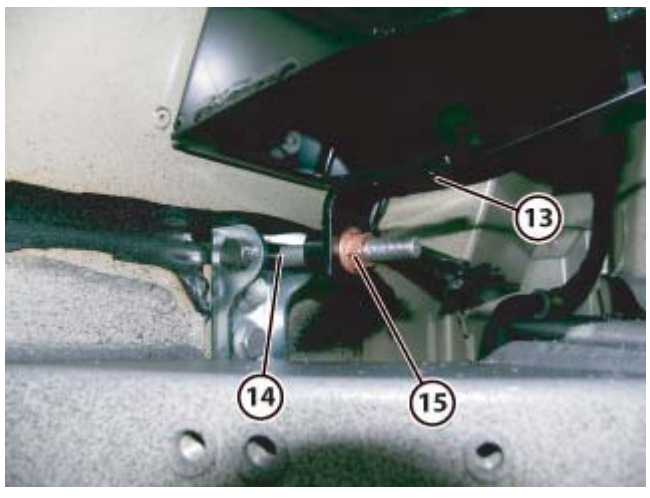
- Fit the two lower mounting brackets **(10)** (one on each side) and, after aligning the holes with the bodyshell from the passenger compartment side, tighten the two screws **(11)**.

Tightening torque	Nm	Class
Screw	20 Nm	B



- Fasten the two lower mounting brackets to the bodyshell by tightening the four screws **(12)**.

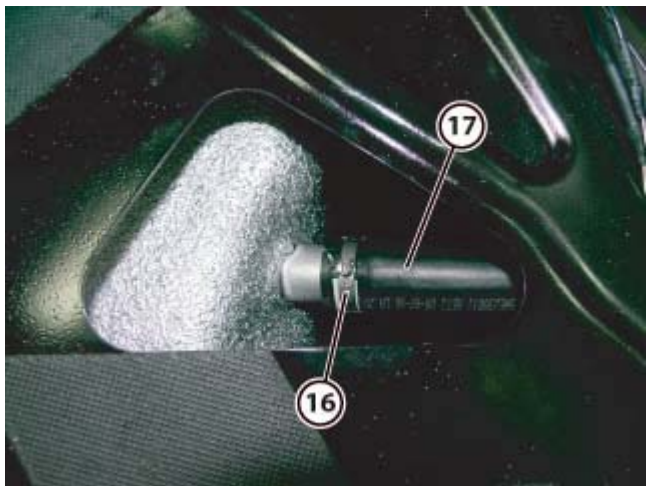
Tightening torque	Nm	Class
Screw	20 Nm	B



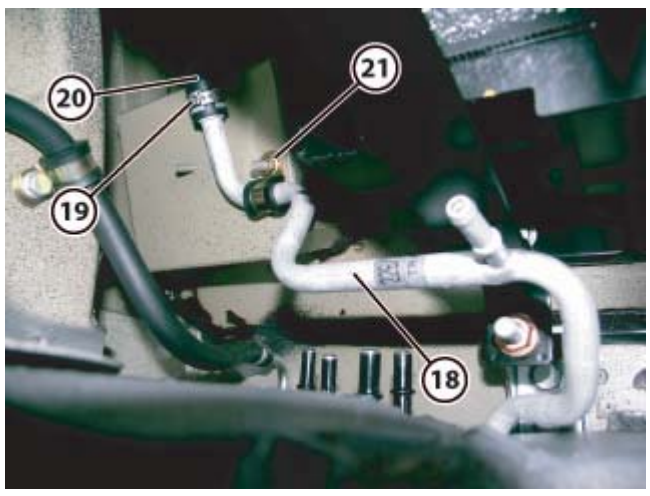
- Fit the two mounting straps **(13)** (one on each side) on the adjuster pins **(14)** and loosely apply first the left-hand, then the right-hand nuts **(15)**.
- Tighten the two nuts **(15)** in the same order.

Tightening torque	Nm	Class
Nut	18 Nm	B

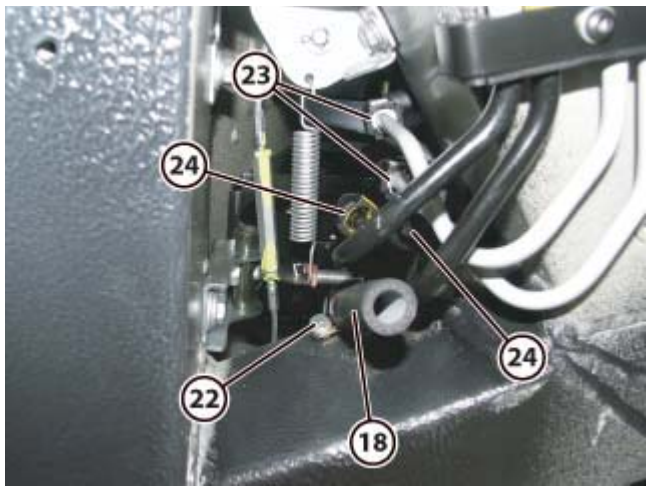
- Remove the jack from under the fuel tank.



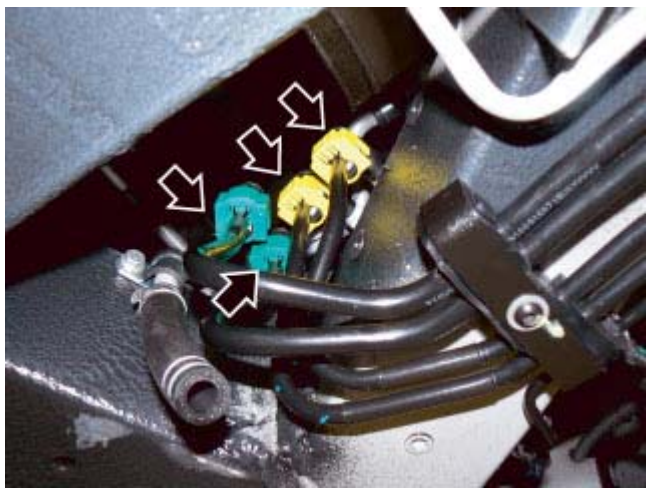
- Connect the filler neck pipe **(17)** to the tank and fasten with the clamp **(16)**.
- Refit the passenger compartment soundproofing **and rear shelf insulating trim panel as originally mounted**.



- Fit the drain pipe **(18)** in the vehicle, fit onto the drain pipe **(20)** leading from the filler compartment and fasten with the clamp **(19)**.
- Fasten the drain pipe **(18)** by tightening the nut **(21)** on the relative clamp.



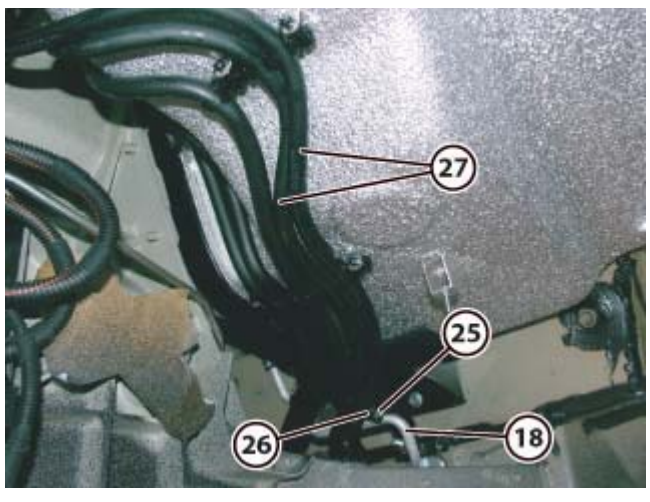
- Fasten the drain pipe **(18)** by tightening the screw **(22)** on the relative clamp.
- Connect the two quick couplings **(23)** for the evaporative emissions control system and the quick couplings **(24)** for the fuel pipes leading from the pumps.



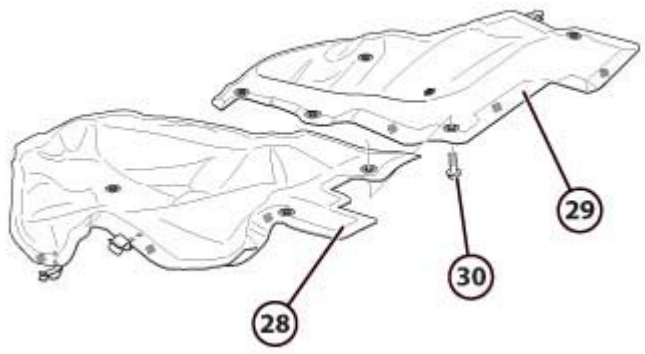
NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

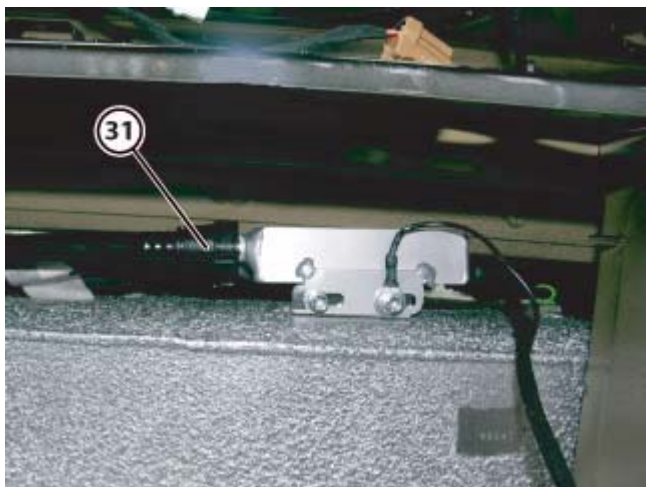
The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.



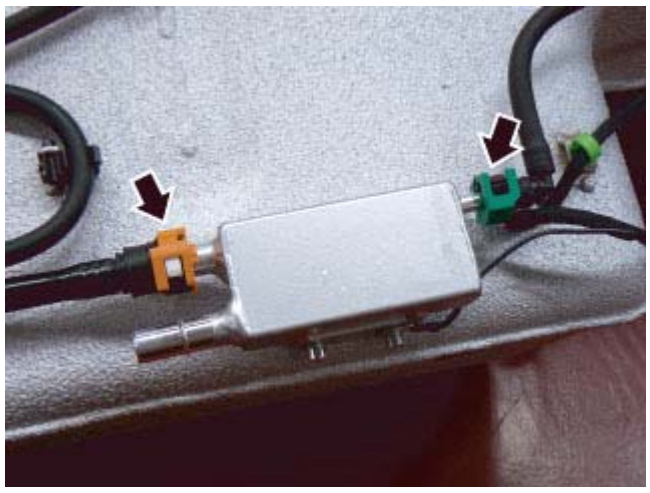
- Connect the pipe **(25)** leading from the multifunctional valve onto the drain pipe **(18)** with the clamp **(26)**.
- Fit and suitably arrange the two pipes **(27)** leading from the active carbon filter on the clamps on the tank.



- Working from underneath the vehicle, fit the left-hand **(28)** and right-hand **(29)** heat shields as originally mounted on the bodyshell, covering the fuel tank.
- Fasten the left-hand **(28)** and right-hand **(29)** heat shields with the seven screws **(30)** and the retainer clips on the stud bolts.



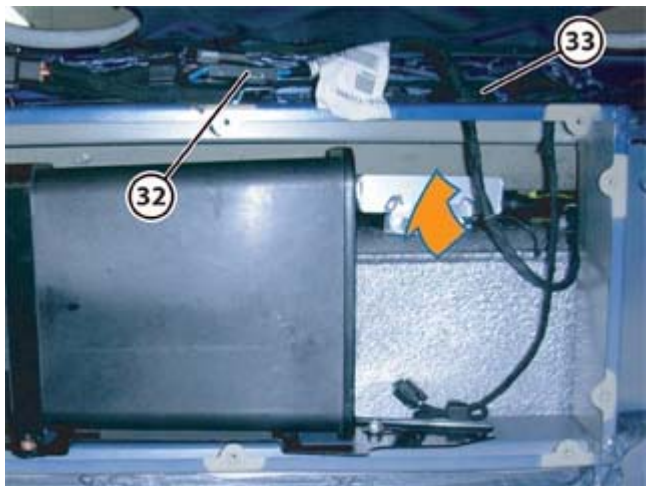
- Connect the quick coupling pipe **(31)** on the fuel vapour separator.



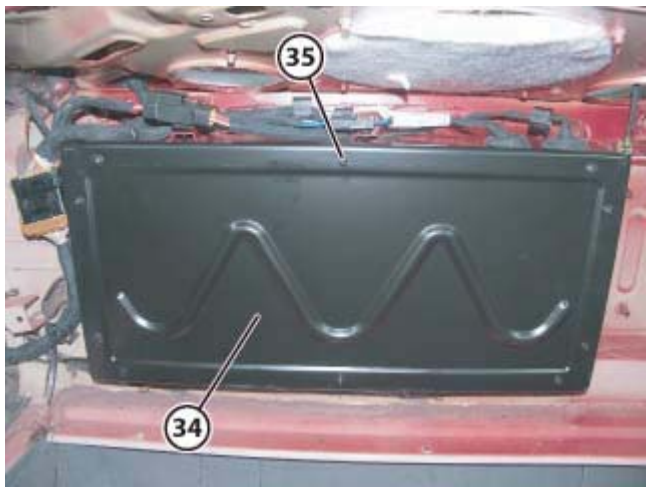
NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.



- Thread the connector **(32)** with relative cable grommet **(33)** through the hole in the ribbing in the bodyshell.
- Attach the connector **(32)** (Y307).

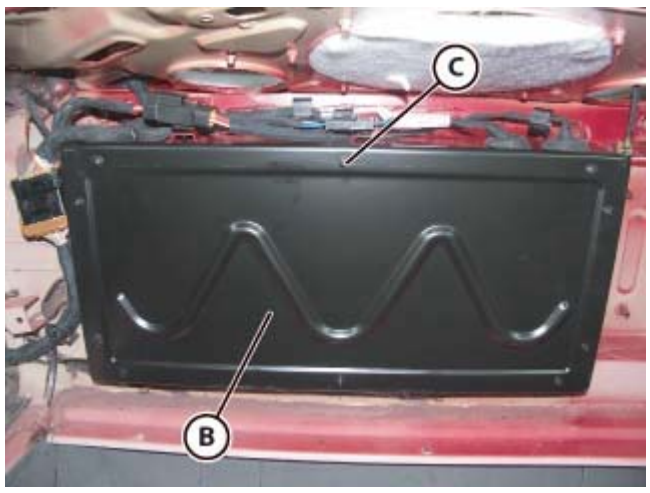


- Fit the metal plate **(34)** in the relative seat in the luggage compartment and fasten by tightening the ten screws **(35)**.

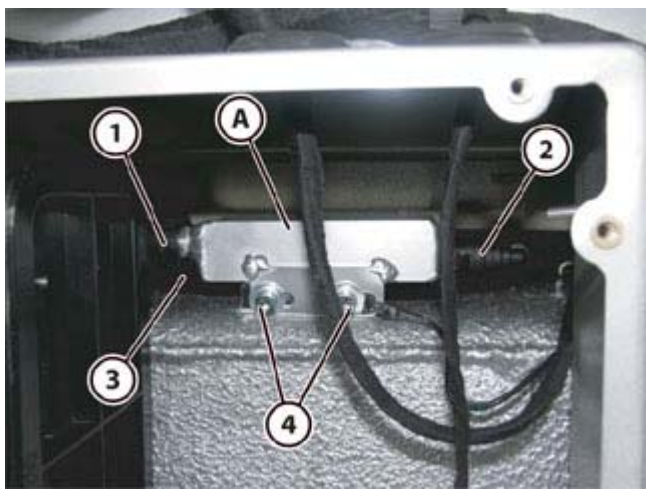
- Refit the rear right hand wheelhouse (M2.05).
- Refit the rear trim panels (M2.24).
- Refit the luggage compartment tank panel trim (M2.23).
- Refit the complete gearbox-differential assembly (D2.02).
- Set the battery master switch to ON (L2.02).

Removing the fuel vapour separator

➢ Remove the tank panel trim panel from the luggage compartment (M2.23).



- Remove the metal fuel tank protector panel **(B)** by undoing the ten screws **(C)**.



- Detach the quick-coupling unions **(1)**, **(2)** and **(3)**.
- Undo the fasteners **(4)** and remove the fuel vapour separator **(A)** from the luggage compartment.



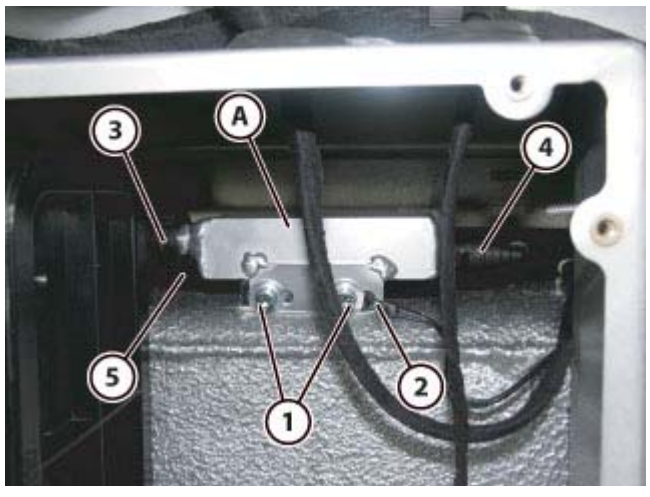
NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- To disconnect the "double-lock" quick-coupling, using due caution and by pressing on both sides, push the safety clip out of its seat until you hear the "unclick".

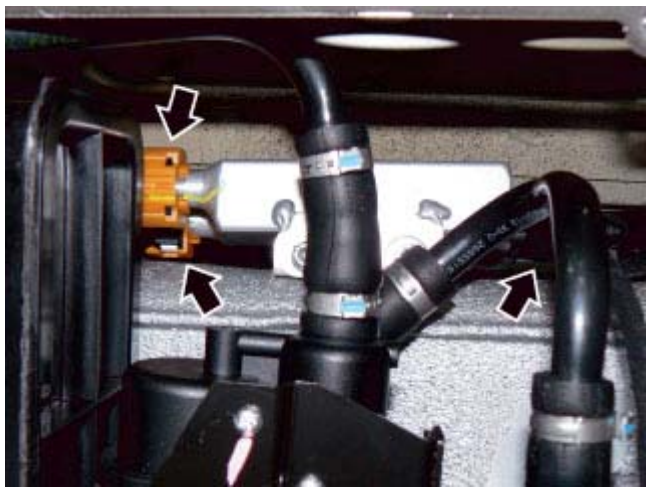
The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.

- Then press on both sides of the quick-coupling and remove the pipe.

Refitting the fuel vapour separator



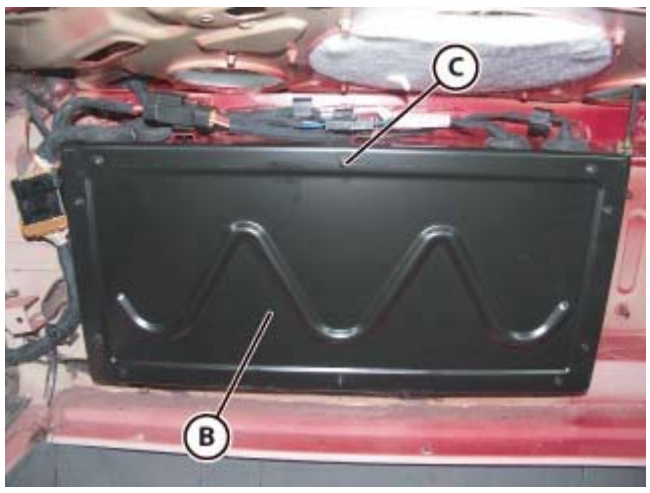
- Fit the fuel vapour separator **(A)** in the luggage compartment on the fuel tank.
- Fasten the separator with the screws **(1)**, refitting the earth cable **(2)** as originally fitted.
- Connect the quick-coupling unions **(3)**, **(4)** and **(5)** and check that they are properly connected.



NEW SOLUTION

- Safety clips called "double-locks" have been introduced on the fuel and evaporative emissions control system pipes.
- Once the quick-coupling evaporative emissions control system pipes have been connected correctly, the "double-lock" clip must be pushed carefully into its seat, pushing on both sides until it clicks audibly into place and ensuring that the pipes are securely fastened.

The difference between the safety clip "unclicked" and "clicked" position is only a few millimetres.



- Fit the protective metal panel **(B)** for the fuel tank, tightening the ten screws **(C)**.

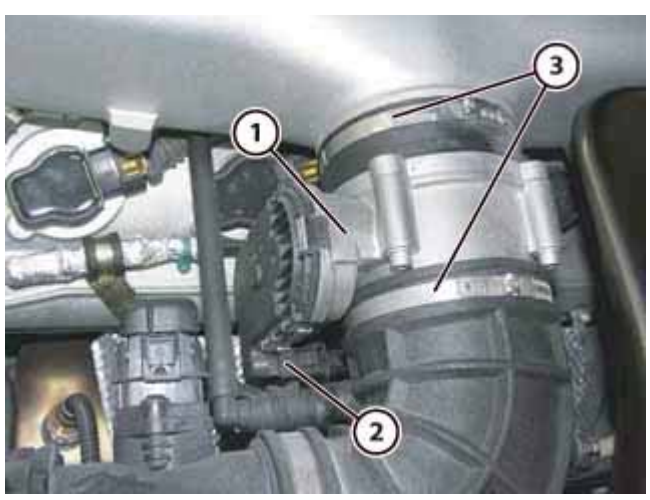
➢ Refit the luggage compartment tank panel trim (☞ M2.23).

B5.07 Motorised throttle body

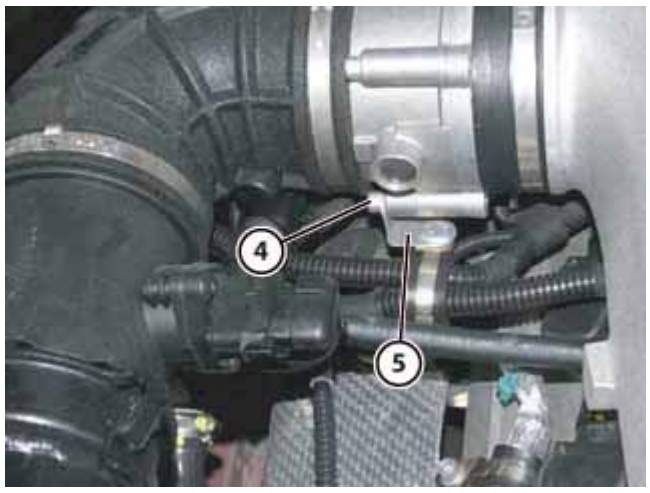
Removing the motorised throttle body

There is one motorised throttle body for each cylinder bank. These are mounted on the sides of the intake manifold on the ducts conveying air from the filter boxes to the manifold.

➢ Set the battery master switch to OFF (L2.02).



- Disconnect the connector **(2)** (M026) (M305) from the motorised throttle body **(1)**.
- Loosen the two clamps **(3)** fastening it to the intake duct.

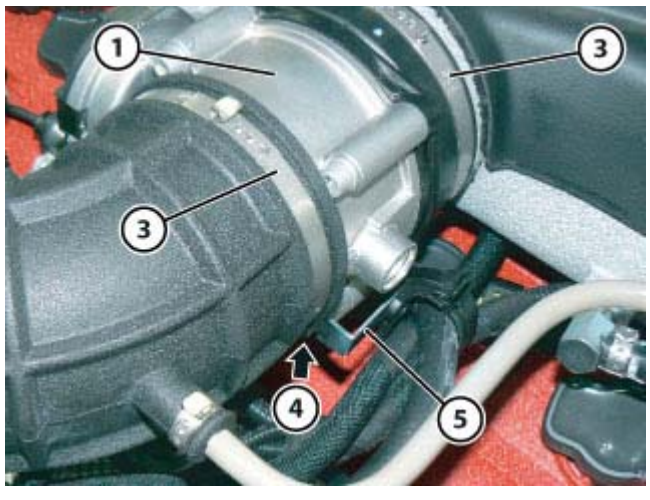


OBSOLETE SOLUTION

- Undo the screw **(4)** fastening the bracket **(5)**.

Handle the motor-driven throttle body with care, avoiding even the smallest vibrations or knocks.

- Remove the motorised throttle body, taking care that no foreign bodies or dirt enter the intake manifold.



NEW SOLUTION

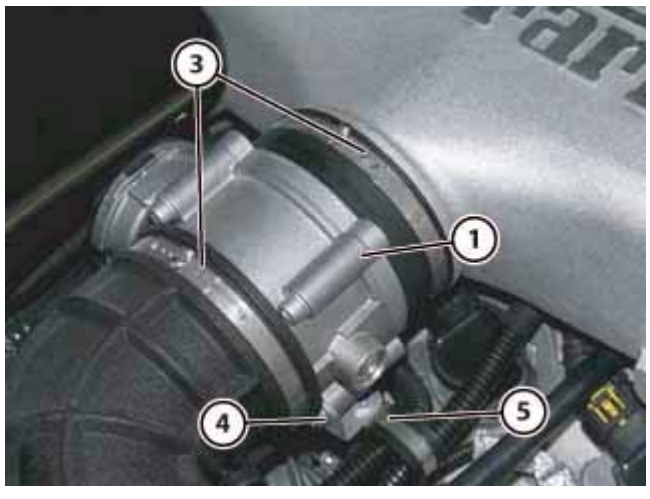
- Undo the screw **(4)** fastening the bracket **(5)**.

Handle the motor-driven throttle body with care, avoiding even the smallest vibrations or knocks.

- Remove the motorised throttle body, taking care that no foreign bodies or dirt enter the intake manifold.

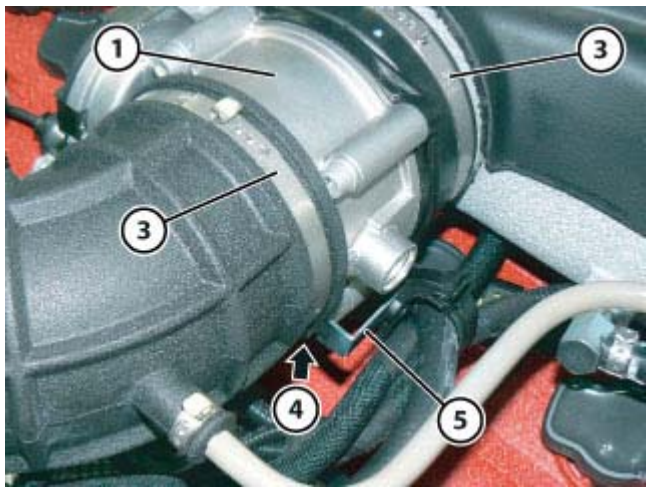
Refitting the motorised throttle body

Check that the air ducts are not obstructed and that there are no foreign bodies inside them; clean thoroughly if necessary.
Clean the contact surfaces between the ducts and the part to be fitted to ensure correct adhesion.



OBSOLETE SOLUTION

- Fit the motorised throttle body **(1)** in the relative seats on the intake duct.
- Fasten to the duct by tightening the two clamps **(3)**.
- Fit the bracket **(5)** fastening the wiring harness.
- Fasten the bracket to the throttle body by tightening the screw **(4)**.



NEW SOLUTION

- Fit the motorised throttle body **(1)** in the relative seats on the intake duct.
- Fasten to the duct by tightening the two clamps **(3)**.
- Fit the bracket **(5)** fastening the wiring harness.
- Fasten the bracket to the throttle body by tightening the screw **(4)**.

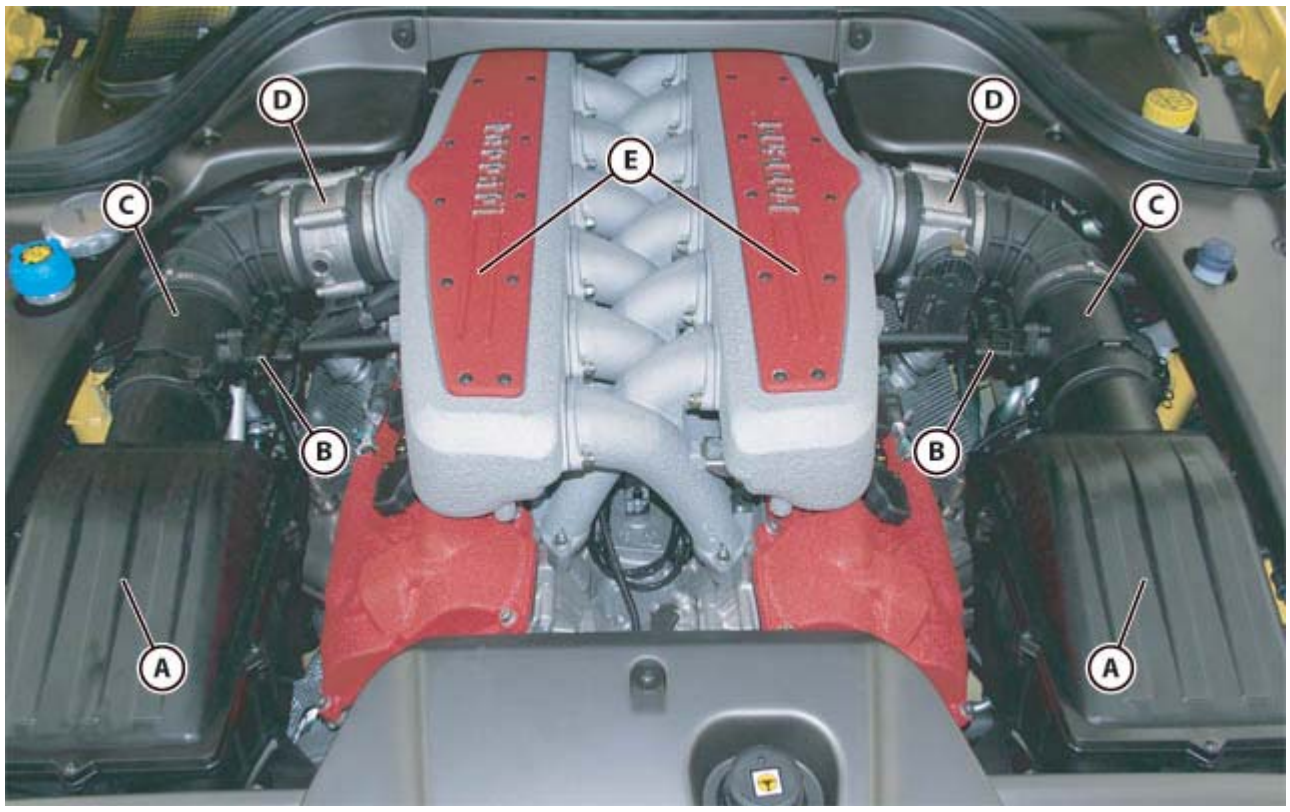


- Connect the connector **(2)** (M026) (M305).

➢ Set the battery master switch to ON (☞ L2.02).

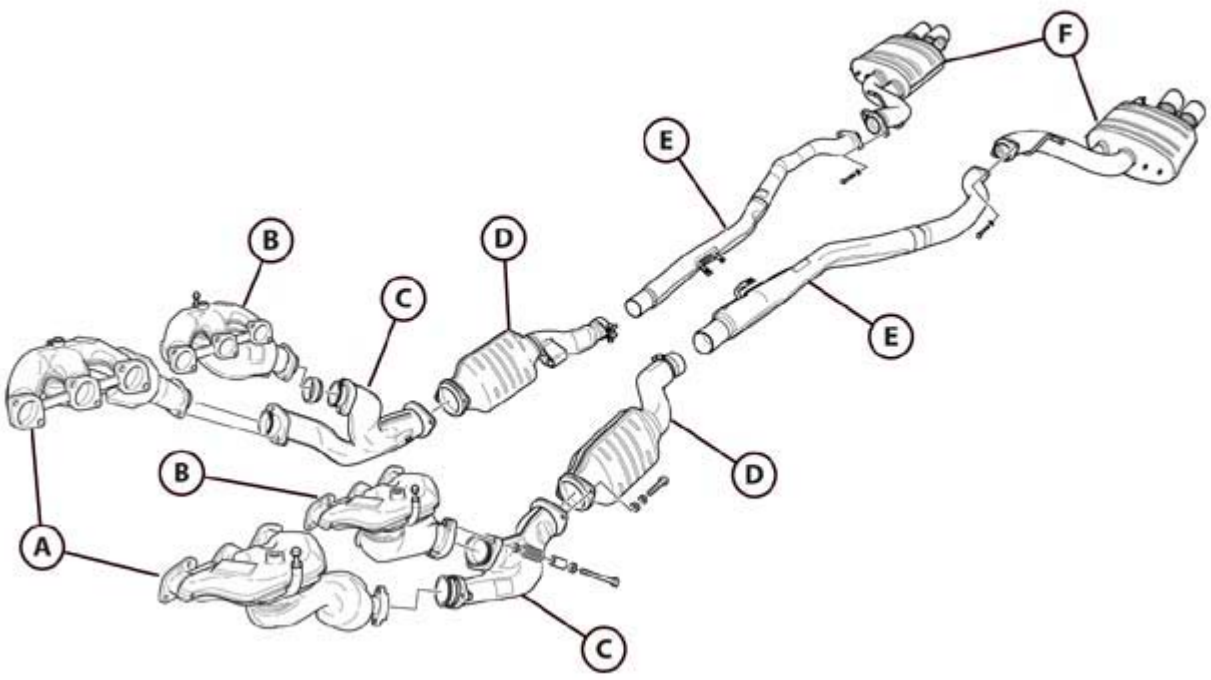
B6.01 System layout

Air intake system



A - Air filter boxes
B - Air flow meters
C - Air flow meters
D - Throttle bodies
E - Intake manifolds

Exhaust system



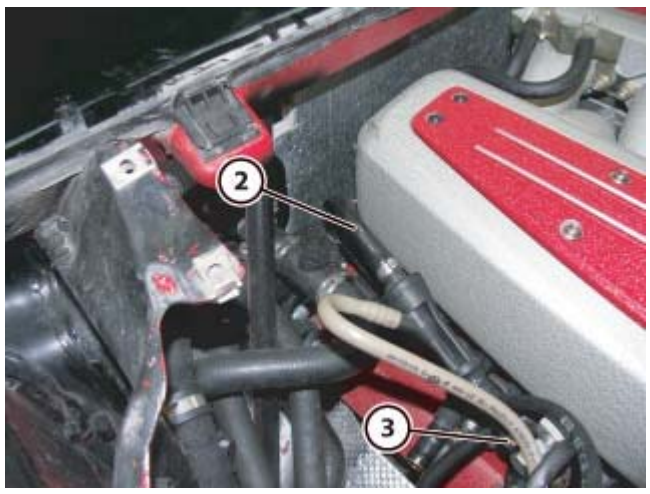
A - Front exhaust manifolds
B - Rear exhaust manifolds
C - Branching from manifolds to catalytic converter
D - Catalytic converters
E - Exhaust extension pipes
F - Silencers

B6.02 Intake manifold

Removing the intake manifold

- Set the battery master switch to OFF (L2.02).
- Remove the central engine compartment shield (M2.17).
- Remove the engine compartment shields on the fenders (M2.17).
- Remove the central windscreen shield (M2.17).
- Remove the motorised throttle body (B5.07).

Remove both.

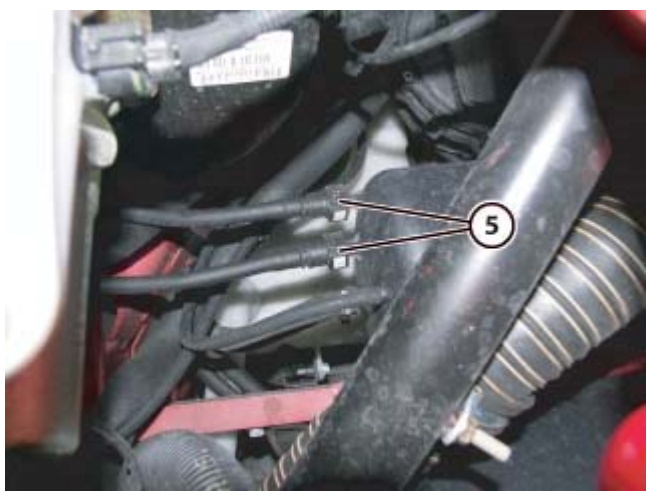


- Remove the brake servo pipe **(2)** complete with valve, removing the clamp **(3)** on the union.

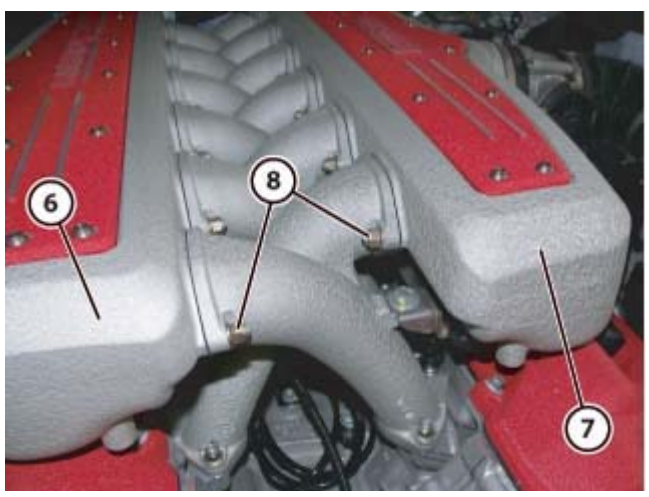
Repeat the procedure on the left plenum chamber.



- Remove the vapour recirculation pipe **(4)** from the oil tank and release it from the relative clamps.

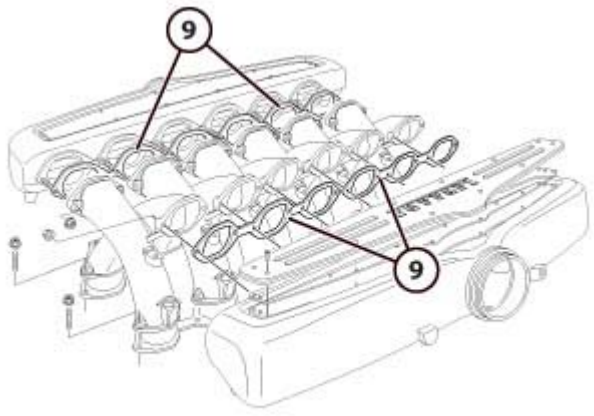


- Detach the two quick-couplings **(5)** on the pipes connecting to the accumulator tank.



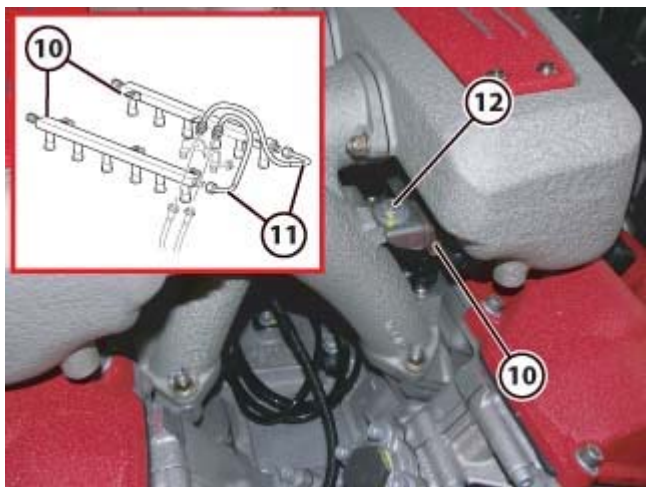
Before lifting the intake plenums, check that all the nuts and washers removed have been retrieved correctly to prevent them from falling into the intake ducts.

- Remove the right plenum chamber **(6)** and the left plenum **(7)**, unscrewing the 24 fastener nuts (12 each) **(8)**.
- Slowly lift the two plenum chambers and detach the oil vapour recirculation pipe from the relative union on each.



Cover the intake duct orifices to prevent foreign bodies from entering.

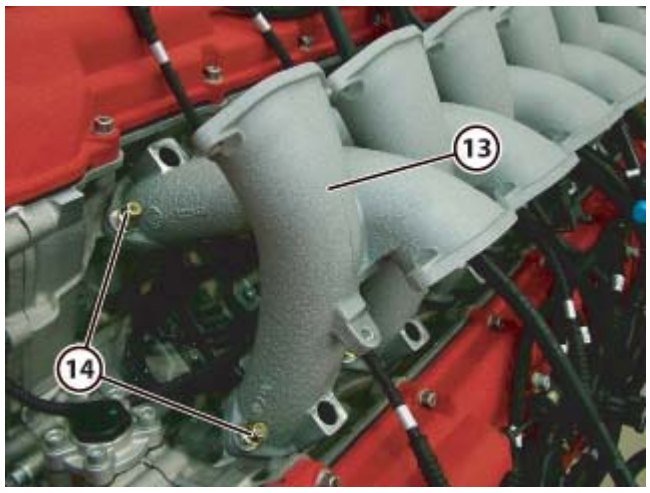
- Retrieve the four gaskets **(9)**.



CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.

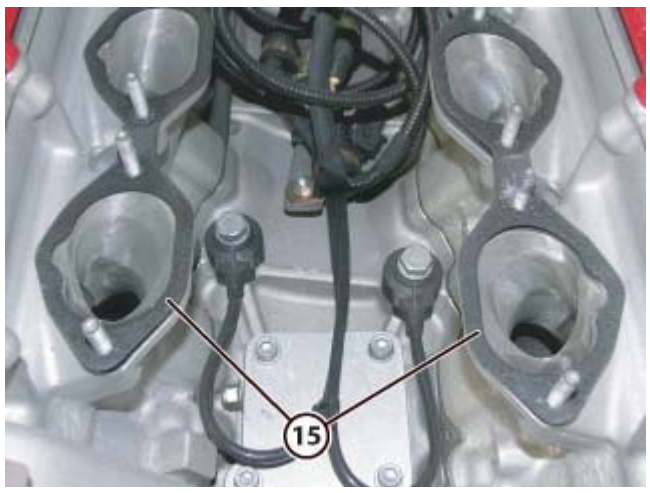
CAUTION
Always plug the fuel pipes to prevent residual fuel from leaking.
When disconnecting a fuel system line, bear in mind that the line may be pressurised and that there is a risk of fuel spraying onto the operator. Proceed with extreme caution and do not work near naked flame.

- Undo the two unions **(11)** on the two injector fuel lines (injector rails) **(10)** and seal with two caps.
- Disconnect the twelve electro-injector connectors and loosen the eight screws **(12)** fastening the fuel lines (injector rails) **(10)** onto the intake manifolds.



Before lifting the intake plenums, check that all the nuts and washers removed have been retrieved correctly to prevent them from falling into the intake ducts.

- Remove the six intake manifolds **(13)**, unscrewing the 24 fastener nuts (4 each) **(14)**.



Cover the intake duct orifices to prevent foreign bodies from entering.

- Recover the four gaskets **(15)**.

- Fit the tool **(AV 3983)** onto the cylinder heads to seal the intake ports.

Refitting the intake manifold

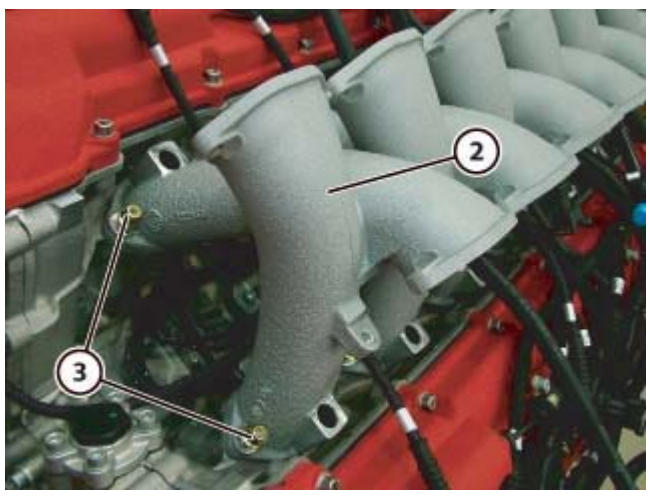


Tightening torque		**Nm**	**Class**
Intake manifold - engine	Nut	10 Nm	B
Fuel line - intake manifold	Screw	25 Nm	B
Fuel lines - mounting bracket/fuel rails	Nut	40 Nm	B
Intake plenum - manifold	Nut	10 Nm	B

- Remove tool **(AV 3983)** from the cylinder heads.

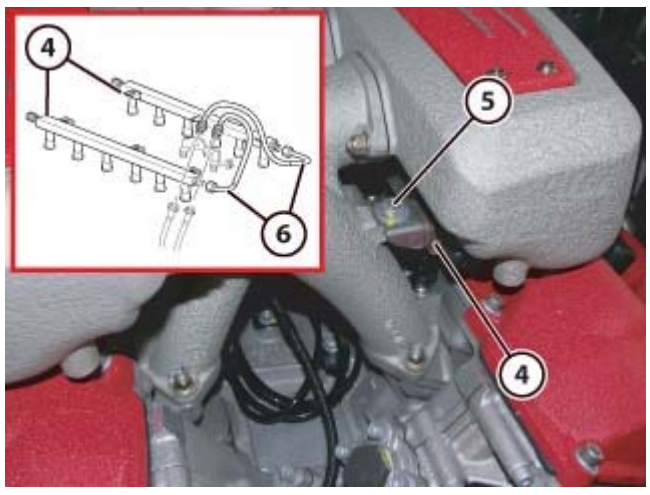


- Carefully clean the contact surfaces of the intake manifolds and the heads, and install four new gaskets **(1)**.



- Fit the six intake manifolds on the heads **(2)** and fasten with the 24 nuts **(3)** (4 each).

Tightening torque	Nm	Class
Nut	10 Nm	B



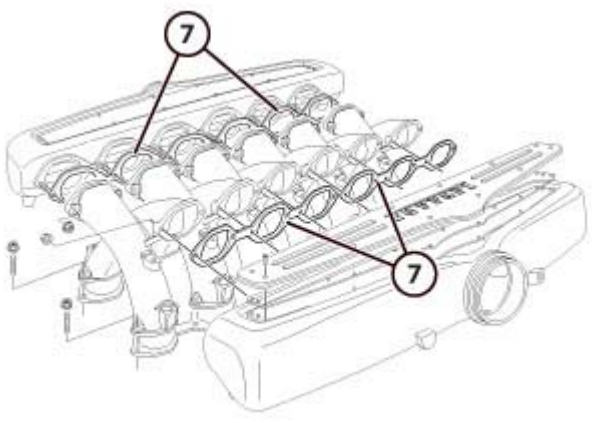
- Replace the O-rings on the electro-injector, taking care not to contaminate the outlet orifices of the electro-injector.
- Apply **SEGO** to the electro-injector outlets and on the O-rings to facilitate installation on the intake manifolds.
- Fit the fuel lines (injector rails) **(4)** in the relative seats on the intake manifolds.
- Press gently on the fuel lines (injector rails) **(4)** near the electro-injectors, and ensure that they are securely fastened onto the manifolds.
- Fasten the fuel pipes **(4)**, tightening the eight screws **(5)** (4 per side).

Tightening torque	Nm	Class
Screw	25 Nm	B

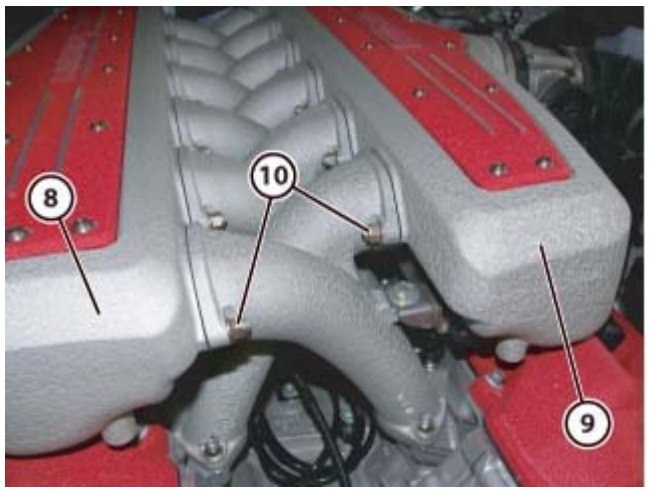
- Fasten the two unions **(6)** on the electro-injector fuel rails **(4)**.

Tightening torque	Nm	Class
Nut	40 Nm	B

- Connect the connectors for the twelve electro-injectors.



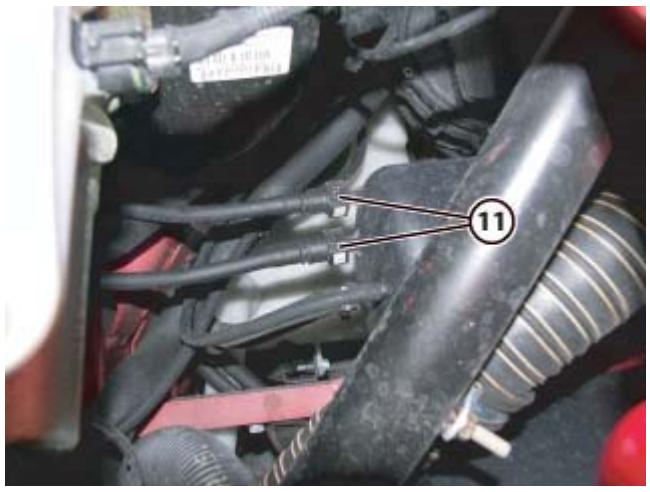
- Working under the two plenum chambers, connect the oil vapour pipe to the relative union.
- Carefully clean the contact surfaces of the intake manifolds and the plenums and fit the four new gaskets **(7)** on their respective stud bolts, pushing completely against the plenum contact surfaces.



Take particular care when fitting the intake plenums. Incorrectly locating the plenums may deform the gaskets, compromising seal integrity and causing the "On board diagnostic system (EOBD)" warning lamp to light.

- Fit the intake plenums **(8)** and **(9)** on the intake manifold.
- Fit the left hand side plenum fuel line mounting bracket as originally installed and tighten the 24 nuts **(10)** (twelve per side).

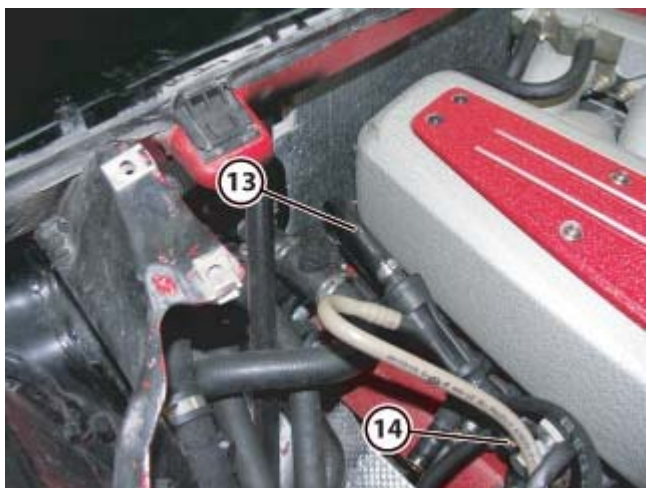
Tightening torque	**Nm**	**Class**
Nut	10 Nm	B



- Connect the two quick-connectors **(11)** connecting to the accumulator tank.



- Connect the vapour pipe to the engine oil tank **(12)**, fastening to the relative clamps as originally installed.



- Connect the brake servo pipe **(13)** to the union using the clamp **(14)**.

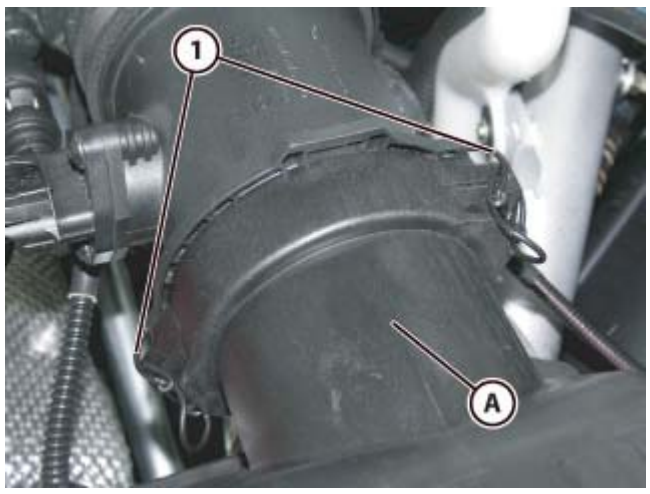
Repeat for the left plenum.

- Refit the motorised throttle body (☞ B5.07).
- Refit the central underwindscreen shield (☞ M2.17).
- Refit the engine compartment shields on the fenders (☞ M2.17).
- Refit the central engine compartment shield (☞ M2.17).
- Set the battery master switch to ON (☞ L2.02).

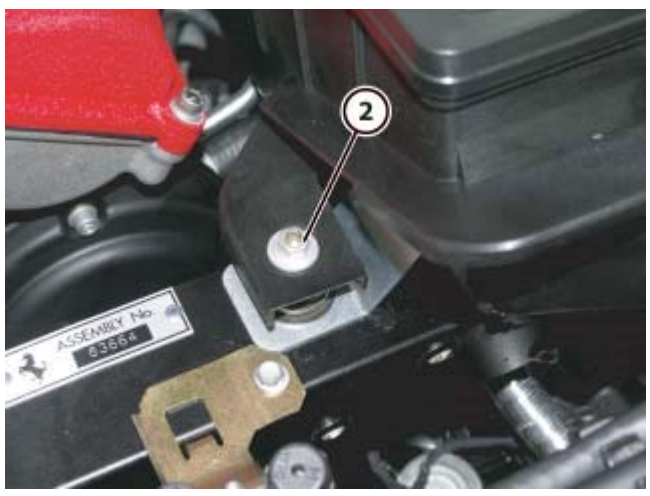
B6.03 Air intake

Removing the air intake

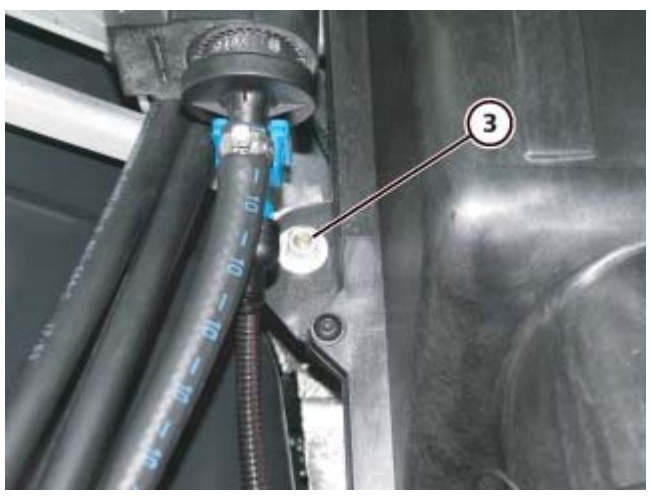
➢ Remove the engine compartment shields on the fenders (M2.17).



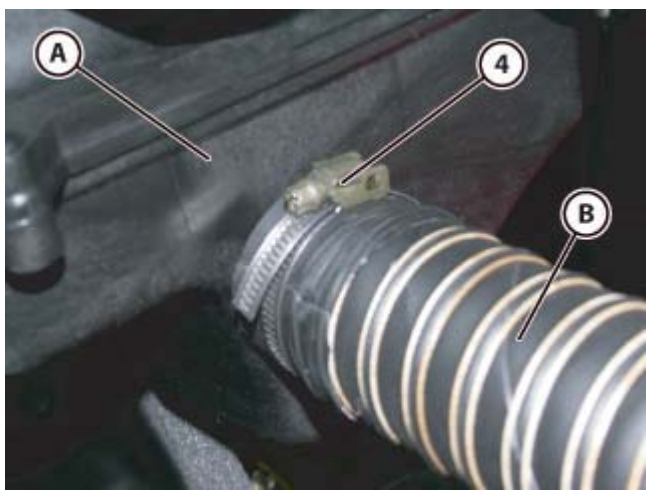
- Remove the two retaining clips **(1)** from the air intake box **(A)**.



- Undo the nut **(2)** on the right hand side of the air box.

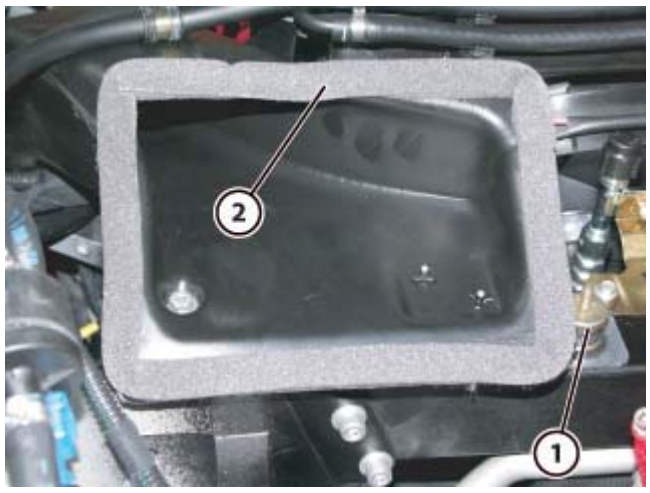


- Undo the nut **(3)** fastening the box to the bodyshell on the left hand side.

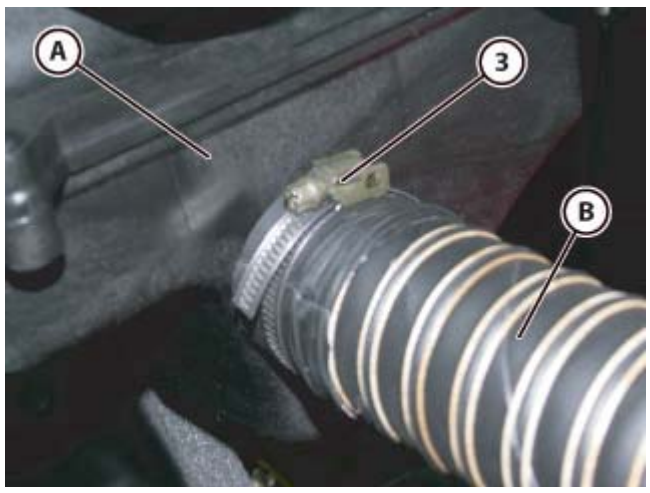


- Lift the complete air box **(A)**, retrieving the gasket, to allow the removal of the clamp **(4)** fastening the excess length of air pipe **(B)**.
- Lift the complete air box and remove from the engine compartment.

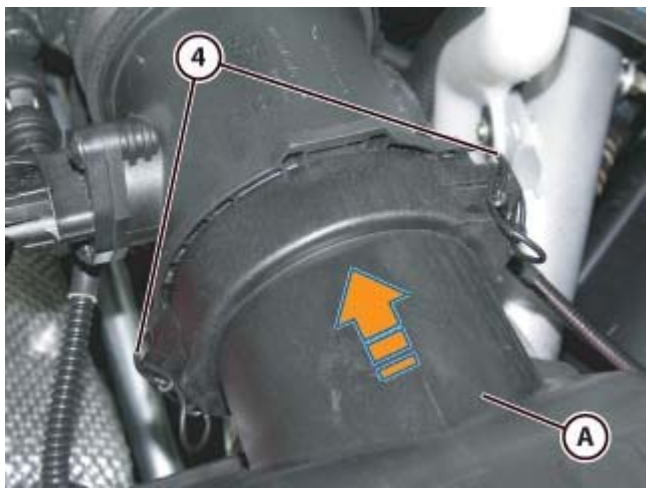
Refitting the air intake



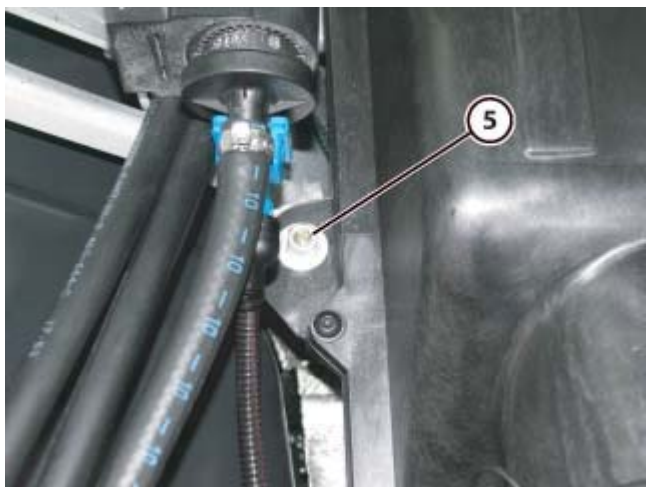
- Check that the rubber mountings **(1)** fastening the air filter box to the chassis are in good condition and replace if necessary.
- Check the state of the contact foam **(2)** between the air duct and the air intake box; replace and refit as originally installed if damaged.
- Replace the gasket between the air box and the air flow meter, if damaged.



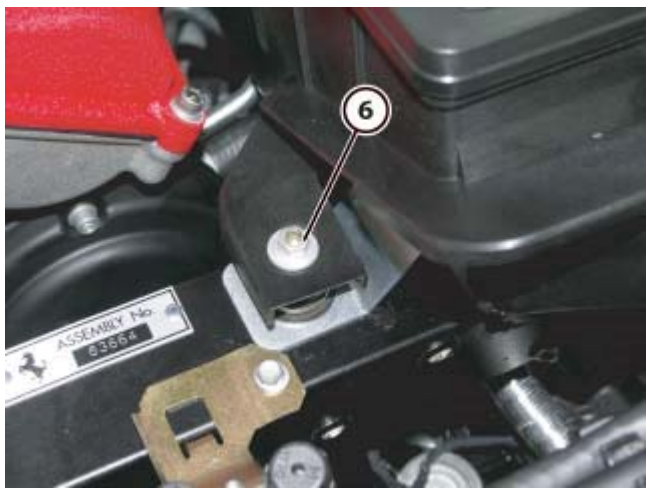
- Fit the air intake **(A)** in the engine compartment, connecting to the excess air outlet pipe **(B)**, using the clamp **(3)**.



- Fit the air intake **(A)** on the chassis mountings and fit the plenum connector pipe in its seat, after installing the relative gasket between the components.
- Fasten the air intake to the air flow meter with the two retainer clips **(4)**.



- Tighten the nut **(5)** fastening it to the bodyshell.

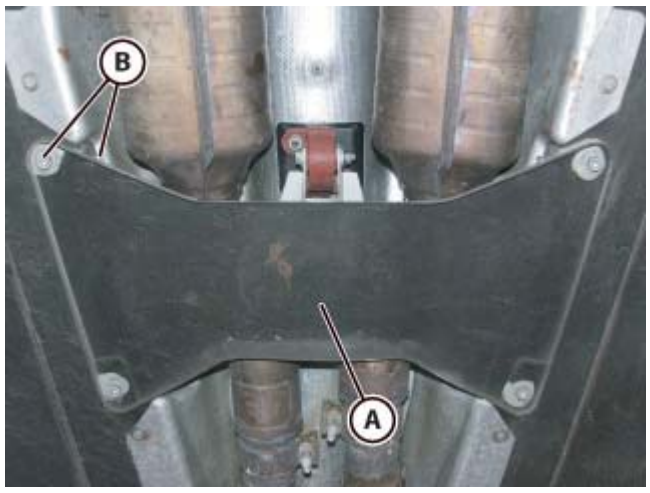


- Tighten the nut **(6)** fastening it to the bodyshell.

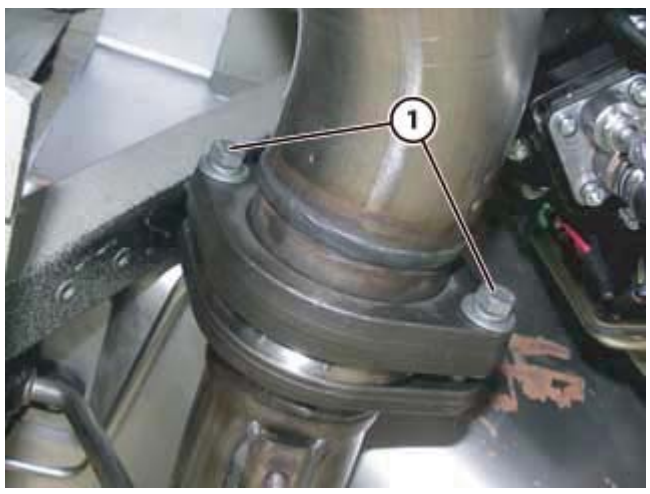
➢ Refit the engine compartment shields on the fenders (M2.17).

B6.04 Catalytic converter

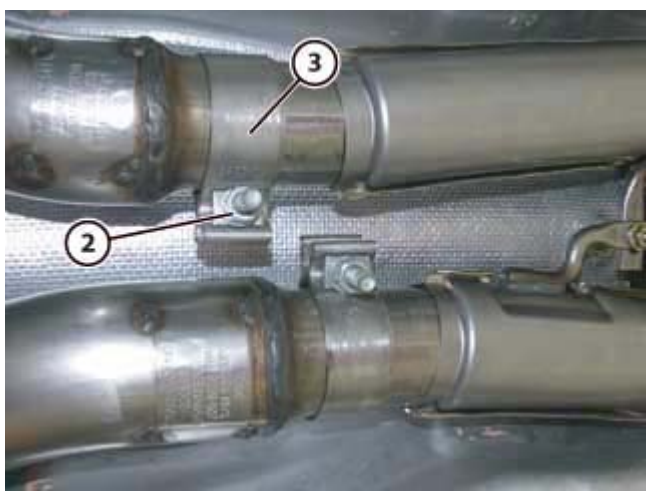
Removing the catalytic converter



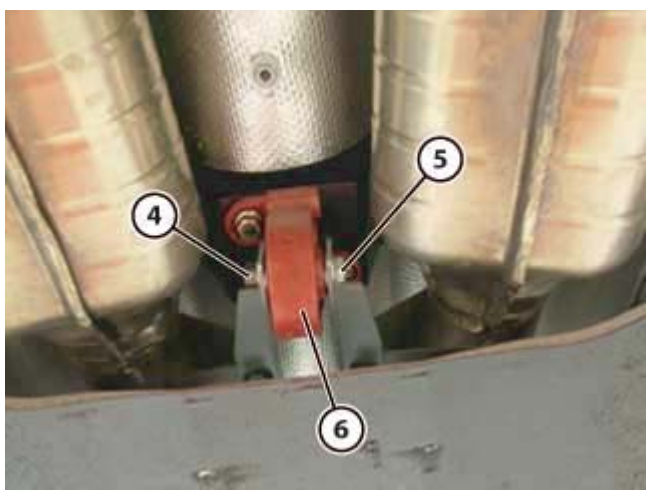
- Remove the plate **(A)**, undoing the eight screws **(B)**.



- Undo the two screws **(1)** fastening the catalytic converter to the exhaust manifold.



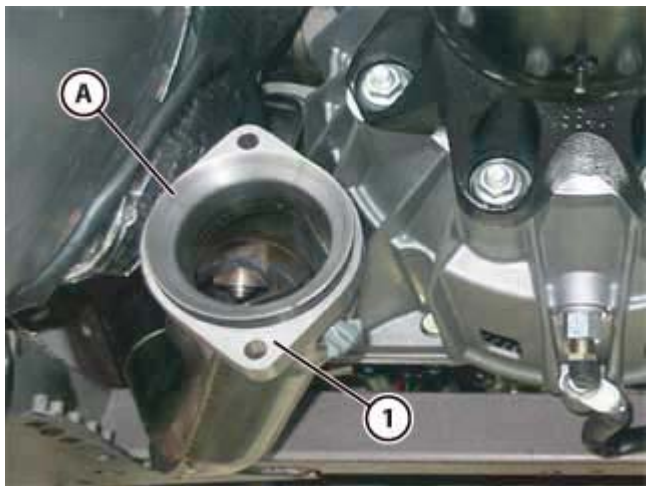
- Loosen the nut **(2)** to release the retainer bracket **(3)** from the exhaust extension pipe.



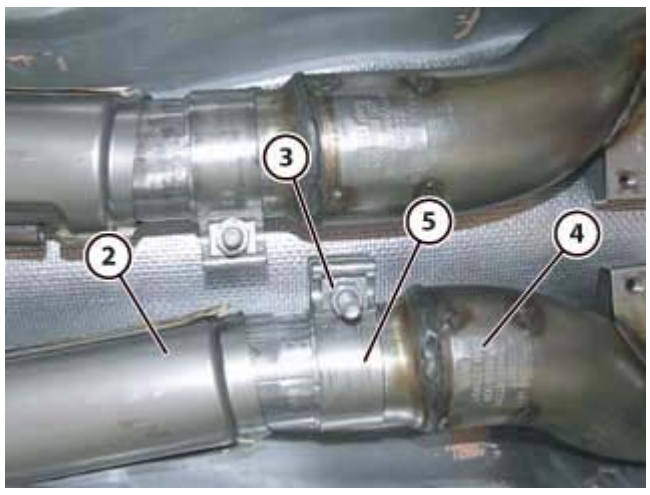
- Unscrew the nut **(4)**.
- Remove the pin **(5)** from the flexible joint **(6)**.
- Remove the catalytic converter from its seat, taking care not to damage it.

Refitting the catalytic converter

			
Tightening torque		**Nm**	**Class**
Catalytic converter - exhaust extension	Clamp	50 Nm	B
Catalytic converter - branching	Screw	16 Nm	B
Structure connector plate - bodyshell	Screw	25 Nm	A

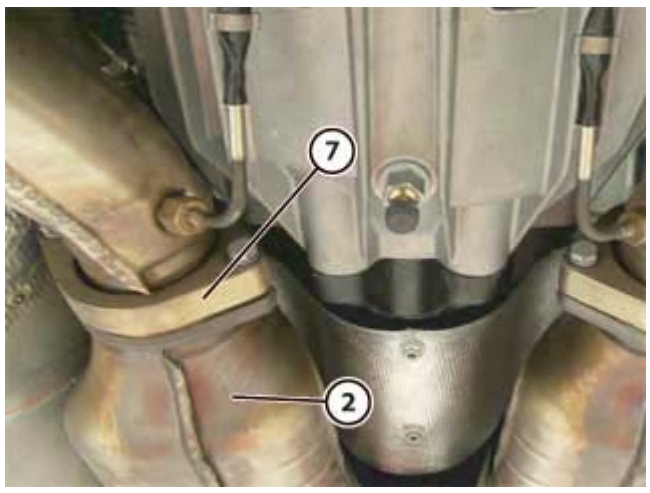


- Thoroughly clean the surface **(A)** of the exhaust manifold.
- Check that the lock ring **(1)** is intact.



- Fit the catalytic converter **(2)** into the exhaust extension pipe **(4)**.
- Fit the clamp **(5)** a few millimetres from the edge of the extension pipe.
- Tighten the nut **(3)**.

Tightening torque	Nm	Class
Clamp	50 Nm	B

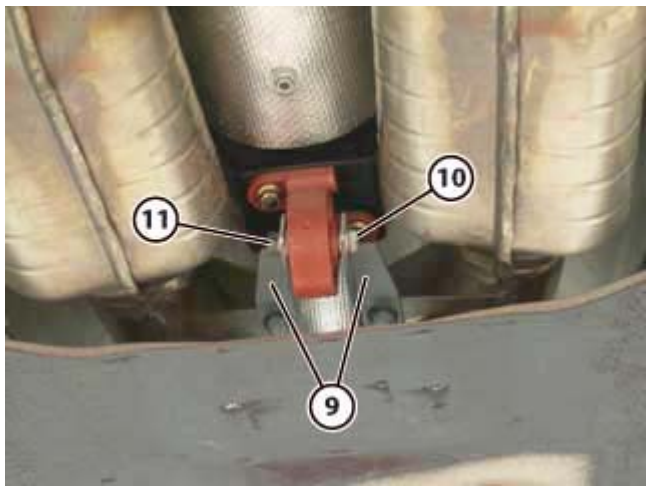


- Fit the catalytic converter **(2)** in its seat on the exhaust manifold.
- Fit the ring **(7)** so that it adheres evenly to the manifold.

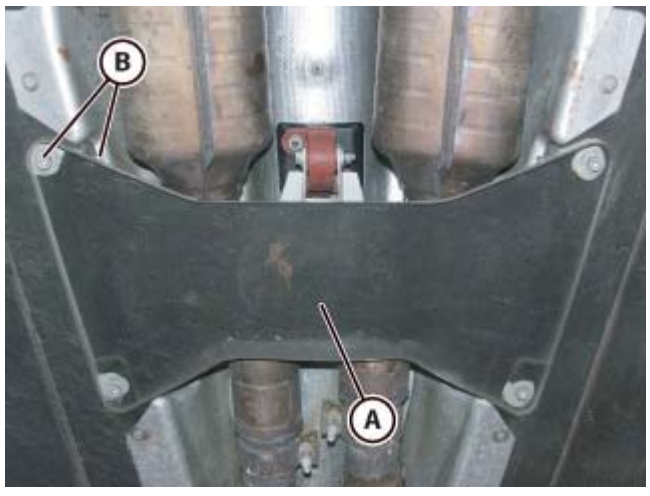


- Tighten the two screws **(8)**.

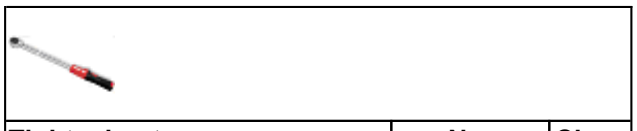
Tightening torque	Nm	Class
Screw	16 Nm	B



- Fasten the brackets **(9)** to the flexible joint by inserting the threaded pin **(10)**.
- Tighten the nut **(11)**.
- Check that there is no contact between the catalytic converter and the chassis and that the catalytic converter is free to move.



- Fit the plate **(A)** and fasten by tightening the eight screws **(B)**.

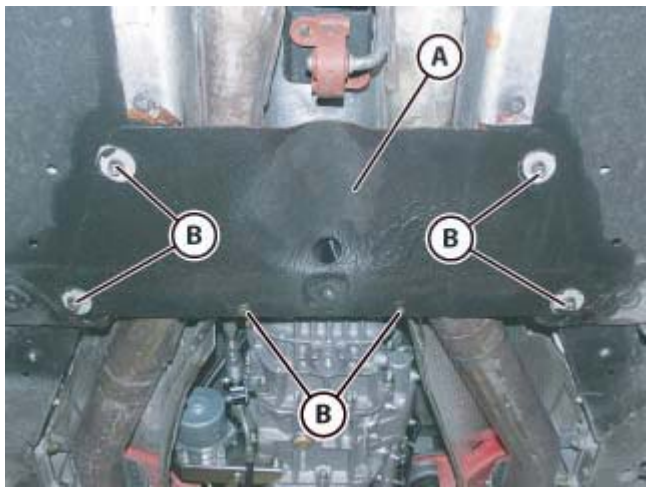


Tightening torque	Nm	Class
Screw	25 Nm	A

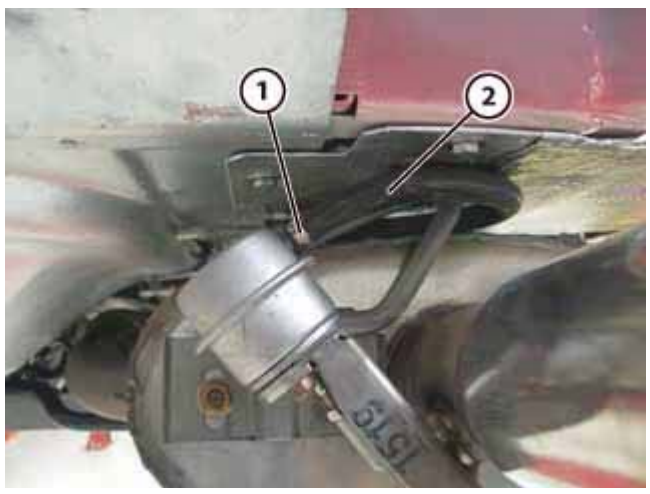
B6.05 Silencer

Removing the silencer and exhaust extension

➢ Remove the rear undertray section (M2.12).
➢ Protect the rear bumper area surrounding the exhaust tailpipes adequately to prevent scratching or gouging during the removal of the silencers from the vehicle.

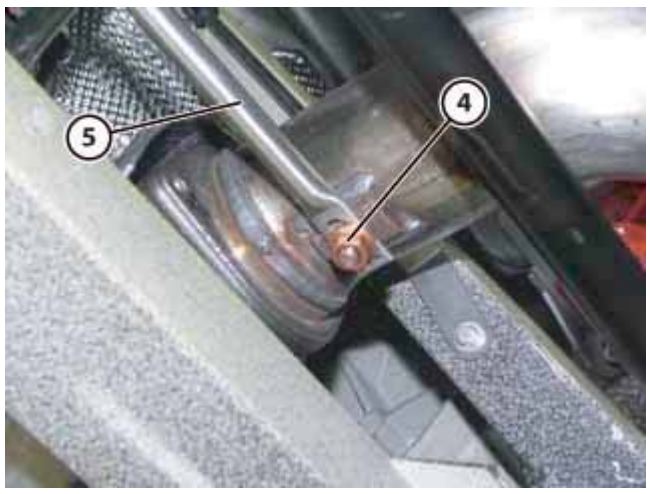


- Remove the plate **(A)** by undoing the screws **(B)**.

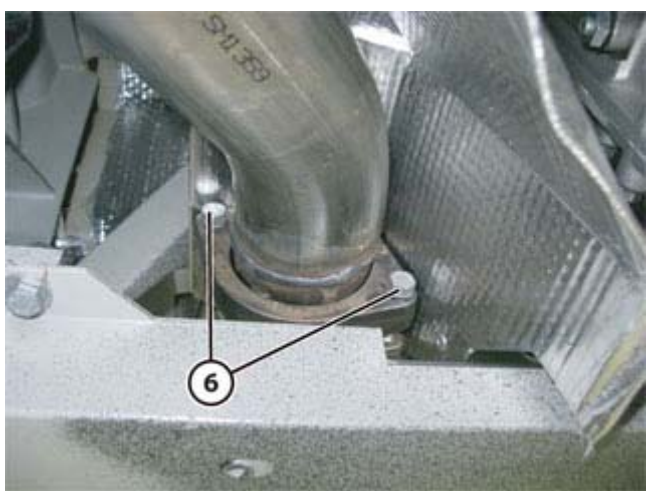


- Detach the clamp **(1)** and remove the pipe **(2)** from the pneumatic valve.

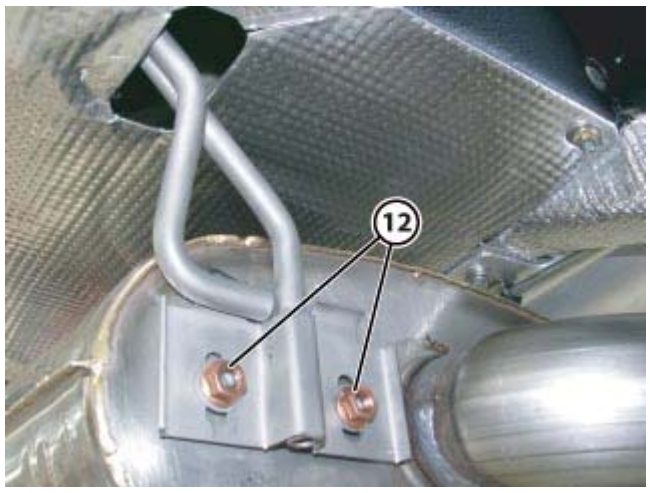
i Note that the following photos were taken with the bumper removed to illustrate the procedure more clearly.



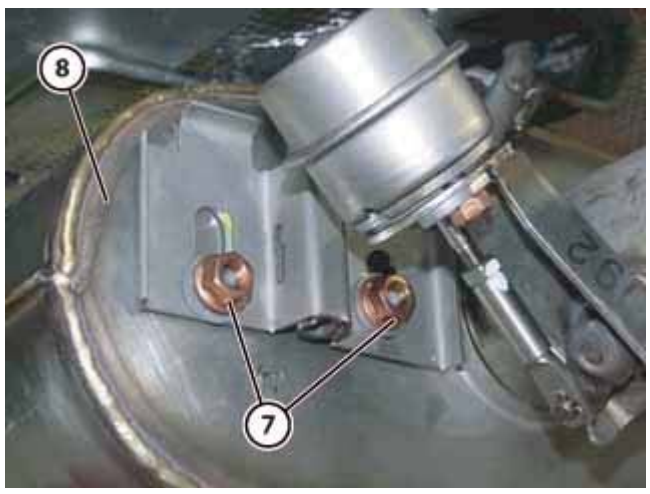
- Undo the nut **(4)** fastening the connector cross member **(5)**.



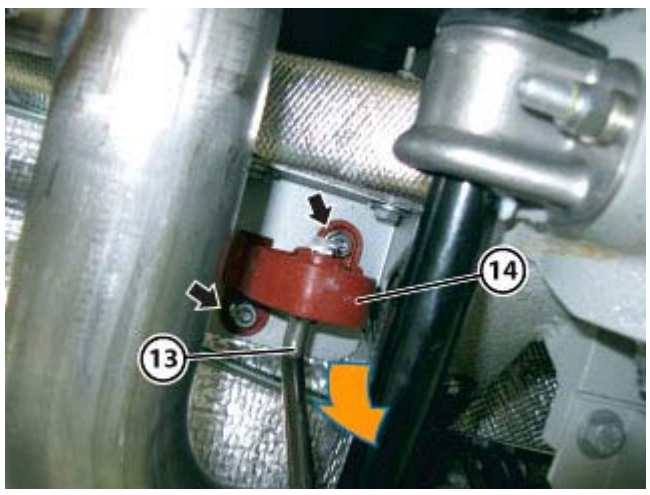
- Undo the two screws **(6)** fastening the exhaust extension to the silencer.



- Undo the two nuts **(12)** and retrieve the washers.



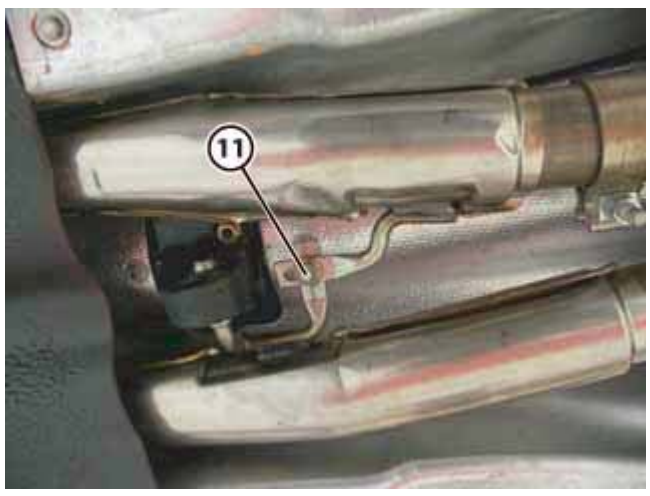
- Undo the two nuts **(7)** and retrieve the washers.
- Detach the silencer **(8)** from the brackets.



- Undo the two nuts indicated fastening the vibration damper mounting **(14)** to the bodyshell.
- Remove the silencer from the vehicle.
- If necessary, detach the silencer pipe **(13)** from the vibration damper mounting **(14)**.



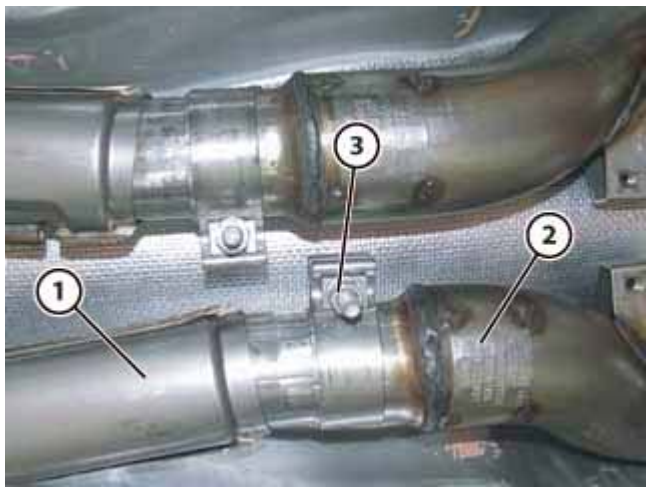
- Undo the nut **(9)** fastening the clamp **(10)**.



- Undo the nut **(11)** fastening the central bracket and detach the exhaust extension.

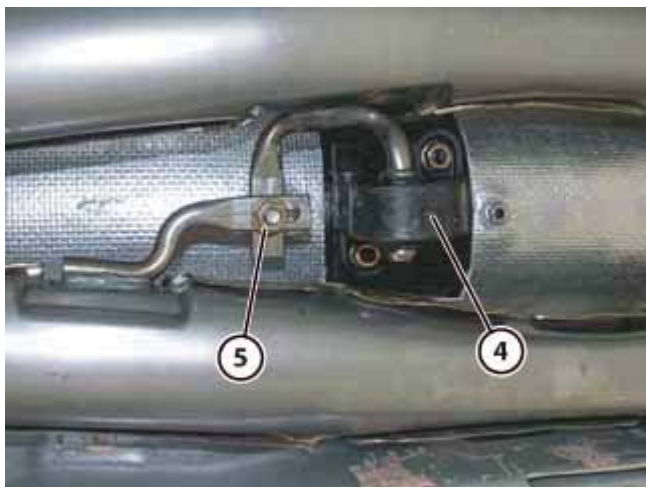
Refitting the silencer and exhaust extension

Tightening torque		Nm	Class
Catalytic converter - exhaust extension	Clamp	50 Nm	B
Exhaust extensions - vibration damper mounting bracket	Nut	16 Nm	B
Vibration damper mounting - bodyshell	Nut	16 Nm	B
Silencer - mounting hooks	Nut	25 Nm	B
Silencer - extension pipe	Screw	16 Nm	B
Silencers - connector crosspiece	Nut	16 Nm	B



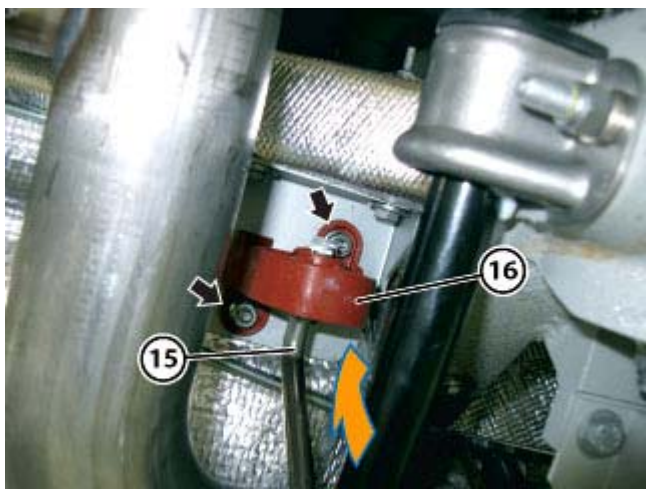
- Fit the exhaust extension **(1)**, installing on the catalytic converter **(2)**.
- Fit the clamp **(3)** a few millimetres from the end of the catalytic converter and tighten.

Tightening torque	Nm	Class
Clamp	50 Nm	B



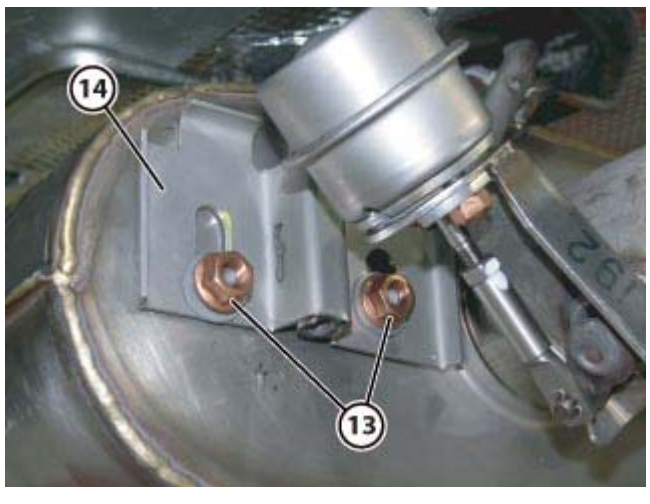
- Fit the extension mounting bracket into the rubber joint seat **(4)** and tighten the nut **(5)**.

Tightening torque	Nm	Class
Nut	16 Nm	B



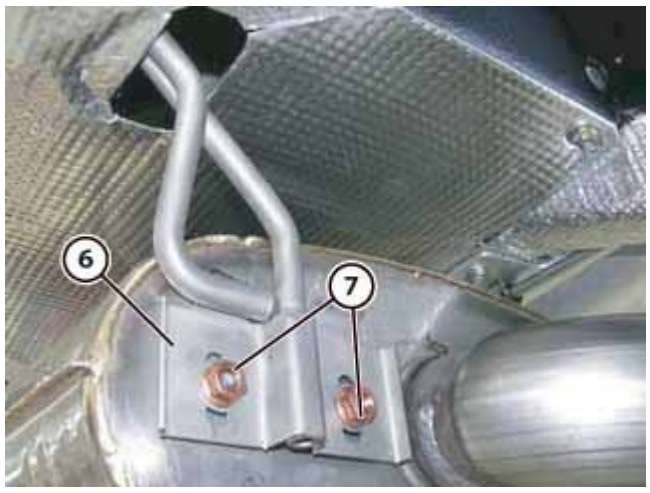
- Apply grease **Z2 PROTECTION** to the part of the pipe **(15)** in contact with the vibration damper.
- On the workbench, fit the silencer pipe **(15)** in its relative seat on the vibration damper mounting **(16)**.
- Fit the silencer in the relative seat and fasten the vibration damper mounting **(16)** to the bodyshell, tightening the two nuts indicated.

Tightening torque	Nm	Class
Nut	16 Nm	B



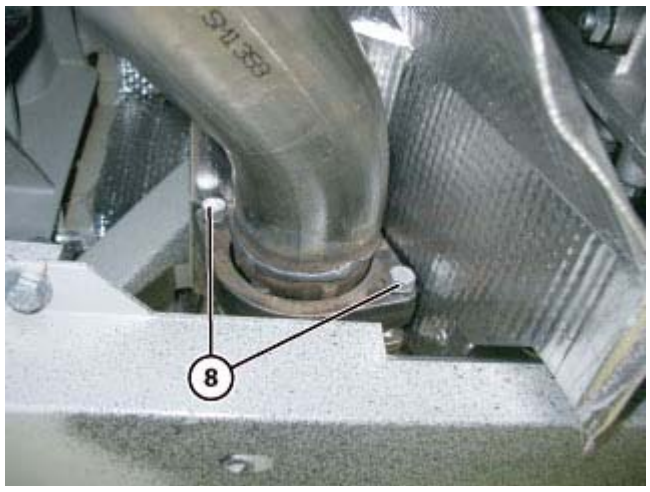
- Fit the silencer, installing the stud bolts for the rear of the silencer in the mounting bracket **(14)** and fasten by tightening the two nuts **(13)**.

Tightening torque	Nm	Class
Nut	25 Nm	B



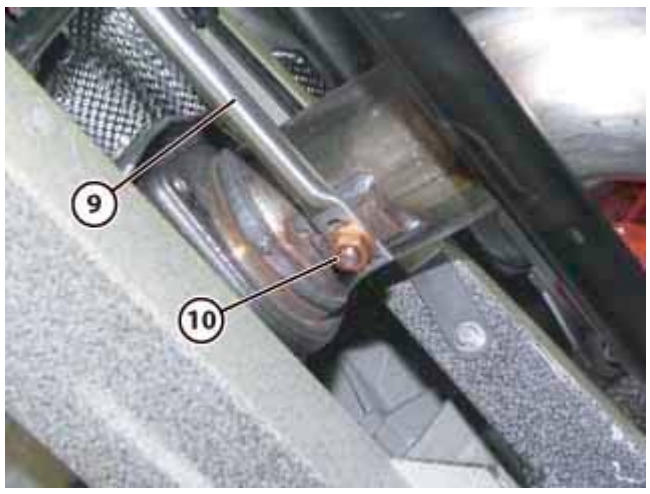
- Install the stud bolts for the front of the silencer in the mounting bracket **(6)** and fasten by tightening the two nuts **(7)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	B



- Fasten the silencer to the exhaust extension by tightening the two screws **(8)**

Tightening torque	**Nm**	**Class**
Screw	16 Nm	B

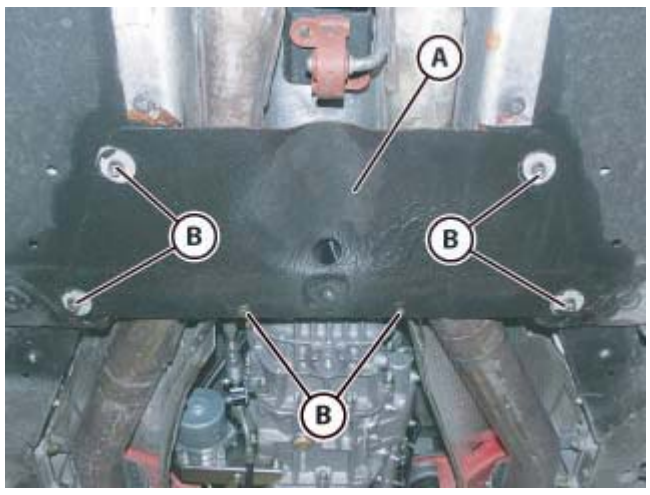


- Fit the connector member **(9)** between the right and left hand silencers, fastening to the silencer by tightening the nut **(10)**.

Tightening torque	**Nm**	**Class**
Nut	16 Nm	B



- Fit the rubber pipe **(11)** and fasten to the pneumatic valve with a clamp.
- Wiggle the silencer gently to check that it can move freely without touching any other parts of the vehicle.



- Fit the plate **(A)** and fasten by tightening the screws **(B)**.

➢ Refit the rear underfloor section (M2.12).

B6.06 Exhaust manifold

Removing the front left exhaust manifold

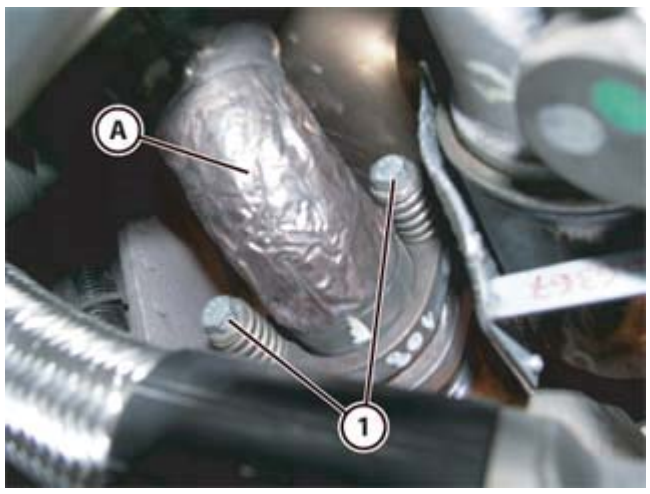
- Remove the front section of the underfloor (M2.12).
- Remove the central engine compartment shield (M2.17).
- Remove the air intake (B6.03).
  - Remove the right hand component.

- Remove the motorised throttle body (B5.07).
  - Remove right hand component only.

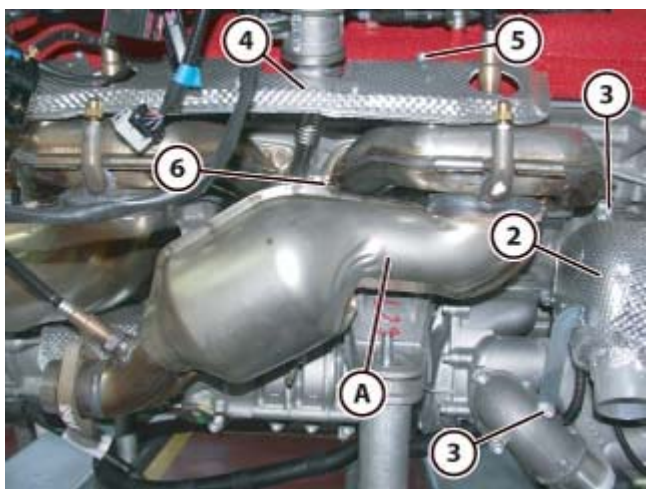
- Remove the oxygen sensor from the right front manifold (A3.09).
  - Remove from the exhaust manifold only.

- Remove the oxygen sensor from the rear right hand manifold (A3.09).
  - Remove from the exhaust manifold only.

- Remove the rear oxygen sensor on the front right hand manifold (A3.09).
  - Remove from the exhaust manifold only.



- Undo the two screws **(1)** fastening the front right exhaust manifold **(A)** to the exhaust branching.



- Remove the heat shield **(2)** by undoing the two screws **(3)**, to facilitate access to the manifold fastener screws.

Note that this photo was taken with the engine out of the vehicle and with the oxygen sensors still mounted to illustrate the operation more clearly.

- Remove the heat shield **(4)** by undoing the five screws **(5)** then remove from the engine compartment.
- Undo the six nuts **(6)** and, working from above, remove the front right exhaust manifold **(A)**, retrieving the gasket.

- Carefully seal the exhaust ports on the head with adhesive tape to prevent foreign objects from entering.

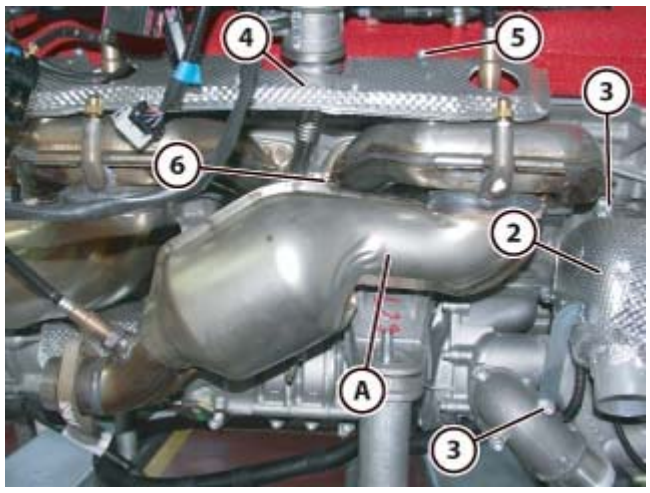
Refitting the front right exhaust manifold

Tightening torque		**Nm**	**Class**
Exhaust manifold - crankcase	Nut	30 Nm	B
Exhaust manifold - branching	Screw	25 Nm	B

- Check that the contact surfaces on the head and the manifold are perfectly flat; if necessary, remove any encrustation or gasket residue.

Preferably replace the gasket each time the manifold is removed.

- Lubricate the head stud bolts with copper based **COPASLIP** grease for high temperatures.

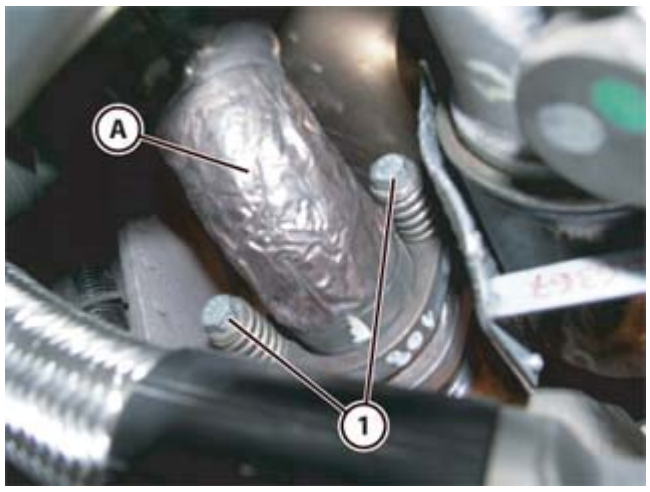


- Fit the front right exhaust manifold **(A)** from above, fit the relative gasket and fasten by tightening the six nuts **(6)**.

Note that this photo was taken with the engine out of the vehicle and with the oxygen sensors already mounted to illustrate the operation more clearly.

Tightening torque	Nm	Class
Nut	30 Nm	B

- Fit the heat shield **(4)** in its relative mounting and fasten by tightening the five screws **(5)**.
- Fit and fasten the heat shield **(2)** as originally mounted, tightening the two screws.**(3)**



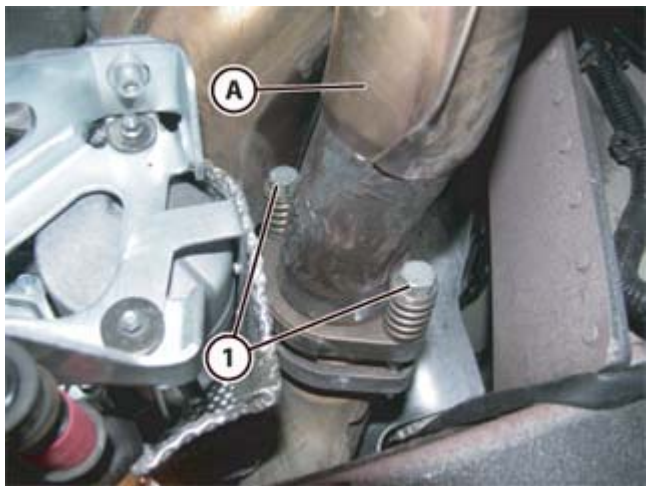
- Fasten the front right exhaust manifold **(A)** to the exhaust branching by tightening the two screws **(1)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

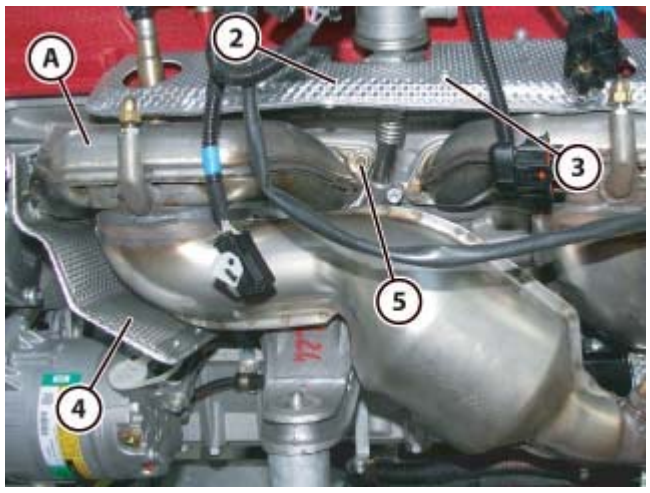
- Refit the rear oxygen sensor on the front right hand manifold (A3.09).
- Refit the oxygen sensor on the rear right hand manifold (A3.09).
- Refit the oxygen sensor on the front right hand manifold (A3.09).
- Refit the motorised throttle body (B5.07).
- Refit the air intake (B6.03).
- Refit the central engine compartment shield (M2.17).
- Refit the front flat undertray section (M2.12).

Removing the front left exhaust manifold

- Remove the front section of the underfloor (M2.12).
- Remove the central engine compartment shield (M2.17).
- Remove the air intake (B6.03).
  Remove the left hand component.
- Remove the motorised throttle body (B5.07).
  Remove left hand component only.
- Remove the oxygen sensor from the front left hand manifold (A3.09).
  Remove from the exhaust manifold only.
- Remove the oxygen sensor from the rear left hand manifold (A3.09).
  Remove from the exhaust manifold only.
- Remove the rear oxygen sensor on the front left hand manifold (A3.09).
  Remove from the exhaust manifold only.



- Undo the two screws **(1)** fastening the front rear exhaust manifold **(A)** to the exhaust branching.



- Remove the heat shield **(2)** by undoing the five screws **(3)** then remove from the engine compartment.

Note that this photo was taken with the engine out of the vehicle and with the oxygen sensors still mounted to illustrate the operation more clearly.

- Remove the heat shield **(4)** by undoing the two screws, to facilitate access to the manifold fastener screws.
- Undo the six nuts **(5)** and, working from above, remove the front left exhaust manifold**(A)**, retrieving the gasket.
- Carefully seal the exhaust ports on the head with adhesive tape to prevent foreign objects from entering.

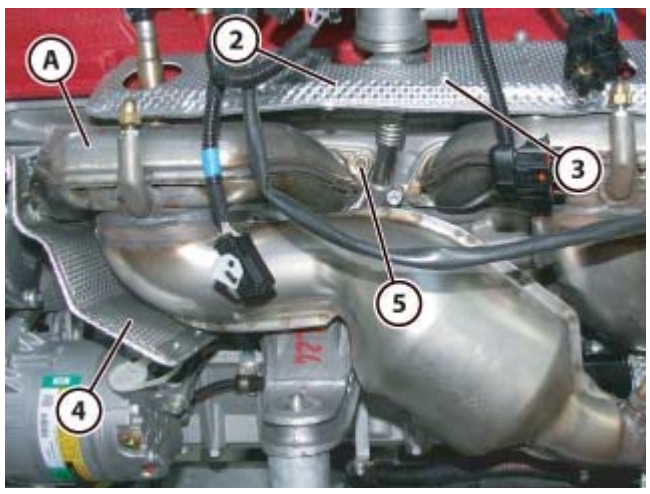
Refitting the front left exhaust manifold

Tightening torque		Nm	Class
Exhaust manifold - crankcase	Nut	30 Nm	B
Exhaust manifold - branching	Screw	25 Nm	B

- Check that the contact surfaces on the head and the manifold are perfectly flat; if necessary, remove any encrustation or gasket residue.

Preferably replace the gasket each time the manifold is removed.

- Lubricate the head stud bolts with copper based **COPASLIP** grease for high temperatures.

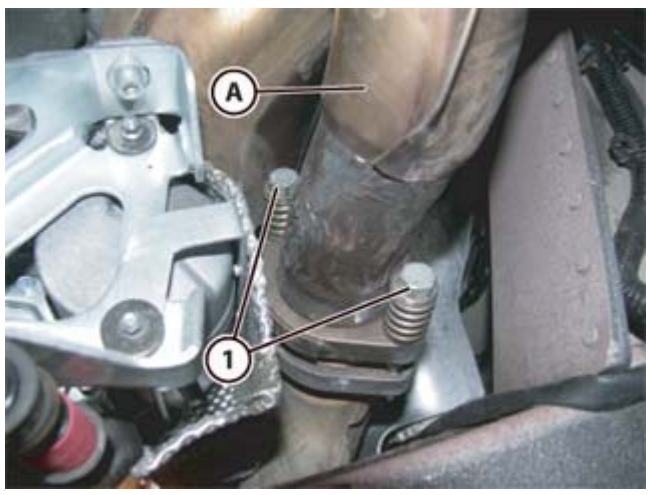


- Fit the front right exhaust manifold **(A)** from above, fit the relative gasket and fasten by tightening the six nuts **(5)**.

Note that this photo was taken with the engine out of the vehicle and with the oxygen sensors already mounted to illustrate the operation more clearly.

Tightening torque	Nm	Class
Nut	30 Nm	B

- Fit and fasten the heat shield **(4)** as originally mounted, tightening the two fastener screws.
- Fit the heat shield **(2)** in its relative mounting and fasten by tightening the five screws **(3)**.



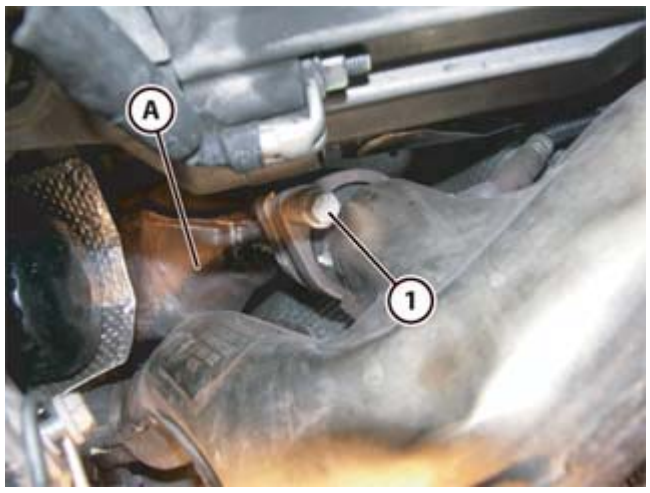
- Fasten the front left exhaust manifold **(A)** to the exhaust branching by tightening the two screws **(1)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

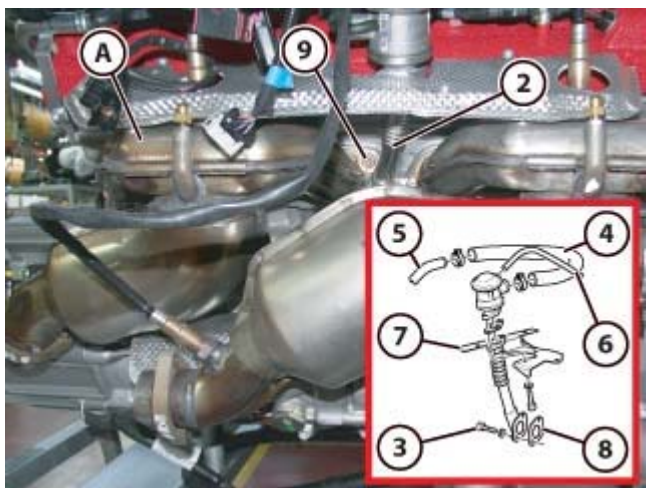
- Refit the rear oxygen sensor on the front left hand manifold (A3.09).
- Refit the oxygen sensor on the rear left hand manifold (A3.09).
- Refit the oxygen sensor on the front left hand manifold (A3.09).
- Refit the motorised throttle body (B5.07).
- Refit the air intake (B6.03).
- Refit the central engine compartment shield (M2.17).
- Refit the front flat undertray section (M2.12).

Removing the rear right exhaust manifold

- Remove the front left exhaust manifold (B6.06).



- Undo the two screws **(1)** fastening the right rear exhaust manifold **(A)** to the exhaust branching.



- Remove the right hand secondary air valve assembly **(2)** undoing the two screws **(3)** on the head and detaching tube **(4)** from the rigid tube **(5)** and tube **(6)** from the valve.

Note that this photo was taken with the engine out of the vehicle and with the front right exhaust manifold still mounted to illustrate the operation more clearly.

- Undo the screw fastening the mounting bracket **(7)** to the head cover then remove the right hand secondary air valve assembly **(2)** from the engine compartment, retrieving the relative seal **(8)**.
- Undo the six nuts **(9)** and remove the rear right exhaust manifold, easing out forwards **(A)** and retrieving the gasket.

- Carefully seal the exhaust ports on the head with adhesive tape to prevent foreign objects from entering.

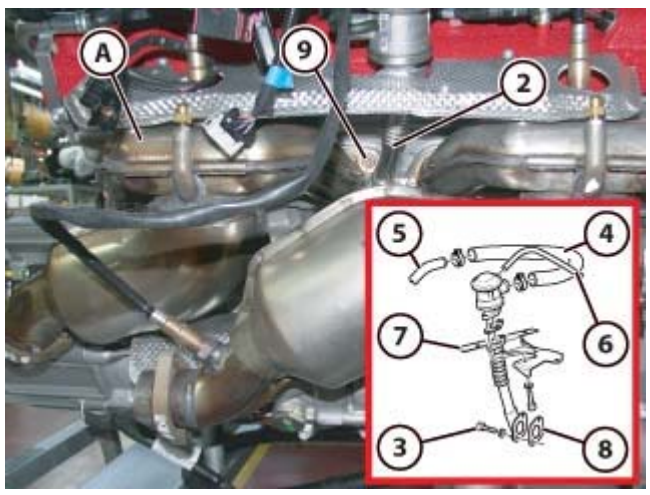
Refitting the rear right exhaust manifold

Tightening torque		Nm	Class
Exhaust manifold - crankcase	Nut	30 Nm	B
Exhaust manifold - branching	Screw	25 Nm	B

- Check that the contact surfaces on the head and the manifold are perfectly flat; if necessary, remove any encrustation or gasket residue.

Preferably replace the gasket each time the manifold is removed.

- Lubricate the head stud bolts with copper based **COPASLIP** grease for high temperatures.

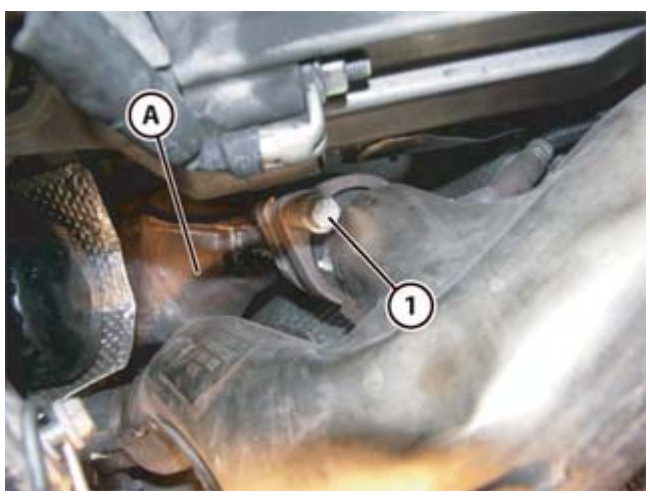


- Fit the rear right exhaust manifold **(A)** in the engine compartment and, after fitting the respective gasket, fasten by tightening the six nuts **(9)**.

Note that this photo was taken with the engine out of the vehicle and with the front right exhaust manifold already mounted to illustrate the operation more clearly.

Tightening torque	Nm	Class
Nut	30 Nm	B

- Check the state of the gasket **(8)**; replace it if necessary.
- Fit the right hand secondary air valve assembly **(2)** on the head with its relative seal and fasten by tightening the screw on the mounting bracket **(7)** into the head cover.
- Screw the two screws **(3)** onto the head, connect tube **(4)** to the rigid tube **(5)** and tube **(6)** to the valve.



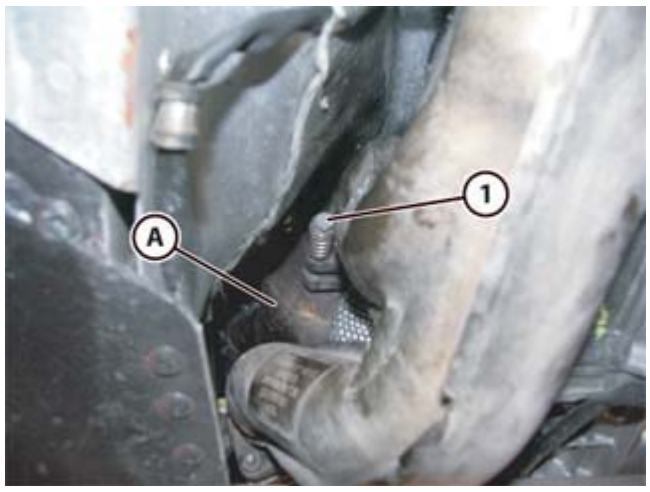
- Fasten the rear right exhaust manifold **(A)** to the exhaust branching by tightening the two screws **(1)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

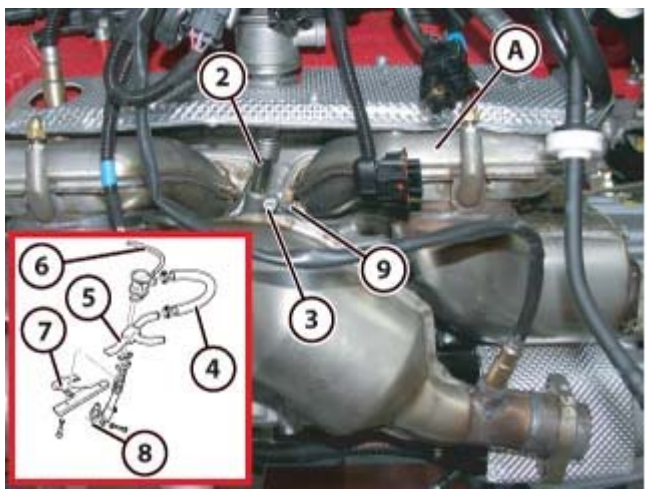
➢ Refit the front right exhaust manifold (B6.06).

Removing the rear left exhaust manifold

➢ Remove the front left exhaust manifold (B6.06).



- Undo the two screws **(1)** fastening the left rear exhaust manifold **(A)** to the exhaust branching.



- Remove the left hand secondary air valve assembly **(2)** undoing the two screws **(3)** on the head and detaching the tube **(4)** from the rigid tube **(5)** and tube **(6)** from the valve.

Note that this photo was taken with the engine out of the vehicle and with the front left exhaust manifold still mounted to illustrate the operation more clearly.

- Undo the screw fastening the mounting bracket **(7)** to the head cover then remove the left hand secondary air valve assembly **(2)** from the engine compartment, retrieving the relative seal **(8)**.
- Undo the six nuts **(9)** and remove the rear left exhaust manifold **(A)**, retrieving the gasket.
- Carefully seal the exhaust ports on the head with adhesive tape to prevent foreign objects from entering.

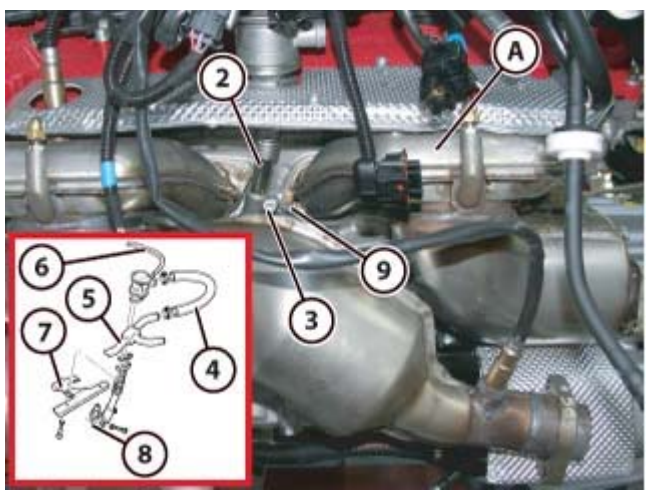
Refitting the rear left exhaust manifold

			
Tightening torque		**Nm**	**Class**
Exhaust manifold - crankcase	Nut	30 Nm	B
Exhaust manifold - branching	Screw	25 Nm	B

- Check that the contact surfaces on the head and the manifold are perfectly flat; if necessary, remove any encrustation or gasket residue.

Preferably replace the gasket each time the manifold is removed.

- Lubricate the head stud bolts with copper based **COPASLIP** grease for high temperatures.

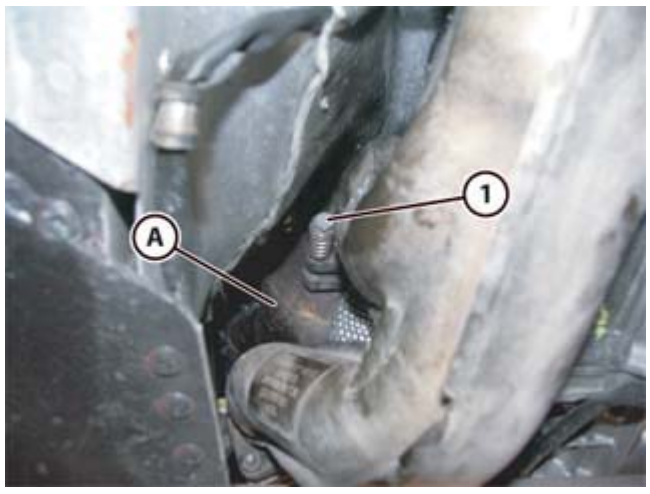


- Fit the rear right exhaust manifold **(A)** in the engine compartment and, after fitting the respective gasket, fasten by tightening the six nuts **(9)**.

Note that this photo was taken with the engine out of the vehicle and with the front left exhaust manifold already mounted to illustrate the operation more clearly.

		
Tightening torque	**Nm**	**Class**
Nut	30 Nm	B

- Check the state of the gasket **(8)**; replace it if necessary.
- Fit the left hand secondary air valve assembly **(2)** on the head with its relative seal and fasten by tightening the screw connecting the mounting bracket **(7)** to the head cover.
- Tighten the two screws **(3)** onto the head, connect tube **(4)** to the rigid tube **(5)** and tube **(6)** to the valve.



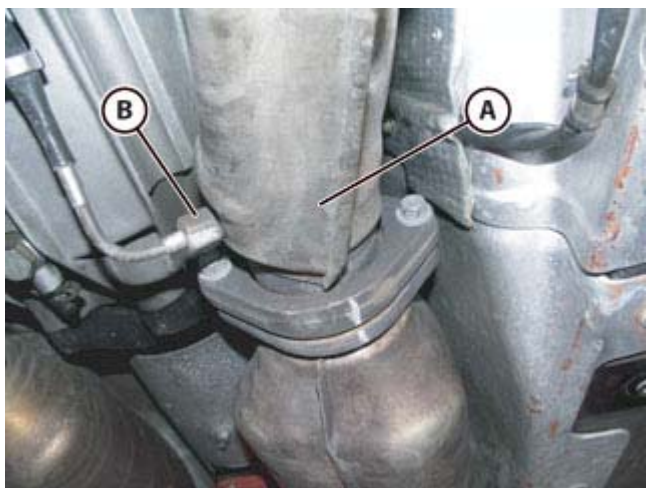
- Fasten the left right exhaust manifold **(A)** to the exhaust branching by tightening the two screws **(1)**.

		
Tightening torque	**Nm**	**Class**
Screw	25 Nm	B

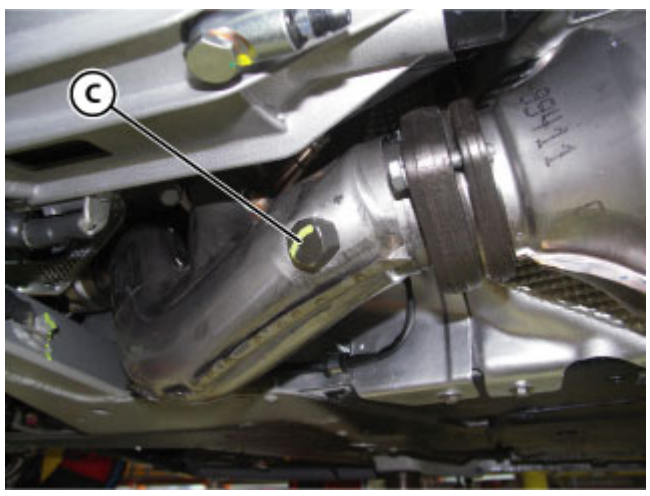
➢ Refit the front left exhaust manifold (B6.06).

Removing the exhaust branching

➢ Remove the front section of the underfloor (M2.12).
➢ Remove the catalytic converter (B6.04).

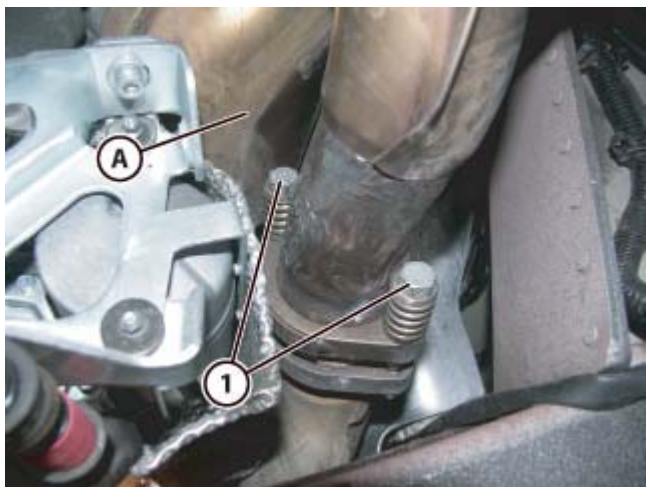


- Remove the thermocouple **(B)** on the exhaust branching **(A)**.



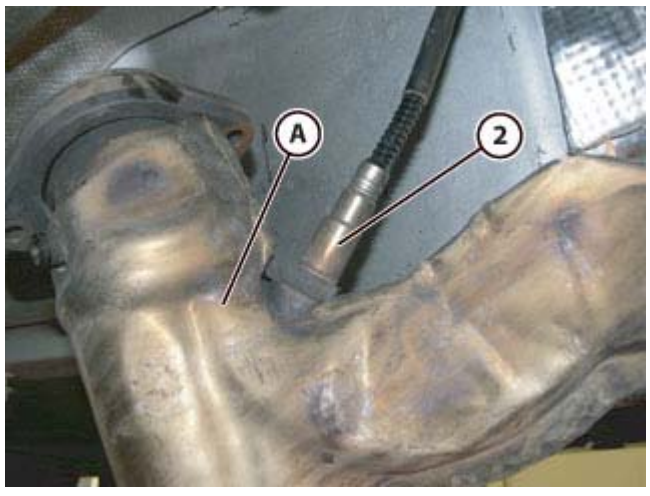
FROM M.Y.'08

- The two thermocouples have been eliminated and the orifices in the catalytic converters have been sealed with two plugs **(C)**.



- Undo the two pairs of screws **(1)** fastening the exhaust branching **(A)** to the exhaust manifolds.

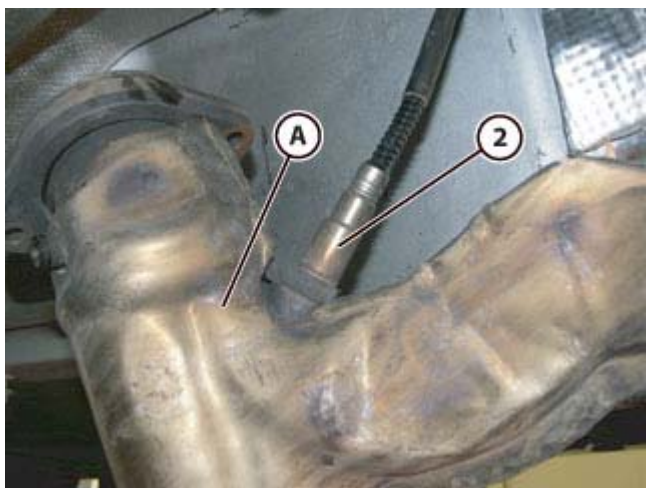
i Note that the photograph was taken with the catalytic converter still fitted.



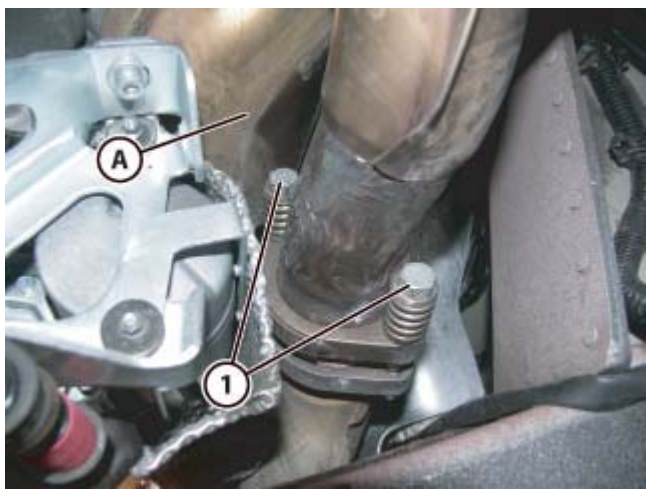
- Unscrew the oxygen sensor **(2)**.
- Retrieve the exhaust branching **(A)** from underneath the vehicle.

Refitting the exhaust branching

Tightening torque		**Nm**	**Class**
Exhaust manifold - branching	Screw	25 Nm	B
Thermocouple - exhaust branching	Thermocouple	45 Nm	B

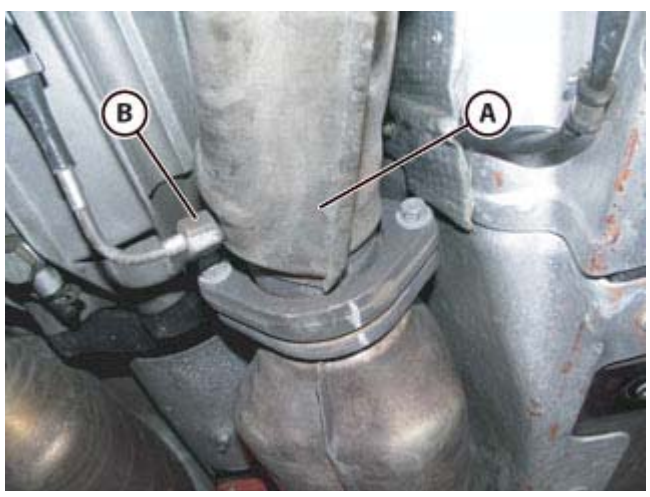


- Screw the oxygen sensor **(2)** into its seat on the exhaust branching**(A)**.



- Fasten the exhaust branching **(A)** to the exhaust manifolds, tightening the two pairs of screws **(1)**.

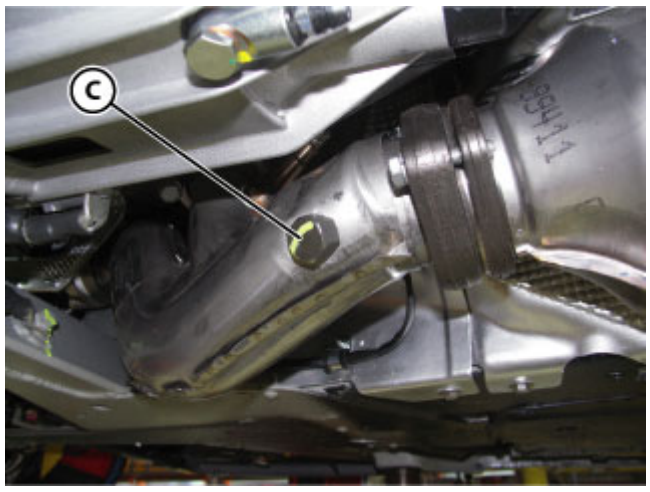
Tightening torque	**Nm**	**Class**
Screw	25 Nm	B



- Refit the thermocouple **(B)** on the exhaust branching **(A)** and tighten.

Note that the photograph was taken with the catalytic converter already fitted.

Tightening torque	**Nm**	**Class**
Thermocouple	45 Nm	B



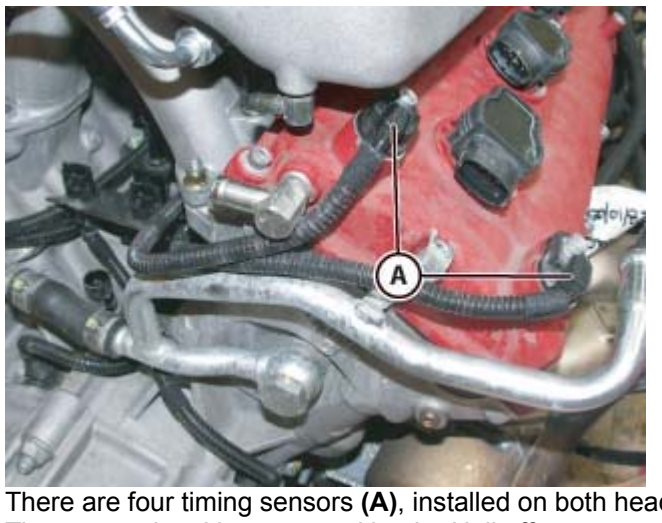
➢ Refit the catalytic converter (B6.04).
➢ Refit the front flat undertray section (M2.12).

FROM M.Y.'08

- The two thermocouples have been eliminated and the orifices in the catalytic converters have been sealed with two plugs **(C)**.

C1.01 Timing sensor

Timing sensor

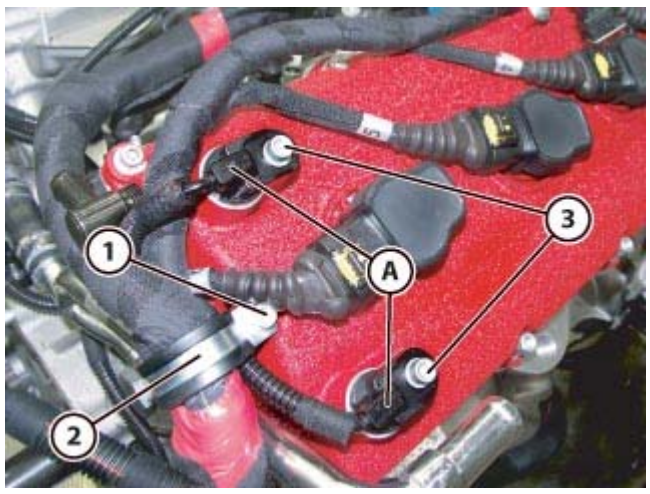


There are four timing sensors **(A)**, installed on both head covers.
The output signal is generated by the Hall effect.
This principle is based on the fact that if a current flows through a semiconductor immersed in a magnetic field which is perpendicular to the current itself, any alteration in the magnetic field will produce a variation in voltage.
The timing sensors receive 12 V power from the ECU.
Each time the rotor passes in front of the sensor, a variation in the sensor output voltage is produced by the Hall effect; this variation persists for as long as the rotor passes in front of the sensor. The signal then returns to its initial value **5V**.

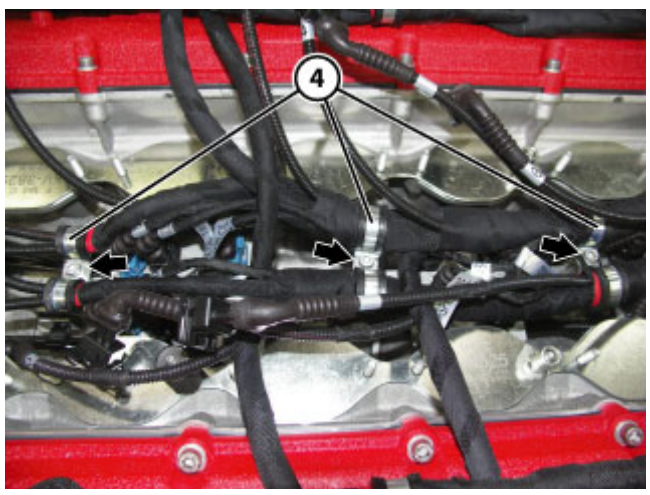
Replacing the timing sensors

Tightening torque		**Nm**	**Class**
Timing sensor - head cover	Screw	8 Nm	B

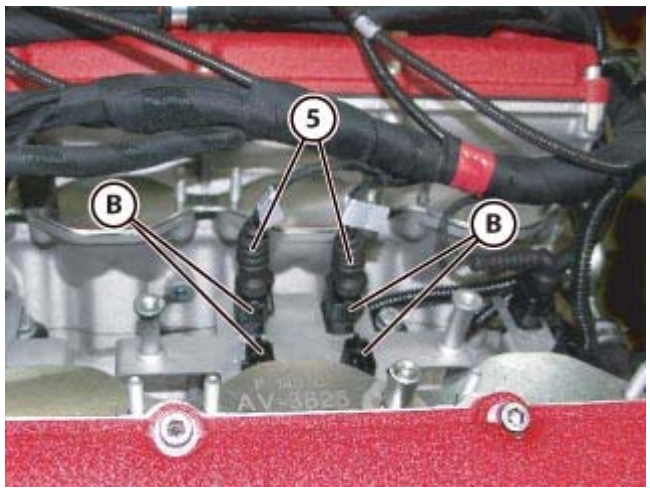
- Set the battery master switch to OFF (L2.02).
- Remove the intake manifold (B6.02).



- Undo the screw **(1)** fastening the injection cable retainer clamp **(2)**.
- Undo the two screws **(3)** fastening the timing sensors **(A)** to the head cover.
- Move the injection cables aside and remove the timing sensors **(A)** from their respective seats.



- Undo the screws fastening the three injection cable retainer clamps **(4)**.

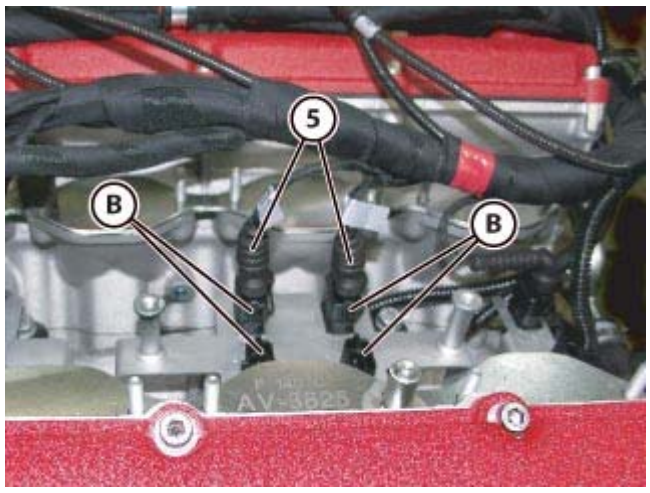


- Move the injection cables aside and disconnect the connectors **(5)** for the sensors to be replaced.

  The timing sensor connectors are identified by labels.

- Remove the connectors **(B)** for the timing sensors to be replaced from the mounting bracket.

- Remove the timing sensors complete with relative cable from the engine and replace.

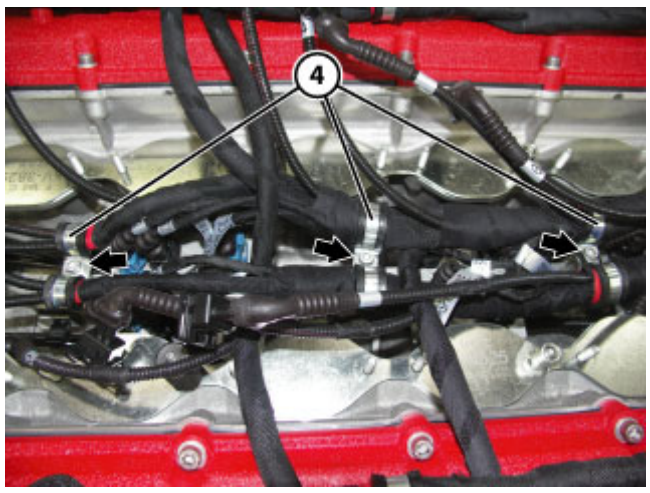


- Fit the connectors **(B)** for the timing sensors to be replaced onto the mounting bracket.

  Install the connectors **(B)** and route the timing sensor cables as originally fitted.

- Connect the connectors **(5)** to the relative timing sensor connectors **(B)**.

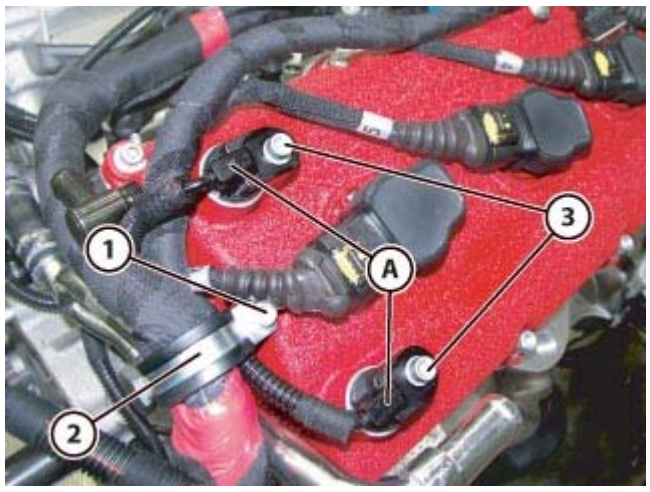
  The timing sensor connectors are identified by labels.



- Position the injection cables as originally fitted, fixing by hand tightening the fastener screws for the three clamps **(4)**.



- Apply grease **SEGO** to the new timing sensors **(A)**.



- Fit the timing sensors **(A)** in the relative seats.

  Install the connectors and route the timing sensor cables **(A)** as originally fitted.

- Hand tighten the two screws **(3)** fastening the timing sensors **(A)**.

		
Tightening torque	**Nm**	**Class**
Screw	8 Nm	B

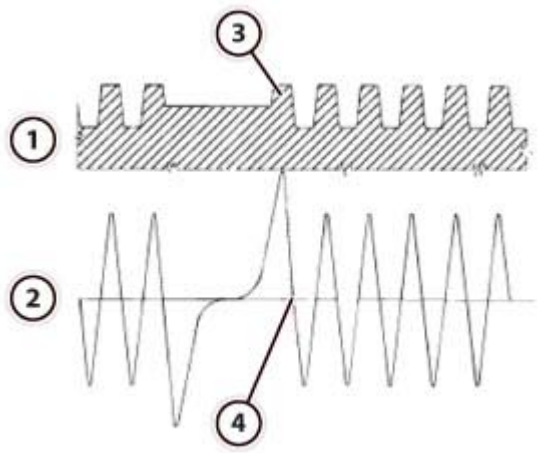
- Position the injection cables as originally fitted and fix by hand tightening the fastener screw **(1)** for the clamp **(2)**.

- Set the battery master switch to ON (L2.02).
- Perform a self-acquisition cycle
- Refit the intake manifold (B6.02).

C1.02 RPM sensor

Engine speed sensor

There are two engine speed sensors, located on the upper part of the crankcase.
This is a variable reluctance sensor. It generates an electric signal by detecting the passage of the teeth and the 2-tooth gap of a 60-tooth tone wheel, mounted on the rear of the crankshaft.
The 2-tooth gap on the tone wheel allows the sensor to identify the top dead centre **TDC** of the cylinders.
The graph below shows the sensor output signal relative to the circumference of the tone wheel.



1 - Toothed wheel profile
2 - Engine speed sensor signal
3 - Reference tooth
4 - Measurement point for TDC identification

As can be seen, the signal generated in correspondence with the gaps is half the frequency of the signal generated by the teeth of the tone wheel.
The ECU also counts the number of pulses generated by the tone wheel teeth in order to predict the position in which the halved frequency signal is expected and recognise any possible interference.
The ECU identifies the timing by analysing the signal and injects fuel, with a predetermined advance, when the intake valve of cylinder no. 1 opens.
Once the system has recognised TDC for the intake stroke of cylinder 1, the ECU injects fuel to the other cylinders in accordance with the predetermined firing order.
As a result, the timing sensor signal is no longer analysed unless the ECU loses synchronism as a result of interference etc.
In the event of the ECU losing synchronism, the ECU analyses the timing sensor again to determine the correct fuel injection order relative to the intake strokes of the individual cylinders.
The sensor connector is a two-way braided cable to reduce electromagnetic interference.

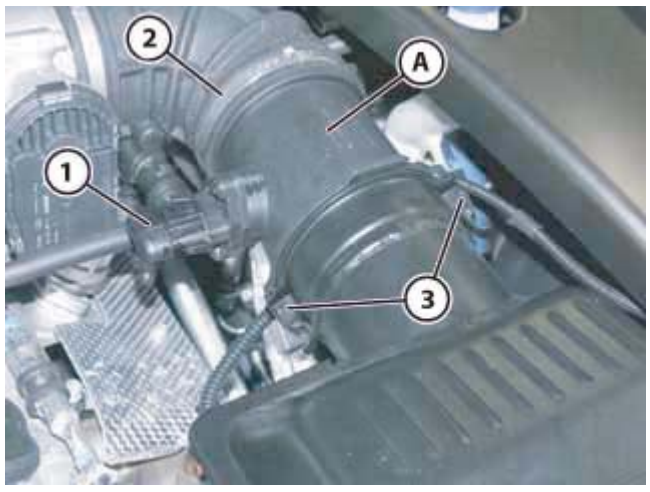
C1.03 Air flow meter

Removing the air flow meter

The air flow meter consists of a platinum hot-film sensor and is a PTC (positive temperature coefficient) type resistor.

The air flow sensor is fastened onto the air flow meter body.

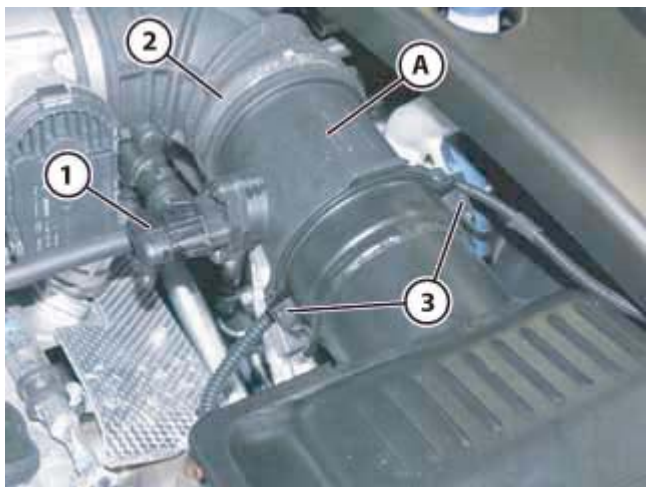
➢ Set the battery master switch to OFF (L2.02).



- Detach the connector **(1)** (Z002) (Z309) from the air flow sensor.
- Loosen the clamp **(2)** fastening it to the intake duct.
- Release the two retainer clips **(3)** fastening the air flow meter body **(A)** to the air filter box.
- Remove the air flow meter, taking care not to allow foreign bodies into the air duct.

Refitting the air flow meter

Check that the air ducts are not obstructed and that there are no foreign bodies inside them; clean thoroughly if necessary.
Clean the contact surfaces between the ducts and the part to be fitted to ensure correct adhesion.



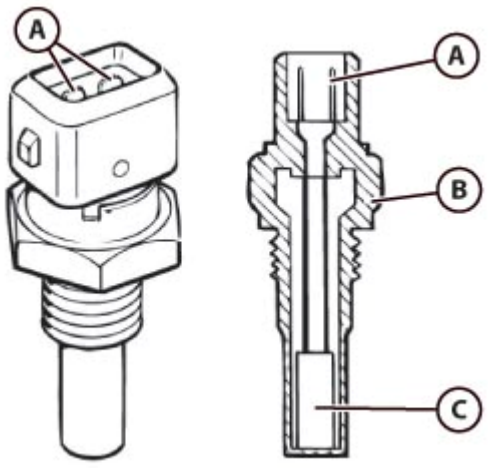
- Fit the air flow meter body **(A)** in the seats on the air filter box and onto the elbow duct connects it to the motorised throttle body.
- Fasten the air flow meter body by latching the two retainer springs **(3)**.
- Fasten the body to the intake duct by tightening the clamp **(2)**.
- Connect the connector **(1)** (Z002) (Z309) to the air flow meter.

➢ Set the battery master switch to ON (L2.02).

C1.04 Coolant temperature sensor

Coolant temperature sensor

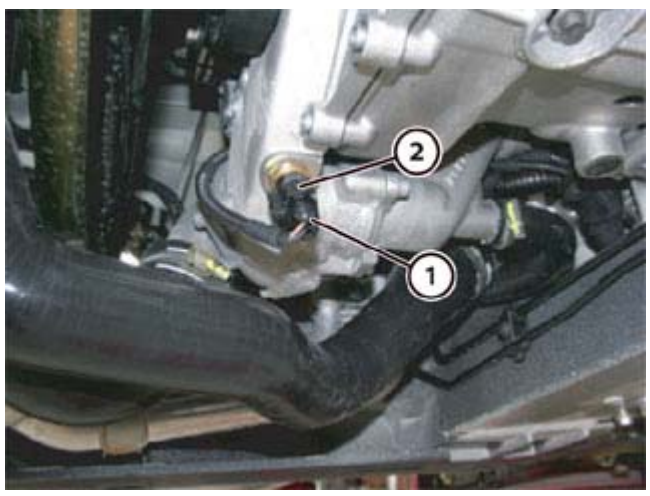
NTC (Negative Temperature Coefficient) type sensor, located on the underside of the front engine cover.
The sensor is installed with the sensing part in contact with the coolant and has gold plated contacts.
Never connect the sensor with different connector types.



The sensor consists of a metal body **(B)** containing a negative temperature coefficient heating element **(C)** connected to the electrical connections **(A)**.

Removing the coolant temperature sensor on the front cover

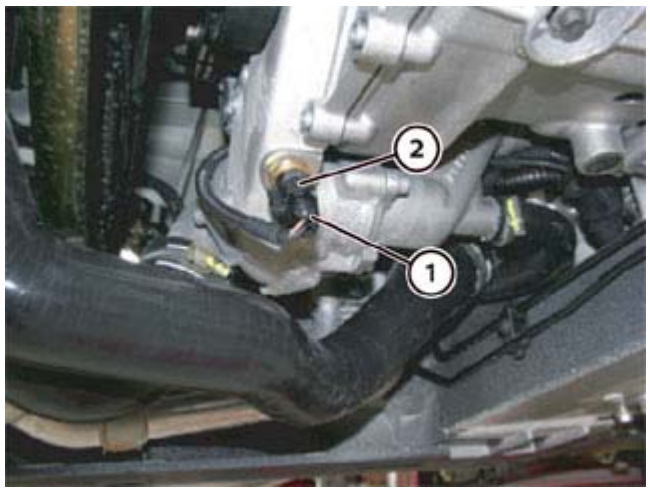
- Remove the front section of the underfloor (M2.12).



- Disconnect the connector **(1)** (S055) from the sensor.
- Remove the sensor **(2)**, unscrewing from the relative seat on the front cover.

Refitting the coolant temperature sensor on the front cover

Tightening torque		Nm	Class
Coolant temperature sensor	Sensor	16 Nm	B



- Screw the sensor **(2)** onto the front cover.

Tightening torque	Nm	Class
Sensor	16 Nm	B

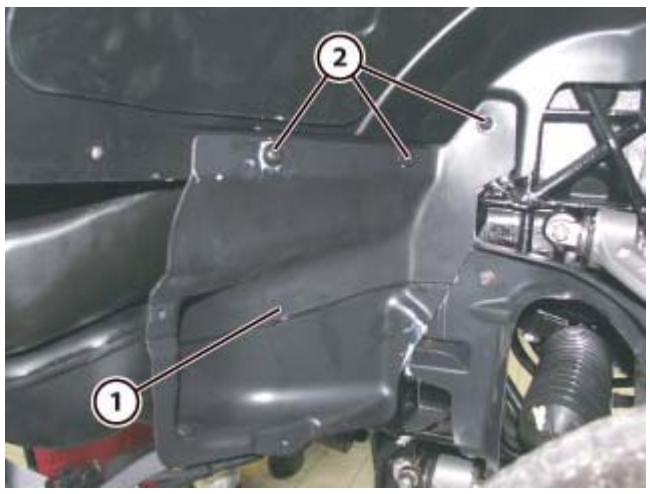
- Connect the connector **(1)** (S055) to the sensor.

➢ Refit the front flat undertray section (M2.12).

Replacing the coolant temperature sensor on the radiator

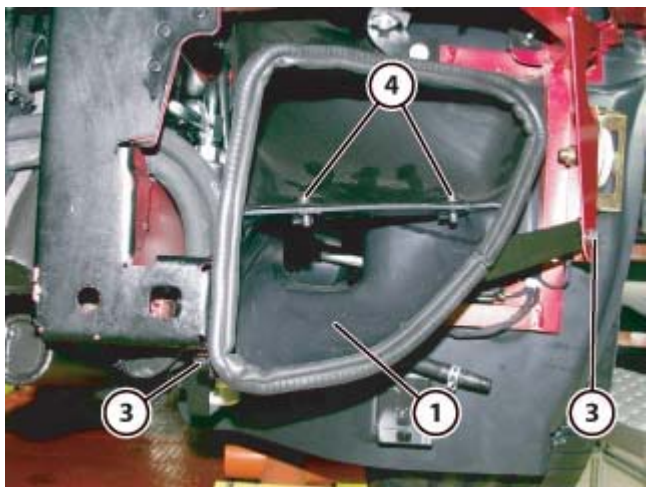
Tightening torque		Nm	Class
Coolant temperature sensor	Sensor	16 Nm	B

- Set the battery master switch to OFF (L2.02).
- Remove the front bumper (M2.03).



- Undo the three screws **(2)** fastening the lower air duct **(1)** to the bodyshell.

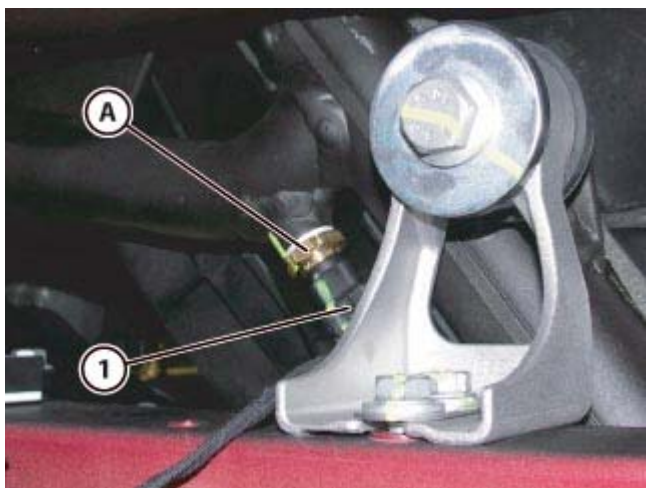
Carry out the following operations on the right hand side of the vehicle; the left hand side of the vehicle is shown in this image.



- Remove the air duct gasket.
- Undo the screws **(3)** and the fastener screws **(4)** on the bodyshell and on the upper air duct.
- Remove the lower duct **(1)** from the wheel bay.

- Replace the siren (H4.01).

Remove it.



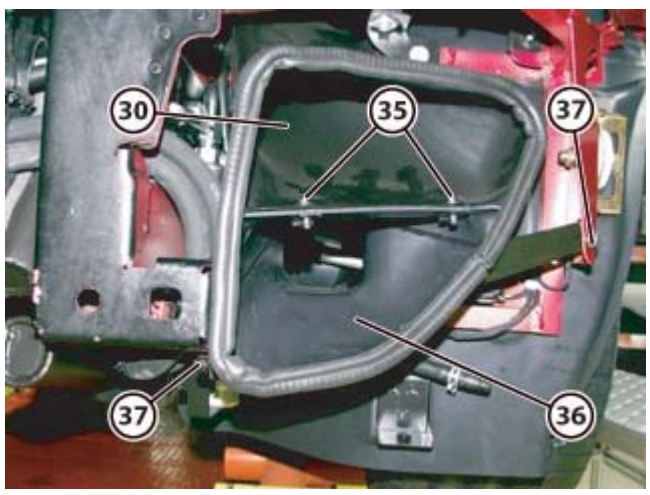
- Disconnect the connector **(1)** from the coolant temperature sensor **(A)**.
- Unscrew the coolant temperature sensor **(A)** remove from its seat and replace.
- Fit the new coolant temperature sensor **(A)** in its relative seat and tighten.

Tightening torque	Nm	Class
Sensor	16 Nm	B

- Connect the connector **(1)** to the coolant temperature sensor **(A)**.

- Replace the siren (H4.01).

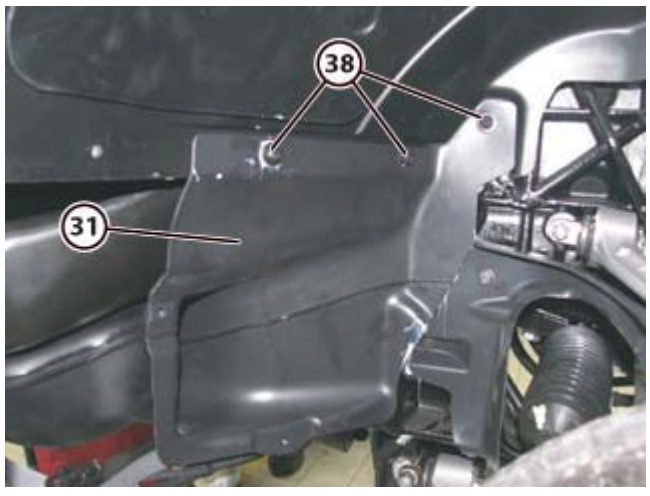
Refit.



- Fit the lower duct **(36)**, introducing from the wheel bay.

Carry out the following operations on the right hand side of the vehicle; the left hand side of the vehicle is shown in this image.

- Fit the upper air duct **(30)** to the lower duct **(36)** with the two screws **(35)**.
- Fit the lower air duct **(36)** to the bodyshell with the two screws **(37)**.
- Fit the perimeter gasket on the air ducts.



- Fasten the lower air duct **(31)** definitively with the screws **(38)**.

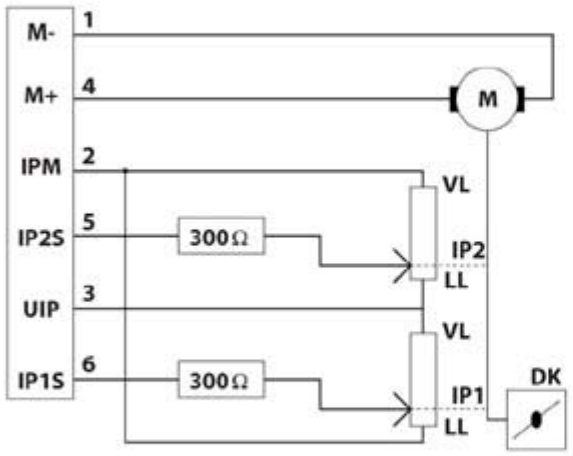
➢ Refit the front bumper (M2.03).
➢ Set the battery master switch to ON (L2.02).

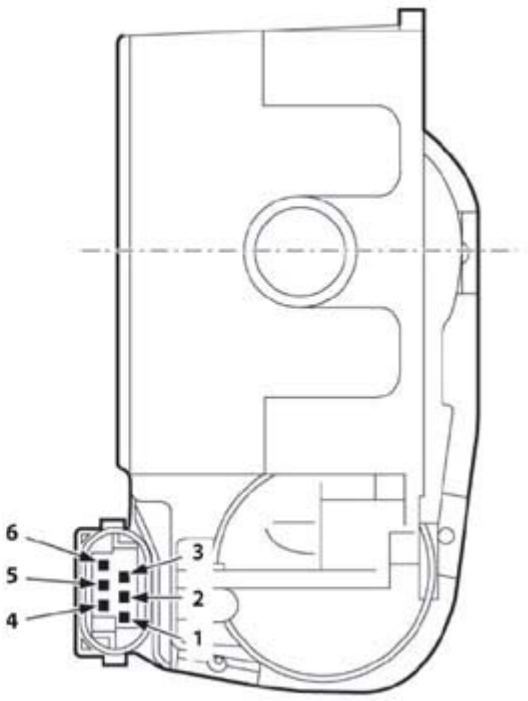
C1.05 Throttle valve potentiometer

Throttle valve potentiometer

The potentiometer cannot be replaced alone as it is built into the motor driven throttle body.

The potentiometer is built into the motorised throttle body of each bank.
The potentiometer is located on the throttle valve spindle and provides the ECU with a continuous throttle valve aperture signal that is proportional to the valve spindle rotation angle.
The wiring diagram of the motor-driven throttle shows that there are actually two parallel potentiometers; this allows the ECU to perform a plausibility check.





The signals, which may be verified with the SD-3 tester, are inversely proportional to one another (as the output voltage of one potentiometer decreases, the voltage of the other increases proportionally).
At every engine start, the ECU automatically calibrates itself to the correct idle position.
Do not press the accelerator pedal during engine start.

Activation thresholds

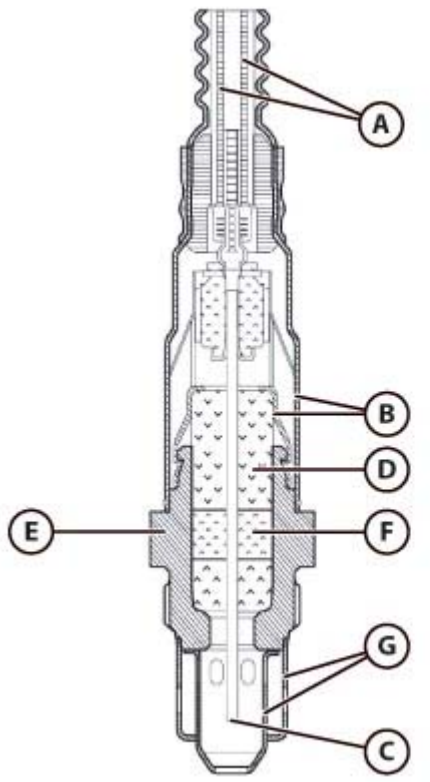
- **10-minute** self-acquisition periods
- Idle position = **2 - 3 %**
- Recovery position (4000 RPM) = **8%**

C1.06 Oxygen sensor (lambda sensor)

Oxygen sensor (Lambda sensor)

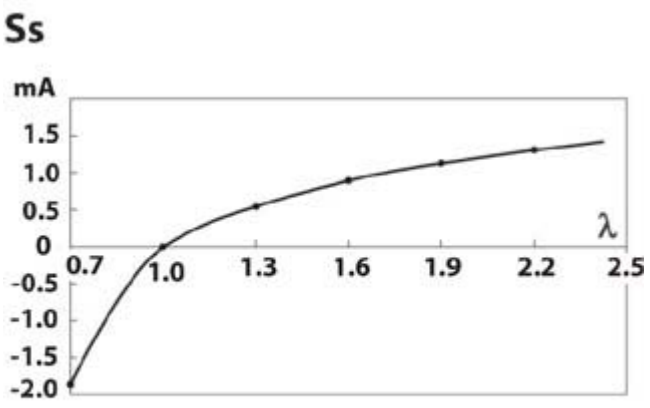
The oxygen sensors measure the oxygen content of the exhaust gases.

Front oxygen sensor, BOSCH LSU 4



A - Connector cable
B - Protective outer casing
C - Flat sensor element
D - Ceramic mounting
E - Sensor body
F - Ceramic gasket
G - Protective cap

This linear, broad band sensor generates a current signal that varies in accordance with the concentration of uncombusted oxygen in the exhaust gases, which is closely correlated with the air/fuel ratio in the intake manifold or the excess air ratio **(λ = lambda)** of the air/fuel mixture.
The main characteristic of this sensor is its linearity, even with **λ** values other than **1**.



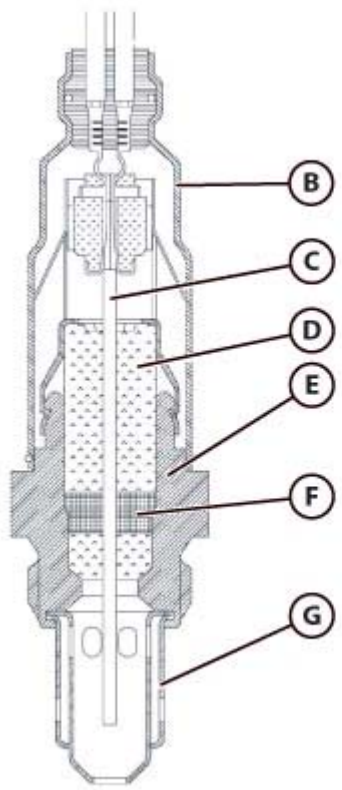
Ss - Sensor signal
λ - Excess lambda ratio

This signal is transmitted to the engine ECU and enables the continuous adjustment of the fuel injection system, to ensure maximum engine performance and efficiency.

The oxygen sensor is active at all engine speeds.
Lambda metering is disabled (oxygen sensor OFF) for the entire period necessary for the pump and the secondary air solenoid valve to complete the ON-OFF-ON cycle.

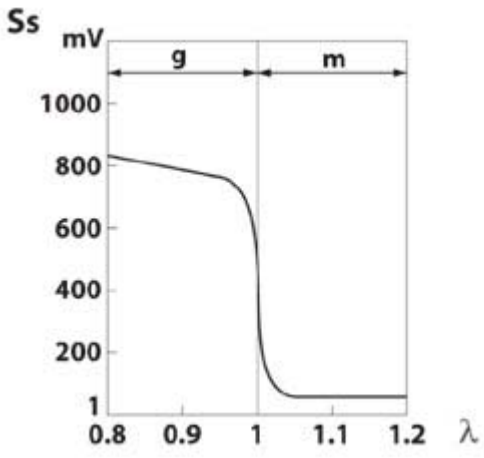
The engine ECU controls a heater that maintains the sensor at an optimum operating temperature of **(700 to 800 °C)** in all conditions.

Rear oxygen sensor, BOSCH LSF 4



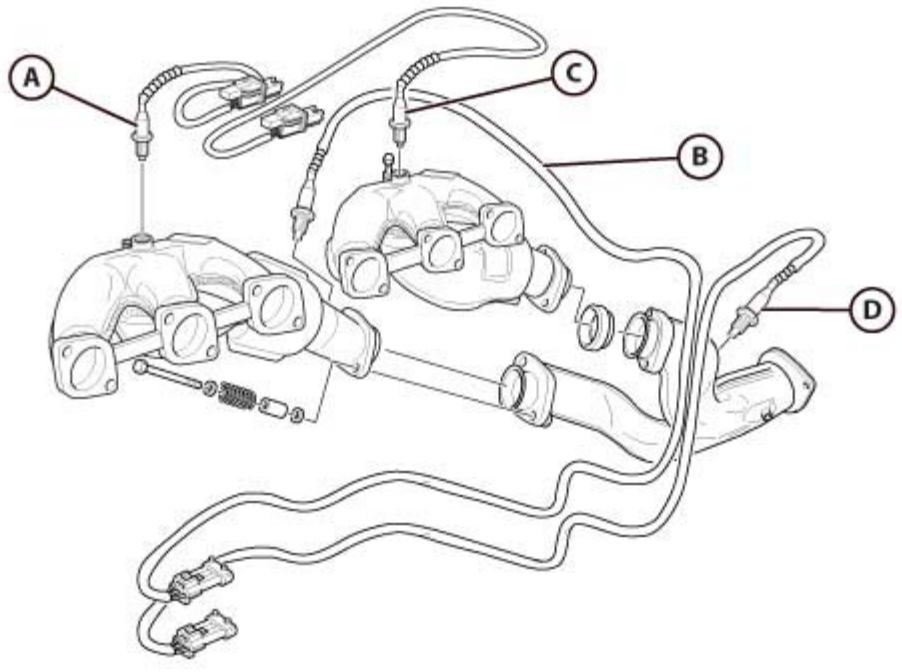
A - Connector cable
B - Protective outer casing
C - Flat sensor element
D - Ceramic mounting
E - Sensor body
F - Ceramic gasket
G - Protective cap

This sensor has a dual role: to detect the degradation of the catalytic converter, by comparison with the signal from the front sensor, and to correct the mixture in the event of degradation of the front oxygen sensor.
At low temperatures **(< 350 °C)**, the internal resistance of the sensor of **(> 1 MΩ)**, impedes the generation of a usable signal.
For this reason, and to speed up the initial warm up time during cold starts and maintain maximum sensor efficiency with the engine at idle speed for prolonged periods, the oxygen sensor is heated internally by a modulated wave element.
The output signal of the sensor is given by the ratio **λ** of the air/fuel mixture and is **stepped** at a value of **λ = 1**.
The signal range is approximately **400 mV**, centred on a value of **450 mV**.



Ss - Sensor signal
λ - Excess lambda ratio
g - Rich mixture
M - Lean mixture

Oxygen sensor location

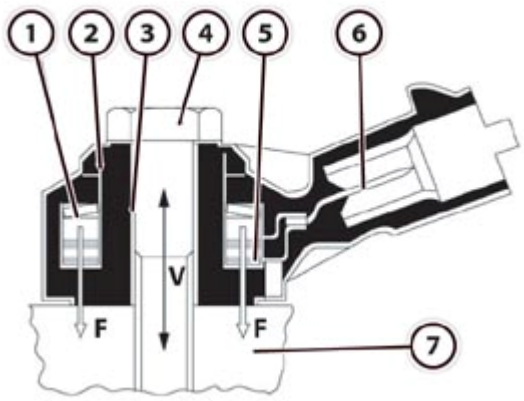


A - Oxygen sensor on front manifold
B - Rear oxygen sensor on front manifold
C - Oxygen sensor on rear manifold
D - Oxygen sensor on exhaust branching

C1.07 Knock sensor

Knock sensor

These sensors are installed on the upper surface of the crankcase, arranged symmetrically relative to the transverse centre line. This configuration is necessary to ensure that knock is detected identically for all cylinders.
This is piezoelectric sensor: in the event of engine knock, vibrations of a certain frequency are produced in the crankcase; these vibrations are transformed by the sensor into a voltage signal, which is proportional to their intensity.
This signal is transmitted via a braided cable (to minimise possible electrical interference) to the ECU, which then adapts ignition accordingly.

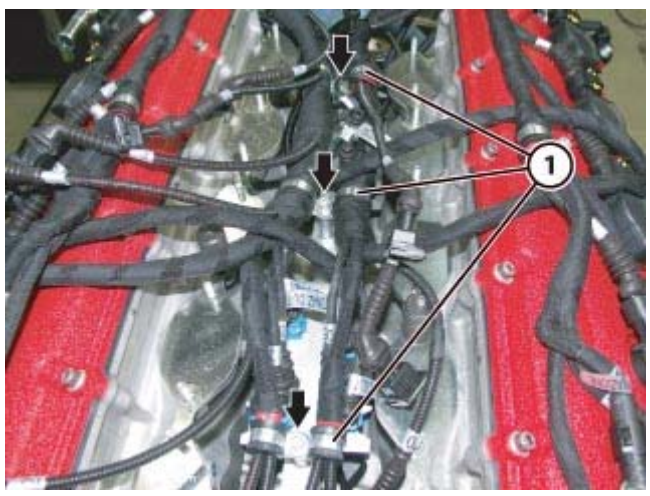


1 - Vibrating core with compression force F
2 - Body
3 - Ceramic body
4 - Fastener screw
5 - Contact
6 - Electrical connection
7 - Vibrations

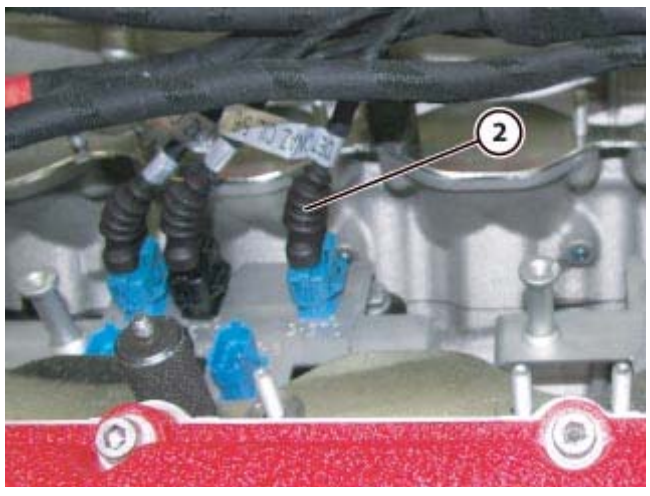
Replacing the knock sensors

Tightening torque		**Nm**	**Class**
Knock sensor - crankcase	Screw	20 Nm	B

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the intake manifold (B6.02).

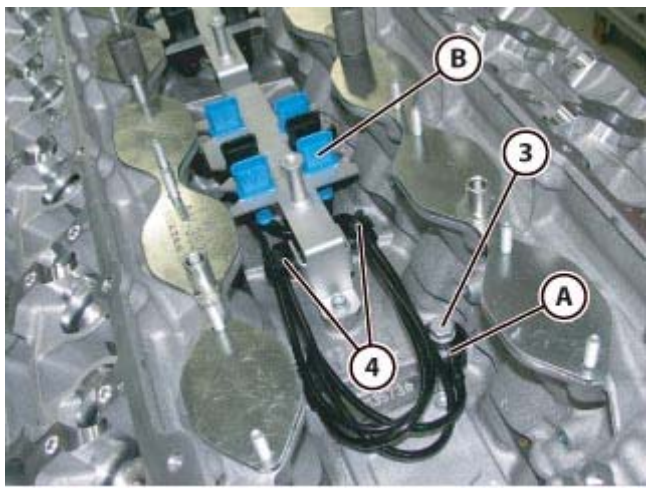


- Undo the screws fastening the three injection cable retainer clamps **(1)**.



- Move the injection cables aside and disconnect the connectors **(2)** for the knock sensors to be replaced.

The knock sensor connectors are identified by labels.



- Undo the two screws **(3)** fastening the knock sensors **(A)** to be replaced.
- Remove the knock sensors **(A)** to be replaced from their relative seats.
- Remove the connectors **(B)** for the knock sensors to be replaced from the mounting bracket.
- Remove the knock sensors completely from the engine, releasing the relative cables from the retainer clips **(4)**, and replace.
- Fit the connectors **(B)** for the cables of the new knock sensors onto the mounting bracket and fasten the relative cables to the retainer clips **(4)**.

i Install the connectors **(B)** and route the knock sensor cables as originally fitted.

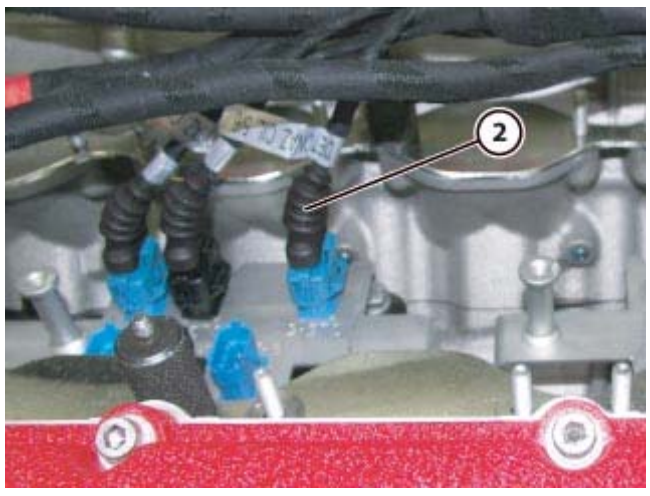
- Fit the new knock sensors **(A)** in the relative seats.

i Install the connectors and route the knock sensor cables **(A)** as originally fitted.

- Tighten the two screws **(3)** fastening the new knock sensors **(A)**.

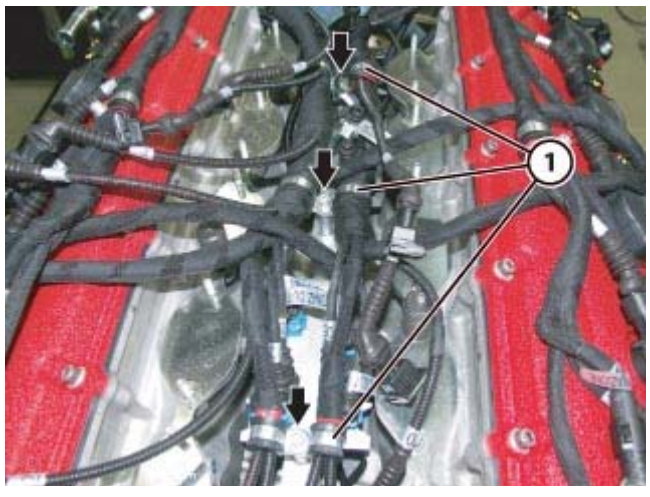


Tightening torque	Nm	Class
Screw	20 Nm	B



- Connect the knock sensor connectors **(2)**.

i The knock sensor connectors are identified by labels.

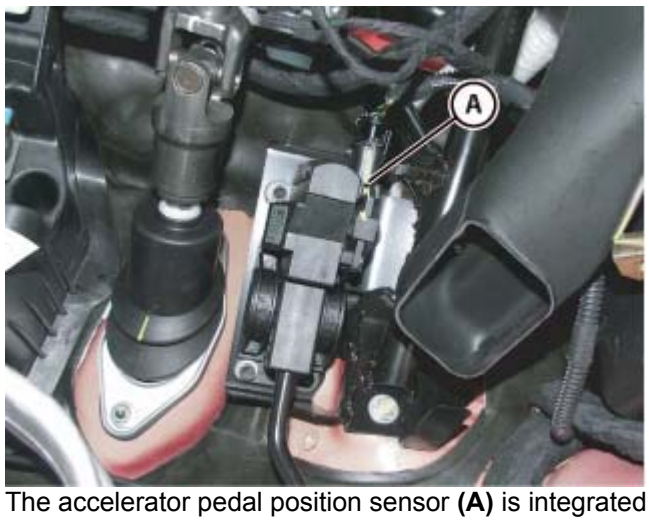


- Position the injection cables as originally fitted and hand tighten the fastener screws for the retainer clamps **(1)**.

➢ Refit the intake manifold (B6.02).
➢ Set the battery master switch to ON (L2.02).
➢ Perform a self-acquisition cycle

C1.08 Accelerator pedal position sensor

Accelerator pedal position sensor



The accelerator pedal position sensor **(A)** is integrated in the accelerator pedal and cannot be replaced individually.

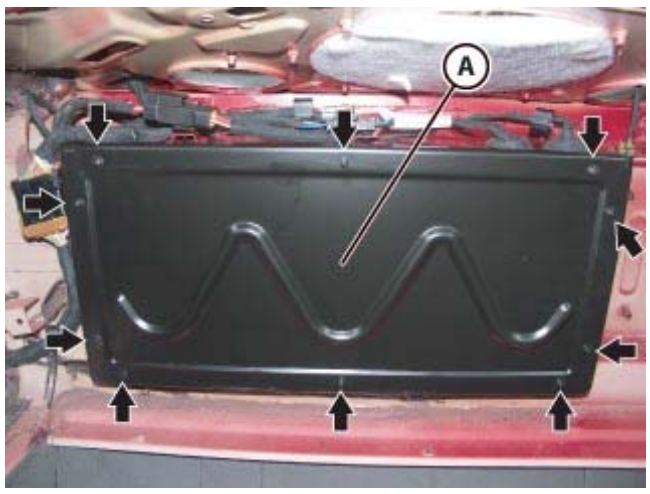
C1.09 Diagnostic pump and filter for OBD pump

Diagnostic pump and OBD pump filter

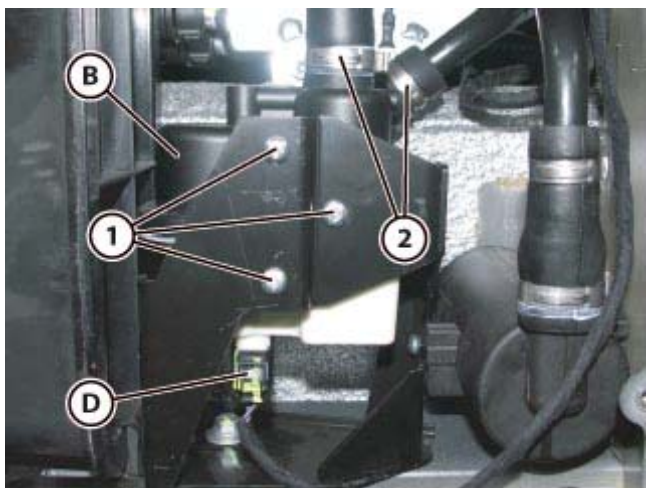
FROM Ass.ly Nr. 71848, the OBD diagnostic pump, the OBD pump filter and relative OBD pipes have been introduced.
These form parts of the evaporative emissions control system and are fastened, by a bracket, near the active carbon filter in the luggage compartment.
The diagnostic pump is connected to the active carbon filter by a hose and is controlled by the engine control unit. The diagnostic pump pumps atmospheric air into the active carbon filter through a filter preventing the entry of foreign objects into the system. The diagnostic pump cyclically over-pressurises the entire evaporative emissions control system to check for leaks.

Replacing the diagnostic pump and filter for the OBD pump (FROM Ass.ly Nr. 71848)

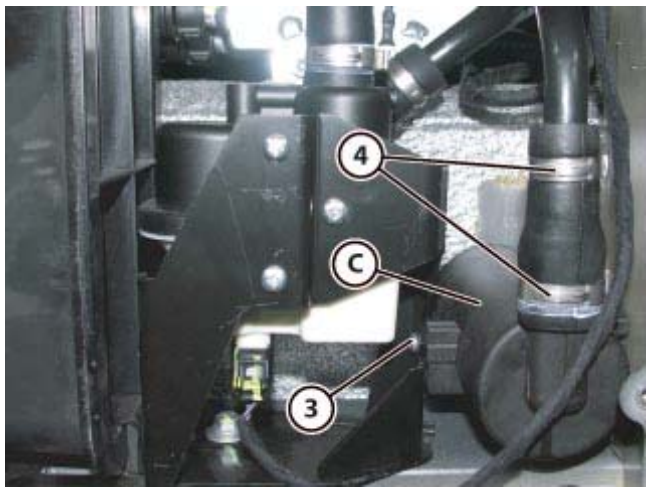
- Set the battery master switch to OFF (L2.02).
- Remove the tank panel trim panel from the luggage compartment (M2.23).



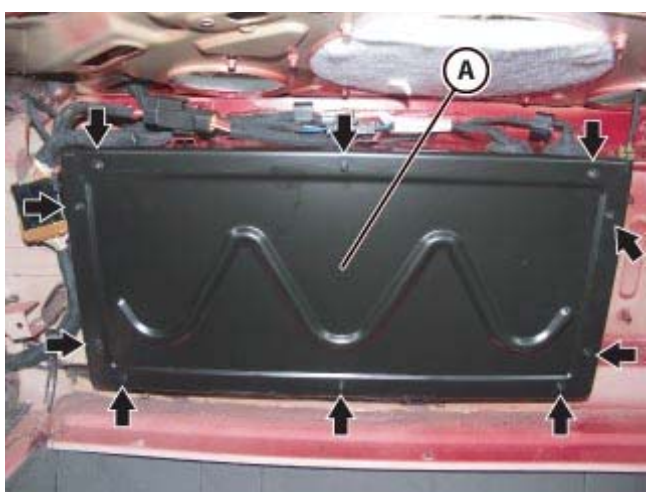
- Undo the ten screws indicated and remove the panel **(A)**.



- To replace the diagnostic pump, undo the three screws **(1)**.
- Remove the clamps **(2)** and disconnect the pipe between the air filter and the pump and the pipe between the canister and the pump.
- Disconnect the connector **(D)**.
- Lift the diagnostic pump **(B)** upward out of its seat and replace.
- Install the diagnostic pump **(B)** in its relative seat.
- Connect the connector **(D)**.
- Connect the pipe between the air filter and the pump, connect the pipe between the canister and the pump and fasten the pipes with clamps **(2)**, as originally mounted.
- Hand tighten the three screws **(1)**.



- To replace the filter, undo the screw **(3)**.
- Remove the clamps **(4)** and disconnect the pipe between the air filter and the pump.
- Remove the filter **(C)** from its seat and replace.
- Install the filter **(C)** in its relative seat.
- Connect the pipe between the air filter and pump and fasten with the clamps **(4)**.
- Hand tighten the screw **(3)**.



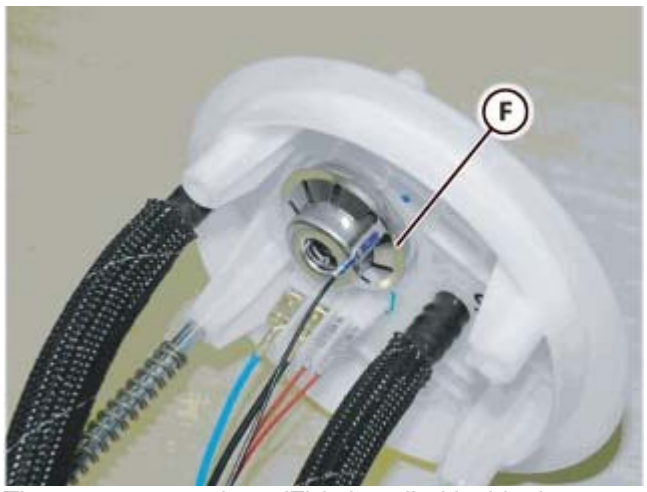
- Fit the panel **(A)** and hand tighten the ten screws indicated.

- Refit the luggage compartment tank panel trim (M2.23).
- Set the battery master switch to ON (L2.02).

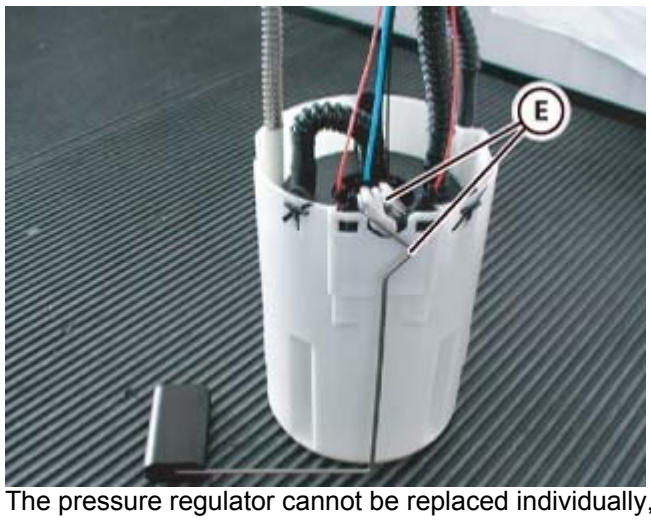
C1.10 Fuel pump

Fuel pump assembly

The pumps feeding each engine cylinder bank are installed within the pickup screens at the bottom of the fuel tank.
If in any doubt whether the fuel pump is working correctly, check pump function only after inspecting the fuel system pipes for leaks.

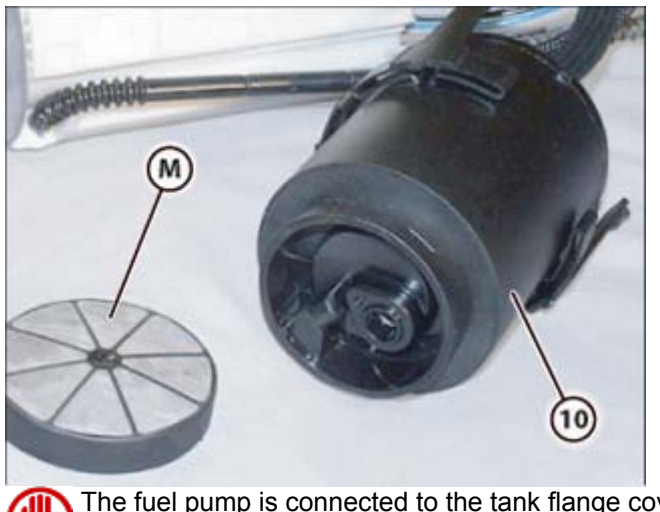


The pressure regulator **(F)** is installed inside the pump, while the level gauge is installed on the edge of the right hand pump pickup screen **(E)**.



The pressure regulator cannot be replaced individually, as it is a part of the pump assembly, which is supplied as a complete spare part.

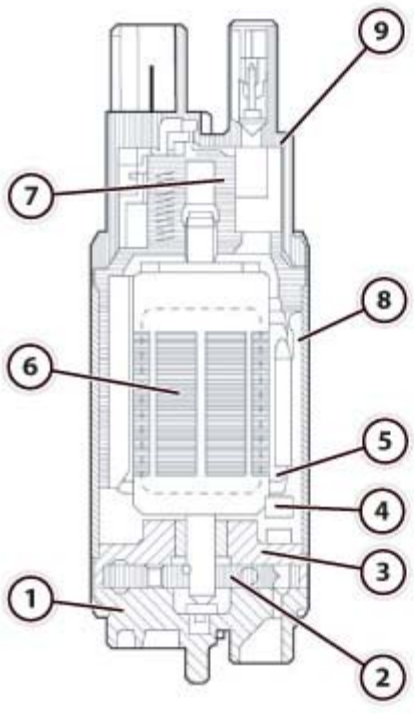
The fuel pump **(BOSCH EKP 14)** is a roller displacement type suction pump driven by a permanent magnet electric motor.

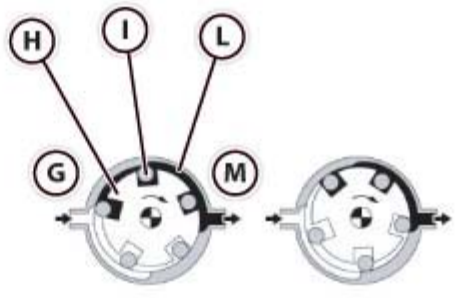


The fuel pump is connected to the tank flange cover by lines and electrical cables which must not be disconnected.

There is a pump installed in each tank, inside a special casing **(10)** which also houses the fuel filter, at the pump inlet. On the lower end there is a meshed suction screen **(M)**.
The pump motor is activated at engine speeds above **40 RPM** and runs constantly after engine start.
If the injection system is activated when the engine is not running, a safety circuit cuts out the fuel pump.
The pump is capable of operating at low voltages and low temperatures to enable cold starts.
The pump has a pressure relief valve which short-circuits delivery to the intake chamber when the pressure exceeds **8 bar**, as in the case of clogging. The pump is also equipped with a check valve that opens at **1.5 bar** and closes when the pump is off, to keep the operating pressure at approximately **3.6 bar**.

Fuel pump components



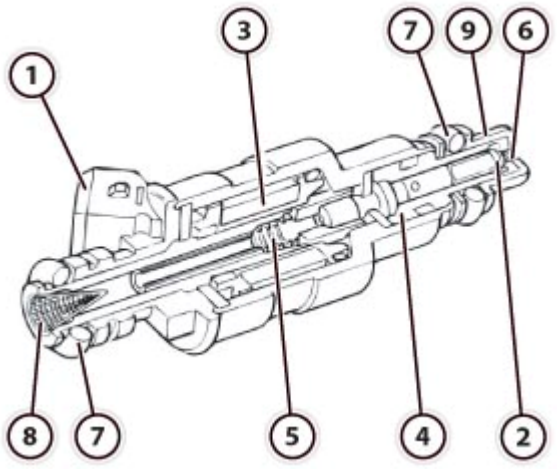


1 - Inlet plate
2 - Impeller
3 - Outlet plate
4 - Magnet
5 - Magnet
6 - Motor body
7 - Bearing support
8 - External mounting
9 - Terminal cover
G - Intake side
H - Rotating disk
I - Roller
L - Roller track
M - Pressurised outlet side

C1.11 Electroinjectors

Electro-injectors

The electro-injectors are controlled directly by the ECU and may either be fully open or fully closed.
The signals sent by the ECU are sequential and synchronised, so that the injectors are activated in accordance to the engine combustion order (sequential). The beginning and duration of injector aperture are dependent on and synchronised with the timing of each individual.
The electro-injector consists of a body and a needle nozzle with a magnetic inductor over the body.



1 - Injector body
2 - Needle nozzle
3 - Magnetic winding
4 - Needle guide
5 - Helical spring
6 - Nozzle pin
7 - O-rings
8 - Mesh filter
9 - Heat protector bushing

The electro-injector body houses a magnetic coil and the guide for the nozzle needle.
When the magnetic coil is not excited, the helical spring presses the nozzle needle against the seal seating at the electro-injector outlet orifice.
As soon as the magnetic coil is excited, the nozzle needle detaches from the seating by about **0.1 mm** allowing fuel to be delivered via a calibrated orifice.
On the front end of the needle is a sharpened nozzle pin that finely atomises the fuel, creating a double spray to render fuel distribution the combustion chamber more uniform.
On the outer body are two O-rings sealing the rail and the intake manifold, and a meshed filter to capture contaminants in the fuel.
The end of the electro-injector is also fitted with a thermal protection bushing in Teflon to prevent fuel evaporation and, as a result, crystallisation of dry residue on the needle. This bushing must not be removed when installed in electro-injector.

The injectors are mounted on the fuel lines (injector rails) which, in turn, are mounted under the intake manifold.

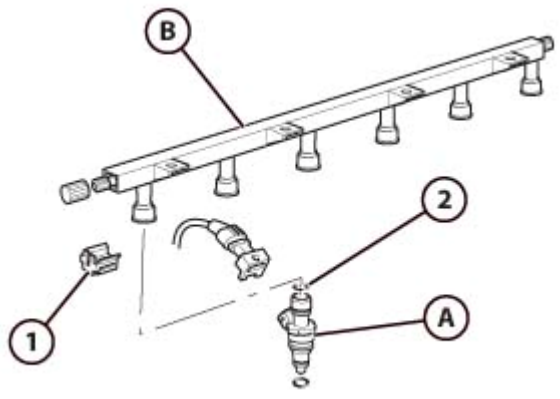
Replacing the electro-injectors

A self-learning cycle must always be performed after replacing electro-injectors.

CAUTION
Fuel is highly flammable.
NEVER WORK ON A WARM OR HOT ENGINE.

The electro-injectors are mounted on the fuel lines which, in turn, are mounted under the intake manifold.

➢ Remove the intake manifold (B6.02).
Follow the disassembly procedure up to the removal of the **fuel lines (injector rails)**.



- Remove the electro-injector **(A)** from the fuel lines (injector rail) **(B)** removing the clip **(1)**.
- Seal the electro-injector seat on the fuel line to prevent fuel from leaking.

Replace O-rings each time the electro-injectors are removed.

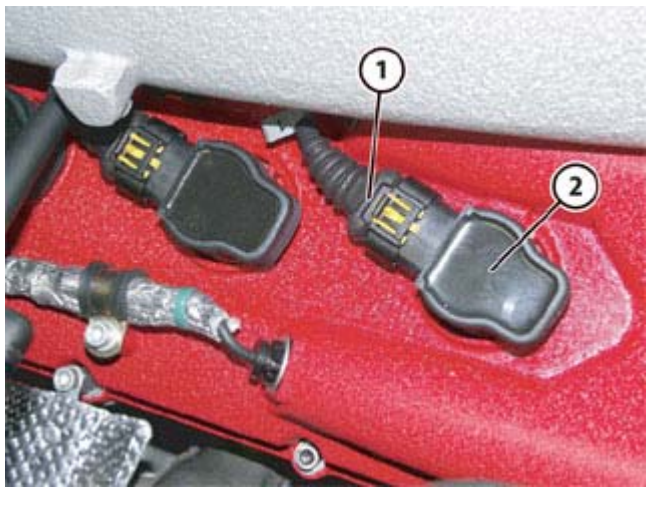
- To install the new electro-injector **(A)** correctly, lubricate the O-rings **(2)** with grease **SEGO**, taking care not to contaminate the inlet orifice.
- Install the electro-injector **(A)** in its respective seat on the fuel line (injector rail) **(B)** and fasten with the clip **(1)**.

➢ Refit the intake manifold (B6.02).

C1.12 Coil

Removing the coils

➢ Set the battery master switch to OFF (L2.02).

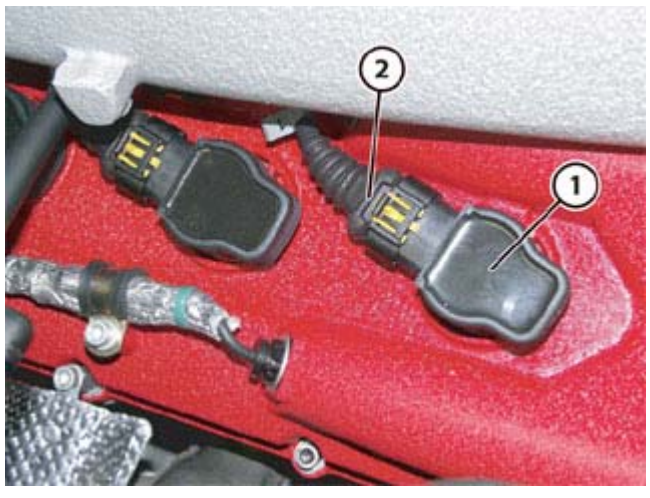


- Detach the system connector **(1)** (L005) (L006) (L031) (L032) (L053) (L054) (L303) (L304) (L323) (L324) (L325) (L326) and remove the coil **(2)** from its seat on the engine head, pulling forcefully.

Refitting the coils

Check that the coil to be installed is in good condition and replace if necessary.

Check that the contact surfaces between the coil and the engine head are clean and in good condition.



- Fit the coil **(1)** in its seat on the head and push down forcefully until completely fitted.
- Connect the connector **(2)** (L005) (L006) (L031) (L032) (L053) (L054) (L303) (L304) (L323) (L324) (L325) (L326).

Always perform a self-acquisition after replacing a coil.

- Check that the coil is fastened correctly.

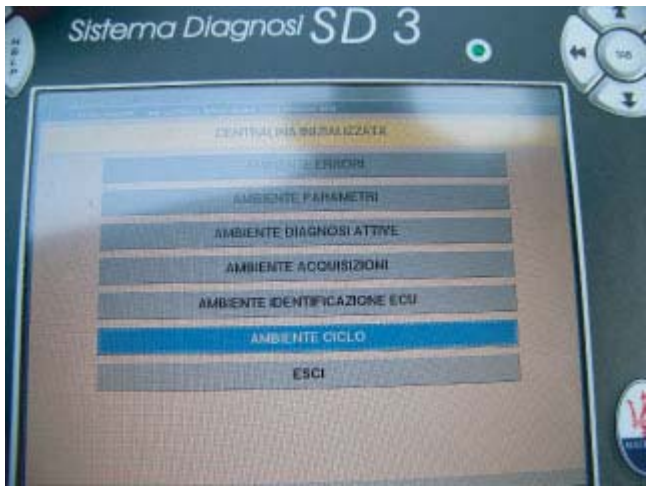
➢ Set the battery master switch to ON (L2.02).

C1.13 Evaporative emissions control system solenoid valve

Inspections for the evaporative emissions control system

In the event of a fault or malfunction attributable to the evaporative emissions control system, proceed as follows.

- Print out the error list and the ECU identification.
- Perform an **oxygen sensor test cycle and canister flushing cycle** with the SD3 diagnostic tester.



- Access the **"CYCLE ENVIRONMENT"** menu for the ECU and follow the guided procedure given by the SD3 diagnostic tester.

- If the test is completed successfully, the diagnosis is complete.
- If the test is failed, carry out the following tests in the sequence given:
- Remove the engine compartment shields on the fenders (M2.17).
- Remove the central engine compartment shield (M2.17).
- check that the evaporative emissions control system solenoid valves function correctly and/or check for contamination; remove any traces of contamination found and, if necessary, replace the non working solenoid valve as follows;

When replacing an evaporative emissions control system solenoid valve, please plug the solenoid valve inlet and outlet and send to the Parts return.

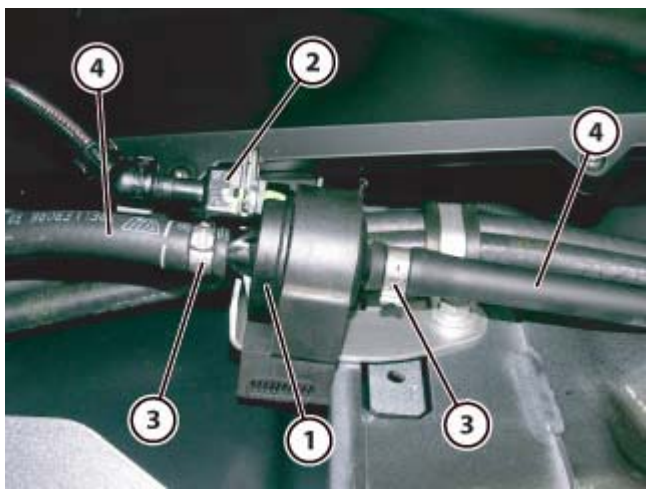
- check for obstruction caused by narrowing or contamination in the evaporative emissions control system pipes; if necessary, restore the correct pipe layout and remove any contaminants; replace the pipes in question if necessary.
- After restoring normal conditions, repeat the **oxygen sensor test cycle and canister flushing cycle** with the SD3 diagnostic tester;
- If the test is completed successfully, the diagnosis is complete.

➢ Refit the central engine compartment shield (M2.17).
➢ Refit the engine compartment shields on the fenders (M2.17).

Removing the evaporation emissions control system solenoid valve

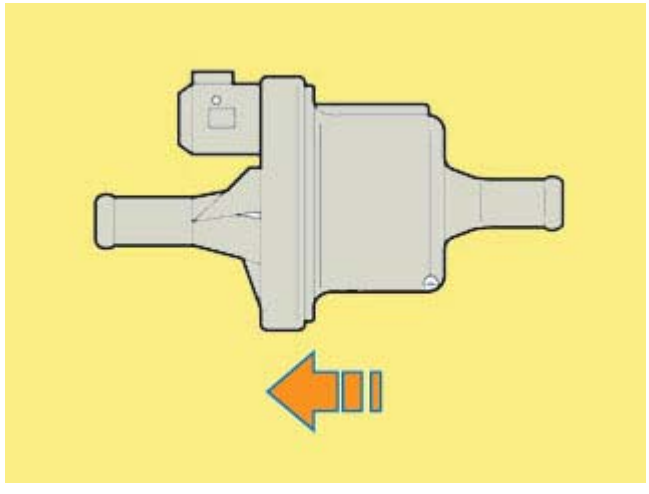
➢ Set the battery master switch to OFF (L2.02).

- Remove the engine compartment shields on the fenders (M2.17).



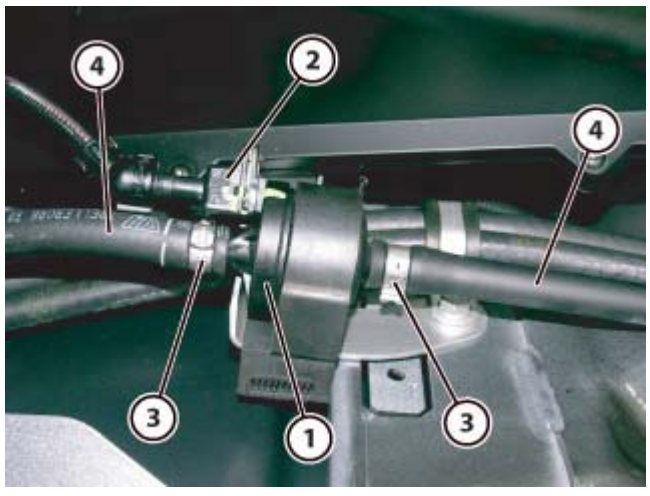
- To remove the valve **(1)**, disconnect the connector **(2)** (L007) (L327).
- Loosen the two clamps **(3)**.
- Remove the inlet and outlet pipes **(4)**.
- Remove the valve **(1)** from the rubber mount.

Replacing the evaporative emissions control system solenoid valve



- Check the valve fitting direction.

The arrow indicates the direction of flow.

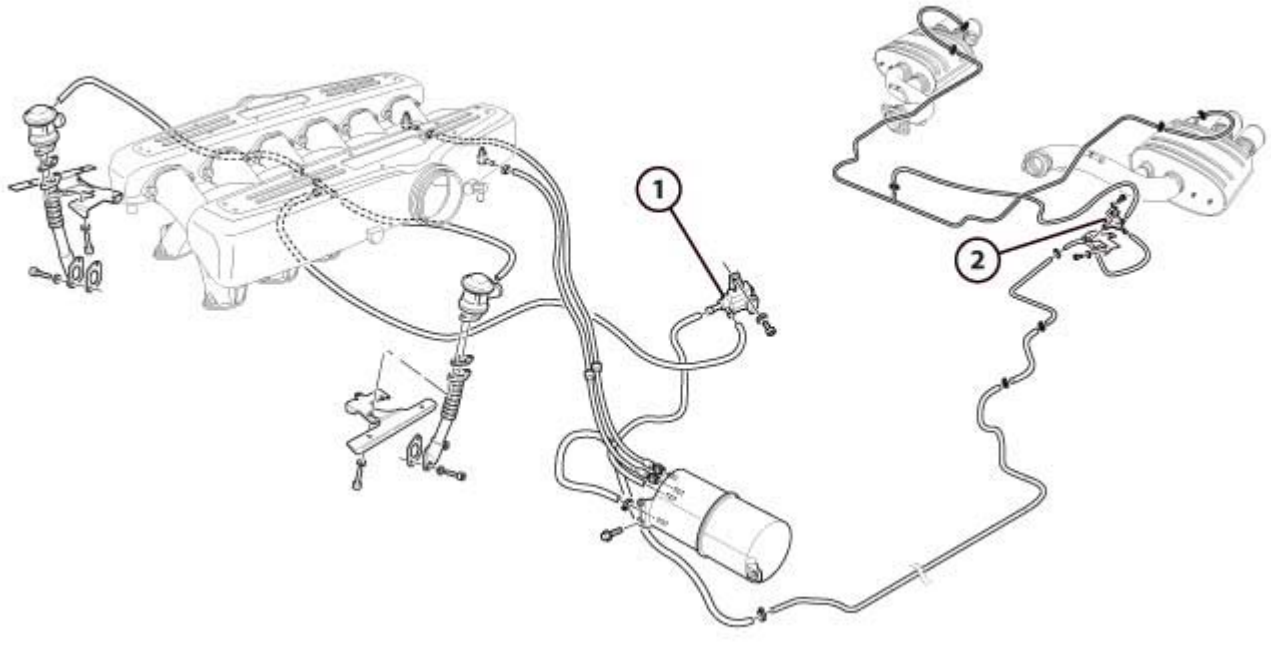


- Fit the valve **(1)** on its rubber mounting.
- Connect the connector **(2)** (L007) (L327).
- Fit the pipes **(4)** onto the valve.
- Fasten the pipes onto the valve by tightening the two clamps **(3)**.

➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

C1.14 Pneumatic actuator system solenoid valves

Pneumatic actuator system solenoid valves



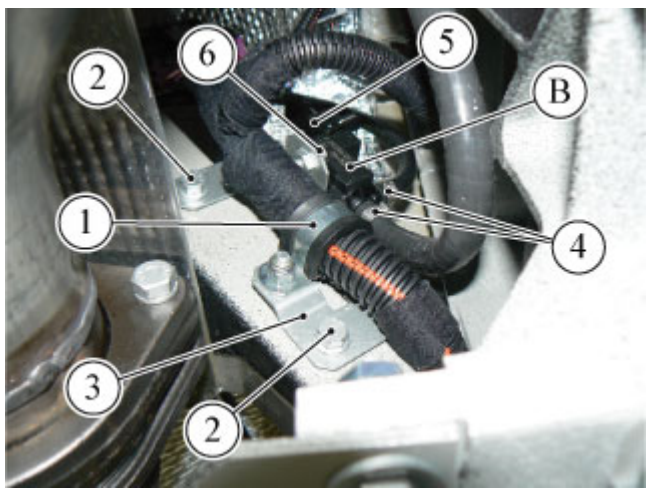
The solenoid valve **(1)** controls the aperture of the secondary air solenoid valves connected to the cylinder heads.
The solenoid valve **(2)** controls the aperture of the pneumatic butterfly valves mounted on the exhaust tailpipes.

The actuators are vacuum-operated and are part of the pneumatic actuating system.
The solenoid valves are switched ON or OFF by the ECU in relation to engine operating conditions. The diagnostic system can detect short circuits (SC) or open circuits (OC) in the solenoid valves. The solenoid valves are switched ON or OFF by the ECU in relation to engine operating conditions. The diagnostic system can detect short circuits (SC) or open circuits (OC) in the solenoid valves.

After replacing the solenoid valves, a self-learning cycle must be performed.

Replacing the rear pneumatic actuator system solenoid valve

- Set the battery master switch to OFF (L2.02).
- Remove the rear undertray section (M2.12).

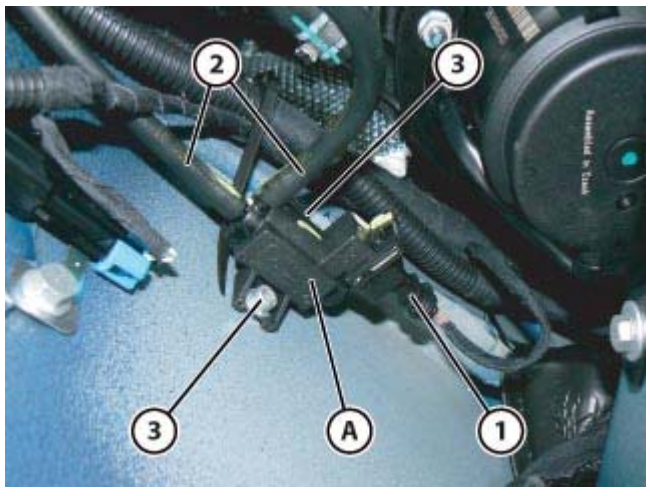


- Remove the clamp **(1)** undoing the relative fastener nut and move the sheath out of the way so that it will not hinder the following operations.
- Undo the two screws **(2)** fastening the mounting bracket **(3)** for the solenoid valve **(B)** and remove from the relative seat.
- Disconnect the two pipes **(4)** from the solenoid valve **(B)**, loosening the two fastener clamps.
- Disconnect the connector **(5)** from the solenoid valve **(B)**.
- Undo the two screws **(6)** fastening the solenoid valve **(B)** to the bracket **(3)**.
- Remove the solenoid valve **(B)** from the bracket **(3)** and replace.
- Fit the new solenoid valve **(B)** onto the bracket **(3)** and fasten by hand tightening the two screws **(6)**.
- Connect the connector **(5)** to the solenoid valve **(B)**.
- Connect the two pipes **(4)** to the solenoid valve **(B)**, by tightening the two fastener clamps.
- Fit the mounting bracket **(3)** for the solenoid valve **(B)** in its relative seat as originally installed and hand tighten the two fastener screws **(2)**.
- Fit the sheath and clamp **(1)** as originally installed and fasten by hand tightening the relative fastener nut.

- Refit the rear underfloor section (M2.12).
- Set the battery master switch to ON (L2.02).

Replacing the front pneumatic actuator system solenoid valve

- Set the battery master switch to OFF (L2.02).
- Remove the windscreen washer-headlight washer tank (M2.08).



- Disconnect the connector **(A)** from the solenoid valve **(1)**.
- Disconnect the two pipes **(2)** from the solenoid valve **(A)**.
- Undo the two screws **(3)** fastening the solenoid valve **(A)** to the bodyshell and remove the solenoid valve.
- Fit the new solenoid valve **(A)** in its relative seat on the bodyshell and fasten by hand tightening the two screws **(3)**.
- Connect the two pipes **(2)** to the solenoid valve **(A)**.
- Connect the connector **(1)** to the solenoid valve **(A)**.

➢ Refit the windscreen washer-headlight washer tank (M2.08).
➢ Set the battery master switch to ON (L2.02).

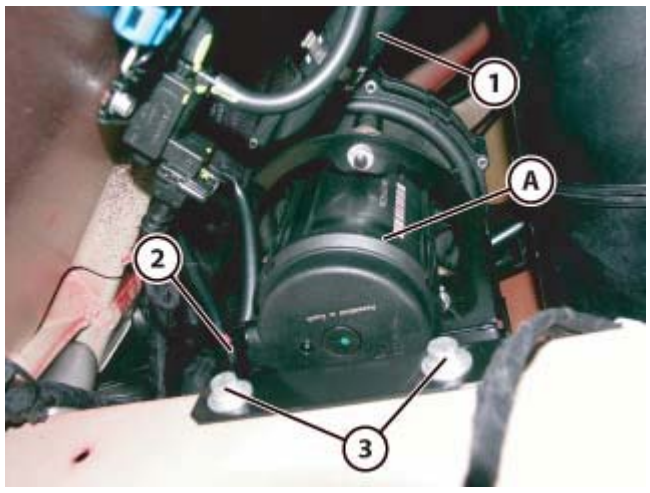
C1.15 Secondary air pump

Secondary air pump

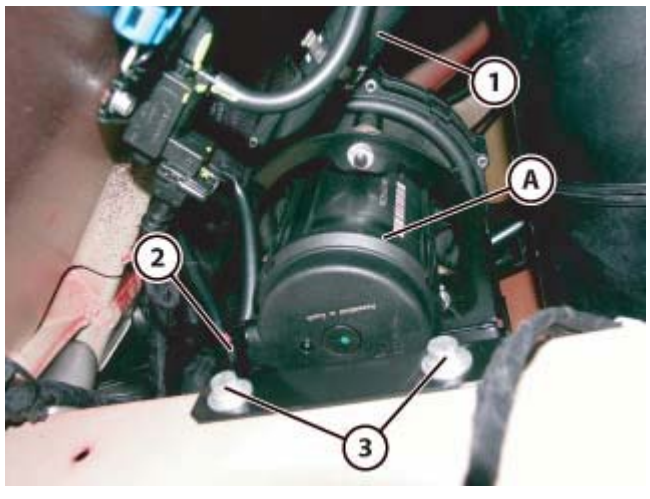
The secondary air pump is located behind the front left hand wheel bay.
The air, aspirated through a filter incorporated in the pump, is conveyed to the secondary air valves through a series of rigid lines and pipe connectors.
The pump and the secondary air solenoid valve are controlled by the Motronic ECUs to reduce harmful emissions into the atmosphere in particular engine operating conditions

Replacing the secondary air pump

- Set the battery master switch to OFF (L2.02).
- Remove the windscreen washer-headlight washer tank (M2.08).



- Disconnect the air delivery pipe **(1)** removing the relative clamp.
- Disconnect the connector **(2)** (M300) and undo the two screws **(3)** fastening the secondary air pump **(A)**, complete with bracket, to the vehicle chassis.
- Ease out and remove the secondary air pump **(A)** from underneath the vehicle and replace.



- Working from underneath the vehicle, fit the secondary air pump **(A)** in its relative chassis seat and fasten by hand tightening the screws **(3)**.
- Connect the delivery pipe **(1)** as originally mounted, fastening the relative clamp and connector **(2)** (M300).

- Refit the windscreen washer-headlight washer tank (M2.08).
- Set the battery master switch to ON (L2.02).

C1.16 Variable timing adjuster control solenoid valve

Applying UNIFLOR 8917 grease to variable timing adjuster control solenoid valve connectors

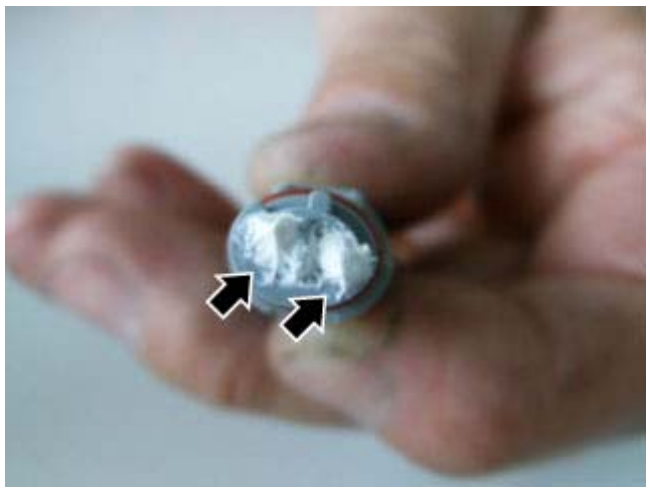
The following procedure must be performed whenever replacing a variable timing adjuster control solenoid valve and, therefore, whenever the relative connector is disconnected.

➢ Set the battery master switch to OFF (L2.02).



DO NOT use blunt instruments for disconnecting the connectors to avoid damaging the O-ring on the wiring side connector.

- Disconnect the connectors **(A)** for the variable timing adjuster control solenoid valves.



- Apply grease **UNIFLOR 8917 Code 70001410** to the connectors (wiring harness side) for the variable timing adjuster control solenoid valves, as illustrated in the photo aside.

Note that the photo shows a connector removed from the vehicle to illustrate the operation more clearly.



- Connect the connectors **(A)** for the variable timing adjuster control solenoid valves.

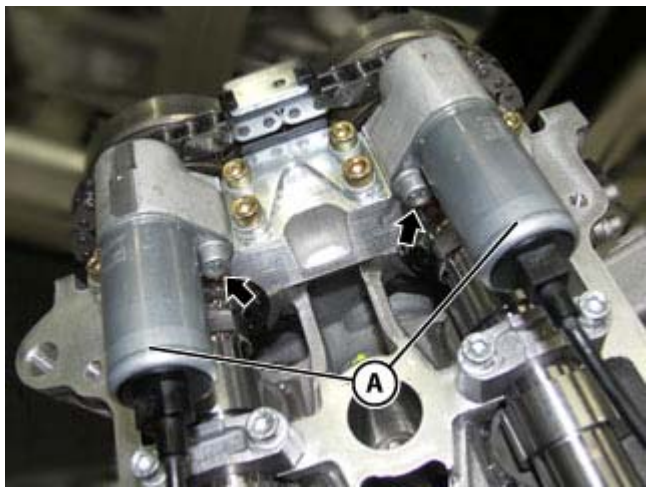
➢ Set the battery master switch to ON (L2.02).

Replacing the timing adjuster actuator solenoid valve

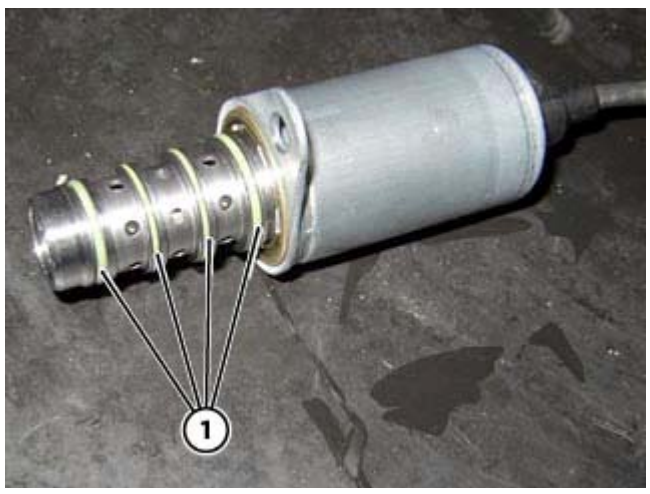
In the event of a failure in the variable timing adjuster control solenoid valve, before replacing the component, carry out the procedure "Applying UNIFLOR 8917 grease to variable timing adjuster control solenoid valve connectors" and check the function again.
If the failure persists, the variable timing adjuster control solenoid valve must be replaced.

Note that the following images show the procedure carried out with the component removed from the vehicle to illustrate the operation more clearly. The procedure may, however, be performed in the vehicle.

➢ Remove the cylinder head covers (B2.03).



- Undo the indicated screws fastening the respective variable timing adjuster control solenoid valves **(A)**.
- Remove the variable timing adjuster control solenoid valves **(A)** from the respective seats and replace.



- Lubricate the seats of the front caps and the variable timing adjuster control solenoid valve seals **(1)** with engine oil.



- Fit the variable timing adjuster control solenoid valves **(A)** in the respective seats.
- Tighten the indicated screws fastening the respective variable timing adjuster control solenoid valves **(A)**.

➢ Refit the cylinder head covers (B2.05).

D1.01 Technical specifications

Gear ratios

	1	2	3	4	5	6 *	R
Transmission gear ratios	41/13=3.154	37/17=2.176	36/23=1.565	32/27=1.185	29/31=0.935	25/33=0.758	41/14=2.929
Bevel gear pair/differential ratio			4.18	(11/46)			

*_alternative 6th gear (short) with different gear ratios (25/32=0.781), fitted up to ' **Ass.ly Nr. 66181**.

Gearbox characteristics

6 forward ratios + reverse	
Floating ring type synchronisers	
Total radial free play between idler gears and 1st and 2nd gear and reverse shafts (on secondary shaft)	0.008 ÷ 0.073 mm
Total radial free play between idler gears and 3rd and 4th gear shafts (on primary shaft)	0.014 ÷ 0.081 mm
Total radial free play between idler gears and 5th and 6th gear shafts (on primary shaft)	0.015 ÷ 0.085 mm
Endfloat between idler gears and shims	0.15 ÷ 0.19 mm
Wear limit	0.2 mm
Endfloat of auxiliary reverse gear wheel	0.2 mm
Radial free play of auxiliary reverse gear wheel	0.018 ÷ 0.048 mm
Meshing free play	0.07 ÷ 0.11 mm
Endfloat between selector forks and sleeves for 1st, 2nd, 3rd, 4th, 5 and 6th gears and reverse	0.15 ÷ 0.25 mm
Endfloat on 1st and 2nd gear diameter	0.6 ÷ 0.75 mm
Radial free play on 3rd, 4th, 5th, 6th and reverse gear diameter.	0.5 ÷ 0.9 mm
Radial free play between selector rods and respective holes	0.005 ÷ 0.07 mm
Shaft eccentricity	0.02 mm
Lubrication_Eccentric gear pump with bypass valves	

SOFAST 4 hardware content

The differences in hardware content between this application and previous SOFAST 2 versions are as follows:

- IT+ type dual plate clutch;
- clutch actuator pressure sensor wired directly to the transmission control unit;
- longitudinal accelerometer, (this is the CAN YAW RATE used by the ESP ECU. The longitudinal acceleration value is read by the gearbox over the CAN line); CFC301 gearbox ECU.

D1.02 Tightening torques

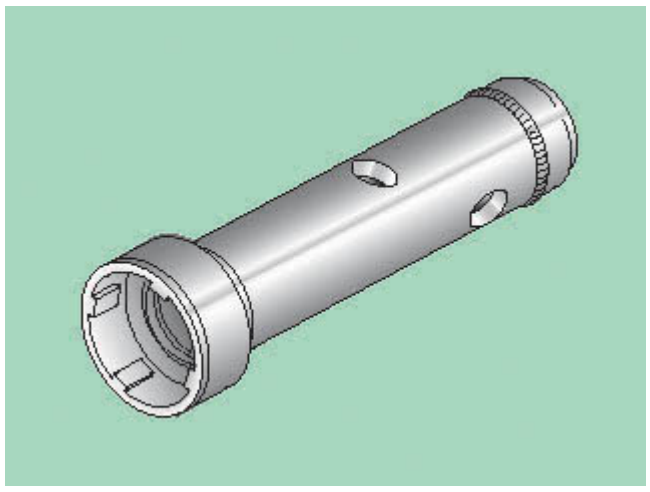


Tightening torque		Nm	Class
Gearbox housing	Nut	30 Nm	C
Rear cover - differential housing	Nut	30 Nm	C
Front cover - gearbox housing	Nut	30 Nm	C
Side cover	Nut	10 Nm	C
Gearbox oil filter	Screw	5 Nm	C
First and second gear fork - rod	Screw	30 Nm	C
Oil pump body - 4th element	Screw	30 Nm	C
First ring nut - secondary shaft	Ring nut	250 Nm	A
Second ring nut - secondary shaft	Ring nut	250 Nm	A
Intermediate ring nut - secondary shaft	Ring nut	350 Nm	A
First ring nut - primary shaft	Ring nut	100 Nm	A
Second ring nut - primary shaft	Ring nut	100 Nm	A
Transmission shaft pipe - gearbox	Nut	60 Nm	A
Gearbox - rubber bushing	Stud bolt	103 Nm	B
Gearbox subframe - chassis	Screw	25 Nm	B
Transmission shaft pipe - clutch housing	Nut	60 Nm	A
Gearbox mounting bushing - chassis	Screw	50 Nm	C
Gear lever housing - bodyshell	Screw	25 Nm	B
Fastening on gearbox control rod connector clamp	Incremental screw pretightening torque	5 Nm	B
	Pretightening torque for screw	10 Nm	B
	Screw	25 Nm	B
Gearbox control rod	Nut	9.8 Nm	B
Threaded gearbox oil filler plug	Plug	60 Nm	B
Power Unit mounting bracket	Nut	15 Nm	A
Actuator - gearbox rod	Screw	34 Nm	A
Actuator - gearbox rod	Nut	34 Nm	A
Actuator - gearbox housing	Screw	24 Nm	B
Power Unit - gearbox cover	Nut	24 Nm	B
Oil delivery pipe to radiator on gearbox	Union	45 Nm	B
Oil return pipe from radiator on gearbox	Union	45 Nm	B
Threaded gearbox oil drainage plug	Plug	48 Nm	B
Lever - lateral gearbox cover control rod	Screw	6 Nm	B
Secondary shaft flange - rear gearbox housing	Screw	30 Nm	C
1st and 2nd gear selector fork Dowel	Dowel	24 Nm	C
Central gearbox housing - rear gearbox housing	Nut	32 Nm	A
First ring nut on primary shaft, differential side.	Ring nut	250 Nm	A
Second ring nut on primary shaft, differential side	Ring nut	250 Nm	A
Central gearbox housing - rear gearbox housing	Stud bolt	32 Nm	A
Front cover - gearbox housing	M10x1.25x45 screw	50 Nm	C
Front cover - gearbox housing	M8x1.25x45 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x40 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x20 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x35 screw	30 Nm	C
Bushing - bearing race on 3rd gearbox housing element	Screw	8 Nm	C
Stud bolts - 2nd gearbox housing element and rear cover - 4th gearbox housing element	M8x1.25x16x30 stud bolt	24 Nm	C
Stud bolts - 2nd gearbox housing element and rear cover - 4th gearbox housing element	M8x1.25x16x35 stud bolt	24 Nm	C
Rear cover stud bolts - 4th gearbox housing element	M8x1.25x65 stud bolt	24 Nm	C
Rear cover stud bolts - 4th gearbox housing element	M8x1.25x70 stud bolt	24 Nm	A
Stud bolt - 4th gearbox housing element	M8x1.25x20x22 stud bolt	40 Nm	A
Differential flanges - 4th gearbox housing element	Nut	50 Nm	C
Front cover stud bolts - 2nd gearbox housing element	M10x1.25x20x25 stud bolt	40 Nm	B
Oil pump - pump body	Screw	4 Nm	C
Side cover	M6x12x22 stud bolt	8 Nm	C
Side cover	M6x12x30 stud bolt	8 Nm	C
Side cover	M6x12x35 stud bolt	8 Nm	C
Side cover	M6x12x55 stud bolt	8 Nm	C
Plug on rear gearbox housing cover	M22x1.5 plug	60 Nm	A
Oil delivery pipe to gearbox on radiator	Union	45 Nm	B
Oil return pipe from gearbox to radiator	Union	45 Nm	B



Tightening torque		Nm	Class
Rear crosspiece	Screw	25 Nm	B
Crosspiece - exhaust extensions	Nut	16 Nm	B
Pipes - F1 gearbox system hydraulic actuator	Pipe union	28 Nm	B
Rear gearbox control rod - selector shaft	Screw / Nut	9.8 Nm	B
Selector shaft retainer dowel	Nut	10 Nm	C
Power Unit - mounting bracket	Nut	21 Nm	B
Rigid pipe from hydraulic pump - Power Unit	Union	21 Nm	B
Gearbox input shaft speed sensor	Screw	8 Nm	C
Electric gearbox oil pump mounting bracket	Nut	20 Nm	C
Electric gearbox oil pump mounting bracket tie-rod	Nut	24 Nm	B
By-pass screw - Power Unit	Screw	3.5 Nm	C
Fastening earth plate to chassis	Screw	18 Nm	B
Fastening radiator on gearbox	Screw	10 Nm	B
Fastening mounting bracket for power unit fluid pipes	Screw	8 Nm	C
Fastening electric pump heat shield	Screw	4 Nm	C
	Nut	8 Nm	B
Fastening stiffener tie-rod	Nut	24 Nm	B
Double disc clutch - flywheel	Hand tightening	4 Nm	B
	Screw	18 Nm	B
Clutch housing - starter motor	Screw	25 Nm	A
Clutch housing - engine	Nut	60 Nm	A
Clutch control pipe - clutch housing	Union	21 Nm	B
Stud bolt - hydraulic control flange	Stud bolt	18 Nm	B
Thrust bearing actuator control pipes - flange	Union	23 Nm	B
Flange - clutch housing	Screw	18 Nm	B
Fastening flywheel - crankshaft	Screw	91 Nm	A
Clutch pump - firewall	Nut	20 Nm	B
Fastening axle shaft to bearing on hub carrier Products to use: Z2 PROTECTION	Ring nut	275 Nm	B
Fastening axle shaft to differential flange Products to use: MOLYKOTE 1000	Pretightening torque for screw	40 Nm	A
	Screw	78 Nm	A
Fastening crown gear to differential Products to use: Loctite® 270	Pretightening torque for screw	60 Nm	A
	Screw	Until screw hear shears off	
Actuator bleeding screws	Screw	5.25 Nm	A

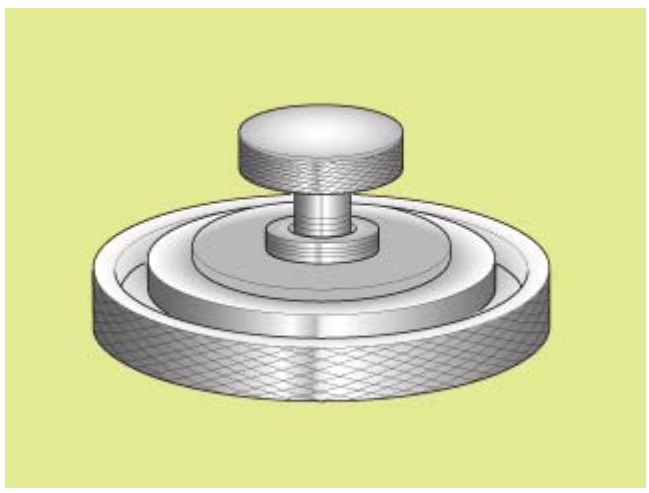
D1.03 Specific tooling and equipment



- Wrench 95975177 (AM 105177)
  for fastening the primary shaft ring nut on the engine side.



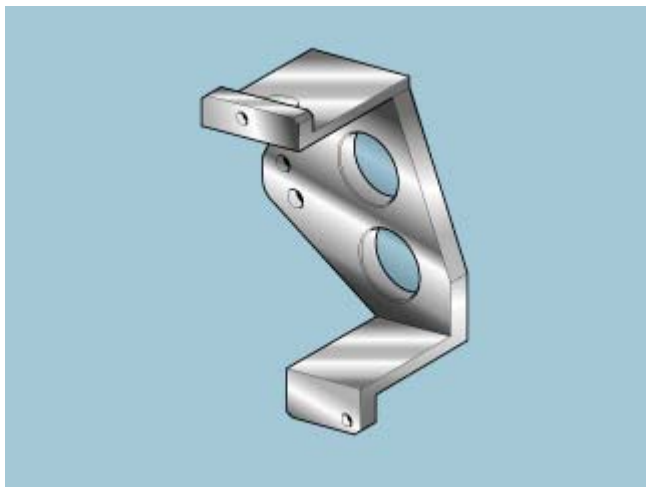
- Tool 95975898 (AM 105898)
  for pinion retention.



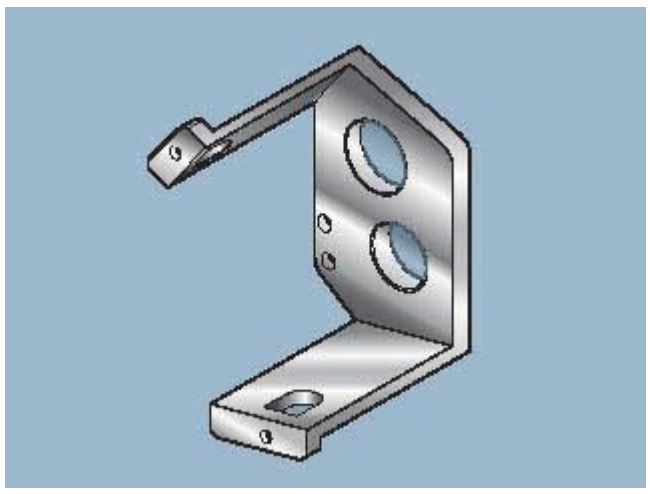
- Tool 95976121 (AM 106121)
  for fitting 1st and 2nd gear synchroniser sleeve.



- Tool 95976122 (AM 106122)
  for fitting 3rd, 4th, 5th, 6th and reverse gear synchroniser.



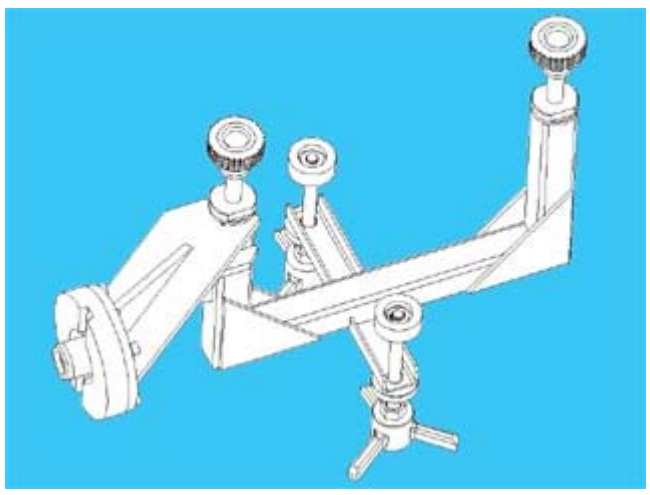
- Jig 95976226 (AM 106226)
  for fitting central gearbox housing onto rear housing.



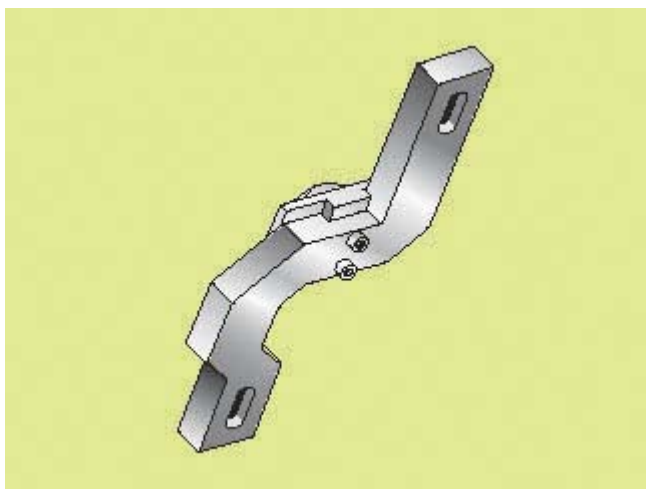
- Jig 95976227 (AM 106227)
  for fitting front gearbox housing onto the central housing.



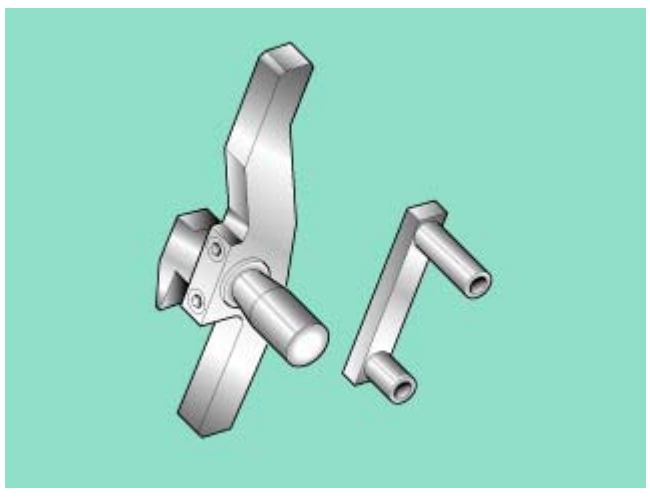
- Punch 95976629 (AM 106629)
  for fitting seat ring on front cover.



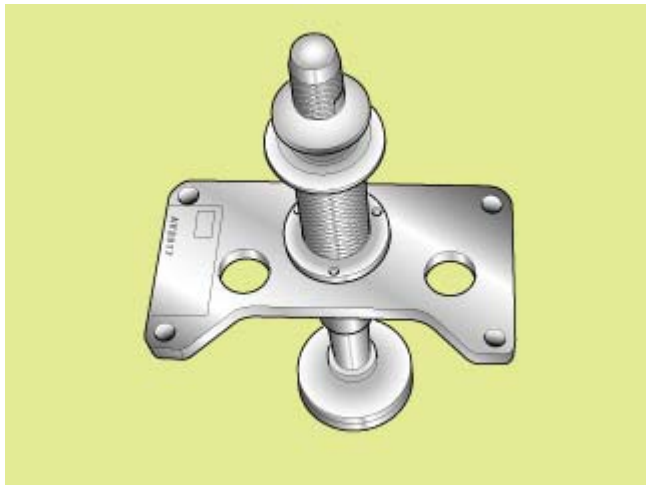
- Support 95977312_1 (AS 107312)
  for fitting gearbox housing onto AV 2621 trolley.



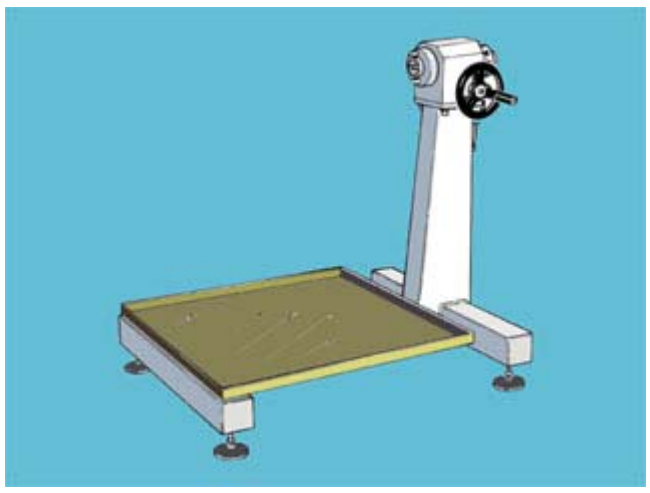
- Tool 95972572 (AV 2572)
  for locating the 1st, 2nd and reverse gear fork.



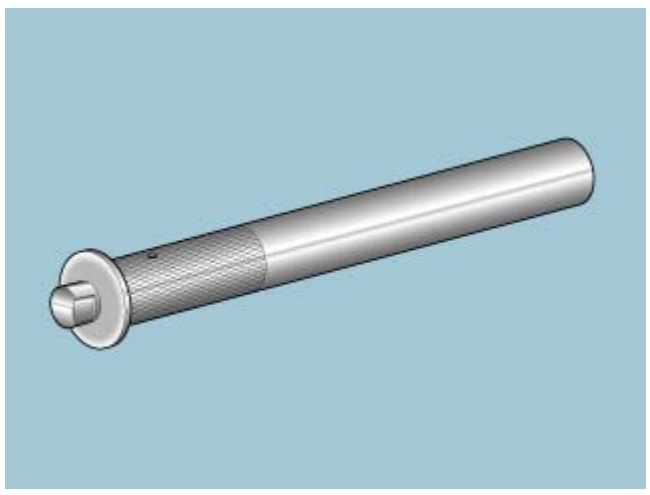
- Tool 95972573 (AV 2573)
  for locating the 3rd, 4th, 5th, 6th gear fork.



- Tool 95972617 (AV 2617)
  for fitting external bearing track onto gearbox housing.



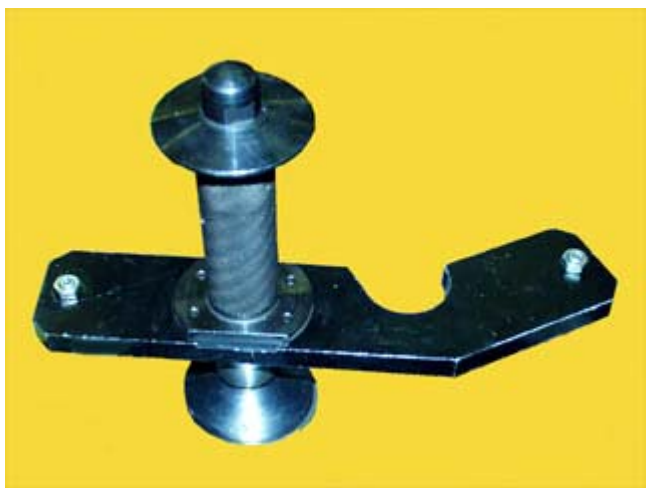
- Trolley 95972621 (AV 2621)
  for overhauling engine-gearbox assemblies



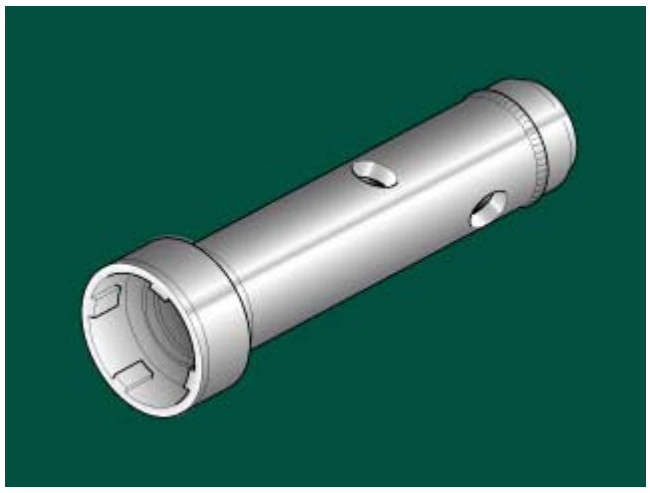
- Tool 95972622 (AV 2622)
  for fitting the bearing onto the pinion.



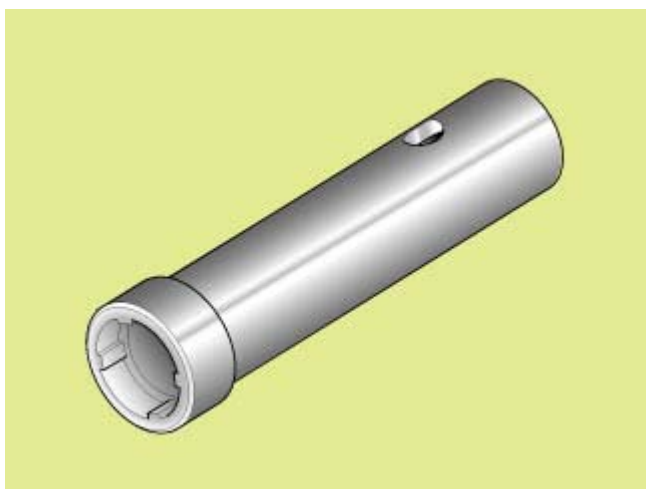
- Tool 95972629 (AV 2629)
  for fitting the bearing onto the central gearbox housing.



- Tool 95972630 (AV 2630)
  for fitting the bearing onto the rear gearbox housing.



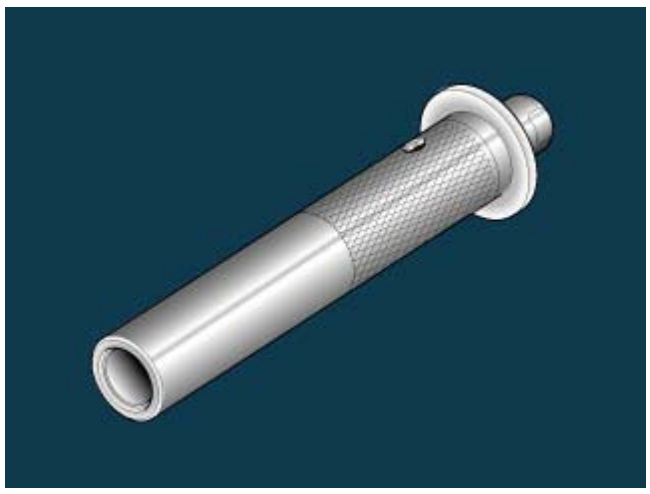
- Wrench 95972631 (AV 2631)
  for the primary shaft ring nut, differential side.



- Wrench 95972633 (AV 2633)
  for the secondary shaft ring nut on engine side and the primary shaft ring nut on differential side.



- Punch 95972640 (AV 2640)
  for fitting the bearing onto the secondary shaft.



- Punch 95972644 (AV 2644)
  for the primary shaft bearing.



- Tool 95972646 (AV 2646)
  for fitting the outer roller bearing seat.



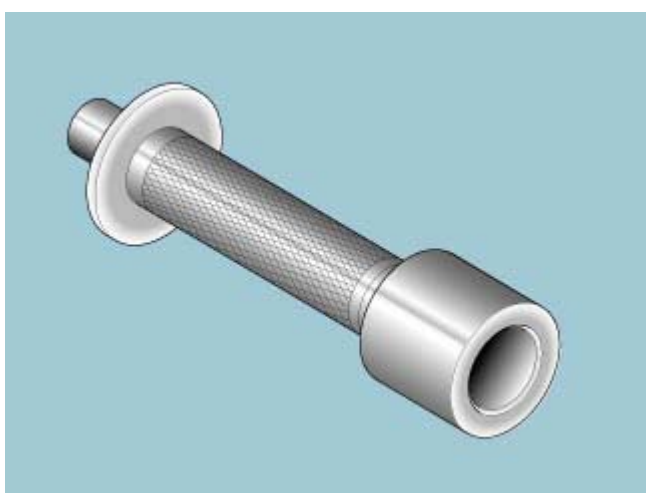
- Punch 95972647 (AV 2647)
  for fitting the bearing onto the primary shaft.



- Punch 95972649 (AV 2649/1)
  for fitting bushings
  15 mm ø.



- Punch 95972649 (AV 2649/2)
  for fitting bushings
  18 mm ø.



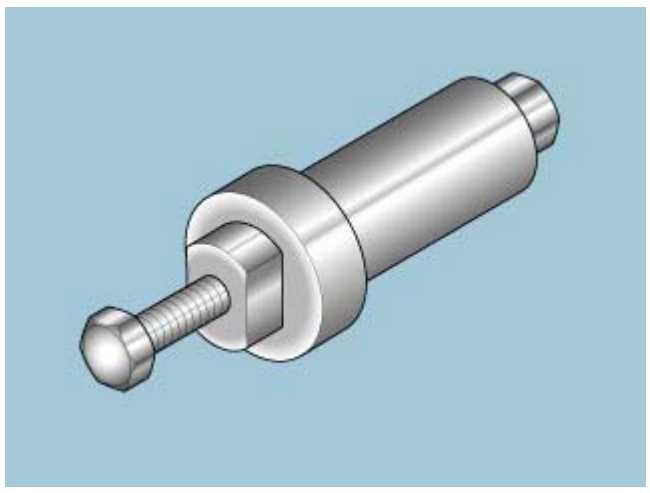
- Punch 95972655 (AV 2655)
  for the primary shaft bearing.



- Pin 95972679 (AV 2679)
  for locating the 3rd, 4th, 5th, 6th gearbox rods.



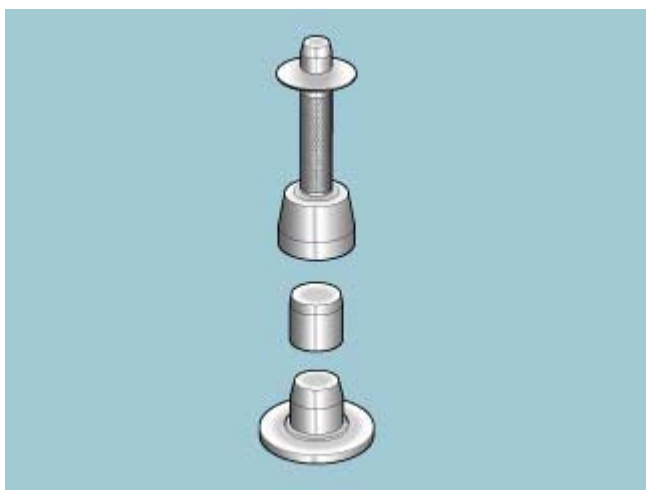
- Tool 95972907 (AV 2907)
  for fitting the outer roller bearing seat.



- Tool 95973070 (AV 3070)
  disengaging the clutch.



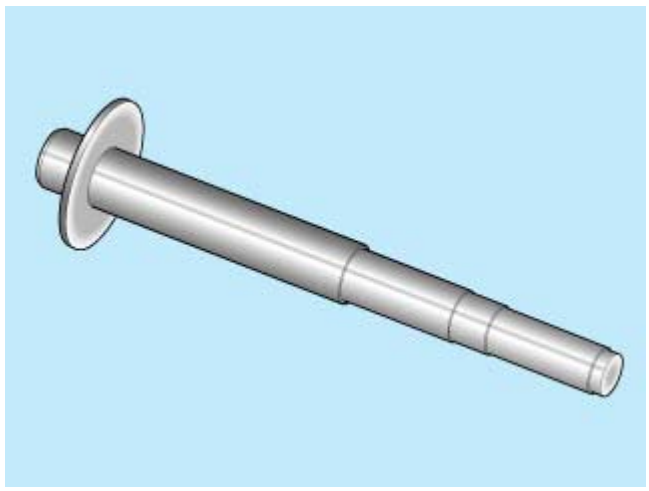
- Punch 95973079 (AV 3079)
  for centring the complete thrust bearing.



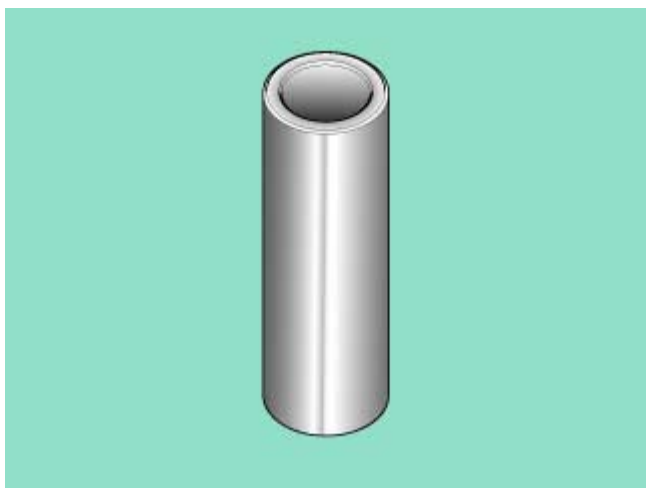
- Tool 95973218 (AV 3218)
  for removing the roller race.
  grommet fitting (3 components).



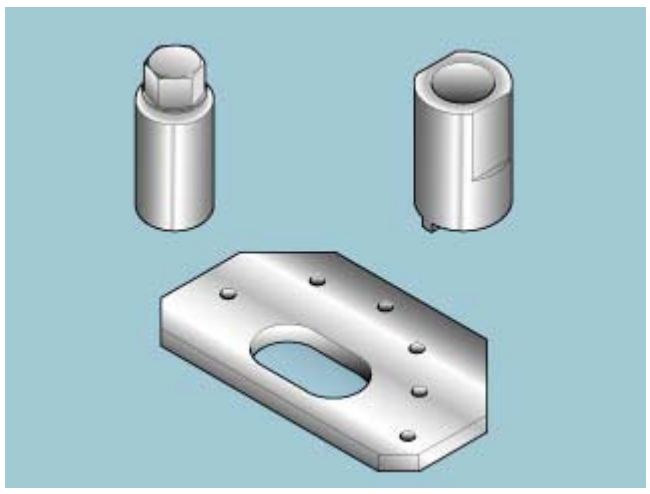
- Union 95973283 (AV 3283)
  to keep the air under pressure.



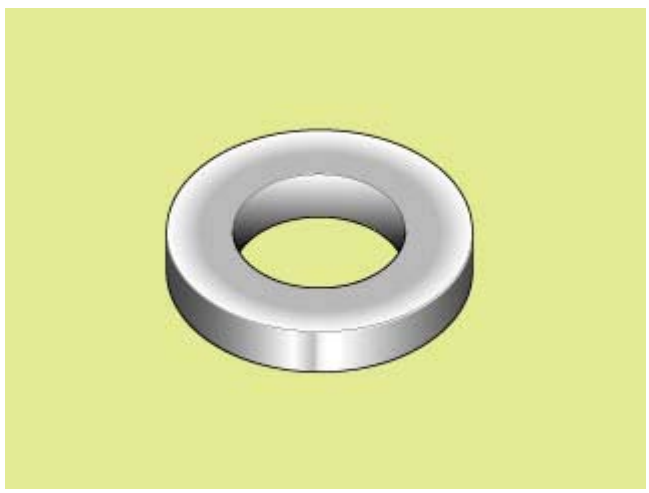
- Punch 95973297 (AV 3297)
  for bushing extraction.



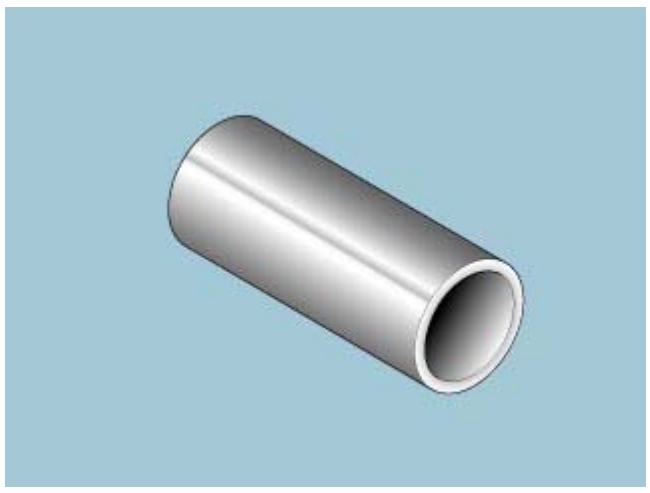
- Tool 95973411 (AV 3411)
  spacer for tool AV2622.



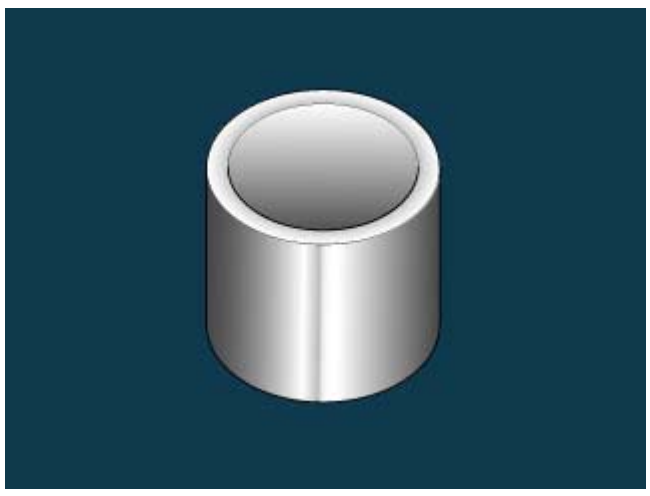
- Wrench 95973412 (AV 3412)
  for the intermediate ring nut on secondary shaft (3 components).



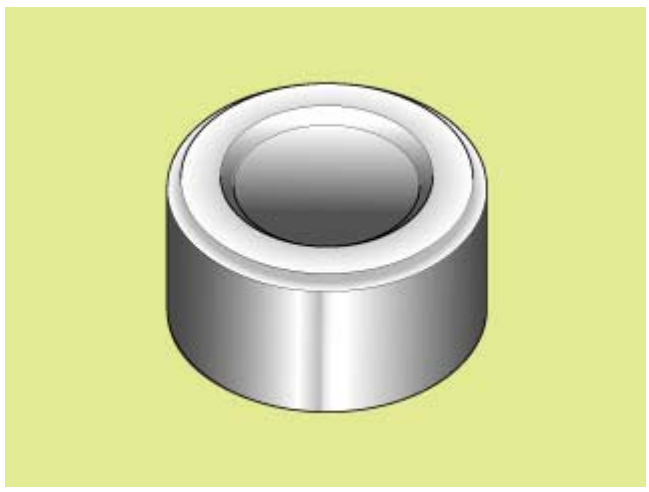
- Shim 95973413 (AV 3413)
  for AV3275 tool.



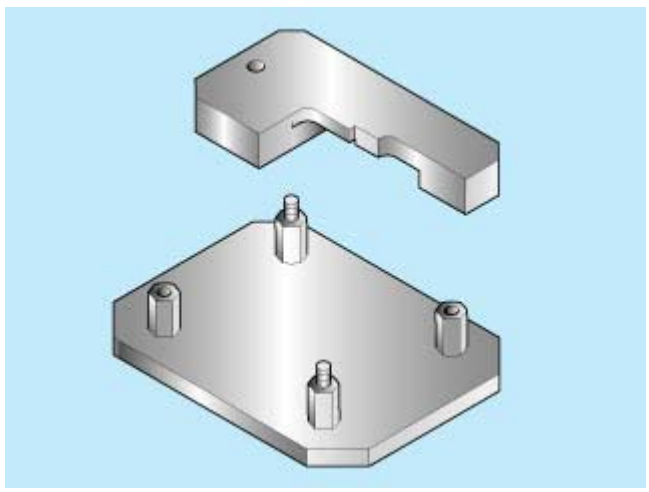
- Shim 95973414 (AV 3414)
  bearing location for tool AV 2622.



- Base 95973415 (AV 3415)
  for removing the bearing race from the pinion.



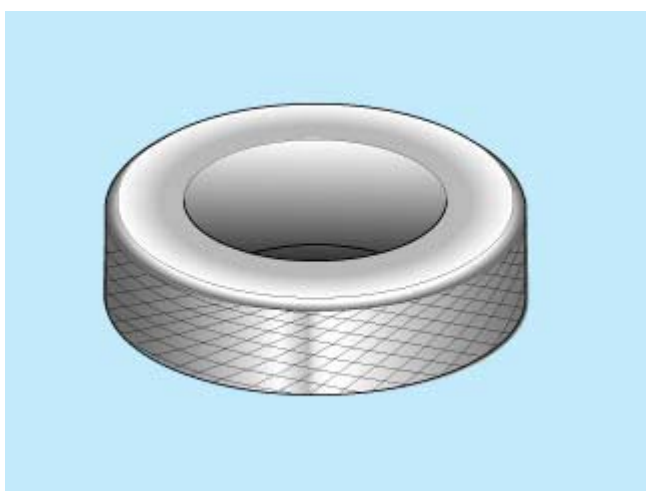
- Shim 95973418 (AV 3418)
  for tool AV 3275.



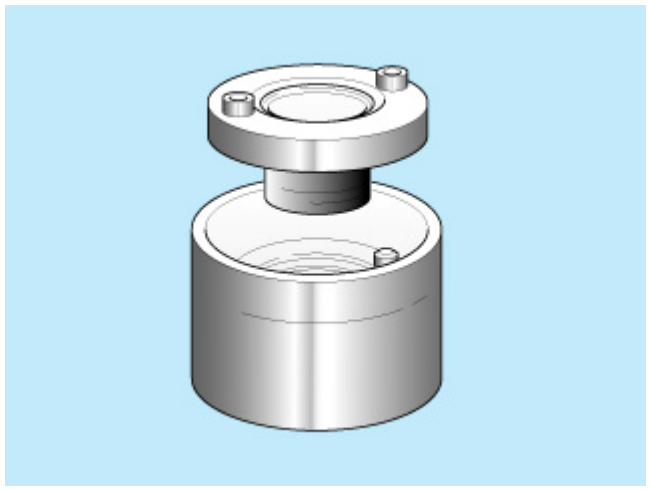
- Tool 95973419 (AV 3419)
  for centring the side cover lever.



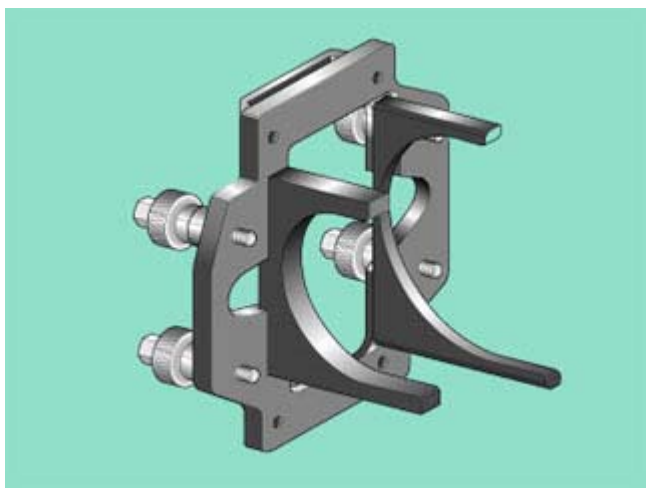
- Tool 95973458 (AV 3458)
  for centring shaft clearance between the universal joint and the actuator.



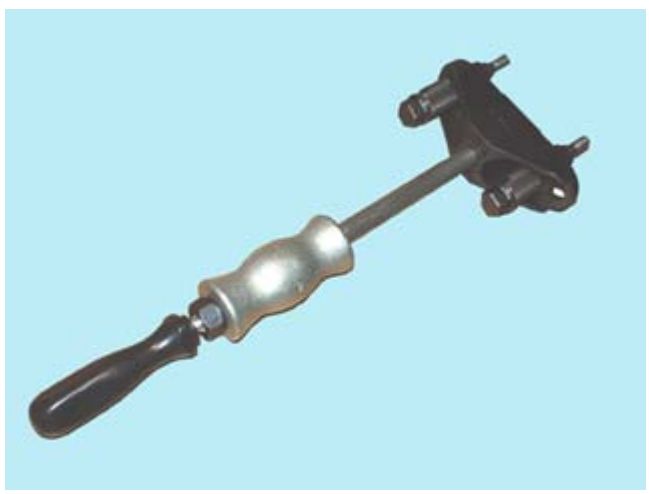
- Shim 95970152 (ALZF08501)
  for tool AV3415.



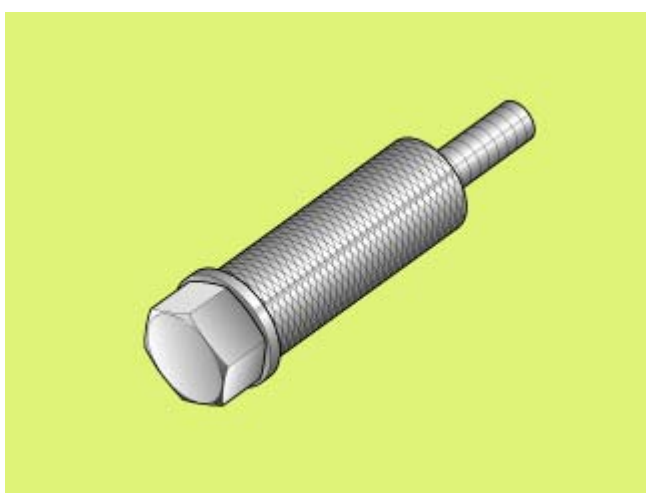
- Tool 95976628 (AM 106628)
  for fitting crown wheel onto differential.



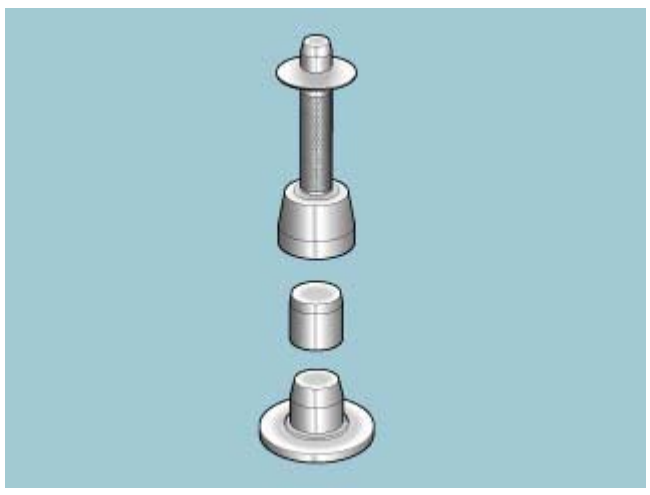
- Tool 95976636 (AM 106636)
  for supporting the differential.



- Extractor 95972714 (AV 2714)
  for the differential flange.



- Extractor 95973045 (AV 3045)
  for the differential flange.



- Tools 95973218 (AV 3218)
  for fitting the seal ring (3 components).



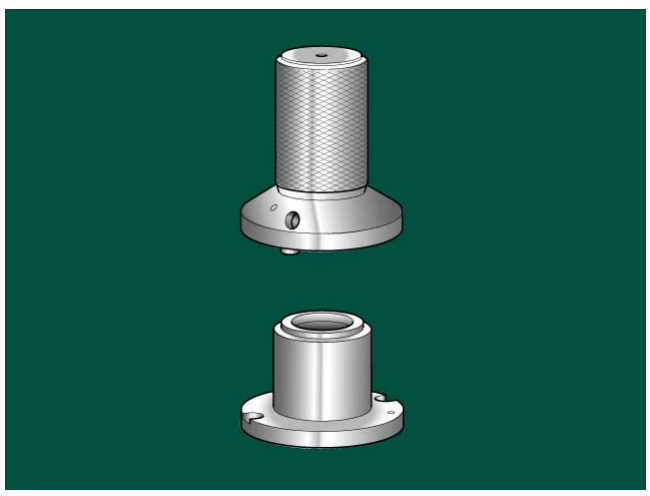
- Tool 95973264 (AV 3264)
  for fitting the ball bearing onto the primary shaft.



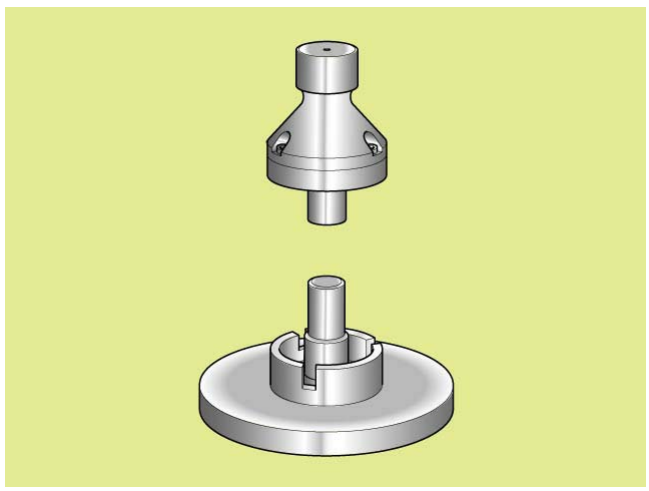
- Tool 95973266 (AV 3266)
  for checking pinion play.



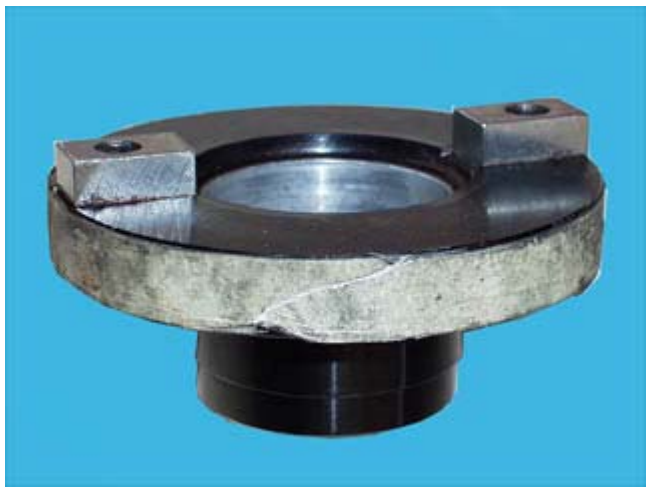
- Tool 95973275 (AV 3275)
  for fitting the external ball bearing ring (2 components).



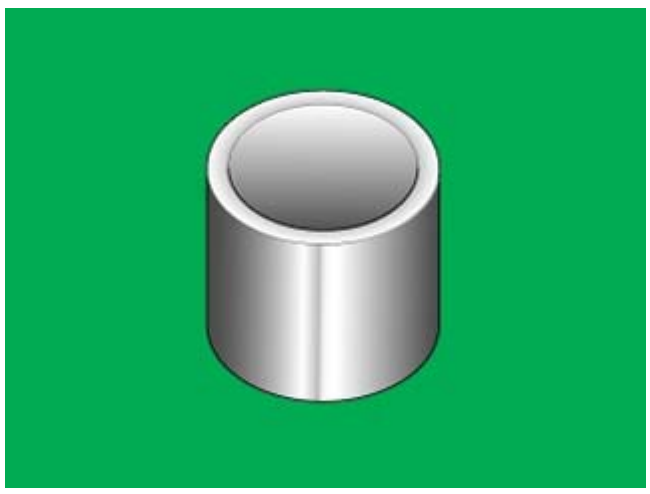
- Tool 95973276 (AV 3276)
  for fitting the bearing onto differential shaft with flange (2 components).



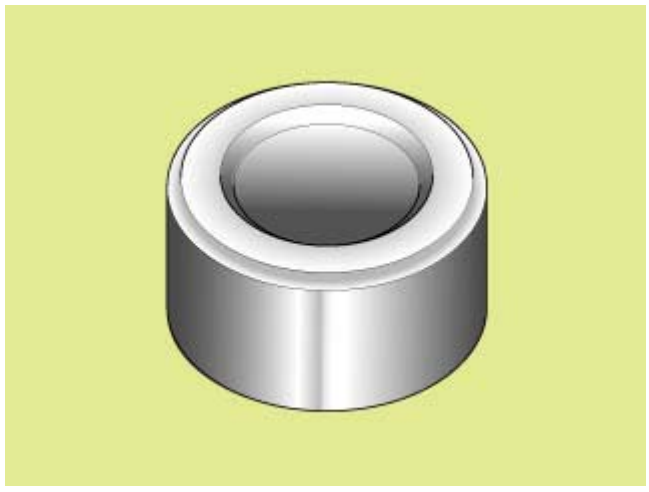
- Tool 95973278 (AV 3278)
  for fitting the tapered differential bearings (2 components).



- Adaptor 95973300 (AV 3300)
  for tool AM106628.



- Base 95973415 (AV 3415)
  for removing the bearing race from the flange.



- Tool 95973418 (AV 3418)
  for fitting the case.



- Tool (900026250)
  for complete clutch mount.



- Tool (AV 8065)
  for topping up oil with F1 kit.



- Ring nut (AV 8066)
  for removing oil tank cap with F1 kit.



- Templates 95978076 (AV 8076)
  locating F1 gearbox kit pipes.



- 354 mm template (AV 8168)
  for setting correct distance between chassis and gearbox (mechanical gearbox).



- Engine bushing installation template (AV 8169)
  for checking alignment of rubber engine bushings.



- Torque wrench 95978172 (AV 8172)
  (Replaces torque wrench USAG 815F)

D2.01 Removing the gearbox assembly

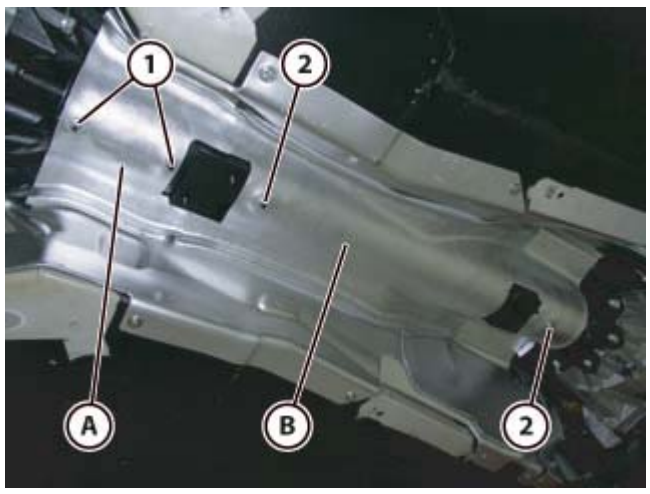
Removing the complete gearbox-differential assembly (F1 gearbox)

- Set the battery master switch to OFF (L2.02).
- Remove the wheels (F2.08).
  - Remove the rear components.

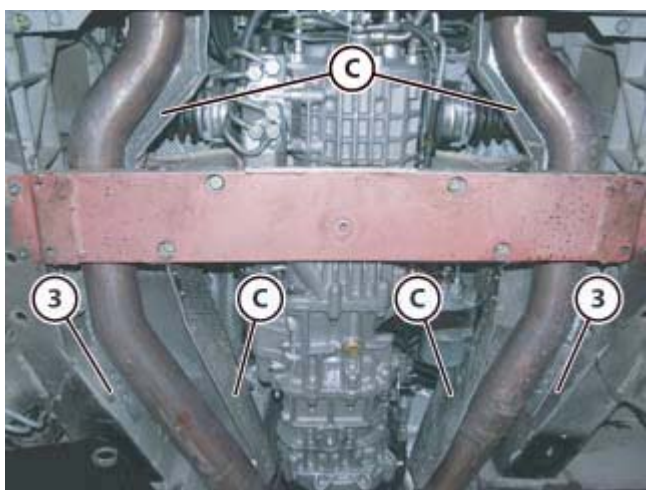
- Remove the rear undertray section (M2.12).
- Remove the silencer and exhaust extension (B6.05).
  - Remove both together with the exhaust pipe extension sections.

- Remove the catalytic converter (B6.04).
  - Remove both.

- Drain the gearbox-differential lubrication system (A3.02).
  - Carry out the procedure when overhauling or replacing a gearbox or if the next oil change interval as per the maintenance schedule is imminent. otherwise, collect the oil drained after disconnecting the pipes and use to refill the gearbox once the procedure is complete.

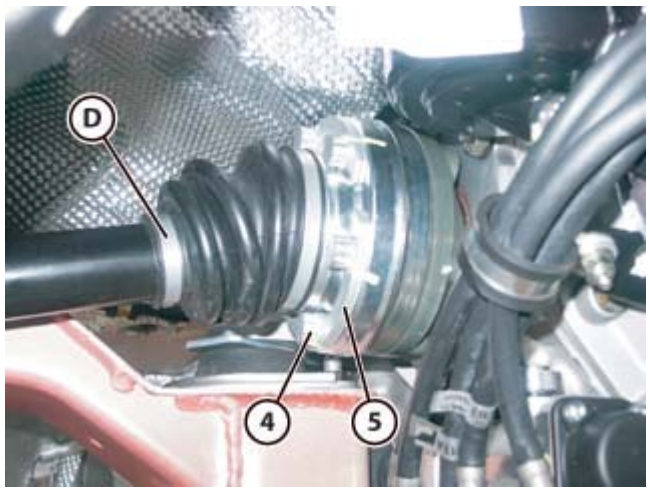


- Remove rear heat guard **(A)** by unscrewing the two nuts **(1)**.
- Remove front heat guard **(B)** by unscrewing the two nuts **(2)**.

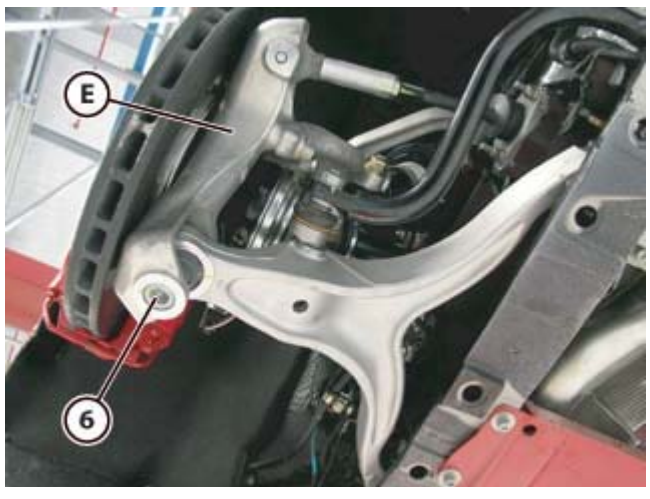


- Remove the four guards **(C)** by undoing the twelve screws **(3)**.

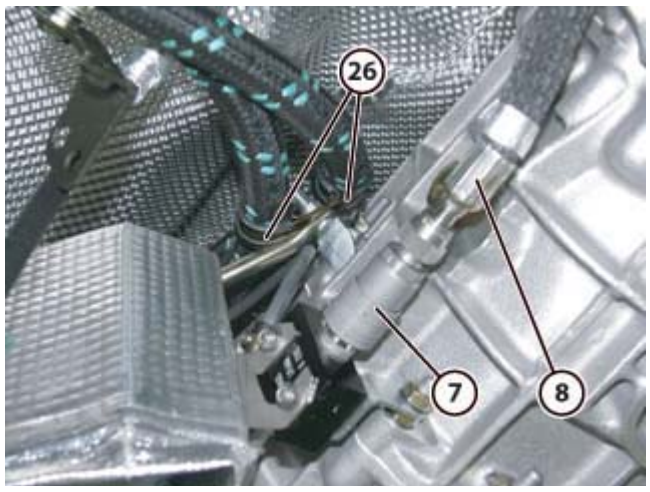
Please note that the photograph was taken with the exhaust extension pipes still fitted.



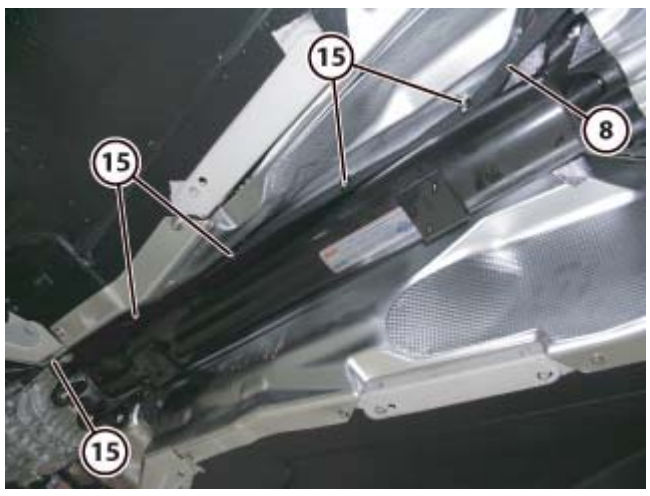
- Undo the six screws **(4)** that secure the axle shaft **(D)** to the differential flange and retrieve the three spacers **(5)**.
- Remove both axle shafts from the differential flanges.



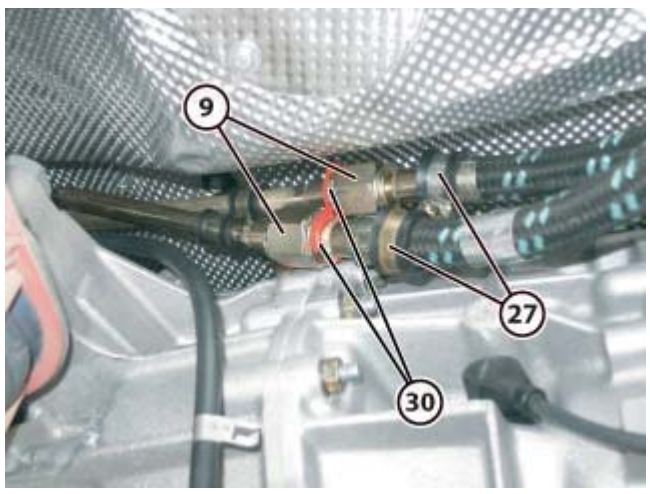
- Undo the screw **(6)** that secures the hub carrier **(E)** to the lower lever.
- Move the hub carrier **(E)** outwards until the axle shaft is detached from the differential flange.



- Disconnect the clutch pipe **(8)** quick-coupling **(7)**, from the connector block.
- Remove the two clamps **(26)** fastening the oil pipes.



- Remove the clamps **(15)** fastening the F1 gearbox clutch pipe **(8)** and the clutch sensor cable to the transmission shaft.
- Move the clutch pipe **(8)** out of the way so that it cannot be damaged or hinder the following operations.

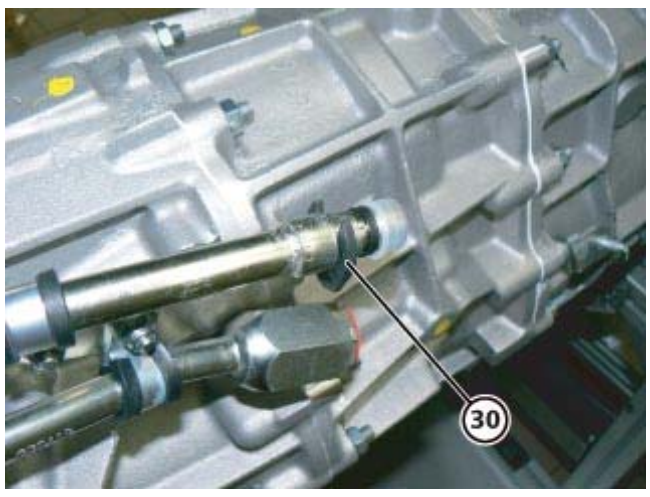


Work with particular CAUTION when disconnecting and reconnecting the gearbox - oil radiator pipes. Follow the sequence given below carefully.

A safety clip is installed on the male oil delivery pipes on the radiator side and on the return pipe on the gearbox side.
ALWAYS check the state of the safety clips and ensure that there are correctly installed.

- Remove the two springs of the limit stop **(30)**, positioned on the male pipes.
- Remove the two clamps **(27)** securing the oil pipes.
- Push the quick connectors **(9)** of the two rigid pipes in completely to disconnect the delivery and return pipes on the radiator. Plug the pipes adequately.

If the gearbox oil has not already been drained, collect the oil drained after disconnecting the pipes and use to refill the oil once the procedure is complete.

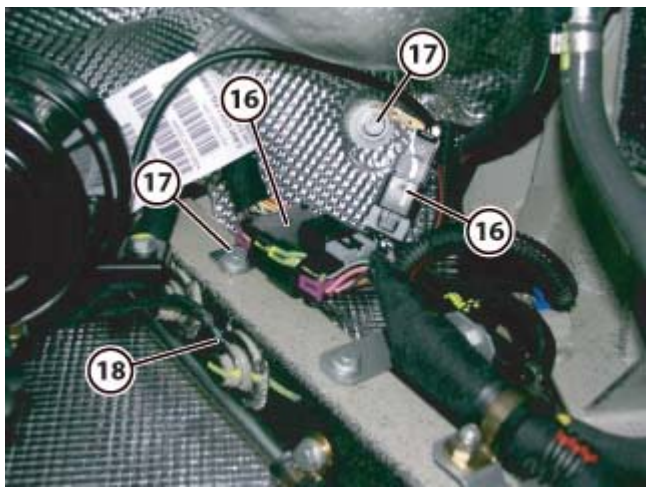


Work with particular CAUTION when disconnecting and reconnecting the gearbox - oil radiator pipes. Follow the sequence given below carefully.

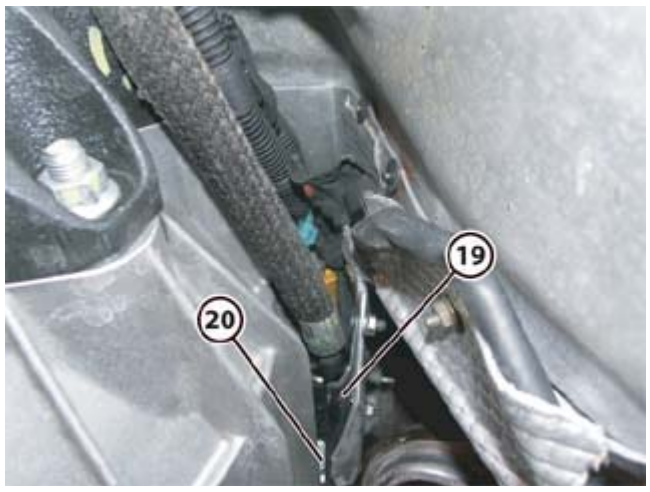
A safety clip is installed on the male oil delivery pipes on the radiator side and on the return pipe on the gearbox side.
ALWAYS check the state of the safety clips and ensure that there are correctly installed.

Before reconnecting the gearbox oil pipe unions, ALWAYS ensure that the stop clips are ALREADY INSTALLED in their respective grooves.

- Immediately after removing the pipes, refit the two previously removed detent clips **(30)** in the relative grooves, ensuring that they are undamaged and correctly positioned.



- Disconnect the two connectors **(16)** (S304) (Y318) and undo the screws **(17)** fastening the mounting lugs.
- Remove the earth cable **(18)** (G305) undoing the relative screw fastening it to the chassis.



- Remove the bracket **(19)** complete with heat shield, undoing the two nuts **(20)** fastening the bracket to the clutch housing.



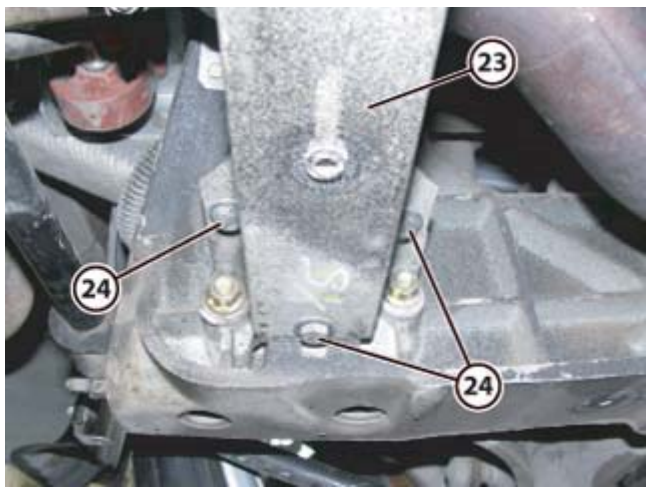
- Disconnect the clutch position sensor connector **(21)** (S062).



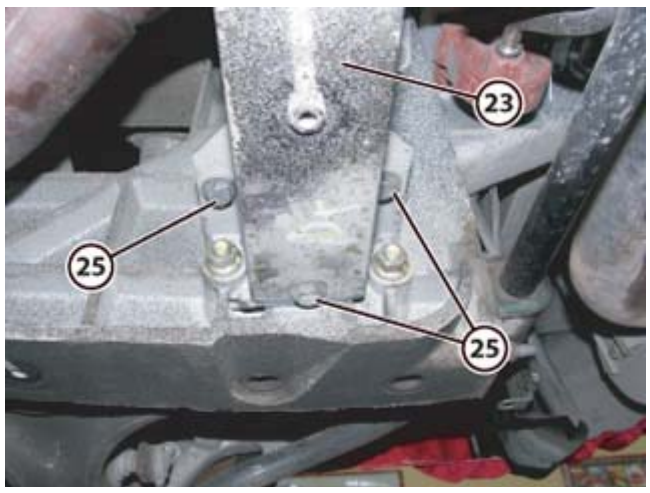
- Disconnect the clutch pressure sensor connector **(22)** (Z303).



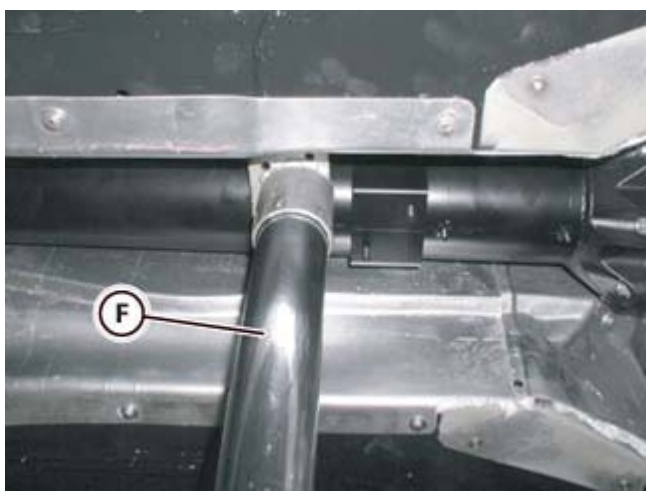
- Remove the three clamps **(28)** fastening the luggage compartment release cable to the gearbox.



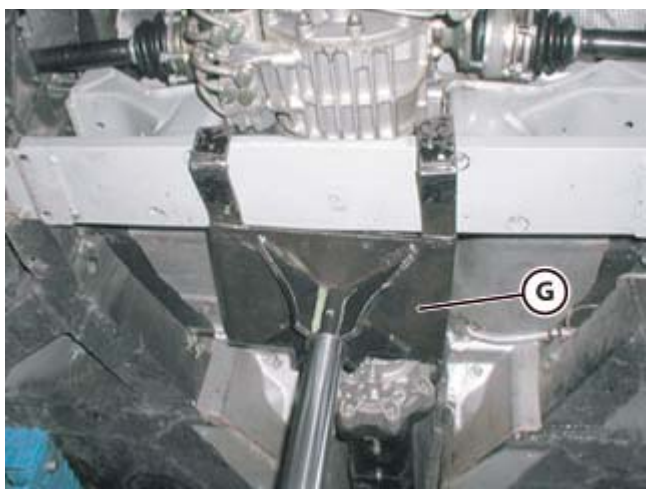
- Undo the three screws **(24)** on the left hand side, fastening the chassis reinforcement bar **(23)**.



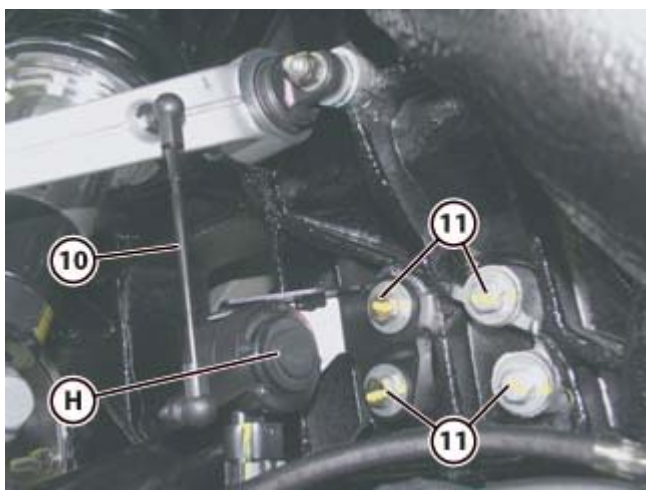
- Undo the three screws **(25)** on the right hand side and retrieve the chassis reinforcement bar **(23)**.



- Place a hydraulic jack **(F)** underneath the transmission shaft pipe and place a rubber pad between the jack and the pipe.

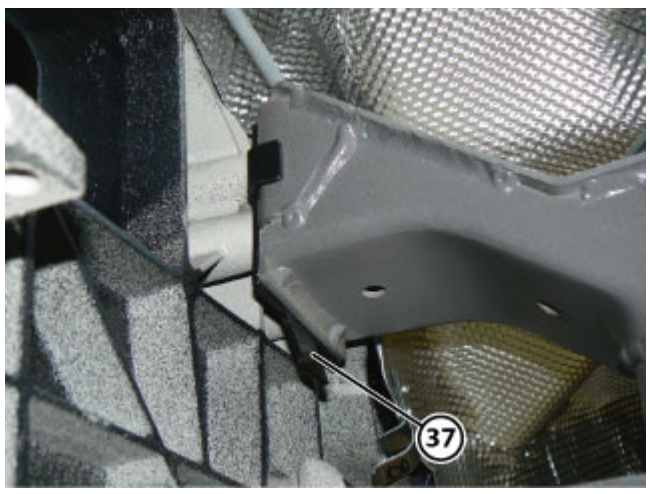


- Place a hydraulic lifting tool **(G)** underneath the gearbox, resting it against it.

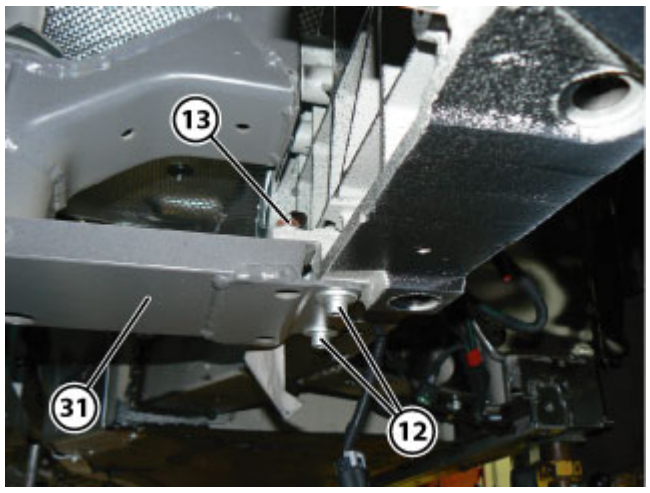


- Detach the tie-rod **(10)** from the upper lever and undo the four screws **(11)** that secure the sides of the gearbox mounting cross member to the chassis and retrieve the sensor **(H)**.

Repeat the procedure on the other side of the vehicle.



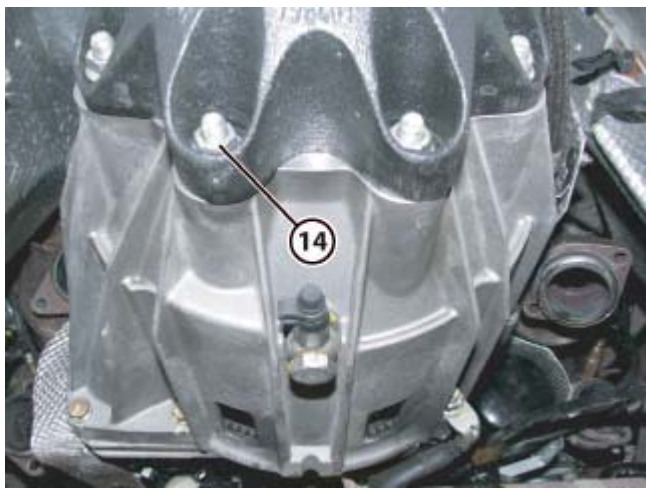
- If present, remove the shims **(37)** from both sides of the gearbox mounting cross member.



- Undo the two bottom screws **(12)** and two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

Repeat the procedure on the other side of the vehicle.

- Lower the gearbox assembly slightly.



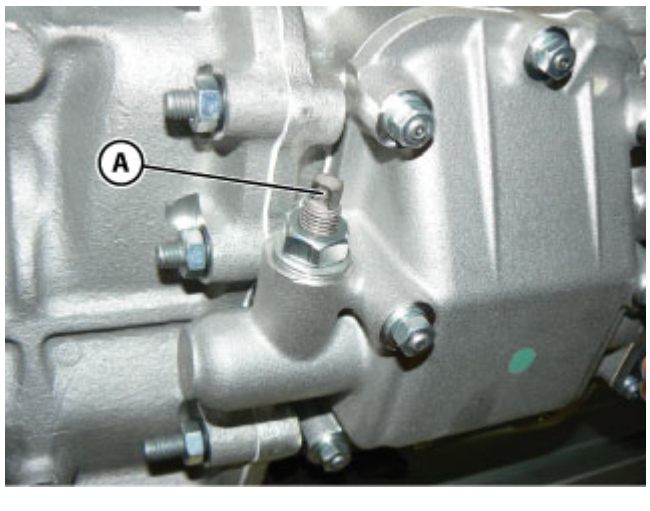
- Unscrew the eight nuts **(14)** fastening the transmission shaft pipe to the clutch housing.

- Move the gearbox complete with transmission tube as far as possible, then lower and ease the transmission tube out of the clutch housing.
- Remove the gearbox complete with transmission tube from the vehicle, avoiding contact with the chassis.
- Remove the transmission shaft (D2.10).

The following procedure is necessary when working on the gearbox.

Replacing the gearbox

- Remove the complete F1 Kit (D2.13).



- The removed gearbox must be shipped to Ferrari with the selector shaft locked in neutral between 3rd – 4th gear, with the relative dowel **(A)** tightened.

DO NOT undo the dowel before assembling the new gearbox complete with F1 Kit.

- The new gearbox will be shipped from the Ferrari Spare Parts service with the selector shaft locked in neutral between 3rd – 4th gear, with the relative dowel **(A)** tightened.

- Refit the complete F1 Kit (D2.13).

After replacing the gearbox in an "F1" vehicle, perform the **"Calibrating the gearbox"** specifications described in chapter "**D2.15 _ Calibrating the electronically-controlled gearbox.**".

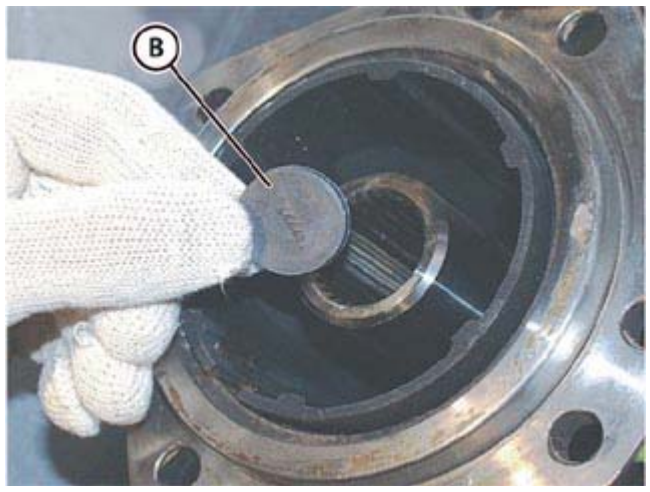
D2.02 Refitting the gearbox assembly

Refitting the complete gearbox-differential assembly (F1 gearbox)

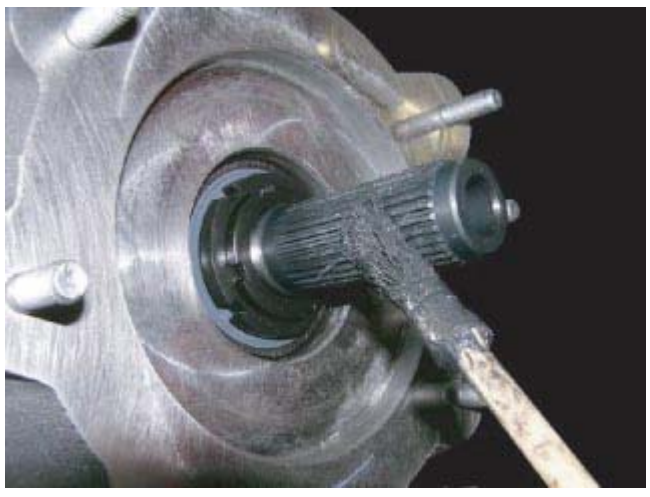
Tightening torque		**Nm**	**Class**
Transmission shaft pipe - clutch housing	Nut	60 Nm	A
Gearbox subframe - chassis	Screw	25 Nm	B
Clutch housing - engine	Nut	60 Nm	A
Fastening earth plate to chassis	Screw	18 Nm	B
Rear suspension lower arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Fastening axle shaft to differential flange Products to use: MOLYKOTE 1000	Pretightening torque for screw	40 Nm	A
	Screw	78 Nm	A

- Refit the transmission shaft (D2.10).

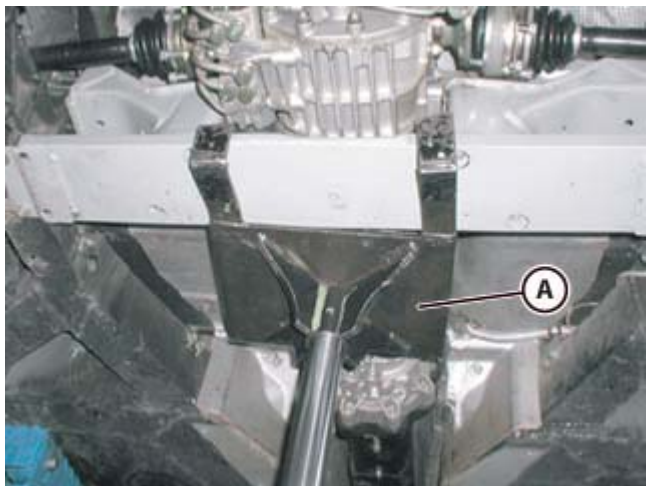
Operation necessary if the component has been removed.



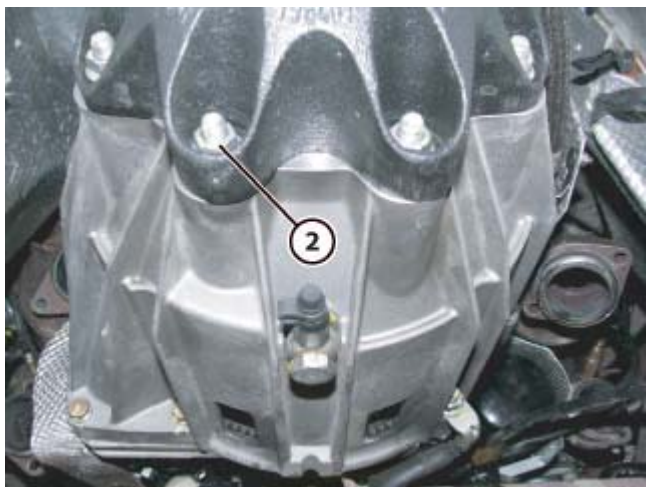
- Fit the rubber end stop bushing **(B)** inside the shaft.



- Always apply **MOLYKOTE FB180** onto the entire surface of the splined shaft.

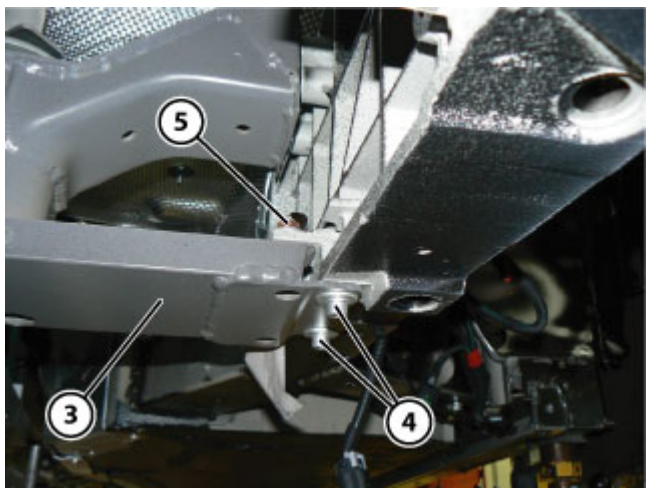


- Support the weight of the gearbox complete with transmission with two jacks, one **(A)** under the gearbox and one under the transmission shaft tube, and position underneath the vehicle; slowly lift the gearbox, aligning the stud bolts on the clutch housing.



- Fit the gearbox-transmission tube assembly on its mountings, aligning the stud bolts and the transmission shaft mounting.
- Tighten the eight nuts **(2)** fastening the assembly to the clutch housing.

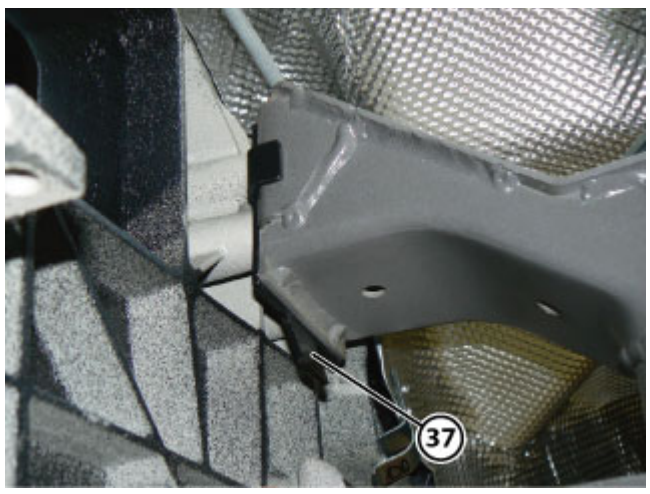
Tightening torque	**Nm**	**Class**
Nut	60 Nm	A



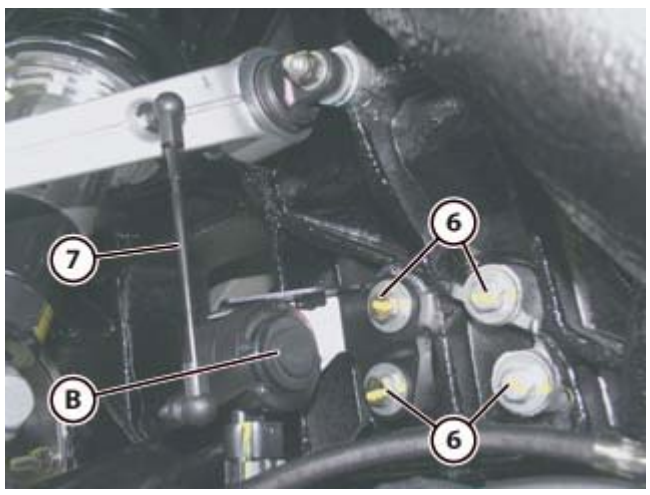
- Tighten the two bottom screws **(4)** and two top nuts **(5)** fastening the gearbox mounting cross member **(3)** to the chassis.

Repeat the procedure on the other side of the vehicle.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	B



- If present, fit suitable shims **(37)** between the chassis and the gearbox mounting cross member.

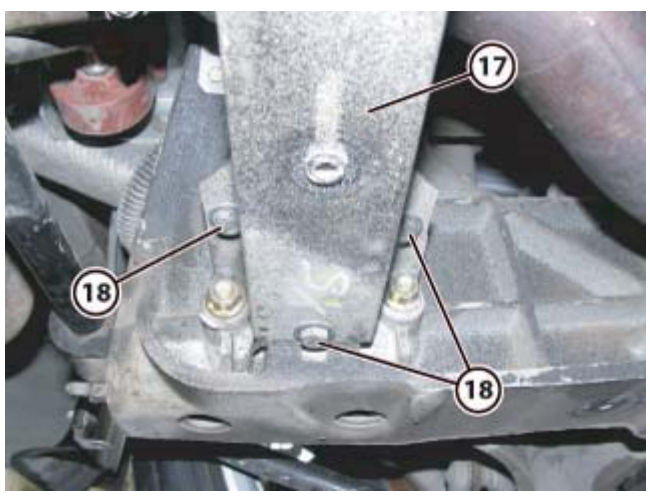


- Fit the sensor **(B)** in its seat and tighten the four screws **(6)** fastening the gearbox mounting cross member to the chassis.

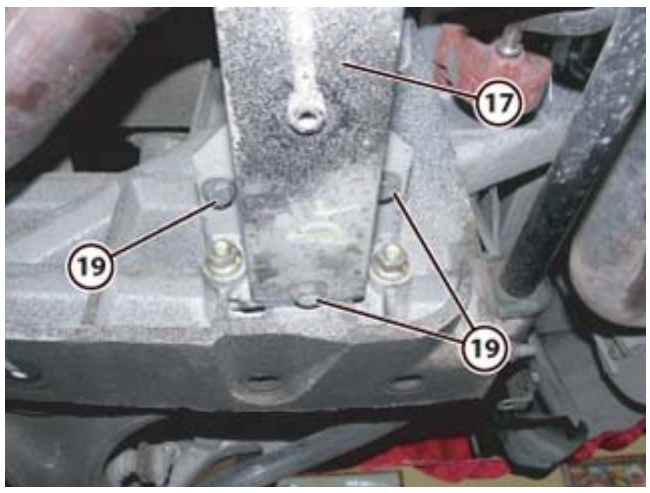
Tightening torque	**Nm**	**Class**
Screw	25 Nm	B

- Fit the tie-rod **(7)** onto the upper arm.

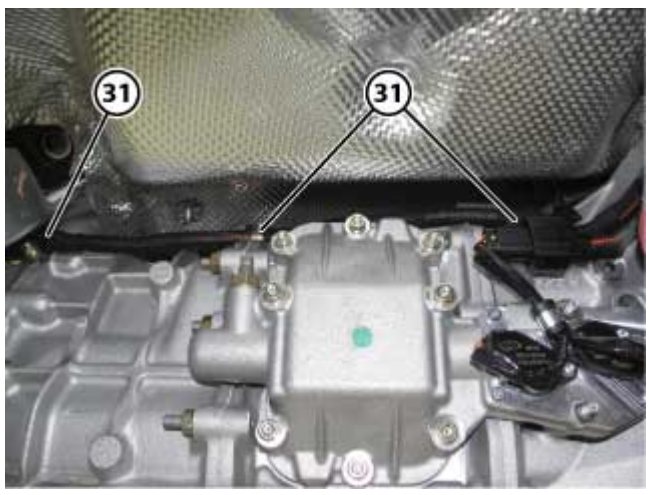
Repeat the procedure on the other side of the vehicle.



- Fit the chassis reinforcement bar **(17)** and fasten on the left hand side with the three screws **(18)**.



- Repeat the same procedure on the right hand side, fastening the chassis reinforcement bar **(17)** by tightening the screws **(19)**.



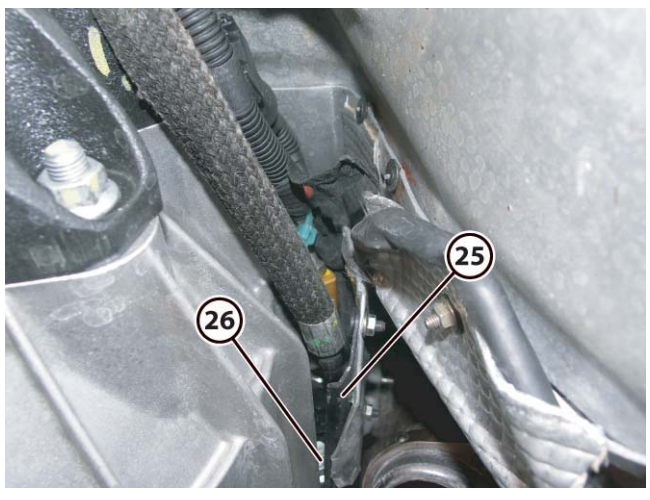
- Fasten the luggage compartment cable to the gearbox housing as originally mounted, using the three clamps **(31)**.



- Connect the clutch pressure sensor connector **(23)** (Z303).

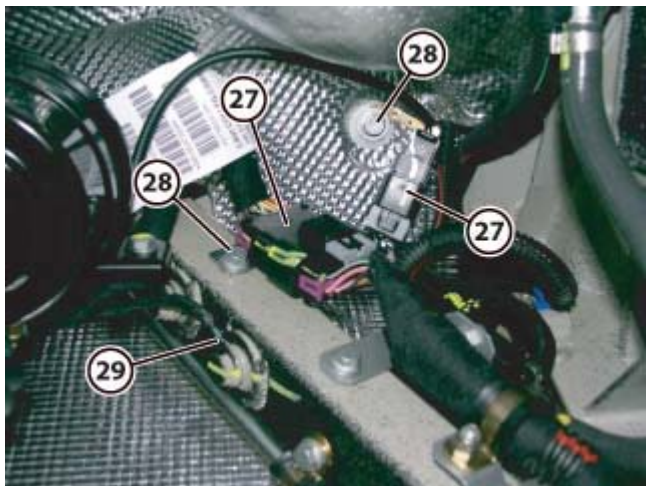


- Connect the clutch position sensor connector **(24)** (S062).



- Refit the bracket **(25)** complete with heat shield and fasten to the clutch housing by tightening the two nuts **(26)**.

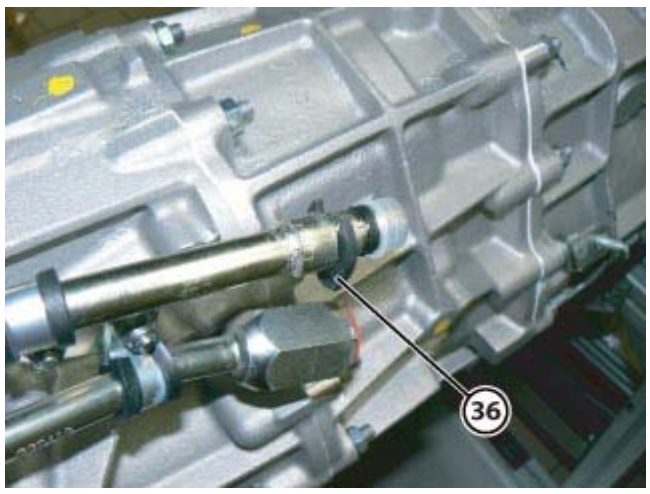
Tightening torque	Nm	Class
Nut	60 Nm	A



- Reconnect the two connector **(27)** (S304) (Y318) and fasten the relative mounting brackets with the screws **(28)**.
- Fasten the earth cable **(29)** to the chassis by tightening the relative screw.



Tightening torque	Nm	Class
Screw	18 Nm	B

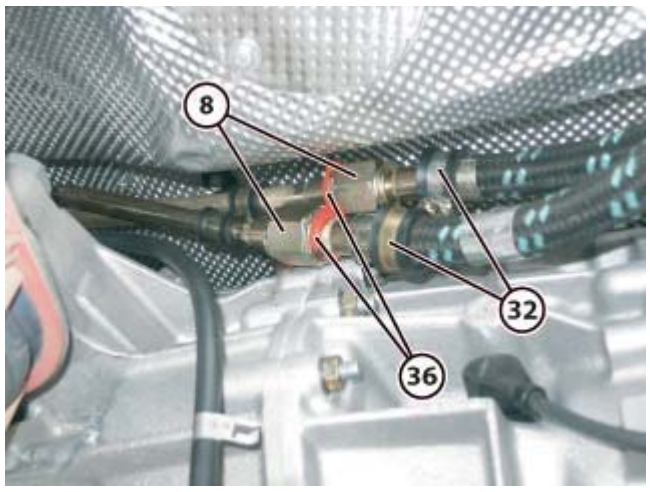


Work with particular CAUTION when disconnecting and reconnecting the gearbox - oil radiator pipes. Follow the sequence given below carefully.

A safety clip is installed on the male oil delivery pipes on the radiator side and on the return pipe on the gearbox side.
Before connecting the pipes, ALWAYS ensure that the safety clips are in good condition and correctly fitted on the male connectors.

Before reconnecting the gearbox oil pipe unions, ALWAYS ensure that the stop clips are ALREADY INSTALLED in their respective grooves.

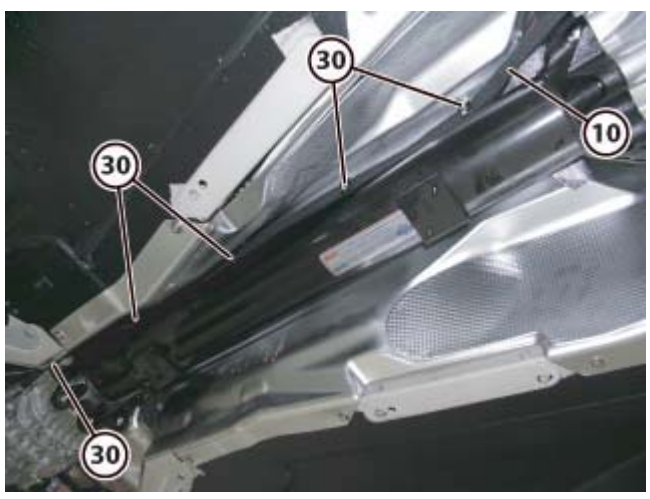
- If not already done during disassembly, refit the two clips **(36)** in the relative grooves, ensuring that they are undamaged and correctly positioned.



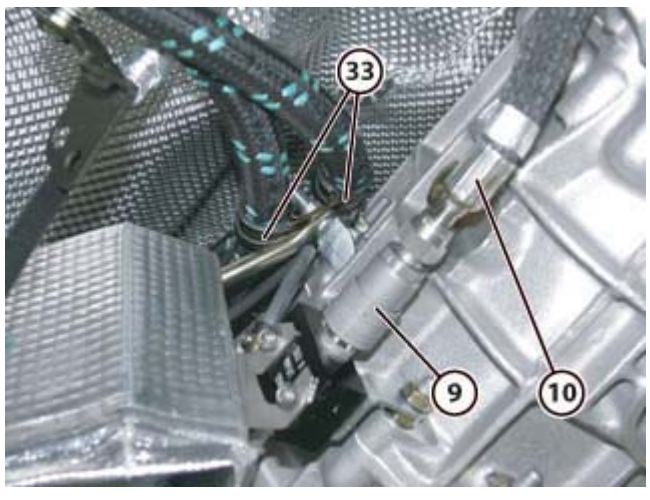
Work with particular CAUTION when disconnecting and reconnecting the gearbox - oil radiator pipes. Follow the sequence given below carefully.

A safety clip is installed on the male oil delivery pipes on the radiator side and on the return pipe on the gearbox side.
Before connecting the pipes, ALWAYS ensure that the safety clips are in good condition and correctly fitted on the male connectors.

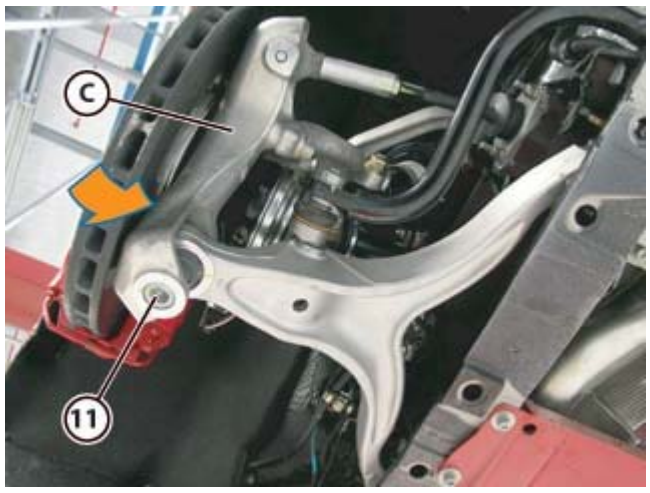
- Reconnect the two quick connectors **(8)** to the unions, pushing completely against the two detent clips **(36)** and ensuring that they are securely fastened.
- Replace the two clamps **(32)** securing the oil pipes.



- Fasten the pipe **(10)** and clutch sensor cable as originally mounted on the transmission tube with the clamps **(30)**.

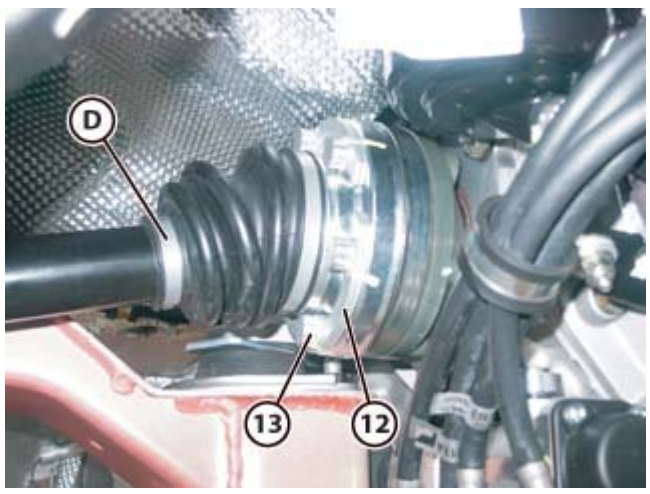


- Connect the quick-coupling **(9)** for the clutch pipe **(10)** on the connector block.
- Lock the clutch pipe **(10)** with the relative clamps on the gearbox housing as originally fitted.
- Replace the two clamps **(33)** securing the oil pipes.



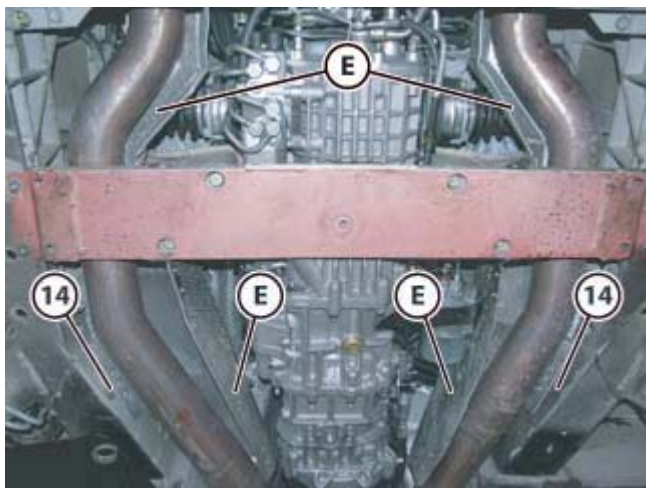
- Fit the hub carrier **(C)** on the lower arm and fasten by tightening the screw **(11)**.

Tightening torque	Nm	Class
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A



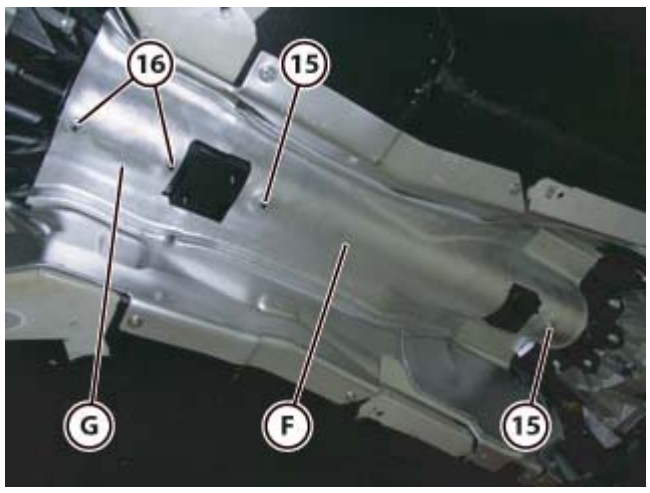
- Fasten both axle shafts on the differential flanges.
- Fit the axle shaft **(D)** in its seat on the flange.
- Apply a film of grease to the threads of the six screws fastening the axle shaft to the flange **MOLYKOTE 1000**.
- Fit the spacers **(12)** and tighten the screws **(13)**.
- Tighten the six screws **(13)**.

Tightening torque	Nm	Class
Screw	78 Nm	A



- Fit the four shields **(E)** and fasten them by tightening the twelve screws **(14)**.

Note that the photograph was taken with the exhaust extension pipes installed.



- Fit the front heat shield **(F)** fastening with the two nuts **(15)**.
- Fit the rear heat shield **(G)** fastening with the two nuts **(16)**.

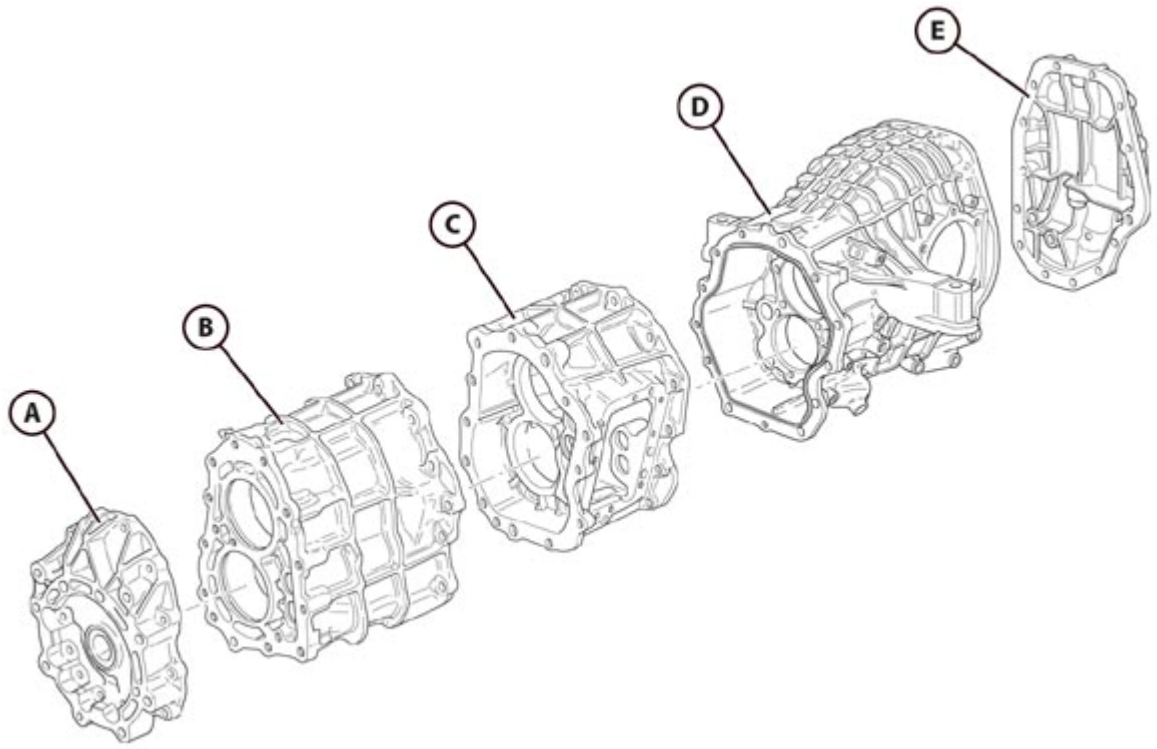
➢ Fill the gearbox-differential lubrication system (A3.02).

Carry out the procedure if the gearbox was emptied previously or refill the gearbox with the oil recovered after disconnecting the pipes during removal.

➢ Bleed the clutch system (D2.14).
➢ Refit the catalytic converter (B6.04).
➢ Refit the silencer and exhaust extension (B6.05).
➢ Refit the rear underfloor section (M2.12).
➢ Refit the wheels (F2.08).
➢ Set the battery master switch to ON (L2.02).

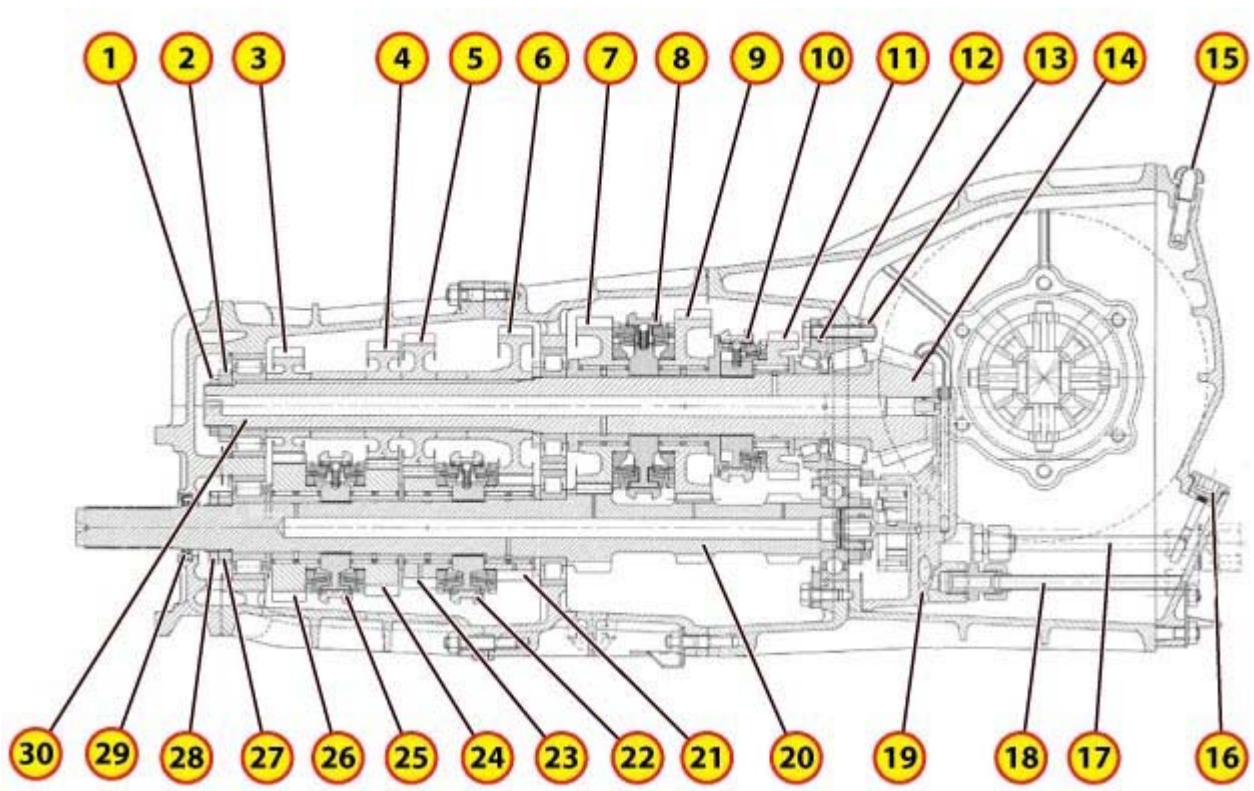
D2.03 Gearbox overhaul

Gearbox housing elements



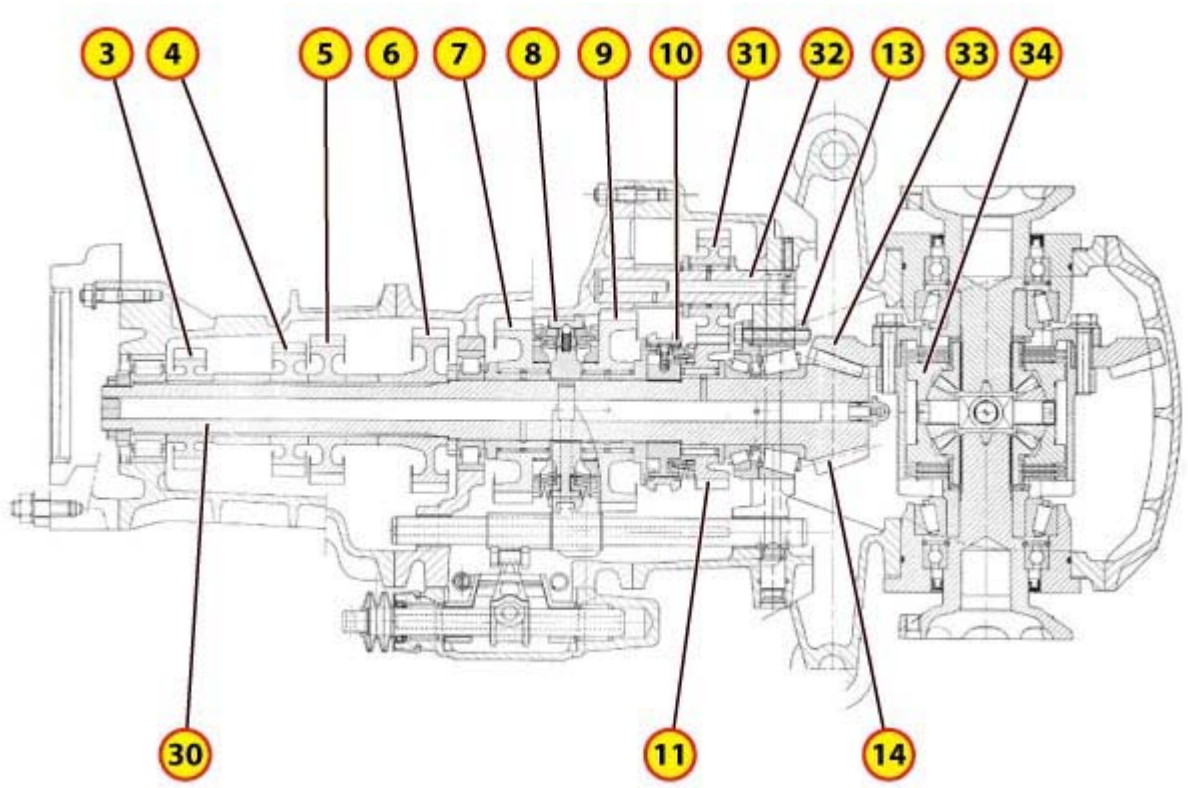
A - Front gearbox cover
B - Front gearbox housing
C - Central gearbox housing
D - Rear gearbox housing
E - Rear cover

Gearbox components



1 - First front ring nut on secondary shaft
2 - Second front ring nut on secondary shaft
3 - 6th gear ratio gear
4 - 5th gear ratio gear
5 - 4th gear ratio gear
6 - 3rd gear ratio gear
7 - 2nd gear ratio gear
8 - Complete 1st and 2nd gear triple-cone synchroniser
9 - 1st gear ratio gear
10 - Complete reverse gear synchroniser
11 - Complete reverse gear ratio gear
12 - Contact adjuster spacer
13 - Pinion retainer ring
14 - Pinion
15 - Oil breather
16 - Oil dipstick
17 - Oil return tube from radiator

18 - Oil delivery tube from radiator
19 - Oil pump mounting body
20 - Primary shaft
21 - Complete 3rd gear ratio gear
22 - 3rd and 4th gear synchroniser assembly
23 - Complete 4th gear ratio gear
24 - Complete 5th gear ratio gear
25 - 5th and 6th gear synchroniser assembly
26 - Complete 6th gear ratio gear
27 - Second front ring nut on primary shaft
28 - First front ring nut on primary shaft
29 - Oil seal ring
30 - Secondary shaft

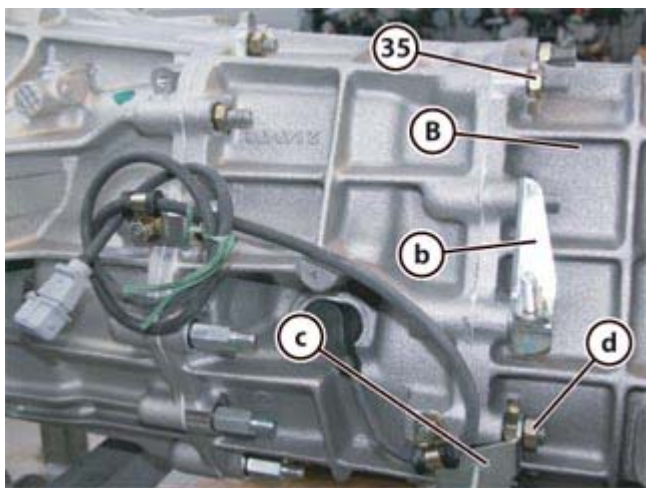


31 - Reverse gear idler gear
32 - Reverse gear idler gear spindle
33 - Crown
34 - Complete differential

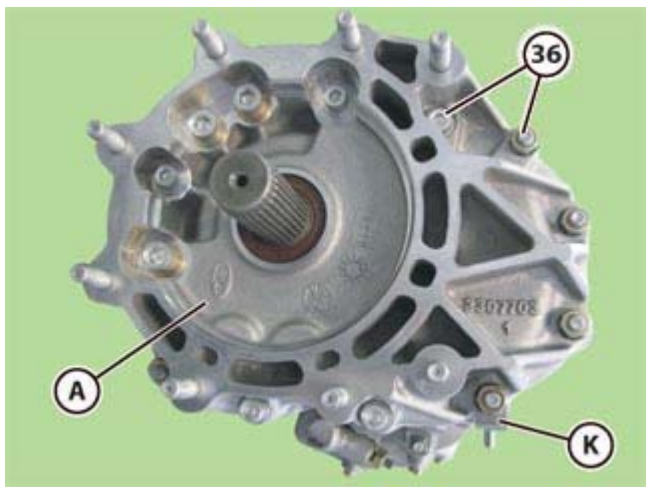
Gearbox disassembly (overhaul)

Tightening torque		**Nm**	**Class**
Bushing - bearing race on 3rd gearbox housing element	Screw	8 Nm	C

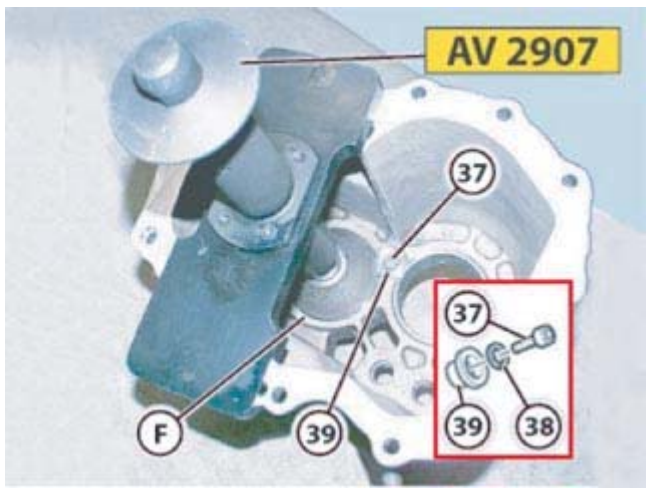
➢ Remove the complete F1 Kit (D2.13).



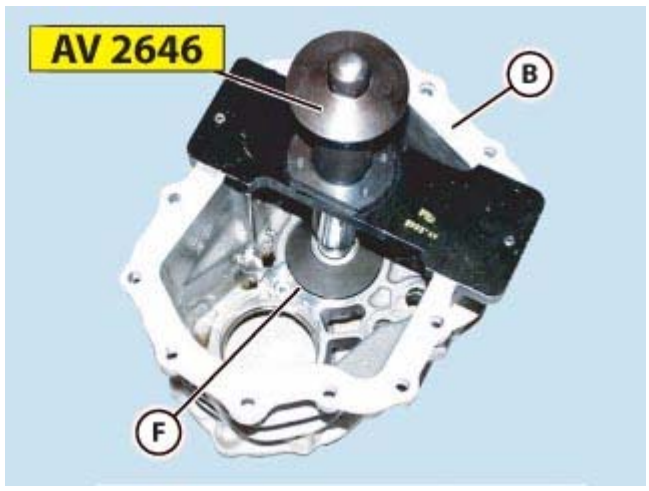
- Loosen the nut **(d)** and retrieve the bracket **(c)**.
- Remove the front gearbox housing **(B)**, undoing the nuts **(35)** and retrieving the bracket **(b)**.
- Tap the front gearbox housing with a rubber mallet **(B)** and remove, easing out from above.



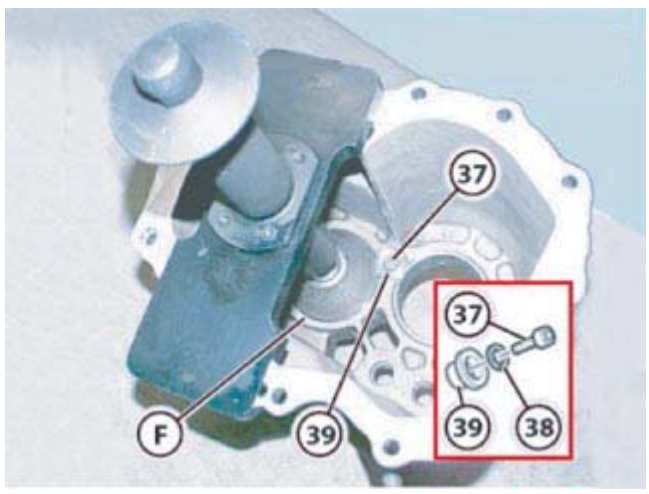
- To remove the front gearbox cover **(A)** from the front gearbox housing, undo the fastener screws **(36)** and retrieve the bracket **(K)**.



- To replace the outer races **(F)** of the bearings on the front gearbox housing, undo the screw **(37)** and remove the spring washer **(38)** and the retainer bushing **(39)**.
- Use a punch to remove the bearing races, tapping with a mallet and moving the punch to a different position after each few strokes.
- To refit the external races **(F)** of the secondary shaft bearing, insert the race in its relative mounting on the housing and use tool **(AV 2907)**.



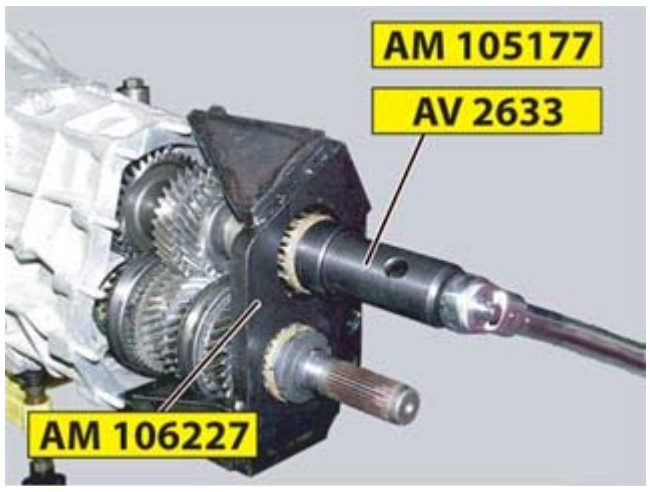
- To refit the external races **(F)** of the primary shaft bearing, insert the race in its relative mounting on the housing and use tool **(AV 2646)**, mounted on the front gearbox housing **(B)**.



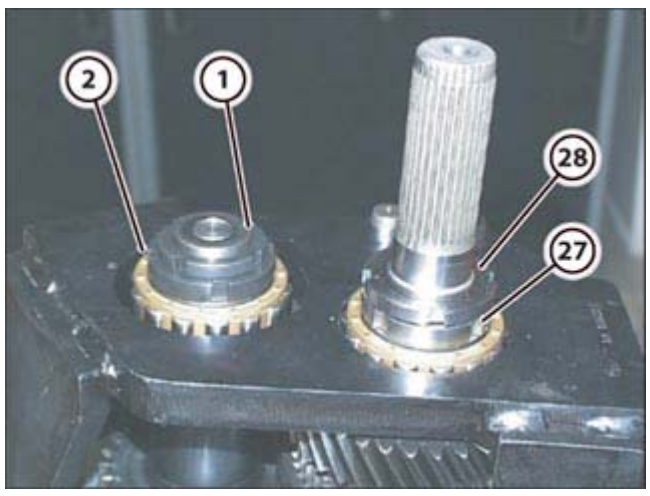
- After installing the internal races **(F)**, refit the retainer bushing **(39)** and spring washer **(38)**, apply **AREXONS 242** and tighten the screw **(37)**.



- Select two different gears; fit the jig **(AM 106227)** on the central gearbox housing and fasten with two nuts.
- Undo the first primary shaft ring nut with tool **(AM 105177)**.
- Undo the second primary shaft ring nut with tool **(AM 105177)**.



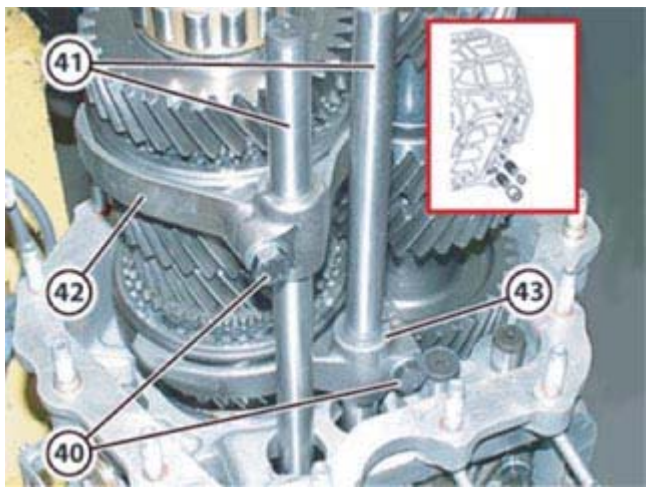
- With the jig **(AM 106227)** still in place, undo the first secondary shaft ring nut with tool **(AV 2633)**.
- Undo the second secondary shaft ring nut with tool **(AM 105177)**.



- Recap of the ring nut removal sequence:
- Remove the first secondary shaft ring nut **(1)** with tool **(AV 2633)**.
- Remove the second secondary shaft ring nut **(2)** with tool **(AM 105177)**.
- Remove the first primary shaft ring nut **(27)** with tool **(AM 105177)**.
- Remove the second primary shaft ring nut **(28)** with tool **(AM 105177)**.

i All ring nuts must be unscrewed with the AM 106227 securely mounted to the housing.

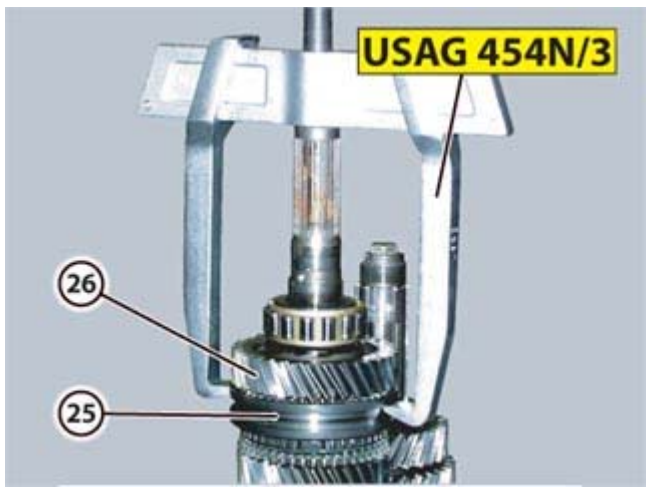
- Remove the jig **(AM 106227)** from the gearbox



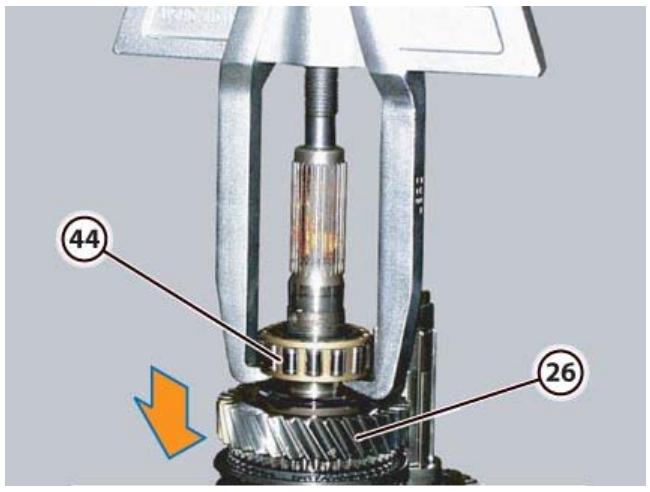
- Undo the two screws **(40)** securing the forks.
- Ease out the rods **(41)** after undoing the relative gear forks, retrieving the springs and balls.
- Remove the 5th and 6th gear fork **(4)**2, then the 3rd and 4th gear fork **(43)**.



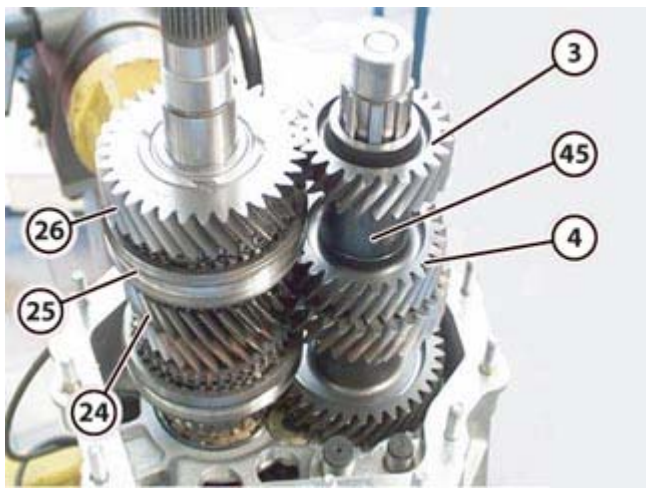
- Fit the ends of the arms of the extractor (USAG 454N/2) under the 6th gear ratio idler gear **(3)** on the secondary shaft, and remove the internal race of the roller bearing **(G)** and the gear itself.



- Fit the ends of the arms of the extractor (USAG 454N/3) on the 5th and 6th gear synchroniser **(25)** on the primary shaft, and lift the complete 6th gear ratio gear **(26)** by a few millimetres.



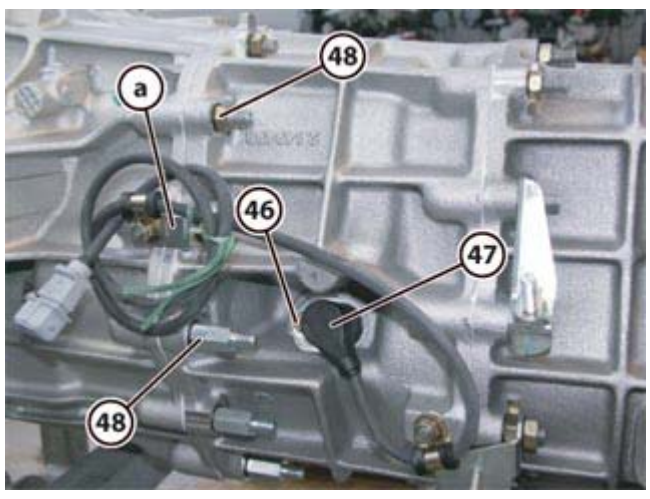
- Lower the complete 6th gear ratio gear **(26)** until it sits in place.
- Reposition the extractor (USAG 454N/3), placing the ends of the arms under the bearing **(44)**, and ease out the bearing.



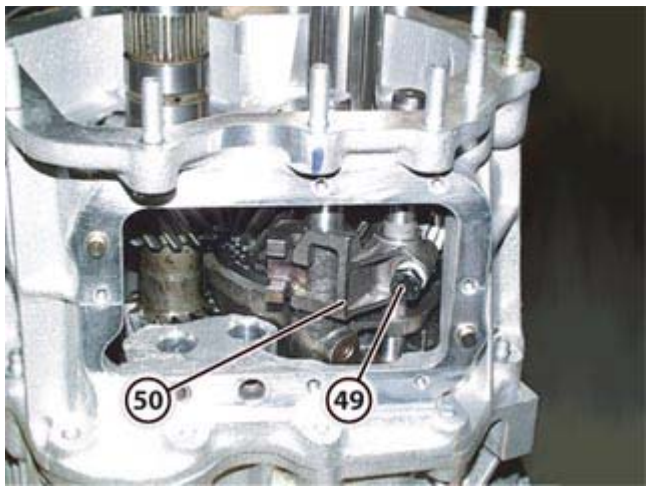
- Remove the 6th gear ratio idler gear **(3)** from the secondary shaft.
- Remove the complete assembly consisting of the 5th gear ratio gear **(24)**, the 5th and 6th gear synchroniser **(25)** and the complete 6th gear ratio gear **(26)**, from the primary shaft.
- Remove the 5th gear ratio idler gear **(4)** and the relative spacer **(45)** from the secondary shaft.



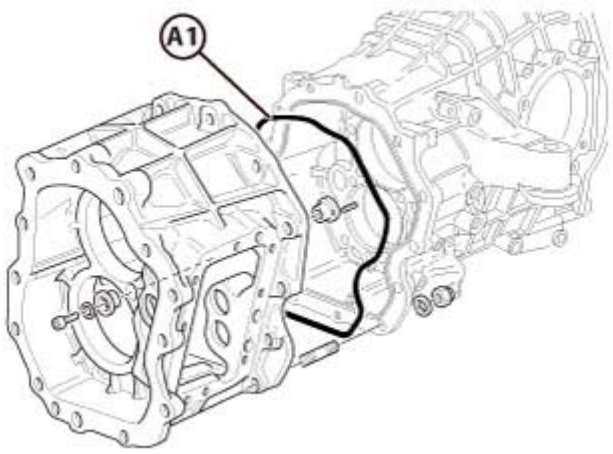
- Remove the 4th gear ratio idler gear **(5)** from the secondary shaft.
- Remove the complete assembly consisting of the 3rd gear ratio gear **(21)**, the 3rd and 4th gear synchroniser **(22)** and the complete 4th gear ratio gear **(23)**, from the primary shaft.



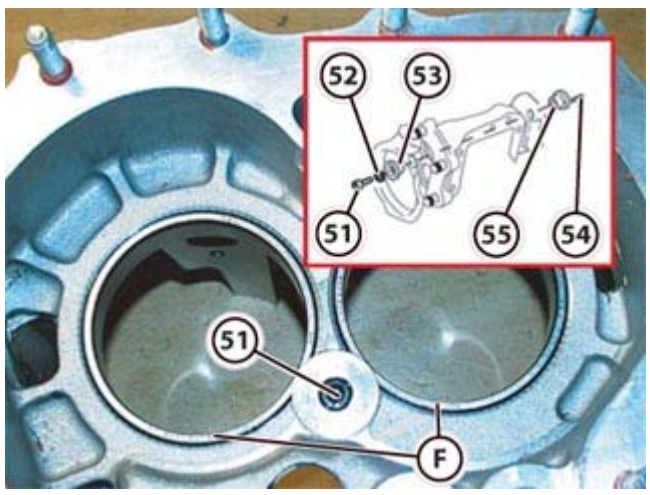
- Undo the screw **(46)** and remove the RPM sensor **(47)** from the gearbox housing.
- Undo the screws **(48)** fastening the central gearbox housing to the rear housing and retrieve the bracket **(a)** supporting the cable sensor.



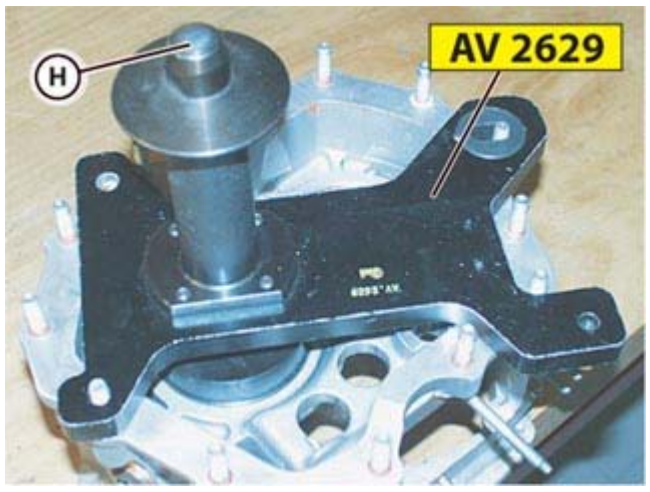
- Undo the screw **(49)** fastening the reverse gear fork **(50)**.
- Remove the central gearbox housing and the reverse gear fork **(50)**.



- Retrieve the gasket **(A1)** from the gearbox housing.



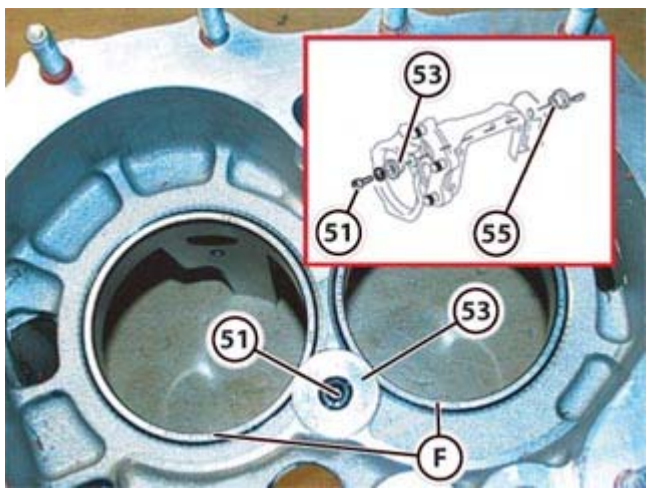
- To replace the outer races **(F)** of the bearings, undo the screw **(51)** and remove the spring washer **(52)** with the retainer bushing **(53)**.
- Working from the clutch side of the central gearbox housing, use a punch to remove the pin **(54)**.
- Remove the bushing **(55)** on the differential side.
- Use a punch to replace the external races **(F)** from the gearbox housing, tapping with a rubber mallet and moving the punch into different positions after each few strokes.



- To refit the external races, position tool **(AV 2629)** on the gearbox housing and tap the punch **(H)** with a mallet until the bearing race is correctly located.



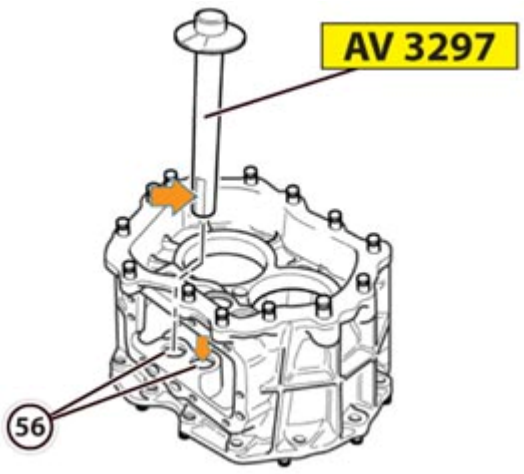
- Reposition tool **(AV 2629)** and repeat the operation on the other race.



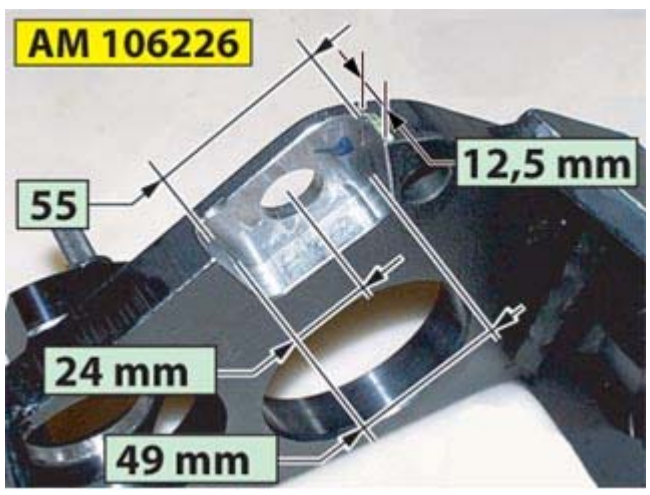
- Check that both races **(F)** are positioned correctly.
- Fasten the races by fitting the retainer bushings **(53)** and **(55)**, fixing the bushings by tightening the screw **(51)**.



Tightening torque	Nm	Class
Screw	8 Nm	C



- Use tool **(AV 3297)** to remove both bushings from the gearbox housing, ensuring that the faceted side of the rubber bushing is facing the pin **(56)**.



- Modify the jig **(AM 106226)**, breaking as shown in the figure.

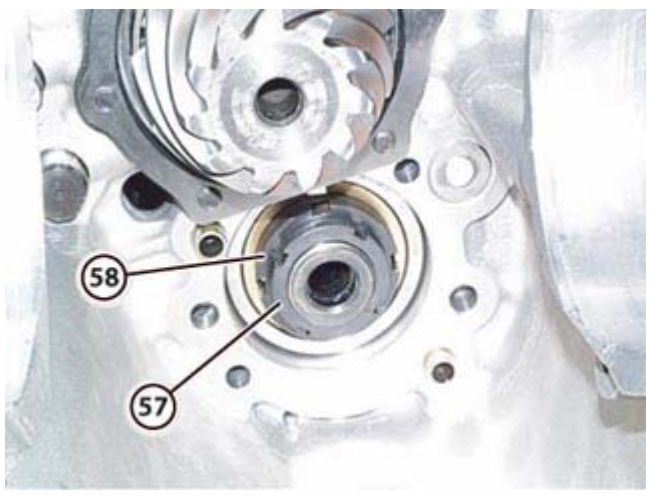


- Fit the jig **(AM 106226)** on the rear gearbox housing **(D)**, securing with two nuts.

- Overhaul the differential (D2.11).

i Remove the differential.

- Remove the gearbox oil pump (D2.03).

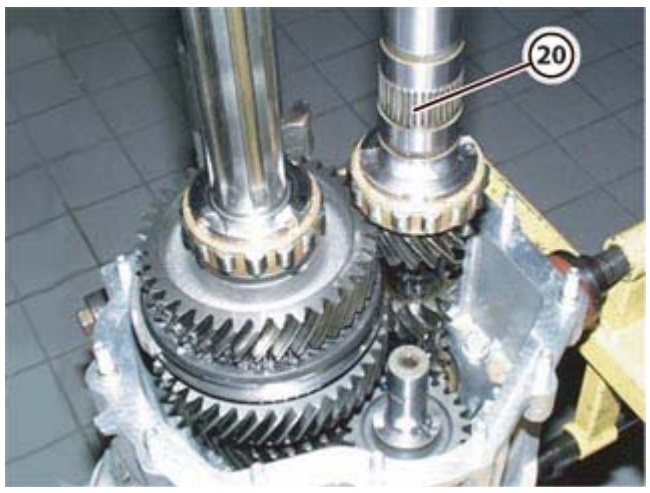


- Undo the ring nuts **(57)** and **(58)** securing the primary shaft to the rear gearbox housing.

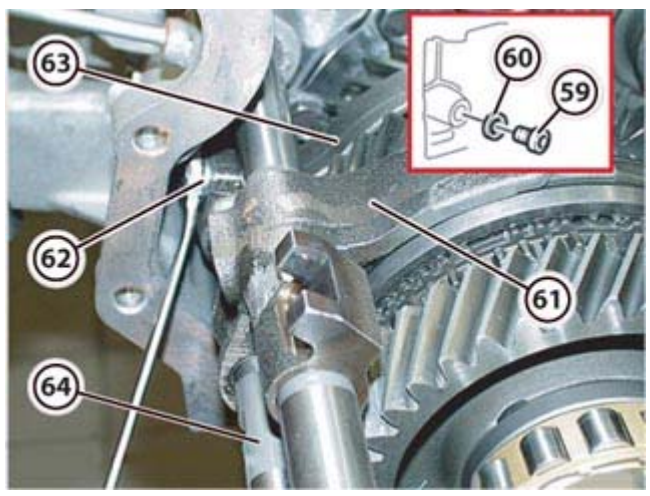
i To facilitate removal, warm the ring nuts with a hairdryer if necessary.



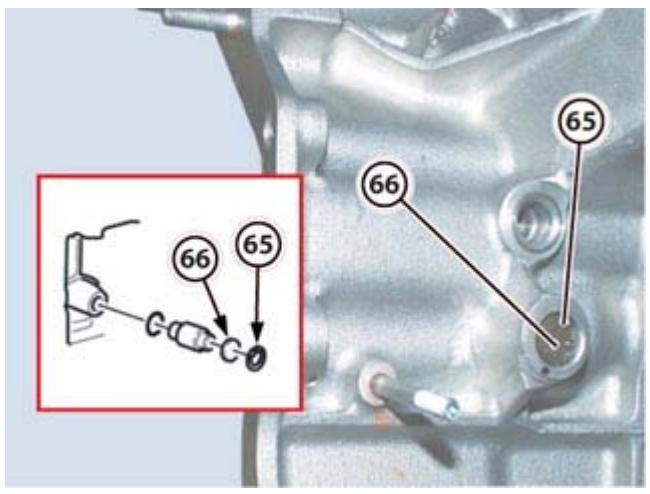
- Use tool **(AV 2633)** with the extension (USAG 236 1/2 125) to undo the first ring nut.
- Use tool **(AV 2631)** to undo the second ring nut.



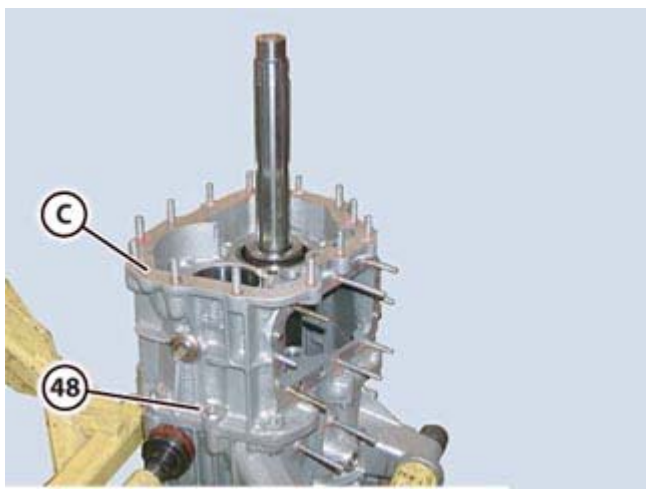
- Remove the jig **(AM 106226)**.
- Remove the primary shaft **(20)** from the rear gearbox housing, tapping with a punch from the rear and turning the shaft to slowly ease it out.



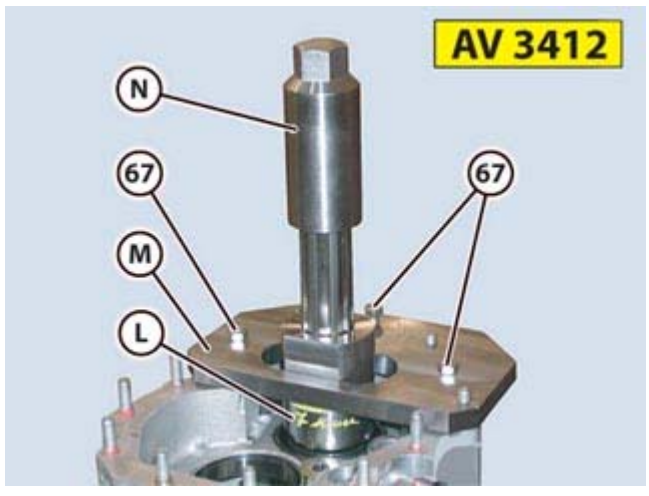
- Undo the cap **(59)** and remove, retrieving the gasket **(60)**.
- Loosen the two dowels and remove 1st and 2nd gear rod together with the relative fork **(61)**.
- Undo the screw **(62)** securing the reverse gear fork **(63)**.
- Remove the reverse gear rod **(64)**, retrieving the spring and ball.



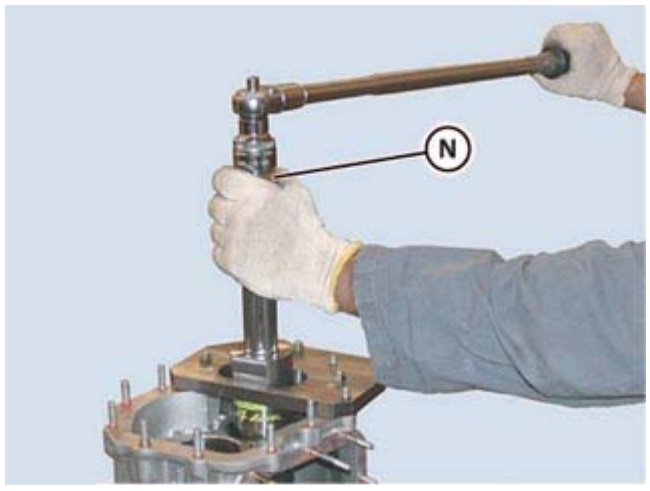
- In the case of oil leakage, remove the seeger ring **(65)** and remove the cover **(66)**.
- Remove the gear position adjuster screw and the O-ring.



- Refit the central gearbox housing **(C)** onto the rear gearbox housing, fastening with at least three nuts **(48)**.



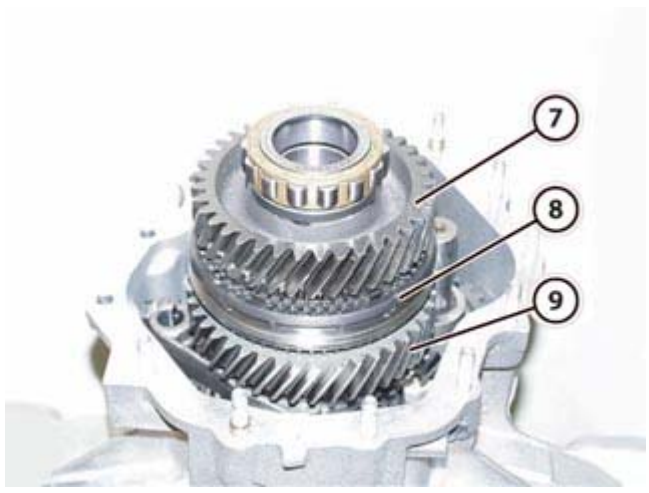
- Fit the three elements of tool **(AV 3412)**.
- Fit element **(L)** onto the secondary shaft, fastening on the ring nut.
- Fit element **(M)** onto the gearbox housing with at least three nuts **(67)**, fitting the slot onto the first element.
- Fit element **(N)** onto the secondary shaft.



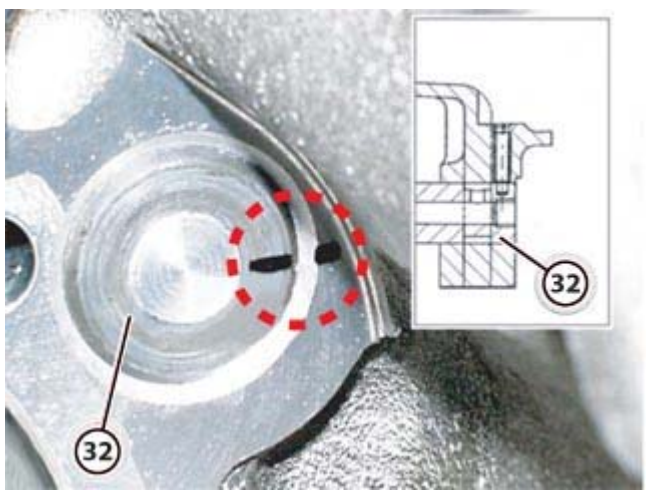
- Fit the wrench on element **(N)** and turn clockwise, holding the shaft firmly in position.



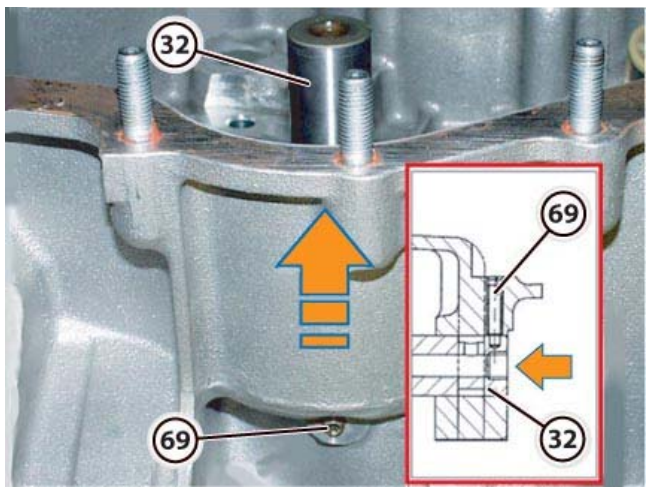
- Remove the central gearbox housing.
- Fit the rear gearbox housing under the press and push out the secondary shaft.



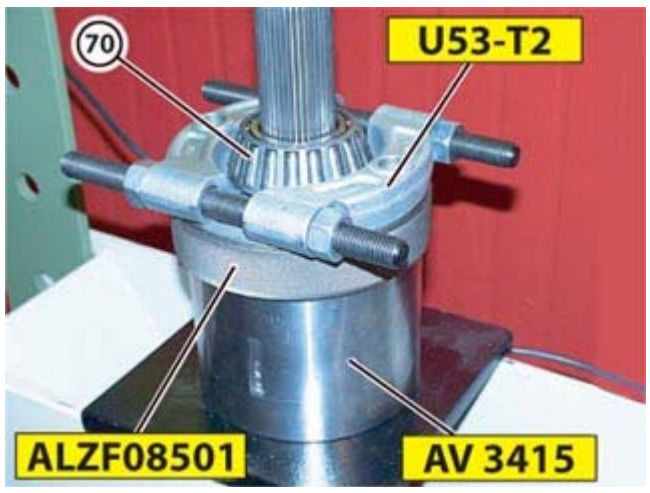
- Remove the remaining elements: complete 2nd gear ratio gear **(7)**, 1st and 2nd gear synchroniser **(8)**, 1st gear ratio gear **(9)**, reverse gear synchroniser and complete reverse gear ratio gear.



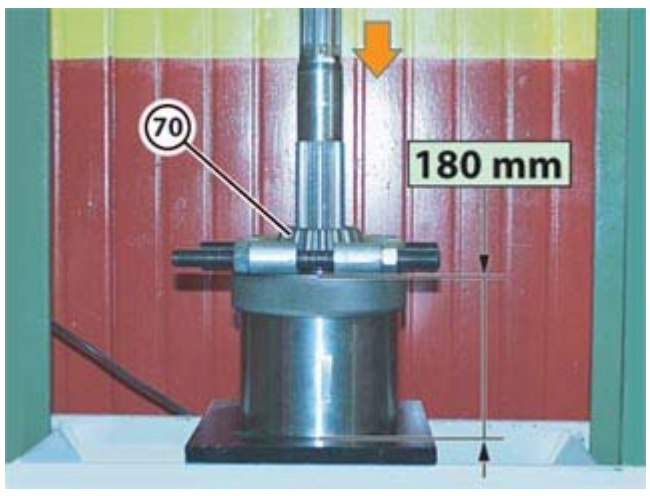
- Mark the reverse gear spindle **(32)** and the gearbox housing to ensure that the components are refitted correctly.



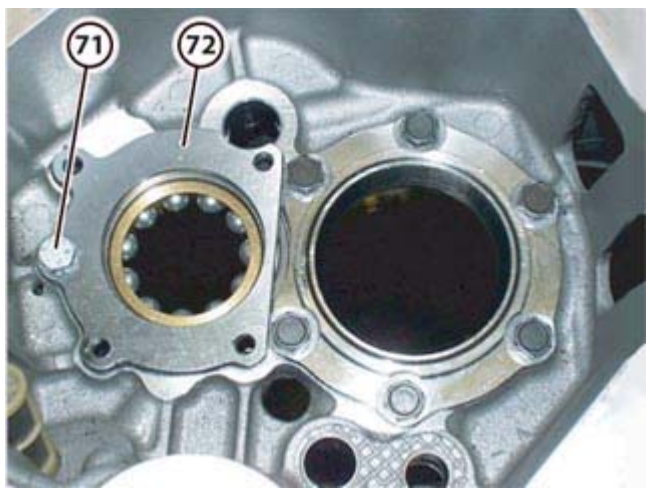
- Undo the alignment adjuster screw **(69)** and remove the reverse gear spindle **(32)** from the gearbox housing in the direction indicated by the arrow, retrieving the spacer bushing.



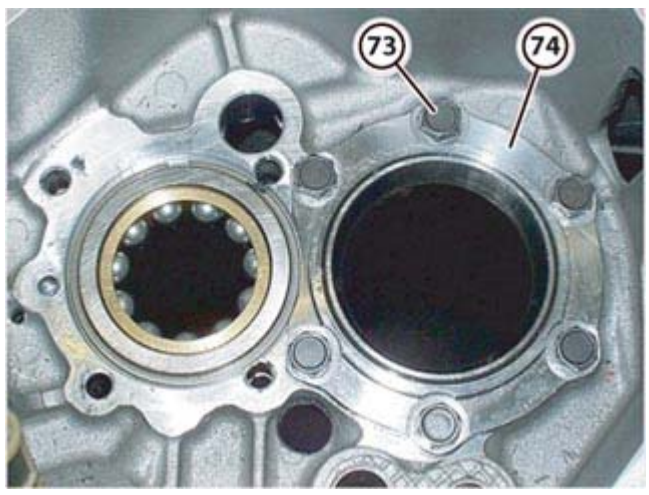
- To remove the internal race **(70)** of the secondary shaft roller bearing, use tools **(AV 3415)** and **(ALZF08501)** as a support and extractor tool (U53-T2).



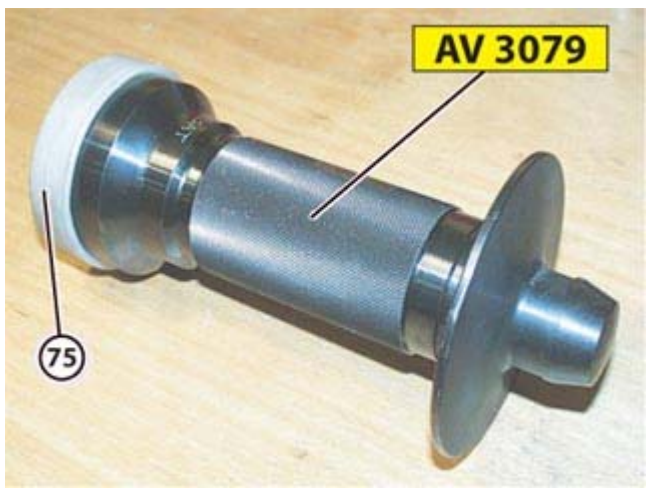
- Fit the entire assembly under the press as shown in the figure, placing a layer of rubber inside the supporting tool so that the pinion does not collide with the metal base after extraction.
- Push the shaft to remove the internal race **(70)**.



- Undo screw **(71)** and remove the flange **(72)** from the rear gearbox housing.



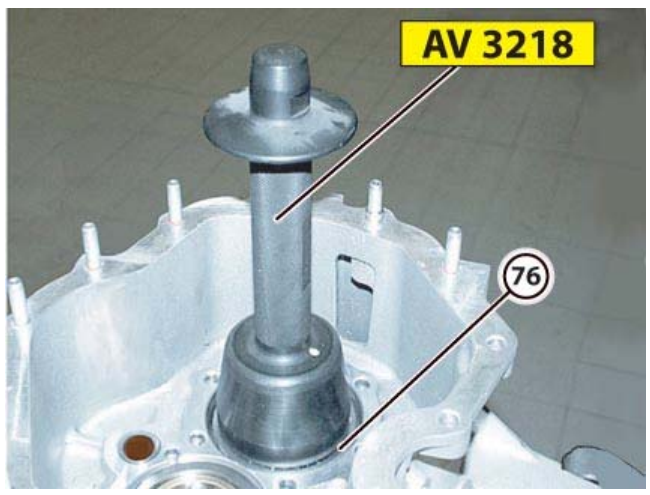
- Undo the six screws **(73)** and remove the flange **(74)**, complete with the external bearing race.



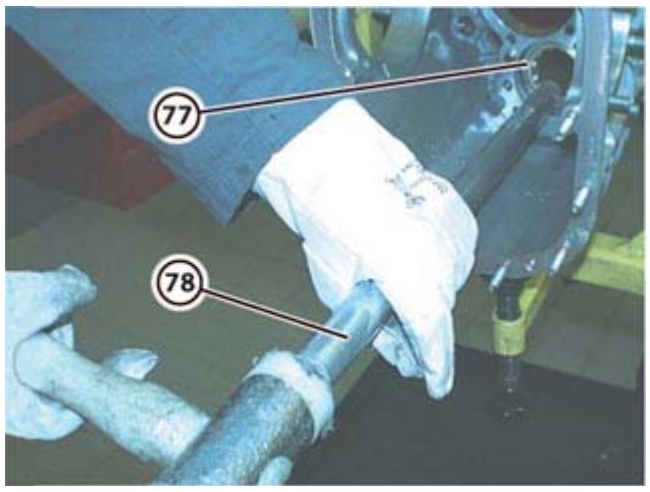
- Remove the plastic element **(75)** from tool **(AV 3079)**, undoing the three retaining screws.



- Fit the flange **(74)** on a vice with aluminium jaws and tap tool **(AV 3079)** to remove the external race of the roller bearing.



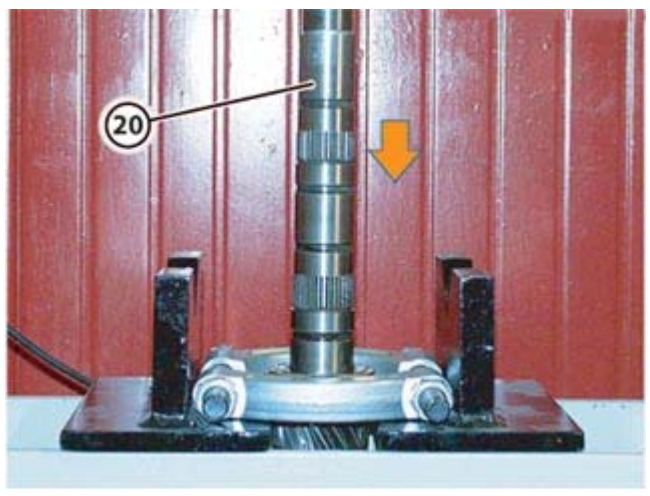
- To remove the external race **(76)** of the gearbox housing roller bearing, use tool **(AV 3218)** and tap with a mallet to remove.



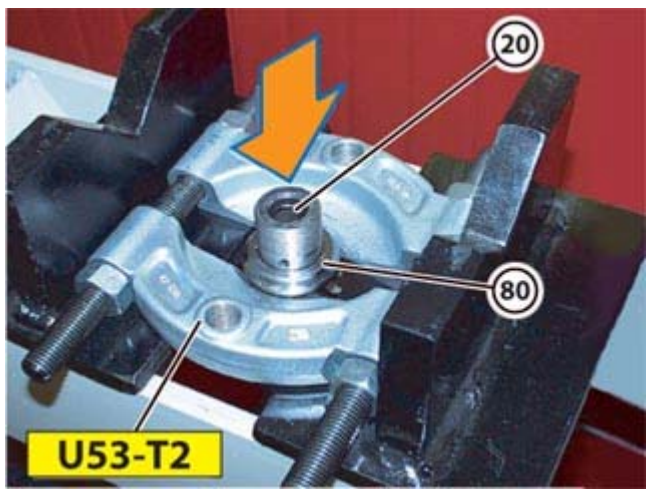
- To remove the external race **(77)** of the primary shaft ball bearing from the gearbox housing, use a punch **(78)**, tapping with a mallet to remove.



- To remove the internal race **(79)** of the primary shaft roller bearing, use tool (U53-T2) to immobilise the race, then position the entire assembly under the press.



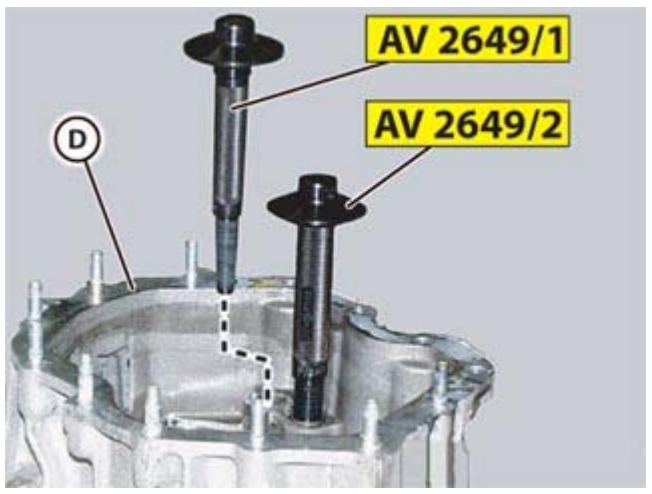
- Apply pressure with the press on the shaft **(20)** to push the bearing out completely.



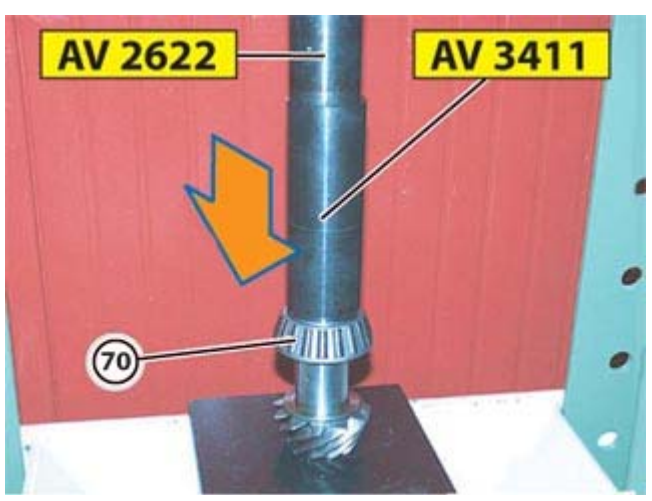
- To remove the race **(80)** of the primary shaft ball bearing, use tool (U53-T2) and apply pressure on the shaft **(20)** with the press to push out completely.

Gearbox reassembly (overhaul)

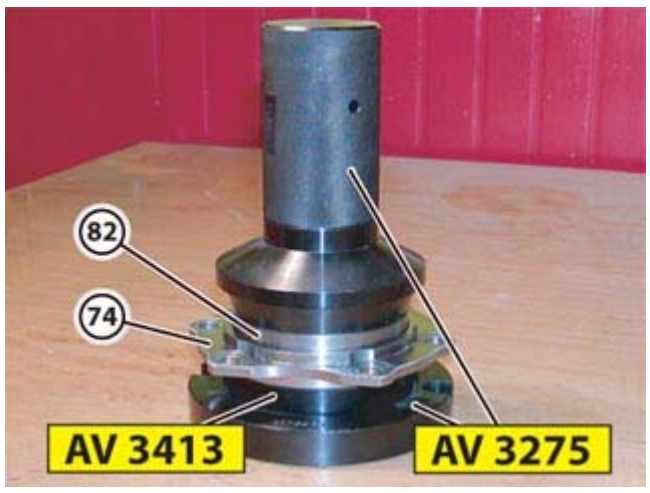
Tightening torque		Nm	Class
Secondary shaft flange - rear gearbox housing	Screw	30 Nm	C
Intermediate ring nut - secondary shaft	Ring nut	350 Nm	A
Second ring nut on primary shaft, differential side	Ring nut	250 Nm	A
First ring nut on primary shaft, differential side.	Ring nut	250 Nm	A
1st and 2nd gear selector fork Dowel	Dowel	24 Nm	C
Central gearbox housing - rear gearbox housing	Nut	32 Nm	A
Central gearbox housing - rear gearbox housing	Stud bolt	32 Nm	A
Second ring nut - secondary shaft	Ring nut	250 Nm	A
First ring nut - secondary shaft	Ring nut	250 Nm	A
Second ring nut - primary shaft	Ring nut	100 Nm	A
First ring nut - primary shaft	Ring nut	100 Nm	A
Gearbox housing	Nut	30 Nm	C
Front cover - gearbox housing	Nut	30 Nm	C
Front cover - gearbox housing	M10x1.25x45 screw	50 Nm	C
Front cover - gearbox housing	M8x1.25x45 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x40 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x20 screw	30 Nm	C
Front cover - gearbox housing	M8x1.25x35 screw	30 Nm	C



- Install the **DU Ø 15 mm** bushing using the pusher tool **(AV 2649/1)** and install the **DU Ø 18 mm** bushing, using the pusher tool **(AV 2649/2)**, on the rear gearbox housing **(D)**, ensuring that the bushing is flush with the casting.



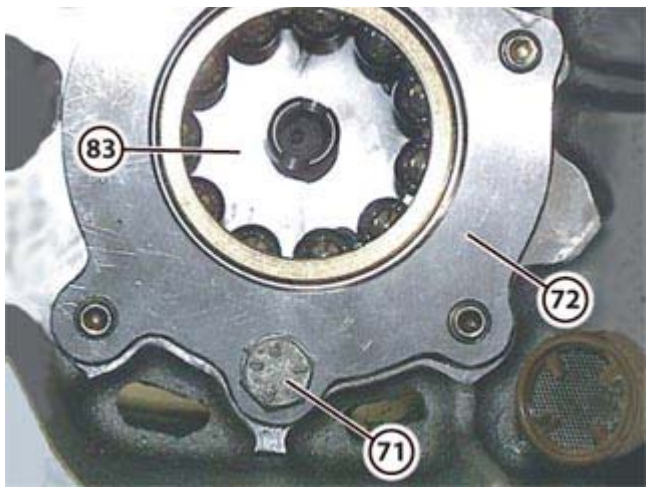
- Install the internal tapered roller bearing race **(70)** on the secondary shaft, using tool **(AV 3411)** as a spacer and tool **(AV 2622)**.
- Use a press to push the bearing completely into its seating.
- Check that the race and pinion have mated correctly with a feeler gauge.



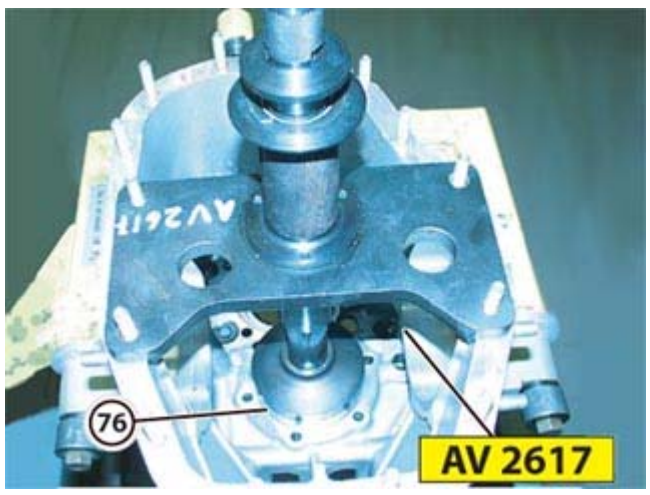
- Rest the guide ring **(AV 3413)** on the lower element of the tool **(AV 3275)**.
- Place the flange **(74)** on the tool, with the tapered roller bearing seat **(82)** already mounted.
- Push completely into the relative seating with the upper element of tool **(AV 3275)**.



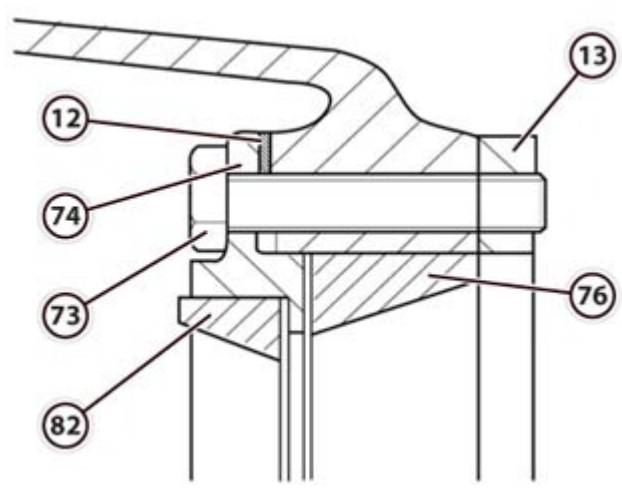
- Use tool **(AV 2630)** to install the primary shaft ball bearing **(77)** on the rear gearbox housing, and fasten to the housing with two nuts.
- Tap the head of the tool with a mallet.



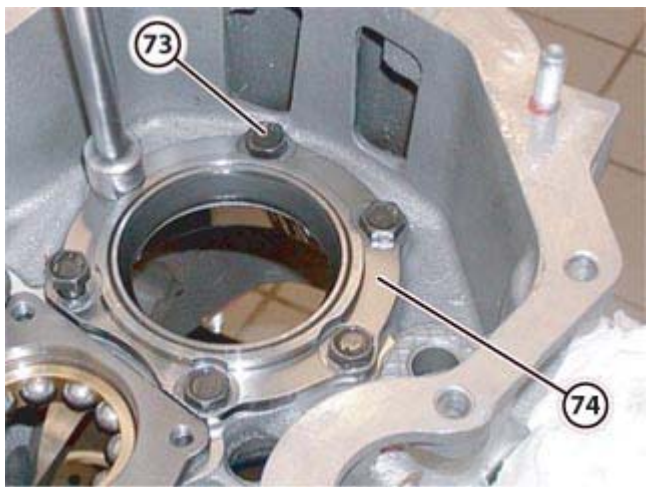
- To install the flange **(72)** correctly, temporarily fit the oil pump **(83)** to the housing with at least two screws and then to the flange.
- Apply **AREXONS 242** to the screw **(71)** and fasten the flange **(72)**.
- Remove the oil pump **(83)** from the gearbox housing.



- To refit the outer race **(76)** of the differential side roller bearing onto the rear gearbox housing, use tool **(AV 2617)**, positioned on the housing as shown in the figure.
- Tap the head of the tool with a mallet.

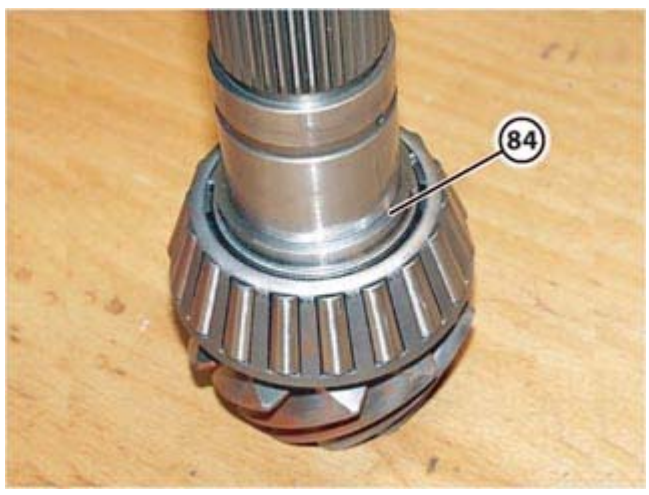


- Thoroughly clean all contact surfaces of the components involved in this stage of reassembly.
- Fit the spacer **(12)**, the flange **(74)**, with the external bearing race **(82)** already installed, and the counter flange **(13)**, with the inner bevel facing the pinion, on the rear gearbox housing.
- Fit three retainer screws **(73)** in opposing positions and tighten.
- Ensure that the flange **(74)**, with the conical bearing seat **(82)**, is in contact with flange **(74)**, with the bearing seat **(76)**.



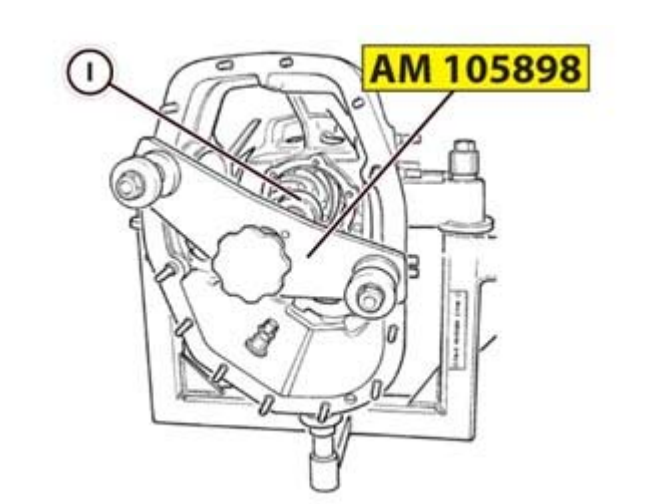
- Undo the three screws fitted previously **(73)**.
- Apply **AREXONS 242** to the new screws and tighten in a crossed pattern.

Tightening torque	Nm	Class
Screw	30 Nm	C

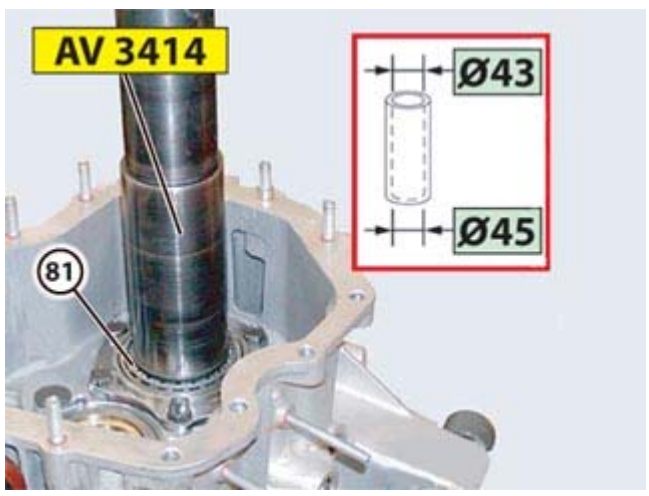


Install the spacer with the bevelled side facing the pinion.

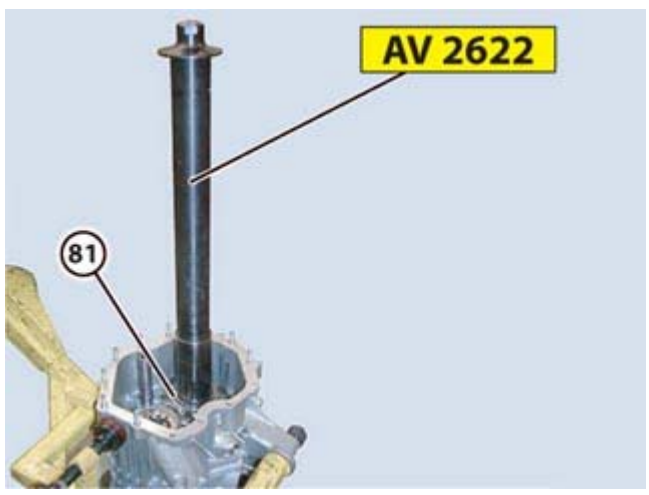
- Fit the previously installed spacer **(84)** on the shaft.



- Fit the shaft complete with pinion in the rear gearbox housing, immobilising with tool **(AM 105898)** fixed to two stud bolts, and bring the rubber bushing **(I)** into contact with the pinion.



- Lubricate the shaft and bearing with gearbox oil.
- Fit the internal bearing race **(81)** and the spacer tool **(AV 3414)** on the shaft.

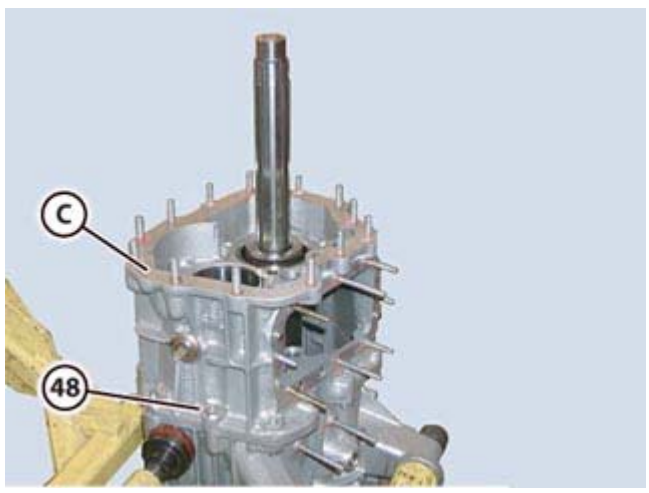


Hold the tools firmly against the component when working.

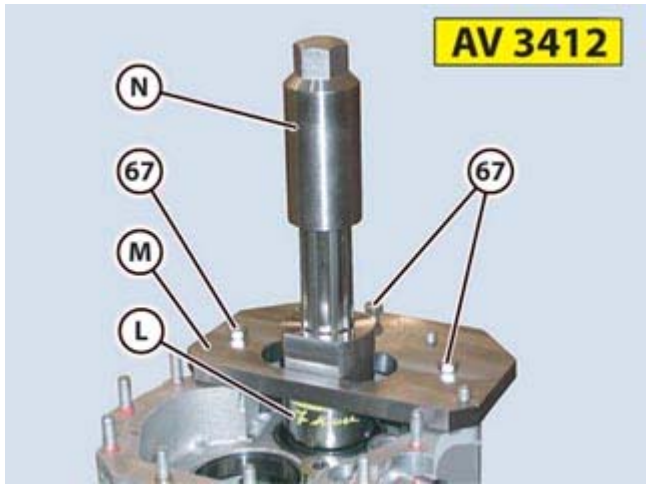
- Fit tool **(AV 2622)** on the shaft and use a press to push the bearing **(81)** into its relative seating.



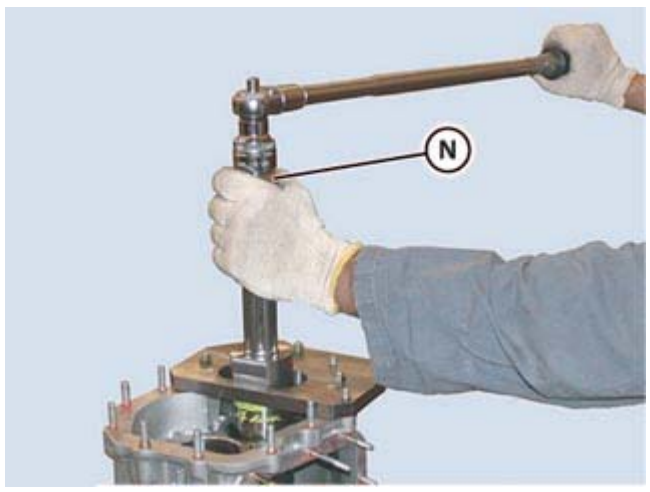
- Remove both tools and fit tool **(AV 3411)**.
- Hand tighten the ring nut **(85)**, leaving tool **(AV 3411)** in place between the internal bearing race and the ring nut.



- Fit the central gearbox housing **(C)**, and fasten to the rear gearbox housing with at least two nuts **(48)**.



- Position the element **(L)** of tool **(AV 3412)** on the shaft, fasten the jig **(M)** to the gearbox housing with at least three nuts **(67)** and position the third element **(N)** on top of the shaft.



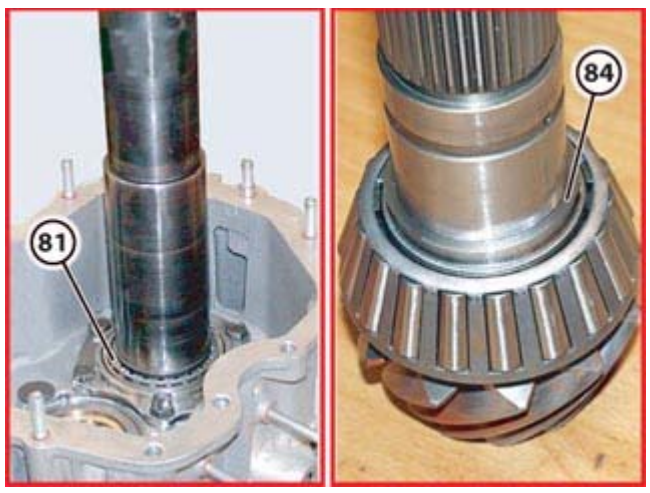
- Use a torque wrench to tighten the ring nut counterclockwise, holding the upper element **(N)** firmly in position.

- Remove all elements of the tool **(AV 3412)**.
- Remove tool **(AM 105898)**.
- Turn the shaft **15 - 20** times to settle.



- Position the third element of the tool **(AV 3412)** on top of the shaft and connect to a (FACOM R.250A) dial torque reading wrench with an extension adapter **(86)**.
- Measure the rolling torque: the value must be between **1.5 and 2.0 Nm**.

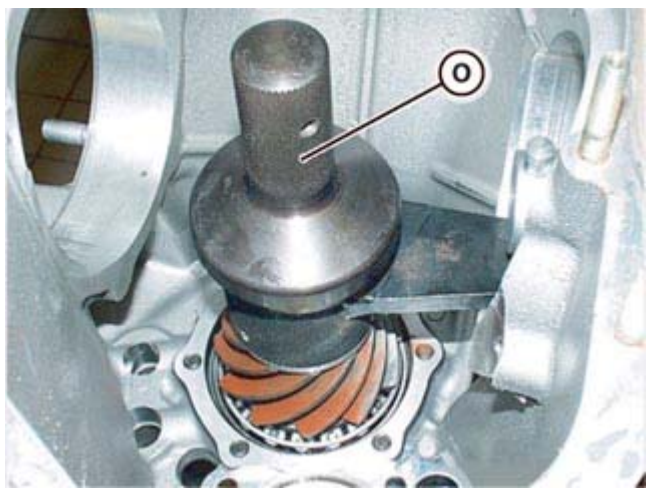
The preload value given is for new bearings. With run-in bearings, reduce the value by 10 to 20%.



- If the above values are not met, remove the bearing **(81)**, as described during the disassembly procedure, remove the spacer **(84)** and resize as necessary.



- Zero the dial gauge (COMPAC 353) at a height of **2 mm** above the surface plate. For a more accurate reading, place a weight **(O)** on top of the dial gauge mounting.

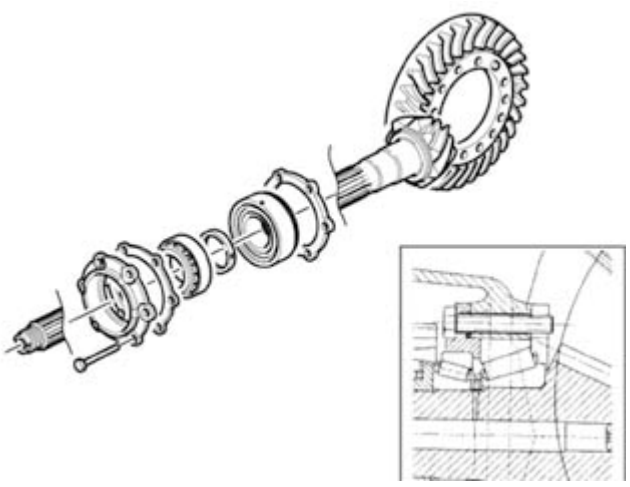


- Check the position of the pinion relative to the rear gearbox housing, using the dial gauge with weight **(O)** as shown in the figure.

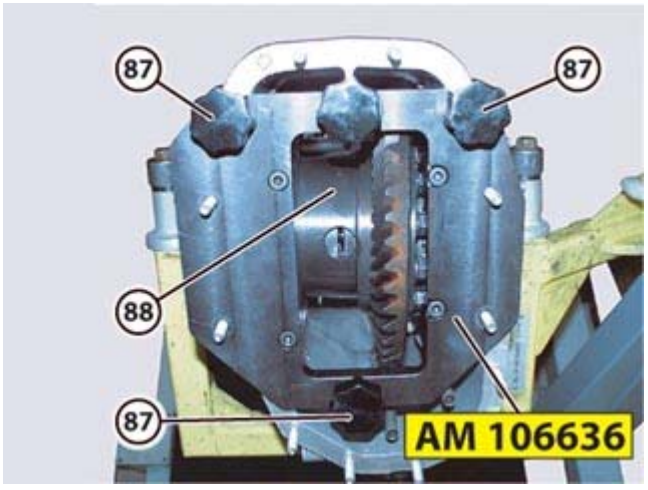


- Bring the probe of the dial gauge (COMPAC 353) into contact with the head of the pinion and measure the deviation **S1**, at the midline of the seating of the left hand differential cover.
- Repeat the procedure to measure the deviation **S2** of the right hand differential cover seating.

- Add the values **S1** and **S2** together, then divide the result by two to obtain an average value.
- Check whether the value obtained is within the tolerance values stamped onto the crown wheel.



- Thoroughly clean the contact surfaces of the components which will be used in the assembly procedure shown in the figure.

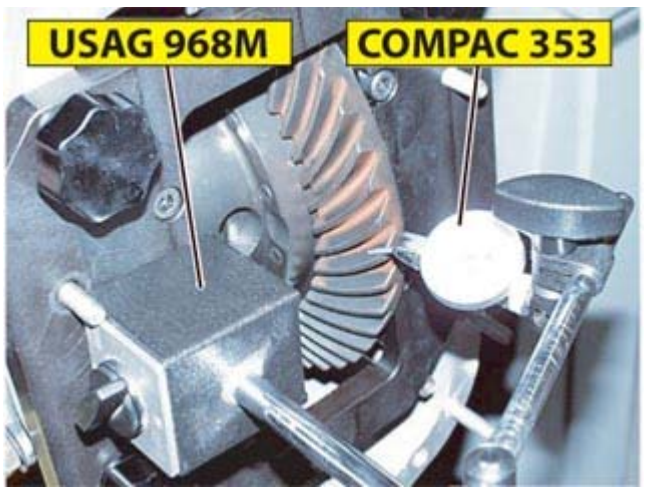


- Fit the differential **(88)**, using tool **(AM 106636)** fixed to the gearbox housing by tightening the pins **(87)** completely.

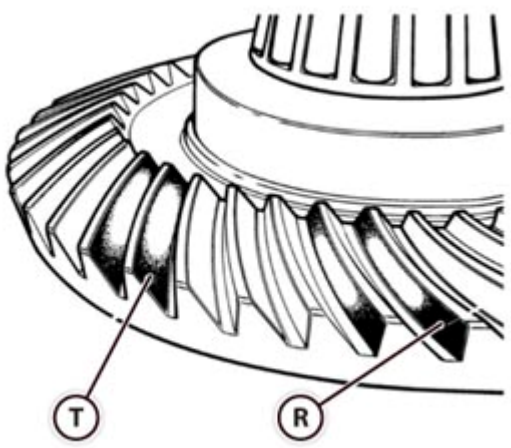
- Overhaul the differential (D2.11).

Carry out the assembly procedure for the side covers, fitting the relative spacers but not the flanges.

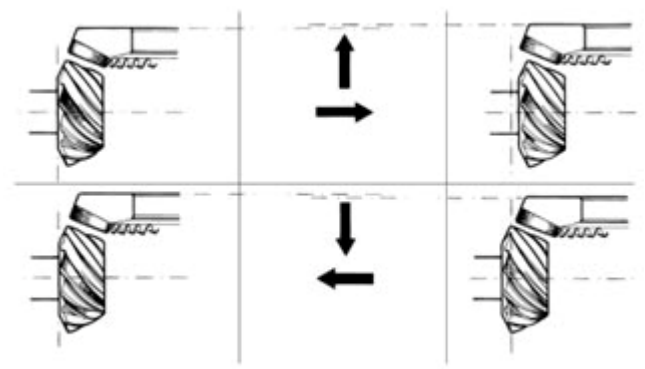
- Check the pinion - crown wheel preload (total preload) as described previously.



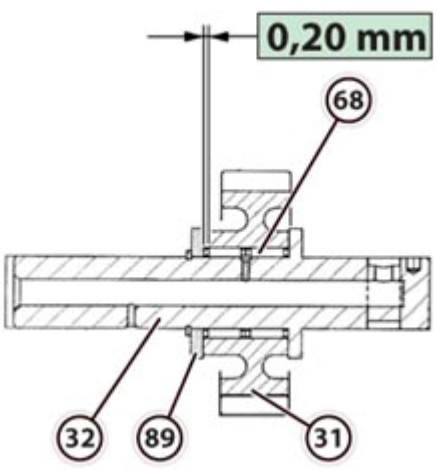
- Fit the dial gauge (COMPAC 353) on the magnetic mounting (USAG 968M) and fit onto tool **(AM 106636)**.
- Measure the crown wheel free play in three positions separated by an angle of **120°** from one another.
- The pinion-crown wheel free play measured must be between **0.07 and 0.11 mm**.



- Ensure that there is contact between the pinion and crown wheel as follows:
- Apply red lead paint to the pinion teeth; turn the pinion a number of revolutions and check carefully that the paint imprint is spread over three quarters of the area of both the drive side **(T)** and the coast side **(R)** of the tooth.

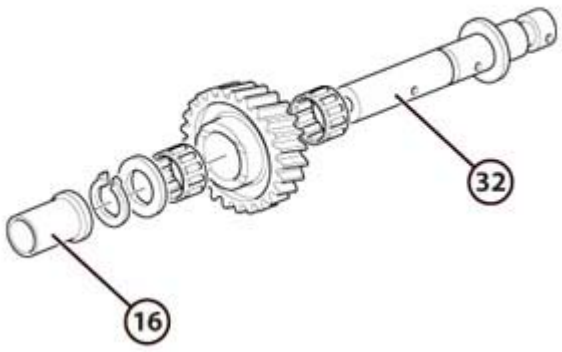


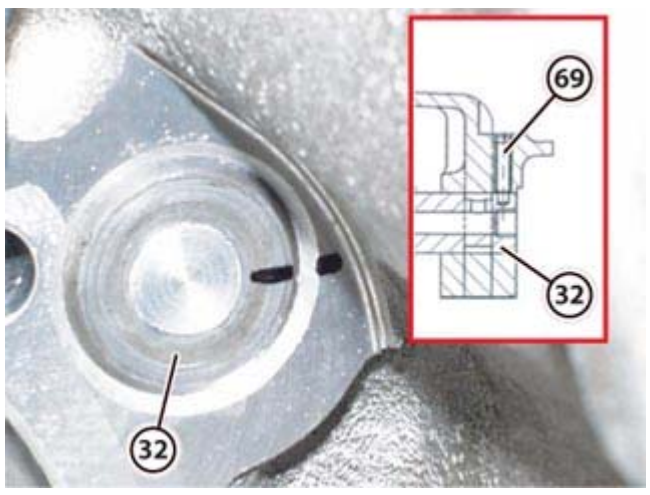
- If the above is not the case, adjust the thickness of the spacer regulating contact between pinion and crown wheel.
- Also adjust the spacers on the differential cover so that the red lead imprint on the pinion-crown wheel teeth is as near as possible to optimum and that the free play, meshing and total preload conditions are correct.
- The example shown on the left is incorrect, whereas the example on the right is correct.



- Fit the idle gear **(31)** on the reverse ratio shaft **(32)**, with the relative roller bearing cage **(68)**.
- Fit the spacer **(89)** in position and fasten with the seeger ring.
- With a feeler gauge, check that the endfloat of gear **(31)** is **0.20 mm**.

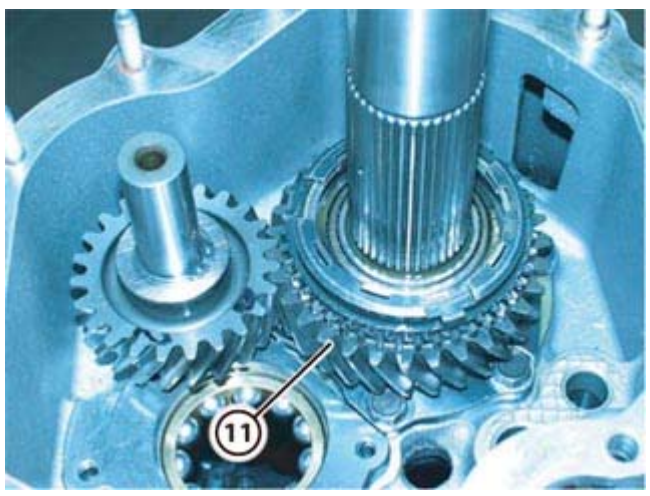
- Fit the spacer bushing **(16)** on the reverse gear synchroniser side of the reverse gear shaft **(32)**.





- Mount the complete reverse gear shaft **(32)** on the gearbox housing, aligning the two parts of the marking made during disassembly
- Fasten the shaft with the dowel **(69)**.

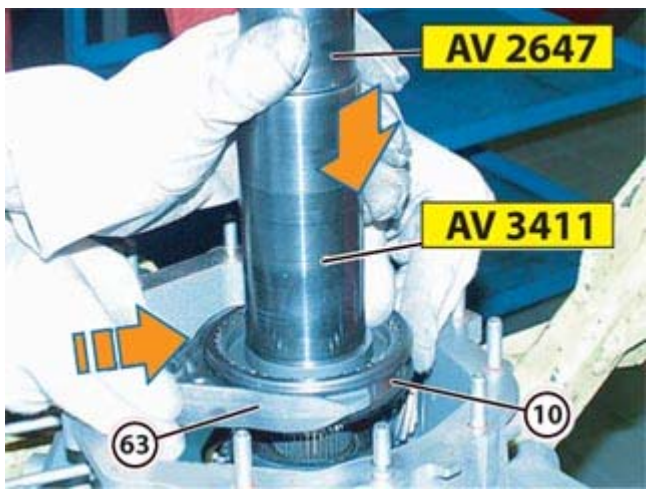
- Fit tool **(AM 105898)** as described previously, and position the gearbox housing under the press.



- Fit the roller bearing cage-race assembly and the complete reverse gear ratio gear **(11)** on the secondary shaft.



- The roller bearing cage-race assemblies shown in the figure must be kept as originally supplied.

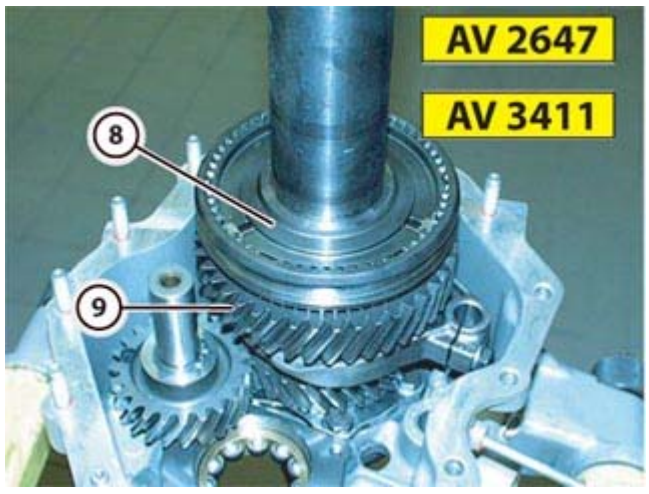


- Warm the synchroniser body to **90°C in the oven for approximately 30 minut**es before installing.
- Fit the relative synchroniser **(10)** and reverse gear selector fork **(63)**, complete with washer and retainer screw.

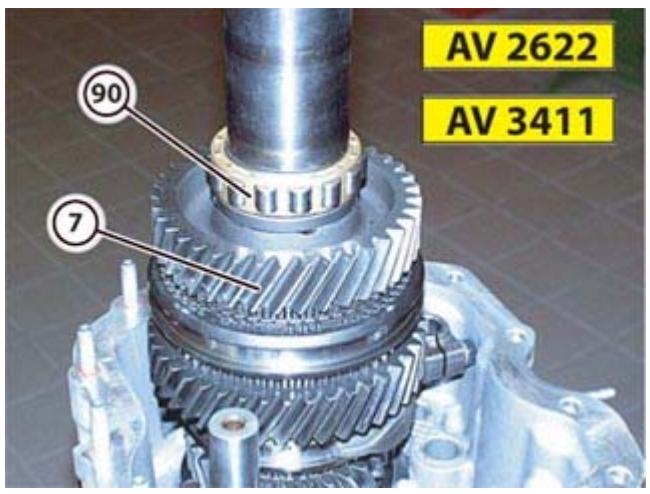
i The reverse gear synchroniser assembly may be mounted in either direction.

i Whenever fitting synchroniser rings and roller bearing cages, lubricate with gearbox oil.

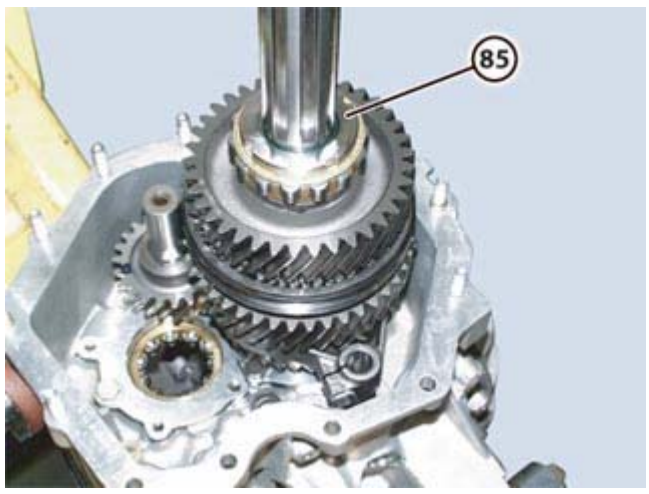
- Use tool **(AV 3411)** as a spacer and tool **(AV 2647)**.
- Apply pressure with the press to tool **(AV 2647)**, holding both tools firmly in position.



- Fit the race, the roller cage and the 1st gear ratio gear **(9)** on the shaft.
- Fit the complete 1st and 2nd gear synchroniser **(8)**.
- Use tool **(AV 3411)** as a spacer and tool **(AV 2647)**.
- Fit as described previously.

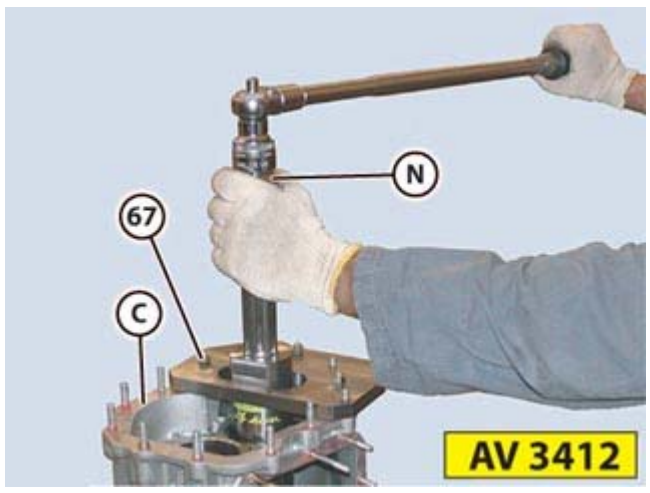


- Fit the race, the roller cage and the 2nd gear ratio gear **(7)** on the shaft.
- Fit the secondary shaft support bearing **(90)** using the tools **(AV 3411)**, **(AV 2622)** and the press.



- Fix the ring nut **(85)** in position.

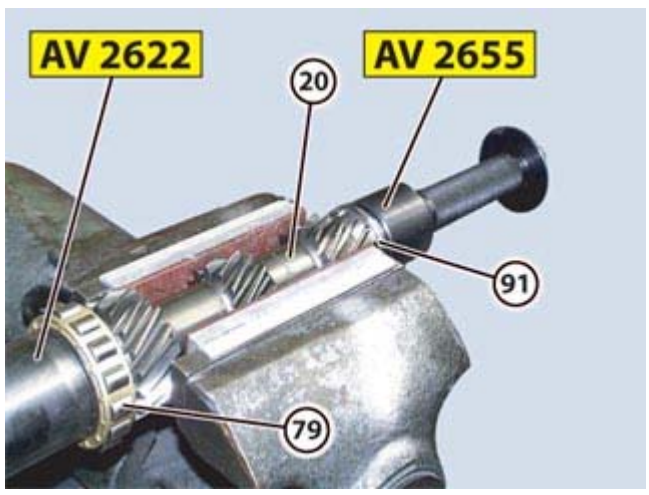
- Place the gearbox housing on the mounting tool **(AV 2621)** and **(AS 107312)**.



- Refit the central gearbox housing **(C)** as described previously, fastening with at least two nuts.
- Fit the three elements of tool **(AV 3412)** as described previously and fasten the jig with at least three nuts **(67)**.
- Apply **Loctite® 270** to the ring nut.
- Use a torque wrench to tighten the ring nut counterclockwise, holding the upper element of the tool **(N)** firmly in position.

Tighten in a single operation.

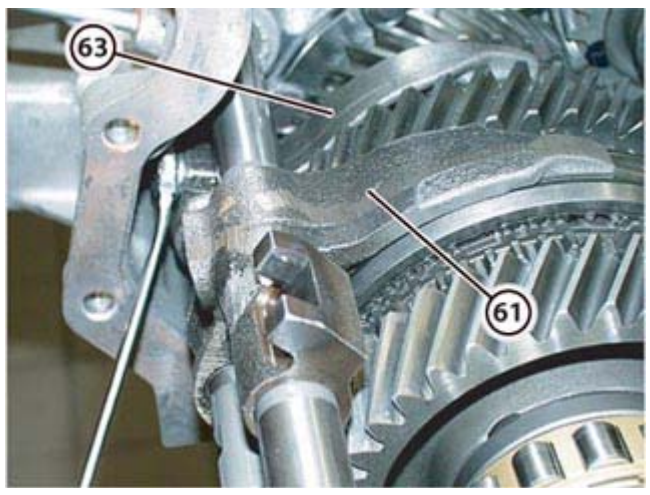
		
Tightening torque	**Nm**	**Class**
Ring nut	350 Nm	A



- Remove the elements of the tool and the gearbox housing mounted previously.
- Prepare the primary shaft **(20)** for assembly, securing in a vice with aluminium jaws.
- Fit the bearing half ring **(91)** on the shaft with tool **(AV 2655)**.
- Fit the bearing **(79)** using tool **(AV 2622)**, tapping the end of the tool with a mallet.

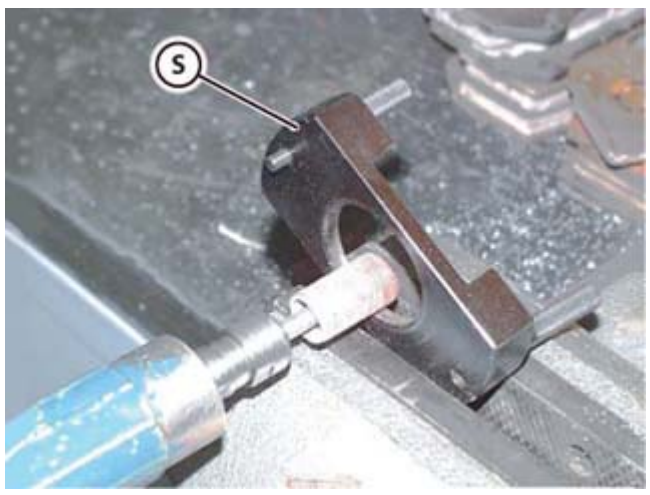


- Fit the oil pump drive spindle **(92)** in its relative seat on the primary shaft.
- Fit the primary shaft on the gearbox housing.

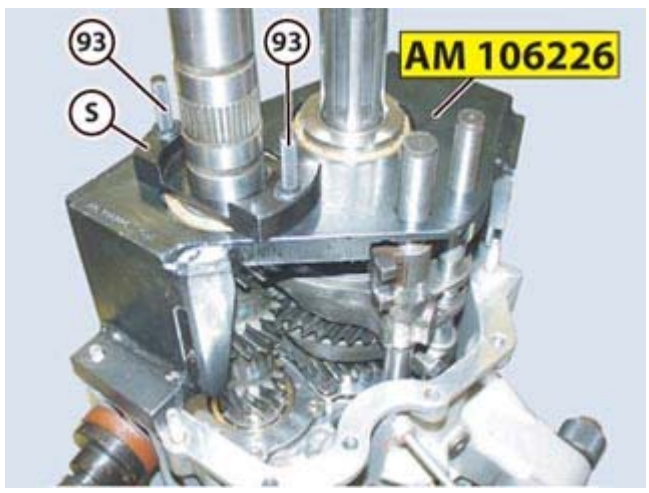


- Mount the 2nd gear selector fork **(61)**.
- Fit both rods.
- Tighten the checknut fastening the 1st gear selector fork **(63)**.

The 1st gear, 2nd gear and reverse gear selector fork may also be adjusted without installing the primary shaft.



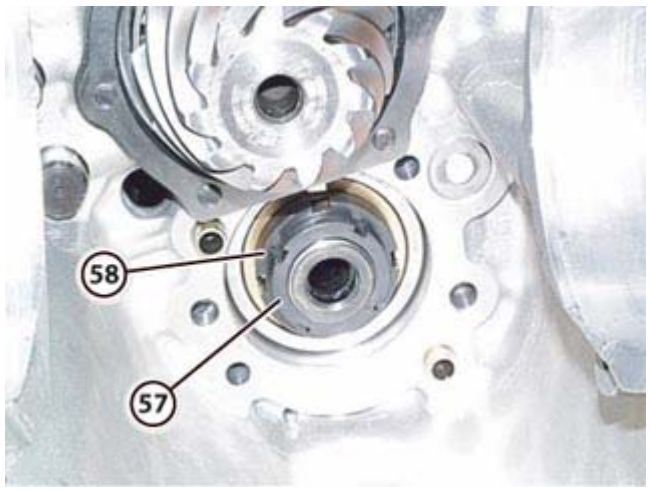
- After removing the element **(S)**, fit the jig modified previously **(AM 106226)**, fastening to the gearbox housing with two nuts.
- Widen the element **(S)** to fit the larger diameter of the primary shaft **(Ø 40 mm)**.



- Fit the element **(S)** on the jig **(AM 106226)**, tightening the two pawls **(93)**.



- Fit the bearing half ring **(94)** on the rear gearbox housing using tool **(AV 2644)**.



- Apply **Loctite® 270** to the thread on the shaft.
- Loosely fit the ring nuts **(58)** and **(57)**.



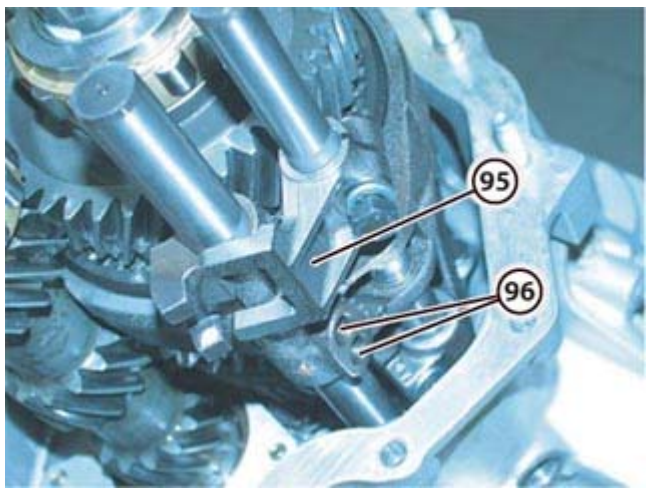
- Select two gears;
- Tighten the second ring nut using tool **(AV 2631)**.

Tightening torque	Nm	Class
Ring nut	250 Nm	A

- Tighten the first ring nut using tool **(AV 2633)** and extension (USAG 236 1/2 125).

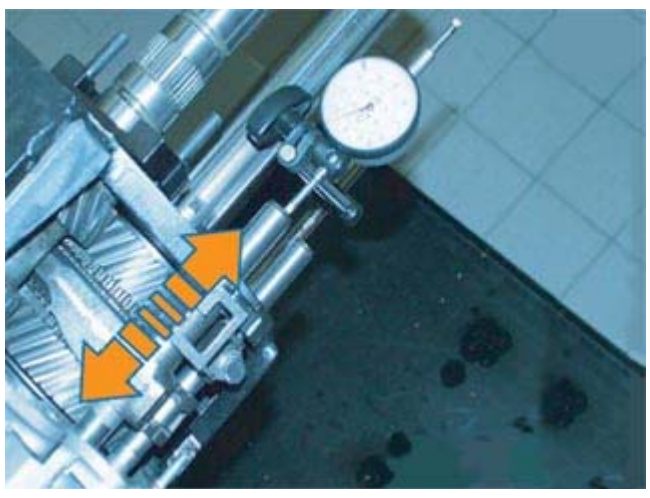
Tightening torque	Nm	Class
Ring nut	250 Nm	A

- Refit the gearbox oil pump (D2.03).
- Remove the jig **(AM 106226)**.

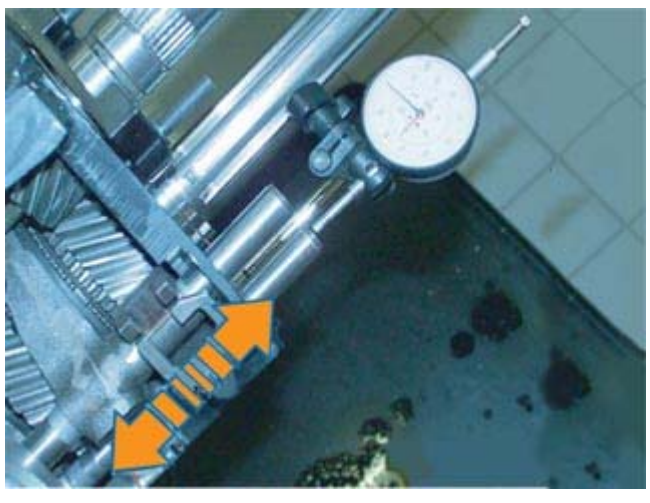


- Fit the reverse gear selector fork **(95)** on the rod, complete with screw and washer.
- Refit the jig **(AM 106226)**.
- Apply **Loctite® 270** to the dowels **(96)** and tighten.

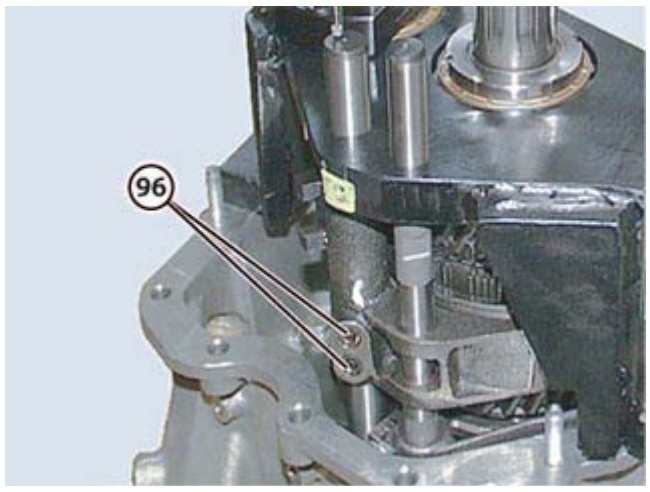
Tightening torque	Nm	Class
Dowel	24 Nm	C



- Position the magnetic mounting with adjustable arms (USAG 968M) on the jig **(AM 106226)** and apply the dial gauge (MITUTOYO no.3058) with the probe in contact with the 1st and 2nd gear selector rod.

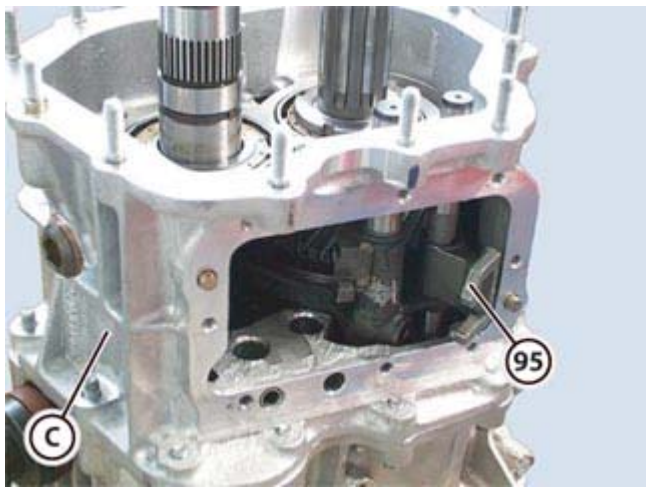


- Position the magnetic mounting with adjustable arms (USAG 968M) on the jig **(AM 106226)** and apply the dial gauge (MITUTOYO no.3058) with the probe in contact with the reverse gear selector rod.

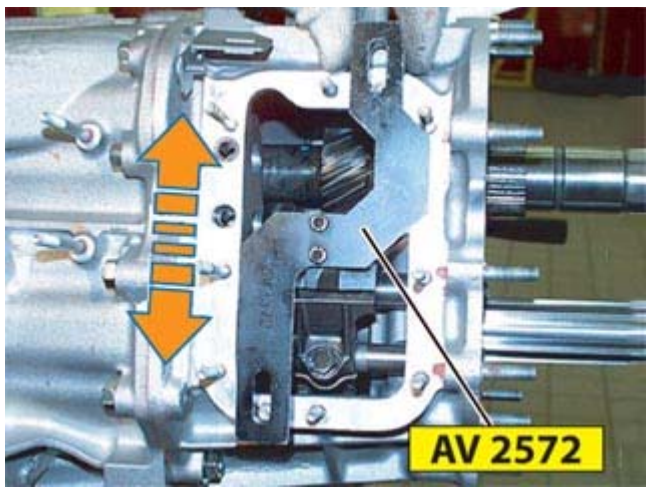


- Move the rods and ensure that the stroke is approximately **9.4 - 9.5 mm**.
- Loosen the dowels **(96)**, move very slightly and retighten, checking the new rod stroke each time.
- Ensure that is always **0.4 mm** of free play on the reverse gear selector rod.
- Once adjustment is complete, retighten the dowels **(96)**.

Tightening torque	Nm	Class
Dowel	24 Nm	C

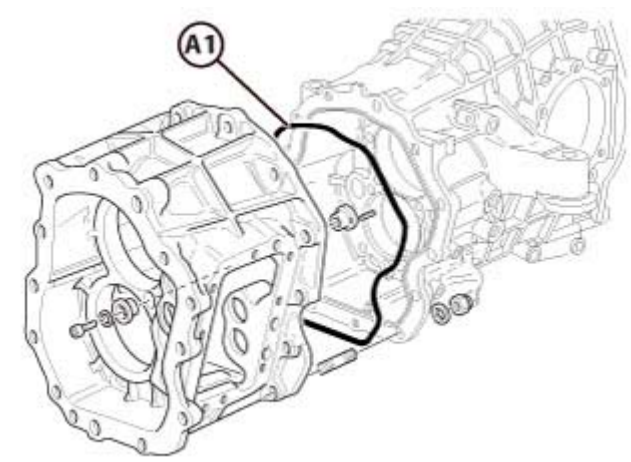


- Remove the jig **(AM 106226)** and the selector fork **(95)** and temporarily fit the central gearbox housing **(C)**, fastening with two nuts.

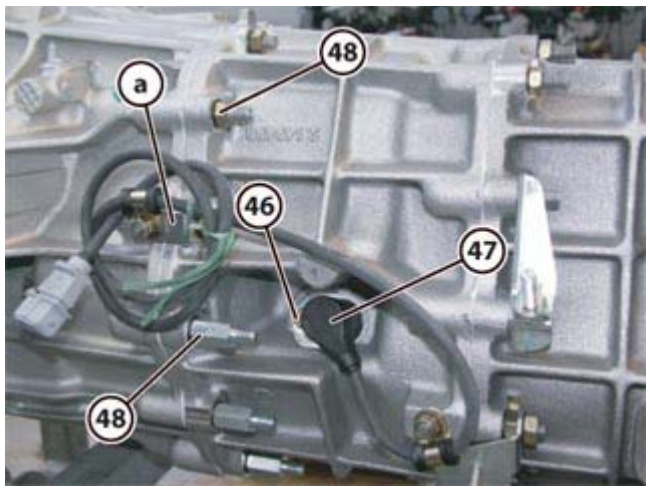


- Position tool **(AV 2572)** on the central gearbox housing, holding the tool in place to maintain contact.
- Check that there is no deviation in the selector fork position and that the fork slides vertically (as seen in the figure) without impediment.

i It is very important that the position of the 1st and 2nd gear selector rod and yoke is correct, as all other gears are adjusted in reference to their positions.



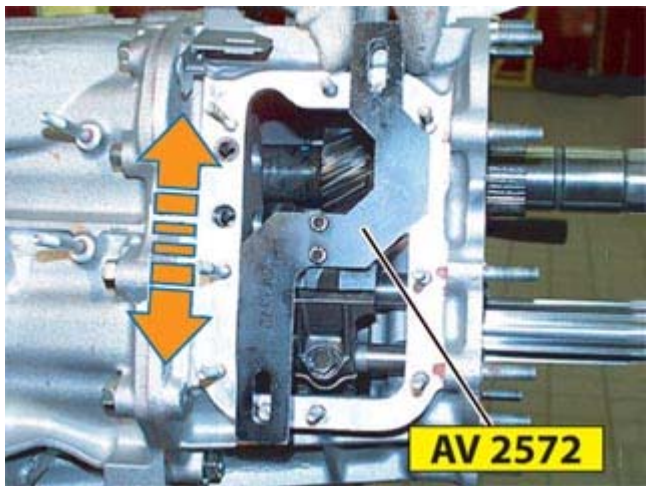
- Install a new, slightly greased gasket **(A1)** in the relative seat on the rear gearbox housing.



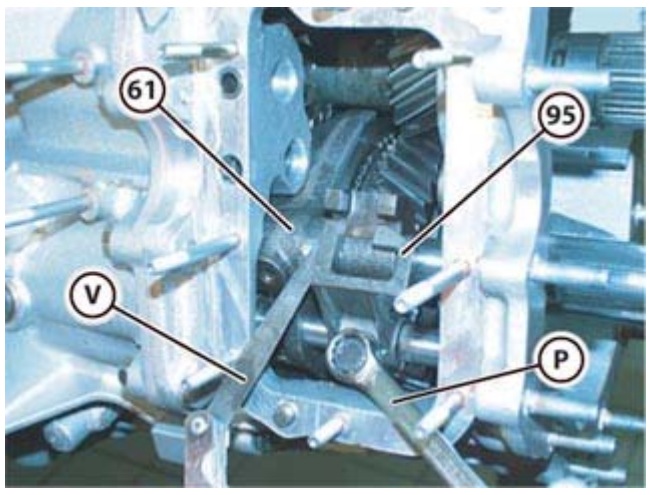
- Apply **AREXONS 510** to the contact surface of the rear gearbox housing.
- Fasten the central gearbox housing by tightening the screws **(48)**, fitting the sensor cable mounting bracket **(a)** between the two components.

Tightening torque	Nm	Class
Nut	32 Nm	A
Stud bolt	32 Nm	A

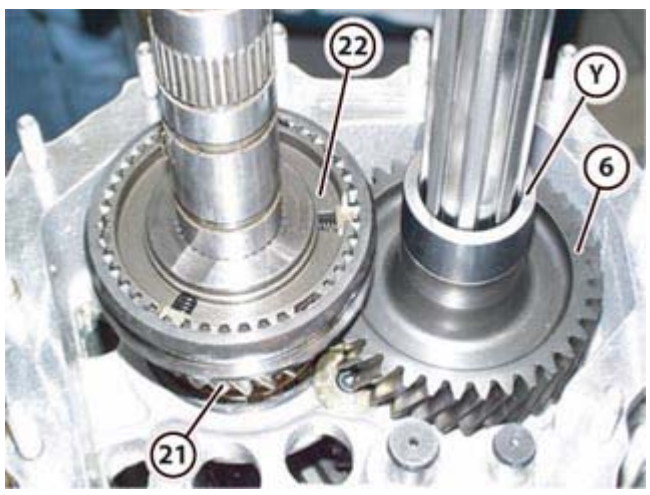
- Fit the sensor **(47)** and fasten to the housing with screw **(46)**.



- Refit the jig **(AV 2572)** to the central gearbox housing and ensure that the reverse gear selector fork is correctly aligned.



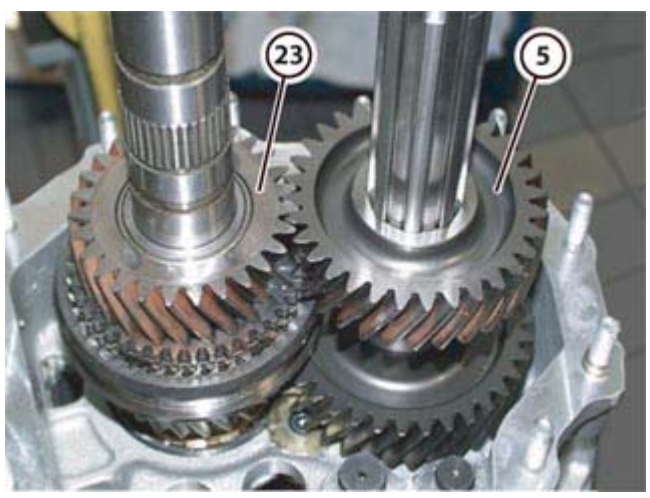
- Maintain lateral alignment.
- Use wrench **(P)** to adjust the screw until the distance from the selector fork is **1.2 mm**.
- Check the spacing between selector fork **(95)** and selector fork **(61)** with a feeler gauge **(V)**.



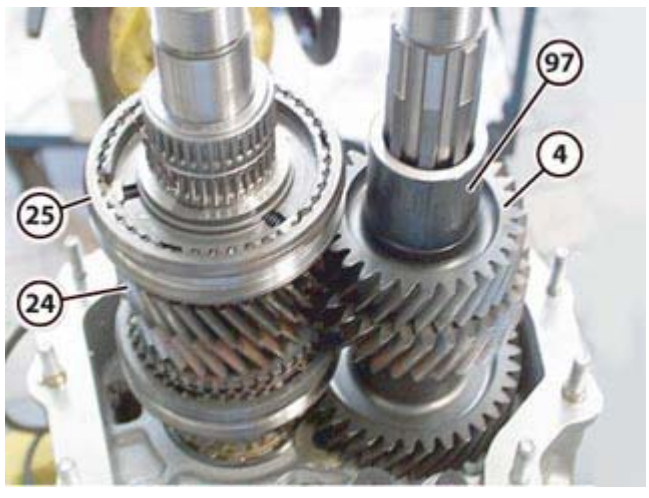
Check that there are no signs of fretting on spacer surfaces (Y) subject to contact with the gears.

- Fit the 3rd gear ratio gear **(6)** and the relative spacer **(Y)** on the secondary shaft.
- Fit the spacer and complete 3rd gear ratio gear **(21)**, with the relative roller bearing cages, and the complete 3rd and 4th gear synchroniser **(22)** on the primary shaft.

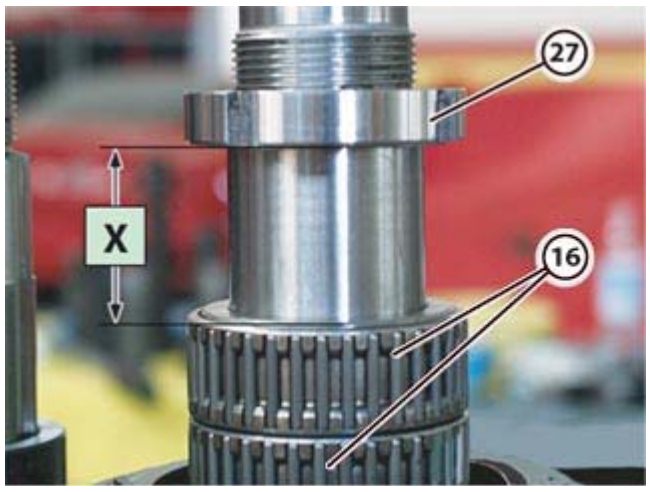
This **(22)** is the only asymmetric synchroniser, and must be installed with the thicker side facing the 3rd gear ratio gear.



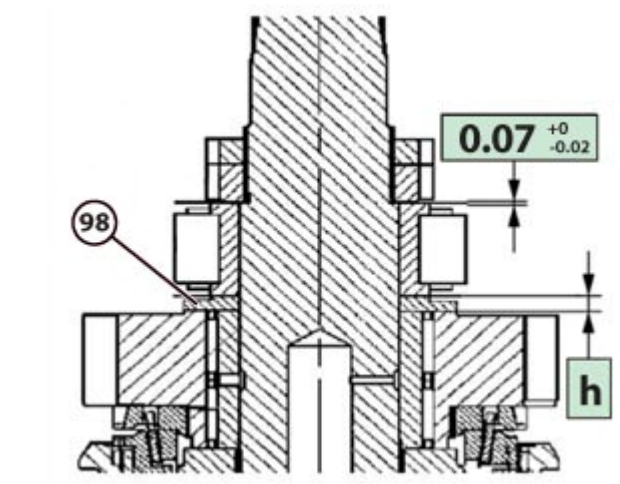
- Fit the complete 4th gear ratio gear **(23)** with the relative roller bearing cage on the primary shaft.
- Fit the 4th gear ratio idler gear **(5)** on the secondary shaft.



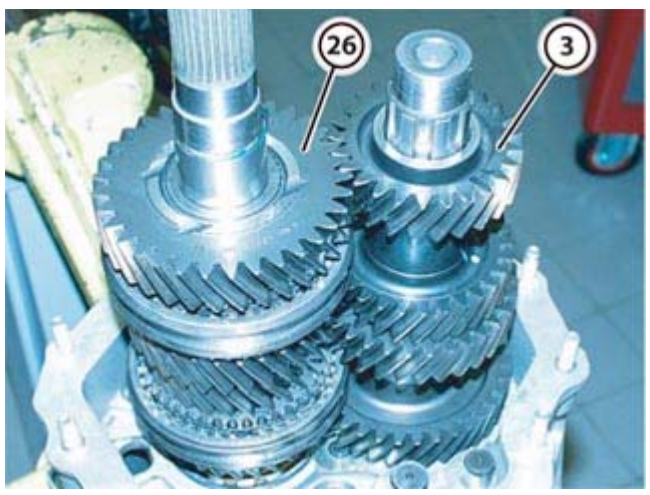
- Fit the 5th gear idler gear **(4)** and the spacer **(97)** on the secondary shaft.
- Fit the complete 5th gear ratio gear **(24)**, with the relative roller bearing cage, and the complete 5th and 6th gear synchroniser **(25)** on the primary shaft.



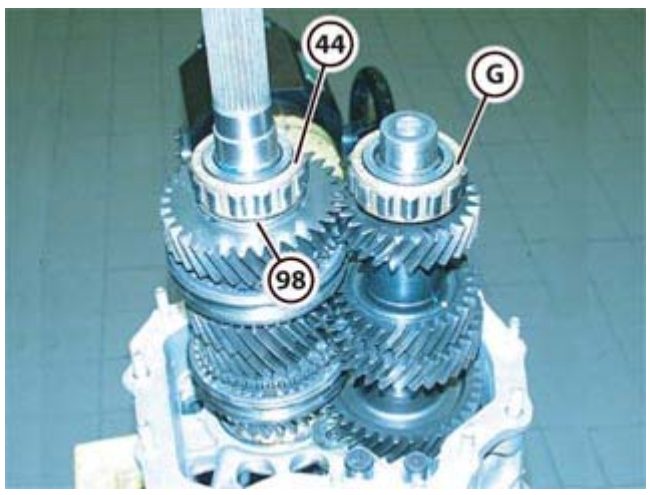
- Fit the two roller bearing cages **(16)** and the ring nut **(27)**, tightening completely on the primary shaft.
- Measure the dimension **(X)** between the surface of the bushing and the contact face of the ring nut.
- The dimension **(X)** is the maximum gap permissible from the bearing. Verify this gap with a feeler gauge, taking the size of the shoulder ring into account.



- The height **(h)** of the shoulder ring **(98)** should be such that there is a free play of **0.07 +0/-0.02 mm** between the ring nut and the bearing.



- Fit the 6th gear ratio idler gear **(3)** on the secondary shaft.
- Fit the complete 6th gear ratio gear **(26)** on the primary shaft.



- Fit the suitably sized shoulder ring **(98)** and the bearing **(44)** on the primary shaft.

i The endfloat between the idler gears and the shims should be between **0.15 and 0.20 mm**.

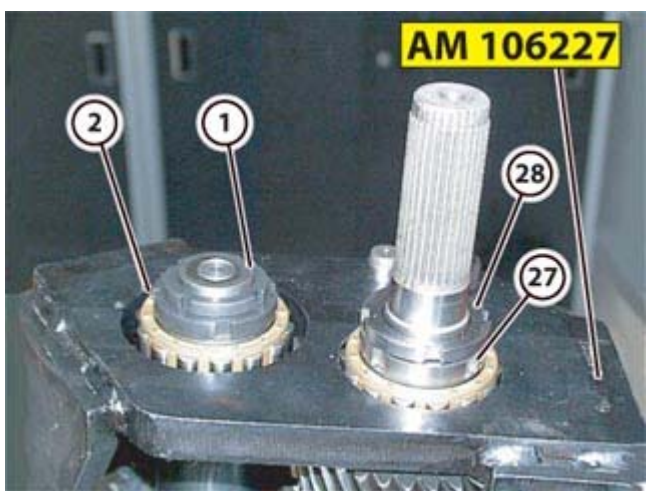
- Fit the bearing **(G)** on the secondary shaft.



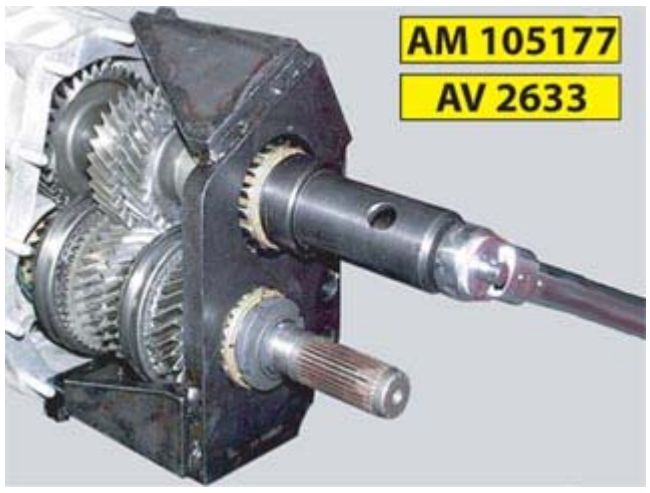
- Install the bearing **(G)** completely in its relative seating on the secondary shaft with tool **(AV 2640)**.



- Install the bearing **(44 G)** completely in its relative seating on the primary shaft with tool **(AV 2647)**.



- Fit the jig **(AM 106227)** on the central gearbox housing and fasten with at least three nuts.
- Apply **Loctite® 270** to the threads of both shafts.
- Tighten the ring nuts **(2)** and **(1)** on the secondary shaft, and ring nuts **(27)** and **(28)** on the primary shaft.



- Select two gears;
- Tighten the second ring nut on the secondary shaft with tool **(AM 105177)**.

Tightening torque	**Nm**	**Class**
Ring nut	250 Nm	A

- Tighten the first ring nut on the secondary shaft with tool **(AV 2633)**.

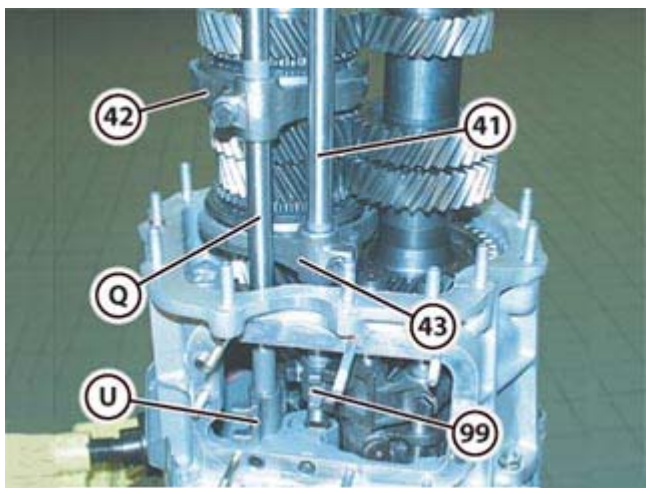
Tightening torque	**Nm**	**Class**
Ring nut	250 Nm	A



- Tighten the second and first ring nuts on the primary shaft with tool **(AM 105177)**.

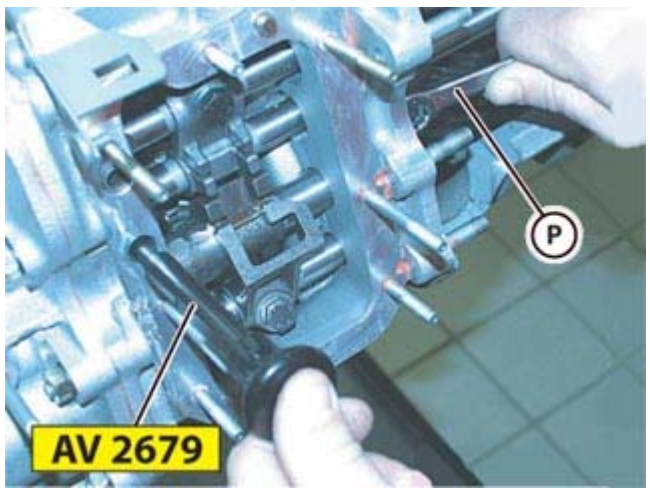
Tightening torque	**Nm**	**Class**
Ring nut	100 Nm	A
Ring nut	100 Nm	A

- Remove the jig **(AM 106227)**.

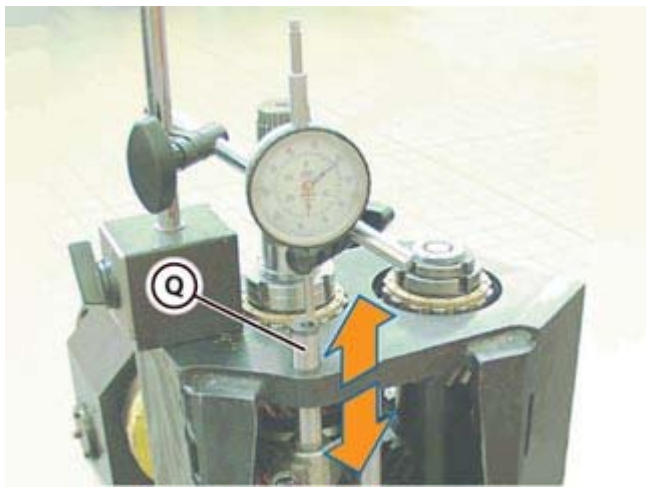


- Fit the 3rd and 4th gear fork **(43)**, and the 5th and 6th gear fork **(42)**.
- Install the rod **(41)** and the relative selector fork **(99)**.
- Fasten the fork **(99)** on the rod.
- Fit the rod **(Q)** and the relative fork **(U)** without fastening.
- Refit the jig **(AM 106227)**.

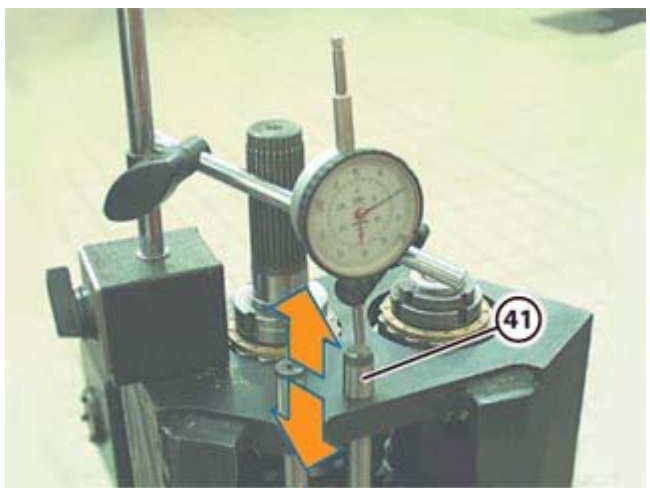
Note that the photograph has been taken without the jig AM 106227 installed to illustrate the operation more clearly.



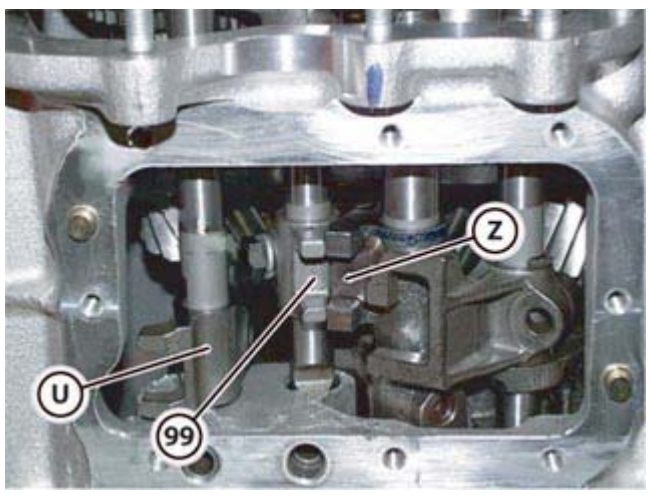
- Centre the rod with the punch **(AV 2679)**, then tighten the screw on the fork with wrench **(P)**.



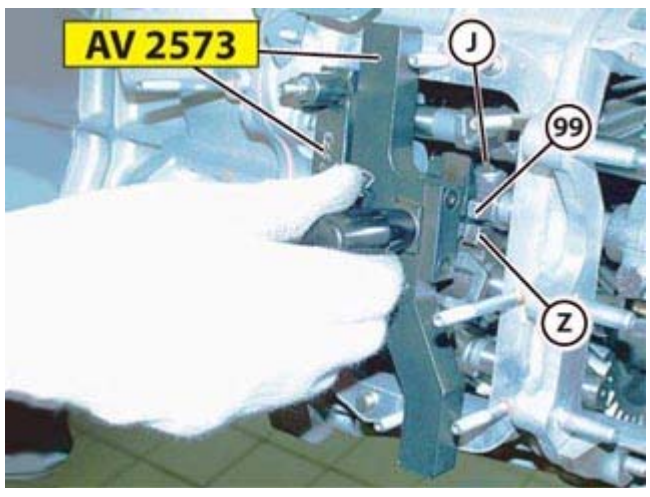
- Position the magnetic mounting with adjustable arms (USAG 968M) on the jig and apply the dial gauge (MITUTOYO no.3058).
- With the probe against the ends of the rods, measure the alignment with the dial gauge.
- Verify that the stroke of the 3rd and 4th gear selector rod **(Q)** is **9.3 mm**, with a tolerance of **0.2 mm** per side.



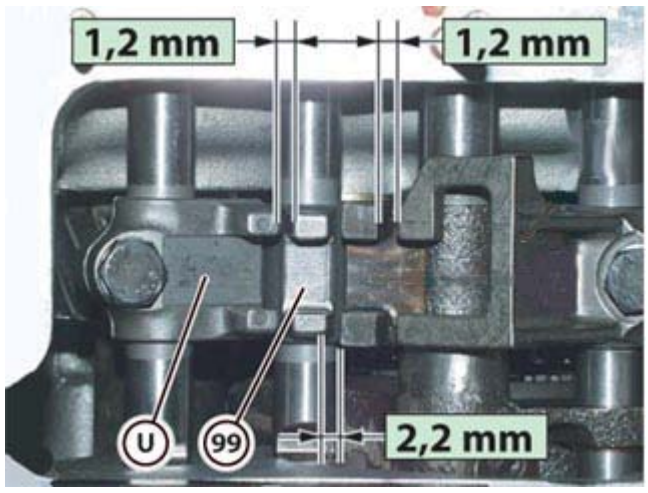
- Verify that the stroke of the 5th and 6th gear selector rod **(41)** is **9.3 mm**, with a tolerance of **0.2 mm** per side.



- To align the 3rd and 4th gear selector fork **(99)** with 1st and 2nd gear selector fork **(Z)**, the 5th and 6th gear selector fork **(U)** must be disengaged.



- Fit the balls and springs in their respective seats in the housing and fasten with the appropriate element of tool **(AV 2573)**, with holes for fastening onto the gearbox stud bolts.
- Align the selector forks **(99)** and **(Z)** with tool **(AV 2573)**, and ensure that the gap between the forks is approximately **2.2 mm**.
- Tighten the screw **(J)**.

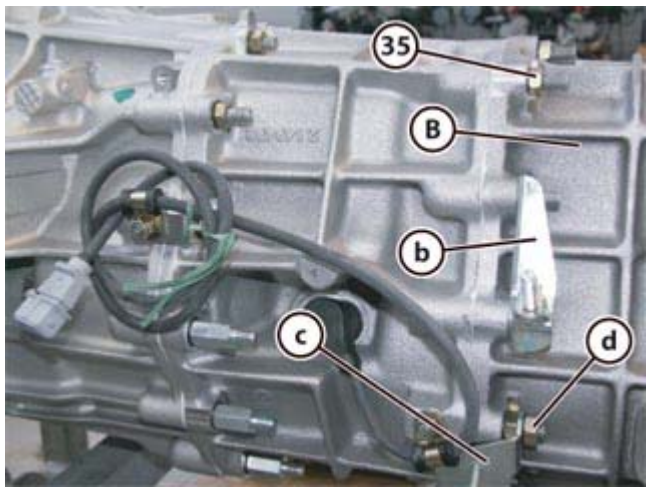


- Align the fork **(U)** with the same procedure, using tool **(AV 2573)**, and ensure that the distance from the 3rd and 4th gear selector fork **(99)** is approximately **1.2 mm**.

The fork alignment gaps are given in the figure shown here.

- After aligning, tighten the selector fork fastener screw **(U)**.

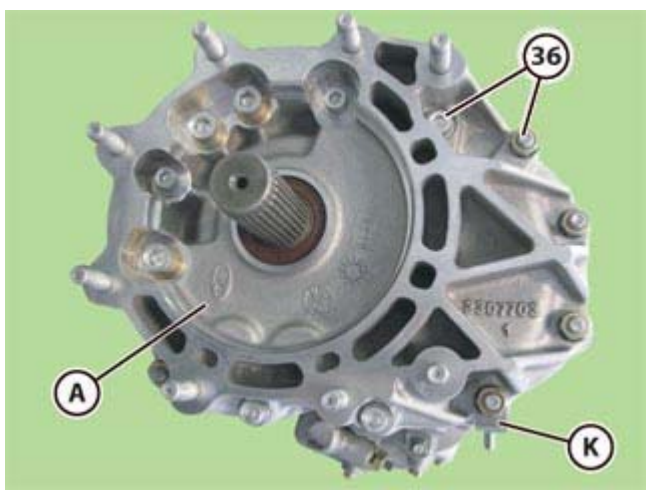
- Remove the jig **(AM 106227)**.



- Apply **AREXONS 510** to the contact surface of the central gearbox housing.
- Fit the front gearbox housing **(B)** and fasten by tightening the nuts **(3)**5, installing the brackets **(b)** and **(c)** between the two parts.

Tightening torque	Nm	Class
Nut	30 Nm	C

- Fasten the bracket **(c)** with the nut **(d)**.



- Apply **AREXONS 510** to the contact surface of the front gearbox housing.
- Fit the front gearbox cover **(A)**, installing the bracket **(K)** between the two parts, and fasten the entire assembly by tightening the relative screws **(36)**.

Tightening torque	Nm	Class
Nut	30 Nm	C
M10x1.25x45 screw	50 Nm	C
M8x1.25x45 screw	30 Nm	C
M8x1.25x40 screw	30 Nm	C
M8x1.25x20 screw	30 Nm	C
M8x1.25x35 screw	30 Nm	C



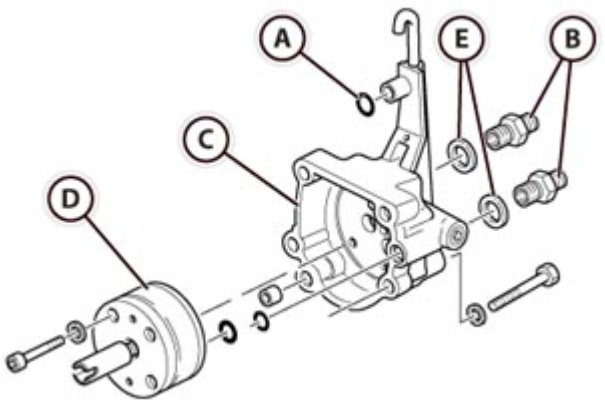
- Fit the oil seal ring **(e)** with tool **(AM 106629)**.

➢ Overhaul the differential (D2.11).

Refit the differential.

➢ Refit the complete F1 Kit (D2.13).

Gearbox oil pump components

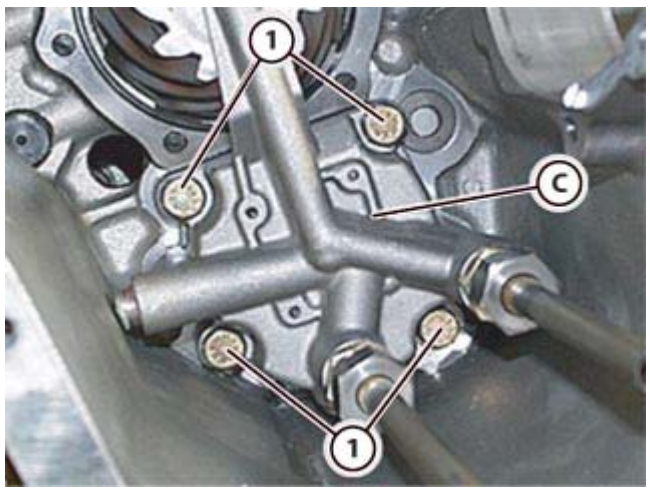


A - Secondary shaft O-ring
B - Unions
C - Pump body
D - Complete oil pump
E - Gaskets

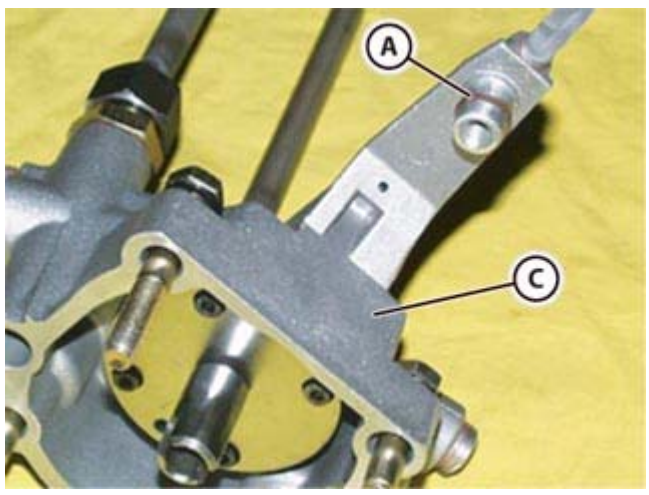
Removing the gearbox oil pump

The pump is supplied as a complete assembly and must not be dismantled.

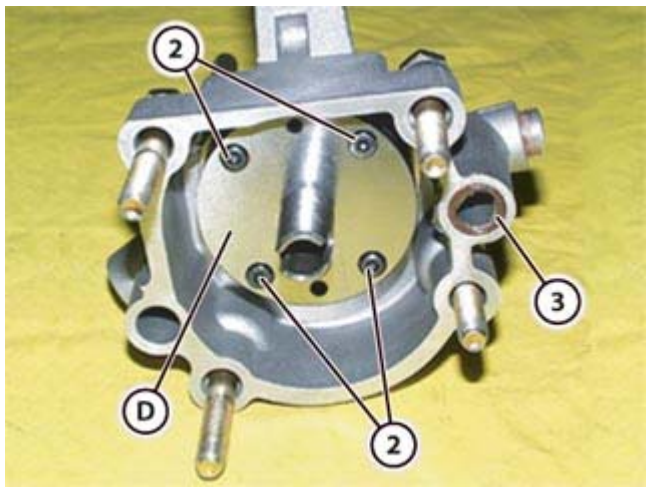
➢ Overhaul the differential (D2.11).
ℹ Remove the differential.



- Undo the four screws **(1)** fastening the pump body **(C)** to the rear gearbox housing.



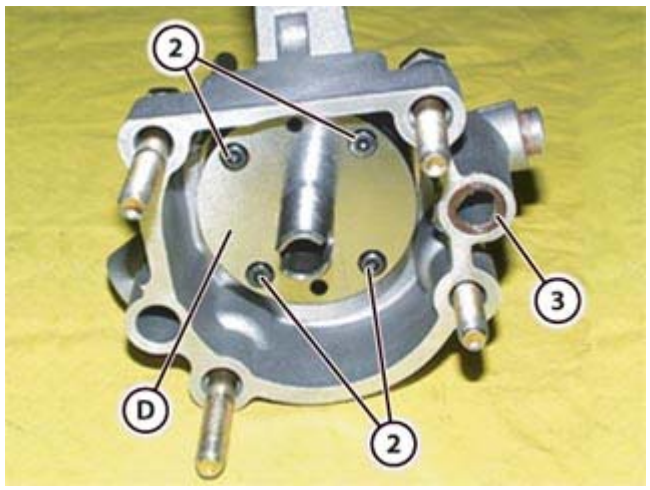
- Remove the pump body **(C)** from the rear gearbox housing, taking care not to damage the O-ring **(A)**. If necessary, replace the O-ring before reassembly.



- Undo the four screws **(2)** to remove the complete oil pump **(D)** from the pump body.
- Remove the O-ring **(3)**.

Refitting the gearbox oil pump

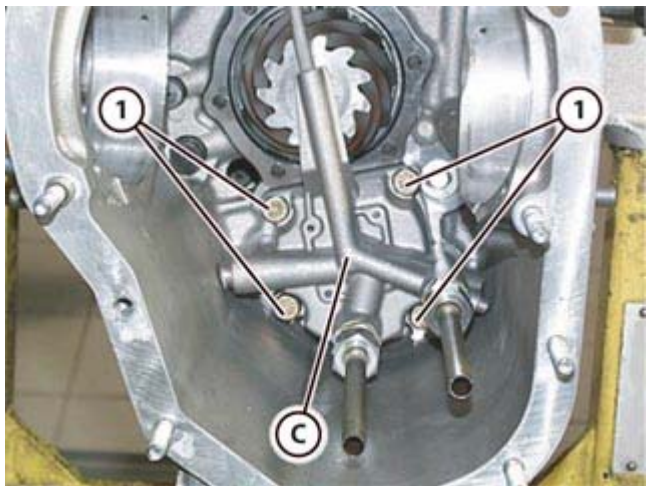
Tightening torque		Nm	Class
Oil pump - pump body	Screw	4 Nm	C
Oil pump body - 4th element	Screw	30 Nm	C



- Fit the complete oil pump **(D)** on the pump body **(C)** and tighten the four screws **(2)**.

Tightening torque	Nm	Class
Screw	4 Nm	C

- Fit a new O-ring **(3)**.

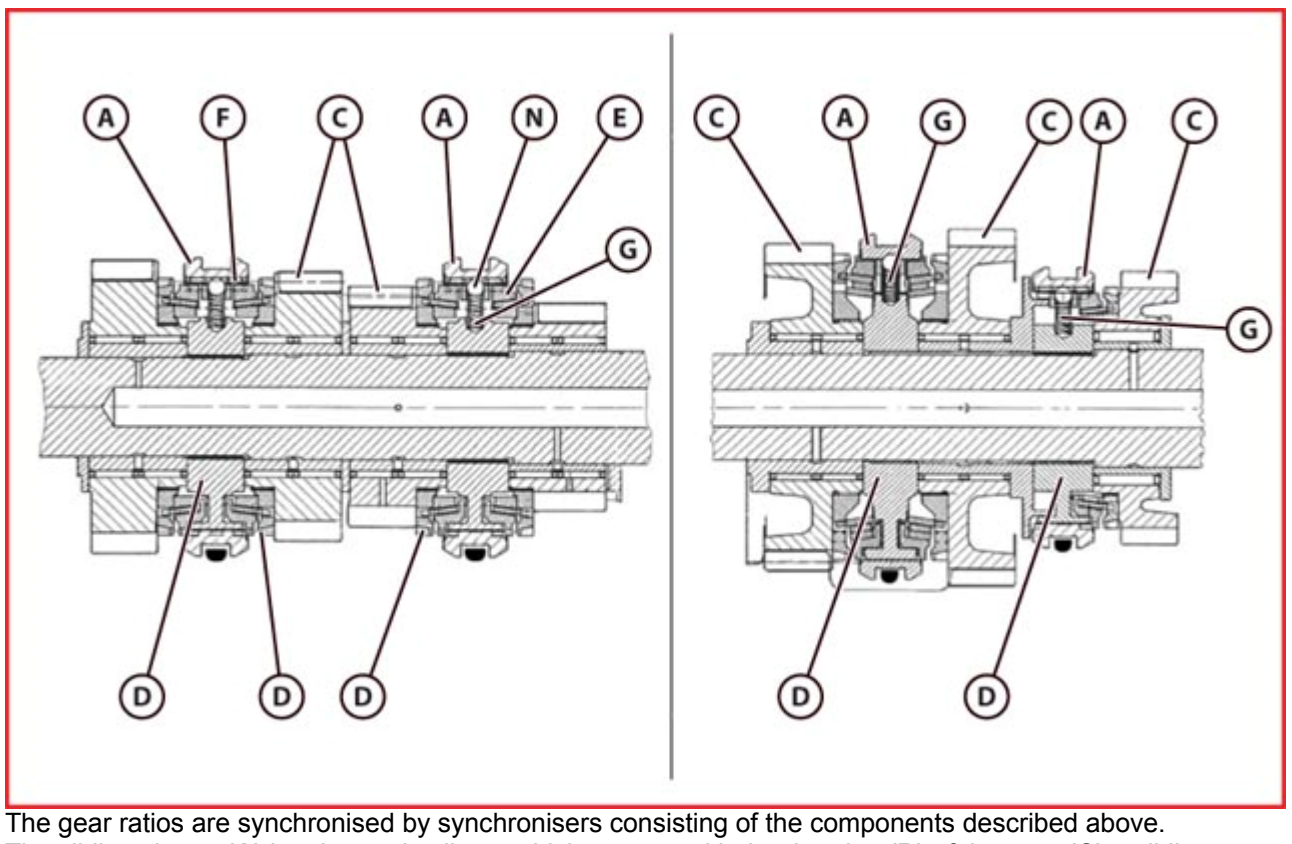


- Check that the contact surfaces between the pump and the gearbox housing are clean and free of scoring.
- Fit the pump body **(C)** on the rear gearbox housing, taking care not to the damage the inlet O-ring on the secondary shaft.
- Apply **AREXONS 242** to the threads of the four screws **(1)** and tighten.

Tightening torque	Nm	Class
Screw	30 Nm	C

➢ Overhaul the differential (D2.11).
Refit the differential.

Synchronisers



The gear ratios are synchronised by synchronisers consisting of the components described above.
The sliding sleeve **(A)** has internal splines, which engage with the dog ring **(B)** of the gear **(C)**, solidly connecting it to the synchroniser **(D)** and, as a result, to the shaft **(H)**.
Moving the sleeve **(I)** axially also slides the synchroniser ring **(E)** along, as the thrust pins **(F)**, when pushed against the ball ring and pressed into the splines of the sleeve by coil springs **(G)**, enable movement.

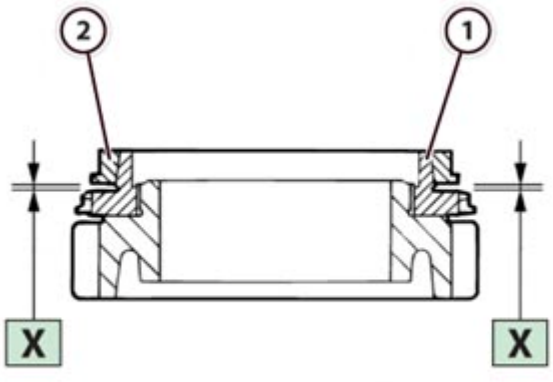
The conical surface of the synchroniser ring is therefore brought into contact with the corresponding conical surface of the dog ring.
Due to a slight angular difference between the two conical surfaces, a radial force is exerted on the gear, causing it to rotate, thus negating the difference in rotational speed between the gear ratio to be engaged and in the synchroniser or, in other terms, between the shaft and the gear.
As soon as the two components are synchronised, the sleeve shifts further and engages with the dog ring of the gear, definitively mating the gear and the synchroniser.

Check the sides of the sliding sleeves for wear and ensure that the sleeve engagement splines are free of burr, chips or excessive wear, which may impede

engagement with the idler gears.
Check that the splines on the synchronisers are undamaged.
The synchroniser rings for R, 3rd, 4th, 5th and 6th gears are similar, whereas different synchroniser rings are used for 1st and 2nd gears.

Checking synchronisers for wear

Check the wear of the reverse gear, 3rd-4th gear and 5th-6th gear synchronisers as follows.

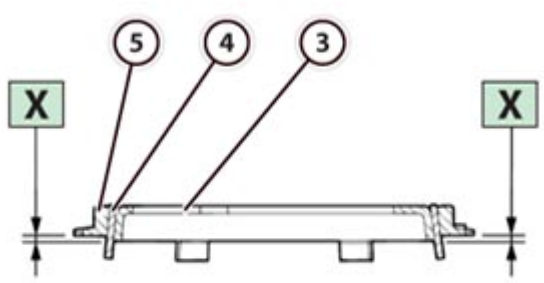


- Visually check that the male cone is not excessively worn and that there are no signs of seizure or overheating.
- Centre the synchroniser ring **(2)** with the corresponding friction cone. A difference in axial rotation speed between the two cones should cause then to engage uniformly and in perfect alignment.
- Measure, at opposite points, the distance **(X)** between the dog ring **(1)** and the synchroniser ring **(2)**.

Wear limit table

	Wear limit (X)
Reverse - 3rd - 4th gear	0.6 mm
5th - 6th gear	0.6 mm

Check the wear of the 1st - 2nd gear synchronisers as follows.



- Visually check that the male cone is not excessively worn and that there are no signs of seizure or overheating.
- Assemble a pack, centring the intermediate synchroniser ring **(4)** on the outer ring **(5)**, and fit the inner ring **(3)** into the intermediate ring, ensuring that all rings are parallel and uniformly mated. Measure the dimension **(X)** and compare with the figures in the following table.



- The figure shows an incorrectly assembled pack.



- The figure shows a correctly assembled pack.

Wear limit table

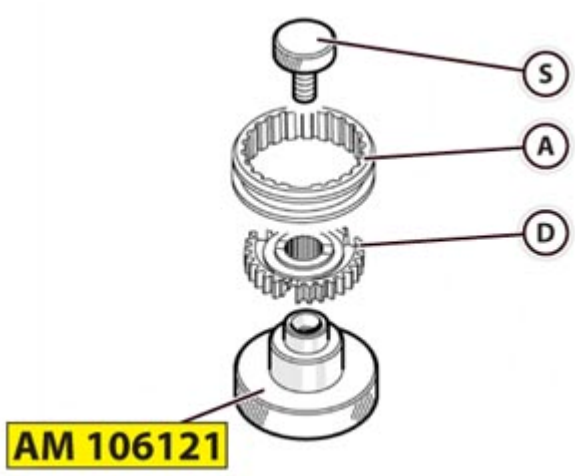
	Wear limit (X)
1st - 2nd gear	0.8 mm

- Place the assembled rings with the divergent part of the inner ring on an appropriate surface plate and, applying a light pressure to the outer ring, measure wear at opposite points.
- If the distance measured is less than the value given in the table, replace the ring with a new component

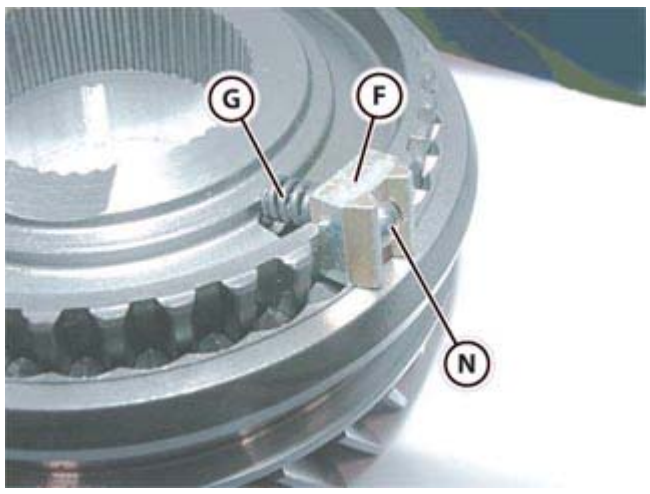
Assembling the synchroniser assembly

To refit the components of the 1st gear - 2nd gear synchroniser assembly, proceed as follows.

- Lubricate all synchroniser components and the seal rings in particular with gearbox oil before installing.

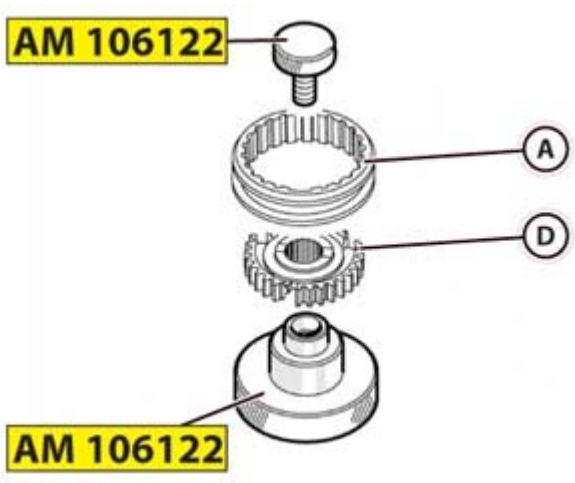


- Mount the synchroniser body **(D)** on tool **(AM 106121)** using a suitably sized pin **(S)**, and fit the sliding sleeve **(A)**.

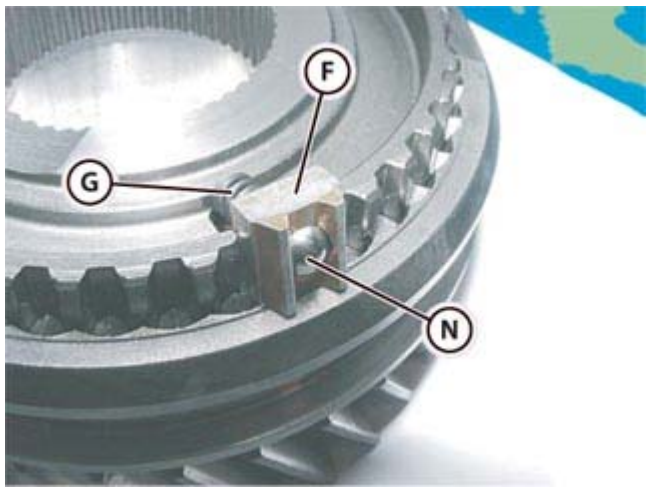


- Position the spring **(G)** and the ball **(N)** and install, together with the block **(F)**, in the relative seating as a single assembly.

- To refit the components of the reverse gear, 3rd - 4th gear and 5th - 6th gear synchroniser assembly, proceed as follows.

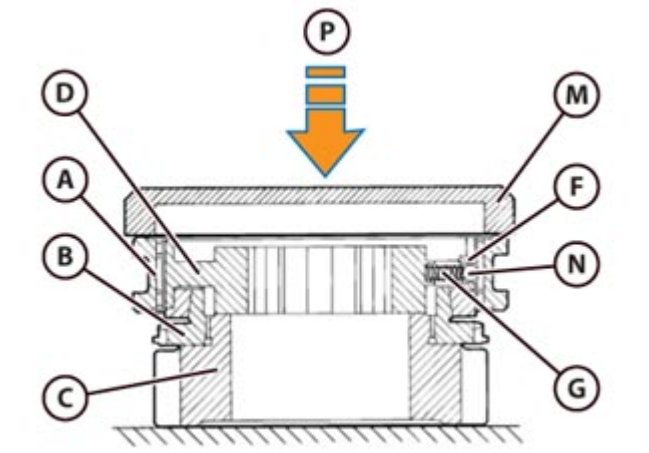


- Fit the synchroniser body **(D)** on the lower element of tool **(AM 106122)** and install the sliding sleeve **(A)**.
- Secure in position with the lower element of tool **(AM 106122)**.



- Position the spring **(G)** and the ball **(N)** and install, together with the block **(F)**, in the relative seating as a single assembly.

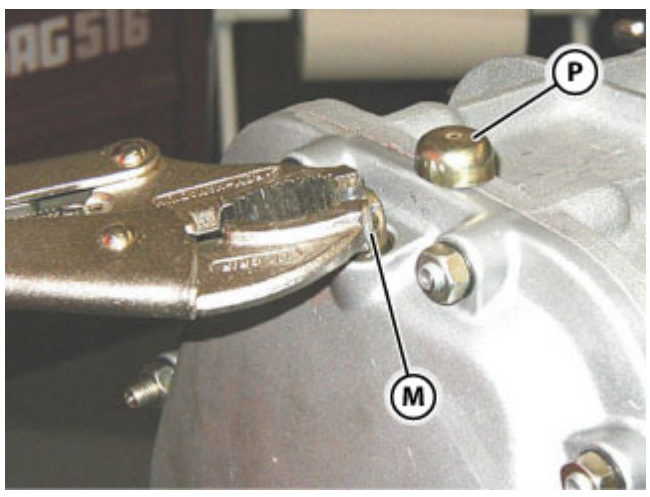
Checking the axial load of the synchronisers



- Check that the synchroniser assembly load **(P)** is correct.
- The load must be measured from both sides.
- Place the synchroniser-gear assembly on a horizontal surface and fit the cup tool **(M)** at the top of the assembly, on the upper edge of the sliding sleeve **(A)**.
- Position the synchroniser ring **(D)** so that the sleeve coupling teeth engage smoothly with the teeth of the dog ring **(B)** on the gear.
- Load the sleeve uniformly until it releases and engages with the dog ring on the gear.
- If the specified load **(P)** is not reached, the springs **(G)** are probably pressing on the counter balls **(N)**, meaning that the springs must be replaced.
- As a guideline, always replace the springs when overhauling.

Water tightness test

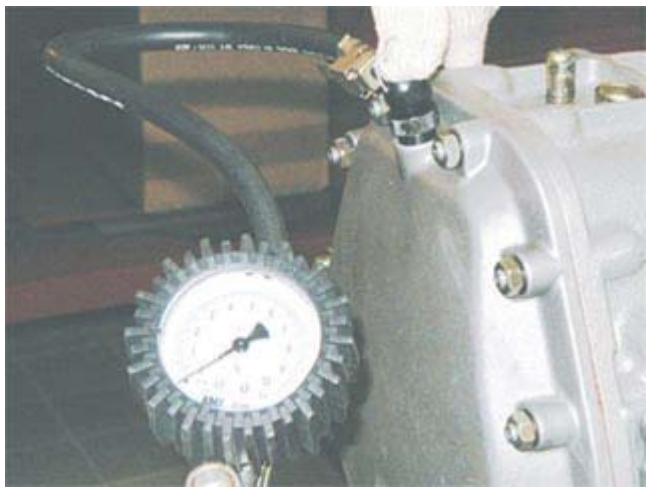
To check for leaks, a tightness test may be performed on the gearbox housing while it is still completely assembled.



- Seal all apertures.
- Remove the protective cover **(P)** and, using pliers, undo the cap **(M)** from the rear cover.



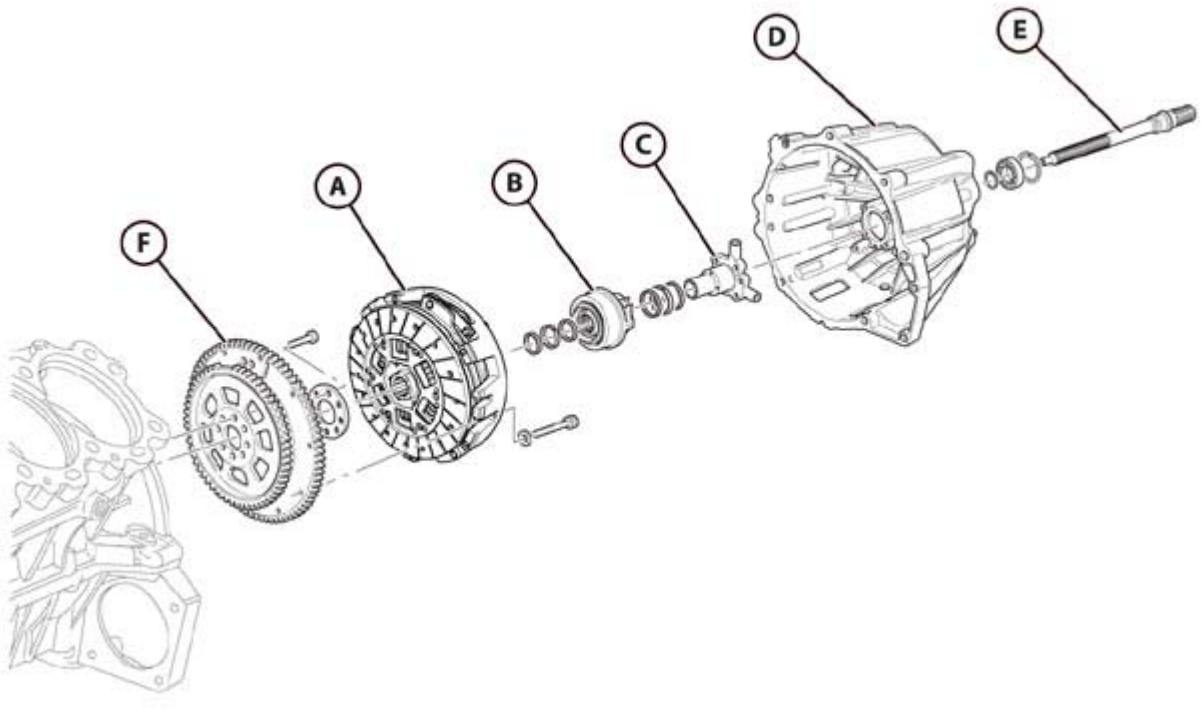
- Fit tool **(AV 3283)**, for filling with air, into the orifice.



- Using a standard inflation pump or compressor equipped with a precision manometer, fill with air to a pressure of **0.3 bar**.
- Check for leaks from the gearbox housing using the leak detector spray. If any leaks are found, replace the external seal rings and/or check that the covers and housings are correctly mated.

D2.04 Replacing the clutch components

Clutch components



A - Double plate clutch
B - Thrust bearing
C - Flange
D - Clutch housing
E - Shaft
F - Flywheel

Check of clutch condition (F1 vehicles)

After a failure related to the clutch, carry out the following procedures:

- Connect the SD3 tester to the diagnostic socket (L2.12).
- **1)** Read the following parameters on the SD-3 and then print them: **% of wear, PIS, Wear Index, EVF valve ON/OFF leakage, Clutch overtemperature time**.

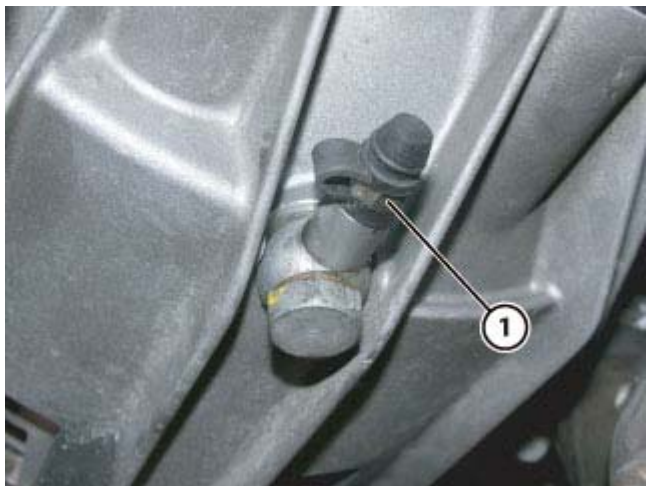
- Bleed the clutch system (D2.14).
- **2)** Press the special "SELF-ACQUISITION" button on the SD-3 to perform the following self-acquisition cycles: **DEIS parameter self-calibration, Resetting of wear index, PIS calculation**.

When the DEIS is being performed, the SD-3 diagnostic tester asks if the clutch is **NEW (less than 5000 km)**, or **USED (more than 5000 km)**. If the clutch has more than 5000 km the DEIS is still performed but the SD-3 does not perform any checks.

- **3)** Use SD-3 to perform the on-road guided procedure for self-acquisition of the Wear Index.
- **4)** Perform a road test for a functional check.
- **5)** If there are problems, repeat this procedure from **"Bleeding the clutch system"** to point **4**.
- **6)** If the problems have not been solved, remove the clutch as indicated below.
- Remove the complete clutch (D2.04).
- **7)** Send the component to Ferrari.

Clutch thrust bearing functional checks

The following operation must be performed with the clutch housing removed from the vehicle and only in the event of clutch assembly malfunction.



- Clean/degrease the union and the bleeder screw with a suitable degreasing product (which must not leave residue) to prevent contamination of the hydraulic circuit.

The entire procedure described as follows must be performed with the bleed screw removed from the relative connector block.

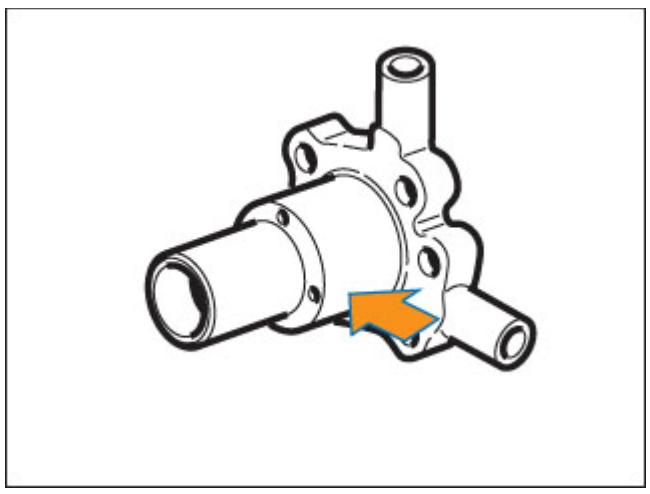
- Remove the bleeder screw **(1)** from the relative union.

- Remove the clutch thrust bearing unit (D2.04).

Remove the clutch thrust bearing only.



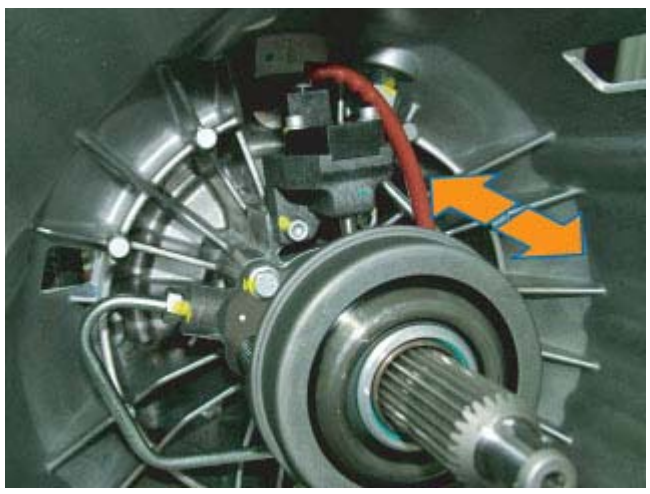
- Clean/degrease the inside of the thrust bearing with a suitable degreasing product (which must not leave residue).



- Visually check the state of roller contact surface on the flange: note any scoring, abrasion or damage.
- If any faults are discovered during visual inspection, carry out the following procedure or replace the bearing seal rings/pads, remove the thrust bearing flange and send to Ferrari.
- Clean/degrease the roller contact surface of the flange with a suitable degreasing product (which must not leave residue).

- Refit the clutch thrust bearing assembly (D2.04).

Refit the thrust bearing only.



- Repeatedly move the thrust bearing by hand to ensure that it functions correctly; from the fully depressed position, the thrust bearing must be returned to its rest position on the studs by the action of the springs when released.

A slight jerkiness is normal.

- If the thrust bearing does not behave as described above, remove again and send to Ferrari without dismantling or tampering.
- If the fault has been resolved, refit the components removed as follows.



- Refit and tighten the bleeder screw **(1)** onto the relative union.

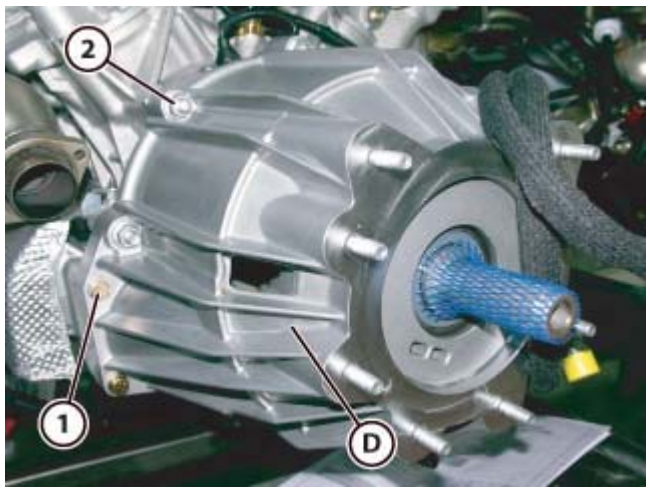
Clutch housing removal

The following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.

➢ Remove the exhaust branching (B6.06).

Remove both.

➢ Remove the gearbox-differential assembly (D2.01).

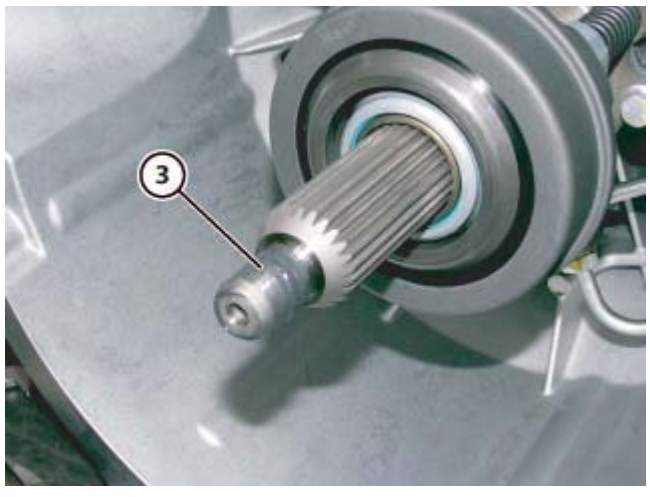


- Undo the three screws **(1)** fastening the clutch housing **(D)** to the starter motor.
- Undo the five nuts **(2)** fastening the clutch housing **(D)** to the engine.
- Ease off and remove the clutch housing **(D)** from the engine.

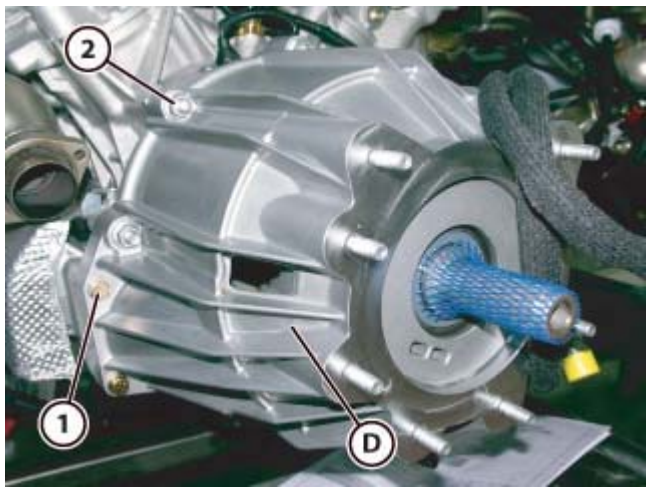
Refitting the clutch housing

Tightening torque		**Nm**	**Class**
Clutch housing - engine	Nut	60 Nm	A
Clutch housing - starter motor	Screw	25 Nm	A

The following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.



- Apply grease **MOLYKOTE BR2** to the end of the shaft **(3)** and fit the clutch housing in its relative seat on the engine.



- Tighten the five nuts **(2)** fastening the earth braid, as originally installed.

Tightening torque	**Nm**	**Class**
Nut	60 Nm	A

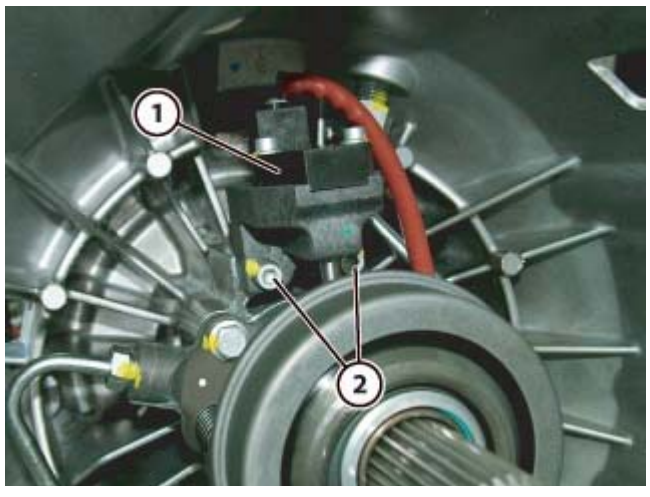
- Fasten the clutch housing **(D)** to the starter motor by tightening the three screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	A

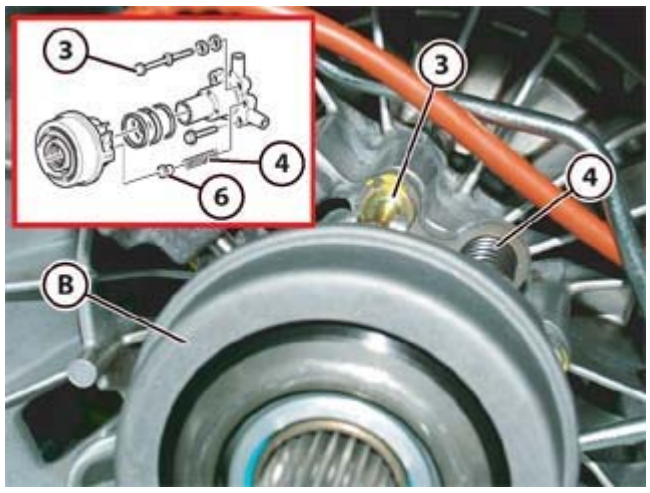
➢ Refit the complete gearbox-differential assembly (D2.02).
➢ Refit the exhaust branching (B6.06).

Removing the clutch thrust bearing unit

➢ Remove the clutch housing (D2.04).

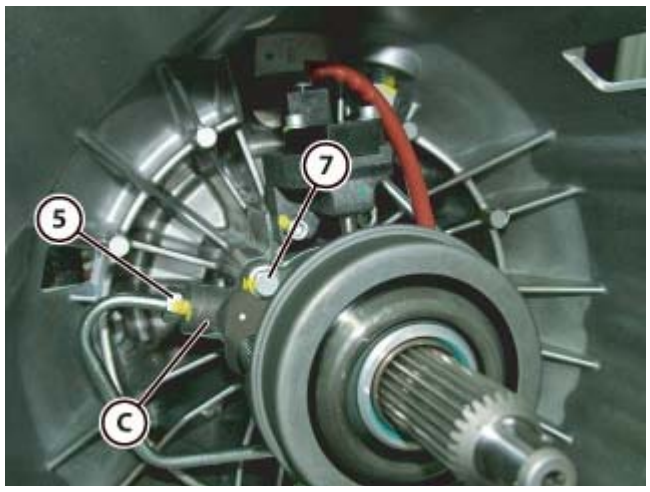


- To remove the clutch sensor and bracket on versions with electronically controlled gearbox **(1)**, unscrew the two screws **(2)**.



In the event of thrust bearing problems, the thrust bearing must be replaced complete with seal rings (for more information, see I.T. 1602, January 2008).
DO NOT remove the seal rings from the replaced thrust bearing.

- Unscrew the two travel limiter stud bolts **(3)** and forcefully remove the thrust bearing **(B)**, retrieving the springs **(4)** and relative shims **(6)** (if present).

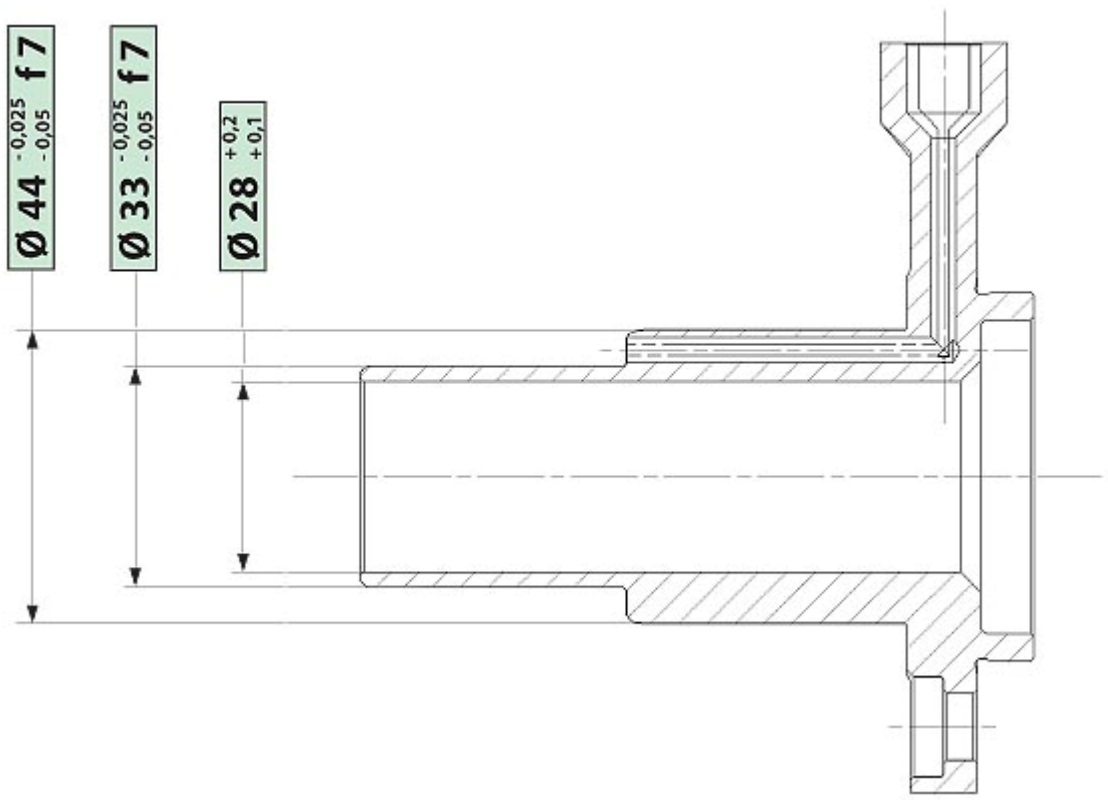


- Unscrew the two unions **(5)** and remove the relative oil pipes from the flange **(C)**.

Note that the image shows the clutch with the thrust bearing and sensor still installed.

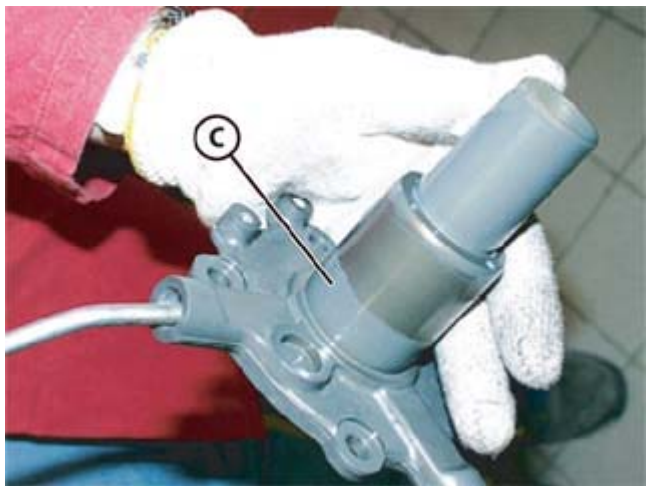
- Unscrew the two screws **(7)** and remove the flange **(C)** from the clutch housing

In the event of oil leakage from the system, check that the dimensions measured on the flange are within tolerance, using the following images as references.

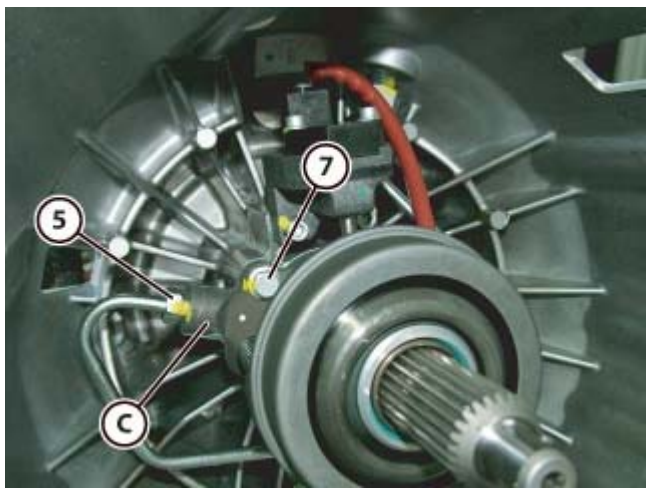


Refitting the clutch thrust bearing assembly

Tightening torque		**Nm**	**Class**
Flange - clutch housing	Screw	18 Nm	B
Thrust bearing actuator control pipes - flange	Union	23 Nm	B
Stud bolt - hydraulic control flange	Stud bolt	18 Nm	B



- Blow compressed air into the oil distribution orifice in the flange **(C)** to clean the channels and to check for obstruction.



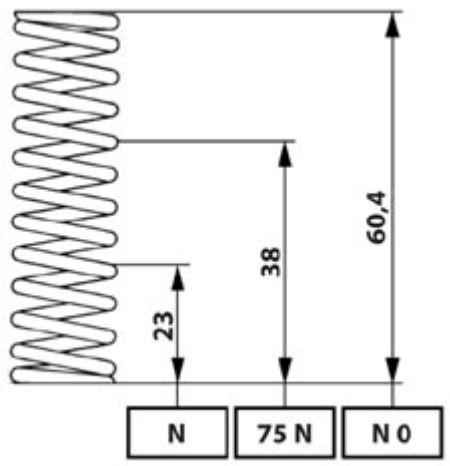
- Fit the flange **(C)** in its relative position on the clutch housing and fasten with the two screws **(7)**.

Note that the photograph was taken with the clutch thrust bearing and sensor already fitted.

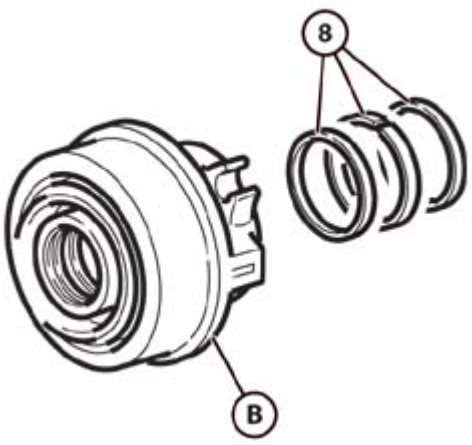
Tightening torque	Nm	Class
Screw	18 Nm	B

- Apply a thin layer of the same oil used in the circuit onto the roller contact surface of the flange.
- Fit the oil pipes on the flange **(C)** and tighten the two unions **(5)**.

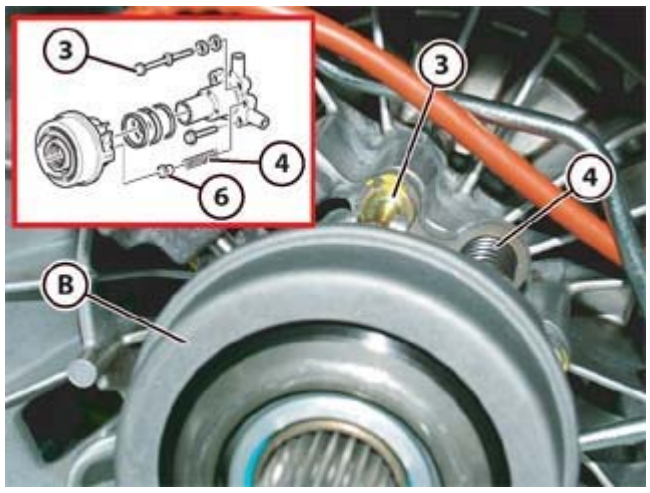
Tightening torque	Nm	Class
Union	23 Nm	B



- Before refitting the thrust bearing, check that the two springs are intact.

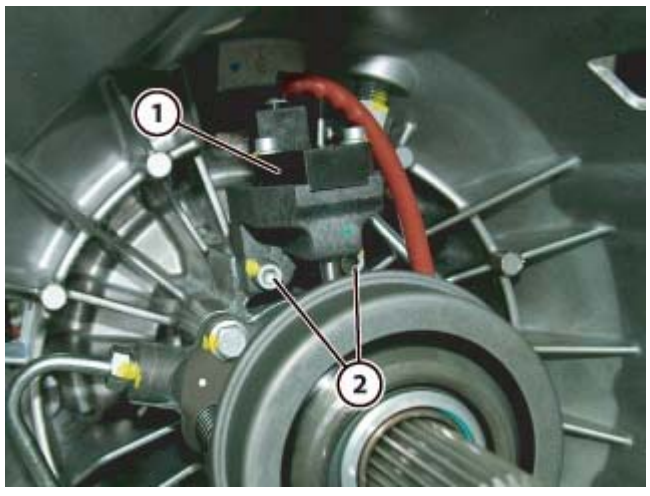


- Also check that the seal rings **(8)** inside the thrust bearing **(B)** are intact;
- Lubricate the seal rings **(8)** generously with the same oil used in the circuit.



- Fit the two springs **(4)** with relative spacers **(6)** (if present) in the seats on the flange.
- Fit the thrust bearing **(B)** against the springs on the flange.
- ALWAYS apply **CAF 4** sealant paste to the threads of the two thrust bearing lateral travel stud bolts **(3)**.
- Insert the two stud bolts **(3)** into the guides on the thrust bearing **(B)** and fasten to the flange.

Tightening torque	Nm	Class
Stud bolt	18 Nm	B

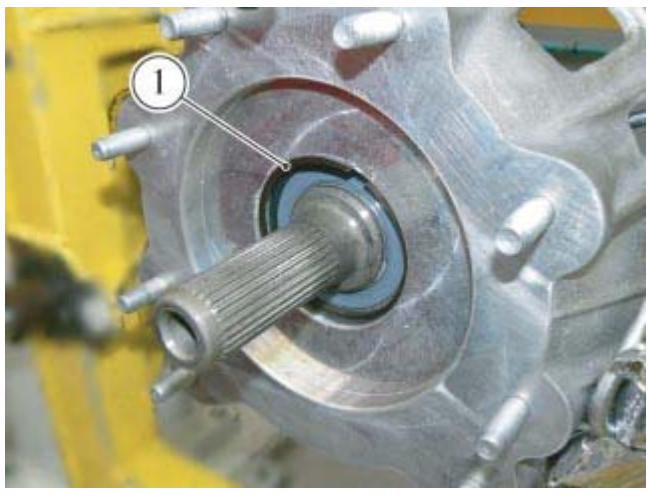


- Fit the clutch sensor **(1)** and bracket on the clutch housing, and fasten with the two screws **(2)**.
- Check that the thrust bearing moves correctly by pushing the thrust bearing a number of times towards the clutch housing and letting it spring back to its rest position.

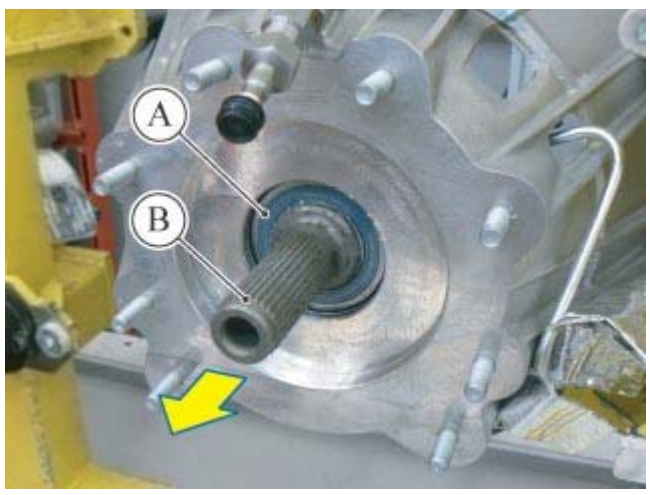
➢ Refit the clutch housing (D2.04).

Replacing the clutch shaft support bearing

➢ Remove the clutch housing (D2.04).

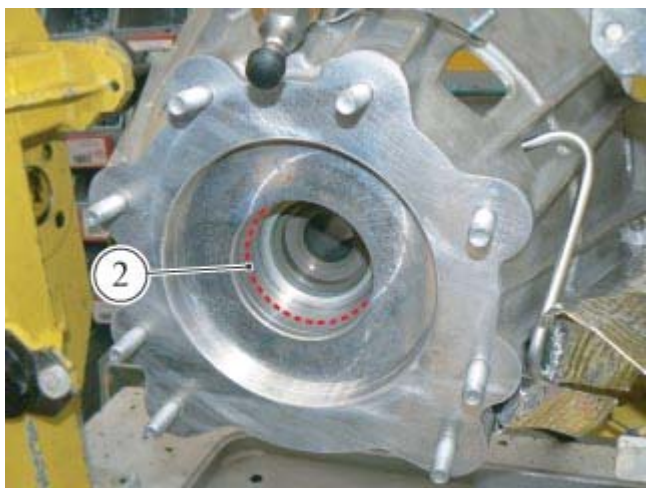


- Prise the snap ring **(1)** out of its seat.

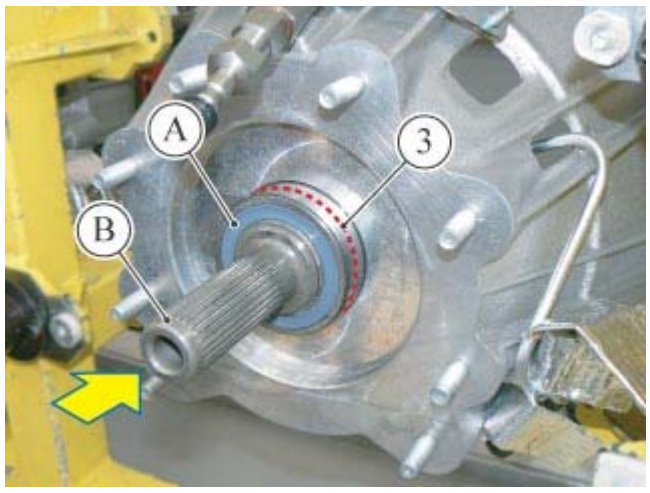


- Extract the clutch shaft **(B)**, tapping in the direction indicated with an appropriate plastic mallet.

- Remove the Seeger ring retaining the clutch shaft support bearing from the clutch shaft.
- Using appropriate tools, remove the clutch shaft support bearing from the clutch shaft.
- Clean the surface of the bearing seat on the clutch housing with solvent.
- Clean the outer surface of the bearing with solvent, taking great care not to allow solvent into the bearing races.

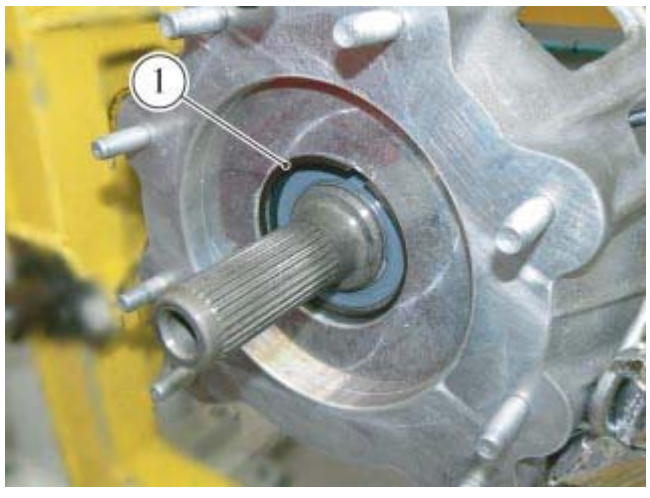


- Chase the surface of the bearing (make five or six indentations with a maximum depth of **0.5 mm**) using the punch (USAG 368).
- Apply a continuous bead **(2)** of **Loctite 638** over the entire circumference of the bearing seat on the clutch housing.



- Install the new clutch shaft support bearing **(A)** on the clutch shaft **(B)** and refit the relevant retainer Seeger ring previously removed.
- Apply a continuous bead **(3)** of **Loctite 638** over the entire circumference of the outer surface of the new clutch shaft support bearing **(A)**.
- Fit the clutch shaft **(B)** complete with new clutch shaft support bearing **(A)** in its seat on the clutch housing, tapping in the direction indicated with an appropriate plastic mallet.

- Clean the seat on the clutch housing and the clutch shaft support bearing to remove any excess of **Loctite 638**, without using solvent.
- Check that the clutch shaft support bearing turns freely.



- Refit the snap ring **(1)**, pressing correctly into its seat on the clutch housing.

- Note vehicle chassis Nr. and mileage and send to Ferrari.

➢ Refit the clutch housing (D2.04).

Removing the complete clutch

The following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.

➢ Remove the clutch housing (D2.04).



- Fit the tool **(900026250)**and undo the nine screws fastening the clutch **(A)** to the flywheel.

i We recommend marking the position of the clutch relative to the flywheel, to aid reinstallation in the original position.

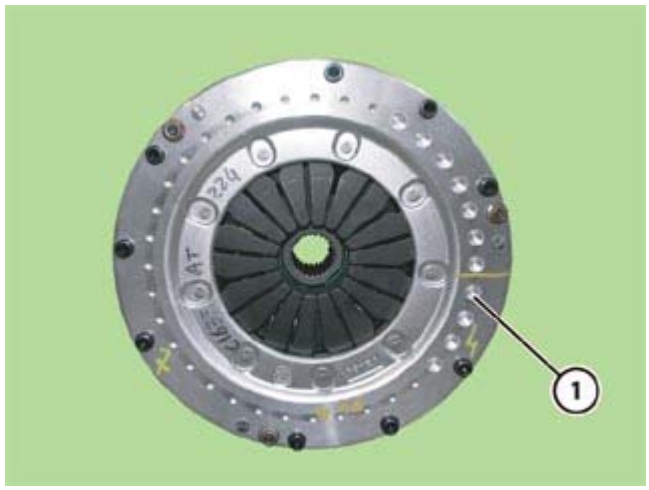
- Remove the complete clutch from the engine.
- Check that the clutch adjustment gap is between **(48.3 and 51.7 mm)** to ensure correct clutch operation and durability.
- Check that wear over the entire clutch plate surface is even and not excessive.

Refitting the complete clutch

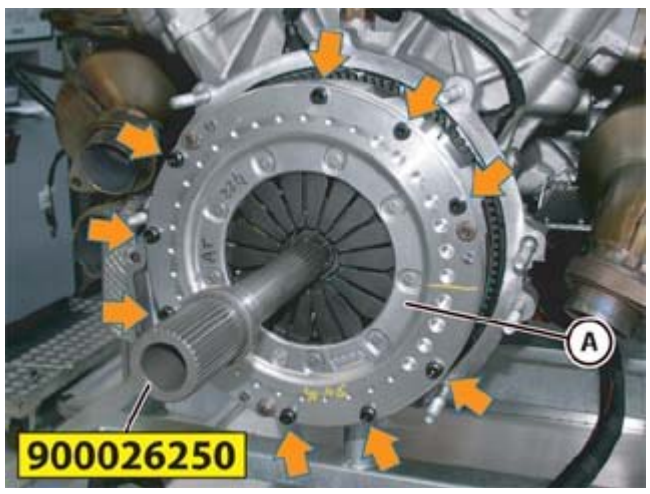


Tightening torque		**Nm**	**Class**
Double disc clutch - flywheel	Hand tightening	4 Nm	B
	Screw	18 Nm	B

The images given aside show the engine removed from the vehicle. However, the operation may also be performed with engine in the vehicle.

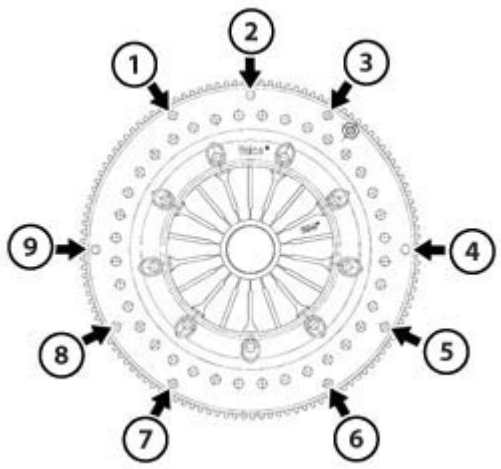


- When replacing the complete clutch, check that the clutch has been balanced with holes **(1)** bored into the outer part of the clutch.



- Using the tool **(900026250)**, fit the complete clutch **(A)** and fasten onto the flywheel, using the markings made previously as reference and hand tightening all the screws.

When fitting a new clutch assembly, place the clutch so that the part with the paint mark (point of maximum imbalance) is diametrically opposed to the maximum imbalance marking on the flywheel.



- Tighten the clutch fastener screws (identified by sequential numbers in the figure) in the following steps:
- **Snug** the screws lightly, starting from the lowest screw and proceeding in the following sequence:
- **a** - screws **(1)**, **(4)**, **(7)**
- **b** - screws **(2)**, **(5)**, **(8)**
- **c** - screws **(3)**, **(6)**, **(9)**

		
Tightening torque	**Nm**	**Class**
Hand tightening	4 Nm	B

- **Tighten** the screws in the following sequence:
- **a** - screws **(7)**, **(1)**, **(4)**
- **b** - screws **(8)**, **(2)**, **(5)**
- **c** - screws **(9)**, **(3)**, **(6)**

		
Tightening torque	**Nm**	**Class**
Screw	18 Nm	B

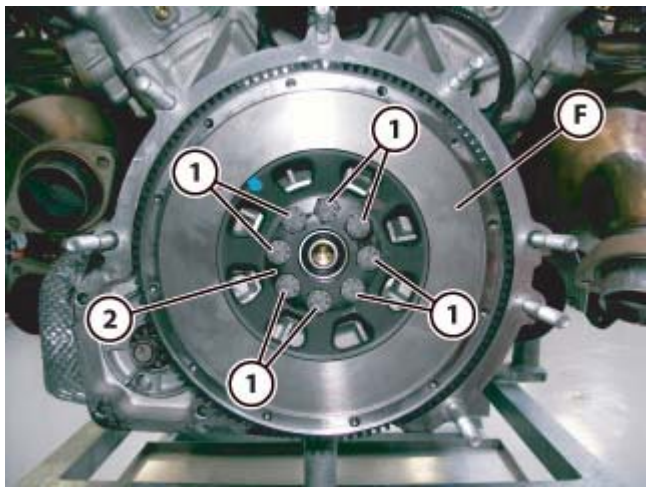
➢ Refit the clutch housing (D2.04).
➢ After replacing the clutch in an "F1" vehicle, perform the **"Calibrating the gearbox"** specifications described in chapter "**D2.15 _ Calibrating the electronically-controlled gearbox.**".

Removing the flywheel

The images given aside show the engine removed from the vehicle. However, the operation may also be performed with engine in the vehicle.

➢ Remove the clutch housing (D2.04).
➢ Remove the complete clutch (D2.04).

- Immobilise the crankshaft with a wrench applied to the screw fastening the torsion damper.



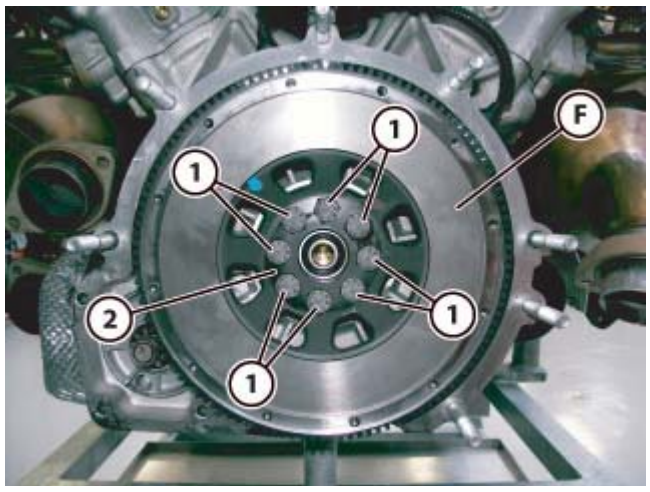
- Undo the eight screws **(1)** fastening the flywheel **(F)** to the crankshaft, retrieving the washer **(2)**.
- Remove the flywheel **(F)** from the engine.

Refitting the flywheel

Tightening torque		Nm	Class
Fastening flywheel - crankshaft	Screw	91 Nm	A

The following images show the engine on the test bench, but the operation may also be carried out with the engine mounted in the vehicle.

- Check the clutch contact surface on the flywheel.
- Check that the flywheel surface is flat and in good condition with no warping or scoring.
- When fitting a new flywheel, check that it has been balanced correctly.



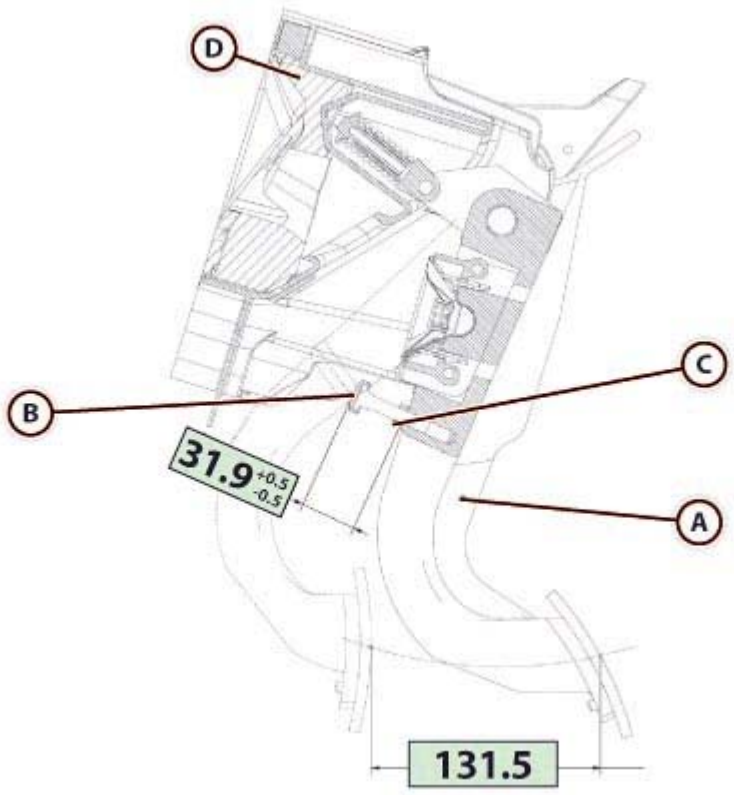
- Fit the flywheel **(F)** on the engine, apply the washer **(2)**, and tighten the eight screws **(1)**.
- Immobilise the crankshaft as during removal and tighten the eight screws **(1)**.

Tightening torque	Nm	Class
Screw	91 Nm	A

- Refit the complete clutch (D2.04).
- Refit the clutch housing (D2.04).

D2.05 Adjusting the clutch pedal travel

Clutch pedal



A - Pedal
B - Adjustment screw
C - Adjustment screw check nut
D - Pedal board

In this clutch, the thrust bearing is in permanent contact, receding as the clutch disc wears out.
The clutch is hydraulically operated and requires no adjustment.

Adjusting clutch pedal travel

Tightening torque		**Nm**	**Class**
Clutch pedal adjuster screw	Checknut	4.4 Nm	B

The clutch pedal release stroke, measured at the centre line of the footrest plate, must be 131.5 mm.



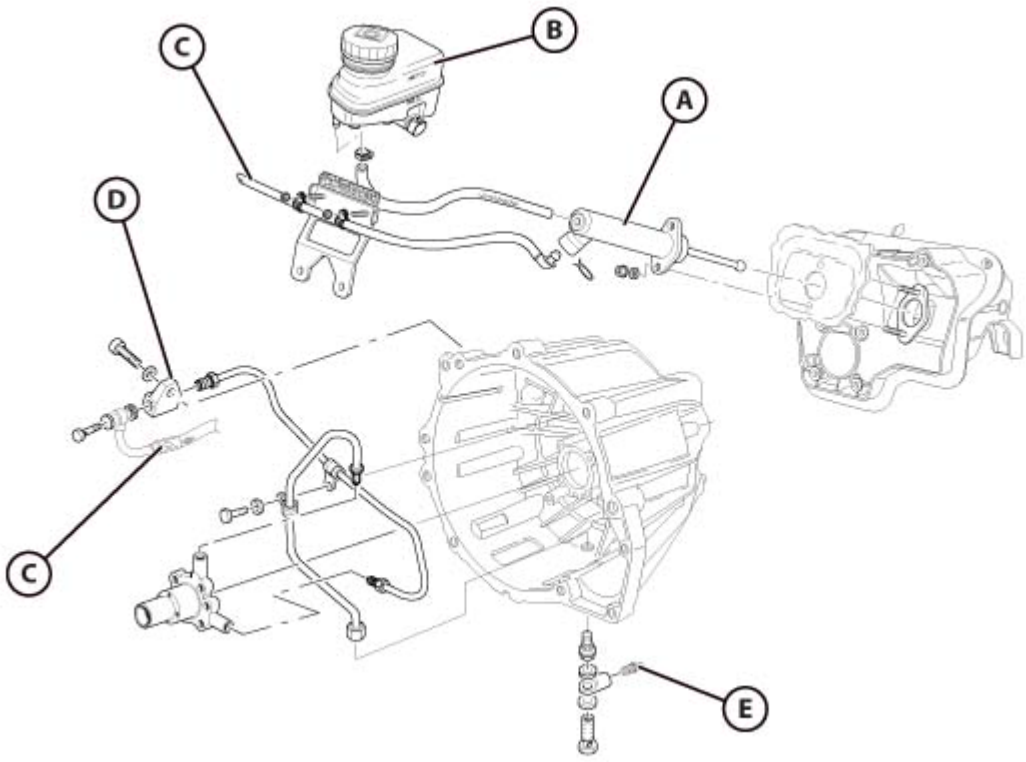
- Undo the check nut **(C)**.
- Set the adjusting screw **(B)** at the position indicated.
- Tighten the check nut **(C)** on the adjusting screw **(B)**.

Tightening torque	**Nm**	**Class**
Checknut	4.4 Nm	B

- Check that the clutch pedal travel is **131.5 mm**.

D2.06 Clutch cylinder

Hydraulic clutch disengagement control system components



A - Clutch cylinder
B - Clutch/brake fluid tank
C - Clutch control pipe from clutch pump
D - Union block
E - Bleed screw

As the clutch is hydraulically controlled, no adjustment is necessary.
If excessive free play is noted between the clutch pedal and the relative mounting pin on the pedal board, replace the clutch pedal.

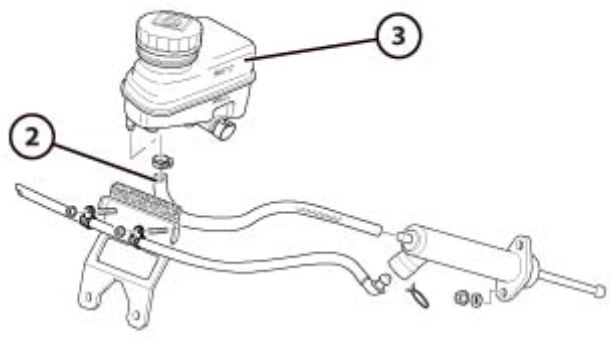
Removing the clutch pump (mechanical gearbox)

➢ Remove the left hand side windscreen shield (M2.17).

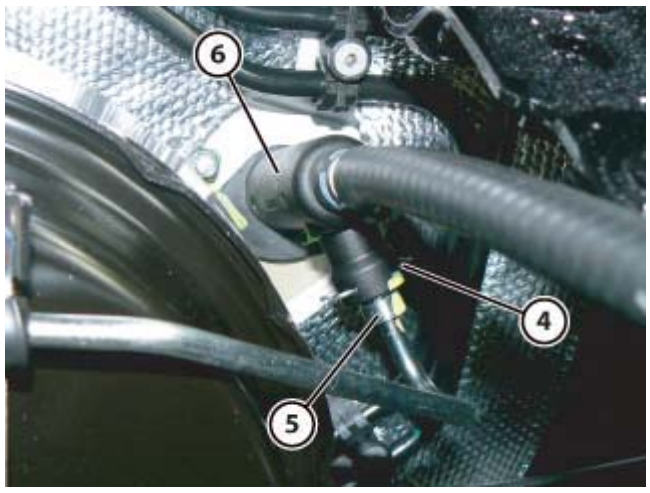


- Working from underneath the steering column, detach the clutch pump rod from the retainer **(1)** on the clutch pedal.

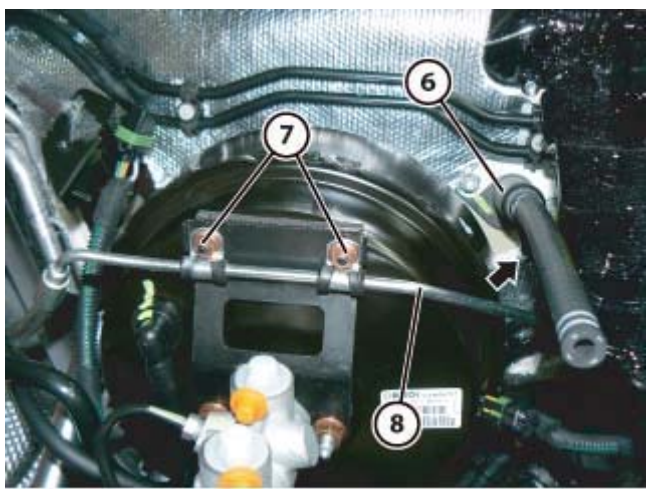
The pedal is shown removed from the vehicle in this image for a clearer view of the retainer.



- Remove the connector pipe **(2)** from the brake fluid tank **(3)**, detaching the relative clamp and plugging the union on the fluid tank.

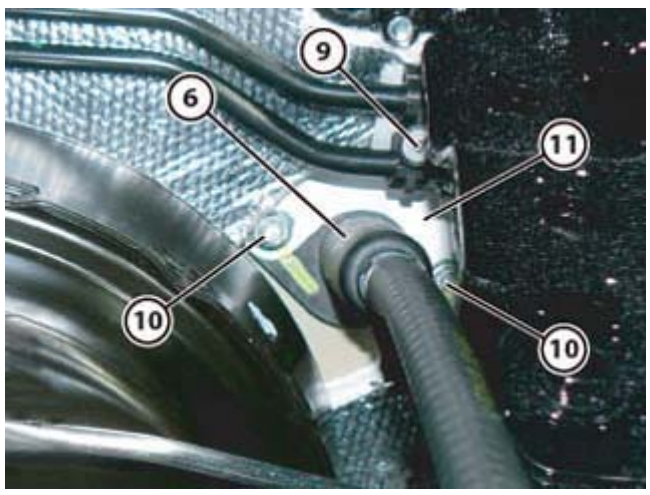


- Remove the cotter pin **(4)** fastening the clutch pipe union **(5)** to the clutch pump **(6)**.



- Undo the two nuts **(7)** and shift the pipe **(8)**, removing from the clutch pump **(6)**.

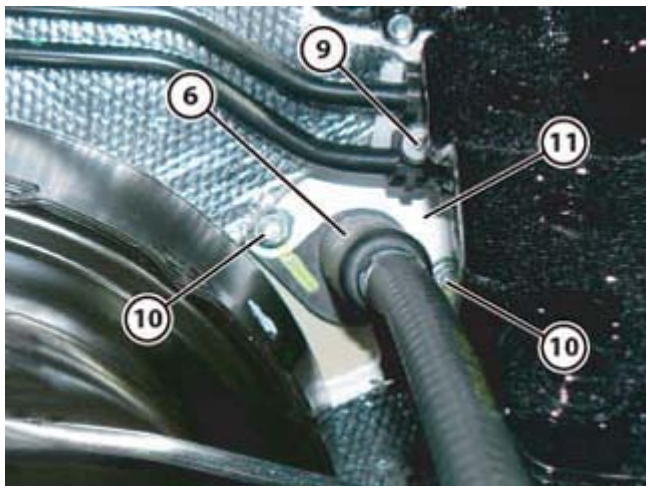
i To illustrate the operation more clearly, the brake fluid tank is not shown in this picture.



- Undo the screw **(9)** fastening the fuel pipes to the mounting plate **(11)**.
- Undo the two nuts **(10)** fastening the clutch pump to the firewall.
- Remove the mounting plate **(11)** from the stud bolts, then remove the clutch pump **(6)**.

Refitting the clutch pump (mechanical gearbox)

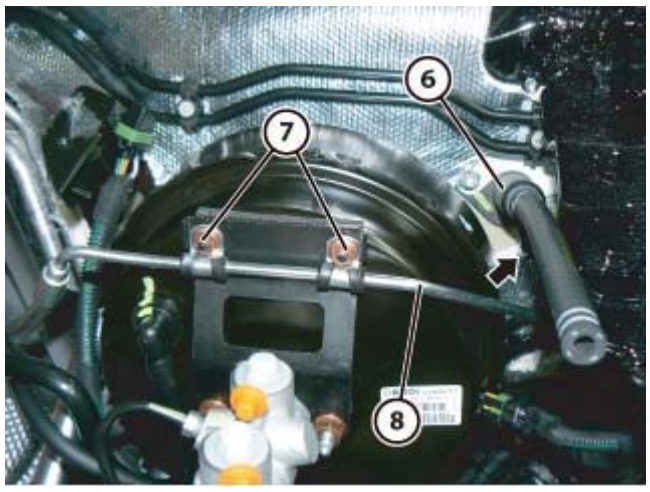
Tightening torque		**Nm**	**Class**
Clutch pump - firewall	Nut	20 Nm	B



- Fit the clutch pump **(6)** in its relative mounting on the firewall, fit the mounting plate **(11)** onto the stud bolts and fasten the whole assembly by tightening the two nuts **(10)**.

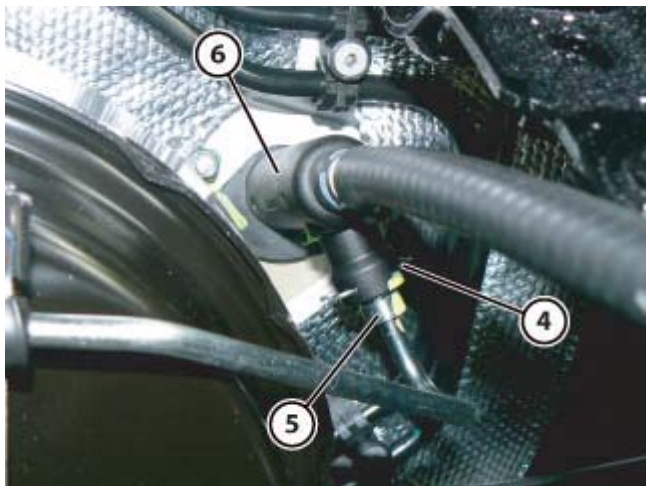
Tightening torque	**Nm**	**Class**
Nut	20 Nm	B

- Fit the fuel cable retainer clip and fasten to the mounting plate **(11)** with the screw **(9)**.

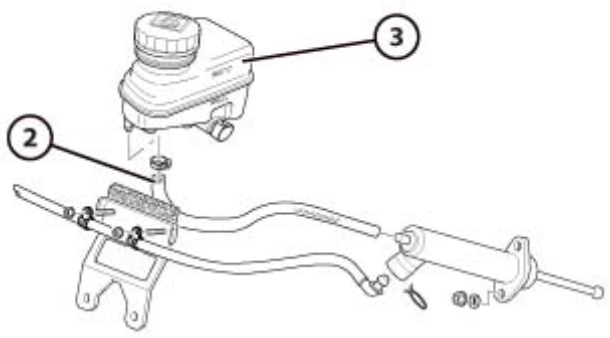


- Fit the pipe union **(8)** into the relative mounting on the clutch pump **(6)** then fasten the tube to the mounting bracket with the two nuts **(7)**.

To illustrate the operation more clearly, the brake fluid tank is not shown in this picture.



- Check that the union **(5)** is correctly installed in the relative mounting on the clutch pump **(6)**, then fit the cotter pin **(4)**.



- Fit the connector pipe **(2)** on the brake fluid tank **(3)** and fasten with the clamp.



- Depress the clutch pedal to engage the clutch pump rod with the fastener **(1)** on the pedal.

The pedal is shown removed from the vehicle in this image for a clearer view of the fastener.

- Bleed the clutch system (D2.14).
- Refit the left hand side underwindscreen shield (M2.17).

D2.07 Replacing the gear lever housing and control lever

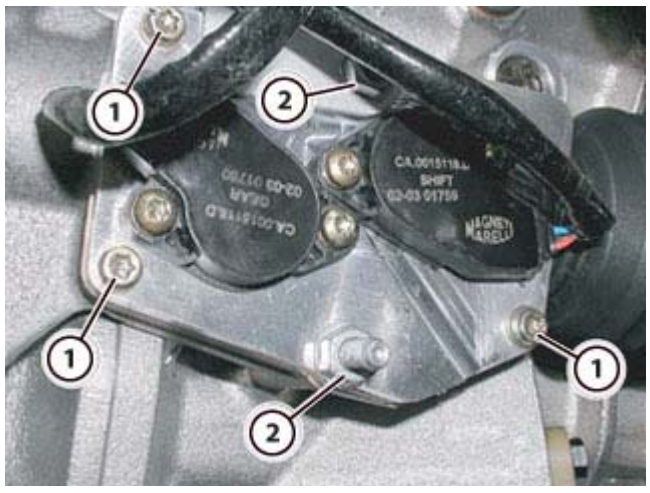
In preparation

- In preparation

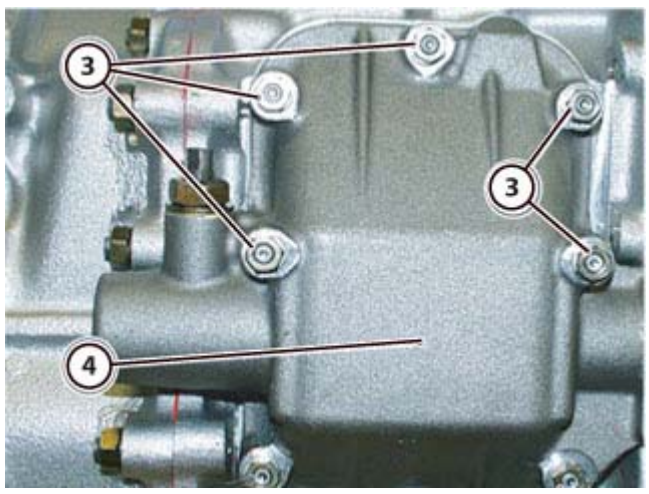
D2.08 Gearbox side cover

Removing the lateral gearbox cover

- Drain the gearbox-differential lubrication system (A3.02).
- Perform the procedure to lock the Gearbox/F1 Kit in neutral between 3rd and 4th gear (D2.13).



- Undo the three screws **(1)** and the two nuts **(2)** fastening the position and gear engagement sensor plate.
- Detach the two connectors that connect the sensors to the system.

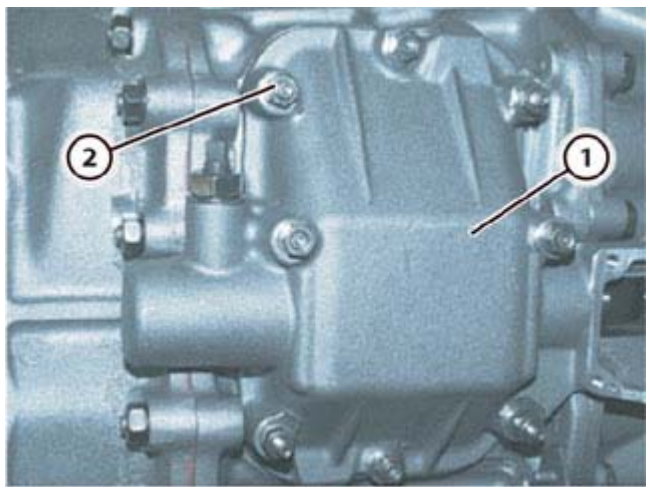


- Unscrew the eight nuts **(3)** fastening the lateral cover to the gearbox.
- Remove the lateral cover **(4)** complete with sensor mounting plate.

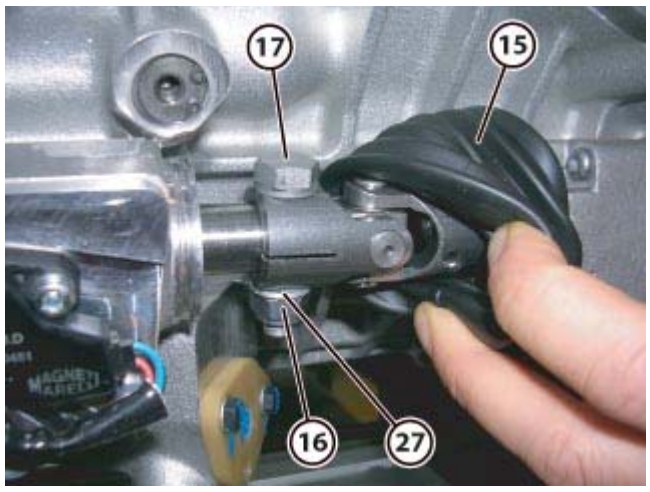
Refitting the gearbox side cover

Tightening torque		Nm	Class
Side cover	Nut	10 Nm	C
Actuator - gearbox rod	Screw	34 Nm	A
Selector shaft retainer dowel	Nut	10 Nm	C
Gearbox subframe - chassis	Screw	25 Nm	B
Gearbox mounting bushing - chassis	Screw	50 Nm	C

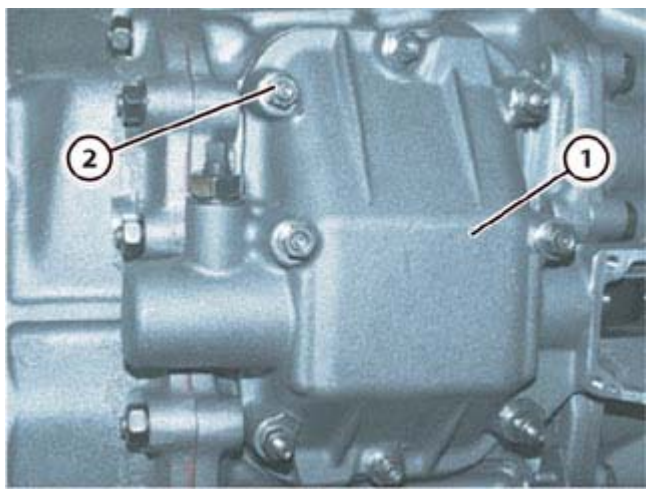
- Thoroughly clean and degrease the mating surfaces between the gearbox and the side cover.
- Check that the forks are properly aligned.
- Apply **AREXONS 510** onto the mating surface of the gearbox housing.



- Fit the lateral cover **(1)** on the gearbox, engaging the gear selector shaft first with the actuator universal joint.
- Fit the lateral cover **(1)** on the central gearbox housing.
- Tap the cover with a plastic mallet to bring it flush with the box.
- Hand tighten the eight nuts **(2)** fastening the cover.

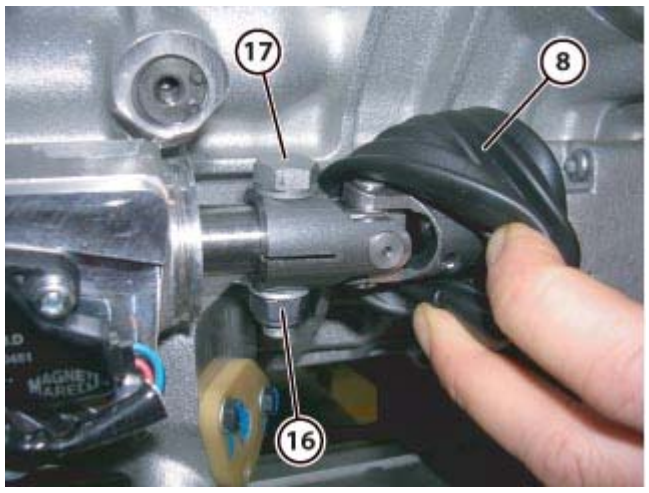


- Move the gaiter **(15)**.
- Fit the screw **(17)** fastening the universal joint to the gear selector shaft from above.
- Fit the washer **(27)** and hand tighten the nut **(16)**.
- Distribute the coupling backlash evenly using the screw **(17)** fitted in the housing between the universal joint and the gear selector shaft.



- Definitively tighten the eight nuts **(2)** fastening the cover.

Tightening torque	Nm	Class
Nut	10 Nm	C



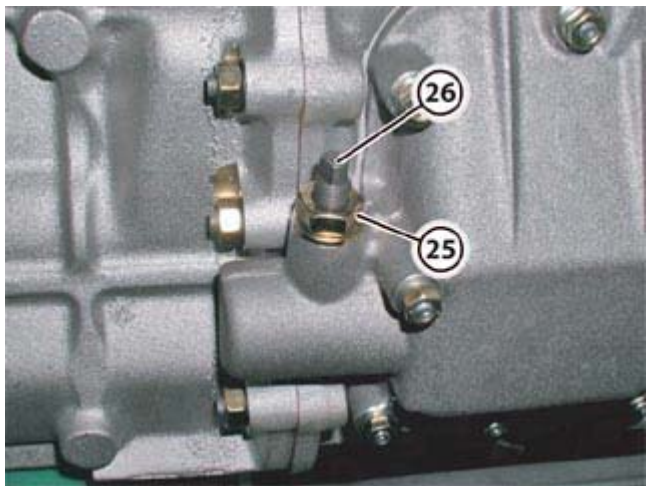
- Ensure that the screw **(17)** fastening the universal joint to the selector shaft turns freely in its relative hole.

If the screw **(17)** does not turn freely, loosen the screws fastening the actuator brackets and repeat the procedure to distribute the coupling backlash between the universal joint and the gear selector shaft.

- Move the gaiter **(8)**.
- Tighten the nut **(16)** of the screw **(17)** fastening the joint to the gearbox selector shaft.

Tightening torque	Nm	Class
Screw	34 Nm	A

- Fit the gaiter **(8)** in the relative seat.

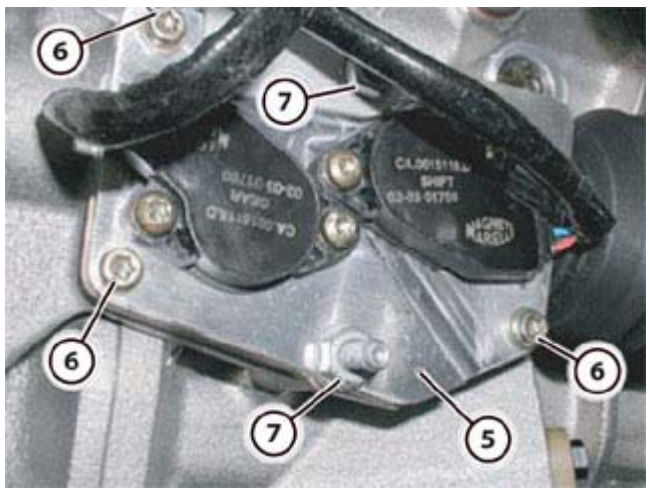


Perform the operation with extreme caution, taking care not to detach the retainer Seeger ring.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

- Unscrew the dowel **(26)** completely, but do not remove.
- Tighten the check nut **(25)**.

Tightening torque	Nm	Class
Nut	10 Nm	C

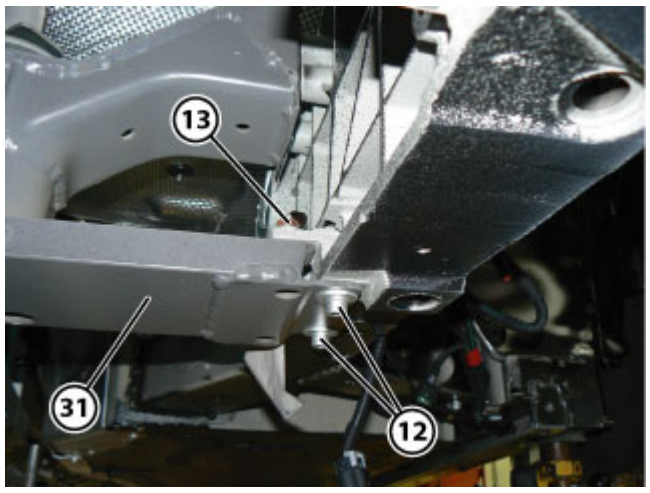
- Remove the tool **(AV 3458)** from the actuator.



- Fit the sensor mounting plate **(5)**.
- Hand tighten the three screws **(6)** and the two nuts **(7)**.
- Connect the gear position and engagement sensor cables to the system.

- Perform a self-acquisition cycle.
- Perform the actuator-gearbox alignment procedure. (D2.13).

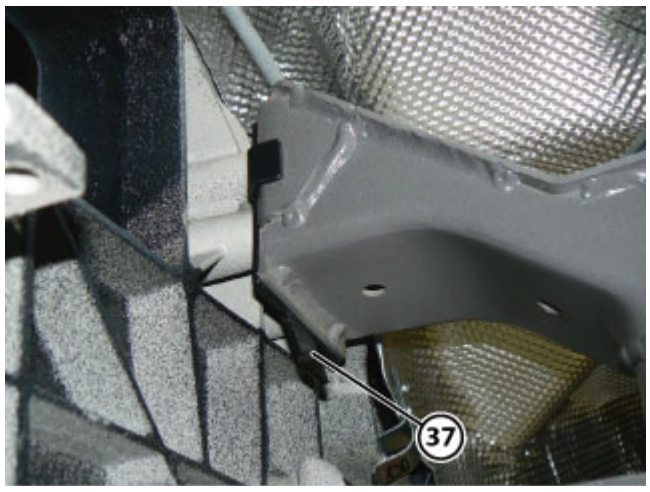
Only if the self-acquisition cycle was not completed successfully.



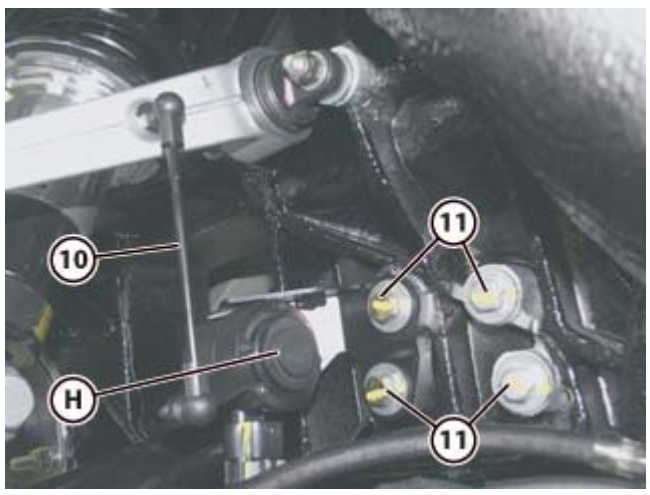
- Fit the gearbox mounting cross member **(31)**.
- Tighten the two bottom screws **(12)** and hand tighten the two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

Repeat the procedure on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



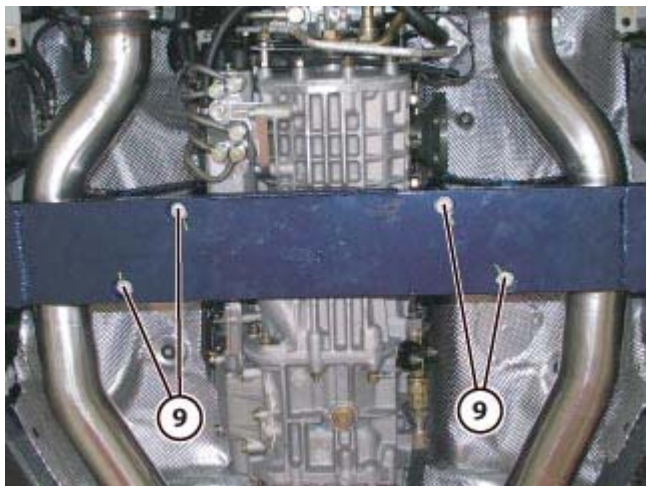
- Place a suitable shim **(37)** on both sides of the vehicle between the chassis and the gearbox mounting cross member.



- Place the sensor **(H)** in its seat, tighten the four screws **(11)** fastening the sides of the gearbox mounting cross member to the chassis and connect the tie-rod **(10)** to the upper arm.

Repeat the procedure on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



- Tighten the four screws **(9)** fastening the gearbox bushings to the mounting cross member.

Tightening torque	Nm	Class
Screw	50 Nm	C

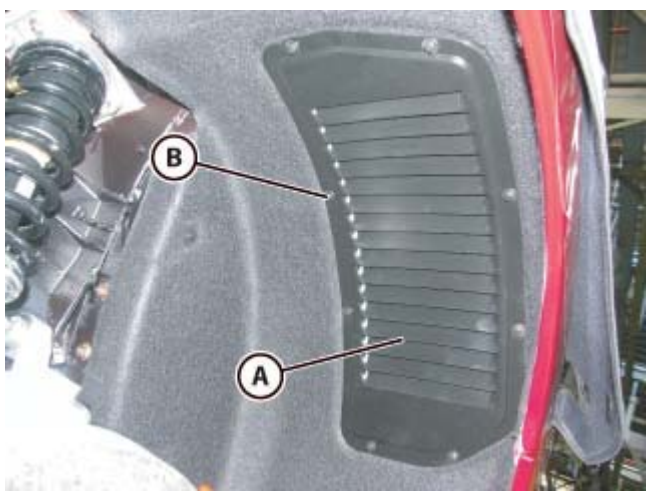
➢ Fill the gearbox-differential lubrication system (A3.02).

D2.09 Gearbox oil radiator

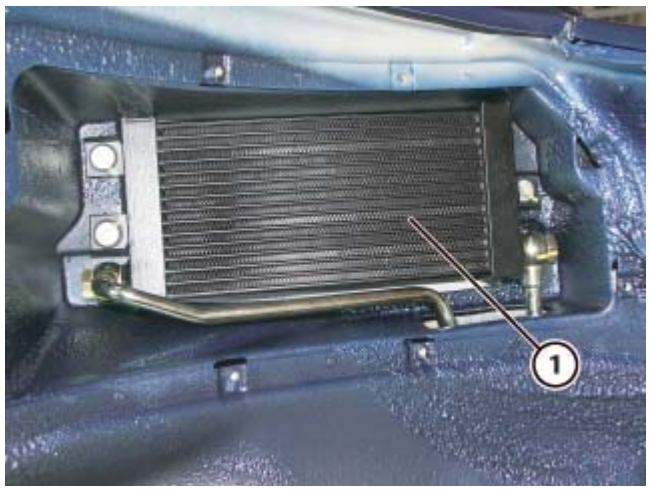
Cleaning the gearbox oil radiator

Clean the gearbox oil radiator located under the right-hand rear wing at the intervals indicated in the Maintenance Schedule.

➢ Remove the wheel (F2.08).
i Remove the rear right hand component.



- Remove the grille **(A)** fastened to the wheelhouse by undoing the eight screws **(B)**.



- Check the condition of the radiator core **(1)**
- Straighten any deformation, taking care not to damage the radiator core.

i If the radiator core is excessively damaged, replace the radiator.

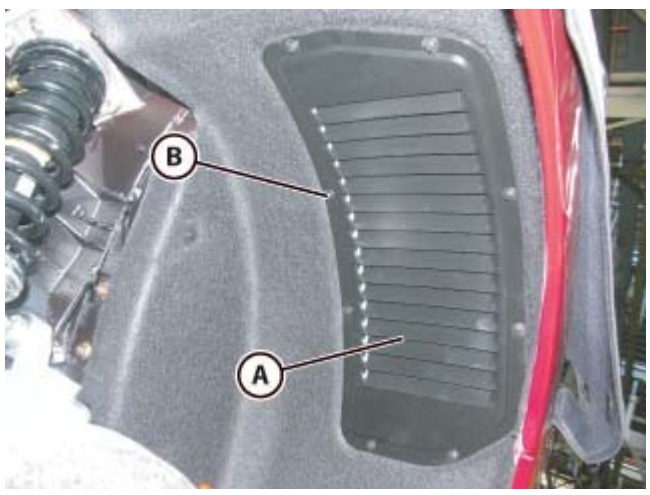
- Clean the radiator fins with compressed air, removing any leaves, insects or other matter that could obstruct air flow and lead to overheating of the fluid.

➢ Refit the wheel (F2.08).

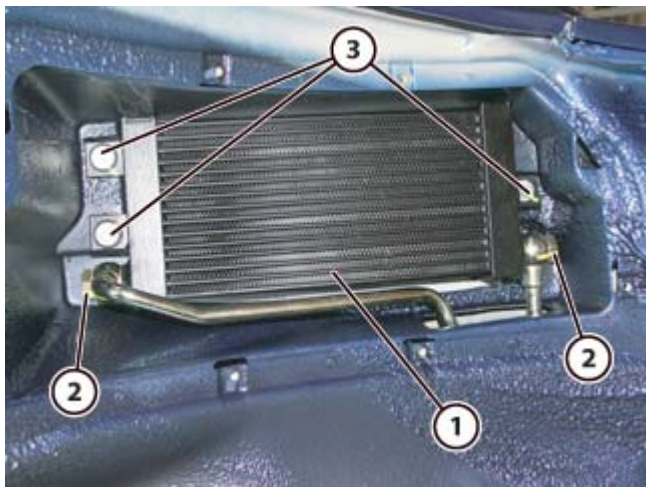
Removing the gearbox oil radiator

➢ Remove the wheel (F2.08).
i Remove the rear right hand component.

➢ Drain the gearbox-differential lubrication system (A3.02).



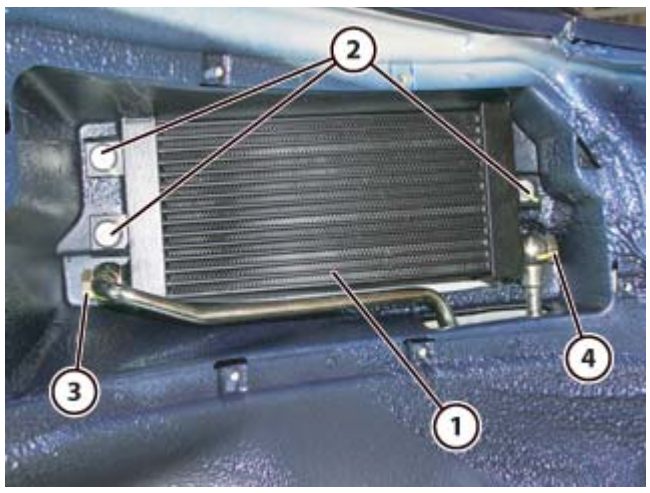
- Remove the grille **(A)** fastened to the wheelhouse by undoing the eight screws **(B)**.



- Unscrew the two oil delivery and return pipe unions **(2)**.
- Undo the three screws **(3)** fastening the gearbox oil radiator **(1)** to the bodywork.
- Remove the radiator **(1)**.

Refitting the gearbox oil radiator

Tightening torque		Nm	Class
Fastening radiator on gearbox	Screw	10 Nm	B
Oil delivery pipe to radiator on gearbox	Union	45 Nm	B
Oil return pipe from radiator on gearbox	Union	45 Nm	B



- Fit the gearbox oil radiator **(1)** and fasten by tightening the three screws **(2)**.

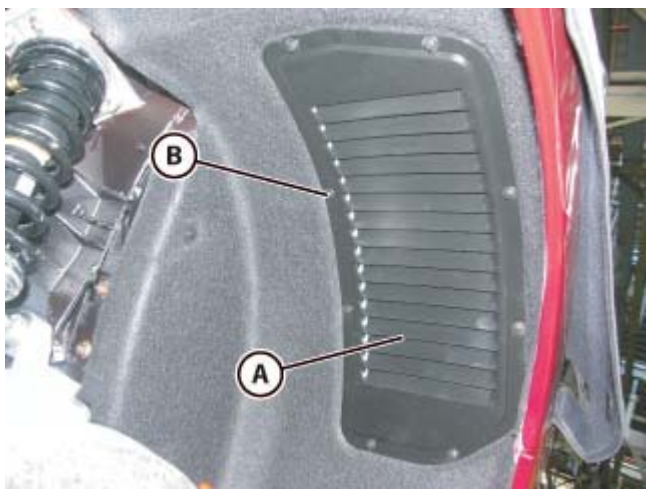
Tightening torque	Nm	Class
Screw	10 Nm	B

- Connect the oil delivery pipe to the radiator and tighten the union **(3)**.

Tightening torque	Nm	Class
Union	45 Nm	B

- Connect the oil return pipe to the radiator and tighten the union **(4)**.

Tightening torque	Nm	Class
Union	45 Nm	B



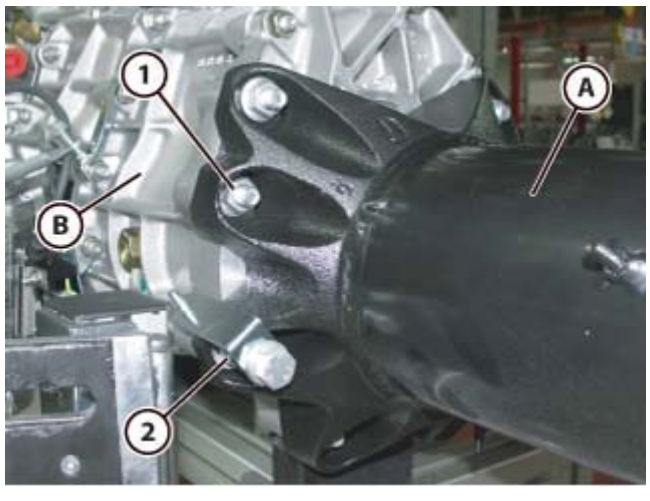
- Fit the grille **(A)** on the gravel guard and tighten the eight screws **(B)**.

➢ Fill the gearbox-differential lubrication system (A3.02).
➢ Refit the wheel (F2.08).

D2.10 Transmission shaft

Removing the transmission shaft

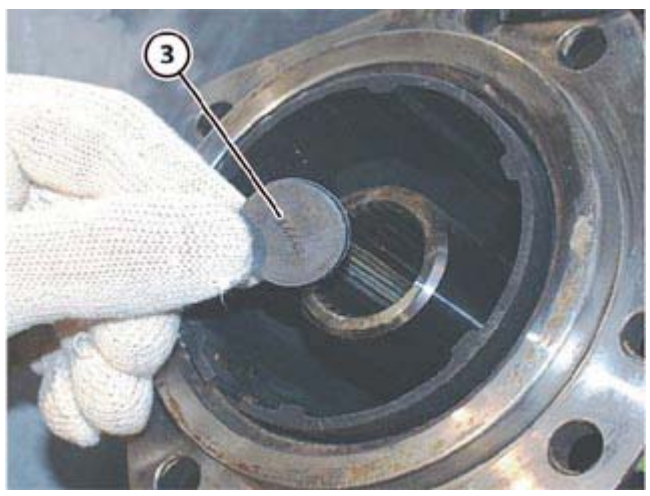
➢ Remove the gearbox-differential assembly (D2.01).



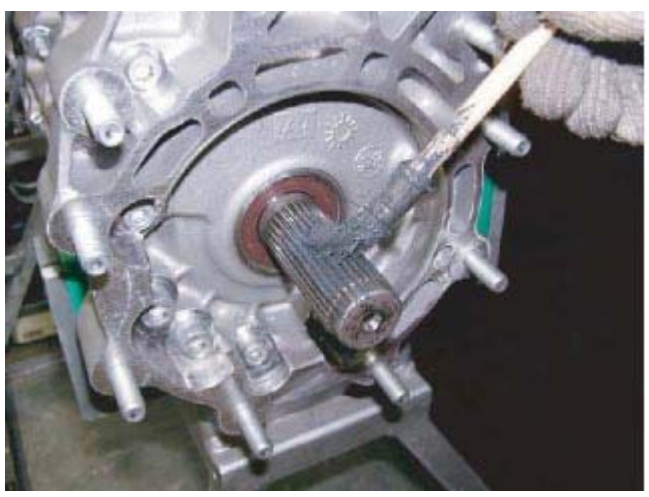
- Separate the transmission shaft **(A)** from the gearbox **(B)** undoing the seven nuts **(1)** and the stud bolt **(2)**.

Refitting the transmission shaft

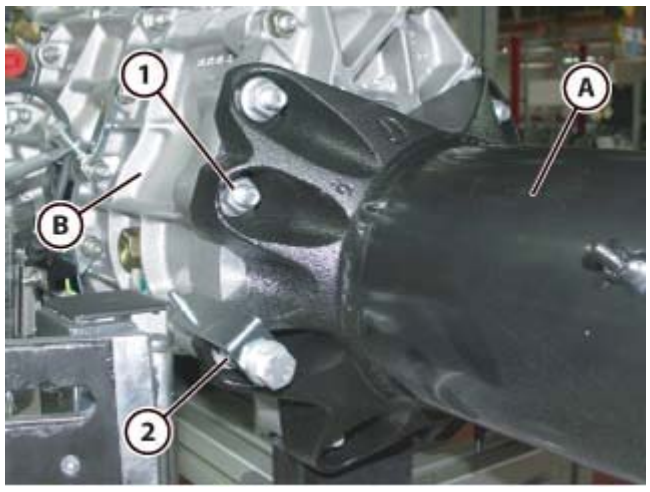
Tightening torque		Nm	Class
Transmission shaft pipe - gearbox	Nut	60 Nm	A



- Insert the endstop bushing **(3)** in the gearbox end of the crankshaft.



- Always apply **MOLYKOTE FB180** onto the entire surface of the splined shaft.



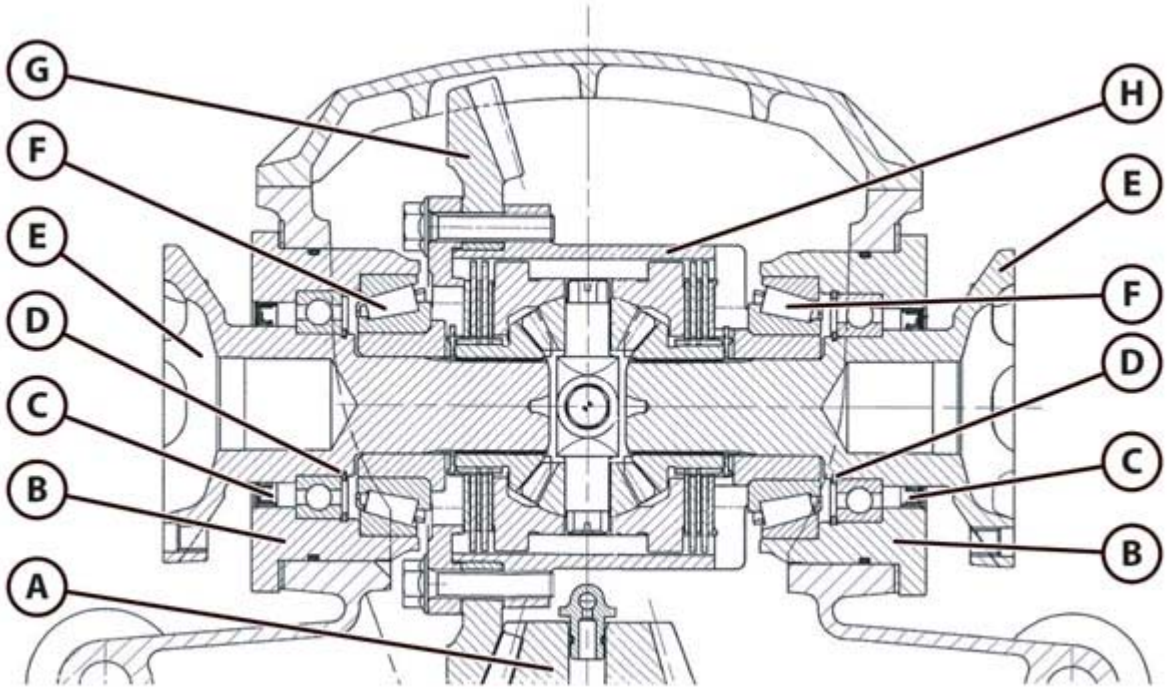
- Fit the transmission shaft **(A)** on the respective gearbox stud bolts **(B)** and secure by tightening the seven nuts **(1)** and the stud bolt **(2)**.

Tightening torque	Nm	Class
Nut	60 Nm	A

➢ Refit the complete gearbox-differential assembly (D2.02).

D2.11 Differential overhaul

Differential assembly components

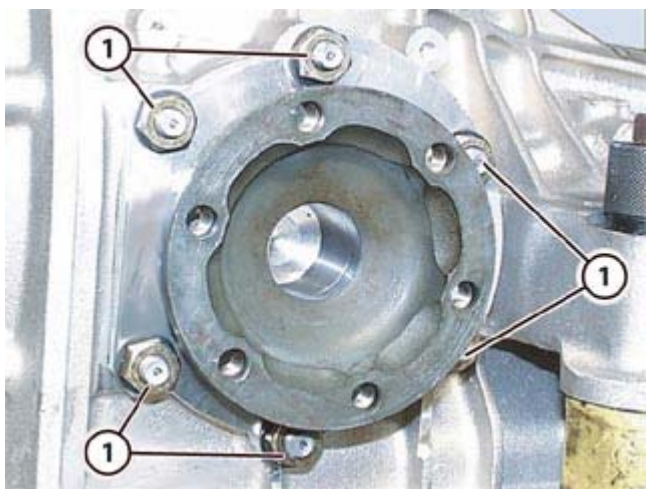


A - Secondary shaft pinion
B - Flange
C - Seal ring
D - Snap ring
E - Differential shaft
F - Tapered roller bearings
G - Crown
H - Differential housing

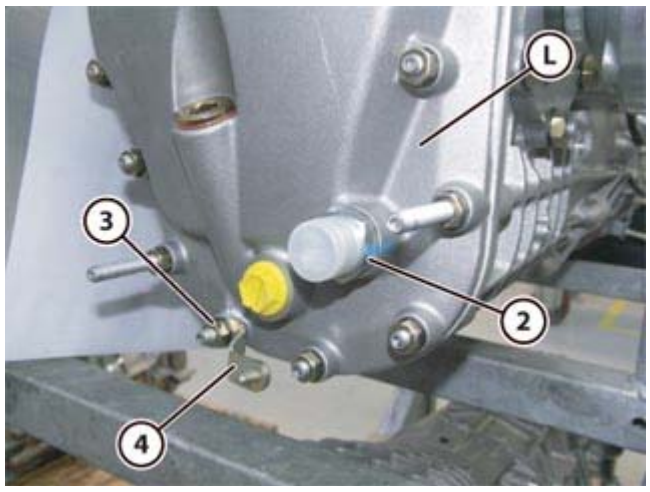
Differential overhaul

Tightening torque		**Nm**	**Class**
Fastening crown gear to differential Products to use: Loctite® 270	Pretightening torque for screw	60 Nm	A
	Screw	Until screw hear shears off	
Stud bolts - 2nd gearbox housing element and rear cover - 4th gearbox housing element	M8x1.25x16x30 stud bolt	24 Nm	C
Gearbox housing	Nut	30 Nm	C
Differential flanges - 4th gearbox housing element	Nut	50 Nm	C

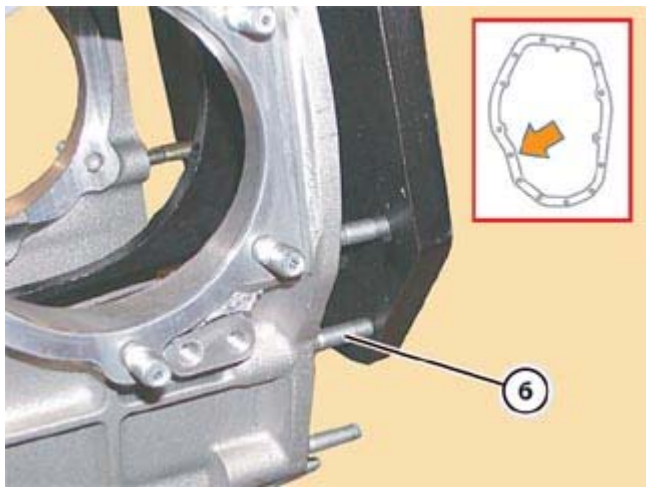
➢ Remove the complete F1 Kit (D2.13).



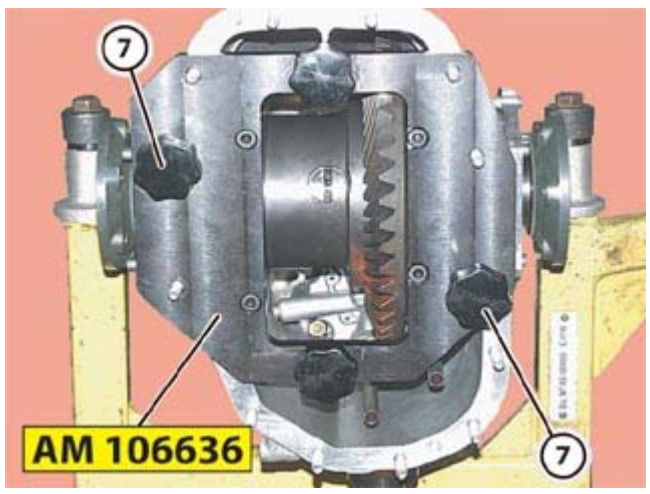
- Loosen the six nuts **(1)** on both lateral covers.



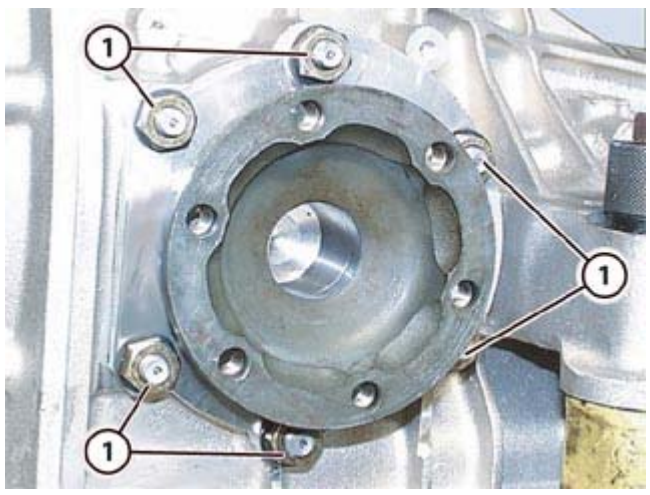
- Undo the oil return union **(2)** from the rear cover and remove.
- Undo the fourteen nuts **(3)** fastening the rear cover to the differential, retrieving the bracket **(4)**.



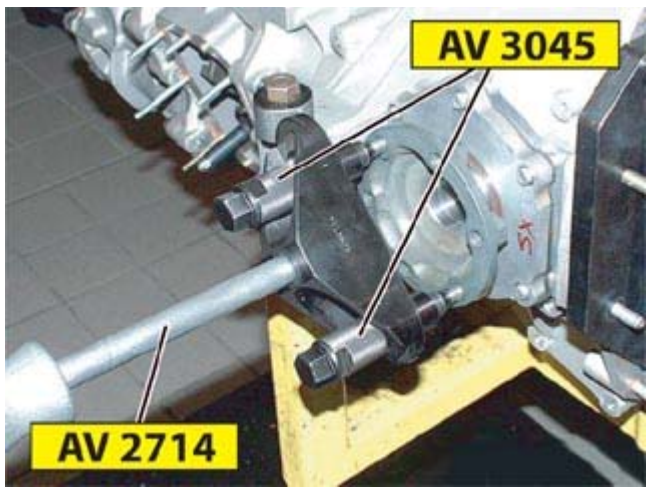
- Remove the stud bolt **(6)** from the rear gearbox housing.



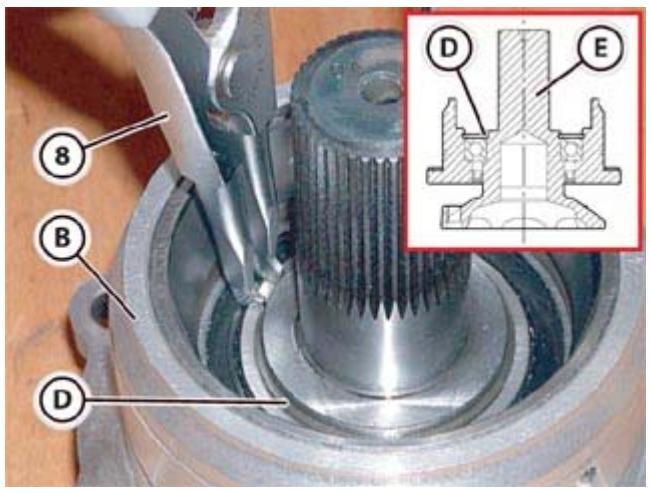
- Fit the tool **(AM 106636)** on the differential and fasten by tightening the two pins **(7)** to the studs.



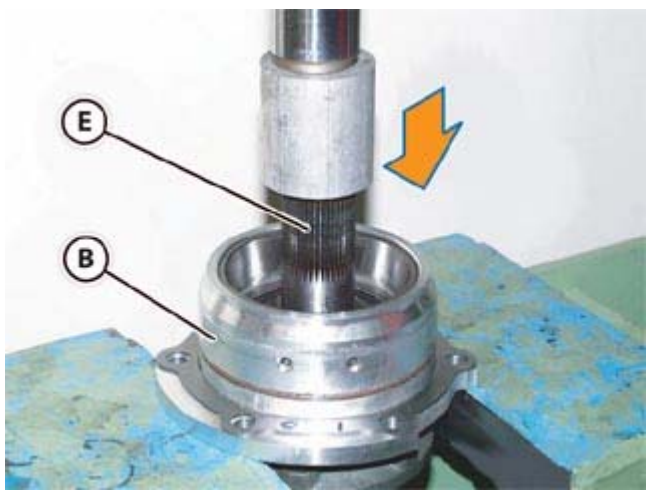
- Undo the six nuts **(1)** on both differential covers.



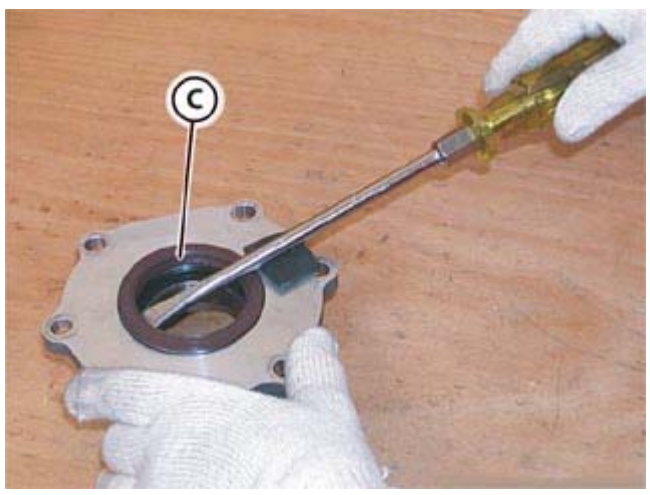
- Fit the tool **(AV 2714)** and the slide hammer extractor **(AV 3045)**, fastening to the differential shaft.
- Remove the flange, complete with cover, from the gearbox housing.



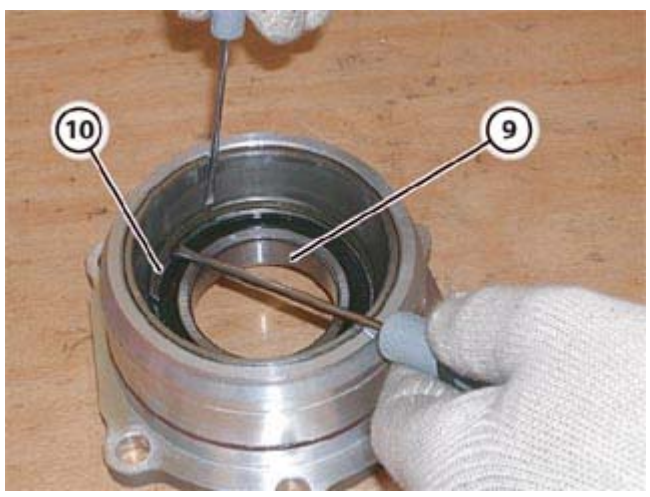
- To remove the shaft **(E)** from the flange **(B)**, remove the Seeger ring **(D)** with flat nosed retainer ring pliers **(8)**.



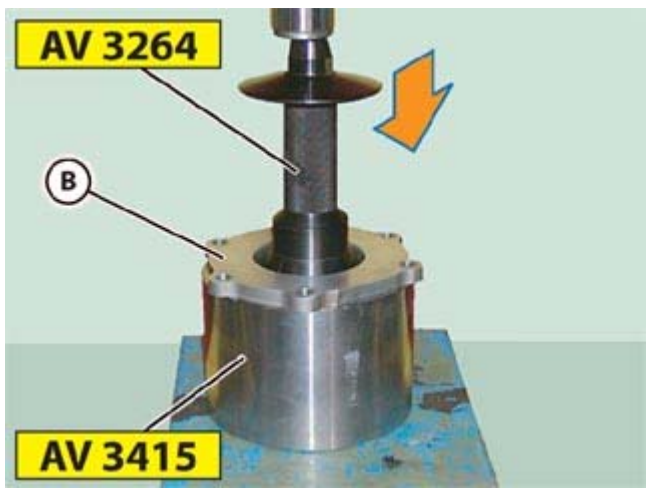
- Place the shaft-flange assembly under a press, with the flange **(B)** on the fixed base, and apply force to the shaft **(E)**, until it is extracted.



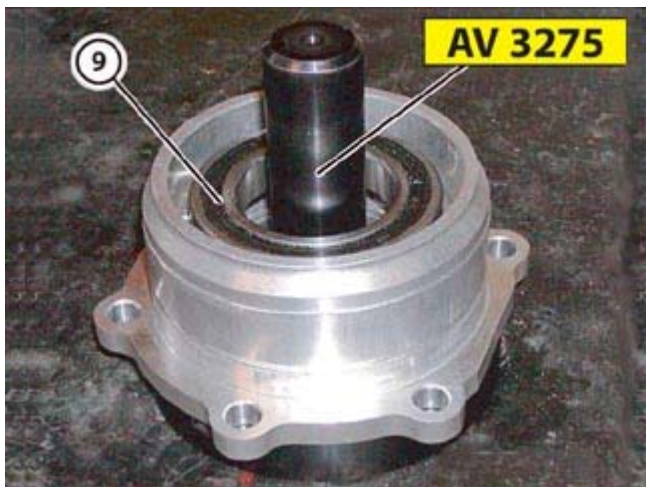
- Remove the Corteco retainer ring **(C)** from the cover, prising out with a screwdriver.



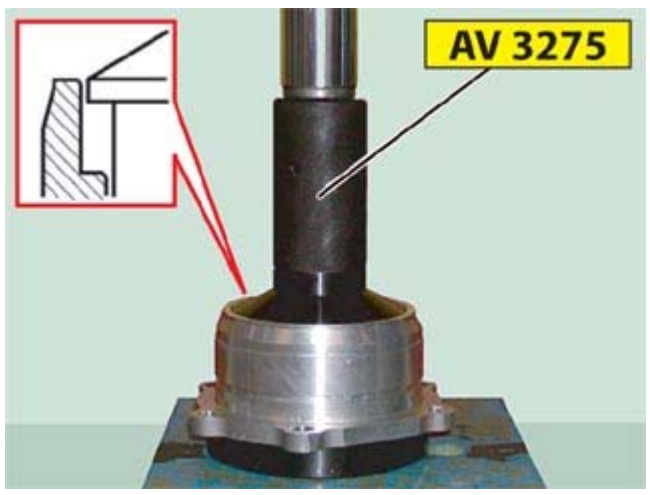
- Remove the Seeger ring **(10)** to extract the bearing **(9)**.



- Place the flange under a press, with the flange **(B)** on the tool **(AV 3415)**, using the tool **(AV 3264)** as a spacer between the bearing and the press.
- Apply force until the bearing **(9)** is extracted from the cover, and retrieve the bearing seat.



- To install the bearing **(9)**, use the lower element of the tool **(AV 3275)** as a support base for the cover.
- Install the bearing as shown in the figure.



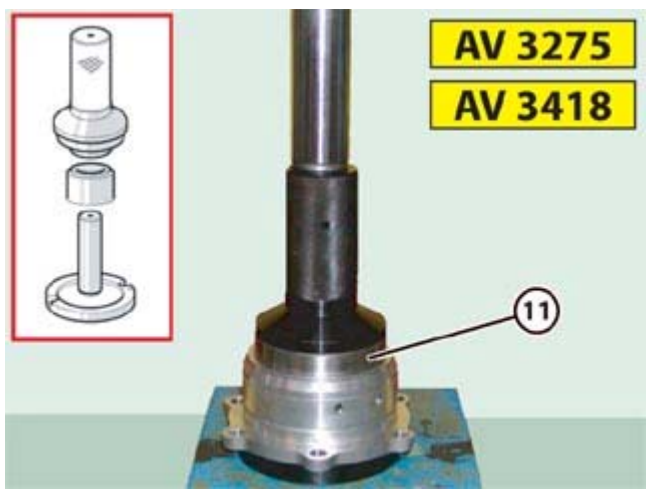
- Use the upper element of the tool **(AV 3275)** to push the bearing correctly into its seat with a press.
- Lower the bearing into its seat until the rim of the upper tool is level with the upper edge of the cover.



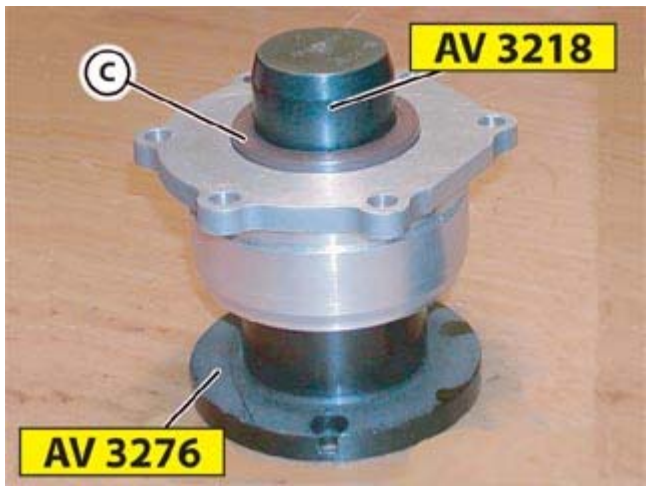
- Install the bearing fully with the tool **(AV 3218)**.



- Fasten the bearing by fitting the Seeger ring **(10)** in the relative seat on the flange.



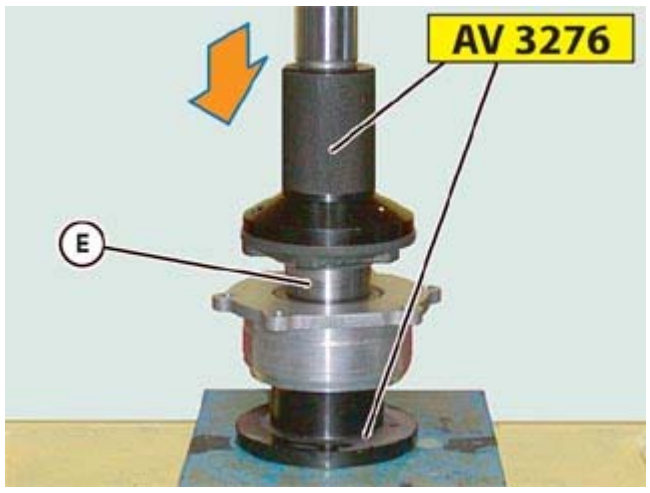
- To install the outer bearing seat **(11)** on the flange, use the two elements of the tool **(AV 3275)** and the tool **(AV 3418)**, and place the assembly under the press.



- Use the tool **(AV 3276)** as a base for the cover and use the two-piece tool **(AV 3218)** to fit the Corteco ring **(C)**.



- Insert the Corteco ring in its seat, tapping the upper element of the tool **(AV 3218)**. with a mallet



- Install the shaft **(E)** in its seat, using the tool **(AV 3276)** as a base and a spacer, placing the shaft-flange assembly under the press.



- Secure the shaft **(E)** to the flange by fitting the Seeger ring **(D)**.

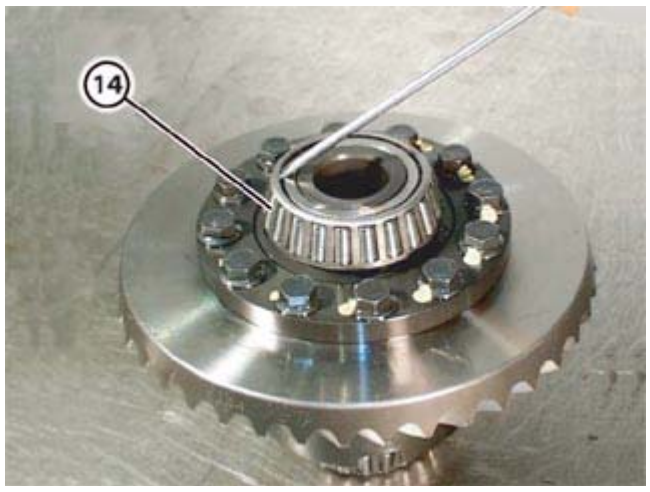
- After removing both flanges from the differential, the complete differential housing may be removed using the tool **(AM 106636)**.

Do not open the differential as there are no replaceable components inside.

- The roller bearings on both sides of the differential casing may be removed and replaced.



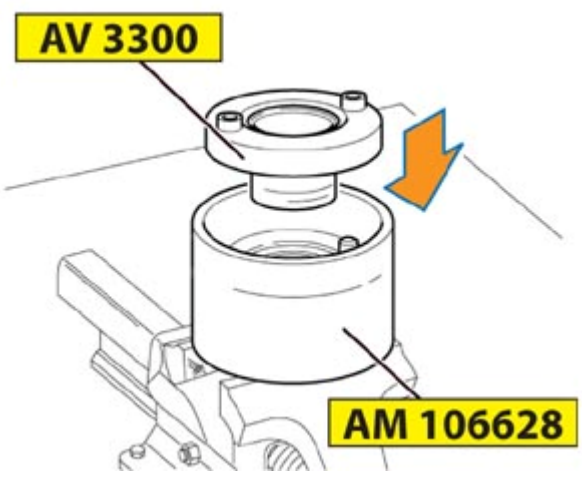
- To remove the roller bearing **(12)**, use the tool (USAG 454N/3) and a counter shim **(13)**. Fit the arms of the tool into the notches on the differential housing, then insert the ends of the arms under the inner race and extract the bearing **(12)**.



- To remove the bearing, prise the roller bearing cage **(14)** forcefully off the inner bearing race.

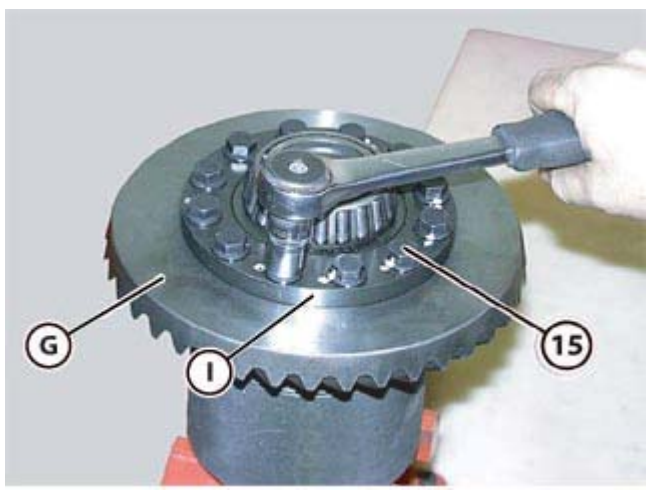


- To remove the roller bearing **(14)** on the crown gear side, use the extractor tool (USAG 454N/3) and a counter shim **(13)**. Insert the arms under the rods of the separator (U53-T2) applied under the bearing race collar and extract the roller bearing **(14)**.



- To remove the crown gear, secure the differential housing in a vice, using the tool **(AM 106628)** and the adapter **(AV 3300)**.

Make a reference marking between the crown gear and differential to facilitate correct reassembly.



- Fit the differential on the support tool with the crown gear facing upwards, then undo the twelve screws **(15)**.
- Remove the flange **(I)**.
- Remove the crown gear **(G)** from the differential and replace.
- Fit the crown gear **(G)**.
- Fit the flange **(I)**.
- Apply **Loctite® 270** on the thread of the screws **(15)**.
- Pretighten the twelve screws **(15)** in a cross pattern.

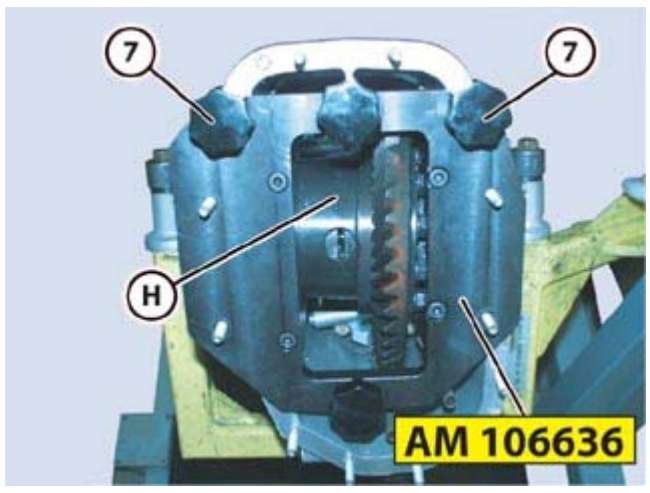
Tightening torque	**Nm**	**Class**
Pretightening torque for screw	60 Nm	A

- Tighten the twelve screws **(15)** in a cross pattern.

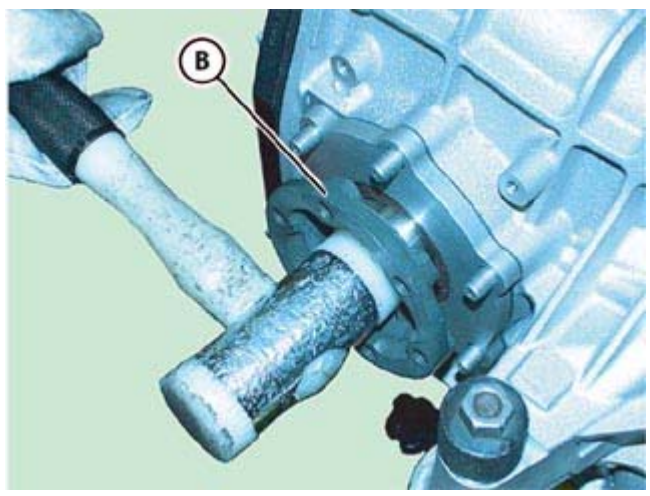
Tightening torque	**Nm**	**Class**
Screw	Until screw hear shears off	



- Use the tool **(AV 3278)** to install both roller bearings.
- Use the first element of the tool **(AV 3278)** as a support base for the differential and the second element of the tool to push the bearing into its seat.

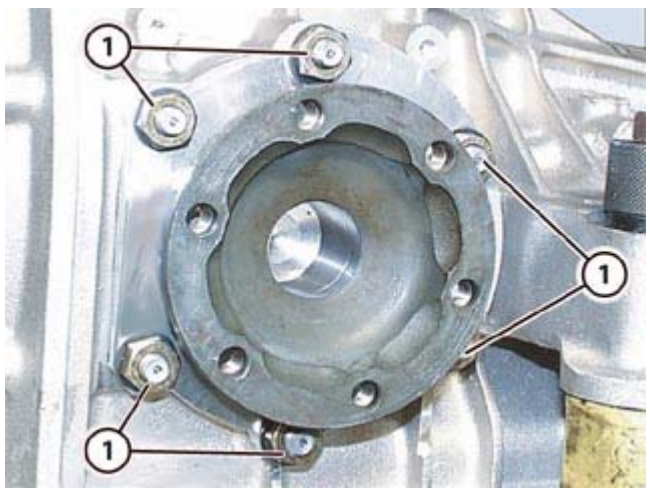


- Using the tool **(AM 106636)**, fit the complete differential housing **(H)** on the rear gearbox housing.
- Fix the tool to the gearbox housing by tightening the two pins **(7)**.



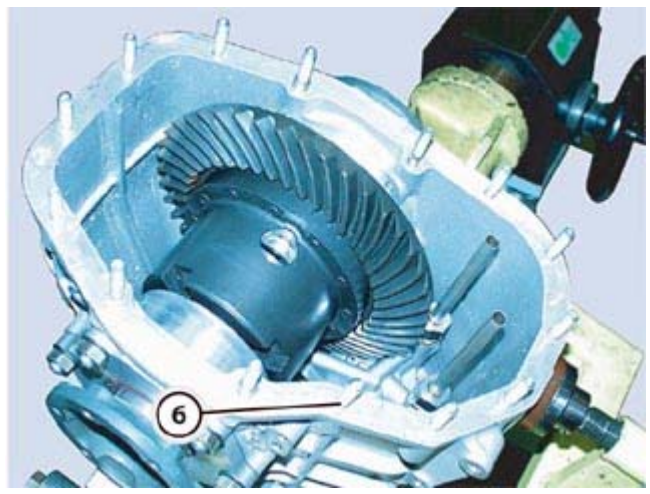
- Fit the flanges **(B)**, complete with differential cover, tapping with a plastic mallet to bring the mating surfaces into contact.

Fit the crown gear side flange first.



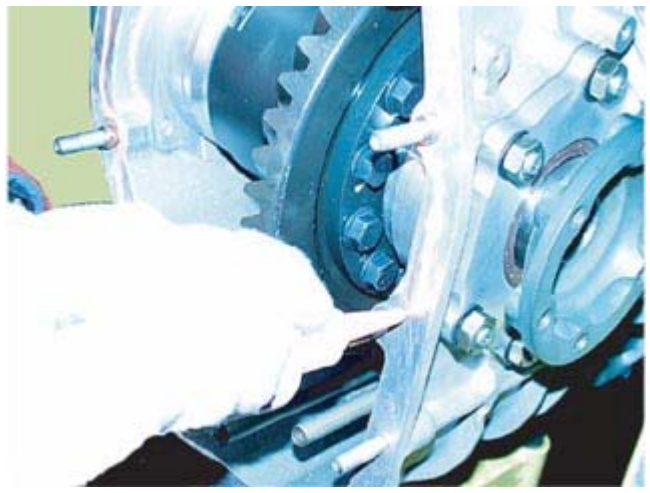
- Secure the lateral differential covers with the six nuts **(1)**, hand-tightening only.

- Remove tool **(AM 106636)**.

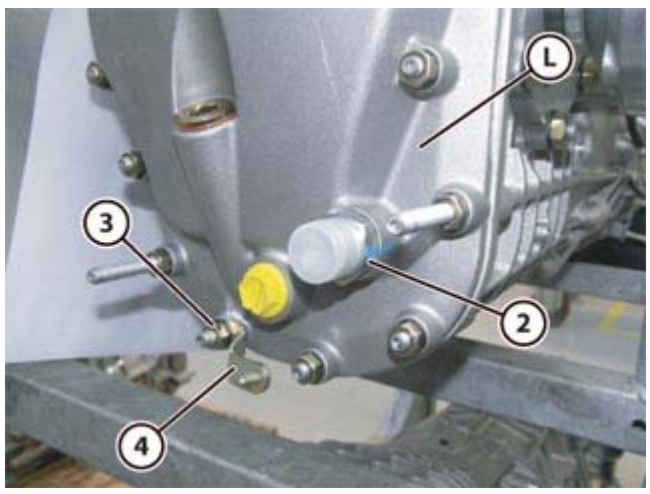


- Refit the stud **(6)** in the seat on the rear gearbox housing, applying **AREXONS 242** to the thread, and tighten definitively.

Tightening torque	Nm	Class
M8x1.25x16x30 stud bolt	24 Nm	C



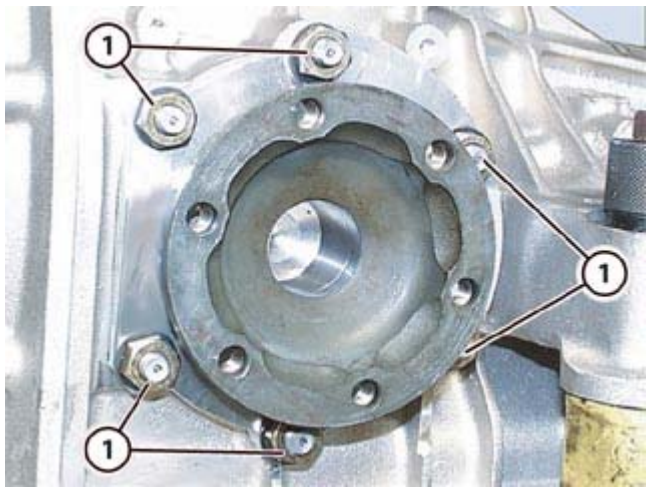
- Thoroughly clean the mating surfaces between the cover and the rear gearbox housing.
- Apply a layer of **AREXONS 510** to the surface of the rear gearbox housing.



- Fit the rear cover **(L)** on the gearbox housing, tightening the fourteen nuts **(3)** after fitting the bracket **(4)**.

Tightening torque	**Nm**	**Class**
Nut	30 Nm	C

- Fit the oil return union **(2)** on the rear cover **(L)**.



- Tighten the six nuts **(1)** on both flanges.

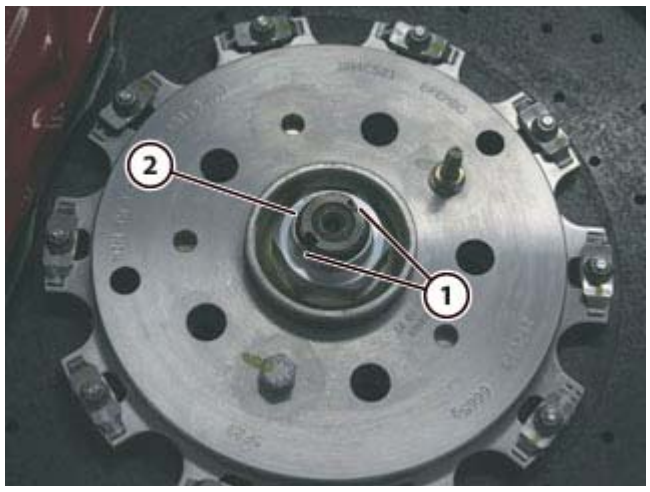
Tightening torque	**Nm**	**Class**
Nut	50 Nm	C

➢ Refit the complete F1 Kit (D2.13).

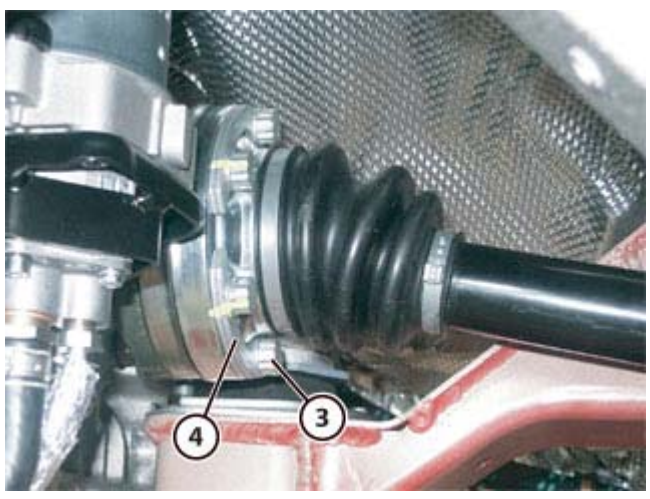
D2.12 Axle shaft

Removing the axle shaft

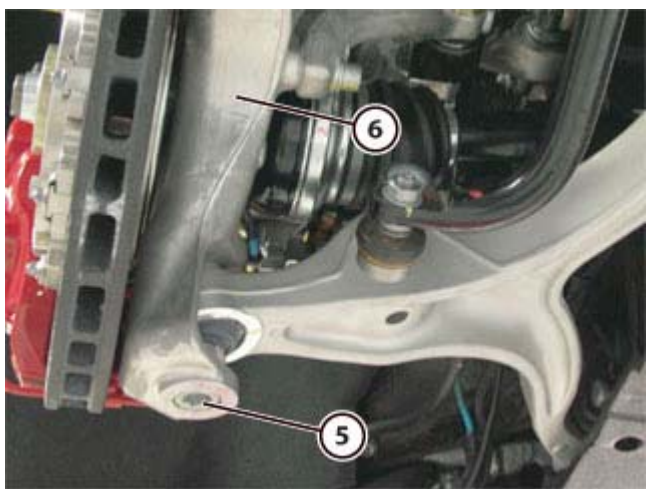
- Remove the wheel (F2.08).
- Remove the rear undertray section (M2.12).



- Using a punch and a hammer, remove the caulking **(1)** from the ring nut.
- Unscrew the ring nut **(2)** fastening the axle shaft to the hub carrier bearing.



- Undo the six screws **(3)** fastening the axle shaft to the differential flange, retrieving the three spacers **(4)**.

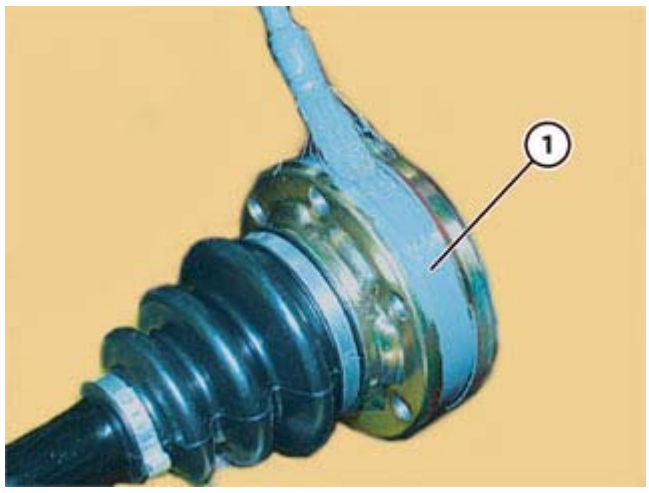


- Undo the screw **(5)** fastening the hub carrier to the lower arm.
- Move the hub carrier **(6)** outwards until the axle shaft slips off the bearing and then remove from the vehicle.

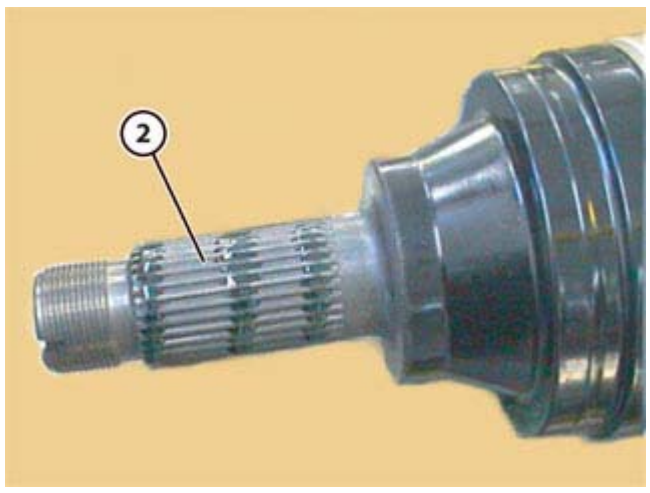
Refitting the axle shaft



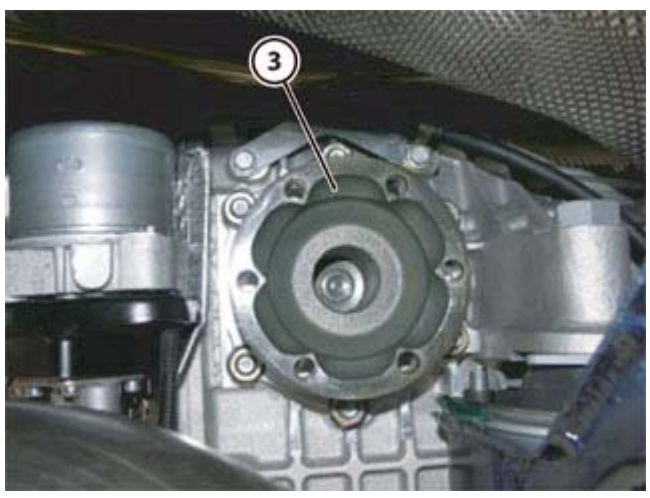
Tightening torque		Nm	Class
Fastening axle shaft to differential flange Products to use: MOLYKOTE 1000	Pretightening torque for screw	40 Nm	A
	Screw	78 Nm	A
Fastening axle shaft to bearing on hub carrier Products to use: Z2 PROTECTION	Ring nut	275 Nm	B



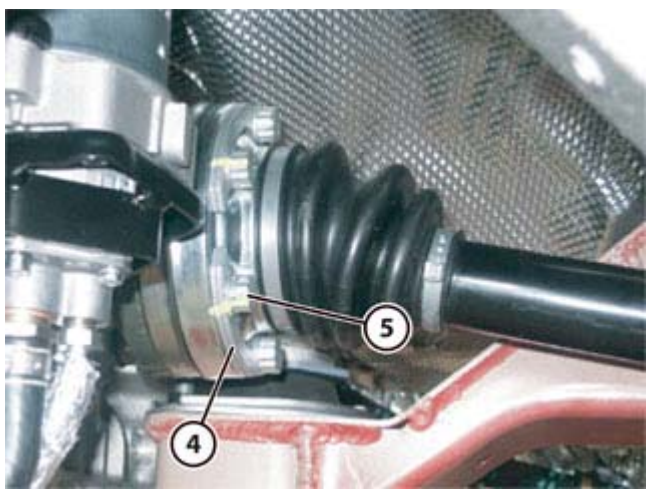
- Apply a thick layer of rustproofing to the outer surface **(1)** of the axle shaft cover.



- Apply **AREXONS SYSTEM 56A01 - HIGH STRENGTH RETAINING COMPOUND** to the splined body **(2)** of the axle shaft.



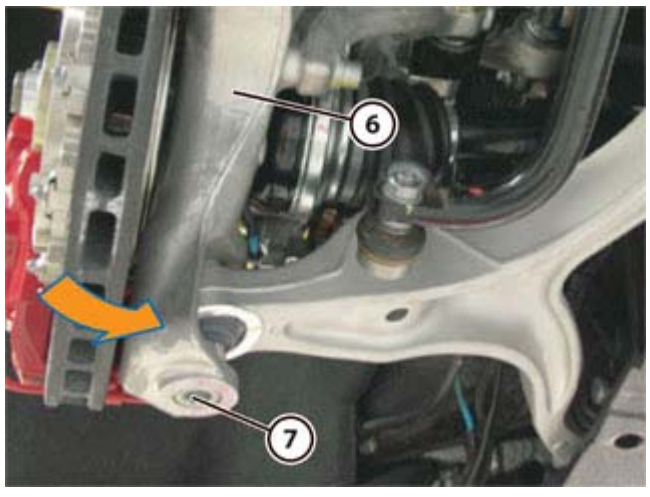
- Check that the surface of the flange **(3)** on the differential is clean.



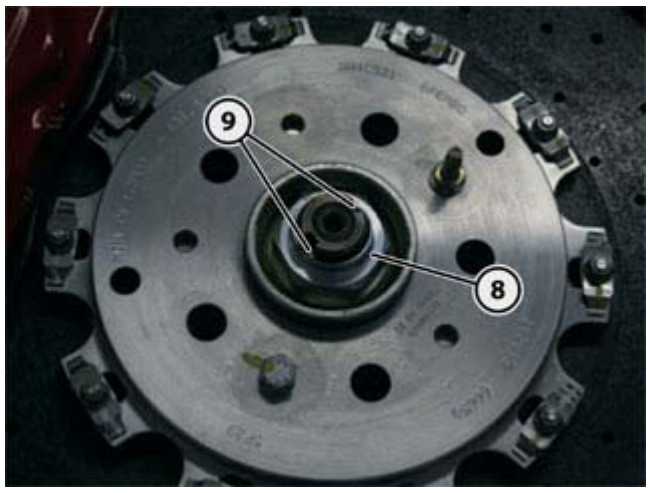
- Fit the axle shaft in its seat on the flange.
- Apply a film of grease to the threads of the six screws fastening the axle shaft to the flange **MOLYKOTE 1000**.
- Fit the spacers **(4)** and tighten the screws **(5)**.
- Tighten the six screws **(5)**.



Tightening torque	Nm	Class
Screw	78 Nm	A



- Loosely fit the hub carrier, inserting the splined body into the bearing.
- Fasten the hub carrier **(6)** to the lower arm and tighten the screw **(7)**.



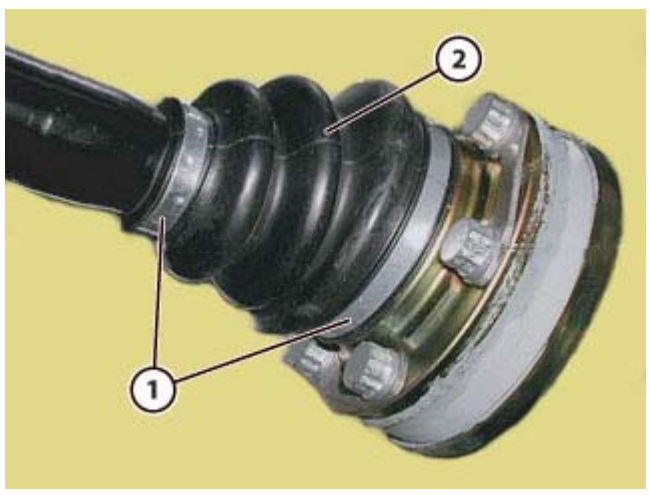
- Apply the ring nut **(8)** and tighten.

Tightening torque	**Nm**	**Class**
Ring nut	275 Nm	B

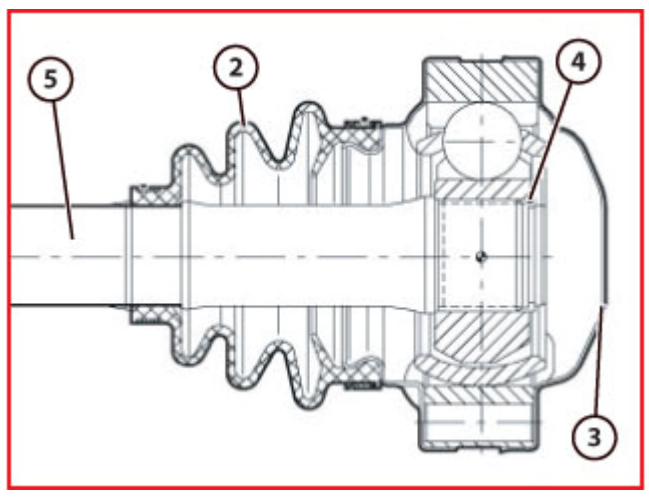
- Using a punch and a hammer, caulk **(9)** the nut near the axle shaft seats.

➢ Refit the rear underfloor section (M2.12).
➢ Refit the wheel (F2.08).

Removing the axle shaft gaiters



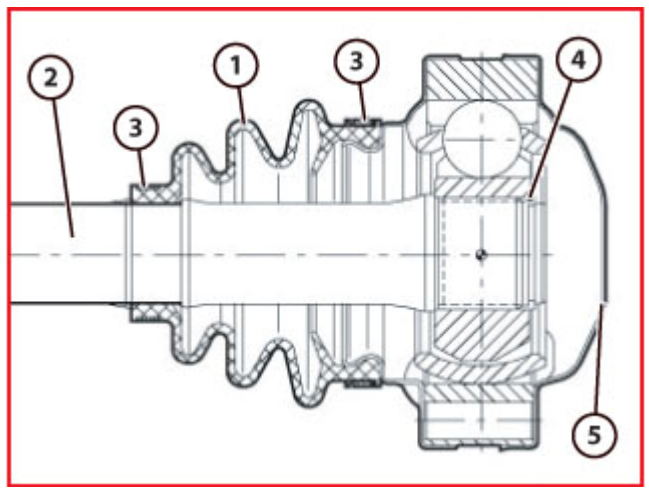
- To remove the gaiter **(2)** from the axle shaft, detach the two clamps **(1)**.



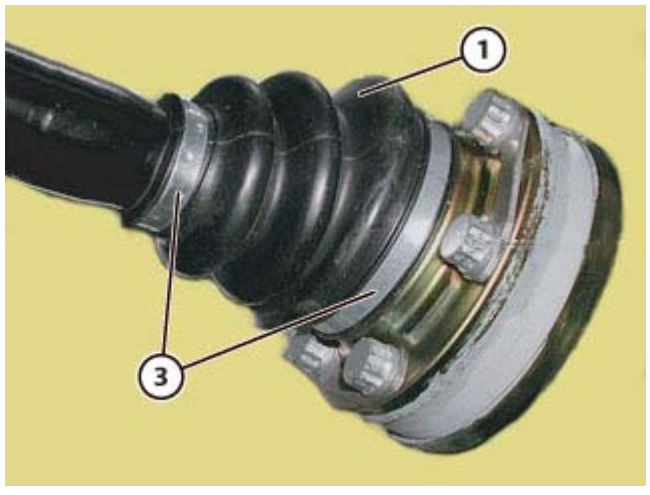
- Remove the cover **(3)** from the axle shaft.
- Remove the snap ring **(4)** from the shaft **(5)**.
- Ease out the complete bearing and remove the protective gaiter **(2)**.

Refitting the axle shaft gaiters

Thoroughly clean the gaiter contact surface on the axle shaft.



- Fit the gaiter **(1)** and the two clamps **(3)** on the axle shaft **(2)**.
- Fit the bearing on the shaft and fasten by fitting the Seeger ring **(4)**.
- Fit the bearing guard cover **(5)**.

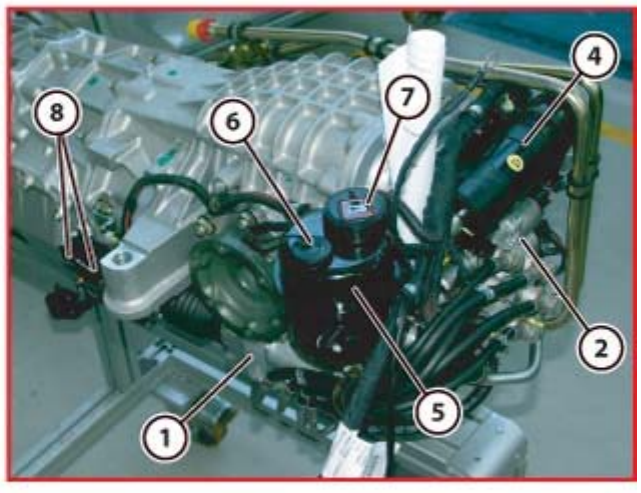


- Fit the gaiter **(1)** in the seats on the shaft and on the bearing.
- Fasten by tightening the clamps **(3)**.

D2.13 Hydraulic system-Power Unit-Actuators-Sensors

Electronically controlled gearbox hydraulic system



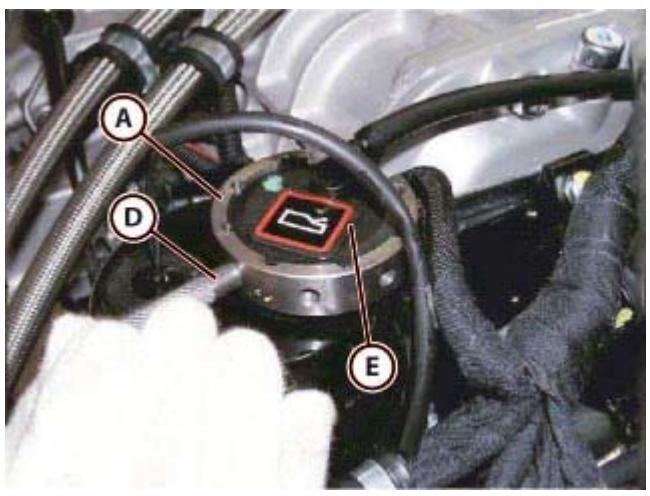


1 - Actuator
2 - Power Unit
3 - motorised pump
4 - Accumulator
5 - Oil tank
6 - Low oil sensor
7 - Tank cap
8 - Gear selection and engagement potentiometers
9 - Clutch quick-connector union connector line

Draining oil from the F1 gearbox system

The oil tank of the F1 gearbox system is located on the rear left-hand side of the gearbox assembly.

➢ Remove the rear undertray section (M2.12).

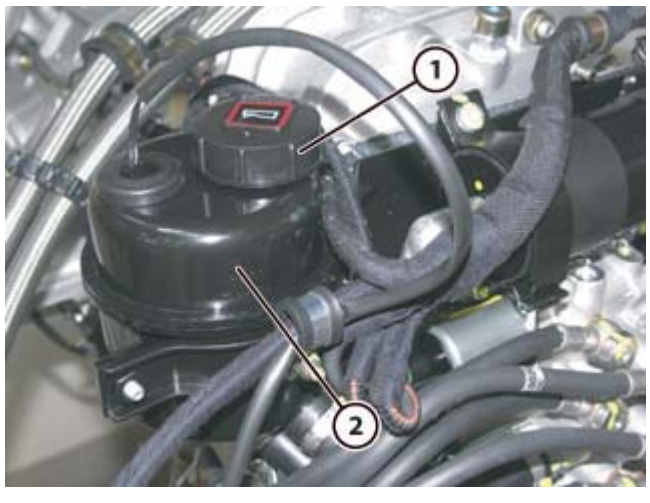


- Fit only the ring nut **(A)** of the tool **(AV 8066)** in the cap **(E)**, without the relative pin **(D)** and with the gap over the breather pipe.
- Screw the pin **(D)** of the tool **(AV 8066)** into one of the holes in the ring nut **(A)**.

Before unscrewing the cap from the F1 kit oil tank, clean the area above the cap carefully with compressed air to prevent dirt from entering the tank and contaminating the oil during the check.

- Release the tank cap **(E)**, turning counterclockwise.
- Remove the ring nut **(A)** and completely unscrew the cap **(E)** by hand.
- Drain the system, aspirating oil with a syringe fitted with a rubber pipe.

Filling F1 gearbox system with oil



- Unscrew the cap **(1)** on the tank **(2)**.

- Fill the system with **(1)**l of the specified oil.

The quantity of oil required may vary slightly relative to the amount indicated for filling the tank when empty. This is due to pooling within the system.

➢ Check the F1 gearbox system oil level (A3.03).

Procedure for mechanically locking the Gearbox/F1 Kit in neutral between 3rd and 4th gear

The following procedure is necessary to ensure that the gearbox/F1 kit is correctly aligned in neutral between 3rd and 4th gear before replacing a gearbox or F1 kit.

Implementing this procedure locks the two gearbox/F1 actuator kit systems in the aligned position, enabling the replacement of either or both.

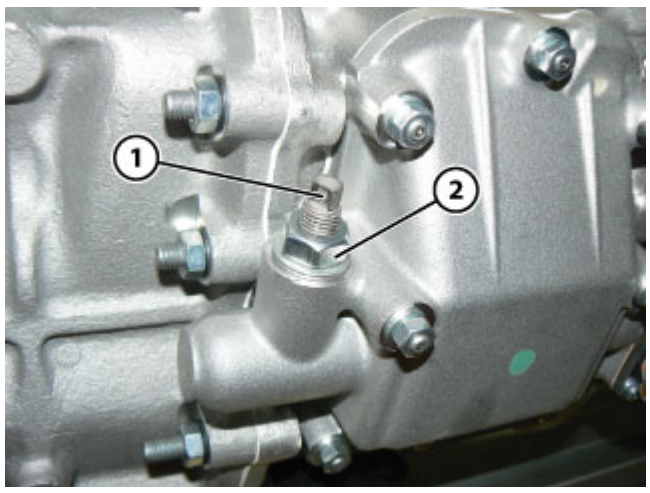
When the new component is installed, it will be locked and already aligned, preventing alignment errors and rendering further alignment procedures unnecessary.

➢ Remove the silencer and exhaust extension (B6.05).

Remove both exhaust extensions.

- Activate the actuator alignment diagnostic procedure from the SD-3, so that the system is set to neutral between **3rd and 4th gear**.

This procedure, which locks the actuator shaft, lasts approximately **10 seconds**, after which the pressure is released.



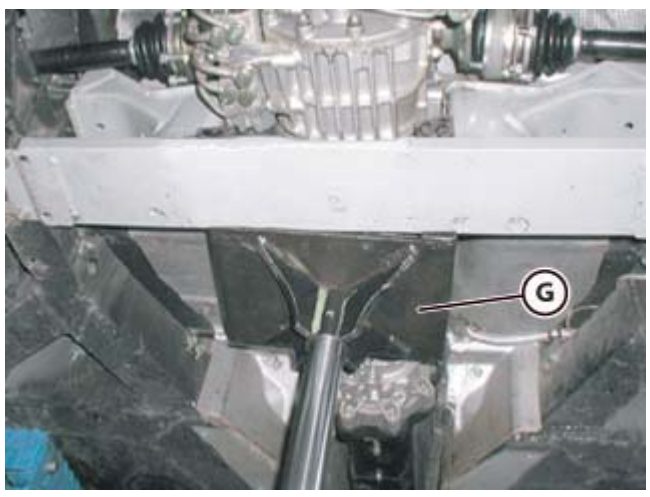
- Loosen the check nut **(2)** for the dowel **(1)**.

Carry out the procedure with extreme caution, taking care not to fasten the shaft with the dowel not correctly engaged in the relative recess.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

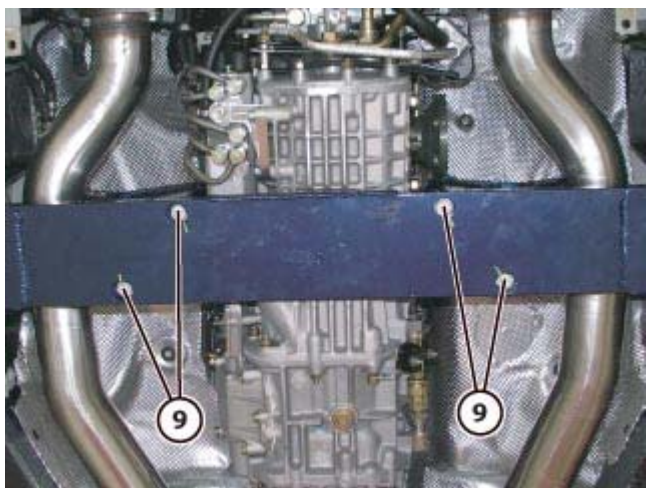
- Without forcing, lock the selector shaft by tightening the dowel **(1)**.

Turn the selector shaft slightly by hand while tightening the fastener dowel **(1)**: during this operation, the selector shaft free play progressively diminishes until the shaft itself is locked.

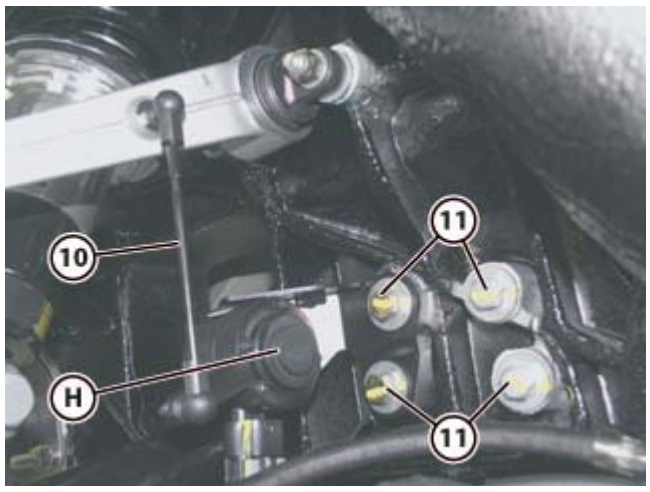
- Without forcing, tighten the check nut **(2)** of the dowel **(1)**.



- Place a hydraulic lifting tool **(G)** underneath the gearbox, resting it against it.



- Undo the four screws **(9)** fastening the gearbox bushings onto the mounting cross member.

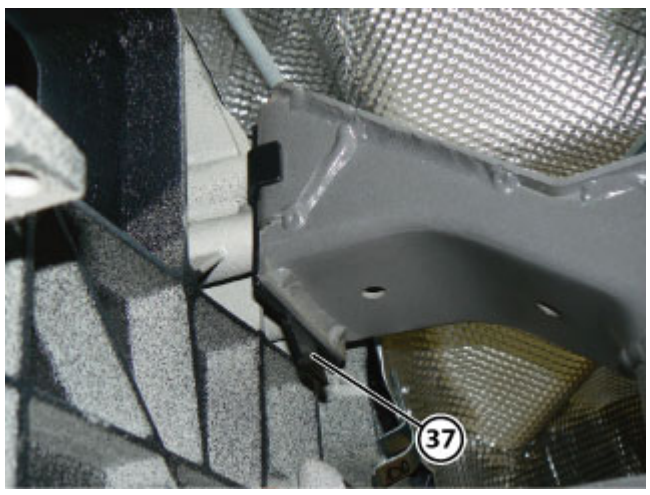


- Detach the tie-rod **(10)** from the upper arm.

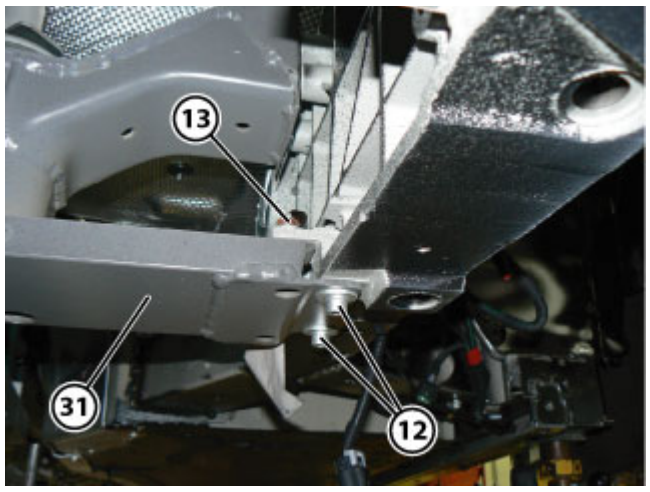
Repeat the procedure on the other side of the vehicle.

- Undo the four lateral screws **(11)** fastening the gearbox mounting cross member to the chassis and retrieve the sensor **(H)**.

Repeat the procedure on the other side of the vehicle.



- Remove the two shims **(37)** from both sides of the gearbox mounting cross member.



CAUTION
Ensure that the gearbox support tool is positioned correctly and functions properly.

- Undo the two bottom screws **(12)** and two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

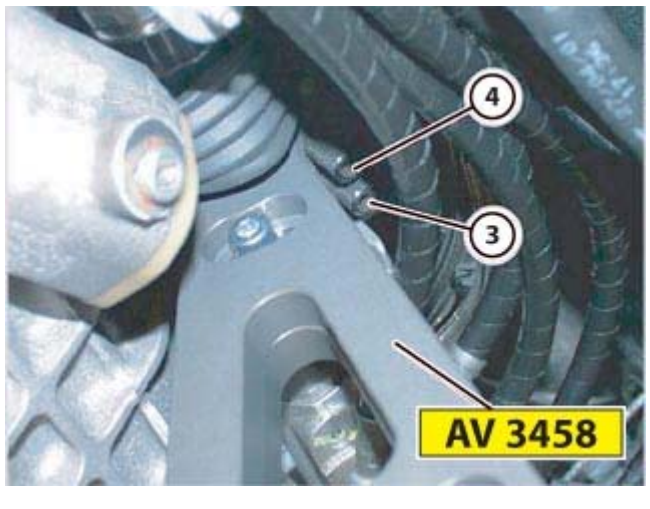
Repeat the procedure on the other side of the vehicle.

- Remove the gearbox mounting cross member **(31)**.



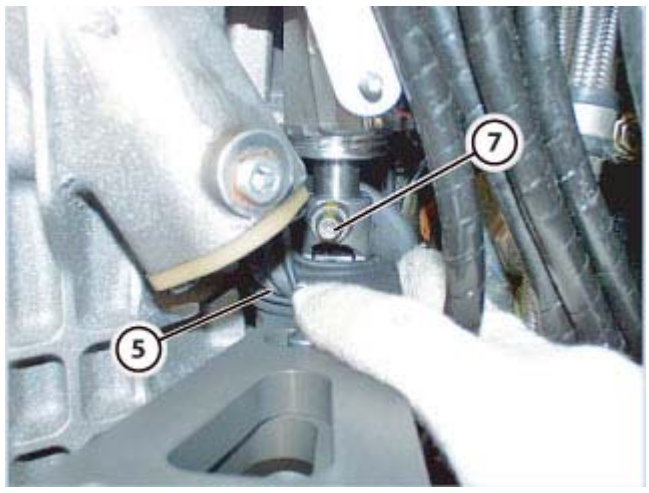
Using the clamp

- If the purpose of the procedure is to replace the complete F1 Kit, use the clamp **(A)** to lock the system mechanically, using the same procedures given for the tool **(AV 3458)**.

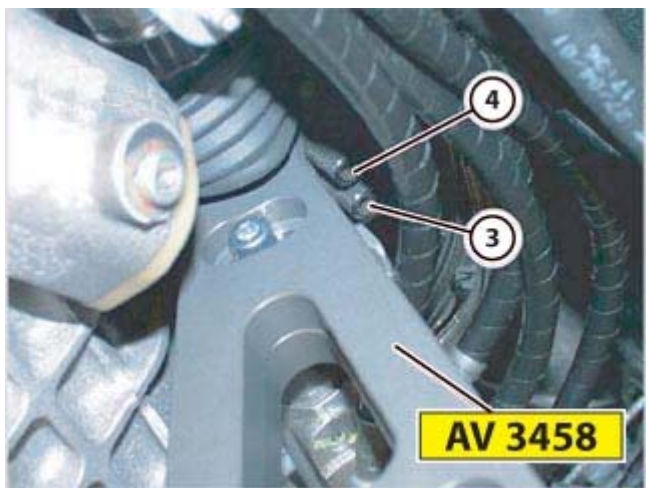


Using tool AV 3458

- Fit the tool **(AV 3458)**, then fasten onto the body of the actuator by hand tightening the screw **(3)**, and onto the actuator shaft by tightening the screw **(4)**.



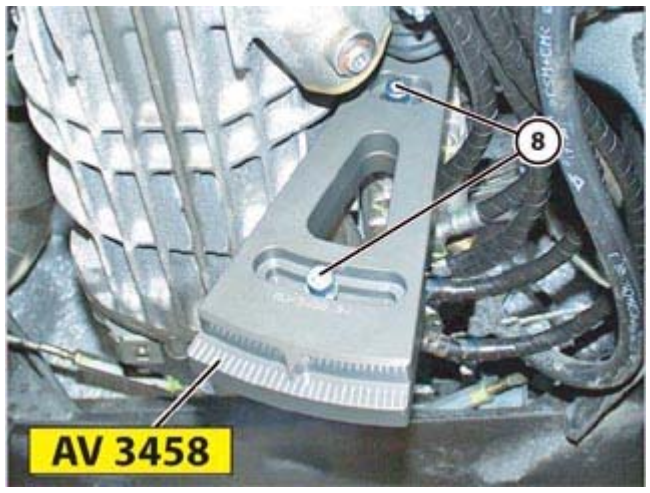
- Move the gaiter **(5)**.
- Loosen the screw **(7)**.



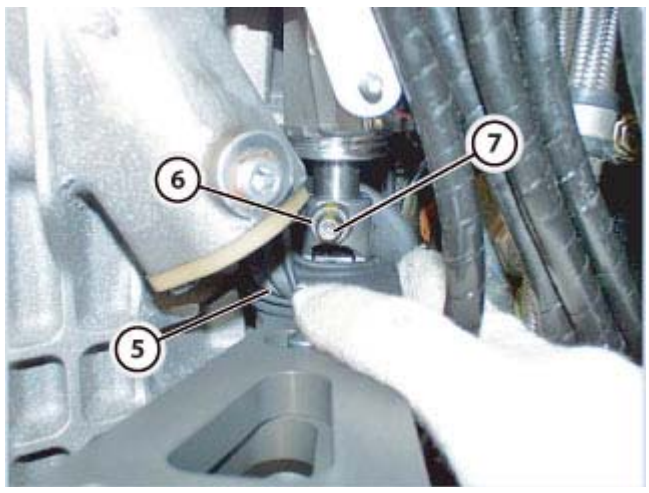
- Activate the actuator alignment diagnostic procedure from the SD-3, so that the system is set to neutral between **3rd and 4th gear**.

This procedure, which locks the actuator shaft, lasts approximately **10 seconds**, after which the pressure is released.

- Fully tighten the screw **(3)** e **(4)** of the tool **(AV 3458)** while the system is still pressurised (within 10 seconds).



- Tighten the two nuts **(8)** fastening the arches of the tool **(AV 3458)**, to lock the actuator precisely in the neutral position between **3rd and 4th gear**.



- Move the gaiter **(5)**.
- Undo the nut **(6)** and remove the screw **(7)** fastening the universal joint to the gearbox selector shaft.

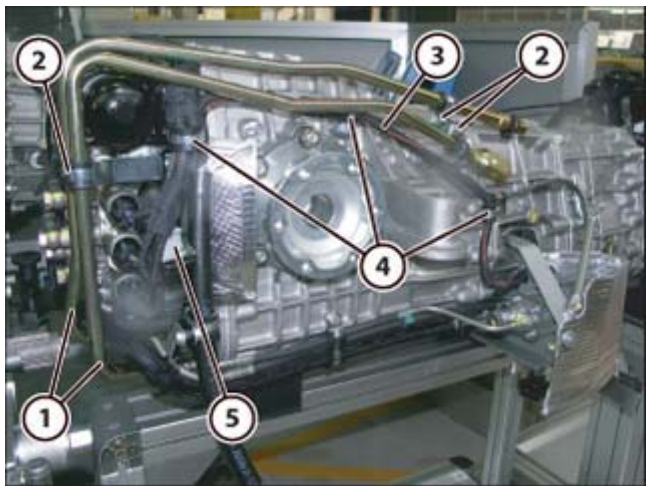
Removing the complete F1 Kit

In the event of replacing the complete Power-Unit / F1 gearbox actuator Kit due to failure of the electric pump, or when replacing the electric pump alone, the relative relay switch (L2.10) must also be replaced.
This is necessary to prevent a potential malfunction of the relay switch, caused by the electric pump fault, from damaging the new electric pump.

➢ Perform the procedure to lock the Gearbox/F1 Kit in neutral between 3rd and 4th gear (☞ D2.13).

As described in the procedure, apply the system immobiliser clamp, as the F1 kit must be returned to Ferrari in the neutral position between 3rd and 4th gear.

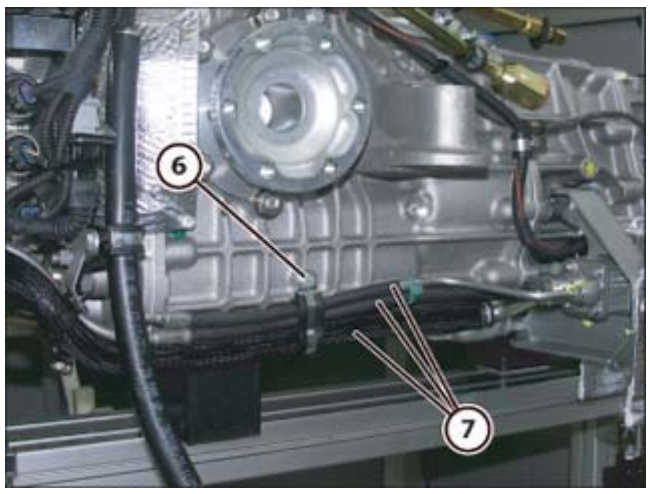
➢ Remove the gearbox-differential assembly (☞ D2.01).



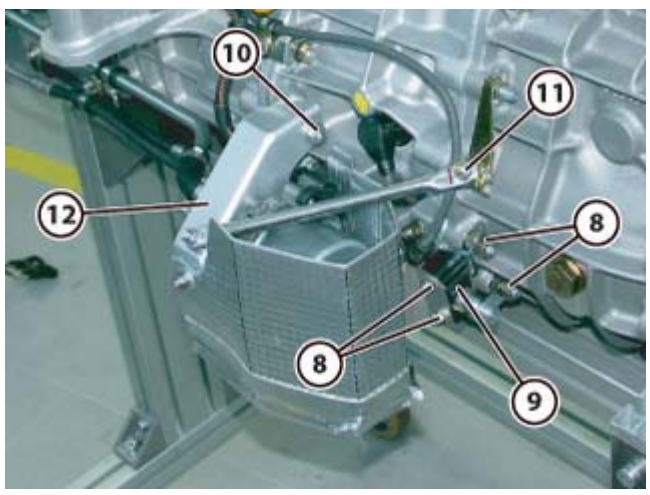
- Unscrew the two oil cooling pipe unions **(1)** on the gearbox.
- Unscrew the nuts **(2)** fastening the clamps retaining the pipes **(1)** on the gearbox.

FROM Ass.ly Nr. 68144 the bracket above the differential flange that formerly supported the gearbox oil radiator pipes has been eliminated.

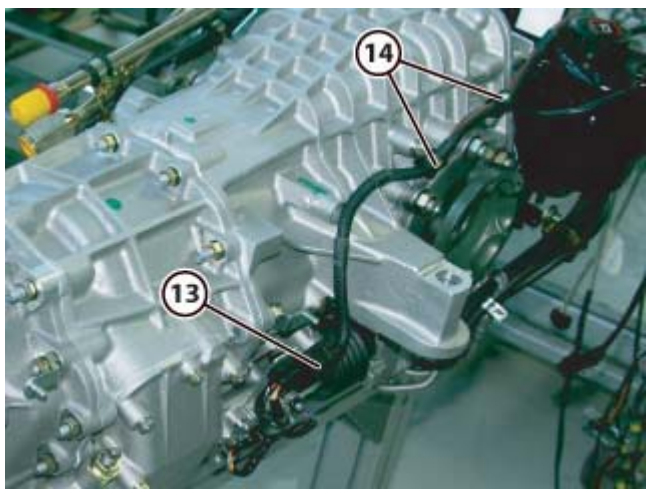
- Remove the two gearbox oil cooling pipes **(1)**.
- Remove the clamps **(4)** then release the two cables **(3)** and disconnect the gearbox input shaft speed sensor connector **(5)** (Z029).



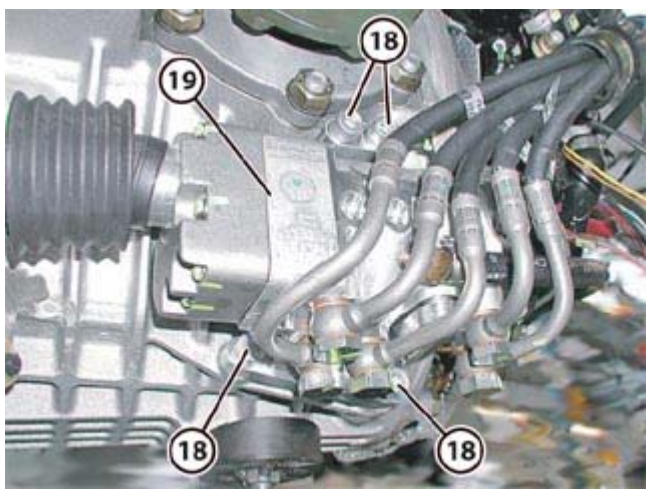
- Unscrew the nut **(6)** fastening the pipes **(7)** to the gearbox.



- Unscrew the nuts **(8)** fastening the connector block **(9)**.
- Unscrew the three nuts **(10)** and the nut **(11)** fastening the gearbox tie-rod.
- Separate the motorised pump **(12)** from the gearbox, suitably supporting its weight so as not to deform the pipes that are still connected to the Power Unit.



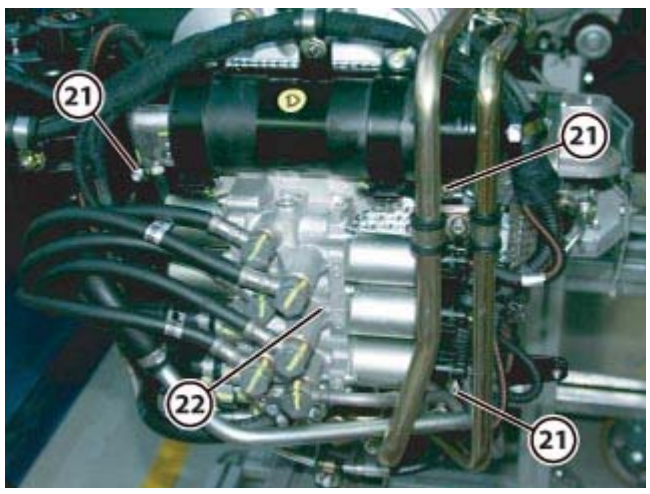
- Disconnect the gear selection and engagement sensor connector **(13)** and release the relative cable by removing the clamps **(14)**.



- Undo the screws **(18)** fastening the actuator **(19)** to the gearbox and, support its weight so as not to bend the connection pipes leading to the Power Unit.



- Undo the nut **(20 and the nut) (23)**.



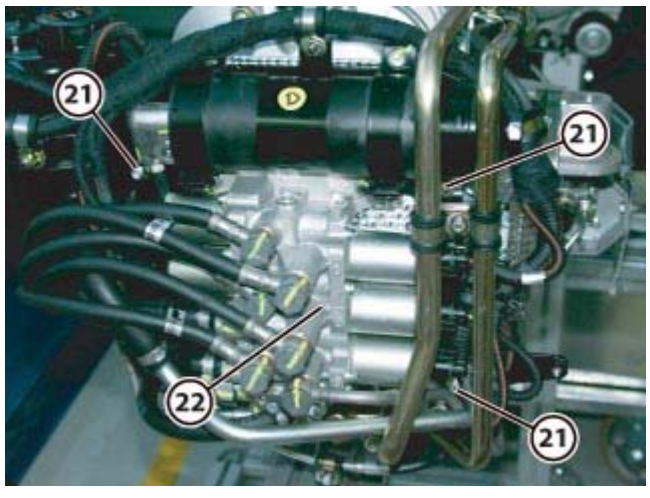
- Unscrew the nuts **(21)** and remove the Power Unit **(22)** and the actuator complete with connector pipes.

Refitting the complete F1 Kit

Tightening torque		**Nm**	**Class**
Power Unit - gearbox cover	Nut	24 Nm	B
Fastening stiffener tie-rod	Nut	24 Nm	B
Fastening electric pump heat shield	Screw	4 Nm	C
	Nut	8 Nm	B
Fastening mounting bracket for power unit fluid pipes	Screw	8 Nm	C
Oil delivery pipe to radiator on gearbox	Union	45 Nm	B
Oil return pipe from radiator on gearbox	Union	45 Nm	B
Actuator - gearbox housing	Screw	24 Nm	B
Actuator - gearbox rod	Nut	34 Nm	A
Selector shaft retainer dowel	Nut	10 Nm	C

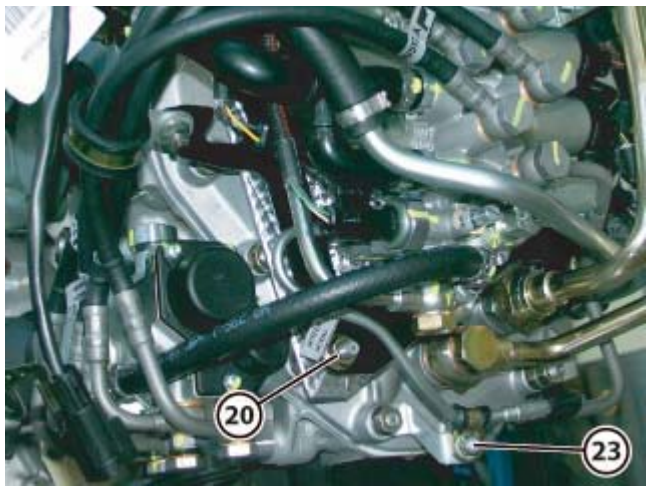
In the event of replacing the complete Power-Unit / F1 gearbox actuator Kit due to failure of the electric pump, or when replacing the electric pump alone, the relative relay switch (L2.10) must also be replaced.
This is necessary to prevent a potential malfunction of the relay switch, caused by the electric pump fault, from damaging the new electric pump.

Fit the F1 kit, complete with connector pipes and solenoid valve, in the relative mountings on the gearbox, supporting the weight of the components to prevent damage to the connector pipes.



- Fit the Power Unit **(22)** in its relative seat on the gearbox and tighten the nuts **(21)**.

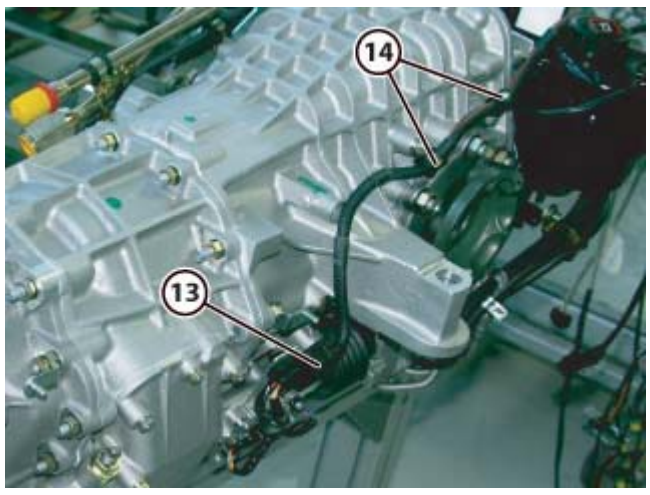
Tightening torque	**Nm**	**Class**
Nut	24 Nm	B



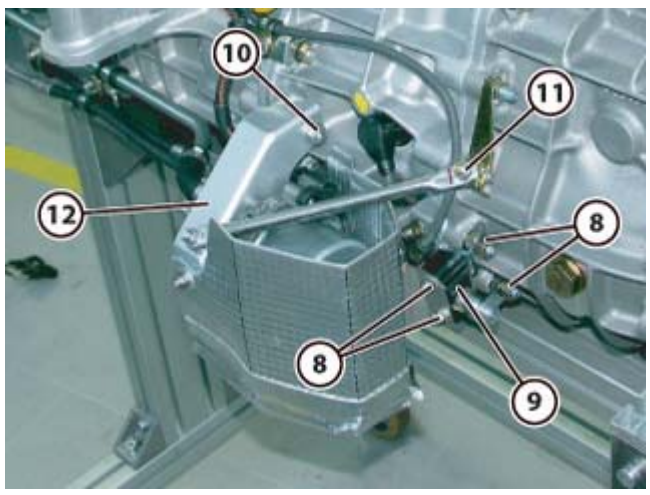
- Fasten the lower left hand part of the Power Unit and tighten the nut **(20)**.

Tightening torque	**Nm**	**Class**
Nut	24 Nm	B

- Tighten the nut **(23)**.



- Connect the gear selection and engagement sensor connector **(13)** and fasten the relative cable with the clamps **(14)**.

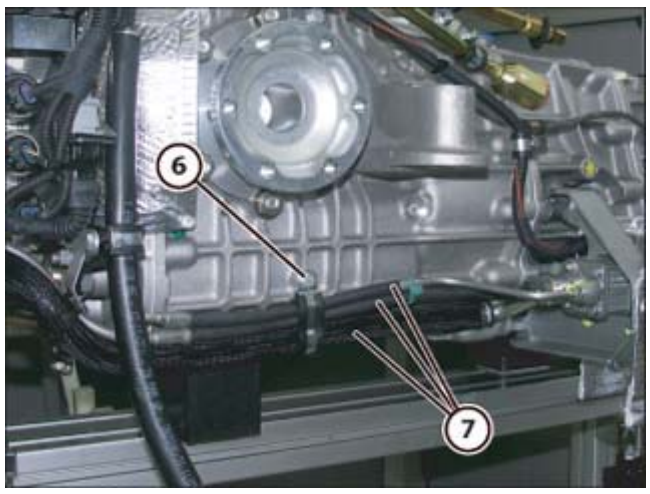


- Fit the motorised pump unit **(12)** on the gearbox and fasten with the three nuts **(10)**.
- Tighten the nut **(11)** fastening the tie-rod on the gearbox.

Tightening torque	**Nm**	**Class**
Nut	24 Nm	B

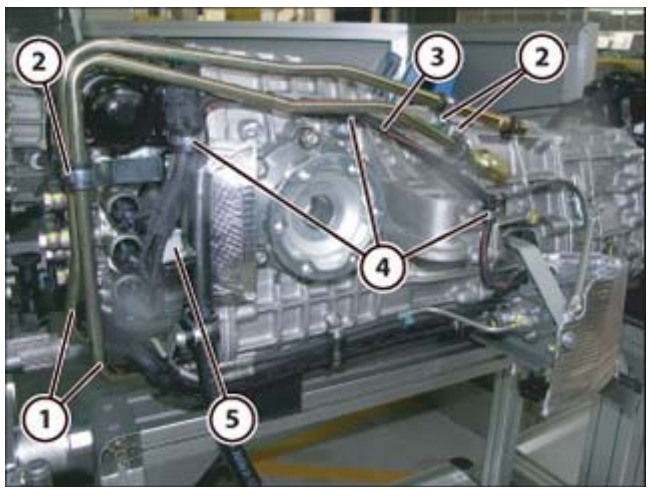
- Tighten the nuts **(8)** fastening the connector block **(9)**.

Tightening torque	**Nm**	**Class**
Nut	8 Nm	B



- Fasten the cables **(7)** by tightening the clamp fastener screw **(6)**.

Tightening torque	**Nm**	**Class**
Screw	8 Nm	C

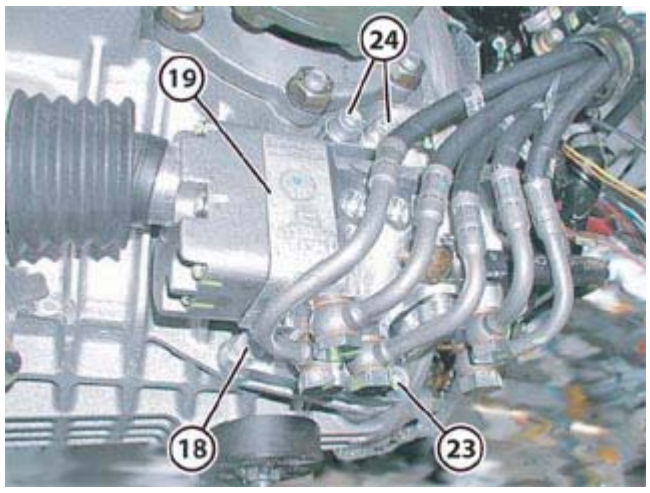


- Connect the gearbox input shaft speed sensor connector **(5)** (Z029) and fasten the cables **(3)** to the gearbox with the clamps **(4)**.
- Tighten the two unions of the oil cooling pipes **(1)** to the gearbox.

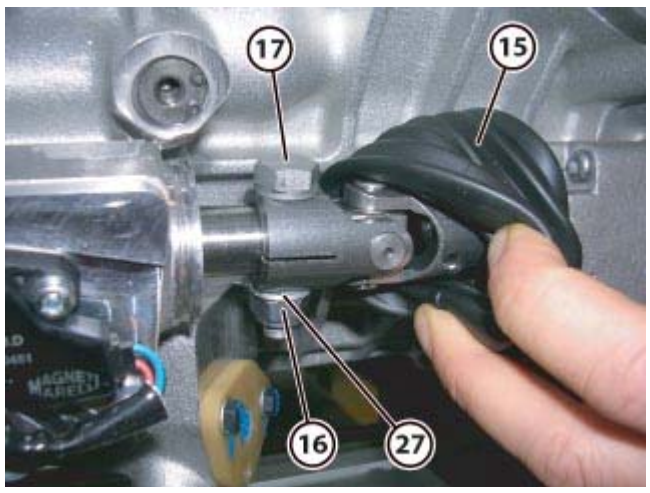
Tightening torque	**Nm**	**Class**
Union	45 Nm	B
Union	45 Nm	B

- Fasten the oil cooling pipes **(1)** to the gearbox by tightening the nuts **(2)**.

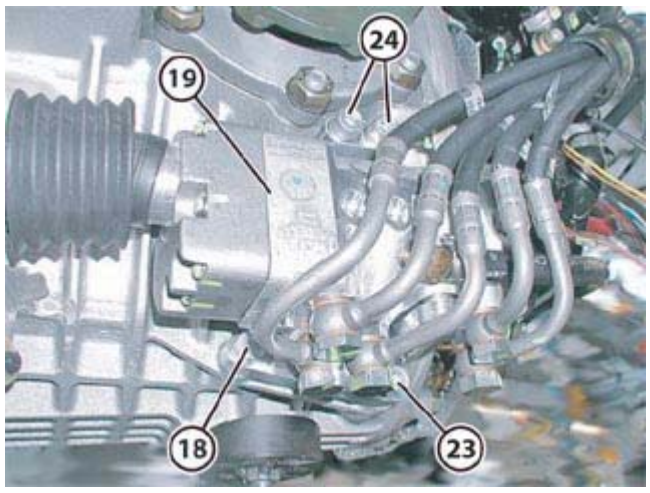
FROM Ass.ly No. 68144 the bracket above the differential flange supporting the gearbox oil radiator pipes has been eliminated.



- Fit the actuator **(19)** on the gearbox, engaging the universal joint with the gear selector shaft.
- Fit the actuator **(19)** fastener screws in the following order: first screw **(18)**, then **(23)** and then **(24)**.
- Visually check for interference between the actuator and the gearbox: rectify if necessary.
- Check that the actuator moves longitudinally without impediment.

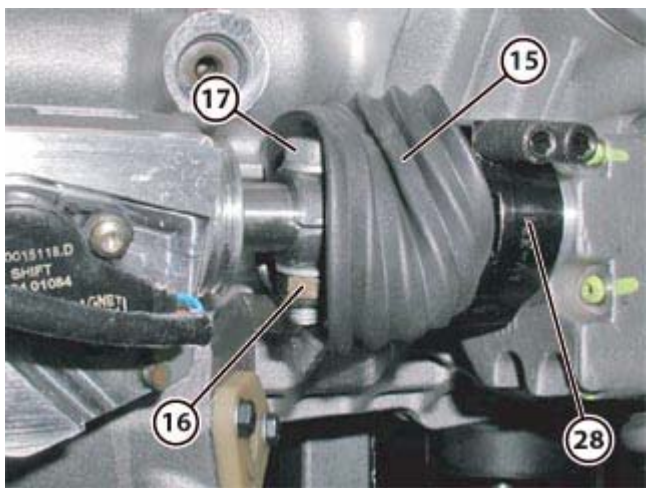


- Move the gaiter **(15)**.
- Fit the screw **(17)** fastening the universal joint to the gear selector shaft from above.
- Fit the washer **(27)** and hand tighten the nut **(16)**.
- Move the actuator to evenly distribute the coupling backlash, with the screw **(17)** fitted in the housing between the universal joint and the gear selector shaft.



- Tighten the screws fastening the actuator **(19)** in the following order: first screw **(18)**, then **(23)** and then **(24)**.

Tightening torque	Nm	Class
Screw	24 Nm	B



- Ensure that the screw **(17)** fastening the universal joint to the selector shaft turns freely in its relative hole.

If the screw **(17)** does not turn freely, loosen the screws fastening the brackets and repeat the procedure to distribute the coupling backlash between the universal joint and the gear selector shaft.

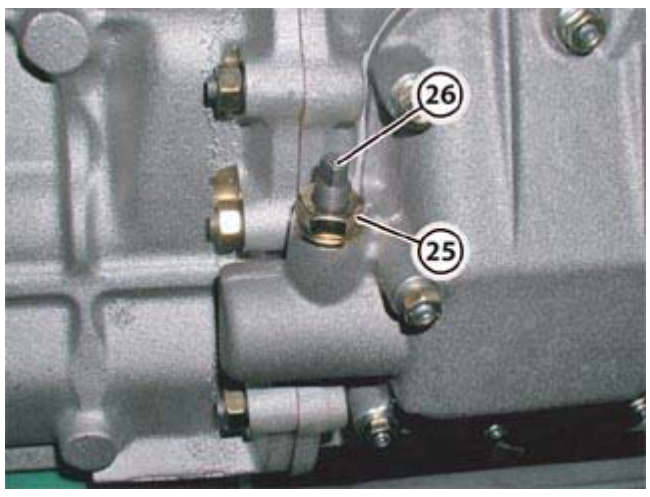
- Tighten the nut **(16)**.

Tightening torque	Nm	Class
Nut	34 Nm	A

- Remove the sleeve, undoing the relative fastener screws **(28)**.

Only if the complete F1 Kit has been replaced.

- Fit the gaiter **(15)** in its relative mounting.



Perform the operation with extreme caution, taking care not to detach the retainer Seeger ring.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

- Unscrew the dowel **(26)** completely, but do not remove.
- Tighten the check nut **(25)**.

Tightening torque	Nm	Class
Nut	10 Nm	C

- Remove tool **(AV 3458)**.

Only if the gearbox has been replaced.

➢ Refit the complete gearbox-differential assembly (D2.02).

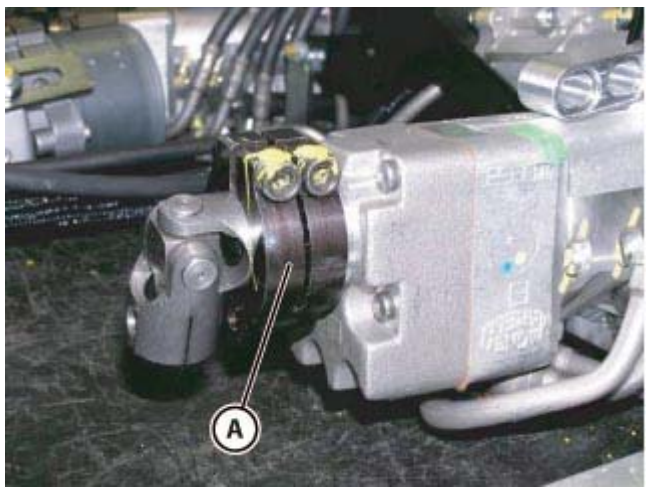
DO NOT refit the gearbox mounting cross member.

➢ Perform a self-acquisition cycle.
➢ Perform the actuator-gearbox alignment procedure. (D2.13).
Only if the self-acquisition cycle was not completed successfully.

➢ Refit the complete gearbox-differential assembly (D2.02).
Refit the gearbox mounting cross member.

Replacing the complete F1 Kit

- Remove the complete F1 Kit (D2.13).



DO NOT remove the sleeve before assembling the new F1 Kit complete with gearbox.

- The new complete F1 Kit will be shipped from the Ferrari Spare Parts service with the actuator shaft locked in neutral between 3rd – 4th gear, with the relative sleeve **(A)**.

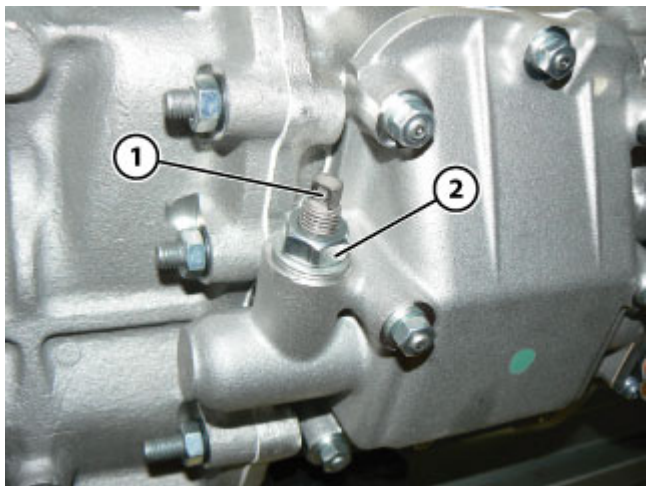
➢ Refit the complete F1 Kit (D2.13).
➢ After replacing the complete F1 Kit, perform the **"Calibrating the gearbox"** specifications described in chapter "**D2.15 _ Calibrating the electronically-controlled gearbox.**".

Actuator - gearbox alignment procedure

Tightening torque		**Nm**	**Class**
Actuator - gearbox rod	Nut	34 Nm	A
Selector shaft retainer dowel	Nut	10 Nm	C
Gearbox subframe - chassis	Screw	25 Nm	B
Gearbox mounting bushing - chassis	Screw	50 Nm	C

➢ Remove the rear undertray section (M2.12).
➢ Remove the silencer and exhaust extension (B6.05).
Remove both exhaust extensions.

- Run the actuator alignment diagnosis from the SD3.
- Stop actuator alignment diagnosis from the SD3, de-energising the solenoid valves.



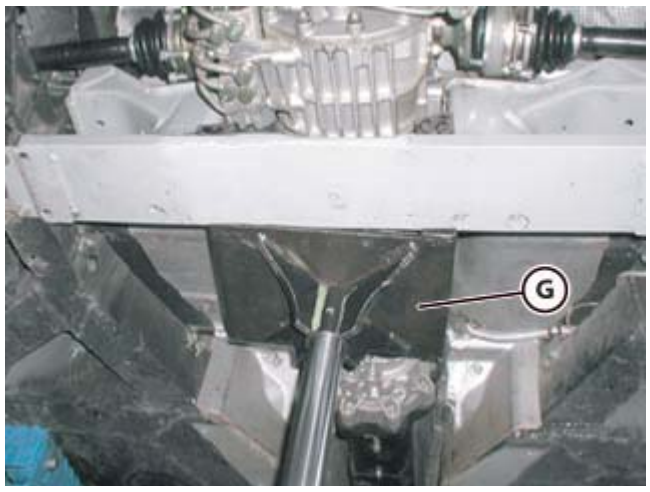
- Loosen the check nut **(2)**.

Carry out the procedure with extreme caution, taking care not to fasten the shaft with the dowel not correctly engaged in the relative recess.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

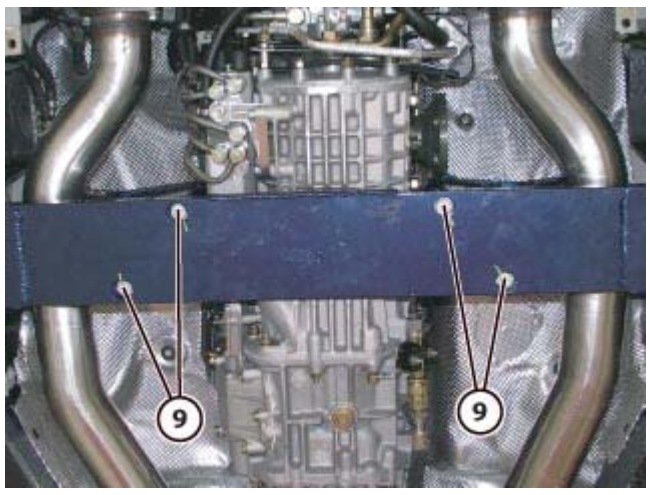
- Tighten the dowel **(1)** to immobilise the selector shaft. Do not tighten excessively.

Turn the selector shaft slightly by hand while tightening the fastener dowel **(1)**: while the dowel is tightened into the corresponding recess on the selector shaft, the shaft clearance gradually reduces until the shaft is immobilised.

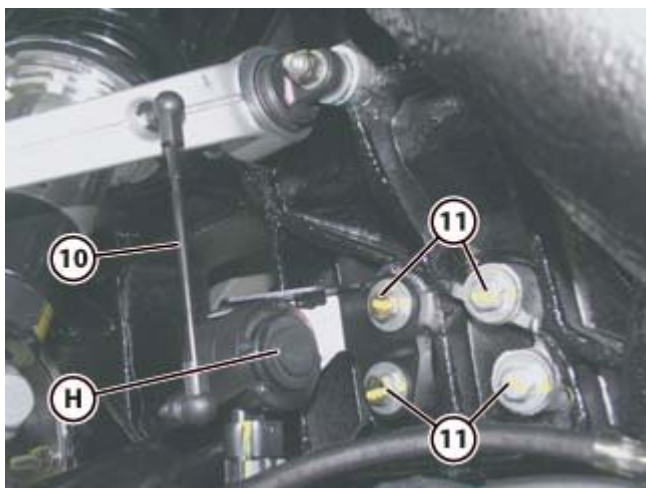
- Tighten the check nut **(2)**. Do not tighten excessively.



- Place a hydraulic lifting tool **(G)** underneath the gearbox, resting it against it.

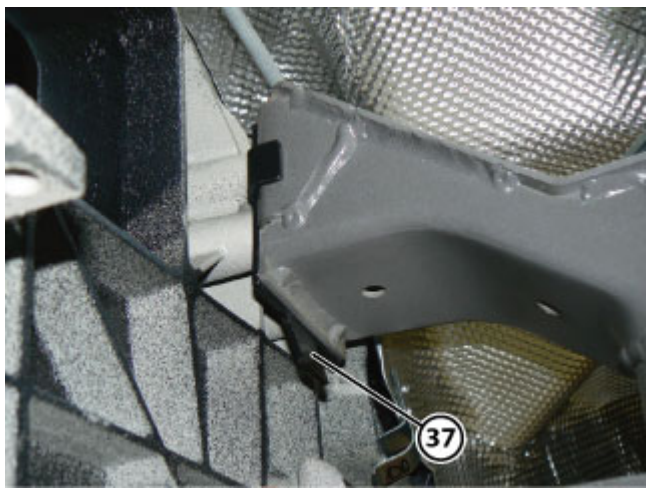


- Undo the four screws **(9)** fastening the gearbox bushings onto the mounting cross member.

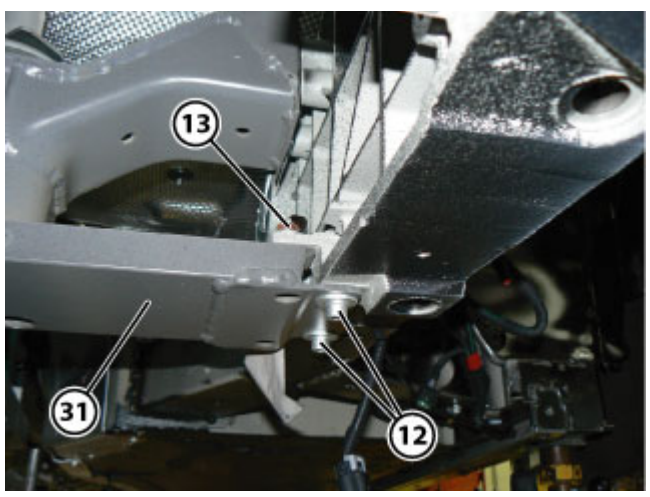


- Detach the tie-rod **(10)** from the upper arm and undo the four screws **(11)** fastening the sides of the gearbox mounting cross member to the chassis, retrieving the sensor **(H)**.

i Repeat the procedure on the other side of the vehicle.



- Remove the two shims **(37)** from both sides of the gearbox mounting cross member.



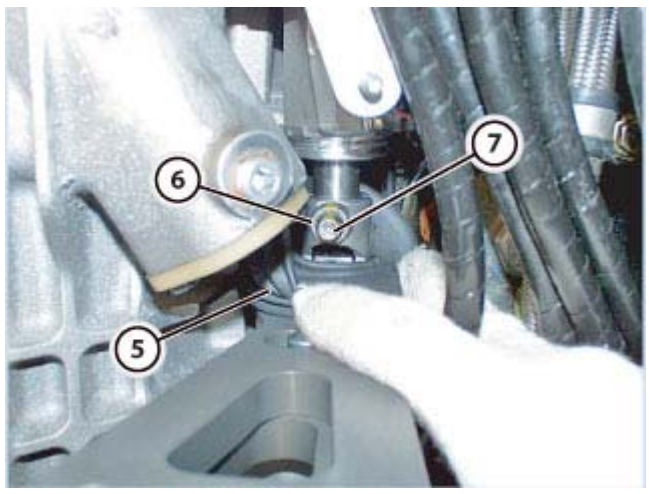
- Undo the two bottom screws **(12)** and two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

i Perform the same operation on the other side of the vehicle.

CAUTION

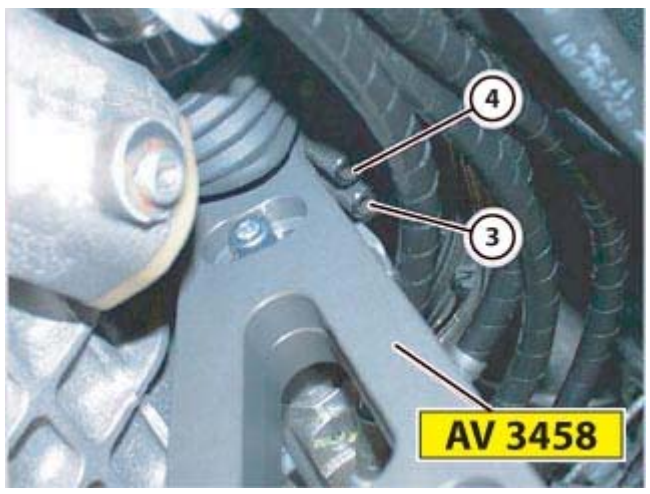
Ensure that the gearbox support tool is positioned correctly and functions properly.

- Remove the gearbox mounting cross member **(31)**.



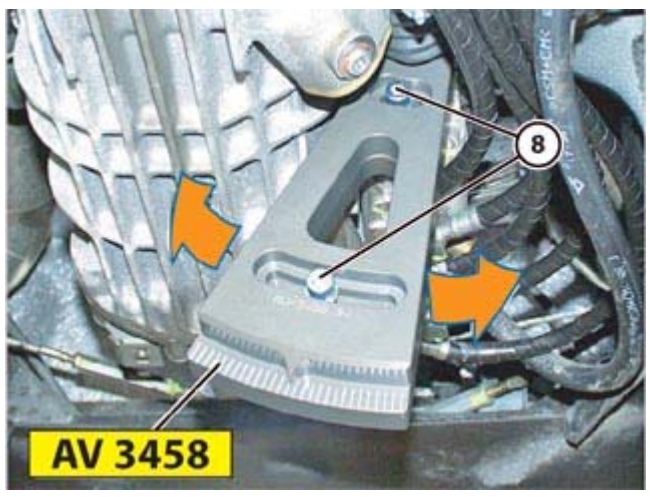
Step (Z)

- Move the gaiter **(5)**.
- Loosen the nut **(6)** on the screw **(7)** fastening the joint with the gearbox control rod.

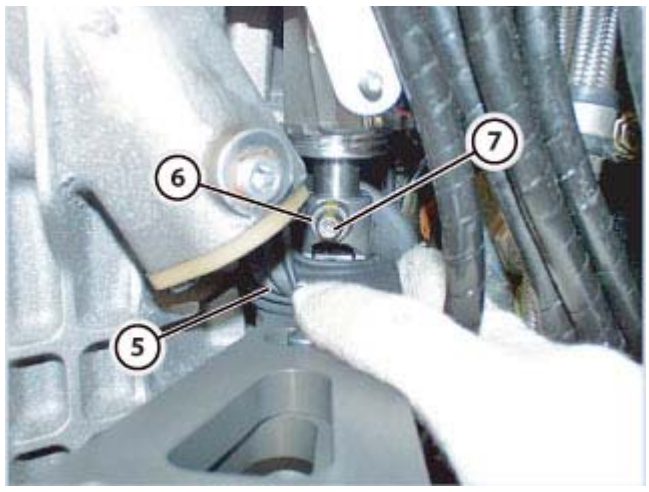


- Fit tool **(AV 3458)**, tightening screw **(3)** on the actuator body and screw **(4)** on the actuator shaft, leaving the screws fastening the two branches of the calliper loose.

- Run the actuator alignment diagnosis from the SD3 again and keep running to keep the actuator pressurised.

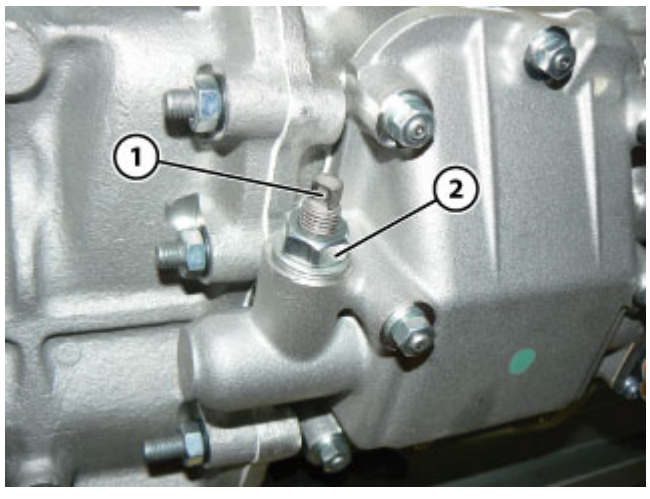


- Open out the two sides of the tool **(AV 3458)** to determine the overall actuator shaft clearance.
- Distribute the clearance evenly and tighten the two screws **(8)** fastening the two sides of the tool **(AV 3458)**.



- Move the gaiter **(5)**.
- Tighten the nut **(6)** on the screw **(7)** fastening the joint to the gear selector shaft.

Tightening torque	Nm	Class
Nut	34 Nm	A



- Loosen the check nut **(2)**.

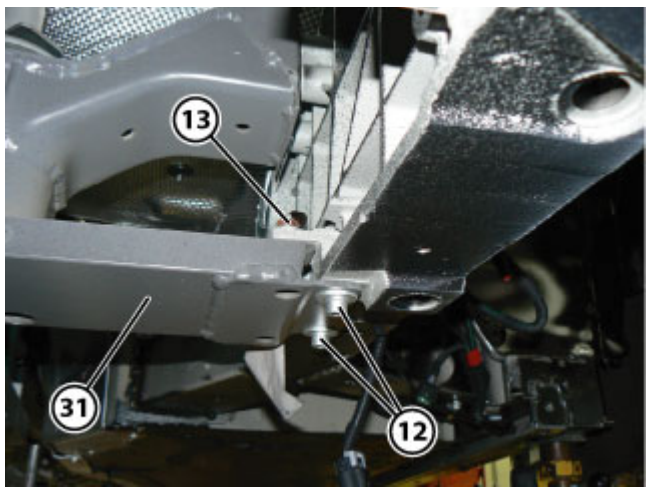
Perform the operation with extreme caution, taking care not to detach the retainer Seeger ring.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

- Unscrew the dowel **(1)** completely but do not remove.
- Tighten the check nut **(2)**.

Tightening torque	Nm	Class
Nut	10 Nm	C

- Remove tool **(AV 3458)**.
- Perform a key off - key on.
- Perform a self-acquisition cycle

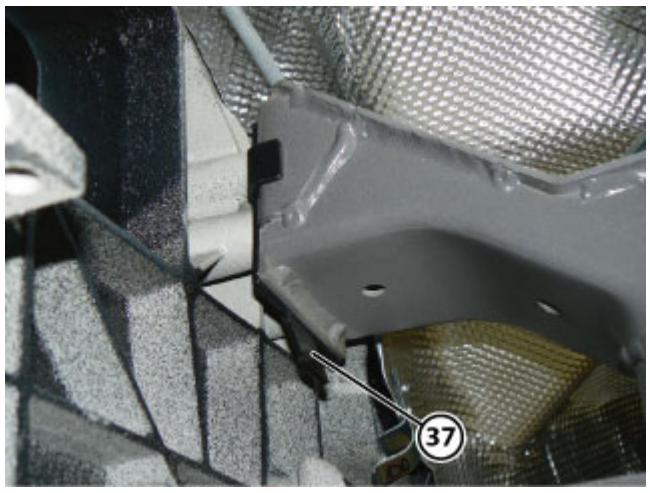
If the cycle is not completed successfully, repeat the centring procedure from **Step (Z)**.



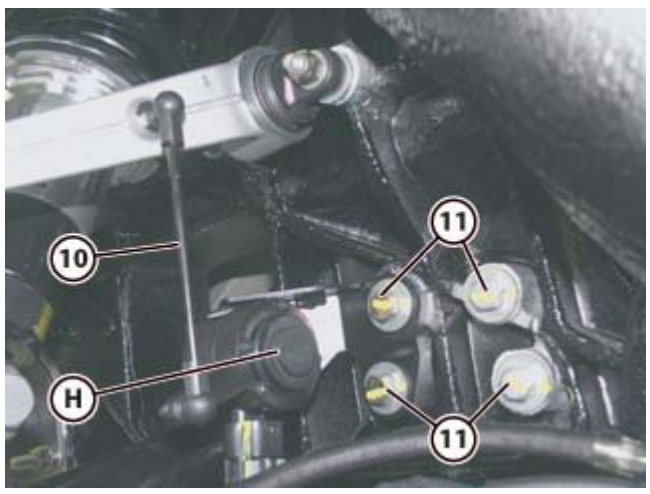
- Fit the gearbox mounting cross member **(31)**.
- Tighten the two bottom screws **(12)** and the two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

Perform the same operation on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



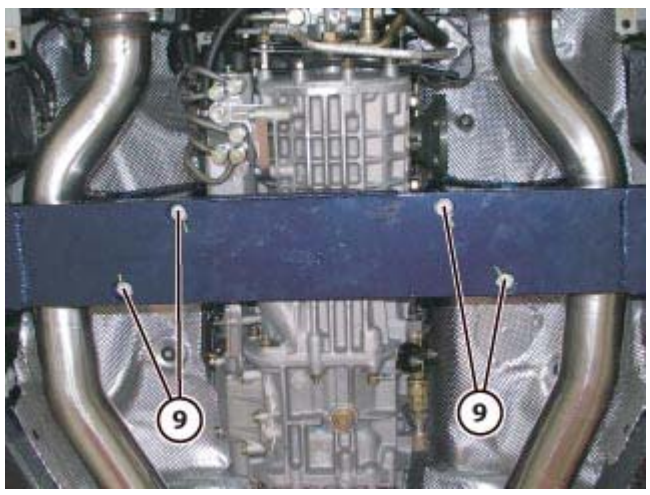
- On both sides of the car, install a shim **(37)** of suitable thickness between the chassis and the gearbox mounting cross member.



- Fit the sensor **(H)** in its seat, tighten the four lateral screws **(11)** fastening the gearbox mounting cross member to the chassis and connect the tie rod **(10)** to the upper arm.

Perform the same operation on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



- Tighten the four screws **(9)** fastening the gearbox bushings onto the mounting cross member.

Tightening torque	Nm	Class
Screw	50 Nm	C

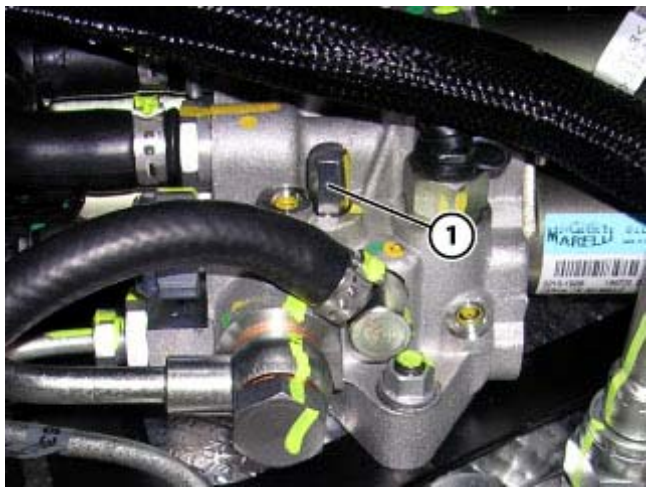
➢ Refit the silencer and exhaust extension (B6.05).
➢ Refit the rear underfloor section (M2.12).

Replacing the F1 gearbox actuator

Tightening torque		Nm	Class
By-pass screw - Power Unit	Screw	3.5 Nm	C
Pipes - F1 gearbox system hydraulic actuator	Pipe union	28 Nm	B
Actuator - gearbox housing	Screw	24 Nm	B
Actuator - gearbox rod	Screw	34 Nm	A

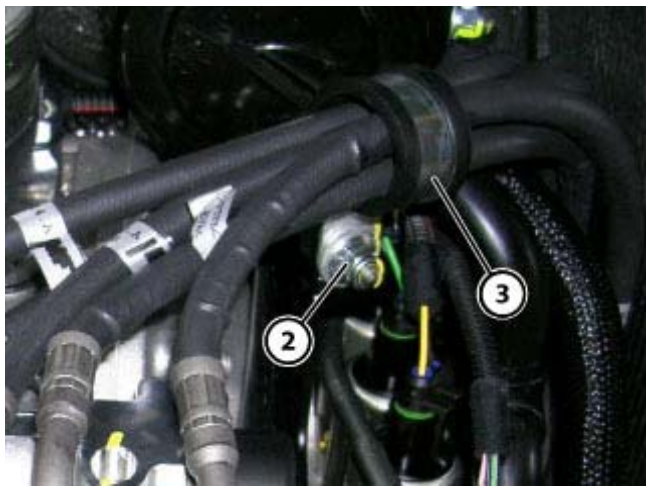
Tightening torque		Nm	Class
Selector shaft retainer dowel	Nut	10 Nm	C
Gearbox subframe - chassis	Screw	25 Nm	B
Gearbox mounting bushing - chassis	Screw	50 Nm	C

- Perform the procedure to lock the Gearbox/F1 Kit in neutral between 3rd and 4th gear (D2.13).
- Drain the oil from the F1 gearbox system (D2.13).

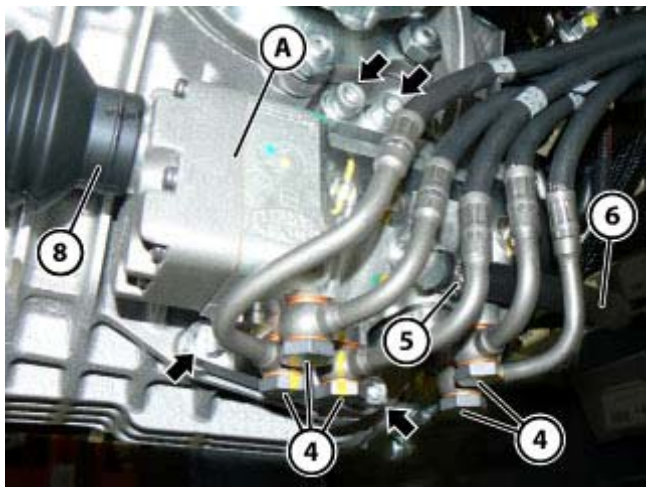


- Loosen the By-pass screw **(1)** on the bottom of the Power Unit to release the pressure in the F1 gearbox hydraulic circuit.
- After releasing the pressure in the F1 gearbox hydraulic circuit, tighten the By-pass screw **(1)** immediately.

Tightening torque	Nm	Class
Screw	3.5 Nm	C



- Undo the nut **(2)** fastening the hydraulic pipe retainer clamp **(2)**.
- Loosen the hydraulic pipe retainer clamp **(3)**.
- Pull out the hydraulic pipes from inside the retainer clamp **(3)**.



Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Undo the pipe unions **(4)** fastening the hydraulic pipes to the hydraulic actuator.

Note the position of each pipe on the actuator to avoid inverting them when reassembling.

- Move the hydraulic pipes out of the way so that they do not hinder the following operations.
- Remove the clamp **(5)** fastening the recirculation pipe **(6)**.
- Disconnect the recirculation pipe **(6)** from the corresponding union on the hydraulic actuator.
- Undo the four screws indicated fastening the gearbox housing actuator **(A)**.
- Remove the actuator **(A)** from the gearbox housing by disconnecting the universal joint from the selector shaft and replace it.
- Remove the bellow **(8)** from the actuator shaft and put it aside.
- Place the bellow **(8)** in the new actuator shaft.
- Fit the actuator **(A)** on the gearbox, engaging the universal joint with the gearbox selector shaft.

The new actuator will be supplied without a shaft fastening sleeve.

- Partially tighten the four screws indicated fastening the actuator **(A)** in the following order: first the bottom left screw, then the bottom right screw and finally, the two top screws.
- Visually check for interference between the actuator and the gearbox: rectify if necessary.
- Check that the actuator moves longitudinally without impediment.
- Connect the recirculation pipe **(6)** to the relative union on the hydraulic actuator.
- Fit a new clamp **(5)** fastening the recirculation pipe **(6)**.



Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new strips onto the pipe unions of the hydraulic pipes.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

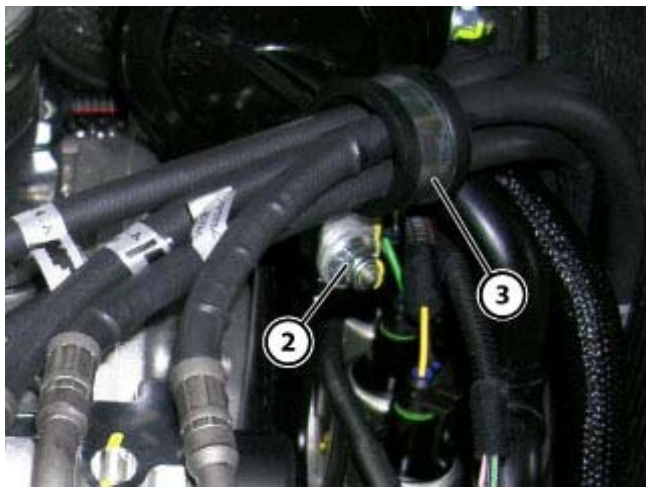
- Place the hydraulic pipe unions on the hydraulic actuator and partially tighten.

ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- Fit the element **03** of the tool **(AV 8076)** onto the hydraulic actuator, place the hydraulic pipes in the correct position and tighten the relative pipe unions.

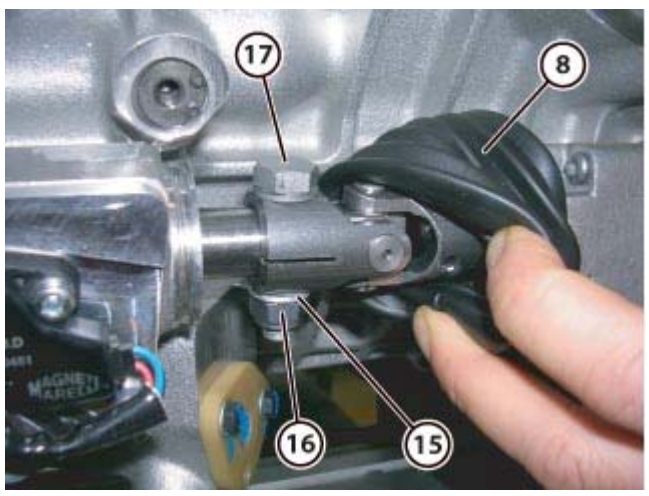


Tightening torque	Nm	Class
Pipe union	28 Nm	B

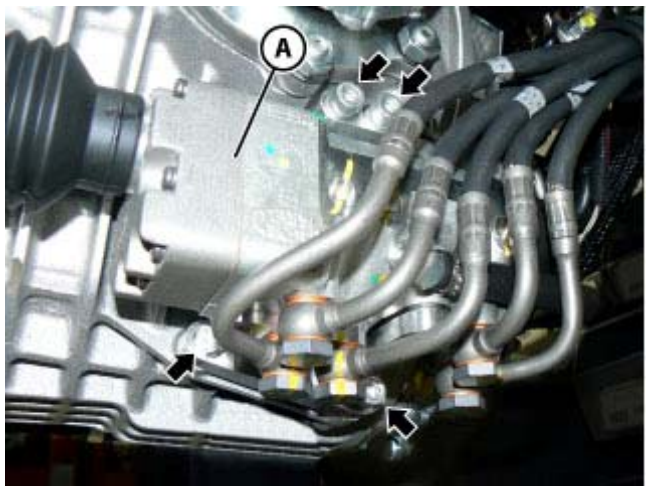


- Place the hydraulic pipes in the retainer clamp **(3)**.
- Tighten the hydraulic pipe retainer clamp **(3)**.
- Tighten the nut **(2)** fastening the hydraulic pipe retainer clamp **(3)**.

- Fill F1 gearbox system with oil (D2.13).
- Bleed the clutch system (D2.14).
- Bleed the gearbox actuator (D2.14).
- Using the SD-3, activate the actuator alignment diagnosis and keep it activated to keep the actuator pressurised.



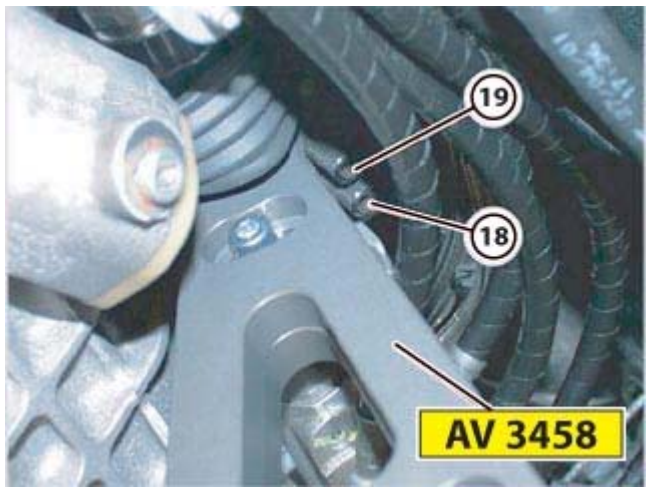
- Move the gaiter **(8)**.
- Fit the screw **(17)** fastening the universal joint to the gear selector shaft from above.
- Fit the washer **(15)** and partially tighten the nut **(16)**.
- Move the actuator to evenly distribute the coupling backlash, with the screw **(17)** fitted in the housing between the universal joint and the gear selector shaft.



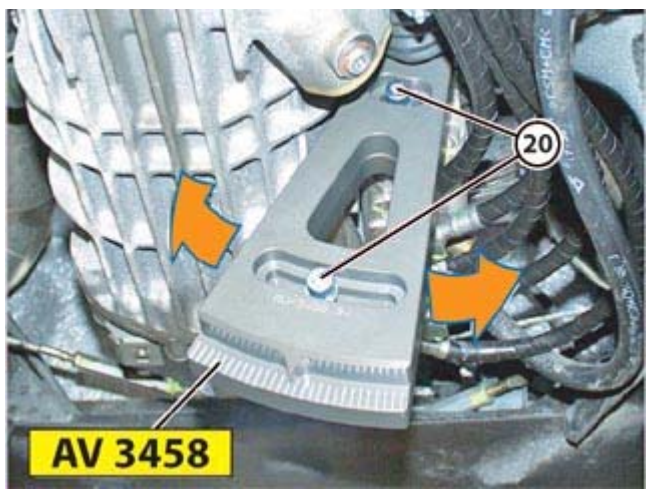
- Tighten the four screws indicated fastening the actuator **(A)** in the following order: first the bottom left screw, then the bottom right screw and finally, the two top screws.



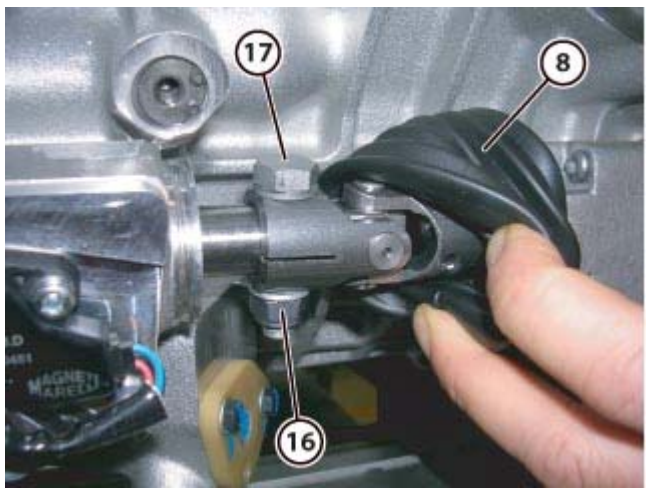
Tightening torque	Nm	Class
Screw	24 Nm	B



- Apply the tool **(AV 3458)** and block the screw **(18)** on the actuator body and the screw **(19)** on the actuator shaft leaving the fastener screws on the two arms of the calliper free.



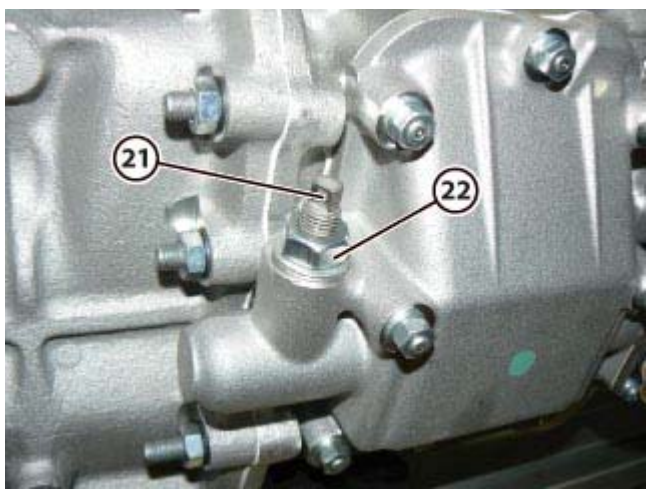
- Move both sides of the tool in each direction **(AV 3458)** to determine the total rotation clearance of the actuator shaft.
- Divide the clearance in half and hand tighten the two screws **(20)** fastening both sides of the tool **(AV 3458)**.



- Move the gaiter **(8)**.
- Tighten the nut **(16)** of the screw **(17)** fastening the joint to the gearbox selector shaft.

Tightening torque	Nm	Class
Screw	34 Nm	A

- Fit the gaiter **(8)** in the relative seat.
- Remove tool **(AV 3458)**.

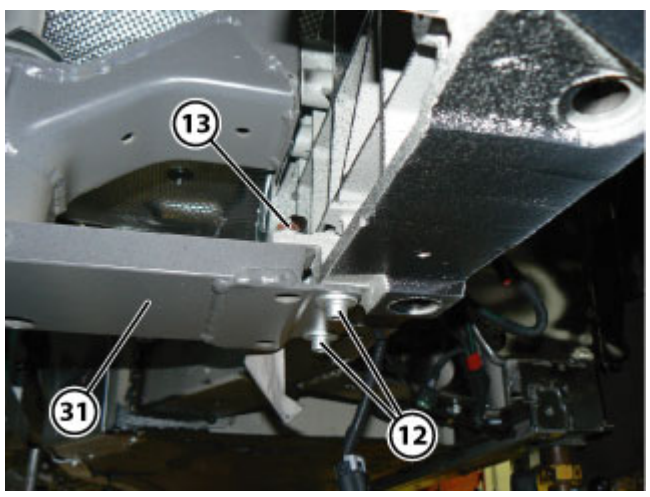


- Loosen the check nut **(22)**.

Perform the operation with extreme caution, taking care not to detach the retainer Seeger ring.
DO NOT remove the dowel: removing the dowel may result in damage to the thread of the aluminium selector body into which it is screwed.

- Unscrew the dowel **(21)** completely, but do not remove.
- Tighten the check nut **(22)**.

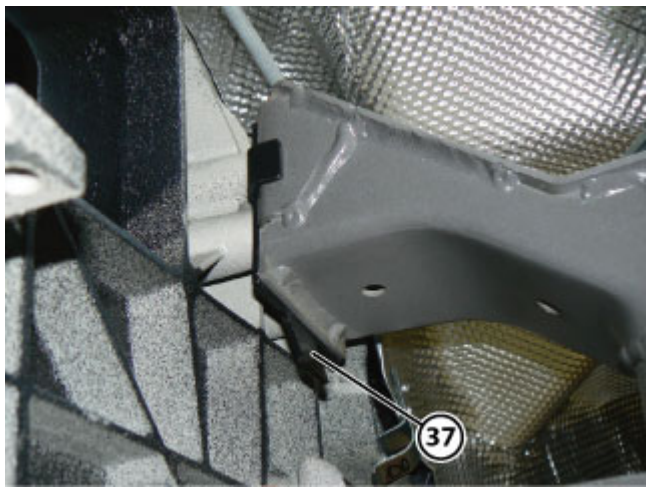
Tightening torque	Nm	Class
Nut	10 Nm	C



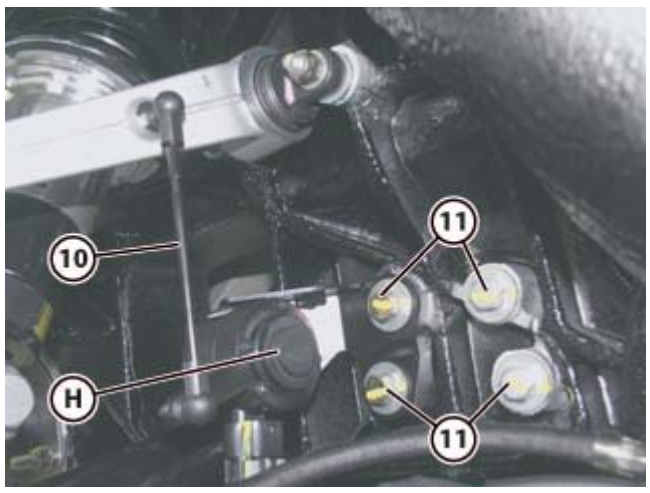
- Fit the gearbox mounting cross member **(31)**.
- Tighten the two bottom screws **(12)** and hand tighten the two top nuts **(13)** fastening the gearbox mounting cross member **(31)** to the chassis.

Repeat the procedure on the other side of the vehicle.

Tightening torque	Nm	Class
Screw	25 Nm	B



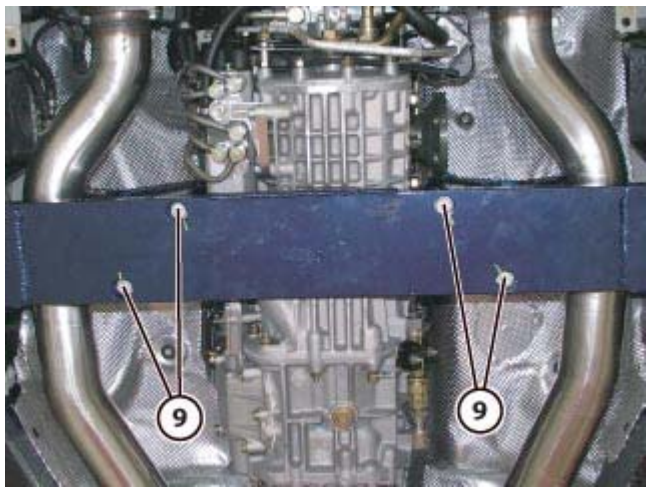
- Place a suitable shim **(37)** on both sides of the vehicle between the chassis and the gearbox mounting cross member.



- Place the sensor **(H)** in its seat, tighten the four screws **(11)** fastening the sides of the gearbox mounting cross member to the chassis and connect the tie-rod **(10)** to the upper arm.

Repeat the procedure on the other side of the vehicle.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	B



- Tighten the four screws **(9)** fastening the gearbox bushings to the mounting cross member.

Tightening torque	**Nm**	**Class**
Screw	50 Nm	C

- Check the F1 gearbox system oil level (A3.03).
- Perform a self-acquisition cycle
- Perform the actuator-gearbox alignment procedure. (D2.13).

Only if the self-acquisition cycle was not successfully completed.

Replacing the Power Unit

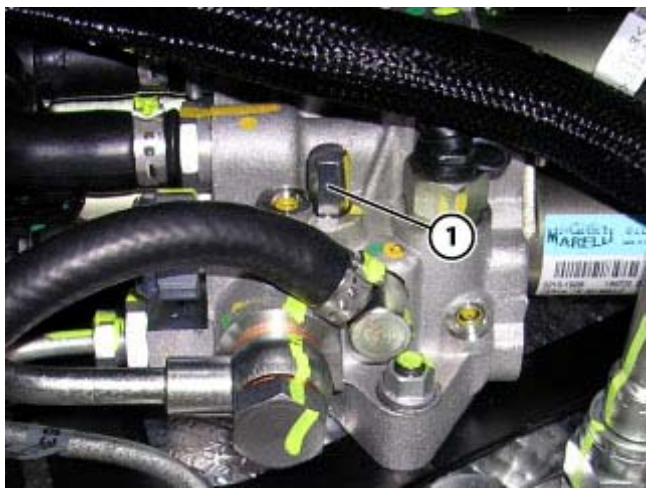
Tightening torque		**Nm**	**Class**
By-pass screw - Power Unit	Screw	3.5 Nm	C
Power Unit - mounting bracket	Nut	21 Nm	B
Pipes - F1 gearbox system hydraulic actuator	Pipe union	28 Nm	B
Rigid pipe from hydraulic pump - Power Unit	Union	21 Nm	B

When the Power Unit is replaced, new solenoid valves may be installed with different characteristics from the solenoid valves installed previously.

- Perform the procedure to lock the Gearbox/F1 Kit in neutral between 3rd and 4th gear (D2.13).

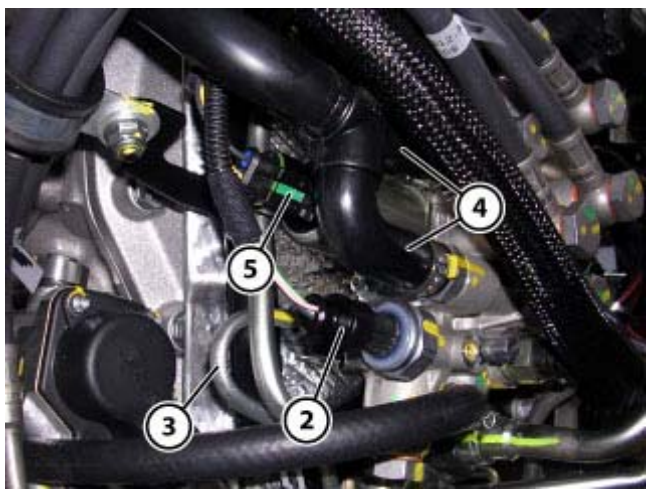
DO NOT remove the cardan joint fastener screw with the gearbox selector shaft.

- Remove the gearbox-differential assembly (D2.01).
- Drain the oil from the F1 gearbox system (D2.13).



- Loosen the By-pass screw **(1)** on the bottom of the Power Unit to release the pressure in the F1 gearbox hydraulic circuit.
- After releasing the pressure in the F1 gearbox hydraulic circuit, tighten the By-pass screw **(1)** immediately.

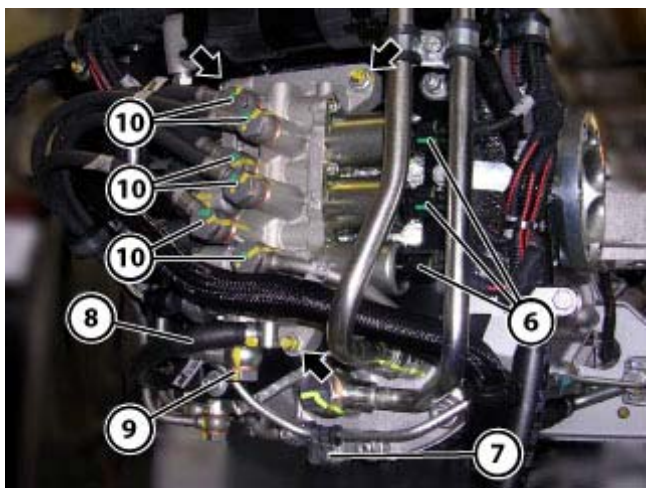
Tightening torque	Nm	Class
Screw	3.5 Nm	C



- Disconnect the connector **(2)** for the hydraulic circuit pressure sensor.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Disconnect the connector pipe **(3)** between the Power Unit and the hydraulic pump, undoing the relative union.
- Disconnect the two pipes **(4)**, removing the two fastener clamps.
- Disconnect the three connectors **(5)** from the respective solenoid valves EV3, EV4 and EV5.



- Disconnect the three connectors **(6)** from the respective solenoid valves EV1, EV2 and EVF.
- Undo the nut **(7)** to release the connector pipe between the Power Unit and the hydraulic pump, and gently move the pipe aside so that it does not hinder the following operations.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Disconnect the recirculation pipe **(8)**, removing the fastener clamp.
- Undo the pipe union **(9)** fastening the connection pipe between the Power Unit and the accumulator.
- Undo the pipe unions **(10)**, disconnect the pipes and move them out of the way so that they do not hinder the following operations.

Note the position of each pipe on the Power Unit to avoid inverting them when reassembling.

- Undo the two upper nuts fastening the Power Unit.
- Undo the lower nut indicated fastening the Power Unit until it touches the recirculation pipe union.
- Ease out the Power Unit until it comes into contact with the lower nut.
- Undo the lower nut completely.
- Remove the Power Unit from the relative seat and replace.
- Place the new Power Unit in its seat in a position that permits subsequent tightening of the lower fastener nut.

To tighten the lower nut, carry out the procedure for removal in reverse order.

- Tighten the three upper nuts indicated fastening the Power Unit.

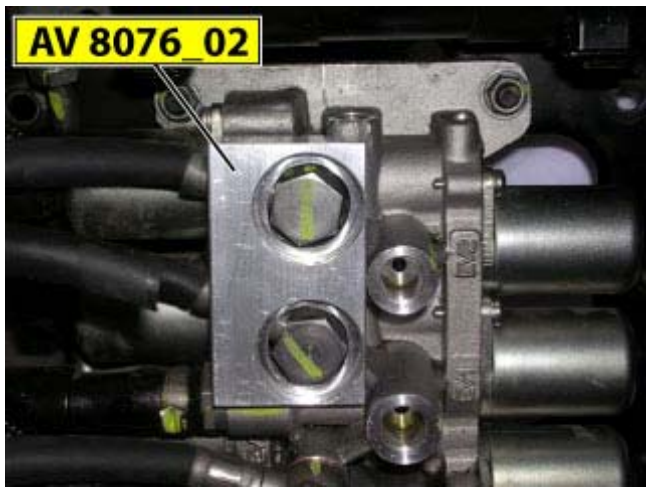
Tightening torque	Nm	Class
Nut	21 Nm	B

Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets onto the pipe union **(9)**.
- Tighten the pipe union **(9)** fastening the connection pipe between the Power Unit and the accumulator.

Tightening torque	Nm	Class
Pipe union	28 Nm	B

- Connect the recirculation pipe **(8)**, installing a new fastener clamp.
- Tighten the nut **(7)** to fasten the connector pipe between the Power Unit and the hydraulic pump.
- Connect the three connectors **(6)** to the respective solenoid valves EV1, EV2 and EVF.



Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets onto the pipe unions of the solenoid valve pipes **EV4** and **EV5**.

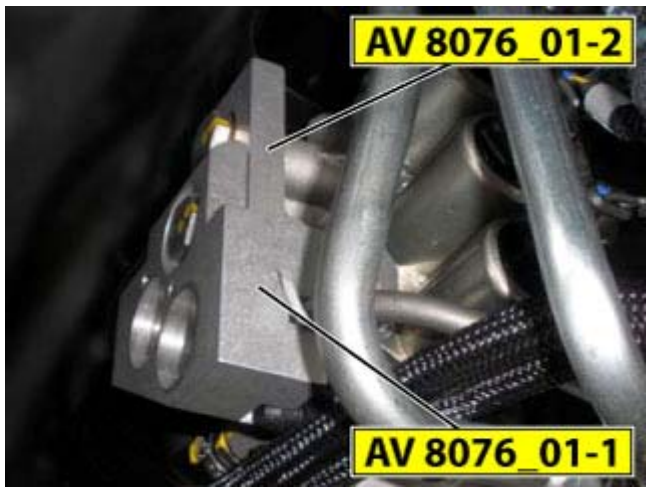
Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Fit the pipe unions of the solenoid valves **EV4** and **EV5** on the Power Unit and partially tighten.

ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- Fit the element **02** of the tool **(AV 8076)** onto the Power Unit, place the solenoid valve pipes **EV4** and **EV5** in the correct position and tighten the pipe unions.

Tightening torque	Nm	Class
Pipe union	28 Nm	B



Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets on the pipe unions of the solenoid valves pipes **EV1**, **EV2**, **EV3** and **EVF**.

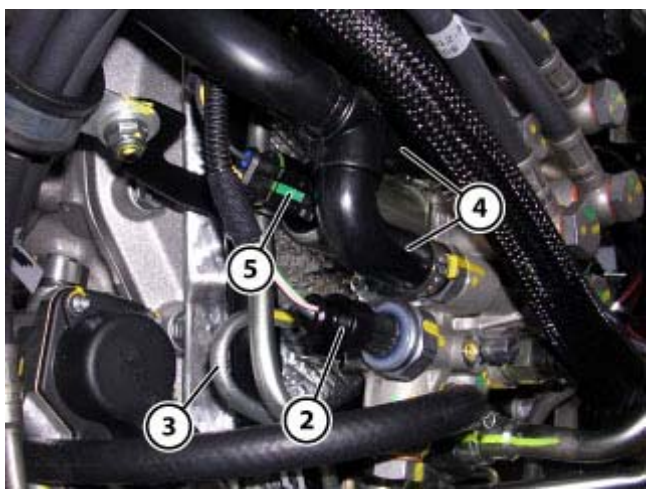
Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Fit the pipe unions of the solenoid valves hydraulic pipes **EV1**, **EV2**, **EV3** and **EVF** on the Power Unit and partially tighten.

ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- First fit element **01-2** and then element **01-1** of the tool **(AV 8076)** on the Power Unit, place the hydraulic pipes of the solenoid valves **EV1**, **EV2**, **EV3** and **EVF** in the correct position and tighten the relative pipe unions.

Tightening torque	Nm	Class
Pipe union	28 Nm	B



- Connect the three connectors **(5)** to the respective solenoid valves EV3, EV4 and EV5.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Connect the two pipes **(4)**, installing two new fastener clamps.
- Connect the connector pipe **(3)** between the Power Unit and the hydraulic pump, tightening the relative union.

Tightening torque	Nm	Class
Union	21 Nm	B

- Connect the connector **(2)** for the hydraulic circuit pressure sensor.
- Remove tool **(AV 3458)**.

➢ Refit the complete gearbox-differential assembly (D2.02).
DO NOT refit the gearbox mounting cross member.

➢ Fill F1 gearbox system with oil (D2.13).
➢ Bleed the clutch system (D2.14).
➢ Bleed the gearbox actuator (D2.14).
➢ Perform a self-acquisition cycle
If the cycle is not completed successfully, repeat the clutch and actuator bleeding procedure and then repeat the self-acquisition cycle.

➢ Refit the complete gearbox-differential assembly (D2.02).
Refit the gearbox mounting cross member.

Replacing the hydraulic pipes of solenoid valves EV1, EV2, EV3, EV4, EV5 and the recirculation pipe

Tightening torque		Nm	Class

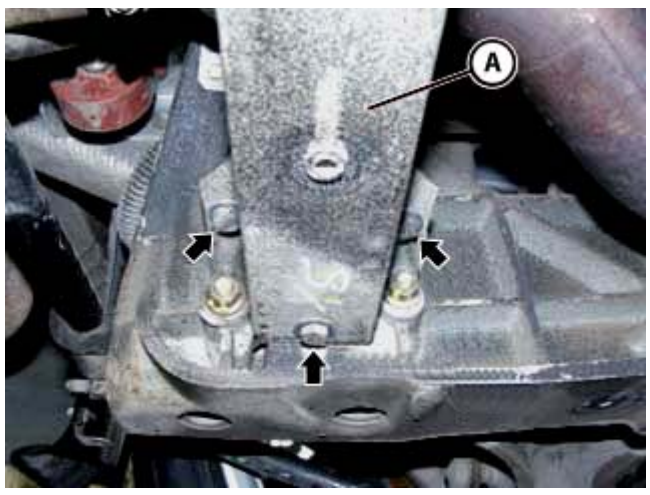
Tightening torque		Nm	Class
By-pass screw - Power Unit	Screw	3.5 Nm	C
Pipes - F1 gearbox system hydraulic actuator	Pipe union	28 Nm	B

CAUTION
The hydraulic system contains high pressure oil.

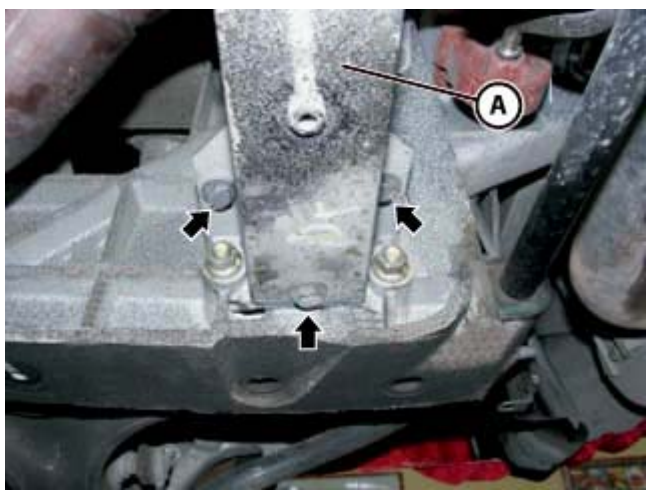
If several pipes need to be replaced, note the position of each pipe to avoid inverting them when reassembling.

- Remove the rear undertray section (M2.12).
- Perform the procedure to lock the Gearbox/F1 Kit in neutral between 3rd and 4th gear (D2.13).

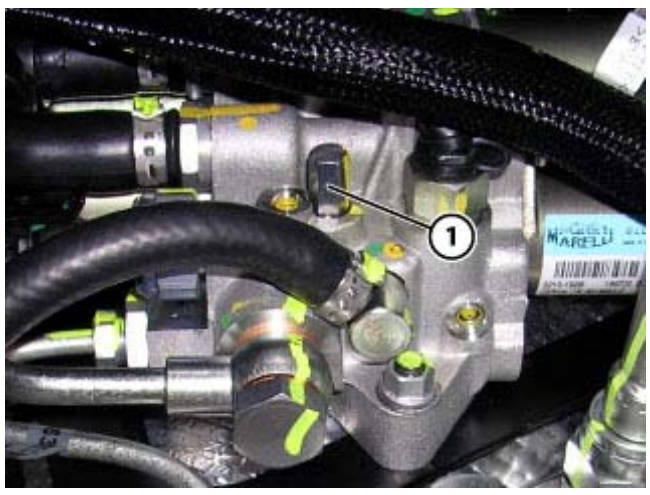
DO NOT remove the cardan joint fastener screw with the gearbox selector shaft.



- On the left-hand side, undo the three screws indicated fastening the chassis reinforcement cross member **(A)**.



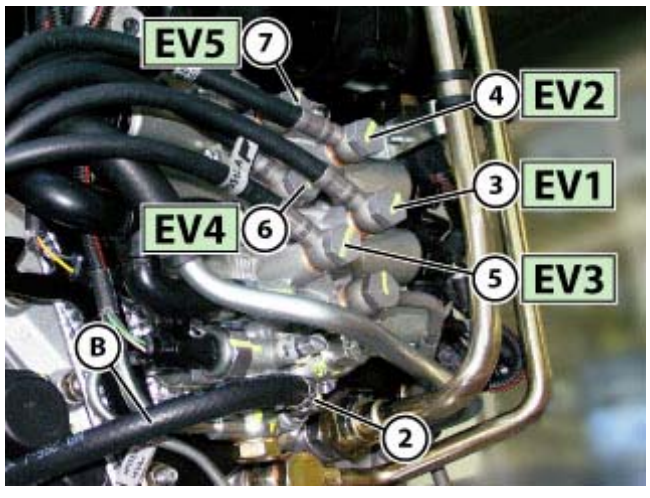
- On the right-hand side, undo the three screws indicated fastening the chassis reinforcement cross member **(A)** and remove it from the vehicle.



- Loosen the By-pass screw **(1)** on the bottom of the Power Unit to release the pressure in the F1 gearbox hydraulic circuit.
- After releasing the pressure in the F1 gearbox hydraulic circuit, tighten the By-pass screw **(1)** immediately.

Tightening torque	Nm	Class
Screw	3.5 Nm	C

- Drain the oil from the F1 gearbox system (D2.13).



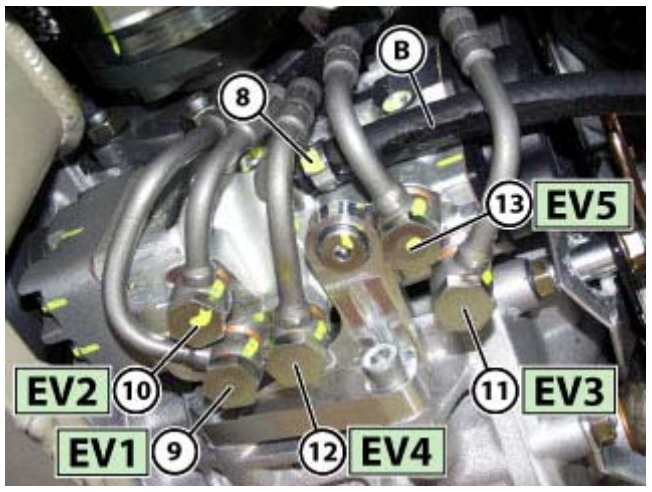
- Place a suitable container under the Power Unit for collecting the oil.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- To replace the recirculation pipe **(B)**, loosen the clamp **(2)** and disconnect it from the corresponding union on the Power Unit.

Note that the photo shows the engine removed from the vehicle to illustrate the operation more clearly.

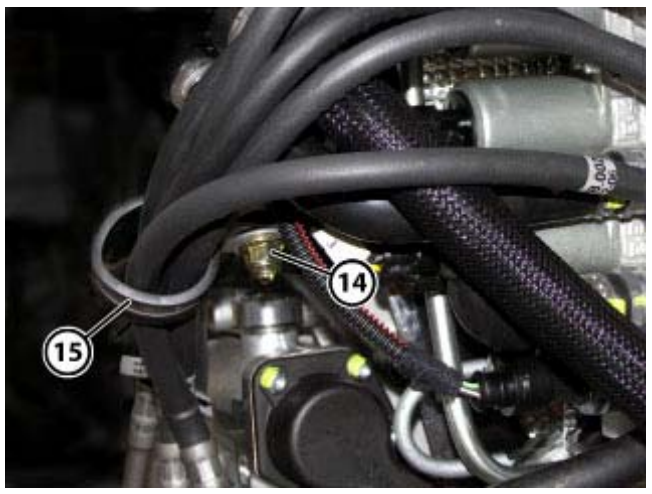
- To replace the solenoid valve pipe **EV1**, undo only the pipe union **(3)** from the Power Unit.
- To replace the solenoid valve pipe **EV2**, undo only the pipe union **(4)** from the Power Unit.
- To replace the solenoid valve pipe **EV3**, undo only the pipe union **(5)** from the Power Unit.
- To replace the solenoid valve pipe **EV4**, first undo pipe unions **(3)** and **(4)** from the Power Unit so that you can then undo pipe union **(6)** from the Power Unit.
- To replace the solenoid valve pipe **EV5**, first undo pipe unions **(3)** and **(4)** from the Power Unit so that you can then undo pipe union **(7)** from the Power Unit.



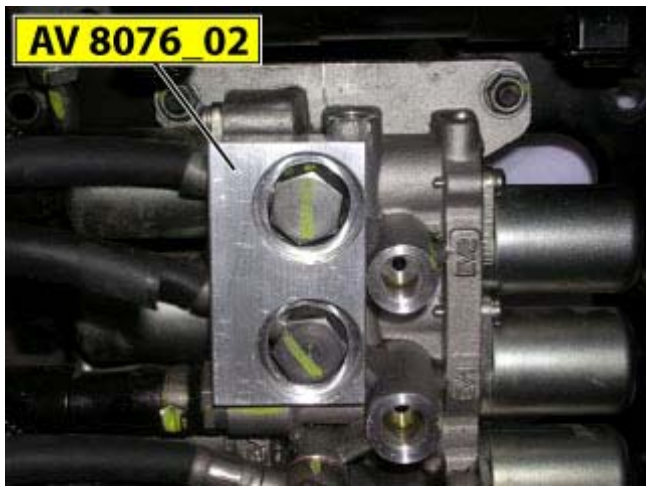
- Place a suitable container under the hydraulic actuator for collecting the oil.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- To replace the recirculation pipe **(B)**, loosen the clamp **(8)** and disconnect it from the corresponding union on the hydraulic actuator.
- To replace the solenoid valve pipe **EV1**, undo only the pipe union **(9)** from the hydraulic actuator.
- To replace the solenoid valve pipe **EV2**, undo only the pipe union **(10)** from the hydraulic actuator.
- To replace the solenoid valve pipe **EV3**, undo only the pipe union **(11)** from the hydraulic actuator.
- To replace the solenoid valve pipe **EV4**, first undo pipe unions **(9)** and **(10)** so that you can then undo pipe union **(12)** from the hydraulic actuator.
- To replace the solenoid valve pipe **EV5**, first undo pipe unions **(9)** and **(10)** so that you can then undo pipe union **(13)** from the hydraulic actuator.



- Undo the nut **(14)** fastening the hydraulic pipe retainer clamp **(15)**.
- Loosen the hydraulic pipe retainer clamp **(15)**.
- Remove the pipe or pipes to be replaced from the hydraulic pipe retainer clamp **(15)** and replace.
- Place the new pipe or pipes in the hydraulic pipe retainer clamp **(15)** and be careful you do not mix them up with the other hydraulic pipes.
- Tighten the hydraulic pipe retainer clamp **(15)**.
- Tighten the nut **(14)** fastening the hydraulic pipe retainer clamp **(15)**.



Fitting the solenoid valve pipe EV4 and/or EV5

Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets onto the pipe union of the new pipe.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Fit the new pipe union onto the Power Unit and partially tighten.

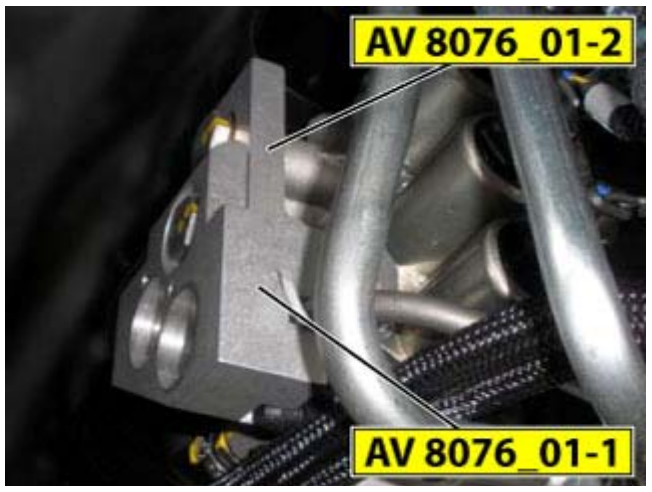
ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- Fit element **02** of the tool **(AV 8076)** onto the Power Unit, position the new pipe correctly and tighten the relevant pipe union.

Note that the photo shows the engine removed from the vehicle to illustrate the operation more clearly.

Tightening torque	Nm	Class
Pipe union	28 Nm	B

- Refit the pipe unions of the solenoid valve pipes **EV1** and **EV2**, previously removed, onto the Power Unit, as described below.



Fitting the solenoid valve pipe EV1 and/or EV2 and/or EV3

Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets onto the pipe union of the new hydraulic pipe.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Fit the new hydraulic pipe union onto the Power Unit and partially tighten.

ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- First fit element **01-2** and then element **01-1** of the tool **(AV 8076)** onto the Power Unit, position the new pipe correctly and tighten the relevant pipe union.

Tightening torque	Nm	Class
Pipe union	28 Nm	B



Each time you loosen a pipe union, ALWAYS replace the gaskets irrespective of whether the pipe has been replaced or not.

- Fit new gaskets onto the pipe union of the new hydraulic pipe.

Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

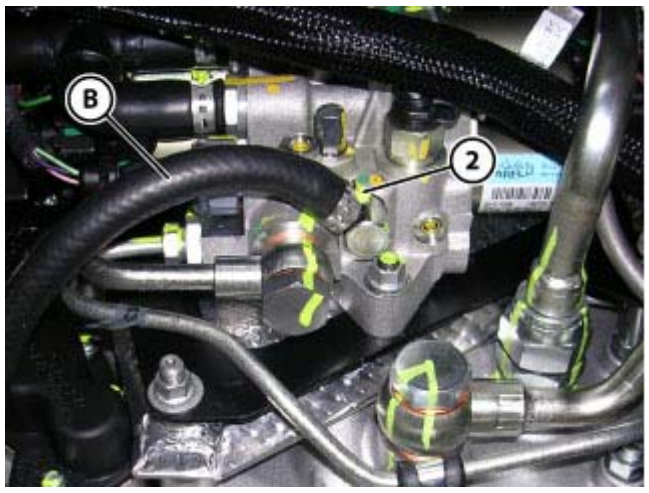
- Fit the new hydraulic pipe union onto the hydraulic actuator and partially tighten.

ALWAYS use the elements of tool AV 8076 to place the Power Unit-actuator pipes in the correct position to avoid unnatural bends or contact with moving parts.

- Fit element **03** of the tool **(AV 8076)** onto the hydraulic actuator, position the new pipe correctly and tighten the relevant pipe union.



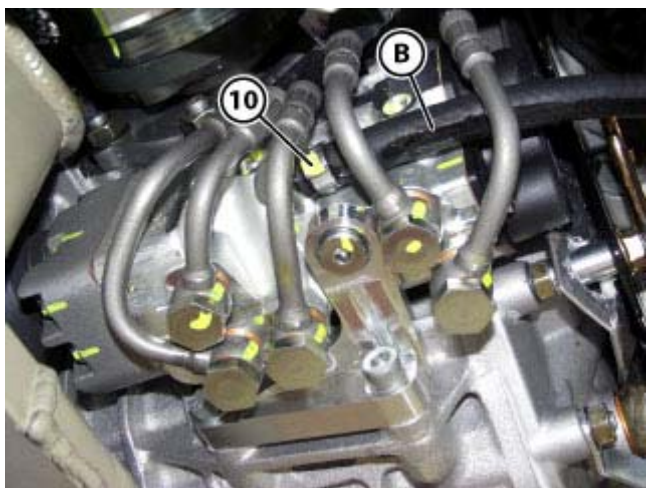
Tightening torque	Nm	Class
Pipe union	28 Nm	B



Fitting the recirculation pipe

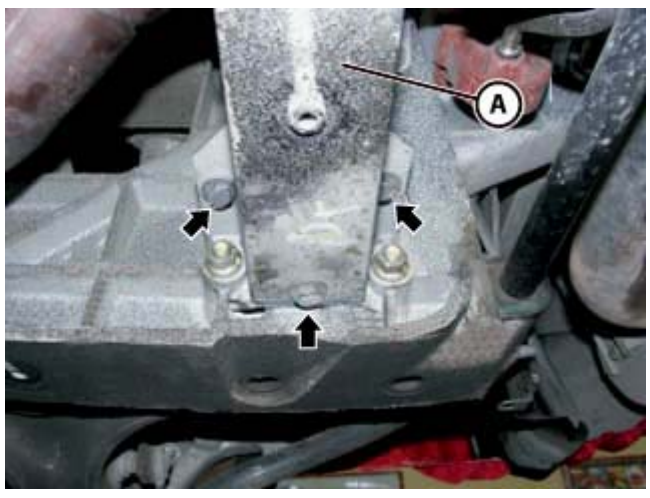
Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Connect the new recirculation pipe **(B)** to the corresponding union on the Power Unit and fasten it by tightening a new clamp **(2)**.



Before disconnecting and connecting any pipes in the F1 gearbox hydraulic system, carefully clean the hydraulic pipes, unions and surrounding areas using a suitable degreasing product (e.g. heptane) to avoid contaminating the oil in the F1 gearbox hydraulic system.

- Connect the new recirculation pipe **(B)** to the corresponding union on the hydraulic actuator and fasten it by tightening a new clamp **(10)**.



- Place the chassis reinforcement cross member **(A)** in its seat and hand tighten the three fastening screws indicated, on the right-hand side.



- On the left-hand side, hand tighten the three screws indicated fastening the chassis reinforcement cross member **(A)**.

➢ Fill F1 gearbox system with oil (D2.13).

➢ Bleed the clutch system (D2.14).
➢ Bleed the gearbox actuator (D2.14).
➢ Refit the rear underfloor section (M2.12).
➢ Perform a self-acquisition cycle
If the cycle is not completed successfully, repeat the clutch and actuator bleeding procedure and then repeat the self-acquisition cycle.

Measurement sensors

The transmission control unit (TCU) measures the parameters necessary for transmission control with an array of sensors installed on the vehicle and interfaces, via the CAN line, with the engine control unit (ECU), the traction control unit (ASR/MSR) and the onboard instrument panel.

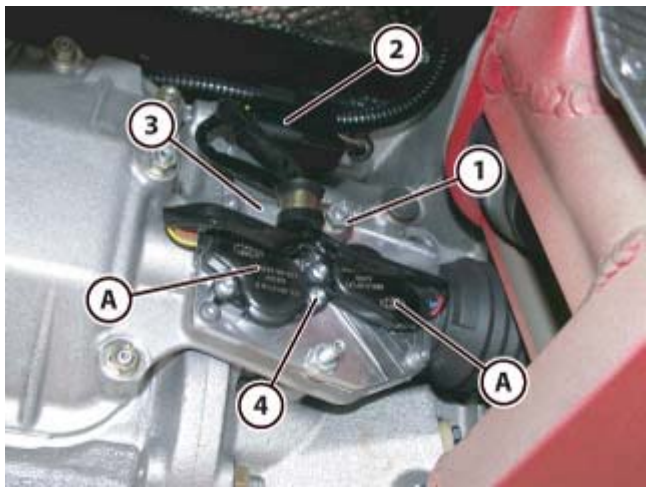
Replacing the gear position and engagement sensors

These sensors are mounted on the lateral gearbox cover and detect the position of the actuator piston that selects and engages gears.

These are "contactless" sensors similar in operation to the clutch position sensor.

The sensor houses an electronic module that converts the signal to 0 - 5 V form.

➢ Remove the rear undertray section (M2.12).



After replacing a sensor, a self learning cycle must be performed.

- Undo the nut **(1)** to remove the clamp fastening the sensor cable **(A)**.
- Disconnect the connector **(2)** (Z304) and remove from the bracket.**(3)**
- Remove the sensors **(A)**, undoing the four screws **(4)**, and replace sensors.

- Refit the new sensors, fastening and supporting them as originally installed.

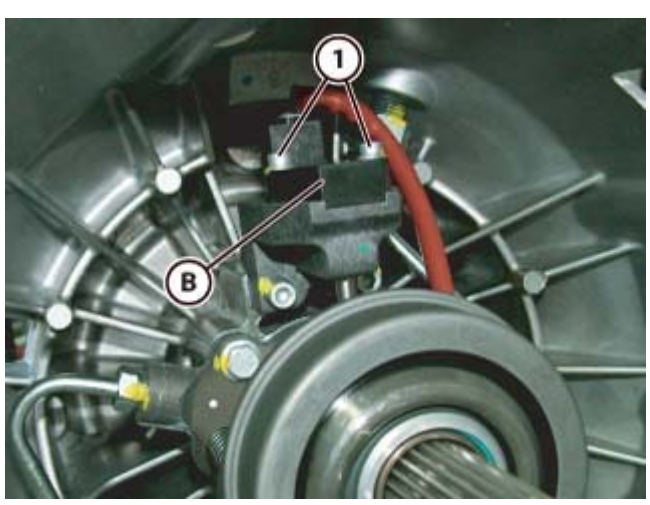
➢ Refit the rear underfloor section (M2.12).

Replacing the clutch position sensor

An LVDT (linear variation differential transformer) type sensor is incorporated in the system to detect the position of the clutch thrust plate.

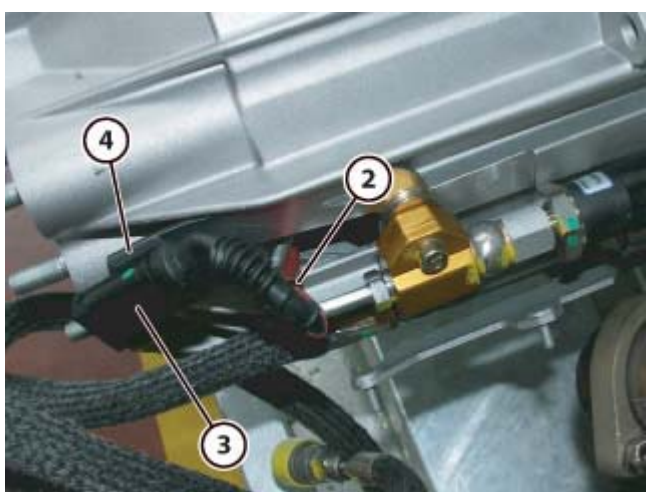
The signals generated by the sensor are sent to the TCU.

➢ Remove the clutch housing (D2.04).



After replacing a sensor, a self learning cycle must be performed.

- Undo the screws **(1)** fastening the sensor **(B)** to the relative mounting inside the clutch housing.



- Cut the clamp **(2)** and disconnect the connector **(3)** from the mounting bracket **(4)**.

- Pull out the clutch position sensor with its relative cable from the clutch housing.
- When refitting the new sensor, fasten and support as originally installed.

➢ Refit the clutch housing (D2.04).

Checking the gearbox input shaft speed sensor

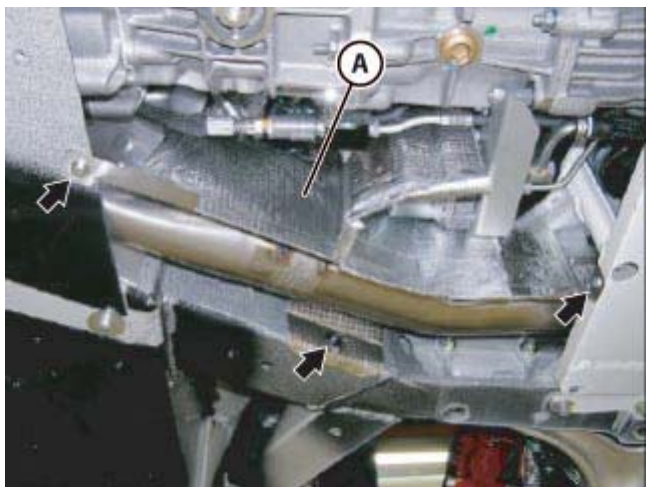
- To check the sensor, connect an ohmmeter to the connector pins and measure the resistance.
- Value should be: **530 Ω±10%**. If not, replace sensor.

Replacing the gearbox input shaft speed sensor

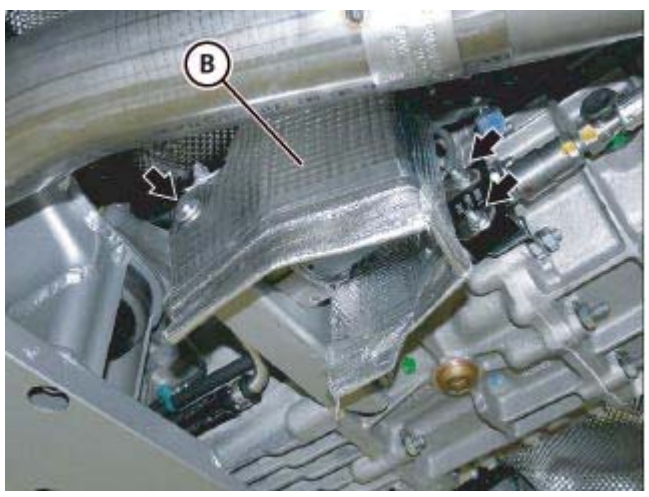
Tightening torque		Nm	Class
Gearbox input shaft speed sensor	Screw	8 Nm	C
Electric gearbox oil pump mounting bracket	Nut	20 Nm	C
Electric gearbox oil pump mounting bracket tie-rod	Nut	24 Nm	B
Fastening electric pump heat shield	Screw	4 Nm	C
	Nut	8 Nm	B

This variable reluctance sensor is mounted on the right-hand side of the third element of the gearbox housing.

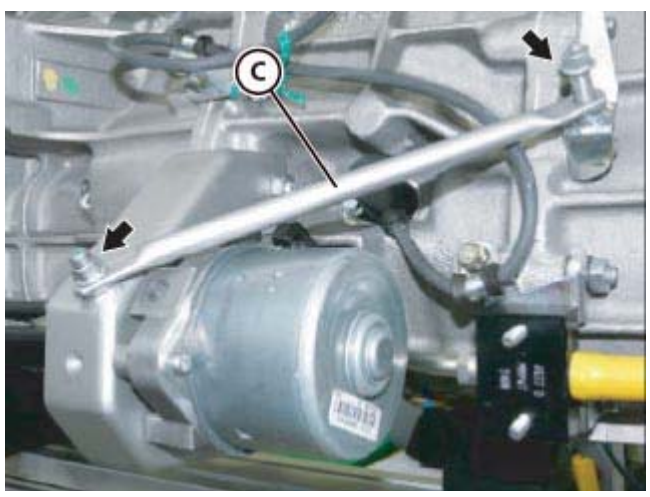
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the rear undertray section (M2.12).



- Remove the front right heat shield **(A)** located over the central section of the right exhaust extension by undoing the three fastener screws indicated.

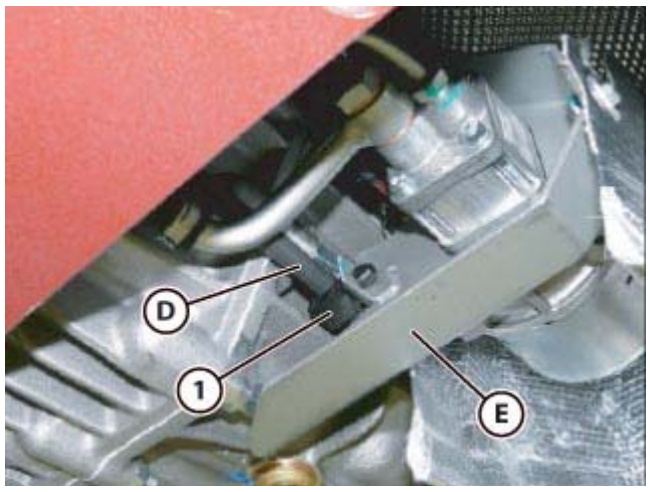


- Remove the heat shield from the F1 Kit electric pump **(B)**, by undoing the three fasteners indicated.

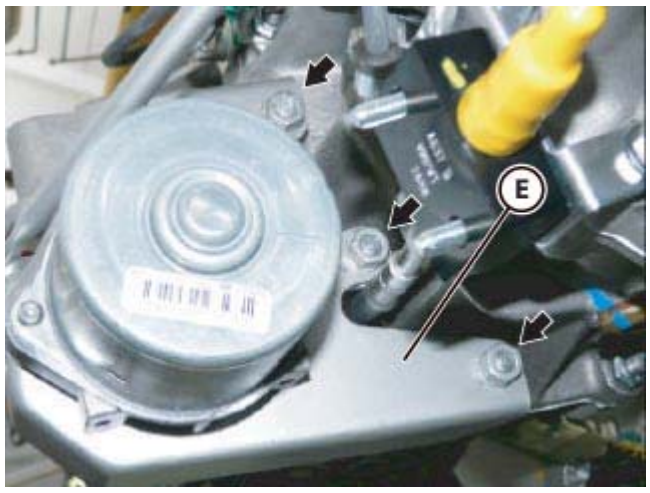


- Remove the tie-rod **(C)** by undoing the two fastener nuts indicated.

The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.



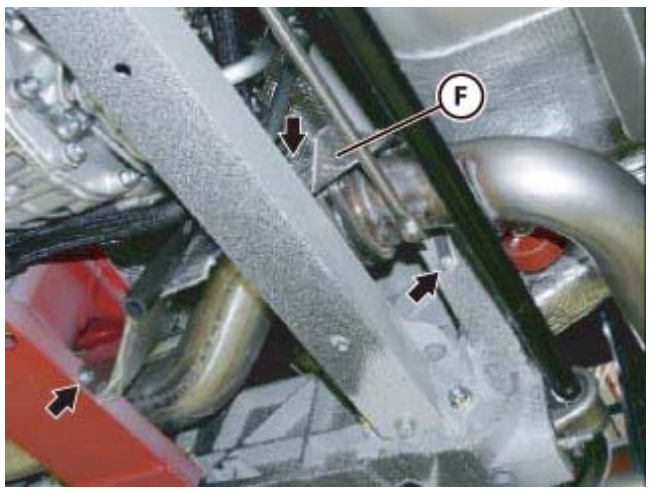
- Detach the pipe **(D)**, leading from the electrohydraulic pump to the Power Unit, from the retainer clip **(1)**, located on the inner side of the electric pump mounting bracket **(E)**.



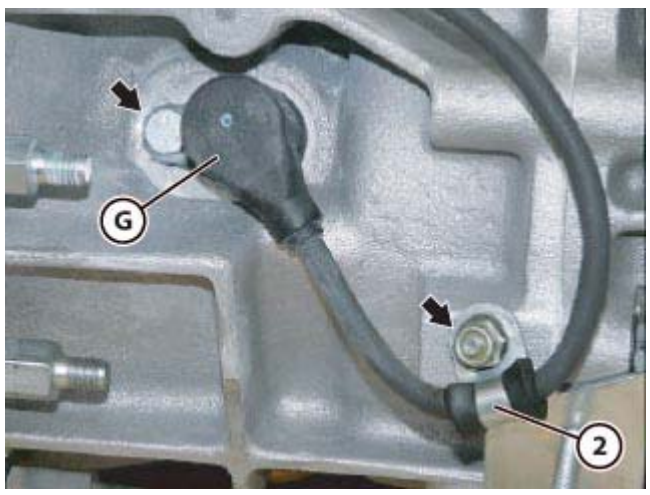
- Remove the mounting bracket with electric pump **(E)** from the gearbox housing by undoing the three fastener nuts indicated.

i The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.

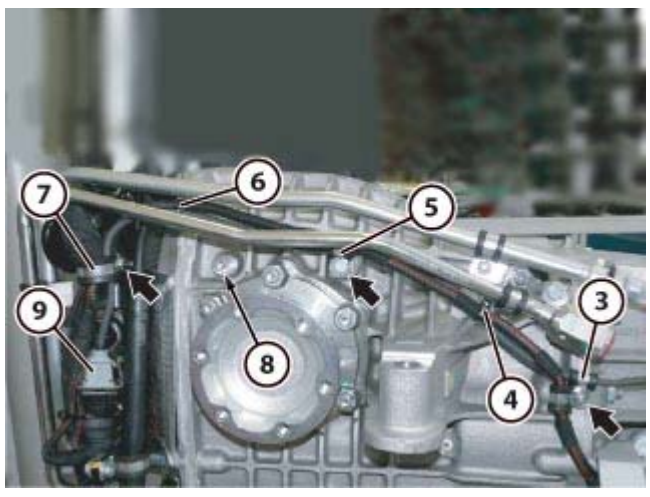
- Fit the mounting bracket **(E)** to the electric pump so as not to hamper subsequent operations and without causing damage to the pipes of the hydraulic system connected to the electric pump.



- Remove the rear right heat shield **(F)** located over the rear central section of the right exhaust extension by undoing the three fastener screws indicated.



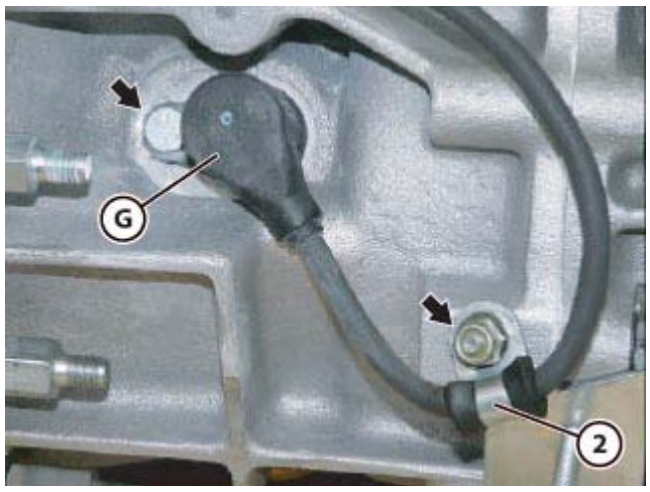
- Free the cable from the bracket with sheath **(2)** by undoing the relative fastener nut indicated.
- Provide adequate protection in case of oil leaks.
- Undo the lock screw indicated and withdraw the sensor **(G)** from its seat.



- Remove the bracket with sheath **(3)** by undoing the relative fastener nut indicated.

i The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.

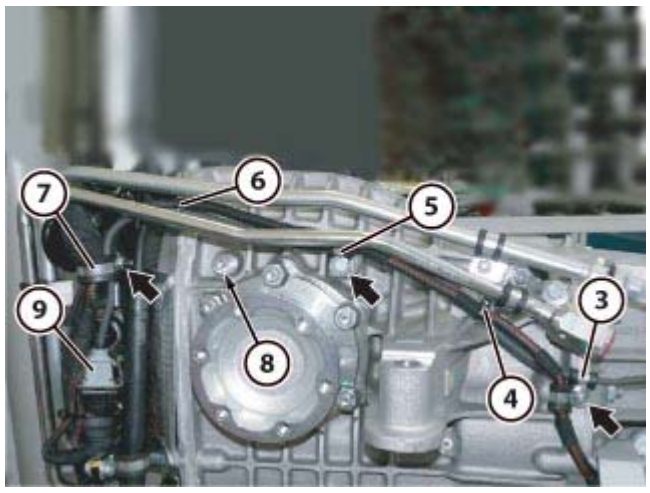
- Cut the cable tie **(4)**.
- Remove the bracket with sheath **(5)** by undoing the relative fastener nut indicated.
- Cut the cable tie **(6)**.
- Remove the bracket with sheath **(7)** by undoing the relative fastener nut indicated.
- If applicable, remove the bracket with sheath **(8)** by undoing the relative fastener nut.
- Disconnect the connector **(9)** from the electric gearbox system.



- Thoroughly clean the seat of the sensor on the gearbox housing and the new sensor with a suitable product (e.g. HEPTANE).
- Dry with compressed air.
- Apply a sealant paste **CAF 4** to the OR strip of the new sensor and to the threading of the screw hole in the gearbox housing.
- With due caution, insert the new sensor **(G)** in its seat, by tightening the fastener screw indicated.

Tightening torque	**Nm**	**Class**
Screw	8 Nm	C

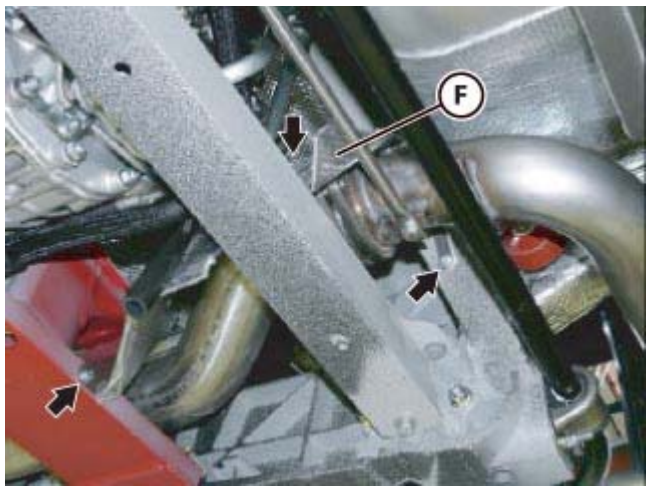
- Refit the bracket with sheath **(2)** by hand tightening the relative fastener nut indicated.



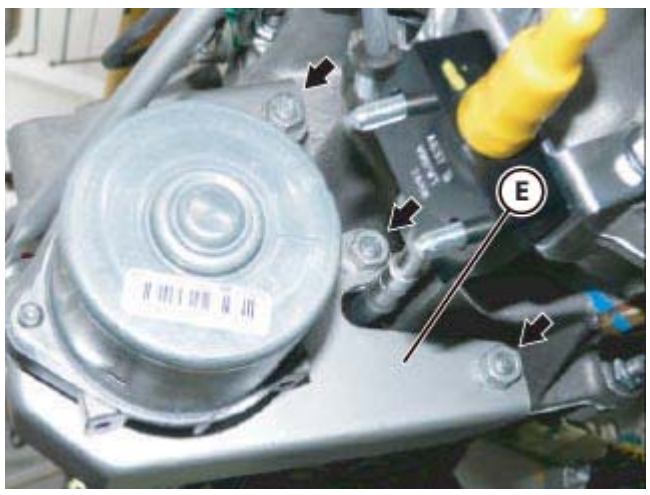
- Refit the bracket with sheath **(3)** by hand tightening the relative fastener nut indicated.

The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.

- Fit a new cable tie **(4)**.
- Refit the bracket with sheath **(5)** by hand tightening the relative fastener nut indicated.
- Fit a new cable tie **(6)**.
- Refit the bracket with sheath **(7)** by hand tightening the relative fastener nut indicated.
- If applicable, refit the bracket with sheath **(8)**, tightening the relative fastener nut.
- Connect the connector **(9)** to the electric gearbox system.



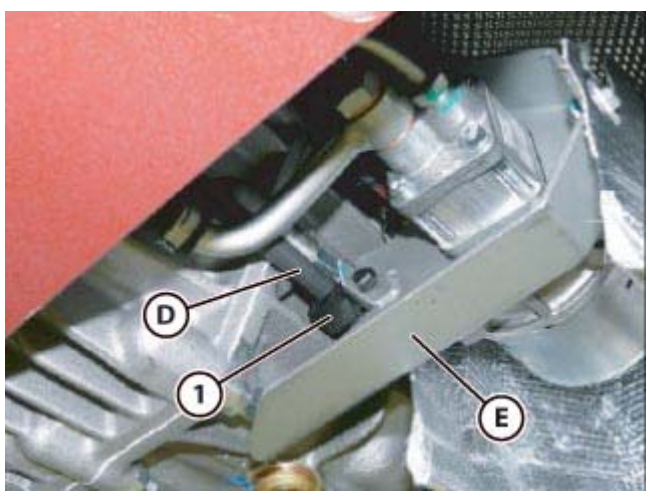
- Refit the rear right heat shield **(F)** located over the rear central section of the right exhaust extension by hand tightening the three fastener screws indicated.



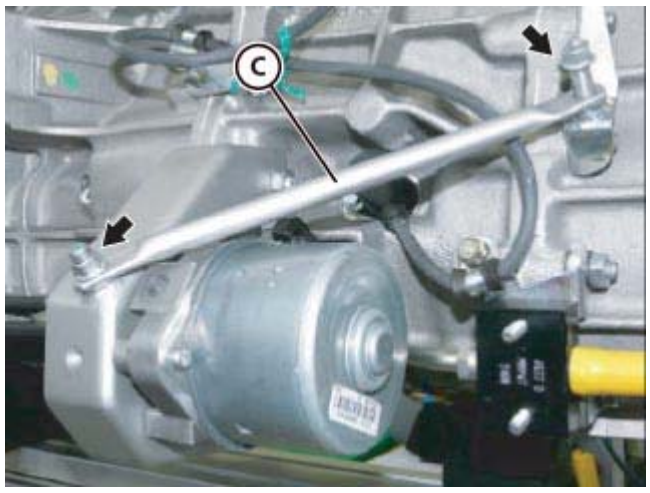
- Refit the mounting bracket **(E)** with electric pump onto the gearbox housing by hand tightening the three fastener nuts indicated.

The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.

Tightening torque	**Nm**	**Class**
Nut	20 Nm	C



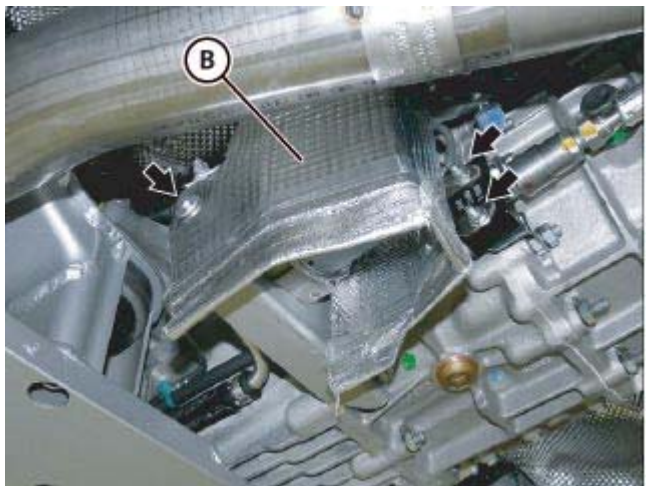
- Attach the pipe **(D)**, leading from the electrohydraulic pump to the Power Unit, to the retainer clip **(1)**, located on the inner side of the electric pump mounting bracket **(E)**.



- Refit the tie-rod **(C)** by hand tightening the two fastener nuts indicated.

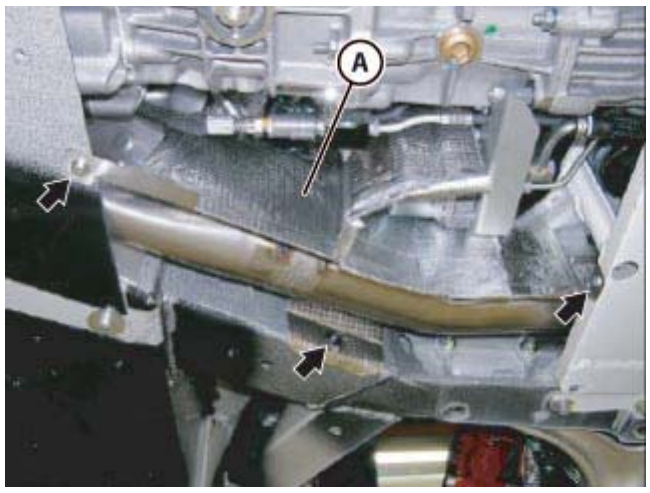
The adjacent image shows the gearbox removed from the vehicle to illustrate the operation more clearly.

Tightening torque	Nm	Class
Nut	24 Nm	B



- Refit the heat shield for the F1 Kit electric pump **(B)**, tightening the three fasteners indicated.

Tightening torque	Nm	Class
Screw	4 Nm	C
Nut	8 Nm	B



- Refit the front right heat shield **(A)** located over the central section of the right exhaust extension by hand tightening the three fastener screws indicated.

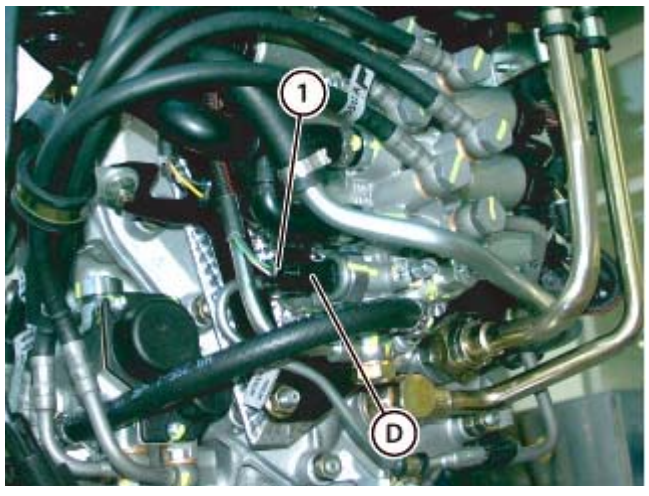
➢ Refit the rear underfloor section (M2.12).
➢ Set the battery master switch to ON (L2.02).

Hydraulic circuit pressure sensor

The sensor is located on the Power Unit and has the following characteristics:
- pressure range: **0 to 80 bar**;
- response voltage: **0.5 to 4.5 Volts**;
- power supply: **5 V DC**.

Replacing the hydraulic circuit pressure sensor

➢ Remove the rear undertray section (M2.12).



After replacing a sensor, a self learning cycle must be performed.

- To remove the sensor **(D)**, disconnect the connector **(1)** (Z302) and unscrew the sensor from the Power Unit.
- Retrieve the hydraulic circuit pressure sensor **(D)** and replace.
- When refitting the new sensor, fasten and support as originally installed.

➢ Refit the rear underfloor section (M2.12).

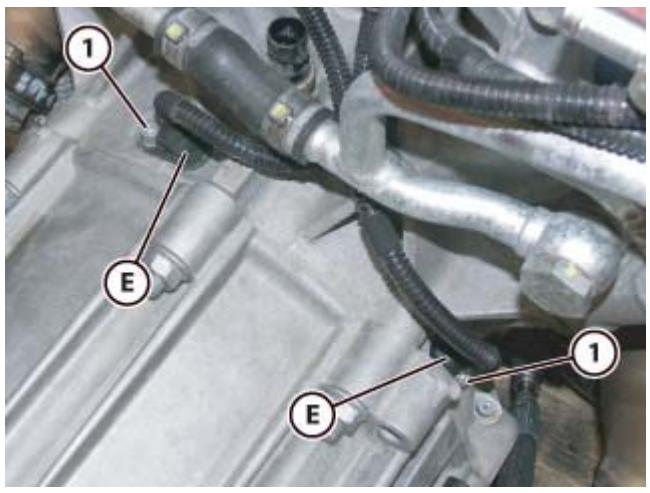
Engine speed sensor

There are two engine speed sensors mounted on the crankcase on the clutch side.
The engine RPM signal is generated by the ECU (square wave with duty cycle **50%** and amplitude **0 to 12 Volts**) and sent to the transmission control unit (TCU).
The engine speed signal is also acquired by the CAN line.

Replacing the engine speed sensors

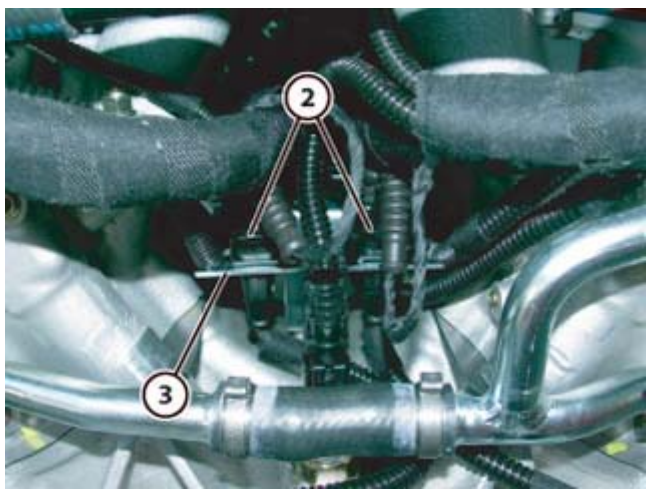
Tightening torque		**Nm**	**Class**
Engine speed sensor - crankcase	Screw	8 Nm	B

➢ Remove the intake manifold (B6.02).



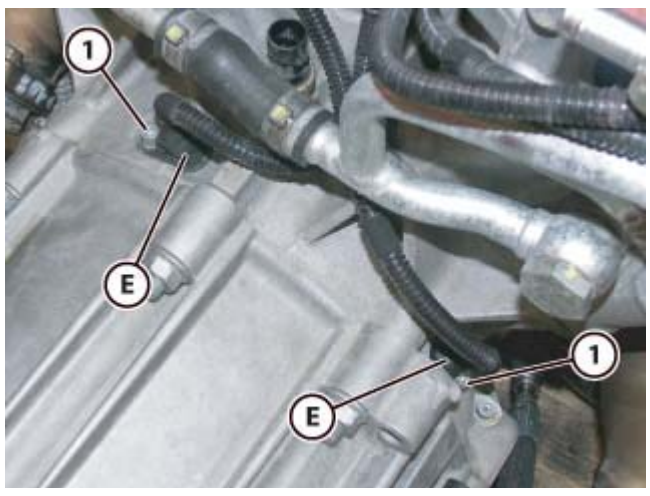
After replacing a sensor, a self learning cycle must be performed.

- Undo the two screws **(1)** and remove the two engine speed sensors **(E)** from the crankcase.



- Disconnect the connectors **(2)** (S012) (S312) and remove the connectors for the two sensors from the retainer bracket **(3)**.

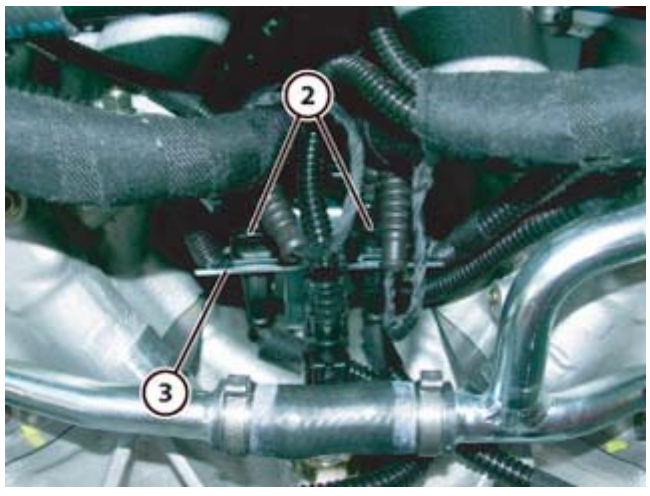
- Retrieve the two sensors complete with cable from the engine and replace.



- Fit the two new sensors **(E)** in the respective seat on the crankcase and fasten by tightening the two screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	8 Nm	B

- Check that the sensor gap is **0.8 to 1.2 mm**.



- Fasten the connectors for the two sensors to the retainer bracket **(3)** and connect the connectors **(2)** (S012) (S312).

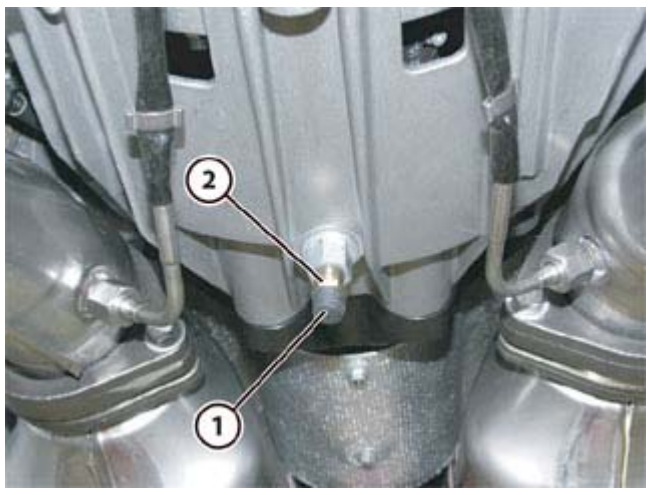
➢ Refit the intake manifold (B6.02).

D2.14 Filling and bleeding the clutch

Bleeding the clutch system

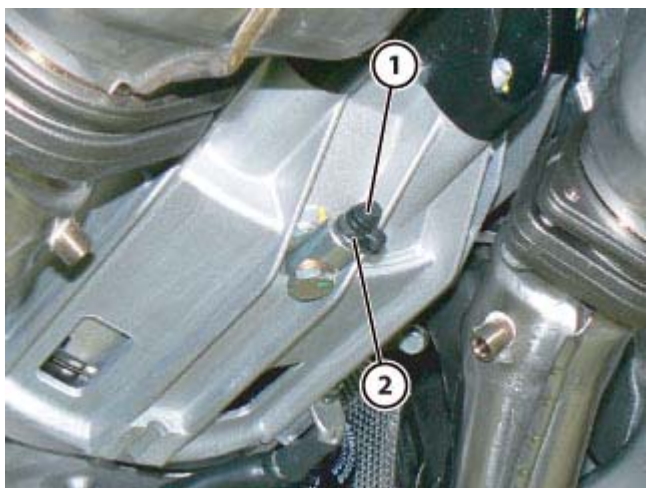
When bleeding, check the oil level in the tank constantly: the level must never drop below the MIN level. Never reuse the oil drained from the system.

After replacing the system components, bleed the air from the circuit.



OLD SOLUTION

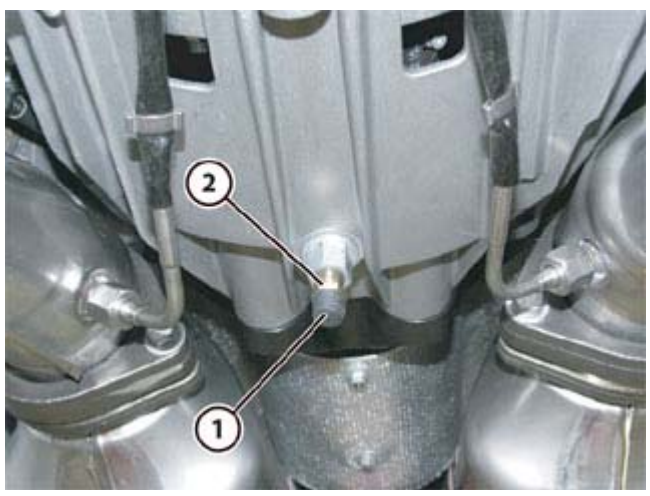
- The system includes a bleed union **(2)**, with protective cap **(1)**, located on the clutch housing.



- The system includes a bleed union **(2)**, with protective cap **(1)**, located on the clutch housing.

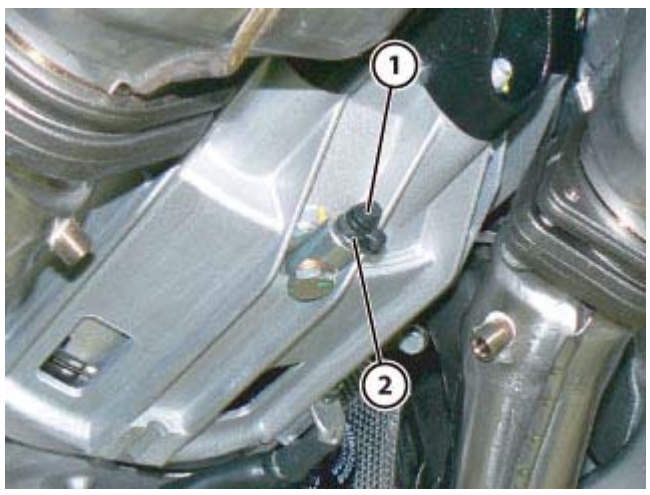


- Loosen the bleed union by two thread turns and insert the transparent pipe leading to a bleed container filled with F1 gearbox fluid (with electronically controlled gearboxes) or brake fluid (with mechanical gearboxes).
- With electronically controlled gearboxes, bleed using the SD-3 tester; perform as many cycles as necessary until fluid without air bubbles flows from the pipe.
- With mechanical gearboxes, depress the clutch pedal and simultaneously unscrew the bleed union; perform as many cycles as necessary until fluid without air bubbles flows from the pipe.



OLD SOLUTION

- Hand tighten the bleed union **(2)** and refit the protective cap **(1)**.



- Hand tighten the bleed union **(2)** and refit the protective cap **(1)**.

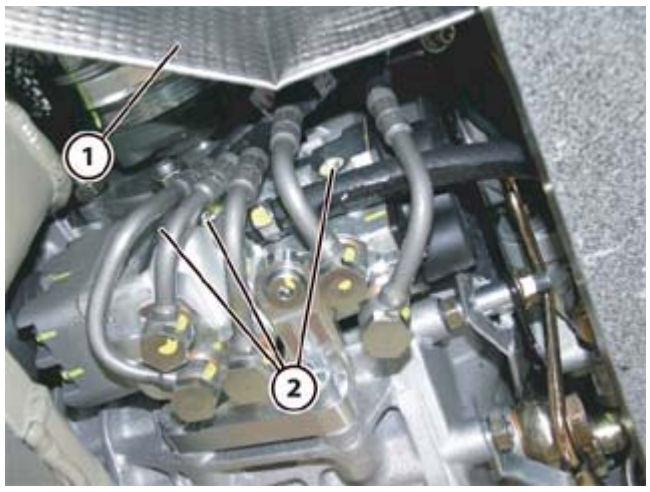
➢ Check the brake fluid tank level (A3.05).
i This operation is necessary only on vehicles with mechanical gearboxes.

➢ Check the F1 gearbox system oil level (A3.03).
i This operation is necessary only on vehicles with electronically controlled gearboxes.

Bleeding the gearbox actuator (electronically controlled gearbox)

Tightening torque		**Nm**	**Class**
Actuator bleeding screws	Screw	5.25 Nm	A

After replacing the system components, bleed the air from the circuit.



- Working from under the vehicle, remove the heat shield **(1)** to allow better access to the bleed screws on the actuator.
- Connect the SD3 tester to the diagnostic socket (L2.12).
- Select **"DIAGNOSTICS"** from the main menu.
- Check the F1 gearbox system oil level (A3.03).
- Loosen each of the bleed screws **(2)** by two turns.
- Select **"BLEEDING THE ACTUATOR"** from the **"DIAGNOSTICS"** menu.
- Press **"ENTER"** to activate the tester.
- Wait for the automatic procedure to be completed.
- Tighten the bleed screws **(2)**.

Tightening torque	**Nm**	**Class**
Screw	5.25 Nm	A

- Check the F1 gearbox system oil level (A3.03).
- Refit the heat shield **(1)**.

➢ Refit the rear underfloor section (M2.12).

D2.15 Calibrating the electronically-controlled gearbox.

Basic checks

The following checks have been defined for improved component management:

- DEIS clutch check: a new clutch checking procedure devised to minimise position error that also employs the clutch actuator pressure feedback.
- clutch transmissibility (wear index) in discrete ranges: instead of a single index, five indexes have been introduced, with one for each of the ranges into which the transmissibility curve has been divided.
- bit/mm clutch position conversion: the new conversion factor is as follows **1mm = 78 bit**.

End of production line calibration with SD-3 Tester

During tests controlled via the SD3 (gear selection, DEIS, bleeding etc.), errors may be memorised giving false diagnostic results. These are not attributable to an effective fault, but are a diagnostic response generated as a result of the software operating in non-standard conditions.
Memorised errors must be cancelled after testing with the SD3.

Calibrating the DEIS clutch test:

This serves to determine the dither to be applied to the clutch valve during adjustment, to estimate the current-flow rate characteristic of the clutch solenoid valve and to measure the Belleville characteristic of the clutch.
The duration of the test varies from a minimum of **2 minutes** to a maximum of **6 minutes**. If the test takes any longer to complete, bleed the clutch and repeat the test.
The test is interrupted and is not completed successfully if the Belleville curve being calibrated exceeds a resistance pressure of **40** bar. If this occurs, the clutch must be replaced as it can no longer be correctly managed by the system.

Accelerometer self-acquisition:

This serves to eliminate the accelerometer assembly offset.
This test lasts only a few seconds and is conducted with the car on a level surface.
The test is conducted even if the value is read from the CAN.

Maintenance

PIS calculation is required for this vehicle.
The default PIS value is 360 bit = 4.61 mm

This operation must be performed after a "clutch replacement":

- BLEEDING THE CLUTCH
- Calibrating DEIS test
- Configuring New Clutch Engaged Position
- Resetting Degradation Index (the software uses the default transmissibility curve)
- PIS calculation
- Error cancellation
- Calibrating Discrete Range Degradation Index: bring the clutch to operating temperature by driving for approximately **30** minutes over a mixed/urban route then perform or simulate an urban cycle lasting 1 hour, with low load, medium load and high load starts. Start with low load starts, then carry out medium load starts and conclude with 3 + 3 high load starts, with a **5 minut**e cooling down period in between. During the test, alternative starts with periods of driving with the clutch engaged to prevent overheating the clutch.

This operation must be performed after an "F1 Kit replacement":

- Calibrating the DEIS test
- Gearbox gate self-acquisition
- Rapid Gearshift self-acquisition
- Error cancellation

This operation must be performed after a "gearbox replacement":

- BLEEDING THE CLUTCH
- Calibrating DEIS test
- Gearbox gate self-acquisition
- Rapid Gearshift self-acquisition
- Error cancellation

This operation must be performed after an "ECU replacement":

- Calibrating DEIS test
- Gearbox gate self-acquisition
- Rapid Gearshift self-acquisition

- Accelerometer self-acquisition
- Configuring New Clutch Engaged Position (set value read by old ECU)
- Set the PIS value read by the old ECU
- Error cancellation
- Calibrating Discrete Range Degradation Index

This operation must be performed after a "clutch bleed":

- Calibrating DEIS test
- Error cancellation

Creating SELESPEED gearshift grid data

IMPORTANT! The values for each individual gear must be measured with a dynamic test, with the vehicle in motion.

The following procedure must only be performed if gear shifting difficulty is experienced with the SELESPEED gearbox.

➢ Connect the SD3 tester to the diagnostic socket (L2.12).

- Carry out the gearbox **self-acquisition** procedure.
- Print out the list of the **minimum** and **maximum SURE ENGAGEMENT THRESHOLD** parameters from the **"Parameters"** screen on the SD-3 diagnostic tester.
- Print out the list of the **minimum** and **maximum SELECTION THRESHOLD** parameters from the **"Parameters"** screen on the SD-3 diagnostic tester.
- During the dynamic test, engage all gears **from 1st to 6th**, **neutral** and **reverse**, transcribing the **ENGAGEMENT** and **SELECTION** travel values for each gear from the **"Parameters"** screen on the SD-3 diagnostic tester.

The neutral value MUST be acquired after engaging first **3rd** gear and then **4th** gear.

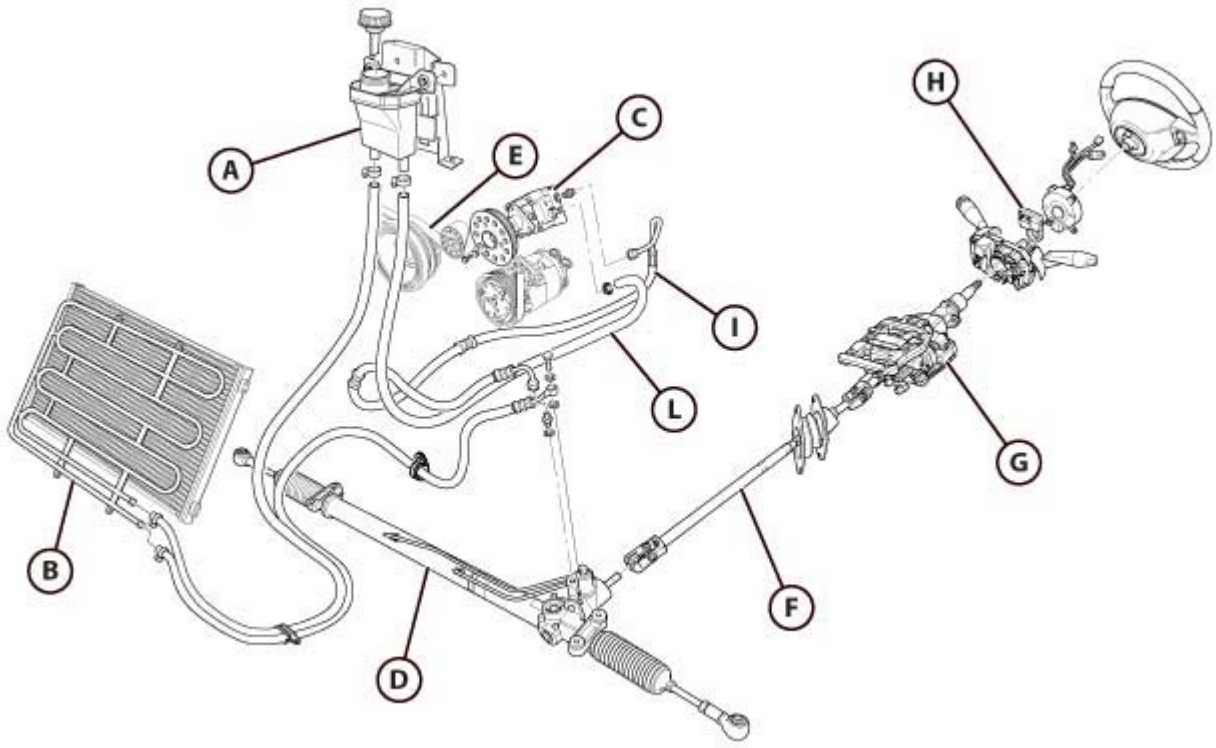
- Download the specific grid data file from the **ModisCS portal**, from the following location: **After Sales > Technical Service > On Line Documentation > Manuals > Self-acquisition Grid**.
- Compile the grid data file with all the values measured.
- Press the "Calculate grid" to obtain the resulting grid.

E1.01 System layout technical specifications

Technical specifications of the steering system

Steering column with electric steering wheel adjustment mechanism.
Steering with collapsible cardan shaft.
Rack and pinion type hydraulic steering with hydraulic power assistance to facilitate parking. As the speed increases, the vehicle's particular aerodynamic structure gives the driver a mechanical-driving sensation which ensures great steering precision and manageability.
The hydraulic steering pump is mounted on the left hand side of the engine and is driven by the crankshaft by a belt that also drives the AC compressor.

Hydraulic system layout



A - Oil tank
B - Oil cooling coil
C - Hydraulic steering pump
D - Steering box
E - Hydraulic steering pump - compressor belt
F - Steering control transmission shaft
G - Steering column
H - Steering angle sensor
I - Pipe from the hydraulic pump to the steering box
L - Pipe from the oil tank to the hydraulic pump

E1.02 Tightening torques



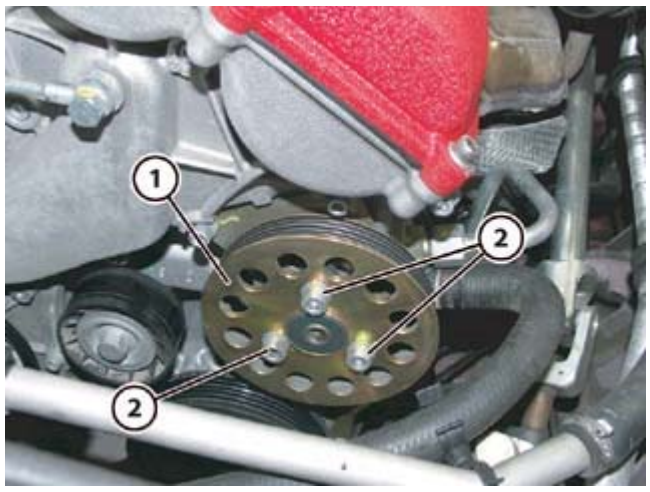
Tightening torque		Nm	Class
Fastening steering box tie-rod to stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A
Ball joint	Nut	60 Nm	B
Pipe from pump - steering box	Union	35 Nm	B
Pipe from pump - steering box	Union	35 Nm	B
Fastening steering box to chassis	Pretightening to "X"	25 Nm	A
	Screw (tightened to 35 Nm, start of control angle 30° - 60°)	60 Nm	A
Steering column - steering box	Screw	30 Nm	B
Hydraulic steering pump - crankcase	Screw	25 Nm	B
Hydraulic steering coil - A.C. condenser	Screw	5 Nm	B
Pipe from steering box to power steering pump	Union	35 Nm	B
Steering column - dashboard cross member	Screw	20 Nm	B

E2.01 Hydraulic steering pump

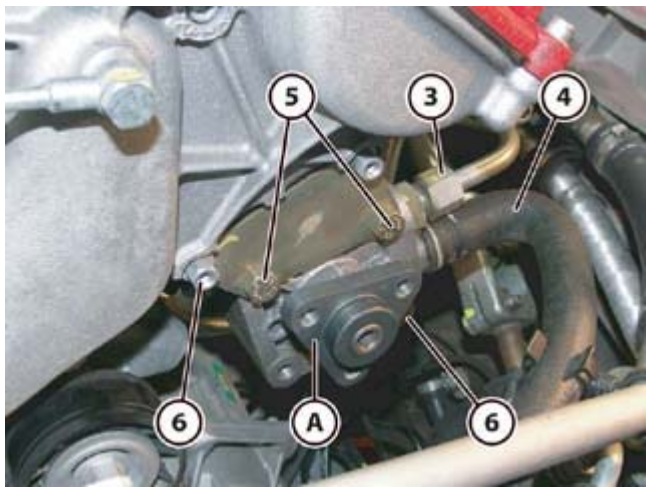
Removing the power steering pump

The majority of cases of NOISY power steering pump operation are caused by contaminated fluid in the system; therefore, attempt to rectify the failure before replacing the power steering pump, replacing the power steering fluid tank ALWAYS. Fit the new tank correctly, ensuring that the tank cap and breather are exactly as specified in the respective vehicle layout to prevent infiltration, which will contaminate the power steering fluid. Then fill the power steering system with fluid and bleed and perform another pump function test. Only replace the power steering pump if the problem persists. (Ref: Technical Information No. 1695 _ December 2008)

- Remove the front section of the underfloor (M2.12).
- Remove the hydraulic steering pump/compressor drive belt (A3.12).



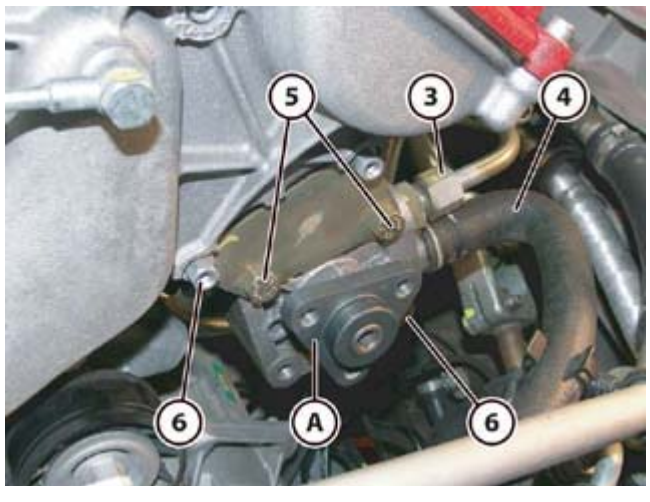
- Remove the power steering pump pulley **(1)** by undoing the three screws **(2)**.



- Remove the union **(3)** and the pipe **(4)** on the pump **(A)** and immediately plug them to prevent fluid from spilling out.
- Undo the two upper screws **(5)** fastening the pump to the front mounting bracket.
- Undo the two lower screws **(6)** fastening the pump onto the engine and retrieve the spacers.
- Remove the power steering pump **(A)** from the engine compartment.

Refitting the power steering pump

Tightening torque		Nm	Class
Hydraulic steering pump - crankcase	Screw	25 Nm	B
Pipe from steering box to power steering pump	Union	35 Nm	B



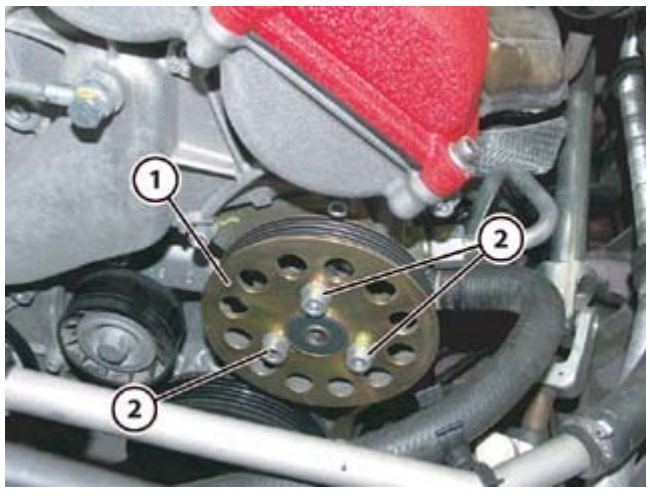
- Fit the power steering pump **(A)** in its seat on the engine. Fit the spacers retrieved during removal and tighten the two lower screws **(6)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

- Fix the pump **(A)** by hand tightening the two upper screws **(5)** fastening the pump to the front mounting bracket.
- Refit and tighten the union **(3)** onto the pump.

Tightening torque	Nm	Class
Union	35 Nm	B

- Connect the pipe **(4)** to the pump using the relative clamp.

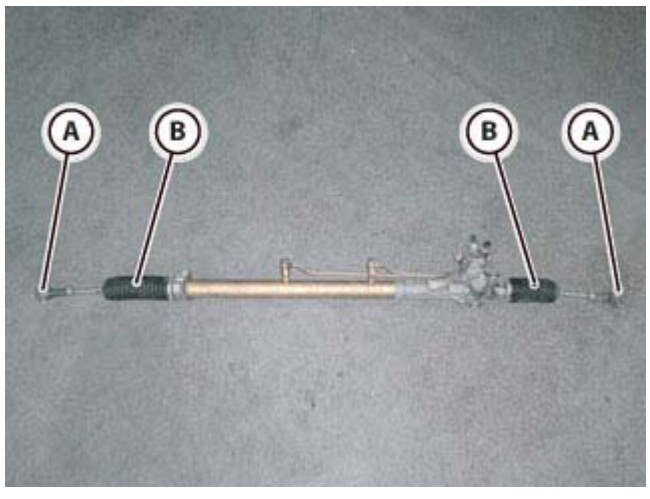


- Refit the drive pulley **(1)** and hand tighten the three screws **(2)**.

- Refit the hydraulic steering pump/compressor drive belt (A3.12).
- Refit the front flat undertray section (M2.12).
- Check the power steering system fluid level (A3.06).

E2.02 Steering box

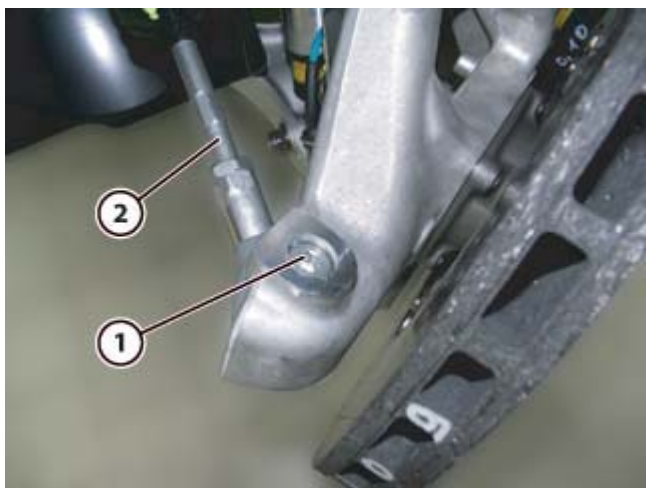
Checking the steering box



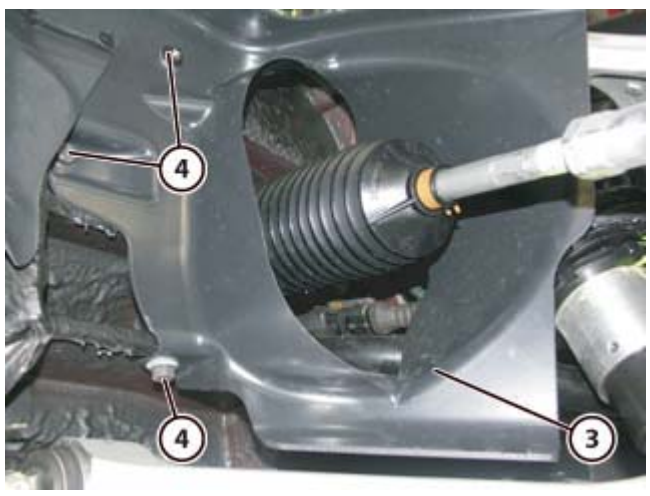
- To ensure correct steering box function, the arm protector bellows **(B)** and the ball joint gaiters **(A)** must be in perfect condition. If any damage is noted, replace, greasing the joints**TUTELA MR3**.

Removing the steering box

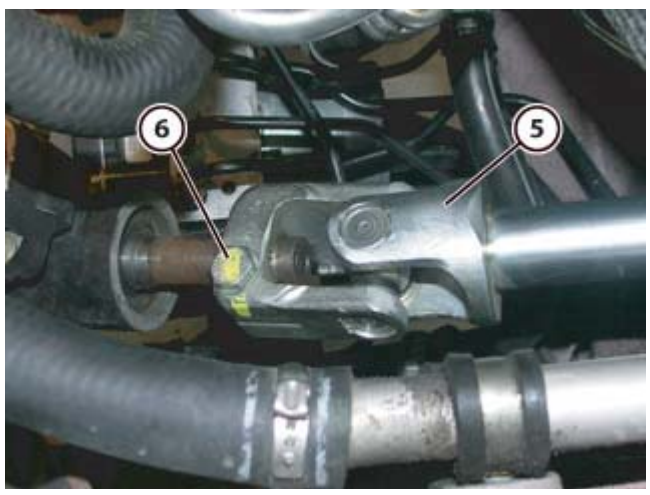
- Drain the hydraulic steering tank drawing out the fluid with a syringe.
- Remove the front section of the underfloor (M2.12).
- Remove the wheel (F2.08).
  - Both the front ones
- Remove the front stabiliser bar (F2.07).
- Remove the air intake (B6.03).
  - Remove the left-hand one.



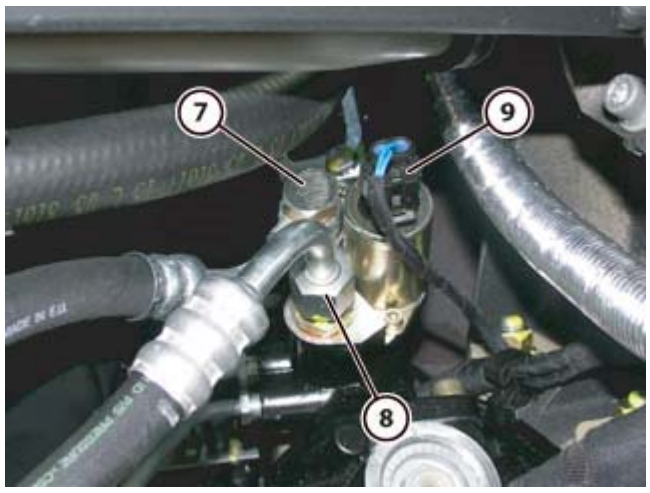
- Undo the screw **(1)** that secures the arm **(2)** of the steering box to the stub axle.



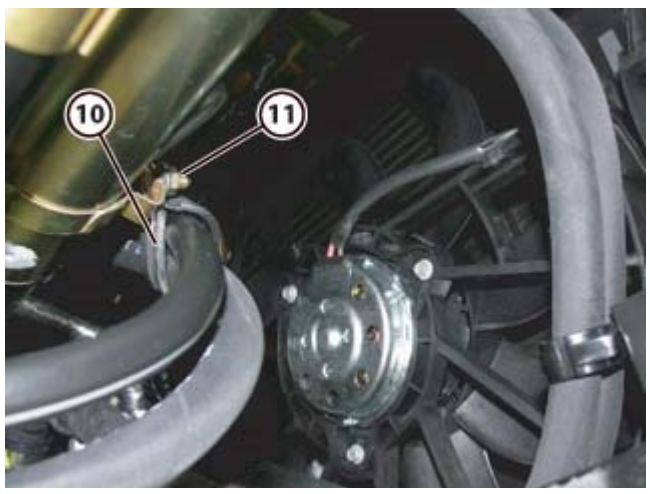
- Remove the brake air flap **(3)** by undoing the three screws **(4)**.



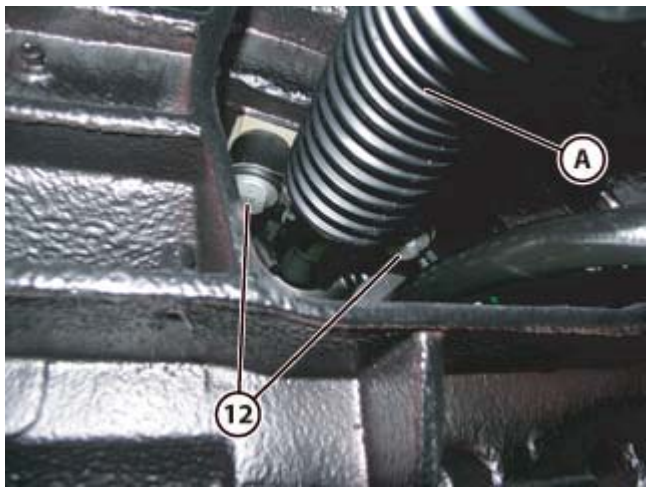
- Mark the position of the steering column **(5)** with respect to the upper cover of the steering box.
- Loosen the screw **(6)** that locks the steering column **(5)** on the steering box.



- Remove the unions **(7)** and **(8)** of the oil pipes on the steering box and cap them immediately.
- Detach the connector **(9)**.



- Remove the clamp **(10)** on the steering box by unscrewing the nut **(11)**.



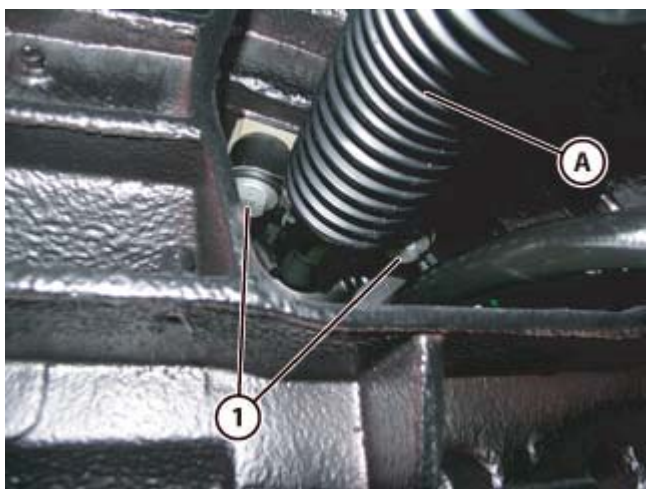
- Undo the retaining screws **(12)** for the steering box **(A)** on both sides of the chassis.

Perform the same operation on the other side of the vehicle.

- Move the steering box to the right as much as necessary to slip the left-hand arm off the chassis, then lower it until the arm slips off the chassis and remove it from the engine compartment.

Refitting the steering box

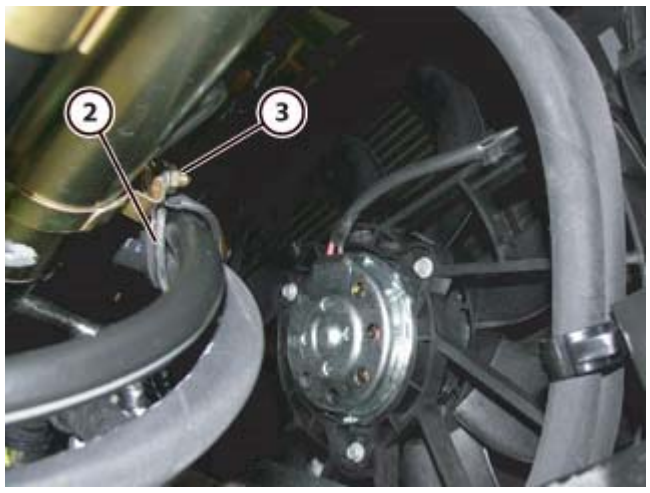
Tightening torque		**Nm**	**Class**
Fastening steering box to chassis	Pretightening to "X"	25 Nm	A
	Screw (tightened to 35 Nm, start of control angle 30° - 60°)	60 Nm	A
Pipe from pump - steering box	Union	35 Nm	B
Steering column - steering box	Screw	30 Nm	B
Front brake air flap	Screw	5 Nm	B
Fastening steering box tie-rod to stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A



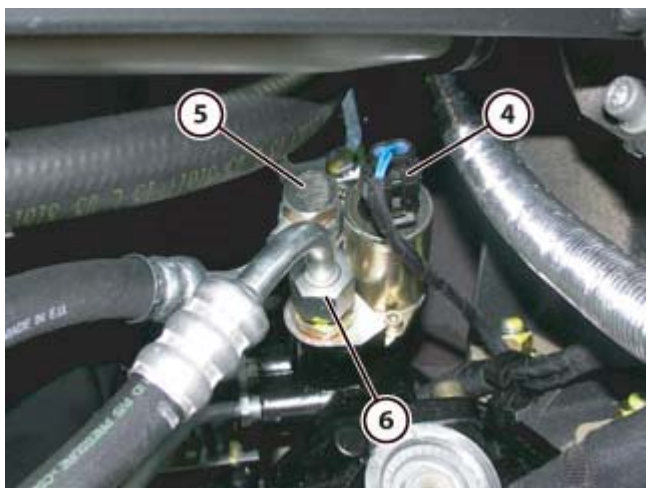
- Fit the steering box **(A)** in its seat on the chassis and tighten the two screws **(1)**.

Repeat the procedure on the other side of the vehicle.

Tightening torque	**Nm**	**Class**
Pretightening to "X"	25 Nm	A

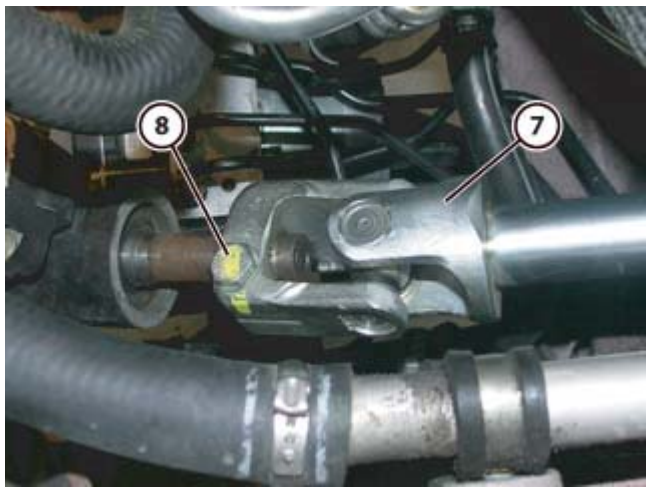


- Fit the clamp **(2)** and tighten the nut **(3)**.



- Connect the connector **(4)**.
- Fasten the oil connection pipe leading to the hydraulic steering coil by tightening the union **(5)**.
- Fasten the oil connection pipe to the hydraulic steering pump by tightening the union **(6)**.

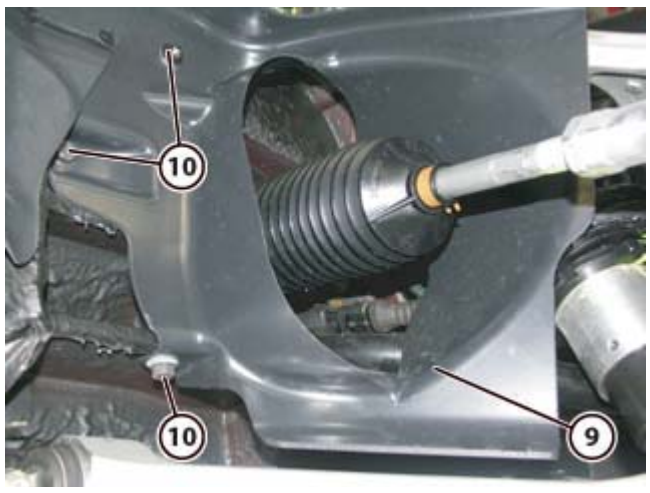
Tightening torque	Nm	Class
Union	35 Nm	B



- If refitting the original steering box, fit the steering column **(7)**, matching the reference marks made during removal, and fasten the screw **(8)**.

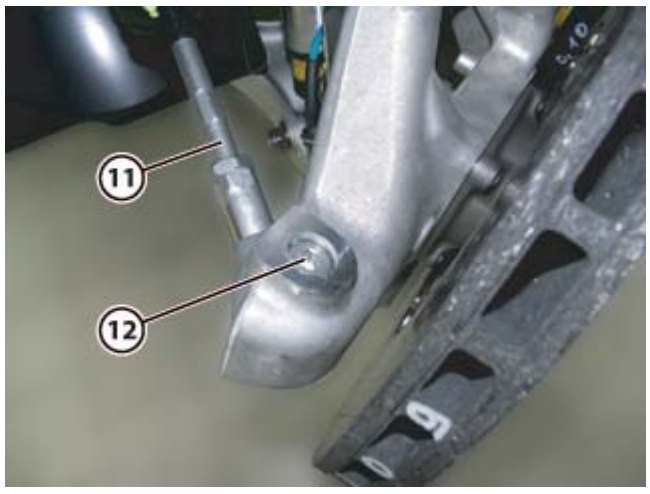
When fitting a new steering box, check the steering angle in both directions after installing the cardan joint.

Tightening torque	Nm	Class
Screw	30 Nm	B



- Fit the brake air deflector **(9)** and tighten the three screws **(10)**.

Tightening torque	Nm	Class
Screw	5 Nm	B



- Fit the arm head **(11)** in its seat on the stub axle and tighten the screw **(12)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A

- Refit the front stabiliser bar (F2.07).
- Refit the air intake (B6.03).
- Refit the front flat undertray section (M2.12).
- Refit the wheel (F2.08).
- Fill the power steering system (E2.07).

E2.03 Hydraulic steering tank

Removing the power steering tank

CAUTION

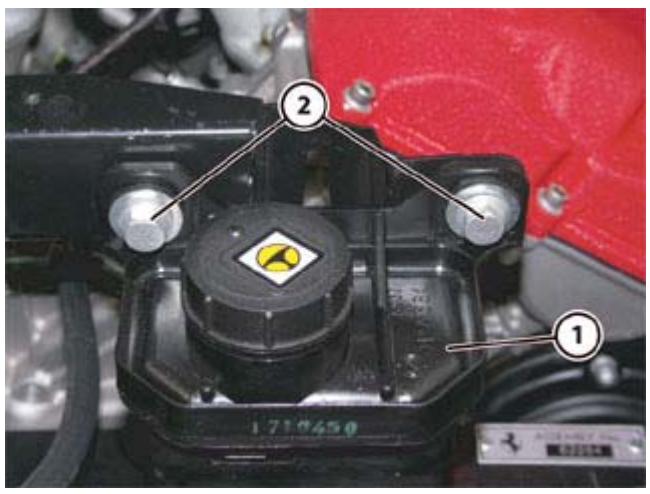
The oil in the hydraulic steering system is harmful to the eyes and skin and may also damage the vehicle bodywork.

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

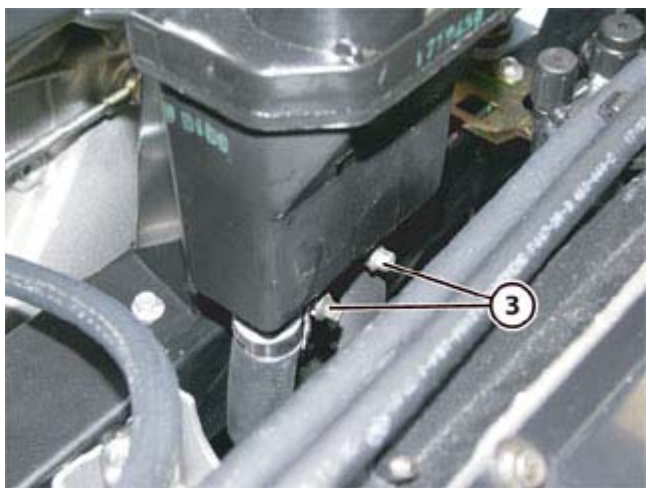
For vehicles UP TO Ass.ly No. 97929, in the event of replacing the power steering fluid reservoir, the pipe leading from the power steering fluid reservoir to the power steering pump, and the pipe leading from the serpentine coil to the power steering fluid reservoir, the components of RETROFIT KIT Part No. 279664 must be installed.

The power steering fluid specified FROM Ass.ly No. 97930 must be used following installation of the components of the RETROFIT KIT Part No. 279664.

- Drain the hydraulic steering tank, aspirating the fluid with a syringe.



- To remove the hydraulic steering tank **(1)** undo the two screws **(2)**.



- Slightly lift the tank and loosen the two fastener clamps **(3)** on the pipes.
- Remove the delivery and return pipes and remove the tank.



- **FROM Ass.ly No. 69466**, a breather pipe **(A)** was introduced on the power steering fluid tank cap.
- The breather pipe **(A)** is fastened at the top to the coolant radiator by retainer clamps.



- The lower part of the breather pipe **(A)** is fastened by the two green retainer clamps indicated on the chassis.

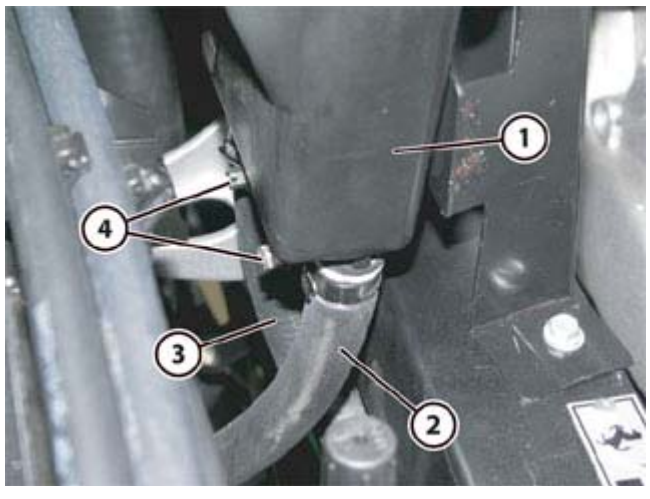
Refitting the power steering tank

CAUTION

The oil in the hydraulic steering system is harmful to the eyes and skin and may also damage the vehicle bodywork.

For vehicles UP TO Ass.ly No. 97929, in the event of replacing the power steering fluid reservoir, the pipe leading from the power steering fluid reservoir to the power steering pump, and the pipe leading from the serpentine coil to the power steering fluid reservoir, the components of RETROFIT KIT Part No. 279664 must be installed.

The power steering fluid specified FROM Ass.ly No. 97930 must be used following installation of the components of the RETROFIT KIT Part No. 279664.



- Remove the hydraulic steering tank **(1)** and insert the pipe **(2)** and the pipe **(3)**into the breather vents.
- Fasten the pipes by tightening the clamps **(4)**.



- Fasten the tank to the bracket by tightening the two screws **(5)**.

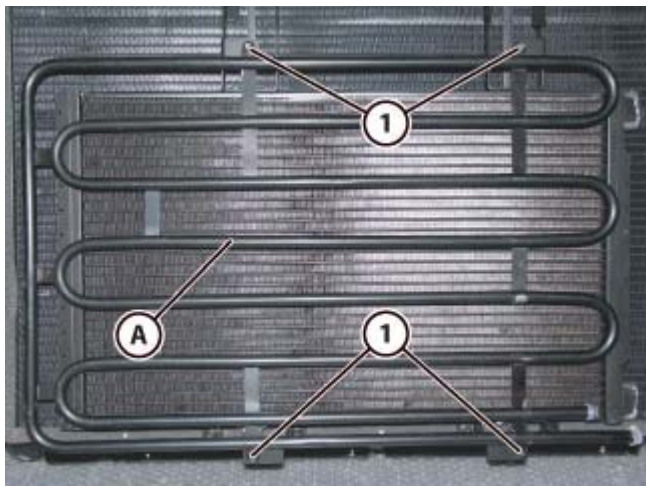
➢ Fill the power steering system (E2.07).

E2.04 Coil

Removing the hydraulic steering coil

The coil used to cool the hydraulic steering system oil is fastened to the air conditioning and heating system condenser which, in turn, is fastened to the coolant radiator.

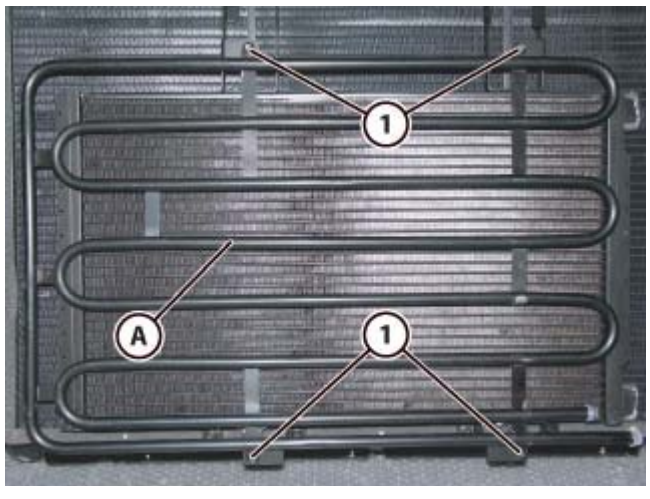
- Remove the front bumper (M2.03).
- Remove the air conditioning and heating system condenser (I2.02).



- Undo the four screws **(1)**.
- Remove the coil **(A)** from the condenser brackets.

Refitting the hydraulic steering coil

Tightening torque		**Nm**	**Class**
Hydraulic steering coil - A.C. condenser	Screw	5 Nm	B



- Fit the coil **(A)** on the brackets for the air conditioning and heating system condenser.
- Tighten the four fastener screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	5 Nm	B

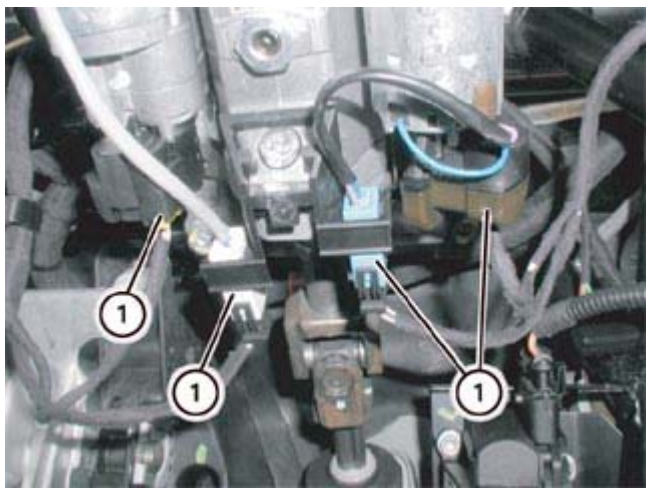
- Refit the air conditioning and heating system condenser (I2.02).
- Refit the front bumper (M2.03).

E2.05 Steering column

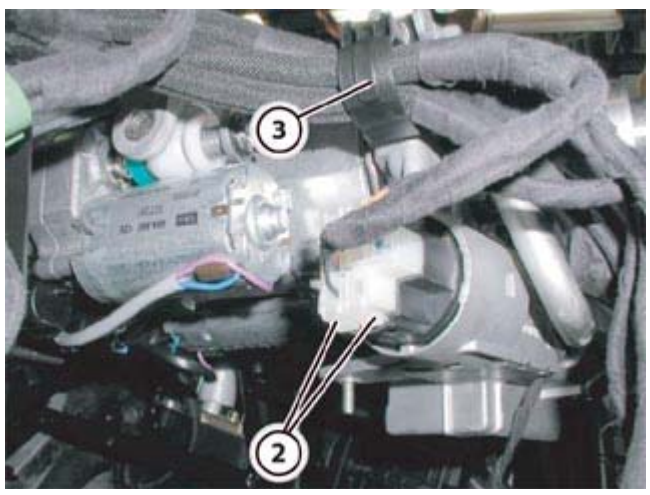
Removing the steering column

- Set the battery master switch to OFF (L2.02).
- Remove the air intake (B6.03).
  Remove the left hand component only.

- Remove the dashboard binnacle (M2.19).



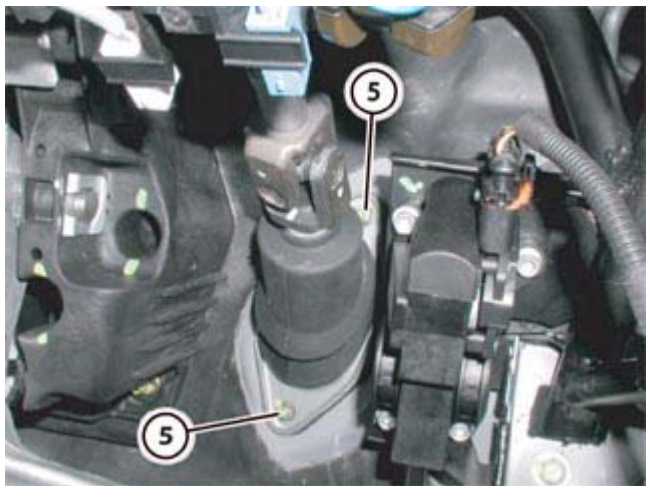
- Remove the four steering column adjustment motor connectors **(1)**.



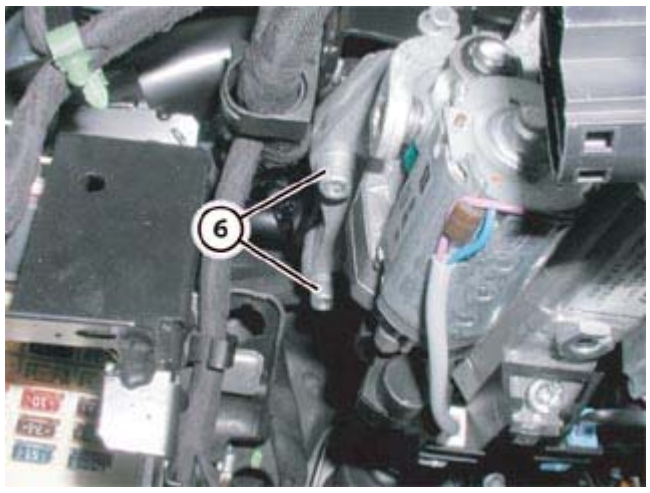
- Remove the starter switch connectors **(2)** and release the cable from the clip **(3)**.



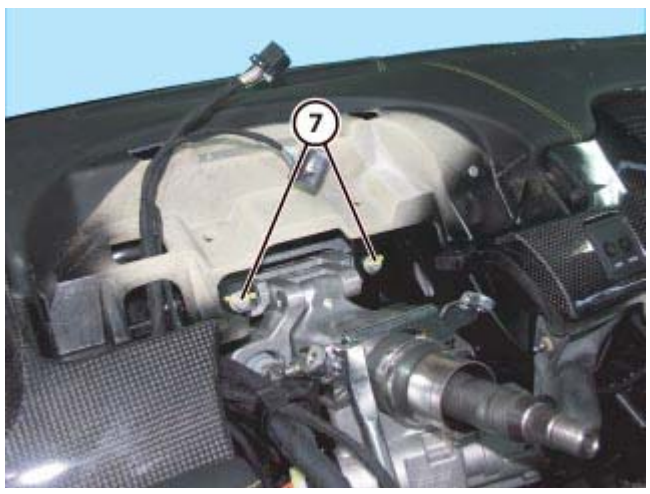
- Mark the position of the joint relative to the steering box shaft.
- Unscrew the screws **(4)** fastening the cardan joint to the steering box.



- Unscrew the two nuts **(5)** fastening the plate onto the bodywork.



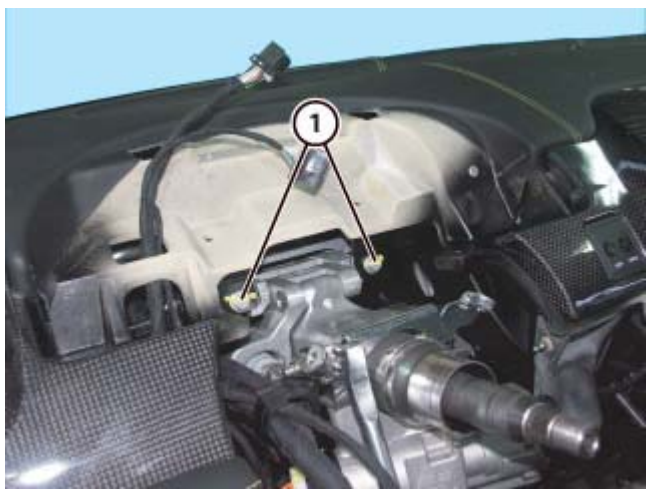
- Unscrew the four screws **(6)** (two on each side) fastening the steering column to the chassis.



- Unscrew the two screws **(7)** fastening the steering column to the chassis.
- Remove the steering column from the passenger compartment.

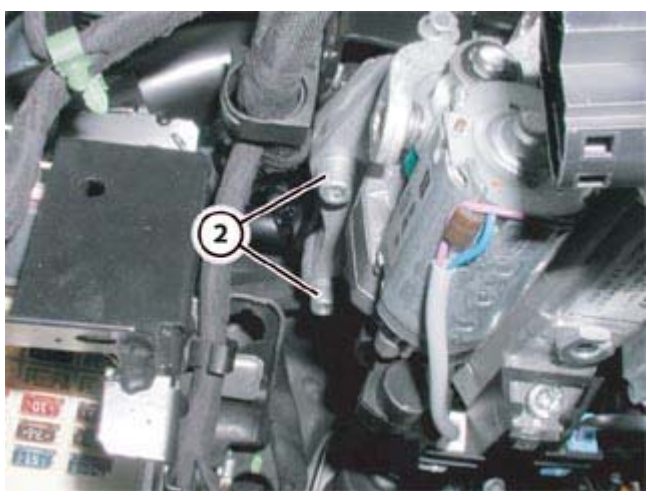
Refitting the steering column

Tightening torque		**Nm**	**Class**
Steering column - dashboard cross member	Screw	20 Nm	B
Steering column - steering box	Screw	30 Nm	B



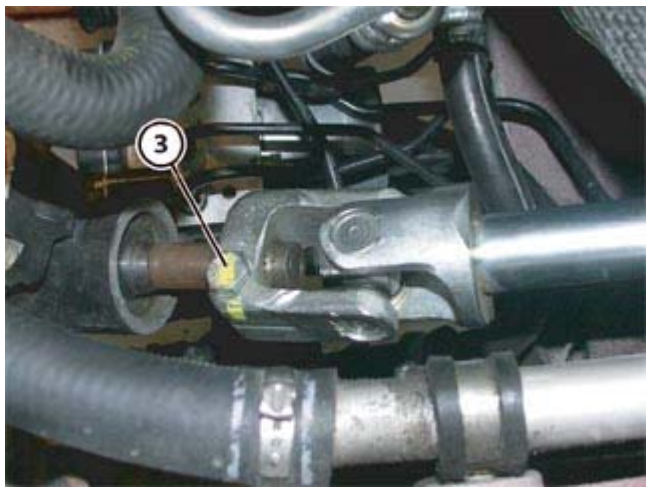
- Working inside the passenger compartment, fit the steering column onto the relative holes in the bodywork.
- Tighten the screws **(1)** fastening the steering column to the bodywork.

Tightening torque	**Nm**	**Class**
Screw	20 Nm	B



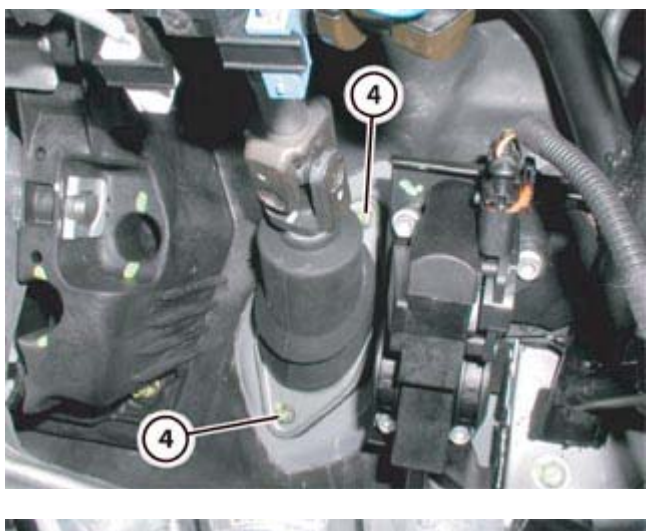
- Tighten the four screws **(2)** (two per side) fastening the steering column to the bodywork.

Tightening torque	**Nm**	**Class**
Screw	20 Nm	B

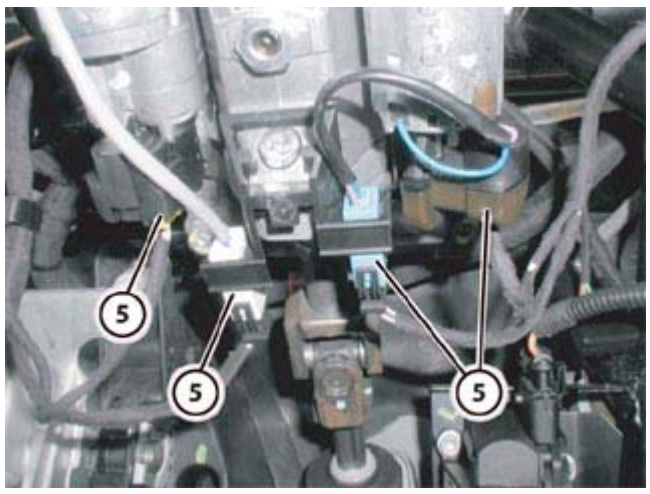


- Using the markings made during removal as reference, tighten the screws **(3)** fastening the cardan joint onto the steering box.

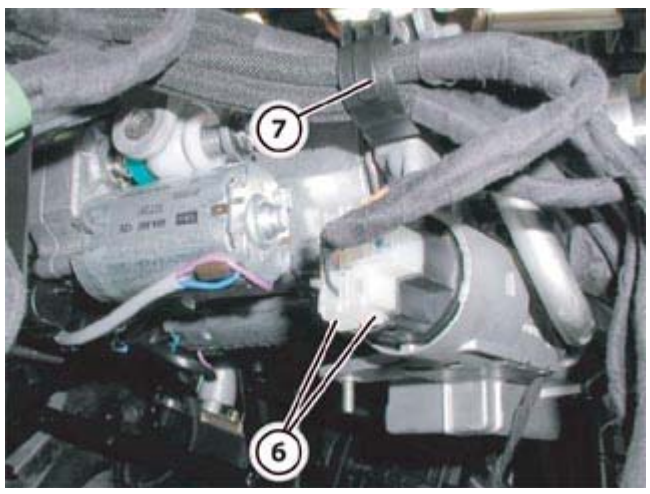
		
Tightening torque	**Nm**	**Class**
Screw	30 Nm	B



- Tighten the two nuts **(4)** fastening the plate to the bodywork.



- Connect the four connectors **(5)**.



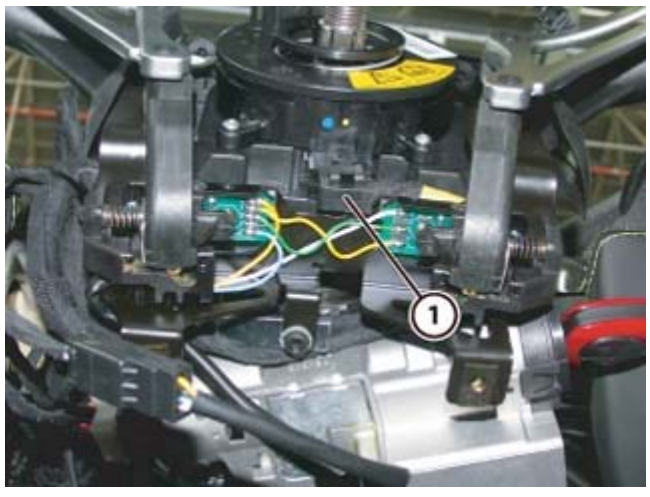
- Connect the two connectors **(6)**, fasten the wiring harness with the clamp **(7)** and ensure that there is no interference when the steering column is moved.

- Refit the binnacle (M2.19).
- Refit the air intake (B6.03).
- Set the battery master switch to ON (L2.02).

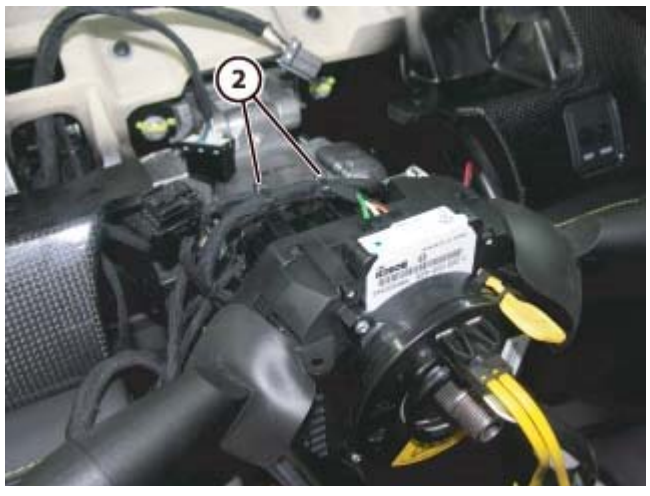
E2.06 Steering column switch

Removing the steering column switch

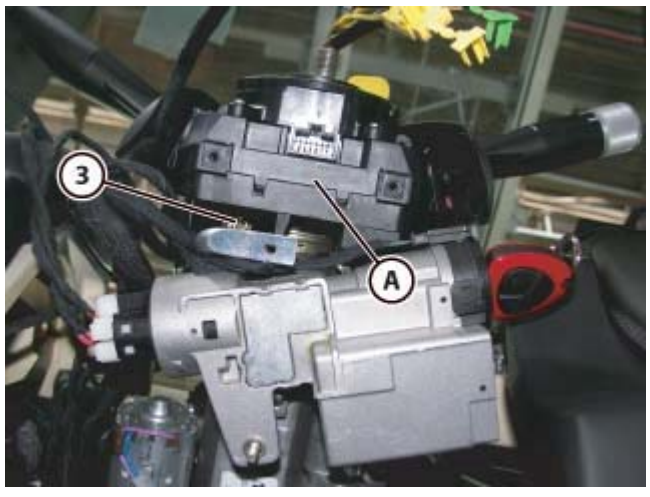
- Set the battery master switch to OFF (L2.02).
- Remove the steering wheel (H3.06).
- Remove the steering column trim panel (M2.19).
- Remove the gear selector paddles (H3.11).
  Remove only if the vehicle is equipped with an electronically controlled gearbox.



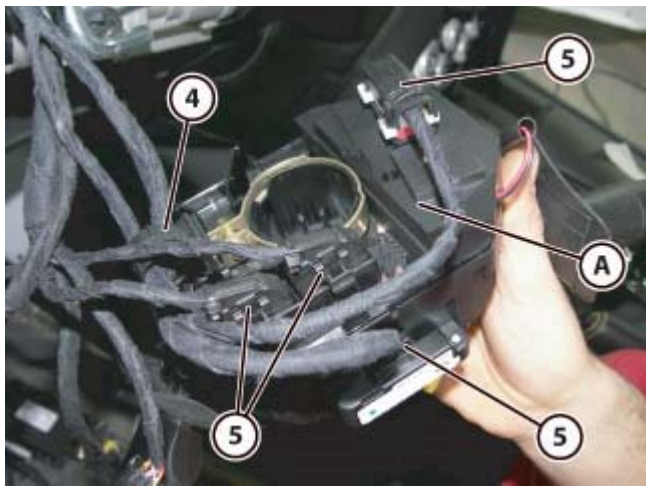
- Disconnect the clock spring connector **(1)** (D058).



- Remove the two cable retainer clamps **(2)** on the steering column switch.

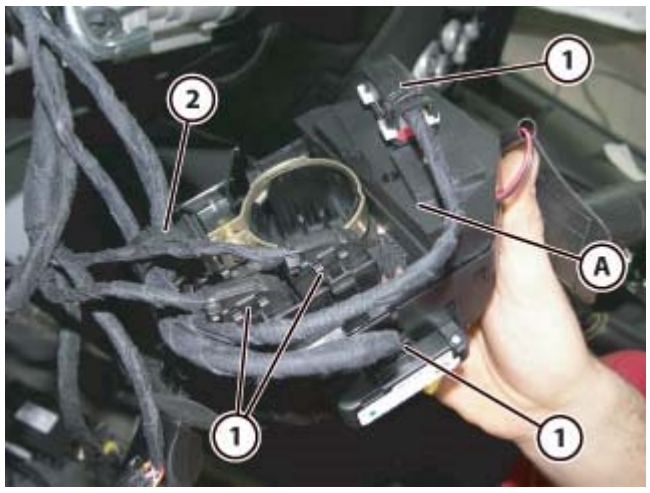


- Undo the screw **(3)** fastening the steering column switch **(A)** to the steering column.

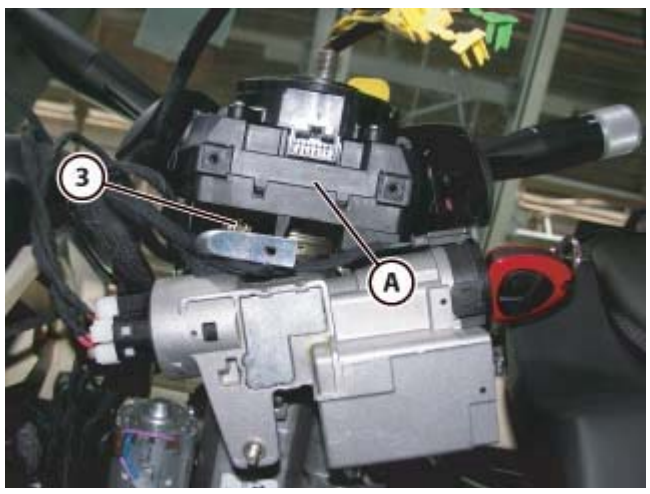


- Remove the steering column switch **(A)** from the steering column, remove the clamp **(4)**, pulling out the cables, and disconnect the four connectors **(5)** (M032) (M034) (D003) (D072).
- Remove the steering column switch **(A)** from the vehicle.

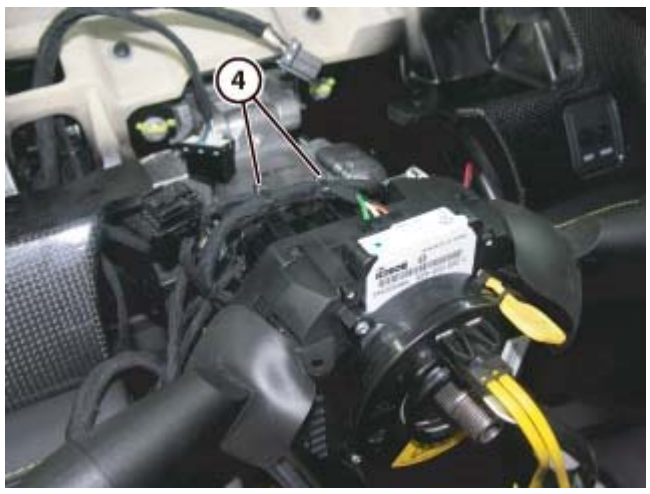
Refitting the steering column switch



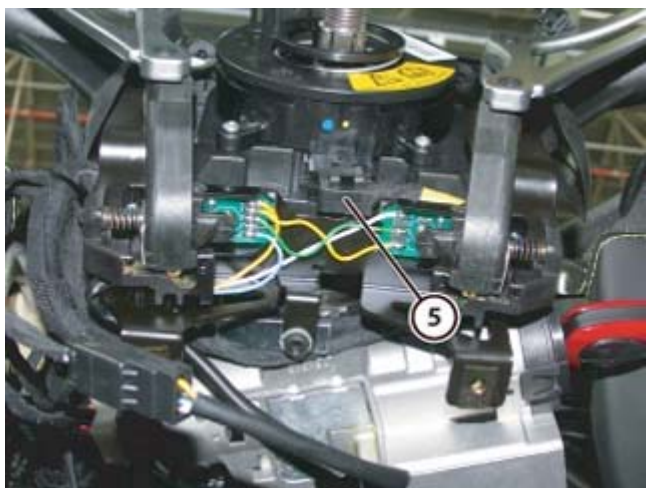
- Connect the four connectors **(1)** (M032) (M034) (D003) (D072) to the steering column switch **(A)**.
- Fit the cables in the clamp **(2)**.



- Fit the steering column switch **(A)** onto the steering column and fasten with the screw **(3)**.



- Refit the two cable retainer clamps **(4)** on the steering column switch.



- Connect the clock spring connector **(5)** (D058).

➢ Refit the gear selector paddles (☞ H3.11).
Perform this operation only on vehicles with electronically controlled gearboxes.

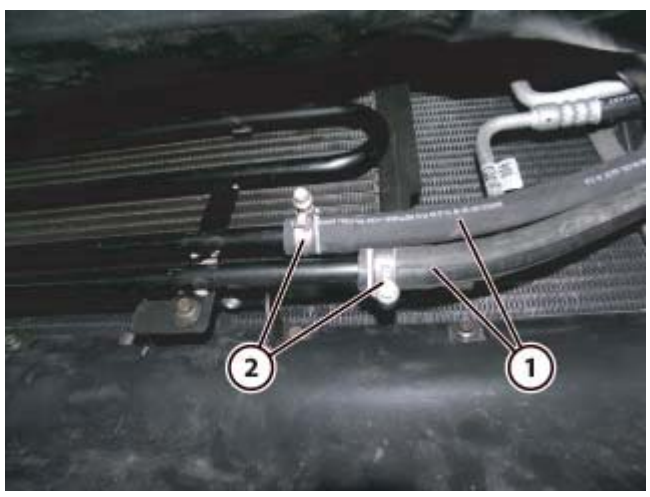
➢ Refit the steering column trim panel (☞ M2.19).
➢ Refit the steering wheel (☞ H3.06).
➢ Set the battery master switch to ON (☞ L2.02).

E2.07 Hydraulic system

Draining the hydraulic steering system

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

➢ Remove the front bumper (M2.03).

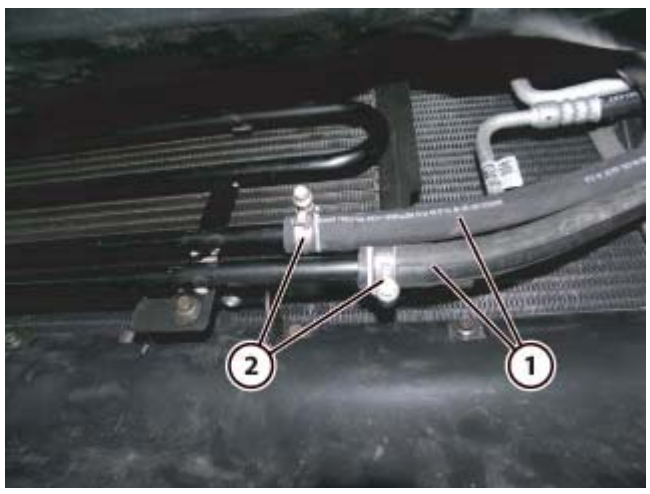


- Remove the two pipes **(1)** by unscrewing the clamps **(2)**.
- Immediately place a container to collect the fluid under the outlet and drain the system completely.

Filling the hydraulic steering system

FROM Ass.ly No. 97930, a different power steering fluid is prescribed.
The power steering fluid specified FROM Ass.ly No. 97930 must be used following installation of the components of the RETROFIT KIT Part No. 279664.
Before topping up or filling the power steering system, always check which type of fluid should be used, as mixing the two different types of power steering fluid will damage the power steering system itself.

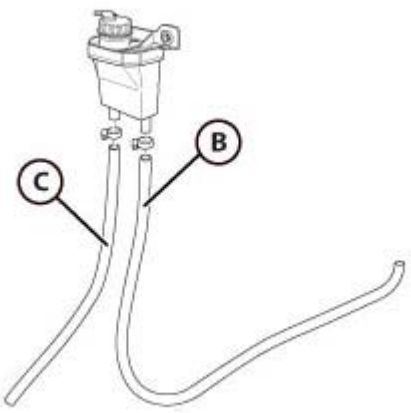
After draining the hydraulic circuit during a scheduled service, or in the event of replacing a component or a pipe, the system must be refilled.



- Refit the two pipes **(1)** on the coil and fasten with the clamps **(2)**.

The system is self-bleeding.

- Remove the hydraulic steering tank (E2.03).
- Clean the interior of the power steering fluid reservoir thoroughly using a small quantity of new power steering fluid of the specified type.
- Allow the power steering fluid used to clean the power steering fluid reservoir to drain completely into a suitable container.
- Use a suitable syringe to aspirate any residue of the power steering fluid used for cleaning from the power steering fluid reservoir.



- Connect a suitable additional pipe to the power steering fluid reservoir return pipe **(C)**
- Place the other end of the pipe into a container for collecting the power steering fluid.

CAUTION
The oil in the hydraulic steering system is harmful to the eyes and skin and may also damage the vehicle bodywork.

- Adequately protect the areas surrounding the power steering tank pipes **(B)** and **(C)**.

DO NOT apply any more turning force to the steering wheel once full lock is reached.

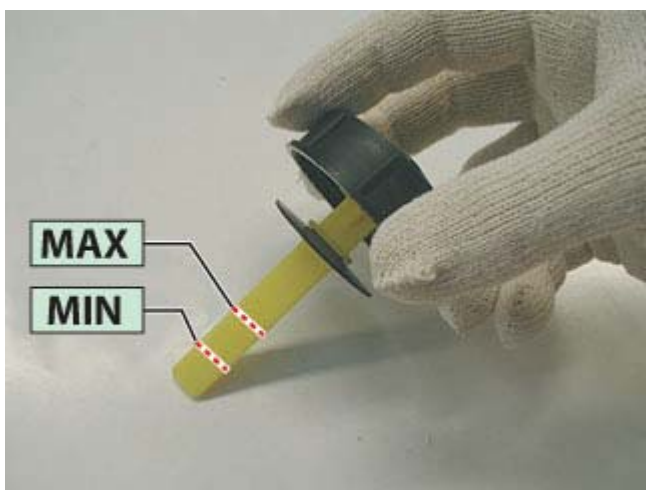
- Steer fully to the left and right a few times until power steering fluid starts to flow from the tank return pipe **(C)**.
- Connect a suitable funnel to the power steering fluid reservoir delivery pipe **(B)**.
- Place an **80 micron** mesh filter in the funnel.
- Pour new power steering fluid into the funnel while simultaneously steering to the left and right a few times until at least **3 litres** of power steering fluid has been collected from the power steering fluid reservoir return pipe.

Do not let the funnel empty during this procedure.

- Disconnect and remove the funnel from the power steering fluid reservoir delivery pipe **(B)**.
- Disconnect and remove the additional pipe from the power steering fluid reservoir return pipe **(C)**.
- Refit the power steering tank (E2.03).



- Undo and open the cap **(A)**.



DO NOT apply any more turning force to the steering wheel once full lock is reached.

- Fill the power steering fluid reservoir to the **MAX** limit on the cap dipstick while simultaneously steering fully to the right and left repeatedly until the power steering fluid level stabilises and the fluid contains no bubbles.

There are MIN and MAX levels indicated on both sides of the dipstick. Use the levels on the side indicating the temperature **20°C**.

- Start and stop the engine twice repeatedly.
- Check that the fluid level is stable and that the fluid is not emulsified with air.
- If the power steering fluid level drops, top the power steering fluid reservoir up to the **MAX** limit on the cap dipstick while simultaneously steering fully to the right and left repeatedly until the power steering fluid level stabilises and the fluid contains no bubbles.

There are MIN and MAX levels indicated on both sides of the dipstick. Use the levels on the side indicating the temperature **20°C**.

- Lift the vehicle with a vehicle lift so that the wheels are not in contact with the ground.
- Start the engine and run at idle speed for **1 minute**.

DO NOT apply any more turning force to the steering wheel once full lock is reached.

- Check the power steering system fluid level (A3.06).

Simultaneously, steer fully 10 times.

- Lower the vehicle to bring the wheels into contact with the ground.
- Wait for the engine coolant temperature to reach **90°C**.

DO NOT apply any more turning force to the steering wheel once full lock is reached.

- Check the power steering system fluid level (A3.06).

Simultaneously, steer fully 10 times.

Repeat this procedure another three times.

- Check the power steering system fluid level (A3.06).
- Refit the front flat undertray section (M2.12).

F1.01 System layout technical specifications

Front

Wheel rim size

Light alloy 8 " J x 19 "
Light alloy 8 " J x 20 " optional
Spare wheel 3.5 " J x 19 "
Spare wheel 4.5 " J x 20 "

Tyre size

245/40 ZR19 Pirelli P Zero
245/40 ZR19 Goodyear Eagle optional
245/40 ZR19 Michelin Pilot Sport optional
245/35 ZR20 Pirelli P Zero optional
245/35 ZR20 Bridgestone RE 050 optional Run Flat
Winter 245/40 ZR19 Pirelli Winter
Spare wheel 115/70 R19 Pirelli P Zero
Spare wheel 145/60 R20 Vredestein

Rear

Wheel rim size

Light alloy 11 " J x 20 "
Spare wheel 3.5 " J x 19 "
Spare wheel 4.5 " J x 20 "

Tyre size

305/35 ZR20 Pirelli P Zero
305/35 ZR20 Goodyear Eagle optional
305/35 ZR20 Michelin Pilot Sport optional
305/35 ZR20 Bridgestone RE 050 optional Run Flat
Winter 305/35 ZR20 Pirelli Winter
Spare wheel 115/70 R19 Pirelli P Zero
Spare wheel 145/60 R20 Vredestein

Wheel rims and tyres for "HGTE" / "60 F1" variants

HGTE variant

The **HGTE** variant is fitted exclusively with:

- **REVERSE RIM COMPOSITE** wheels, measuring **8,5" J x 20"** on the front axle and **11" J x 20"** on the rear axle.
- **Pirelli P Zero 245/35 ZR 20** tyres at the front and **305/35 ZR 20** tyres at the rear.



CAUTION!
The composite wheels (on "HGTE" variants) are REVERSE RIM components.
To prevent wheel damage, the tyre must only be demounted and mounted from the inner side of the wheel itself.
Two warning labels are applied on these wheels - one on the rim well and one on the flange face.
When mounting, ensure that no adhesive residue is left on the flange surface.

Only tubeless tyres may be fitted on REVERSE RIM COMPOSITE wheels (for "HGTE" variants). Do not use run flat tyres with these wheels.
As the use of run flat tyres with REVERSE RIM COMPOSITE wheels is prohibited in all Gulf States (Bahrain, Kuwait, Qatar, Saudi Arabia, UAE and Oman) by Gulf Standard 42/2003 “Motor Vehicles: General Requirements”, the vehicle must be equipped with a spare wheel.

When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

60 F1 variant

The **60 F1** variant is fitted exclusively with:

- **8,5" J x 20"** wheel rims at the front and **10,5" J x 20"** at the rear.
- **Pirelli P Zero 245/35 ZR 20** tyres at the front and **305/35 ZR 20** tyres at the rear.

Inflation pressure (cold)

	Front	**Rear**
Pirelli P Zero	2.2 bar	2 bar
Bridgestone RE 050	2.2 bar	2.2 bar
Goodyear Eagle	2.5 bar	2.5 bar
Pirelli Winter	2.4 bar	2.2 bar
Michelin Pilot Sport	2.6 bar	2 bar
Pirelli (spare)	3.2 bar	3.2 bar
Vredestein (Spare wheel)	4.2 bar	4.2 bar

F1.02 Tightening torques

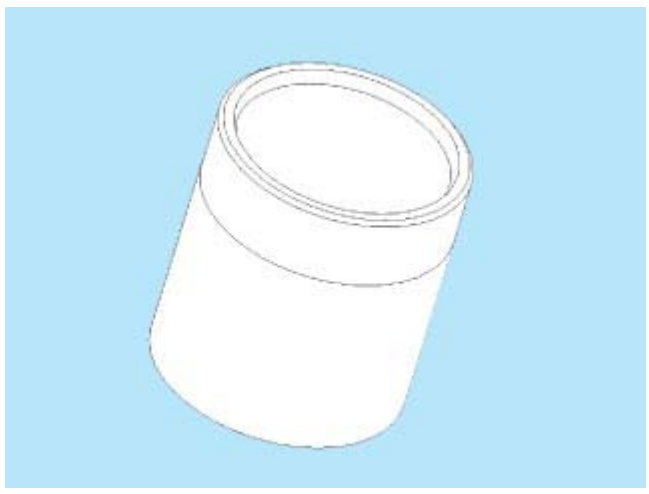


Tightening torque		Nm	Class
Front stabiliser bar - chassis	Nut	25 Nm	B
Rear stabiliser bar - chassis	Nut	25 Nm	B
Front suspension lower arm - chassis	Nut	60 Nm	A
Front suspension upper arm - chassis	Nut	25 Nm	A
Spherical tie-rod - front suspension lower arm	Tie-rod	50 Nm	B
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B
Brake pipe - front calliper	Union	18 Nm	A
Front brake pipe - rigid pipe	Union	16 Nm	B
Toe-in adjustment tie-rod - chassis	Nut	25 Nm	B
Front suspension lower arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Front suspension upper arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A
Front suspension shock absorber - lower arm	Nut	80 Nm	A
Shock absorber stop cap	Ring nut	65 Nm	B
Bushing and shock absorber retainer washer Products to use: AREXONS 4706 SYSTEM 52A42	Nut	40 Nm	A
Connector - shock absorber strut	Nut	40 Nm	A
Spherical tie-rod - rear lower arm	Tie-rod	50 Nm	B
Toe-in adjustment tie-rod - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	B
Axle shaft - bearing on hub carrier Products to use: Z2 PROTECTION	Nut	275 Nm	A
Rear suspension lower arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Rear suspension upper arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A
Shock absorber - hub carrier	Nut	80 Nm	A
Ball joint - rear suspension lower arm Products to use: AREXONS 4706 SYSTEM 52A42	Joint	5 Nm	B
Front shock absorber - chassis	Nut	25 Nm	A
Rear shock absorber - chassis	Nut	25 Nm	A
Rear suspension upper arm - chassis	Nut	25 Nm	A
Rear suspension lower arm - chassis	Nut	60 Nm	A
Spherical tie-rod - rear stabiliser bar	Nut	50 Nm	A
Fastening tyre inflation valve	Nut	4 Nm	A
Fastening tyre pressure sensor	Screw	4 Nm	A
Earth cable and front suspension brake pad wear sensor	Nut	4 Nm	B
Earth cable and rear suspension brake pad wear sensor	Nut	8 Nm	B

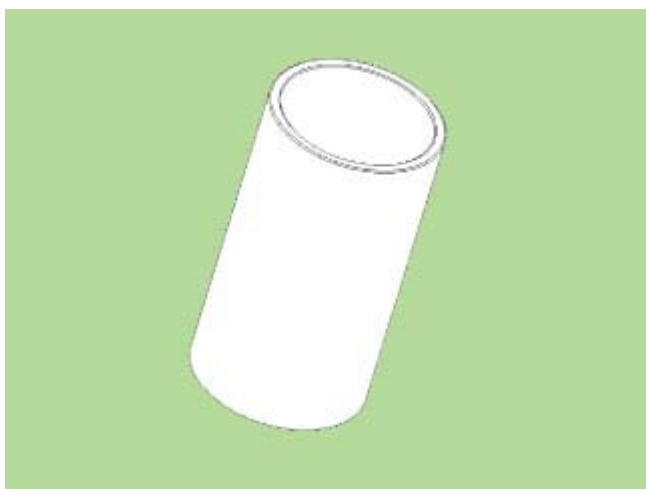
F1.03 Specific tooling and equipment



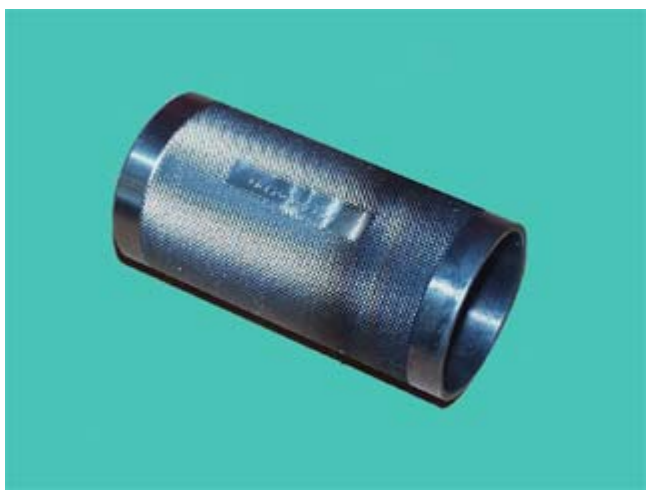
- Support 95973206 (AV 3206)
  for complete hub.



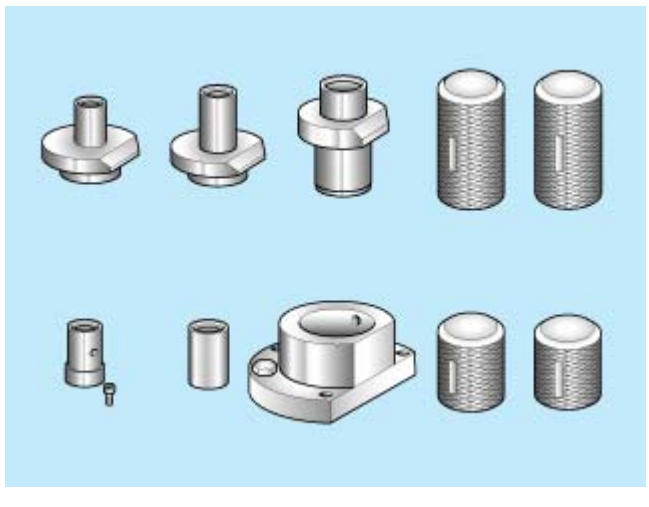
- Tool 95977310 (AM 107310)
  leverage surface for installing Flanbloc.



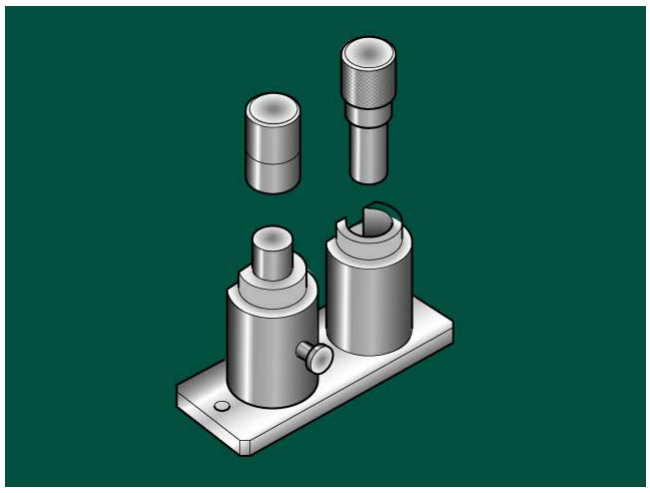
- Tool 95977311 (AM 107311)
  leverage surface for extracting Flanbloc and ball joint.



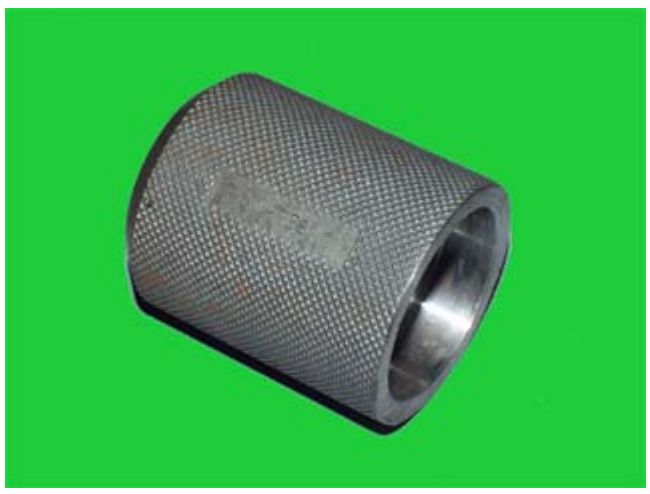
- Tool (AV 3427-13)
  for fitting Flanbloc.



- Tool 95973282 (AV 3282)
  for fitting and removing Flanbloc.



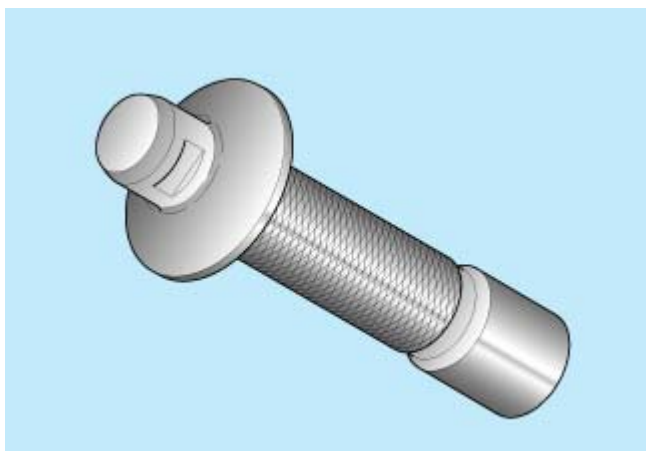
- Tool 95973189 (AV 3189)
  for removing Flanbloc and ball joint.



- Tool 95973281 (AV 3281)
  leverage surface for installing Flanbloc.



- Tool (AV 5225-2)
  leverage surface for extracting Flanbloc.



- Tool 95971651 (AV 1651)
  for removing lever ball joint.



- Torque wrench 95978172 (AV 8172)
  (Replaces torque wrench USAG 815F)

F2.01 Detaching the entire front suspension

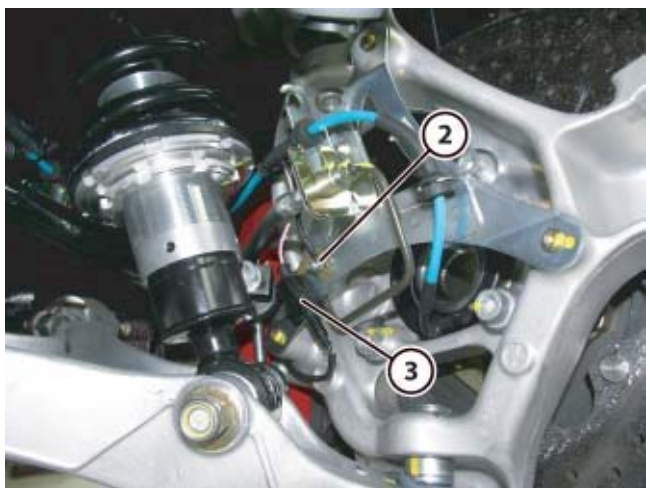
Detaching the entire front suspension

This procedure describes how to remove the entire suspension from the chassis. This operation is necessary, for example, for inspecting the chassis. See the specific chapters for information on removing individual suspension components.

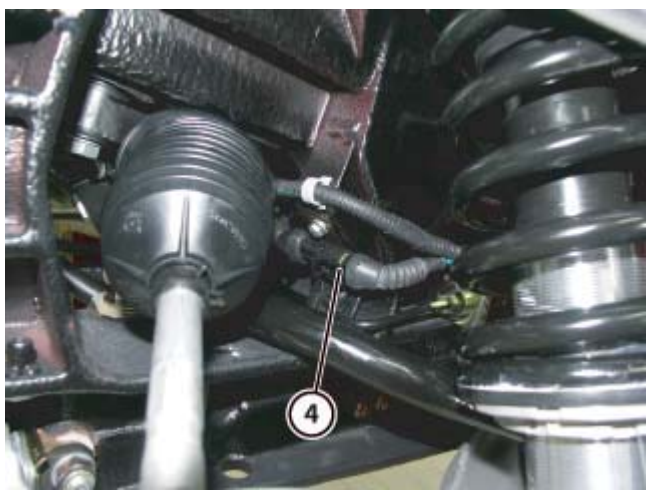
- Set the battery master switch to OFF (L2.02).
- Remove the wheel (F2.08).



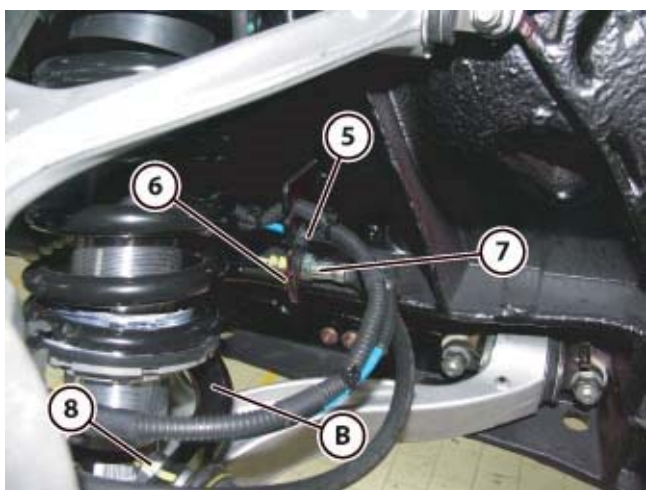
- Remove the flap **(A)** by undoing the three fastenings **(1)**.



- Undo the nut **(2)** fastening the earth cable and disconnect the brake pad wear sensor connector **(3)** (S004) (S006).



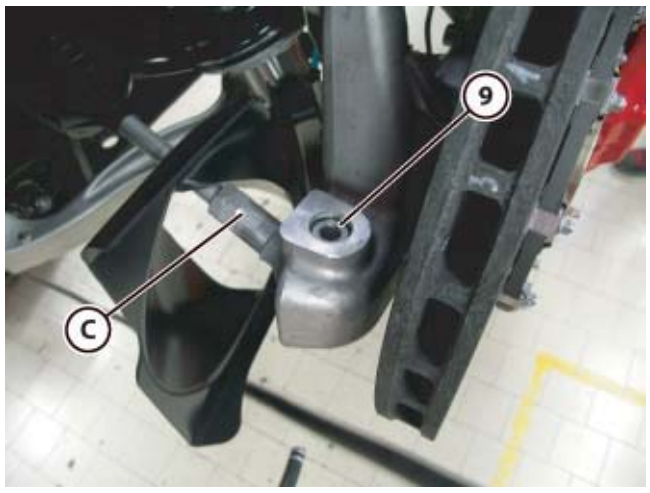
- Disconnect the ABS sensor connector **(4)** (Z016) (Z017).



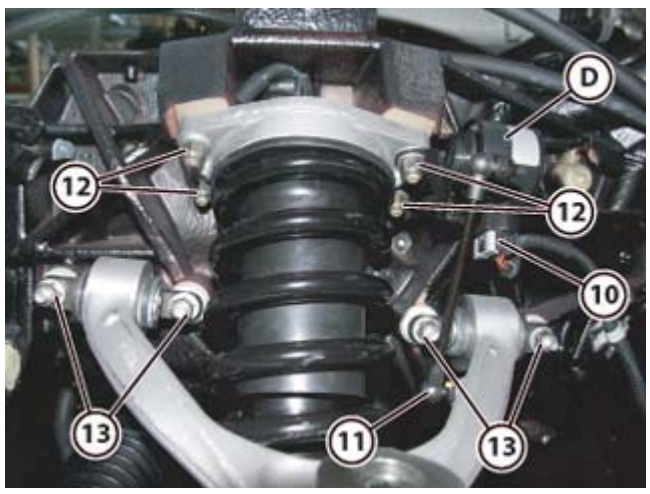
- Remove the cable grommet **(5)** from chassis bracket and remove the retainer clamps together with the brake pad wear sensor cable.

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash affected parts with plenty of running water. The fluid may also damage paintwork.

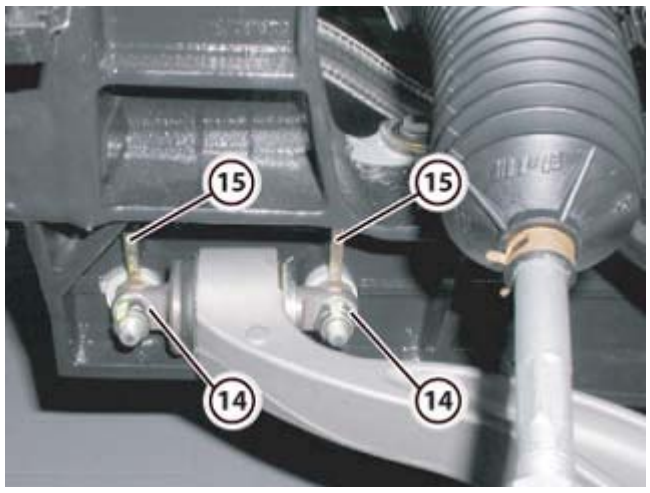
- Detach the retainer spring **(6)** from the brake pipe.
- Unscrew the union **(7)** on the brake hose and plug the line to prevent excessive brake fluid loss.
- **(Detach the stabiliser bar from the ball tie-rod by unscrewing the fastener nut)(8)**.



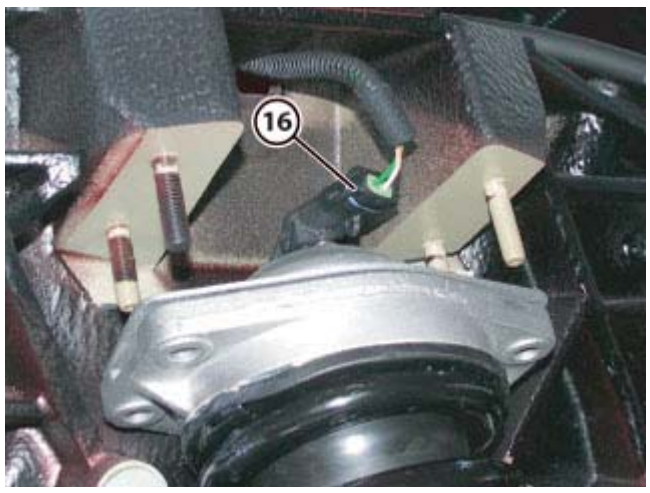
- Detach the steering box arm **(C)** from the stub axle by undoing the screw **(9)** and fit the suspension support tool **(AV 3206)**.



- Disconnect the connector **(10)** (Z317) (Z318)and the tie-rod **(11)** for the sensor **(D)** from the upper arm.
- Undo the nuts **(12)** fastening the shock absorber and remove the sensor **(D)**.
- Undo the four nuts **(13)** fastening the upper arm to the chassis and retrieve the flanbloc shims.



- Undo the four nuts **(14)** fastening the upper arm to the chassis.
- Retrieve the spacers **(15)** on the lower arm.



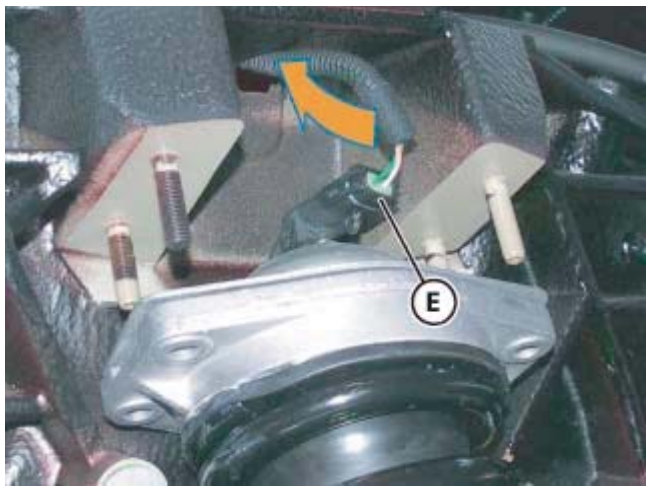
- With the weight supported by the tool, **(AV 3206)** lower the complete suspension slowly and disconnect the connector **(16)** (L347) (L348)on the shock absorber.

➢ Remove the complete suspension from the vehicle.

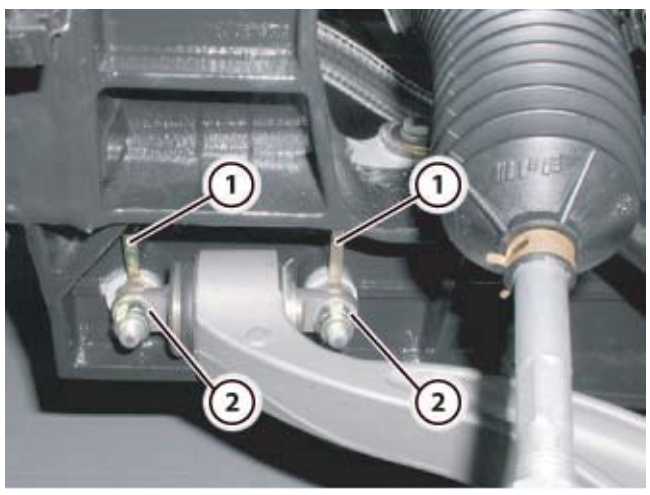
Refitting the entire front suspension

Tightening torque		**Nm**	**Class**
Front suspension lower arm - chassis	Nut	60 Nm	A
Front shock absorber - chassis	Nut	25 Nm	A
Front suspension upper arm - chassis	Nut	25 Nm	A
Earth cable and front suspension brake pad wear sensor	Nut	4 Nm	B
Front brake pipe - rigid pipe	Union	16 Nm	B
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B
Fastening steering box tie-rod to stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A
Front brake air flap	Screw	5 Nm	B

➢ Fit the flanbloc shims on the locator pins for the upper arm on the chassis.
➢ Fit the complete front suspension, with its weight sustained by the tool **(AV 3206)**, onto the relative fastener pins on the chassis.

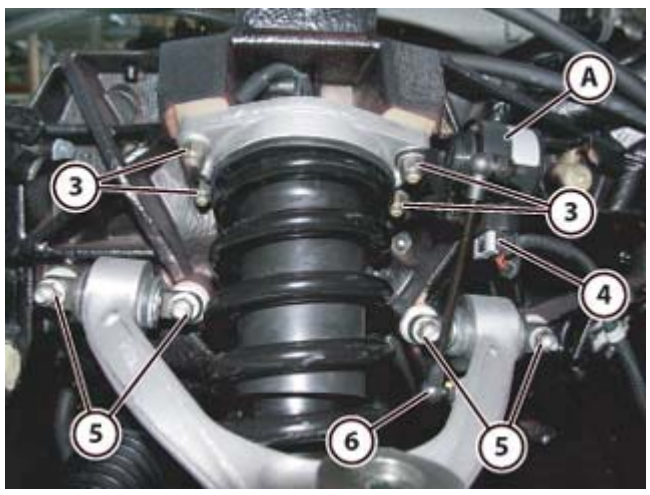


- Connect the shock absorber connector **(E)** (L347) (L348), and turn toward the front as indicated by the arrow.



- Fit the shims **(1)**.
- Tighten the four nuts **(2)** fastening the lower arm to the chassis.

Tightening torque	Nm	Class
Nut	60 Nm	A



- Lift the complete suspension slightly in order to fit the shock absorber on the relative pins on the chassis.
- Fit the sensor **(A)** onto the relative fastener pins then apply and tighten the nuts **(3)** fastening the shock absorber.

Tightening torque	Nm	Class
Nut	25 Nm	A

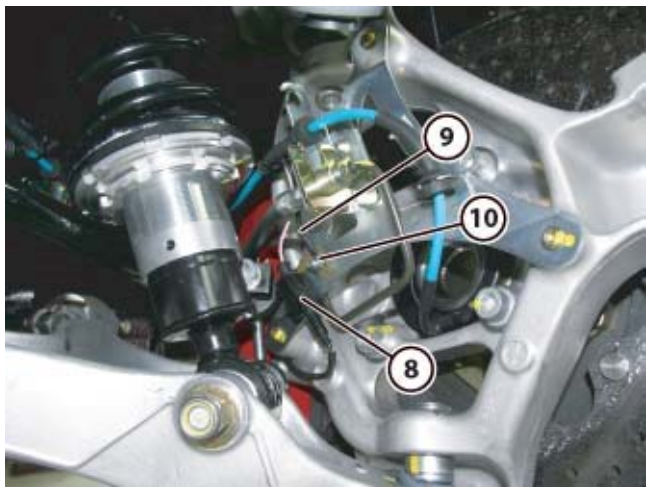
- Connect the connector **(4)** for the sensor **(A)**.
- Fit and tighten the nuts **(5)** fastening the upper arm.

Tightening torque	Nm	Class
Nut	25 Nm	A

- Fit the tie-rod **(6)** for the sensor **(A)**on the upper arm.

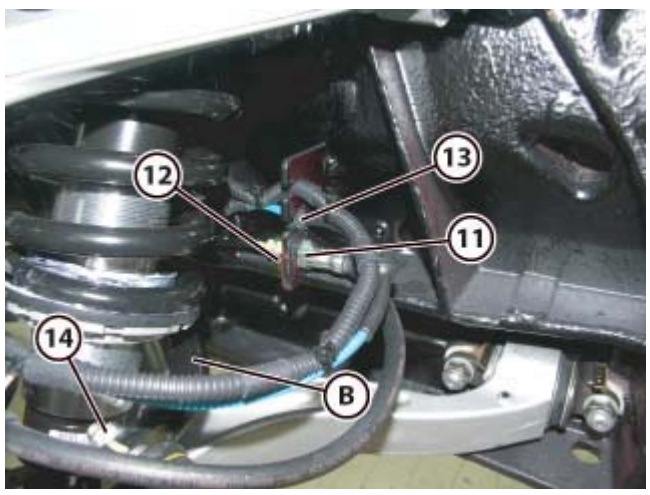


- Connect the connector **(7)** for the ABS sensor cable (Z016) (Z017).



- Connect the connection **(8)** (S004) (S006) for the brake pad wear sensor and fasten together with the earth cable **(9)**, tightening the nut **(10)**.

Tightening torque	Nm	Class
Nut	4 Nm	B

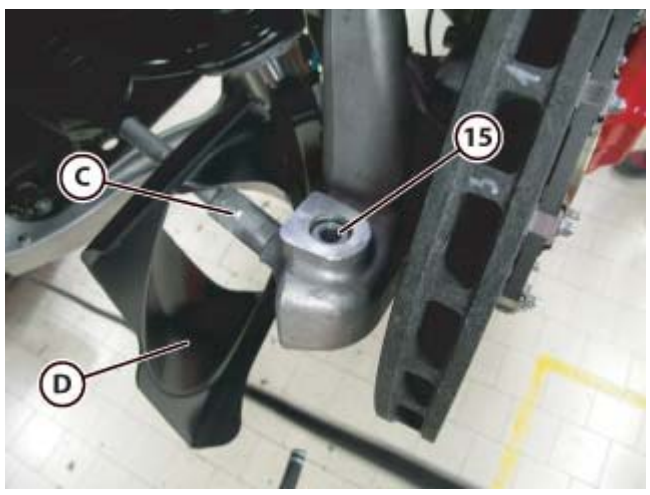


- Tighten the brake fluid hose union **(11)** to the rigid pipe and fasten to the bracket on the chassis with the spring **(12)**.

Tightening torque	Nm	Class
Union	16 Nm	B

- Fasten the cable grommet **(13)** onto the chassis bracket.
- Refit the retainer clamps for the ABS sensor and brake pad wear sensor cables.
- Tighten the nut **(14)** fastening the stabiliser bar **(B)** to the tie-rod on the stub axle.

Tightening torque	Nm	Class
Nut	50 Nm	B



- Fit the shield **(D)** onto the steering box arm **(C)** and tighten the screw **(15)** fastening to the stub axle.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A



- Tighten the three fasteners **(16)** securing the flap **(D)** to the chassis.

Tightening torque	Nm	Class
Screw	5 Nm	B

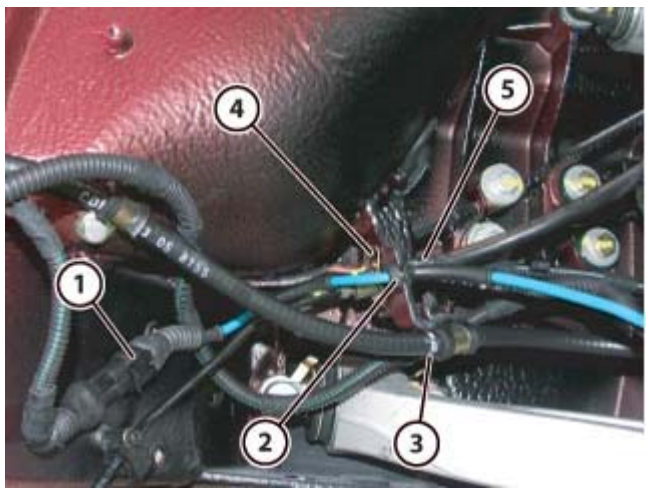
- Fill and bleed the braking system (G2.10).
- Refit the wheel (F2.08).
- Set the battery master switch to ON (L2.02).
- Perform the vehicle set-up procedure.
- Carry out the automatic EOL cycle for the NCS ECU (Suspension Control Node) (L2.13).

F2.02 Detaching the entire rear suspension

Detaching the entire rear suspension

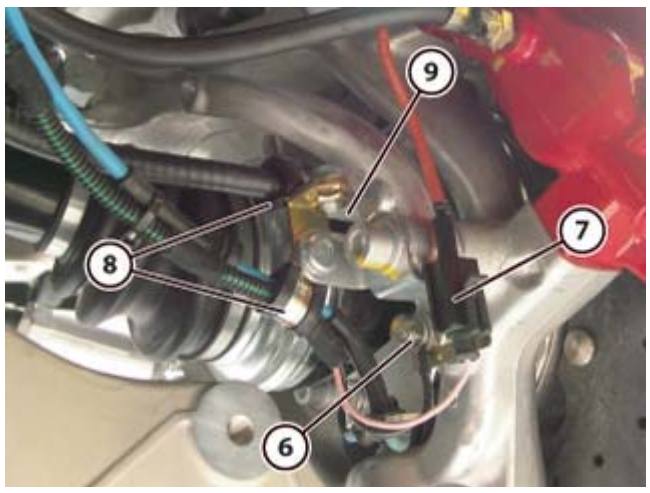
This procedure describes how to remove the entire suspension from the chassis. This operation is necessary, for example, for inspecting the chassis. See the specific chapters for information on removing individual suspension components.

- Set the battery master switch to OFF (L2.02).
- Remove the wheel (F2.08).
- Remove the rear undertray section (M2.12).
- Remove the rear wheelhouses (M2.05).

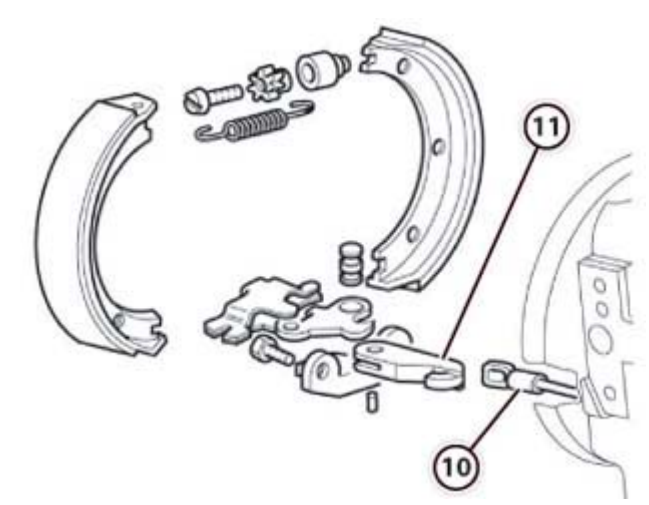


The fluid used in the braking and clutch system is harmful if it comes into contact with the eyes and skin; wash the affected parts with plenty of running water. In addition, the fluid can damage the painted parts of the vehicle.

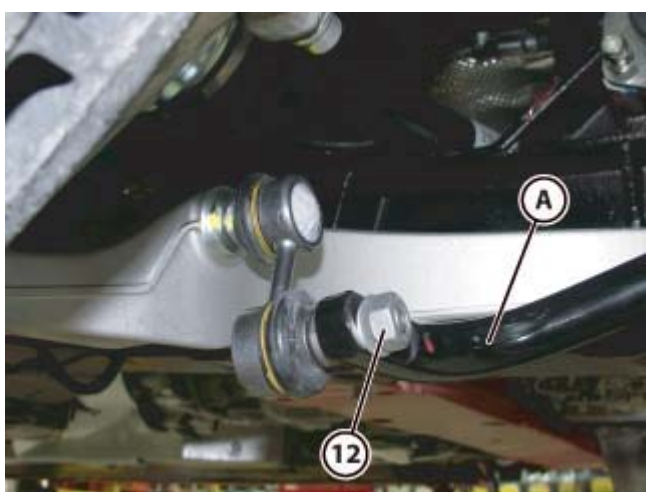
- Disconnect the ABS sensor connector **(1)** (Z018) (Z019) and remove the cable grommet **(2)** from the chassis bracket.
- Undo the screw **(3)** fastening the two clamps retaining the parking brake and the pad wear sensor cables.
- Remove the clip **(4)** and unscrew the flexible hose union **(5)** from the rigid brake pipe. Plug the pipe to avoid excessive brake fluid leakage.



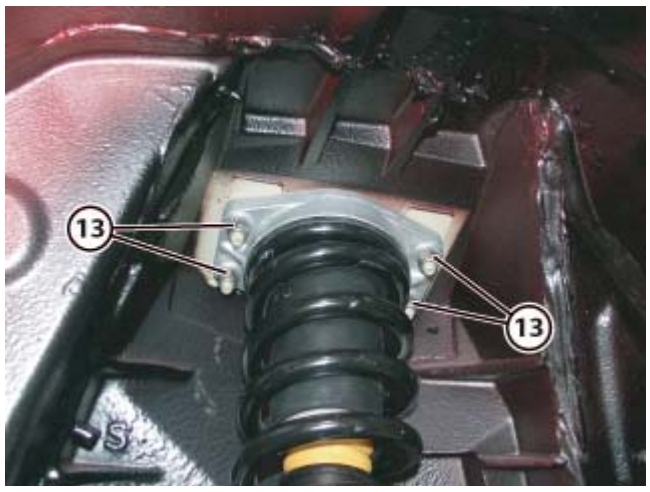
- Unscrew the earth cable fastener nut **(6)** and disconnect the pad wear sensor connector **(7)** (S330) (S331).
- Remove the two retainer clamps **(8)** and remove the parking brake sheath retainer **(9)** from the hub carrier.



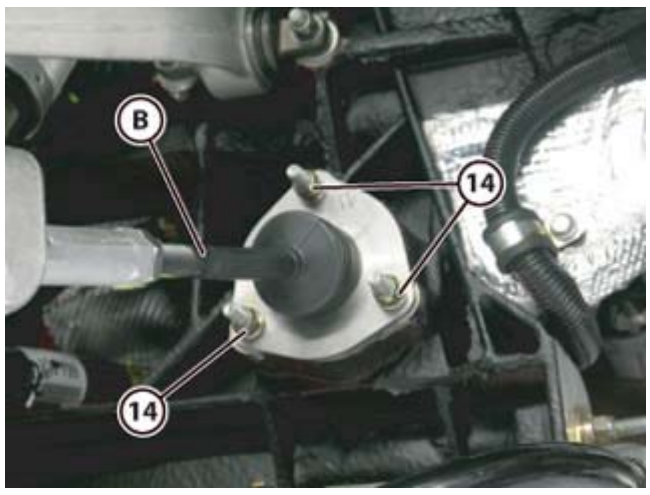
- Loosen the parking brake cable and unhook the eyebolt **(10)** at the end of the cable from the fork **(11)** connected to the parking brake shoes.



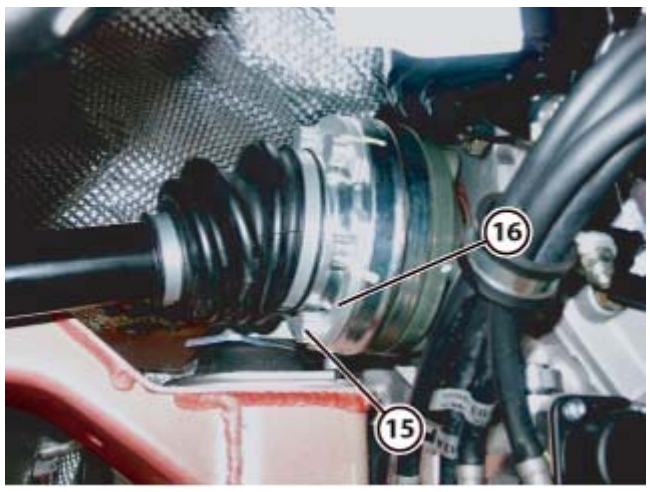
- Detach the tie-rod from the rear stabiliser bar **(A)** by unscrewing the nut **(12)**.



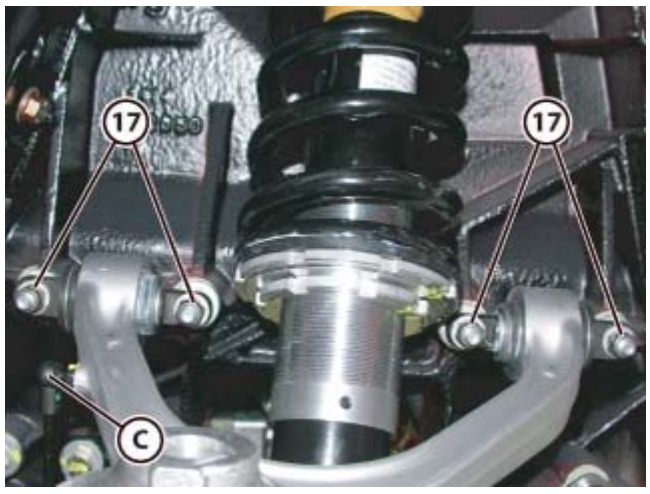
- Install the complete suspension support tool **(AV 3206)** and undo the four nuts **(13)** fastening the shock absorber to the chassis.



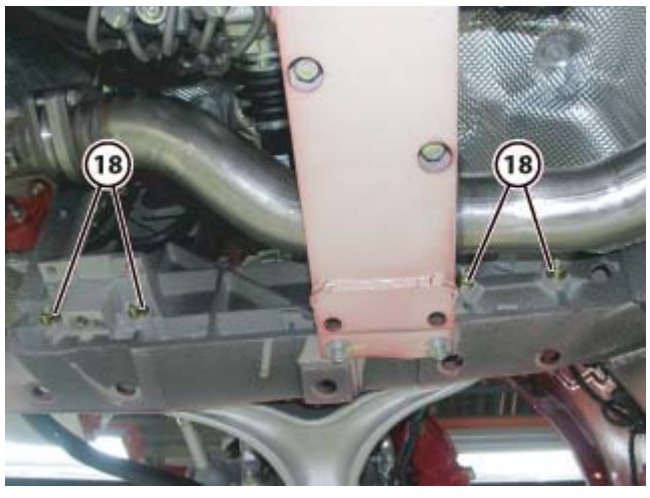
- Unscrew the three nuts **(14)** fastening the toe-in adjustment tie-rod **(B)** to the chassis.



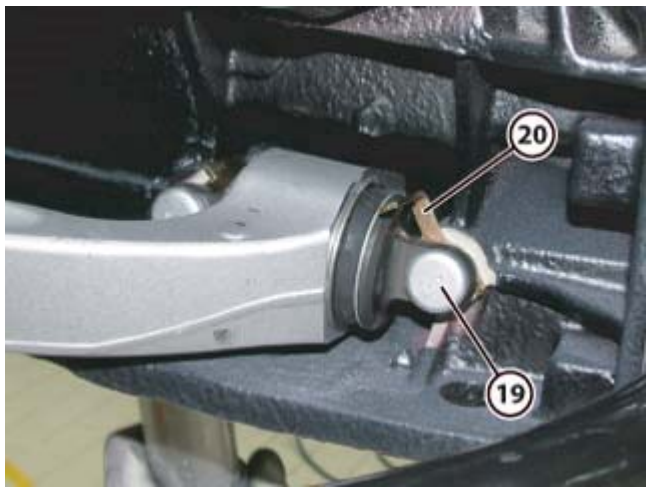
- Undo the six screws **(15)** fastening the axle shaft to the flange, retrieving the spacers **(16)**.



- Undo the four nuts **(17)** fastening the upper arm to the chassis and retrieve the flanbloc shims.
- Remove the sensor tie-rod **(C)** from the upper arm.



- Working from underneath the vehicle, undo the four nuts **(18)** fastening the lower arm to the chassis.



- Remove the four screws **(19)** and retrieve the relative spacers **(20)**.



- With the weight supported by the tool, **(AV 3206)** lower the complete suspension slowly and disconnect the connector **(21)** (L345) (L346)on the shock absorber.

➢ Remove the entire rear suspension from the vehicle.

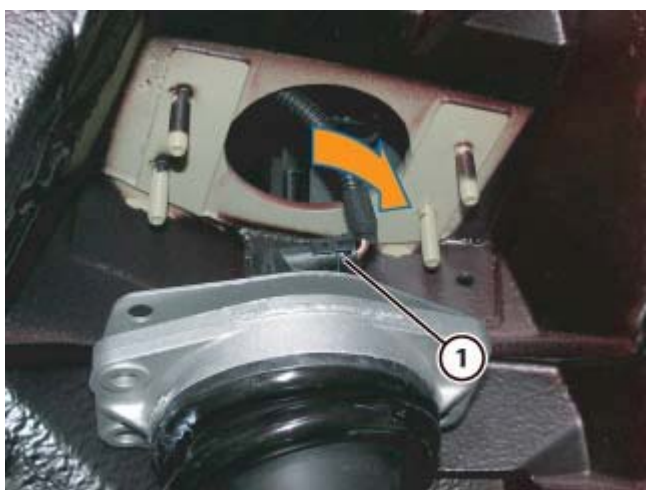
Refitting the complete rear suspension



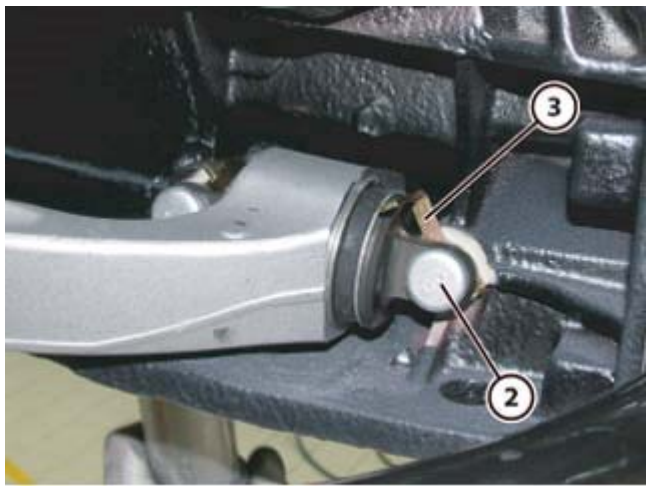
Tightening torque		Nm	Class
Rear suspension lower arm - chassis	Nut	60 Nm	A
Fastening axle shaft to differential flange Products to use: MOLYKOTE 1000	Pretightening torque for screw	40 Nm	A
	Screw	78 Nm	A
Toe-in adjustment tie-rod - chassis	Nut	25 Nm	B
Rear shock absorber - chassis	Nut	25 Nm	A
Rear suspension upper arm - chassis	Nut	25 Nm	A
Spherical tie-rod - rear stabiliser bar	Nut	50 Nm	A
Earth cable and rear suspension brake pad wear sensor	Nut	8 Nm	B
Connection between rigid brake pipe and hose	Union	16 Nm	B

➢ Fit the flanbloc shims on the locator pins for the upper arm on the chassis.

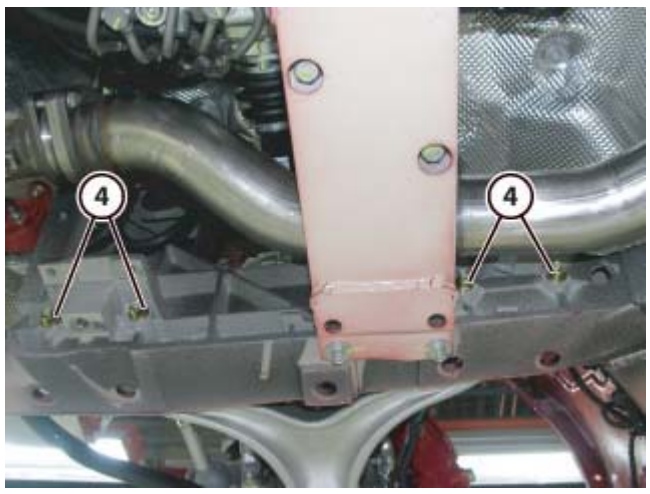
➢ Fit the complete rear suspension, with its weight sustained by the tool **(AV 3206)**, onto the relative seats and fastener pins on the chassis.



- Connect the shock absorber connector **(1)**(L345) (L346), and turn toward the rear of the vehicle as indicated by the arrow.



- Fit the four screws **(2)** fastening the lower arm and install the shims **(3)**.



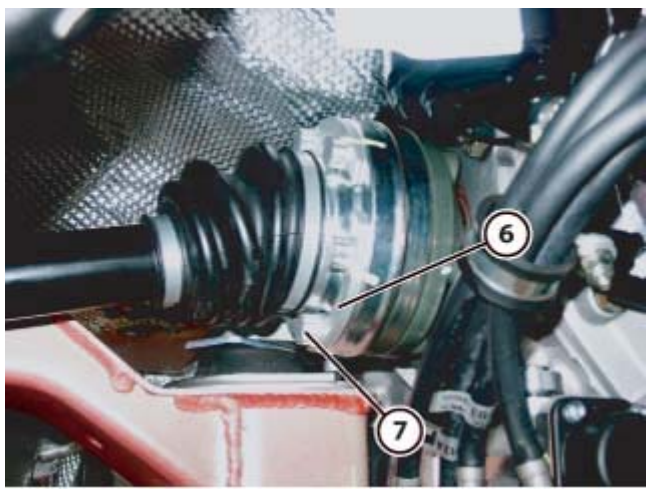
- Working from underneath the vehicle, tighten the four nuts **(4)**.



Tightening torque	Nm	Class
Nut	60 Nm	A



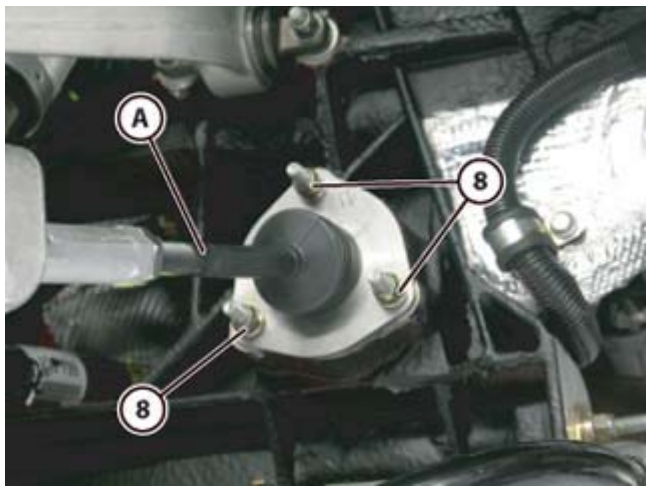
- Check that the surface of the flange **(5)** on the differential is clean.



- Apply a film of **MOLYKOTE 1000** grease to the threads of the six screws fastening the axle shaft to the flange.
- Fit the shims **(6)** and hand tighten the screws **(7)**.
- Tighten the six screws **(7)**.



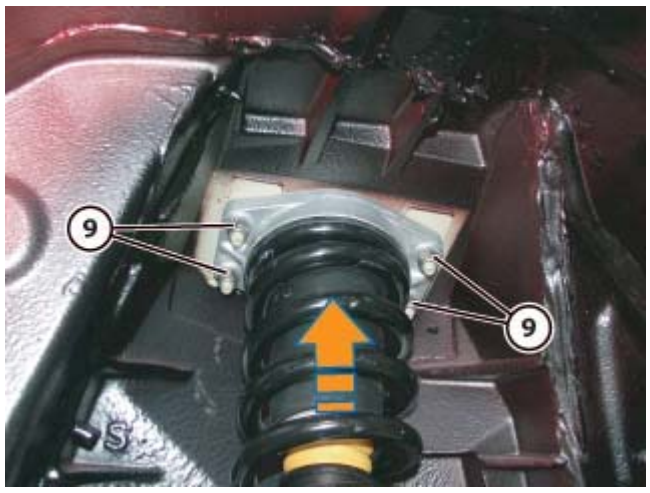
Tightening torque	Nm	Class
Pretightening torque for screw	40 Nm	A
Screw	78 Nm	A



- Tighten the three nuts **(8)** fastening the toe-in adjustment tie-rod **(A)** to the chassis..

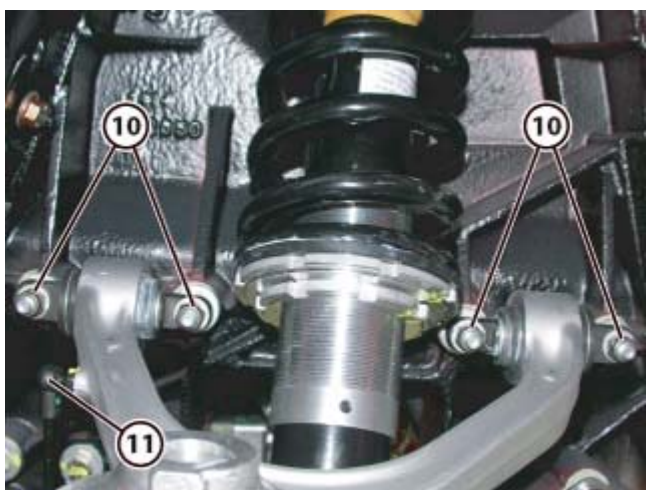


Tightening torque	Nm	Class
Nut	25 Nm	B



- Lift the complete suspension slightly in order to fit the shock absorber onto the relative pins on the chassis and fasten by tightening the nuts **(9)**.

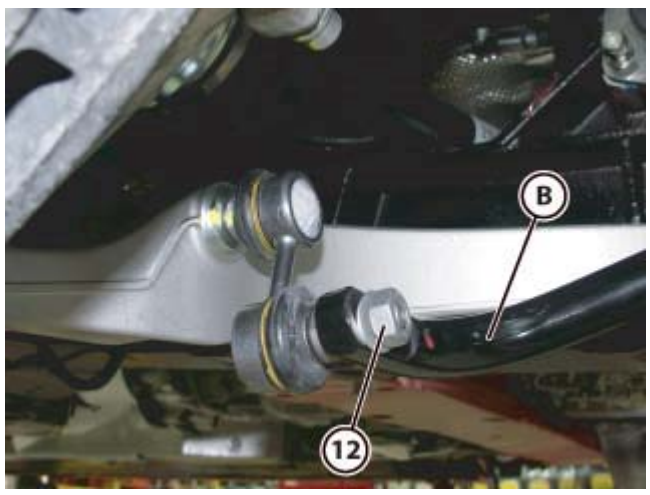
Tightening torque	Nm	Class
Nut	25 Nm	A



- Fit the four fastener nuts **(10)** onto the upper arm after fitting the shim washers.
- Tighten the four nuts **(10)**.

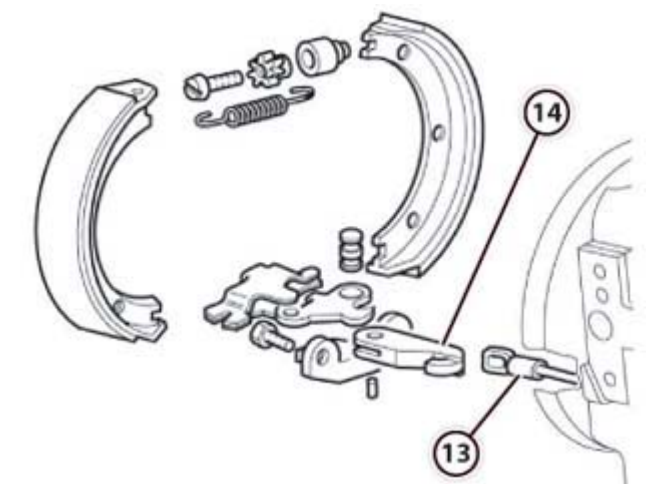
Tightening torque	Nm	Class
Nut	25 Nm	A

- Fit the sensor tie-rod **(11)** onto the upper arm.
- Remove the tool supporting the complete suspension from the vehicle.

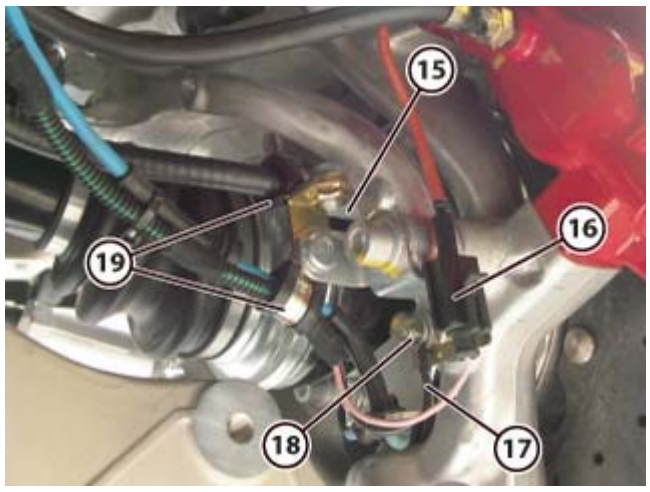


- Fasten the rear stabiliser bar **(B)** to the spherical tie-rod by tightening the nut **(12)**.

Tightening torque	Nm	Class
Nut	50 Nm	A



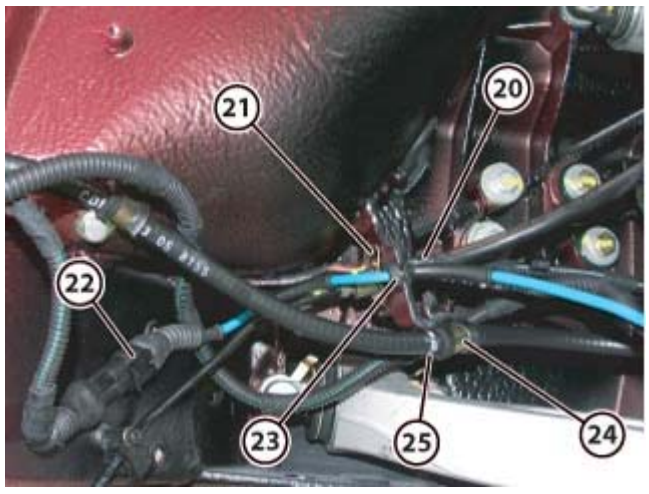
- Attach the eyebolt **(13)** at the end of the parking brake cable onto the fork **(14)** connected to the parking brake shoes.



- Fit the parking brake sheath retainer **(15)** in its seat on the hub carrier.
- Connect the connector **(16)** for the brake pad wear sensor (S330) (S331).
- Fasten the earth cable **(17)** to the hub carrier, together with the brake pad wear sensor connector, by tightening the nut **(18)**.

Tightening torque	Nm	Class
Nut	8 Nm	B

- Refit the two clamps **(19)** retaining the parking brake cable and the ABS sensor cable.



- Tighten the brake fluid hose union **(20)** onto the rigid pipe.

		
Tightening torque	**Nm**	**Class**
Union	16 Nm	B

- Fasten the brake fluid pipe to the bracket on the chassis with the clip **(21)**.
- Connect the connector **(22)** for the ABS sensor (Z018) (Z019) and fasten the relative cable grommet **(23)** to the bracket on the chassis.
- Refit the cable **(24)** retaining the parking brake cable, fastening to the chassis with the screw **(25)**.

- Fill and bleed the braking system (G2.10).
- Adjust the parking brake (G2.06).
- Refit the rear wheelhouses (M2.05).
- Refit the rear underfloor section (M2.12).
- Refit the wheel (F2.08).
- Set the battery master switch to ON (L2.02).
- Perform the vehicle set-up procedure.
- Carry out the automatic EOL cycle for the NCS ECU (Suspension Control Node) (L2.13).

F2.03 Suspension arms-Flanblocs

Upper front arm



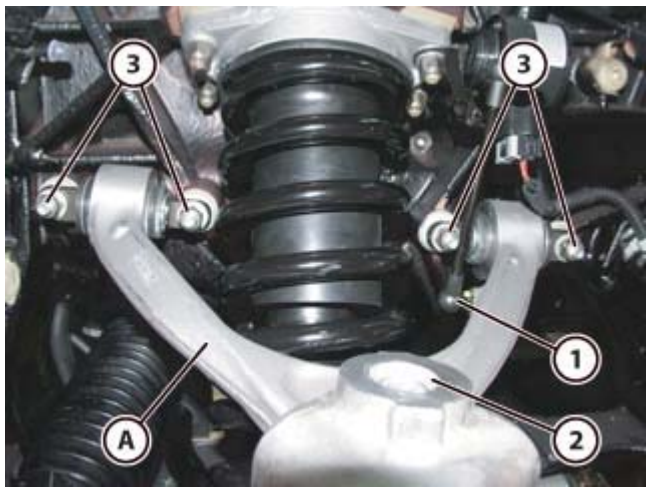
The arms are made from aluminium alloy to reduce unsprung mass and are connected to the chassis by means of flanblocs. Visually inspect that the arms are in good condition and that they are not deformed, twisted or cracked. Replace the flanblocs if they have excessive free play.

Replacing the spherical joints on the suspension arms is NO LONGER PERMITTED; the only permitted procedure is the replacement of the complete arm.

Removing the front suspension upper arm

➢ Remove the wheel (F2.08).

- Use the support tool **(AV 3206)** to facilitate the removal of the arm.
- Apply the tool and fasten to the brake disc with at least one wheel fastener stud bolt.
- Lift the suspension slightly with the support tool, so that the weight of the suspension is not carried by the arms.



- Remove the sensor tie-rod **(1)** from the arm.
- Undo the screw **(2)** fastening the upper arm to the stub axle.
- Unscrew the four nuts **(3)** that fasten the flanblocs to the chassis.
- Remove the arm **(A)** and retrieve the flanbloc shims.

Refitting the front suspension upper arm



Tightening torque		Nm	Class
Front suspension upper arm - chassis	Nut	25 Nm	A
Front suspension upper arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A



- Fit the arm **(A)**, complete with flanbloc and ball joint, onto the chassis stud bolts after installing the relative shims for the flanbloc retrieved during removal.
- Tighten the nuts **(3)** fastening the arm **(A)** to the chassis.

Tightening torque	Nm	Class
Nut	25 Nm	A

- Fasten the arm **(A)** to the stub axle by tightening the screw **(2)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A

- Fit the sensor tie-rod **(1)** for the arm to the chassis.
- Remove the support tool **(AV 3206)**.

➢ Refit the wheel (F2.08).
➢ Perform the vehicle set-up procedure.

Lower front arm



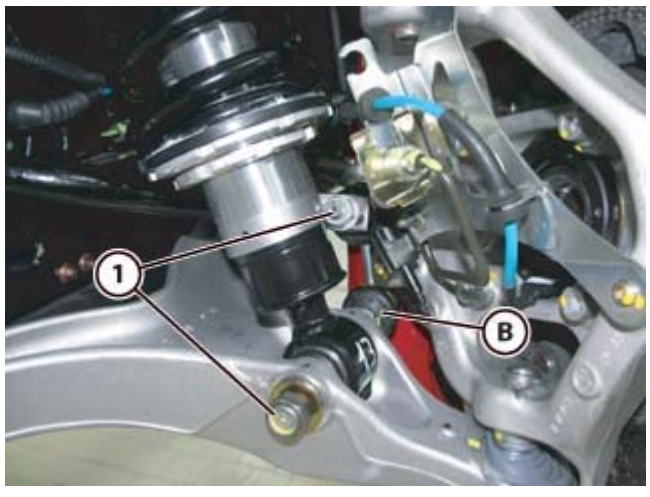
The arms are made from aluminium alloy to reduce unsprung mass and are connected to the chassis by means of flanblocs. Visually inspect that the arms are in good condition and that they are not deformed, twisted or cracked. Replace the flanblocs if they have excessive free play.

Replacing the spherical joints on the suspension arms is NO LONGER PERMITTED; the only permitted procedure is the replacement of the complete arm.

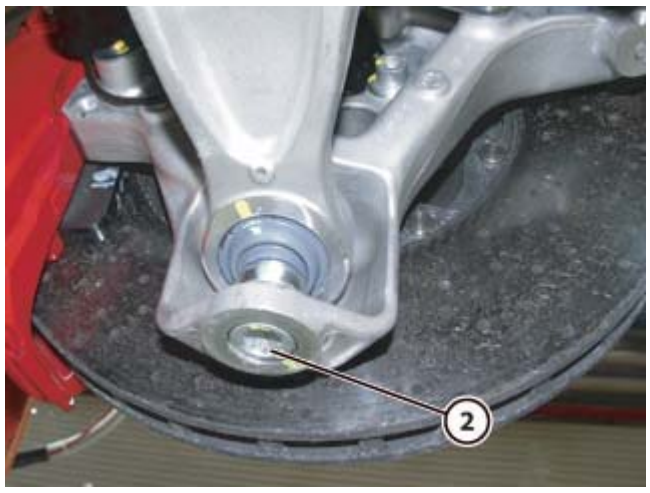
Removing the front suspension lower arm

➢ Remove the wheel (F2.08).

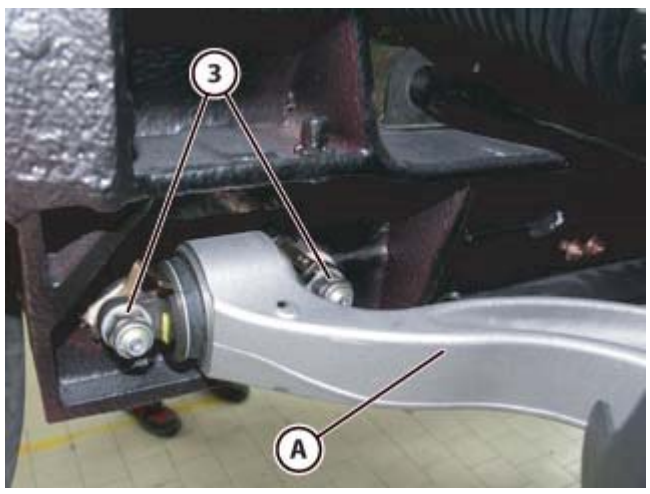
- Use the support tool **(AV 3206)** to facilitate the removal of the arm.
- Apply the tool and fasten to the brake disc with at least one wheel fastener stud bolt.
- Lift the suspension slightly with the support tool, so that the weight of the suspension is not carried by the arms.



- Unscrew the two nuts **(1)** and remove the ball tie-rod **(B)** together with the pin that fastens the shock absorber to the lower lever.
- Detach the end of the shock absorber from the lower lever.



- Undo the screw **(2)** fastening the lower arm to the stub axle.



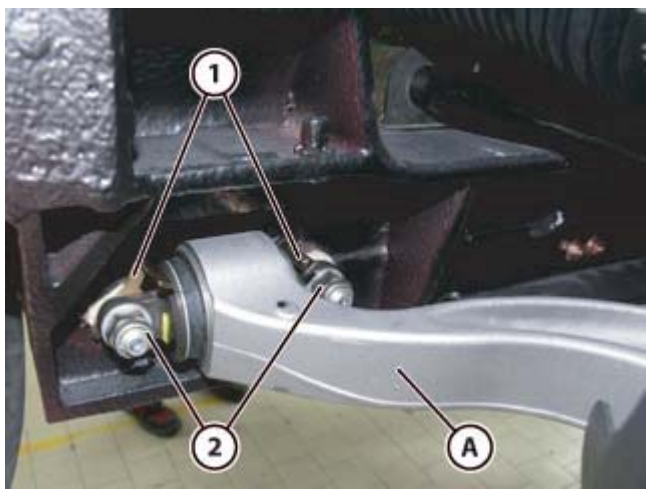
- Unscrew the four nuts **(3)** that fasten the flanblocs to the chassis.

The caster adjustment plates must be kept and carefully refitted in their original position.

- Remove the arm **(A)**, retrieving the caster adjustment plates.

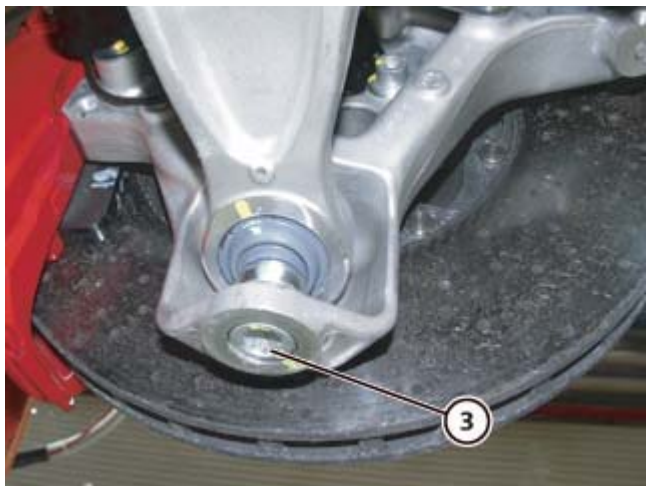
Refitting the front suspension lower arm

Tightening torque		Nm	Class
Front suspension lower arm - chassis	Nut	60 Nm	A
Front suspension lower arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Front suspension shock absorber - lower arm	Nut	80 Nm	A
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B



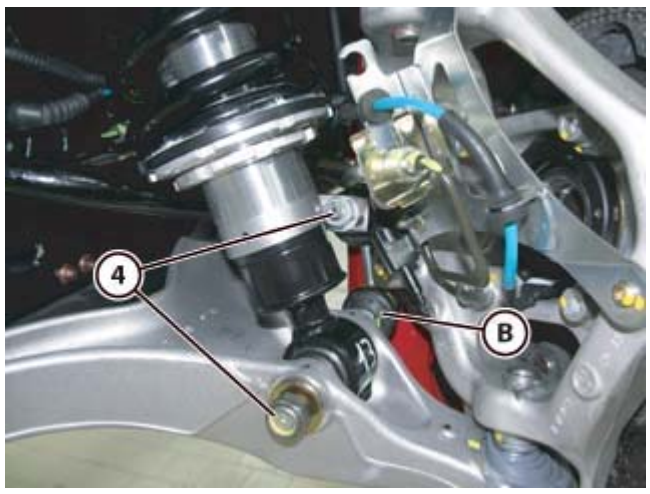
- Fit the arm **(A)**, complete with flanbloc and ball joints, onto the chassis stud bolts after fitting the caster plates **(1)**, retrieved during removal, as originally installed.
- Apply and tighten the four nuts **(2)** fastening the lower arm to the chassis.

Tightening torque	Nm	Class
Nut	60 Nm	A



- Apply and tighten the screw **(3)** fastening the lower arm to the stub axle.

Tightening torque	Nm	Class
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A



- Remove the support tool **(AV 3206)**.

➢ Refit the wheel (F2.08).
➢ Perform the vehicle set-up procedure.

Upper rear arm



- Fit the spherical tie-rod **(B)**, complete with the shock absorber fastener pin, onto the lower arm, thus also fastening the shock absorber, and tighten the two nuts **(4)**.

Tightening torque	Nm	Class
Nut	80 Nm	A
Nut	50 Nm	B

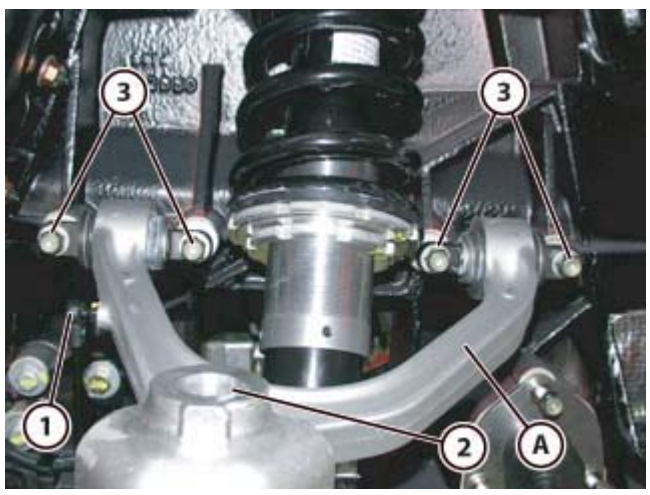
The arms are made from aluminium alloy to reduce unsprung mass and are connected to the chassis by means of flanblocs. Visually inspect that the arms are in good condition and that they are not deformed, twisted or cracked. Replace the flanblocs if they have excessive free play.

Replacing the spherical joints on the suspension arms is NO LONGER PERMITTED; the only permitted procedure is the replacement of the complete arm.

Removing the rear suspension upper arm

➢ Remove the wheel (F2.08).

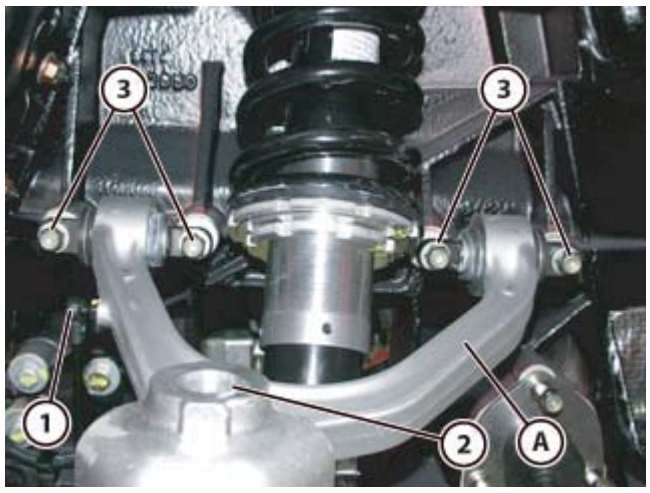
- Use the support tool **(AV 3206)** to facilitate the removal of the arm.
- Apply the tool and fasten to the brake disc with at least one wheel fastener stud bolt.
- Lift the suspension slightly with the support tool, so that the weight of the suspension is not carried by the arms.



- Detach the sensor tie-rod **(1)** from the upper arm **(A)**.
- Undo the screw **(2)** fastening the arm to the hub carrier.
- Unscrew the four nuts **(3)** that fasten the flanblocs to the chassis.
- Remove the arm **(A)** and retrieve the flanbloc shims.

Refitting the rear suspension upper arm

Tightening torque		Nm	Class
Rear suspension upper arm - chassis	Nut	25 Nm	A
Rear suspension upper arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A



- Fit the arm **(A)**, complete with flanbloc and ball joints, onto the chassis stud bolts after installing the relative shims for the flanbloc retrieved during removal.
- Hand tighten the four nuts **(3)** fastening the arm **(A)** to the chassis.
- Tighten the nuts **(3)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	A

- Fasten the arm **(A)** to the hub carrier by tightening the screw **(2)**.

Tightening torque	**Nm**	**Class**
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A

- Fit the tie-rod **(1)** for the sensor on the upper arm.
- Remove the support tool **(AV 3206)**.

➢ Refit the wheel (F2.08).
➢ Perform the vehicle set-up procedure.

Lower rear arm



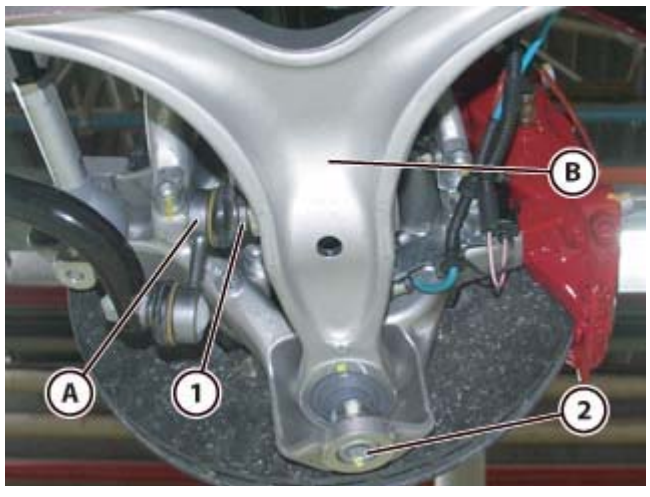
The arms are made from aluminium alloy to reduce unsprung mass and are connected to the chassis by means of flanblocs. Visually inspect that the arms are in good condition and that they are not deformed, twisted or cracked. Replace the flanblocs if they have excessive free play.

Replacing the spherical joints on the suspension arms is NO LONGER PERMITTED; the only permitted procedure is the replacement of the complete arm.

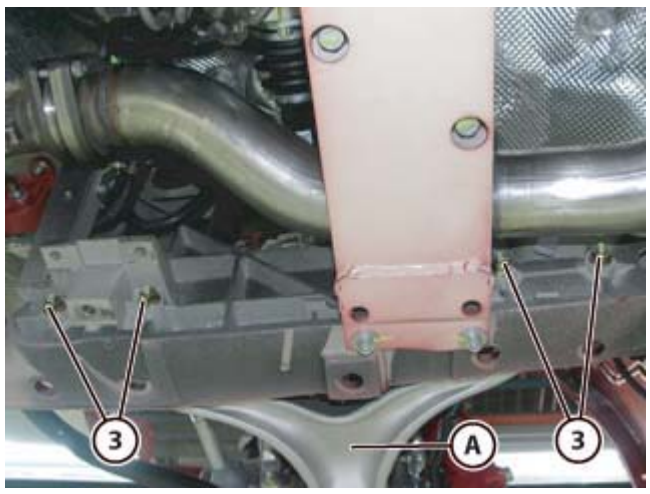
Removing the rear suspension lower arm

➢ Remove the wheel (F2.08).
➢ Remove the rear undertray section (M2.12).

- Use the support tool **(AV 3206)** to facilitate the removal of the arm.
- Apply the tool and fasten to the brake disc with at least one wheel fastener stud bolt.
- Lift the suspension slightly with the support tool, so that the weight of the suspension is not carried by the arms.



- Undo the screw **(1)** of the ball tie-rod **(A)** from the lower arm **(B)**.
- Undo the screw **(2)** fastening the lower arm to the hub carrier.



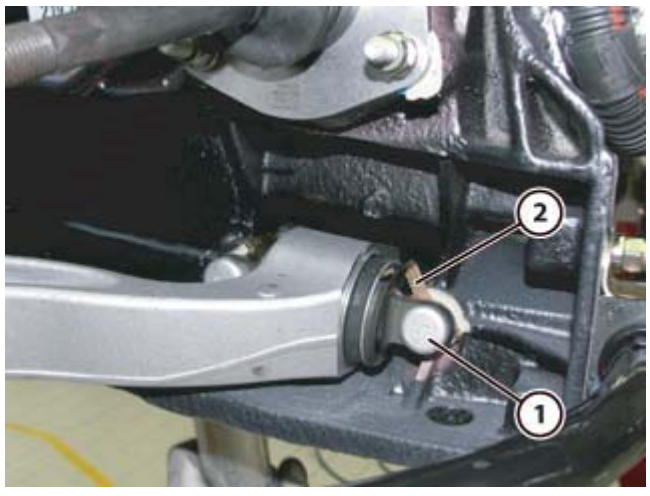
- Unscrew the four nuts **(3)** that fasten the flanblocs to the chassis.

The caster adjustment plates must be kept and carefully refitted in their original position.

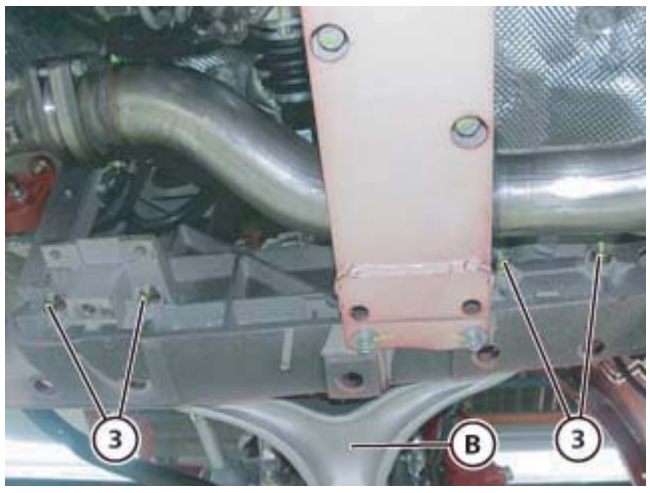
- Remove the lower arm **(B)**, retrieving the caster adjustment plates.

Refitting the rear suspension lower arm

Tightening torque		**Nm**	**Class**
Rear suspension lower arm - chassis	Nut	60 Nm	A
Rear suspension lower arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Spherical tie-rod - rear lower arm	Tie-rod	50 Nm	B

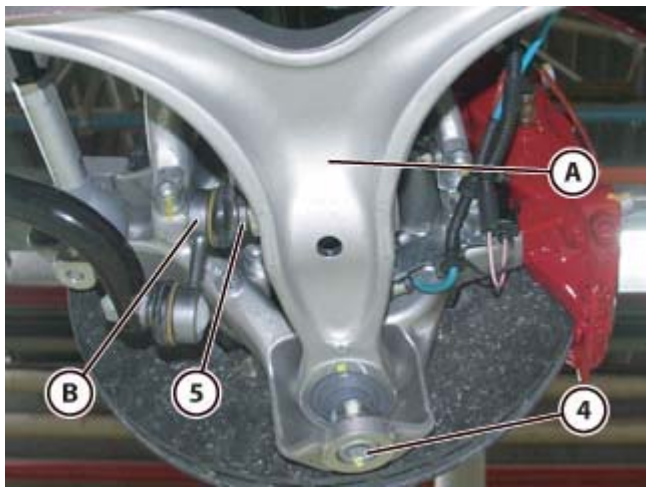


- Fit the arm, complete with flanbloc and ball joints, in the relative seat.
- Fasten the arm with the fastener pins **(1)** and fit the caster plates **(2)**, retrieved during removal, as originally installed.



- Apply and tighten the four nuts **(3)** fastening the lower arm **(A)** to the chassis.

Tightening torque	**Nm**	**Class**
Nut	60 Nm	A



- Apply and tighten the screw **(4)** fastening the lower arm to the hub carrier.

Tightening torque	**Nm**	**Class**
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A

- Apply and tighten the fastener **(5)** securing the spherical tie-rod **(B)** to the arm **(A)**.

Tightening torque	**Nm**	**Class**
Tie-rod	50 Nm	B

- Remove the support tool **(AV 3206)**.

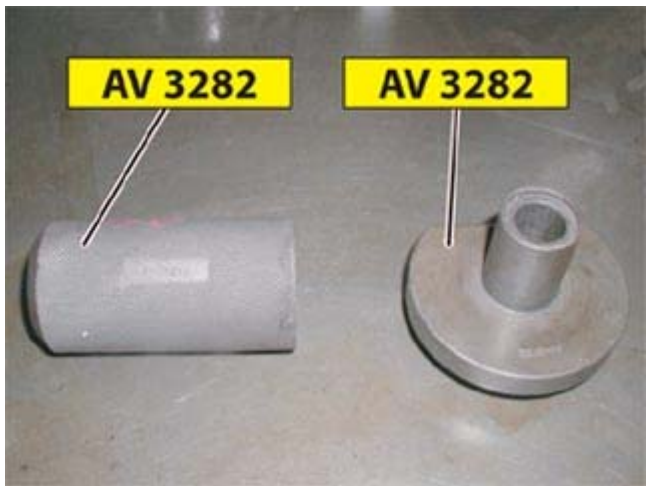
➢ Refit the wheel (F2.08).
➢ Perform the vehicle set-up procedure.
➢ Refit the rear underfloor section (M2.12).

flanbloc

The suspension arms are connected to the chassis via flanbloc type elastic bushings.
If bending or excessive free play in the coupling to the seat is noted when removing the arm, these must be replaced.
The flanbloc bushings are mounted by mechanical interference onto the suspension arms; a press and special tools are necessary for their replacement.
The flanbloc bushings mounted on the front lower arms are identical to those mounted on the lower rear arms. The tools and procedures for removal/refitting are identical in both cases. The two flanbloc bushings mounted on the lower arm are identical.
The flanblocs mounted on the front upper arms are identical to those mounted on the rear upper arms. The tools and procedures for removal/refitting are identical in both cases. The two flanbloc bushings mounted on the upper arm are identical.

Removing the upper arm flanblocs

- Remove the upper arm of the front suspension (F2.03).
- Remove the rear suspension upper arm (F2.03).

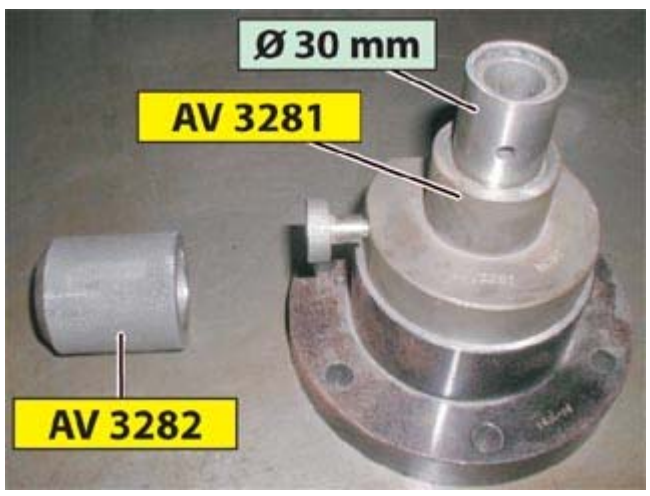


- Use the tools **(AV 3282)** with a 29 mm punch and **2** and **(AV 3282)** with an internal diameter of **38 mm**.



- Place the tool **(AV 3282)** with the **29 mm** punch on the work surface of the press and set the upper arm on top of the tool.
- Position the tool **(AV 3282)** with internal diameter of **38 mm** on the flanbloc you wish to remove and operate the press to remove the flanbloc.

Refitting the upper arm flanblocs



- Use the insertion tools **(AV 3281)**, with a **30 mm** punch and **(AV 3282)** with an internal diameter of **34.5 mm**.



- Place the tool **(AV 3281)** on the work surface of the press, then place the arm and the flanbloc on top, in the order indicated.

Apply grease **MOLYKOTE BR2** to the flanbloc to facilitate installation.

- Fit the tool **(AV 3282)** with an internal diameter of **34.5 mm** onto the flanbloc you wish to insert and operate the press.



- Tighten the knob **(A)** on the tool then raise the press and retrieve the upper arm.

➢ Refit the front suspension upper arm (F2.03).
➢ Refit the upper rear suspension arm. (F2.03).

Removing the lower arm flanblocs

➢ Remove the front suspension lower arm (F2.03).
➢ Remove the rear suspension lower arm (F2.03).



- Place the tool **(AV 3189)** on the press work surface and set the arm on top of the tool.
- Position the tool **(AM 107311)** on the flanbloc you wish to remove and operate the press to remove the flanbloc.

Refitting lower arm flanblocs



- Place the tool **(AM 107310)** on the work surface of the press, then place the arm and the flanbloc on top, in the order indicated.

Apply grease **MOLYKOTE BR2** to the flanbloc to facilitate installation.

- Rest the punch **(AV 3427-13)** on the lever and operate the press to insert the flanbloc.

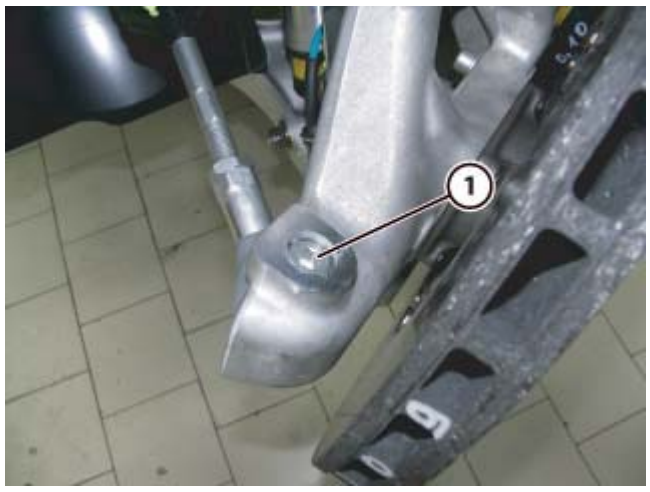
➢ Refit the lower front suspension arm (F2.03).
➢ Refit the lower rear suspension arm. (F2.03).

F2.04 Stub axle-hub carrier

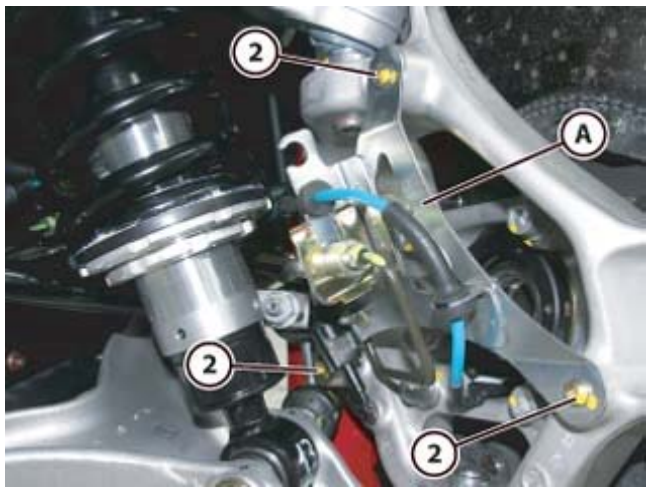
Removing the stub axle

➢ Remove the front brake calliper (G2.04).
i Without removing completely, try to release the rigid brake pipe from the clamps and the retainer clips so that the caliper can be moved more easily.

➢ Remove the brake disc (G2.05).
➢ Remove the front wheel bearing (F2.05).



- Undo the screw **(1)** fastening the stub axle to the steering tie-rod.



- Undo the screws **(2)** fastening the bracket **(A)** to the stub axle.



- Undo the screw **(3)** fastening the stub axle to the upper arm joint.

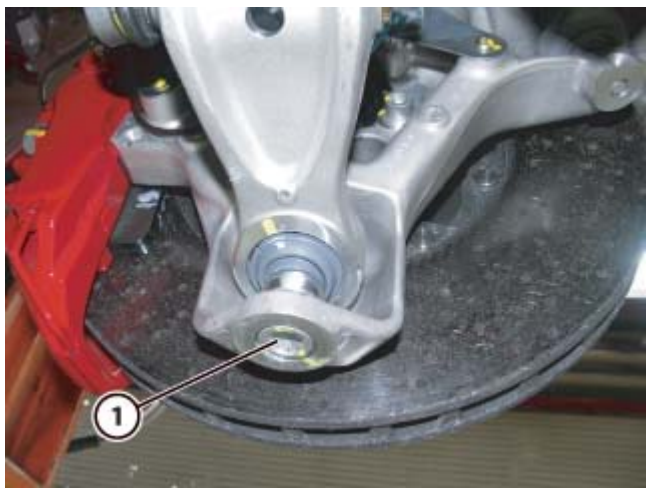


- Undo the screw **(4)** fastening the stub axle to the lower arm joint.
- Remove the stub axle from the suspension.

Refitting the stub axle

Tightening torque	**Nm**	**Class**

Tightening torque		Nm	Class
Front suspension lower arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Front suspension upper arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A
Fastening steering box tie-rod to stub axle Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A



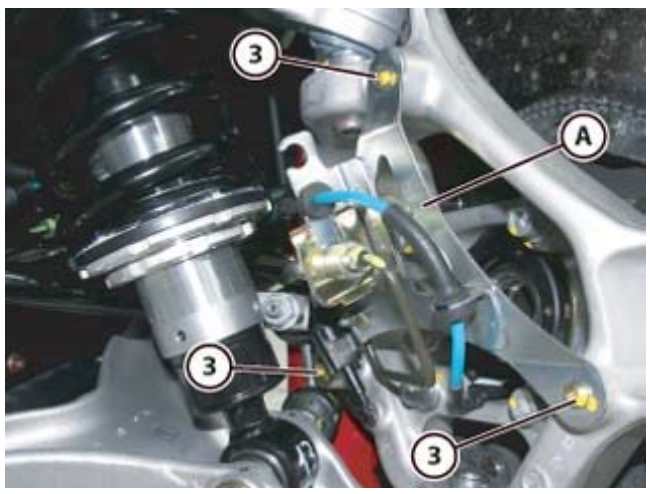
- Fit the stub axle in its seat on the lower arm and tighten the screw **(1)**.

Tightening torque	Nm	Class
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A

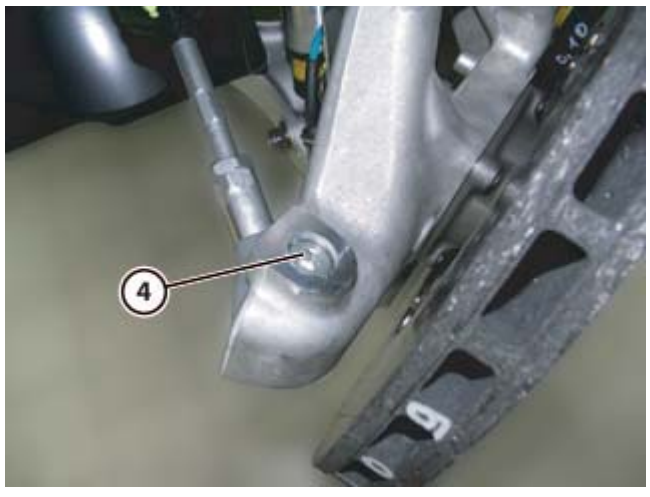


- Fit the upper arm in its seat on the stub axle and tighten the screw **(2)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A



- Fit the brake oil pipe and cable mounting bracket **(A)** on the stub axle and tighten the fastener screws **(3)**.



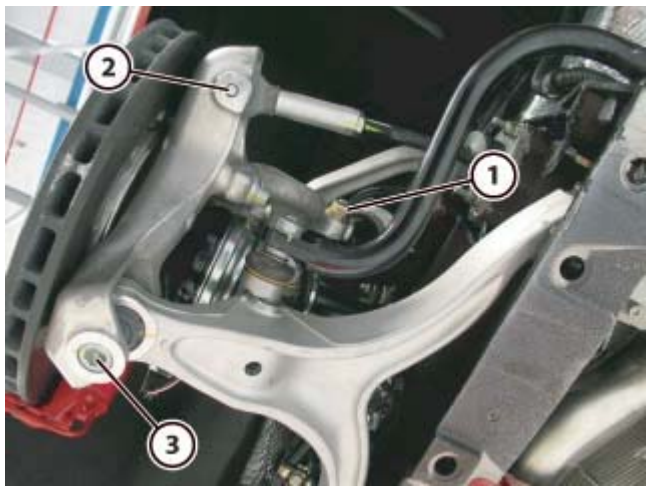
- Fit the steering arm on the stub axle and tighten the screw **(4)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	A

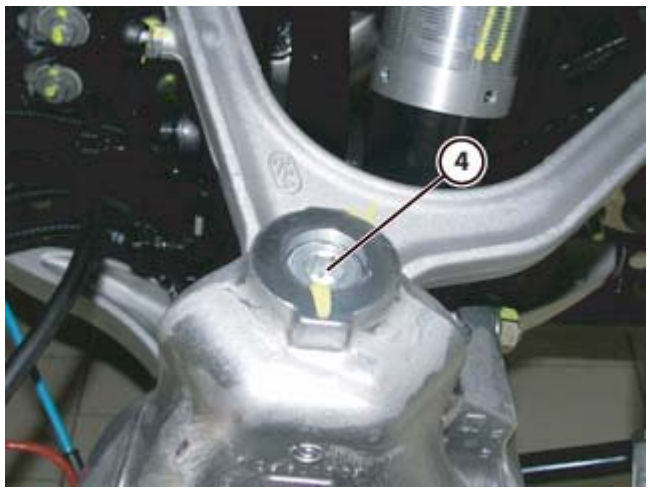
- Refit the front wheel bearing (F2.05).
- Refit the brake disc (G2.05).
- Refit the front brake calliper (G2.04).

Removing the hub carrier

- Remove the rear brake callipers (G2.04).
- Remove the brake disc (G2.05).
- Remove the parking brake shoes (G2.06).
- Remove the rear bearing (F2.05).



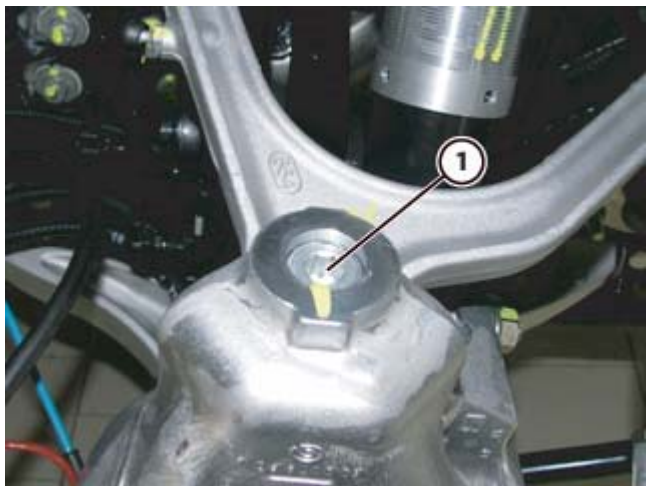
- Unscrew the nut **(1)** and remove the shock absorber fastener pin.
- Undo the screw **(2)** fastening the toe-in adjustment tie-rod to the hub carrier.
- Undo the lower screw **(3)** fastening the lower arm to the hub carrier.



- Undo the screw **(4)** fastening the hub carrier to the upper arm.
- Remove the hub carrier from the rear suspension.

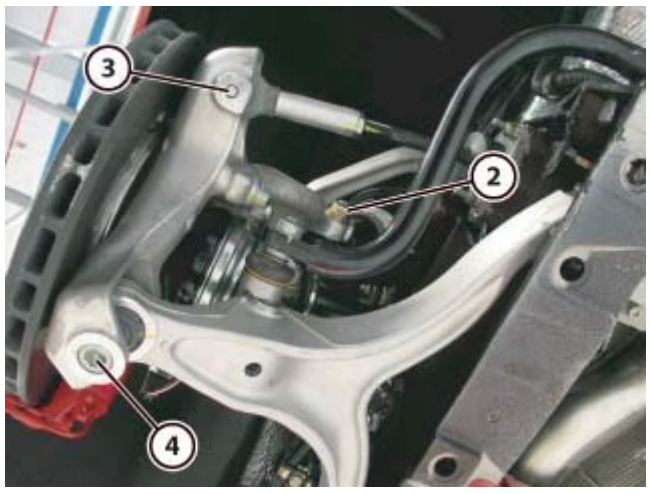
Refitting the hub carrier

Tightening torque		Nm	Class
Rear suspension upper arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A
Shock absorber - hub carrier	Nut	80 Nm	A
Toe-in adjustment tie-rod - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	B
Rear suspension lower arm - hub carrier Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A



- Fit the hub carrier in its seat on the upper arm and tighten the fastener screw **(1)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	60 Nm	A



- Fasten the shock absorber onto the hub carrier, fitting the relative fastener pin and tightening the nut **(2)**.

Tightening torque	Nm	Class
Nut	80 Nm	A

- Fit the toe-in adjustment tie-rod onto the hub carrier and fasten by tightening the screw **(3)**.

Tightening torque	Nm	Class
Screw (tightened to 35 Nm, start of control angle 30° - 100°)	65 Nm	B

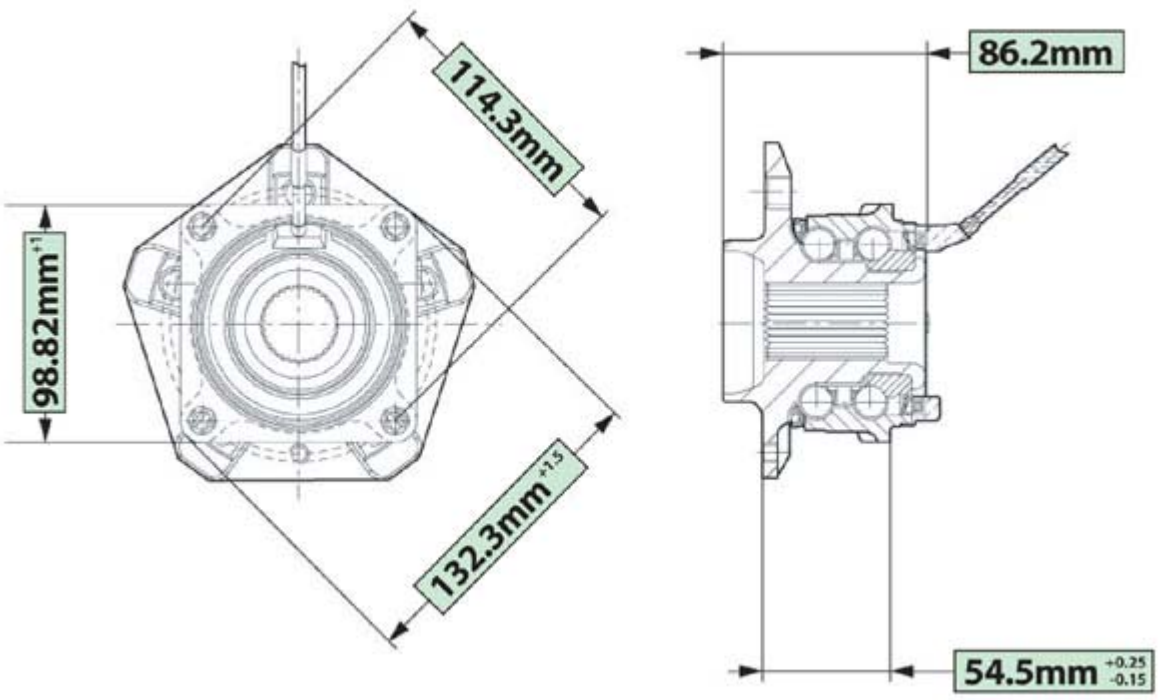
- Fit the lower arm on the hub carrier and fasten by tightening the screw **(4)**.

Tightening torque	Nm	Class
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A

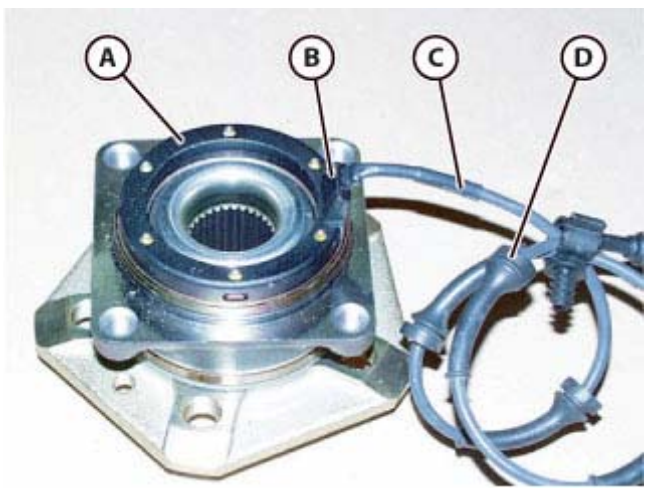
- Refit the rear bearing (F2.05).
- Refit the parking brake shoes (G2.06).
- Refit the brake disc (G2.05).
- Refit the rear brake calliper (G2.04).

F2.05 Bearings

Wheel bearings



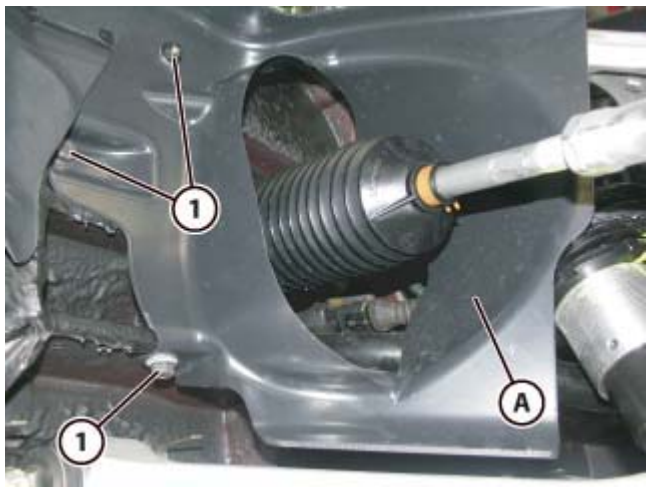
The four wheel bearings are all of the same type: with roller bearings and double watertight shielding.
The bearing components cannot be disassembled.
The bearings must have no backlash.
To check the backlash, axially apply (at a radius of **102 mm)** a load of **30 Nm** on the brake disc towards the outside.
Perform the same operation applying the same load towards the inside. The total angular variation of the disc/flange assembly, measured with a dial gauge resting on the brake disc, on the indicated radius, must be **max. 0.1 mm**.
If the backlash is larger, replace the bearing.
The tone wheel with ABS sensor is incorporated in the bearing.



A - Tone wheel shield
B - ABS sensor
C - Bipolar cable with heatshrunk sheath
D - Rubber cable grommets

Removing the front bearing

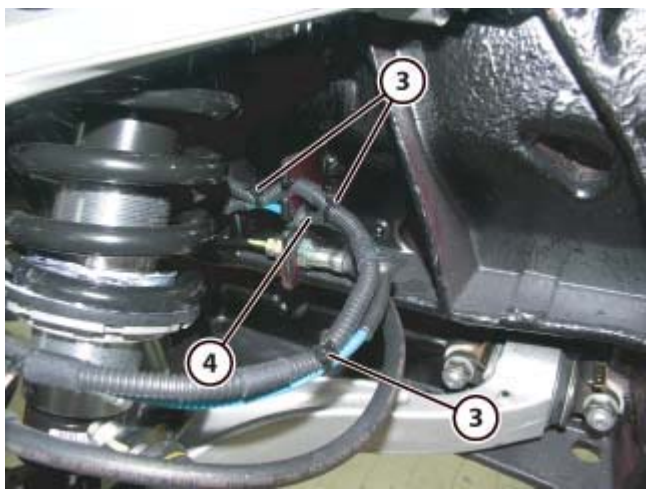
- Set the battery master switch to OFF (☞ L2.02).
- Remove the wheel (☞ F2.08).
- Remove the brake disc (☞ G2.05).



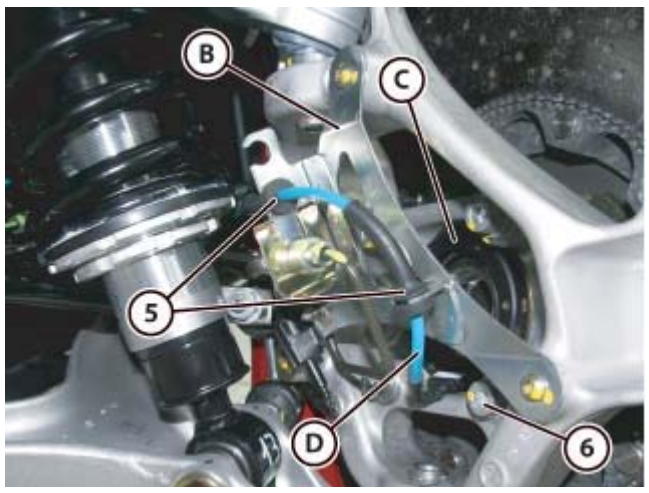
- Remove the flap **(A)** by undoing the three fastenings **(1)**.



- Disconnect the connector **(2)** for the ABS cable (Z016) (Z017).



- Remove the ABS cable retainer clamps **(3)** together with the pad wear sensor.
- Detach the cable grommet **(4)** from the bracket on the chassis.

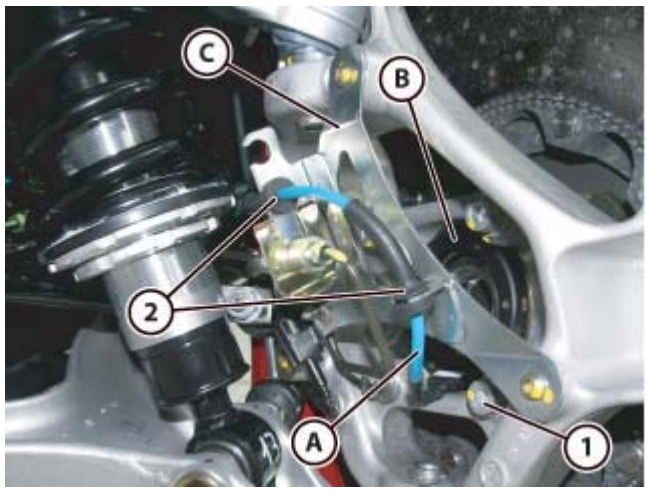


- Detach the two cable grommets **(5)** from the mounting bracket **(B)**.
- Undo the four screws **(6)** fastening the bearing **(C)** to the stub axle.
- Remove the bearing **(C)** from the outside, pulling the ABS sensor cable **(A)** out form the stub axle.

Refitting the front bearing

			
Tightening torque		**Nm**	**Class**
Wheel bearing - stub axle fastening	Screw	60 Nm	A
Front brake air flap	Screw	5 Nm	B

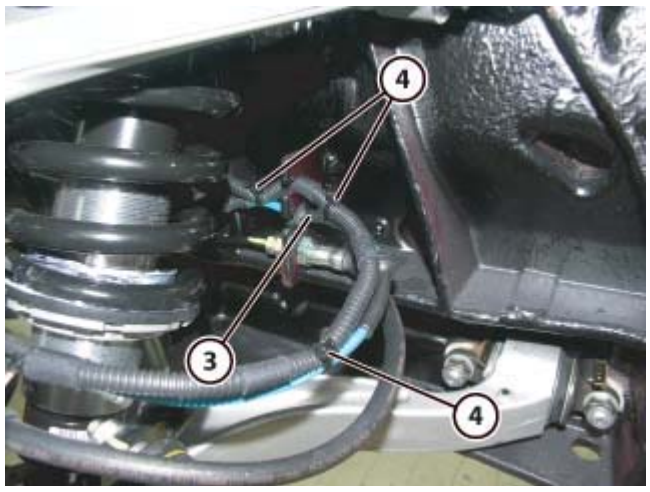
Check that the mating surfaces between the bearing and the stub axle are in good condition. Remove any residue or dirt if necessary.



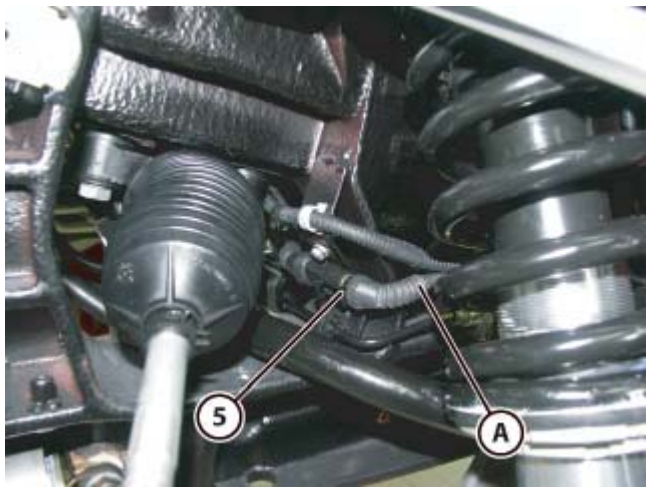
- Insert the ABS sensor cable **(A)** into the hole on the stub axle and fit the bearing **(B)**.
- Fasten the bearing **(B)** by tightening the four screws **(1)**.

		
Tightening torque	**Nm**	**Class**
Screw	60 Nm	A

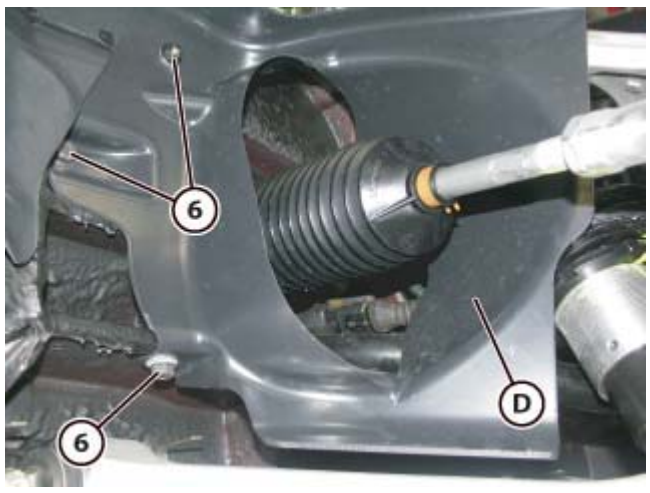
- Fasten the two cable grommets **(2)** onto the support bracket **(C)**.



- Fit the cable grommet **(3)** onto the bracket on the chassis and fasten the ABS cable, together with the pad wear sensor, using the three clamps **(4)**.



- Connect the connector **(5)** for the ABS sensor **(A)** (Z016) (Z017).



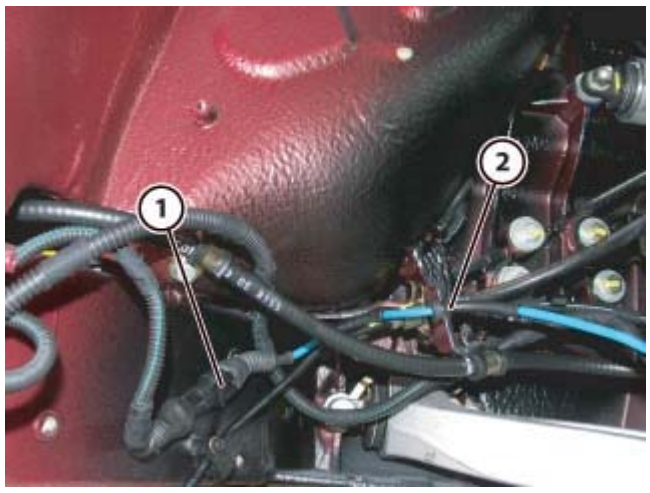
- Refit the flap **(D)** to the chassis, fastening with the three fastenings **(6)**.

		
Tightening torque	**Nm**	**Class**
Screw	5 Nm	B

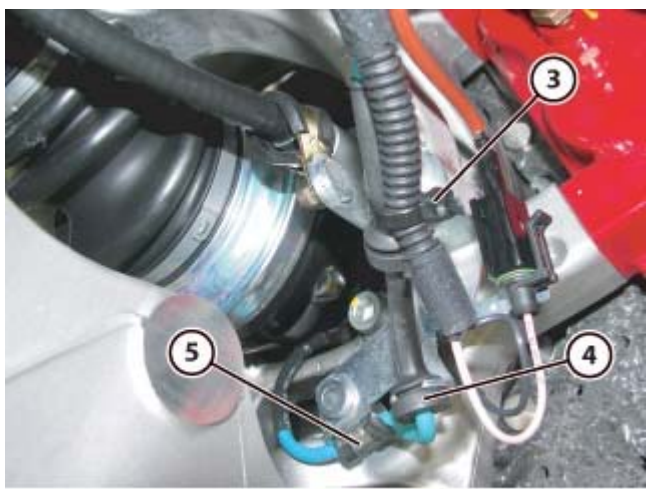
- Refit the brake disc (G2.05).
- Refit the wheel (F2.08).
- Set the battery master switch to ON (L2.02).

Removing the rear bearing

- Set the battery master switch to OFF (L2.02).
- Remove the rear undertray section (M2.12).
- Remove the wheel (F2.08).
- Remove the rear wheelhouses (M2.05).
- Remove the brake disc (G2.05).
- Remove the parking brake shoes (G2.06).
- Remove the axle shaft (D2.12).



- Disconnect the ABS sensor connector **(1)** (Z018) (Z019) and pull the cable out of the bracket **(2)** on the chassis..



- Detach the clamp **(3)** and remove the cable grommet **(4)** from the bracket on the hub carrier.
- Remove the clamp **(5)** by undoing the fastener screw on the bracket.

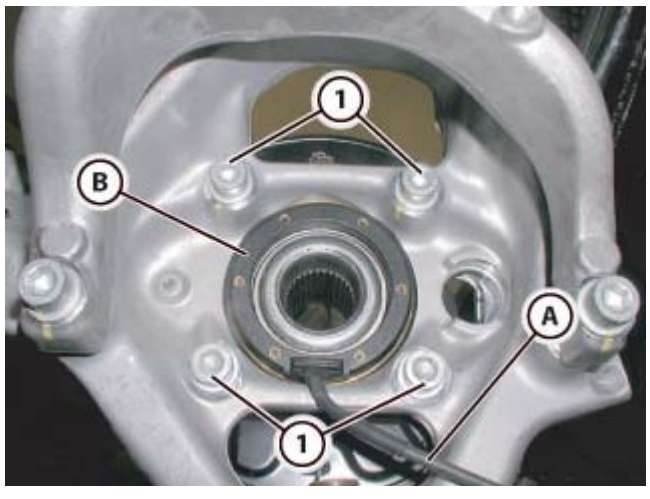


- Undo the four screws **(6)** fastening the bearing to the hub carrier.
- Remove the bearing, pulling the ABS sensor cable out of the hub-carrier.

Refitting the rear bearing

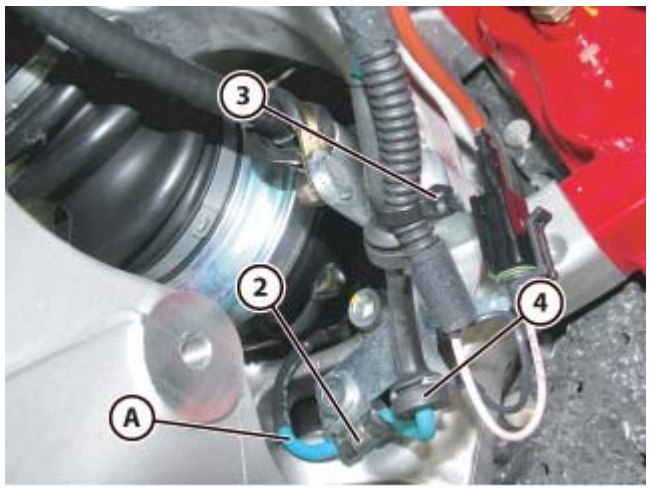
Tightening torque		**Nm**	**Class**
Wheel bearing - hub carrier fastening	Screw	60 Nm	A

Check that the mating surfaces between the bearing and the hub carrier are in good condition. Remove any residue or dirt if necessary.

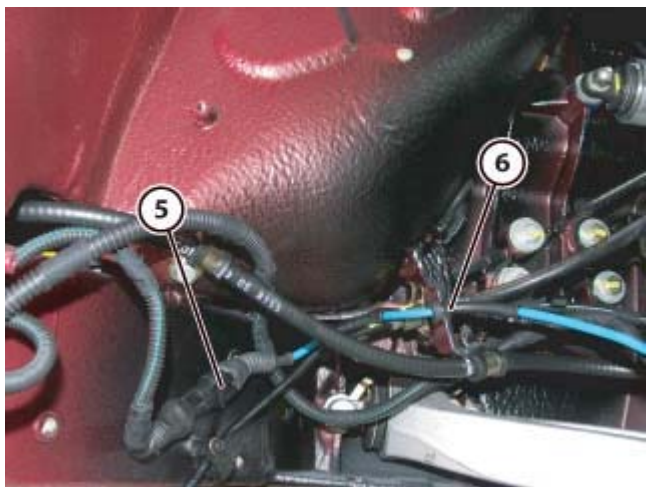


- Insert the ABS cable **(A)** into the central hole on the hub carrier and fit the bearing **(B)** in its seat.
- Apply and tighten the four screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	60 Nm	A



- Fasten the ABS cable **(A)** to the clamp **(2)** on the chassis, using the relative fastener screw, and to the clamp **(3)** with the brake pad wear sensor cable.
- Fit the cable grommet **(4)** on the hub carrier bracket.



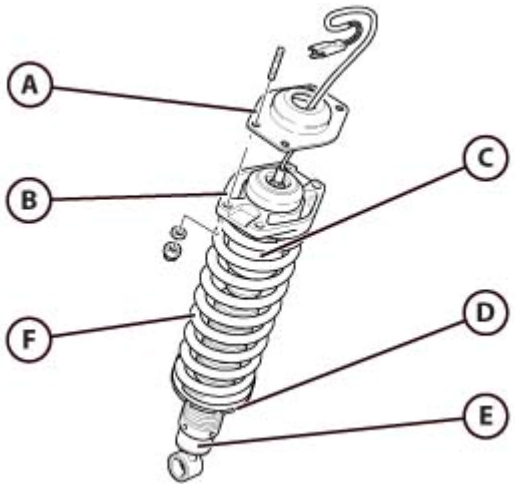
- Connect the ABS sensor connector **(5)** (Z018) (Z019) and fasten the cable grommet **(6)** on the bracket on the chassis.

- Refit the parking brake shoes (G2.06).
- Refit the axle shaft (D2.12).
- Refit the brake disc (G2.05).
- Refit the rear brake calliper (G2.04).
- Refit the rear wheelhouses (M2.05).
- Refit the rear underfloor section (M2.12).
- Refit the wheel (F2.08).
- Set the battery master switch to ON (L2.02).

F2.06 Shock absorbers

Shock absorber components

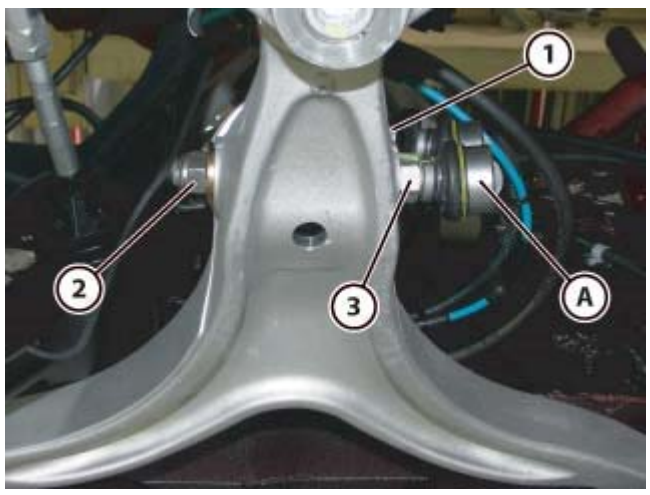
The car is fitted with dual action pneumatic type shock absorbers with electronically controlled variable damping, installed coaxially within the coil springs.
The end of travel of the compression stroke is damped by a rubber bushing fitted coaxially with the rod; the end of travel of the rebound stroke is damped by an elastic pad installed inside the shock absorber.
Special composite joints capable of rotating around the fulcrum axis are installed on the bottom ends of the shock absorbers.



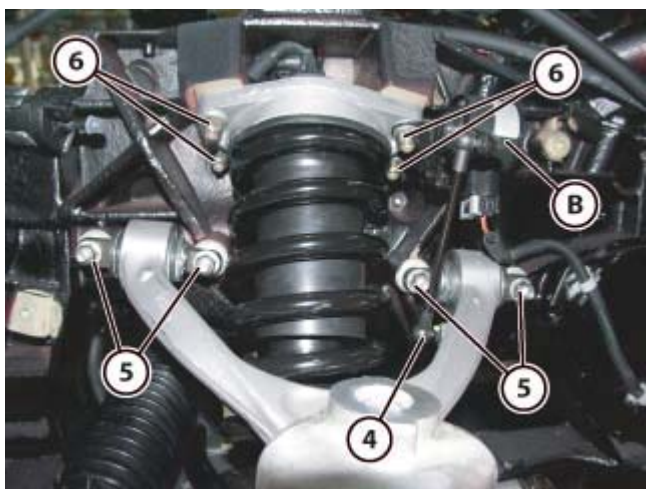
A - Rubber bushing retainer washer
B - Spring retainer washer
C - Upper spring spacer
D - Spring mounting ring nut
E - Shock absorber
F - Spring

Removing the front shock absorber

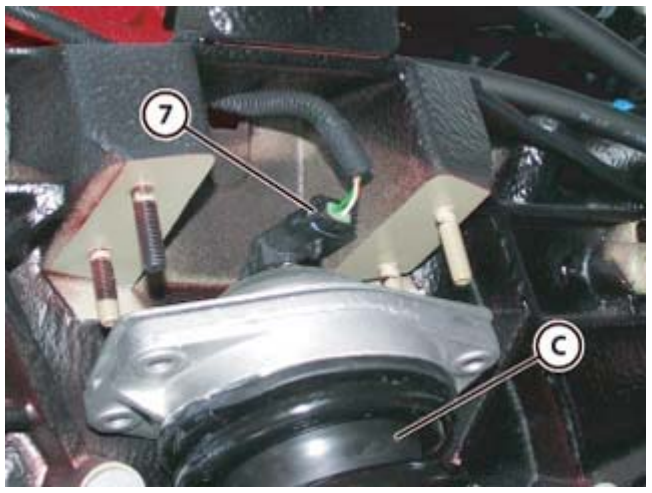
- Set the battery master switch to OFF (L2.02).
- Remove the wheel (F2.08).
- Fit the tool **(AV 3206)** on the front suspension to prevent the full weight of the suspension from being supported by just a few components.



- Undo the nut **(1)** fastening the stabiliser bar to the ball tie-rod **(A)**.
- Undo the nut **(2)** retaining the pin **(3)**.
- Remove the ball tie-rod **(A)**.



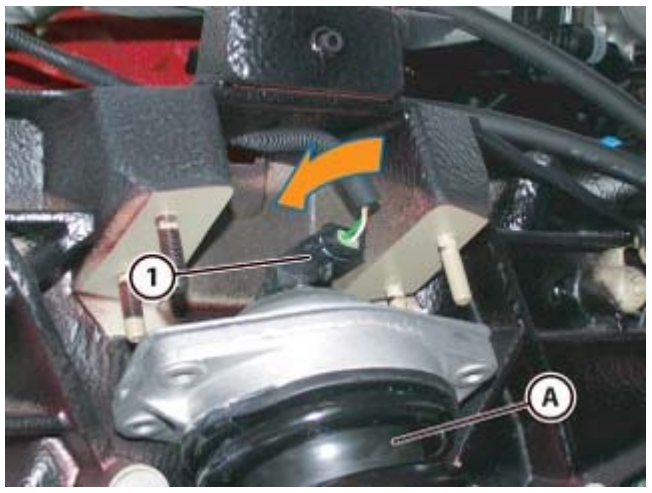
- Remove the tie-rod **(4)** for the sensor **(B)**
- Undo the four nuts **(5)** fastening the upper arm to the chassis and retrieve the flanbloc shims.
- Undo the four nuts **(6)** fastening the shock absorber to the chassis.



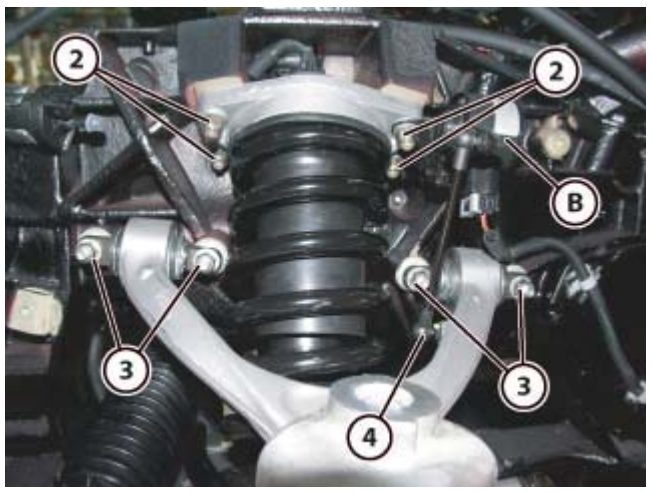
- Detach the shock absorber **(C)** connector **(7)** (L348) (L347) and remove from the vehicle.

Refitting the front shock absorber

Tightening torque		**Nm**	**Class**
Front shock absorber - chassis	Nut	25 Nm	A
Front suspension upper arm - chassis	Nut	25 Nm	A
Front suspension shock absorber - lower arm	Nut	80 Nm	A
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B



- Fit the shock absorber **(A)** in the vehicle and connect the connector **(1)** (L347) (L348).
- Turn the connector toward the front (as indicated by the arrow).



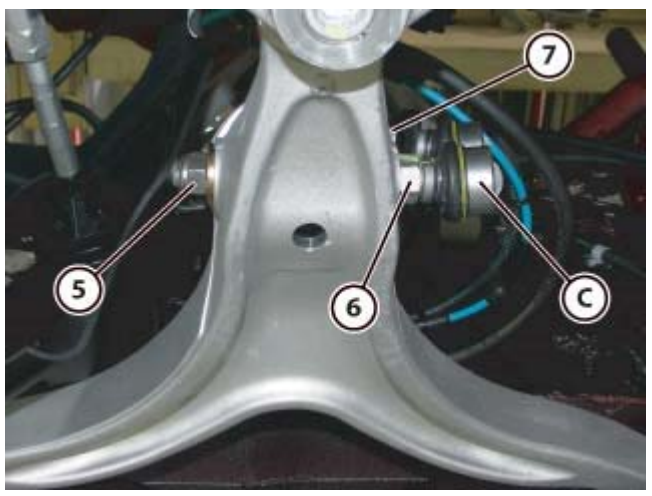
- Fasten the shock absorber, fitting onto the relative fastener pins.
- Fit the sensor **(B)** on the shock absorber and tighten the four nuts **(2)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	A

- Fasten the upper arm by tightening the four nuts **(3)**, after installing the flanbloc shims.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	A

- Fit the tie-rod **(4)** for the sensor on the upper arm.
- Remove the support tool **(AV 3206)** from the suspension.



- Fit the spherical tie-rod **(C)**.
- Tighten the nut **(5)**, keeping the pin **(6)** immobilised.

Tightening torque	**Nm**	**Class**
Nut	80 Nm	A

- Tighten the nut **(7)** fastening the stabiliser bar to the spherical tie-rod **(C)**.

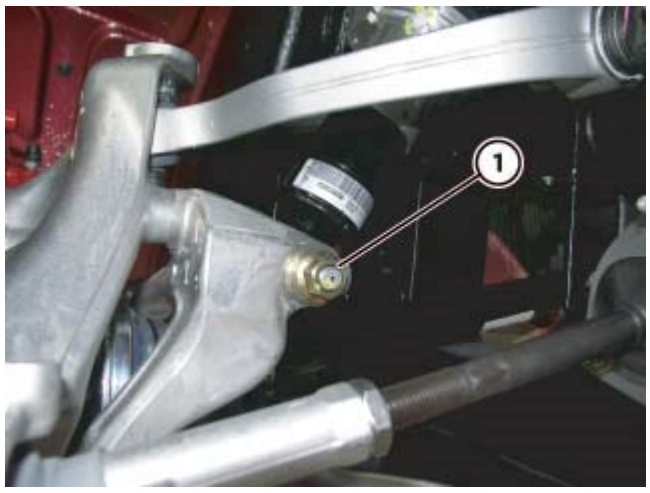
Tightening torque	**Nm**	**Class**
Nut	50 Nm	B

- Refit the wheel (F2.08).
- Set the battery master switch to ON (L2.02).

➢ Perform the vehicle set-up procedure.
➢ Carry out the automatic EOL cycle for the NCS ECU (Suspension Control Node) (L2.13).

Removing the rear shock absorber

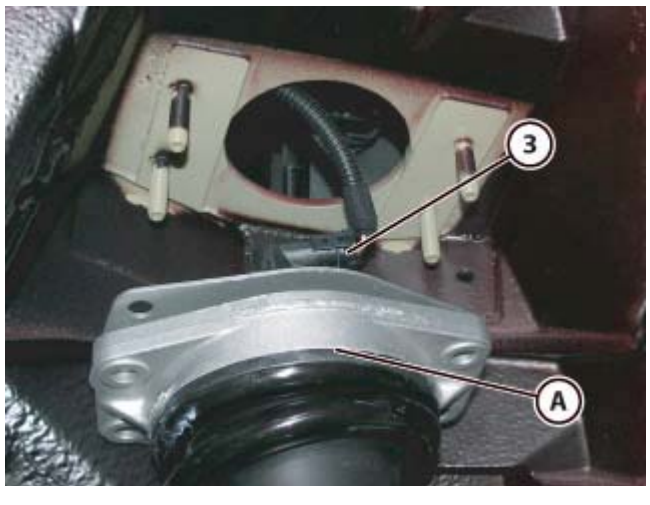
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the wheel (F2.08).



- Undo the nut **(1)** fastening the shock absorber to the hub carrier and ease out the connector pin between the shock absorber and the hub carrier.



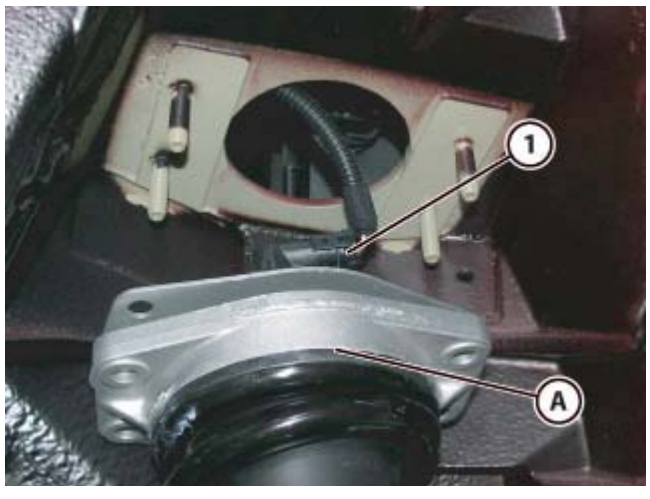
- Undo the four nuts **(2)** fastening the shock absorber to the chassis.



- Detach the connection **(3)** (L345) (L346) and remove the shock absorber **(A)** from the vehicle.

Refitting the rear shock absorber

Tightening torque		**Nm**	**Class**
Rear shock absorber - chassis	Nut	25 Nm	A
Shock absorber - hub carrier	Nut	80 Nm	A

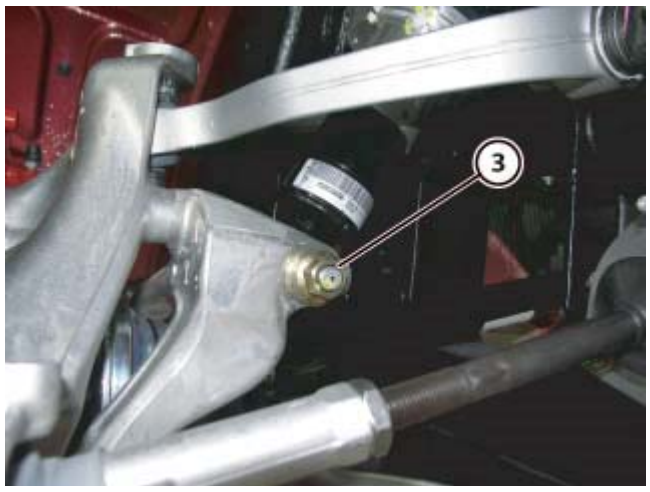


- Fit the shock absorber **(A)** in the vehicle and connect the connector **(1)** (L345) (L346).
- Turn the connector toward the rear of the vehicle.



- Fit the shock absorber on the relative fastener pins.
- Tighten the four nuts **(2)** fastening the shock absorber to the chassis.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	A



- Fit the pin connecting the shock absorber and the hub carrier and tighten the nut **(3)**.

Tightening torque	**Nm**	**Class**
Nut	80 Nm	A

➢ Refit the wheel (F2.08).
➢ Set the battery master switch to ON (L2.02).
➢ Carry out the automatic EOL cycle for the NCS ECU (Suspension Control Node) (L2.13).

Replacing the shock absorber elements

Tightening torque		**Nm**	**Class**
Bushing and shock absorber retainer washer Products to use: AREXONS 4706 SYSTEM 52A42	Nut	40 Nm	A
Connector - shock absorber strut	Nut	40 Nm	A

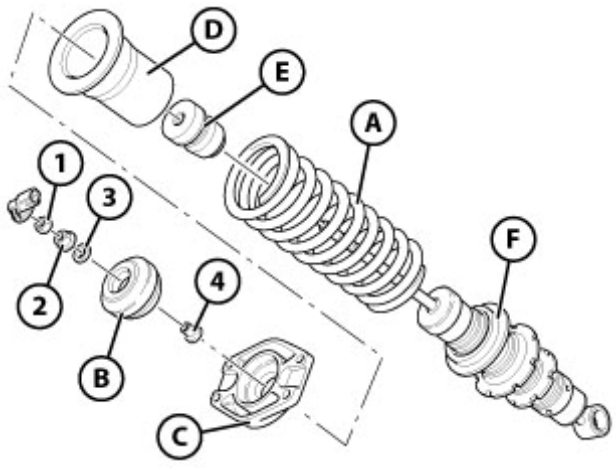
When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

The following procedure describes how to disassemble the front and rear shock absorbers, in order to replace individual components if necessary.

➢ Remove the front shock absorber (F2.06).
To replace a component of the front shock absorber.

➢ Remove the rear shock absorber (F2.06).
To replace a component of the rear shock absorber.

Disassembly



- Remove the upper bushing retainer washer.
- Undo the nut **(1)** complete with connector.
- Immobilise the shock absorber.

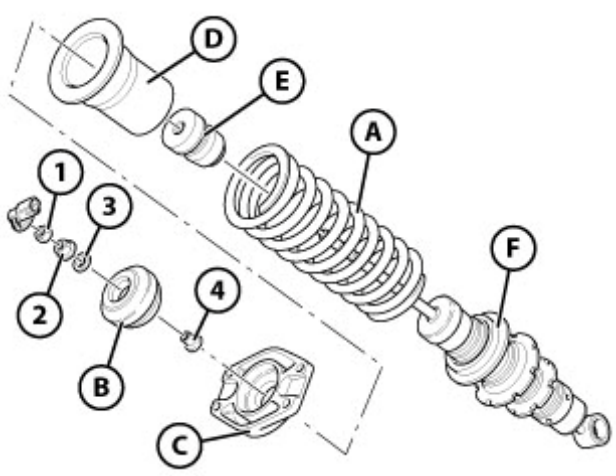
CAUTION
The following procedure for removing the nut must be observed precisely in order to compress and remove the spring safely.

- Undo the nut **(2)** by one turn only in order to decompress the spring.
- Compress the spring **(A)** with a suitable press.
- Undo the nut **(2)** completely, retrieving the relative washer **(3)**.
- Slowly release the spring **(A)**.
- Remove the hyperblock **(B)**.
- Remove the lower spring retainer washer **(C)**.
- Remove the upper spring shim **(D)**.
- Remove the spring **(A)**.
- Remove the bushing **(4)**.

When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

- Remove the plug **(E)**.
- Remove the lower spring shim **(F)**.

Reassembly



- Apply grease **Z2 PROTECTION** to the surface of the lower shim **(F)** in contact with the spring.
- Fit the lower shim **(F)** on the shock absorber.

When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

- Fit the plug **(E)**.
- Fit the bushing **(4)**.
- Fit the spring **(A)**.
- Apply grease **Z2 PROTECTION** to the surface of the upper shim **(D)** in contact with the spring.
- Fit the upper shim **(D)** on the shock absorber.
- Fit the lower spring retainer washer **(C)**.
- Apply grease **SYN-SETRAL PG814** to the upper part of the lower spring retainer washer **(C)** in contact with the hyperblock.
- Fit the hyperblock **(B)**.
- Compress the spring **(A)** with a suitable press.

CAUTION
Do not release the spring until the nut is tightened onto the shock absorber strut.

- Apply thread lock **AREXONS 4706 SYSTEM 52A42** to the thread of the strut and, installing the relative washer **(3)**, tighten the nut **(2)**.



Tightening torque	Nm	Class
Nut	40 Nm	A

- Tighten the nut **(1)** complete with connector.



Tightening torque	Nm	Class
Nut	40 Nm	A

- Slowly release the spring **(A)**.
- Apply grease **SYN-SETRAL PG814** to the lower part of the upper plug retainer washer in contact with the hyperblock.
- Fit the upper bushing retainer washer.

- Refit the rear shock absorber (F2.06).
- Refit the front shock absorber (F2.06).
- Adjust the shock absorber length (F2.06).
- Carry out the automatic EOL cycle for the NCS ECU (Suspension Control Node) (L2.13).

Adjusting the shock absorber length

On "HGTE" / "60 F1" vehicle variants, the shock absorber height must be adjusted with particular care as there is a risk of the spring detaching at maximum extension if this parameter is incorrectly set.

- The length (L) of the stop cap at the lower pivot axis must be adjusted in accordance with the type of spring installed. Two different spring sizes are available with different control load tolerances, identifiable by the different colours stamped on a coil turn.



Front shock absorber length	
Yellow	133 mm



Front shock absorber length	
White	131 mm



Rear shock absorber length	
Yellow	168.3 mm



Rear shock absorber length	
White	165.8 mm



Front shock absorber length (HGTE / 60 F1 variants)	
Yellow	147.9 mm



Front shock absorber length (HGTE / 60 F1 variants)	
White	146.1 mm



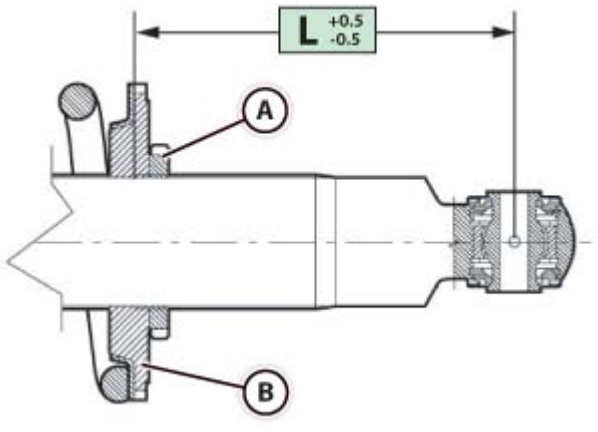
Rear shock absorber length (HGTE / 60 F1 variants)	
Yellow	171.8 mm



Rear shock absorber length (HGTE / 60 F1 variants)	
White	170.2 mm



Tightening torque		**Nm**	**Class**
Shock absorber stop cap	Ring nut	65 Nm	B



- Using a standard pin wrench, loosen the ring nut **(A)** fastening the stop cap.
- Hand tighten or loosen the spring stop cap **(B)** to obtain the distance **(L)**.
- Hold the stop cap in this position and tighten the ring nut **(A)**.

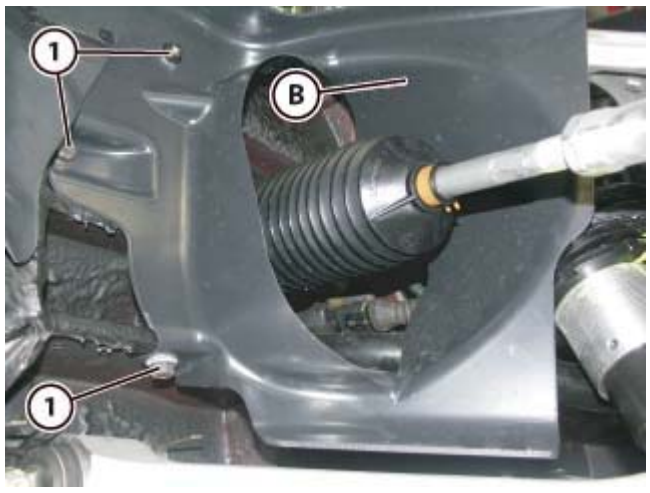


Tightening torque	Nm	Class
Ring nut	65 Nm	B

F2.07 Stabiliser bars and tie-rods

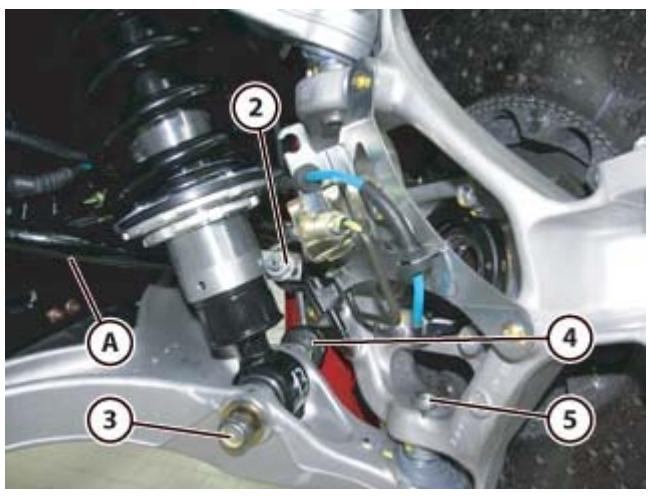
Removing the front stabiliser bar

➢ Remove the wheel (F2.08).
➢ Remove the front section of the underfloor (M2.12).



- Remove the brake air deflector **(B)** by undoing the three screws **(1)**.

Repeat the procedure for the right hand side deflector.



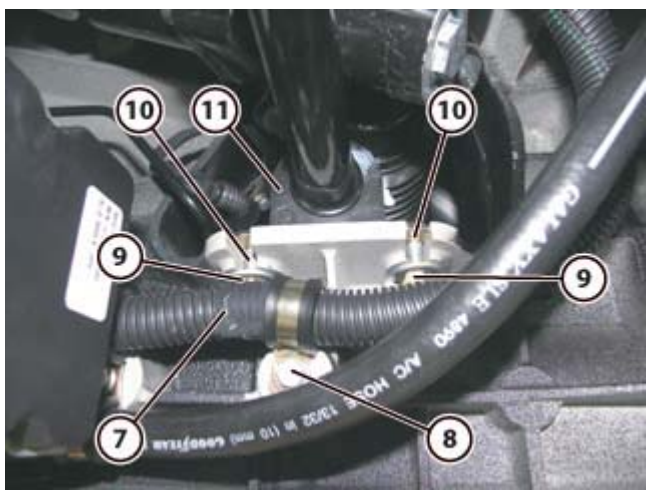
- Unscrew the fastener nut **(2)** on the stabiliser bar **(A)**.

Repeat the procedure on the other side of the stabiliser bar.

- Undo the nut **(3)** fastening the shock absorber to the lower arm and remove the relative fastener pin, complete with spherical tie-rod **(4)**.

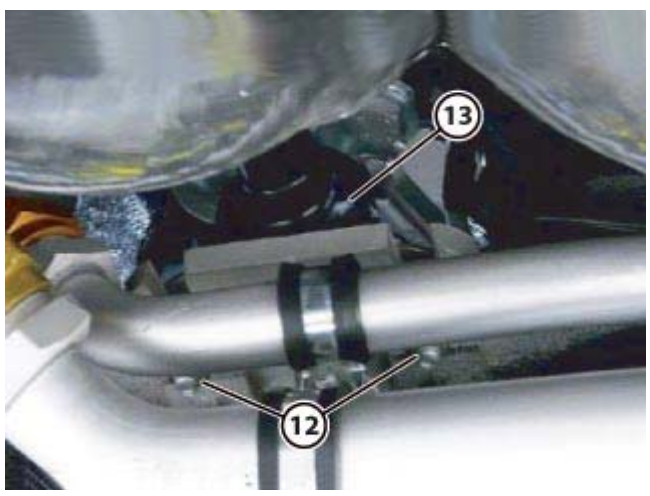
Repeat the procedure on the other side of the stabiliser bar.

- Undo the screw **(5)** fastening the lower left hand arm to the stub axle.



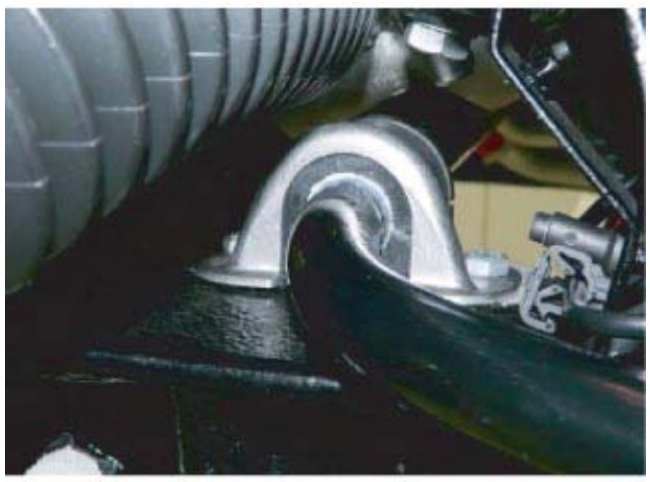
Left-hand side

- Remove the cables **(7)**, undoing the clamp fastener nut **(8)**.
- Unscrew the nuts **(9)** fastening the bushings **(11)** to the chassis, retrieving the washers, and remove the screws **(10)**.
- Remove the bushing **(11)** from the stabiliser bar.

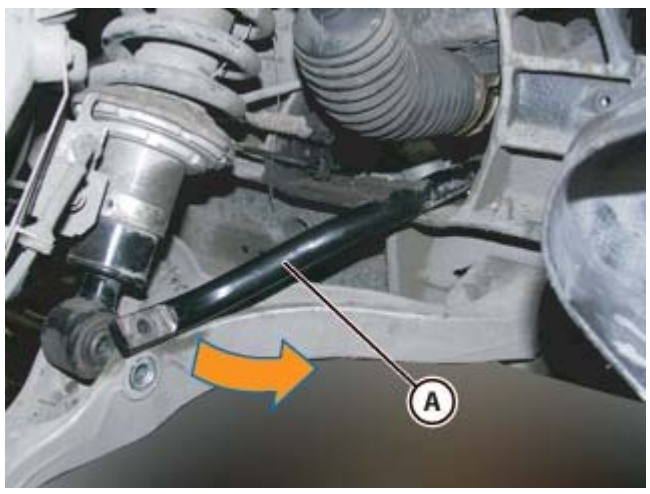


Right-hand side

- Unscrew the nuts **(12)** fastening the bushings **(13)** to the chassis, retrieving the washers and the relative screws.
- Remove the bushing **(13)** from the stabiliser bar.



- With **Technical Information Nr. 1641 _ Campaign 281**, the bushing retainer plates **(Drg. Nr. 133802)** have been replaced with new improved bushing retainer plates **(Drg. Nr. 239775)** (shown in the image aside), reinforced with a rib ensuring that the bushing is securely fixed in place.



- Lifting the shock absorbers, move the curved section of the stabiliser bar **(A)** towards the front (as indicated by the arrow).
- Remove the stabiliser bar **(A)** from underneath the vehicle.

- Note the respective positions and orientation, then remove the rubber bushes from the stabiliser bar.

Refitting the front stabiliser bar



Tightening torque		Nm	Class
Front stabiliser bar - chassis	Nut	25 Nm	B
Front suspension lower arm - stub axle Products to use: Z2 PROTECTION	Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A
Front suspension shock absorber - lower arm	Nut	80 Nm	A
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B
Front brake air flap	Screw	5 Nm	B

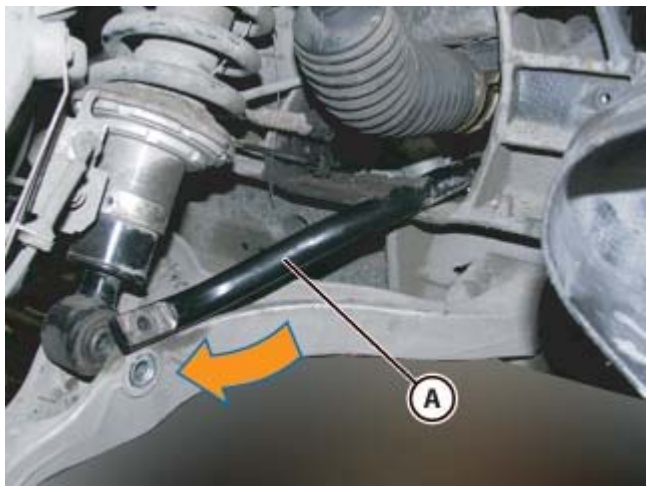


- Apply a uniform layer of grease **DuPont Lubricants Krytox® 205 GPL Standard Grade Grease** on the surfaces of shoulder bushings in contact with the rubber bushes.



- Apply **1 ml** of grease **DuPont Lubricants Krytox® 205 GPL Standard Grade Grease** uniformly on the inner surfaces of the rubber bushes.

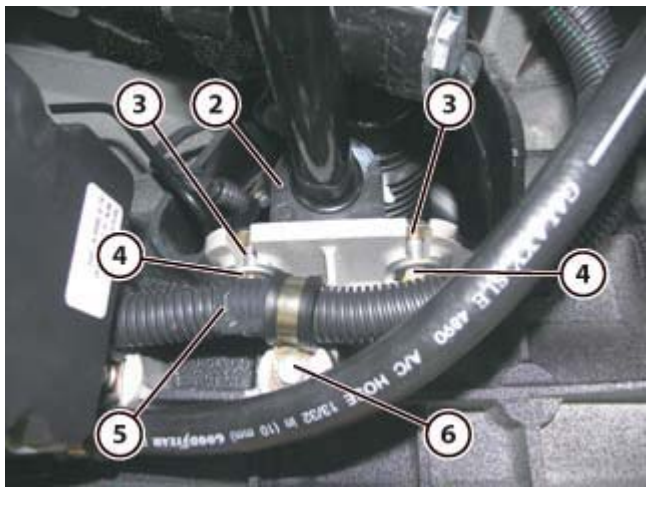
- Pressing into place by hand, fit the rubber bushes on the stabiliser bar in the same position and orientation noted during disassembly.



- Fit the front stabiliser bar **(A)**, complete with bushings, in its seat on the vehicle chassis (as indicated by the arrow).
- Lift the shock absorbers enough to pass the curved part of the stabiliser bar **(A)** underneath and towards the rear of the vehicle.



- With **Technical Information No. 1641 _ Campaign 281**, the bushing retainer plates **(Drg. Nr. 133802)** have been replaced with new improved bushing retainer plates **(Drg. Nr. 239775)** (shown in the image aside), reinforced with a rib ensuring that the bushing is securely fixed in place.

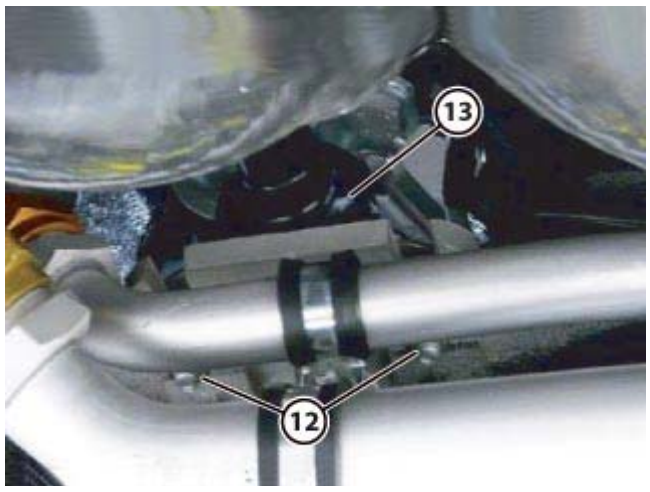


Left-hand side

- Using a cloth moistened with heptane, thoroughly clean and degrease the outer surface of the rubber bush **(2)** and the inner surface of the bush bracket.
- Fit the screws **(3)** and washers retrieved during removal and fasten by tightening the new nuts **(4)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	B

- Remove any excess grease from the rubber bush **(2)** and the bush bracket.
- Reposition the cable **(5)** as originally fitted and tighten the nut **(6)** on the clamp.

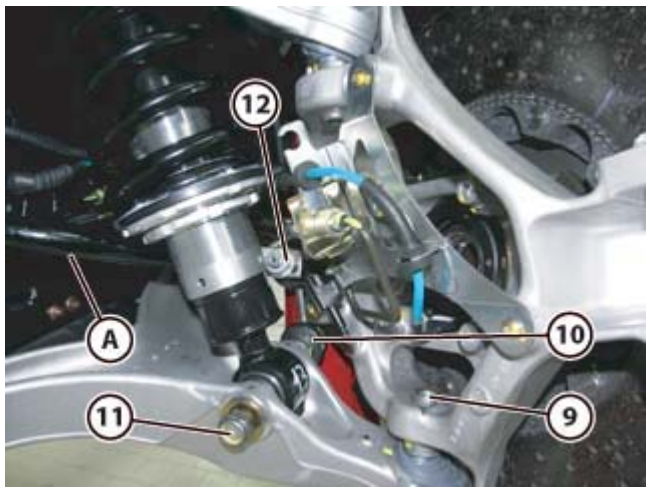


Right-hand side

- Using a cloth moistened with heptane, thoroughly clean and degrease the outer surface of the rubber bush **(13)** and the inner surface of the bush bracket.
- Fit the relative screws and washers retrieved during removal and fasten by tightening the new nuts **(12)**.

Tightening torque	**Nm**	**Class**
Nut	25 Nm	B

- Remove any excess grease from the rubber bush **(13)** and the bush bracket.



- Apply and tighten the screw **(9)** fastening the left hand lower arm onto the stub axle.

Tightening torque	Nm	Class
Screw (tightened to 50 Nm, start of control angle 25° - 90°)	85 Nm	A

- Fasten the shock absorber, inserting the fastening pin complete with spherical tie-rod **(10)** in its seat and tighten the nut **(11)**.

Tightening torque	Nm	Class
Nut	80 Nm	A

- Fix the stabiliser bar **(A)** to the spherical tie-rod **(10)**, tightening the nut **(12)**.

Tightening torque	Nm	Class
Nut	50 Nm	B



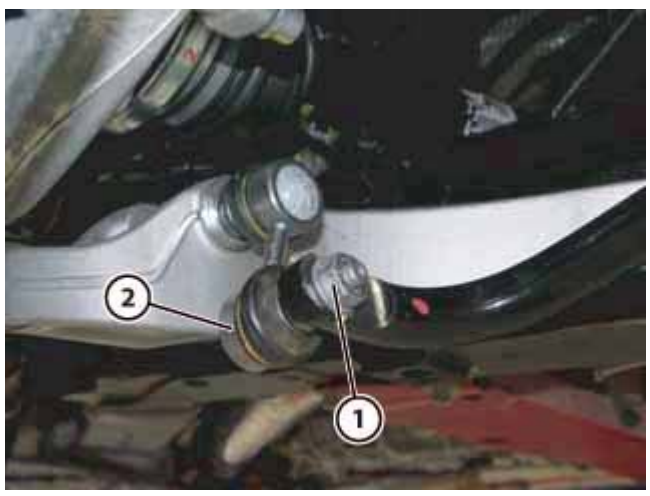
- Fit the two brake air deflectors **(13)** and fasten by tightening the six screws **(14)**.

Tightening torque	Nm	Class
Screw	5 Nm	B

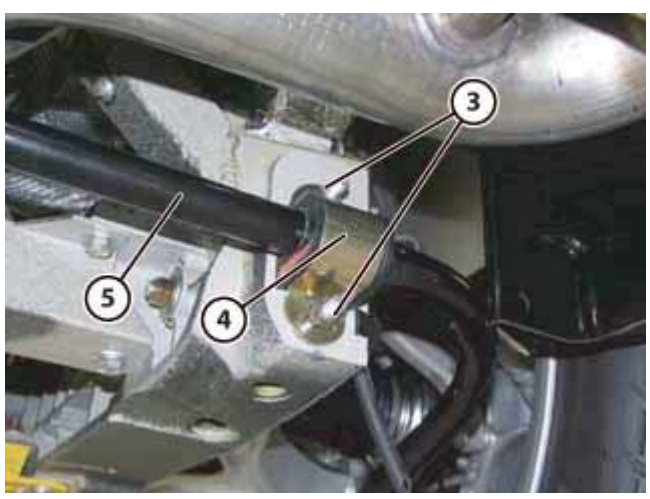
➢ Refit the front flat undertray section (M2.12).
➢ Refit the wheel (F2.08).

Removing the rear stabiliser bar

➢ Remove the rear undertray section (M2.12).



- Unscrew the nut **(1)** fastening the stabiliser bar to the tie-rod **(2)**.



OLD SOLUTION

- Unscrew the two nuts **(3)** fastening the rubber bushing bracket **(4)** to the vehicle chassis.
- Repeat the procedure on the other side of the vehicle and remove the stabiliser bar **(5)**.
- Note the respective positions and orientation, then remove the rubber bushes from the stabiliser bar.



NEW SOLUTION

- New improved bushing retainer plates have been introduced **(Drg. Nr. 239775)** (shown in the image aside), reinforced with a rib ensuring that the bushing is securely fixed in place.

The old plates **(Drg. Nr. 133802)** will no longer be available.

- Note the respective positions and orientation, then remove the rubber bushes from the stabiliser bar.

Refitting the rear stabiliser bar

Tightening torque		**Nm**	**Class**
Spherical tie-rod - rear stabiliser bar	Nut	50 Nm	A
Rear stabiliser bar - chassis	Nut	25 Nm	B

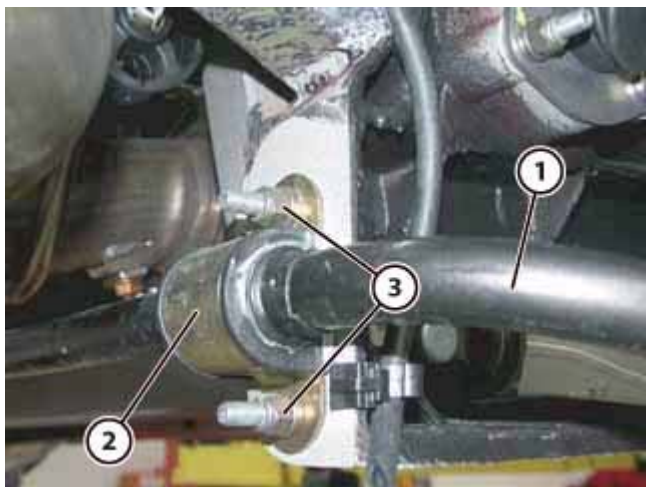


- Apply a uniform layer of grease **DuPont Lubricants Krytox® 205 GPL Standard Grade Grease** on the surfaces of shoulder bushings in contact with the rubber bushes.



- Apply **1 ml** of grease **DuPont Lubricants Krytox® 205 GPL Standard Grade Grease** uniformly on the inner surfaces of the rubber bushes.

- Pressing into place by hand, fit the rubber bushes on the stabiliser bar in the same position and orientation noted during disassembly.



OLD SOLUTION

- Fit the stabiliser bar **(1)** complete with bushings **(2)** on the chassis stud bolts.
- Using a cloth moistened with heptane, thoroughly clean and degrease the outer surface of the rubber bush **(2)** and the inner surface of the bush bracket.
- Hand tighten the four new nuts **(3)**.
- Remove any excess grease from the rubber bush **(2)** and the bush bracket.

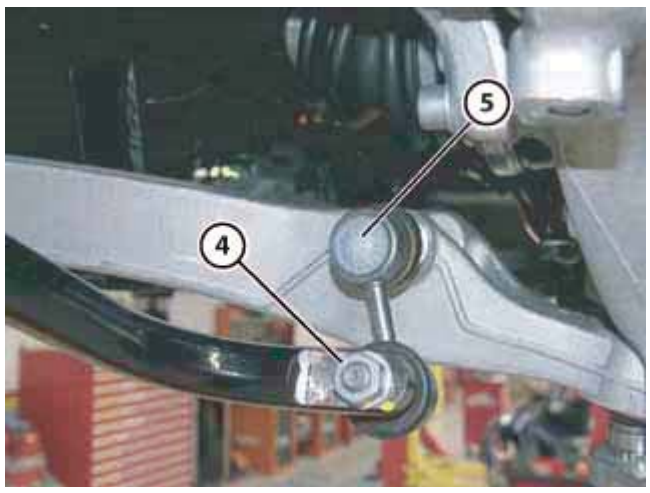


NEW SOLUTION

- New improved bushing retainer plates have been introduced **(Drg. Nr. 239775)** (shown in the image aside), reinforced with a rib ensuring that the bushing is securely fixed in place.

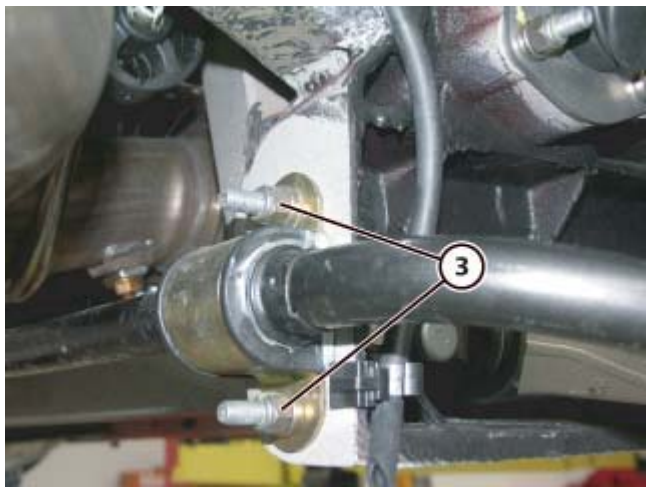
The old plates **(Drg. Nr. 133802)** will no longer be available.

- When refitting, fit the plates with the rib facing towards the inside and follow the same procedures described for the previous solution.



- Align the hole on the bar with the stud bolt on the suspension tie-rods **(5)**.
- Tighten the nut **(4)**.

Tightening torque	Nm	Class
Nut	50 Nm	A



- Tighten the four nuts **(3)**.

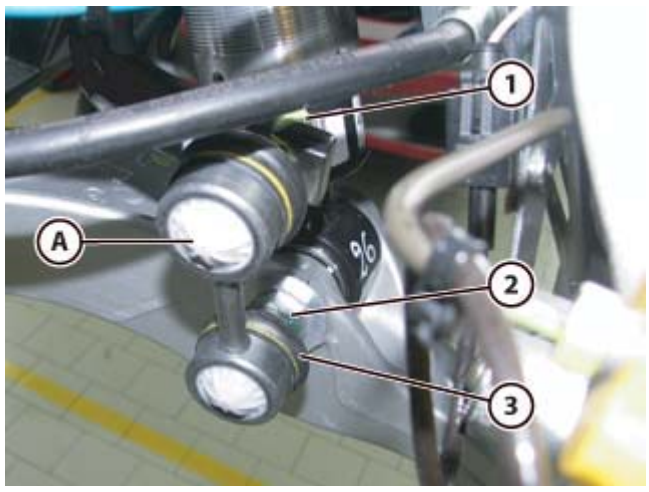
Tightening torque	Nm	Class
Nut	25 Nm	B

➢ Refit the rear underfloor section (M2.12).

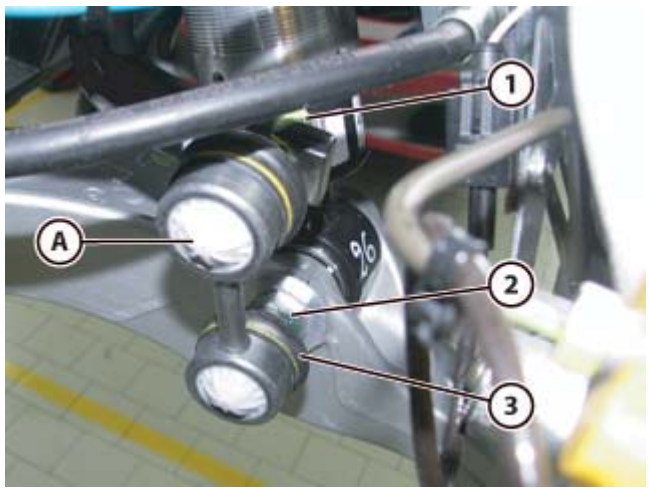
Replacing the front tie-rod

Tightening torque		Nm	Class
Spherical tie-rod - front suspension lower arm	Tie-rod	50 Nm	B
Spherical tie-rod - front stabiliser bar	Nut	50 Nm	B

➢ Remove the wheel (F2.08).



- Unscrew the nut **(1)** and remove the head from the stabiliser bar.
- Holding the pin **(2)** firm, unscrew the ball head **(3)**.
- Remove the front ball tie-rod **(A)** from the suspension.



- Refit the tie-rod **(A)** in its seat on the pin **(2)** and tighten the head **(3)**, holding the pin **(2)** still.

Tightening torque	Nm	Class
Tie-rod	50 Nm	B

- Tighten the fastener nut **(1)** on the stabiliser bar.

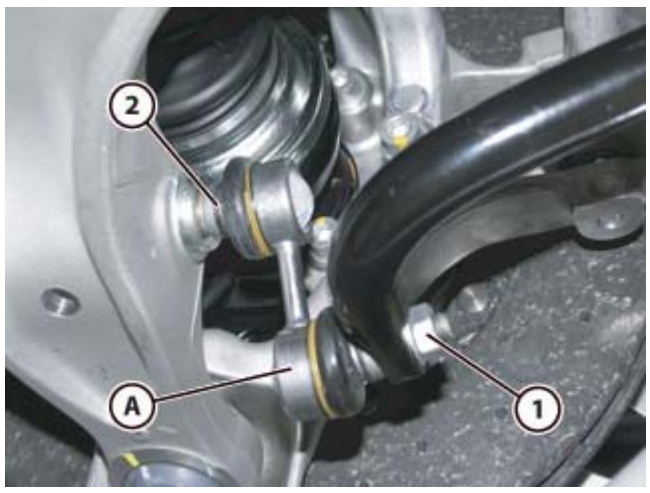
Tightening torque	Nm	Class
Nut	50 Nm	B

➢ Refit the wheel (F2.08).

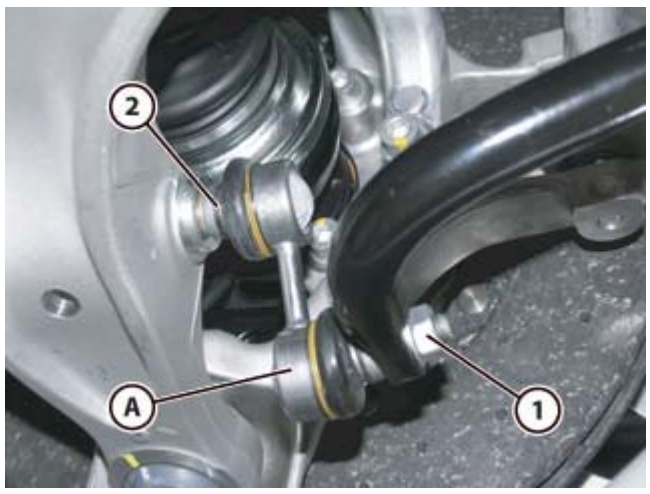
Replacing the rear tie-rod

Tightening torque		Nm	Class
Spherical tie-rod - rear lower arm	Tie-rod	50 Nm	B
Spherical tie-rod - rear stabiliser bar	Nut	50 Nm	A

➢ Remove the wheel (F2.08).



- Unscrew the nut **(1)** and remove the head from the stabiliser bar.
- Unscrew the head **(2)** from the lower rear suspension arm.
- Remove the rear ball tie-rod **(A)** from the suspension.



- Refit the tie-rod **(A)** in its seat on the arm and tighten the head **(2)**.

Tightening torque	Nm	Class
Tie-rod	50 Nm	B

- Tighten the fastener nut **(1)** on the stabiliser bar.

Tightening torque	Nm	Class
Nut	50 Nm	A

➢ Refit the wheel (F2.08).

F2.08 Wheels and tyres

Checking the state of the tyres

Tyre replacement is recommend after 4 years of normal use. Frequent use in maximum load conditions and at high temperatures may lead to premature deterioration.

Check the state of the tyres during the scheduled maintenance.

CAUTION
Pressure increases with increasing tyre temperature. Never reduce the tyre pressure if measured when the tyres are hot.
Tyre overheating due to underinflation may seriously compromise handling and tyre integrity.
Do not inflate the tyres to a pressure other than the specified value, as this would render the tyre pressure monitoring system useless.
After replacing one or more tyres, always calibrate the tyre pressure monitoring system by pressing the button on the passenger compartment dome light panel.

- Check the inflation pressure: pressure must be measured with cold tyres and must match the values specified.

CAUTION
Always inspect any tyre damage very carefully to assess severity: damage may greatly reduce tyre life and cause accidents.

- Check the tyres to ensure that there are no signs of damage such as abrasion, cuts, cracks, bubbles etc.
- Violent knocks against kerbs, holes or other obstacles and driving on poor road surfaces for extended periods may cause tyre damage. This damage may not always be visible. Any foreign objects penetrating the tyre in these conditions may cause structural damage that is only identifiable after removing the tyre from the wheel.

CAUTION
If the same tyres have been fitted on the vehicle for over 3 years, check frequently and carefully for signs of deterioration.
Do not monitor the pressure of a damaged tyre.

- Tyres will deteriorate even if the vehicle is used rarely or kept stationary. Cracks in the rubber on the tread and sidewalls, at times accompanied by blisters, are an indication of tyre deterioration.

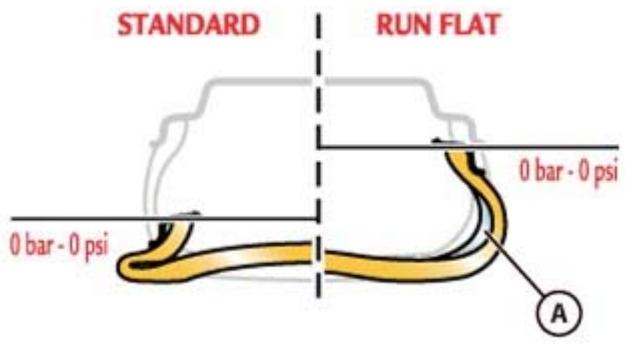
CAUTION
Never fit a tyre with tread depth under the specified limit, even if only in a single localised area.

- Check the tread depth: the minimum permissible value is **1.7 mm**. This depth is identified by the tyre wear indicators.
- Check the wear over the entire tread; in the event of uneven tread wear, perform static and dynamic wheel balancing.

Note that once Run Flat tyres have been fitted, the instrument panel must be reprogrammed when refitting conventional tyres to prevent a warning message from being shown on the TFT display.

- Replace any tyres that have been punctured and/or been inflated with the tyre inflation bottle included with vehicle toolkit. For safety reasons, we do not recommend attempting to repair punctured tyres.

Run Flat tyres (optional)



The vehicle may be equipped with "Run Flat" tyres. These tyres have reinforced sidewalls **(A)**, allowing the vehicle to continue travelling at a moderate speed (80 Km/h) after a puncture for a precisely defined distance.
After receiving the 'tyre puncture' signal from the tyre pressure monitoring ECU, the instrument panel calculates the remaining range and visualises a warning message on the TFT display after 50 Km.
After 100 Km, a warning message is shown on the display instructing the driver to stop the vehicle.
Note that once Run Flat tyres have been fitted, the instrument panel must be reprogrammed when refitting conventional tyres to prevent a warning message from being shown on the TFT display.

Observing the specified geometry values is fundamental for ensuring the best possible tyre performance and maximum tyre durability.

Removing the wheel



- Loosen the five stud bolts **(1)** fastening the wheel to be removed.
- Raise the vehicle until the wheels lift off the ground.
- Completely unscrew the five stud bolts **(1)** and remove the wheel.

Removing the wheels



- Loosen the five stud bolts **(1)** fastening each wheel.
- Raise the vehicle until the wheels lift off the ground.
- Completely unscrew the stud bolts and remove all the wheels.

Refitting the wheel

Tightening torque		**Nm**	**Class**
Wheel fastening	Pre-torque	35 Nm	C
	Stud bolt	100 Nm	A

Whenever any work is carried out on the suspension, the "Wheel position sensor offset cycle" must be repeated with the SD3 tester.

- Before refitting the wheel, check the tyre and wheel rim for wear.
- Check the contact surfaces of the wheel rim and the brake disc and clean if necessary.
- Check the stud bolts for wear and replace if necessary. Clean before refitting.



- Fit the wheel, inserting the locator pin into its seat on the wheel rim.
- Fit the stud bolt opposite the locator pin first, without tightening.
- Fit the other stud bolts **(1)** and tighten them to the pre-torque value.
- Lower the vehicle completely.
- Tighten the stud bolts **(1)**.

Tightening torque	**Nm**	**Class**
Stud bolt	100 Nm	A

Refitting the wheels

Tightening torque		**Nm**	**Class**
Wheel fastening	Pre-torque	35 Nm	C
	Stud bolt	100 Nm	A

Whenever any work is carried out on the suspension, the "Wheel position sensor offset cycle" must be repeated with the SD3 tester.

- Before refitting the wheels, check the state of wear of the tyres and wheel rims.

➢ Check the contact surfaces of the wheel rims and the brake discs and clean if necessary.
➢ Check the stud bolts for wear and replace if necessary. Clean before refitting.



- Fit each wheel, inserting the locator pin into its seat on the wheel rim.
- Fit the stud bolt opposite the locator pin first, without tightening.
- Fit the other stud bolts **(1)** and tighten them to the pre-torque value.
- Lower the vehicle completely.
- Tighten the stud bolts **(1)**.

Tightening torque	**Nm**	**Class**
Stud bolt	100 Nm	A

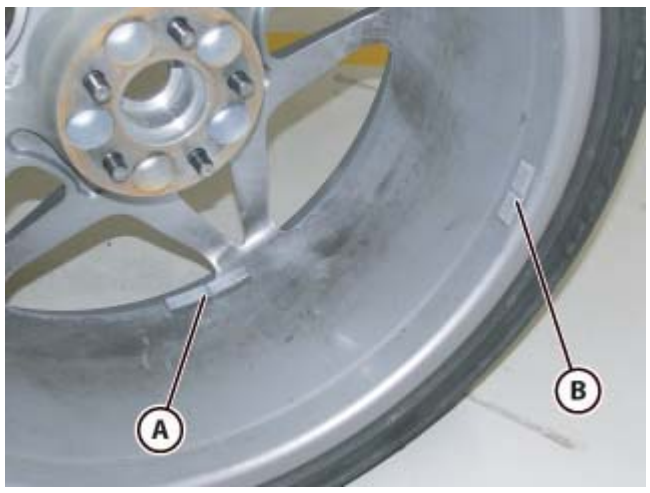
Wheel balancing

Only use self adhesive counterweights. In addition to damaging the wheel rim, other types of counterweight may interfere with suspension components or detach while driving.

Do not touch the adhesive surface of the counterweights before applying to the wheel rim and never reuse counterweights or use weights with no backing paper, as these may detach while driving.

After replacing a tyre, wheel rim, or both, the wheel must be statically and dynamically balanced using a balancing machine and suitable counterweights.

Manufacturers identify the heaviest part of the wheel rim and the tyre with a reference mark. When mounting the tyre onto the rim, always set these reference marks opposite each other to minimise the amount of counterweights necessary for balancing.



- The counterweights must be applied in position **(A)** on the inner edge of the wheel rim, in position **(B)**, or in both positions if necessary.
- Thoroughly clean the wheel rim surface onto which the counterweight will be applied with heptane.
- Remove the protective backing and affix the counterweight onto the wheel rim, pressing evenly to ensure that it adheres perfectly.

Preparation for tyre removal

The tyre pressure monitoring sensor is installed on the wheel rims, near the inflation valve.





Removing the tyre without using the correct tools and taking the necessary precautions may damage the sensor.



To avoid this problem, we are showing the entire procedure for removal and refitting of the tyres from the wheel rim, using a **CORGHI** tool, model **Artiglio A2019 RC** (shown in the photo) or **Artiglio A2020 TI**, recommended by Ferrari.
To prevent damage to the wheel rim, all parts of the tool that may come into contact with the rim are rubber coated.

Only use rubberised tools.
Wear gloves and protective eyewear.

Removing the tyre

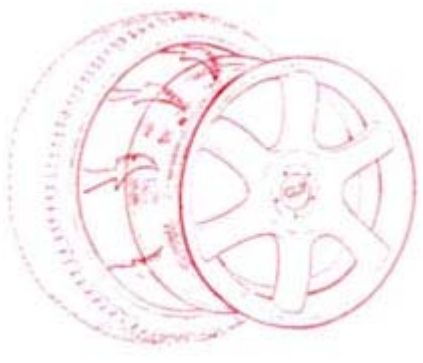
Ensure that tyres are not kept in stock for more than 4 years. Tyres may be kept in stock for a maximum of 4 years, provided that they are kept out of direct sunlight, protected from the weather and humidity and stored in low oxygen conditions. If necessary, the Ferrari Service Network will verify whether old tyres are suitable for use. In all cases, tyres mounted on a vehicle for over 3 years must be inspected by an authorised Ferrari Service Centre.

Tyre replacement is recommend after 4 years of normal use. Frequent use in maximum load conditions and at high temperatures may lead to premature deterioration.

When removing and refitting tyres, DO NOT use tyre levers which could damage the rim and compromise its protective layer. Use levers coated in protective material.

The photos shown here were taken using a rim from the 575M Maranello.

To more clearly identify the correct mounting positions for the tools relative to the wheel, the vertical column of the tyre demounting machine is used as the starting point (12 o'clock).



COMPOSITE REVERSE RIM wheel (standard on HGTE variant)

CAUTION!
The composite wheels (on "HGTE" variants) are REVERSE RIM components.
To prevent wheel damage, the tyre must only be demounted and mounted from the inner side of the wheel itself.
Two warning labels are applied on these wheels - one on the rim well and one on the flange face.
When mounting, ensure that no adhesive residue is left on the flange surface.

Only tubeless tyres may be fitted on REVERSE RIM COMPOSITE wheels (for "HGTE" variants). Do not use run flat tyres with these wheels.
As the use of run flat tyres with REVERSE RIM COMPOSITE wheels is prohibited in all Gulf States (Bahrain, Kuwait, Qatar, Saudi Arabia, UAE and Oman) by Gulf Standard 42/2003 “Motor Vehicles: General Requirements”, the vehicle must be equipped with a spare wheel.

When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

- The correct method for demounting and mounting a tyre on a composite reverse rim wheel is illustrated aside.



- Undo the core of the valve **(A)** to completely deflate the tyre.



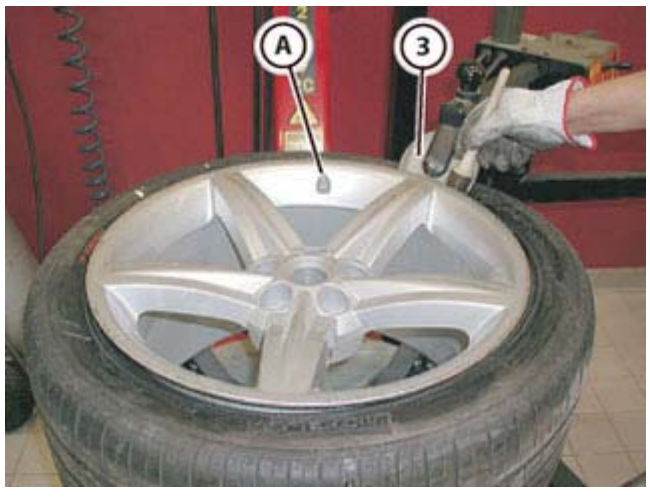
- Place the wheel on the machine table and break the bead on both the inner and outer sides.
- Lubricate the bead **(1)** with the lubricant spray provided.



- Place the wheel on the self-centring clamp and use the bead breaker to ensure that the wheel is gripped correctly by the clamps **(2)** on the table.

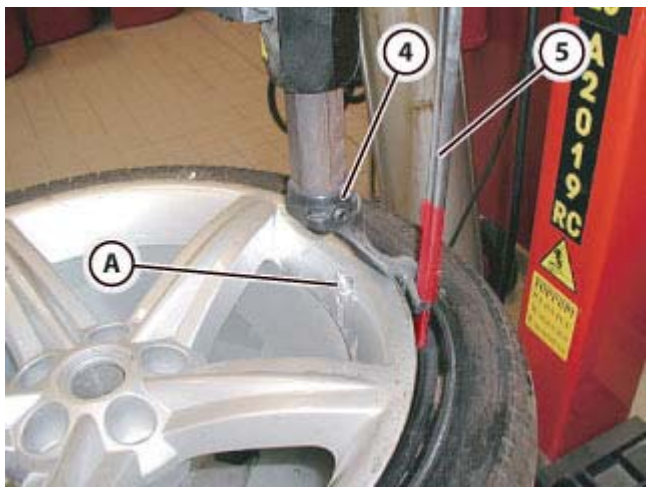
If the machine is not equipped with a bead breaker, clamp the wheel from the inside.

- Clamp the wheel.



Observe the correct positions for bead breaking shown as follows.

- Position the inflation valve **(A)** at **12 o'clock**.
- Position the bead breaker disc **(3)**.
- Push the bead into the rim channel using the bead breaker disc while simultaneously turning the tyre counterclockwise, until the inflation valve **(A)** is at **3 o'clock**.
- Lubricate the bead while turning.
- To facilitate tyre removal, if necessary, insert a bead breaker lever at **180°** relative to the sensor.
- If the bead is not completely broken, repeat this stage in a clockwise direction, moving the inflation valve from **3 o'clock** to **12 o'clock**. Perform this stage repeatedly, clockwise and anticlockwise, until the bead is completely broken.



- Fit tool **(4)**: after clamping, the tool automatically moves upwards and outwards.
- Position the inflation valve **(A)** at **11 o'clock**.
- Mount the lever **(5)** on tool **(4)**, using the bead breaker disc to facilitate the operation if necessary.
- Remove the bead breaker disc.



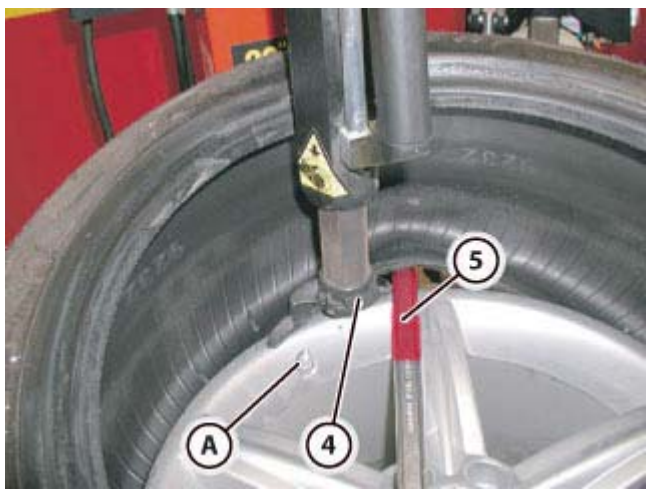
- Position the tyre bead on the tool **(4)** using the lever **(5)**.
- Remove the lever.



- Ensure that the entire edge of the bead is outside the rim and completely visible. If this is not the case, the bead may be damaged.

If the bead does not slide easily into the groove, lubricate the contact area.

- Turn the wheel clockwise.



- Position the inflation valve **(A)** at **12 o'clock**.
- Fit the lever **(5)** on the tool **(4)**.
- Lift the tyre.

Take care not to damage the sensor when inserting the tyre lever (5).

- Position the lower bead of the tyre on the tool **(4)**, using the lever **(5)**.
- Turn the wheel clockwise.

- Remove the rim from the machine and put carefully in a safe place.
- If the tyre is not to be refitted immediately, refit the valve core and cap.

➢ Remove the tyre pressure sensors (F2.09).
Proceed as follows if removal is necessary.

Checking wheel rims

- When carrying out regular maintenance or replacing tyres, check the state of the wheel rims.
- Visually inspect the external and internal wheel rim surfaces; if cracks or deep gouges are noted, replace the wheel.
- In the case of scratching, minor dents or superficial scuffs, repaint the affected area or, if necessary, the entire rim. Use the standard procedure for repainting an alloy wheel, applying a coat of silver based paint then, once the coat had dried to a matte finish, applying a layer of clear coat. Dry the wheel in the oven to polymerise the layers of paint applied.

Cover the valve mounting and the hub badge when repainting, as the additional thickness of the paint may impede correct assembly and compromise the effectiveness of the corrosion treatment applied.

- Take particular care around the mating surface with the brake disc; this area is only coated with a single layer of cataphoresis film.
- This treatment has a limited lifespan as the film is gradually eroded by fretting between the surfaces. This area cannot be repainted and a rim with a deteriorated film must be replaced.
- Before refitting, always check that the mating surfaces between the wheel and the brake disc are perfectly clean.

Using inappropriate tools for removing and refitting the tyre may damage the wheel rim and compromise the protective layer.

- Balance the wheel without the tyre but with the pressure sensor and valve installed: if, after removing the balancer weights, the values for static balance exceed **36** (including vertical bouncing and wobble), the rim must be replaced.

Refitting the tyre

Ensure that tyres are not kept in stock for more than 4 years. Tyres may be kept in stock for a maximum of 4 years, provided that they are kept out of direct sunlight, protected from the weather and humidity and stored in low oxygen conditions. If necessary, the Ferrari Service Network will verify whether old tyres are suitable for use. In all cases, tyres mounted on a vehicle for over 3 years must be inspected by an authorised Ferrari Service Centre.

Tyre replacement is recommend after 4 years of normal use. Frequent use in maximum load conditions and at high temperatures may lead to premature deterioration.

When removing and refitting tyres, DO NOT use tyre levers which could damage the rim and compromise its protective layer. Use levers coated in protective material.

➢ Refit the tyre pressure sensors (☞ F2.09).
Proceed as follows if the component has already been removed.



COMPOSITE REVERSE RIM wheel (standard on HGTE variant)

CAUTION!
The composite wheels (on "HGTE" variants) are REVERSE RIM components.
To prevent wheel damage, the tyre must only be demounted and mounted from the inner side of the wheel itself.
Two warning labels are applied on these wheels - one on the rim well and one on the flange face.
When mounting, ensure that no adhesive residue is left on the flange surface.

Only tubeless tyres may be fitted on REVERSE RIM COMPOSITE wheels (for "HGTE" variants). Do not use run flat tyres with these wheels.
As the use of run flat tyres with REVERSE RIM COMPOSITE wheels is prohibited in all Gulf States (Bahrain, Kuwait, Qatar, Saudi Arabia, UAE and Oman) by Gulf Standard 42/2003 “Motor Vehicles: General Requirements”, the vehicle must be equipped with a spare wheel.

When fitting REVERSE RIM COMPOSITE rims (standard on HGTE variant), the specific HGTE bump stops must be fitted on the front shock absorbers.

- The correct method for demounting and mounting a tyre on a composite reverse rim wheel is illustrated aside.



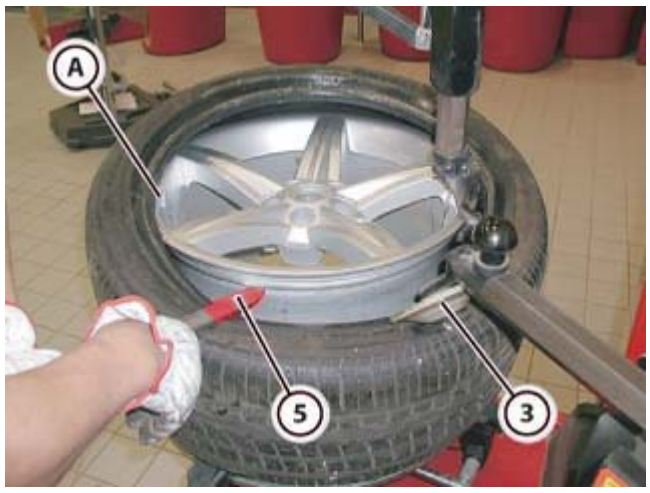
- After installing the pressure sensor **(A)**, mount the clean rim on the self-centring clamp, ensuring that the wheel is gripped correctly by the clamps **(2)** on the table.
- Lubricate the wheel.



- Pick up the tyre and ensure that the direction of rotation is correct.
- Lubricate both beads.



- Fit the inflation valve **(A)** at **6 o'clock**.
- Place the tyre on the rim and tip the tool arm **(4)** forwards.
- Fit the lower bead under the right hand part of the tool **(4)**.
- Turn the wheel clockwise.
- Mount the bead on the rim, applying constant pressure.
- Turn the wheel, bringing the inflation valve **(A)** to **12 o'clock**.



The bead breaker disc must never reach the valve-sensor assembly position.

- Fit the inflation valve **(A)** at **4-5 o'clock**.
- Place the tyre on the rim, matching the lighter parts of the rim, marked with an embossed letter **"G"**, with the yellow dots on the tyre.
- Insert the lever **(5)** at **2-3 o'clock**, using the bead breaker disc **(3)** to push the bead in.

If available, use tyre pliers instead of the lever **(5)**, with the appropriate adapter fitted.

If necessary, insert a second set of tyre pliers, with the correct adapter fitted.

- Turn the wheel clockwise until the upper bead is completely mounted.
- If used, remove the tyre lever with the bead breaker disc.



- Release the wheel from the clamps **(2)** on the table.



- Refit the core of the valve **(A)**.



- To ensure that the bead is mounted correctly, inflate the tyre immediately, while the beads are still lubricated.

The tyre must be inflated to **activate** the tyre pressure monitoring system sensor. Inflate the tyre to a pressure greater than **0.6 bar and keep inflated at this pressure for a few minutes**.

- If the maximum permissible inflation pressure of **(3.2 bar / 44 psi)** is not sufficient to seat the beads, lubricate again.

- Balance the wheels (F2.08).
- Refit the wheel (F2.08).
- Carry out the automatic EOL cycle for NTP ECU (Tyre Pressure Node) (L2.13).

Perform whenever fitting tyres of a different brand or type.

F2.09 Tyre pressure monitoring system

Tyre pressure monitoring system components

Whenever any component of the tyre pressure monitoring system is replaced or whenever fitting tyres of a different brand or type, the Automatic EOL cycle for the NTP ECU (Tyre Pressure Node) must be performed.

The vehicle is equipped with a system that monitors tyre pressure with special sensors installed inside the wheel rims, near the inflation valve. These sensors transmit a signal (433MHz or 315MHz) that is picked up by antennas installed on the bodyshell behind the gravel guards and connected to the ECU.

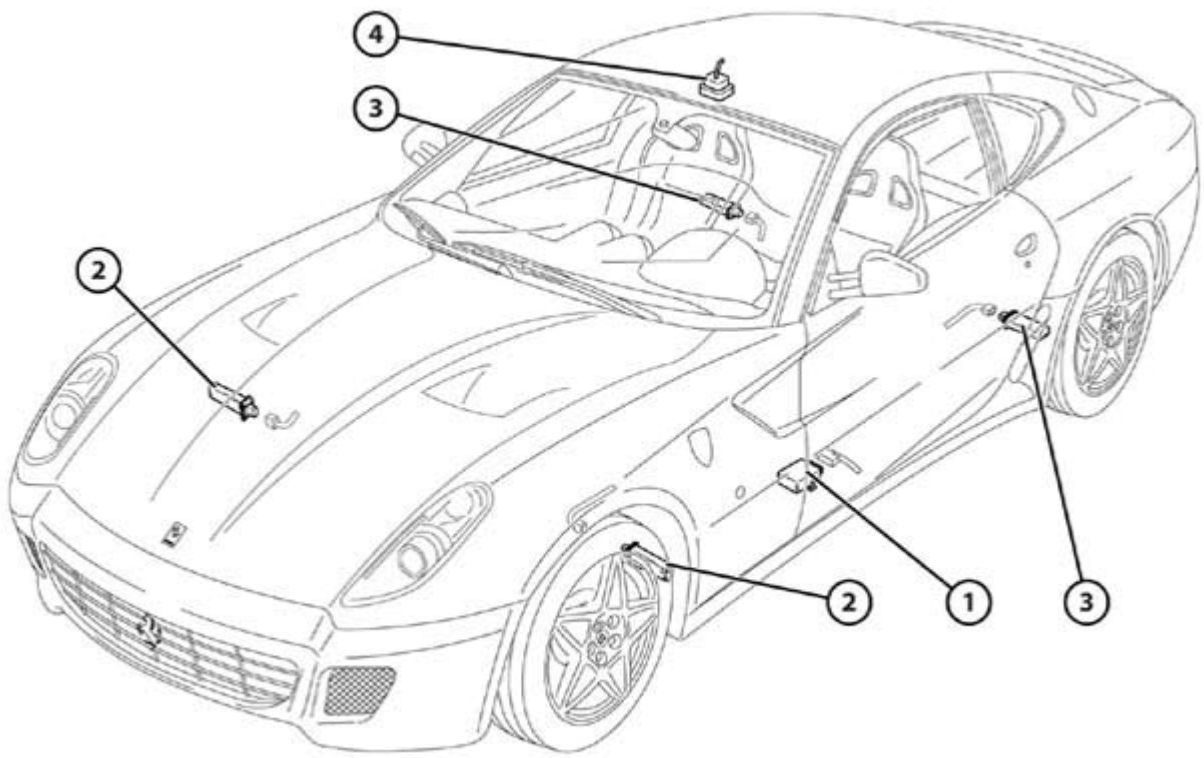
The tyre pressure monitoring system may be temporarily affected by radio disturbance emitted by devices using similar frequencies.

The signal transmitted by the ECU triggers the visualisation of a number of icons on the TFT display with two different priority levels: a **soft warning (sw)**, if the pressure drop relative to nominal pressure **is greater than 0.2 bar**, and a **hard warning (hw)** if the drop is **greater than 0.4 bar** or in the event of a reduction rate **greater than 0.2 bar/min**.



The calibration button **(4)** is located on the roof panel

Press the relative button to calibrate the system after replacing or inflating tyres.
Although the monitoring system warns the driver in the event of loss of tyre pressure, the tyres must still be periodically checked and inflated correctly.
The system will not warn the driver in the event of sudden tyre damage caused by external factors.



1 - Electronic Control Unit
2 - Front wheel antennas
3 - Rear wheel antennas
4 - Calibration button

Tyre pressure calibration

Note that once Run Flat tyres have been fitted, the instrument panel must be reprogrammed when refitting conventional tyres to prevent a warning message from being shown on the TFT display.

To calibrate the system, turn the ignition key to position **II** and press and hold the button **(4)** for 4 to 10 seconds.
The system takes up to 20 minutes to complete the calibration procedure with the vehicle moving. The condition detected is displayed on the TFT display.

Visualising messages on the "TFT" display (OBSOLETE SOLUTION)



The driver may access the information screen **(A)** (night mode) or **(B)** (day mode) displaying the pressure values for each tyre either by pressing the **"DISP"** button or from the Menu.

A



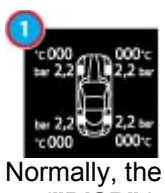
B



When an event-related indication must be displayed, the failure is displayed in place of the tyre pressure information. The failure is displayed for a time equal to its entire display cycle.
When the display cycle ends, the tyre pressure screen is available once again and the icon for the failure is displayed in the specific area until the failure is rectified.

- Normal conditions -

1



Normally, the driver may access the information screen (screen **1**) displaying the pressure values for each tyre either by briefly pressing the quick info recall button (**"DISP"** button) or from the Menu.

- Low pressure -

2



When the onboard instrument panel receives a message from the tyre pressure ECU indicating that one or more tyres have pressure values below the "check threshold", screens **2** and **3** are displayed together with the message **"Low tyre pressure"** for 20 seconds.

3



The symbol is then displayed in the warning light area (page **4**) until the situation is rectified, as with all other "HW" priority failures.

4



The specific page showing individual tyre pressures may be recalled at any time by the driver using the Menu function or the "DISP" button.
If the failure persists at the subsequent engine start, the indication is shown again on the display.



In certain cases, the system may not be able to identify which wheel is sending the failure signal. In this case, screen **5** will be displayed only, together with the message **"Low tyre pressure"**.
The symbol is then displayed in the warning light area (page **4**) until the situation is rectified, as with all other "HW" priority failures.
The information page showing the pressure value for each tyre cannot be recalled by the driver.
If the tyre pressure problem persists at the next engine start, the screen **5** is displayed once again, together with the message **"Low tyre pressure"**. The symbol is then displayed in the warning light area of the display until the problem is rectified, as with all other "hw" priority failures (screen **4**).

- Tyre puncture -



When the onboard instrument panel receives a message from the tyre pressure ECU indicating that one or more tyres have pressure values below the alarm threshold, pages **6** and **7** are displayed together with the message **"Tyre puncture"**.
Page **6** identifies the punctured tyre.



In the case of "RUN FLAT" tyres, pages **6** and **8** will be displayed together with the message **"Tyre puncture: MAX speed 80 km/h"**.



The same display logic used for all other "HW" priority failures is applied until the problem is rectified and the system recalibrated (after a key-off/key-on cycle).
Page **9** shows an example of the standard display, with the symbol shown in the warning light area - as with all other “HW” priority failures - until the problem is rectified and the system recalibrated.



If the problem persists at the next key-on, pages **6** and **7** will be displayed again together with the message **"Tyre puncture"**, or pages **6** and **8** together with the message **"Tyre puncture: MAX speed 80 km/h"**.
The symbol is then displayed in the warning light area (page **9**) until the situation is rectified and the system recalibrated.
In certain cases, the system may not be able to identify which wheel is sending the failure signal; in this case, page **10** will be displayed together with the message **"Tyre puncture"**, or page **11** together with the message **"Tyre puncture: MAX speed 80 km/h"**. When the cycle has been completed, the relative symbol will be displayed in the warning light area.





The information page showing the pressure value for each tyre cannot be recalled by the driver.
Here too, if the problem persists at the next key-on, page **10** will be displayed together with the message **"Tyre puncture"**, or page **11** together with the message **"Tyre puncture: MAX speed 80 km/h"**.
The symbol is then displayed in the warning light area (page **9**) until the situation is rectified and the system recalibrated, as with all other "HW" priority failures.
With "RUN FLAT" tyres, the instrument panel calculates (but does not display) the residual tyre operating range in kilometres and displays the message again after 50 km.
In "punctured tyre" state, if the vehicle is driven more than 100 miles, or at a speed over 80 mph, pages **6** and **12** are displayed together with the message **"Tyre puncture: stop vehicle"**, or pages **6** and **8** together with the message **"Tyre puncture: MAX speed 80 km/h"**.



If the system is unable to identify the punctured tyre, the same messages will appear but without displaying the vehicle image.

- System not calibrated -

If the system has not been calibrated or following a tyre replacement, page **13** will appear together with the message **"TPMS not calibrated"**.



Subsequently, the page reappears with the “icon” symbol in the warning light area (as with all other “HW” priority failures).
The system is calibrated by pressing and holding the specific button for 4 to 10 seconds, with the key been turned to ON. When the calibration button is pressed,

page **14** will appear for 5 sec. together with the message **"Calibration activated"**.



The page showing the pressure value for each tyre cannot be recalled by the driver.
Before calibrating the system ensure that the tyre pressures are correct as prescribed. If this is not done, the system may incorrectly indicate low pressure conditions.

- Tyre pressure monitoring system failure -



Page **15** together with the message **"TPMS failure"** appears in the following cases:
- failure in the circuit and/or wiring leading to the ECU;
- no signal received from one or more sensors due to failure, breakage or dead battery;
- ECU failure.

The display logic applied is the same as the logic used for all “HW” priority failures, with the symbol appearing in the dedicated area after 20 seconds.

- System temporarily inactive -



When one of the following conditions arises:
- excessively high temperature;
- during the first calibration procedure;
- radio frequencies disturbing the wheel sensor signal.

Page **16** appears together with the message **"TPMS temporarily inactive"**.

- System inactive -

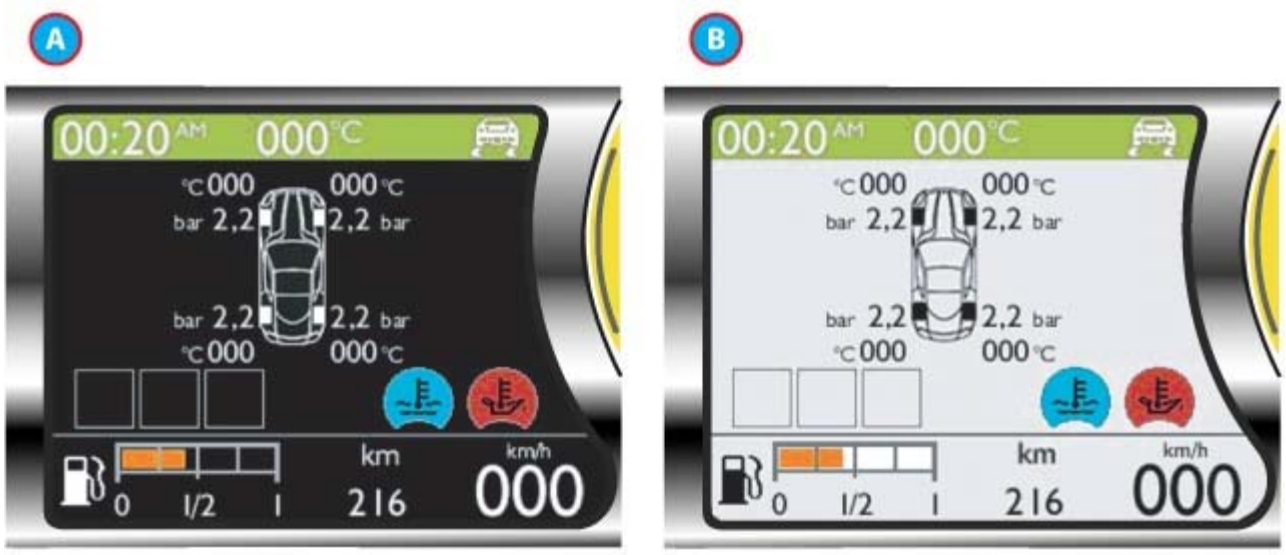


Page **17** together with the message **"TPMS inactive"** appears for a time ranging from a few seconds up to a minute after key-on, if the system was deactivated with the diagnostic tester.

Viewing messages on the "TFT" display (NEW SOLUTION)



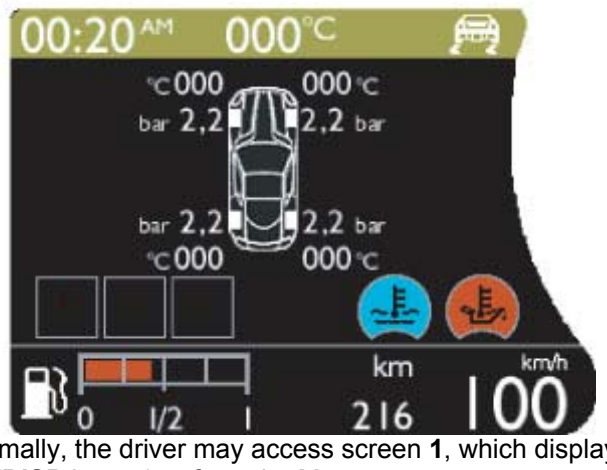
The driver may access the information screen **(A)** (night mode) or **(B)** (day mode) displaying the pressure and temperature values for each tyre either by pressing the **"DISP"** button or from the Menu.



When an event-related indication must be displayed, the vehicle symbol moves to the side of the Tyres screen to permit the display of the fault for the entire duration of its display cycle.
At the end of the display cycle, the Tyres screen is available once again and the vehicle symbol returns to the centre of the screen, and the icon for the fault is displayed in the specific area until the fault itself is rectified.

- Normal conditions -

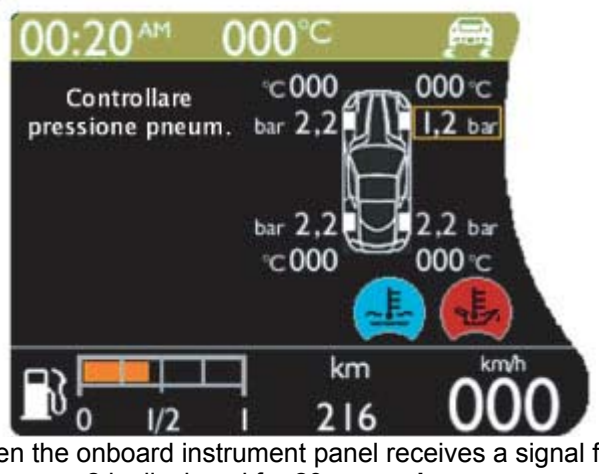
①



Normally, the driver may access screen **1**, which displays the pressure and temperature values for each tyre, either by briefly pressing the quick info recall button (**DISP** button) or from the Menu.

- Low pressure -

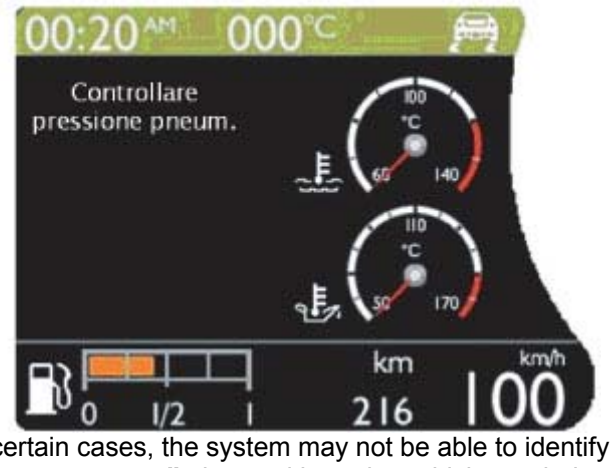
②



When the onboard instrument panel receives a signal from the tyre pressure ECU indicating that the pressure of one or more tyres is below the "check threshold", **screen 2** is displayed for **20 seconds**.
Regardless of the currently active screen, the fault is indicated with the specific message **“Check tyre pressure”** and the vehicle symbol indicating the tyre pressure. The pressure value and relative unit of measurement for the faulty tyre are framed by an amber rectangle. The display period is **20 seconds**, after which time the specific screen disappears.
At key-off, no information is displayed but the function continues to monitor tyre pressure while the vehicle is parked; if the fault persists at the subsequent key-on, the screen described above is shown again on the display.

Screen 1 may be recalled whenever required via the relative Menu function or by pressing DISP, enabling the driver to identify the tyres with insufficient pressure at any time.

③

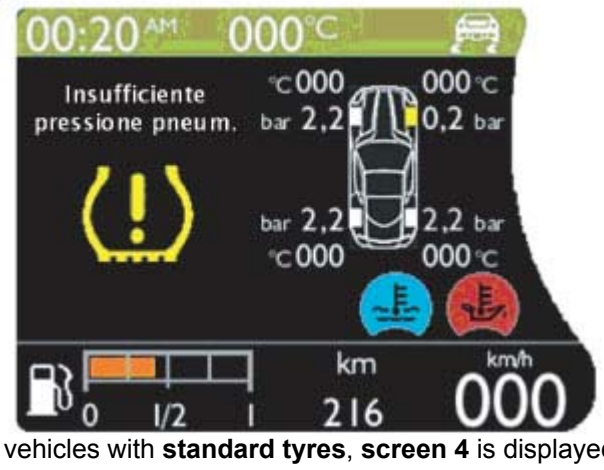


In certain cases, the system may not be able to identify the wheel generating the fault signal. In this case, **screen 3** is displayed, containing the message **"Check tyre pressure"** alone, without the vehicle symbol.
In this case, the default screen is activated immediately (even if **screen 1** was active when the fault occurred).
After the display period of **20 seconds**, the specific screen disappears.
As **screen 1** cannot display these values, it is not recallable by the driver.
In this case too, no information is displayed at key-off; if the pressure fault persists at the subsequent key-on, the screen described above is shown again on the display.

- Tyre puncture -

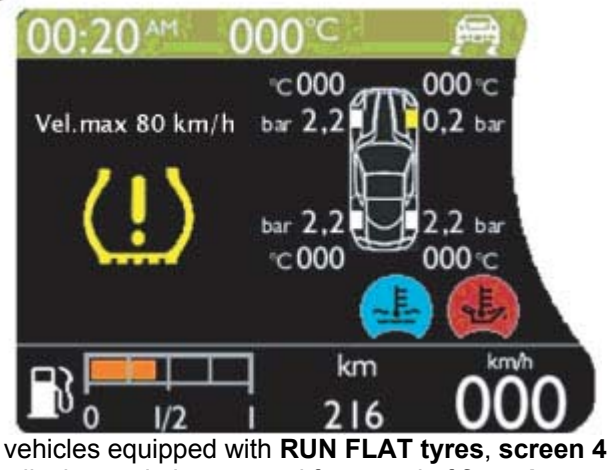
With any currently active screen, when the onboard instrument panel receives a signal from the tyre pressure ECU indicating that one or more tyres have pressure values below the "alarm threshold", the warning lamp on the instrument panel lights constantly and the relative message and specific symbol are displayed, together with the vehicle symbol indicating the faulty tyre.
The active screen prior to the failure event remains set in the menu.

④



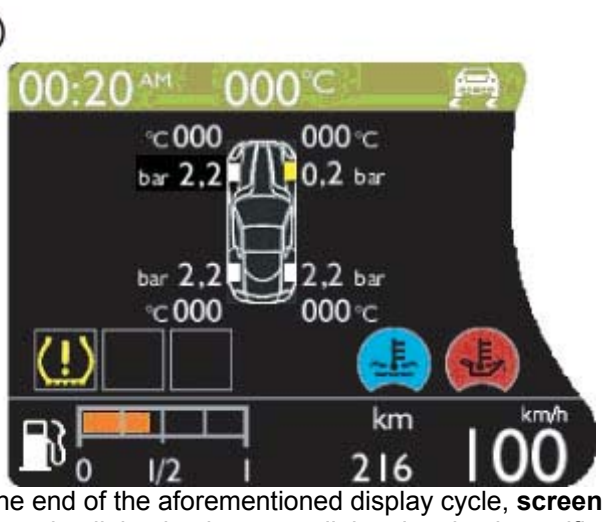
On vehicles with **standard tyres**, **screen 4** is displayed.

⑤



On vehicles equipped with **RUN FLAT tyres**, **screen 4** is displayed for **3 seconds**, after which **screen 5** is displayed for **2 seconds**.
The display cycle is repeated for a total of **four times**.

⑥

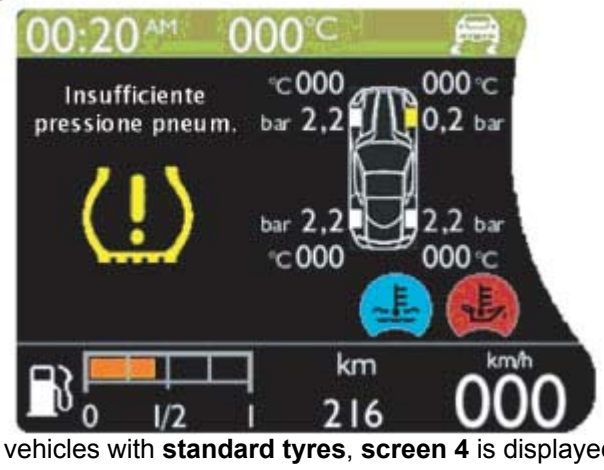


At the end of the aforementioned display cycle, **screen 6** is displayed, in which the warning light remains constantly lit, and the specific symbol is displayed in the warning light check area until the situation is rectified (after subsequent system calibration), as with all other priority 2 faults.
When **screen 1** is active, the vehicle symbol, **with the relative tyre highlighted in yellow**, will also be displayed.

The instrument panel continues to calculate (but does not display) the remaining range in Km (or mi) and repeats the warning after **50 Km (31** mi).
If the vehicle is driven for more than **100 Km (62 mi)** or at a vehicle speed above **80 Km/h (50 mph)** in "punctured tyre" state, **screen 4** or **screen 5** is displayed,

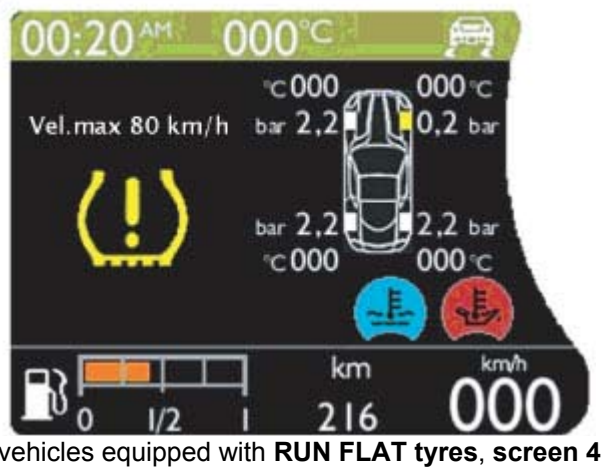
according the logic implemented for priority 0 faults.

④



On vehicles with **standard tyres**, **screen 4** is displayed.

⑤



On vehicles equipped with **RUN FLAT tyres**, **screen 4** is displayed for **3 seconds**, after which **screen 5** is displayed for **2 seconds**.

⑦



⑧



In the event of a puncture to another tyre, the instrument continues to calculate (but does not display) the updated remaining range in Km (mi), in relation to the distance driven since the previous puncture event.
Screen 7 will be displayed for **3 seconds**, after which **screen 8** is displayed for **2 seconds**.
The display cycle is repeated for a total of **four times**.

Pressing the **MODE** button during the display cycle for a priority 0 fault (puncture with standard tyres) immediately accesses the Set-up Menu screen, as with all priority 0 faults.
If the MODE button is pressed during the aforementioned priority 2 fault display cycle (RUN FLAT tyre puncture, with speed limit not exceeded and with tyres still in usable condition), **screen 6** is displayed with the iconised symbol in the warning light area, as with all other priority 2 faults, until the situation is rectified and the system recalibrated as requested by the system itself.

Even in the event of tyre puncture, **screen 1** is still recallable via the relative Menu function or by pressing DISP.

In certain cases, the system may not be able to identify which wheel is generating the fault signal.

(9)



On vehicles equipped with **standard tyres**, the vehicle symbol is not displayed. If the fault occurs while **screen 1** is active, **screen 9** is displayed automatically.

(10)



On vehicles equipped with **RUN FLAT tyres**, the vehicle symbol is not displayed. If the fault occurs while **screen 1** is active, **screen 9** is displayed automatically for **3 seconds**, after which **screen 10** is displayed for **2 seconds**.
The display cycle is repeated for a total of **four times**.

At the end of the display cycle, the specific symbol is displayed in the warning light check area until the situation is rectified (and subsequent system recalibration), as with all other priority 2 faults.

The instrument panel continues to calculate (but does not display) the remaining range in Km (or mi) and repeats the warning after **50 Km (31** mi).
If the vehicle is driven for more than **100 Km (62 mi)** or at a vehicle speed above **80 Km/h (50 mph)** in “punctured tyre” state, **screen 9** or **screen 10** is displayed, according the logic implemented for priority 0 faults.

Screen 1 is not recallable by the driver.

- System not calibrated -

If the system has not been calibrated or following a tyre replacement, the specific warning light on the instrument panel flashes for a maximum period of 90 seconds, after which it remains lit constantly until the system is calibrated.

(11)



Simultaneously, **screen 11** is displayed for **20 seconds**.
In these cases, the vehicle symbol is not displayed.

Subsequently, **screen 11** is displayed again with the symbol reduced to icon in the warning light area (as with all other priority 2 faults).
The system may be calibrated by pressing and holding the relative button in both key-on and key off states.

(12)



When the button is pressed and calibration is performed, **screen 12** is displayed for **5 seconds**.

In “Calibration activated” state **screen 1** is recallable, but the pressure and temperature values are replaced by dashes.

- Tyre pressure monitoring system failure -

This indication may occur in the following cases:
- failure in circuit and/or wiring harness leading to ECU;
- no signal received from one or more sensors due to failure, breakage or dead battery;
- TPMS ECU malfunction.

In the case of this fault, the specific indicator light on the instrument panel starts flashing and continues to flash for a maximum period of 90 seconds, after which the indicator light remains lit continuously until normal operating conditions are restored.

(13)



Simultaneously, **screen 13** is displayed for **20 seconds**.
In these cases, the vehicle symbol is not displayed.

Screen 1 is not recallable by the driver.

- System temporarily inactive -

When one of the following conditions arises:
- sensors overheated;
- the ECU fails to recognise the sensor identifiers during calibration;
- radio frequencies disturbing the sensor signal;

the specific indicator light on the instrument panel starts flashing and continues to flash for a maximum period of 90 seconds, after which the indicator light remains lit continuously until normal operating conditions are restored.

(14)



Simultaneously, **screen 14** is displayed for **20 seconds**.
In this case, the vehicle symbol is not displayed.

The specific symbol is then displayed in the warning light check area until the situation is rectified, as with all other priority 2 faults.

Screen 1 is not recallable by the driver.

- System inactive -

If the system has been disabled via the diagnostic tester, the specific indicator light on the instrument panel starts flashing and continues to flash for a maximum period of 90 seconds, after which the indicator light remains lit continuously until normal operating conditions are restored.

(15)



Simultaneously, **screen 15** is displayed.

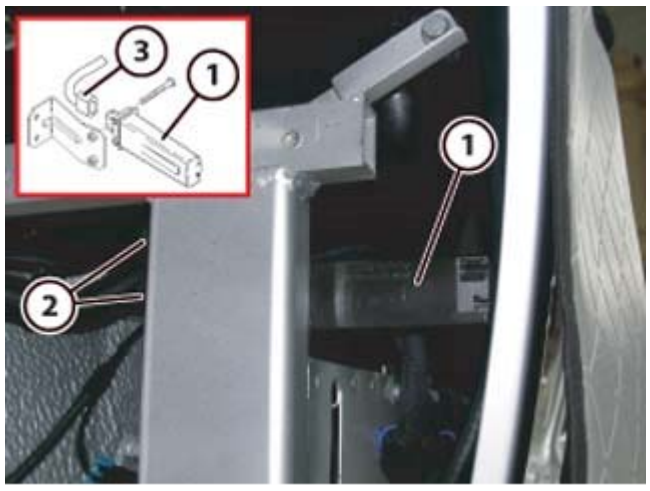
In this case, the vehicle symbol is not displayed.

After the failure display period, the relative information is no longer displayed.
If, however, the driver presses the button with the “ESCAPE” function during the display cycle, the specific symbol indicated is displayed in the warning light check area until the situation is rectified, as with all other priority 2 faults.

Screen 1 is not recallable by the driver.

Removing the front antenna

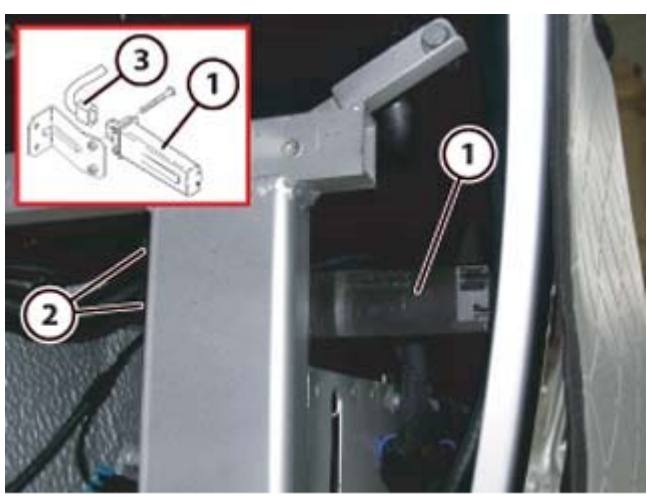
- Set the battery master switch to OFF (L2.02).
- Remove the front wheelhouses (M2.05).
  - Remove the rear section.



- Undo the two screws **(2)** fastening the antenna mounting bracket **(1)** to the chassis.
- Move the antenna **(1)** to facilitate disconnection of the relative connector **(3)** (S079) (S080).
- Remove the front antenna **(1)** from the wheel bay.

Refitting the front antenna

Whenever any component of the tyre pressure monitoring system is replaced or whenever fitting tyres of a different brand or type, the Automatic EOL cycle for the NTP ECU (Tyre Pressure Node) must be performed.

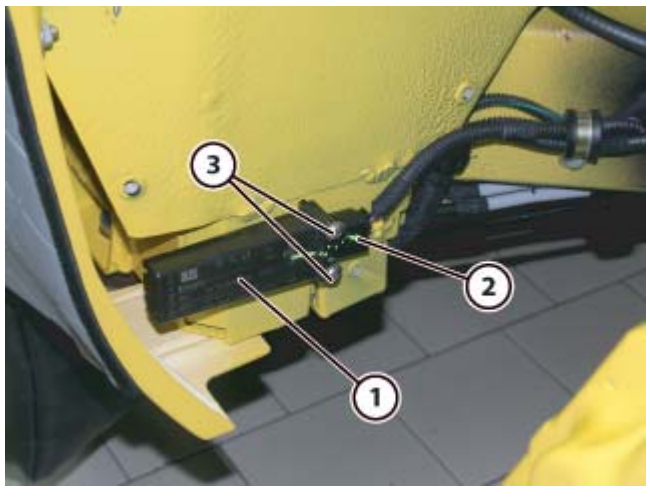


- Fit the front antenna **(1)** in the wheel bay and connect the connector **(3)** (S079) (S080).
- Fit the front antenna **(1)** complete with bracket in its relative seat on the chassis and fasten with the two screws **(2)**.

- Refit the front wheelhouses (M2.05).
- Set the battery master switch to ON (L2.02).

Removing the rear antenna

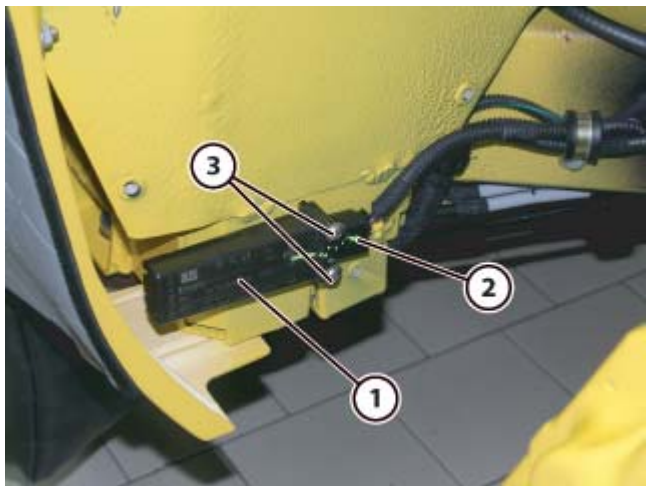
- Set the battery master switch to OFF (L2.02).
- Remove the rear wheelhouses (M2.05).
  - Remove the front section.



- Remove the connector **(2)** (S081) (S082).
- Undo the two screws **(3)** fastening the antenna **(1)** to the bodywork.
- Remove the rear antenna **(1)** from the wheel bay.

Refitting the rear antenna

Whenever any component of the tyre pressure monitoring system is replaced or whenever fitting tyres of a different brand or type, the Automatic EOL cycle for the NTP ECU (Tyre Pressure Node) must be performed.



- Position the rear antenna **(1)** in its seat in the wheel bay and secure it with the two screws **(3)**.
- Attach the connector **(2)** (S081) (S082).

➢ Refit the rear wheelhouses (M2.05).
➢ Set the battery master switch to ON (L2.02).

Tyre pressure sensor

The sensors are mounted to the wheel rim and secured by the inflation valve.
The sensor must be correctly fixed to the valve for the system to function.

ALWAYS replace with new components when REMOVING the TPMS sensor, complete with valve, from the rim.
Replace the entire sensor-valve assembly even if only one of the components is damaged.
Detaching the tyre from the rim without due caution may cause irreparable damage to the sensor.

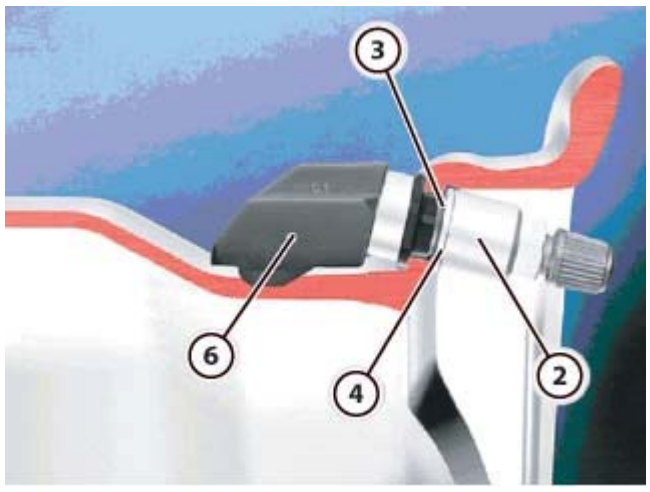
Removing the tyre pressure sensors

ALWAYS replace with new components when REMOVING the TPMS sensor, complete with valve, from the rim.
The sealant liquid contained in puncture repair aerosols may damage the sensor. Always replace the sensor if a tyre has been repaired with a puncture repair aerosol.
Replace the entire sensor-valve assembly even if only one of the components is damaged.

➢ Remove the tyre (F2.08).



- To prevent the inflation valve from turning, insert the rod **(1)**, included in the kit, in the hole on the sensor side.



- Undo the nut **(2)** from the inflation valve, retrieving the insulator washer **(3)**.
- Remove the sensor **(6)** with valve **(4)** from the wheel rim and replace.

Refitting the tyre pressure sensors



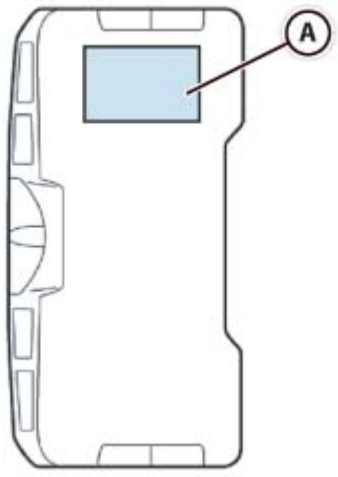
Tightening torque		**Nm**	**Class**
Fastening tyre inflation valve	Nut	4 Nm	A

Tightening torque		**Nm**	**Class**
Fastening tyre pressure sensor	Screw	4 Nm	A

When replacing the tyre pressure sensors, carry out the new ECU sensor acquisition procedure with the SD3 tester.

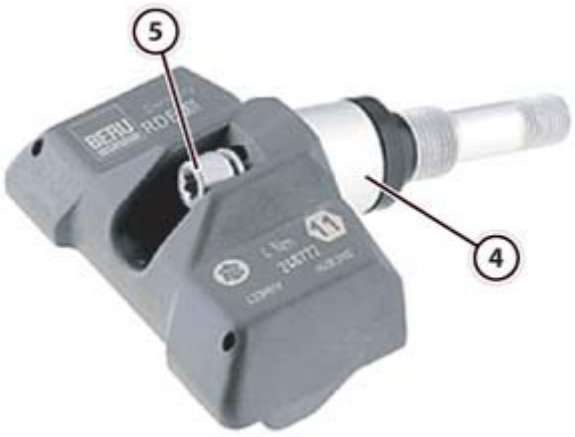
Always finish all the components in the batch opened previously before starting a new sensor batch, as the sensors are equipped with a battery with a limited lifespan.
Once the sensor has been activated, the internal battery has a lifespan of approximately 10 years.

ALWAYS replace with new components when REMOVING the TPMS sensor, complete with valve, from the rim.
The sealant liquid contained in puncture repair aerosols may damage the sensor. Always replace the sensor if a tyre has been repaired with a puncture repair aerosol.
Replace the entire sensor-valve assembly even if only one of the components is damaged.

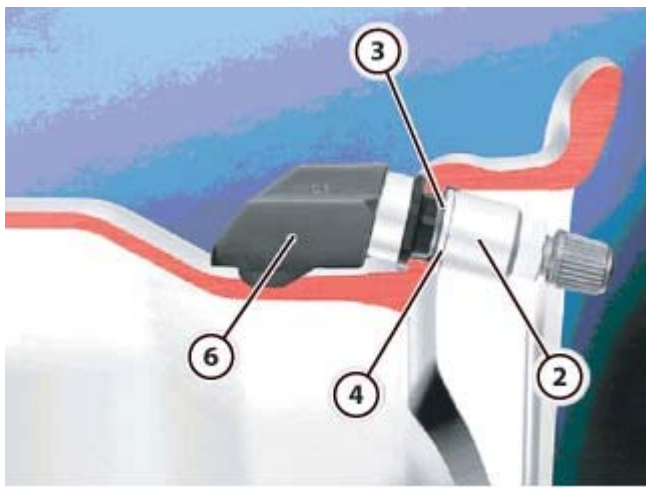


The sensor must not be treated with detergents, solvents or other harsh products.
Do not clean with compressed air or pressurised liquids (e.g. pulivapor).
Take particular care not to tear the surface of the filter interface (A) on the inner side of the sensor.
Always replace the sensor if the interface surface is dirty or torn.
Store all the components of the sensor-valve assembly in a clean, dry place.

- Select a new TPMS valve-sensor assembly.
- Clean the sensor mating area on the wheel rim.
- Check that the sensor frequency matches the system frequency: **433 MHz** for the **STANDARD** version, white label on sensor; **315 MHz** for the **JAPAN** version, blue label on sensor.



- Fit the self-locking screw **(5)** in the hole on the sensor and tighten the valve **(4)** by two or three turns.



- Fit the valve **(4)** with sensor **(6)** already assembled, in the hole on the wheel rim.

Ensure that the insulating washer is fitted onto the outside of the rim and is perpendicular to the valve.

- Fit the insulating washer **(3)** and tighten the nut **(2)** fully.



Use a rod to ensure that the hole on the valve is kept outside the rim.

- Fit the rod **(1)** in the radial hole of the valve and tighten the nut **(2)**.

ALWAYS use a torque wrench, using only certified and calibrated tools to ensure that the correct tightening torque is achieved.

Tightening torque	**Nm**	**Class**
Nut	4 Nm	A

- Remove the rod **(1)**.



For the sensor to function correctly, there must be contact between the rim and the mounting points of the sensor itself. The system may not function correctly if the sensor is not installed exactly as instructed.

- Push the sensor gently onto the rim to ensure contact between the rim and the mating surface of the sensor itself.
- Tighten the self-locking screw **(5)**.

ALWAYS use a torque wrench, using only certified and calibrated tools to ensure that the correct tightening torque is achieved.

Tightening torque	Nm	Class
Screw	4 Nm	A

➢ Refit the tyre (F2.08).
➢ Carry out the automatic EOL cycle for NTP ECU (Tyre Pressure Node) (L2.13).

Activating the tyre pressure sensor

Always finish all the components in the batch opened previously before starting a new sensor batch, as the sensors are equipped with a battery with a limited lifespan.
Once the sensor has been activated, the internal battery has a lifespan of approximately 10 years.

During manufacture, the tyre pressure sensor is put into a dormant state to preserve battery life during storage.
The sensor is activated when it detects a given pressure. To activate, proceed as follows.

- Refit the tyre pressure sensors (F2.09).
- Refit the tyre (F2.08).
- Inflate the tyre to a pressure greater than **0.6 bar (8.7 psi)** and keep inflated at this pressure **for a few minutes**. This causes the sensor to activate.
- Inflate the tyre to the specified pressure.
- Refit the wheel (F2.08).

F2.10 Set-up check and adjustment

Checks and preparation of vehicle

Check the following before inspecting the set-up:
- Wheel fastening;
- Tyre pressure;
- Clearance between pinion and rack in steering system;
- Clearance between ball studs and steering tie-rods;
- State of the gas shock absorbers;
- Play between the stub axle pillar and the ball joints;

To facilitate adjustment, set-up data for the vehicle WITHOUT BALLAST SAND BAGS is provided.
Please note that the following set-up adjustment procedure must be performed WITHOUT BALLAST sand bags placed on the seats.
The setup data has therefore been converted, and the new data must be entered in the specific vehicle setup adjustment equipment.

Set the vehicle on a flat surface, **filled with the correct quantities of fluids**, with a full tank of fuel and with the parking brake engaged.
If the tank is not full, place **0.735 Kg** on the transmission tunnel for every litre of missing fuel.
Toe-in is measured over a diameter of **495 mm**.

The following set-up data is relative to the car WITHOUT SAND BAGS.

On "HGTE" / "60 F1" vehicle variants, the shock absorber height must be adjusted with particular care as there is a risk of the spring detaching at maximum extension if this parameter is incorrectly set.

Front geometry data

Adjusted vehicle height	140.4±4.5 mm
Wheel camber	- 0.74° ± 0.17°
Front caster	5.95° ± 0.72°

Rear geometry data

Adjusted vehicle height	169.7±4.5 mm
Wheel camber	- 1.23° ± 0.17°
Rear caster	5.33° ± 0.5°

Toe-in

	Total	**On wheel**
Front	3.5±0.5 mm	1.75±0.25 mm
Rear	2.7±0.5 mm	1.35±0.25 mm

Front geometry data (for "HGTE" / "60 F1" variants)

Adjusted vehicle height	128.7±4.5 mm
Wheel camber	- 1.23° ± 0.17°
Front caster	6.58° ± 0.72°

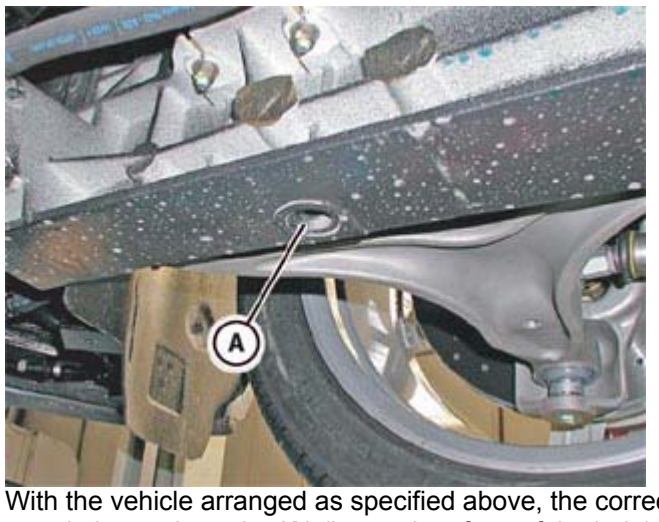
Rear geometry data (for "HGTE" / "60 F1" variants)

Adjusted vehicle height	160±4.5 mm
Wheel camber	- 1.67° ± 0.17°
Rear caster	5.34° ± 0.5°

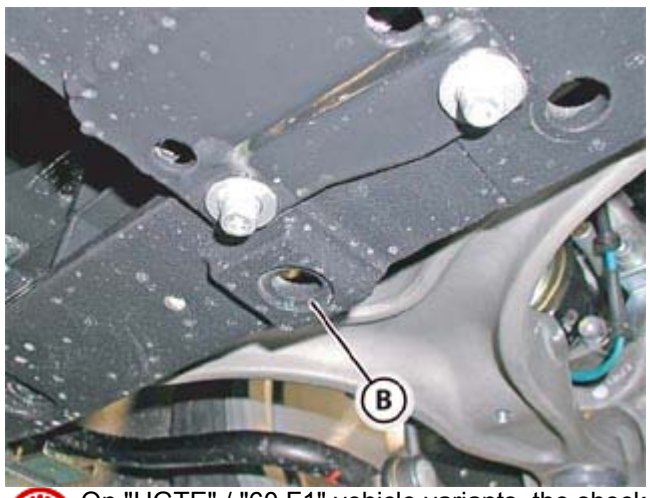
Toe-in (for "HGTE" / "60 F1" variants)

	Total	**On wheel**
Front	3.6±0.5 mm	1.8±0.25 mm
Rear	1.7±0.5 mm	0.85±0.25 mm

Height check



With the vehicle arranged as specified above, the correct height of the vehicle measured between the ground and the front section of the chassis, measured in relation to the point **(A)** (internal surface of the hole), must correspond to the specified set-up values.

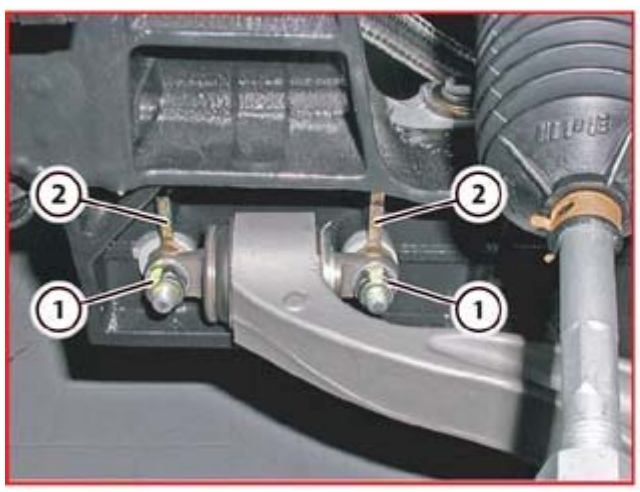


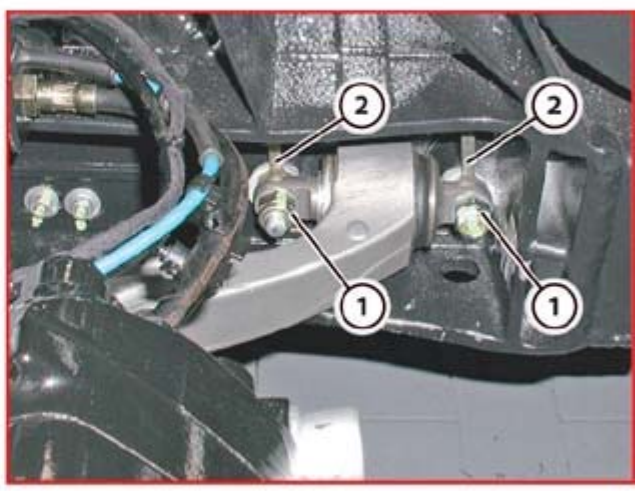
On "HGTE" / "60 F1" vehicle variants, the shock absorber height must be adjusted with particular care as there is a risk of the spring detaching at maximum extension if this parameter is incorrectly set.

With the vehicle arranged as specified above, the correct height of the vehicle measured between the ground and the rear section of the chassis, measured in relation to the point **(B)** (internal surface of the hole), must correspond to the specified set-up values.

Front suspension

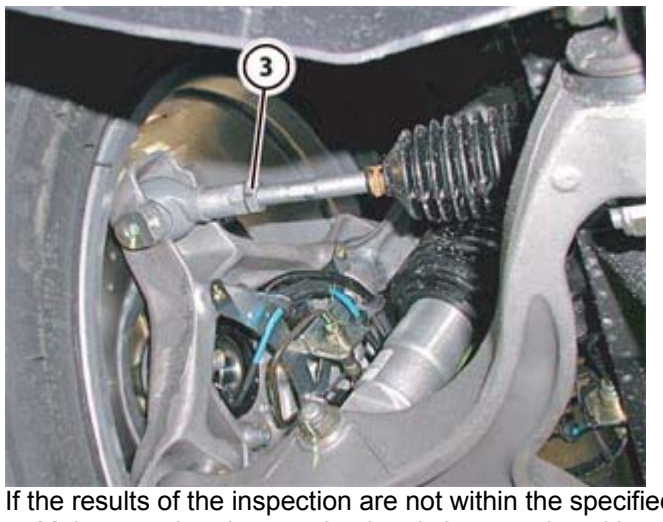
- Wheel camber -





- Check that the lower suspension arms are in the correct position.
- If the results of the inspection are not within the specified limits, loosen the nuts **(1)** and insert new shims **(2)** until the wheel camber angle is between the values specified above.
- Tighten the nuts to a torque of **60 Nm**.

- Toe-in -

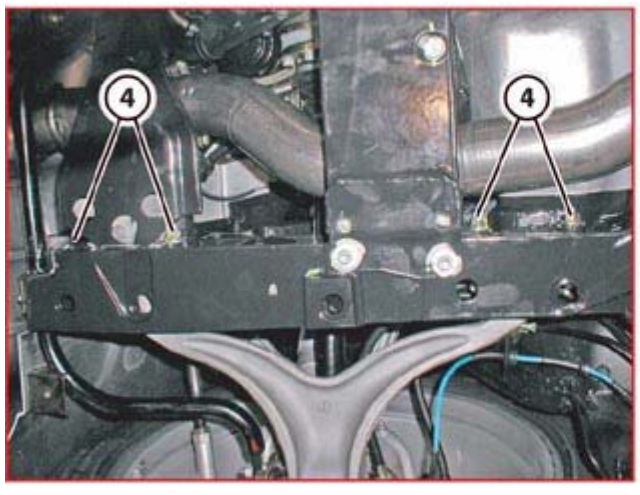


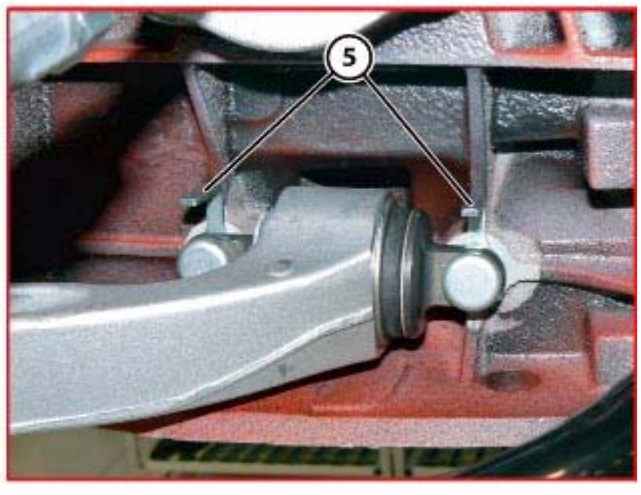
If the results of the inspection are not within the specified values, perform the following operations:

- Make sure that the steering box is in central position and that the steering wheel is perfectly horizontal. To assess this condition, use a mounting fitted with a spirit level. In this position, the two lateral tie-rods should be equal in length. If they are not equal, adjust them.
- Loosen the nuts **(3)** on the lateral tie-rod ball joints; adjust their length equally to obtain the correct toe-in value.
- Tighten the nuts to a torque of **60 Nm**.

Rear suspension

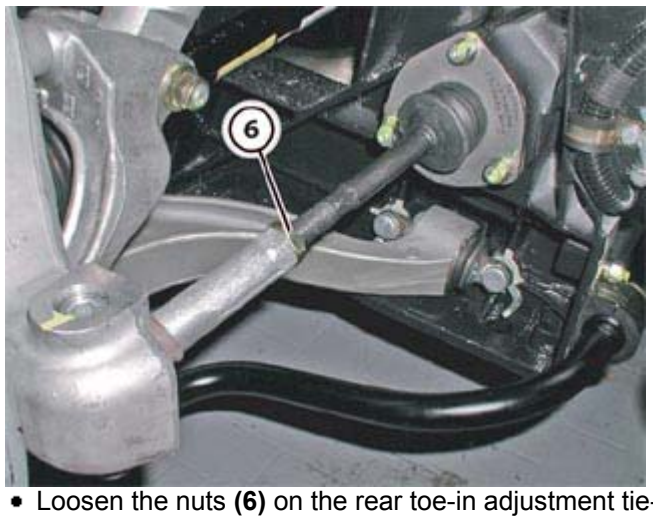
- Wheel camber -





- Check that the lower suspension arms are in the correct position.
- If the value is not within the specified limits, loosen the nuts **(4)** and insert new shims **(5)** until the wheel camber angle is between the specified values.
- Tighten the nuts to a torque of **60 Nm**.

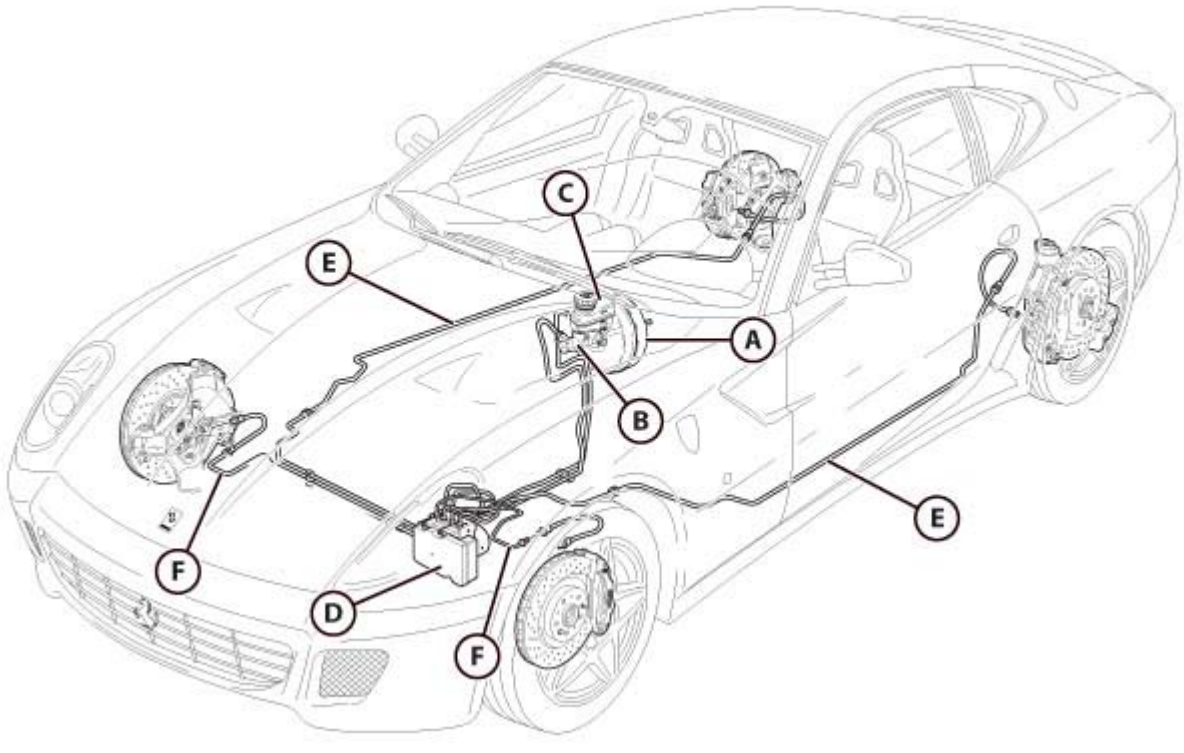
- Toe-in -



- Loosen the nuts **(6)** on the rear toe-in adjustment tie-rod ball joints and adjust their length to obtain the correct toe-in value.
- Tighten the nuts to a torque of **60 Nm**.

G1.01 Technical specifications-System diagram

Braking system layout



A - Brake servo
B - Master brake cylinder
C - Brake fluid tank
D - ABS/ASR electronic control unit
E - Rear wheel brake pipe unions
F - Front wheel brake pipe unions

Disc diameter

	Front discs	Rear discs
Disc diameter	355 mm	330 mm
CCM disc diameter (optional)	398 mm	360 mm

Nominal brake disc thickness

	Front discs	Rear discs
Nominal brake disc thickness	32 mm	28 mm
Rated CCM brake disc thickness (optional)	36 mm	32 mm

G1.02 Tightening torques

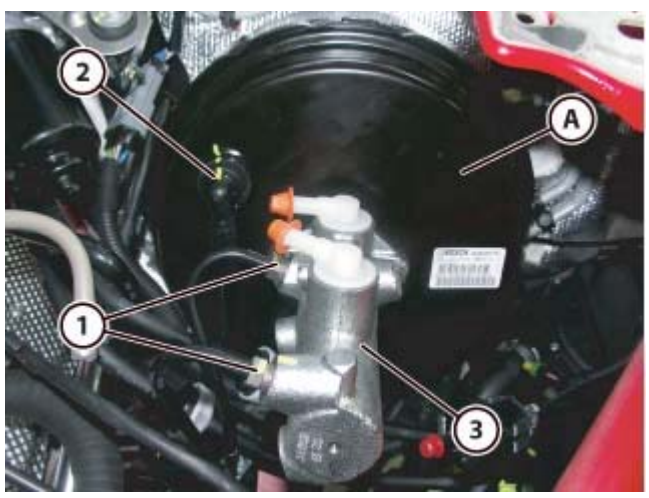


Tightening torque		Nm	Class
Complete pedal board - brake servo	Nut	20 Nm	B
Complete pedal board - bodyshell	Screw	20 Nm	B
Clutch pump	Nut	20 Nm	B
Blanking plate - bodyshell	Nut	20 Nm	B
ABS unit mounting bracket - chassis (lateral fastener)	Nut	8 Nm	B
ABS unit mounting bracket - chassis	Screw	20 Nm	B
Brake fluid pipes - master brake cylinder	Union	16 Nm	B
Intermediate brake fluid pipe connections	Union	16 Nm	B
Connection between rigid brake pipe and calliper	Union	16 Nm	B
Front brake air flap	Screw	5 Nm	B
Connection between rigid brake pipe and hose	Union	16 Nm	B
Brake calliper bleed union	Union	15 Nm	B
Brake disc - bearing	Screw	15 Nm	C
Locator pin - brake disc	Pin	15 Nm	C
Screw fastening calliper to stub axle	Screw	100 Nm	A
Screw fastening calliper to hub carrier	Screw	100 Nm	A
Screw fastening brake hose to calliper	Union	16 Nm	B
Brake fluid pipes from master brake cylinder - ABS/ASR electrohydraulic unit	Union	16 Nm	B
Brake fluid outlet pipes - electrohydraulic unit	Union	16 Nm	B

G2.01 Brake servo-Pump

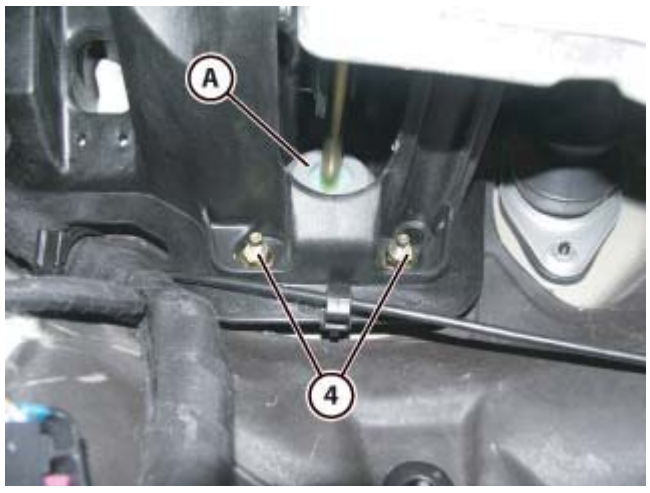
Removing the brake servo

➢ Remove the brake fluid tank (G2.02).

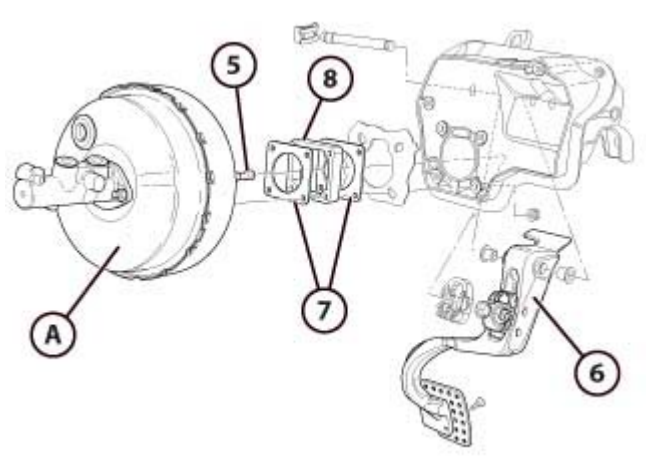


- Undo the brake pipe unions **(1)** from the master brake cylinder **(3)**.
- Disconnect the vacuum pipe **(2)** on the brake servo **(A)**.

- Place the pipes you have removed out of the way, without bending or twisting them, so that they do not hinder the following operations.



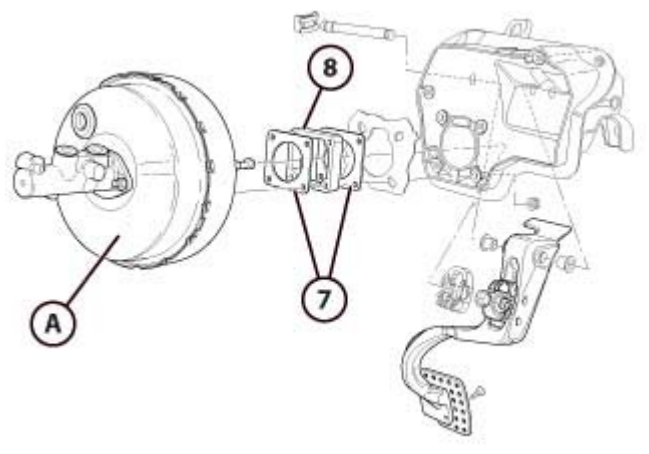
- Working from underneath the driver side of the dashboard, undo the four nuts **(4)** (2 each side), fastening the brake servo **(A)** to the pedal board.



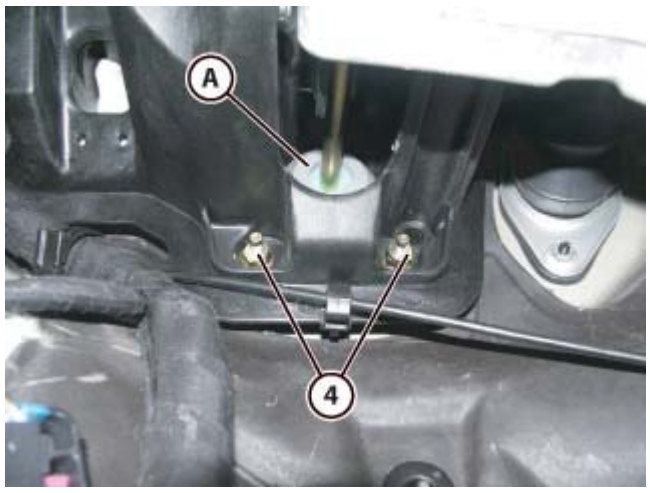
- Detach the brake servo pin **(5)** from the brake pedal **(6)** and remove the brake servo **(A)** from the engine compartment complete with master brake cylinder.
- Retrieve the two firewall gaskets **(7)** and the relative spacer **(8)**.

Refitting the brake servo

Tightening torque		**Nm**	**Class**
Complete pedal board - brake servo	Nut	20 Nm	B
Brake fluid pipes - master brake cylinder	Union	16 Nm	B

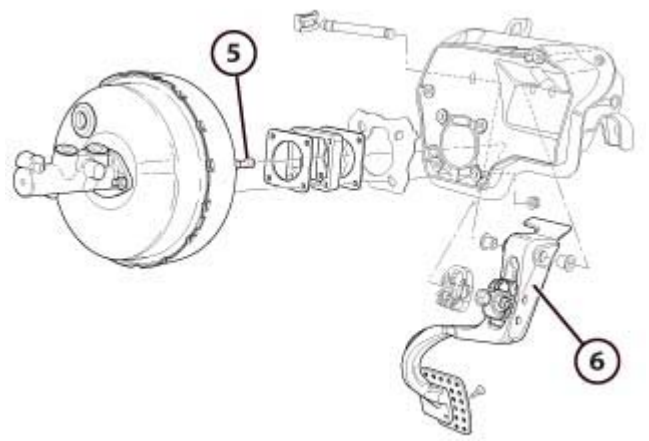


- Position the brake servo unit **(A)** inside the engine compartment and, after having positioned the two fire guard gaskets **(7)** and related spacers **(8)**, introduce it into its location on the pedal board.

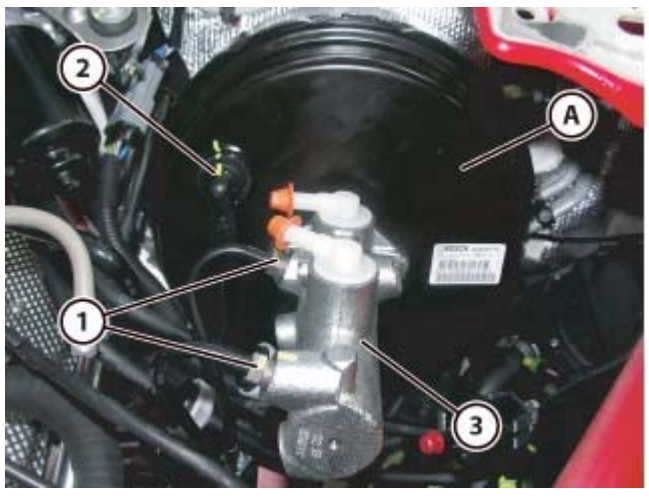


- Secure the brake servo **(A)** by tightening the four nuts **(4)** (2 each side).

Tightening torque	Nm	Class
Nut	20 Nm	B



- Push the brake pedal **(6)** down to its limit so it hooks with the push rod **(5)** of the brake servo.
- Release the brake pedal **(6)** and make sure that it has been correctly hooked.



- Secure the two unions **(1)** of the brake pipes to the brake master cylinder **(3)**.

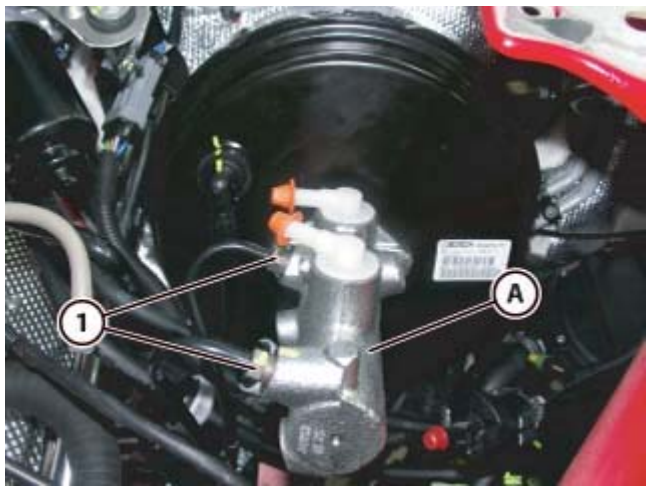
Tightening torque	Nm	Class
Union	16 Nm	B

- Connect the vacuum pipe **(2)** on the brake servo **(A)**.

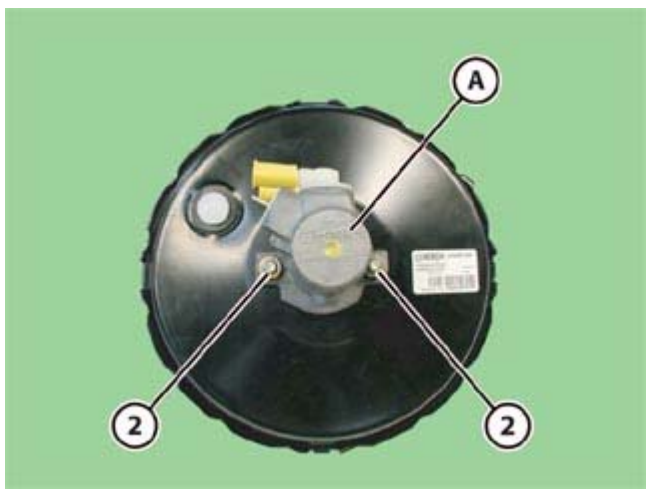
➢ Refit the brake fluid tank (G2.02).
➢ Fill and bleed the braking system (G2.10).

Removing the master brake cylinder

➢ Remove the brake fluid tank (G2.02).



- Unscrew the brake pipe unions **(1)** from the master brake cylinder **(A)**.
- Place the pipes in a safe place, taking care not to bend or twist them so that they do not require straightening for the next operation.

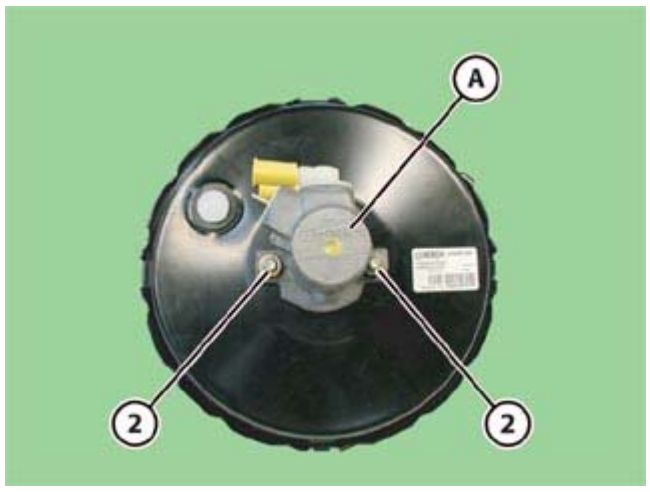


Brake fluid may leak during the removal of the brake master cylinder from the brake servo; ensure that the oil does not come into contact with surrounding parts.

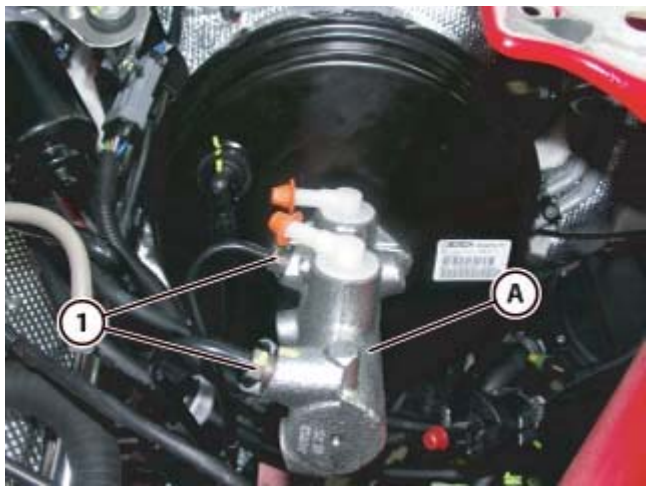
- Unscrew the two nuts **(2)** fastening the master brake cylinder **(A)** to the brake servo.
- Remove the master brake cylinder **(A)** from the engine compartment.

Refitting the master brake cylinder

			
Tightening torque		**Nm**	**Class**
Brake fluid pipes - master brake cylinder	Union	16 Nm	B



- Fit the master brake cylinder **(A)** onto the pins on the brake servo and tighten the two fastener nuts **(2)**.



- Reconnect the brake pipes, tightening the two unions **(1)** on the master brake cylinder **(A)**.

		
Tightening torque	**Nm**	**Class**
Union	16 Nm	B

- Refit the brake fluid tank (G2.02).
- Fill and bleed the braking system (G2.10).

G2.02 Brake fluid tank

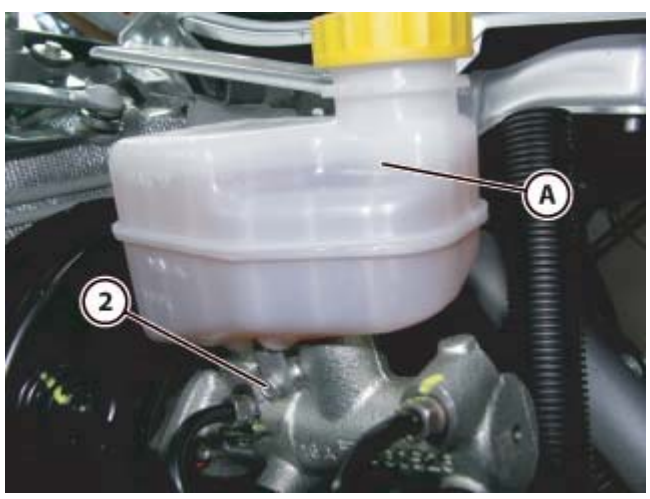
Removing the brake fluid tank

Pour the oil drained from the system into a container and seal it. DO NOT dispose of used oil in the environment.

- Set the battery master switch to OFF (L2.02).
- Remove the left hand side windscreen shield (M2.17).
- Drain the brake fluid tank completely, aspirating the fluid with a syringe.



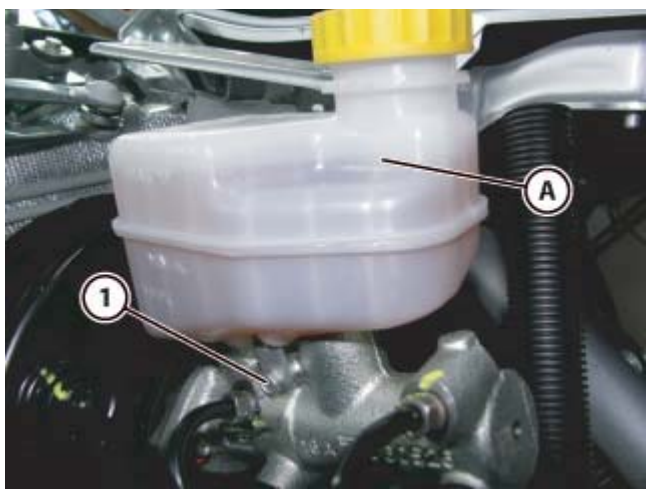
- Disconnect the connector **(1)** (S003)on the tank.



The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

- Undo the screw **(2)** fastening it to the master brake cylinder.
- Remove the tank **(A)** and plug the inlets on the master brake cylinder to prevent foreign bodies from entering.

Refitting the brake fluid tank



The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

- Fit the brake fluid tank **(A)** on the pump and fasten with the screw **(1)**.



- Connect the connector **(2)** (S003)on the tank.

- Set the battery master switch to ON (L2.02).
- Fill and bleed the braking system (G2.10).
- Bleed the clutch system (D2.14).

This operation is necessary only on vehicles with mechanical gearboxes.

G2.03 Pedal board-Pedal position adjustment

Replacing the pedal board

Tightening torque		**Nm**	**Class**
Complete pedal board - brake servo	Nut	20 Nm	B
Complete pedal board - bodyshell	Screw	20 Nm	B

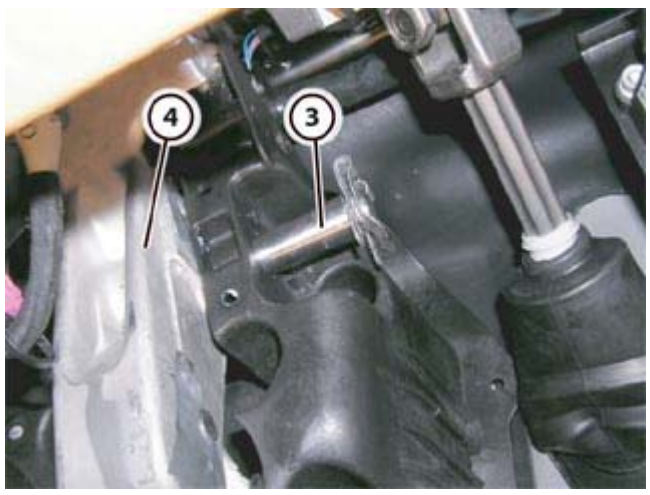
➢ Set the battery master switch to OFF (L2.02).



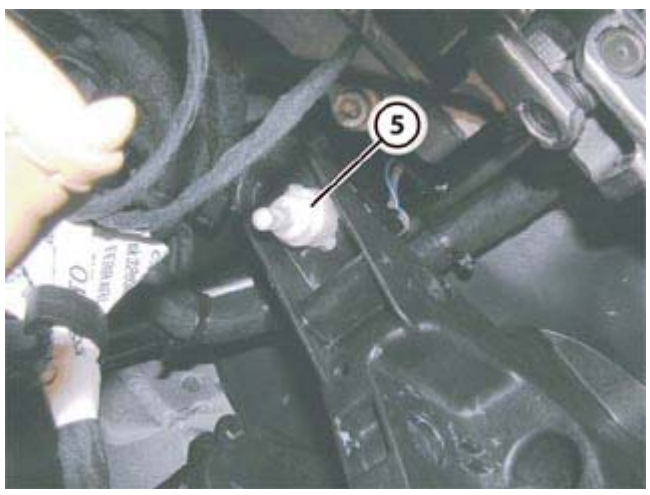
- Detach the servo brake push rod by releasing the clip **(1)**.



- Remove the clip **(2)**.



- Remove the pivot **(3)** then remove the brake pedal **(4)**.



- Disconnect the connector (D006) from the brake pedal stop light switch **(5)**.

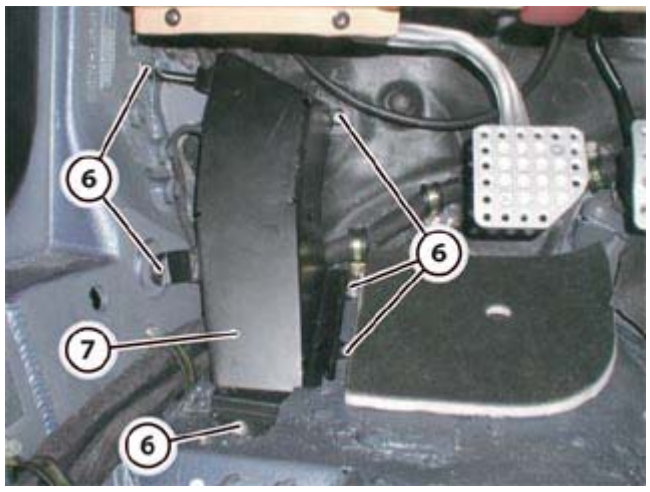
- Remove the mats (M2.24).

Remove component on driver side.

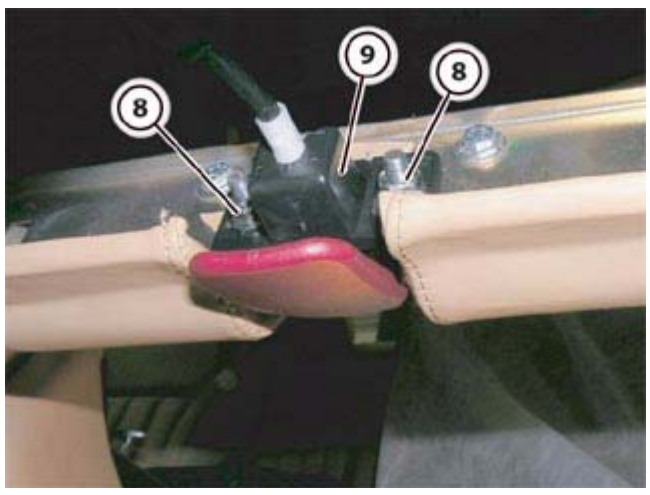
Follow the disassembly procedure up to the removal of the **moulded front mat**.

- Remove the lateral trim panels (M2.24).

Remove component on driver side.



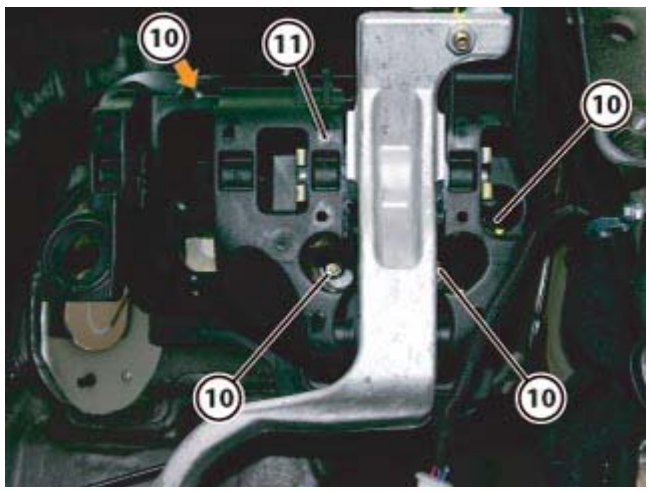
- Remove the driver side footrest **(7)**, undoing the six fastenings **(6)**.



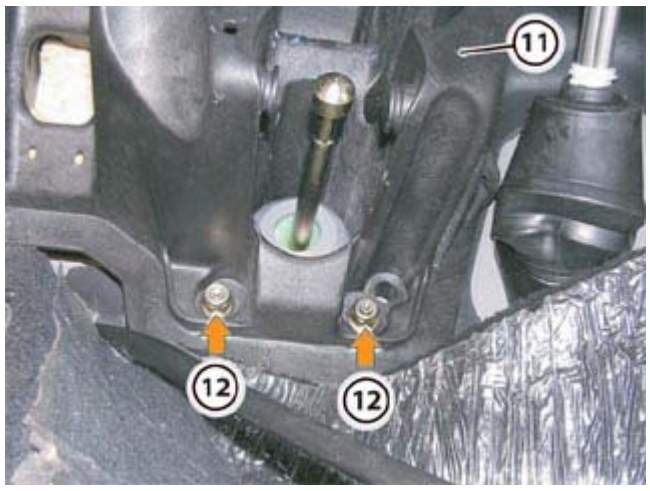
- Remove the two nuts **(8)** and move the engine compartment lid release lever **(9)** out of the way, so that it does not hinder the following procedures.



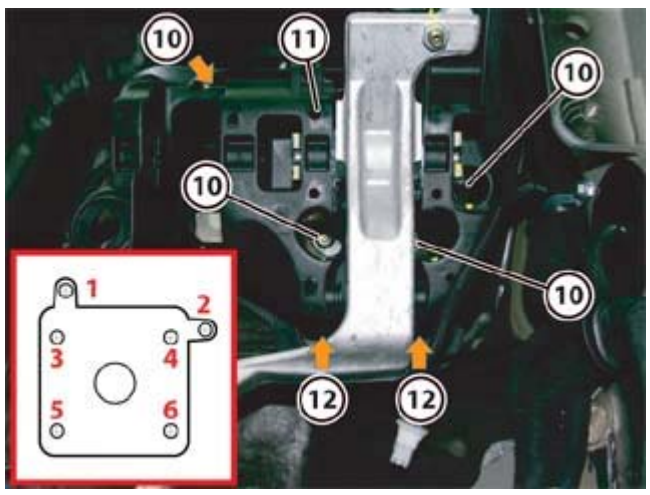
- Use a ratchet wrench with U-joint and extension, as shown in the figure, to remove the pedal board fastenings.



- Undo the four fastenings **(10)** from the pedal board **(11)**.



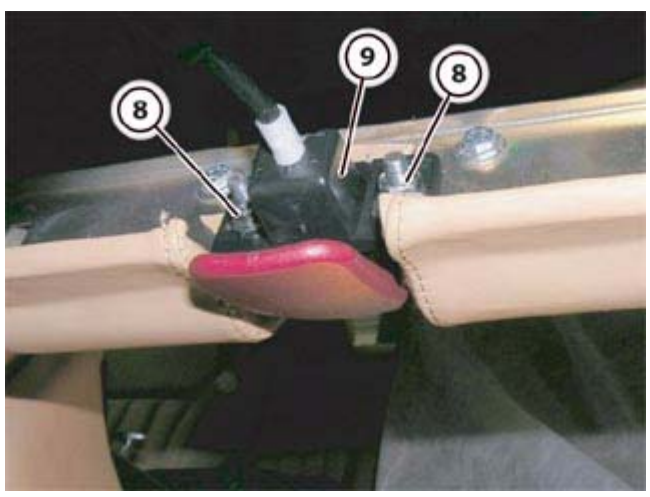
- Undo the two nuts **(12)** then remove the pedal board **(11)** from the passenger compartment and replace.



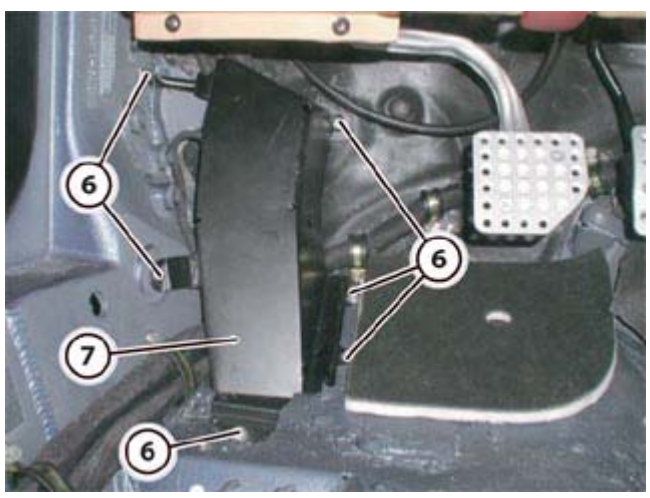
- Fit the pedal board **(11)** in the passenger compartment and use the ratchet wrench with U-joint and extension to tighten the fastenings **(10)** and **(12)** in the tightening sequence indicated in the figure.



Tightening torque	Nm	Class
Nut	20 Nm	B
Screw	20 Nm	B

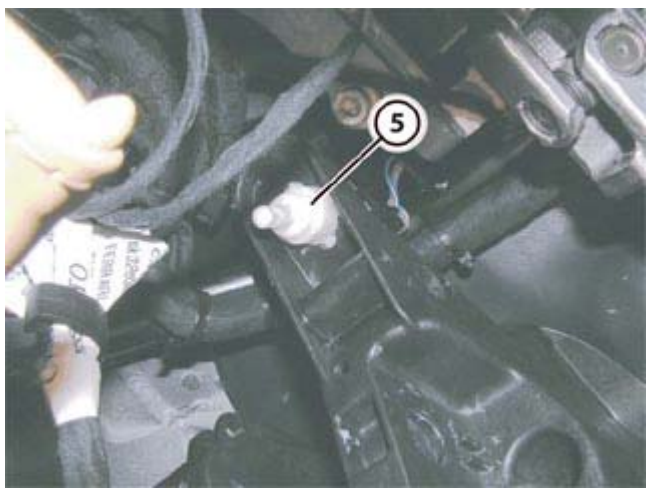


- Fit the engine compartment lid release lever **(9)** in its relative seat on the dash, by hand tightening the two nuts **(8)**.

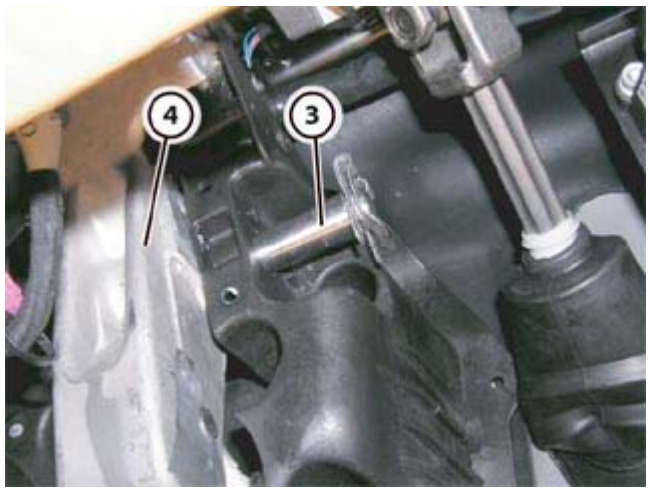


- Fit the driver side footrest **(7)**, by hand tightening the six fastenings **(6)**.

- Refit the lateral trim panels (M2.24).
- Refit the mats (M2.24).



- Connect the connector (D006) to the brake pedal stop light switch **(5)**.



- Fit the brake pedal **(4)** and fasten by inserting the pivot **(3)**.



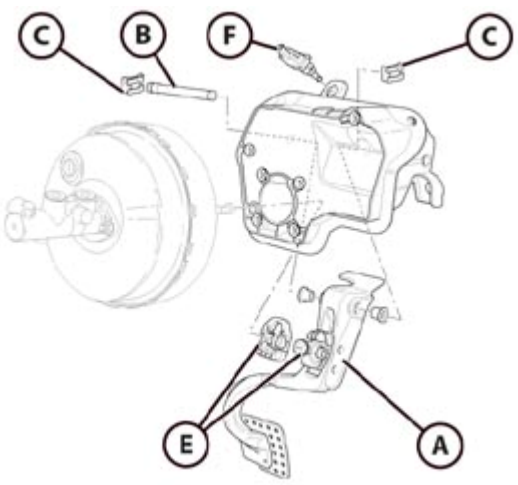
- Fit the clip **(2)** fastening the pivot to the brake pedal.



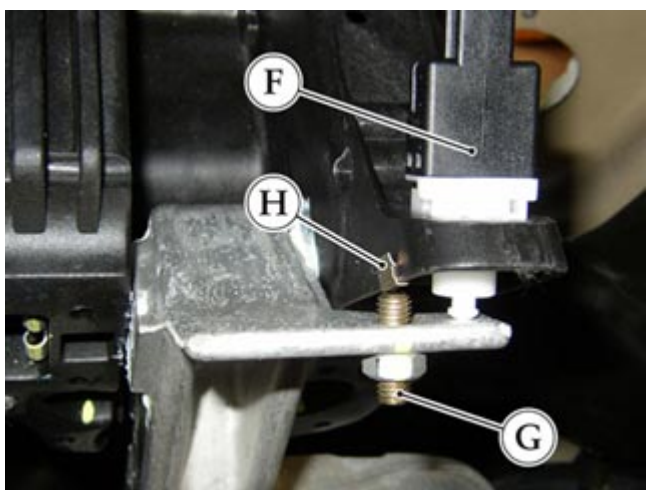
- Attach the servo brake rod as originally mounted, fastening the clip **(1)**.

➢ Set the battery master switch to ON (L2.02).

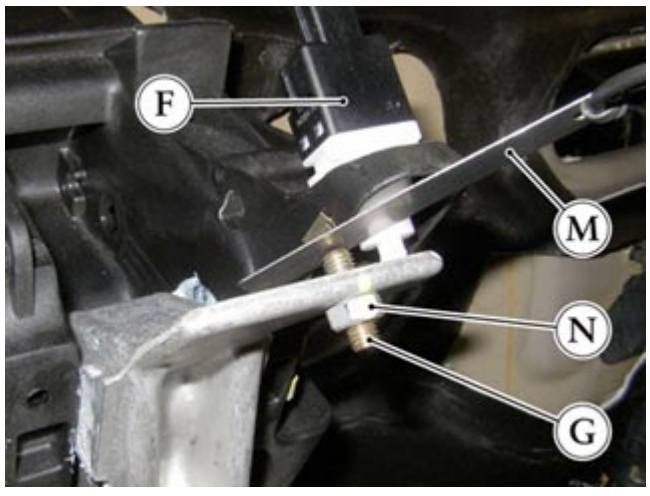
Brake pedal position adjustment



- The brake pedal **(A)** is pivoted on the pedal board by a pin **(B)** secured at both ends by clips **(C)**.
- The brake servo pin is connected to the brake pedal via a snap fit coupling inside the fasteners **(E)**.
- With the brake pedal **(A)** in the rest position, the switch **(F)** is on; as a result, when the brake pedal **(A)** is pressed, the switch deactivates and turns on the brake lights.



- Adjust the end of travel of the pedal as follows.
- Ensure that the adjuster dowel **(G)** has been loosened, so that it will not collide with the end stop **(H)** on the pedal board mounting.
- Ensure that the end stop **(H)** is perfectly aligned with the adjuster dowel **(G)**, so that depressing the pedal brings the dowel into contact with the centre of the end stop.
- Depress the brake pedal completely and hold in this position.
- Fit the STOP light switch **(F)** in the relative seat on the mounting and turn to fasten.



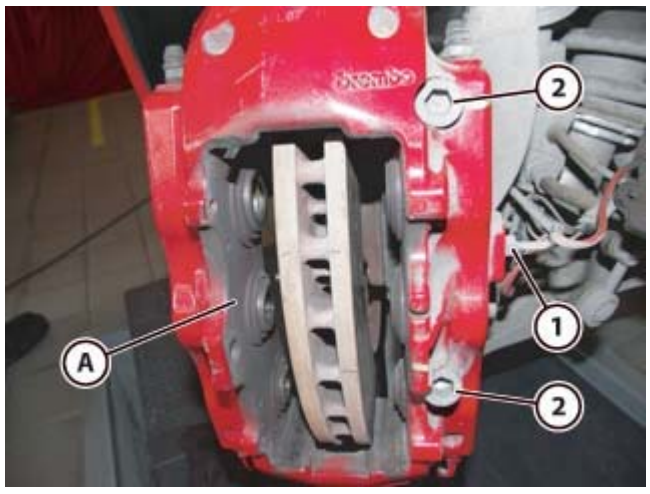
- Release the pedal so that the pedal presses against the adjustment screw on the switch **(F)**.
- Tighten the adjuster dowel **(G)**, with a spacer **(M)**measuring **0.5 mm** placed between the dowel and the end stop.
- Ensure that the spacer moves freely without impediment, then tighten the check nut **(N)**, holding the adjuster dowel in position.

G2.04 Brake callipers

Removing the front brake caliper

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

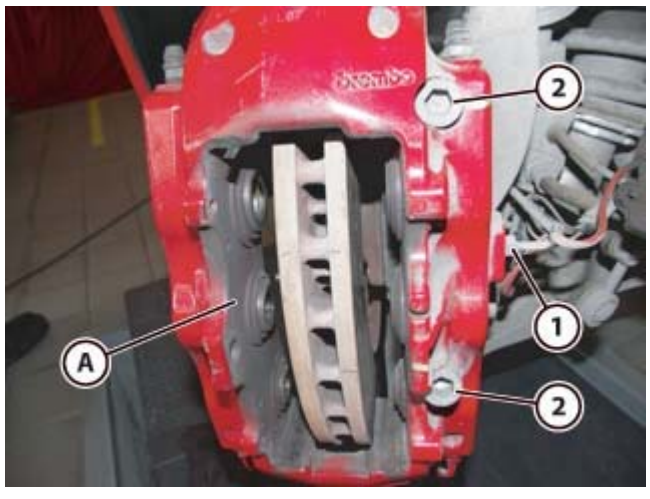
- Remove the wheel (F2.08).
- Refit the front brake pads (G2.08).



- Unscrew the union **(1)** for the rigid pipe on the caliper.
- Undo the two screws **(2)** fastening the caliper **(A)**.
- Remove the caliper from the front suspension.

Refitting the front brake calliper

Tightening torque		Nm	Class
Screw fastening calliper to stub axle	Screw	100 Nm	A
Connection between rigid brake pipe and calliper	Union	16 Nm	B



- Check that the calliper mating surfaces with the stub axle are clean, fit the calliper **(A)** to the disc and tighten the two screws **(2)**.

Tightening torque	Nm	Class
Screw	100 Nm	A

- Fit the rigid pipe on the caliper and tighten the union **(1)**.

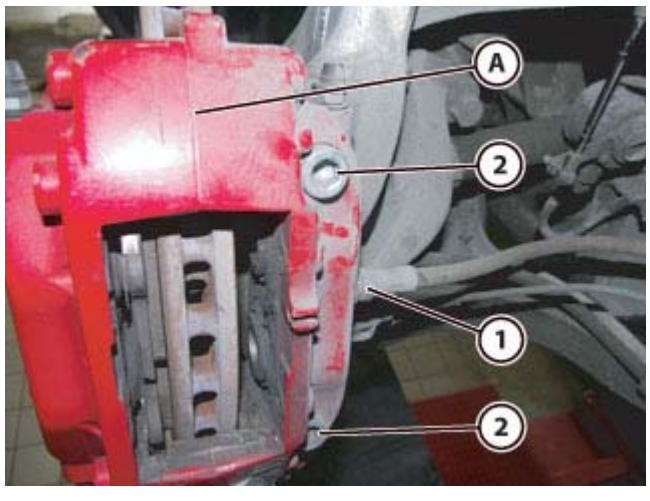
Tightening torque	Nm	Class
Union	16 Nm	B

- Refit the front brake pads (G2.08).
- Fill and bleed the braking system (G2.10).
- Refit the wheel (F2.08).

Removing the rear brake callipers

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

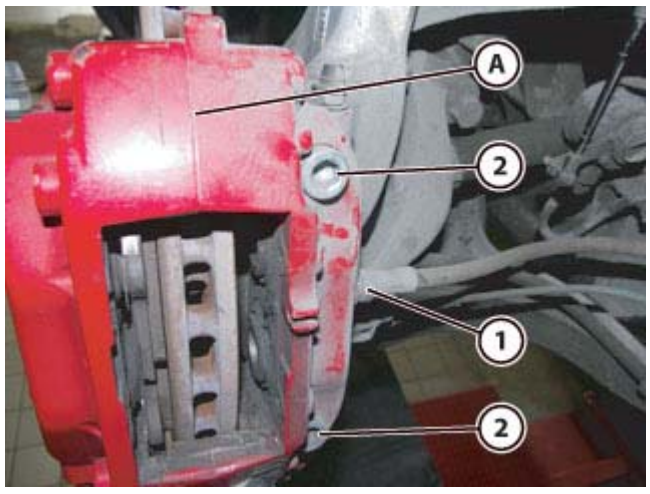
- Remove the wheel (F2.08).
- Remove the rear brake pads (G2.08).



- Unscrew the union **(1)** for the flexible hose on the caliper.
- Undo the two screws **(2)** fastening the caliper **(A)**.
- Remove the caliper from the rear suspension.

Refitting the rear brake callipers

Tightening torque		Nm	Class
Screw fastening calliper to hub carrier	Screw	100 Nm	A
Screw fastening brake hose to calliper	Union	16 Nm	B



- Check that the calliper mating surfaces with the stub axle are clean, fit the calliper **(A)** to the disc and tighten the two screws **(2)**.

Tightening torque	Nm	Class
Screw	100 Nm	A

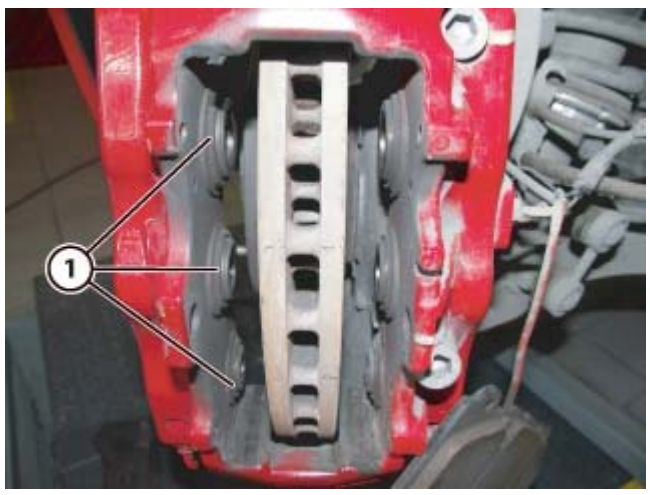
- Fit the flexible hose onto the calliper and tighten the union **(1)**.

Tightening torque	Nm	Class
Union	16 Nm	B

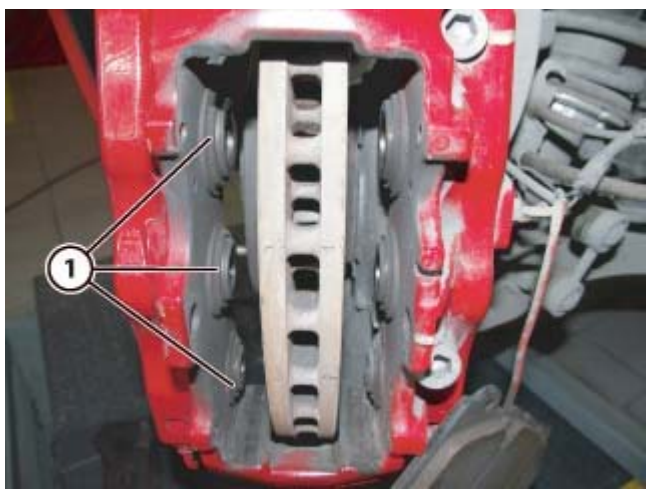
➢ Refit the rear brake pads (G2.08).
➢ Fill and bleed the braking system (G2.10).
➢ Refit the wheel (F2.08).

Replacing the gaiters

➢ Refit the front brake pads (G2.08).
➢ Remove the rear brake pads (G2.08).
➢ Remove the front brake calliper (G2.04).
➢ Remove the rear brake callipers (G2.04).



- Prise the gaiters **(1)** off with a screwdriver.



Always refit new gaiters.

- Using a screwdriver for leverage, fit the gaiters **(1)**, taking care not to damage them.

Note that the gaiters have different diameters.

- Check that the gaiters **(1)** and pistons are correctly installed and mated.

➢ Refit the front brake calliper (G2.04).
➢ Refit the rear brake calliper (G2.04).
➢ Refit the front brake pads (G2.08).
➢ Refit the rear brake pads (G2.08).

G2.05 Brake discs

Checking and inspecting the brake discs

The brake discs must be perfectly clean, free of any oil, grease or rust, and must not be excessively scored.

In the event of poor braking performance not attributable to the state of the brake pads and callipers, carry out a series of dimensional checks on the discs.

- Using a dial gauge, measure the planarity with the disc fitted on the wheel hub.
- Using a micrometer, measure the parallelism between the contact surfaces and the pads at different points on the braking surface.
- Using the special tool, check the roughness of the pad contact surface.

➢ In the event of values not within permissible tolerances, the disc may be ground, taking care not to reduce thickness beyond the wear limit indicated on the edge of the disc itself.
➢ The rear discs differ from the front discs in that they have two additional holes to enable access to the brake shoe adjustment pin without removing the disc.
➢ They also have a large friction surface on the inner side for the parking brake.

Checking CCM brake discs (optional) for wear

- This operation includes:
- Visually inspecting for alterations in the brake disc friction surface.
- Checking the minimum brake disc thickness (maximum permitted wear **0.5 mm**).
- Checking the brake disc edges for damage (damage caused by improper use).
- The brake discs must be replaced if:
- there are significant alterations in the friction surface;
- the brake discs are worn beyond the minimum required thickness (material abraded).

- Normally, both forms of brake disc wear occur simultaneously. Only rarely, following prolonged stress on the race track with large temperature variations on the friction surface, surface alteration may become so pronounced as to necessitate earlier replacement of the brake discs.

The front and rear CCM brake discs must always be replaced in pairs (both discs on the same axle).

- Front and rear CCM disc wear is calculated by the instrument panel operating software, which uses an algorithm to determine when to switch on the relative indicator to warn the driver.

The bedding in procedure must be carried out after replacing discs or the pads alone.

- The discs must be replaced when the wear limit is reached, as indicated by the warning on the TFT display, or if visual inspection reveals any surface damage.

- **Visual inspection of the disc friction surface**

- The alterations in the friction surface are caused by the material oxidising as a result of extremely high thermal stress. The high temperatures reached by the brake discs, especially in race track conditions, cause the material to oxidise progressively.
- Surface alteration is detrimental to braking comfort, reduces brake disc resistance and increases pad wear, requiring the replacement of components earlier than scheduled.

- Understanding the signs of brake disc wear and consequent operations necessary:



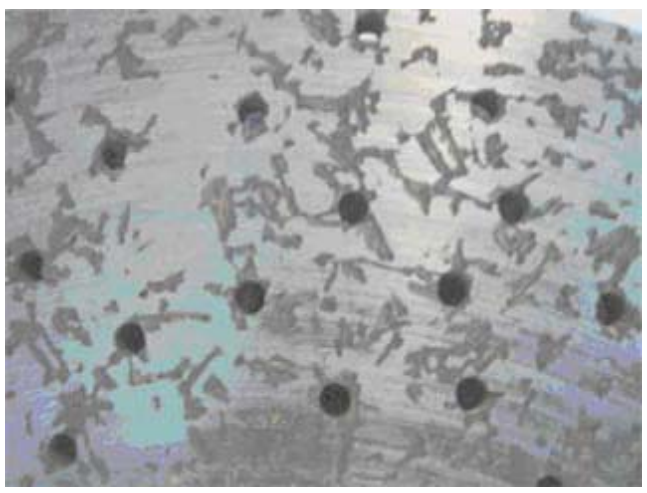
- The figure aside shows the friction surface after normal brake usage in road conditions; disc replacement is not necessary in this case.



- The figure aside shows the friction surface after a long journey, with only one intense brake application; here too, disc replacement is not necessary.



- The figure aside shows the friction surface after an appropriate mileage or following maximum stress in track conditions; disc replacement is necessary in this case.



- The figure aside shows the friction surface after an appropriate mileage or following maximum stress in track conditions; disc replacement is necessary in this case.

- **Checking minimum disc thickness**
- The minimum thickness of cross-drilled discs must always be measured at the base of the inner or outer friction surface track. Use a suitable micrometrical screw or a brake disc template.
- Maximum permissible wear is **0.5 mm**

- **Checking disc edges for damage**



Regardless of the overall state of wear, the disc must be replaced if it shows signs of damage around the edge.

Any unauthorised mechanical work on the holes in the surface of the disc may damage the brake disc itself.
If necessary, clean the holes in the disc brake and the friction surface of the rotor with a pressure cleaner.
Do not perform any mechanical work on the holes in the disc.

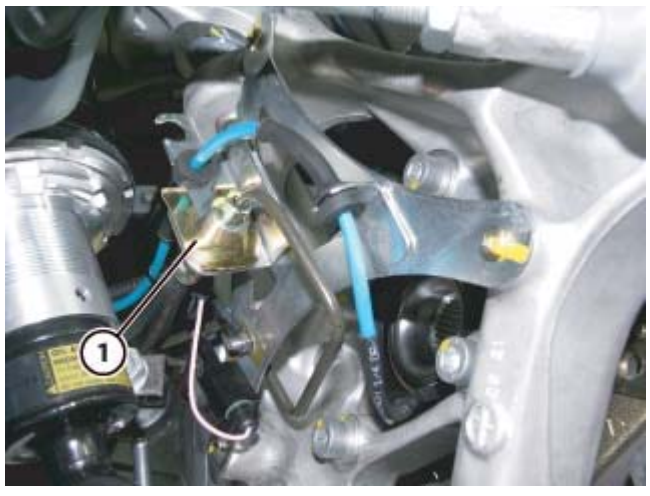
CAUTION
When using pressure cleaners to clean discs, use adequate face protection.

- When assessing damage to the disc edges, apply the following criteria:
- maximum permissible width/depth **2 mm**;
- maximum permissible length **(10 mm)**;
- no more than **3** damaged areas are permissible;

Removing the brake discs

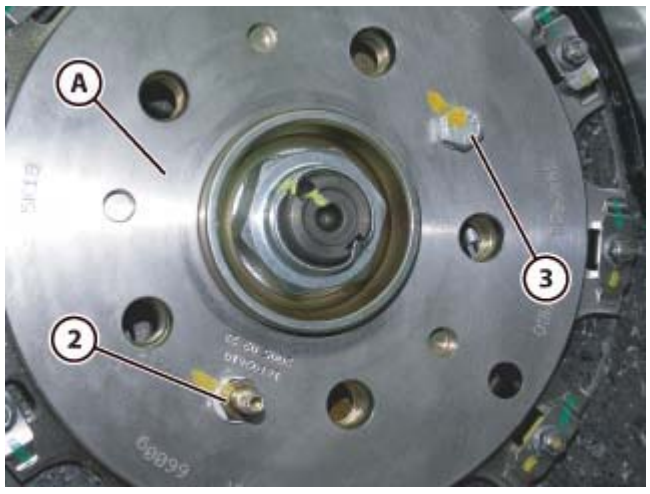
Before proceeding, identify the cause for excessive disc wear or damage.

➢ Remove the wheel (F2.08).
➢ Remove the rear brake callipers (G2.04).
This operation does not require the removal of the brake pipe from the caliper. Handle the caliper with extreme care in order not to damage the oil pipe.



- When working on the front discs, remove the brake pipe retainer clip **(1)** so that the caliper is easier to move and does not need to be disconnected from the system.

- Remove the front brake calliper (G2.04).



- Unscrew the wheel locator pin **(2)**and the screw fastening the disc **(3)**to the wheel bearing.
- Remove the disc **(A)** by easing it off the bearing.

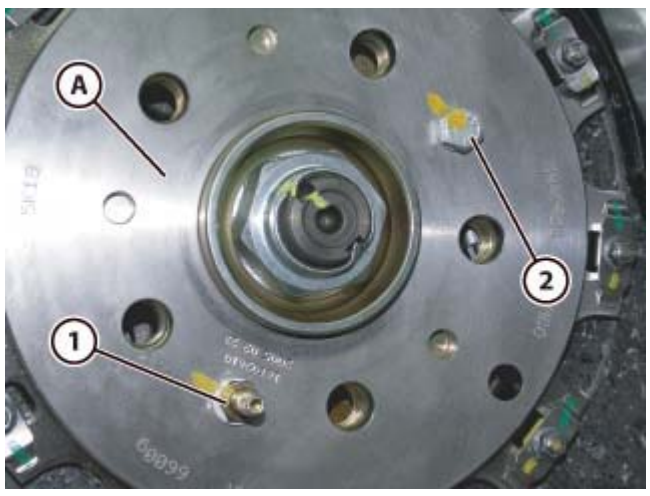
➢ Check and inspect the state of the brake discs (G2.05).

Refitting the brake discs

Tightening torque		**Nm**	**Class**
Brake disc - bearing	Screw	15 Nm	C
Locator pin - brake disc	Pin	15 Nm	C

Check that the disc is in proper working condition, even if new, and inspect the disc contact surface.

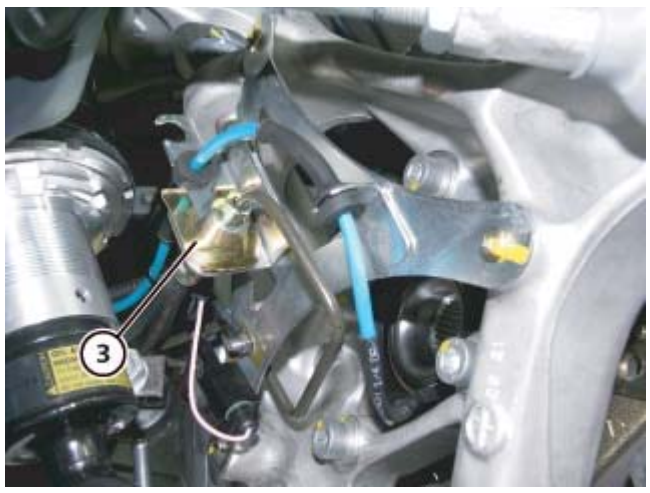
Check that the disc surface is clean and that it has no stains or spots of grease and/or oil; if necessary, clean with common solvents, degreasers and/or soap and water.



- Fit the new disc **(A)** on the stub axle or on the hub.
- To centre the disc on the wheel bearing, tighten the wheel fastener stud bolts into their seats.
- Fit the pin **(1)** and the screw **(2)** and then tighten both.

Tightening torque	**Nm**	**Class**
Screw	15 Nm	C
Pin	15 Nm	C

- Remove the stud bolts fitted previously for alignment.



- If working on the front suspension, fit the retainer clip **(3)** for the front brake pipe.

➢ Refit the front brake calliper (G2.04).
➢ Refit the rear brake calliper (G2.04).
➢ Refit the wheel (F2.08).
➢ Only in the case of replacing CCM discs. Bed in the CCM pads (G2.08).

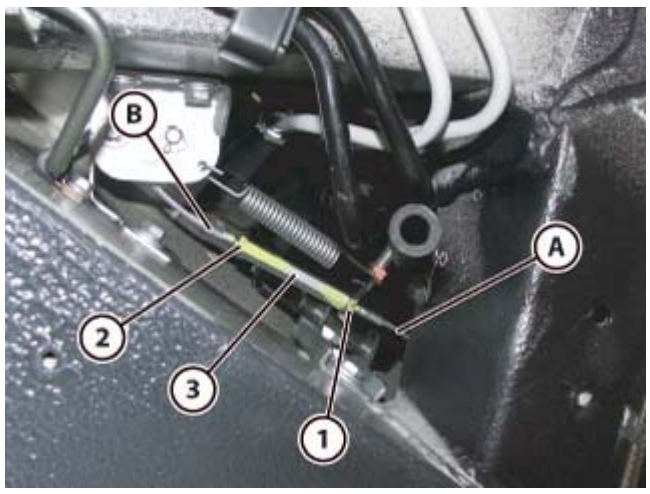
G2.06 Parking brake - Brake shoes

Removing the parking brake shoes

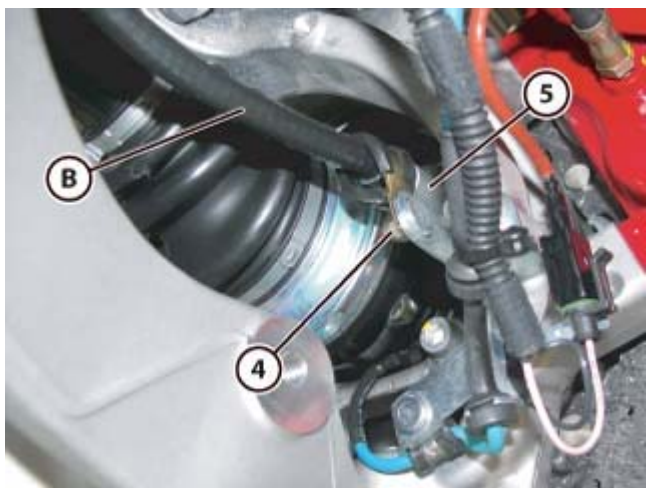
➢ Remove the wheel (F2.08).
i Remove the rear component

➢ Remove the brake disc (G2.05).
i Remove the rear component

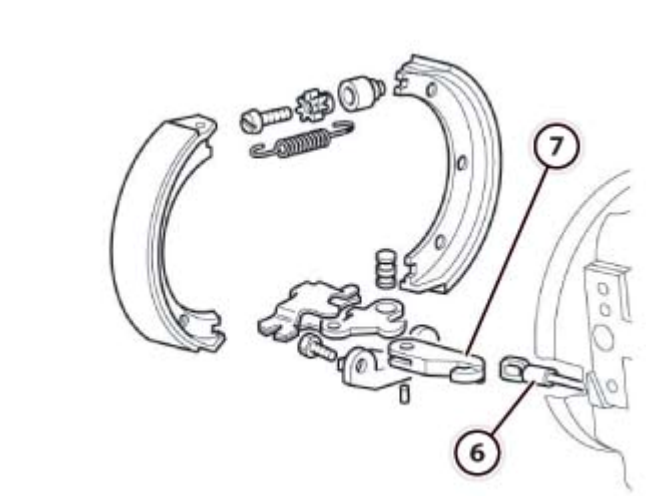
➢ Remove the rear undertray section (M2.12).



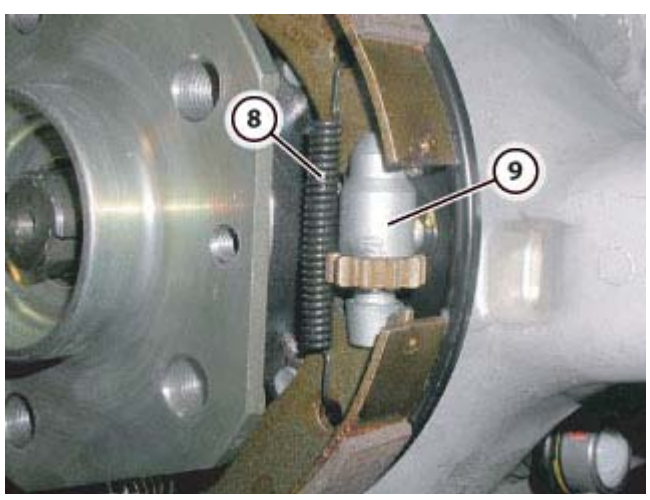
- Slacken the parking brake cables **(A)** and **(B)** by loosening the check nuts **(1)** and **(2)**, then unscrew the adjuster screw **(3)**.



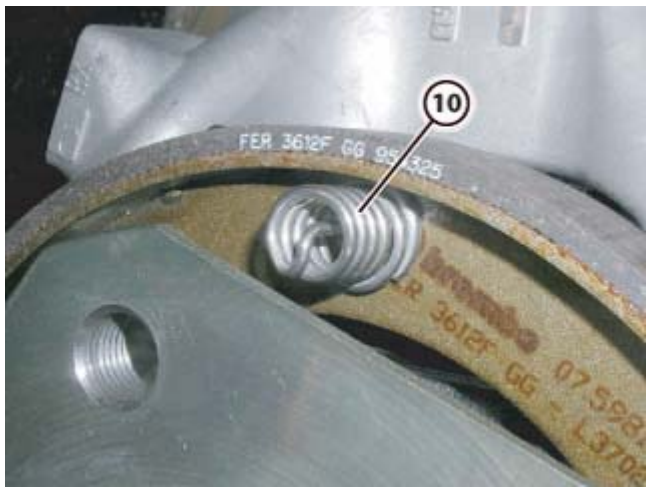
- Unscrew the nut **(4)** to release the parking brake cable **(B)** from the fastener clamp on the hub carrier.
- Remove the parking brake sheath retainer **(5)** from the hub carrier.



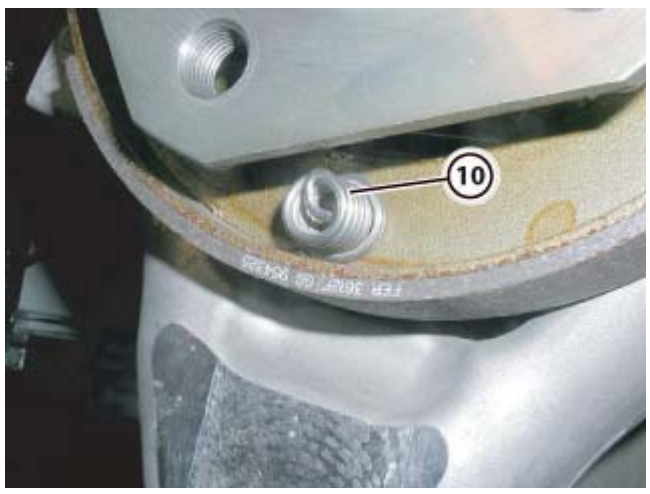
- Unhook the eyebolt **(6)** from the fork **(7)**.



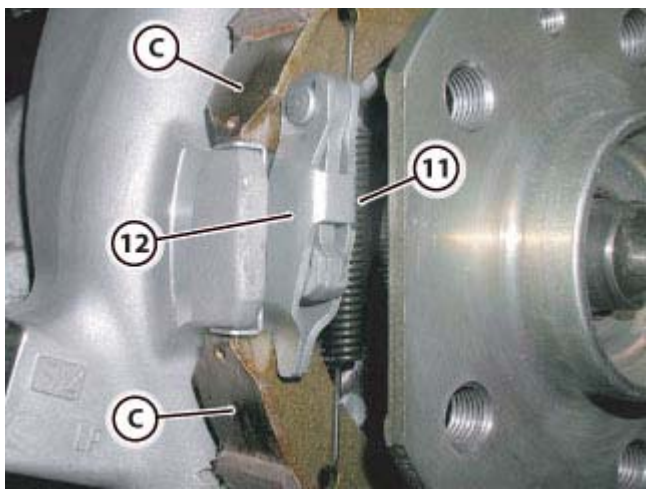
- Release the spring **(8)** and retrieve the adjuster pin **(9)**.



- Remove the upper spring **(10)** by pushing towards the brake shoes and then turning.

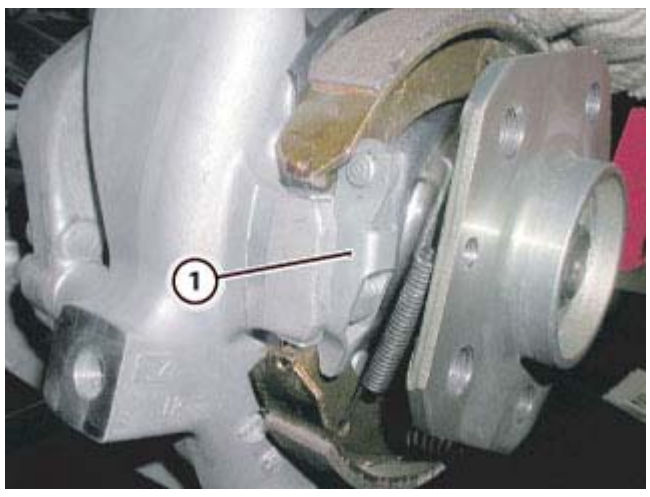


- Remove the lower spring **(10)** by pushing towards the brake shoes and then turning.

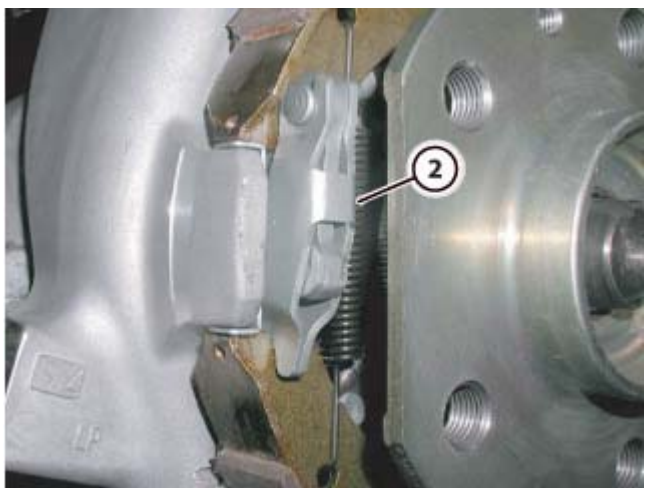


- Release the spring **(11)** and remove the brake shoes **(A)**, taking care not to shift the linkage pins **(12)**.

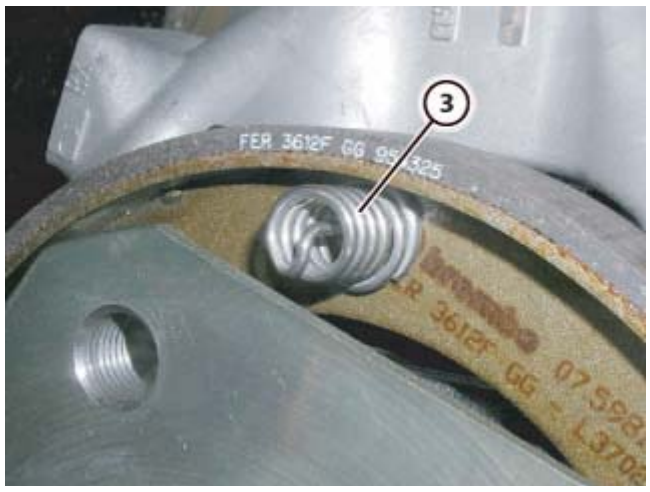
Refitting the parking brake shoes



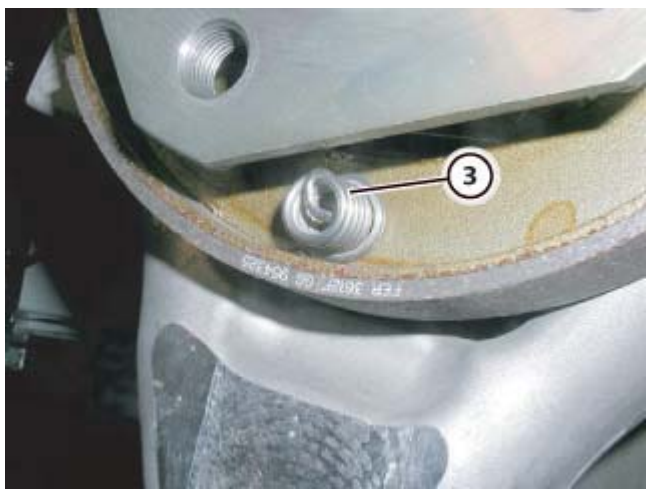
- Fit the lower linkages **(1)** correctly and install the brake shoes in their seats, with the spring already fitted to one of the shows.



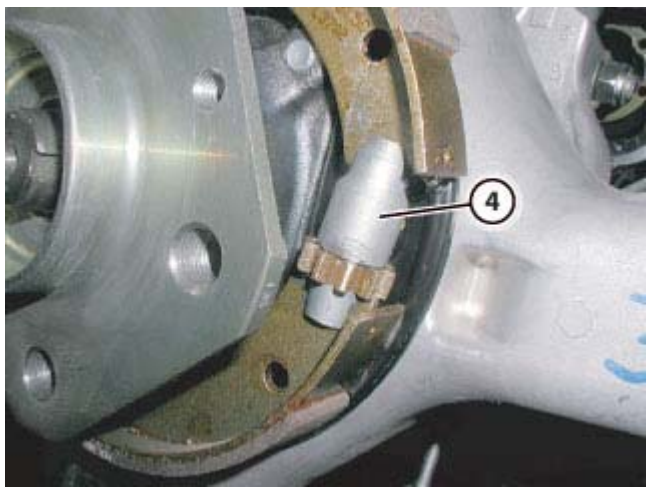
- Using a pair of pliers, fit the spring **(2)** to the other brake shoe.



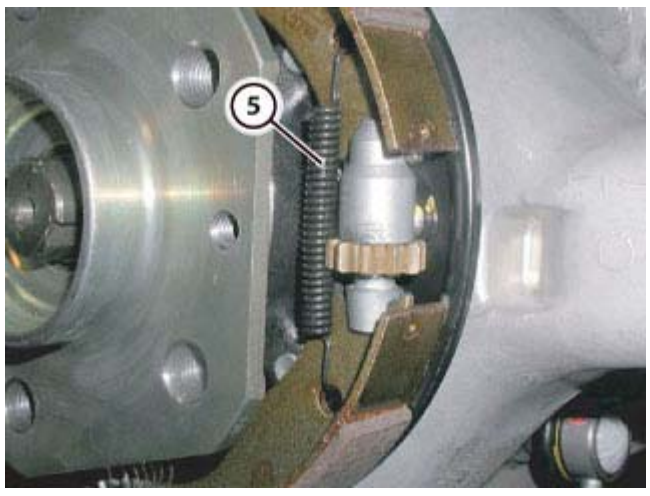
- Fit the upper spring **(3)**, pushing towards the brake shoes and then turning the spring.



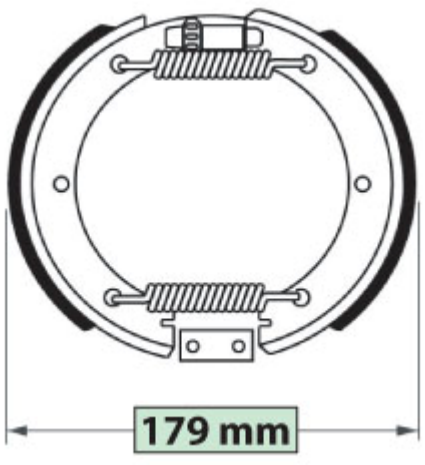
- Fit the lower spring **(3)**, pushing towards the brake shoes and then turning the spring.



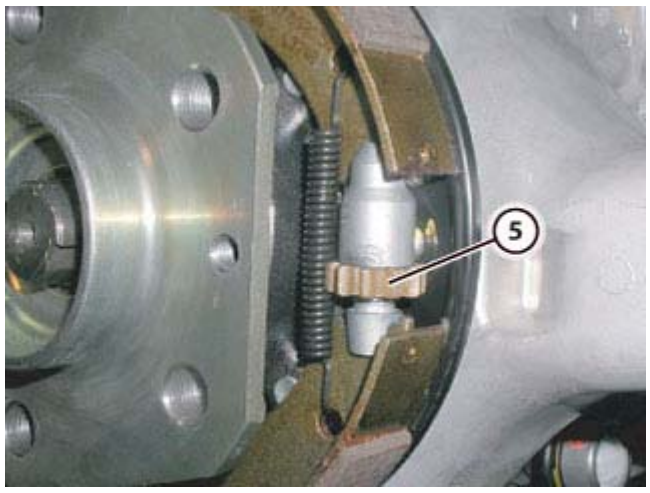
- Fit the adjuster pin **(4)** in its seat.



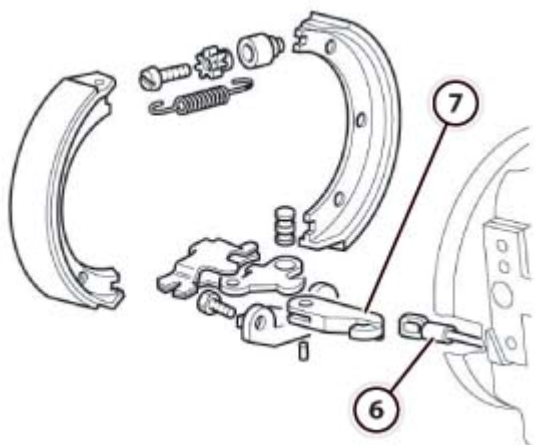
- Attach the spring **(5)** to both brake shoes.



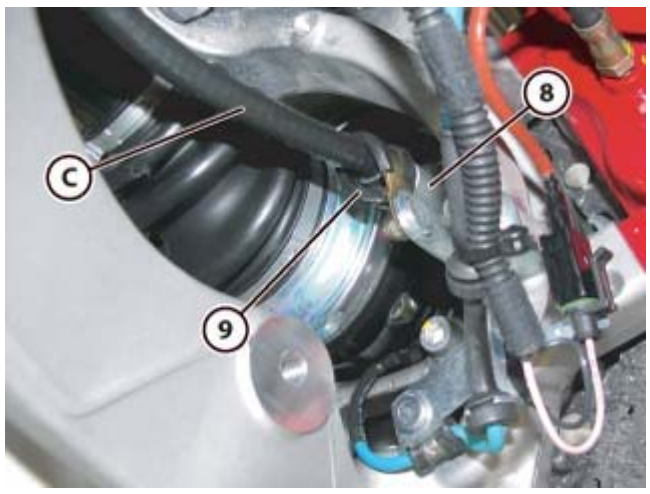
- Check that the distance between the outer surfaces of the shoes is approximately **179 mm**.



- To adjust the distance, use a screwdriver to turn the toothed sleeve on the adjuster pin **(5)**.

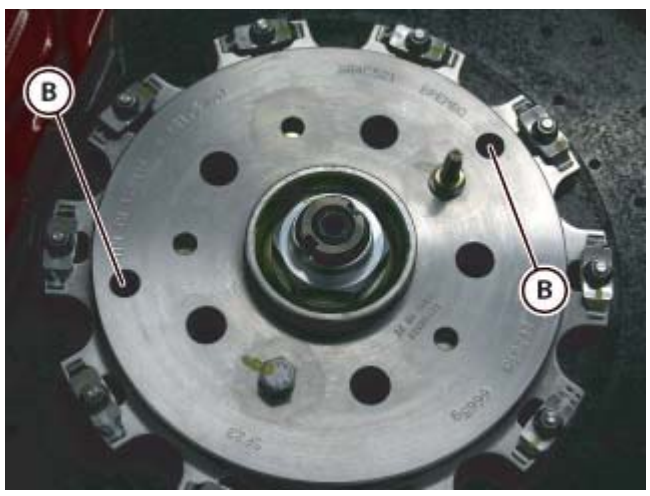


- Hook the eyebolt **(6)** of the parking brake cable onto the fork **(7)**.



- Fit the parking brake sheath retainer **(8)** onto the hub carrier.
- Fasten the parking brake cable **(C)** onto the clamp **(9)**.

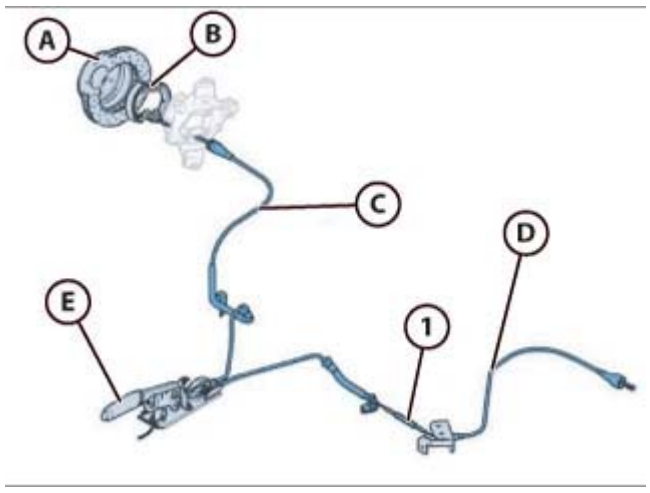
- Refit the brake disc (G2.05).



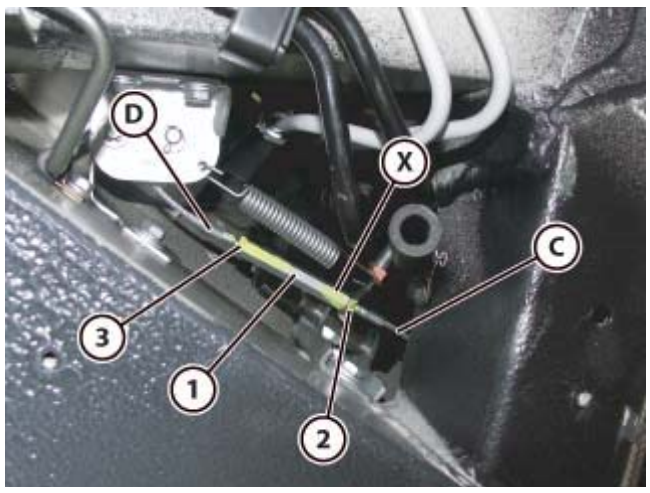
- Check that the disc rotates freely without impediment. If not, adjust the adjuster pin to achieve the optimum position.
- Adjustment is also possible with the disc installed, inserting a screwdriver through the hole **(B)**.
- Turn the adjuster pin to separate the brake shoes until a slight resistance is felt; then turn the toothed sleeve by one turn in the opposite direction to close them slightly.

- Adjust the parking brake (G2.06).
- Refit the rear underfloor section (M2.12).
- Refit the wheel (F2.08).

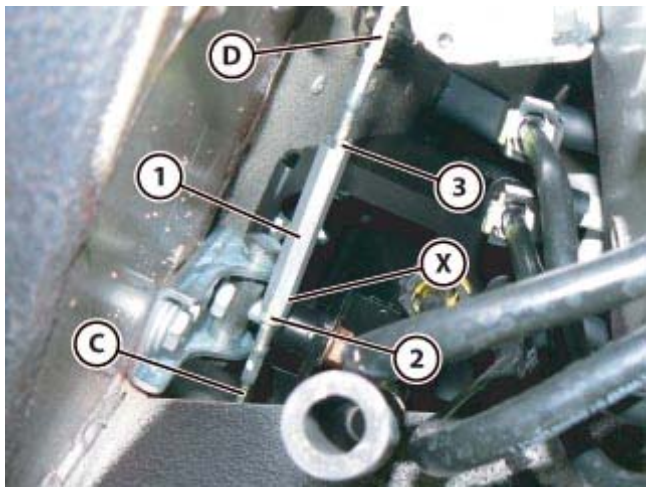
Adjusting the parking brake



- Use a screwdriver inserted through the slot on the disc **(A)** to turn the sleeve **(B)** sufficiently to lock the disc.
- Then turn the sleeve **(B)** in the opposite direction until the disc turns freely.



- Tighten the adjustment screw **(1)** on the side with the marking **(X)** by 6-7 turns onto the end of the right hand control cable **(C)**, on which the check nut **(2)** must already be fitted.
- Loosely fit the adjustment screw **(1)** on the end of the left-hand control cable **(D)**, on which the check nut **(3)** should already be fitted.
- Pull the parking brake lever **(E)** a couple of times to tension the cables.
- Tighten the adjustment screw **(1)** on the ends of the control cables to set the correct tension.
- Pull the parking brake lever **(E)** so that the rear wheels lock within the first **3 - 4 clicks**.
- If necessary, adjust the lever position with the adjustment screw **(1)**.
- Tighten the check nuts **(2)** and **(3)** on the adjustment screw **(1)**.



FROM Ass.ly Nr. 68545

- Tighten the adjustment screw **(1)** on the side with the marking **(X)** by 6-7 turns onto the end of the right hand control cable **(C)**, on which the check nut **(2)** must already be fitted.
- Loosely fit the adjustment screw **(1)** on the end of the left-hand control cable **(D)**, on which the check nut **(3)** should already be fitted.
- Pull the parking brake lever **(E)** a couple of times to tension the cables.
- Tighten the adjustment screw **(1)** on the ends of the control cables to set the correct tension.
- Pull the parking brake lever **(E)** so that the rear wheels lock within the first **3 - 4 clicks**.
- If necessary, adjust the lever position with the adjustment screw **(1)**.
- Tighten the check nuts **(2)** and **(3)** on the adjustment screw **(1)**.

Replacing the parking brake cables

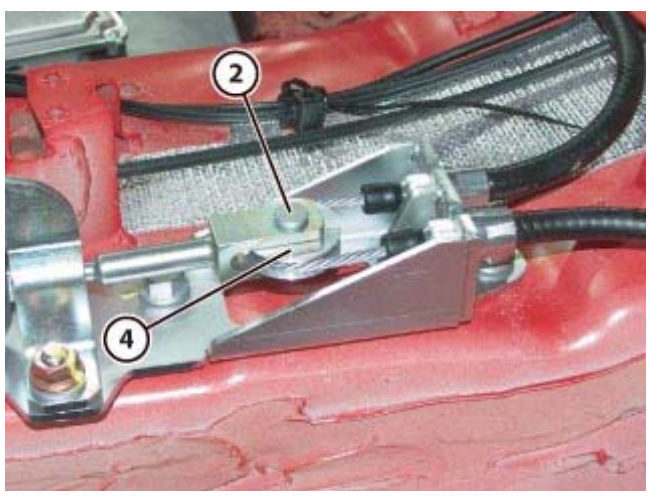
➢ Remove the wheel (F2.08).

ℹ Remove the rear wheels.

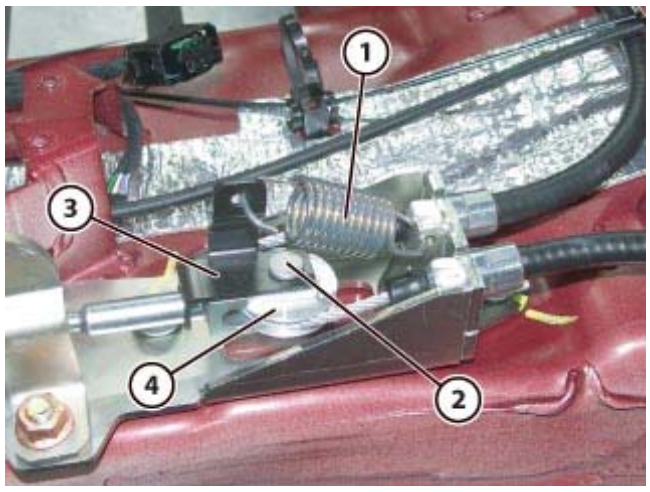
➢ Remove the rear undertray section (M2.12).

RIGHT HAND CABLE

- Remove the console trim (M2.24).

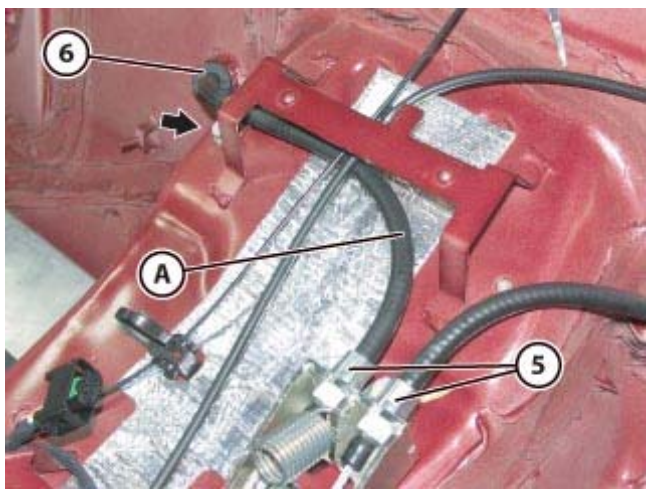


- Remove the lower cotter pin with plastic washer and remove the pin **(2)**.
- Remove the pulley **(4)** from the control cable.



FROM Ass.ly Nr. 68545

- Detach the spring **(1)**.
- Remove the lower cotter pin with plastic washer and remove the pin **(2)**.
- Remove the bracket **(3)**.
- Remove the pulley **(4)** from the control cable.

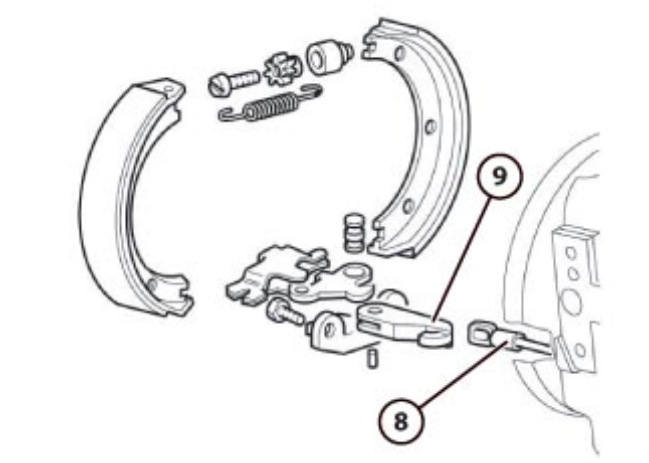


- Undo the screw fastening the clamp retaining the right hand control cable **(A)** to the body.
- Detach the ends **(5)** of the right hand control cable sheaths **(A)** from the retainer bracket.
- Remove the rubber plug **(6)** from the body.

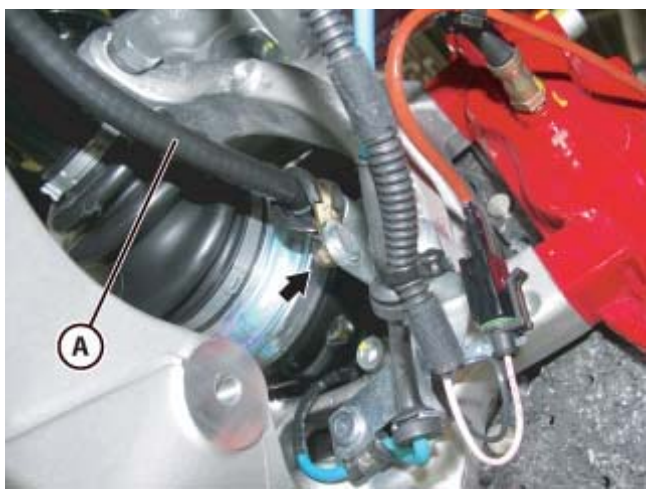
Carry out on both sides of the tunnel.



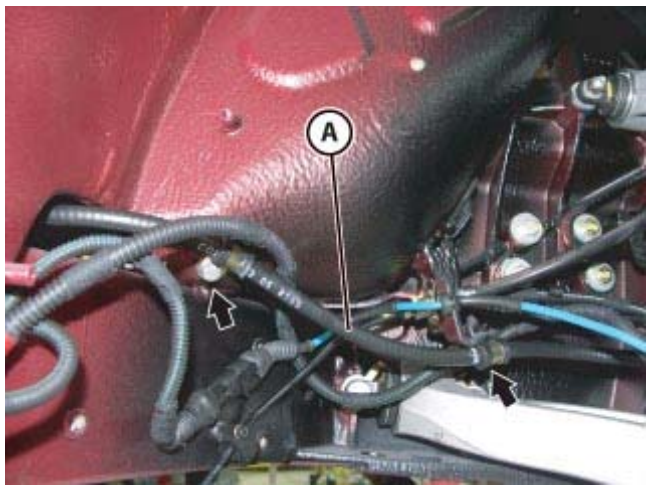
- Remove the sheath end stop **(7)** from the hub carrier.



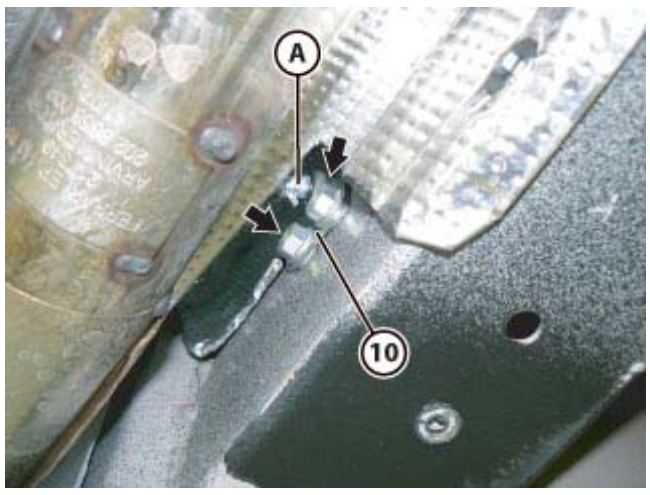
- Unhook the eyebolt **(8)** from the fork **(9)**.



- Undo the screw fastening the clamp retaining the right hand control cable **(A)**.

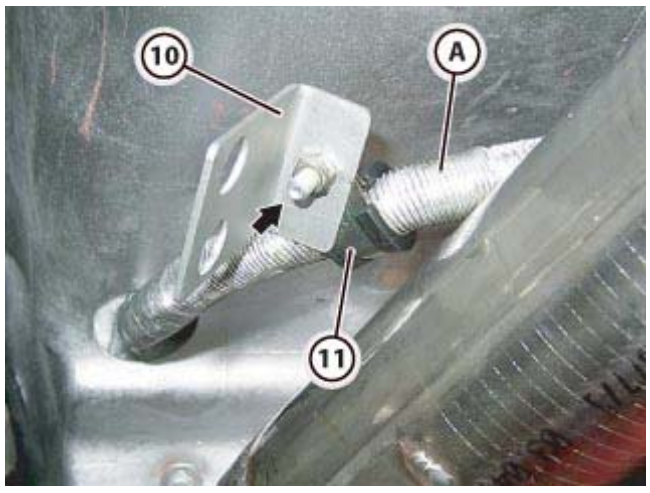


- Undo the screws fastening the clamps retaining the right hand control cable **(A)**.

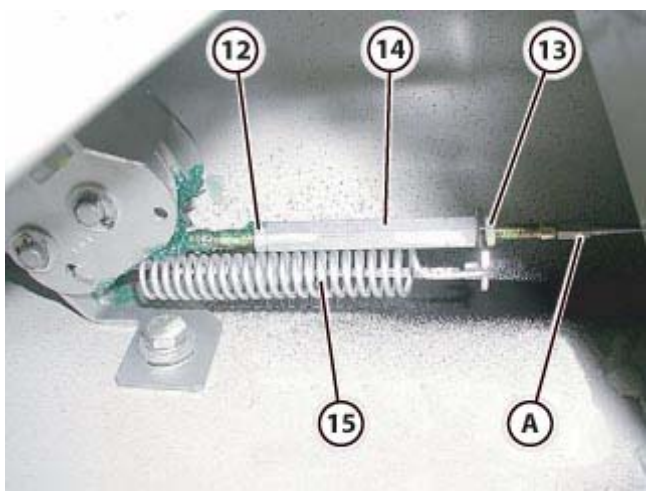


- Undo the two screws fastening the mounting bracket **(10)** for the clamp retaining the right hand control cable **(A)** to the chassis.

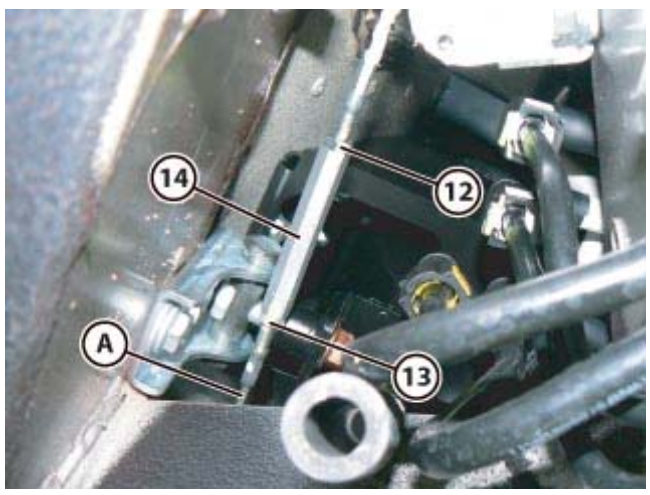
Carry out on both branches of the cable.



- Detach the clamp **(11)** from the bracket **(10)**, undoing the fastener screw, and remove the clamp from the right hand control cable **(A)**.



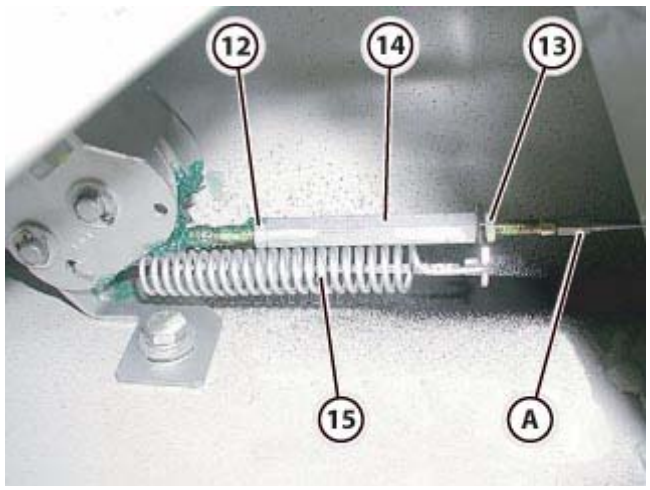
- Release the coupling spring **(15)** on the cable pulley mounting.
- Loosen checknuts **(12)** and **(13)**.
- Completely undo the adjuster screw **(14)** to release the right hand control cable **(A)**.



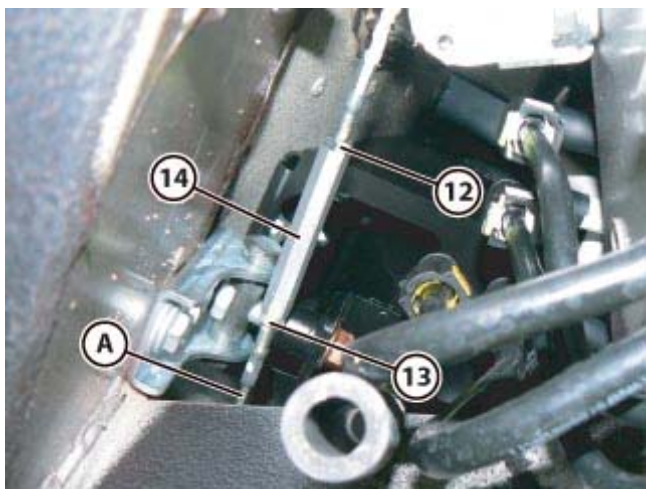
FROM Ass.ly Nr. 68545

- Loosen checknuts **(12)** and **(13)**.
- Completely undo the adjuster screw **(14)** to release the right hand control cable **(A)**.

- Remove both branches of the right hand control cable, pulling from the passenger compartment and lubricating to facilitate the installation of the new cable.
- Fit both branches of the new right hand control cable from the passenger compartment

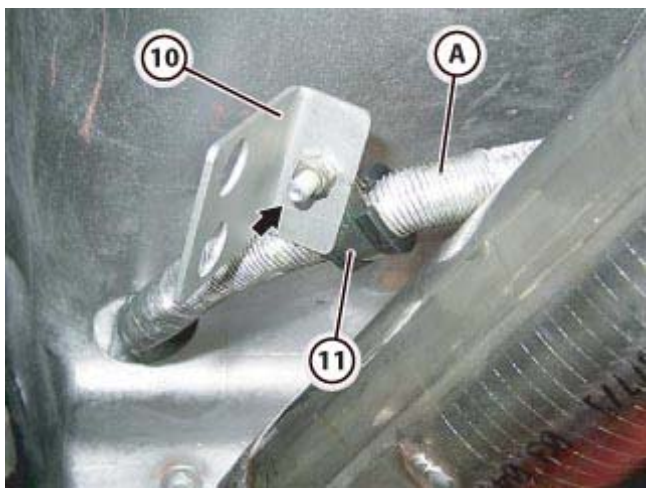


- Completely tighten the adjuster screw **(14)** to fasten the right hand control cable **(A)**.
- Tighten checknuts **(12)** and **(13)**.
- Attach the coupling spring **(15)** on the cable pulley mounting.

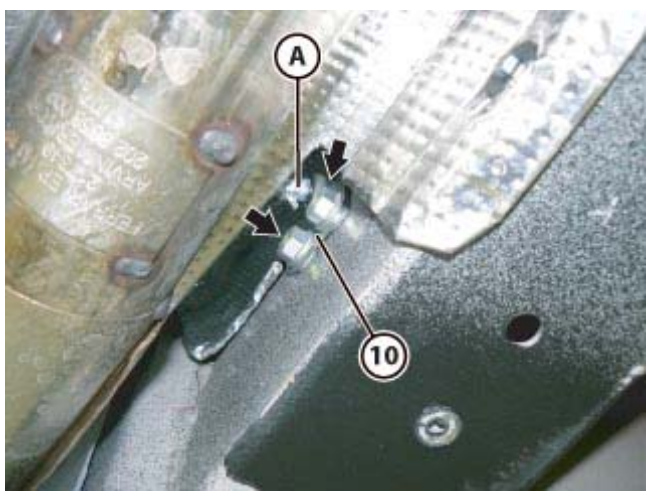


FROM Ass.ly Nr. 68545

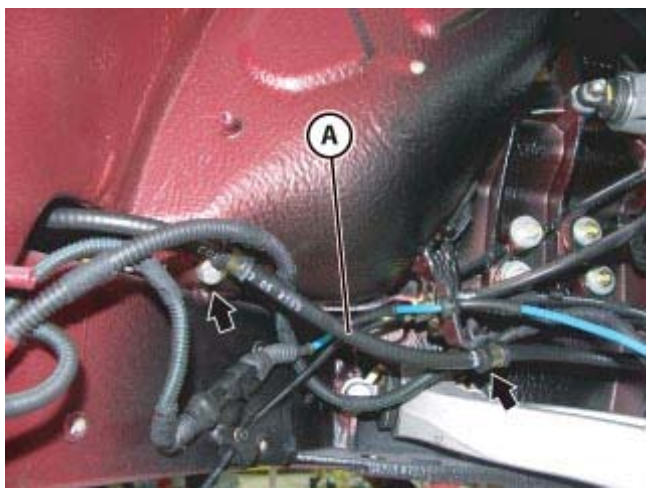
- Completely tighten the adjuster screw **(14)** to fasten the right hand control cable **(A)**.
- Tighten checknuts **(12)** and **(13)**.



- Fit the clamp **(11)** onto the right hand control cable **(A)** and fasten to the bracket **(10)**, tightening the fastener screw.



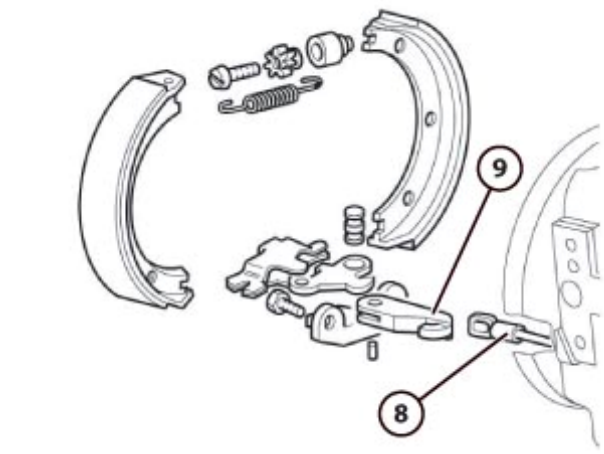
- Tighten the two screws fastening the mounting bracket **(10)** for the clamp retaining the right hand control cable **(A)** to the chassis.



- Tighten the screws fastening the clamps retaining the right hand control cable **(A)**.



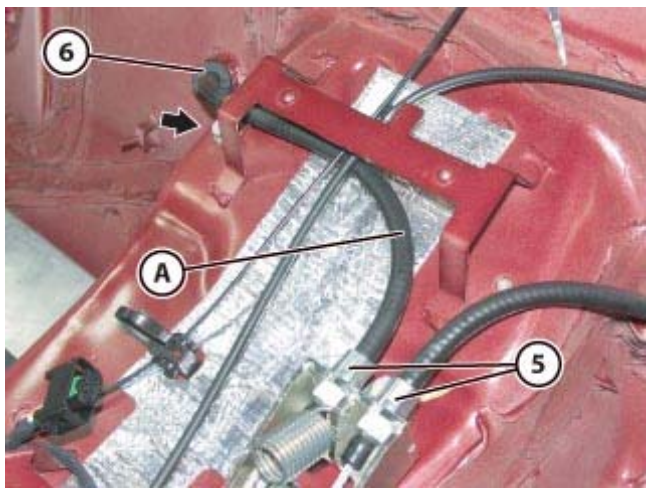
- Tighten the screw fastening the clamp retaining the right hand control cable **(A)**.



- Attach the eyebolt **(8)** to the fork **(9)**.



- Fit the sheath end stop **(7)** onto the hub carrier.

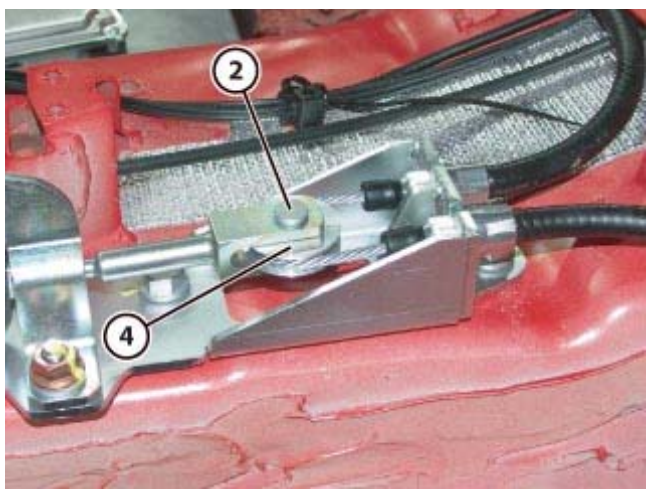


- Fit the rubber plug **(6)** onto the body.

Carry out on both sides of the tunnel.

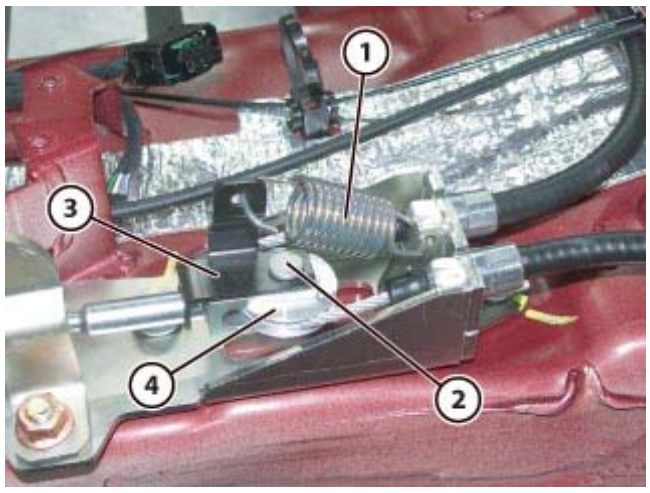
To ensure that the new cables run as smoothly as the original cables in the sheaths, the rubber guards must be fitted correctly at the end of the two branches of the right-hand cable, near the lever.

- Attach the ends **(5)** of the right hand control cable sheaths **(A)** onto the retainer bracket.
- Tighten the screw fastening the clamp retaining the right hand control cable **(A)** to the body.



Ensure that the pulley is positioned correctly; once fitted, the pulley must spin without excessive friction.

- Fit the pulley **(4)** to the control cable.
- Fit the pin **(2)** into the relative seat and fasten by fitting the lower cotter pin with plastic washer.



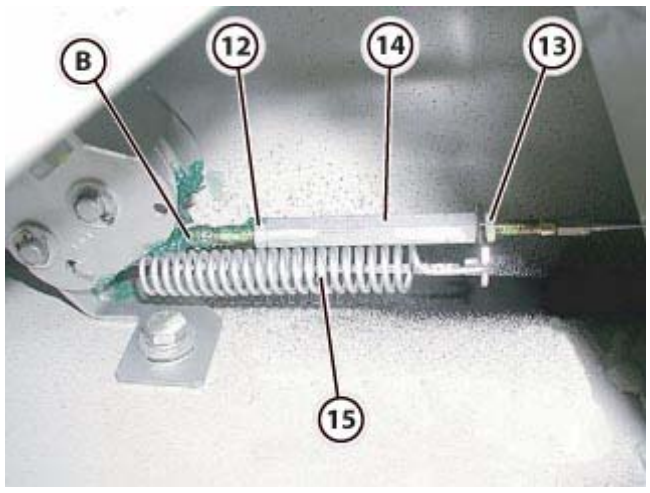
FROM Ass.ly Nr. 68545

Ensure that the pulley is positioned correctly; once fitted, the pulley must spin without excessive friction.

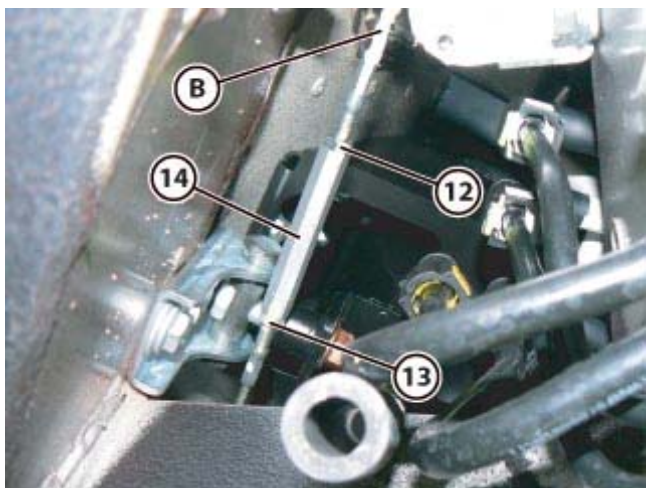
- Fit the pulley **(4)** to the control cable.
- Fit the bracket **(3)**.
- Fit the pin **(2)** into the relative seat and fasten by fitting the lower cotter pin with plastic washer.
- Attach the spring **(1)**.

- Refit the console trim panels (M2.24).

- **Left hand cable**

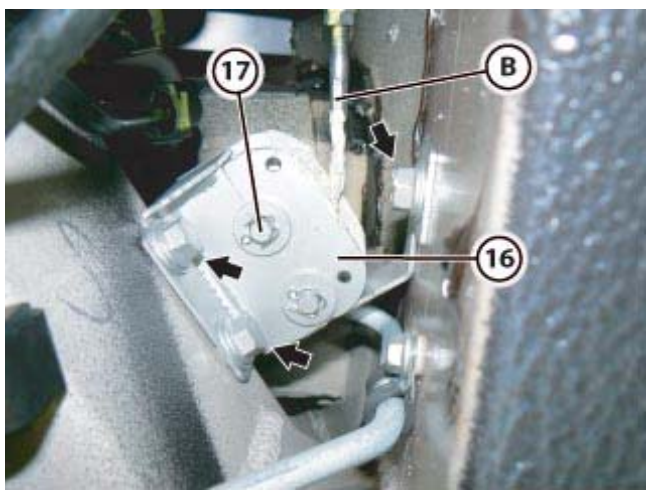


- Release the coupling spring **(15)** on the cable pulley mounting.
- Loosen checknuts **(12)** and **(13)**.
- Completely undo the adjuster screw **(14)** to release the left hand control cable **(B)**.



FROM Ass.ly Nr. 68545

- Loosen checknuts **(12)** and **(13)**.
- Completely undo the adjuster screw **(14)** to release the left hand control cable **(B)**.



- Remove the cable pulley mounting **(16)**, undoing the three fastener screws.
- Remove the lower cotter pin with washer and remove the retainer pin **(17)** from the cable pulley.
- Remove the cable pulley, releasing the left hand control cable **(B)** from the mounting **(16)**.

- Disconnect the left hand control cable from the left hand hub carrier.

Repeat the procedure used to detach the right hand control cable from the right hand hub carrier.

- Release the left hand control cable from the clamps.

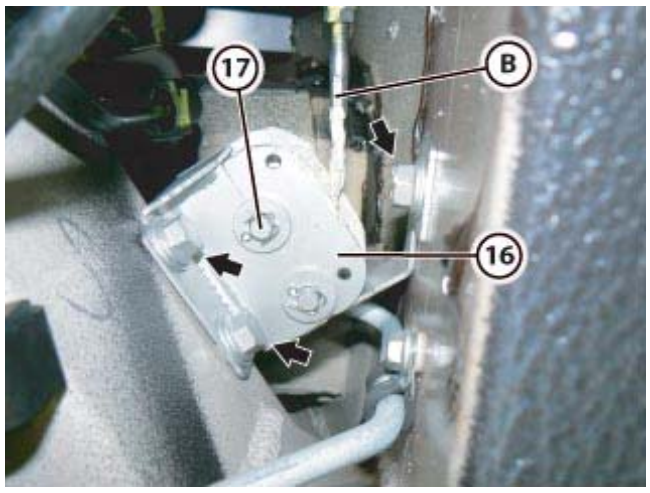
Repeat the procedure used to release the right hand control cable.

- Remove the left hand control cable.
- Fit the new left hand control cable.
- Fasten the left hand control cable to the clamps.

Repeat the procedure used to fasten the right hand control cable.

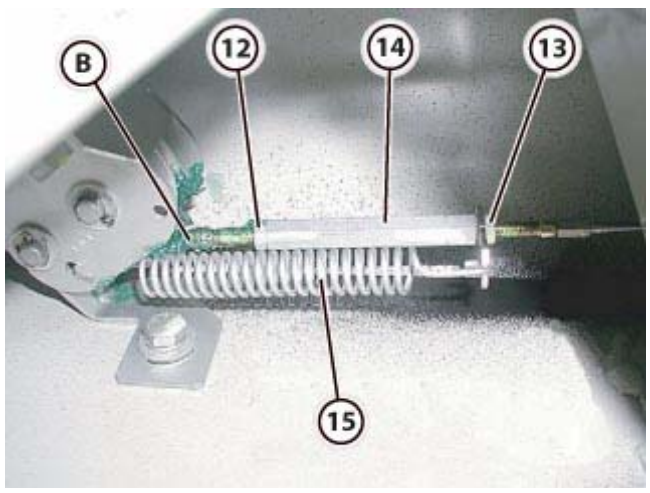
- Connect the left hand control cable to the left hand hub carrier.

Repeat the procedure used to connect the right hand control cable to the right hand hub carrier.

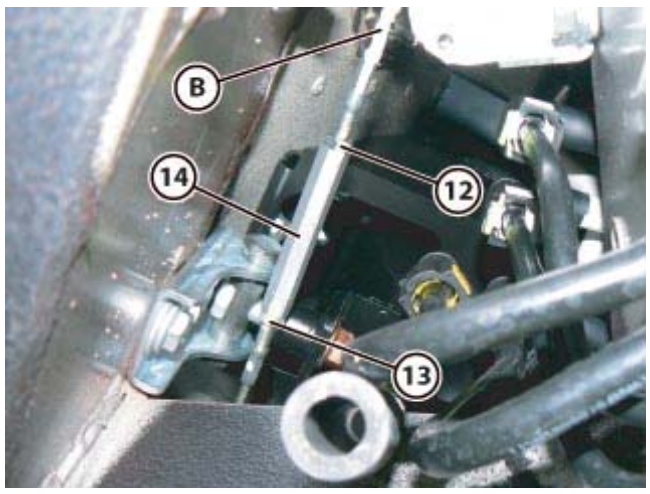


Ensure that the pulley is positioned correctly; once fitted, the pulley must spin without excessive friction.

- Fit the cable pulley onto the left hand control cable **(B)**, fastening to the mounting **(16)**.
- Fit the cable pulley retainer pin **(17)** and fasten by fitting the cotter pin with washer.
- Fit the cable pulley mounting **(16)**, tightening the three fastener screws.



- Completely tighten the adjuster screw **(14)** to connect the left hand control cable **(B)**.
- Tighten checknuts **(12)** and **(13)**.
- Attach the coupling spring **(15)** on the cable pulley mounting.



FROM Ass.ly Nr. 68545

- Completely tighten the adjuster screw **(14)** to connect the left hand control cable **(B)**.
- Tighten checknuts **(12)** and **(13)**.

➢ Refit the rear underfloor section (☞ M2.12).
➢ Refit the wheel (☞ F2.08).

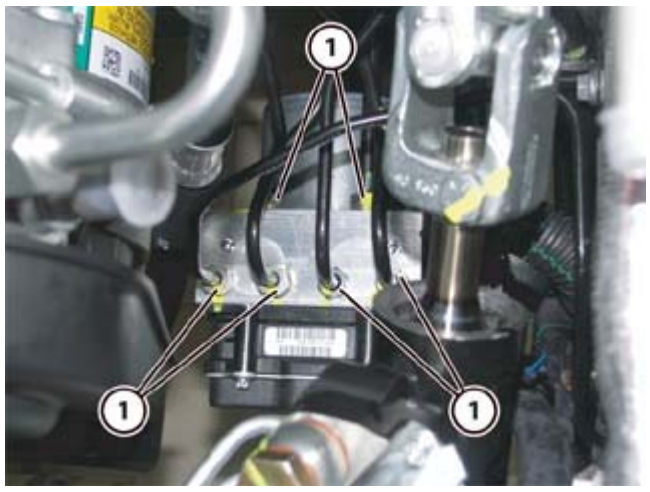
G2.07 ABS/ASR electro-hydraulic unit

Removing the electro-hydraulic ABS/ASR unit

The unit is located in the engine compartment, fastened to the chassis cross member, and consists of a hydraulic component and an ECU.

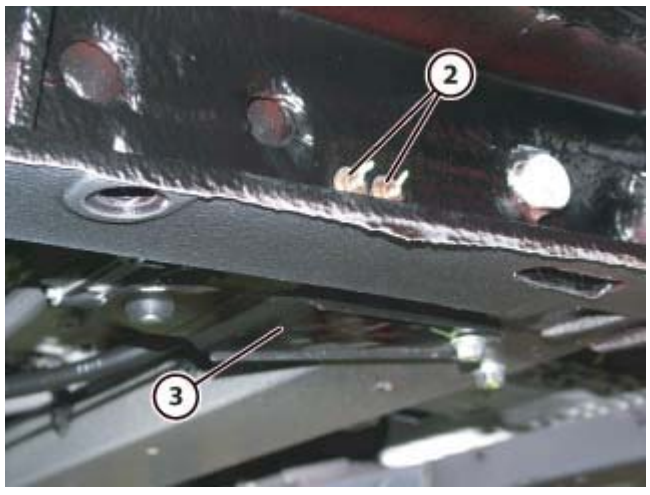
- Remove the front section of the underfloor (M2.12).
- Remove the air intake (B6.03).
  - Remove the left hand component.

- Set the battery master switch to OFF (L2.02).

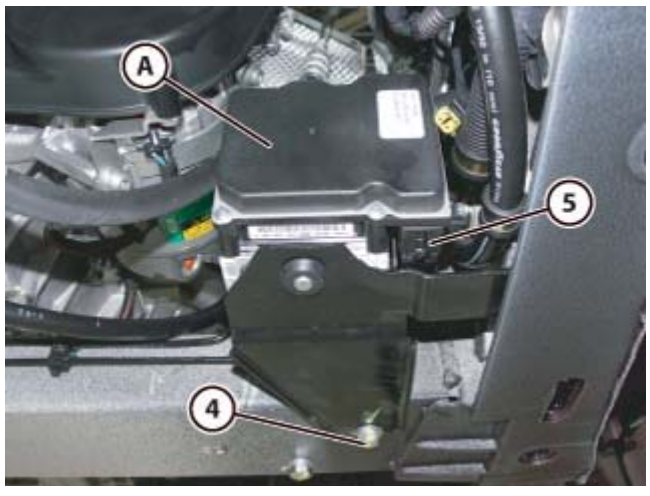


The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

- Unscrew the unions **(1)** for the pipe leading from the brake pump and the delivery pipe to the callipers and immediately plug them to prevent the brake fluid from spilling out.



- Unscrew the nuts **(2)** fastening the mounting bracket **(3)** to the vehicle chassis.

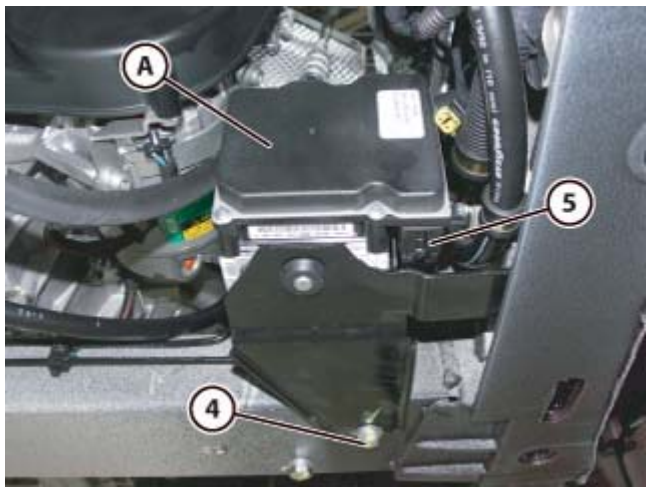


- Unscrew the screw **(4)** and disconnect the terminal board **(5)** from the electro-hydraulic unit.
- Remove the electro-hydraulic unit **(A)**, complete with mounting bracket, from the car.

Refitting the electro-hydraulic ABS/ASR unit

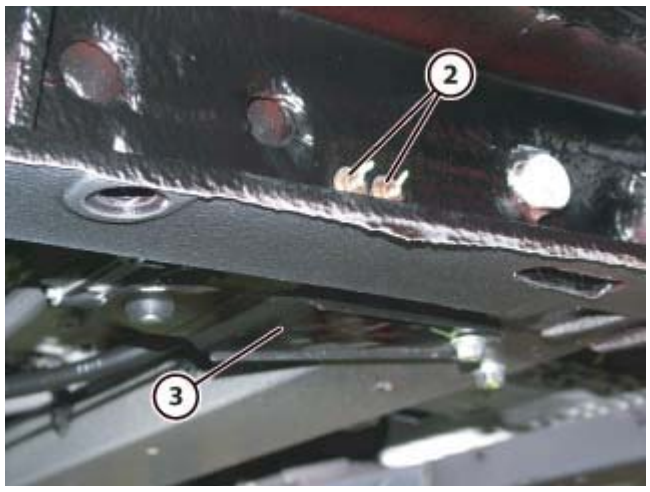
			
Tightening torque		**Nm**	**Class**
ABS unit mounting bracket - chassis	Screw	20 Nm	B
ABS unit mounting bracket - chassis (lateral fastener)	Nut	8 Nm	B
Brake fluid pipes from master brake cylinder - ABS/ASR electrohydraulic unit	Union	16 Nm	B
Brake fluid outlet pipes - electrohydraulic unit	Union	16 Nm	B

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.



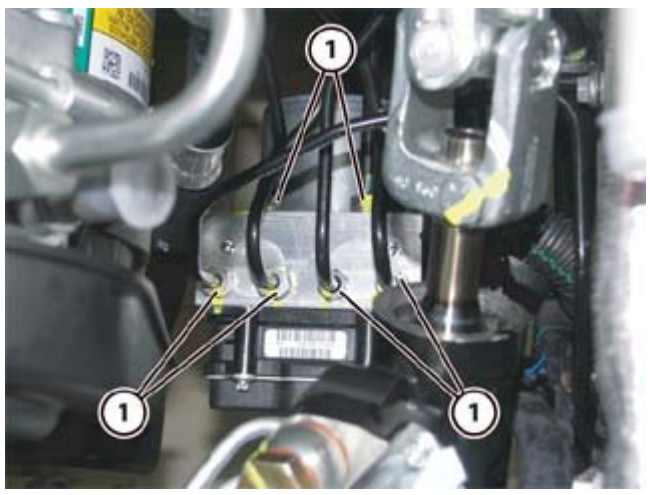
- Fit the electro-hydraulic ABS/ASR unit **(A)** in its relative seat on the vehicle chassis.
- Connect the terminal board **(5)** and fix the mounting bracket to the chassis, tightening the screws **(4)**.

Tightening torque	Nm	Class
Screw	20 Nm	B



- Fasten the electro-hydraulic unit mounting bracket **(3)** laterally, tightening the nuts **(2)**.

Tightening torque	Nm	Class
Nut	8 Nm	B



- Fit the oil pipes on the electro-hydraulic unit and tighten the relative unions **(1)**.

Tightening torque	Nm	Class
Union	16 Nm	B
Union	16 Nm	B

- Refit the front flat undertray section (M2.12).
- Refit the air intake (B6.03).
- Fill and bleed the braking system (G2.10).
- Set the battery master switch to ON (L2.02).
- Perform the automatic NFR (Brake System Node) ECU diagnostic cycle (G2.07).

Automatic NFR (Brake System Node) ECU diagnostic cycle

The automatic NFR diagnostic cycle must be performed with the SD3 tester updated with the latest software version.

Carry out the following procedures, waiting at least 3 seconds between one operation and the next.

Whenever replacing the NFR airbag (Brake System Node) unit or any of the system components, perform the relative automatic cycle with the SD3 tester.

- Connect the SD3 tester to the relative diagnostic socket on the car.
- ECU Error Check.
- Select "CYCLE ENVIRONMENT".
- Automatic brake fluid fill check.
- Calibrate the longitudinal sensor, following all the instructions given by the SD3.
- Steering angle calibration: position the wheel so that the wheels point straight ahead.
- Brake pedal check: press the brake pedal and check the effective brake system pressure.
- ABS Check: with the assistance of another person, check while braking that the wheel indicated on the SD3 is effectively locked.
- ESP Check: follow the instructions given by the SD3.

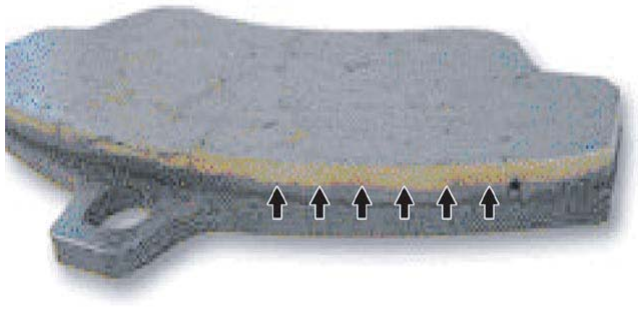
G2.08 Replacing the service brake pads

Checking brake pad alignment

If a single pad is found to be excessively worn, check that the respective disc is properly aligned with the pad friction surfaces.

- With the brake pedal released, check the distance between the disc and the pads with a feeler gauge.
- Maximum permissible tolerance for pad alignment relative to the disc is **0.9 mm**.
- Higher values may be attributable to the pistons not moving smoothly inside their respective seats on the caliper. In this case, the caliper must be replaced.

Checking CCM brake pad wear (optional)



After severe race track use, visually inspect the appearance of the pads as well as checking for wear. If a marked white coloration is noted around the edges of the pads, extending almost as far as the metal backing plate, the pads must be replaced to ensure optimum braking performance.

CCM brake disc wear

The instrument panel operating software uses an algorithm to calculate, in relation to effective vehicle usage (e.g.: deceleration caused by braking), separate wear indices for the front **P(a)** and rear **P(p)** carbon brake discs, expressed as a percentage (%) of wear.
These indices are periodically compared against a threshold value **(100%)**. Upon reaching this threshold, an amber warning signal (possible danger of disc failure) is shown on the TFT display, warning the user that disc replacement is necessary.
The user is warned of this condition by the appearance of the message: **“CCM disc brakes wear”** on the display, together with the specific amber symbol. At the end of the display cycle, or when the MODE button is pressed (with **“Escape”** function), the symbol is reduced to icon form.



An RLI for “Number of brake disc replacements” is also generated, identifying the number of times that the discs have been replaced.
Once the brake discs have been replaced, the wear index may be reset on the instrument panel.
The wear index on the instrument panel may only be reset once the discs have been replaced, after the index has exceeded 100%.

To maintain a record of the latest brake wear index reset, three values are stored in the statistics memory for the front and rear brakes, which are updated upon reset (with the possibility of storing the last seven resets):

- Number of brake disc changes counter: --------- (dimensionless number)
- Kilometres at first disc brake change: --------- Km
- Wear percentage at first disc brake change: --------- %

At each service, submit the following data (printing out the parameters from the instrument panel):

- vehicle serial number
- vehicle mileage (“Odometer” parameter)
- “Disc Wear Index” value

There are essentially **5** different scenarios possible:

- 1 - Replacing all carbon discs due to vehicle usage;
- 2 - Replacing one carbon disc (or two discs on same axle) due to failure;
- 3 - Replacing a working instrument panel (dialogue with diagnostic instrument possible);
- 4 - Replacing of a malfunctioning instrument panel (dialogue with diagnostic instrument not possible);
- 5 - Replacing the carbon discs before reaching wear threshold (“Disc Wear Index” parameter < 100%).

1 - Replacing the carbon discs due to vehicle usage

- In this situation, the amber warning signal on the TFT display is lit.
- Use the diagnostic instrument to verify from the instrument panel that the disc wear index has exceeded 100%.
- Replace the carbon discs.
- Reset the carbon disc wear index on the instrument panel with the diagnostic instrument.

2 - Replacing one carbon disc (or two discs on same axle) due to failure

- In this situation, only one disc (or two discs on the same axle) are replaced, without modifying the parameters on the instrument panel.
- In other terms, the “Disc Wear Index” parameter is left at the value for the discs not being replaced (partially worn).

3 - Replacing a working instrument panel (dialogue with diagnostic instrument possible)
Order a replacement instrument panel following the instructions given in **TI 2009** issued **May 2012**.

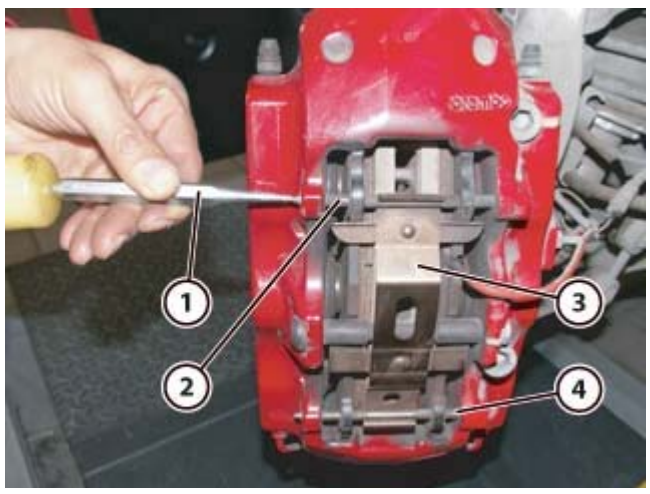
4 - Replacing a malfunctioning instrument panel (dialogue with diagnostic instrument not possible)
Order a replacement instrument panel following the instructions given in **TI 2009** issued **May 2012**, specifying:
- the serial number of the vehicle;
- estimated vehicle mileage.

SAT will verify the estimated vehicle mileage.
Using a table correlating vehicle usage time with increase in disc wear % compiled by the engineering division, SAT will determine the % disc wear value to be entered in the new instrument panel in relation to the mileage recorded at the last service.
Upon approval from SAT (which will verify the data supplied by the dealership), the Spare Parts Department will confirm the order and supply a spare instrument panel (with the estimated values from the replaced unit).

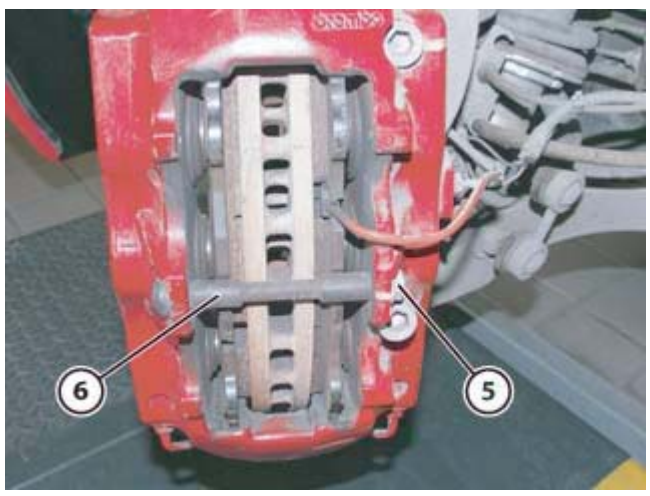
5 - Replacing the carbon discs before reaching wear threshold (“Disc Wear Index” parameter < 100%)
This is a non-standard procedure and may only be performed by authorised personnel. Contact the Ferrari SAT service.

Removing the front brake pads

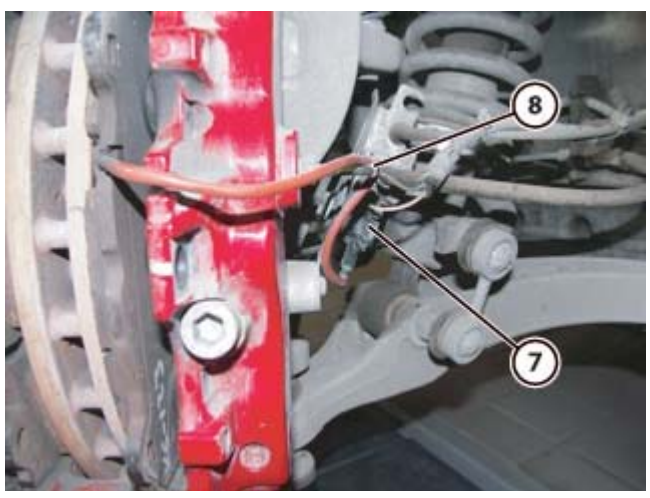
➢ Remove the wheel (F2.08).



- Using a punch **(1)** and a hammer, tap the upper pin **(2)** out of its seat on the caliper.
- Lift out and remove the spring **(3)**.
- Remove the lower pin **(4)** from the caliper as described above.



- Undo the screw **(5)** and ease out the pin **(6)**.



- Disconnect the connector **(7)** (S004) (S006)and remove the cable retainer clamp **(8)**.



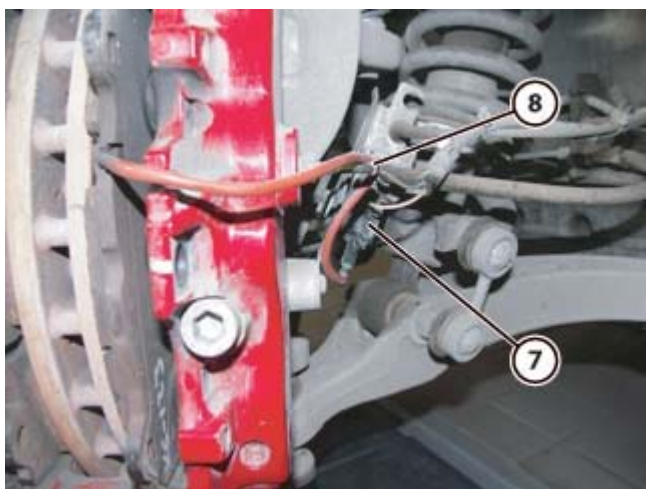
- Remove the two pads **(A)** from the caliper.

Refitting the front brake pads

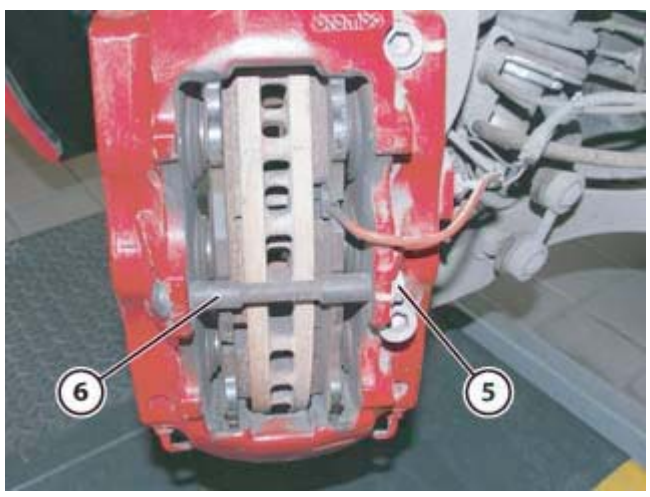
- To enable installation of the pads, separate the pistons of the half-callipers with the relative tool(FACOM DF.6).



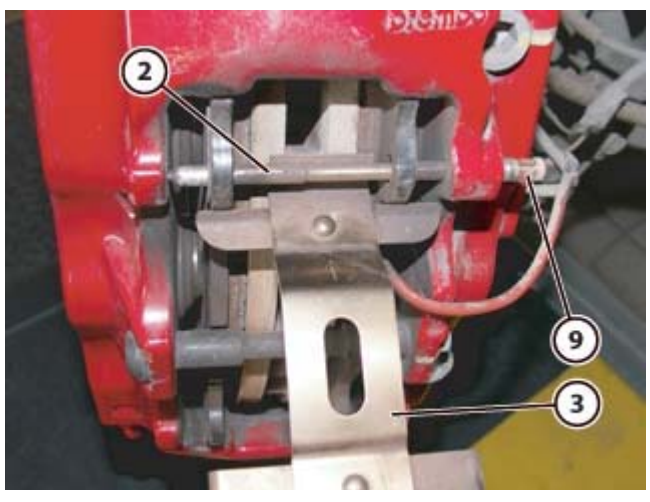
- Fit the pads **(A)** in their respective seats on the brake calliper.



- Connect the pad wear sensor connector **(7)** (S004) (S006) and refit the clamp **(8)**.

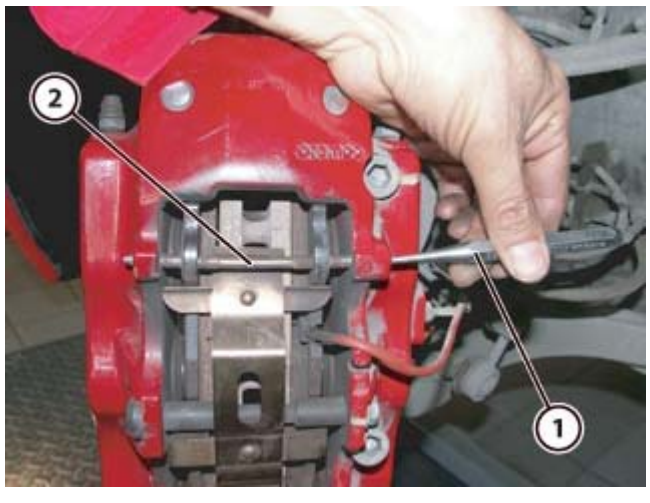


- Insert the pin **(6)** in its seat and fasten with the screw **(5)**.



- Check that the upper and lower pins and the retainers **(9)** are in proper working condition; replace if necessary.
- Fit the upper pin **(2)** in the hole on the calliper and fit the spring **(3)**.

The arrow on the spring **(3)** must point upward.



- Fit the upper pin in place **(2)** using a punch **(1)** and a hammer.
- Keep the spring compressed against the pads and repeat the above procedure for the lower pin.

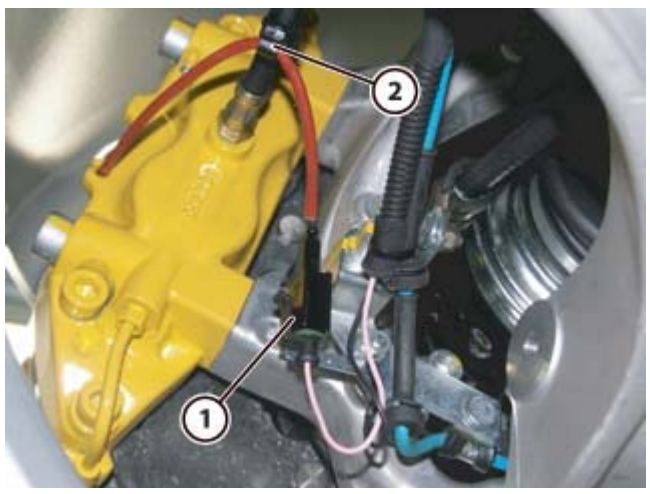
CAUTION
Take care when fitting the spring: check that the centre part does not impede pad movement.
Also check that the upper and lower pins have limited free play and are correctly retained in their seats.

- Depress the brake pedal fully repeatedly until it stiffens, to settle the pistons correctly in the callipers.

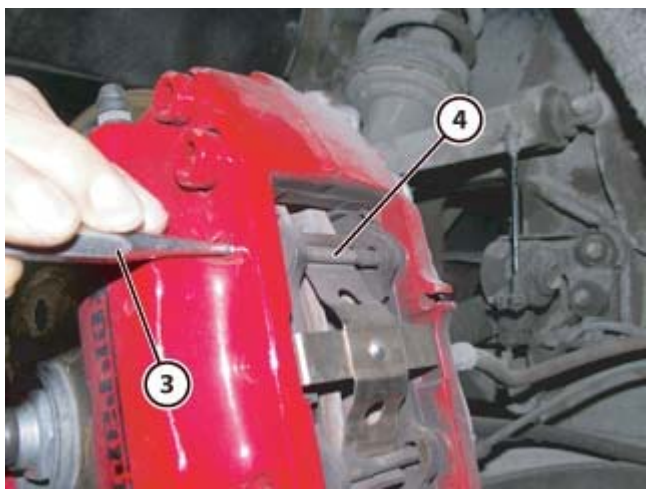
➢ Refit the wheel (☞ F2.08).
➢ Only in the case of replacing CCM pads. Bed in the CCM pads (☞ G2.08).

Removing the rear brake pads

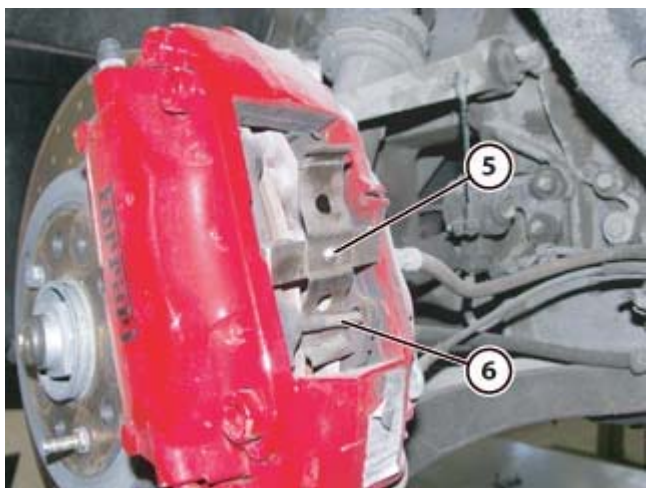
➢ Remove the wheel (☞ F2.08).



- Disconnect the pad wear sensor connector **(1)** (S330) (S331) and remove the cable from the clamp **(2)**.



- Using a punch **(3)** and a hammer, remove the upper pin **(4)** from its seat.



- Remove the spring **(5)** and remove the lower pin **(6)** as described above.



- Remove the two pads **(A)** from the brake caliper.

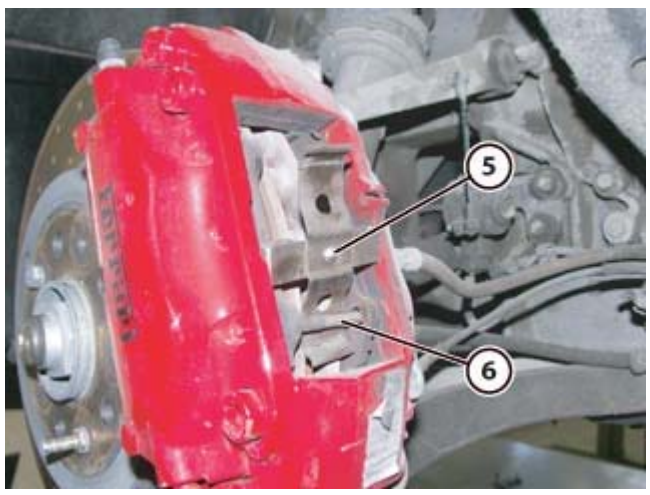
Refitting the rear brake pads

- To enable installation of the pads, separate the pistons of the half-callipers with the relative tool(FACOM DF.6).

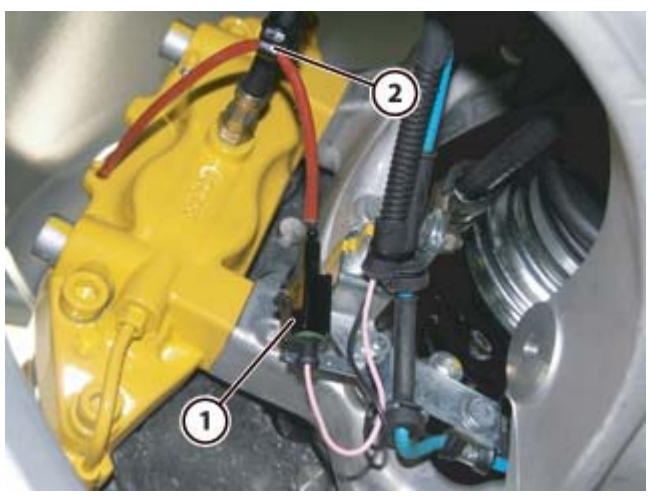


- Fit the pads **(A)**.

- Check that the upper and lower pins and the retainers are in good condition; replace if necessary.



- Fit the lower pin **(6)** in the hole in the calliper and fit the spring **(5)**.
- Keep the spring compressed against the pads and repeat the above procedure for the upper pin.



- Connect the pad wear sensor connector **(1)** (S330) (S331) and refit the clamp **(2)**.

CAUTION
Take care when fitting the spring: check that the centre part does not impede pad movement.
Also check that the upper and lower pins have limited free play and are correctly retained in their seats.

- Depress the brake pedal fully repeatedly until it stiffens, to settle the pistons correctly in the callipers.

➢ Refit the wheel (F2.08).
➢ Only in the case of replacing CCM pads. Bed in the CCM pads (G2.08).

Bedding-in new brake pads (for cast iron discs)

- To increase brake pad grip on the discs and to maintain uniform braking performance throughout the lifetime of the pads, always carry out the following after replacing the pads:
- Sand the brake discs with fine abrasive paper (do not sand new discs).
- Clean the surface of the brake discs with trichloroethylene or other non-greasy solvent.
- Avoid hard braking until the new brake pads are sufficiently bedded-in (**after 80 to 100 Km**).
- Once the pads have been bedded in, in the event of unusual noise when braking, disassemble the pads and remove any metal residue from the braking surfaces with a scraper.

Bedding in CCM pads

The following procedure is applicable for both CCM1 and CCM2 brake systems and must be performed EACH TIME the CCM brake pads and/or CCM brake discs are replaced.

For vehicles intended for ROAD use

- Brake **16 times** from **80 Km/h** to **20 Km/h** with constant pressure on the brake pedal and without activating the ABS system.
- Leave the brake system to cool for approximately **120 seconds**.
- Brake **16 times** from **120 Km/h** to **20 Km/h** with constant pressure on the brake pedal and without activating the ABS system.
- Leave the system to cool for **180 seconds**.

The ABS system must be triggered during the last set of braking runs.

- Brake **AT LEAST 5 times** from **120 Km/h** to **0 Km/h** (vehicle completely stopped), causing the ABS system to activate.

Allow the brake system to cool completely before using the vehicle again after the bedding-in procedure to ensure maximum braking efficacy.

- As soon as you notice an increase in brake pedal travel, stop the car and wait for the brake system to cool completely.

For vehicles intended for TRACK use

- Brake **16 times** from **80 Km/h** to **20 Km/h** with constant pressure on the brake pedal and without activating the ABS system.
- Leave the brake system to cool for approximately **120 seconds**.
- Brake **16 times** from **120 Km/h** to **20 Km/h** with constant pressure on the brake pedal and without activating the ABS system.
- Leave the system to cool for **180 seconds**.

The ABS system must be triggered during the last set of braking runs.

- Brake **AT LEAST 5 times** from **160 Km/h** to **0 Km/h** (vehicle completely stopped), causing the ABS system to activate.

Allow the brake system to cool completely before using the vehicle again after the bedding-in procedure to ensure maximum braking efficacy.

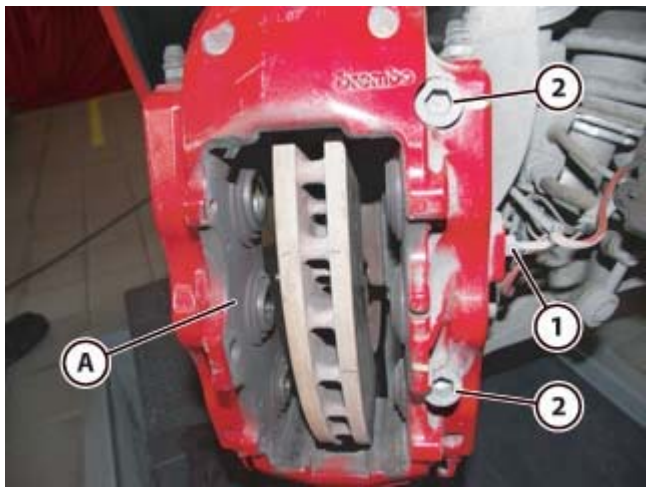
- As soon as you notice an increase in brake pedal travel, stop the car and wait for the brake system to cool completely.

G2.09 Replacing the service brake callipers

Removing the front brake caliper

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

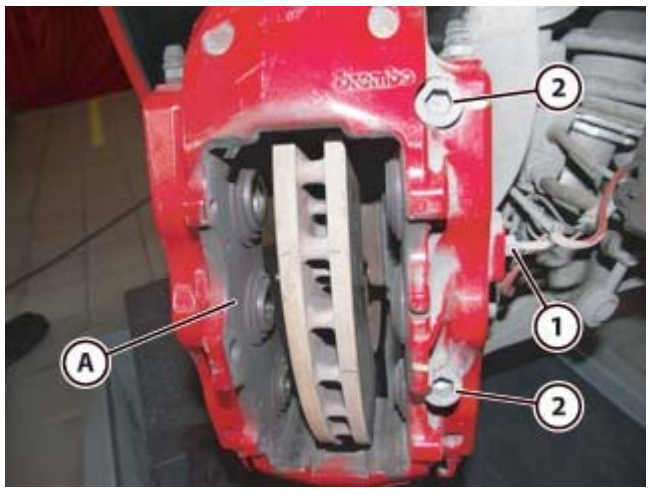
- Remove the wheel (F2.08).
- Refit the front brake pads (G2.08).



- Unscrew the union **(1)** for the rigid pipe on the caliper.
- Undo the two screws **(2)** fastening the caliper **(A)**.
- Remove the caliper from the front suspension.

Refitting the front brake calliper

Tightening torque		Nm	Class
Screw fastening calliper to stub axle	Screw	100 Nm	A
Connection between rigid brake pipe and calliper	Union	16 Nm	B



- Check that the calliper mating surfaces with the stub axle are clean, fit the calliper **(A)** to the disc and tighten the two screws **(2)**.

Tightening torque	Nm	Class
Screw	100 Nm	A

- Fit the rigid pipe on the caliper and tighten the union **(1)**.

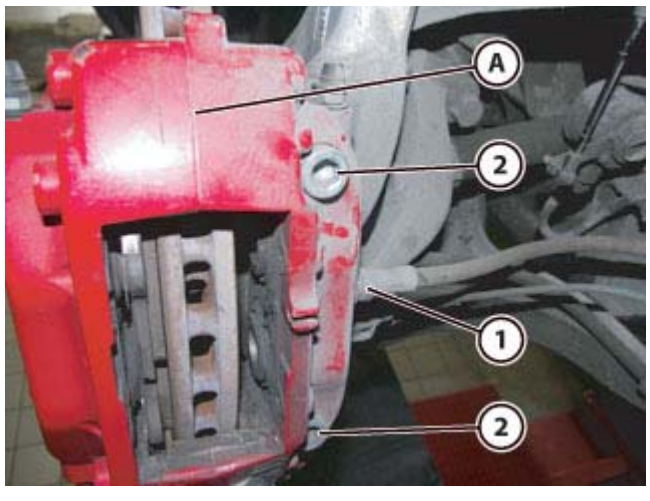
Tightening torque	Nm	Class
Union	16 Nm	B

- Refit the front brake pads (G2.08).
- Fill and bleed the braking system (G2.10).
- Refit the wheel (F2.08).

Removing the rear brake callipers

The fluid in the brake and clutch system is harmful in the event of contact with the eyes or skin; wash the affected parts with plenty of running water. The fluid may also damage paintwork.

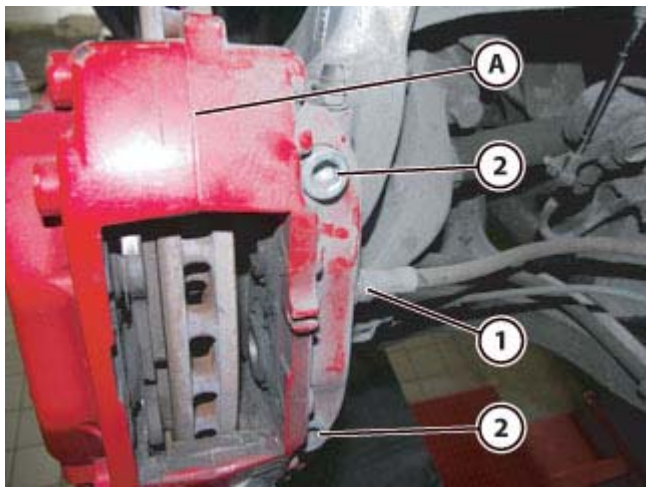
- Remove the wheel (F2.08).
- Remove the rear brake pads (G2.08).



- Unscrew the union **(1)** for the flexible hose on the caliper.
- Undo the two screws **(2)** fastening the caliper **(A)**.
- Remove the caliper from the rear suspension.

Refitting the rear brake callipers

Tightening torque		Nm	Class
Screw fastening calliper to hub carrier	Screw	100 Nm	A
Screw fastening brake hose to calliper	Union	16 Nm	B



- Check that the calliper mating surfaces with the stub axle are clean, fit the calliper **(A)** to the disc and tighten the two screws **(2)**.

Tightening torque	Nm	Class
Screw	100 Nm	A

- Fit the flexible hose onto the calliper and tighten the union **(1)**.

Tightening torque	Nm	Class
Union	16 Nm	B

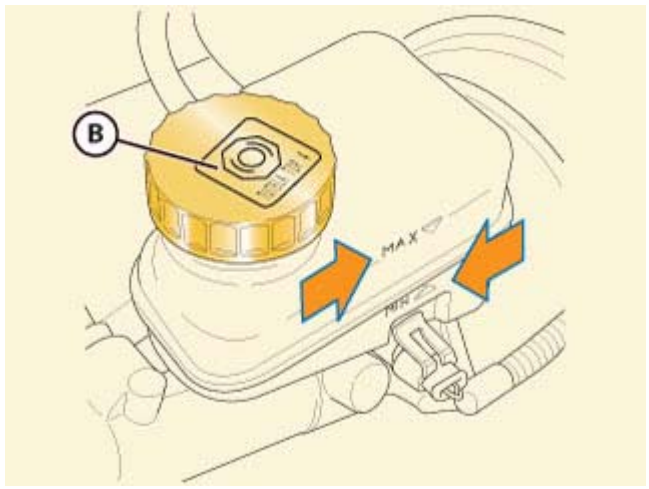
➢ Refit the rear brake pads (G2.08).
➢ Fill and bleed the braking system (G2.10).
➢ Refit the wheel (F2.08).

G2.10 Filling and bleeding

Filling and bleeding the braking system

			
Tightening torque		**Nm**	**Class**
Brake calliper bleed union	Union	15 Nm	B

➢ Remove the wheels (☞ F2.08).
➢ Remove the left hand side windscreen shield (☞ M2.17).



- Fill the tank, considering that during bleeding, the fluid level in the tank must never drop below the **MIN** level indicated on the tank.

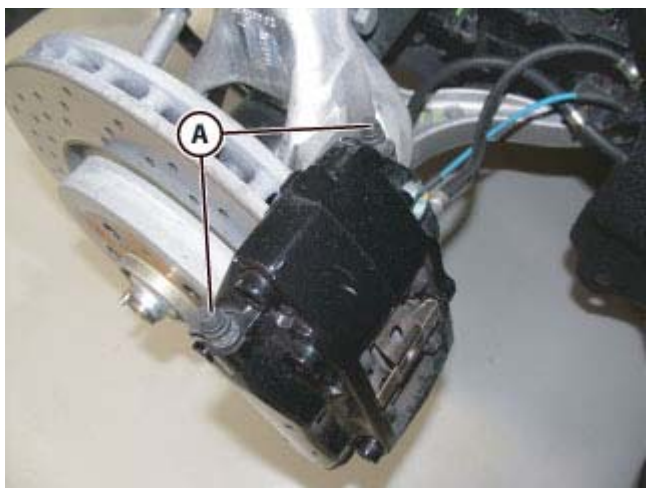
i Always use fresh fluid of the recommended type and in the indicated quantity, taken from a sealed container.

i The symbol **(B)** on the tank indicates that the circuit contains synthetic fluid. Using mineral fluid may cause irreparable damage to the rubber gaskets in the system .



- **"Electronic"** brake system bleeding must be performed with the SD3 tester, running the specific active diagnosis function, and following the procedure described.

- Connect the SD3 tester to the diagnostic socket (☞ L2.12).



- Bleed one caliper at a time.
- Fit a transparent plastic tube on each caliper bleeder union **(A)**.
- Immerse the end of the pipe in a container filled with brake fluid.
- Control the pulse sequence with the SD3 tester and depress the brake pedal to pressurise the circuit, until all the air has been bled and the circuit is filled.
- Tighten the bleeder unions **(A)** and fit the protective cap.

		
Tightening torque	**Nm**	**Class**
Union	15 Nm	B

➢ Fill the tank with fluid up to the **MAX** level.
➢ After the procedure, there must be no sponginess in the pedal and the braking action must be progressive, starting immediately after a short free play.
➢ Refit the left hand side underwindscreen shield (☞ M2.17).
➢ Refit the wheels (☞ F2.08).

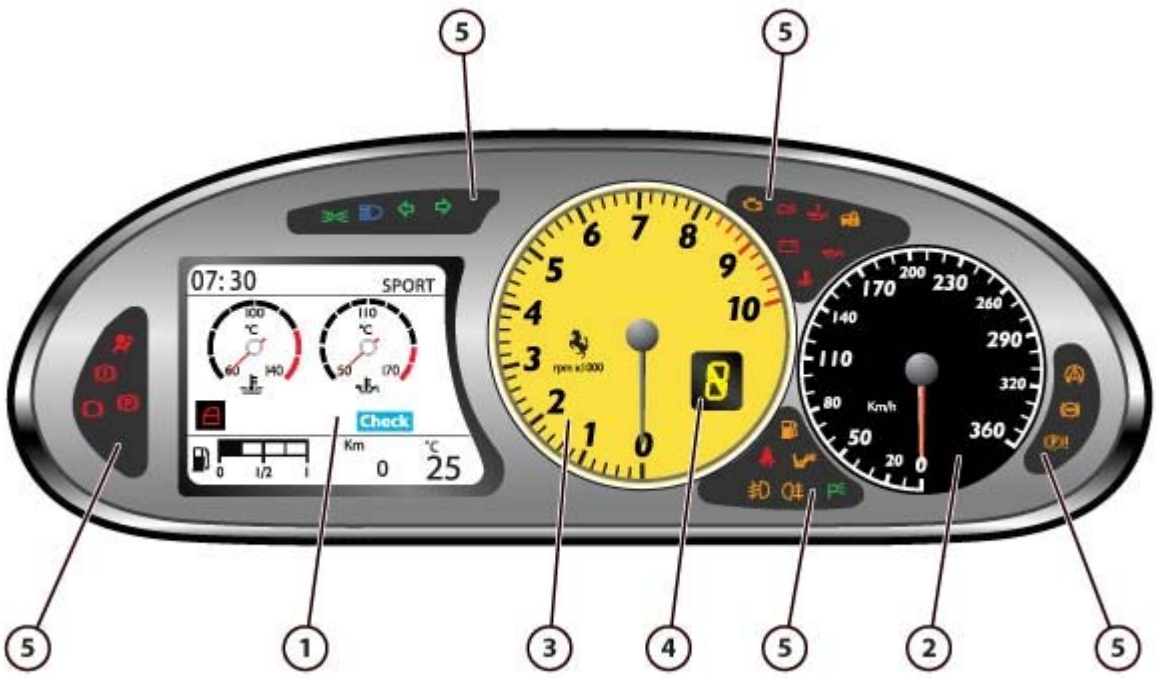
H1.01 Specific tooling and equipment



- Tool (AV 3994)
  for adjusting engine compartment lid striker plate retainer bracket.

H2.01 Instrument panel

Instrument panel



1 - TFT display
2 - Electronic speedometer
3 - Rev. Counter
4 - Gear display
5 - Warning lights

The instrument panel is as a maintenance-free component, and the bulbs, instruments, etc. are not replaceable.
All the functions of the instrument panel are controlled and managed by an electronic microprocessor board, specifically:

- digital and analogue instrument control;
- dashboard lighting management;
- communication with ECUs for the engine area and coachwork functions;
- management of multifunction display signals and indicator lights;
- diagnosis via the Ferrari SD-3 Tester;
- historical and statistical vehicle data storage.
- loudspeaker (buzzer) control for audible signals

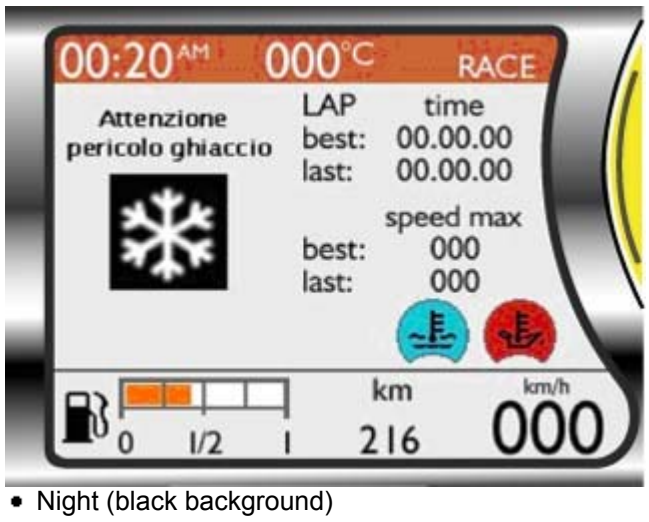
Operating the TFT display

The TFT display is incorporated in the instrument panel and performs the following functions:

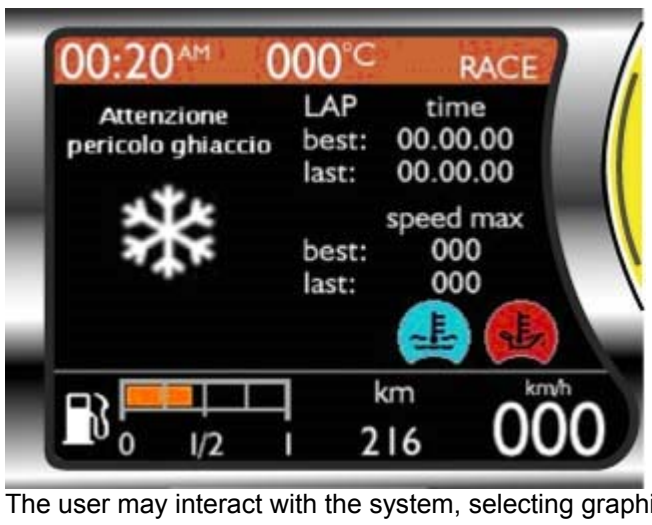
- control parameter indication;
- indication of general information while driving;
- malfunction indication.

The display has two different colour schemes:

- Day (grey background)

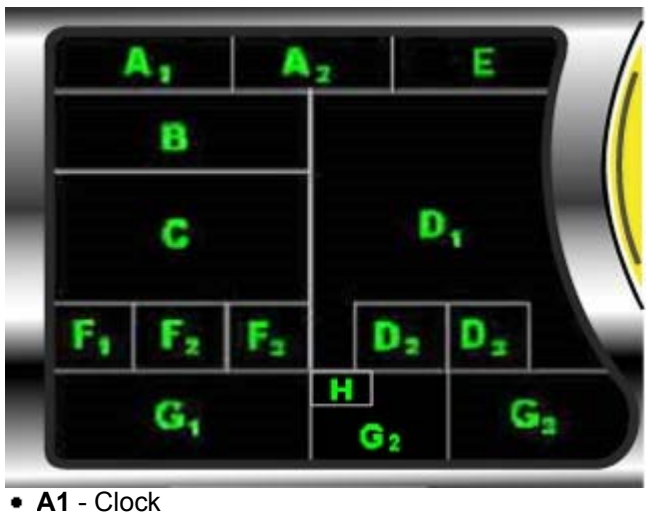


- Night (black background)



The user may interact with the system, selecting graphic configurations and setting parameters.

The screen is divided into different areas, depending on the display configuration:

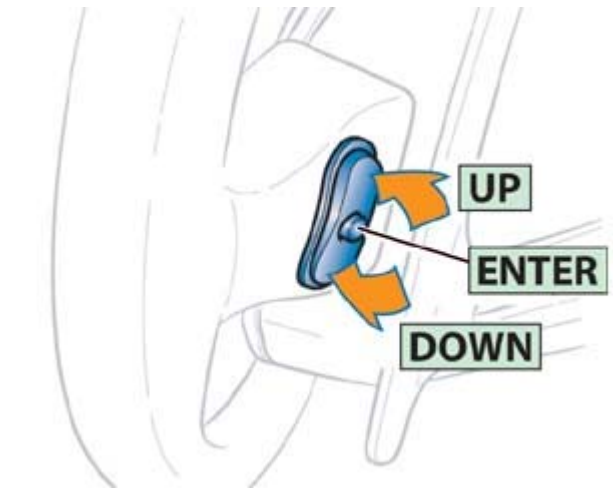


- **A1** - Clock
- **A2** - External temperature or the script "Manettino" (if duplicated speedometer indication is not available)
- **B+C+F** - Menu information (with Menu page active)
- **B+C+D1** - Virtual engine coolant temperature and engine oil temperature gauges (full size) / RACE information (with RACE page active)
- **B** - Message text
- **C** - Graphic symbols
- **B+C** - Graphic symbol display for parking sensors
- **D** - Engine coolant temperature/engine oil temperature gauges (medium size) / vehicle symbol with tyre pressure and temperature on TYRES screen page
- **D2** - Virtual engine coolant temperature gauge (minimum size)
- **D3** - Virtual engine oil temperature gauge (minimum size)
- **D2+D3** - Check/Check OK text messages
- **E** - Selected driving mode
- **F1** - 1st area for priority 1/2 fault indicator symbol
- **F2** - 2nd area for priority 1/2 fault indicator symbol
- **F3** - 3rd area for priority 1/2 fault indicator symbol
- **G1** - Fuel level
- **G2** - Trip and total distance odometer (TRIP A or B)
- **G3** - Duplicated speedometer indication or ambient temperature
- **H** - Indicates "F1-SUPERFAST" mode enabled / Duplicated automatic gearbox mode display (message “auto”)
- **B+C+D1** - Trip A or B information screen(the trip page will also show the date at the top of area D), Engine screen upon starting.

Controls

The screen is activated and set by pressing the **"MODE"**, **and "DISP"** buttons on the dashboard to the right of the steering wheel, and the buttons **"UP"**, **"DOWN"** and **"ENTER"** behind the steering wheel.





- MODE -
Pressed briefly (< 2 sec)
- activate MENU PAGE (shown in reduced format if the vehicle is moving);
- Within a submenu: back to last page displayed;
- flashing odometer: go back to previously active information
- during a test cycle at key-on: interrupts display (ESCAPE function).

Pressed and held (> 2 sec)
- MENU page not active and TRIP B disabled: TRIP A reset
- MENU page not active and TRIP B enabled: select odometer displayed on display (total, A or B)
- MENU page active: goes back to the display active before MODE button was pressed.

- DISP (DISPLAY) -
Scrolls through the following screens:
- SPORT
- RACE
- TYRES
- TRIP A
- TRIP B

Pressing and holding the DISP button in RACE mode resets the chronometer and the previous trip information.

- UP -
- selects main functions, scrolling up
- sets/adjusts MENU functions;
- MENU page not active: incremental panel brightness adjustment;
- flashing odometer: selected TRIP counter for reset;
- Twilight sensor Auto Function active: incremental brightness adjustment

- DOWN -
- selects main functions, scrolling down
- sets/adjusts MENU functions;
- flashing odometer - selected TRIP counter for resetting;
- Twilight sensor Auto Function active: decreasing brightness adjustment.

- ENTER -
- MENU page not active: toggles between display of total odometer, TRIP A and TRIP B (if enabled);
- confirms selected function;
- confirms setting / modification made;
- memorises the confirmed modifications.

Setting configurations

The different parameter display configurations may be set and customised from the MENU page.
To display the MENU page, press the **MODE** button briefly.
The following parameters are settable:

- Lighting
- Display configuration
- Date and time
- Language and units of measurement
- Vehicle set-up

The parameters listed above and their relative functions are selected by pressing the **UP** and **DOWN** buttons. Press **ENTER** to confirm the parameter.

- Display configuration -

Area for selection of permanently displayed configuration; the following options are available: SPORT, RACE, TYRES, TRIP A and TRIP B.

- Date and time

Date may be displayed in two formats: day/month/year or month/day/year. Select and modify the format with the **UP** and **DOWN** buttons. Press **ENTER** to confirm.
The time can be displayed in "24h" or "12h - AM/PM" format. Select and modify the time format with the **UP** and **DOWN** buttons. Press **ENTER** to confirm.

- Language and U.M.

The languages available are:

- English
- German
- Italian
- French
- Spanish

The units of measurement available are:

- Distance U.M. (Km or M)
- Temperature U.M. (°C or °F)
- Pressure U.M. (bar or psi)

Select parameters with the **UP** and **DOWN** buttons. Press **ENTER** to confirm the parameter.

- Vehicle setup

The following parameters are modifiable:

- Door lock
- Door unlock
- Autoclose
- Speed limit
- Buzzer volume
- Light sensor
- Glove compartment button
- Parking sensors
- Equalisation
- Maintenance Schedule

Select parameters with the **UP** and **DOWN** buttons. Press **ENTER** to confirm the parameter.

Screen pages

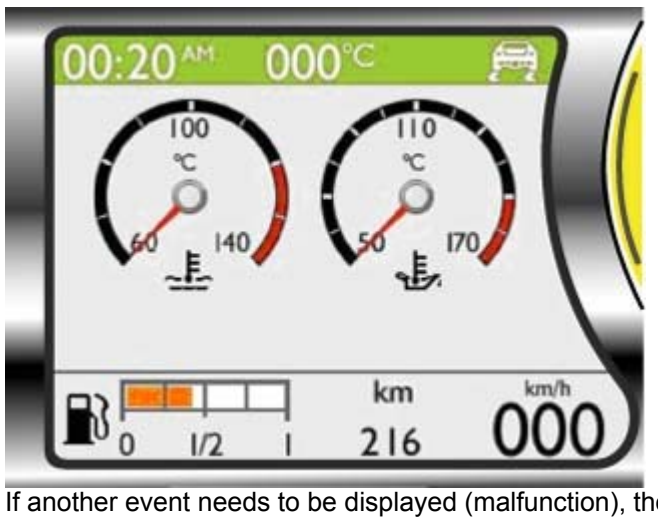
The following configurations are available for the TFT display. These are selectable either by using the **DISP** or by using the **MODE** button from the MENU page.

- SPORT
- RACE
- TYRES
- TRIP A
- TRIP B

- SPORT page -
In addition to the common parameters, the screen also includes virtual gauges for:

- Oil temperature
- Water temperature

In normal conditions, the display appears as follows:



If another event needs to be displayed (malfunction), the display will be as follows:

In the case of malfunctions/events requiring the display of an icon, the icon is displayed in one of the three areas (F1, F2 or F3) once the current display cycle is complete.

- RACE page -

In addition to the common parameters, the screen also displays:

- Minimised virtual oil temperature and water temperature gauges
- Current Lap
- Best Lap
- Last Lap
- Max-Speed Last
- Max-Speed Best

Minimised virtual gauges are displayed without pointers or graduated scales, but only as black symbols on a background colour that changes (blue, green, red) depending on the current temperature range.

In normal conditions, recalling the RACE configuration enables the visualisation of recorded chronometer times (the chronometer is enabled by pressing **ENTER**).

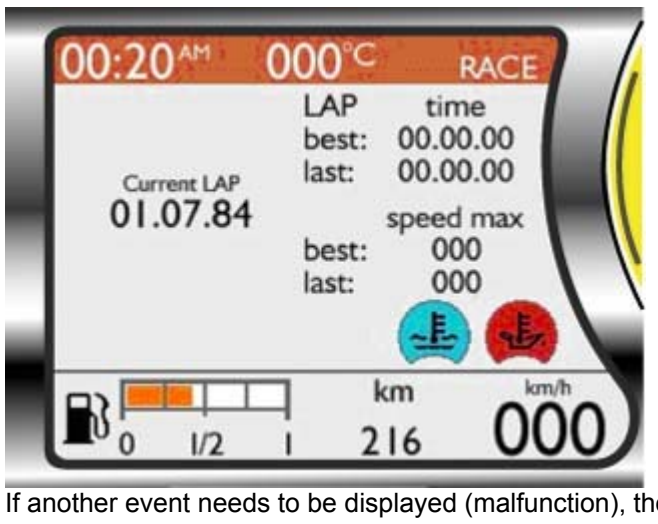
Oil temperature gauge:

- Blue = oil T less than **80°C (176°F)**
- Green = oil T between **80°and 155°C (176°F and 311°F)**
- Red = oil temperatures equal to or more than **155°C (311 °F)**

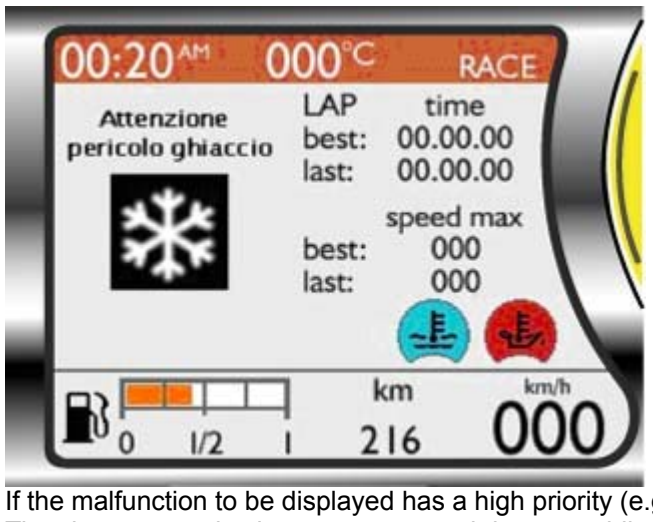
Water temperature gauge

- Blue = water T less than **70°C (158°F)**
- Green = water T between **70°and 125°C (158°F and 257°F)**
- Red = water T equal to or more than **125°C (257°F)**

In normal conditions, the display appears as follows:



If another event needs to be displayed (malfunction), the display will be as follows:

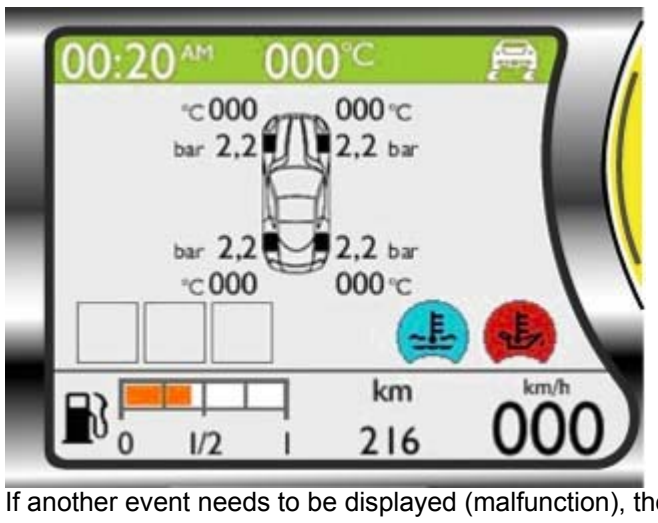


If the malfunction to be displayed has a high priority (e.g. water/oil temperature too high), the chronometer stops.
The chronometer is always reset at each key-on, while the last valid data relative to the Last Lap and Best Lap are stored in the memory.

- TYRES screen -
In addition to the common parameters, the screen also displays:

- minimised virtual water temperature gauges
- vehicle symbol with pressure and temperature values for each tyre
- pressure and temperature values for each tyre, if necessary

In normal conditions, the display appears as follows:



If another event needs to be displayed (malfunction), the display will be as follows:



- TRIP A / TRIP B screen -
In addition to the common parameters, the screen also displays:

- minimised virtual water temperature gauges
- date
- distance travelled
- average speed
- maximum speed
- trip time

In normal conditions, the display appears as follows:

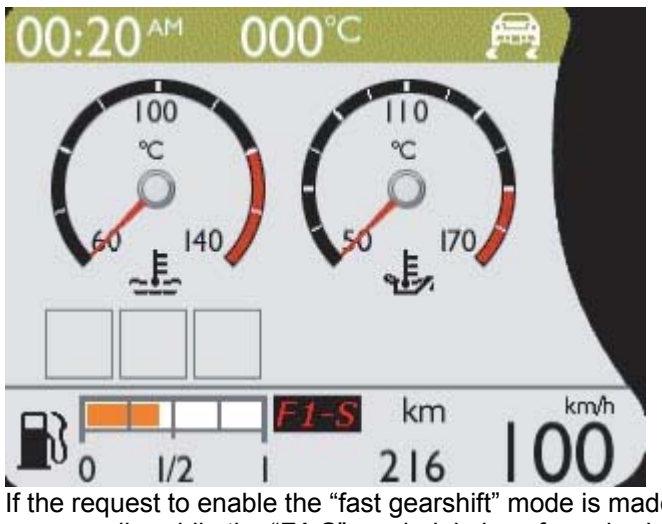


If another events needs to be displayed (malfunction), the display returns to the SPORT page (with malfunction).
If the user selects TRIP B screen as the main page and then deselects it from the MENU page, the default page is automatically set as the main page.

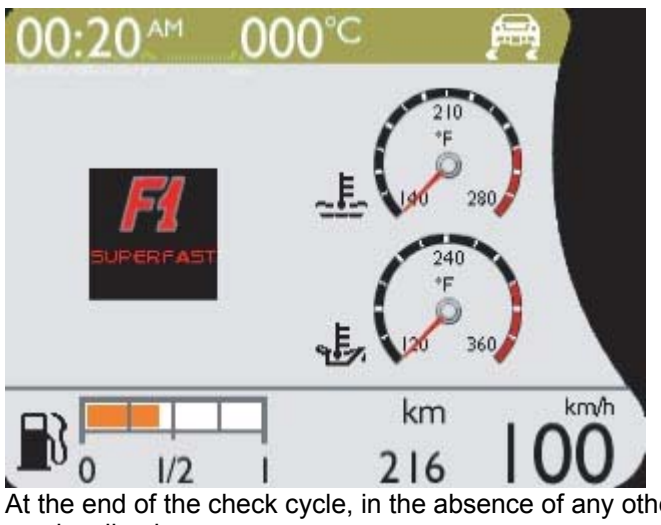
- F1 SUPERFAST gearshift screen



To notify the user when conditions required for the fast gearshift function are met, the instrument panel displays the mode in response to a specific signal received from the NCR.



If the request to enable the “fast gearshift” mode is made during the key-on check cycle (Check in progress / Service), the sequence of screens displayed proceeds normally, while the “**F1-S**” symbol, in icon form, is shown directly in the specific area **H** on the display.



At the end of the check cycle, in the absence of any other display visualisation requests (e.g. malfunctions and/or event related information), the specific screen is visualised.

In general, if the request to enable “fast gearshift” mode is made during the visualisation of malfunctions and/or event related information, or if a malfunction/event occurs during the visualisation of the screen described previously, the mode is displayed directly in icon form.

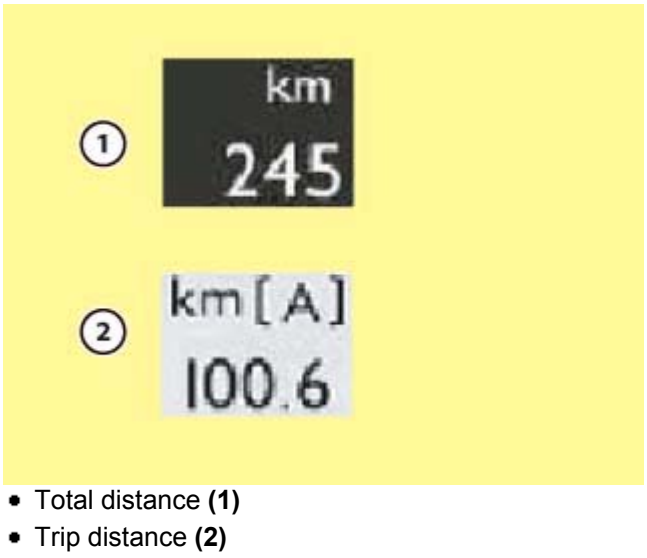
Memorise "service start date"

When the vehicle is delivered, the service start date must be memorised, as the countdown to the deadline for the first "Maintenance Schedule” car service will be started from that date.
Once **the date** is set, using the **MODE** key as described previously, the system will store the parameter after exceeding a mileage of **201 km**.

Until this distance has been completed, the battery must not be disconnected.
If the battery is disconnected, the system will reset the date as **01/01/2000** and will start the countdown to the deadline for the first service from this date (after a mileage of 201 km).
After a mileage of **201 km**, setting a new date will cause the SERVICE warning light to illuminate immediately. This does not mean that a service is effectively required.
If the wrong date is memorised, the information cannot be corrected or cancelled and the instrument panel will have to be replaced.

Odometer

Press **ENTER** to toggle total and trip distances on the TFT display.

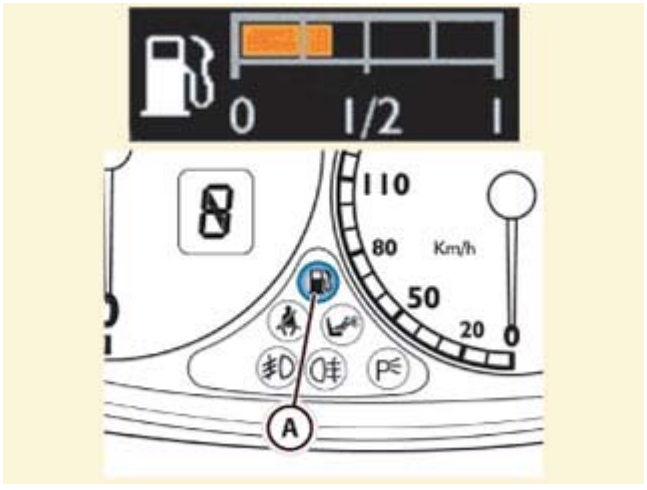


- Total distance **(1)**
- Trip distance **(2)**

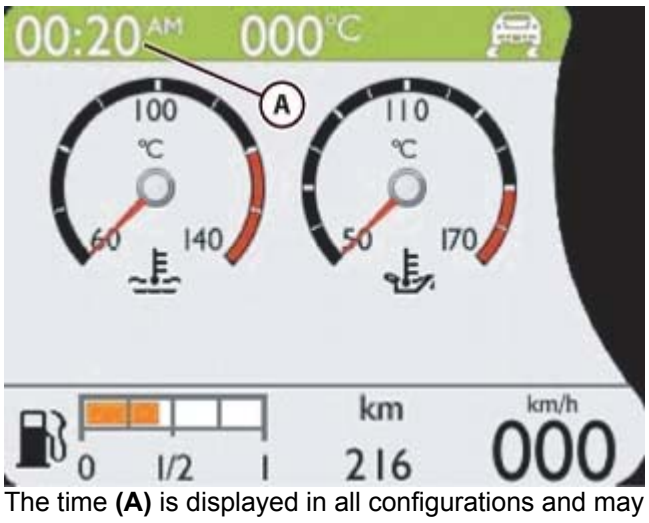
To reset the trip odometers, press and hold the **MODE** button. If TRIP B is disabled, TRIP A is reset automatically. If trip B is enabled, the active odometer will start flashing. Use the **UP** and **DOWN** buttons to highlight and move the selected odometer, then press **ENTER** to reset the flashing odometer.
While the odometer is flashing, pressing **MODE** briefly or waiting for 10 seconds returns to the previous active screen.

Fuel level gauge

This gauge is shown permanently on the TFT display.
The low fuel warning light **(A)** switches on when only 20 litres fuel are left in the tank.



Clock



The time **(A)** is displayed in all configurations and may be shown in 12 or 24 hour format.

Engine oil temperature gauge

Engine oil temperature information is permanently shown on the TFT display.
The gauge may be displayed in three different sizes (maximum, medium, minimum) and in different areas of the display, depending on the active page and whether an event needs to displayed.

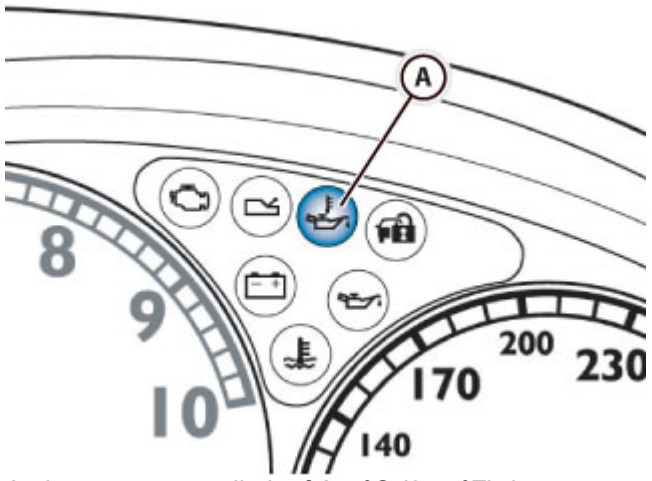






Minimised virtual gauges are displayed without pointers or graduated scales, but only as black symbols on a background colour differing as follows:

- **BLUE**, temperature lower than **80°C (176 °F)**.
- **GREEN**, temperatures between **80 °C and 155°C (176 °F and 257 °F)**.
- **RED**, temperatures equal to or more than **155°C (257 °F)**.



At the temperature limit of **155°C (257 °F)** the corresponding red warning lamp **(A)** on the instrument panel lights continuously.

Engine coolant temperature gauge.

The information related to the engine coolant temperature is always shown on the TFT display.
The gauge can be displayed in three different sizes (maximum, medium, minimum) in different areas of the display, depending on the active page and if an event

needs to displayed.







The minimum-sized virtual gauges are displayed without pointer or graduated scale, but only with the symbols in black on a background that may have three different colours:

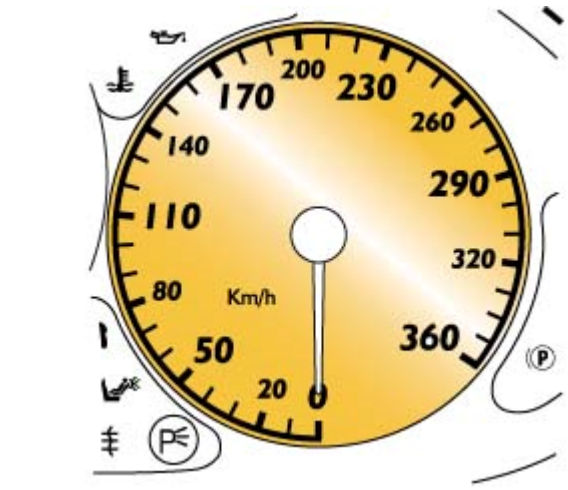
- **BLUE**, temperature lower than **70°C (158 °F)**.
- **GREEN**, temperatures between **70 °C and 125°C (158 °F and 257 °F)**.
- **RED**, temperature higher than or equal to **125°C (257 °F)**.



At the temperature limit of **125°C (257 °F)** the corresponding red warning lamp **(A)** on the instrument panel lights continuously.

Electronic speedometer

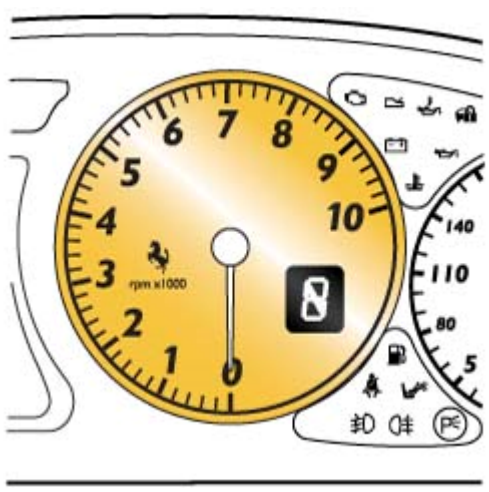
This indicates the driving speed. The value may also be shown on the TFT display **(A)** when the ambient temperature is not displayed.





Tachometer

Indicated engine speed in RPM.
Avoid engine speeds in the red sector.
If these engine speeds are exceeded, the ignition/injection ECU will temporarily cut out the fuel supply.



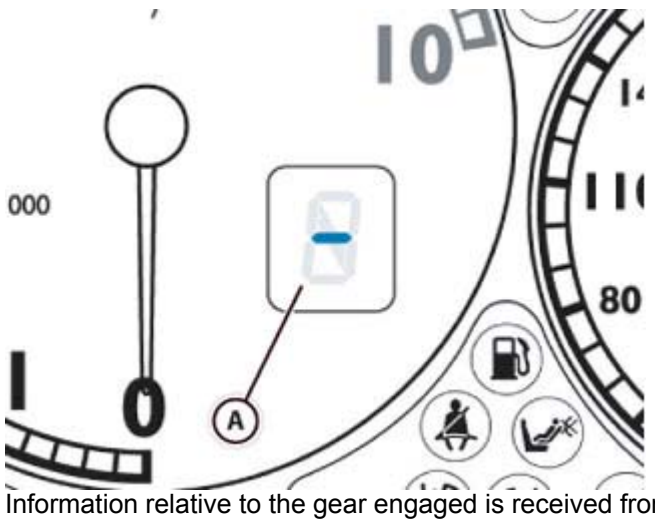
Gear display (F1 gearbox)

The display is incorporated in the tachometer; the display shows the gear engaged with the ignition key in position **"II"**.

- **N** Neutral
- **R** Reverse gear
- **L** - Launch Control
- **1** - 1st gear
- **2** - 2nd gear
- **3** - 3rd gear
- **4** - 4th gear
- **5** - 5th gear
- **6** - 6th gear
- **Auto** - Automatic gearbox mode
- **Auto (with arrow pointing downwards)** - Auto easy exit gearbox mode



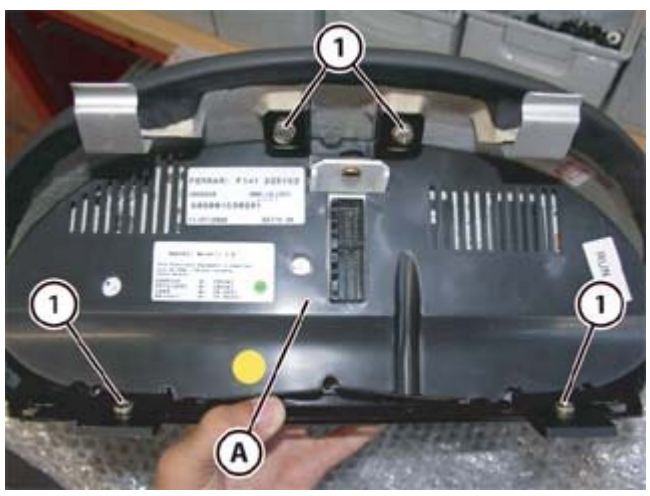
The symbol **(A) "-"** indicates a gearbox failure.



Information relative to the gear engaged is received from the electronically controlled gearbox ECU via the CAN line.

Replacing the instrument panel

➢ Remove the dashboard binnacle (M2.19).



- Undo the screws **(1)** and remove the instrument panel **(A)** from the binnacle.
- When refitting, fit the instrument panel**(A)** in its relative seat in the binnacle and fasten with the screws **(1)**.

➢ Refit the binnacle (M2.19).

H2.02 Warning lights

Warning lights

The warning lights illuminate during the system check at key-on and in the following conditions:
(*) duplicated on the TFT display.

ABS (*)



While driving, ABS system failure.
The standard braking system remains operational.

Brake failure (*)



Insufficient brake fluid level.

Parking brake



Parking brake engaged.

Brake pads worn (*)



Brake pads are worn.

Airbag (*)



While driving, airbag system and/or seat belt pretensioner failure.

"F1" gearbox failure (*)



Warning light lit constantly and accompanied by acoustic alarm: "F1" gearbox functional failure.
Flashing warning light: low system pressure.

Coolant temperature (*)



Engine coolant temperature too high.

Oil pressure (*)



Insufficient engine oil pressure.

Oil temperature (*)



Engine oil temperature too high.

Seat belts



With the ignition key turned to **"II"**, with the driver side seat belt not buckled.

Alternator failure (*)



Recharging system failure.
Insufficient or excessive battery charge (flashing).

On board diagnostics system (EOBD) (*)



During operation, evaporative emissions control system and ignition/injection system failure.
Remains lit indicating self-diagnosis from when the ignition key is turned to position **"II"** to a few seconds after engine start.

Fuel reserve (*)



Only 20 litres of fuel left in tank or fuel gauge failure.

Turn indicator



Turn indicators on.
Hazard warning lights on.

Running lights/low beams



Running lights or low beams on.

High beams



High beams on.
When flashing the high beams.

Parking lights



When parking light button is pressed.

Rear fog lights



Rear fog lights on.

Alarm system failure (*)



While driving, alarm system failure.

ASR/CST system failure (*)



ASR/CST system failure.

Passenger airbag disable



Passenger side airbag disabled with the relative (optional) key-operated switch.

ASR + CST disabled



ASR and CST systems disabled.

Cruise control on (*)



Cruise Control enabled.

Tyre pressure (*) (NEW SOLUTION)



Lights continuously to indicate puncture of one or more tyres.
Flashes for 90 seconds and then lights continuously to indicate tyre pressure monitoring system failure.
Flashes for 90 seconds and then lights continuously to indicate that the system is inactive.
Flashes for 90 seconds and then lights continuously to indicate that the system is temporarily inactive.
Flashes for 90 seconds and then lights continuously to indicate that the system is not calibrated.

Multiple lights illuminating simultaneously

Failure of all braking systems "ABS - EBD - CST" (*)







If all three warning lights illuminate simultaneously, there is a risk of the rear wheels locking due to a failure in the electronic brake force distribution system. Stop the vehicle, avoiding sudden braking. Do not drive any further.
The car may still be driven at low speeds (max. 40 Km/h) to clear the road.

H2.03 TFT display warning lights

TFT display indicator lights

Priority 0 (Very serious failure): displayed indefinitely until problem is resolved.
Priority 1/Priority 2 (Serious failure/Minor fault): displayed for 20 seconds in the relative graphic symbol area of the screen, then reduced to icon form and displayed in the relative icon display area until the problem is resolved.

Alarm system fault



Alarm system fault (priority **1**).
System not programmed (priority **2**).
May be displayed in conjunction with messages.

Fuel reserve



Insufficient fuel level (priority **2**).

Battery charger connected



Indicates, when instrument panel is on, an active battery charger connection (priority **0**).

Inertia switch



Inertia switch triggered by a collision, cutting off the fuel supply (priority **0**).

Alternator



Alternator fault (priority **1**).

Low windscreen washer fluid level



Insufficient fluid level in windscreen washer tank (priority **2**).

Oil temperature



Oil temperature too high (priority **0**).

Oil pressure


Oil pressure too low (priority **0**).

Engine coolant temperature


Engine coolant temperature too high (priority **0**).

On board diagnostics system (EOBD)


Engine diagnostics system and evaporative emissions control system fault (priority **0**).

Lights failure


System fault or one or more driving lights, running lights or rear fog lights blown (priority **2**).

Number plate light failure


System fault or number plate light bulb blown (priority **2**).

Twilight sensor fault



Twilight sensor fault (priority **2**).

Catalytic converter temperature


Indicates a high catalytic converter temperature: reduce speed until the lamp extinguishes (priority **1**).
Catalytic converter temperature too high: stop the vehicle (priority **0**).
Catalytic converter temperature sensor fault (priority **0**).

Stop lights failure



System fault or one or more stop light bulbs blown (priority **2**).

Power steering fault


Power steering system fault (priority **2**).

Fuel filler flap open


Fuel filler flap open (with warning sound if car is in motion).

Low F1 gearbox oil level


F1 gearbox system oil level too low (priority **0**).

Doors and lids open


Doors or engine/luggage compartment lids open or incorrectly close. Relative part of vehicle displayed in red (with warning sound if vehicle is in motion).

ABS



ABS system fault (priority **1**).
The standard braking system remains operational.

General failure


Generic fault (priority **0**).

ASR + CST enabled


ASR and CST systems engaged (priority **1**).

ASR/CST system in action


Indicates when CST system is in action (priority **1**).

ASR + CST disabled


ASR and CST systems disabled (priority **1**).
Displayed together with message: CST disabled.

ASR/CST fault


ASR/CST system fault (priority **1**).

Tyre pressure


Warning light for tyre pressure monitoring system.
Tyre pressure calibration in progress.

Tyre pressure


Warning light for tyre pressure monitoring system.
Insufficient tyre pressure or tyre pressure monitoring system fault.
Tyre puncture (NEW SOLUTION).

Tyre pressure (OBSOLETE SOLUTION)


Warning light for tyre pressure monitoring system.
Tyre puncture.

Airbag system fault



System fault (priority **0**).
With airbag warning lamp flashing simultaneously, airbag diagnosis still in progress (priority **0**).

Brake fault


Insufficient brake fluid level or EBD system fault (priority **0**).

Manettino selector fault


Manettino selector fault (priority **1**).

Gearbox fault


System fault (priority **1**).

Rain sensor fault


Rain sensor fault (priority **2**).

Parking sensor fault


Parking sensor system fault (on vehicles with system) (priority **2**).

Ice hazard


It lights up when the external temperature is equal to or lower than 3 °C (38° F) to indicate the road surface is icy.
Drive carefully and slow down as grip is considerably reduced.
Do not select "SPORT" or "RACE" modes.

Suspension control system fault


Suspension control system fault (priority **2**).

Maintenance Schedule


Depending on the associated message, indicates that a maintenance schedule interval is impending or has been reached.

CCM brake disc wear


Carbon ceramic brake discs worn (priority **2**).

Brake pad wear


Brake pad wear (priority **2**).

Heated seats


Heated seat function enabled (remains displayed for 5 seconds).

EBD



EBD system fault (priority **0**).
Displayed simultaneously with ABS warning lamp.

Passenger side seat belt not buckled


Passenger side seat belt has not been buckled (priority **0**).

Speed limit exceeded



Speed limit set by driver has been exceeded (priority **2**).

F1 - Superfast



Informs driver when "superfast" gearshifting is available.

Radio information


Radio is on. An additional message on the TFT display displays the tuning frequency or the word "search" (when searching).

CD and CD MP3 information


CD player operating in Audio or MP3 mode. The current track is also displayed on the TFT display.

CD changer information


CD changer on. Current CD and track also shown on TFT display.

Flash card information



Flash card in use. The current track is also shown on the TFT display.

Telephone repeater



Indicates an incoming, outgoing or ongoing call (when "telephone indication" function is active).

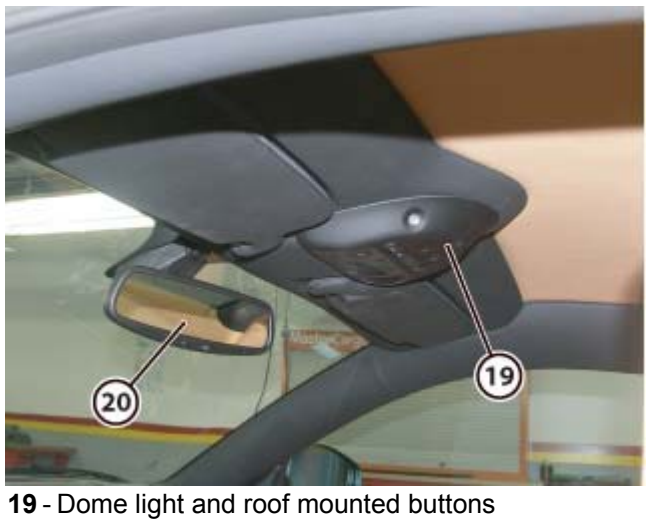
H3.01 Location in the vehicle

Location in the vehicle

The figure shows the location of the controls, instruments and devices necessary to drive the vehicle.



1 - Light switch
2 - External rear view mirror controls
3 - Instrument panel
4 - Steering wheel mounted controls
5 - Ignition switch
6 - Car stereo system
7 - Air conditioning/heating system controls
8 - Power window control
9 - Handbrake lever
10 - F1 gearbox control panel
11 - Tunnel console buttons
12 - Internal door release handle
13 - Seat adjustment controls
14 - Steering wheel rake and reach adjustment control
15 - Luggage compartment lid release button
16 - Fuel filler flap release button
17 - Engine compartment lid release lever
18 - F1 gearbox selector lever



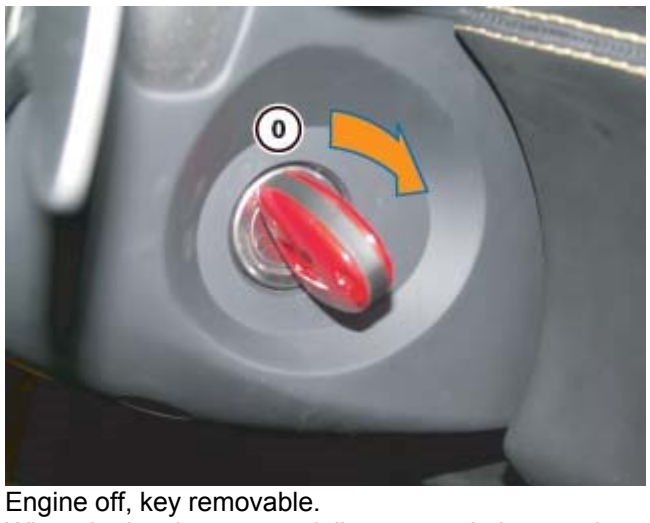
19 - Dome light and roof mounted buttons
20 - Internal rear-view mirror

H3.02 Ignition switch

Ignition switch

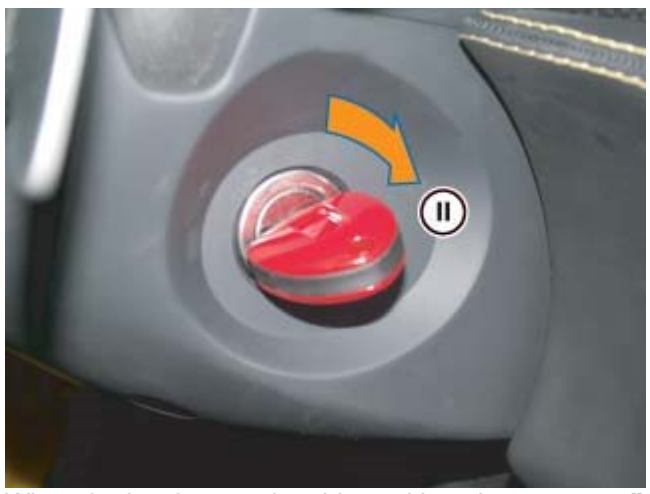
The ignition key has two positions:

Position 0 - Stop



Engine off, key removable.
When the key is even partially extracted, the steering column is locked.
The hazard warning lights and the parking lights may still be turned on.
To facilitate releasing the steering column, turn the key while simultaneously wiggling the steering wheel gently in both directions.

Position II - Start



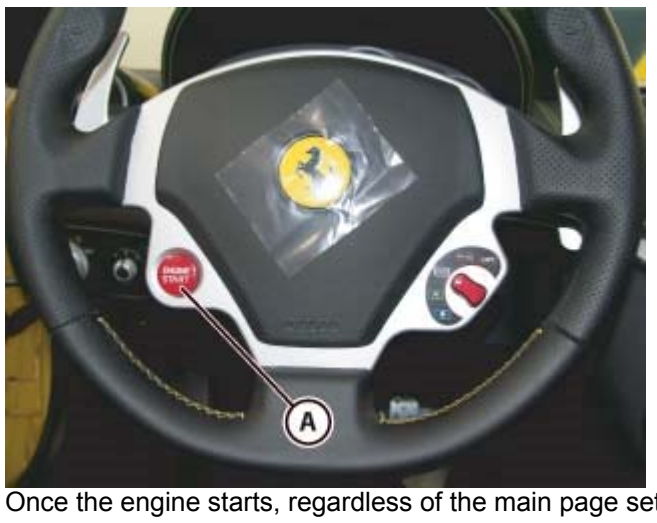
When the key is turned to this position, the message **"CHECK" lights up on the TFT display**.



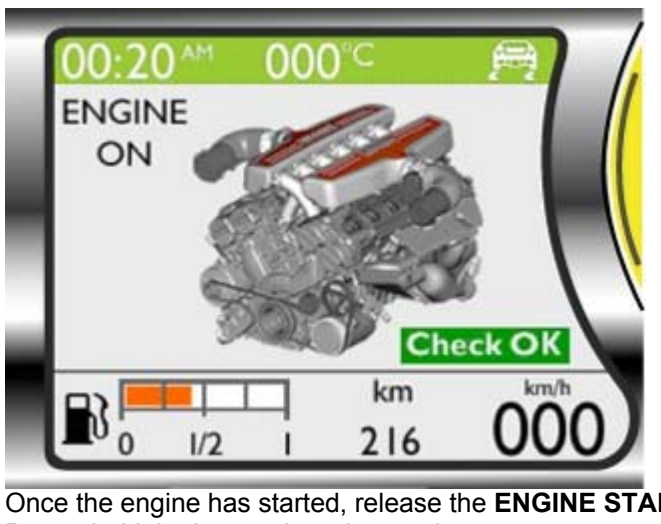
The system runs a check on the signals received from the systems installed in the vehicle; if no faults are found, the message **"CHECK OK"** appears on a green background and the engine may be started.



Press the **ENGINE START button (A)** to start the engine.



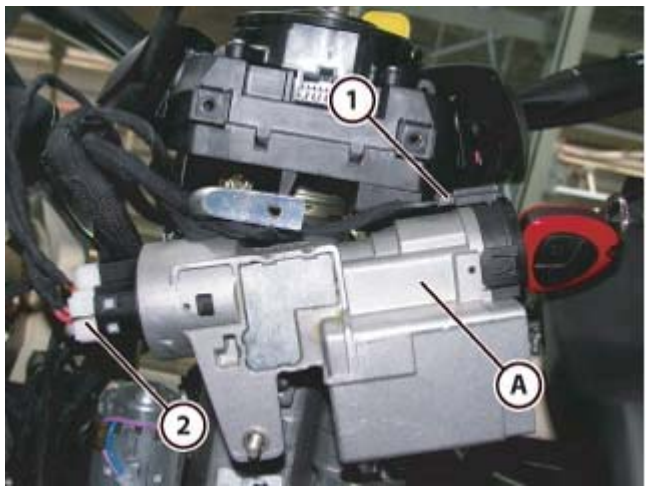
Once the engine starts, regardless of the main page set, the **ENGINE ON** screen will be shown on the TFT display.



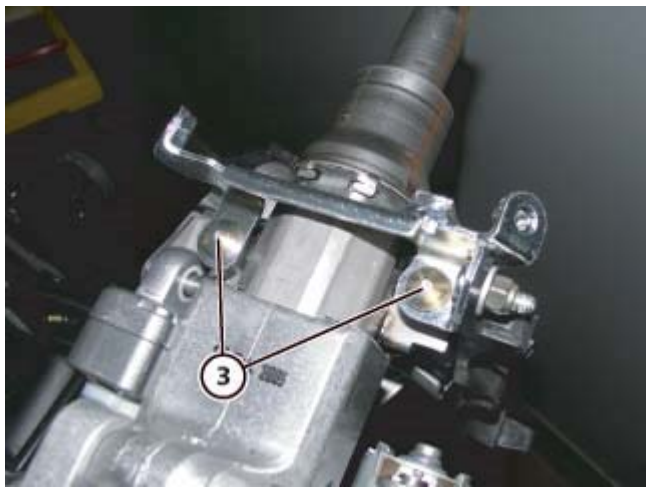
Once the engine has started, release the **ENGINE START** button.
Do not hold the button down longer than necessary.

Replacing the ignition switch

- The switch is supplied as a spare part together with door locks.
- Remove the steering wheel (H3.06).
- Remove the steering column trim panel (M2.19).



- Detach the immobiliser antenna connector **(1)** (S020).
- Disconnect the connector **(2)** (D002) on the ignition switch **(A)**.



- Make a cut in the head of the two screws **(3)**, unscrew them and retrieve the ignition switch from under the steering column.
- Replace the ignition switch

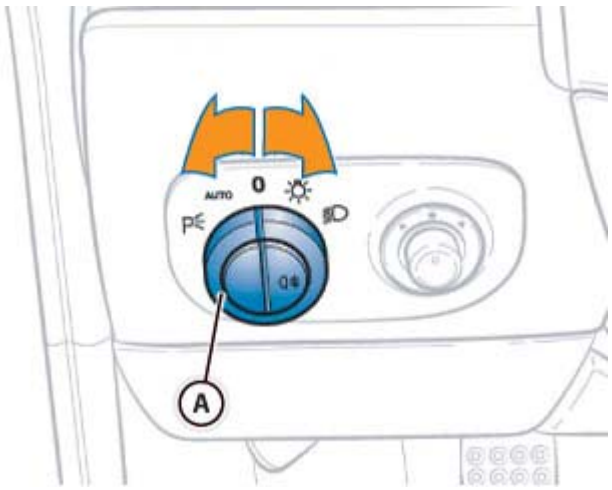
- When refitting, follow the removal sequence in reverse order and fasten the switch with two new screws with pre-set breaking strength.

- Refit the steering column trim panel (M2.19).
- Refit the steering wheel (H3.06).

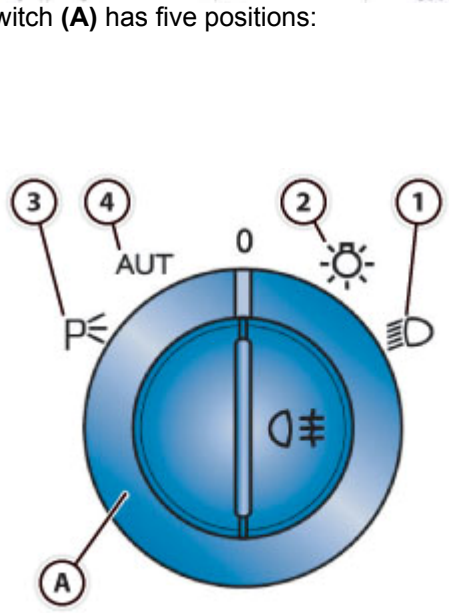
H3.03 Switches/Buttons

External light switch

The light switch **(A)** is located on the panel to the left of the steering wheel.

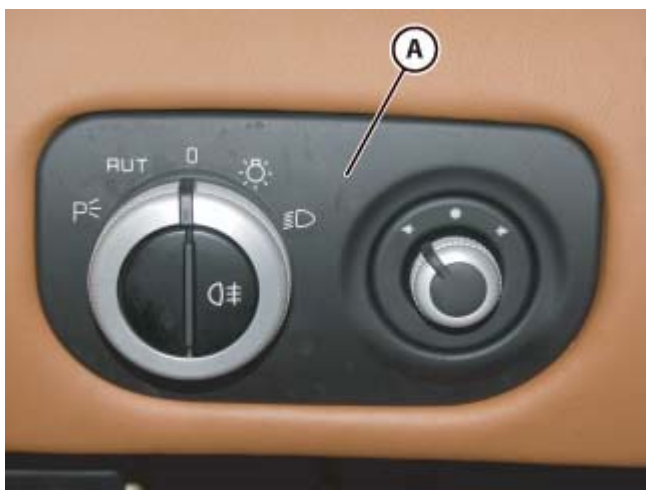


The switch **(A)** has five positions:

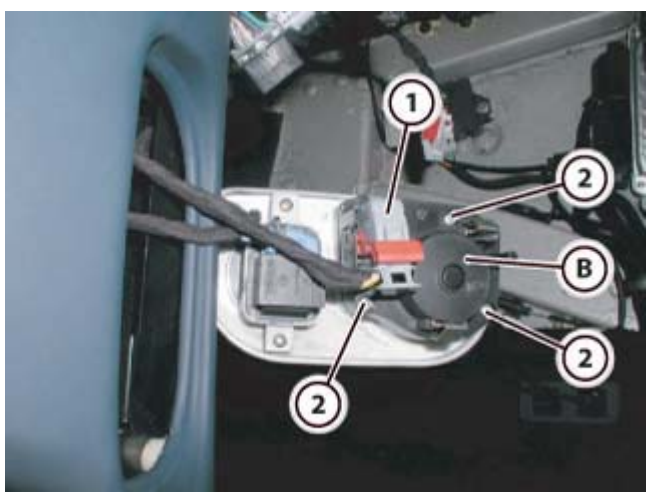


0 - Lights off
1 - Low beams
2 - Running lights and number plate lights on
3 - Parking lights
4 - AUT - External lights activated and deactivated automatically depending on ambient light conditions

Replacing the external light switch



- Use a screwdriver to prise the external light control panel **(A)** out of its seat, taking care not to damage the leather trim.



- Disconnect the connector **(1)** (D020) and undo the three screws **(2)**, then remove the external light control **(B)**.

Controls on the console



A - Lock doors
B - Unlock doors
C - Front parking sensor activation (optional)

Removing the centre console control panel

➢ Set the battery master switch to OFF (L2.02).

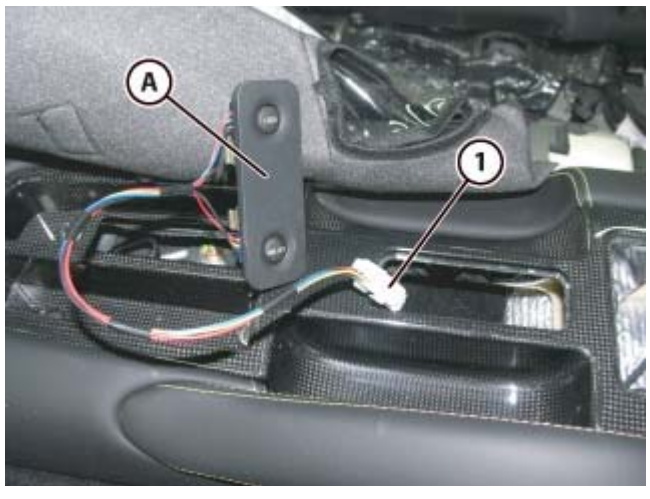


- Prise out the centre console control panel **(A)** with a pointed tool, taking care not to damage the adjacent trim panel.



- Detach the connector **(1)** (D303) and remove the centre console control panel **(A)** from the passenger compartment.

Refitting the centre console control panel



- Connect the connector **(1)** (D303)on the centre console control panel **(A)**.

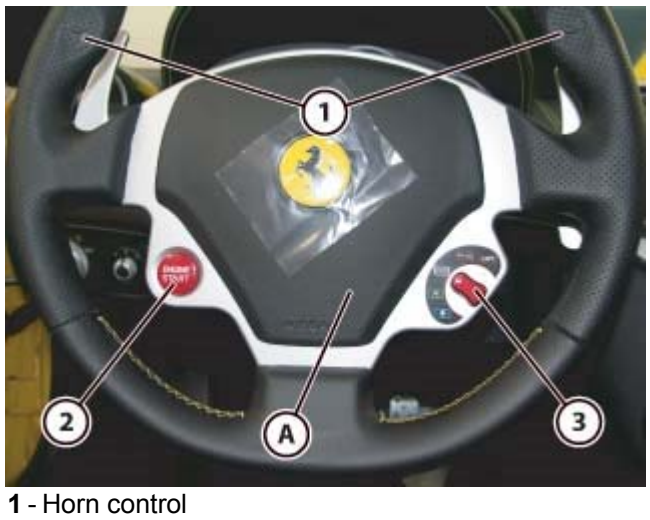


- Fit the centre console control panel **(A)** in its relative seat on the centre console trim panel and press into place.
- Check for flush fitment.

➢ Set the battery master switch to ON (L2.02).

Steering wheel buttons

The following controls are located on the steering wheel **(A)**:



1 - Horn control
2 - ENGINE START button
3 - "Manettino" driving mode selector

Horn

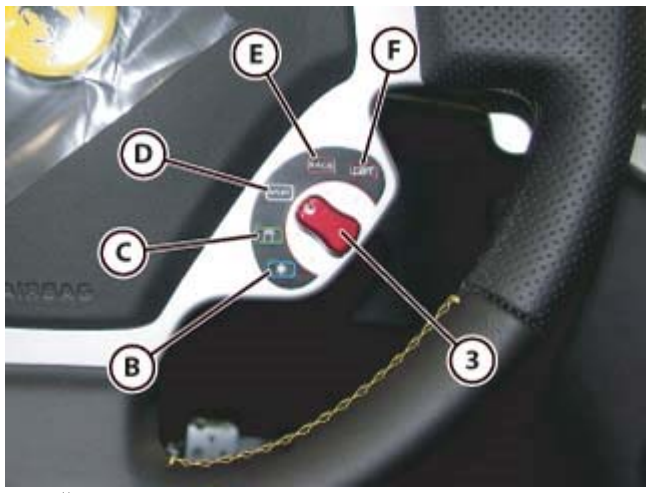
Press the horn symbols **(1)** on the steering wheel to sound the horn.



"Manettino" driving mode control

The "Manettino" **(3)** on the steering wheel allows the driver to make the best possible use of the vehicle's capabilities quickly and intuitively.
The five driving modes available are ordered in relation to grip levels (from low to high) and, as a result, to the degree of driver assistance offered (from maximum to none).

The "Manettino" dial **(3)** selects between predetermined driving modes:

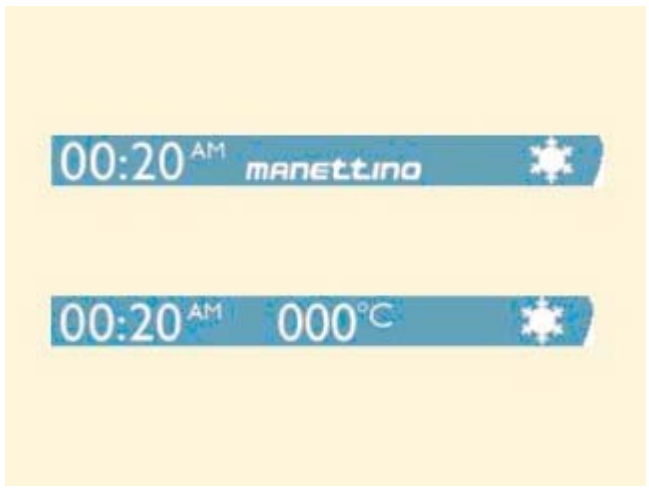


B - “Ice” Mode
C - LOW-GRIP mode
D - SPORT mode
E - RACE mode
F - RACE mode + CST deactivation

- ICE mode -

In ICE mode, vehicle performance is considerably limited while maximum stability, essential for driving in very low grip conditions (e.g., snow or ice) is given priority.
Traction and stability control (CST) is at its highest level (level 1).
The vehicle behaves very "smoothly".
On vehicles with F1 gearbox, gearshifting is automatic and disabled at high engine speeds, with engine brake effect limitation during downshifts, even on ice.

"Ice" mode selection is indicated at the top of the TFT display, which turns blue in one of the following modes (depending on the selected display configuration).



"Low Grip" mode -

LOW-GRIP mode ensures stability on both dry and wet roads.
Recommended for road conditions with poor grip (rain) and for slippery or particularly poorly surfaced roads. This mode is also recommended for increased comfort and for city driving.
Unlike the previous configuration, this configuration allows the driver to shift gears freely.
Suspension damping is optimised to provide the best possible comfort. CST remains at the previous level.

Low-Grip mode selection is indicated at the top of the TFT display, which turns green in one of the following modes (depending on the selected display configuration).



- SPORT mode -

SPORT mode is the basic driving setup for the vehicle, providing the best compromise between stability and performance.
This mode ensures stability only in medium to high grip conditions, but not in low grip conditions (in which case the previous mode is recommended).
This mode allows the vehicle to express the best performance possible on public roads.
Suspension damping is stepped up to the next level to maximise performance, handling and high speed stability.
The CST system is also stepped down a level (Level 2), allowing greater driver freedom.

In Sport mode, the F1-Trac system limits engine power to a much less degree. This is why this mode cannot guarantee stability in low grip road conditions.

Sport mode selection is indicated at the top of the TFT display, which turns white in one of the following modes (depending on the selected display configuration).



- RACE mode -

"RACE" mode is exclusively for use on the race track.
On vehicles with the F1 gearbox, gearshift times are much faster.
The CST steps down to Level 3 (minimal engine output limitation) and the suspension stiffens even further.
In this mode, the driver has a greater sense of control over the car as there is only minimal engine output limitation.
Stability is not ensured.

RACE mode selection is indicated at the top of the TFT display, which turns orange in one of the following modes (depending on the selected display configuration).



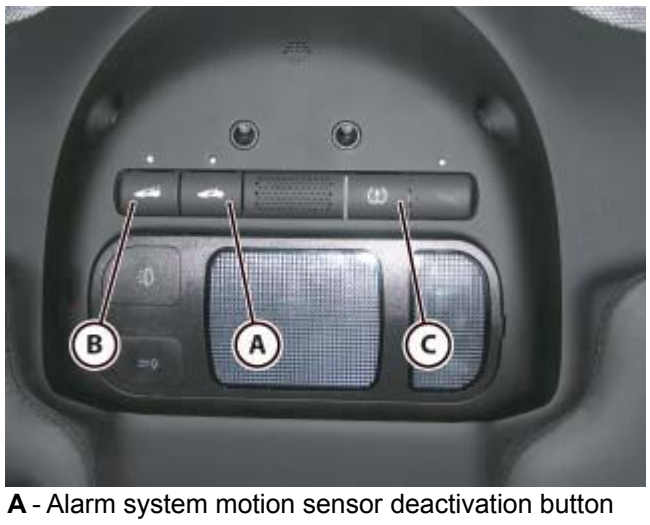
- RACE mode + CST disable

The CST system is disabled in this setting.
No stability control whatsoever. Stability is completely in the hands of the driver.
The only aids still active are those that cannot be deactivated, namely ABS and EBD.
When the brake pedal is depressed, the VDC system is reactivated but the F1-Trac system remains disabled. Gearbox speed (on vehicles with F1 gearbox) and damping control remain the same as in RACE mode.

"Race + CST disable" mode selection is indicated at the top of the TFT display, which turns red in one of the following modes (depending on the selected display configuration).



Roof buttons



A - Alarm system motion sensor deactivation button
B - Anti-lifting alarm system button
C - Tyre pressure calibration button

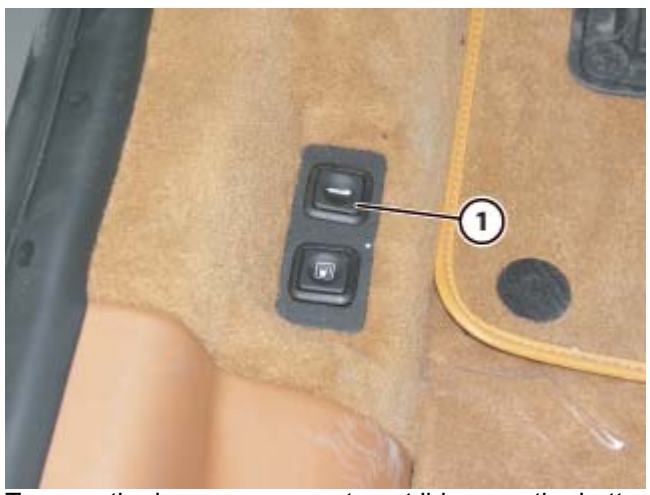
Disabling the alarm system motion sensors

Press the button **(A)** to disable the motion sensing alarm. When this function is disabled, the LED above the button will flash for 3 seconds and then turn off.

Disabling the anti-lifting alarm system

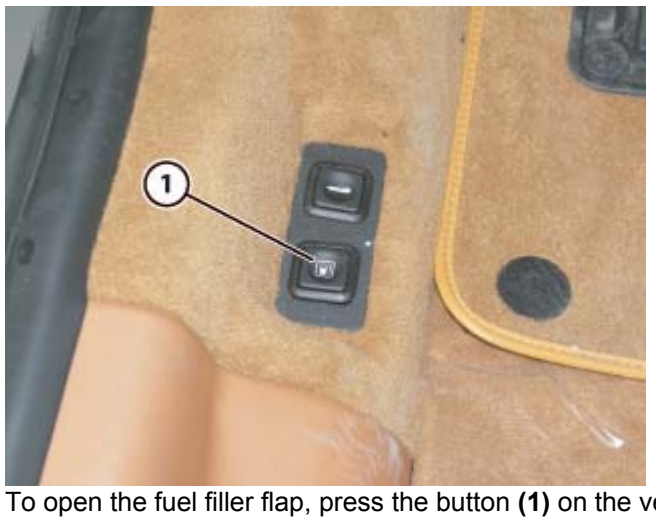
Press the button **(A)** to disable the anti-lifting alarm. When this function is disabled, the LED above the button will flash for 3 seconds and then turn off.

Luggage compartment lid release button



To open the luggage compartment lid, press the button **(1)** on the floor of the vehicle, on the left hand side of the driver seat.

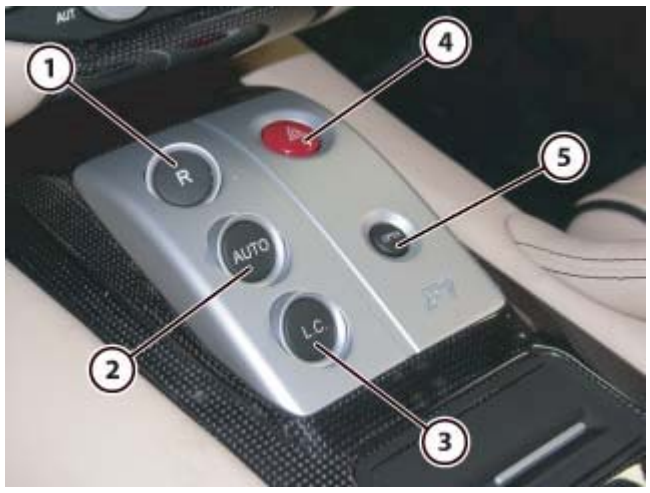
Fuel filler flap release button



To open the fuel filler flap, press the button **(1)** on the vehicle floor, on the left hand side of the driver seat.

Gearbox control panel (F1 gearbox)

There are five buttons on the electronically controlled gearbox panel:



1 - Reverse gear engagement button
2 - "Automatic gearshift" mode button
3 - "Launch Control" performance start button
4 - Hazard warning light button
5 - Glove compartment door release button

Reverse button



Press button **(1)** on the gearbox control panel to engage reverse gear.

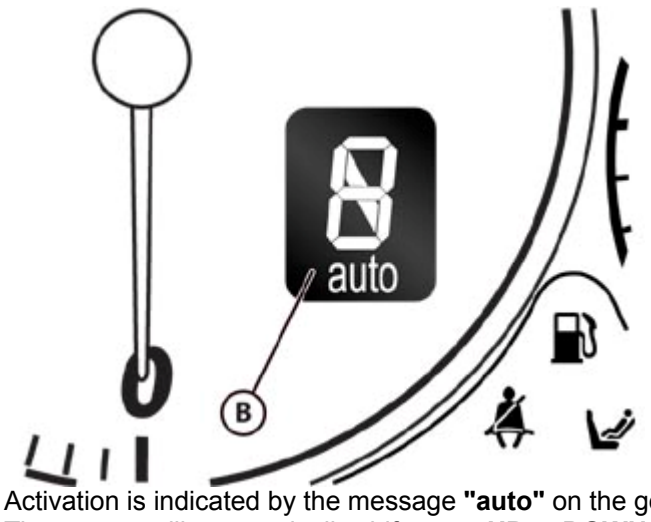


Engagement is indicated with the letter **"R"** on the display.
Reverse gear engagement is accompanied by an acoustic safety warning that sounds as long as reverse gear is engaged.

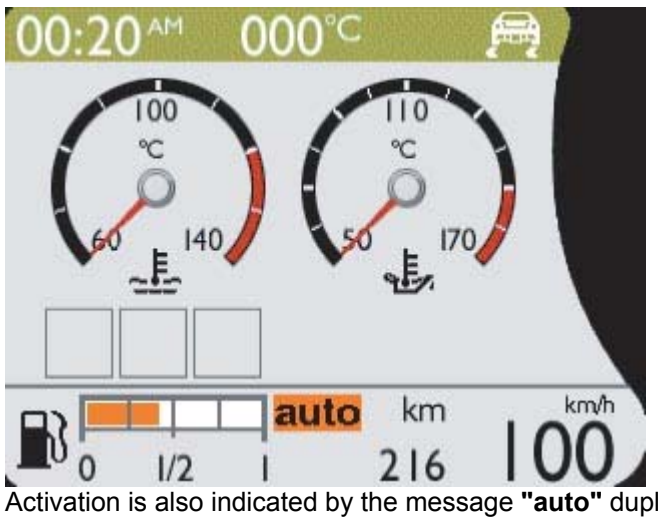
"Automatic gearshift" button



This mode is activated by pressing button **(2)** on the gearbox control panel.



Activation is indicated by the message **"auto"** on the gear display **(B)** on the instrument panel.
The system will automatically shift gears **UP** or **DOWN** depending on the vehicle speed, the engine RPM and the torque/power requested by the driver.



Activation is also indicated by the message **"auto"** duplicated in the area H of the TFT display.

Launch Control button for performance starts



This function can be activated by pressing button **(3)** on the gearbox control panel.
the F1 gearbox system includes a "Launch Control" programme for optimised standing starts in performance driving conditions.
The programme is enabled when all following conditions are met:

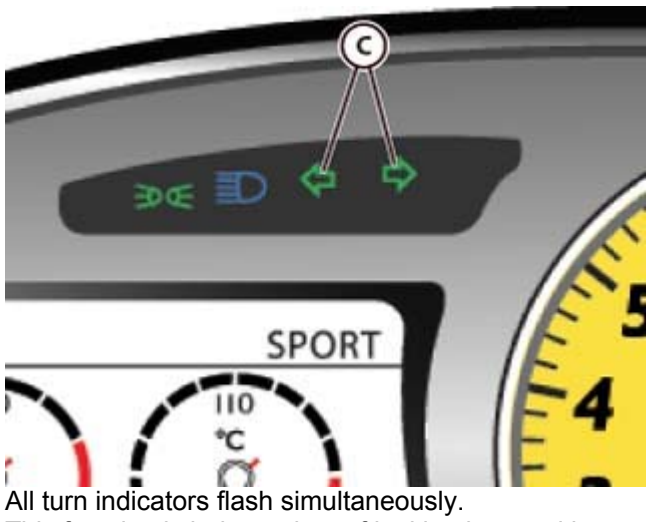
- **1st** gear engaged
- brake pedal pressed
- **CST off** mode active
- **LC** button pressed

When these conditions are met, a flashing **L** appears on the gear display. The driver may now accelerate, while maintaining the vehicle stationary with the brake pedal, to the desired engine speed for starting (usually maximum torque rpm), then release the brake pedal and achieve the fastest standing start possible as the programme implements a clutch engagement strategy optimised for the specific engine speed.

Hazard warning light button



Press the button **(4)** to switch on the hazard warning lights.



All turn indicators flash simultaneously.
This function is independent of ignition key position.
Activation of the hazard lights is indicated by an intermittent blinking of the warning lights **(C)** and the button **(4)**.
Press the button again to switch the hazard lights off.

Glove compartment door release button



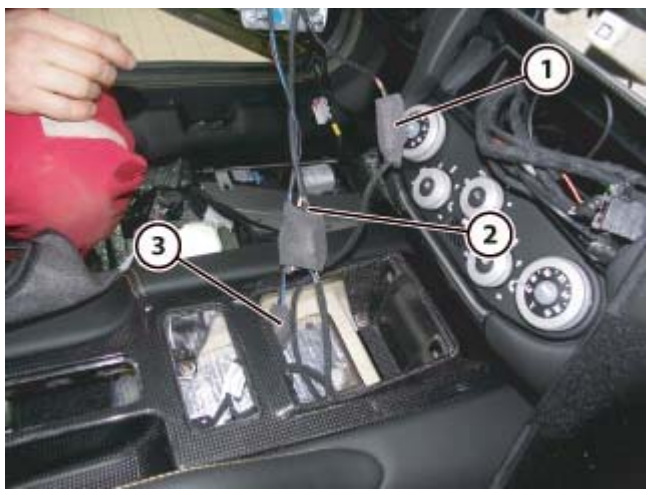
Press the button **(5)** to open the glove compartment.

Removing the gearbox panel (F1 gearbox)

➢ Set the battery master switch to OFF (L2.02).

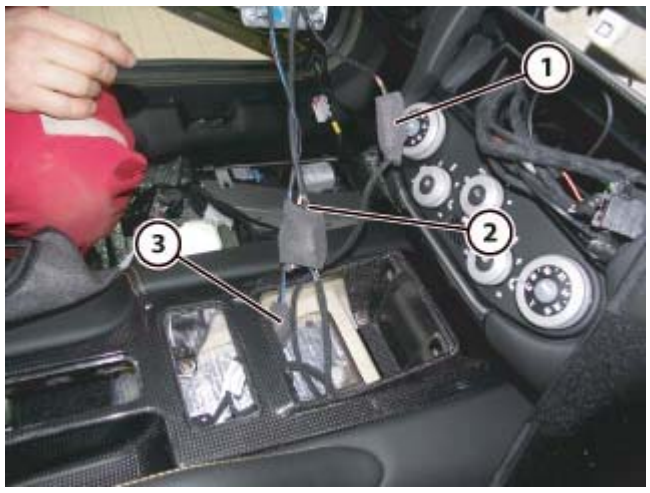


- To remove the gearbox panel **(A)** from the centre console, prise out with a pointed tool.



- Disconnect the connector **(1)** (D060)for the hazard warning light button.
- Disconnect the connector **(2)** (D068) for the electronically-controlled gearbox buttons.
- Disconnect the connector **(3)** (D312)for the glove compartment door release button.
- Remove the gearbox panel **(A)** from the passenger compartment.

Refitting the gearbox panel (F1 gearbox)



- Connect the hazard light button **(1,)** (D060) the electronically-controlled gearbox control **(2)**, (D300) and the glove compartment door release button **(3)** (D312) onto the gearbox panel.
- Refit the adhesive foam rubber around the connectors as originally fitted.



- Fit the gearbox panel **(A)** in its seat on the centre console trim panel and press into place.

➢ Set the battery master switch to ON (L2.02).

Replacing the TFT control panel

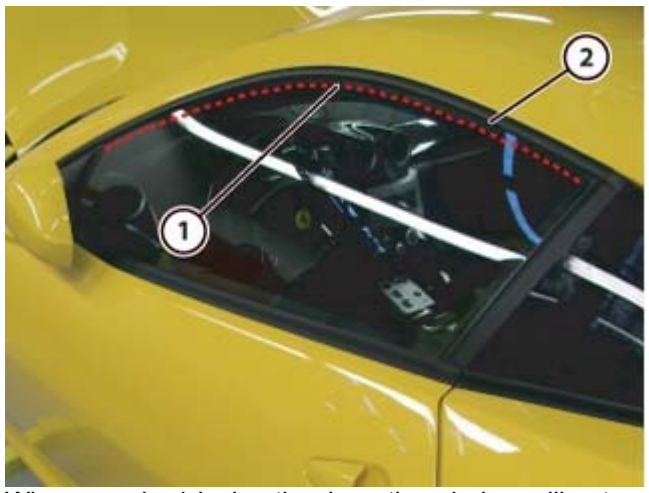


- Prise the TFT control panel **(A)** out of its seat on the dashboard with a screwdriver, taking care not to damage the trim panel.
- Disconnect the relative connector (D011) and remove the TFT control panel from the passenger compartment.

- Replace the panel, reconnect the connector (D011), press-fit the panel in the dashboard and check that it is correctly aligned.

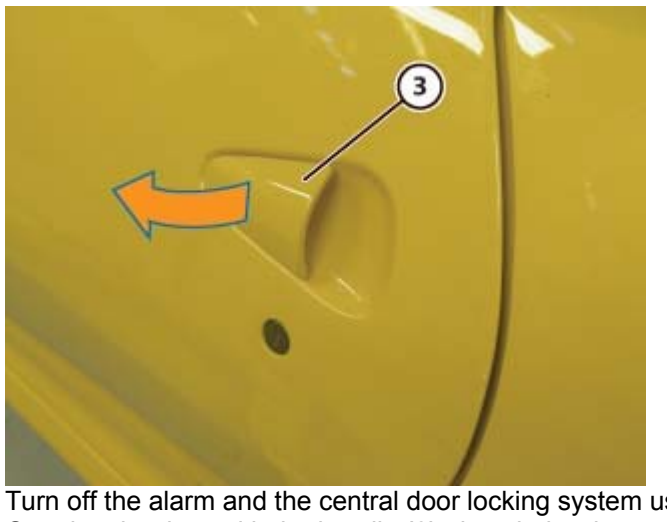
H3.04 Door controls

Door controls



When opening/closing the door, the window will automatically lower by approximately 2 centimetres **(1) to a pre-set threshold**, to prevent contact with the door seal strip.
When the door is closed, the window automatically rises to the **upper threshold (2)**.

Opening from the outside

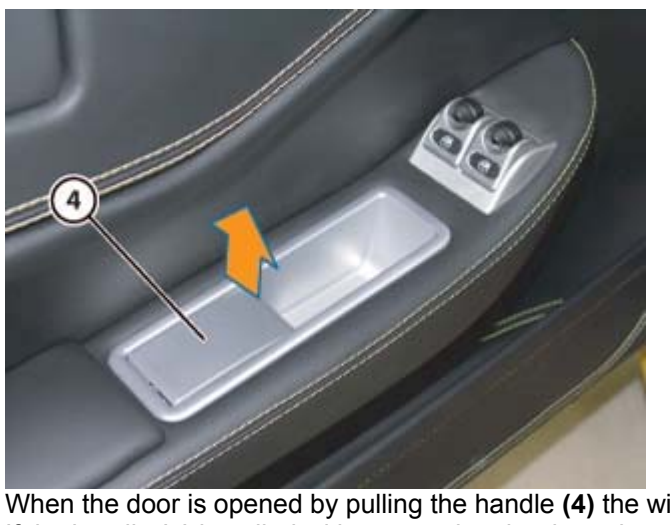


Turn off the alarm and the central door locking system using the remote control, or turn the key in the lock to turn off the central door locking system.
Opening the door with the handle **(3)**, the window lowers by approximately 2 centimetres.

Locking and opening the doors from the inside



Both doors are locked by pressing the **LOCK (A)** button and unlocked by pressing the **(UNLOCK) (B)** button.



When the door is opened by pulling the handle **(4)** the window lowers to the **"lower threshold"**. When the door is closed, the window rises to the **"upper threshold"**.
If the handle **(4)** is pulled without opening the door, the window lowers to the **"lower threshold"** and if the door is not opened after 2 seconds, the window returns to the **"upper threshold"**.
To open the door, release the handle and pull again.

Doors open indication and puddle lights

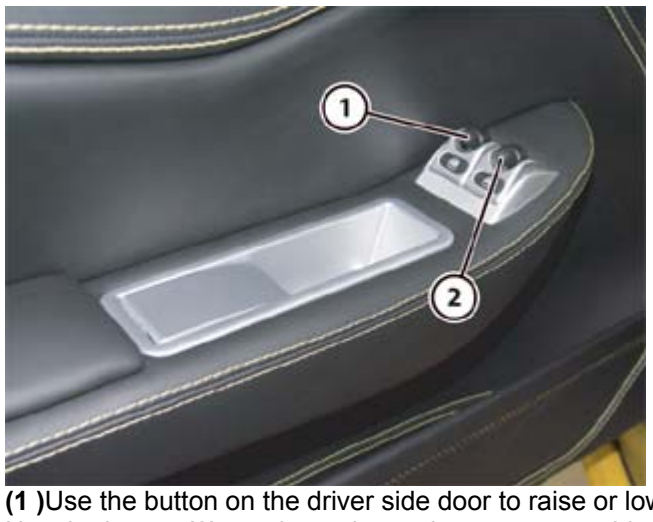


Both doors are equipped with a puddle light **(5)** located underneath the internal panel, which lights the door is opened and illuminates the area where the user will place his/her feet when getting out of the vehicle.

H3.05 Power windows

Power window operation

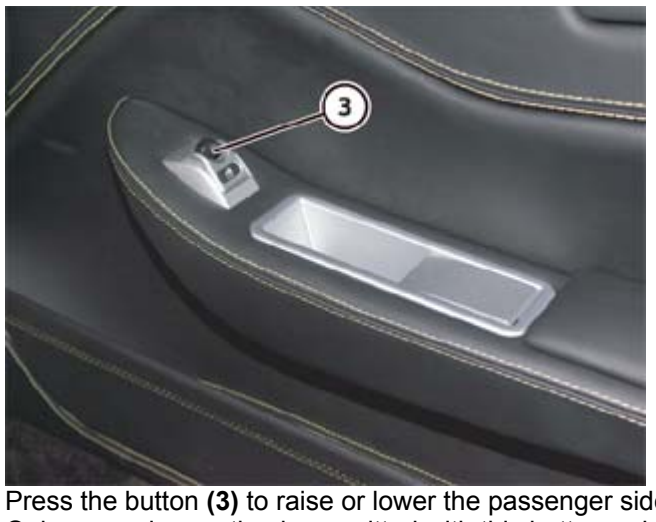
Driver side power window



(1) Use the button on the driver side door to raise or lower the window.
Use the button **(2)** to raise or lower the passenger side window.
Pressing the button **(1)** briefly enables user controlled window operation, i.e. the window may be stopped in the desired position by simply releasing the button.
Pressing the button is held down for more than **300 ms** enables automatic operation of the window is activated, i.e. the window will stop at the end of its travel or when the button is pressed briefly again.

Power window operation

Passenger side power window



Press the button **(3)** to raise or lower the passenger side window.
Only manual operation is permitted with this button: releasing the button stops the window in the current position.

H3.06 Steering wheel

Steering wheel adjustment

Do not adjust the steering wheel while the vehicle is moving.



The steering wheel is electrically adjustable for reach and rake.
Adjust the steering wheel with the control **(A)** on the steering column trim panel, on the left hand side of the steering wheel.

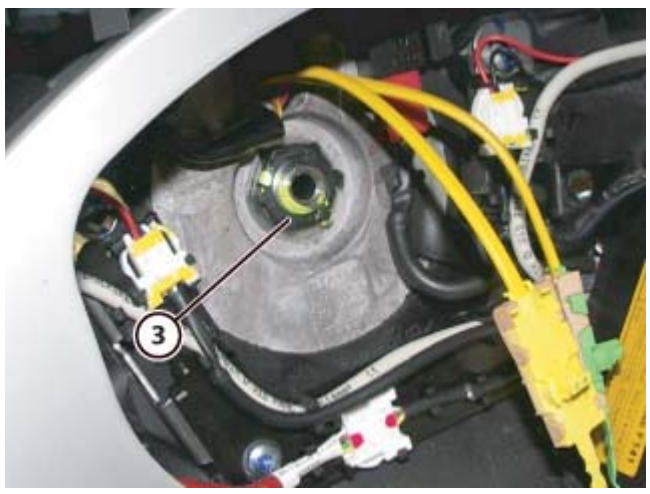
Removing the steering wheel

- Set the battery master switch to OFF (L2.02).
- Remove the driver side airbag (H4.02).

Steer the wheels straight ahead and mark the position of the steering column relative to the steering wheel, to aid reassembly in the correct original position.



- Remove the shield **(1)** and disconnect the connector **(2)**(D003) (D072).

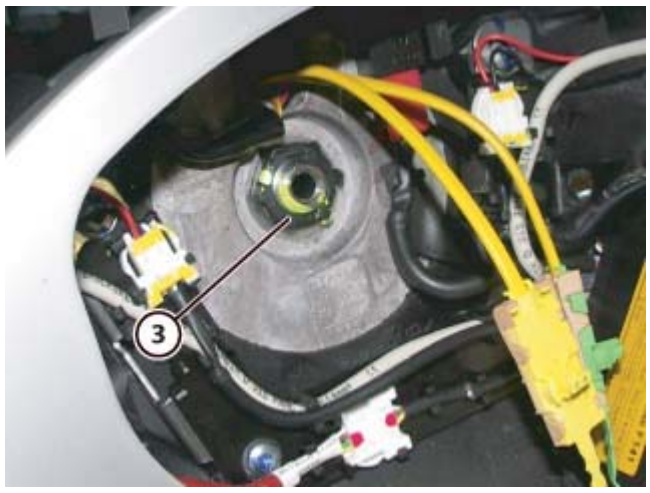


- Undo the central nut **((3))** and remove the steering wheel from the hub.

Refitting the steering wheel

Tightening torque		**Nm**	**Class**
Steering wheel - steering column	Nut	50 Nm	B

- Fit the steering wheel onto the steering column, using the marks made during removal as reference, ensuring that the wheels are steered straight head.



- Fasten the steering wheel to the steering column and tighten the nut **(3)**.

		
Tightening torque	**Nm**	**Class**
Nut	50 Nm	B



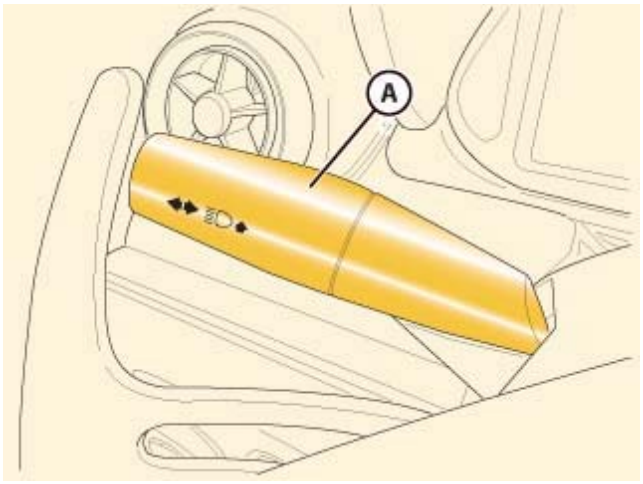
- Refit the shield **(1)** and connect the connector **(2)**(D003) (D072).

- Refit the driver side airbag (☞ H4.02).
- Set the battery master switch to ON (☞ L2.02).

H3.07 Steering wheel stalks

Steering wheel stalks - Turn indicators

The devices controlled by the steering wheel stalks will only function with the ignition key on.



The stalk **(A)** operates the high beams and the turn indicators.



The stalk **(A)** has three positions:

- Turn indicators off
- Stalk up: right hand indicators
- Stalk down: left hand indicators

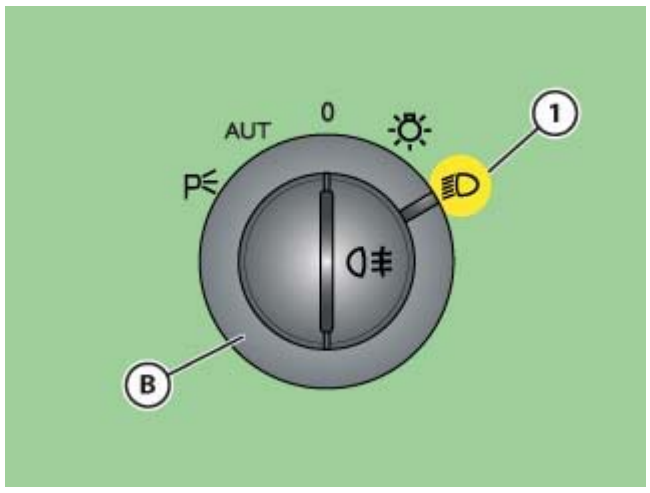
To signal a short lane change manoeuvre, involving only a small steering angle, push the stalk in the desired direction without clicking into position, so that the stalk springs back when released.
When the turn indicators are on, the relative indicator light on the instrument panel flashes.

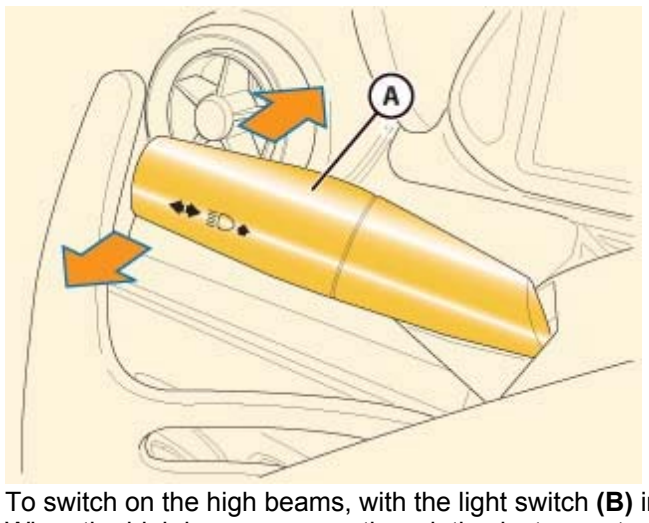
Steering column stalks - High beams

The devices controlled by the steering wheel stalks will only function with the ignition key on.

The high beams are switched on with the stalk **(A)** on the left hand side of the steering wheel.

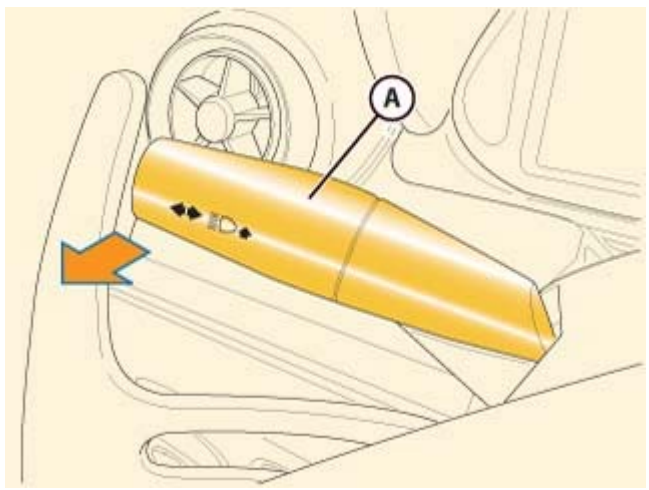
Switching on the high beams





To switch on the high beams, with the light switch **(B)** in position **(1)**, push the left hand stalk **(A)** towards the dashboard.
When the high beams are on, the relative instrument panel indicator light illuminates.
Pull the stalk **(A)** towards the steering wheel to switch off the high beams and switch on the low beams.

Flashing the headlights



To flash the headlights, pull the left hand stalk **(A)** towards the steering wheel.
The headlights may also be flashed when the lights are off if the ignition key is in **"II"**.
The high beams are used for headlight flashing.

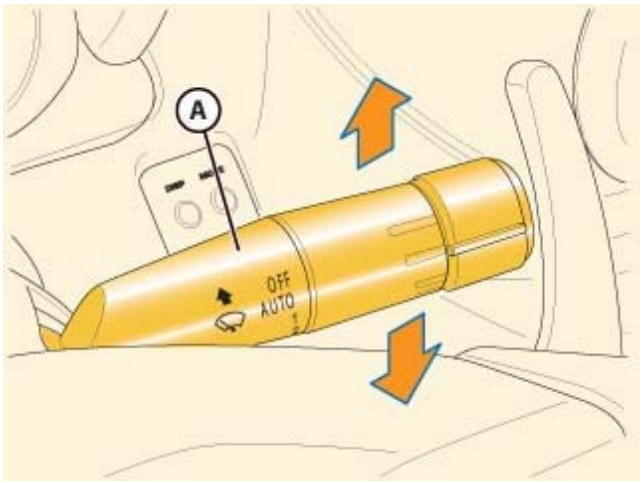
Steering wheel stalks - Windscreen washer/wipers and headlight washers

The devices controlled by the steering wheel stalks will only function with the ignition key on.



The windscreen wipers and headlight washers are operated with the stalk **(A)** on the right hand side of the steering wheel.

Switching on the windscreen wipers

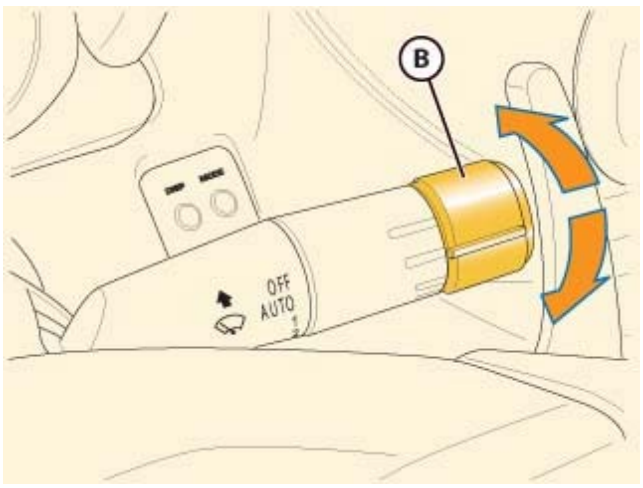


The stalk **(A)** has five positions:

- **OFF** - Windscreen wipers off.
- **AUTO** - Automatic wiper mode. The rain sensor sensitivity may be adjusted with the stalk in this position (first click).
- **1** - Slow continuous wipe (second click)
- **2** - Fast continuous wipe (third click)
- **Lever up** - Fast short wipe (automatic return)

Automatic windscreen wiper operation - Rain sensor

The rain sensor automatically adapts windscreen wiper frequency in relation to the rain intensity (in intermittent mode).
All the other functions are controlled by the right hand lever: windscreen wiper off, continuous slow and fast wipe, short fast wipe and windscreen washer-headlight washer operation all remain unchanged.

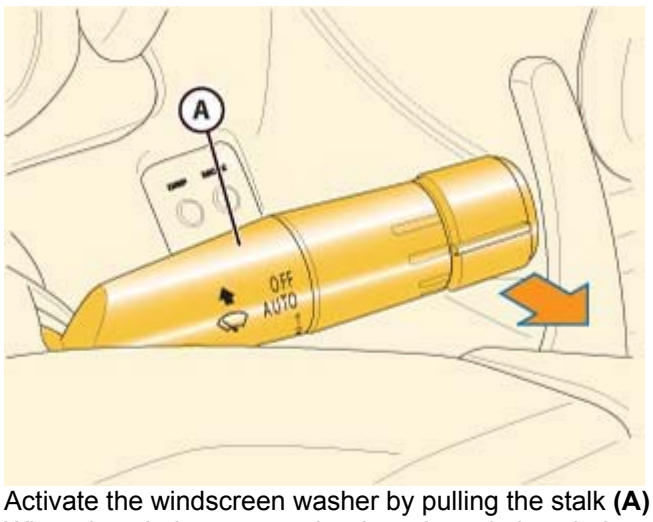


The rain sensor is enabled automatically by setting the right hand lever **(A)** to **AUTO** position. The sensor adjustment range varies progressively from windscreen wiper off, when the windscreen is dry, to fast, continuous windscreen wiper operation with pouring rain.
To adjust the wipe frequency in intermittent mode, set the lever **(A)** to **AUTO** and turn the end wheel **(B)**.
Turning the end wheel anticlockwise adjusts the frequency setting continuously from maximum (fast intermittent wipe) to minimum (slow intermittent wipe).

Rain sensor fault

In the event of sensor fault with the windscreen wipers switched on and in intermittent mode, normal intermittent mode is activated, with the frequency set by the user, regardless of whether there is rain on the windscreen or not.

Windscreen washer activation



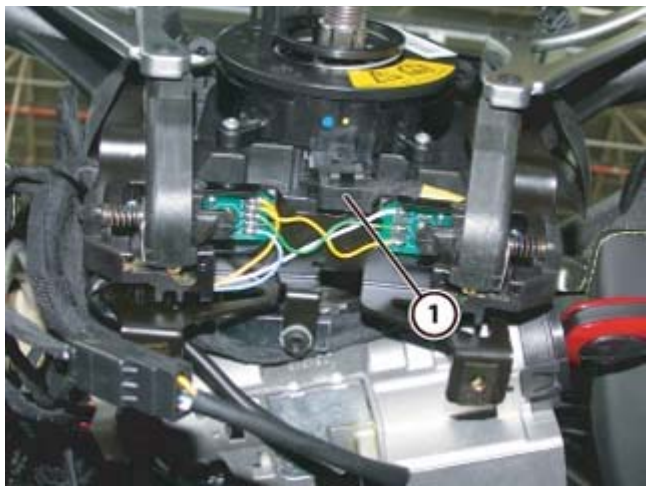
Activate the windscreen washer by pulling the stalk **(A)** towards the steering wheel (automatic return).
When the windscreen washer is activated, the windscreen wiper operates automatically. Releasing the lever stops the jet of fluid, while the wipers continue to function for a short period.
When the windscreen washer fluid is low, the relative warning light on the instrument panel comes on.

Headlight washer activation

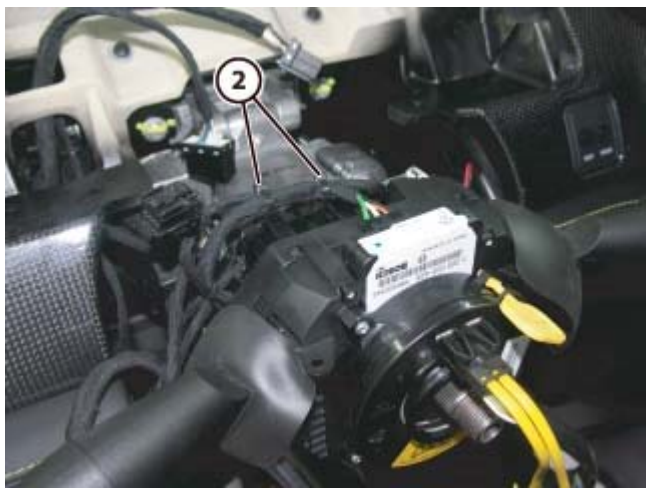
The headlight washers are automatically activated when the windscreen washer is used (as previously described) and the external lights are on.
The headlight washer and windscreen washer share the same fluid tank. When the fluid level is low, the relative warning light on the instrument panel comes on.

Removing the steering column switch

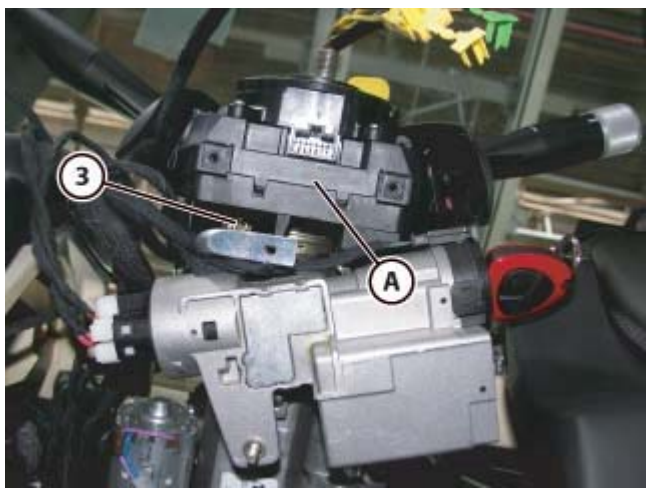
- Set the battery master switch to OFF (L2.02).
- Remove the steering wheel (H3.06).
- Remove the steering column trim panel (M2.19).
- Remove the gear selector paddles (H3.11).
  Remove only if the vehicle is equipped with an electronically controlled gearbox.



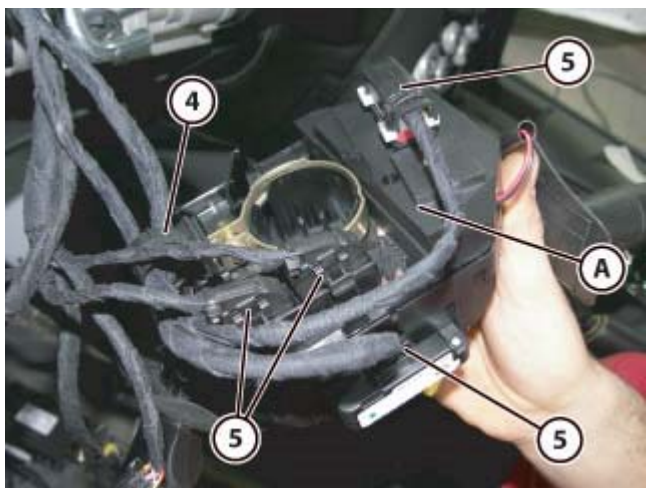
- Disconnect the clock spring connector **(1)** (D058).



- Remove the two cable retainer clamps **(2)** on the steering column switch.

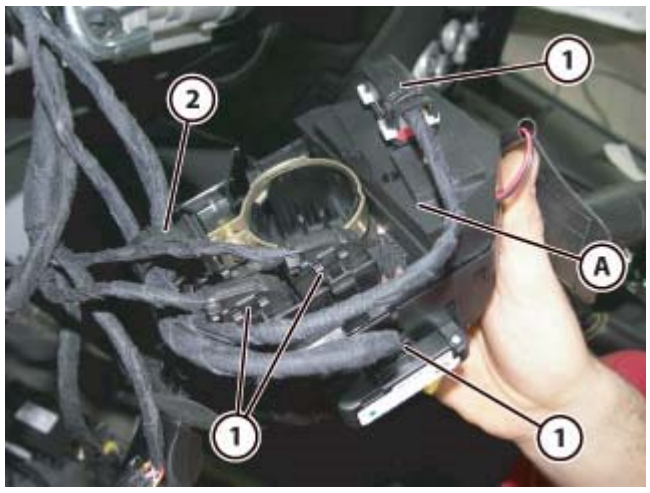


- Undo the screw **(3)** fastening the steering column switch **(A)** to the steering column.

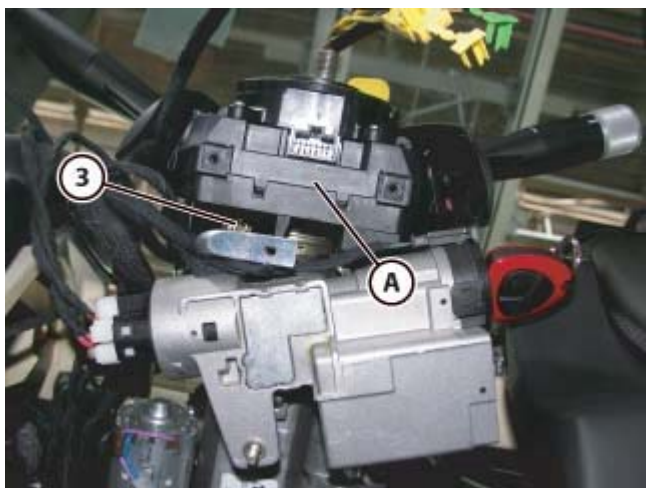


- Remove the steering column switch **(A)** from the steering column, remove the clamp **(4)**, pulling out the cables, and disconnect the four connectors **(5)** (M032) (M034) (D003) (D072).
- Remove the steering column switch **(A)** from the vehicle.

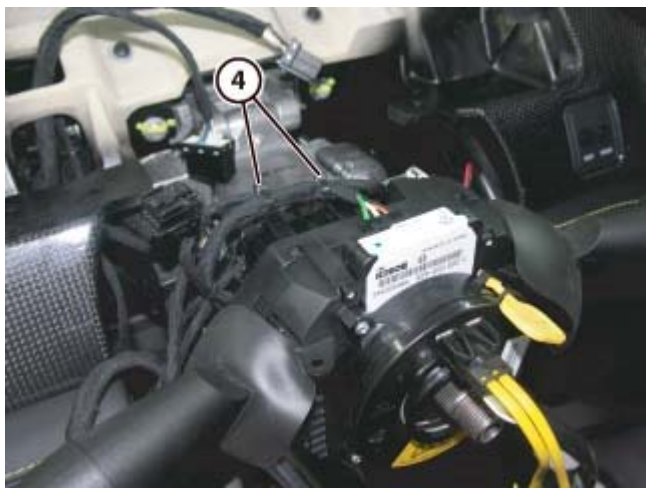
Refitting the steering column switch



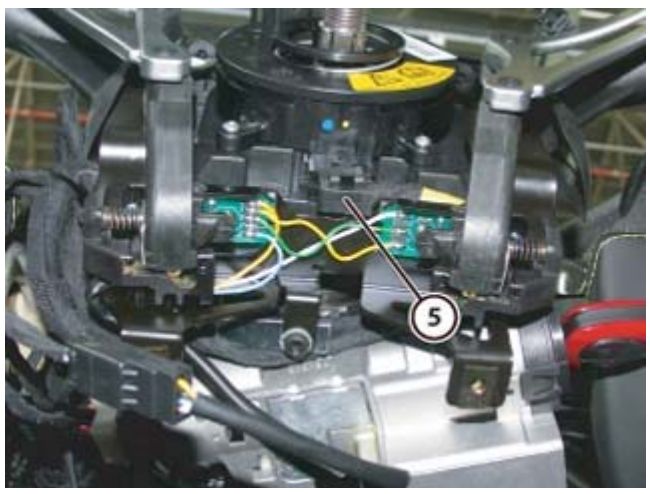
- Connect the four connectors **(1)** (M032) (M034) (D003) (D072) to the steering column switch **(A)**.
- Fit the cables in the clamp **(2)**.



- Fit the steering column switch **(A)** onto the steering column and fasten with the screw **(3)**.



- Refit the two cable retainer clamps **(4)** on the steering column switch.



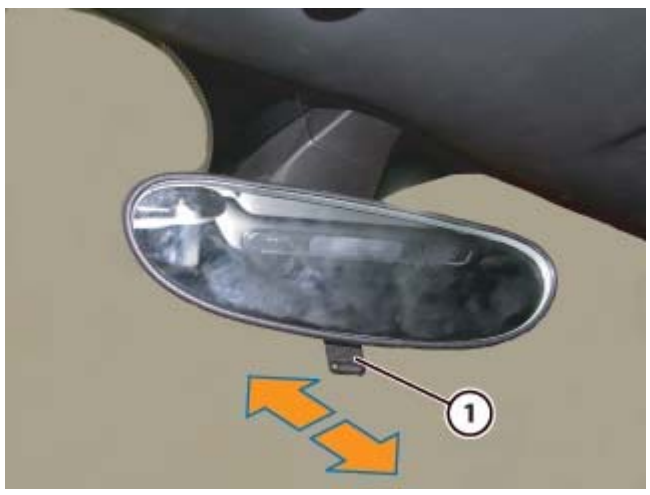
- Connect the clock spring connector **(5)** (D058).

➢ Refit the gear selector paddles (☞ H3.11).
Perform this operation only on vehicles with electronically controlled gearboxes.

➢ Refit the steering column trim panel (☞ M2.19).
➢ Refit the steering wheel (☞ H3.06).
➢ Set the battery master switch to ON (☞ L2.02).

H3.08 Rear-view mirrors

Adjusting the internal rear view mirror



- Grip the internal rear view mirror with one hand and adjust manually.
- To enable the dimming function, push the lever **(1)** towards the windscreen.

Adjusting the external rear view mirrors

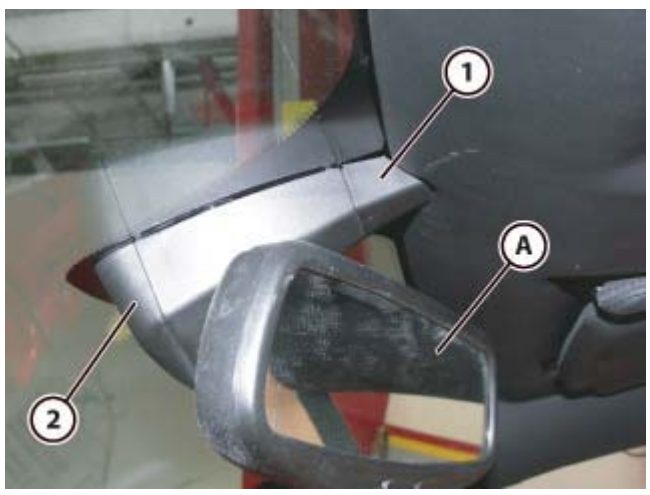


Do not adjust the rear view mirrors while the vehicle is in motion.

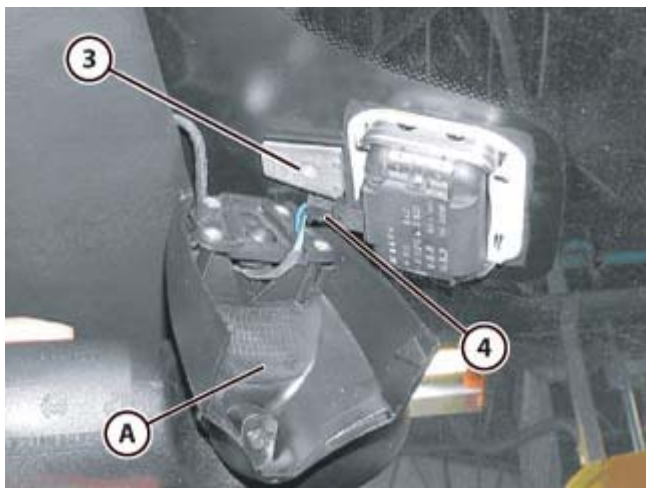
- To adjust the external rear-view mirrors, turn the dial **(1)** on the dashboard, to the left of the driver.
- Turn the dial to the left to adjust the driver side mirror.
- Turn the dial to the right to adjust the passenger side mirror.
- Adjust the mirror as required by pushing the dial in the relative direction.

Removing the internal rear view mirror

➢ Set the battery master switch to OFF (L2.02).

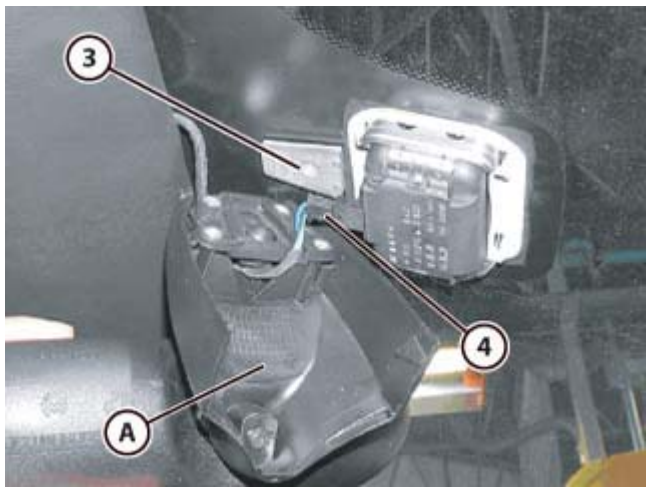


- To remove the interior rear view mirror **(A)** from the windscreen, detach the upper section **(1)** from the mirror base, passing it under the headliner trim, and detach the lower section **(2)**.

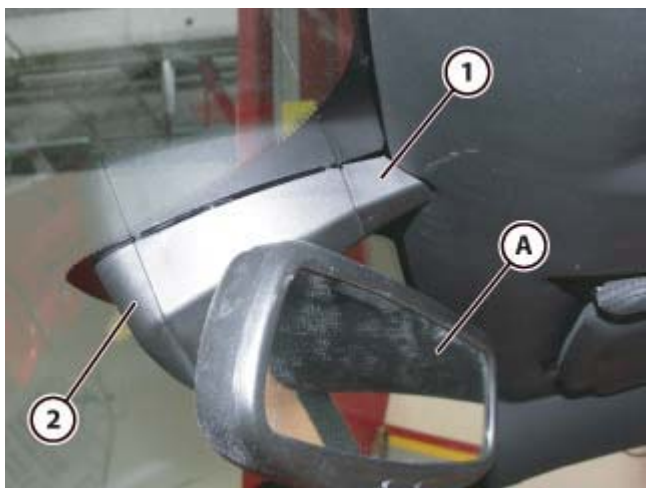


- Push the interior rear view mirror base upward to release from its retainer shoe **(3)** on the windscreen.
- Disconnect the rain sensor connector **(4)** (Z006), remove the cable and remove the interior rear view mirror **(A)**.

Refitting the internal rear view mirror



- Hold the internal rear view mirror **(A)**, fit the rain sensor cable in its respective mounting and connect the connector **(4)** (Z006).
- Fit the base of the rear view mirror into the retainer shoe **(3)** on the windscreen from above.



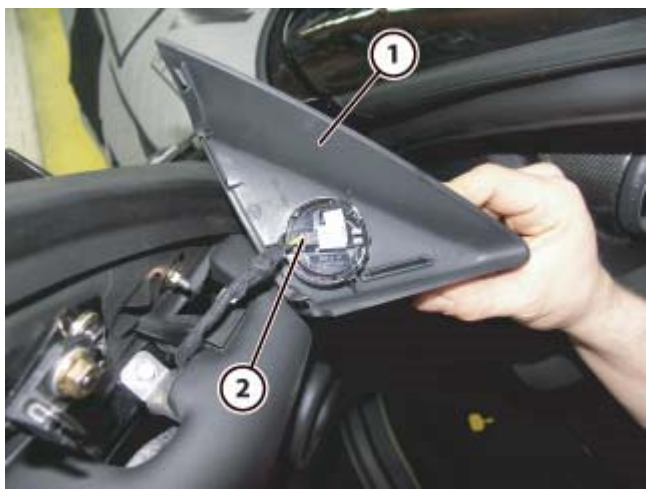
- Snap the lower section **(2)** and the upper section **(1)** onto the base of the internal rear view mirror **(A)**.

➢ Set the battery master switch to ON (L2.02).

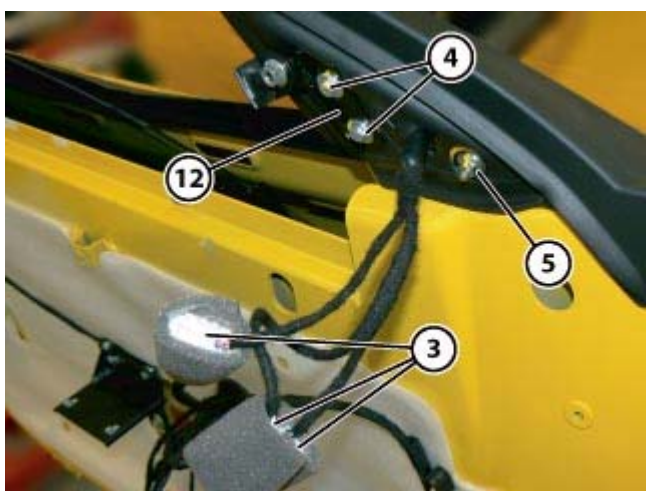
Removing the external rear-view mirrors



- Remove the internal fixing plate **(1)** , detaching first from the top then the bottom.



- Disconnect the tweeter loudspeaker connector **(2)** (L062) (L065) and remove the internal fixing plate **(1)**.

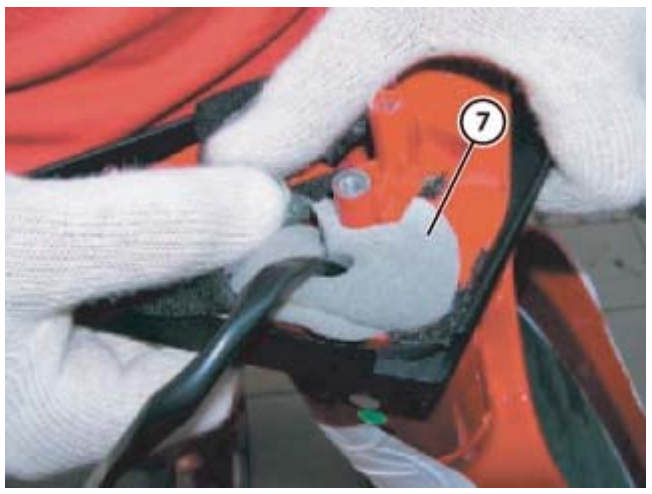


- Disconnect the connectors **(3)** (M008) (M009) from the door wiring harness.
- Undo the two screws **(4)** and retrieve the bracket **(12)**.
- Undo the nut **(5)**.



- Remove the complete rear view mirror, sliding the bituminized seal ring **(6)** off the mirror wiring harness.

Refitting the external rear-view mirrors



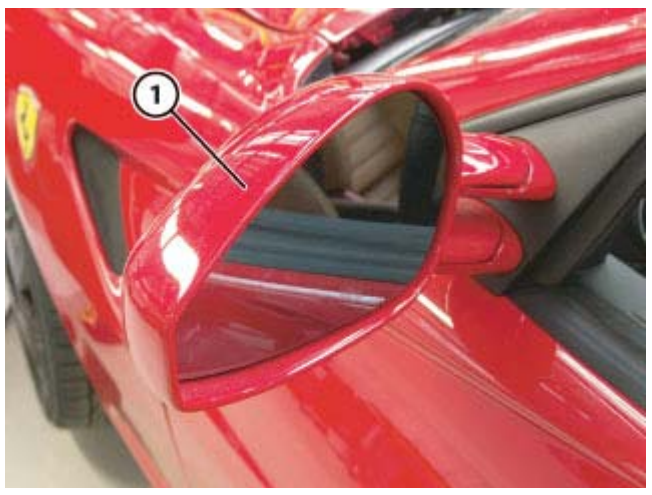
- When replacing a rear-view mirror, the impermeable sponge layers must be refitted exactly as originally mounted to prevent water infiltration.
- Fit the light grey filler sponge **(7)** inside the body of the rear-view mirror, remembering to insert the mirror wiring as shown in the figure.



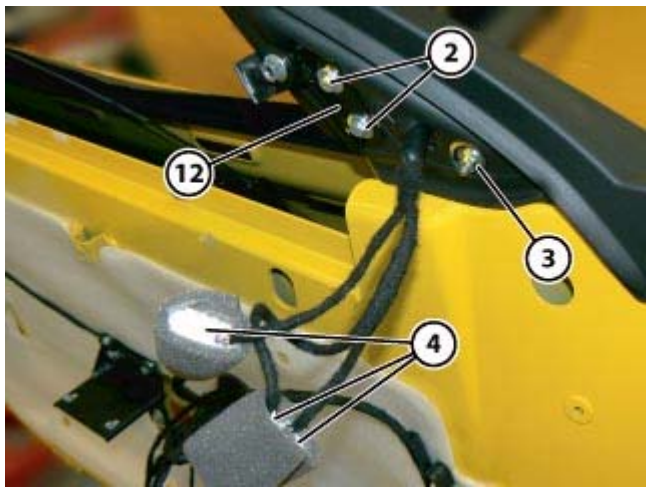
- Fit the first layer **(8)** of impermeable sponge, ensuring that the wiring is spaced from the lower edge of the mirror body as shown in the figure.



- Fit the second layer **(9)** of impermeable sponge as shown in the figure.



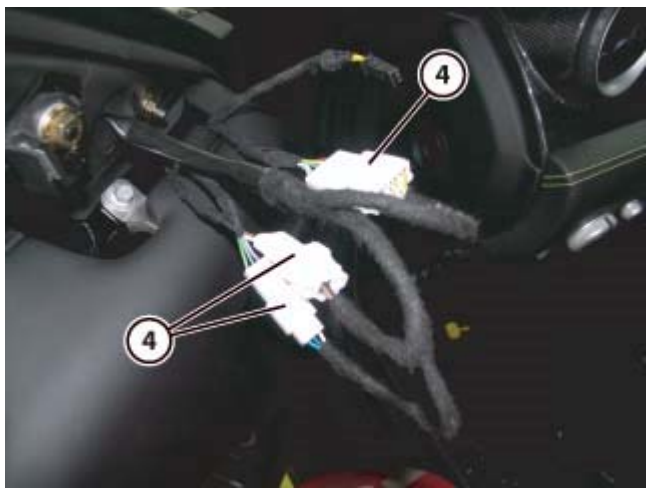
- Fit the mirror **(1)**, fixing to the door framework.



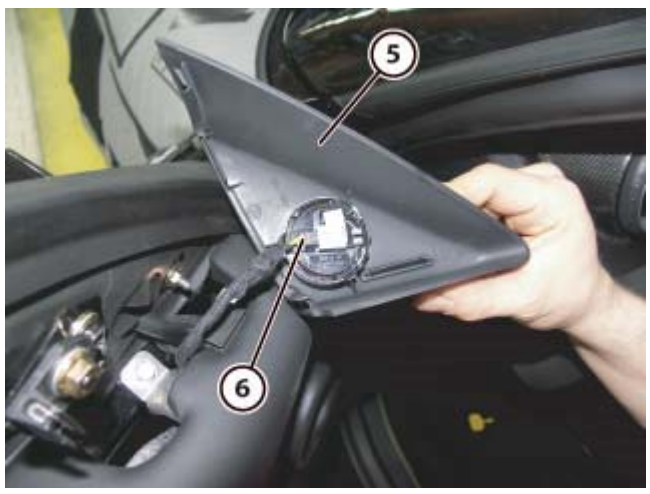
- Fasten to the door, after installing the internal door triangle retainer bracket **(12)** and fed the cable with connectors **(4)** into the relative hole in the door substructure, tightening the two screws **(2)** and the nut **(3)**.



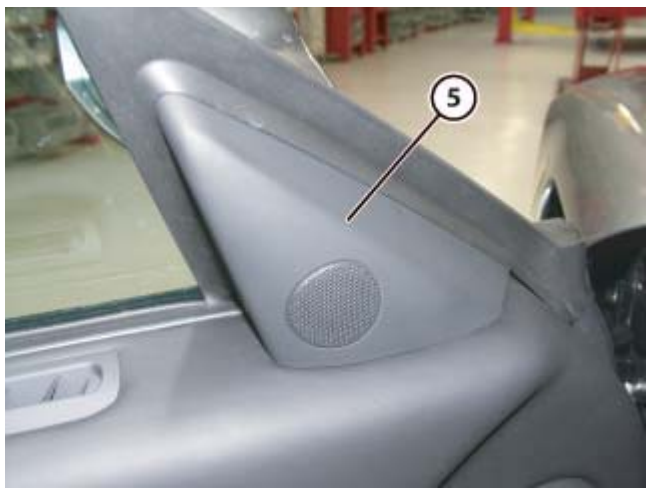
- Refit the tarred grommet **(10)** onto the mirror wiring, then insert completely into the wiring harness outlet on the door.



- Connect the connectors **(4)** (M008) (M009) to the door wiring harness



- Connect the tweeter loudspeaker connector **(6)** (L062) (L065) to the internal fixing plate **(5)**.



- Insert the internal fixing plate **(5)** into its relative mounting on the door.

H3.09 Internal lights

Internal lights



The central light **(3)** comes on automatically when the doors are opened; when the doors are closed, the light may be turned on and off by pressing the button **(1)**.
Once the doors are closed, the central dome light stays on for 20 seconds or until the engine is started.
The button **(2)** switches on the individual passenger light **(4)**.

Removing the interior dome light

➢ Set the battery master switch to OFF (L2.02).



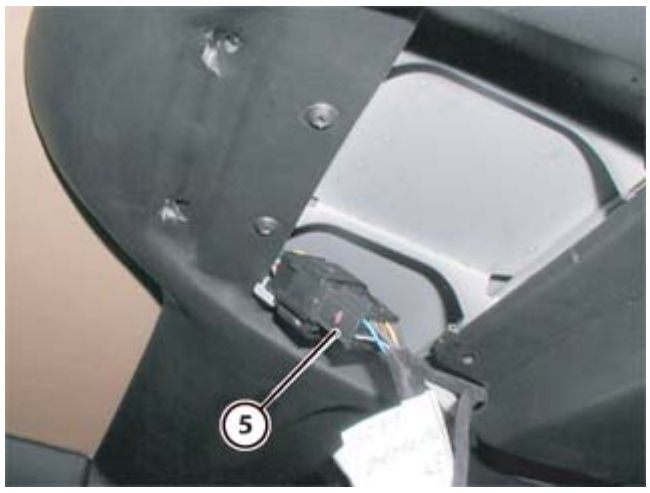
- Remove the fixing plate **(1)** complete with buttons, prising with a screwdriver at the opening on the right hand side of the plate (indicated by the arrow), taking care not to damage the dome light trim panel.



- Disconnect the connector **(2)**(I025).

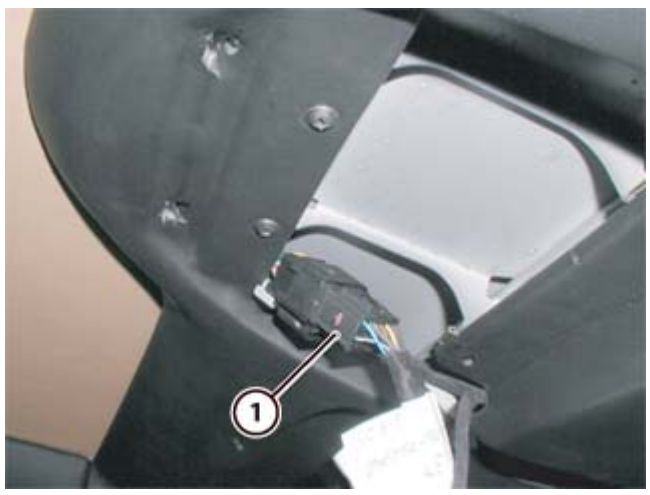


- Remove the dome light trim panel **(3)** by undoing the two screws **(4)**.



- Disconnect the connector **(5)** (X332) (Y332)for the passenger compartment wiring harness.
- Remove the complete dome light.

Refitting the internal dome light



- Connect the dome light connector **(1)** (X332) (Y332)to the luggage compartment wiring harness.
- Fit the cable and the connector in the gap between the roof and trim panel, leaving enough room to install the dome light complete with fixing plate.



- Fit the dome light **(2)** and fasten by tightening the two screws **(3)**.



- Connect the fixing plate connector **(4)**(I025).



- Fit the fixing plate **(5)** on the dome light, pressing gently until the lateral catch clicks into place.

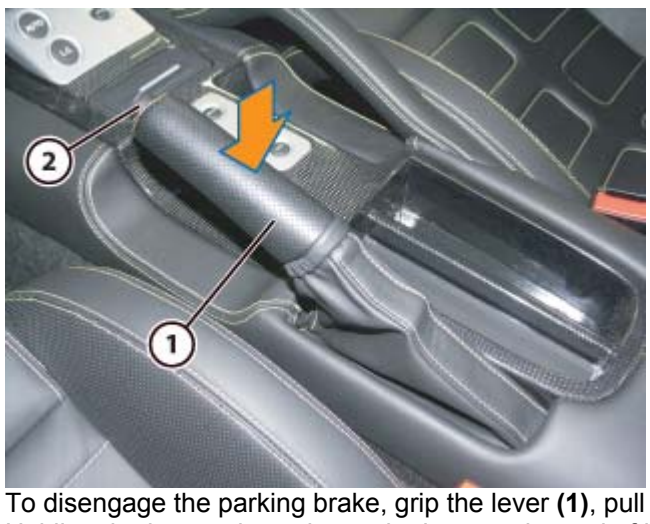
➢ Set the battery master switch to ON (L2.02).

H3.10 Parking brake lever

Operating the parking brake



To engage the parking brake, pull the lever **(1)** upwards to the end of its travel.

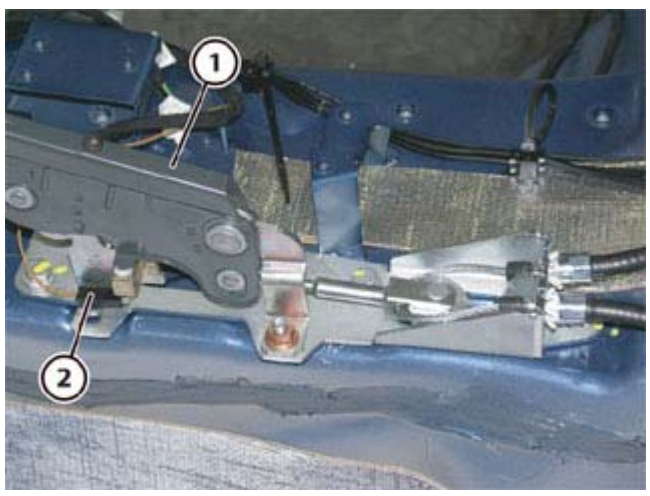


To disengage the parking brake, grip the lever **(1)**, pull it up slightly and simultaneously press the release button **(2)**.
Holding the button down, lower the lever to the end of its travel.

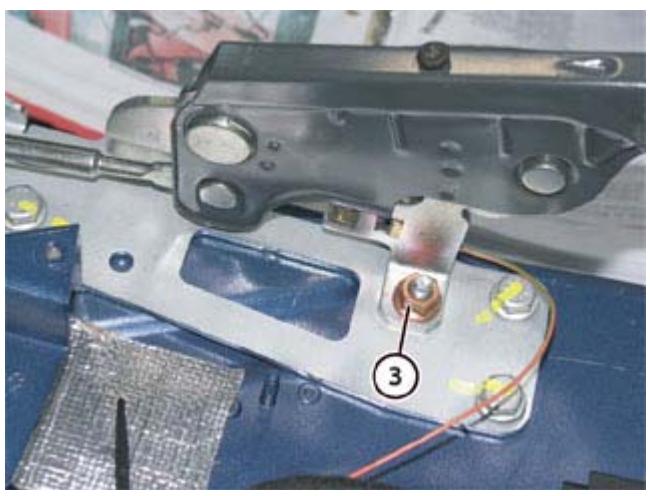
Removing the parking brake lever

FROM Ass.ly Nr. 68545, a tensioner spring is installed.

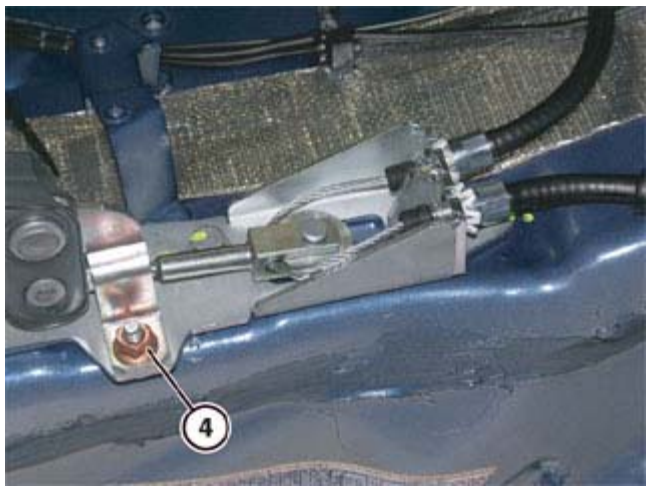
- Set the battery master switch to OFF (L2.02).
- Remove the console trim panel (M2.20).



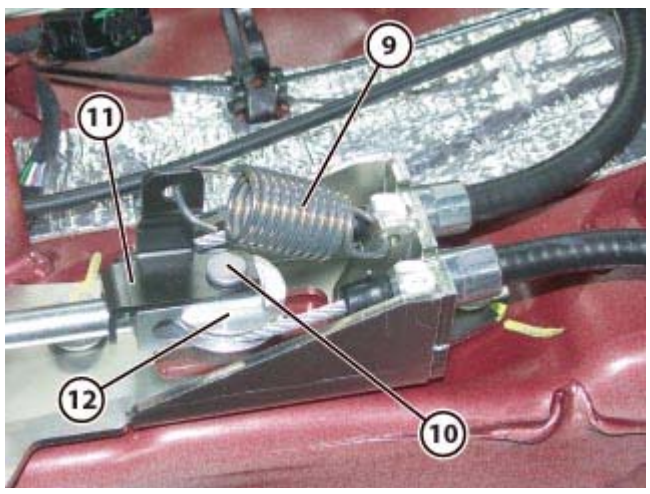
- To remove the parking brake lever **(1)** complete with the relative mechanism, disconnect the connector **(2)** (D021).



- Undo the nut **(3)** fastening the bracket to the bodywork.

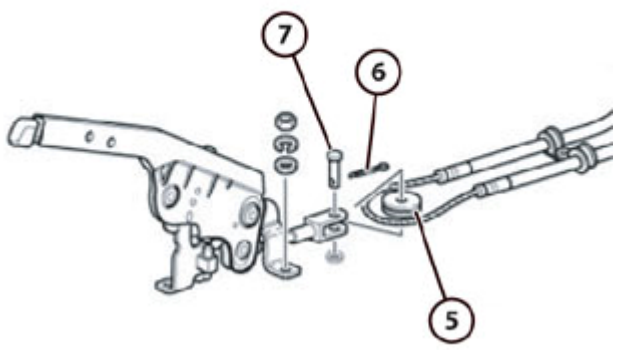


- Undo the nut **(4)**.



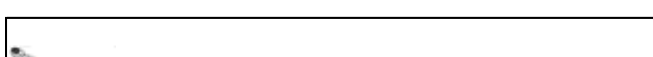
FROM Ass.ly Nr. 68545

- Lift the lever complete with bracket.
- Disconnect the tensioner spring **(9)** from the bracket **(11)**.
- Remove the lower cotter pin with plastic washer and remove the pin **(10)**.
- Remove the bracket **(11)**.
- Detach the control cable from the pulley **(12)**.



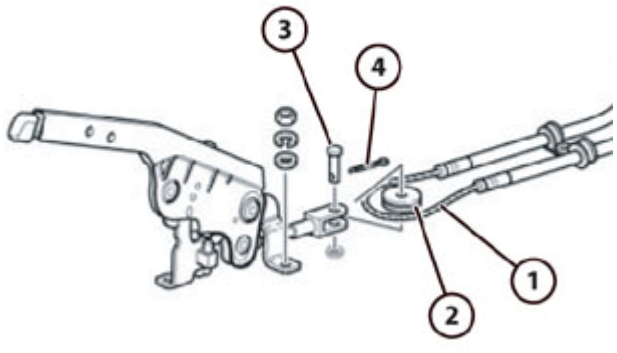
- Lift the lever complete with bracket.
- To release the pulley, **(5)** remove the cotter pin **(6)**.
- Remove the pin **(7)** then slide the brake cable off the pulley.

Refitting the parking brake lever

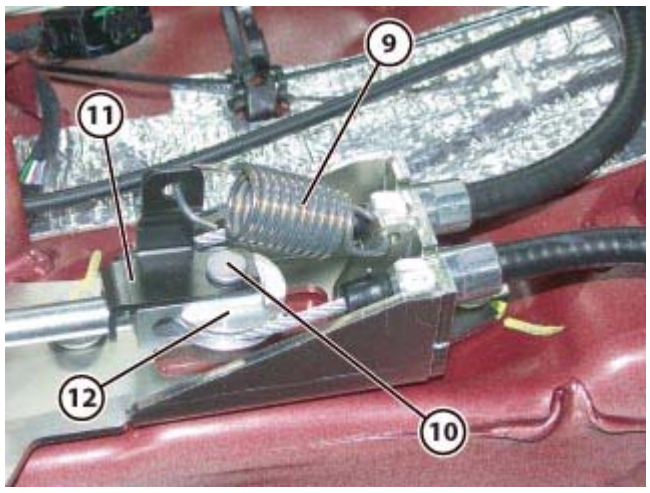


Tightening torque		Nm	Class
Parking brake lever	Nut	25 Nm	A

FROM Ass.ly No. 68545, a tensioner spring is installed.

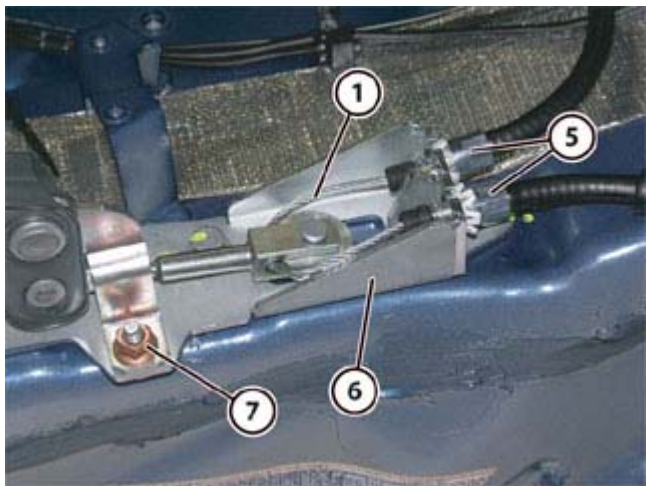


- Fit the parking brake cable **(1)** to the pulley **(2)**.
- Fit the pulley **(2)**, complete with cable, into the brake lever fork.
- Fit the pin **(3)** and fasten with the cotter pin **(4)**.



FROM Ass.ly No. 68545

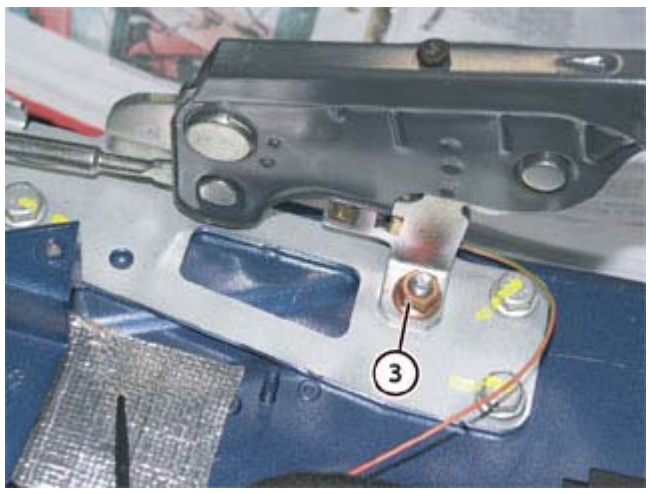
- Fit the control cable onto the pulley **(12)**.
- Fit the bracket **(11)**.
- Fit the pin **(10)** and fasten by fitting the lower cotter pin with plastic washer.
- Connect the tensioner spring **(9)** to the bracket **(11)**.
- Fit the lever complete with bracket.



- Fasten the lever complete with bracket, tightening the nut **(7)**.

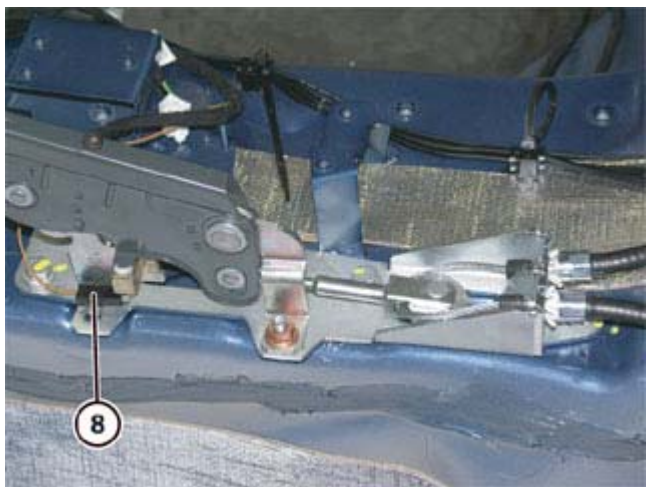
		
Tightening torque	**Nm**	**Class**
Nut	25 Nm	A

- Check that the cable **(1)** is slack and free to move.
- Fit both cable clips **(5)** in the slots on the bracket.



- Tighten the nut **(3)**.

		
Tightening torque	**Nm**	**Class**
Nut	25 Nm	A



- Connect the connector **(8)** (D021).

- Refit the console trim panel (☞ M2.20).
- Set the battery master switch to ON (☞ L2.02).

H3.11 Gear selector lever

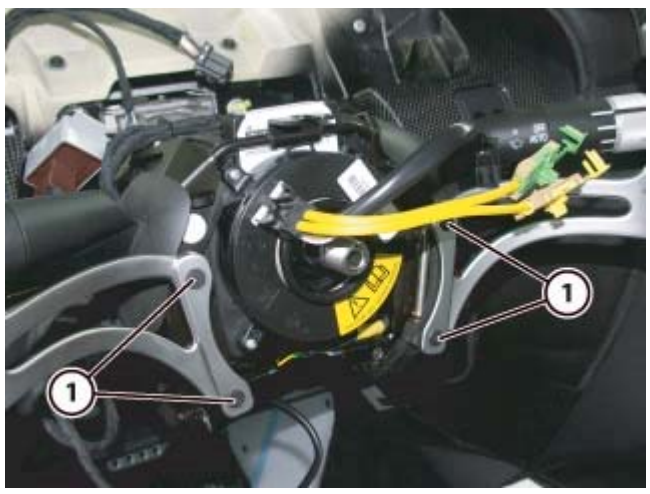
Gear selector paddles (F1 gearbox)



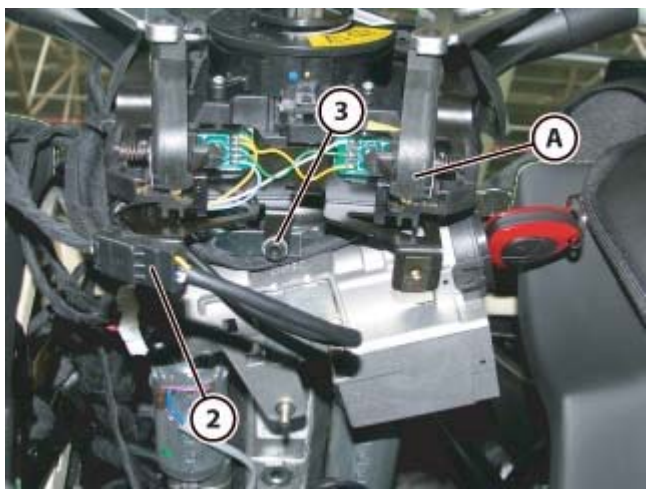
The driver imparts gear shift requests using the two paddles connected to the switches selecting **DOWN** shifts, **UP** shifts and **N**eutral.
Pull the left hand paddle to request a **DOWNSHIFT**, pull the right hand paddle to request an **UPSHIFT** and pull both paddles simultaneously to request **NEUTRAL**.

Removing the gear selector paddles (F1 gearbox)

- Set the battery master switch to OFF (L2.02).
- Remove the steering wheel (H3.06).
- Remove the steering column trim panel (M2.19).



- To replace the gear selector paddles, undo the fastener screws **(1)**.



- To remove the gear selector paddle assembly from the steering wheel **(A)**, disconnect the connector **(2)** (D301) and undo the lower screw **(3)**.

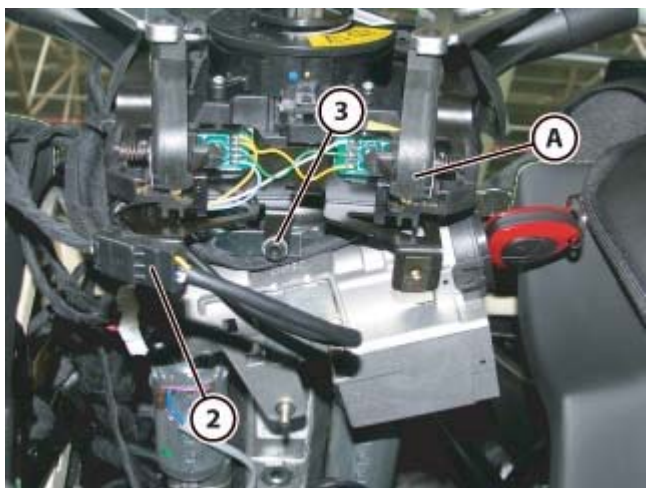


- Undo the two upper screws **(4)** and remove the gear selector paddle assembly from the steering column.

Refitting the gear selector paddles (F1 gearbox)



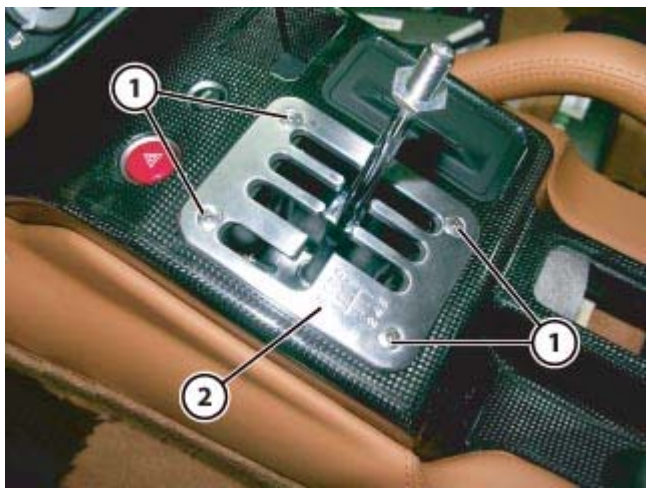
- Fit the gear selection paddles on the steering column and fasten with the two upper screws **(4)**.



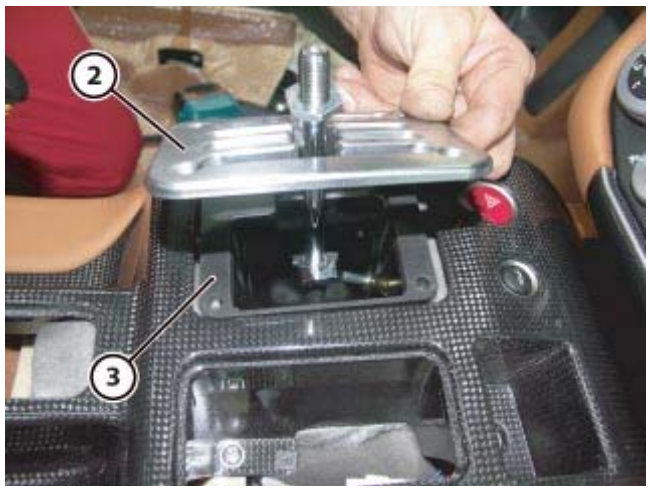
- Fasten the gear selection paddles **(A)** by hand tightening the lower screw **(3)** and connect the connector **(2)** (D301).

➢ Refit the steering column trim panel (M2.19).
➢ Refit the steering wheel (H3.06).

Removing the gear selector (mechanical gearbox)

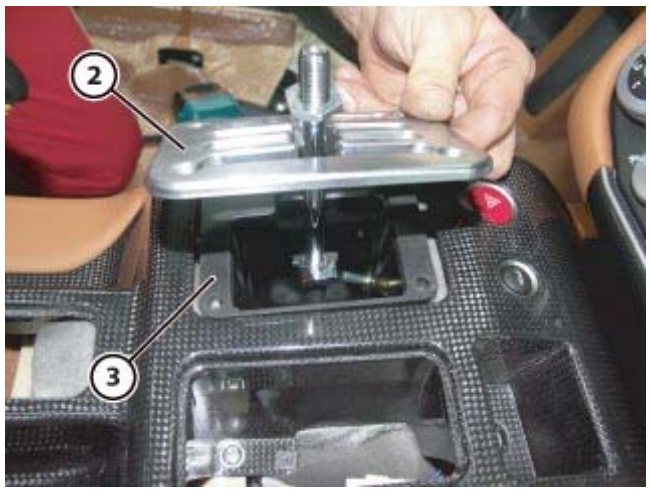


- Unscrew the gear lever knob and remove.
- Undo the four screws **(1)** fastening the gear selector **(2)** to the gear selector housing.

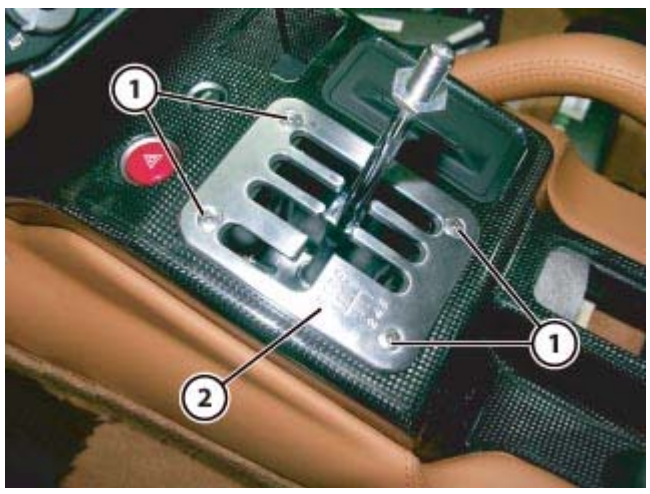


- Remove the gear selector **(2)** and the seal **(3)**.

Refitting the gear selector (mechanical gearbox)



- Fit the seal **(3)** in the relative seat on the gear selector housing, as shown in the figure.
- Fit the gear selector **(2)**.



- Fasten the gear selector **(2)**, by hand tightening the four screws **(1)**.

- Tighten the gear lever knob as originally fitted.

➢ Set the battery master switch to ON (☞ L2.02).

H3.12 Ashtray - Cigarette lighter

Ashtray

Accessing the ashtray



To access the ashtray, lift the cover **(1)**.
Press gently on the cover to close.

Cigarette lighter

Using the cigarette lighter



Push the centre button in completely to switch on the cigarette lighter **(2)**.
After a few seconds, once operating temperature is reached, the cigarette lighter automatically springs back to its initial position.
Remove the cigarette lighter and use.
To replace, push gently into its socket.

Removing the ashtray

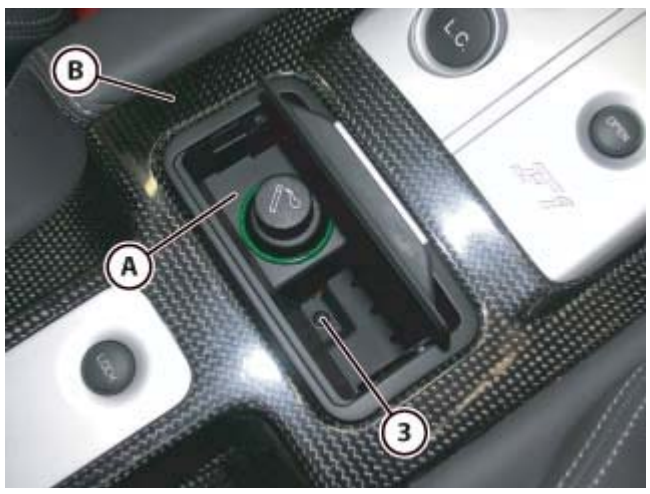
➢ Set the battery master switch to OFF (L2.02).



- Lift the flap **(1)** to access the cigarette lighter.



- Remove the ashtray **(2)**.



- Undo the screw **(3)** and use a screwdriver to prise the ashtray **(A)** out of the centre console trim **(B)**.



- Disconnect the connector **(4)** (R004)and remove the ashtray/cigarette lighter from the passenger compartment **(A)**.

Refitting the ashtray



- Connect the ashtray **(A)**, complete with cigarette lighter, to the connector **(4)**(R004).



- Press the ashtray **(A)** downward until it snaps into place on the centre console trim panel **(B)**.
- Fasten with the screw **(3)**.



- Refit the ashtray **(2)** and close the cover.

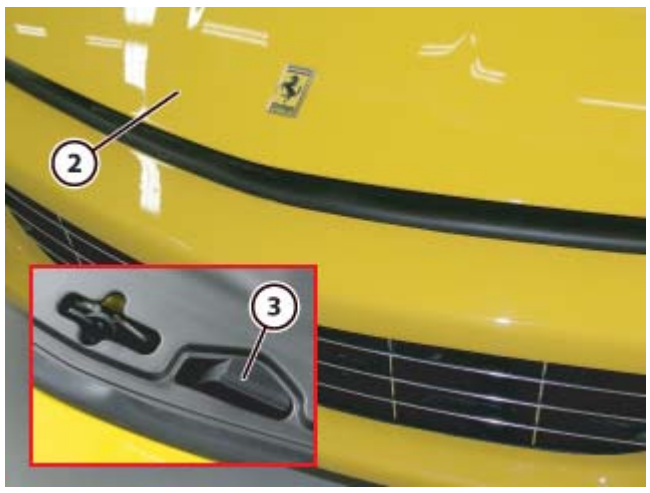
➢ Set the battery master switch to ON (L2.02).

H3.13 Lid and fuel filler flap opening systems

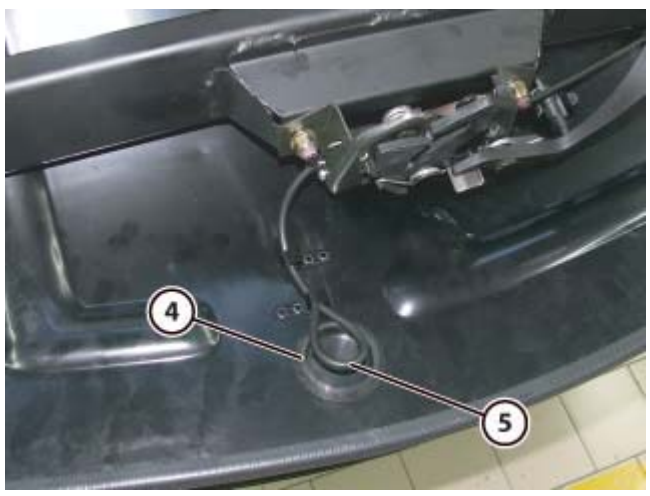
Opening the engine compartment lid



- Pull the release lever **(1)** on the lower left hand dashboard trim panel.



- Once released, to lift the engine compartment lid **(2)**, pull the lever **(3)** located under the lid itself at the centre front of the vehicle.
- Lift the lid until the two gas struts support the weight.



- Should the engine compartment lid opening lever fail to work, insert your hand through the louvres of the front grille and push to remove the protector cap from its mounting **(4)**.
- Grip the ring **(5)** with your fingers and pull outward.

Note that the photo was taken with the bumpers and central engine compartment guard removed to illustrate the operation more clearly.

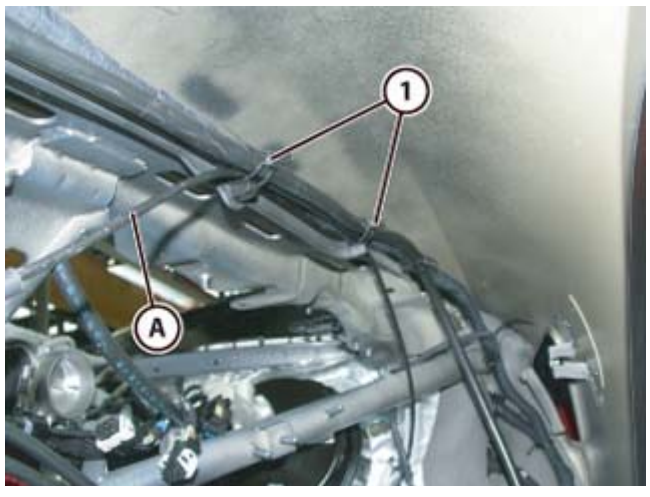
Closing the engine compartment lid

CAUTION
Always check that the engine compartment lid has been correctly closed to prevent accidental opening while driving.

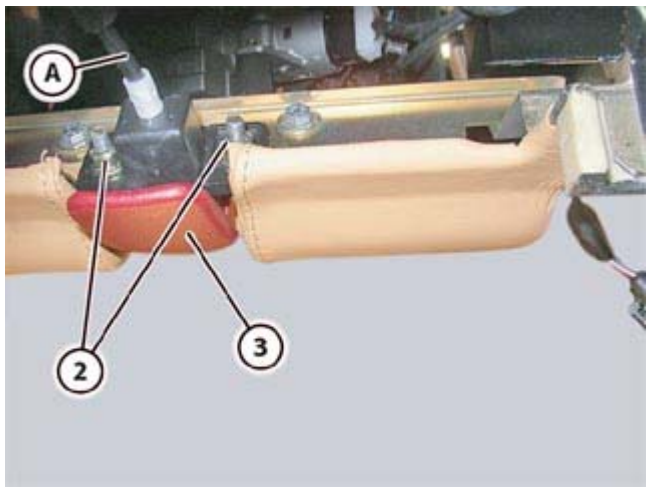
- Lower the lid to close while simultaneously pressing down on the lock until it clicks audibly.

Replacing the engine compartment lid release cable

- Remove the central engine compartment shield (M2.17).
- Remove the front left hand wheelhouse (M2.05).

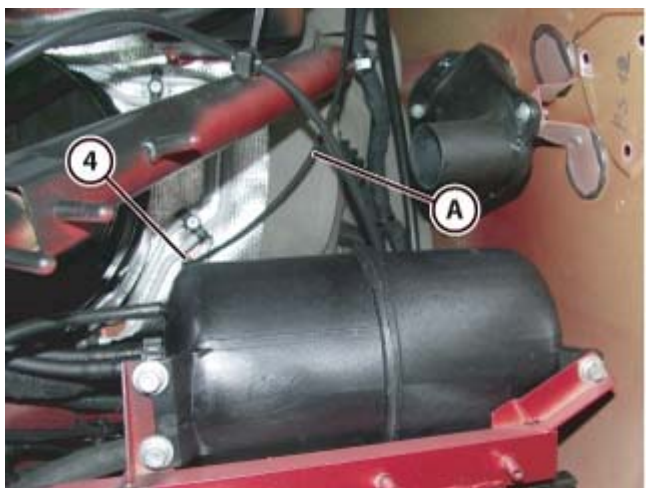


- Working from the front left wheelhouse, detach the engine compartment lid release cable **(A)** from the chassis mounting clamps **(1)**.

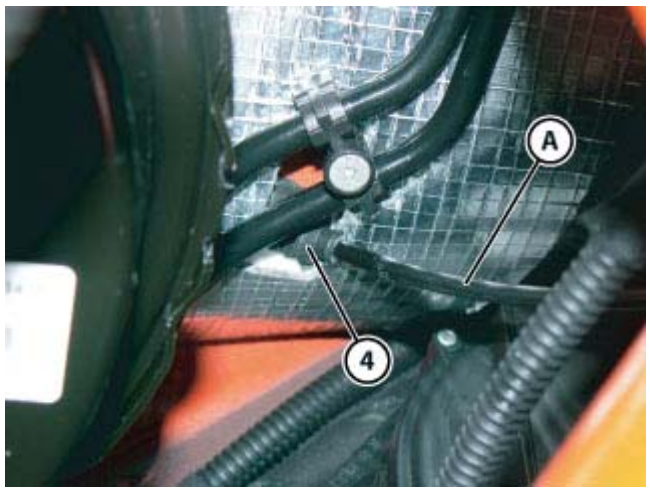


Never close the engine compartment lid if the relative release cable is disconnected.

- Working from under the dashboard on the driver side, undo the two nuts **(2)** fastening the release mechanism to the dashboard.
- Now detach the end of the engine compartment lid release cable **(A)** from the release lever **(3)**.



- Working from the front left wheelhouse, pull the end of the engine compartment lid**(A)** release cable out through the cable grommet **(4)** on the engine compartment/passenger compartment firewall.



FROM Ass.ly Nr. 80637

- The engine compartment lid release cable and, more specifically, the cable guide **(4)** on the passenger compartment bulkhead, has been updated.



- Detach the front end of the engine compartment lid release cable **(A)** from the lock **(5)**.
- Pull out the engine compartment lid**(A)** release cable out completely from the engine compartment.

- Fit the new cable, starting from the engine compartment, routing and securing as originally installed.





- Before closing the engine compartment lid, pull the release lever **(3)** to ensure that the lock functions correctly **(5)**.

➢ Refit the front left hand wheelhouse (M2.05).
➢ Refit the central engine compartment shield (M2.17).

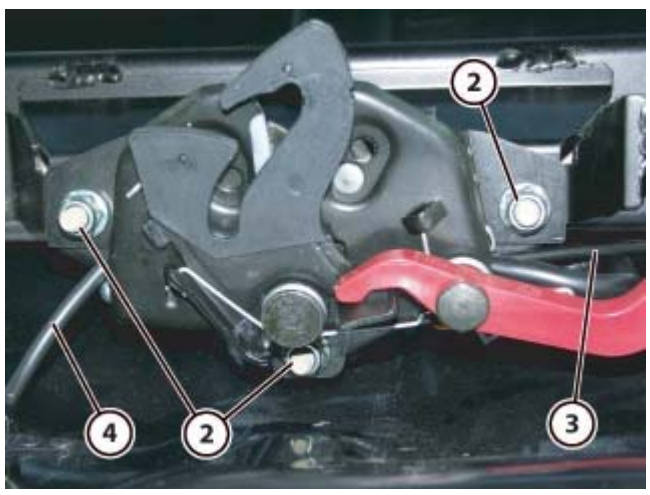
Replacing the engine compartment lid lock

Tightening torque		**Nm**	**Class**
Engine compartment lid lock - chassis	Nut	24 Nm	B
Fastening engine compartment lid lock striker plate	Screw	8.5 Nm	B

➢ Remove the central engine compartment shield (M2.17).



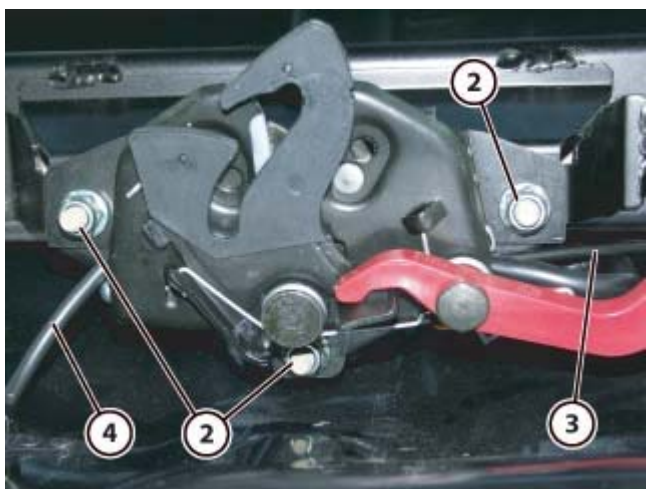
- Disconnect the connector **(1)**(D304).



- Undo the three nuts **(2)** fastening the lock to the chassis.
- Detach the engine compartment lid release cable **(3)** from the lock, and detach the emergency release cable **(4)** from the retainer hooks on the air duct.
- Remove the lock and replace.



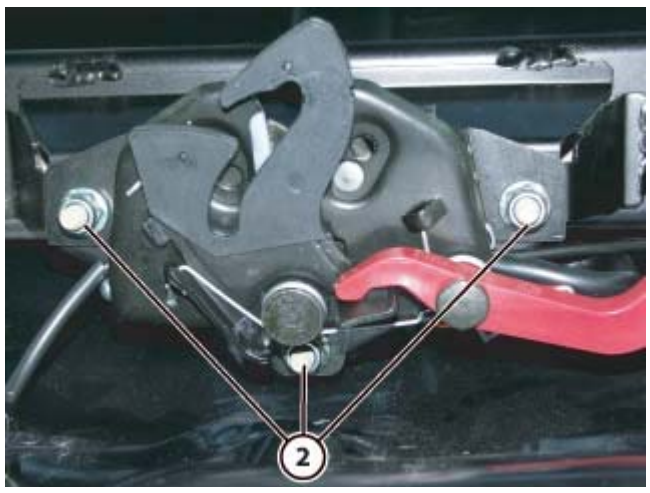
- Before fitting, check that the back of the lock bears the green marking as shown in the photo. If not, replace with a new lock with the correct marking.



- Hold the lock complete with emergency release cable **(4)** and attach the engine compartment lid opener cable **(3)** in the relative seat.
- Fasten the lock by tightening the three nuts **(2)**.



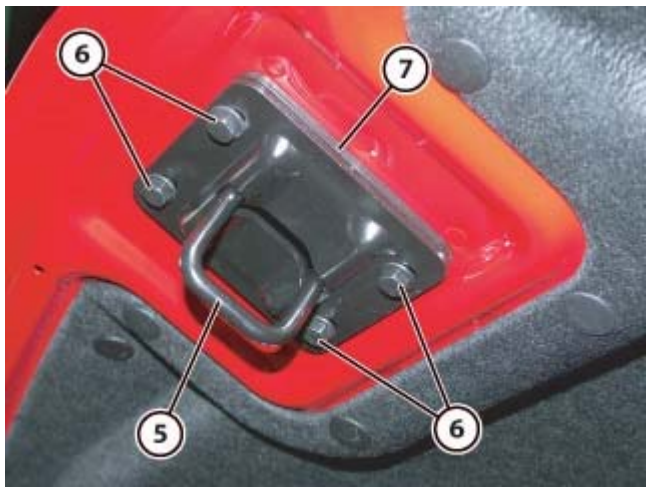
- Connect the connector **(1)** (D304) and fit the emergency release cable as originally installed in the retainer hooks on the air duct.



- After checking that the lid opens and closes correctly without jamming or straining, tighten the three nuts **(2)**.

Tightening torque	Nm	Class
Nut	24 Nm	B

- If the lock needs to be adjusted, loosen the three nuts **(2)** and move the lock vertically into the position necessary for the lid to close correctly.



- Should the previous adjustment be insufficient, remove the engine compartment lid lock striker plate **(5)**, undoing the four screws **(6)**, and add or remove shims **(7)**.
- Once correctly adjusted, tighten the four screws **(6)**.

Tightening torque	Nm	Class
Screw	8.5 Nm	B

➢ Adjust the engine compartment lid lock striker plate retainer bracket (H3.13).
Operation necessary if the engine compartment lid lock striker plate has been removed.

➢ Refit the central engine compartment shield (M2.17).

Adjusting the engine compartment lid lock striker plate retainer bracket

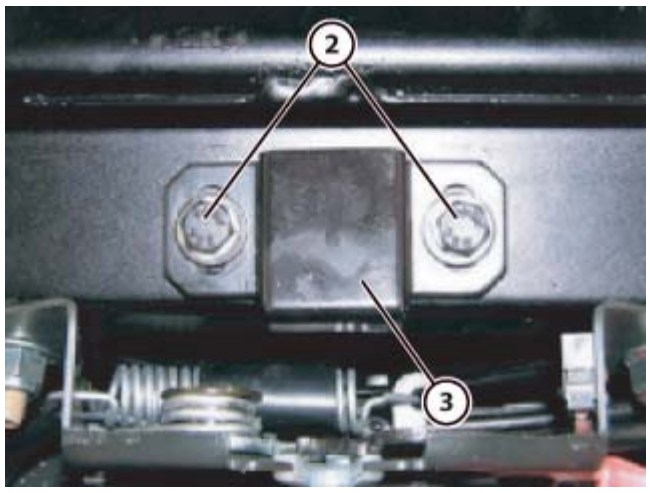
Tightening torque		Nm	Class
Striker plate retainer bracket	Screw	7.4 Nm	B

The following operation is necessary in the event of any adjustment to the engine compartment lid, to ensure that the engine compartment lid closes correctly.

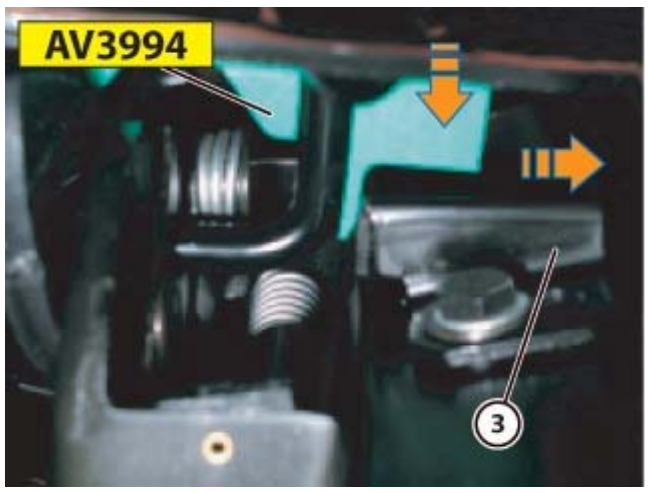
➢ Remove the central engine compartment shield (M2.17).
Operation necessary if the plate has not been removed.



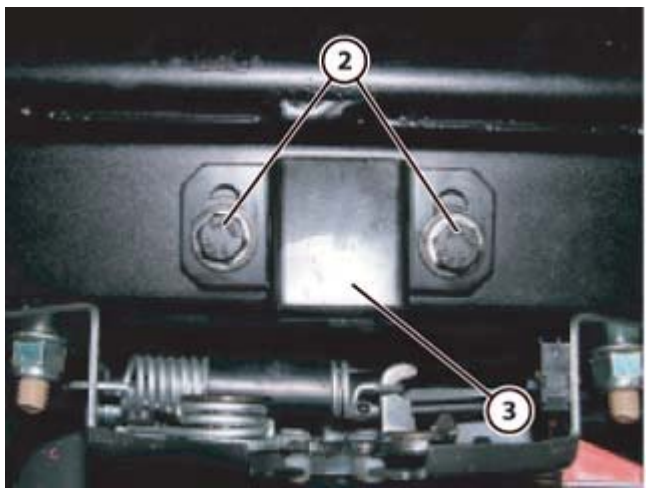
- Fit the tool **(AV 3994)** correctly on the engine compartment lid lock striker plate, fastening with the relative pins **(1)**.



- Undo the screws **(2)** fastening the striker plate retainer bracket **(3)**.
- Position the striker plate retainer bracket **(3)** so that the fastener screws and washers are perfectly aligned with the centres of the slots on the bracket itself.
- Tighten the screws **(2)** sufficiently to maintain the position described above, while allowing the striker plate retainer bracket **(3)** to move laterally.



- Close the engine compartment lid delicately to its shut position and release at least twice; the lid will not close because the tool **(AV 3994)** is in place.
- During this operation, the finger on the tool **(AV 3994)** automatically moves the striker plate retainer bracket **(3)** into the correct position. Lift the engine compartment lid.



- Fasten the striker plate retainer bracket **(3)** by tightening the screws **(2)**.

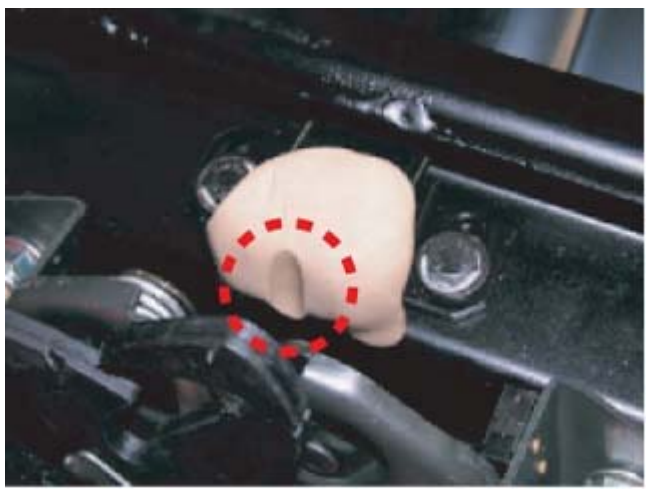


Tightening torque	Nm	Class
Screw	7.4 Nm	B

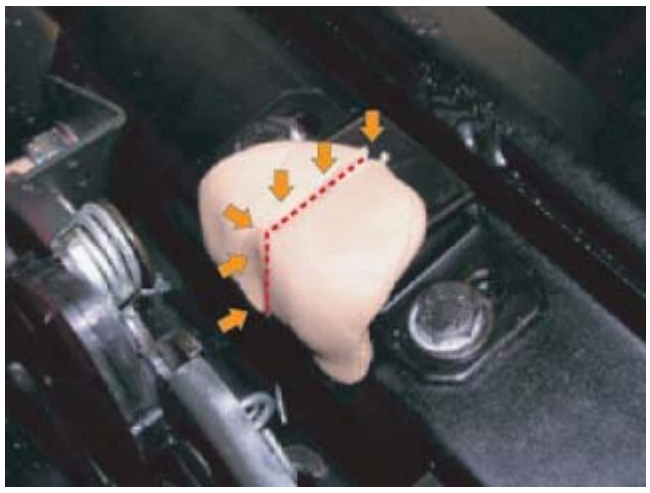
- Remove the tool **(AV 3994)** from the engine compartment lid lock striker plate.



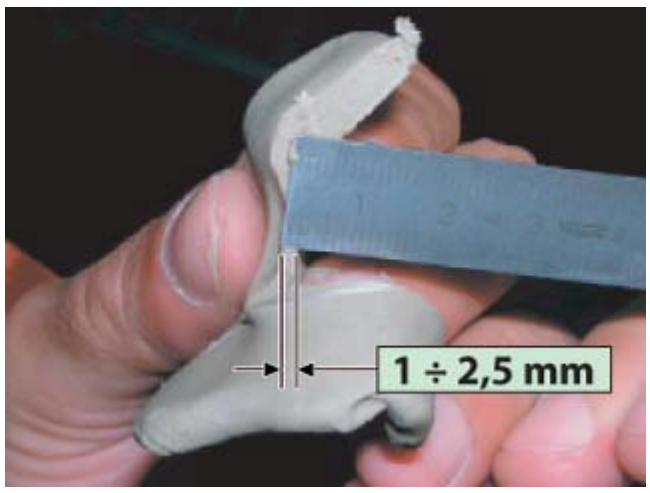
- Apply modelling clay to the front of the striker plate retainer bracket **(3)** as shown in the figure, then completely close the engine compartment lid.



- Open the engine compartment lid and check that the striker plate has left a mark in the modelling clay, as shown in the figure.



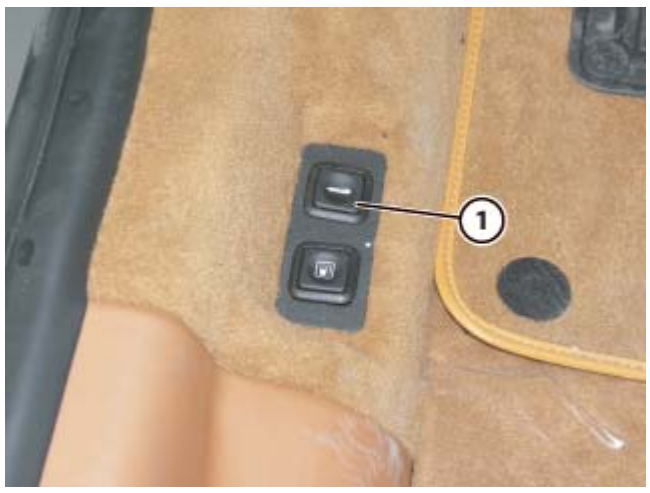
- Use a cutter to make a central/longitudinal cut along the marking made in the modelling clay, as shown in the figure.



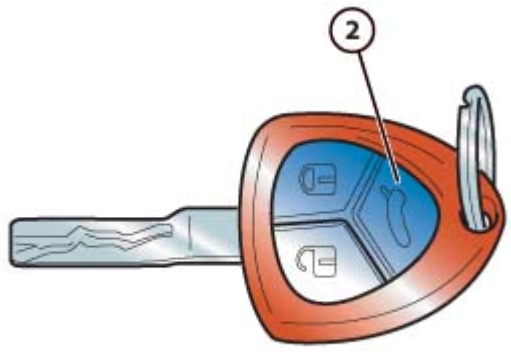
- Remove the modelling clay and ensure that the central part of the striker plate marking measures between **1 mm** and **2.5 mm**.

➢ Refit the central engine compartment shield (M2.17).

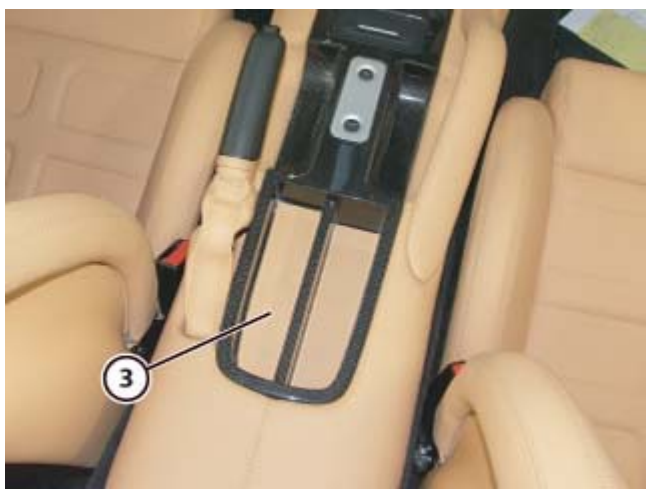
Opening the luggage compartment lid



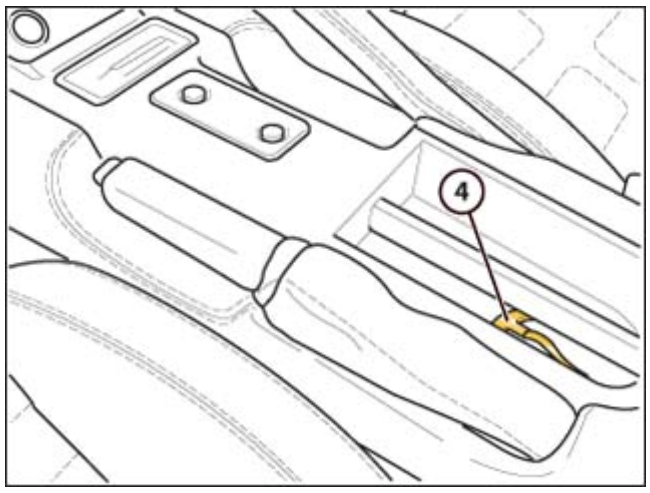
- Press the release button **(1)** on the left hand side of the driver's seat and lift the luggage compartment lid.



- The luggage compartment lid may also be opened by pressing and holding the button **(2)** on the ignition key remote for more than **2 sec**.



- Should the release buttons not work, lift the trim **(3)** of the centre console stowage compartment.



- Pull the ring **(4)** on the emergency luggage compartment lid release cable.

Closing the luggage compartment lid

- Accompany the luggage compartment lid until it comes into contact with the body, using the recessed handle on the inner surface.

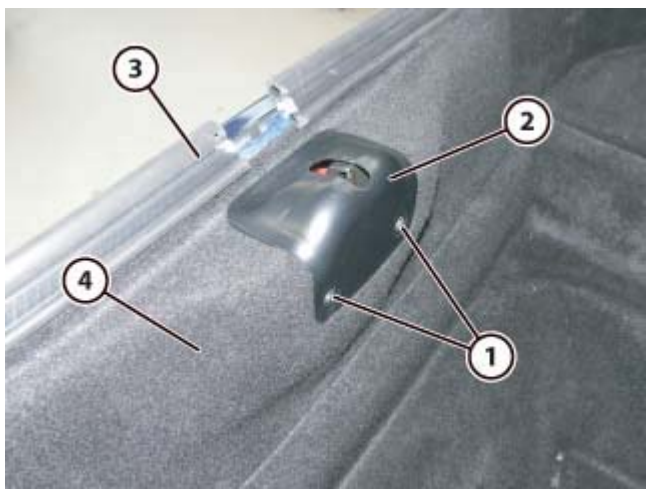


- Press down at the position indicated by the arrow until the lock clicks audibly.

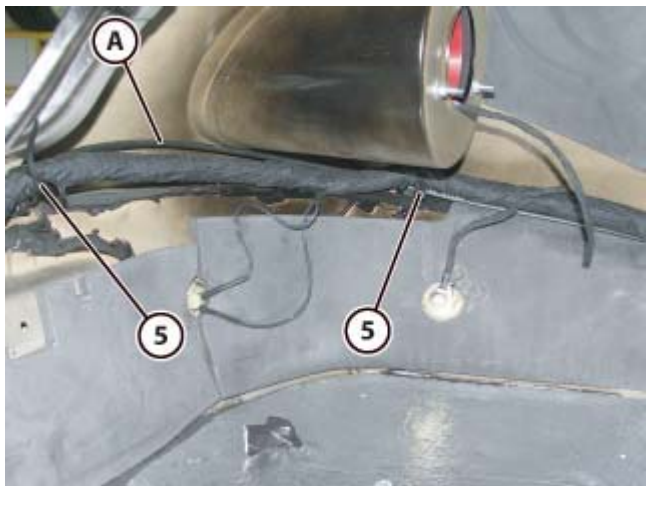
Replacing the emergency luggage compartment lid release cable @

➢ Remove the luggage compartment side trim panels (M2.23).
➢ Remove the rear trim panels (M2.24).
Follow the removal sequence up to the removal of the **backrest trim panel**.

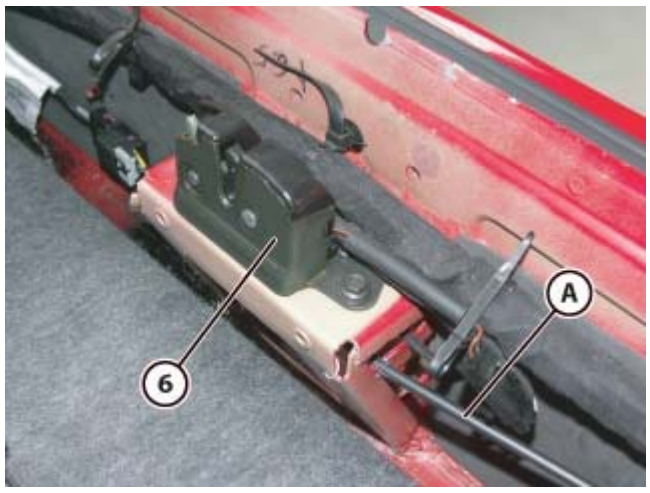
➢ Remove the console trim panel (M2.20).
➢ Remove the console trim (M2.24).
Follow the removal sequence up to the removal of the **rear console cover**.



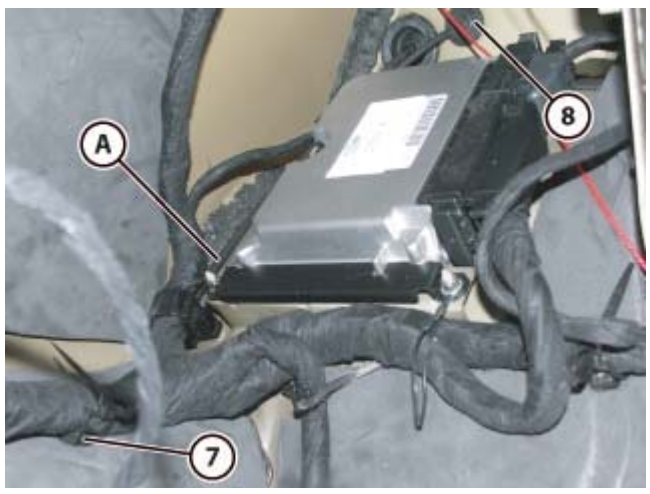
- Undo the two screws **(1)** and remove the luggage compartment lid lock cover **(2)**.
- Remove the nearby perimeter gasket **(3)** and lift the luggage compartment floor mat **(4)** to expose the lock.



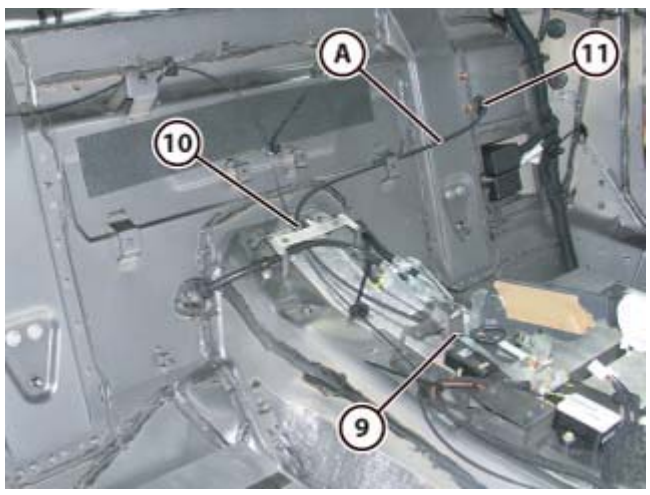
- Release the luggage compartment lid emergency opener cable **(A)** from the clamps **(5)**.



- Detach the luggage compartment lid emergency opener cable **(A)** from the lock **(6)**.



- Release the luggage compartment lid emergency opener cable **(A)** from the clamp **(7)** and push into the cable guide **(8)** towards the passenger compartment.



- Remove the seeger ring **(9)** and detach the luggage compartment lid emergency opener cable **(A)** from the bracket on the centre console.
- Remove the retaining clip **(10)** and, from the passenger compartment, pull the luggage compartment lid emergency opener cable **(A)** through the cable guide **(11)**.

- Fit the new cable, starting from the passenger compartment, routing and securing as the original cable was mounted.





- Before closing the luggage compartment, pull the luggage compartment lid emergency opener cable ring **(12)** and check that the lock clicks **(6)**.

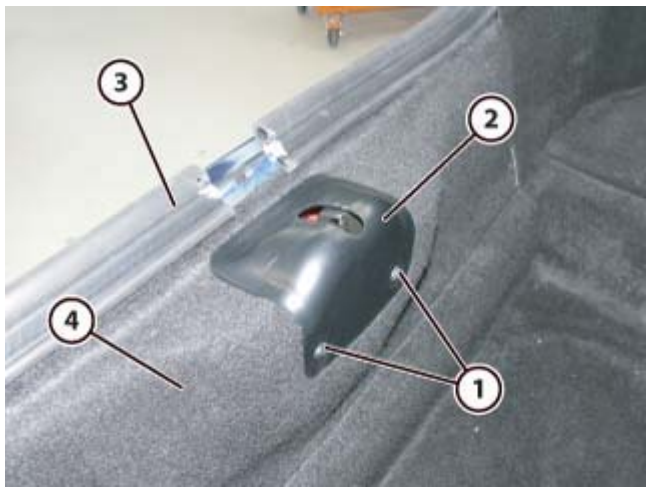
➢ Refit the console trim panels (M2.24).
➢ Refit the console trim panel (M2.20).
➢ Refit the rear trim panels (M2.24).
➢ Refit the luggage compartment side trim panels (M2.23).

Replacing luggage compartment lid lock

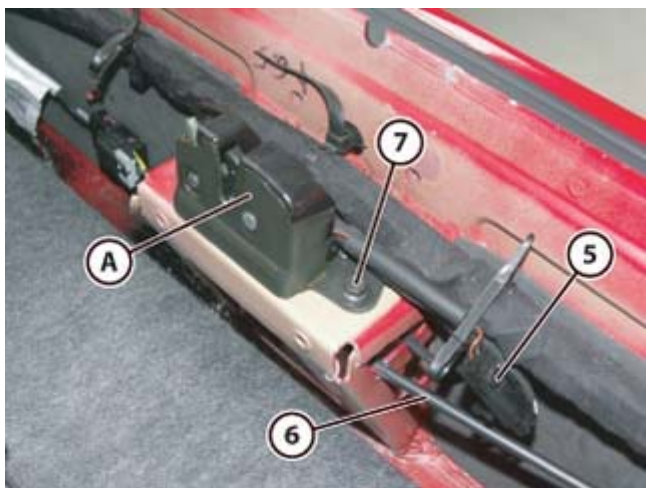


Tightening torque		Nm	Class
Luggage compartment lid lock - bodyshell	Screw	24 Nm	B

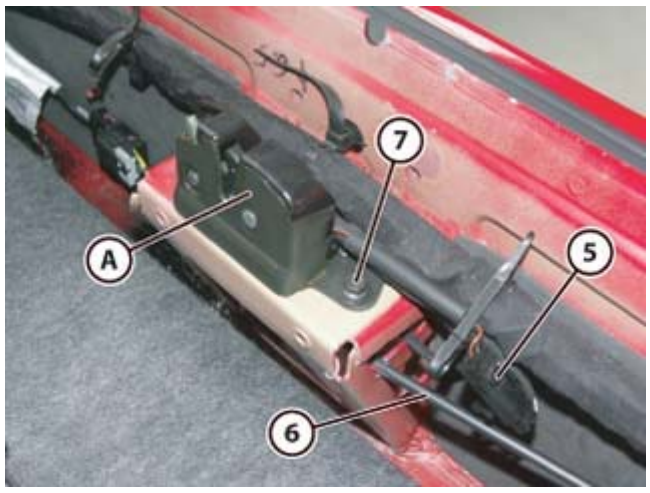
➢ Remove the luggage compartment side trim panels (M2.23).



- Undo the two screws **(1)** and remove the luggage compartment lid lock cover **(2)**.
- Remove the nearby perimeter gasket **(3)** and lift the luggage compartment floor mat **(4)** to expose the lock.



- Disconnect the connector **(5)** and detach the luggage compartment lid emergency opener cable **(6)** from the lock **(A)**.
- Undo the two screws **(7)** and remove the lock **(A)** from the luggage compartment.

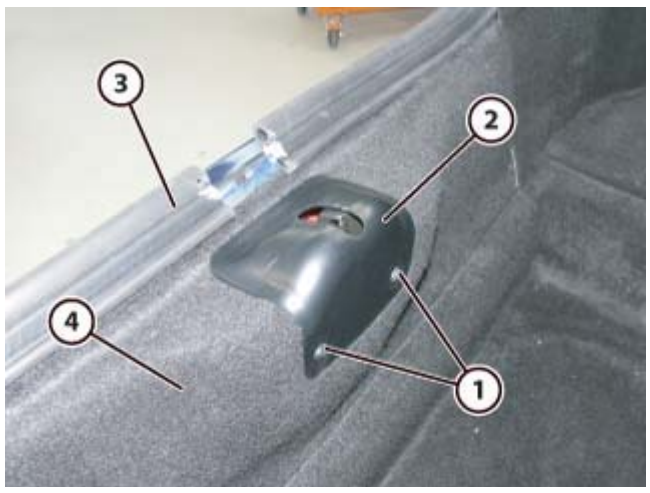


- Fit the new lock **(A)**, positioning in the relative mounting and securing by tightening the two screws **(7)**.



Tightening torque	Nm	Class
Screw	24 Nm	B

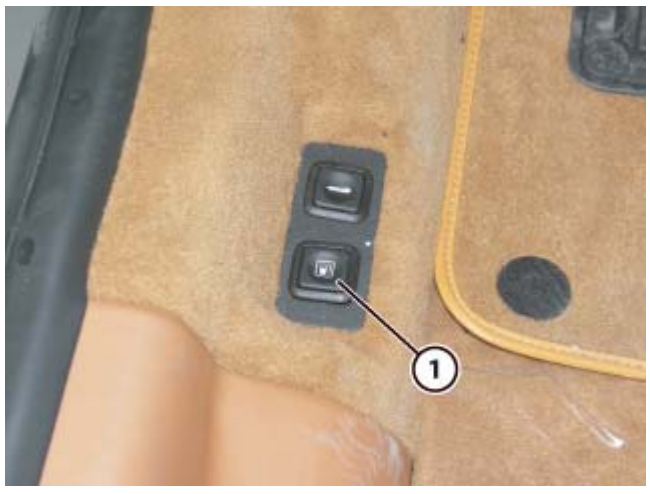
- Attach the luggage compartment lid emergency opener cable **(6)** to the lock **(A)** and connect the connector **(5)**.



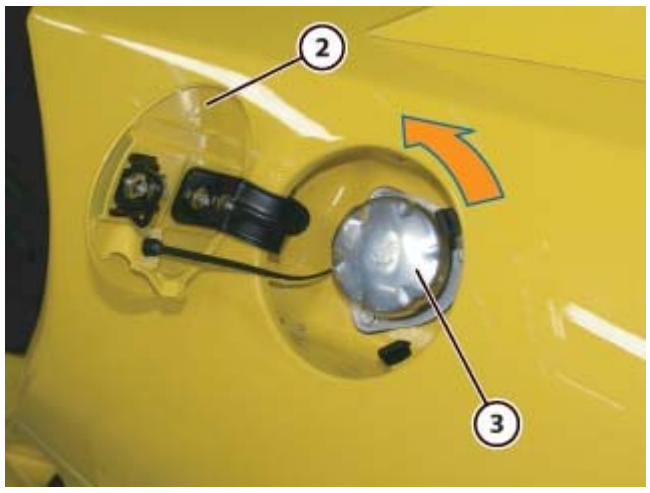
- Position the luggage compartment floor mat **(4)** and the perimeter gasket **(3)** as originally fitted.
- Position the luggage compartment lid lock cover **(2)** and secure by tightening the two screws **(1)**.

➢ Refit the luggage compartment side trim panels (M2.23).

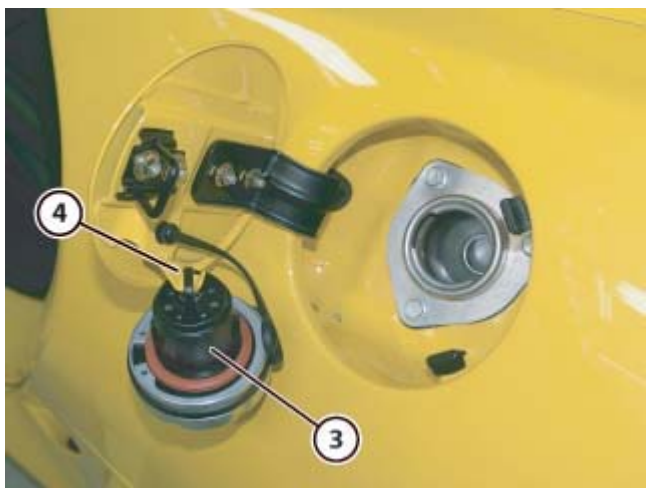
Opening the fuel filler flap



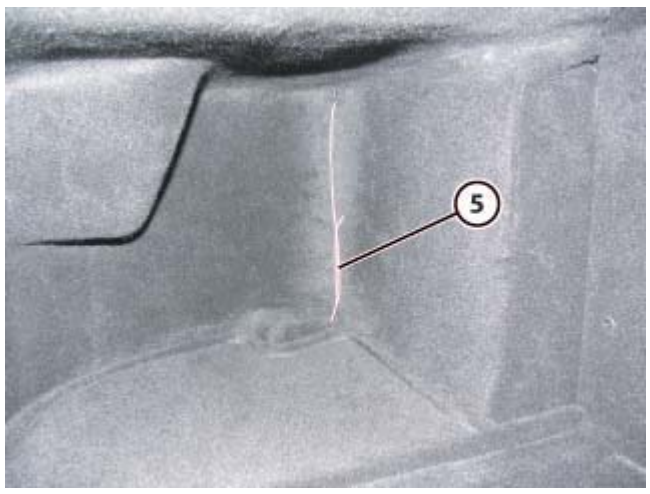
- With the ignition key turned to **"0"**, press the release button **(1)** on the left hand side of the driver's seat to release the fuel filler flap.



- Open the flap **(2)** and unscrew the cap **(3)**, turning counterclockwise.

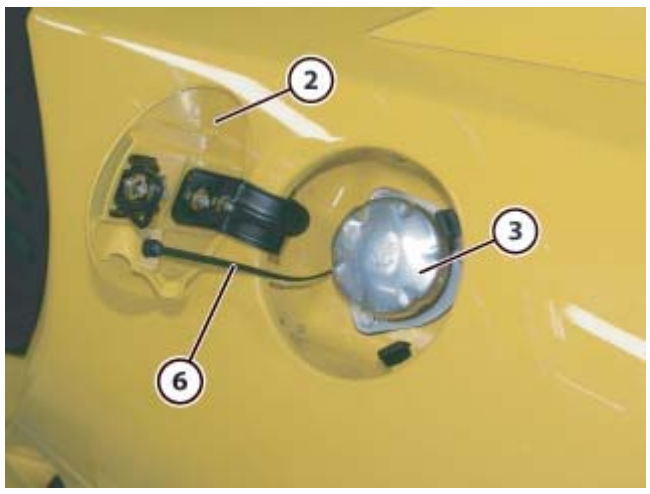


- Remove the cap **(3)** and hang on the relative hook **(4)**.



- In the event of button failure, the flap may be opened manually by pulling the emergency cable **(5)** on the left hand side of the luggage compartment.

Closing the fuel filler flap

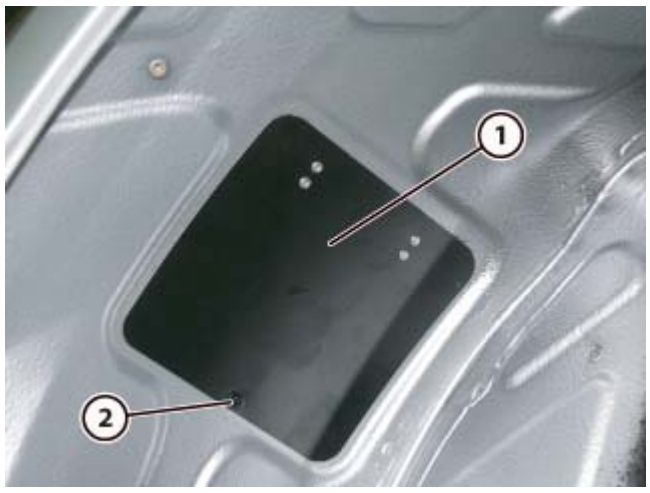


- Screw the cap **(3)** back on completely and push the fuel filler flap **(2)** closed.
- Ensure that the emergency cable **(6)** does not protrude from the fuel filler cap compartment.

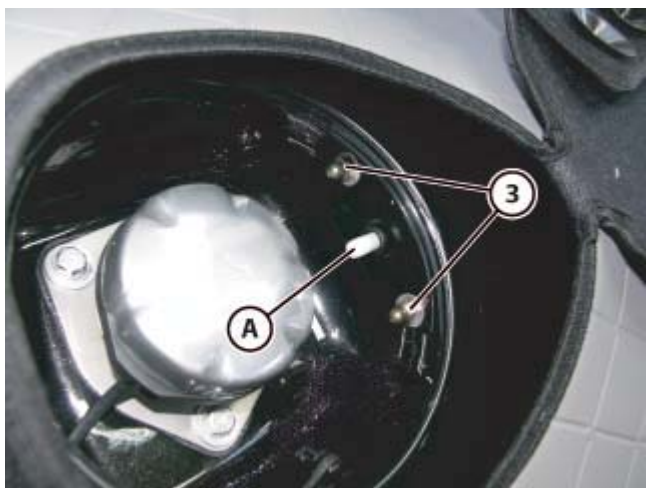
Replacing the fuel filler flap release mechanism

➢ Remove the luggage compartment side trim panels (M2.23).
Remove left hand component only.

➢ Remove the rear left hand wheelhouse (M2.05).

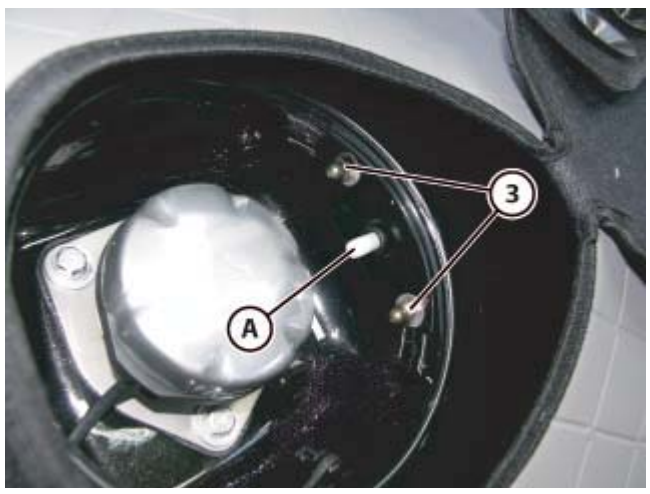


- Remove the flap **(1)** by undoing the screw **(2)** fastening the flap to the body.

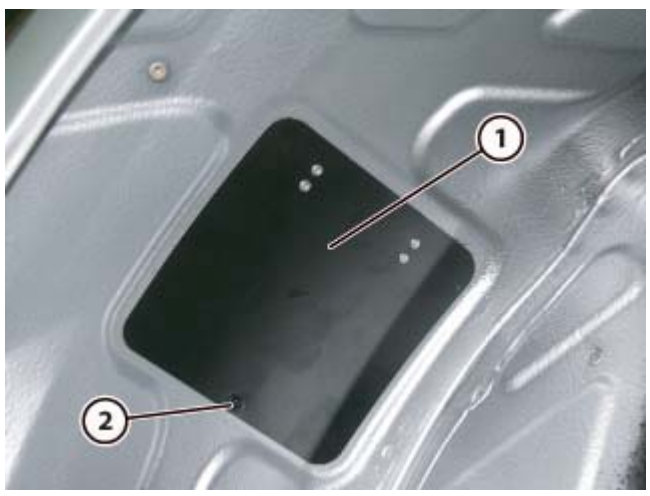


- Undo the two nuts **(3)** in the fuel filler cap recess and remove the lid release mechanism **(A)** through the aperture in the fender.
- Disconnect the relative connector (M049) and remove from the vehicle.
- Replace the complete mechanism.

The mechanism is supplied complete with emergency release cable and requires no adjustment.



- Insert and fit the complete mechanism **(A)** in its relative seat; connect the connector (M049), thread the release cable through the relative hole in the body and fasten the mechanism **(A)** with the two nuts **(3)**.



- Fit the flap **(1)** on the body and fasten with the screw **(2)**.

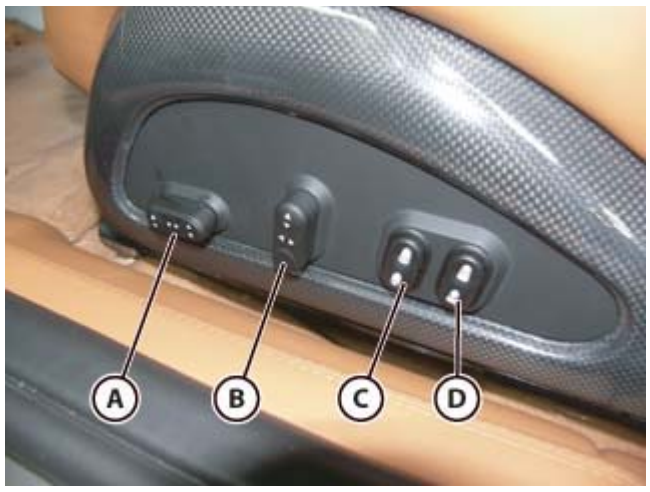
➢ Refit the rear left hand wheelhouse (M2.05).
➢ Refit the luggage compartment side trim panels (M2.23).

H3.14 Seat controls and functions

Seat controls and operation

CAUTION
Never adjust the seat position while driving, as this may cause loss of control of the vehicle.

The seats may be adjusted with the ignition key in position **II**.

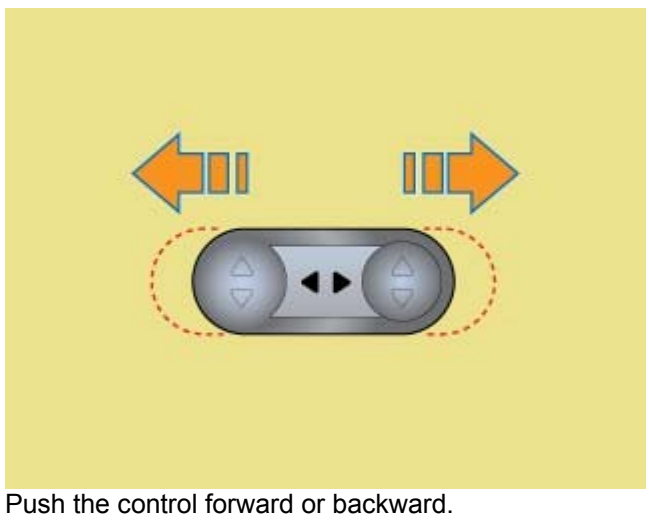


A - Backward/forward, height and rake seat adjustment
B - Seat back rake adjustment
C - Seat side adjustment
D - Lumbar support adjustment

Forward/backward controls



To adjust the seat forward/backward, use control **(A)** on the outside of the seat.

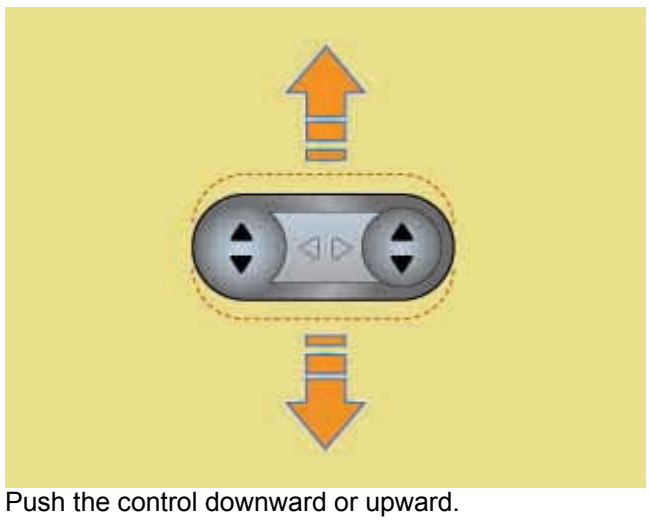


Push the control forward or backward.

Height adjustment



To adjust the seat height push control **(A)** on the outside of the seat.

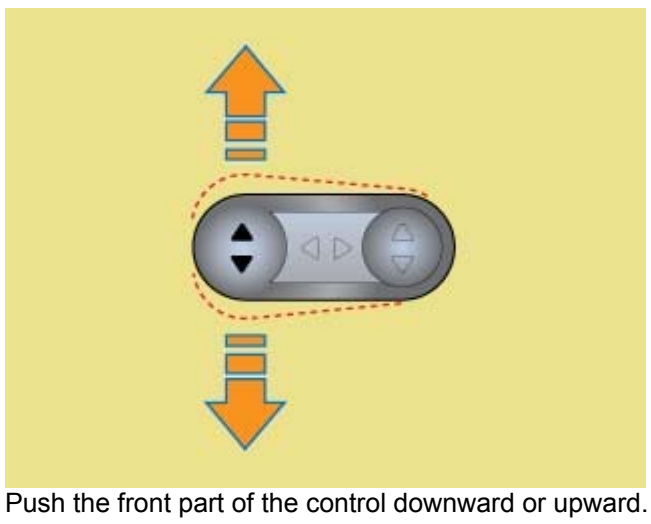


Push the control downward or upward.

Seat tilt adjustment (tilting forwards)



To tilt the seat forward, push control **(A)** on the outside of the seat.

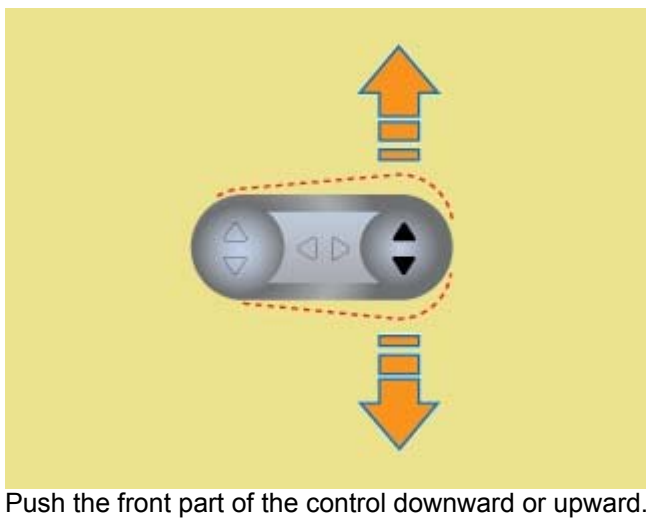


Push the front part of the control downward or upward.

Seat tilt adjustment (tilting backwards)



To tilt the seat backwards, push control **(A)** on the outside of the seat.


Push the front part of the control downward or upward.

Seat back rake adjustment



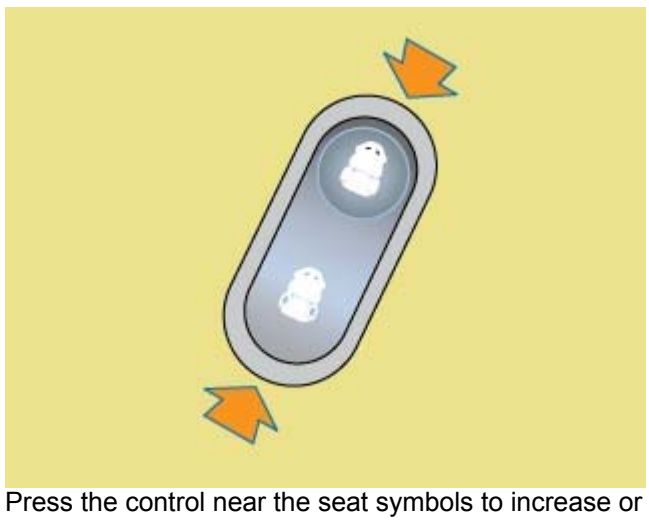
To adjust backrest rake, push control **(A)** on the outside of the seat.


Push the upper part of the control forward or backward to adjust the backrest into upright or inclined position.

Seat bolster adjustment



To adjust the seat bolsters, push control **(A)** on the outside of the seat.

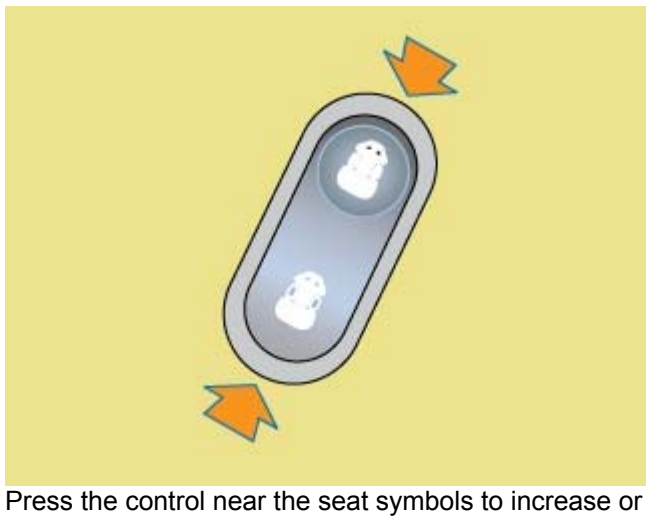


Press the control near the seat symbols to increase or decrease lateral support.

Lumbar support adjustment

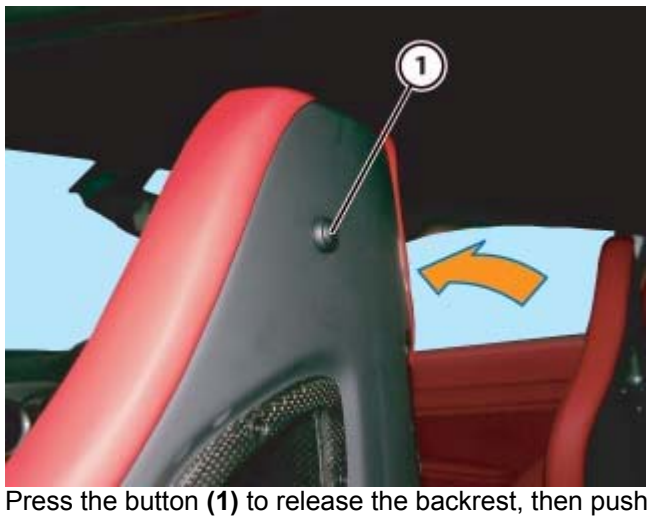


For lumbar adjustment, push control **(D)** on the outside of the seat.



Press the control near the seat symbols to increase or decrease the lumbar support.

Tipping the backrest



Press the button **(1)** to release the backrest, then push forward manually to tip.


To restore the original seat position, push the backrest back until it locks into place.

Heating system (optional)



Switch on the seat heating system by turning the dial **(E)**.
When this function is enabled for one or both seats, the relative indicator light on the instrument panel comes on.
Three possible heating settings, numbered 1, 2 and 3, may be set with the dial **(E)**.

Driver seat position memory (optional)

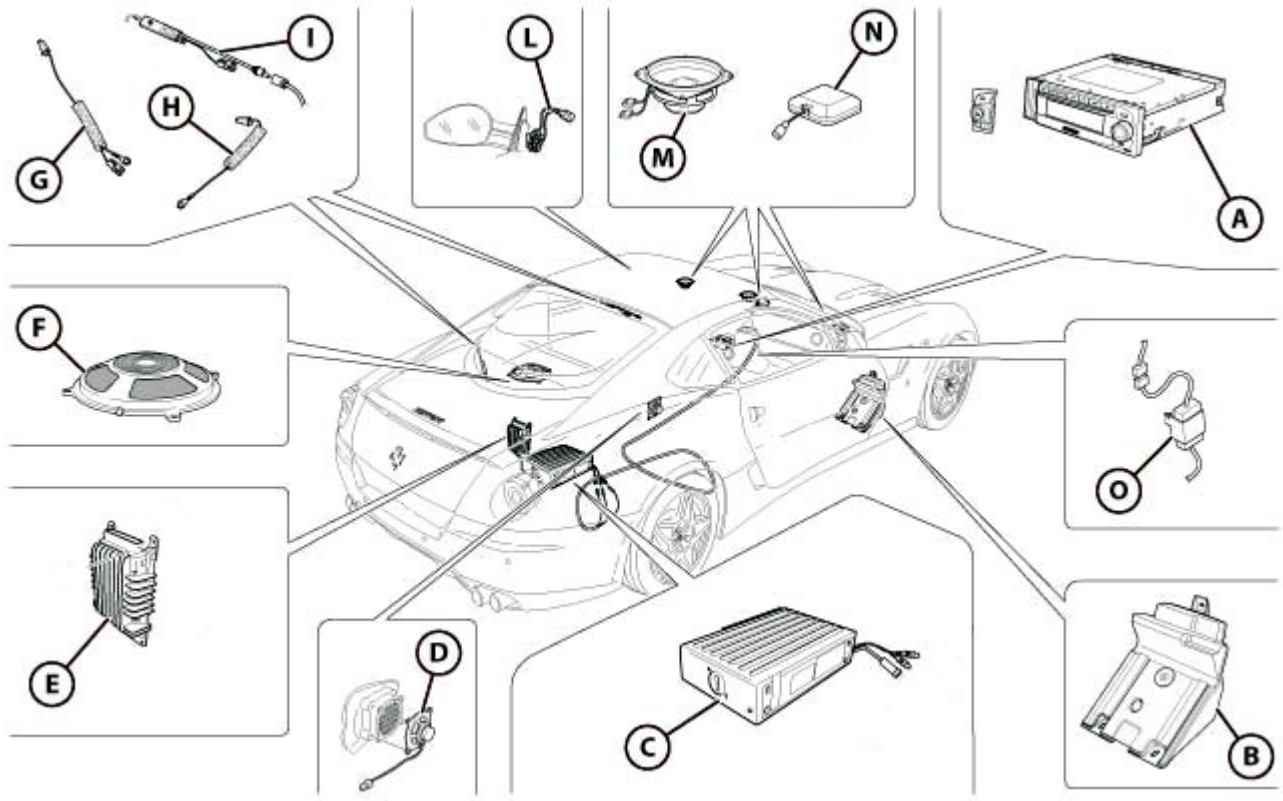


The system can memorise and recall up to three different driver seat positions.
Seat positions can only be memorised with the ignition key in position **II**.
After adjusting the seat to preference with the controls described previously, press one of the three buttons **(F)** (1, 2 or 3) corresponding to the three possible memorisable seat positions, until a double beep is emitted.
The lumbar setting is not memorised.
Memorising a new seat setting automatically cancels the setting previously assigned to the relative button.
To recall up one of the memorised positions, with the door open, press the relative button **(F)** (1, 2 or 3) for approximately **3 seconds**.

The memorised position may also be recalled with the door closed by pressing and holding the relative button pressed until the seat stop signal is heard.

H3.15 Car stereo system

Parts of the system



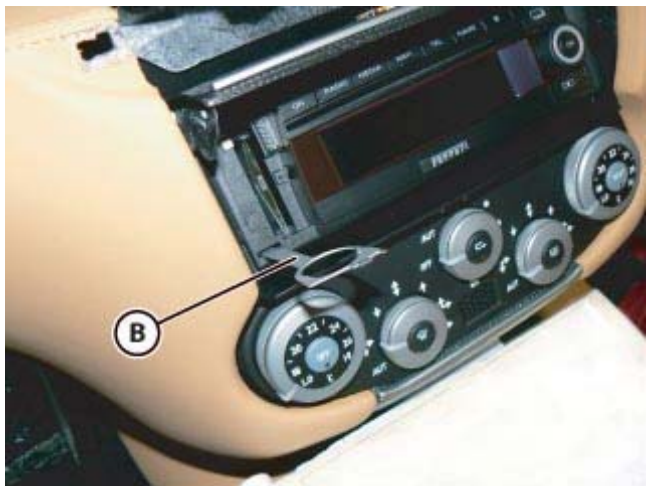
A - Car stereo system
B - Bassbox with loudspeaker (high power Hi-Fi)
C - CD changer (optional)
D - Lateral twiddlers
E - Amplifier
F - Sub woofer
G - Rear screen power AM filter
H - Rear screen AM earth filter
I - Preamp for antenna
L - Tweeters
M - Central twiddler
N - GPS navigator antenna (optional)
O - iPod connectivity (optional)

Removing the car stereo

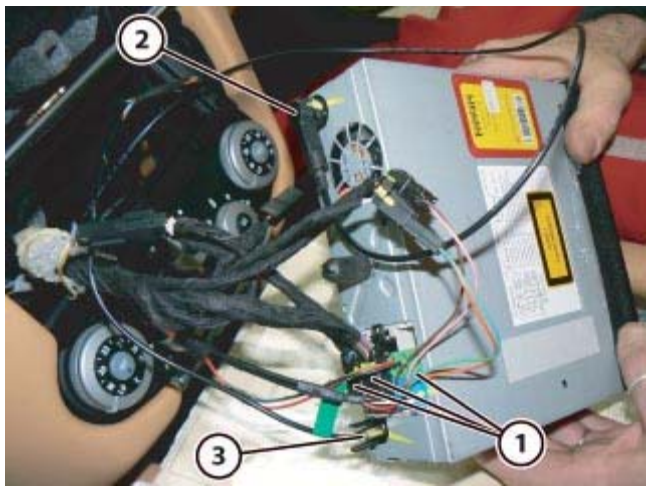
➢ Set the battery master switch to OFF (L2.02).



- The car stereo unit **(A)** is mounted in the central dashboard insert



- Remove the car stereo unit from its seat in the dashboard using the special tools **(B)** supplied.

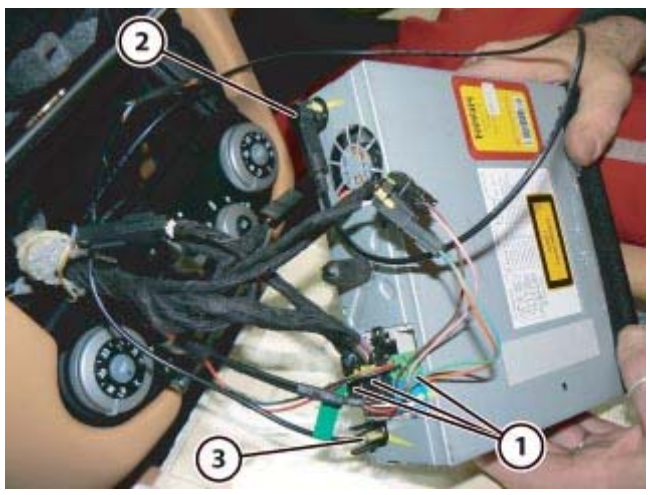


- At the rear of the car stereo unit, disconnect the dashboard cable connectors **(1)**, the aerial cable connector **(2)** and the GPS aerial connector **(3)** (optional).

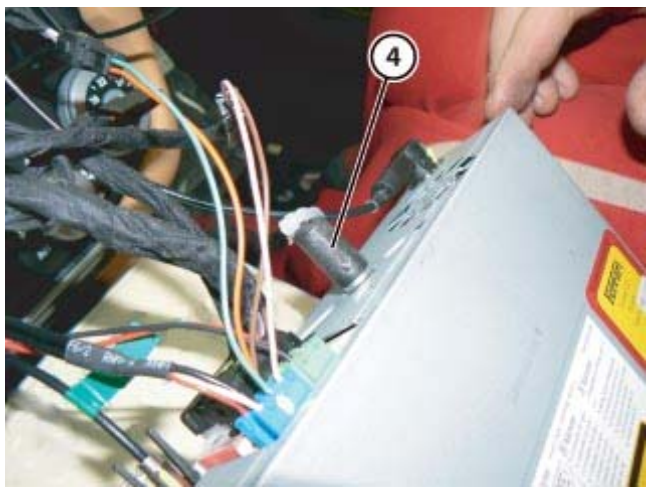
if the car stereo malfunctions, check that it is properly connected before carrying out any further work.

- The car stereo unit system be completely removed once all connectors are disconnected.

Refitting the car stereo



- At the rear of the car stereo unit, connect the dashboard cable connectors **(1)**, the aerial cable connector **(2)** and the GPS aerial connector **(3)** (optional).



- Apply **SEGO** to the locator pin **(4)** for alignment with the dash subframe, located at the rear of the car stereo unit.

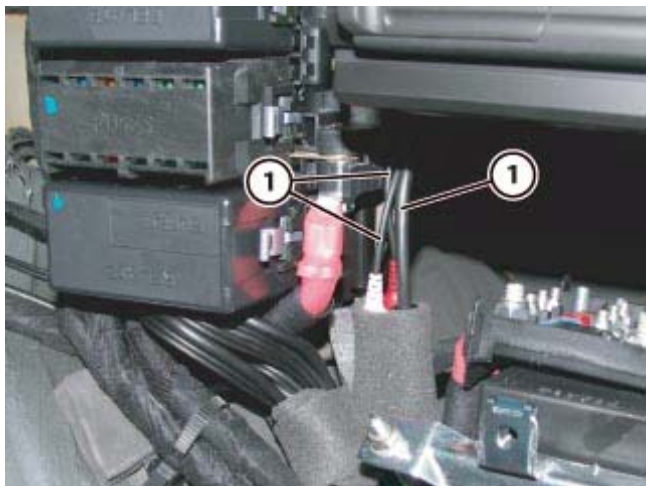
To prevent damage to the cables and connections, ensure that they are correctly located inside the dash before fitting the car stereo unit.

- Fit the car stereo unit into its relative mounting in the dashboard, aligning the pin **(4)**and pushing until the unit locks into place.

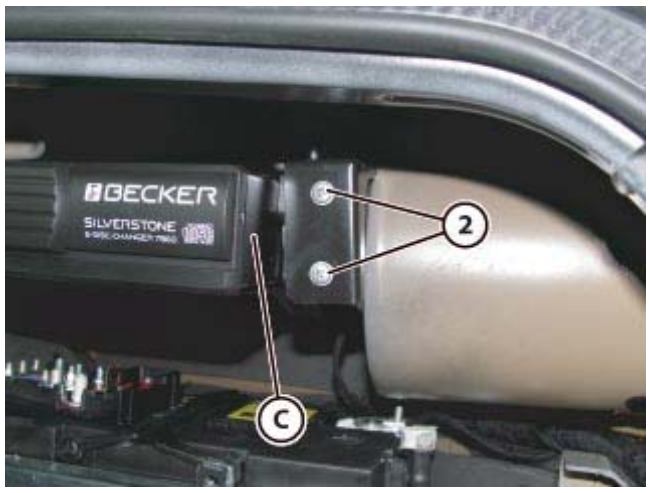
➢ Set the battery master switch to ON (L2.02).

Removing the CD charger

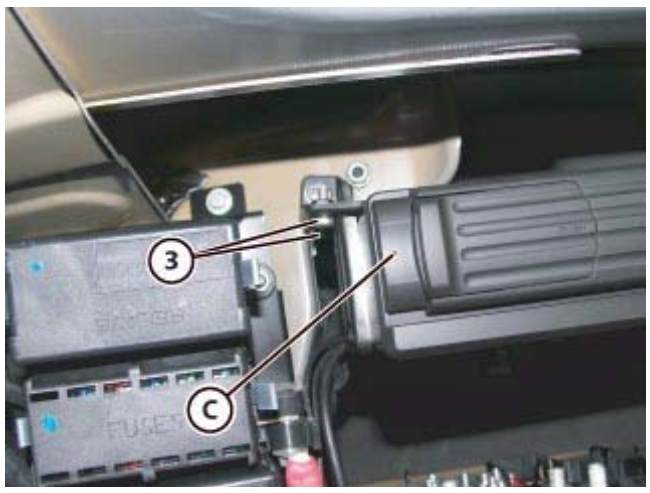
➢ Set the battery master switch to OFF (L2.02).



- Disconnect the three connectors for the three cables **(1)**.

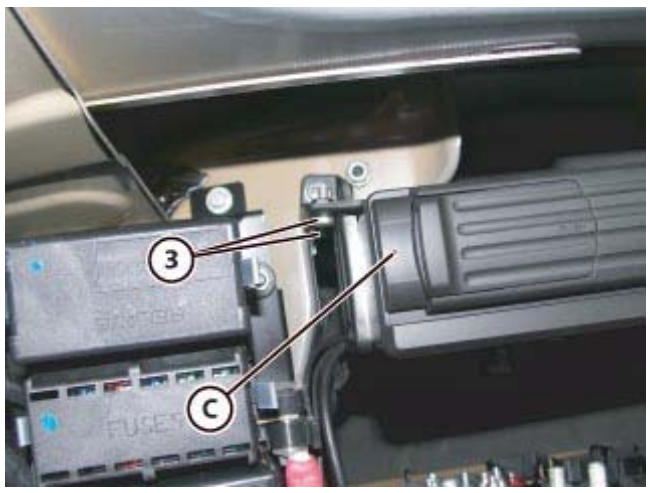


- Undo the two screws **(2)** fastening the right-hand side of the CD charger **(A)**.

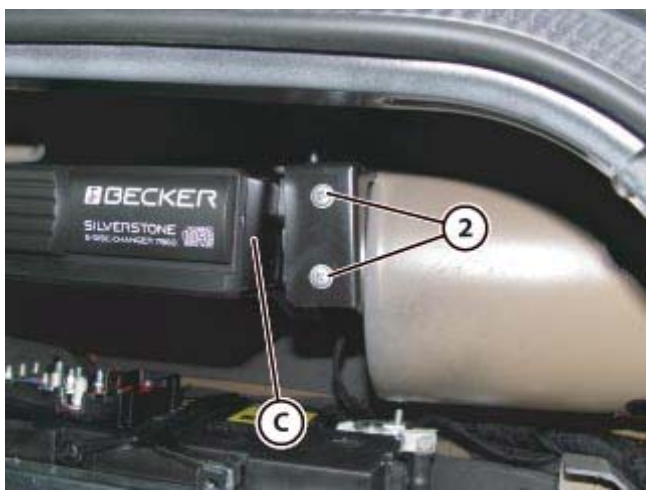


- Undo the two screws **(3)** fastening the left-hand side of the CD charger **(A)**.
- Remove the CD changer **(A)** from its seat.

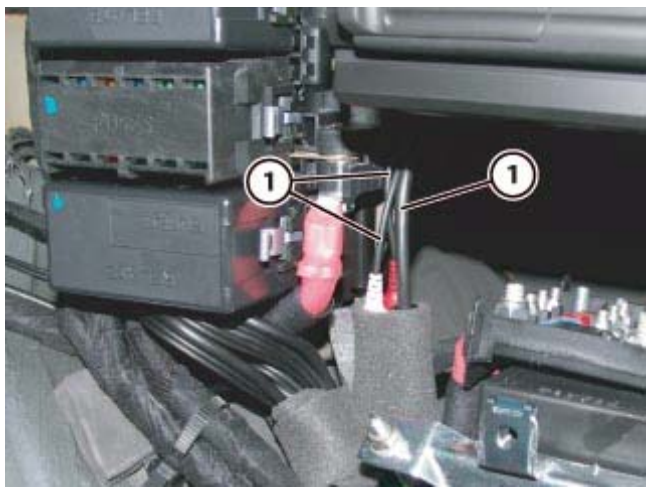
Refitting the CD charger



- Fit the CD charger **(A)** in the relative seat.
- Tighten the two screws **(3)** fastening the left-hand side of the CD charger **(A)**.



- Tighten the two screws **(2)** fastening the right-hand side of the CD charger **(A)**.



- Connect the three connectors for the three cables **(1)**.

➢ Set the battery master switch to ON (L2.02).

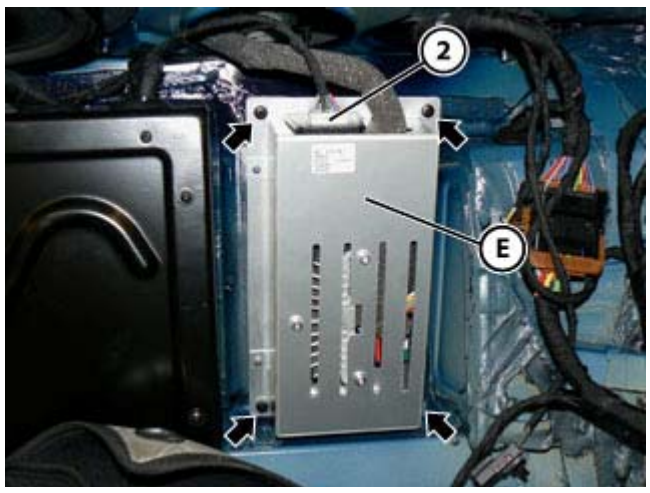
Amplifier replacement

- Set the battery master switch to OFF (L2.02).
- Remove the passenger compartment and roof trim panels (M2.22).
  Remove the parcel shelf trim panel.

- Remove the tank panel trim panel from the luggage compartment (M2.23).



- Disconnect the connectors **(1)**.



- Disconnect the connector **(2)**.
- Undo the screws indicated.
- Remove the amplifier **(E)**, gently pulling the cables out of the relative hole, and replace.
- Fit the new amplifier **(E)**, inserting the cables gently into the relative hole.
- Hand tighten the screws indicated.
- Connect the connector **(2)**.



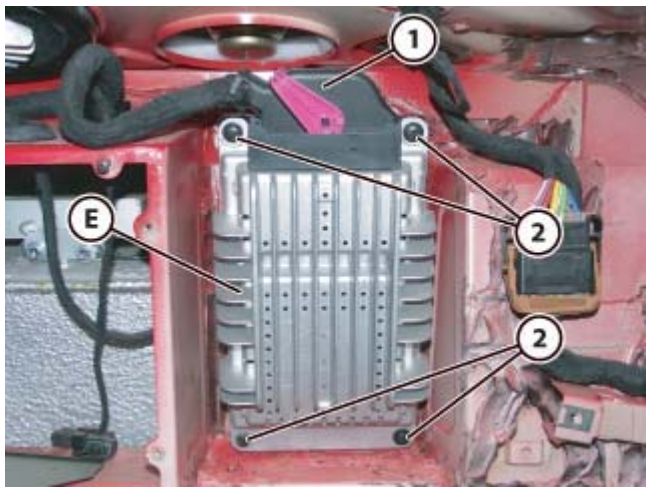
- Disconnect the connectors **(1)**.

- Refit the luggage compartment tank panel trim (M2.23).
- Refit the passenger compartment and roof trim panels (M2.22).
  Refit the parcel shelf trim panel.

- Set the battery master switch to ON (L2.02).

Replacing the amplifier (high-power Hi-Fi)

- Set the battery master switch to OFF (L2.02).
- Remove the tank panel trim panel from the luggage compartment (M2.23).

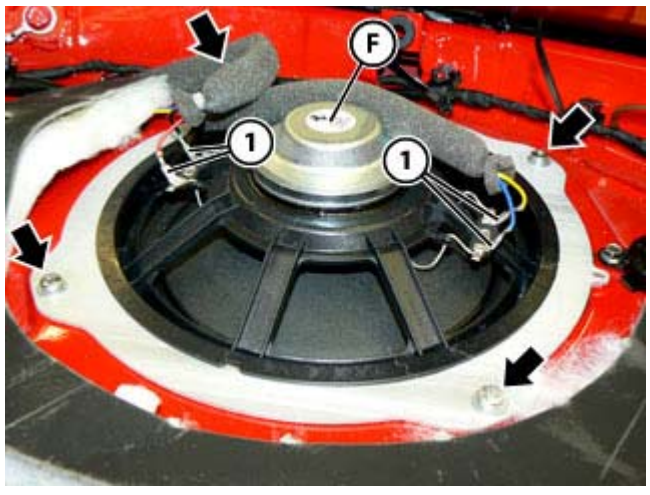


- Disconnect the connector **(1)**.
- Undo the screws **(2)**.
- Remove the amplifier **(E)** from the luggage compartment and replace.
- Fit the new amplifier **(E)** in the relative seat.
- Tighten the screws **(2)**.
- Connect the connector **(1)**.

- Refit the luggage compartment tank panel trim (M2.23).
- Set the battery master switch to ON (L2.02).

Replacing the Sub Woofer

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Remove the parcel shelf trim panel.



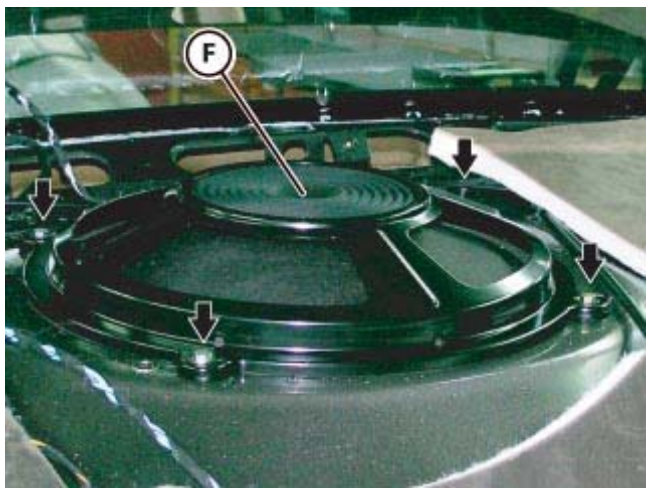
- Disconnect the connectors **(1)**.
- Undo the fastener screws indicated.
- Remove the Sub Woofer **(F)** and replace.
- Fit the new Sub Woofer **(F)**.
- Hand tighten the fastener screws indicated.
- Connect the connectors **(1)**.

➢ Refit the passenger compartment and roof trim panels (M2.22).
Refit the parcel shelf trim panel.

➢ Set the battery master switch to ON (L2.02).

Replacing the Sub Woofer (high power Hi-Fi)

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Remove the parcel shelf trim panel.



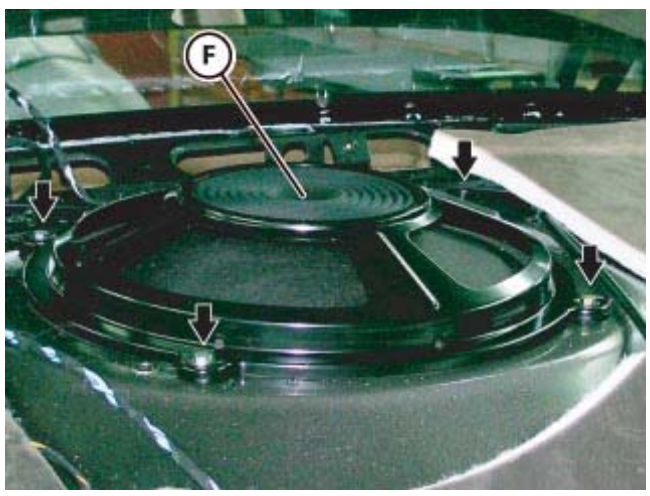
- Undo the four screws fastening the Sub Woofer **(F)**.



- Remove the unit from its mounting and disconnect the connector **(1)**.

For greater clarity, the Sub Woofer is shown in the image aside from inside the luggage compartment, with the fuel tank bulkhead trim removed from the luggage compartment; removing the fuel tank bulkhead trim from the luggage compartment is not necessary for replacing the sub woofer.

- Replace the Sub Woofer **(F)**, connect the connector **(1)** and fit the unit in its relative mounting.



- Tighten the four screws indicated fastening the Sub Woofer **(F)**.

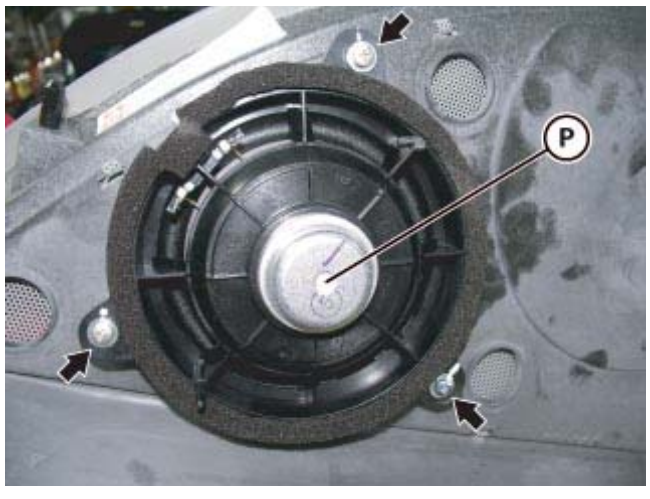
➢ Refit the passenger compartment and roof trim panels (M2.22).
Refit the parcel shelf trim panel.

➢ Set the battery master switch to ON (L2.02).

Replacing the rear woofers in the parcel shelf trim panel

The procedure for replacing the right hand woofer in the parcel shelf trim panel is the same as the procedure for replacing the left hand woofer given as follows.

➢ Remove the passenger compartment and roof trim panels (M2.22).
Remove the **parcel shelf trim panel**.

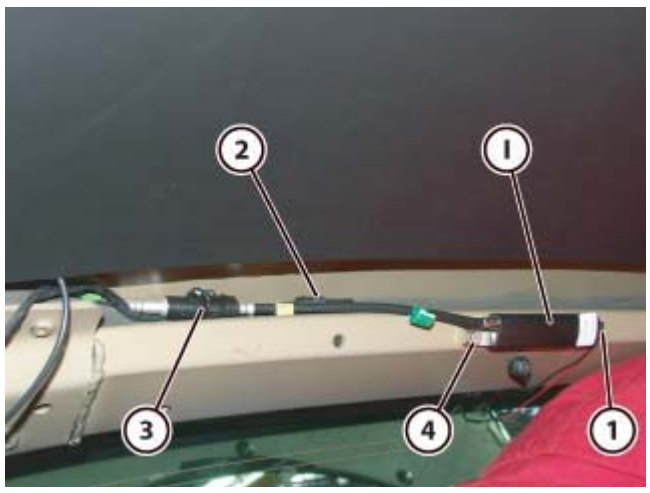


- Undo the three fastener screws and remove the left hand woofer **(P)** from the parcel shelf trim panel.
- Fit the new left hand woofer **(P)**, fixing to the parcel shelf trim panel by tightening the three fastener screws.

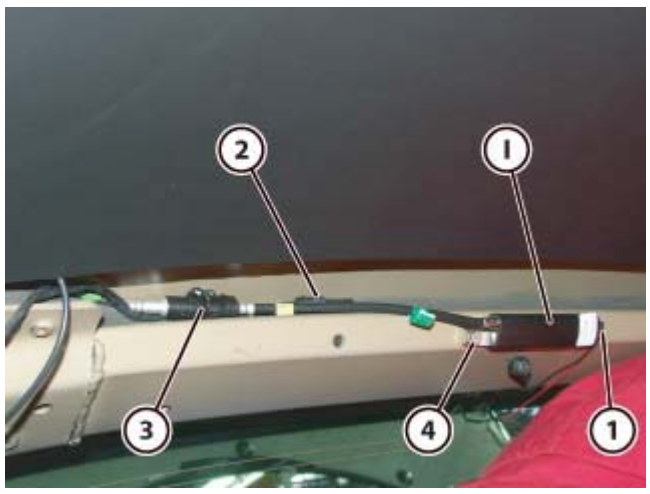
➢ Refit the passenger compartment and roof trim panels (M2.22).

Replacing the preamp

➢ Remove the passenger compartment and roof trim panels (M2.22).
Follow the disassembly procedure up to the removal of the **rear headliner**.



- Disconnect the connector **(1)**.
- Detach connector **(2)** (S021) and the aerial connector **(3)**.
- Undo the screw **(4)** fastening the preamp **(I)** and remove from the passenger compartment.



- To refit, fit preamp **(I)** in its relative seat in the passenger compartment and fasten by tightening the screw **(4)**.
- Connect connectors **(1)** and **(2)** (S021) and the aerial connector **(3)**.

➢ Refit the passenger compartment and roof trim panels (M2.22).

Replacing the tweeter

The procedure for replacing the left hand tweeter is the same as the procedure for replacing the right hand tweeter given as follows.

➢ Set the battery master switch to OFF (L2.02).



- Remove the internal fixing plate **(1)** from the door, detaching the top edge first, then the bottom edge.



- Disconnect the connector **(2)**.
- Detach the three fastener clips and remove the tweeter **(A)** from the fixing plate.
- Fit the new tweeter **(A)**, fastening to the three clips on the fixing plate.
- Connect the connector **(2)**.

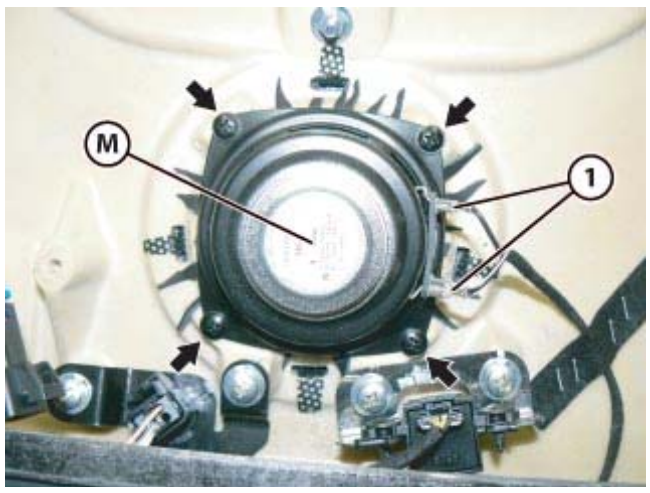


- Fit the fixing plate **(1)** on the door, attaching the bottom edge first, then the top edge.

➢ Set the battery master switch to ON (L2.02).

Replacing central twiddler in dashboard (high power Hi-Fi)

➢ Remove the instrument panel (M2.19).

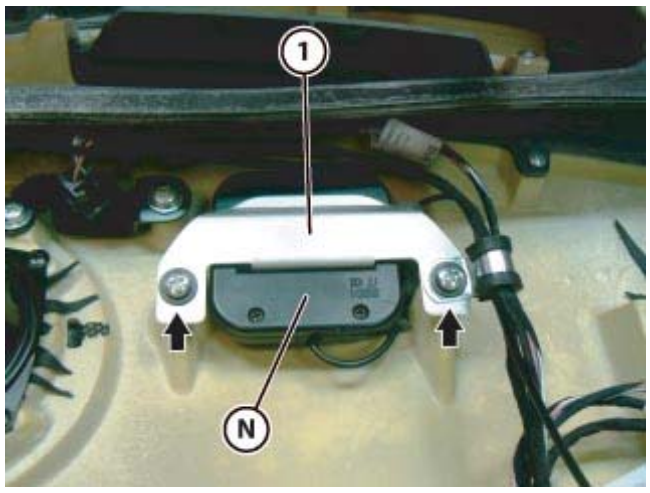


- Disconnect the two connectors **(1)**.
- Undo the four fastener screws and remove the central twiddler **(M)** from the dash.
- Fit the central twiddler **(M)** and fasten to the dash by tightening the four fastening screws.
- Connect the two connectors **(1)**.

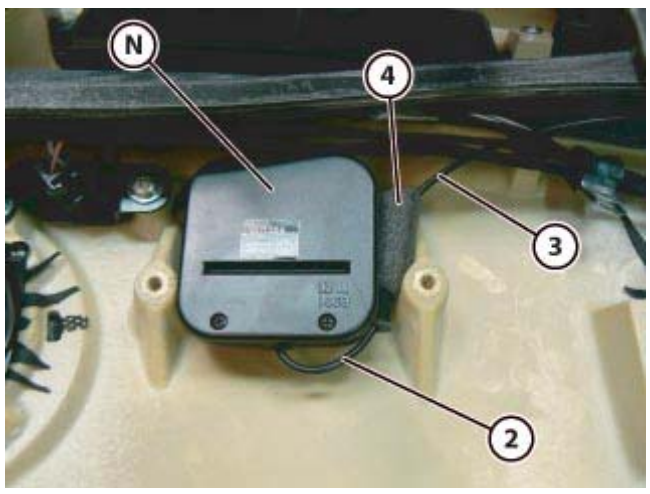
➢ Refit the instrument panel (M2.19).

Replacing the GPS antenna (optional)

➢ Remove the instrument panel (M2.19).

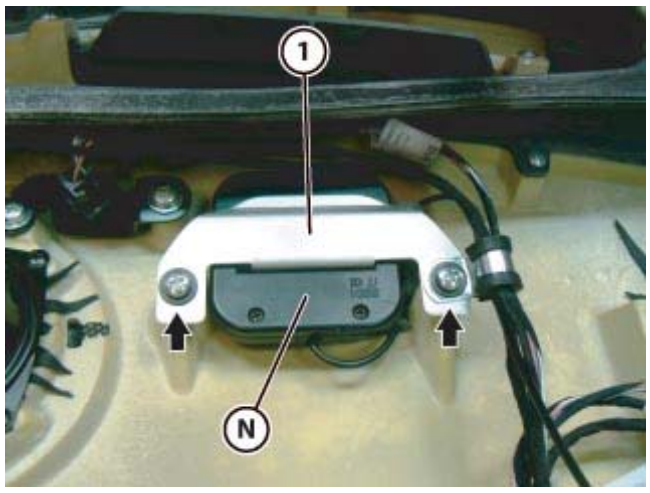


- Undo the two screws fastening the retainer bracket **(1)**.
- Remove the retainer bracket **(1)** for the GPS aerial **(N)**.



- Detach the GPS aerial **(N)** cable **(2)** from the extension **(3)**, disconnecting the connector covered in protective foam **(4)**.
- Remove and replace the GPS aerial **(N)**.
- Fit the GPS aerial **(N)** and connect the cable **(2)** to the extension **(3)**, connecting the connector covered in protective foam **(4)**.

Place the connector covered in protective foam **(4)** next to the GPS aerial **(N)**.

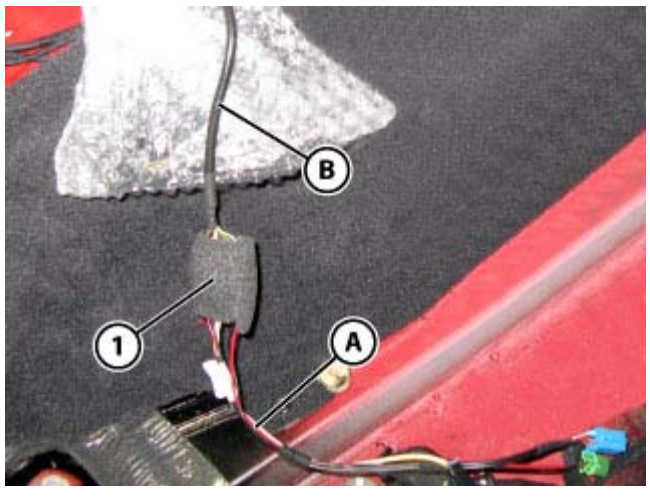


- Fit the retainer bracket **(1)** onto the GPS aerial **(N)**.
- Tighten the two screws fastening the retainer bracket **(1)**.

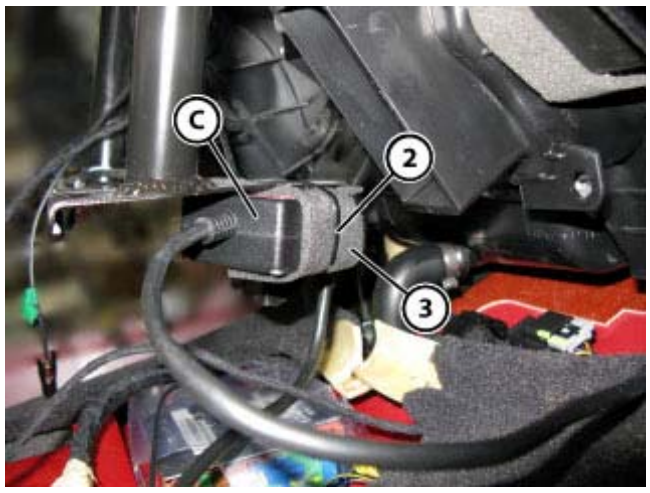
➢ Refit the instrument panel (M2.19).

Replacing the iPod adapter (optional)

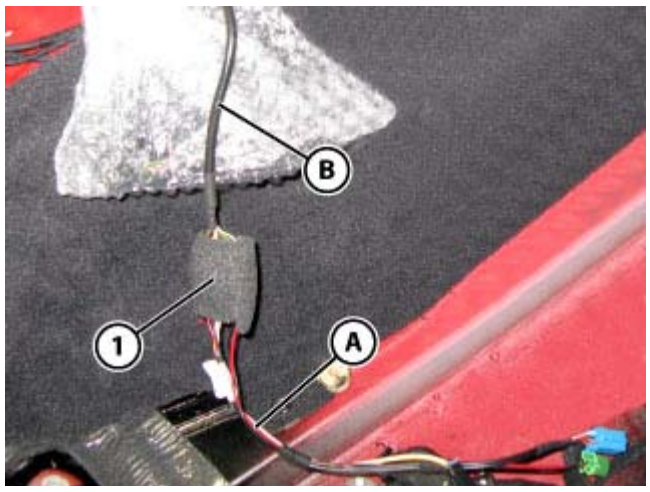
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the central sides of the dashboard (M2.20).
➢ Remove the glove compartment lid (M2.19).



- Remove the protective foam rubber **(1)**.
- Disconnect the wiring braid **(A)** between the car stereo system and the iPod adapter from the iPod adapter cable **(B)**.



- Remove the cable tie **(2)** and remove the iPod adapter **(C)** from the relative seat.
- Remove and retrieve the protective foam rubber **(3)** from the iPod adapter.
- Replace the iPod adapter **(C)**.
- Place the protective foam rubber **(3)** previously retrieved on the new iPod adapter **(C)**.
- Place the new iPod adapter **(C)** in the relative seat and fasten it by tightening a new cable tie **(2)**.

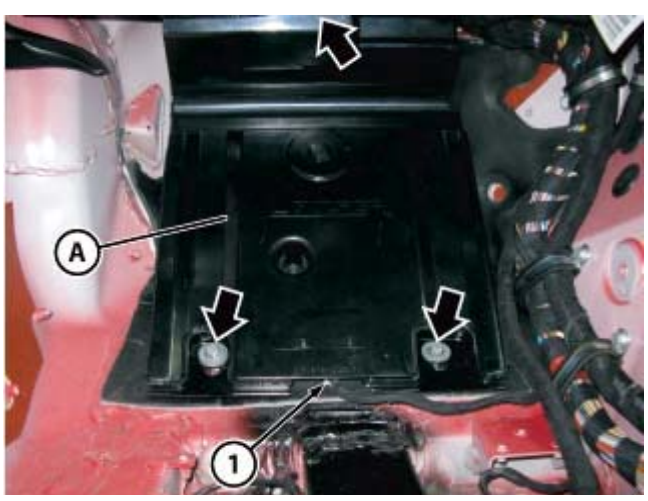


- Connect the wiring braid **(A)** between the car stereo system and the iPod adapter to the iPod adapter cable **(B)**.
- Refit the protective foam rubber **(1)**.

➢ Refit the glove compartment lid (M2.19).
➢ Refit the central sides of the dashboard (M2.20).
➢ Set the battery master switch to ON (L2.02).

Replacing the BassBox (high-power Hi-Fi)

➢ Remove the mats (M2.24).
i Remove the passenger side footrest.



- Undo the screws indicated.
- Turn the BassBox over and disconnect the connector **(1)** at the back.
- Remove and replace the BassBox **(A)**.
- Connect the connector **(1)** at the back of the BassBox.
- Fit and fasten the BassBox, tightening the indicated screws.

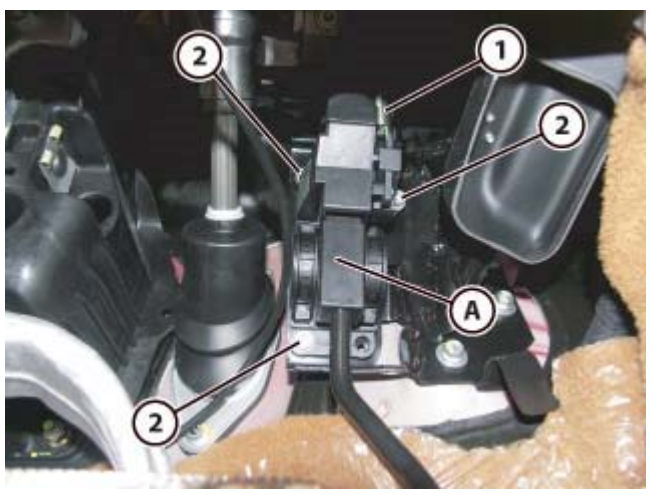
➢ Refit the mats (M2.24).

H3.16 Accelerator control

Removing the accelerator control

The accelerator control pedal is pivoted on a mounting fixed to the vehicle bodywork next to the pedal board. This mounting also includes the sensor informing the ECU of the accelerator pedal position.

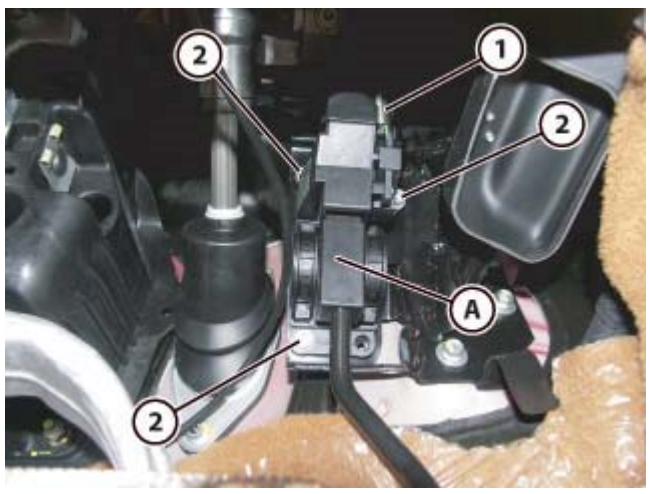
➢ Set the battery master switch to OFF (L2.02).



- Disconnect the sensor connector **(1)** (D068) and undo the three screws **(2)**.
- Remove the complete control **(A)**.

ℹ The accelerator pedal can not be disassembled.

Refitting the accelerator control



- Fit the accelerator control **(A)** in its respective seat on the mounting fastened to the chassis.
- Hand tighten the three screws **(2)**.
- Connect the accelerator pedal sensor connector **(1)** (D068).

➢ Set the battery master switch to ON (L2.02).

H4.01 Alarm system

Ferrari CODE System

Upon delivery of the vehicle, two identical keys are supplied, which may be used for:
- central door locking;
- starting the vehicle;
- disabling the antitheft system;
- activating/deactivating the alarm system.

Enter the code numbers in the relative spaces in the “WARRANTY CARD”.
In the event of loss or theft, a duplicate may be requested from the Ferrari Service Network.

Where supplementary keys are requested (provided that the conditions required for the issue of keys are met), all the keys (up to a maximum of 8 keys) must be programmed.

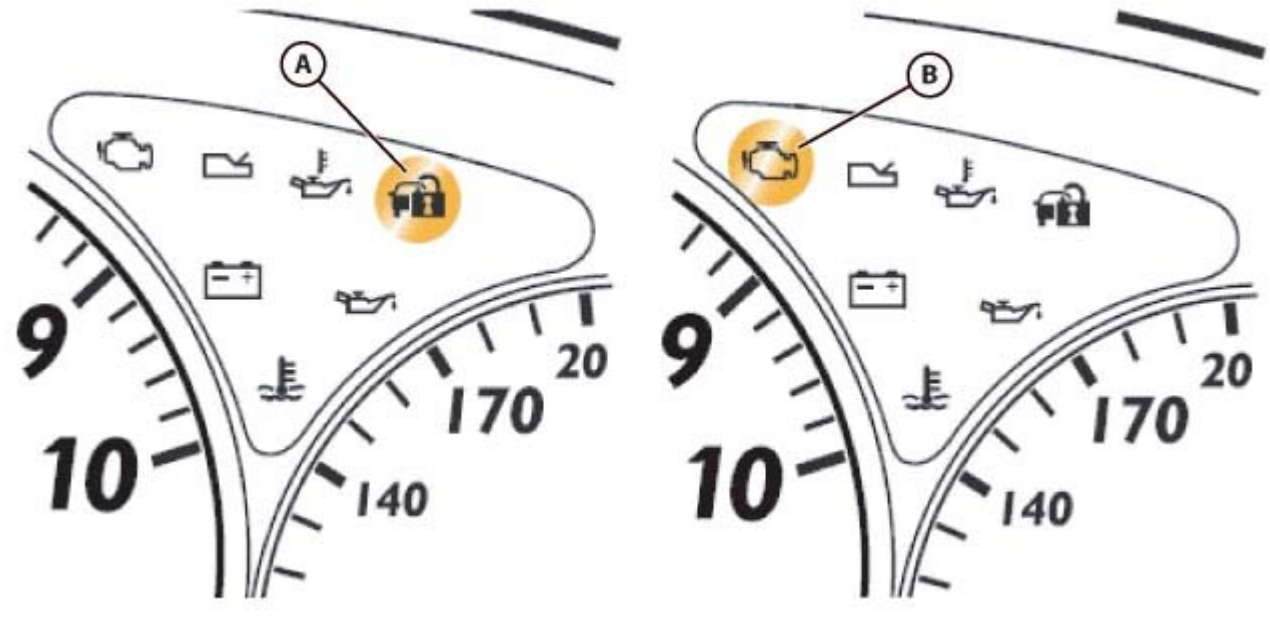
Each key supplied has its own specific code, which must be stored in the memory of the system control unit.

A CODE CARD is supplied together with the keys, containing:
- the electronic code necessary for performing the “emergency start” procedure;
- the mechanical code for the keys to be quoted to the Ferrari Service Network when requesting duplicate keys.

The code numbers given on the CODE CARD must be kept safely and out of reach of others at all times.
Note that an emergency start may only be performed using the electronic code on the CODE CARD.

The vehicle is equipped with an electronic engine immobiliser system (Ferrari CODE) which is activated automatically when the ignition key is removed.
The keys contain an electronic device which transmits a coded signal to the Ferrari CODE ECU.
The Ferrari CODE ECU only permits engine start once it has recognised the signal.
Each time the ignition key is removed from the **0** position, the protection system will immobilise the engine.

Operation



- Once the engine starts, press the ENGINE START button on the steering wheel:

- If the code is recognised, the CODE warning light **(A)** on the instrument panel goes out within one second, while the EOBD light **(B)** goes out once the ECU diagnostic cycle has been completed, after about four seconds; this means that the security system has recognised the key code and disabled the engine immobiliser.
- If the CODE warning light **(A)** remains lit and the EOBD warning light **(B)**, does not go out after the **4 second** ECU diagnostic period, the code has not been recognised. If this occurs, try turning the key back to position **0** and then back to **II**; If the engine immobiliser is still not deactivated, try with the other key provided.

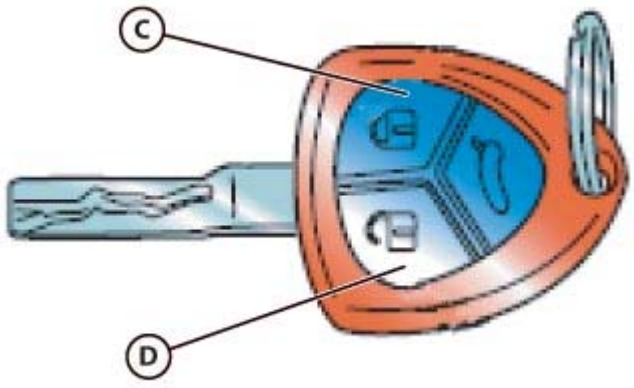
- While driving, with the ignition key in position II:

- The CODE indicator light **(A)** illuminates to indicate that the system is running a self-diagnostic cycle. The next time that the vehicle is stopped, the system may be tested by switching off the engine, turning the ignition key to position **0** and then turning the key to position **II** again: the CODE warning light **(A)** illuminates and should go out again within **1 second**. If the warning light stays on, leave the key in position **0** for at least **30** seconds then repeat the procedure.
- If the CODE warning light **(A)** flashes, this indicates that the vehicle is not protected by the immobiliser device. Contact the Ferrari Service Network immediately to have all the keys programmed.

Electronic alarm

The electronic alarm performs the following functions:

- manages remote centralised door locking/unlocking;
- perimeter surveillance, detecting if any of the doors or lids are opened;
- volumetric surveillance, detecting intrusions into the passenger compartment;
- vehicle movement surveillance.



- System activation -

- press button **(C)** on the key;
- the turn indicators flash **once**;
- the system emits an audible signal;
- the red LED on the dashboard flashes;
- the central door locking system is activated and the doors are locked.
- after approximately **25 seconds**, the system is active.

The luggage compartment may be opened from the key with the electronic alarm system activated; in this case, the motion sensors and anti-lifting sensors are temporarily disabled.
The sensors are reactivated when the luggage compartment lid is closed again.
If the turn indicators and the red LED on the dash flash **9 times** when the alarm is activated, one of the doors, the luggage compartment lid or the engine compartment lid are not closed correctly and the car is not protected by the perimeter surveillance function.
Should this occur, check all doors and lids and close any doors or lids left open. Disarming the alarm is not necessary. The turn indicators will **flash once** to indicate that the door or lid is now correctly closed and the car is protected by the perimeter surveillance function.

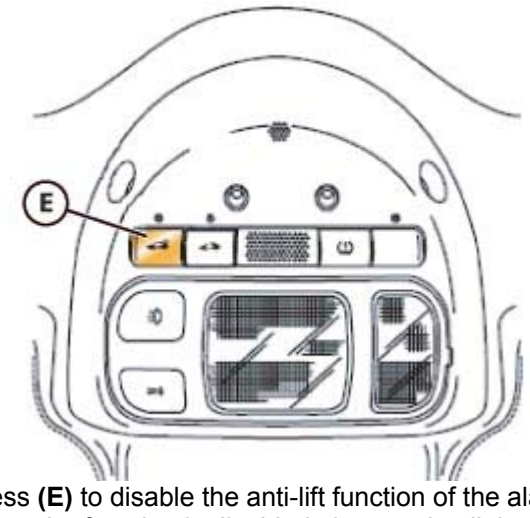
If the turn indicators and the red LED on the dashboard flash 9 times when the alarm is activated with the doors and engine and luggage compartment lids correctly closed, this indicates that the self diagnosis function has identified a system malfunction and that the system must be checked by the Ferrari Service Network.

- Deactivation

- press button **(D)** on the key;
- the turn indicators flash **twice**;
- the system emits a double audible signal;
- the red LED on the dashboard turns off;
- the cabin lights and puddle lights switch on;
- the vehicle central locking system is deactivated, unlocking the doors.

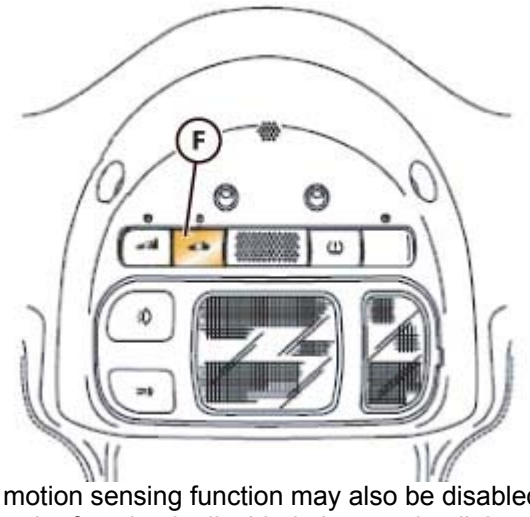
In addition to unlocking the doors, pressing the button **(D)** twice also switches on the low beam headlights for **30 seconds**.
The alarm system is now disarmed and you may now enter the vehicle and start the engine.
To access the vehicle if the remote control key battery is flat, insert the key into either of the two door locks and turn to unlock the door; the car alarm siren will sound.
Start the vehicle normally; the alarm siren deactivates.

Disabling anti-lifting protection



Press **(E)** to disable the anti-lift function of the alarm system.
When the function is disabled, the warning light on the button flashes for approximately **3 seconds** and then goes out.

Disabling motion sensing



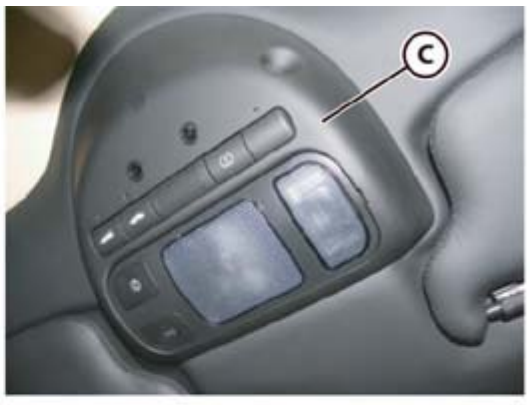
The motion sensing function may also be disabled by pressing the button **(F)** on the roof panel.
When the function is disabled, the warning light on the button flashes for approximately **3 seconds** and then goes out.

Alarm memory

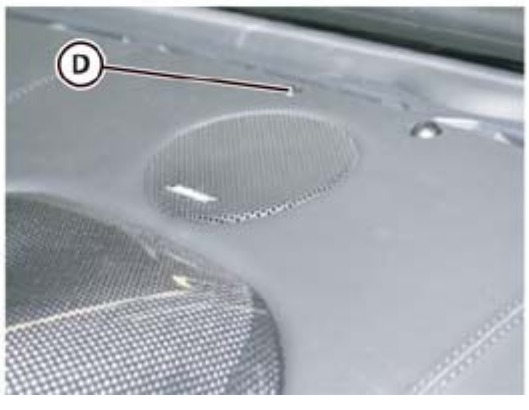
The CODE indicator light is shown on the display when starting the vehicle to indicate that there has been an attempted break-in.
The alarm system memory is cleared when the ignition key is turned.

Alarm system components







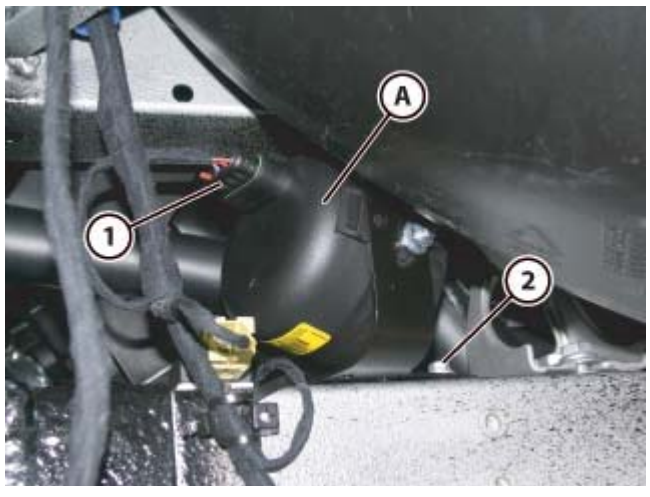


A - Siren
B - Body Computer
C - Passenger compartment dome light
D - Dashboard LED

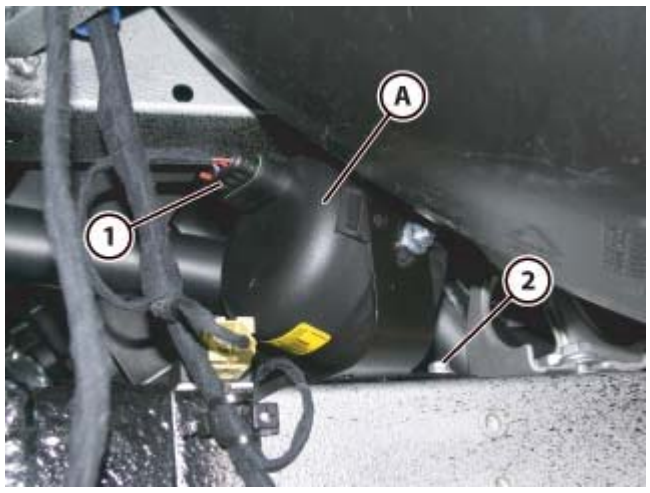
Replacing the siren

The siren is located on the right hand side of the engine compartment, next to the radiator assembly.

- Set the battery master switch to OFF (L2.02).
- Remove the front bumper (M2.03).



- Disconnect the connector **(1)** (E001) and undo the two screws **(2)**.
- Remove the siren **(A)**.



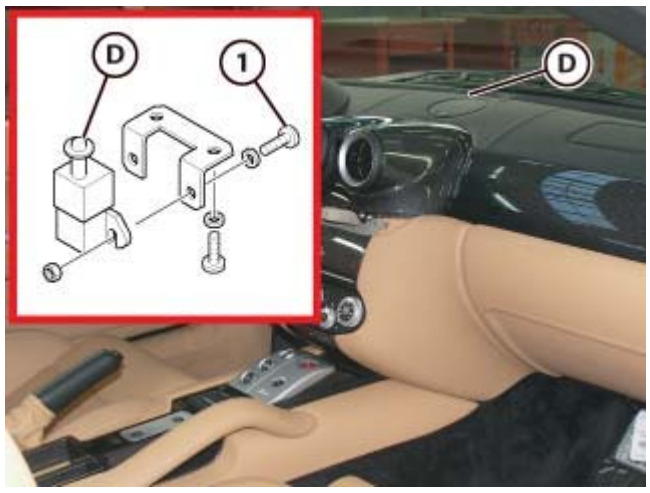
- Refit the siren **(A)** in its relative seat on the chassis and fasten with the two screws **(2)**.
- Connect the connector **(1)** (E001) and direct the cone of the siren downwards at an angle of **30°** allow water to drain out.

➢ Refit the front bumper (M2.03).
➢ Set the battery master switch to ON (L2.02).

Replacing the LED

The LED is located on the dashboard just below the windscreen.

➢ Remove the instrument panel (M2.19).

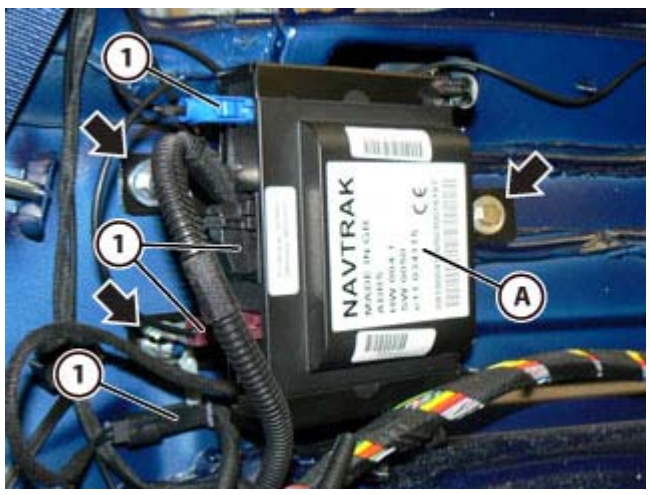


- Undo the two screws **(1)** and remove the LED **(D)**.
- When refitting, ensure that the LED is flush with the top of the dashboard.

➢ Refit the instrument panel (M2.19).

Replacing the satellite anti-theft system ECU

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Remove the RH centre pillar trim panel.



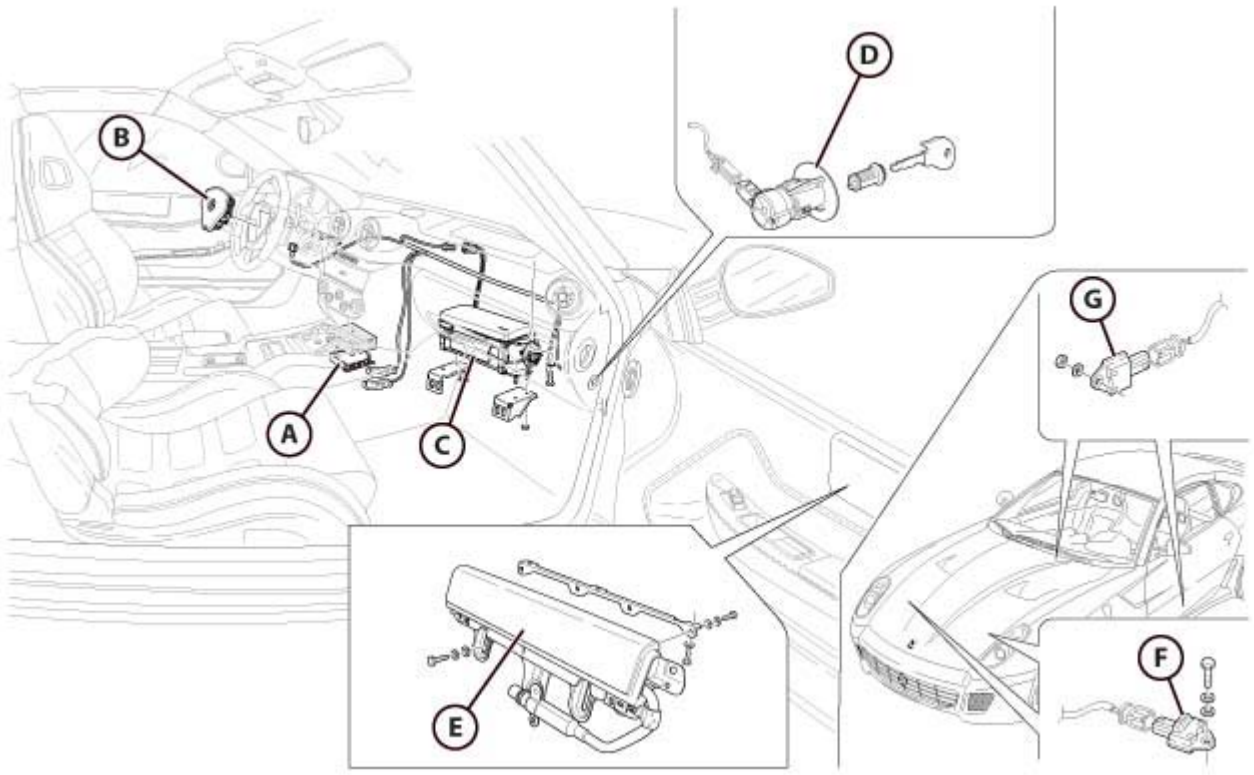
- Disconnect the connectors **(1)**.
- Undo the indicated nut and screws.
- Remove the satellite anti-theft system ECU **(A)** and replace.
- Fit the new satellite alarm system ECU **(A)**.
- Tighten the indicated nut and screws.
- Connect the connectors **(1)**.

➢ Refit the passenger compartment and roof trim panels (M2.22).
Refit the RH centre pillar trim panel.

➢ Set the battery master switch to ON (L2.02).

H4.02 Airbag

Airbag system components



A - Airbag ECU
B - Driver side front airbag
C - Passenger-side front airbag
D - Passenger side airbag disable switch (optional)
E - Side airbag
F - Front crash sensor
G - Side crash sensor

Description

The vehicle is equipped with an active restraint system with airbags and seat belts with electronically controlled pretensioners which, in the event of frontal and/or lateral collision, activates the seat belt pretensioners and the front and/or side airbags.

Operation

To determine the severity of the impact, the ECU analyses signals from internal accelerometers, two front sensors mounted near the wheels and two lateral sensors mounted on the bodyshell near the doors.
The ECU can therefore determine the forces to which the occupants of the vehicle will be subjected, and activate the appropriate components (front and side airbags and pretensioners) to minimise injury.
The following components are housed in the ECU:

- a piezoelectric accelerometer securely rigidly to one of the walls of the ECU box;
- a second, backup mechanical acceleration sensor;
- a microprocessor integrating the deceleration curve measured with a specific algorithm to determine what measures the system should take;
- a permanent failure memory;
- a permanent crash memory.

The decelerations occurring during a collision are measured by the piezoelectric accelerometer and converted into an electric voltage signal. If the calculations performed by the microprocessor indicate that the predetermined threshold values are exceeded, ignition signals are sent to the gas alternators.
Airbag inflation and seat belt pretensioning only occur if the mechanical backup sensor closes simultaneously with the electric ignition signal. This sensor is a mechanical switch that is independent of the electronic circuit, which closes in the event of strong acceleration, and the airbags and pretensioners may only be fired if this backup sensor is closed. This prevents accidental ignition as a result of any combination of faults of the various devices.
The ECU is designed to continue functioning for approximately **220 ms** after power has been cut as a result of a collision. This function is made possible by a rubber bushing condenser incorporated in the circuitry, which stores electricity and allows the ECU to generate the signal necessary to fire the explosive cartridges. This allows the system to function even when the collision has interrupted power to the system (e.g. damage to battery, severed power cables, etc.).
With the key inserted and in position **II**, with the engine on or off, the airbags may be deployed even with the car at rest in the event of being hit by another vehicle.
Bear in mind that with the key inserted and in position **0** no safety devices (airbags or pretensioners) will be activated in the event of impact; the failure of these devices to activate in these conditions is not, therefore, indicative of a system fault.

Driver side airbag module

The airbag module is installed in the centre of the steering wheel: The metal canister contains a folded bag, while the gas generator is fastened to the metal structure of the steering wheel with screws.
The gas generator is activated electrically by a signal from the ECU: the signal fires a pyrotechnic charge which releases gas, inflating the bag. The plastic cover of the module opens upwards along predetermined break lines, to allow the full inflation of the bag.
The bag is made from a permeable material to allow it to deflate immediately.

Passenger side airbag module

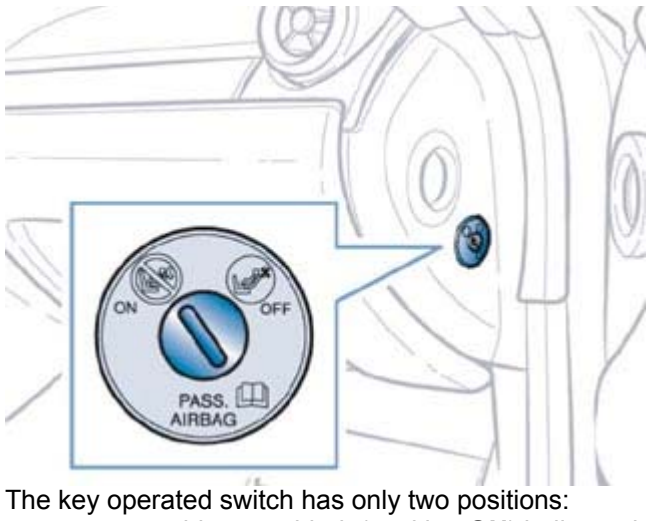
The passenger side airbag module is mounted in the dashboard above the glove compartment. The airbag functions in exactly the same way as the driver's side airbag module. The module is anchored directly to the vehicle cross member by a special bracket.
A special trim panel built into the dashboard allows the bag to deploy.
The module is secured to the dashboard by hooks and clips with predetermined break points: in the event of airbag activation, the panel opens upwards, breaking the clips and allowing the complete inflation of the bag.
The bag is made from a permeable material to allow it to deflate immediately.

Side airbag

The vehicle is equipped with two side bags, one in the driver side door and the other in the passenger side door.
The side bag system consists of two bags that inflate instantaneously to protect the heads of the occupants in the even of lateral impact.
These modules function in exactly the same way as the other airbag modules. In the event of impact, the airbag begins to inflate, breaking the trim along a break line, and reaches full inflation in a few hundredths of a second.
Once inflated, the side bags act as a protective barrier between the head of the occupant and any structures entering from the exterior that could cause injury. The airbag deflates immediately afterwards.
The deployment of the side bags is not dependent on the stature or build of the occupant. These bags are activated whenever the ECU detects a collision large enough to trigger their deployment.

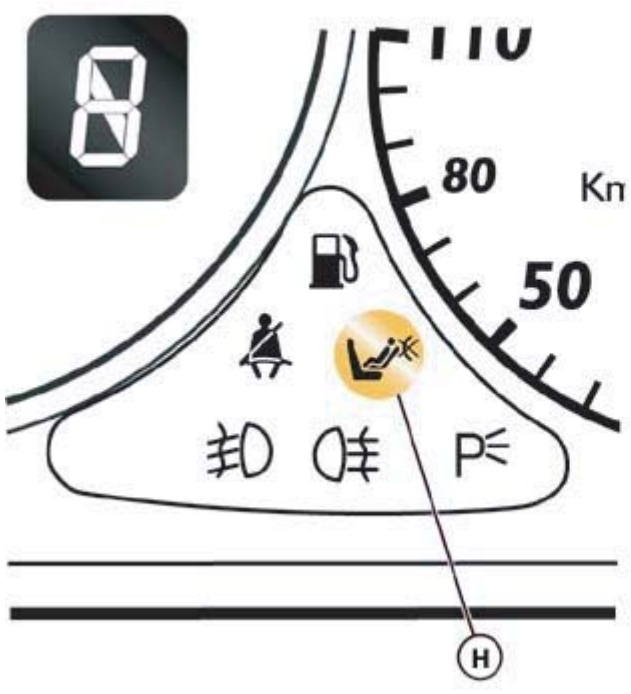
Manually disabling the passenger side airbag (optional function)

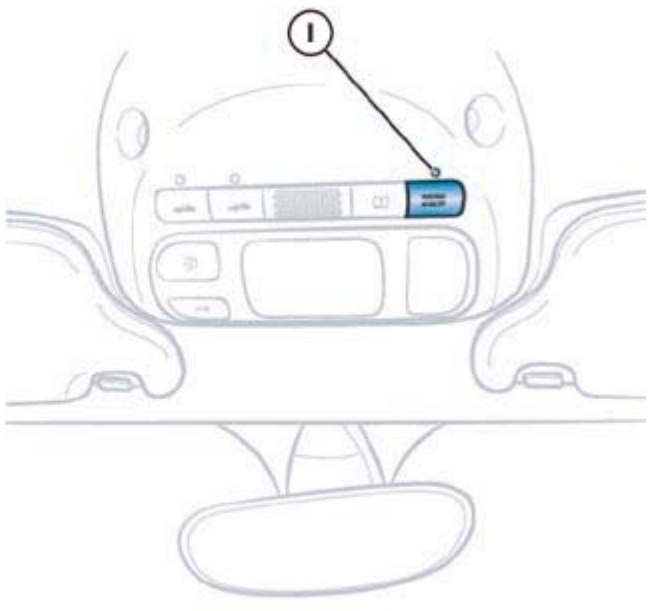
Disable the passenger side airbag before installing a child seat on the passenger seat.
To disable, turn the key operated switch on the right hand side panel of the dashboard with the ignition key. The switch is only accessible with the door open.



The key operated switch has only two positions:

- passenger airbag enabled: (position **ON**) indicator lamp **(H)** on instrument panel off; never transport children with appropriate restraint systems on the passenger seat when the airbag is enabled.
- passenger airbag disabled: (position **OFF**) indicator lamp **(H)** on instrument panel on and LED **(I)** on cabin light button panel on; children may be transported with appropriate restraint systems on the passenger seat when the airbag is disabled.



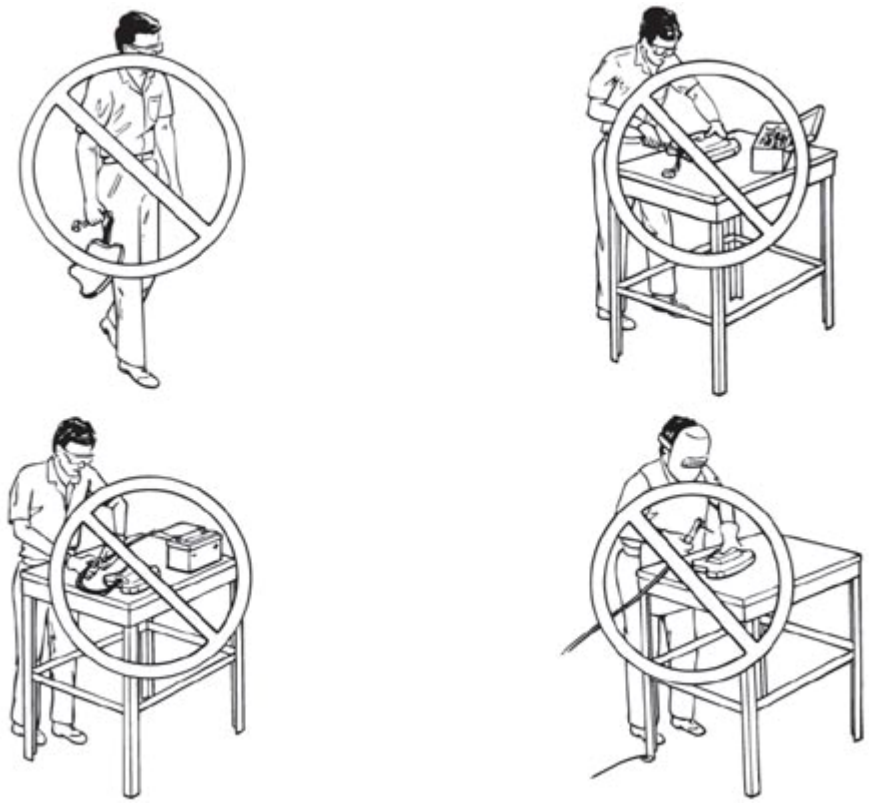


The indicator lamp **(H)** and the LED **(I)** remain lit permanently until the passenger airbag is enabled once again. With the door open, the key may be inserted and removed in both positions.
When the passenger airbag is disabled because the seat is occupied by a person considered by applicable law to be at risk and who, therefore, must be secured by supplementary restraint systems, the passenger will not be offered the additional protection of the airbag in the event of collision.
Disable the airbag only when transporting persons of increased risk categories and enable once again as soon as the journey is completed.

Important warnings

When the system is activated, gases are released to inflate the bag. These gases are not harmful as they are suitably cooled and filtered.

Certain residues of combustion may generate toxic substances in the event of contact with fluids or halogens (e.g. moisture, fuel, etc.).



To ensure safe working conditions, implement the following precautions:

- wear protective goggles whenever handling closed airbag modules;
- always put airbag modules down with the opening panel facing upwards;
- never place objects on the opening panel of an airbag module;
- always carry airbag modules with the opening panel facing away from the body;
- never modify or reuse the airbag system or its components, or install the airbag system or its components on a vehicle other than the model for which they were designed and manufactured;
- store closed, undamaged airbag modules in a cool, dry, closed and protected place;
- always wear rubber gloves and protective goggles when handling open airbag modules after firing. The surface of the airbag may contain sodium hydroxide or hydrazoic acid (produced by contact between the combustion residue and fluids, moisture, fuel, etc.). These compounds may even be lethal;
- When an airbag module has been activated, allow it to cool for approximately **20 minutes** before working on the inflation system;
- store units that have failed to deploy and defective units (e.g. with faulty inflation system) away from acids, halogens, heavy metals and salts ;
- never try to repair the electrical system of the airbag; in the event of malfunction, replace the entire unit;
- when repairing cars with accident or fire damage, check that the electrical system functions correctly with the SD-3, fitting the test resistors before connecting the airbag module;
- do not cover with adhesive or treat the trim panels of the driver side, passenger side and side airbags in any way;
- after an accident triggering any of the airbags, **all the components of the entire system must be replaced**.

CAUTION

NEVER expose the airbag modules to temperatures above 150°C (300°F), as at these high temperatures the explosive charge may fire even without electrical triggering.

Removing the driver side airbag

The driver and passenger airbag modules must be replaced 15 years after installation (see EC label), even if the car has not been involved in any collisions.
Do not install any child restraint systems on the passenger seat.
Where prescribed by law, children under twelve years may not travel on the front seats.
In the event of a collision resulting in activation of the airbag modules, dispose of the exploded modules as toxic waste, in accordance with applicable legislation in the relative country.

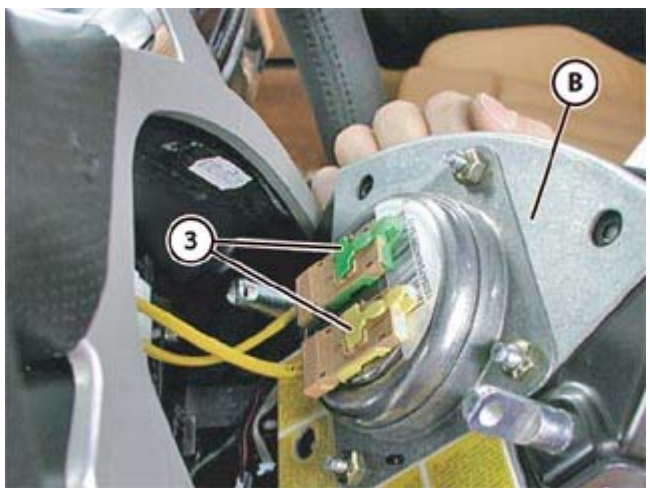
➢ Set the battery master switch to OFF (L2.02).



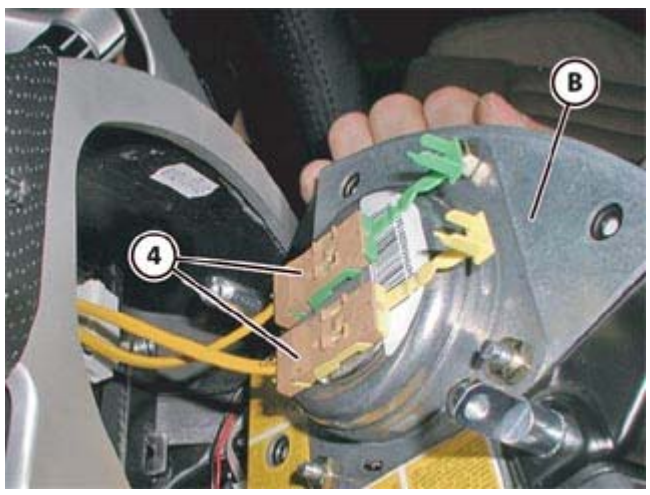
- Remove the protection plugs **(1)** from the rear of the steering wheel.



- Undo the two lateral screws **(2)**.



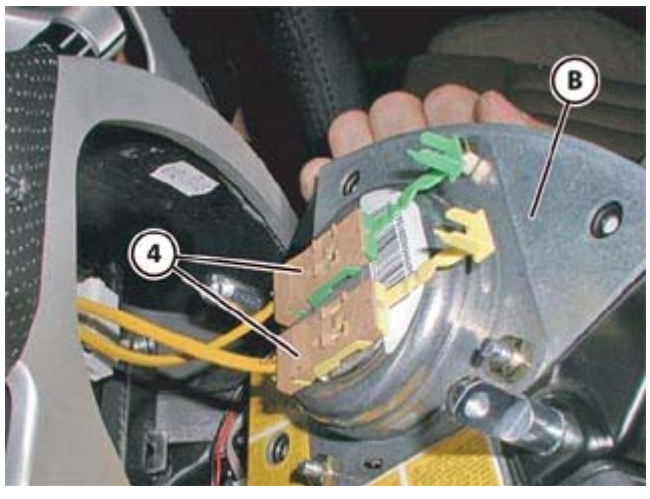
- Remove the module **(B)** from the steering wheel and remove the safety devices **(3)**.



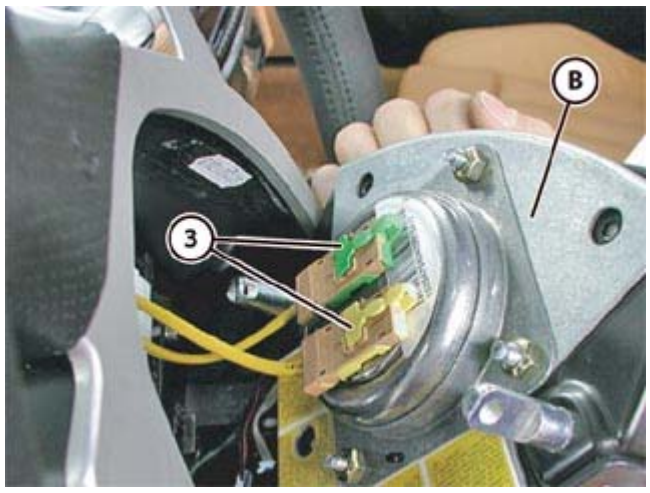
- Disconnect the airbag module **(B)** connectors **(4)** and remove from the passenger compartment.

Refitting driver side airbag

Tightening torque		**Nm**	**Class**
Driver side airbag - steering wheel	Screw	10 Nm	B



- Hold the airbag module **(B)** and connect the two connectors **(4)**.



- Fit the two safety devices **(3)** onto their respective connectors and fit the airbag module **(B)** in its relative seat on the steering wheel.



- Fasten the airbag module by tightening the two lateral screws **(2)**.

Tightening torque	**Nm**	**Class**
Screw	10 Nm	B



- Refit the protector plugs **(1)** at the rear of the steering wheel.

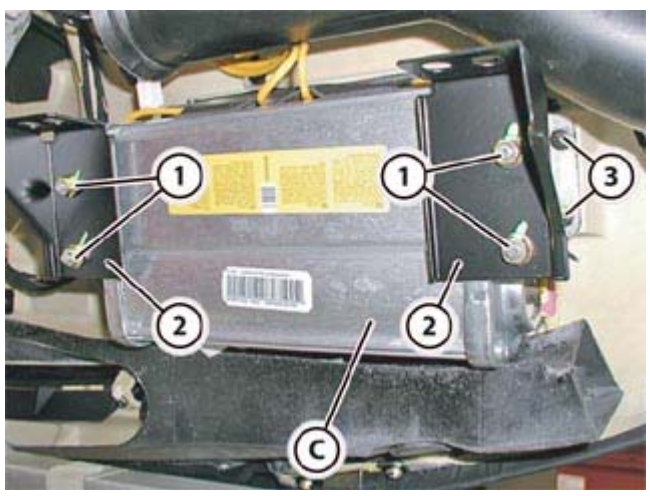
➢ Set the battery master switch to ON (L2.02).
➢ Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).

Replacing the passenger side airbag module

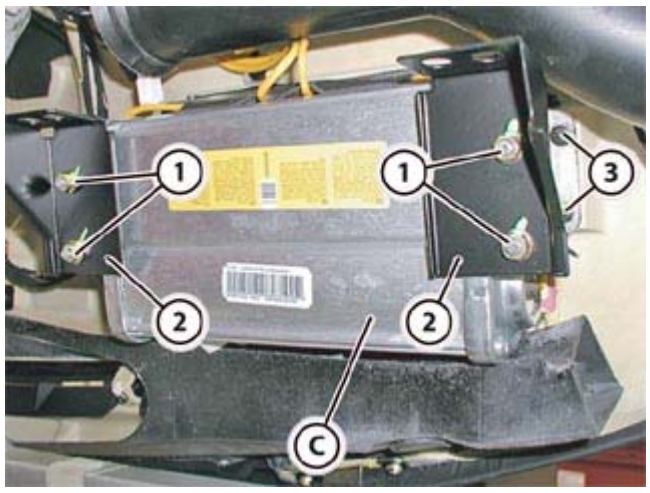
Tightening torque		**Nm**	**Class**
Airbag module - dashboard	Screw	4.1 Nm	A
Passenger side airbag module - bracket	Nut	10 Nm	B

The driver and passenger airbag modules must be replaced 15 years after installation (see EC label), even if the car has not been involved in any collisions.
Do not install any child restraint systems on the passenger seat.
Where prescribed by law, children under twelve years may not travel on the front seats.
In the event of a collision resulting in activation of the airbag modules, dispose of the exploded modules as toxic waste, in accordance with applicable legislation in the relative country.

➢ Remove the instrument panel (M2.19).



- Undo the four nuts **(1)** and remove the two brackets **(2)**.
- Undo the four screws **(3)** (two per side) and remove the module **(C)**.



- Fit the new module **(C)** on the dashboard ensuring that the outer trim panel lies flush with the dashboard; if necessary, insert spacers to adjust the height relative to the dashboard.
- Fasten the module **(C)** by tightening the four screws **(3)**.

Tightening torque	Nm	Class
Screw	4.1 Nm	A

- Fit the two brackets **(2)** and fasten to the module **(C)** by tightening the four nuts **(1)**.

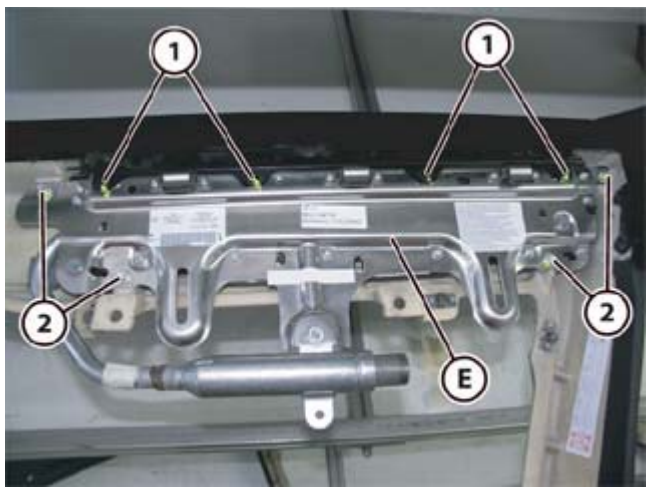
Tightening torque	Nm	Class
Nut	10 Nm	B

➢ Refit the instrument panel (M2.19).
➢ Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).

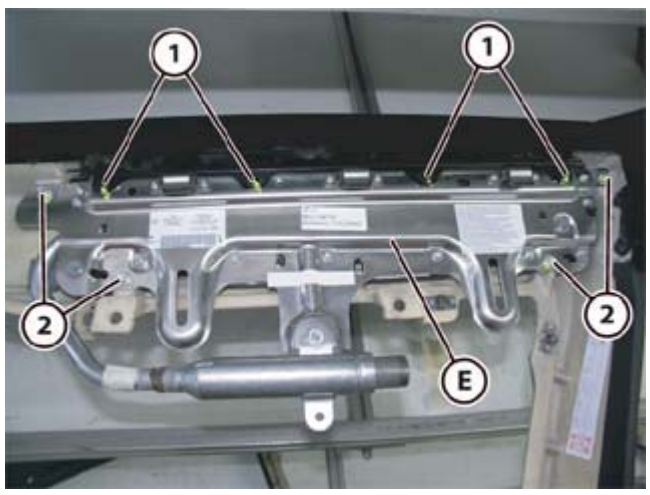
Replacing the side airbag module

Tightening torque		Nm	Class
Side airbag module - door trim	Screw	6 Nm	B

➢ Remove the door panel (M2.11).



- Undo the screws **(1)** fastening the bracket to the airbag module **(E)**.
- Undo the screws **(2)** fastening the module **(E)** to the door panel.
- Ease the module **(E)** out, remove from the door panel and replace.



- When refitting, fit the module in its seat on the door panel, ensuring that the outer trim lies flush with the door, and fasten by tightening the screws **(2)**.

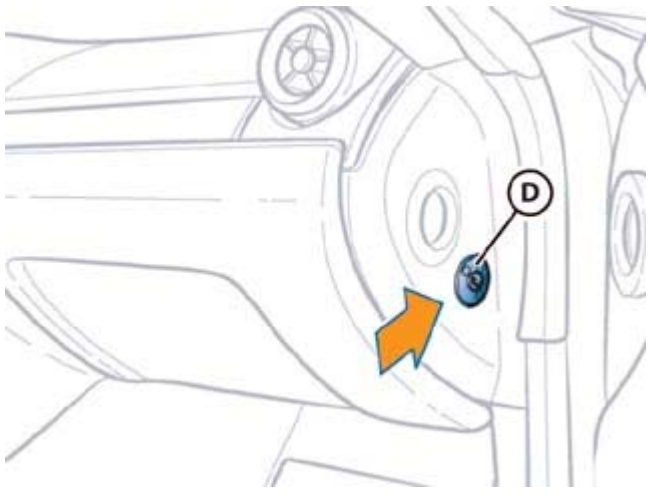
Tightening torque	Nm	Class
Screw	6 Nm	B

- Fit the screws **(1)** fastening the bracket to the module **(E and tighten)**.

➢ Refit the door panel (M2.11).

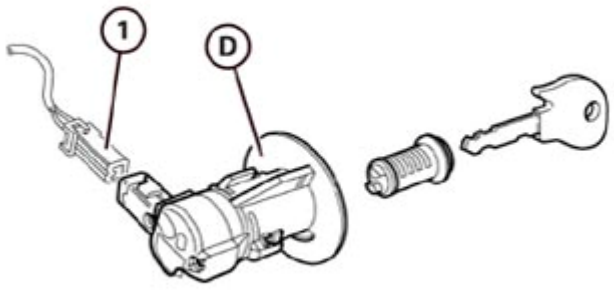
Removing the passenger airbag disable switch

➢ Set the battery master switch to OFF (L2.02).



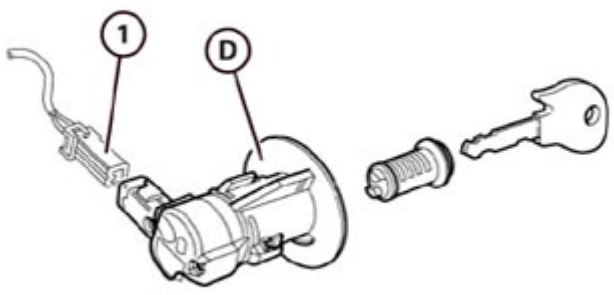
- Apply leverage with a pointed tool at the position indicated by the arrow, taking particular care not to damage the trim, and slowly prise out the passenger airbag disable switch **(D)**.

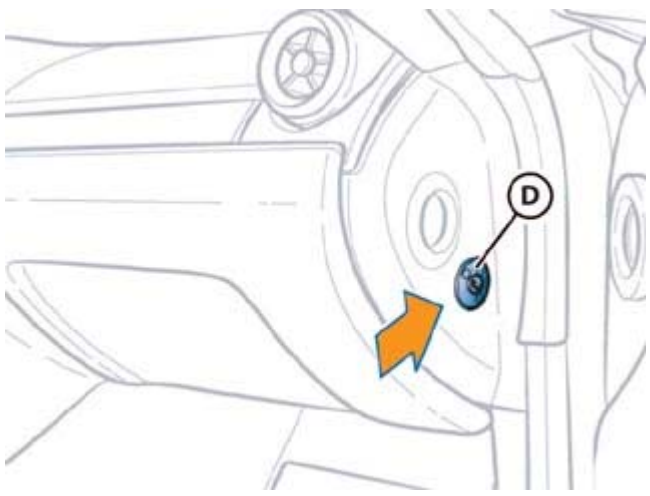
- Disconnect the connector **(1)** (D001) and remove the passenger airbag disable switch **(D)**.



Refitting the passenger airbag disable switch

- Connect the connector **(1)** (D001) to the passenger airbag disable switch **(D)**.





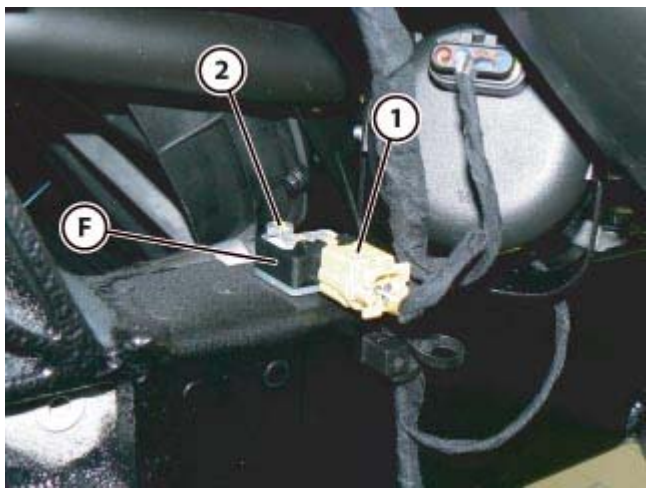
- Fit the passenger airbag disable switch **(D)** in its relative mounting in the right hand trim panel, ensuring that it is correctly mounted and flush with the panel.

➢ Set the battery master switch to ON (☞ L2.02).
➢ Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (☞ L2.13).

Replacing the front impact sensors

The two front impact sensors are located at the front of the engine compartment, to the sides of the radiator assemblies.

➢ Set the battery master switch to OFF (☞ L2.02).
➢ Remove the front wheelhouses (☞ M2.05).



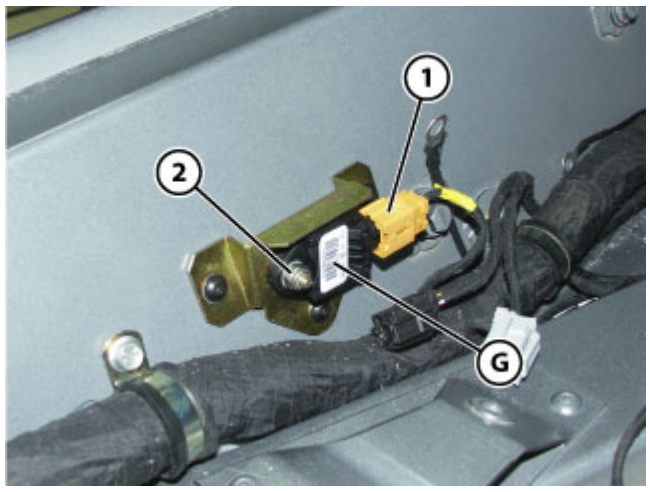
- Disconnect the connector **(1)** from the sensor **(F)**.
- Undo the fastener screw **(2)** and remove the sensor **(F)**.
- Fit the new sensor **(F)** and secure by tightening the fastener screw **(2)**.
- Connect the connector **(1)** to the sensor **(F)**.

- Refit the front wheelhouses (M2.05).
- Set the battery master switch to ON (L2.02).
- Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).

Replacing the lateral impact sensors

The two lateral impact sensors are located on the sills (one on each sill), under the sill trim.

- Set the battery master switch to OFF (L2.02).
- Remove the lateral trim panels (M2.24).

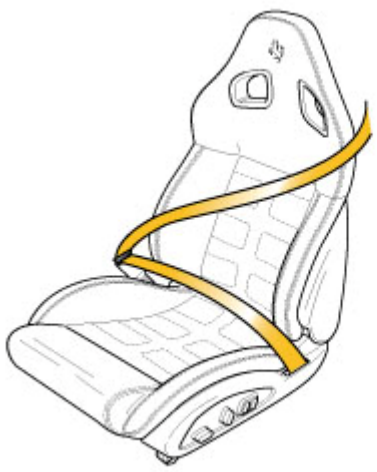


- Disconnect the connector **(1)** from the sensor **(G)**.
- Undo the fastener screw **(2)** and remove the sensor **(G)**.
- Fit the new sensor **(G)** and secure by tightening the fastener screw **(2)**.
- Connect the connector **(1)** to the sensor **(G)**.

- Remove the lateral trim panels (M2.24).
- Set the battery master switch to OFF (L2.02).
- Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).

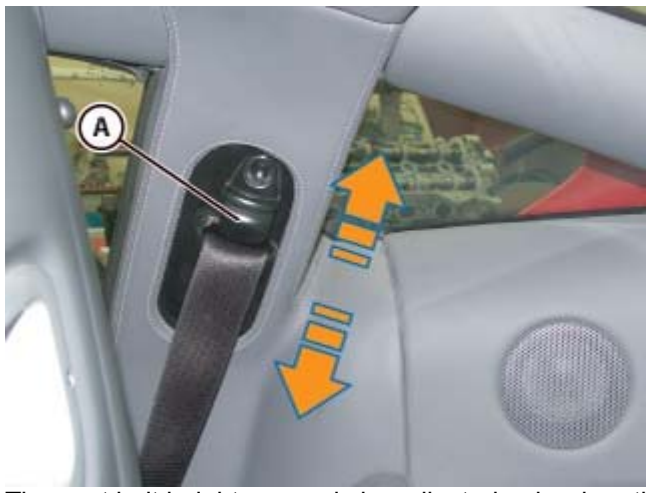
H4.03 Seat belts

Three-point seat belts



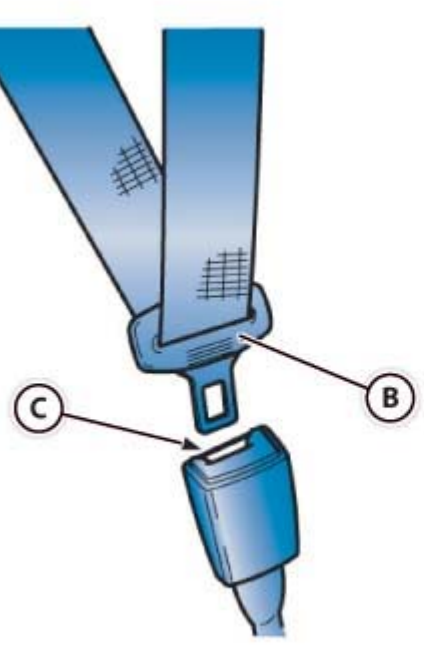
The three-point seat belts have an automatically retracting reel with emergency inertial locking and a pretensioner system.

Adjusting height with three-point seat belts



The seat belt height may only be adjusted only when the vehicle is stationary, moving the adjuster **(A)**.
Always adjust the seat belt height to suit the stature of the driver and passenger. This precaution may substantially reduce the risk of injury in a collision.
The belt height is correct when the sash of the belt passes about midway between the end of the shoulder and the neck.

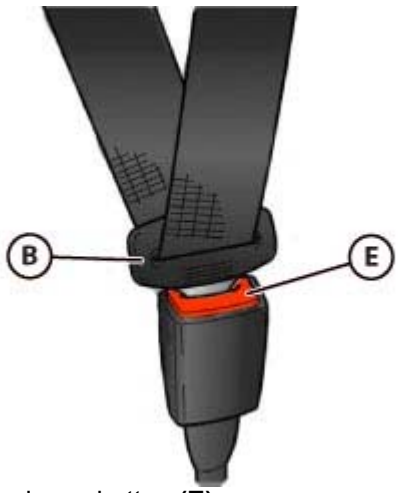
Fastening three-point seat belts





After adjusting the seat correctly, grip the clip **(B)**, pull the belt slowly and insert the tongue into the buckle **(C)**. If the belt locks while pulling, let it rewind a little and then pull it again without jerking abruptly.
Ensure that the tongue clicks audibly into the buckle.
Position the seat belt correctly.
If the driver side seat belt is not buckled, the warning lamp **(D)** lights when the ignition key is turned to **II**.

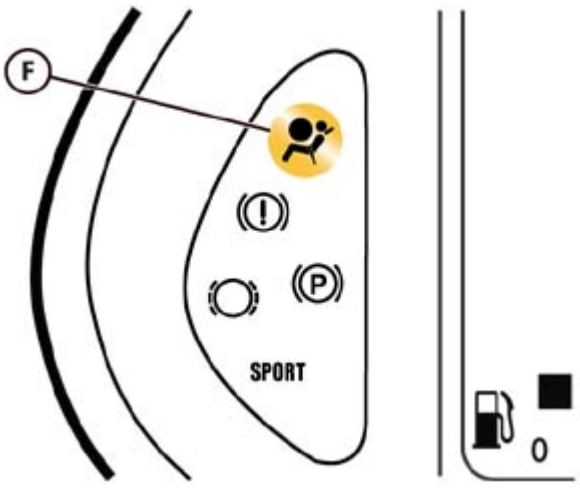
Releasing three-point seat belts



Press the release button **(E)**.
Accompany the buckle **(B)** back to its rest position.

Pretensioners

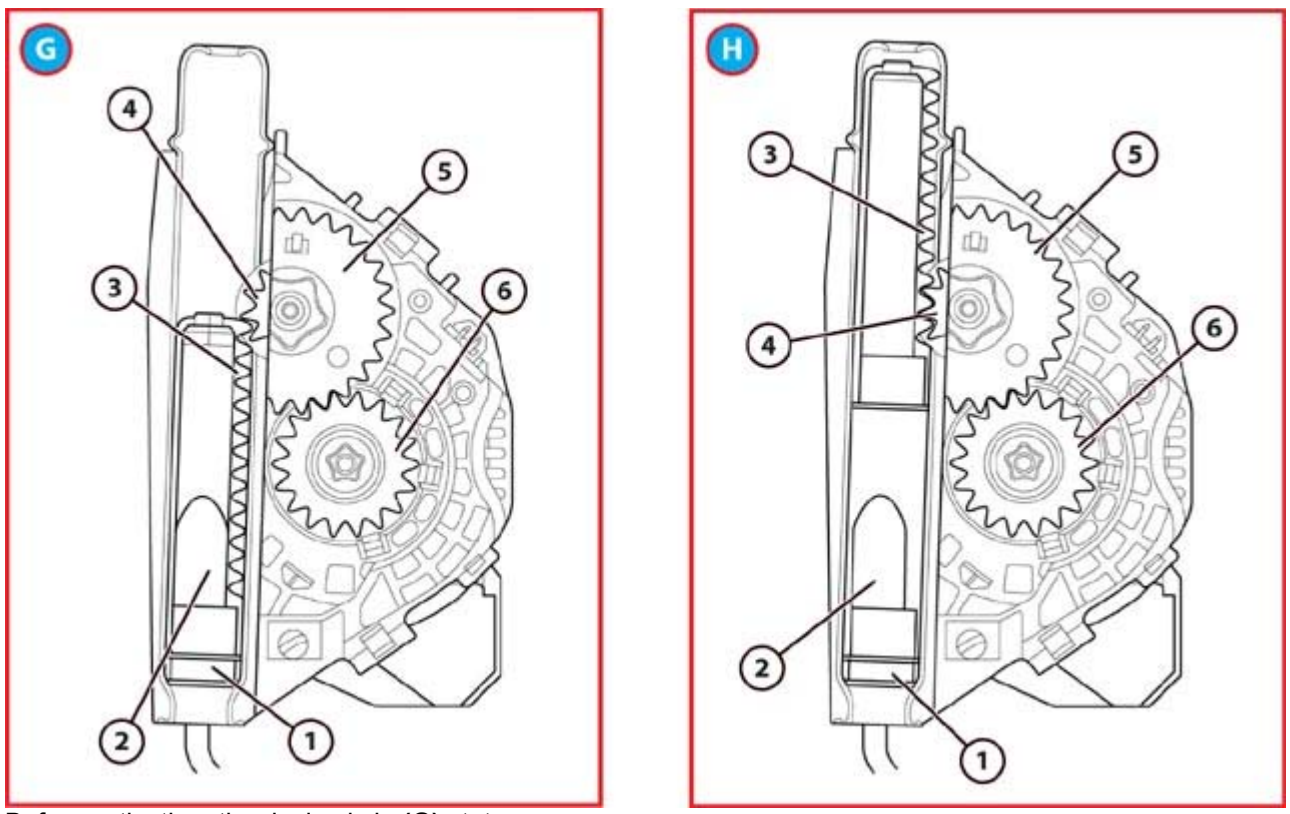
This device consists of a belt retractor with a pyrotechnic pretensioner. The pyrotechnic system is integrated in a single component with the retractor.
This device maximises the protective action of the seatbelt.
The pretensioner is activated by the airbag control ECU in the event of a frontal collision (direction of impact between 11 and 1 o'clock) of excessive severity, or in the event of lateral collision of sufficient severity. The seat belt is rewound by a few centimetres immediately before the restraining action begins, taking up any slack between the belt and the body of the occupant.



Effective activation of the pretensioner is indicated by the light **(F)** on the instrument panel and by the tightening of the belt.

Pretensioner activation releases a small quantity of powder. This powder is harmless and is not an indication of fire.
Pretensioner activation depends solely on the state of the seat belt and is not influenced by the presence of the occupant.
If the belt is not buckled, the pretensioner is not activated even if the seat is occupied.
The seat belt is equipped with a load limiter to reduce the restraint force exerted by the belt on the body of the occupant in the event of a collision. This device controls the force with which the seat belt is rewound during a collision.

Operation



Before activation, the device is in **(G)** state.
When the ECU detects a collision of a severity above the set threshold, it sends a signal to the pretensioner, firing the pyrotechnic charge **(1)** of the gas generator: the combustion of the propellant **(2)** releases high pressure gas, exerting an upward force on the rack piston **(3)**.
This motion is transmitted via pinions **(4)** and **(5)** to the toothed bushing **(6)**, which rewinds the belt by a few centimetres (state **H**).
This takes up any slack between the belt and the body of the occupant immediately before the retention action begins.

Once activated, a pretensioner is no longer functional, cannot be repaired and must be replaced.

Seat belt and pretensioner care

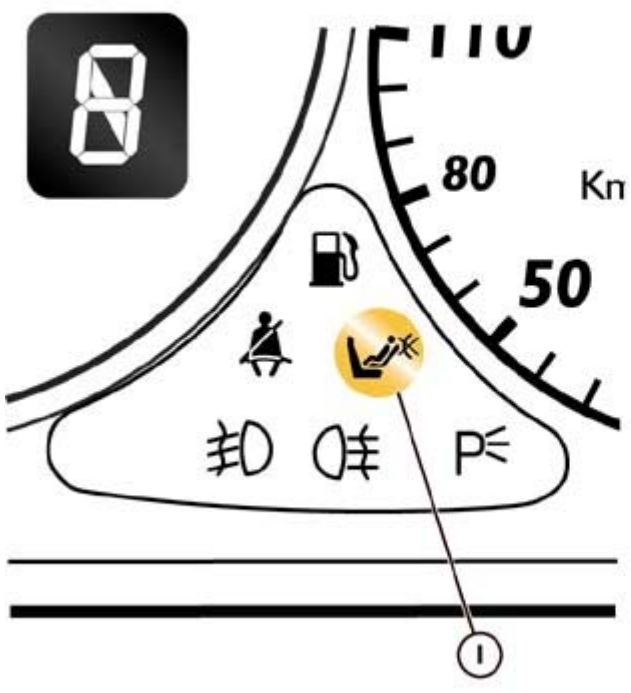
- Replace the seat belt after a severe collision even if it does not appear damaged.
- Periodically check that the anchor screws are tightly fastened and that the belt itself is in good condition and winds and unwinds smoothly.
- The belt must be kept clean; dirt may compromise the effectiveness of the retractor.
- To clean the belt, hand wash with water and mild soap, rinse and allow to dry. Do not use strong detergents, bleach or harsh solvents that could weaken the fibres.
- Do not wet the retractors: water infiltration may compromise operation.
- The pretensioner requires no maintenance or lubrication. If the pretensioner has been immersed in water or mud, it must be replaced.
- The pretensioner must be replaced every **15 years**.
- Never dismantle or modify the belts, retractors and pretensioners.
- Particular repairs and maintenance work causing violent knocks, vibration or heating near the pretensioner may accidentally trigger the pretensioner; Road vibration and shocks will not trigger the pretensioners.

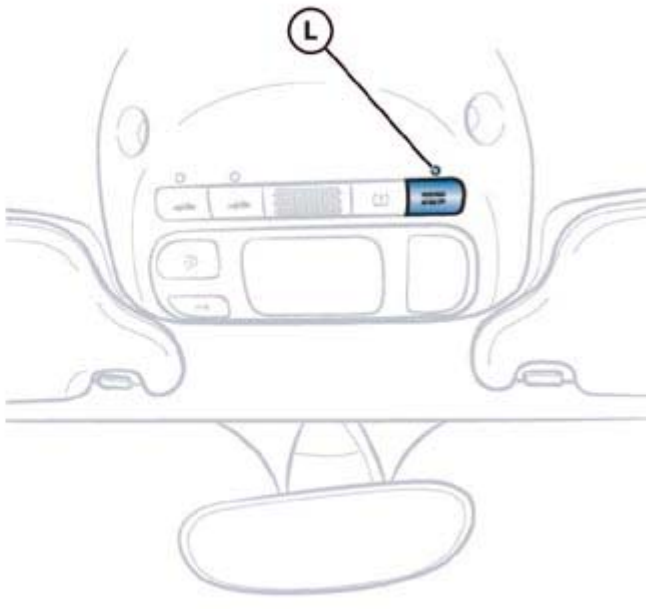
Safety devices

- The pretensioners must be protected from exposure to temperatures over **100 °C** for more than **6 hours** and from sparks and naked flames.
- The pretensioner may fire spontaneously at temperatures above **150 °C**.
- Pretensioners that have sustained knocks or falls must not be used and must be returned to the manufacturer, specifying the reason.
- Gas generators must be kept away from acids, water, grease or heavy metals to prevent the formation of toxic gases or explosive compounds.
- Do not store pretensioners together with inflammable and/or combustible materials.
- Never dismantle retention system components.
- Never carry pretensioners by the belt, as this may cause damage.
- Remove the pretensioners before carrying out repair jobs that may involve violent shocks (e.g. coachwork/chassis repairs) and/or high temperatures (e.g. painting with temperatures above **100 °C**).
- Fire pretensioners before scrapping.
- Avoid skin contact with the propellant or swallowing: wear protective gloves when handling fired pretensioners. In the event of contact with the propellant, wash with plenty of water and seek medical assistance.

Child safety

Due to their size and constitution, children are subject to greater risks than adults. Adequate retention and safety systems must therefore be used with children.
All minors with physical characteristics (height and weight) within the limits defined by applicable legislation in the country of use must be protected by appropriate retention or safety systems (child seats, cradles or booster cushions) with type approval in compliance with **ECE/ONU 44** regulations.
In countries that do not implement ECE/ONU 44 regulations, please refer to specific national legislation.
It is always advisable to use type approved child retention systems bearing a mark of compliance.
In the event of an accident, an incorrectly installed child retention system will increase the risk of injury.
The seat belts installed in the vehicle have been designed and tested to protect persons weighing at least **36 Kg** and measuring at least **1.50 m** in height.
To correctly retain persons not within these limits, specific retention systems with dedicated belts or accessories to adapt the position of the occupant to suit the seat belt in the car must be installed.
When installing and using child retention systems, follow the instructions that the manufacturer is required by law to provide with the device.
Never mount a child seat facing backwards with the airbag enabled. This exposes the child to the risk of serious injury in the event of airbag deployment, independently of the severity of the accident.
Where necessary, a child may be seated in the passenger seat in a vehicle equipped with (optional) front passenger airbag disable function.
In this case, always check that the airbag is effectively disabled. This is indicated by the warning light **(I)** on the instrument panel and the LED **(L)** on the roof liner.





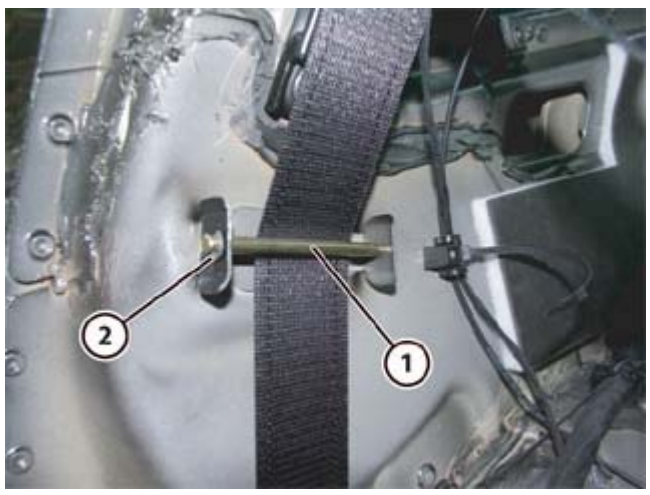
Replacing the 3 point seat harnesses

Tightening torque		Nm	Class
Seat belt height adjuster - bodywork	Screw	20 Nm	B
Seat belt retractor body - bodywork	Screw	40 Nm	A

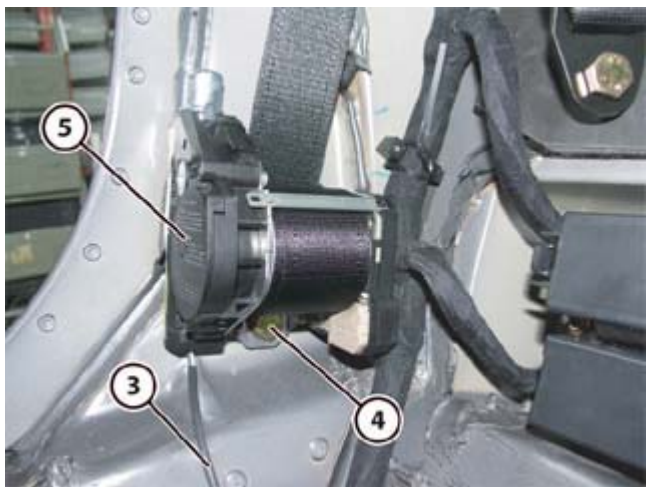
➢ Set the battery master switch to OFF (L2.02).

➢ Remove the passenger compartment and roof trim panels (M2.22).

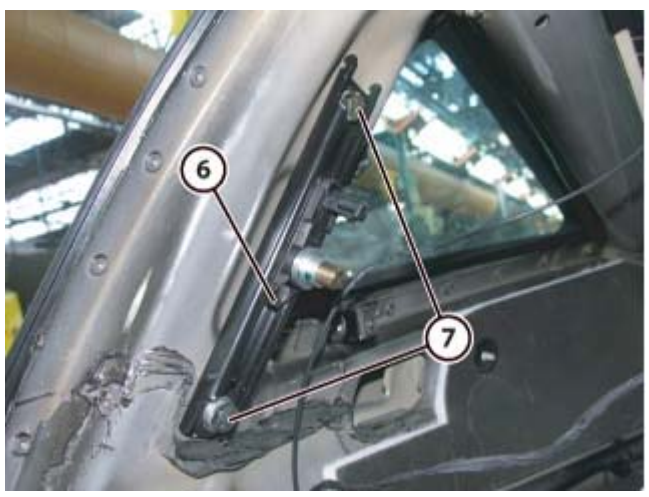
Follow the disassembly procedure up to the removal of the **B-pillar trim**.



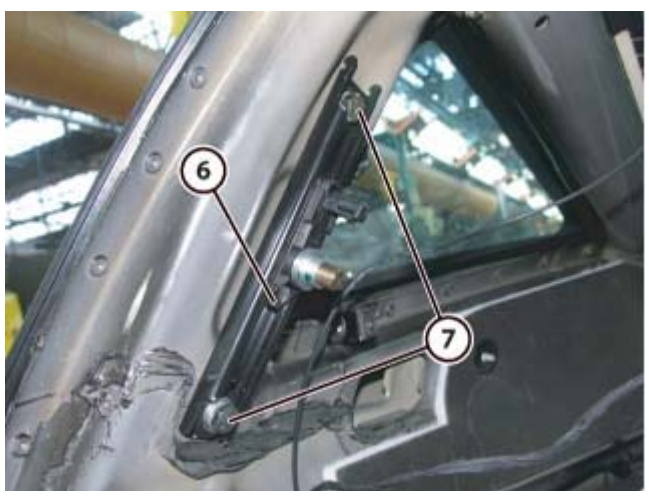
- Remove the belt return pin **(1)** removing the two snap rings **(2)** (one per side).



- Disconnect the connector **(3)** (R014) (R015), undo the screw **(4)**, remove the seat belt-retractor assembly **(5)** and replace.

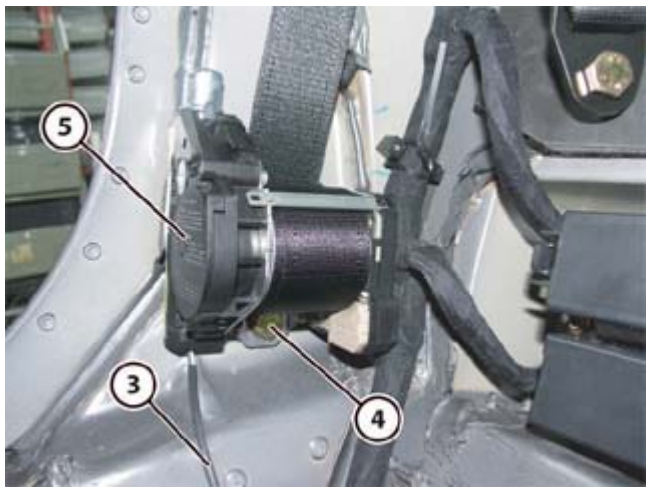


- Should it be necessary to replace the seat belt height adjuster **(6)** undo the two screws **(7)**, retrieving the relative spacers.



- To refit, install the spacers, fit the seat belt height adjuster **(6)** and fasten by tightening the screws **(7)**.

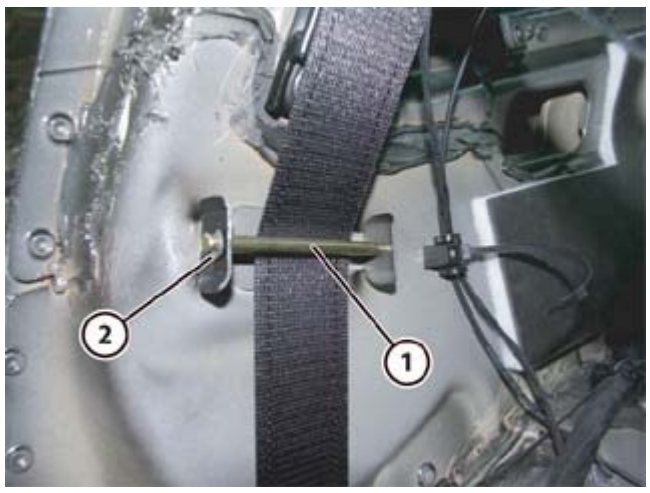
Tightening torque	Nm	Class
Screw	20 Nm	B



- To refit, fit the belt complete with retractor **(5)** in the relative seat in the passenger compartment.
- Fit and tighten the fastener screw **(4)**.

Tightening torque	Nm	Class
Screw	40 Nm	A

- Connect the connector **(3)** (R014) (R015).



- Secure the belt, positioning the belt return pin **(1)** in its relative holes in the bodyshell bracket and secure with the two snap rings **(2)** (one per side).

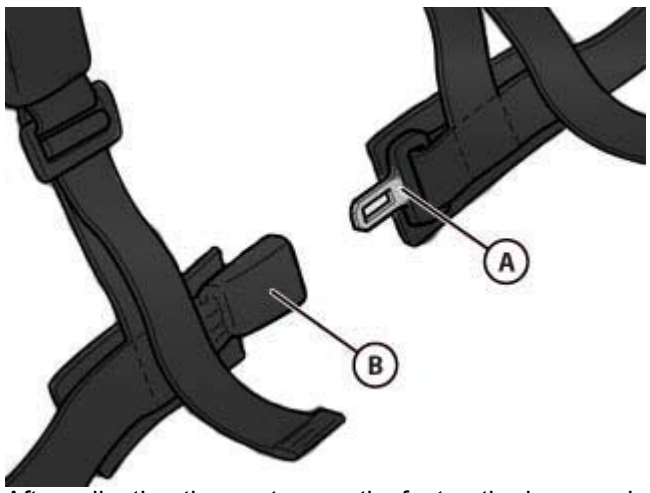
➢ Refit the passenger compartment and roof trim panels (M2.22).
➢ Set the battery master switch to ON (L2.02).

Four-point seat harnesses

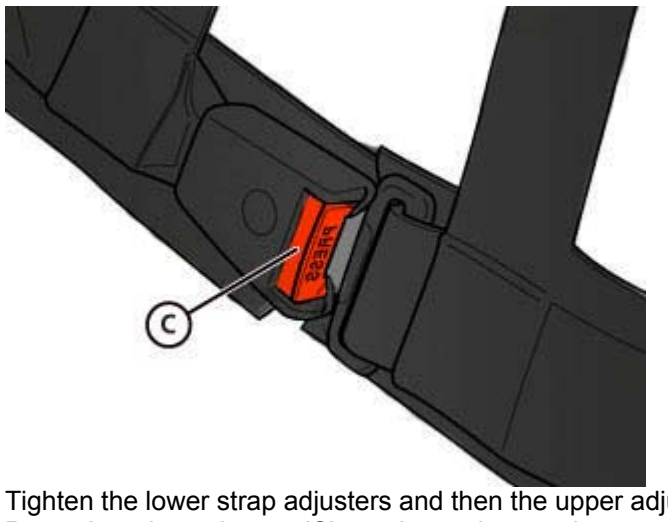


On request, the vehicle may be fitted with four point seat harnesses, with "fixed" mounting points and with strap adjusters for adjusting length.
Four-point seat harnesses are fitted as standard in "60 F1" variants.

Fastening four point seat harnesses



After adjusting the seat correctly, fasten the harness by inserting the tongue **(A)** into the buckle **(B)**, ensuring that the tongue clicks audibly into the buckle.



Tighten the lower strap adjusters and then the upper adjusters so that the harness straps fit snugly to the body.
Press the release button **(C)** to release the seat harnesses.

Replacing four-point seat harnesses

- Remove the seat (M2.21).
- Remove the passenger compartment and roof trim panels (M2.22).

Remove the parcel shelf trim panel.

- Replace the four-point seat harnesses, installing the new components as originally fitted.
- Refit the passenger compartment and roof trim panels (M2.22).
- Refit the seat (M2.21).

H4.04 Inertia switch

Inertia switch operation

The inertia switch is located in front of the driver seat, underneath the floor mat cover.
In the event of a violent collision, the inertia switch cuts the power to the fuel pumps thereby preventing further fuel leakage from the tank.
The switch is triggered by a steel ball which can move in a tapered seat and is held in place by the attraction of a permanent magnet.
In the event of a violent collision, the inertia of the ball overcomes the attractive force of the magnet, pushing the ball up and out of the tapered seat, where it strikes a quick-release mechanism normally forming a closed circuit.
When the ball strikes the mechanism, the latter changes position, opening the circuit and cutting the power to the pumps.
Once triggered, the switch may be reset by pressing the top button **(A)**.

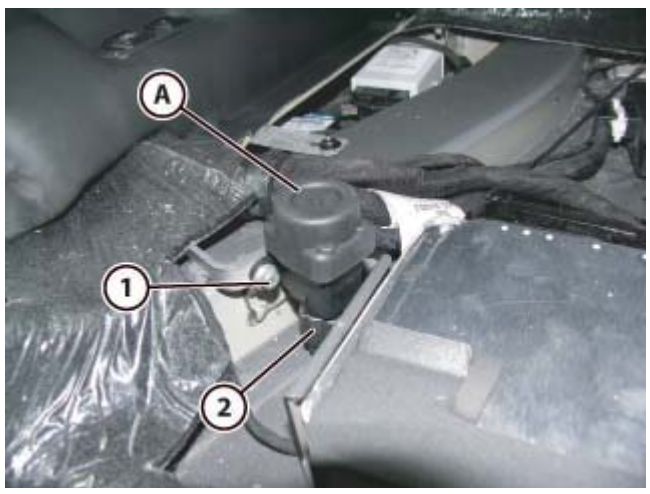


CAUTION
If fuel is smelt or fuel leaks are noted from the fuel system after a mild collision, the inertia switch must not be reset in order to prevent the risk of fire and to enable the safe identification of the cause of the problem.

Replacing the inertia switch

- Set the battery master switch to OFF (L2.02).
- Remove the mats (M2.24).

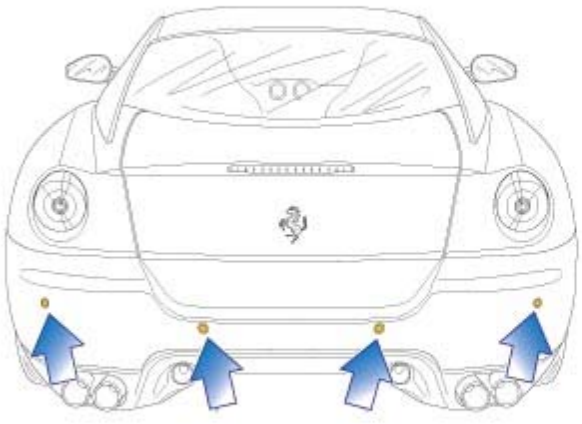
Follow the removal sequence up to the removal of the **floor mat cover on the driver side**.

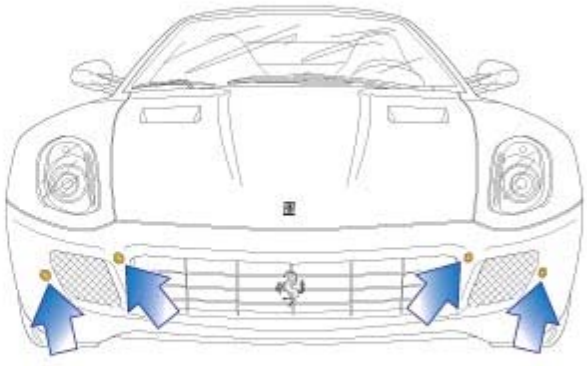


- Undo the two screws **(1)** fastening the inertia switch to the bodywork.
- Disconnect the connector **(2)** (S078) and remove the inertia switch from the passenger compartment **(A)**.

- When refitting, after connecting the inertia switch to the system, reconnect the battery and wait at least one minute before starting the engine.

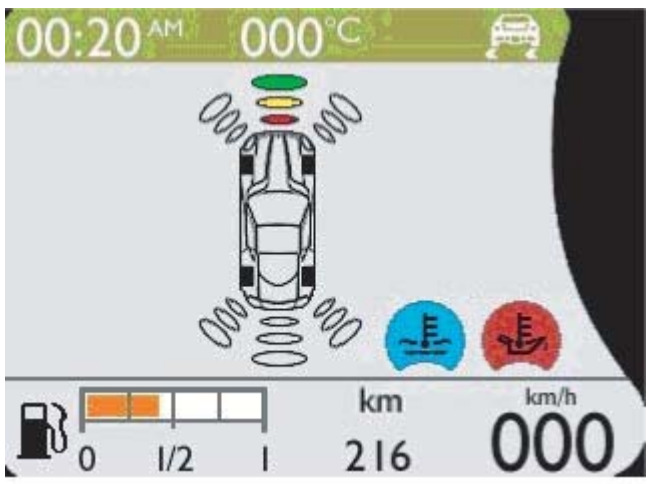
H4.05 Park assist





The vehicle may be equipped with four sensors installed in the front and rear bumpers to assist the driver during parking manoeuvres.

For the system to operate correctly, the sensors positioned on the bumpers must be kept free from mud, dirt, snow or ice.



When approaching obstacles in front of or behind the vehicle, the parking sensors provide the driver with information on the distance between the vehicle and the obstacles.

The driver is given information about the presence and distance of obstacles via audible signals that increase in frequency as the obstacle approaches, and with visual signals on the TFT display.

Instead of relying solely on what can be seen from the cabin, the driver is also assisted by the audible and visual signals generated by the system in avoiding collisions while manoeuvring.

Front and rear sensors are activated automatically, with the key in position **II**, when shifting into reverse gear.

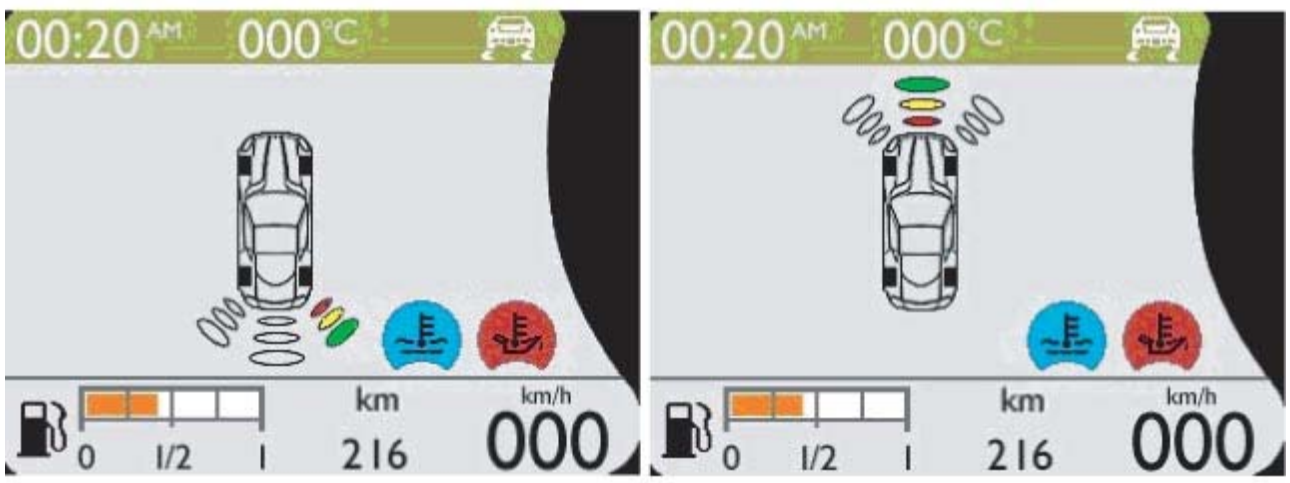


When the vehicle is also equipped with front sensors, all sensors may be activated by pressing button **(A)** located on the tunnel; when the front sensors are active, the button illuminates with an amber colour.

To disable the sensors, press button **(A)** again.

When the sensors are activated, the system begins to beep as soon as an obstacle is detected and the beep frequency increases as the vehicle approaches the obstacle.

When an obstacle is located at a distance of less than **35** cm from the bumper, the beep is continuous. The tone cycle remains constant if the distance measured by the central sensors remains unchanged.



On vehicles with both front and rear sensors, the distance between vehicle and obstacles is also visualised graphically on the TFT display.
The position and distance of the obstacle are indicated by the zones surrounding the vehicle.
The colour represents distance, whereas the zone represents position.
Green represents the maximum distance measurable, yellow represents medium distances and red represents the minimum distance.
If only the front sensors are active, the rear sensors are omitted from the graphic display.

Cleaning the sensors

Take particular care when cleaning the sensors to avoid scratching or damaging them; do not use dry, rough or hard cloths.
The sensors must be washed with clean water or a solution of specific car shampoo and water.
In car washes using pressure cleaners or steam cleaners, clean the sensors very quickly with the nozzle at least **10 cm** away from the sensor.
When repainting the bumper or touching up the sensor area, remove the bumper and remove the sensors from the area concerned. Incorrect paint application may affect the parking sensor operation.

Sensor range

The sensors enable the system to monitor the front and rear of the vehicle;
The sensors are positioned so that their range covers the middle and lateral zones of the front and rear of the vehicle.
Centrally located obstacles will be detected at ranges of less than **1.40 m**, depending on the type and size of the obstacle.
Lateral obstacles are detected at ranges **under 0.8 m**.

Fault signals

The system ECU checks all components every time reverse gear is engaged.

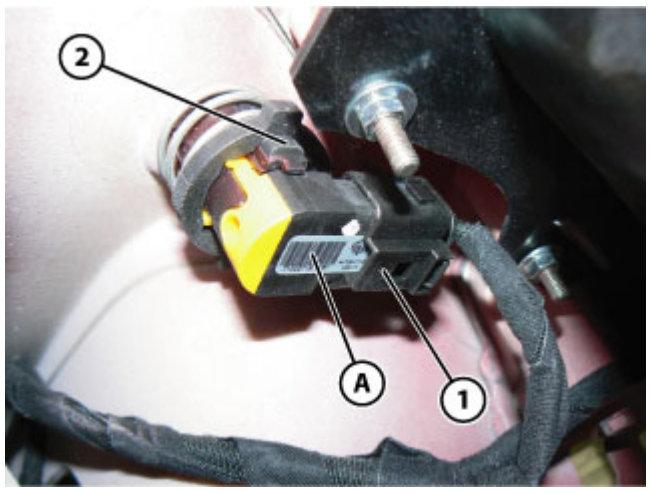


In the event of a parking sensor malfunction, this will be shown on the TFT display.
Stop the vehicle and turn the ignition key to position **0** (Stop).
Try cleaning the sensors or moving the vehicle away from any possible ultrasound sources (e.g. pneumatic truck brakes or pneumatic hammers) and turn the ignition key back to position **II**.
If the cause of the malfunction has been eliminated, the system will automatically resume normal operation again and the failure warning sound will stop.
If the malfunction warning sound continues, the system must be checked for faults.
When parking, be particularly cautious of obstacles which might be located above or below the sensors.
In some circumstances, objects located very close to the rear of the vehicle may not be detected by the system and may, as a result, be damaged or cause damage to the vehicle.
Damage to the sensors, dirt, snow or ice on the sensors or ultrasound sources (e.g., pneumatic truck brakes or pneumatic hammers) in the vicinity may cause interference with the signals transmitted by the sensors.

Replacing the front parking sensors

The following procedure is for replacing a single parking sensor.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the front bumper (M2.03).



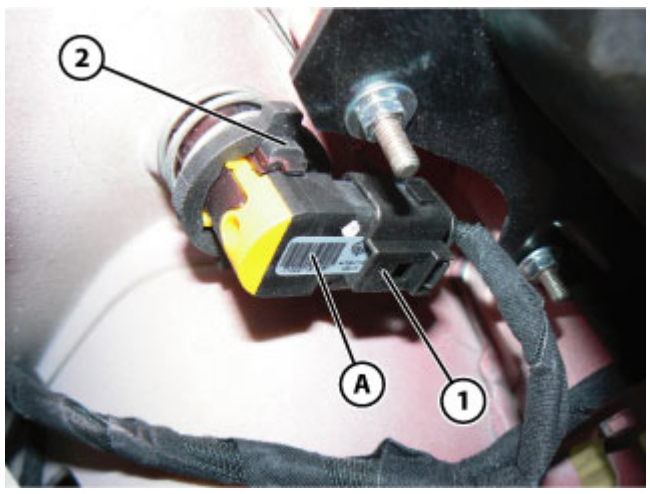
- Disconnect the connector **(1)** from the sensor **(A)**.
- Detach the sensor **(A)** from the fastener ring **(2)** and remove.
- Fit the new sensor **(A)** and fix to the fastener ring **(2)**.
- Connect the connector **(1)** to the sensor **(A)**.

➢ Refit the front bumper (M2.03).
➢ Set the battery master switch to ON (L2.02).

Replacing the rear parking sensors

The following procedure is for replacing a single parking sensor.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the rear bumper (M2.04).



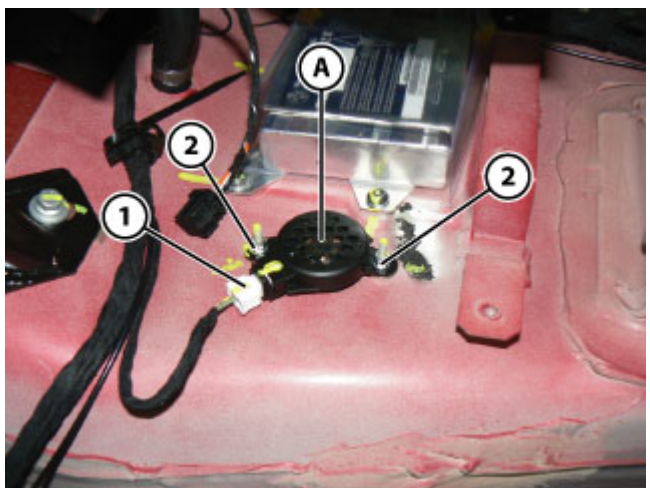
- Disconnect the connector **(1)** from the sensor **(A)**.
- Detach the sensor **(A)** from the fastener ring **(2)** and remove.
- Fit the new sensor **(A)** and fix to the fastener ring **(2)**.
- Connect the connector **(1)** to the sensor **(A)**.

➢ Refit the rear bumper (M2.04).
➢ Set the battery master switch to ON (L2.02).

Replacing the front parking sensor buzzer

The front parking distance control system is mounted under the console trim panel on the tunnel.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the console trim panel (M2.20).



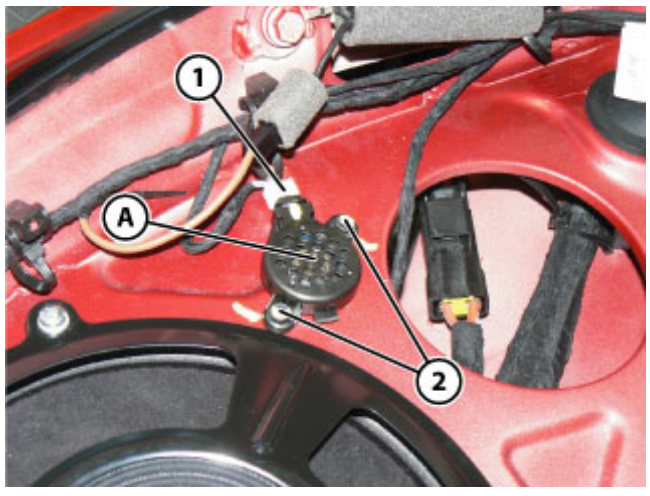
- Disconnect the connector **(1)** from the buzzer **(A)**.
- Undo the two fastener nuts **(2)** and remove the buzzer **(A)**.
- Fit the new buzzer **(A)** and secure by tightening the two fastener nuts **(2)**.
- Connect the connector **(1)** to the buzzer **(A)**.

➢ Refit the console trim panel (M2.20).
➢ Set the battery master switch to ON (L2.02).

Replacing the rear parking sensor buzzer

The rear parking distance control system is mounted under the trim on the parcel shelf.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Remove the parcel shelf trim panel.



- Disconnect the connector **(1)** from the buzzer **(A)**.
- Undo the two fastener nuts **(2)** and remove the buzzer **(A)**.
- Fit the new buzzer **(A)** and fasten by tightening the two fastener nuts **(2)**.
- Connect the connector **(1)** to the buzzer **(A)**.

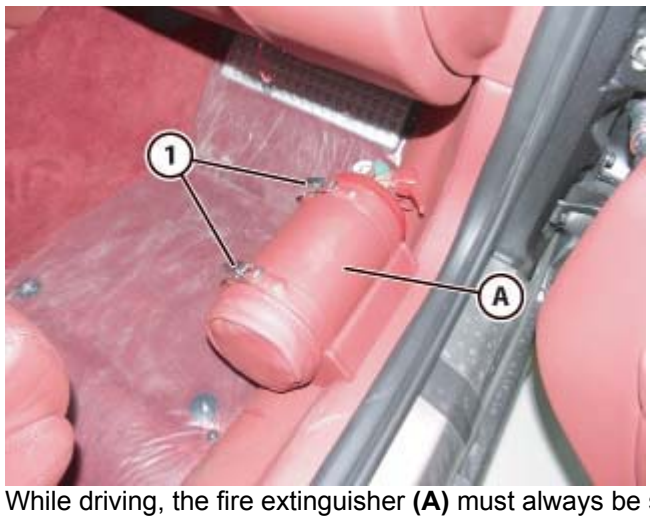
➢ Refit the passenger compartment and roof trim panels (M2.22).
➢ Set the battery master switch to ON (L2.02).

H4.06 Fire extinguisher

Fire extinguisher

An optional fire extinguisher complete with mounting brackets is also available, for installation on the floor on the passenger side.

To use the fire extinguisher, follow the specific instructions given on the extinguisher itself.

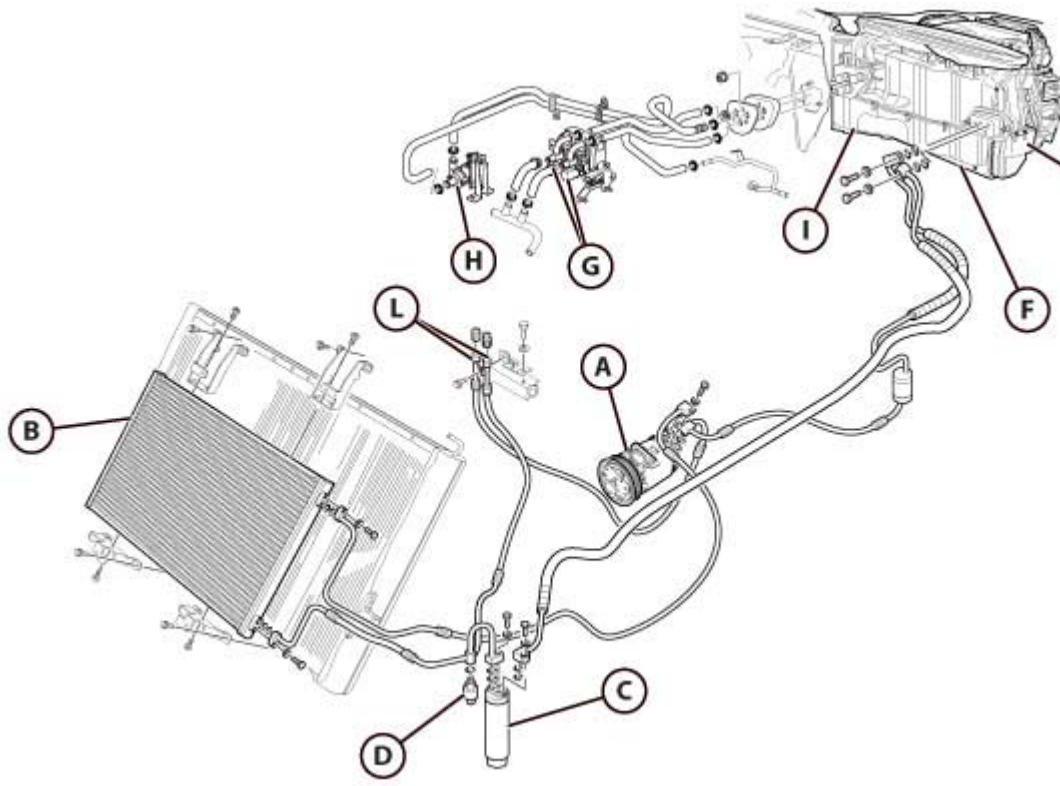


While driving, the fire extinguisher **(A)** must always be secured to the mounting bracket with the relative retainer straps **(1)**.

I1.01 System layout

Air conditioning and heating system layout

The air conditioning and heating system consists of an ECU controlled heater/evaporator unit which, in automatic and manual mode, keeps the temperature within the passenger compartment constant as the ambient temperature rises and falls, by regulating the temperature, distribution and flow of the air.
The system automatically selects whether to use air from outside the vehicle or air recirculated within the passenger compartment, independently of ambient conditions.
The refrigerant **R134 A** is aspirated in gaseous by the compressor **(A)**, which sends it to the condenser **(B)** at a pressure that varies in relation to ambient temperature.
When the refrigerant cools inside the condenser, it condenses and becomes a liquid.
The dehydrator filter **(C)** removes any traces of humidity due to water vapour in the system and acts as a tank for the liquid refrigerant.
A pressure switch **(D)** in this part of the system measures the pressure and disengages the electromagnetic clutch when the pressure limit is reached.
The refrigerant passes from the dehydrator filter through the expansion valve **(E)**, which regulates flow to the evaporator **(F)**, reducing the pressure.
Inside the evaporator, refrigerant passes from liquid state to gaseous state at low pressure **(1.5 ÷ 2 bar)**, and low temperature **(-5 ÷ +5° C)**, absorbing heat from the air passing through the air conditioning unit.
As the refrigerant leaves the evaporator, it is aspirated into the compressor, which pumps it back into the circuit.



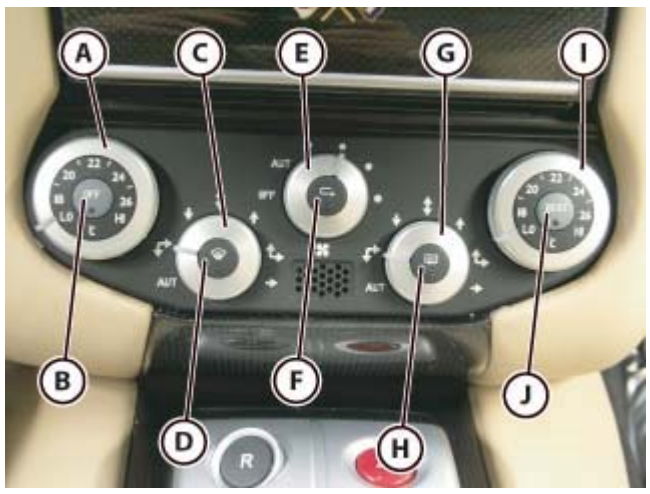
A - Compressor
B - Condenser
C - Dehydrator filter
D - Pressure switch
E - Expansion valve
F - Heater/evaporator
G - TGK proportional valve
H - Water circulation pump
I - Pollen filter
L - Coolant inlet/outlet unions

I1.02 Controls

Air conditioning/heating system controls

The air conditioning and heating system allows the user to adjust the temperature and humidity within the passenger compartment.
The vehicle is equipped with an automatic dual zone air conditioner/heater. This system is capable of regulating air temperature, distribution and flow separately for the driver side and passenger side of the passenger compartment.

Function and controls

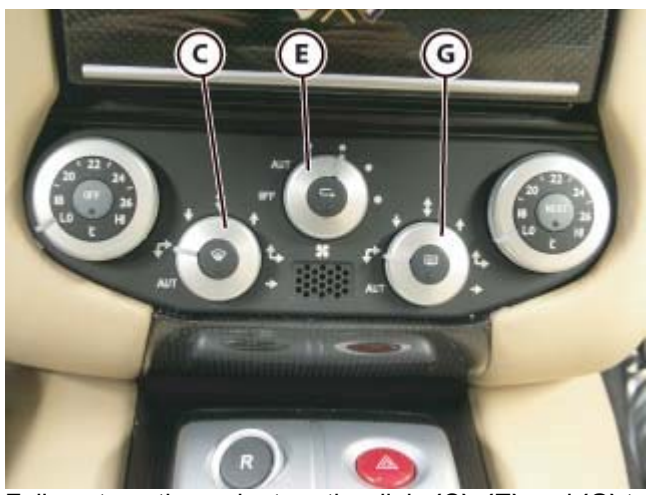


A - Left-hand side temperature setting
B - A.C. compressor activation/deactivation
C - Left-hand side air distribution selection
D - Windscreen defogging/demisting
E - Fan speed adjustment
F - Recirculation function
G - Right-hand side air distribution selection
H - Defogging/demisting for rear window and external rear-view mirrors
I - Right-hand side temperature setting
J - Residual heat function

Modes

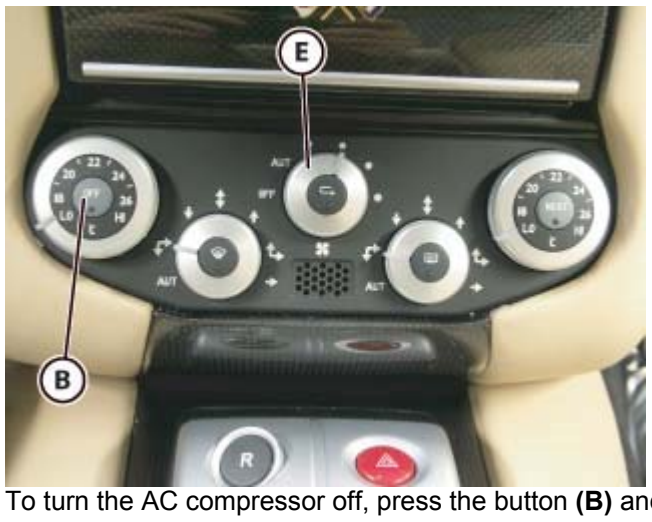
Automatic: this mode automatically adjusts humidity and ventilation according to the selected temperature.
Semiautomatic: this enables the user to set certain parameters manually while others remain controlled automatically.
Manual: this allows the user to the set the values manually as preferred.

Switching on



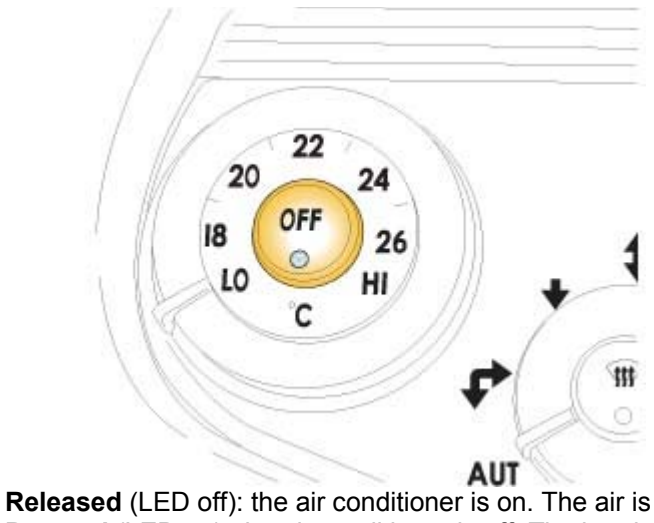
Fully automatic mode: turn the dials **(C)**, **(E)** and **(G)** to **AUT**.

Switching off



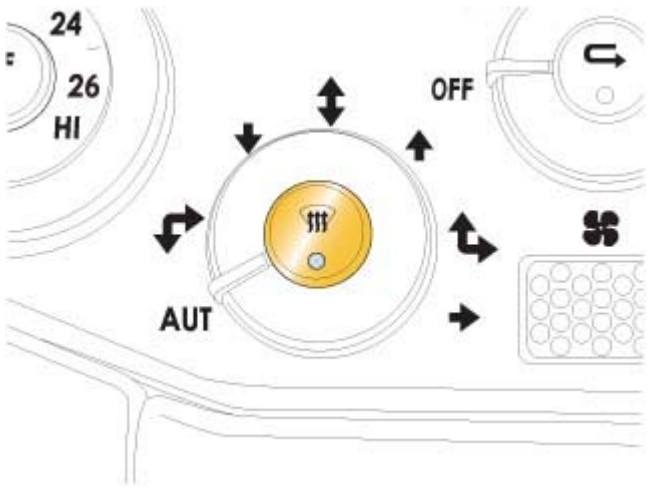
To turn the AC compressor off, press the button **(B)** and turn the dial **E** (fan speed) to **(OFF)**.

Air conditioning control switch (B)



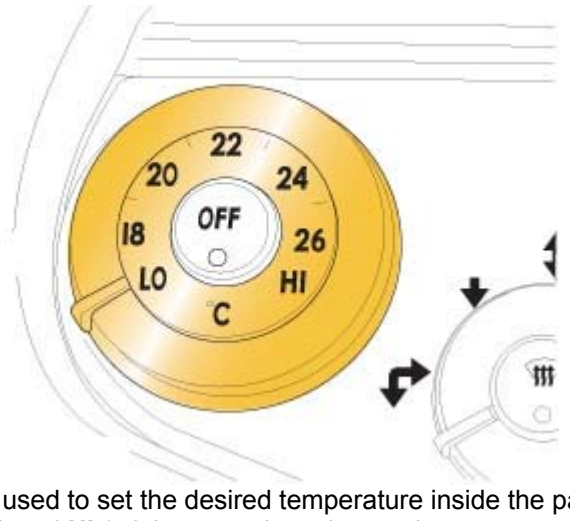
Released (LED off): the air conditioner is on. The air is cooled and/or dehumidified only in relation to the selected temperature.
Pressed (LED on): the air conditioner is off. The heating function remains enabled and will activate in relation to the selected temperature.

Air distribution controls (C) and (G)



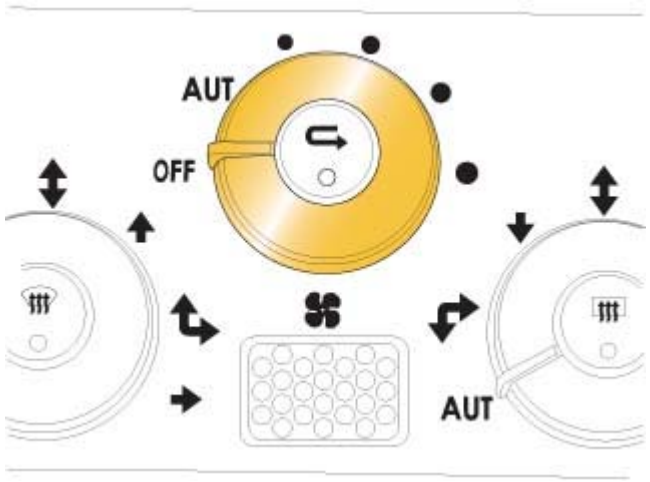
There are two air distribution modes:
Automatic AUT: air distribution is controlled automatically by the electronic system in relation to ambient conditions and the selected temperature.
Manual: air flow may be manually adjusted in six different positions in the respective zone (driver or passenger).

Temperature selection controls (A) and (I)



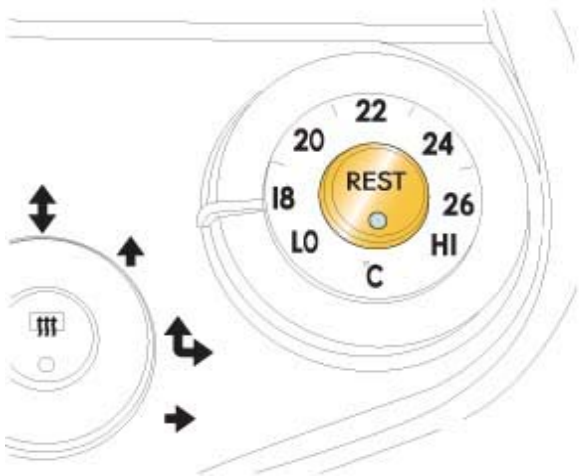
This is used to set the desired temperature inside the passenger compartment.
The **LO** and **HI** (minimum and maximum air temperature) functions are enabled by turning the dial completely in the relative direction.

Fan speed control (E)



There are three fan speed modes:
Automatic AUT: air distribution is controlled automatically by the electronic system to achieve and maintain the selected temperature.
Manual OFF: this switches the air conditioning off, permitting external air into the vehicle only when the vehicle is moving.
Fan speed: allows occupants to select from four possible fan speed settings.

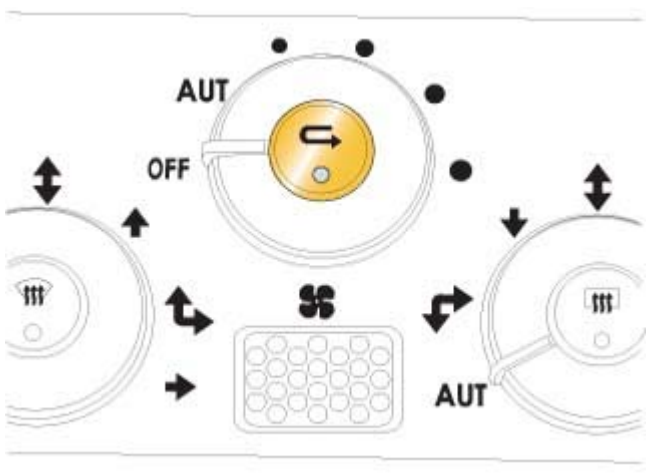
Residual heat function (J)



Once selected, the residual heat function is enabled for a period determined by an internal timer (maximum 15 minutes) when the key is turned to **"0"**.
Turning the ignition key disables the function.
The function cannot be enabled or is automatically disabled in the following cases:
- battery voltage lower than 11.5 V.
- ambient temperature above 25°C.

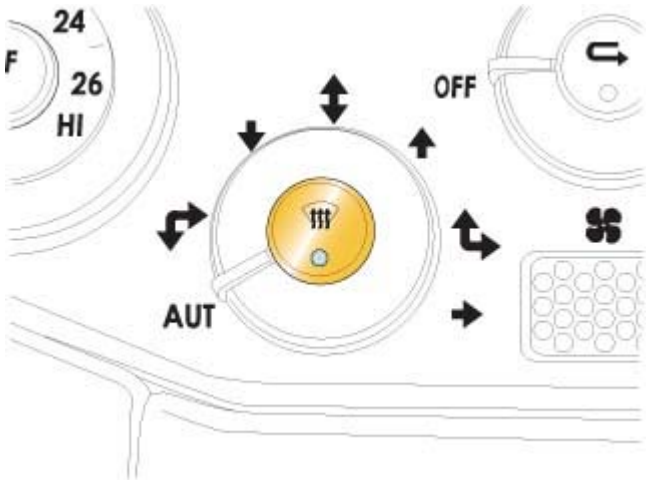
With the ignition key turned to **"0"** and the function enabled, the system:
- memorises ambient, passenger compartment and engine coolant temperature data
- activates the recirculation pump
- deactivates the compressor
- controls split zone distribution
- forces air recirculation function to open mode
- sets air flow to minimum
- controls valve aperture to maintain passenger compartment temperature as constant as possible.

Air recirculation switch (F)



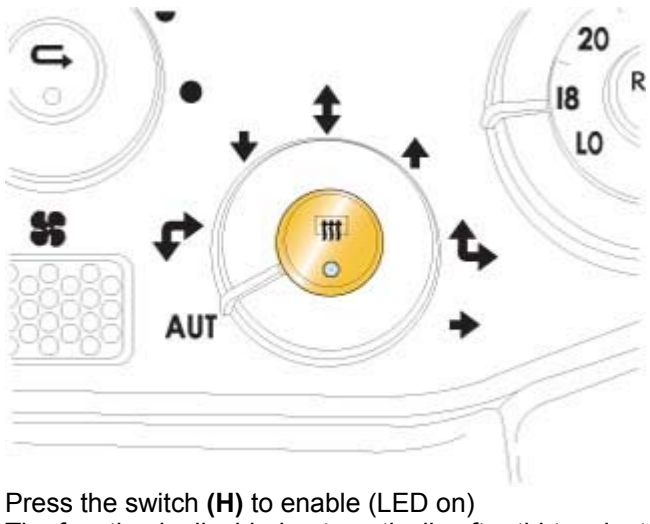
Released (LED off): air flow sourced from outside the vehicle.
With ambient temperatures above 35°C (95°F), the air recirculation function is constantly enabled, with a 120 second pause every twenty minutes to refresh the air.
Pressed (LED on): air flow sourced from inside the passenger compartment.
The recirculation function speeds up air heating or cooling.

Windscreen demist/de-ice switch (D)



Press (LED on) to enable the windscreen demist/de-ice function.
Press the switch **(D)** to disable the function.

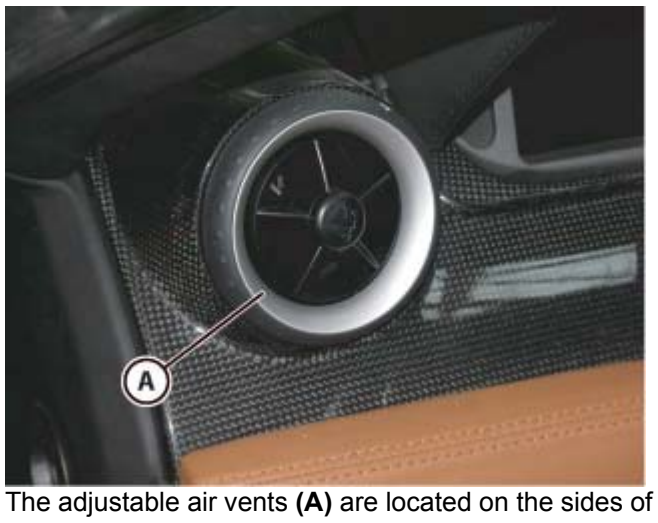
Demist/de-ice switch (H) for rear screen and external rear view mirrors



Press the switch **(H)** to enable (LED on)
The function is disabled automatically after thirty minutes if not switched off by the user.

Adjusting air vents





The adjustable air vents **(A)** are located on the sides of the dashboard.



The adjustable air vents **(A)** are located at the centre of the dashboard.



Air flow direction **(X)**.
Air flow rate **(Y)**.
Turned counterclockwise: open
Turned clockwise: closed

Maintenance

The pollen filter must be replaced every year.

Sun sensor

The sensor is located on the instrument panel and optimises ventilation and temperature control inside the passenger compartment in relation to sunlight intensity.

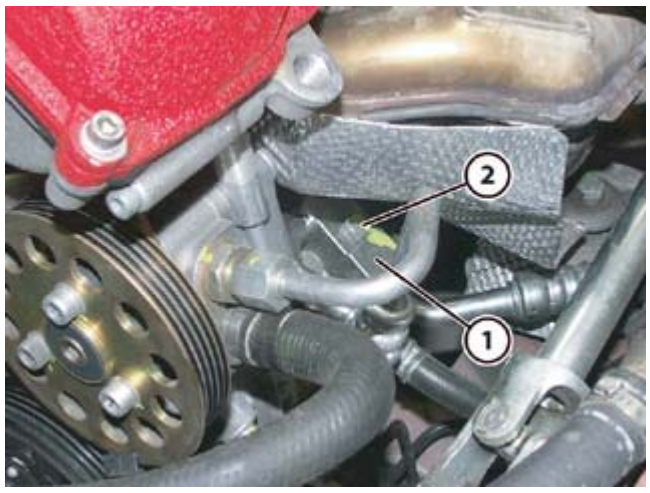
I2.01 Compressor

Compressor

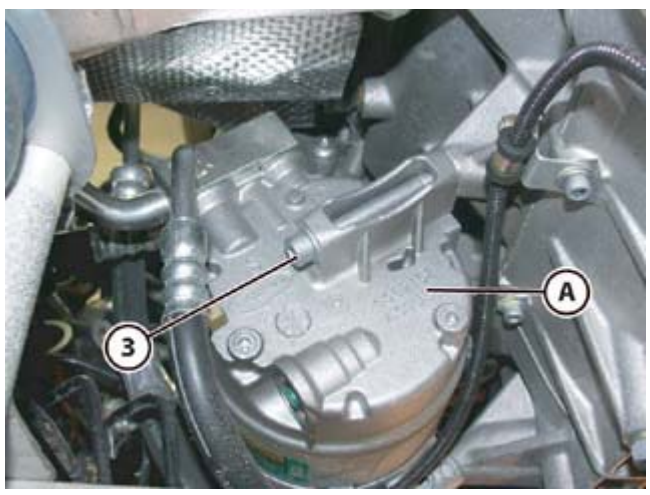
The A.C. compressor is located at the front left hand side of the engine.
Like the hydraulic steering pump, the compressor is driven by a belt driven in turn by the pulley on the crankshaft.

Removing the AC compressor

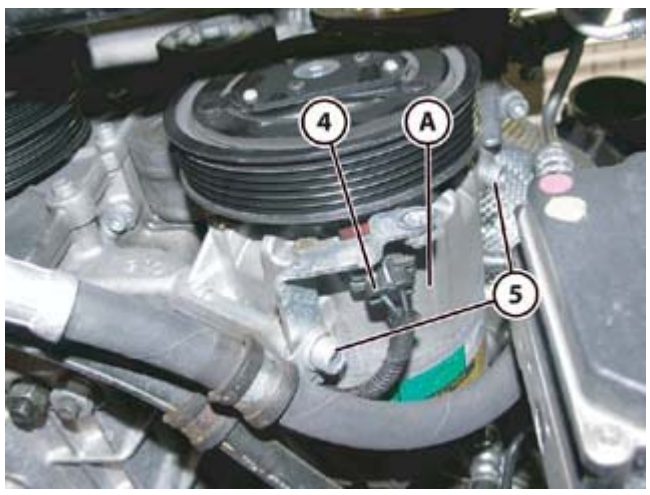
- Set the battery master switch to OFF (L2.02).
- Remove the hydraulic steering pump/compressor drive belt (A3.12).
- Empty the air-conditioning system (I3.01).



- Remove the inlet pipe **(1)** and the outlet pipe by undoing the screw **(2)**.



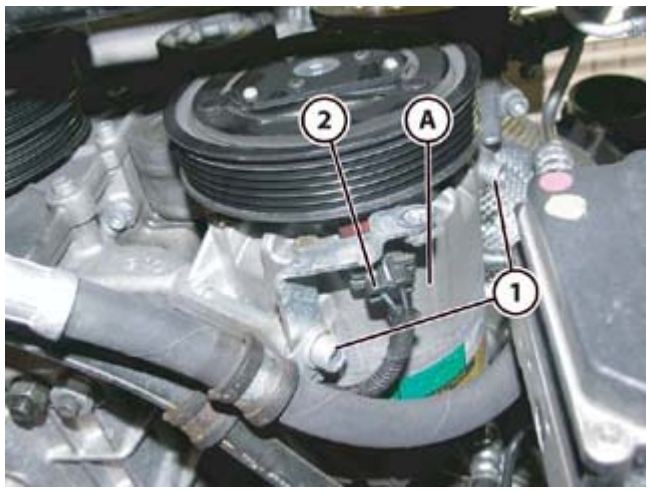
- Undo the rear screw **(3)** fastening the compressor **(A)** onto the engine.



- Detach the connector **(4)** (M025) and undo the two screws **(5)**, retrieving the spacers.
- Easing the compressor **(A)** out from underneath the vehicle, remove from the engine compartment.

Refitting the A.C. compressor

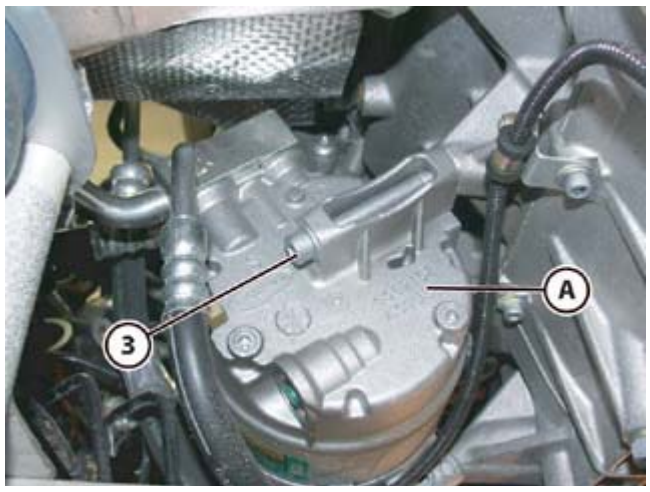
Tightening torque		Nm	Class
A.C. compressor - crankcase	Screw	25 Nm	B
Pipes - compressor	Screw	25 Nm	A



- Fit the A.C. compressor **(A)** in its seat, working from underneath the vehicle, and fit the spacers retrieved during removal.
- Tighten the two screws **(1)**.

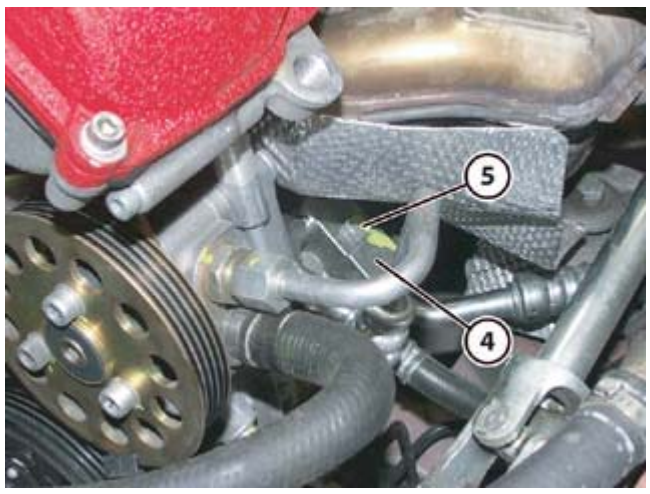
Tightening torque	Nm	Class
Screw	25 Nm	B

- Fit the connector **(2)** (M025)onto the compressor.



- Fasten the compressor **(A)** at the rear, tightening the rear screw **(3)**.

Tightening torque	Nm	Class
Screw	25 Nm	B



- Fasten the inlet and outlet pipes **(4)** onto the compressor with the screw **(5)**.

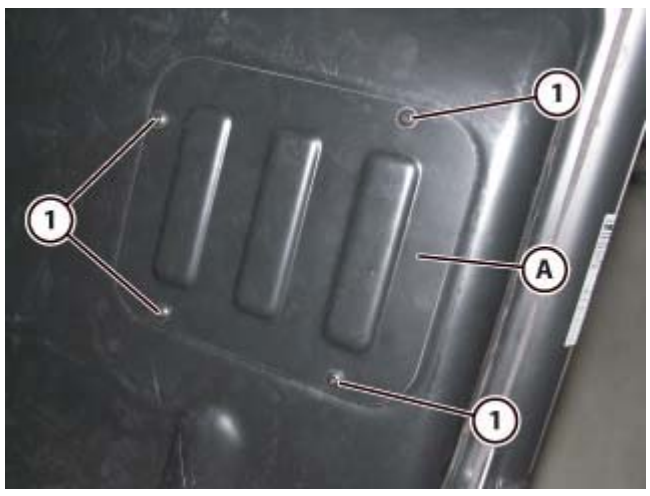
Tightening torque	Nm	Class
Screw	25 Nm	A

- Fill the air-conditioning system. (I3.01).
- Refit the hydraulic steering pump/compressor drive belt (A3.12).
- Set the battery master switch to ON (L2.02).

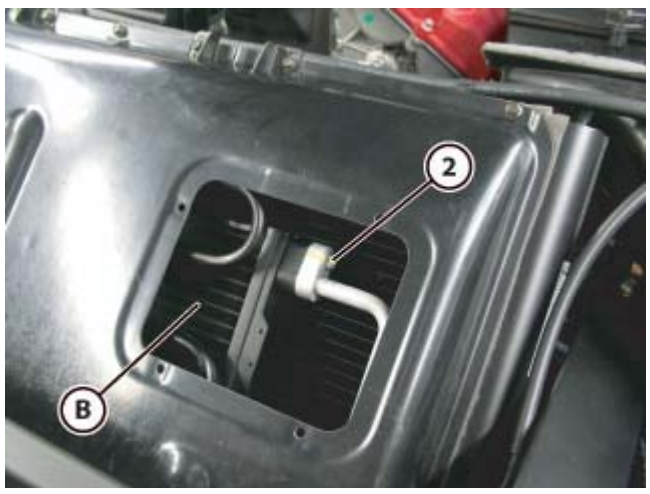
I2.02 Condenser

Removing the air conditioning and heating system condenser

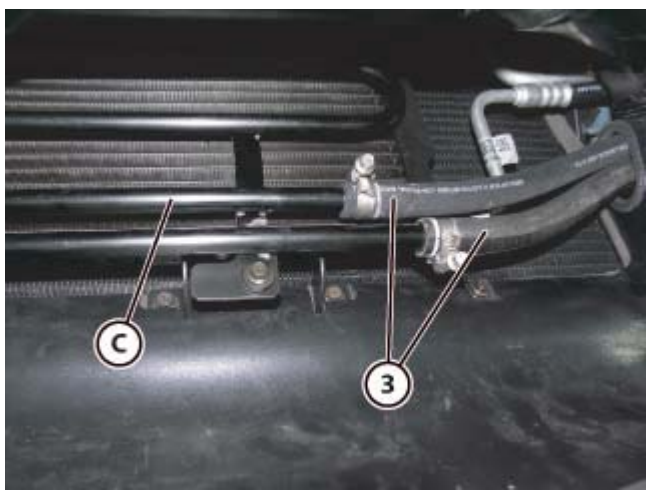
- Remove the central engine compartment shield (M2.17).
- Empty the air-conditioning system (I3.01).
- Remove the front bumper (M2.03).
- Drain the hydraulic steering system (E2.07).



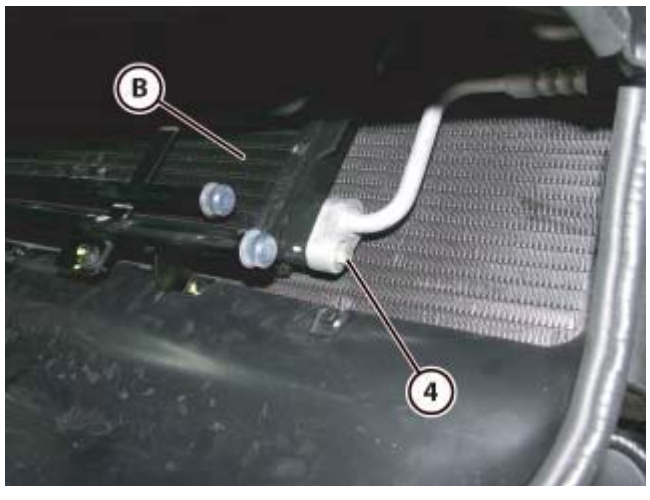
- Remove the inspection cover **(A)** and tighten the four screws **(1)**.



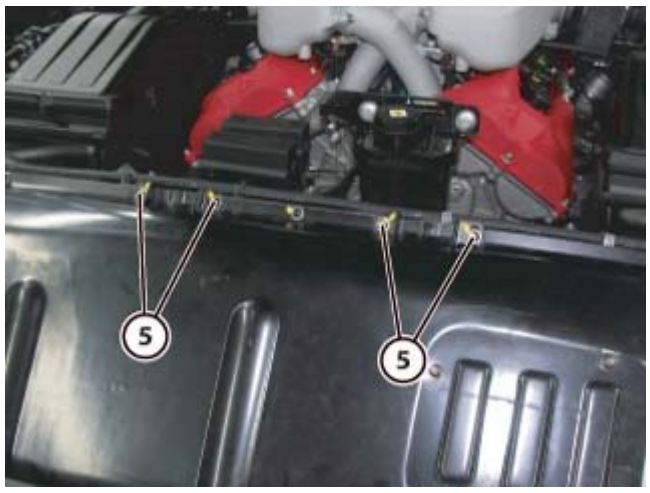
- Undo the screw **(2)** fastening the upper pipe to the air conditioning and heating system condenser **(B)**.



- Remove the two delivery and return pipes **(3)** from the hydraulic steering fluid coil **(C)**.



- Undo the screw **(4)** fastening the upper pipe to the air conditioning and heating system condenser **(B)**.



- Remove the four screws **(5)** from the condenser mounting brackets on the coolant radiator.



- Remove the four screws **(6)** from the condenser mounting brackets on the coolant radiator.
- Remove the condenser **(B)** complete with hydraulic steering coil, easing out from underneath.

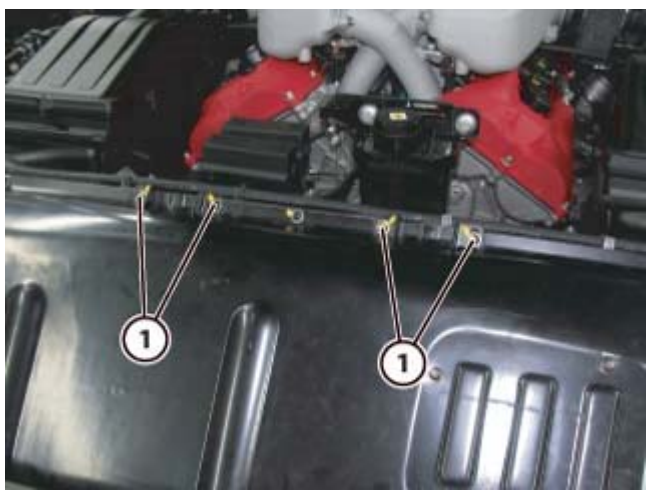
➢ Remove the hydraulic steering coil (E2.04).

Refitting the air conditioning and heating system condenser

Tightening torque		Nm	Class
Refrigerant radiator condenser bracket	Screw	5 Nm	B
Unions - condenser	Screw	7.4 Nm	B

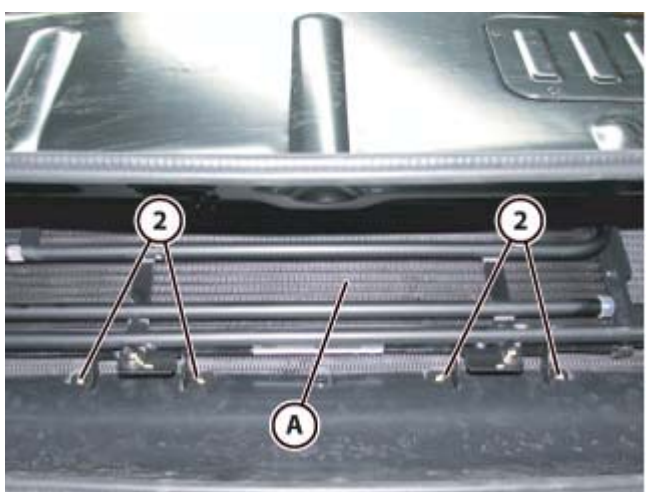
Before refitting, check that the air conditioning and heating system condenser is in proper working order.

➢ Refit the hydraulic steering coil (E2.04).



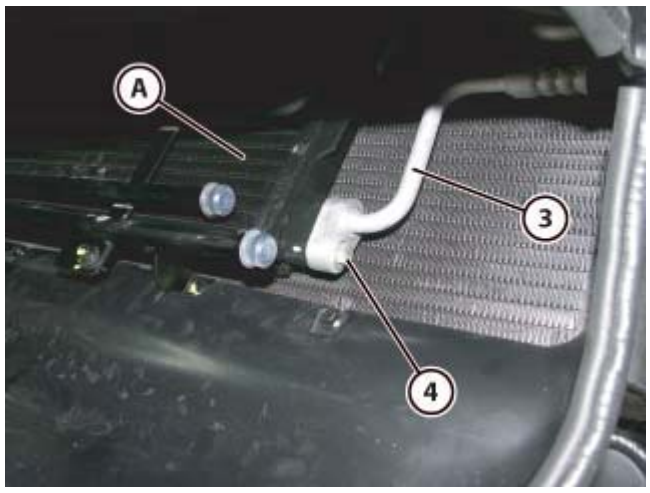
- Fit the air conditioning and heating system condenser, complete with coil, in the vehicle, underneath the air duct, on the coolant radiator.
- Fasten the condenser and tighten the four upper screws **(1)**.

Tightening torque	Nm	Class
Screw	5 Nm	B



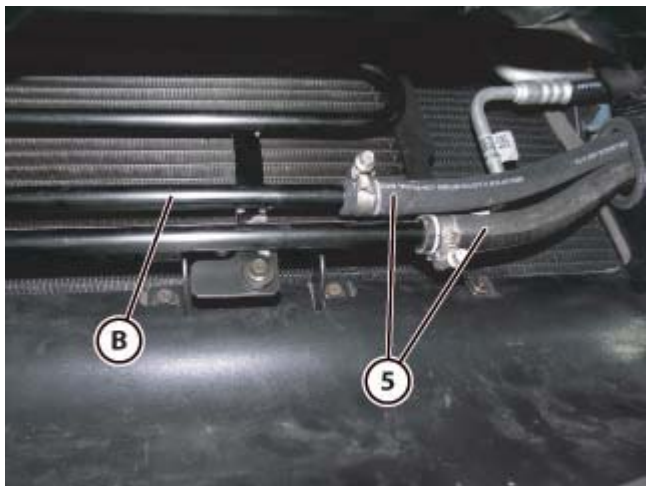
- Fasten the condenser **(A)** by tightening the four lower screws **(2)**.

Tightening torque	Nm	Class
Screw	5 Nm	B

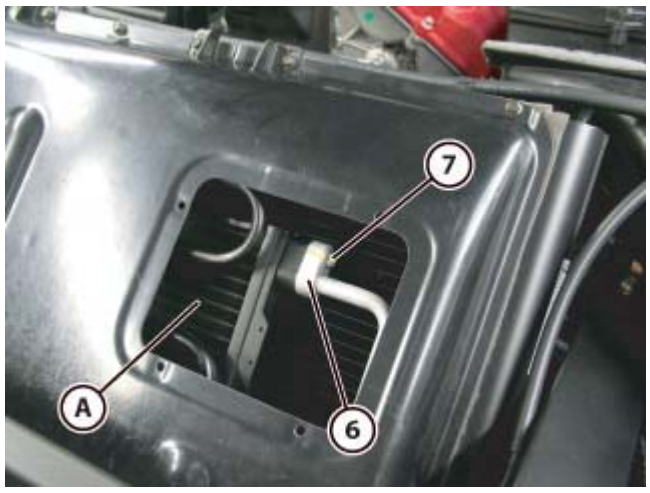


- Fit the pipe **(3)** on the condenser **(A)** and tighten the screws **(4)**.

Tightening torque	Nm	Class
Screw	7.4 Nm	B

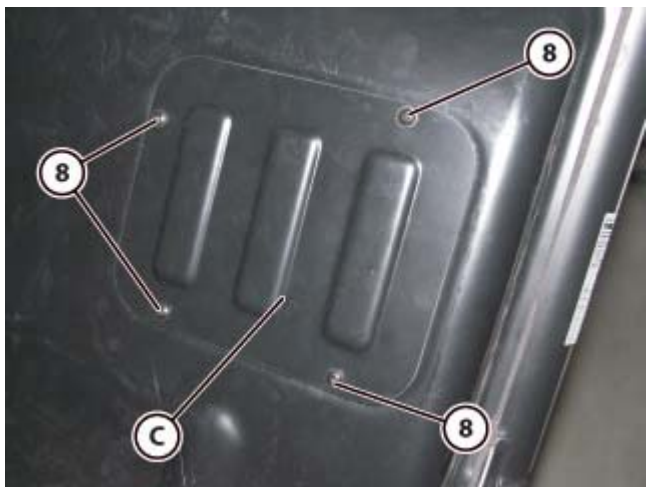


- Connect the two delivery and return pipes **(5)** to the coil **(B)**.



- Fit the pipe **(6)** on the condenser **(A)** and tighten the screw **(7)**.

Tightening torque	Nm	Class
Screw	7.4 Nm	B



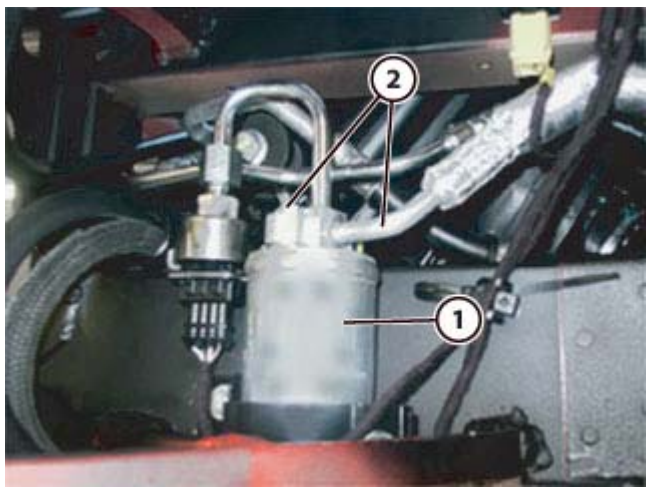
- Fit the inspection cover **(C)** and tighten the four screws **(8)**.

- Fill the power steering system (E2.07).
- Refit the front bumper (M2.03).
- Fill the air-conditioning system. (I3.01).
- Refit the central engine compartment shield (M2.17).

I2.03 Dehydrator filter

Removing the dehydrator filter

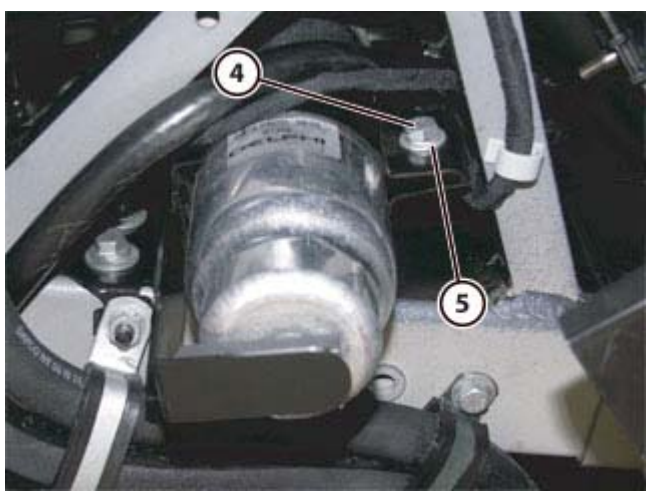
- Empty the air-conditioning system (I3.01).
- Remove the front section of the underfloor (M2.12).
- Remove the front left hand wheelhouse (M2.05).



- To remove the dehydrator filter, **(1)** remove the pipe unions **(2)**.

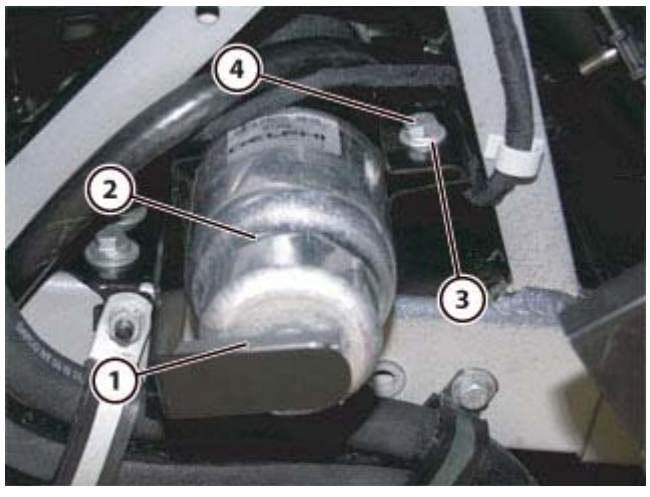


- Unscrew the nut **(3)**.



- Remove the screw **(4)**, retrieving the washer **(5)**.
- Remove the dehydrator filter from the bracket.

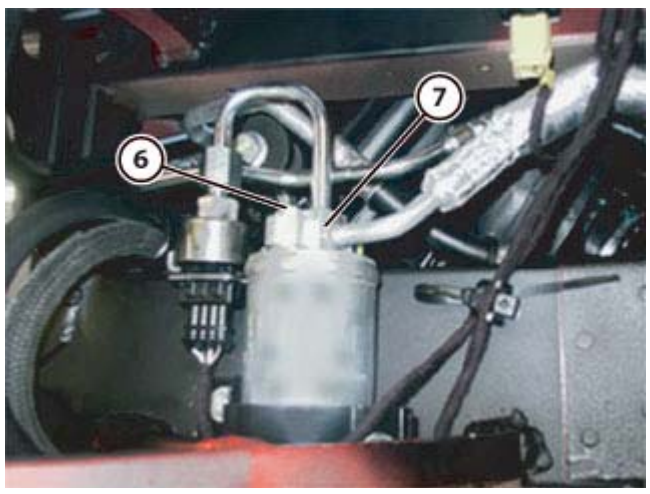
Refitting the dehydrator filter



- Check that the rubber shim is fitted **(1)** correctly on the base of the filter bracket and that it is good condition.
- Fit the filter **(2)** in its seat on the bracket.
- Fit the screw **(4)** and the washer **(3)** into the hole on the bracket.



- Tighten the nut **(5)**.



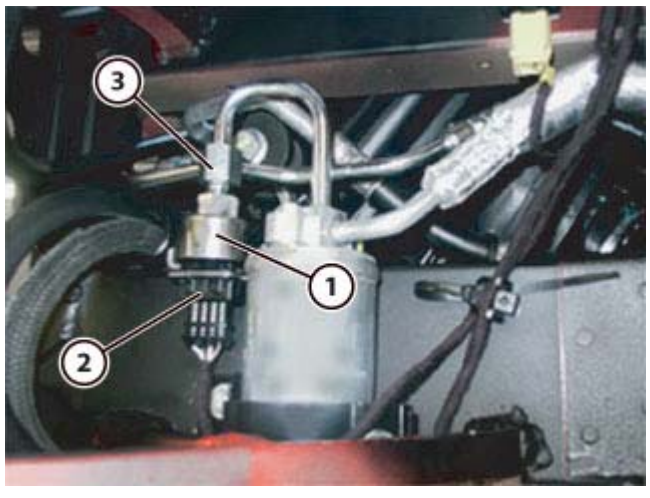
- Fit the pipes **(6)** and **(7)** on the filter and tighten the relative unions.

- Refit the front left hand wheelhouse (☞ M2.05).
- Refit the front flat undertray section (☞ M2.12).
- Fill the air-conditioning system. (☞ I3.01).

I2.04 Pressure switch

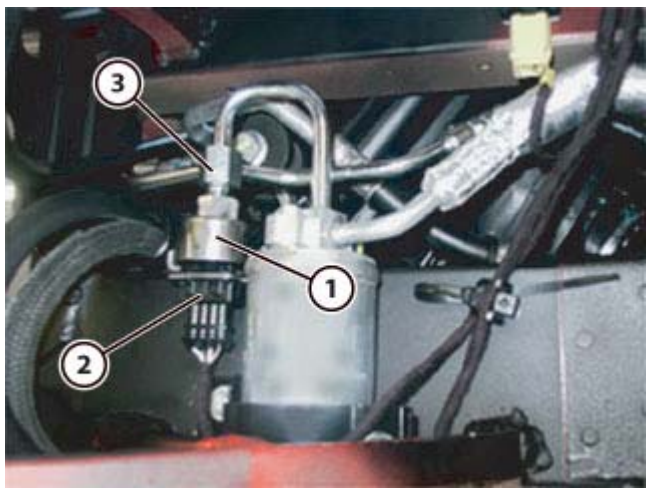
Removing the pressure switch

- Set the battery master switch to OFF (L2.02).
- Empty the air-conditioning system (I3.01).
- Remove the front left hand wheelhouse (M2.05).



- To remove the pressure switch **(1)**, disconnect the connector **(2)** (S005).
- Unscrew the union **(3)**.
- Remove the pressure switch.

Refitting the pressure switch



- Fit the pressure switch **(1)** and tighten the coupling **(3)**.
- Connect the connector **(2)** (S005).

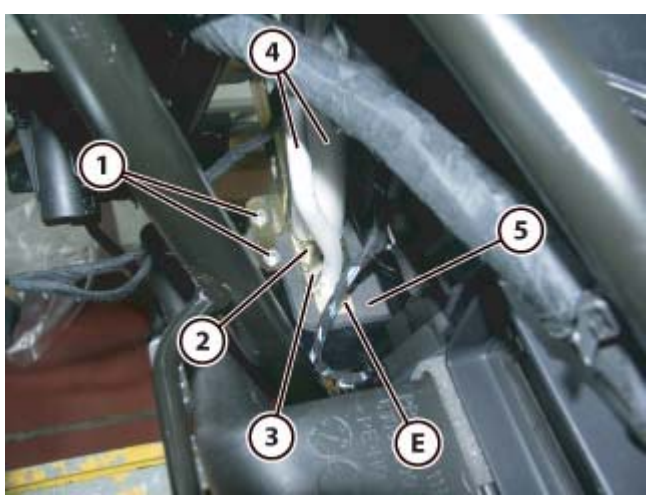
- Set the battery master switch to ON (L2.02).
- Fill the air-conditioning system. (I3.01).
- Refit the front left hand wheelhouse (M2.05).

I2.05 Expansion valve

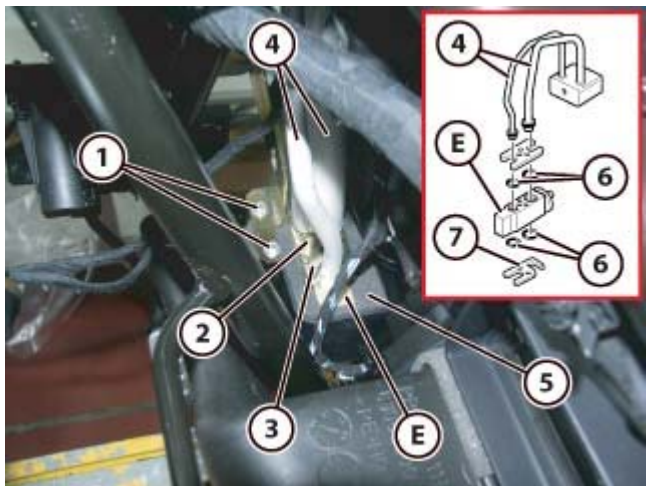
Replacing the expansion valve

The expansion valve is supplied together with the heater/evaporator unit but may also be ordered individually in the event of malfunction.

➢ Remove the heater/evaporator (I2.06).



- Unscrew the two screws **(1)** fastening the bracket onto the expansion valve container.
- Unscrew the screws **(2)** and remove the upper flange **(3)**
- Remove the two pipes **(4)** complete with flange fastening to the bodywork.
- Remove the insulation **(5)** and disconnect the expansion valve **(E)** from the pipes on the evaporator.



- Replace the four O-rings **(6)** lubricating, with specific oil for refrigeration systems **R134A**.
- Fit the expansion valve **(E)** correctly in its seat.
- Fit the insulation **(5)**, as originally installed, and fit the pipes **(4)**, on the expansion valve **(A)**.
- Fasten the expansion valve **(A)** to the lower flange **(7)**, and fasten the pipes **(4)** fitting and fastening the upper flange **(3)** with the screws **(2)**.
- Fit the bracket on the expansion valve container and fasten with the two screws **(1)**.

➢ Refit the heater/evaporator (I2.06).

I2.06 Heater/Evaporator

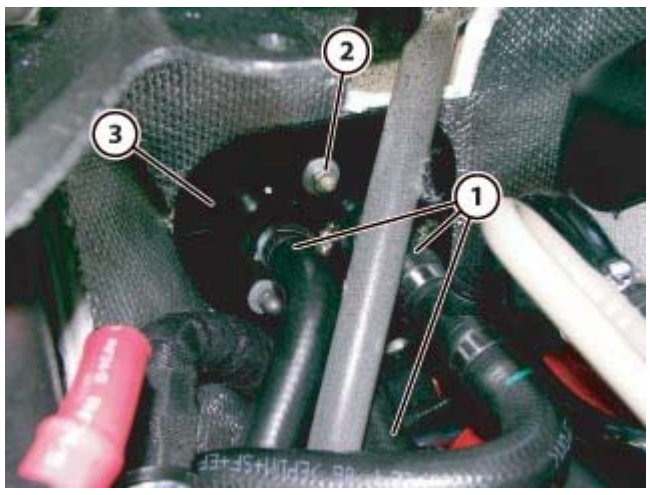
Removing the heater/evaporator

The unit is mounted onto to the passenger compartment-engine compartment bulkhead and contains the heater and evaporator in a single assembly.

- Set the battery master switch to OFF (L2.02).
- Empty the air-conditioning system (I3.01).
- Drain the engine cooling system (A3.07).
- Remove the underwindscreen shields (M2.17).
- Replace the windscreen wiper motor (L2.05).
  Remove only.

- Remove the seat (M2.21).
  Remove both.

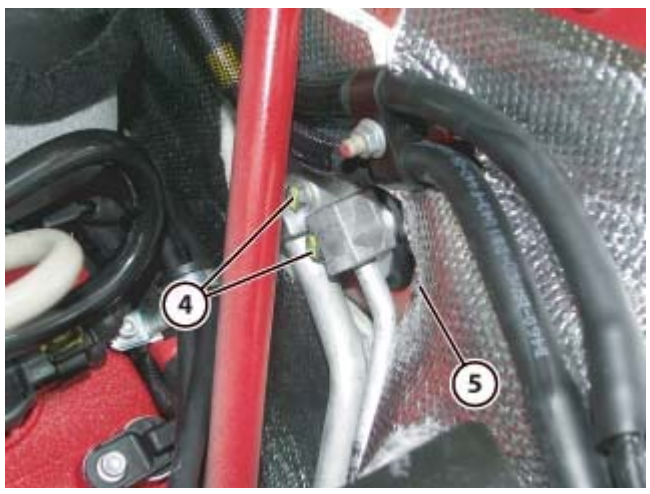
- Remove the instrument panel (M2.19).
- Remove the accelerator control (H3.16).



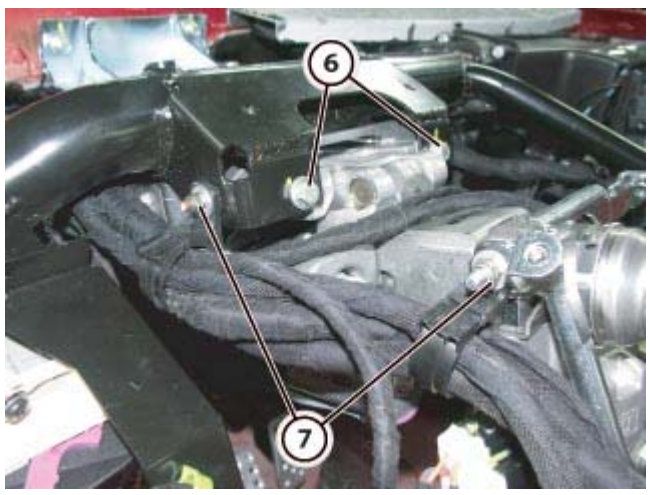
- Disconnect the heating/cooling unit delivery and return lines **(1)** to the engine.

Protective sleeves may be fitted to the pipes described above at interference points with surrounding components; when replacing pipes, refit the sleeves as originally installed.

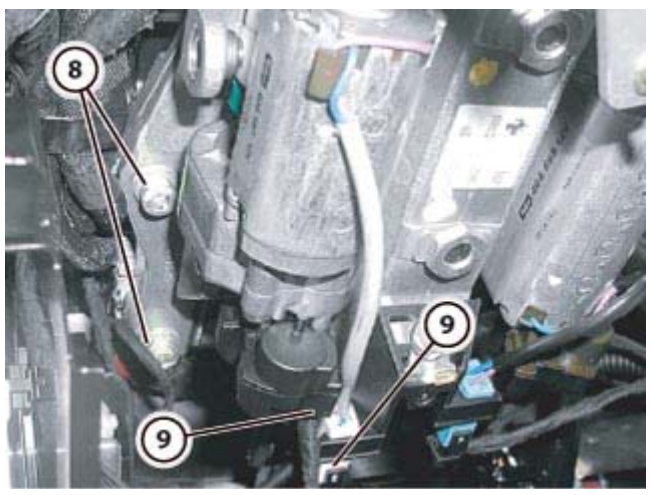
- Undo the three nuts **(2)** and remove the plate **(3)** from the engine compartment.



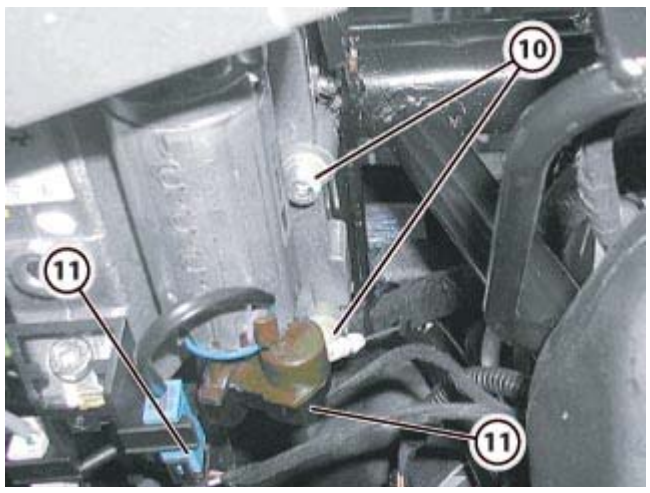
- Undo the screws **(4)** in the engine compartment and disconnect the two low and high pressure air conditioning and heating system lines.
- Undo the two nuts **(5)** fastening the heating/cooling unit to the bodywork.



- Undo the two upper screws **(6)** fastening the steering column to the cross member.
- Undo the two nuts **(7)** fastening the wiring harness.



- Undo the two fastener screws **(8)** at the bottom left of the steering column.
- Disconnect the two connectors **(9)** (M034) for vertical steering column adjustment.



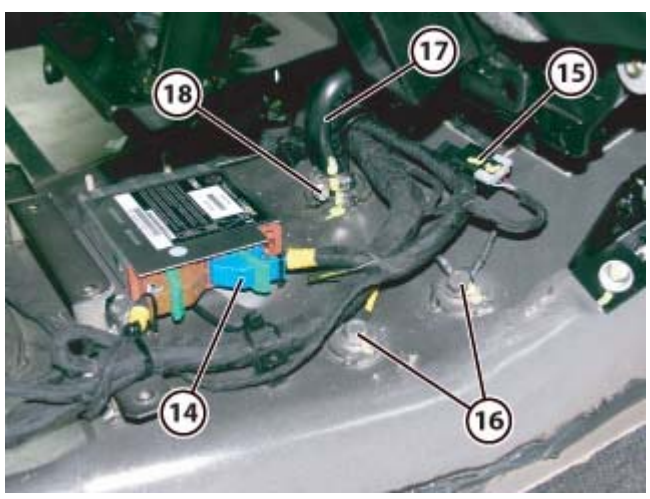
- Undo the two bottom right hand fastener screws **(10)** and lower the steering column.
- Disconnect the two connectors **(11)** (M032) for axial steering column adjustment.



- Disconnect the connector **(12)** (D002) from the ignition switch.



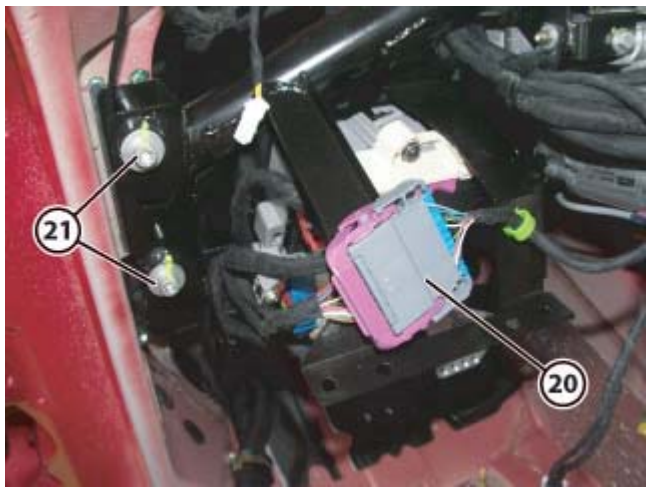
- Undo the screw **(13)** fastening the dash cross member to the bodywork.



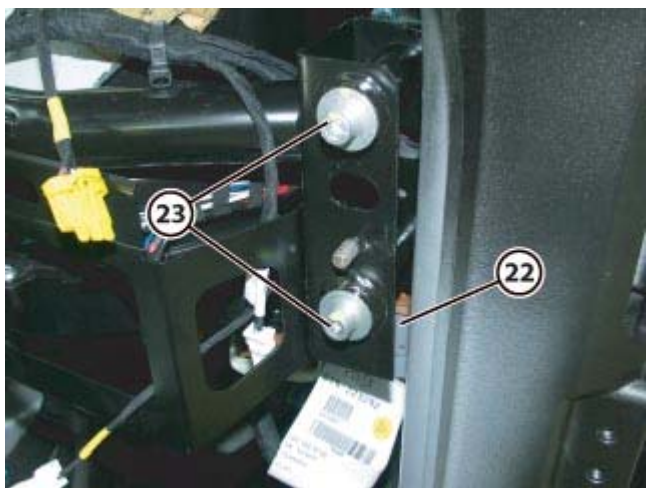
- Disconnect the connector **(14)** (E073), **(15)** (X306) and undo the two screws **(16)** fastening the two earth leads (G024) (G313) (G317).
- Disconnect the condensation drain tube **(17)** and remove the clamp **(18)**.



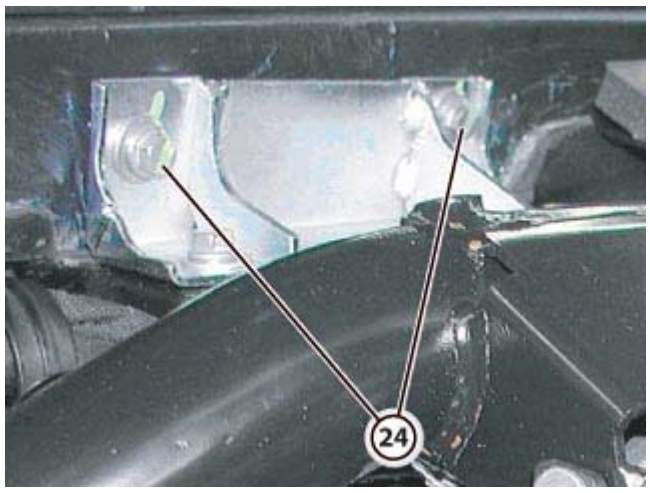
- Undo the two screws **(19)** fastening the heater/evaporator to the bodywork behind the fan.



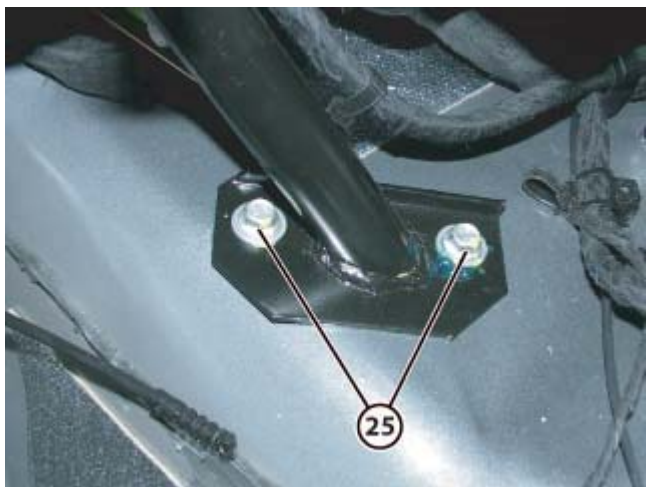
- Disconnect the connector linking the dash wiring harness and the engine compartment wiring harness **(20)** (Y312) and undo the two screws **(21)** fastening the cross member to the dash on the driver side.



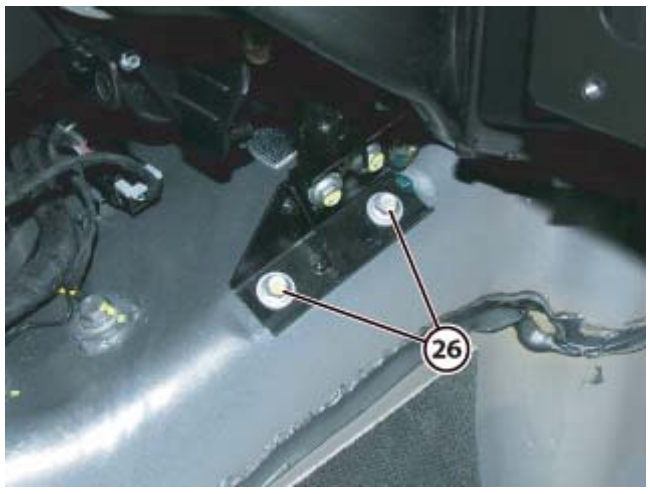
- Disconnect the connector linking the dash wiring harness and the passenger compartment wiring harness **(22)** (Y306) and undo the two screws **(23)** fastening the cross member to the dash on the passenger side.



- Undo the two screws **(24)** fastening the dashboard cross member to the bodywork above the steering column.



- Undo the two screws **(25)** fastening the dashboard cross member to the bodywork on the driver side of the transmission tunnel.



- Undo the two screws **(26)** fastening the dashboard cross member to the bodywork on the passenger side of the transmission tunnel.

- Slowly remove the heating/cooling unit, complete with dash cross member, from the passenger compartment, taking care not to damage surrounding components.

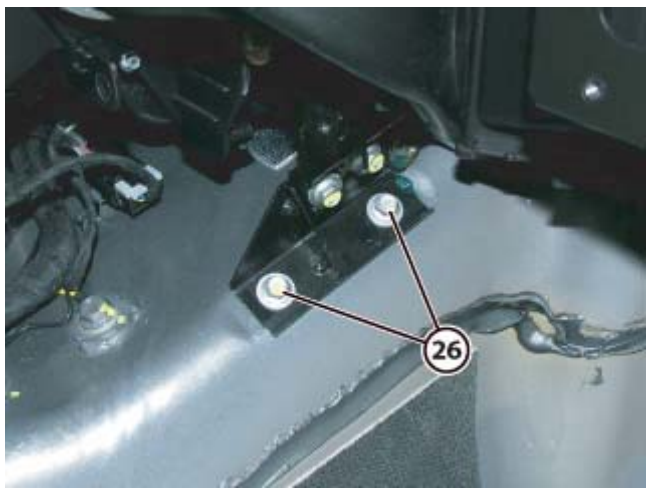
Recover the spacers and secure in their respective seats with adhesive tape to ensure that they are correctly reinstalled later in their original positions.

Refitting the heater/evaporator

Tightening torque		Nm	Class
Dashboard mounting cross member - bodyshell	Screw	25 Nm	B
Steering column - dashboard cross member	Screw	20 Nm	B

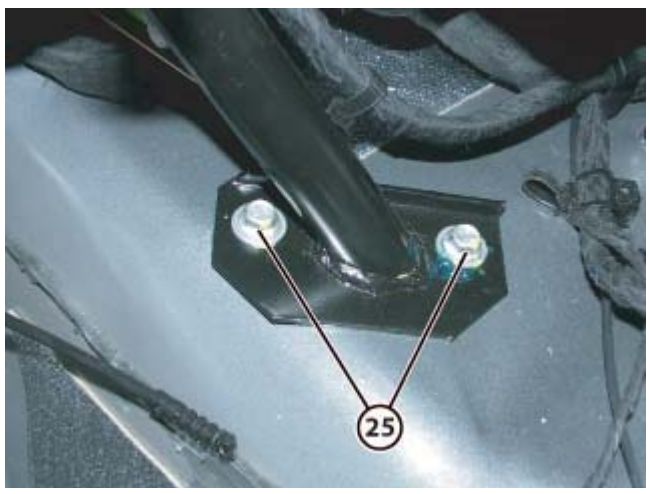
Replace all the rubber gaskets in the air conditioning system lines.

- Fit the heater/evaporator in its relative seat in the passenger compartment, with the original spacers already in place and taking care not to damage any surrounding components.
- Temporarily power the system and check that the electric motors and specific controls of the heating/cooling unit function correctly; in the event of excessive noise or malfunction, troubleshoot and resolve cause.



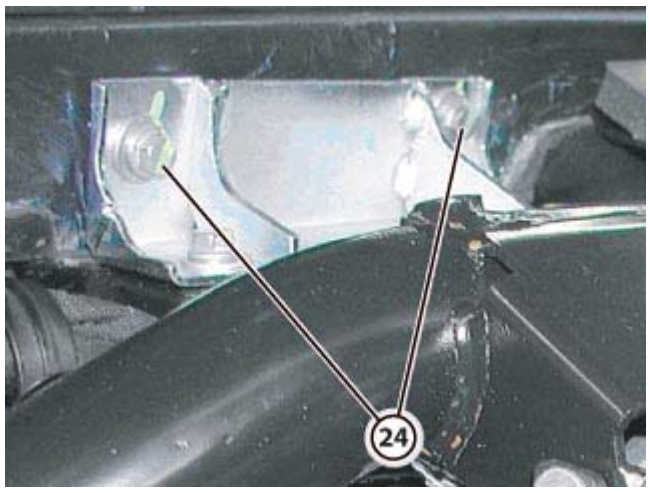
- Tighten the two screws **(26)** fastening the dashboard cross member to the bodywork on the passenger side of the transmission tunnel.

Tightening torque	Nm	Class
Screw	25 Nm	B



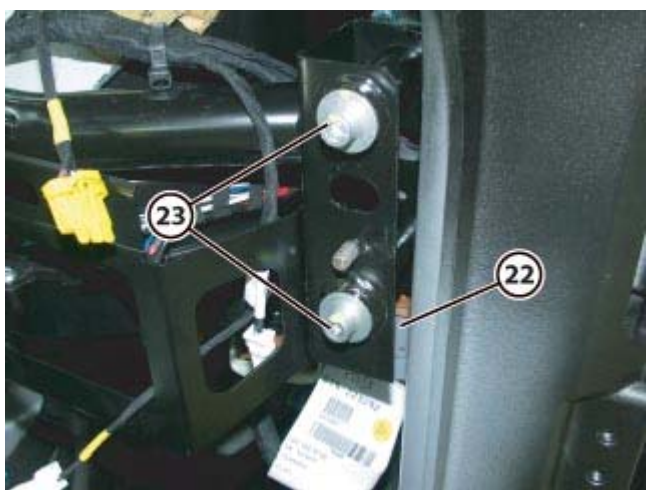
- Tighten the two screws **(25)** fastening the dashboard cross member to the bodywork on the driver side of the transmission tunnel.

Tightening torque	Nm	Class
Screw	25 Nm	B



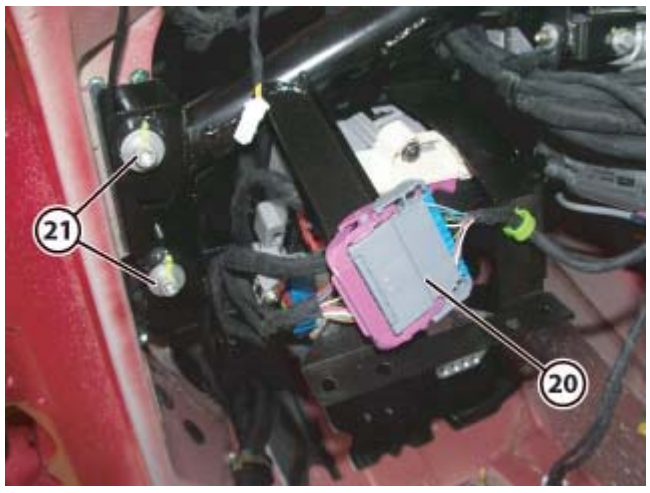
- Tighten the two screws **(24)** fastening the dashboard cross member to the bodywork above the steering column.

Tightening torque	Nm	Class
Screw	25 Nm	B



- Connect the connector joining the dash wiring harness and the passenger compartment wiring harness **(22)** (Y306) and tighten the two screws **(23)** fastening the cross member to the dash on the passenger side.

Tightening torque	Nm	Class
Screw	25 Nm	B



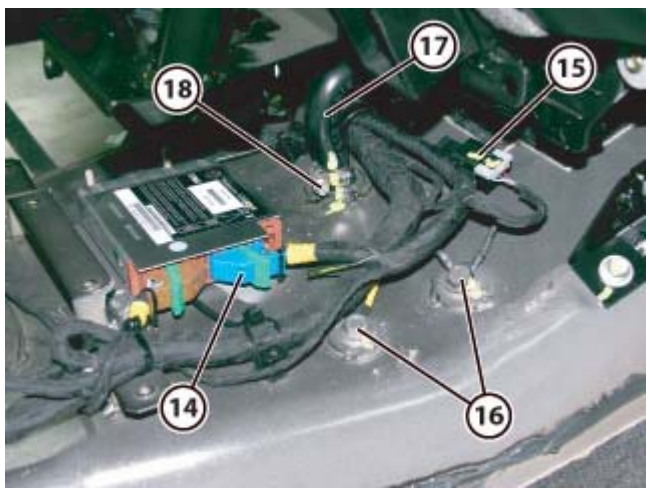
- Connect the connector joining the dash wiring harness and the engine compartment wiring harness **(20)** (Y312) and tighten the two screws **(21)** fastening the cross member to the dash on the driver side.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	B



- Tighten the two screws **(19)** fastening the heater/evaporator to the bodywork behind the fan.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	B



- Connect the condensation drain tube **(17)** and fasten the clamp **(18)**.
- Connect the connector **(14)** (E073), **(15)** (X306) and hand tighten the two screws **(16)** fastening the earth leads (G024) (G313) (G317).

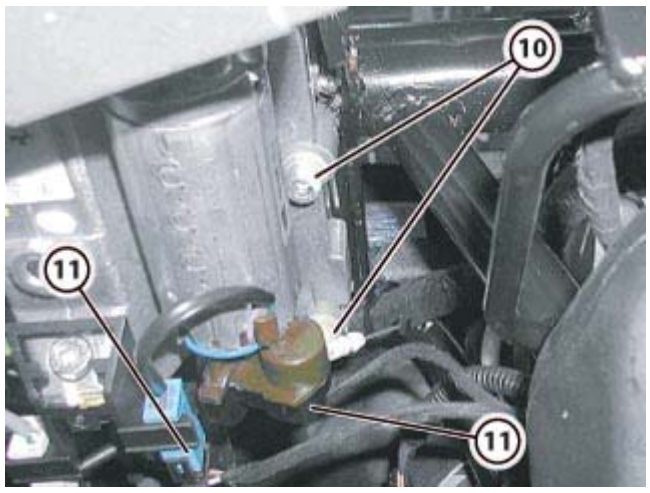


- Tighten the screw **(13)** fastening the dash cross member to the bodywork.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	B

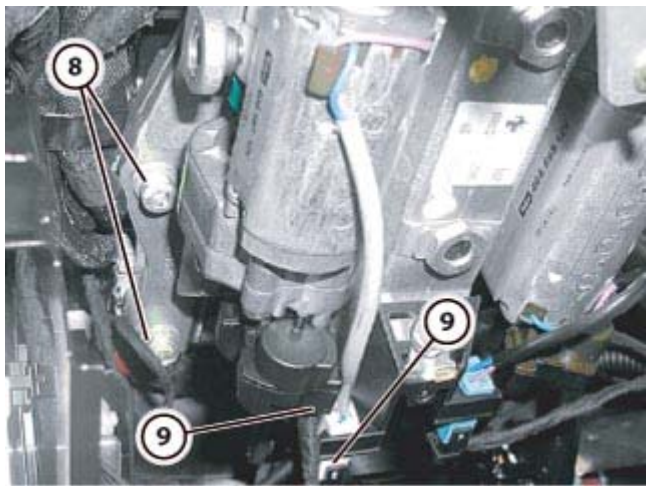


- Connect the connector **(12)** (D002) to the ignition switch.



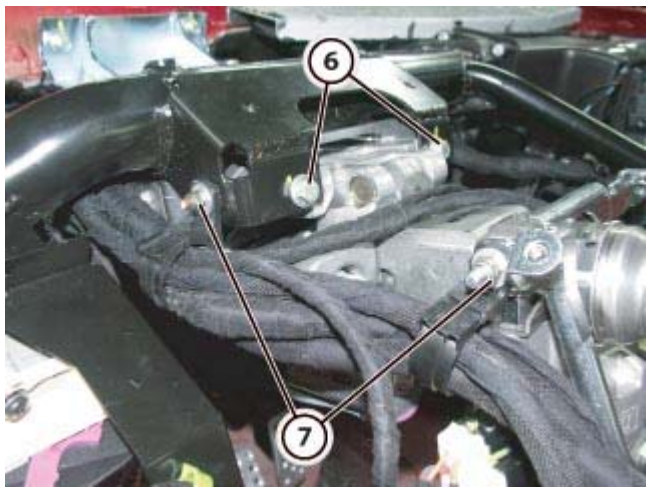
- Connect the two connectors **(11)** (M032) for axial steering column adjustment.
- Lift the steering column and tighten the two bottom right hand fastener screws **(10)**.

Tightening torque	Nm	Class
Screw	20 Nm	B



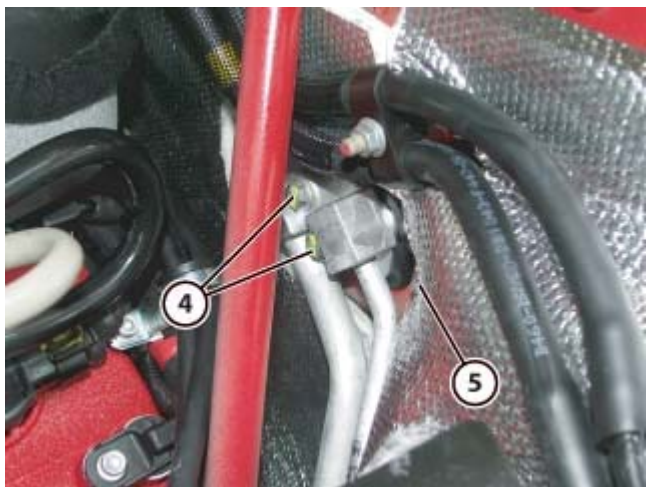
- Connect the two connectors **(9)** (M034) for vertical steering column adjustment.
- Tighten the two fastener screws **(8)** at the bottom left of the steering column.

Tightening torque	Nm	Class
Screw	20 Nm	B

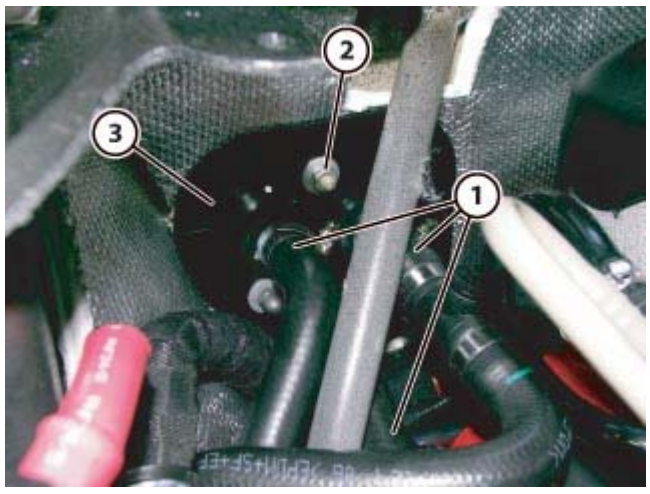


- Hand tighten the two nuts **(7)** fastening the wiring harness.
- Tighten the two upper screws **(6)** fastening the steering column to the cross member.

Tightening torque	Nm	Class
Screw	20 Nm	B



- Working from the engine compartment, hand tighten the two nuts **(5)** fastening the heating/cooling unit to the bodywork.
- Connect the two air conditioning and heating system low and high pressure lines and hand tighten the screws **(4)**.



- Working from the engine compartment, fit the plate **(3)** and fasten by hand tightening the three nuts **(2)**.
- Connect the heating/cooling unit delivery and return lines **(1)** to the engine.

i Protective sleeves may be fitted to the pipes described above at interference points with surrounding components; when replacing pipes, refit the sleeves as originally installed.

- Refit the accelerator control (H3.16).
- Refit the instrument panel (M2.19).
- Refit the seat (M2.21).
- Replace the windscreen wiper motor (L2.05).

i Refit.

- Refit the underwindscreen shields (M2.17).
- Set the battery master switch to ON (L2.02).
- Fill the cooling system (A3.07).
- Fill the air-conditioning system. (I3.01).

Replacing the TGK valve heater pipes

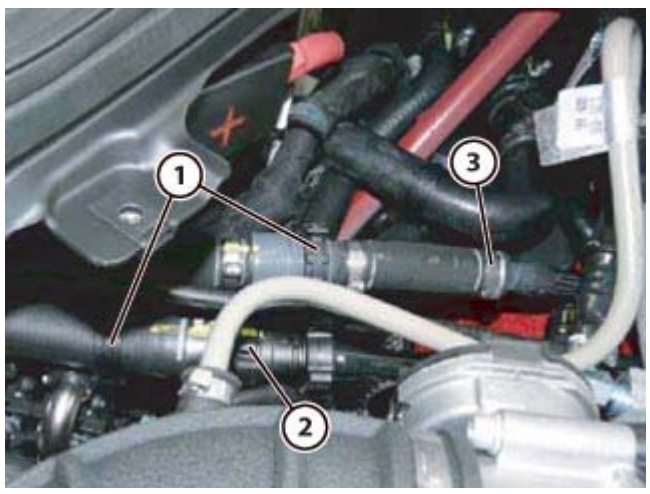
Tightening torque		**Nm**	**Class**
A.C. system water pipes	Screw collar	4 Nm	B

- Set the battery master switch to OFF (L2.02).
- Drain the engine cooling system (A3.07).
- Remove the underwindscreen shields (M2.17).

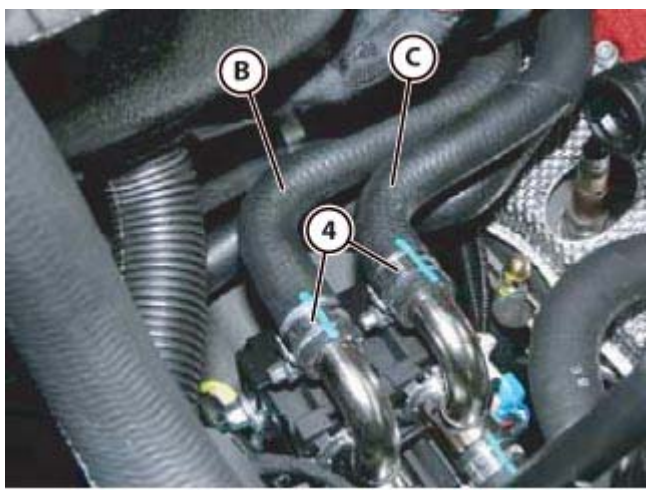
  Remove the central underwindscreen shield only.



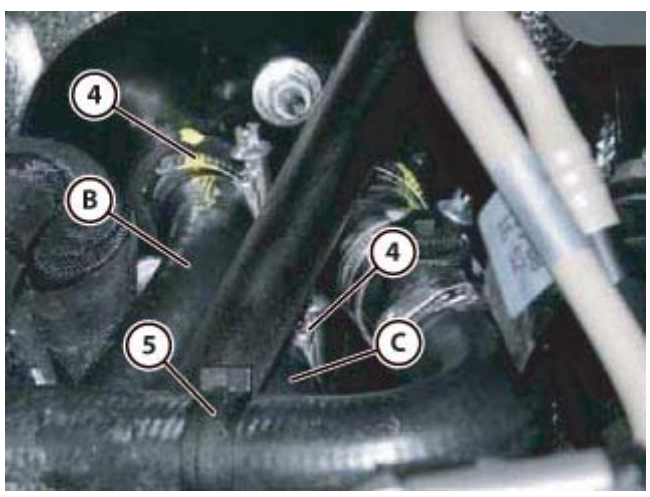
- Disconnect the oil vapour recirculation pipe **(A)** from the coupling on the engine oil tank.



- Remove the elastic retainer clips **(1)**, then disconnect the quick-coupling **(2)** and cut the retainer clamp **(3)** away from the Blow-by system pipes.
- Move the pipes out of the way so that they do not hinder the subsequent operations.

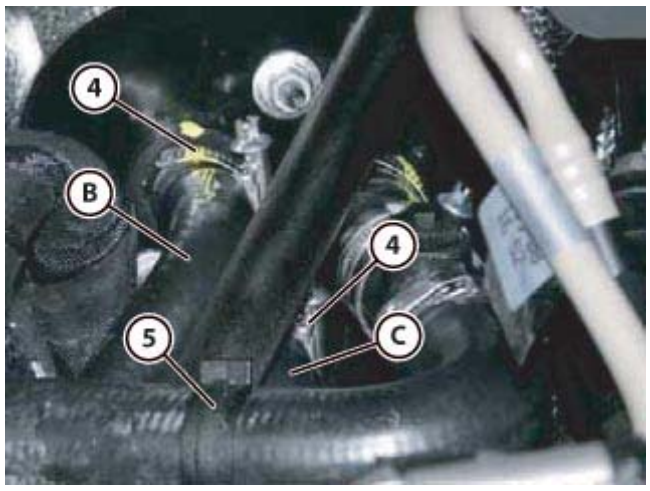


- Disconnect the damaged pipe **(B)** and/or **(C)** from the relevant TGK valve, loosening the relevant screw collar **(4)**.



- Remove the elastic clip **(5)** and then disconnect the damaged pipe, **(B)** and/or **(C)**, from the relevant coupling on the heater, loosening the relevant screw collar **(4)**.

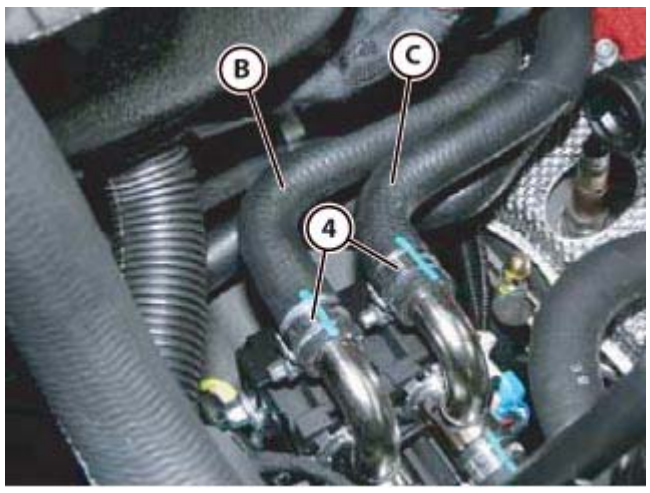
- Clean and degrease the pipe couplings on the TGK valves and on the heater.



- Connect the new pipe, **(B)** and/or **(C)**, to the relevant coupling on the heater, by tightening the relevant screw collar **(4)**, and then refit the elastic clip **(5)**.

Use new screw collars for fastening the new pipes.

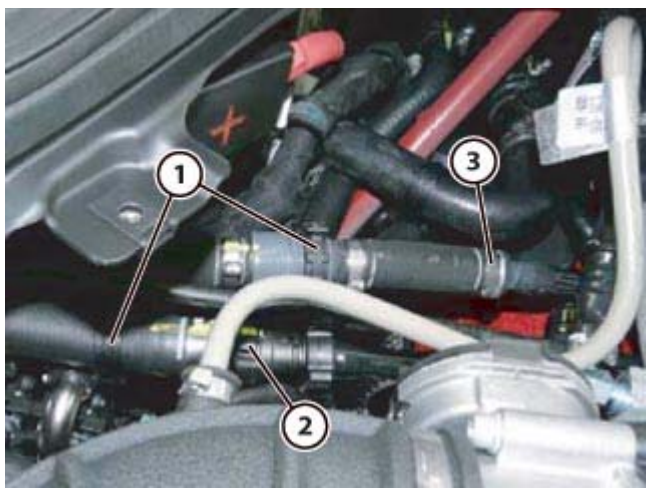
Tightening torque	Nm	Class
Screw collar	4 Nm	B



- Connect the new pipe, **(B)** and/or **(C)**, to the relevant TGK valve, by tightening the relevant screw collar **(4)**.

Use new screw collars for fastening the new pipes.

Tightening torque	Nm	Class
Screw collar	4 Nm	B



- Fit a new retainer clamp **(3)** onto the Blow-by system pipes and connect the quick coupling **(2)**, then refit the elastic retainer clips **(1)**.



- Connect the oil vapour recirculation pipe **(A)** to the coupling on the engine oil tank.

➢ Set the battery master switch to ON (L2.02).
➢ Fill the cooling system (A3.07).
➢ Refit the underwindscreen shields (M2.17).

Replacing the pipes from the heater to the water recirculation pump

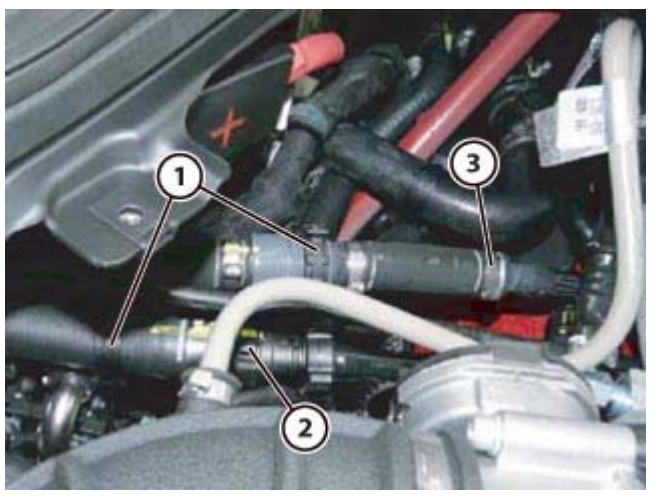
Tightening torque		Nm	Class
A.C. system water pipes	Screw collar	4 Nm	B

➢ Set the battery master switch to OFF (L2.02).
➢ Drain the engine cooling system (A3.07).
➢ Remove the underwindscreen shields (M2.17).

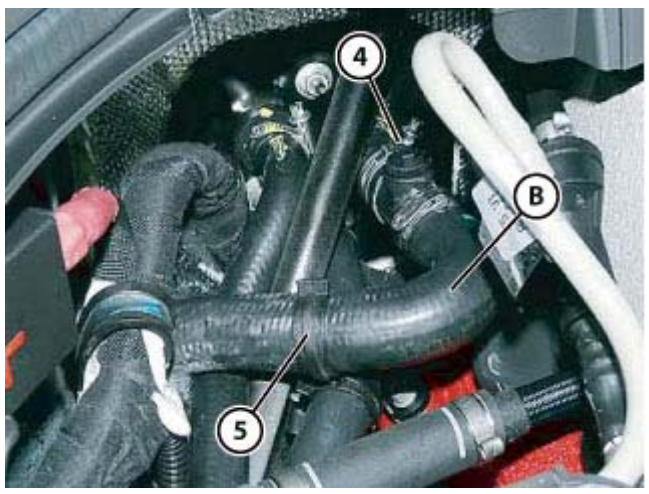
Remove the central shield and the right hand lateral shield.



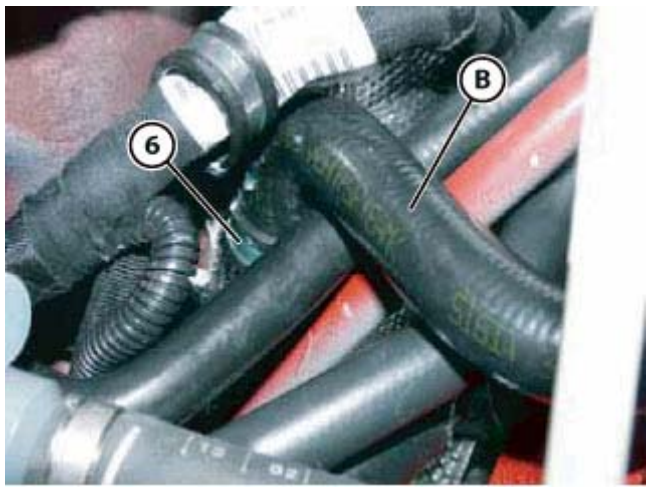
- Disconnect the oil vapour recirculation pipe **(A)** from the coupling on the engine oil tank.



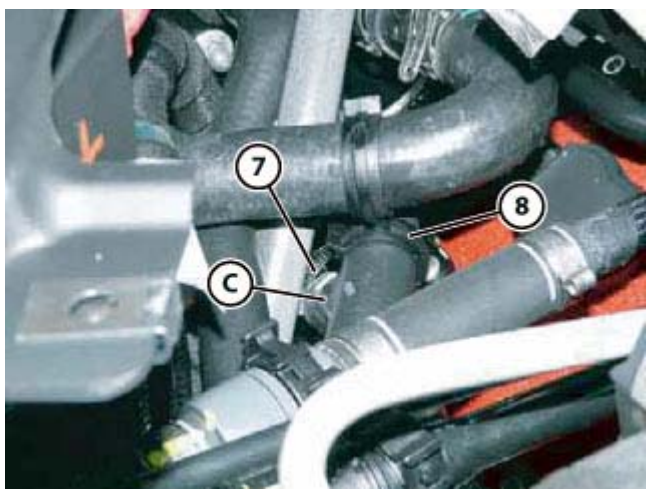
- Remove the elastic retainer clips **(1)**, then disconnect the quick-coupling **(2)** and cut the retainer clamp **(3)** away from the Blow-by system pipes.
- Move the pipes out of the way so that they do not hinder the subsequent operations.



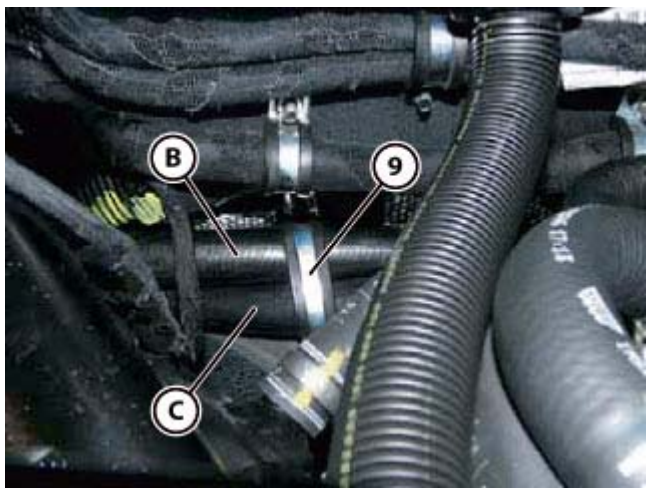
- To replace the pipe **(B)**, disconnect the heater by undoing the screw collar **(4)**.
- Remove the elastic clip **(5)**.



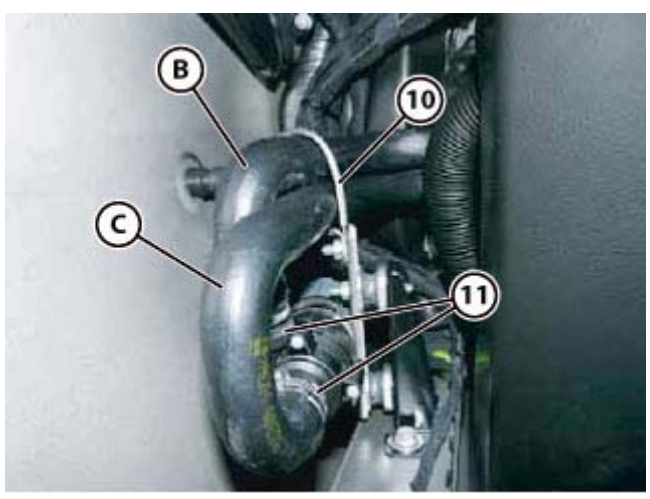
- Remove the bracket with sheath **(6)** retaining the pipe **(B)** to the bodywork.



- To replace the pipe **(C)**, disconnect the pipe from the coupling of the pipe leading to the cylinder heads, undoing the screw collar **(7)**.
- Remove the elastic clip **(8)** first to facilitate the operation.

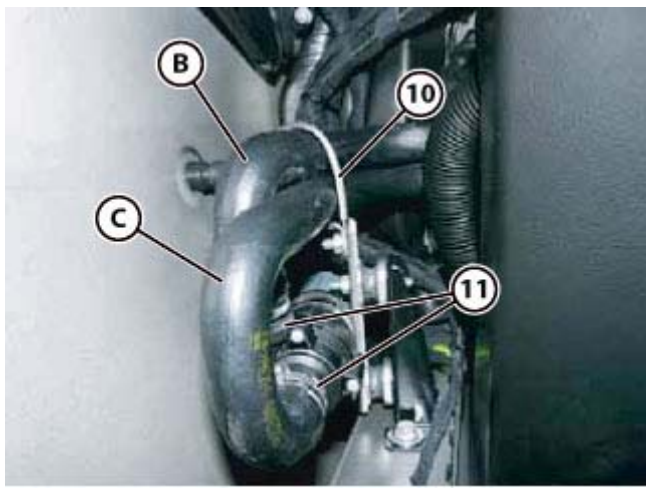


- When replacing pipe **(B)** and/or **(C)**, remove the bracket with sheath **(9)**, located on the front lower wall of the air intake tub on the bodywork.



- When replacing pipe **(B)** and/or **(C)**, remove the bracket with sheath **(10)**, located on the recirculation pump mounting bracket.
- Disconnect the pipe to be replaced from the recirculation pump coupling, undoing the relative screw collar **(11)**.

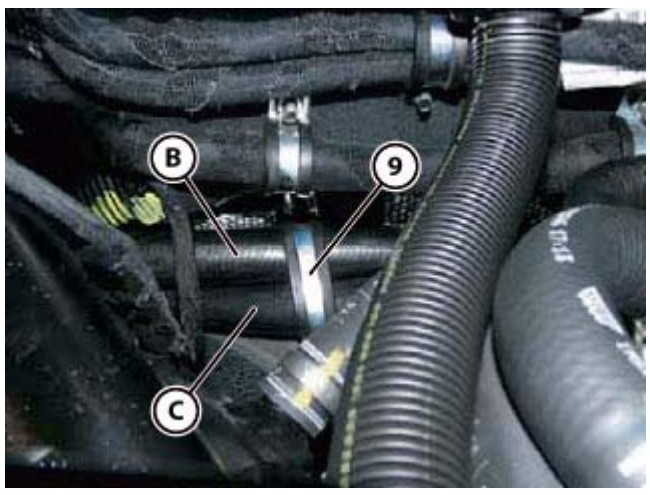
- Remove the pipe or pipes from the vehicle and replace.
- Clean and degrease the pipe couplings on the pump, the heater and/or the pipe leading to the cylinder heads.
- Install the new pipe or pipes in the vehicle without forcing.



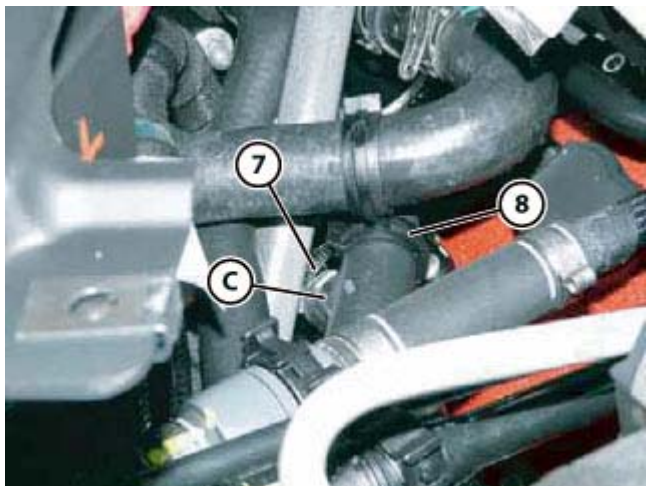
- When replacing pipe **(B)** and/or **(C)**, connect the replaced pipe onto the recirculation pump coupling, by tightening the relative new screw collar **(11)**.

Tightening torque	**Nm**	**Class**
Screw collar	4 Nm	B

- Refit the bracket with sheath **(10)** onto the recirculation pump mounting bracket.



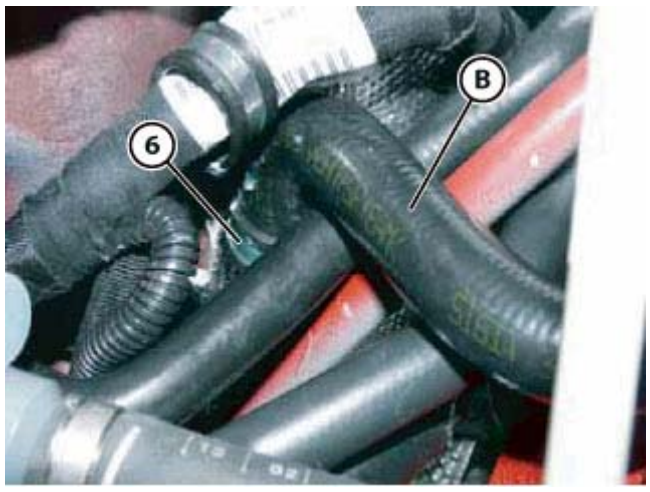
- When replacing pipe **(B)** and/or **(C)**, refit the bracket with sheath **(9)**, located on the front lower wall of the air intake tub on the bodywork.



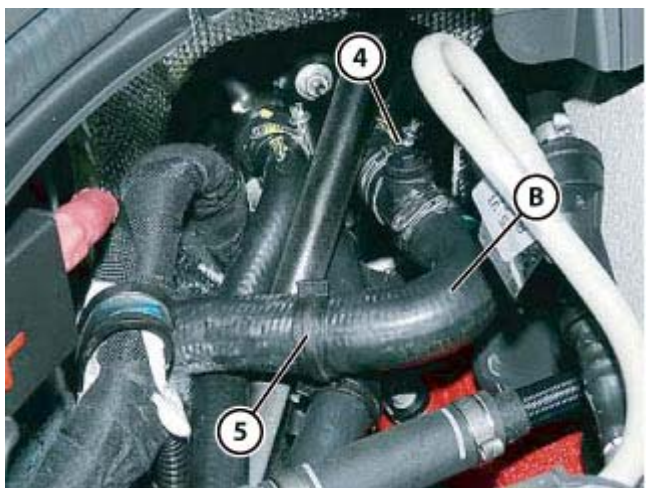
- If the pipe **(C)** has been replaced, refit the elastic clip **(8)**.
- Connect the pipe **(C)** to the coupling of the pipe leading to the cylinder heads, by tightening the new screw collar **(7)**.

Tightening torque	**Nm**	**Class**
Screw collar	4 Nm	B

- Check that the protruding tab on the new screw collar **(7)** on the coupling of the pipe leading to the heads DOES NOT interfere with the pipe overhead leading from the heater to the left hand TGK valve. If necessary, bend the tab down with suitable pliers.

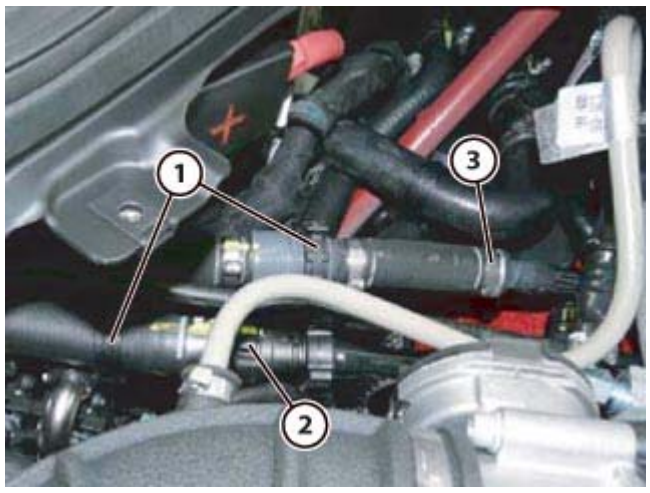


- If the pipe **(B)** has been replaced, refit the bracket with sheath **(6)** retaining the pipe **(B)** to the bodywork.



- Refit the elastic clip **(5)**.
- Connect the pipe **(B)** to the heater, by tightening the new screw collar **(4)**.

Tightening torque	Nm	Class
Screw collar	4 Nm	B



- Fit a new retainer clamp **(3)** onto the Blow-by system pipes and connect the quick coupling **(2)**, then refit the elastic retainer clips **(1)**.



- Connect the oil vapour recirculation pipe **(A)** to the coupling on the engine oil tank.

- Fill the cooling system (A3.07).
- Refit the underwindscreen shields (M2.17).
  - Refit the right hand lateral shield and the central shield.

- Set the battery master switch to ON (L2.02).

I2.07 Proportional valve (TGK)

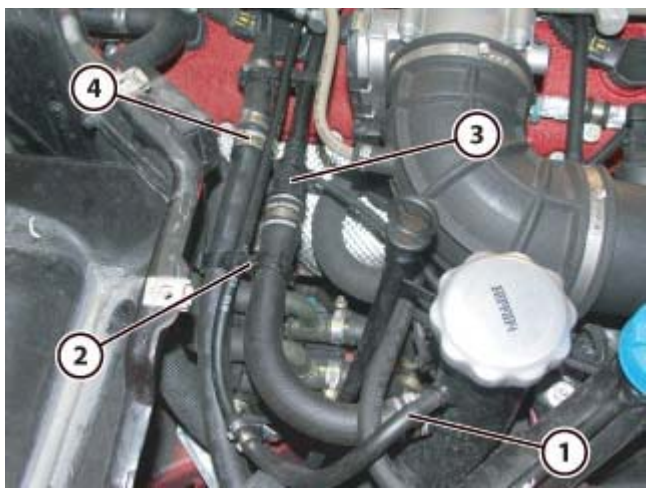
Proportional valve (TGK)

There are two, located in the right-hand side of the engine compartment, next to the engine oil tank.
The solenoid valves proportionally limit the flow of hot water from the engine with a shutter valve driven by a proportionally adjustable electric motor.
The water flow into the heater is therefore controlled by the ECU.

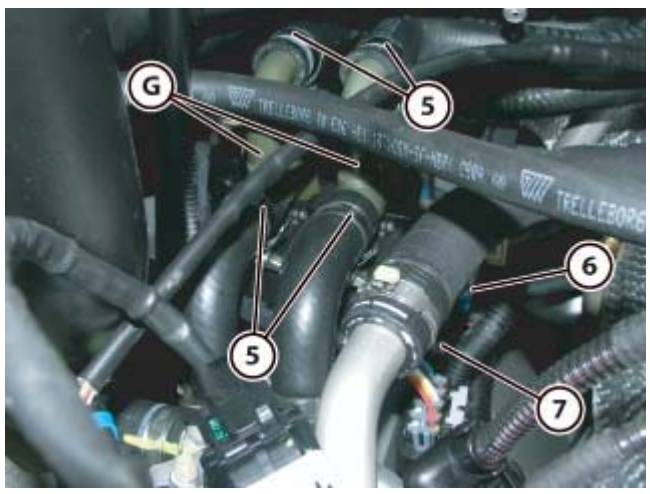
Replacing the proportional (TGK) valve

- Set the battery master switch to OFF (L2.02).
- Remove the engine compartment shields on the fenders (M2.17).
  - Remove the right hand component only.

- Remove the right hand side windscreen shield (M2.17).
- Drain the engine cooling system (A3.07).

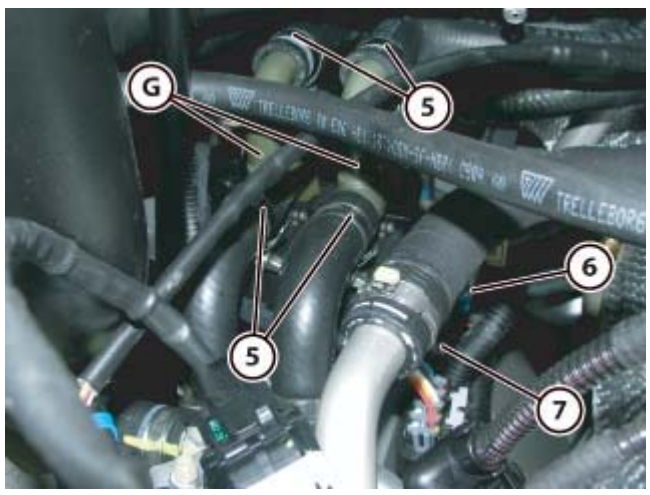


- Detach the oil vapour recirculation pipe **(1)** from the engine oil tank.
- Remove the clip **(2)** to release the pipes.
- Disconnect the quick-coupling **(3)** and the clamp **(4)** on the oil vapour aspiration pipes.
- Move the pipes out of the way so that they do not hinder the subsequent operations.

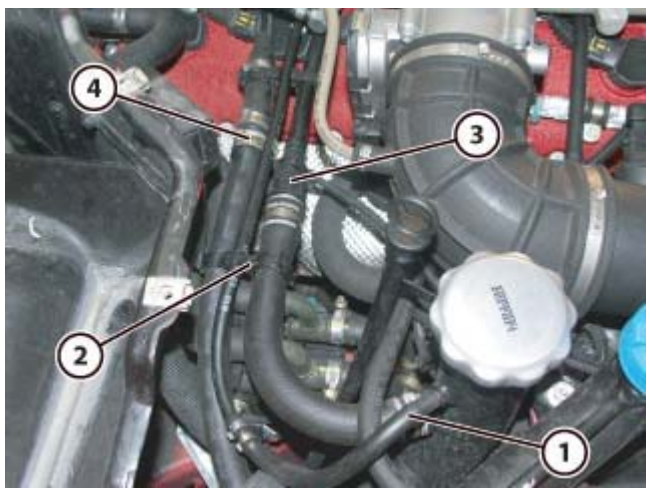


- Remove the four clamps **(5)** and disconnect the relative pipes one at a time, looking out for possible coolant spillage; have a container at hand.
- Disconnect the two connectors **(6)** and unscrew the two fastening screws **(7)** to the vehicle chassis.
- Remove the proportional valve **(G)** and mounting bracket from the upper part of the engine compartment.

The photo was taken with the air flow meter and related rubber pipes removed to illustrate the operation more clearly.



- Refit the proportional valves **(G)** in the relative seats in the engine compartment and fasten to the vehicle chassis with the two screws **(7)**.
- Reconnect the two connectors **(6)**.
- Fit the four pipes on the proportional valves **(G)** and fasten with the relative clamps **(5)**.



- Connect the oil vapour recirculation pipe **(1)** to the engine oil tank.
- Reconnect the quick-coupling **(3)** and the clamp **(4)** on the oil vapour aspiration pipes.

- Set the battery master switch to ON (L2.02).

- Fill the cooling system (A3.07).
- Refit the right hand side underwindscreen shield (M2.17).
- Refit the engine compartment shields on the fenders (M2.17).

Water valve travel acquisition procedure

Each time the battery is reconnected, the travel acquisition procedure for both water valves is performed. If a correct result is obtained (valid travel) the procedure will not be repeated. If however a good result is not obtained (even if just one of the 2 travel values is invalid), the procedure will be repeated at each key-on until the right result is obtained.

The above procedure consists of the following stages:
- valves completely opened (maximum duration 6 seconds);
- aperture position value for both valves saved (average value **950**);
- valves completely closed (maximum duration 6 seconds);
- closure position value for both valves saved (average value **50**);
- travel value for both valves saved (Travel =Aperture-Closure, average value **900**);
- valve travel analysis even if just one of the 2 travel values is lower than **500**; both travel values will be allocated a recovery value of **800** and the procedure will be repeated at the next key-on;
- valve travel analysis if both travel values measured are greater than **500**, in this case the travel values are calculated and procedure will not be repeated at the next key-on.

NOTES and TIPS
- the maximum duration of the procedure is 15 seconds;
- if the NCL ECU is connected, **first** insert the **yellow connector (26 pin)** and **then** the **white connector (20 pin)**, otherwise an incorrect travel acquisition will almost certainly be obtained. There will therefore be recovery values and incorrect operation until the next key-on.

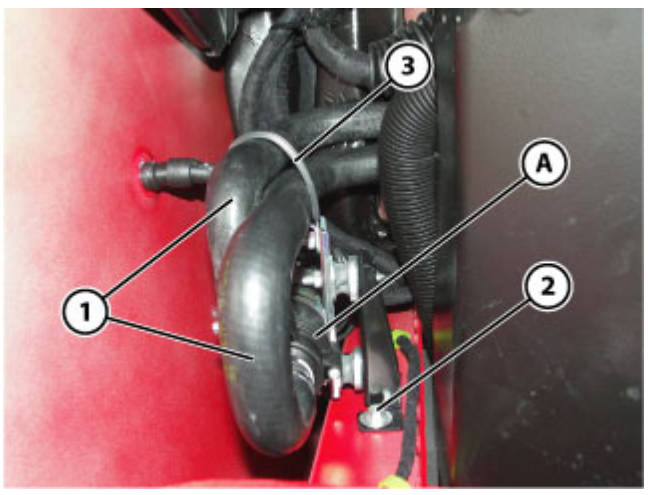
I2.08 Recirculation pump

Replacing the recirculation pump

The recirculation pump is located behind the rear section of the front right hand gravel guard. It is connected to the water-oil pump and to the heater/evaporator unit and is controlled by the air conditioning and heating system ECU, to which it is connected via a branching of the dashboard cable.

➢ Remove the front right hand wheelhouse (☞ M2.05).
ℹ Remove the rear section only.

➢ Drain the engine cooling system (☞ A3.07).



- Remove the clip **(3)** retaining the pipes **(1)**.
- Detach the two lines **(1)** leading to the evaporator and the water pump by removing the clamps.

ℹ Protective sleeves may be fitted to the pipes in the engine compartment described above at interference points with surrounding components; when replacing pipes, refit the sleeves as originally installed.

- Undo the two screws **(2)** fastening the recirculation pump **(A)** to the chassis.
- Slightly move the pump **(A)** to detach the connector (M059) for the dashboard cable and completely remove it from the wheel bay together with the mounting brackets.
- Separate the recirculation pump from the support brackets and replace.
- Fasten the new recirculation pump **(A)** on the mounting bracket and fit in the vehicle.
- Connect the dashboard cable connector(M059).
- Fasten the recirculation pump **(A)** with two screws **(2)**.
- Connect the two lines **(1)** leading to the evaporator and the water pump using the relative clamps.

ℹ Protective sleeves may be fitted to the pipes in the engine compartment described above at interference points with surrounding components; when replacing pipes, refit the sleeves as originally installed.

- Fasten the pipes **(1)** with the retainer clamp **(3)**.

➢ Fill the cooling system (☞ A3.07).
➢ Refit the front right hand wheelhouse (☞ M2.05).

I2.09 Air vents

Air vents



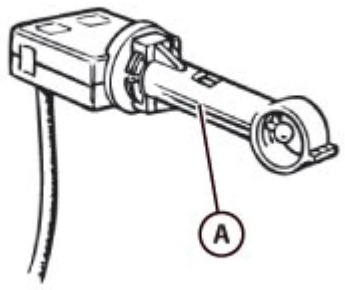
1 - Fixed air vents for windscreen.
2 - Fixed air vents for quarterlights.
3 - Adjustable central and lateral front air vents.
4 - Air vents for footwell.
5 - Sun sensor
6 - External temperature sensor
7 - Passenger compartment temperature sensor.
8 - Air conditioning and heating system controls.
9 - Pollen filter

I2.10 Sensors

Sensors

The sensors measure the temperature in different zones in the car and transmit the values to the ECU to optimise air conditioning.
Connection with the SD-3 diagnostics system is necessary to control the functions of the sensors.

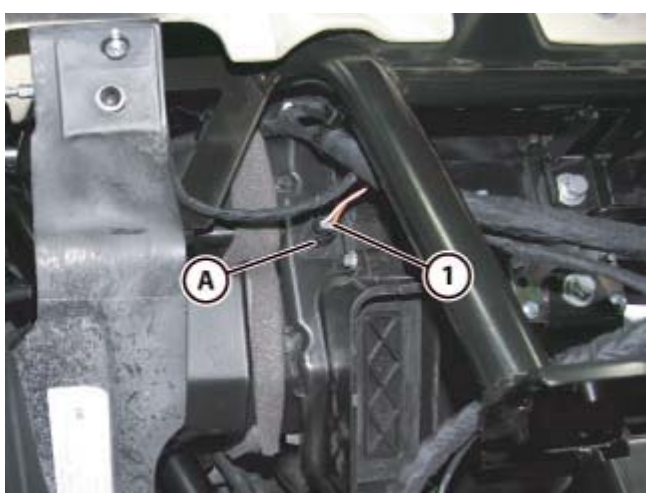
Treated air temperature sensor



These are NTC sensors **(A)** with variable resistance in relation to temperature.
There are two sensors, located on the heating/cooling unit. These transmit a signal to the ECU, which is used to optimise the operating cycles of the compressor and of the proportional valve controlling water flow.

Replacing the treated air temperature sensors

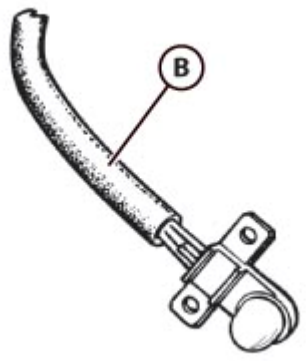
- Set the battery master switch to OFF (L2.02).
- Remove the central sides of the dashboard (M2.20).



- Disconnect the connector **(1)** (S851) (S852) and remove the temperature sensor **(A)** from the heating/cooling unit.
- Replace the sensor and refit as originally installed.

- Refit the central sides of the dashboard (M2.20).
- Set the battery master switch to ON (L2.02).

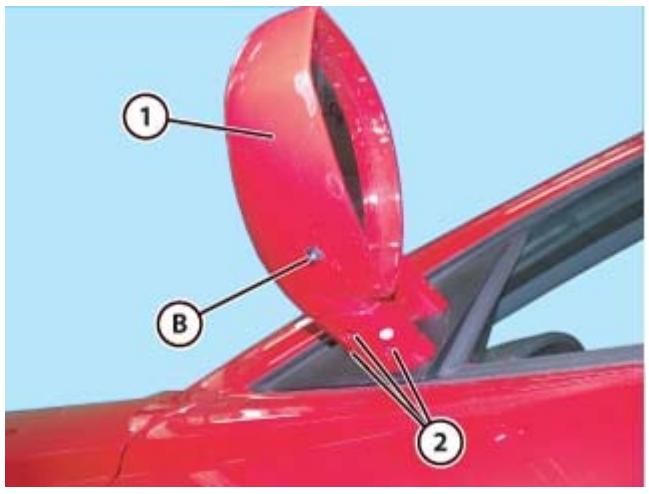
Ambient air temperature sensor



This is an NTC sensor **(B)**, with variable resistance in relation to temperature.
The sensor is located in the left external rear view mirror and provides information concerning the external air temperature.

Replacing the external air temperature sensor

➢ Set the battery master switch to OFF (☞ L2.02).
➢ Remove the external rear-view mirror (☞ H3.08).



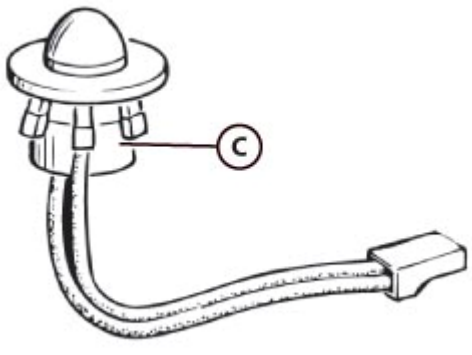
- Separate the two parts of the rear view mirror **(1)** undoing the three screws **(2)**.
- Remove the external air temperature sensor **(B)** from inside the moveable part of the rear view mirror **(1)**.
- Replace the sensor and refit as originally installed.

➢ Refit the external rear view mirror (☞ H3.08).
➢ Set the battery master switch to ON (☞ L2.02).

Passenger compartment temperature sensor

The sensor is an integral part of the AC control panel and sends a continually updated signal relative to the internal cabin temperature to the ECU.

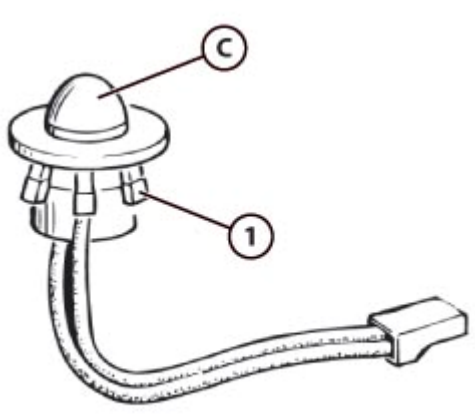
Sun sensor



The sun sensor **(C)** located on the top of the instrument panel optimises ventilation and the temperature adjustment within the passenger compartment in relation to the intensity of the sunlight.

Replacing the sun radiation sensor

➢ Set the battery master switch to OFF (☞ L2.02).
➢ Remove the instrument panel (☞ M2.19).



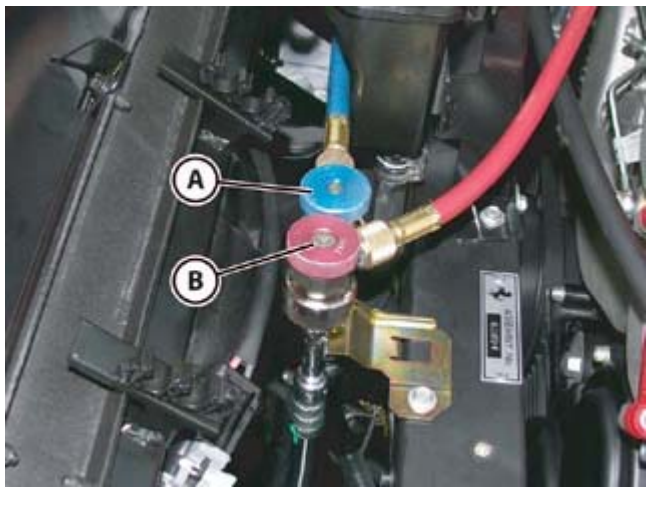
- Detach the fastener clips **(1)** from the Seeger ring on the inner side of the dashboard, and ease out the sun sensor **(C)** from the outside.
- Replace the sensor and refit as originally installed.

➢ Refit the instrument panel (☞ M2.19).
➢ Set the battery master switch to ON (☞ L2.02).

I3.01 System draining and refilling

Emptying the air-conditioning system

- The air-conditioning system may be emptied with the special tool for recovering refrigerant gas.
- On If the function is available on the tool, measure the quantity of fluid emptied from the system to enable subsequent refilling with the correct amount.



CAUTION
Discharging refrigerant gas near open flame is extremely dangerous and may result in the emission of toxic gas (phosgene).

- Remove the caps on the empty/fill unions and screw the **RED** union **(B)** for the filling pipe onto the union on the air filter box side, and the **BLUE** union **(A)** for the intake pipe onto the union on the hydraulic steering tank side.
- Recover the refrigerant gas and then perform the **system vacuum cycle**.
- The specified vacuum values must be attained during the system vacuum cycle.

i This operation is very important to ensure system efficiency.

- Check that the vacuum does increase by more than **33 mbar (25 mmHg)** in **5 minutes**. If these values are not attained, there is a leak in the system. Check for leaks with an electronic leak detector.

CAUTION
Do not use open flames to search for refrigerant leaks, as this may generate toxic gas (phosgene).

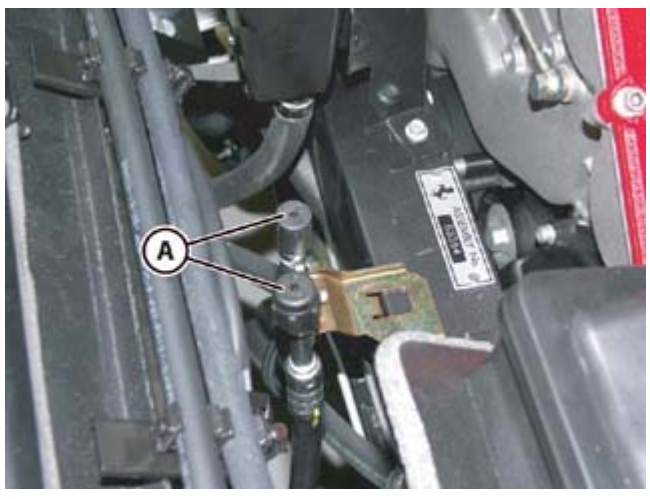
- In the event of removal of any system components, repeat the system vacuum cycle **and check** for leaks.

Filling the air-conditioning system

- After **draining the system**, attach the special tool to the system inlet/outlet unions and recharge the system.
- If some of the compressor oil has remained trapped in the machine after the emptying procedure, top up the system with the same quantity of the specified oil.
- Perform the **system filling** cycle.
- Approximately **750 ± 50 g** of refrigerant is needed to completely charge the system.
- If pressure equilibrium is reached before charging is complete, proceed as follows:
- - start the engine and run at **2000 RPM**;
- - turn on the AC system, set to max. cold and select max. fan speed;
- - close the doors.

i This will ensure that the compressor also aspirates the remaining refrigerant.

- When the filling procedure is complete, let the system run for about **10 minutes**.
- After 10 minutes of operation at **MAX** cooling level, the following conditions must be met:
- - ambient temperature: **20 to 22°C**;
- - relative low pressure: **2.0 bar**;
- - relative high pressure: **13.5 bar**.
- - output air temperature (average measured at the vents): **8 to 13 °C**.



- Remove the unions from the charging/draining lines and fit the caps **(A)**.

I4.01 Inspections

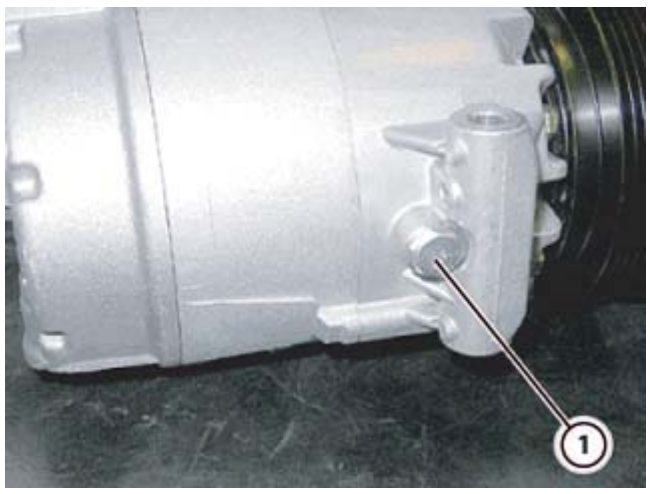
Checking compressor oil level and refilling

The oil level in the compressor does not need to be checked when using tools that recharge the system with the same amount of oil removed during draining.

The oil level may only be determined with the compressor removed from the vehicle, as there is no level sensor.

The compressor oil level must be checked every time a system leak is noted and before recharging with refrigerant.

- Refill as follows.
- Remove the AC compressor (I2.01).



- Undo the cap **(1)** and drain all remaining oil.

Use only the specified oil type. Do not use products that may cause hose damage.

- Pour the specified quantity **(165 cc)** of oil **RL-488** through the filler cap **(1)**.
- Refit the cap **(1)** with relative gasket and tighten securely.

➢ Refit the A.C. compressor (I2.01).

Checking electric fan activation

- Run the engine at **2000 rpm** with the charger connected.



- Release the **OFF (1)** button to engage the system.
- Turn the dial **(2)** anticlockwise to the minimum temperature position **LO**.
- Check that the electric condenser fan is activated by the pressure switch, when the high pressure gauge exceeds approximately **15 bar** (first electric fan speed setting) and at approximately **20 bar** (second electric fan speed setting).

L1.01 Main data

Bulb application	Type	Power (12V)
High / Low beams	Gas discharge (Xenon) lamp	Das
Front low beams	Incandescent	H6W
Front turn indicators	Incandescent	21W
Side turn indicators	Incandescent	T4W
Running lights in taillight	LED	
Stop lights	LED	
Turn indicators in taillight	LED	
Rear fog lights	Incandescent	H21W
Reverse lights	Incandescent	H6W
Number plate lights	Incandescent	R5W
Third stop light	LED	
Dome light	Incandescent	10W
Spot light	Incandescent	6W
Document compartment light	Incandescent	W5W
Underdoor courtesy light	Incandescent	W5W
Luggage compartment light	Incandescent	W5W

L1.02 Key-operated circuits

Key-operated circuits

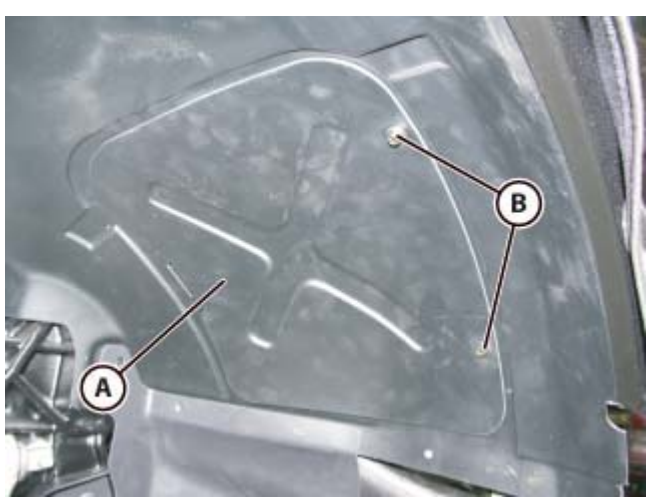
- Start-up
- Windscreen wipers
- Stop lights
- Direction indicators
- Hazard lights
- Rear fog lights
- Reverse lights
- Glove compartment release and light
- Driver seat adjustment and memorisation
- Power windows
- Steering wheel adjustment
- Ignition
- Injection
- Electric fuel pumps
- Air conditioning and heating system
- Instruments
- Water radiator cooling fan motors
- Demist windscreen, rear screen and wing mirrors
- External rear-view mirror adjustment
- Shock absorber calibration control system
- ABS / CST system
- Exhaust temperature monitoring circuit
- Tyre pressure monitoring system

L1.03 Lamps

Replacing the running light bulb

Always check the relative fuse before replacing a light bulb.

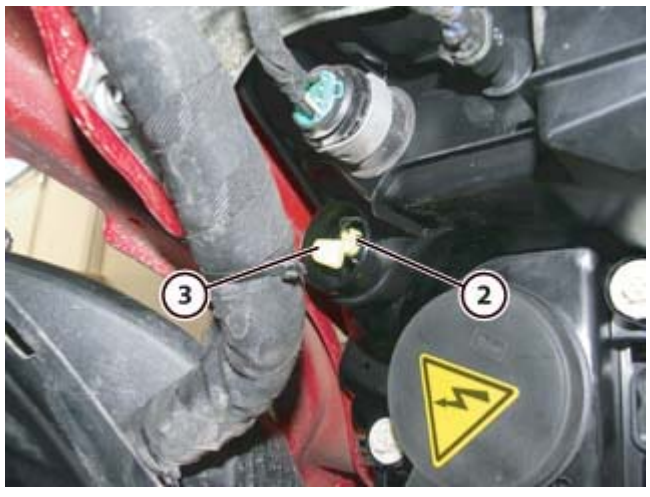
➢ Set the battery master switch to OFF (L2.02).



- Remove the access cover **(A)** for the headlight bulbs located on the front section of the wheelhouse by undoing the two screws **(B)**.



- Remove the rubber cover **(1)** from the headlight.



- Grip the bulb holder **(2)** by the tab **(3)** and remove from the headlight.



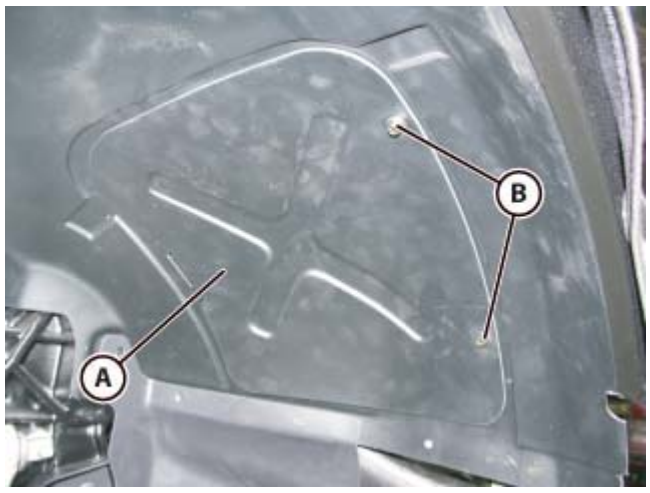
- Remove the bulb **(4)** by pulling it outwards and replace.

➢ When fitting the new bulb, make sure that it is firmly secured in its seat.

Replacing the turn indicator bulb

Always check the relative fuse before replacing a light bulb.

➢ Set the battery master switch to OFF (L2.02).



- Remove the access cover **(A)** for the headlight bulbs located on the front section of the wheelhouse by undoing the two screws **(B)**.



- Turn the bulb holder **(1)** clockwise and remove the complete bulb holder.



- Remove the bulb **(2)** from the bulb holder by pulling it outwards and replace.

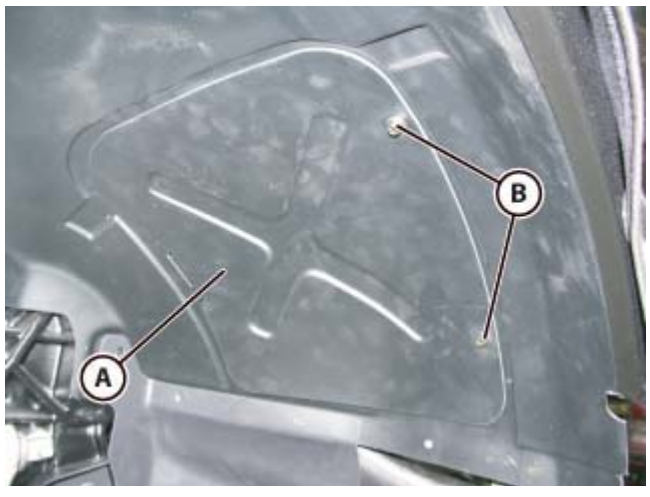
➢ When fitting the new bulb, make sure that it is firmly secured in its seat.

Replacing the Xenon low/high beam lights

Always check the relative fuse before replacing a light bulb.

These bulbs operate at high voltage. Never work on the lamps with the ignition key in position "II".

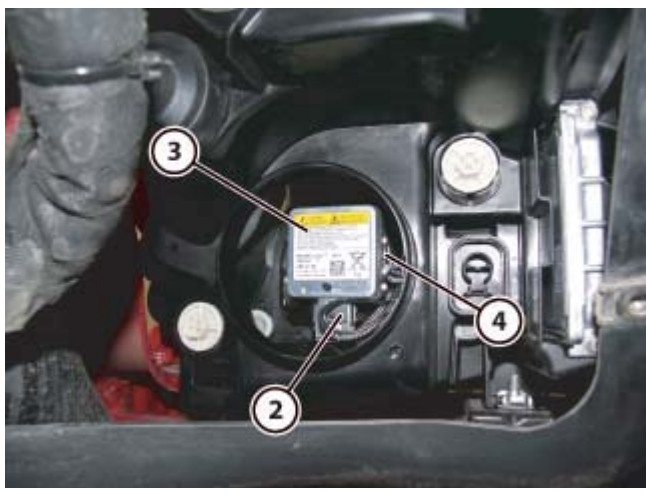
➢ Set the battery master switch to OFF (L2.02).



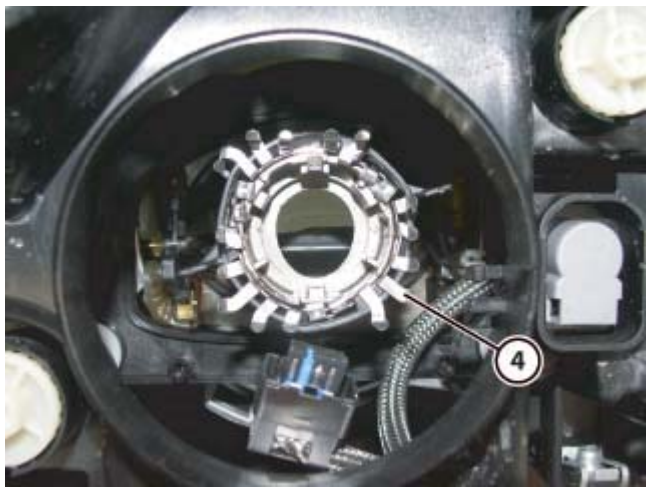
- Remove the access cover **(A)** for the headlight bulbs located on the front section of the wheelhouse by undoing the two screws **(B)**.



- Remove the rubber cover **(1)** for the headlight.



- Disconnect the connector **(2)** from the bulb **(3)**.
- Turn the retainer ring nut counterclockwise.
- Remove the bulb **(3)** from the retainer clips **(4)**.



- Before fitting the new bulb, check that the retainer clips **(4)** are not bent or twisted, as this may prevent the bulb from being secured correctly.

➢ Replace the bulb and while refitting, check that it locks properly into its seat.

Replacing the lateral turn indicator bulb

Always check the relative fuse before replacing a light bulb.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the complete lateral turn indicator (L2.08).



- Remove the external plastic lens **(1)** from the lateral turn indicator **(2)**.



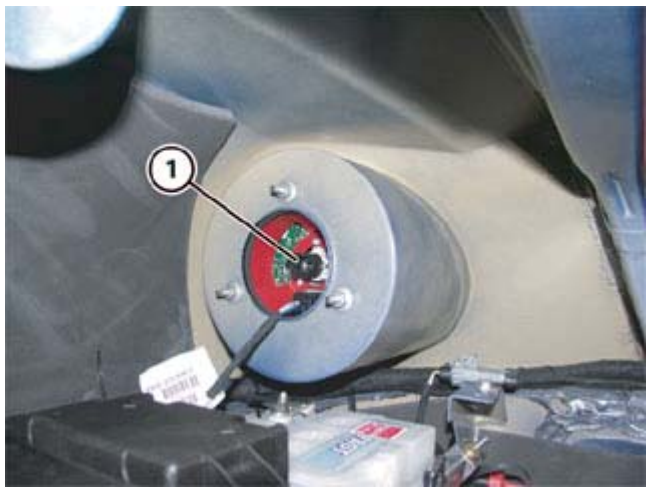
- Remove the burnt bulb **(3)** by pushing it and turning it counterclockwise in its seat.

➢ Place the new bulb in the indicator body and refit the external plastic lens.

Replacing the taillight bulb

Always check the relative fuse before replacing a light bulb.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the luggage compartment side trim panels (M2.23).



- Remove the bulb **(1)** from the taillight.

➢ Remove the bulb from the bulb fixture, pulling outwards, and replace.
➢ When refitting, make sure that it locks properly into its seat.

L2.01 Battery

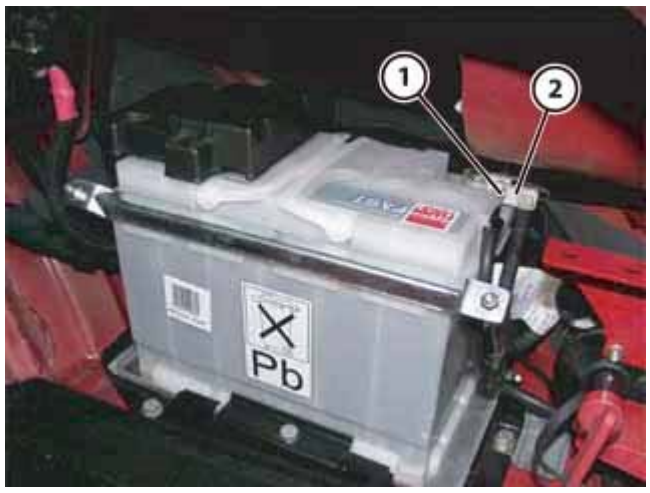
Removing the battery

In the event of any service requiring battery replacement, follow the instructions given in Technical Information Nr. 1628 dated March 2008 precisely.

The battery is located on the right hand side of the luggage compartment, under the trim panel.

➢ Remove the luggage compartment side trim panels (M2.23).
Remove the right hand tail light cover mat.

➢ Set the battery master switch to OFF (L2.02).



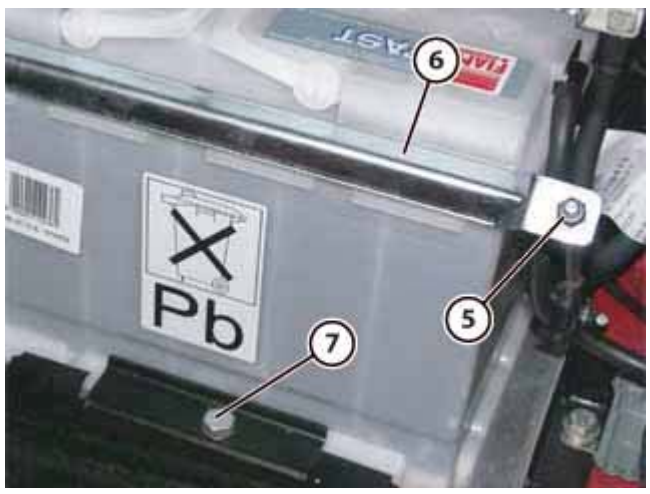
- Loosen the nut **(1)** and remove the terminal **(2)** of the negative pole (B001).



- Open the box **(3)** protecting the battery connectors.



- Loosen the screw **(4)** fastening the box to the battery and remove.

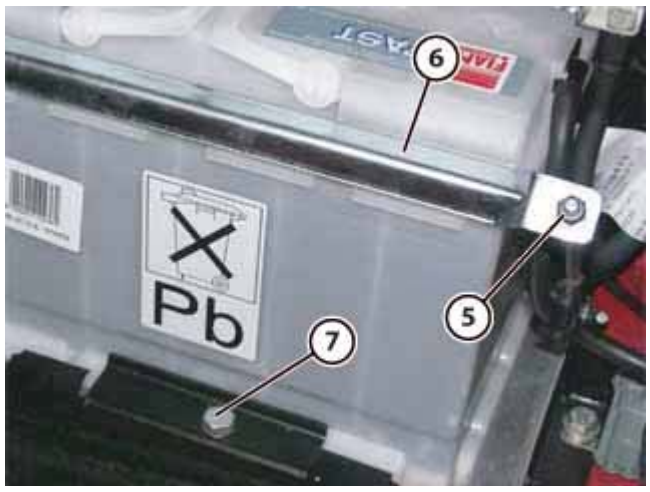


- Loosen the two nuts **(5)** to loosen the battery retainer bracket **(6)**.
- Push the bracket downwards.
- Undo the screw **(7)** fastening the component to the bodywork.
- Remove the battery.

Refitting the battery

In the event of any service requiring battery replacement, follow the instructions given in Technical Information Nr. 1628 dated March 2008 precisely.

Every time the battery is replaced or disconnected from the rest of the vehicle system, all self-acquired parameters are deleted from the injection ECU. These parameters must be reacquired before reusing the vehicle.



- Install the battery in the respective mount in the luggage compartment.
- Fasten the lower bracket by tightening the screw **(7)**.

Ensure that the battery is securely fastened to the vehicle bodyshell.

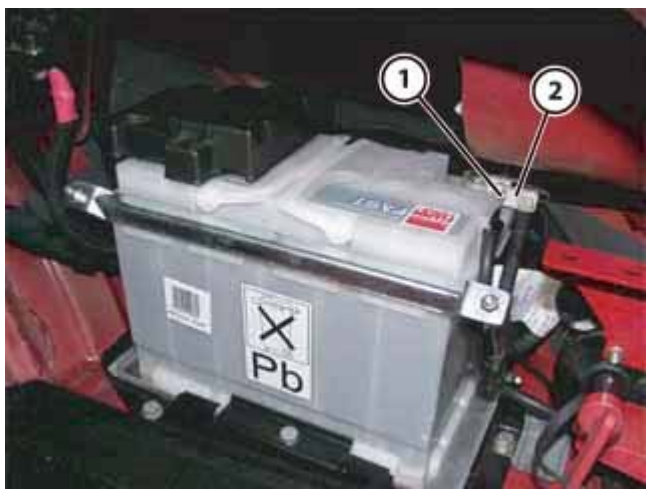
- Lift the bracket **(6)** to the top edge of the battery and fasten by tightening the two nuts **(5)**.



- Clean both battery poles thoroughly and install the terminal board for the positive pole (B001), fastening with the nut **(4)**.



- Close the terminal board protective box **(3)**.



- Fit the terminal clamp **(2)** for the negative pole and tighten the nut **(1)**.

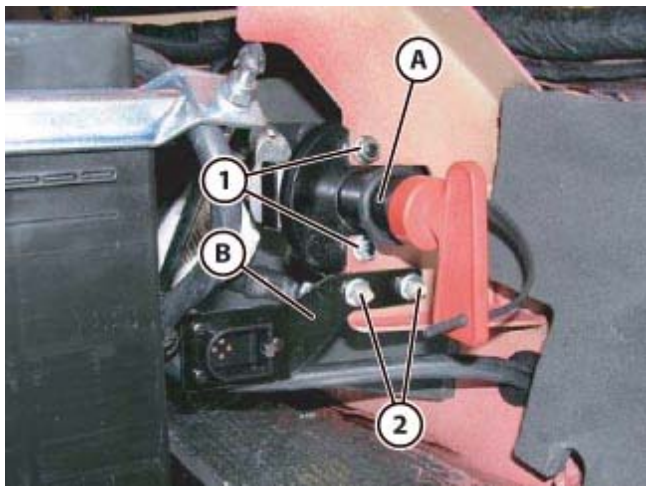
➢ Set the battery master switch to ON (L2.02).
➢ Refit the luggage compartment side trim panels (M2.23).

Visual inspection of the vehicle chassis earth plate

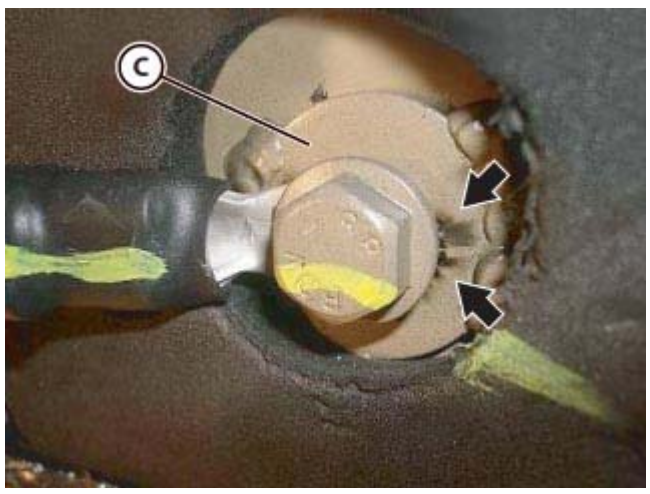
This procedure consists in visually inspecting the vehicle earth plate to check that there are NO burn marks from short circuiting.

➢ Remove the luggage compartment side trim panels (M2.23).
Remove the right-hand light cover.

➢ Set the battery master switch to OFF (L2.02).



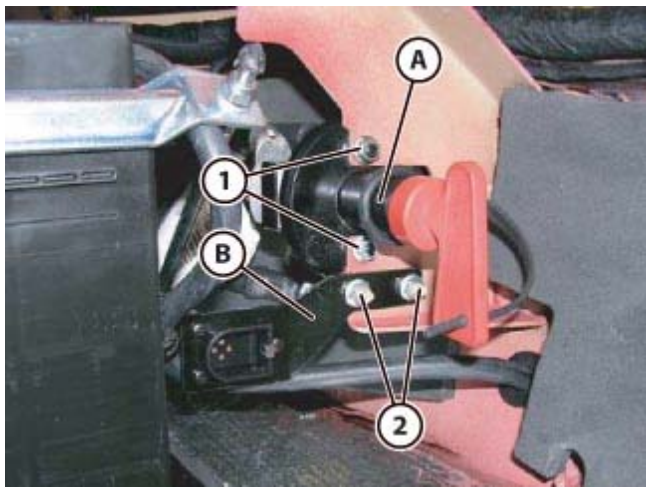
- Remove the battery master switch **(A)** from the mounting bracket, undoing the two fastener nuts **(1)**.
- Remove the mounting bracket **(B)** for the battery charger connector braid or battery charge maintainer connector braid, undoing the relative two fastener screws **(2)**.



- Identify the chassis earth point located behind the battery master mounting bracket and check for burn marks on the earth plate **(C)**.
- Replace the vehicle chassis earth plate (L2.01).

If burn marks are noted during the inspection.

- If no burn marks are noted during the inspection, the earth plate does not need to be replaced **(C)**.



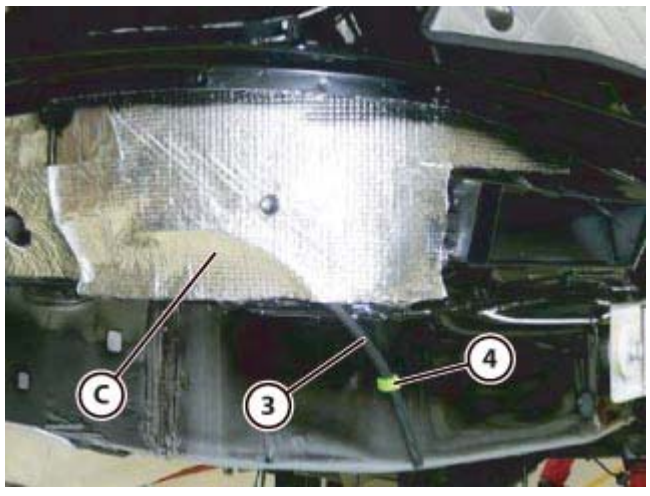
- Fit the mounting bracket **(B)** for the battery charger connector braid or battery charge maintainer connector braid, tightening the relative two fastener screws **(2)**.
- Fit the battery master switch **(A)** to the mounting bracket, tightening the two fastener nuts **(1)**.

➢ Set the battery master switch to ON (L2.02).
➢ Refit the luggage compartment side trim panels (M2.23).

Replacing the vehicle chassis earth plate

Tightening torque		**Nm**	**Class**
Earth plate - chassis	Screw	18 Nm	B

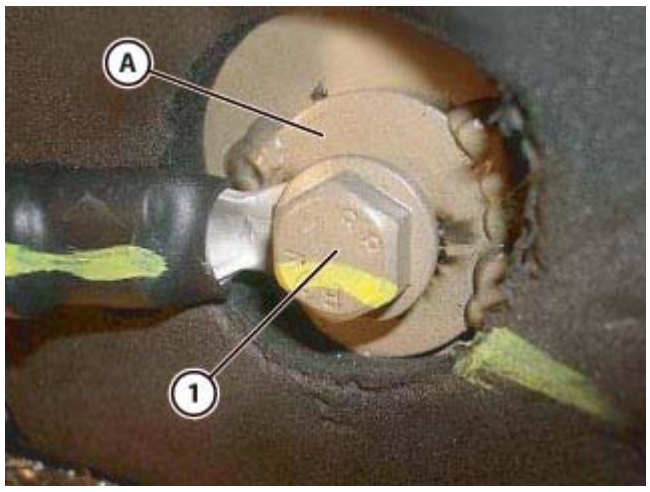
➢ Remove the rear bumper (M2.04).



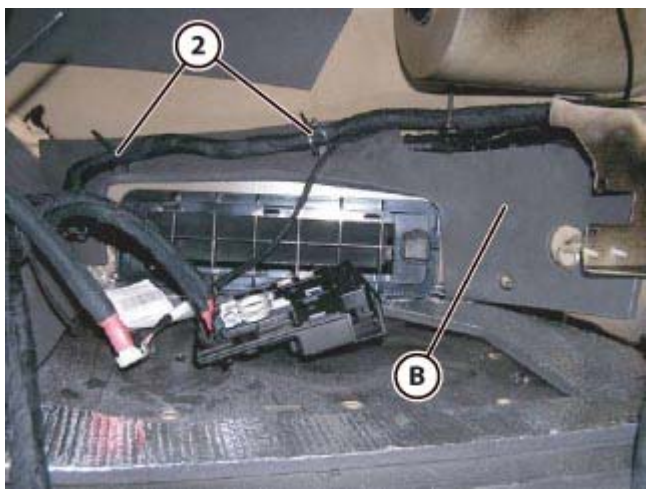
- Remove the right hand rear exterior insulation **(C)** from the body and remove the battery breather pipe **(3)** from the relative retainer clip **(4)**.
- Remove the CD charger (H3.15).

If installed in vehicle.

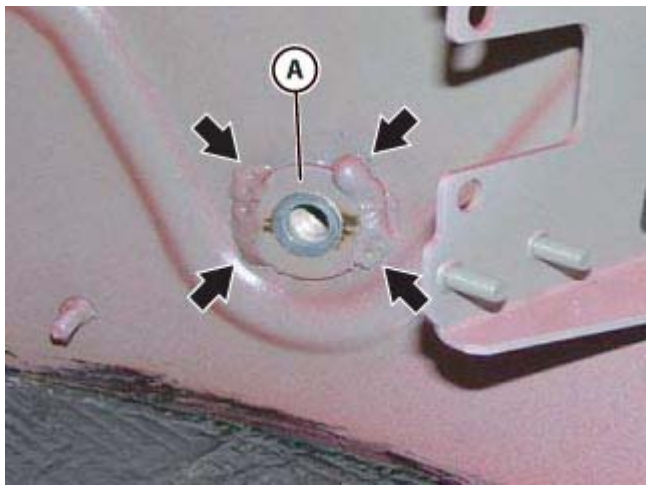
- Remove the battery (L2.01).



- Disconnect the braid connecting the battery master switch to the vehicle chassis earth plate **(A)**, undoing the screw **(1)**.



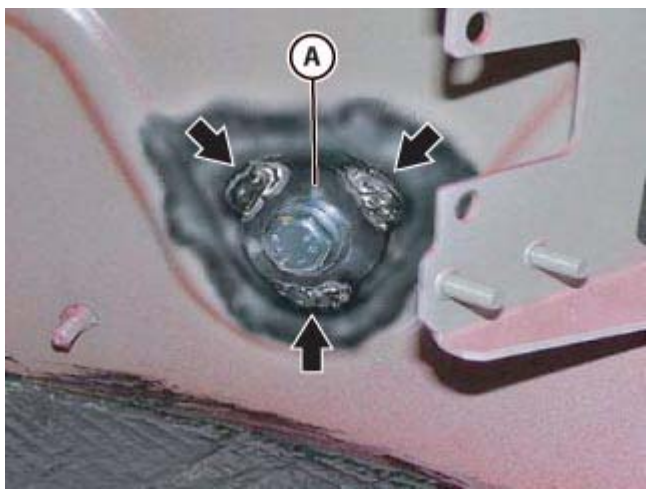
- Remove the two clamps **(2)** retaining the section of the right hand luggage compartment wiring harness over the air vent grille.
- Remove the right hand side insulation **(B)** from the vehicle chassis.



- Clean the chassis thoroughly to remove any glue residue, taking particular care in the area surrounding the earth plate **(A)**.
- Cover the carpeting left in the vehicle and all electrical components in the luggage compartment with adequate fireproof material.
- Use an appropriately sized angle grinder to grind away the earth plate **(A)** fixing welds completely.
- Remove the earth plate **(A)**.
- File down the earth plate contact surface until flat.

i The earth plate must be welded onto bare metal (with no paint residue).

- Clean the area thoroughly to remove any dirt and swarf left by the grinding process.



- Fit the new earth plate **(A)**, complete with screw and washer.

Let each section of weld cool completely before starting the next section, taking care to keep the weld bead AWAY from the washer and screw head.

- Weld the new earth plate **(A)** to the chassis, using a MIG welding system and applying three weld beads measuring no more than **10 mm** in length.
- Brush the welds and the charred surrounding areas on the inner side thoroughly with a wire brush.
- Apply anticorrosion primer **Deltron D831 Universal** to the inner side, following the specific procedure for application described in Technical Information 1264 dated October 2004.
- Bake the area treated with **Deltron D831 Universal** with a heat gun (Bosch PHG 600-2 CE 2000W), using a low power setting (approx. 500 W) and holding the gun at least **15-20 cm** away from the surface, for approximately **10 minutes**.
- Wait until completely cooled.
- Check that the primer is correctly baked, drawing a line on the treated surface with an HB pencil.

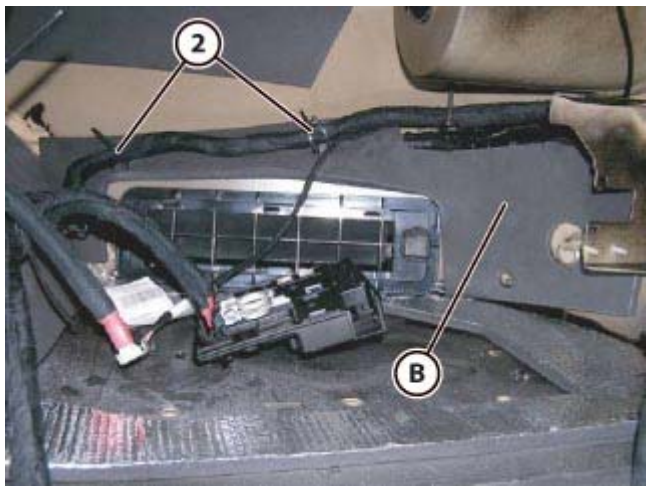
i There must be no groove in the surface after the graphite is wiped off with a finger; if this is not the case, repeat the baking procedure.



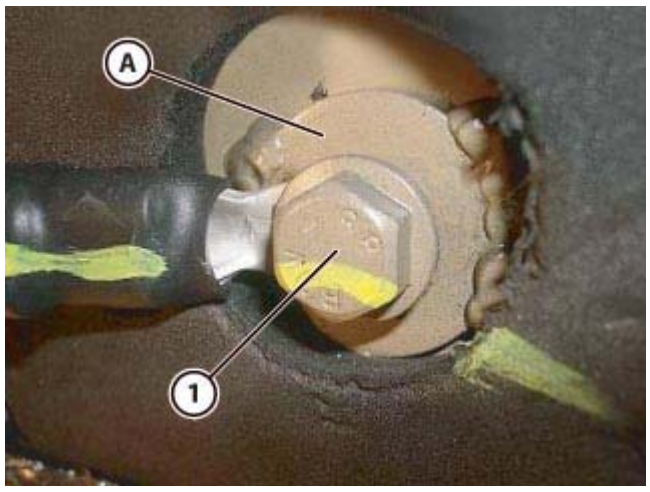
- Brush the welds and the charred surrounding areas on the outer side thoroughly with a wire brush.
- Apply anticorrosion primer **Deltron D831 Universal** to the outer side, following the specific procedure for application described in Technical Information 1264 dated October 2004.
- Bake the area treated with **Deltron D831 Universal** with a heat gun (Bosch PHG 600-2 CE 2000W), using a low power setting (approx. 500 W) and holding the gun at least **15-20 cm** away from the surface, for approximately **10 minutes**.
- Wait until completely cooled.
- Check that the primer is correctly baked, drawing a line on the treated surface with an HB pencil.

i There must be no groove in the surface after the graphite is wiped off with a finger; if this is not the case, repeat the baking procedure.

- On the outer side, apply a coat of paint to the relative area.
- Clean the area and the luggage compartment thoroughly to remove any welding residue, then remove the fireproof coverings.



- Apply the new rear right hand side insulation **(B)** to the chassis.
- Tighten the two clamps **(2)** retaining the section of the right hand luggage compartment wiring harness over the air vent grille.



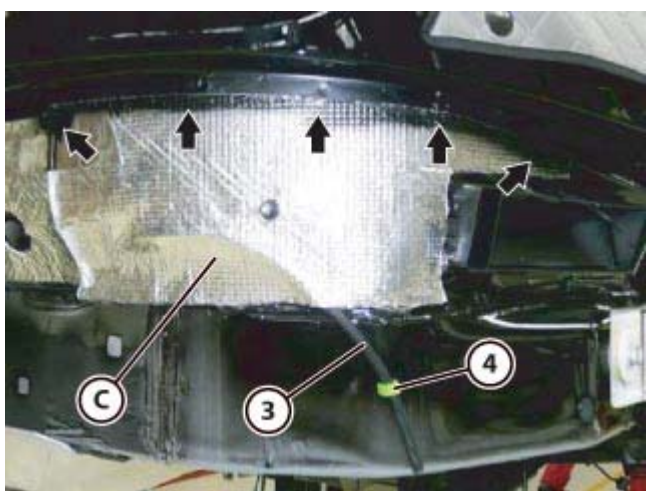
- Connect the braid connecting the battery master switch to the vehicle chassis earth plate **(A)**, tightening the screw **(1)**.



Tightening torque	Nm	Class
Screw	18 Nm	B

- Refit the battery (L2.01).
- Refit the CD charger (H3.15).

If installed in vehicle.



- Fit the battery breather pipe **(3)** correctly in the relative retainer clip **(4)** and fit the new external rear right insulation **(C)** onto the under-bumper subframe.
- Apply "black finish" paint to the top of the new right hand outer insulation **(C)**.

Refit the rear bumper (M2.04).

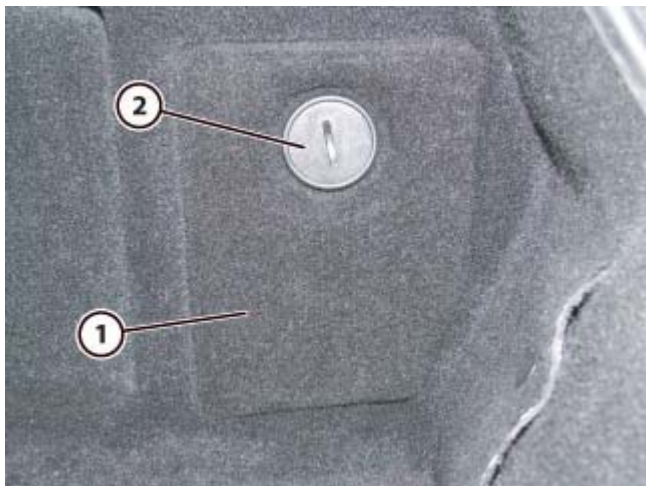
L2.02 Battery master switch

Operating the battery master switch

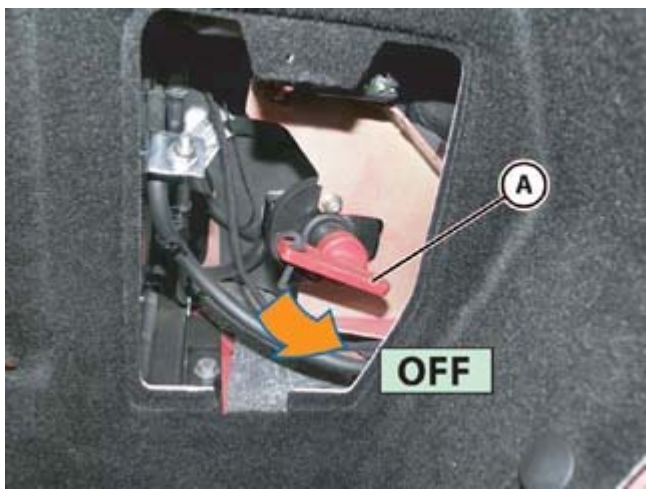
Every time the battery is disconnected from the rest of the vehicle system, all self-acquired parameters are deleted from the injection ECU. These parameters must be reacquired before reusing the vehicle.

The battery master switch is located on the right-hand side of the luggage compartment behind a removable panel and is used to electrically disconnect the battery. Whenever working on any device or in the event of prolonged periods with the vehicle not in use, set the battery master switch to OFF.

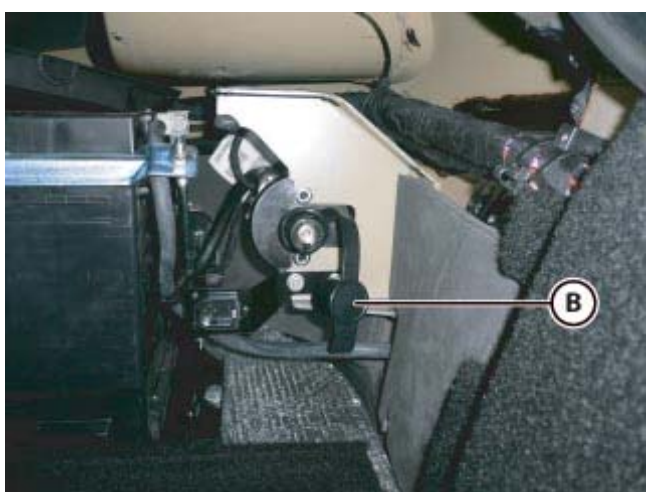
FROM Ass.ly Nr. 75572 the handle has been replaced by a cover and a special Torx wrench is required to disconnect the battery as the battery master switch may only be operated by Ferrari Service Network personnel.



- To access the switch, remove the panel **(1)** by turning the catch **(2)**.



- To set the battery master switch to **OFF**, turn the handle **(A)** in the direction indicated by the arrow.



FROM Ass.ly Nr. 75572

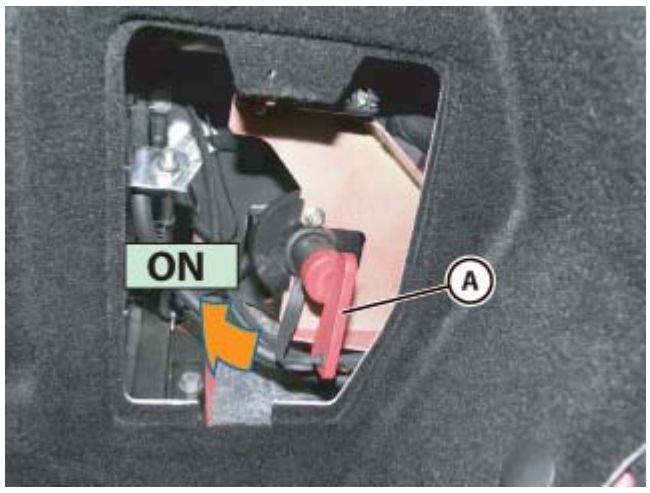
The battery master switch may only be operated by Ferrari Service Network personnel.

- Remove the cover **(B)** from the battery master switch.
- Turn counterclockwise with the special Torx wrench to set the battery master switch to **OFF**.

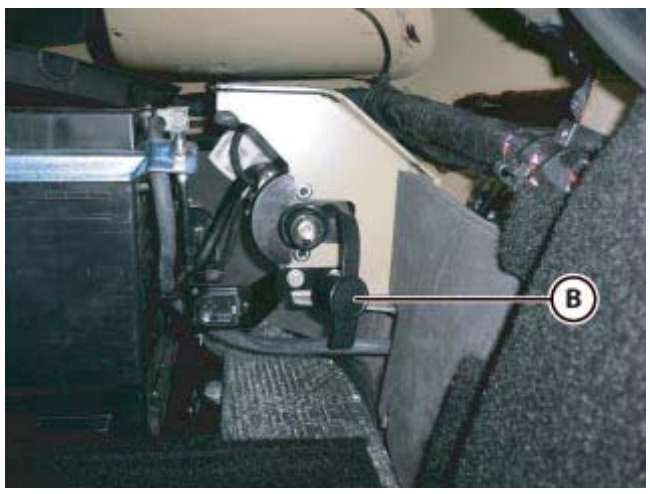
Operating the battery master switch

When turning the battery master switch back ON, wait at least one minute BEFORE inserting the ignition key. Insert the ignition key and turn to "II", then WAIT AT LEAST 20 seconds BEFORE starting the engine. These procedures ensure that the ECUs in the vehicle are powered up and synchronised correctly and ensure the correct acquisition of all motorised valve aperture and closure travel parameters and all TGK proportional valve aperture and closure travel parameters. During this period, DO NOT switch any system or device on. These self-acquisition procedures are launched each time the battery master switch is reconnected or whenever the connection to the battery is restored.

FROM Ass.ly Nr. 75572 the handle has been replaced by a cover and a special Torx wrench is required to disconnect the battery as the battery master switch may only be operated by Ferrari Service Network personnel.



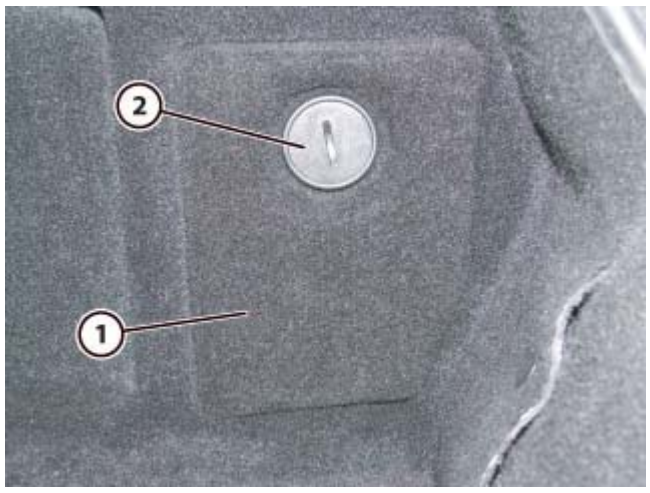
- To set the battery master switch to **ON**, turn the handle **(A)** in the direction indicated by the arrow.



FROM Ass.ly Nr. 75572

The battery master switch may only be operated by Ferrari Service Network personnel.

- Turn clockwise with the special Torx wrench to set the battery master switch to **ON**.
- Fit the cover **(B)** onto the battery master switch.



- Fit the covering door **(1)** and fasten by turning the catch **(2)**.

➢ Restore the self-adaptive parameters (L2.02).

Water valve travel acquisition procedure

Each time the battery is reconnected, the travel acquisition procedure for both water valves is performed. If a correct result is obtained (valid travel) the procedure will not be repeated. If however a good result is not obtained (even if just one of the 2 travel values is invalid), the procedure will be repeated at each key-on until the right result is obtained.

The above procedure consists of the following stages:

- valves completely opened (maximum duration 6 seconds);
- aperture position value for both valves saved (average value **950**);
- valves completely closed (maximum duration 6 seconds);
- closure position value for both valves saved (average value **50**);
- travel value for both valves saved (Travel =Aperture-Closure, average value **900**);
- valve travel analysis even if just one of the 2 travel values is lower than **500**; both travel values will be allocated a recovery value of **800** and the procedure will be repeated at the next key-on;
- valve travel analysis if both travel values measured are greater than **500**, in this case the travel values are calculated and procedure will not be repeated at the next key-on.

NOTES and TIPS

- the maximum duration of the procedure is 15 seconds;
- if the NCL ECU is connected, **first** insert the **yellow connector (26 pin)** and **then** the **white connector (20 pin)**, otherwise an incorrect travel acquisition will almost certainly be obtained. There will therefore be recovery values and incorrect operation until the next key-on.

Restoring the self-adaptive parameters

Each time the battery is disconnected from the electrical system of the vehicle, all the self-acquisition parameters are cancelled from the ignition/injection ECU.

These parameters must be restored before the vehicle is used again, proceeding as follows.

The self-acquisition function of the Motronic ECUs will only be performed correctly at intake air temperatures above 5 °C. Ensure that the ambient air temperature is

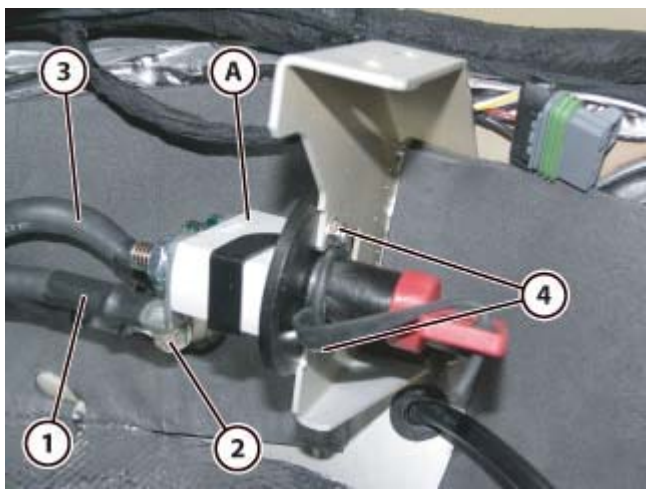
not below this value.

- Leave the engine stationary for approximately **10 minutes** in the following conditions:
- engine at idle speed;
- water temperature stabilised;
- current consumers switched off (lights, windscreen wipers etc.);
- air conditioner off.

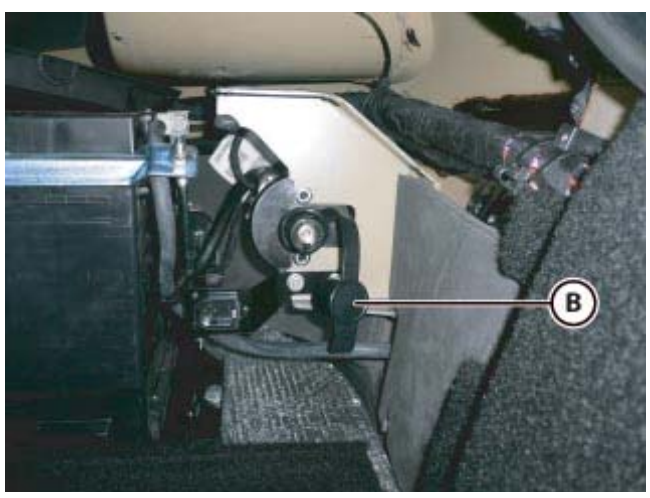
- These preparations allow the ECU to optimise the self-adaptive parameters quickly by preventing irregular engine operation.

Removing the battery master switch.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the luggage compartment side trim panels (M2.23).
Remove the right hand component only.



- Remove the earth cable **(1)** from the battery.
- Undo the screw **(2)** fastening the earth cable **(3)** onto the bodywork.
- Undo the two nuts **(4)** fastening the battery master switch to the chassis.
- Remove the battery master switch **(A)** (D313) from the luggage compartment.



FROM Ass.ly Nr. 75572

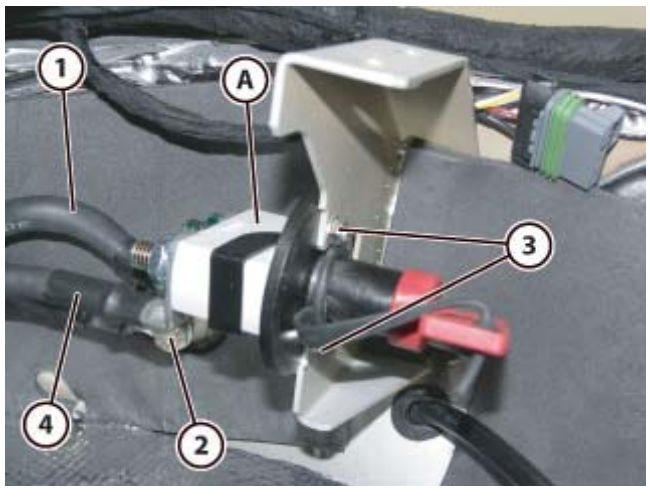
- The handle has been replaced by a cover **(B)**.
The removal procedure is the same.

Refitting the battery master switch

Tightening torque		Nm	Class
Battery master switch ground cable and battery - chassis	Screw	15 Nm	B

Every time the battery is disconnected from the rest of the vehicle system, all self-acquired parameters are deleted from the injection ECU. These parameters must be reacquired before reusing the vehicle.

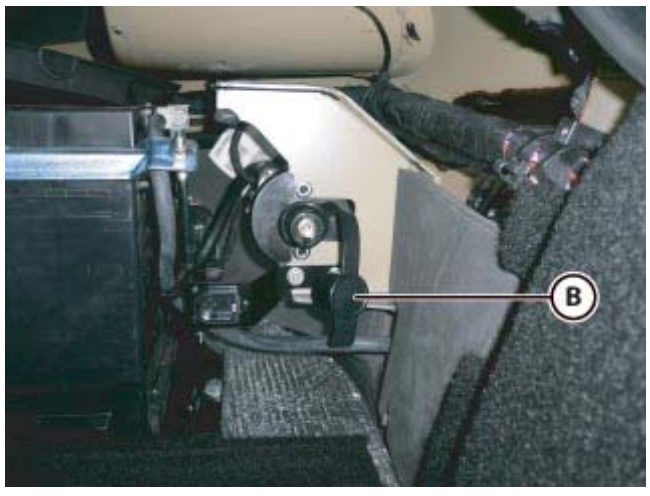
Apply protective grease for electrical contacts to both the cable terminals and the fastening pins.



- Fasten the earth cable **(1)** to the bodywork by tightening the screw **(2)**.

Tightening torque	Nm	Class
Screw	15 Nm	B

- Fix the battery master switch **(A)** (D313) to the chassis with the two fastener nuts **(3)**.
- Reconnect the cable **(4)** to the battery.



FROM Ass.ly Nr. 75572

- The handle has been replaced by a cover **(B)**.

The reassembly procedure is the same.

- Set the battery master switch to ON (L2.02).
- Refit the luggage compartment side trim panels (M2.23).

L2.03 Alternator

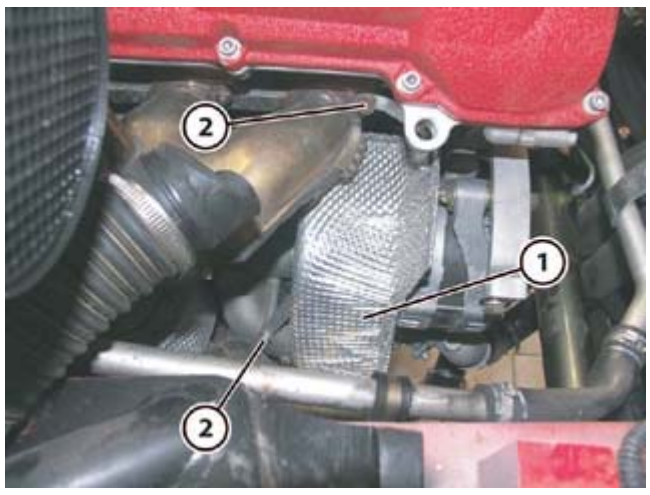
Alternator

The alternator is fixed on the front right hand side of the engine and is driven by the crankshaft pulley via a belt.
Periodically, or in the event of recharging system malfunction, check the absorption of the vehicle electric system and recharge the alternator.

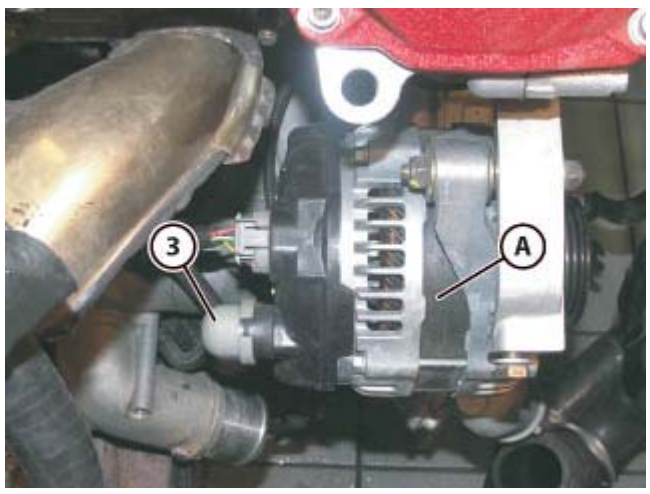
Removing the alternator

FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779, a new alternator fastening solution was introduced. The belt mounting and adjustment bracket has been eliminated and replaced by a fixed bracket.

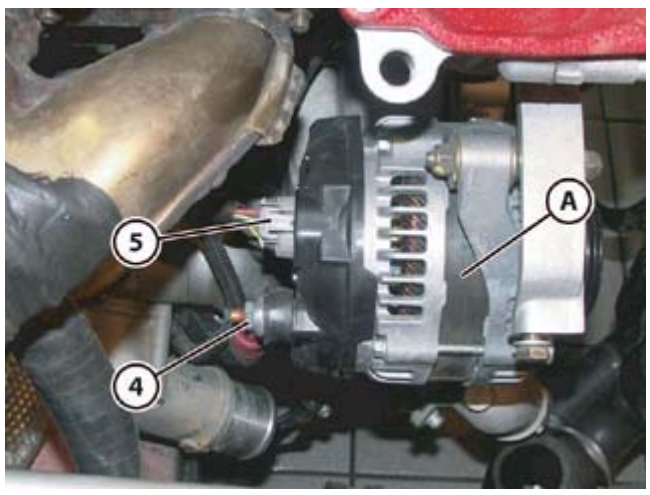
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the alternator drive belt (A3.12).



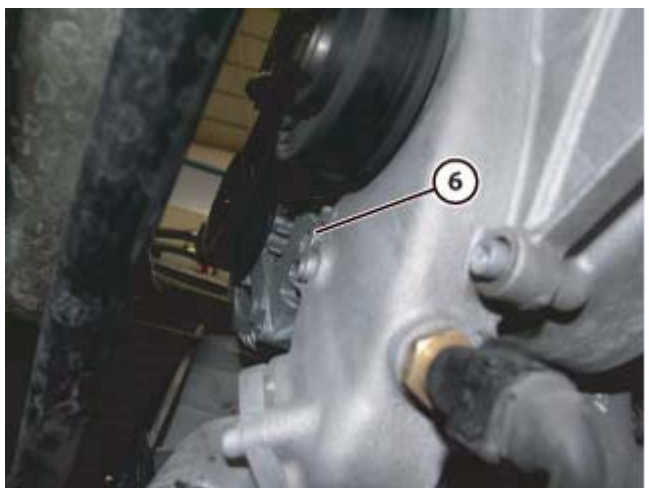
- Remove the heat shield **(1)** on the alternator by unscrewing the two nuts **(2)**.



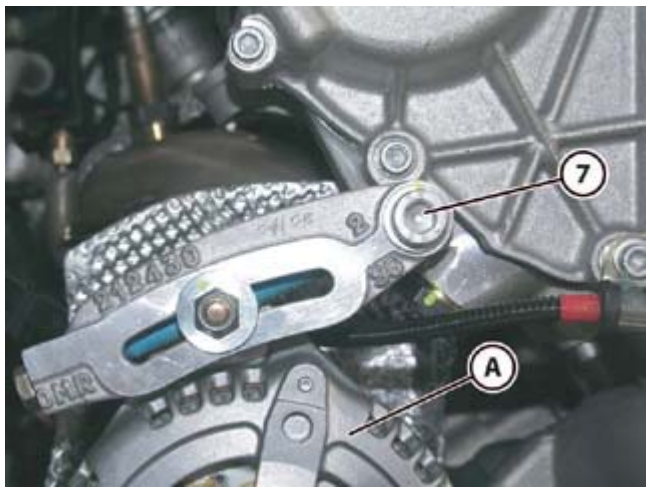
- Remove the cap **(3)** on the engine services cable fastener nut, located on the alternator **(A)**.



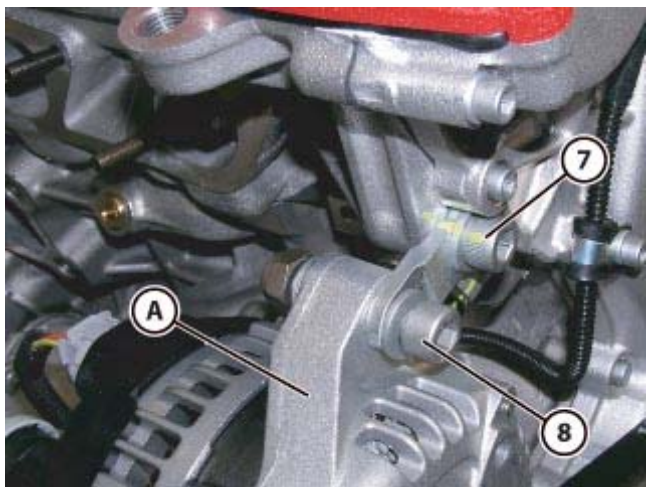
- Unscrew the engine services cable fastener nut **(4)**, retrieving the washers, and disconnect the connector **(5)** (B002) on the alternator **(A)**.



- Undo the lower screw **(6)**.



- Undo the upper screw **(7)** and remove the alternator **(A)** complete with mounting bracket from the engine compartment, easing out from above.



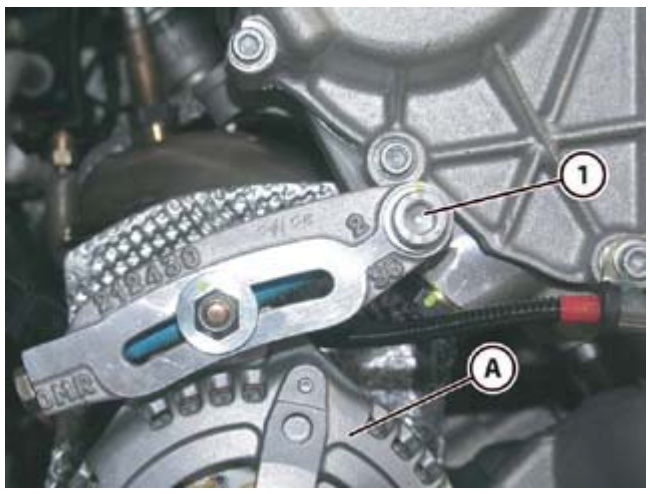
FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

- Loosen the screw **(7)** fastening the bracket to the cylinder head.
- Undo the screw **(8)**, recovering the washers and nut, then remove the alternator from the engine compartment.

Refitting the alternator

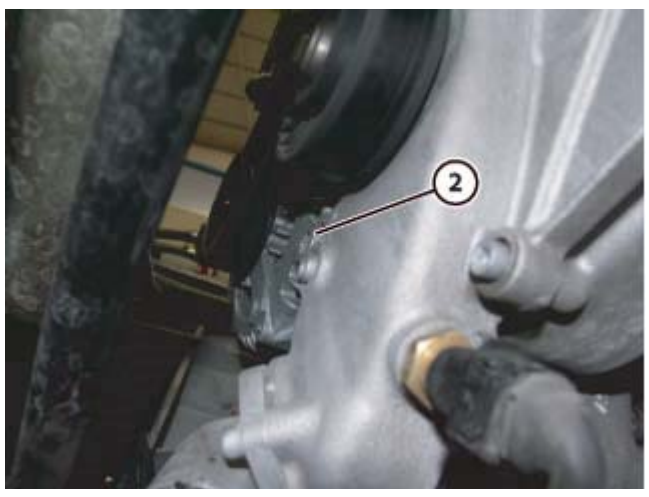
Tightening torque		**Nm**	**Class**
Upper alternator mounting - crankcase	Screw	59 Nm	B
Upper alternator mounting - engine	Screw	49 Nm	B
Lower alternator mounting - crankcase	Screw	49 Nm	B

FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779, a new alternator fastening solution was introduced. The belt support and adjustment bracket has been eliminated and replaced by a fixed bracket.

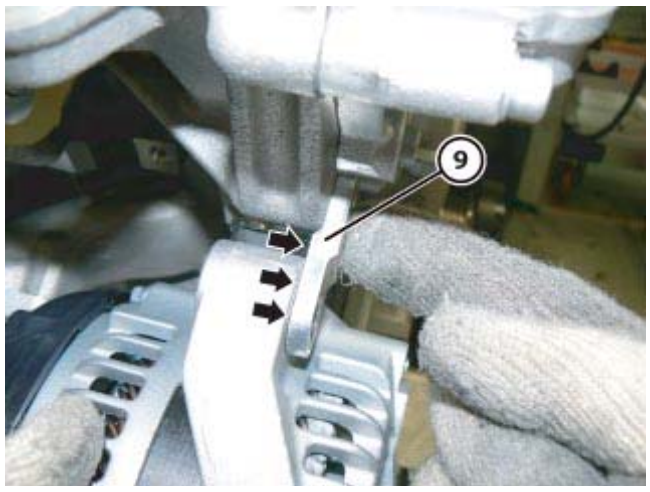


- Position the alternator **(A)** on the engine and secure it by tightening the upper screw **(1)**.

Tightening torque	**Nm**	**Class**
Screw	59 Nm	B



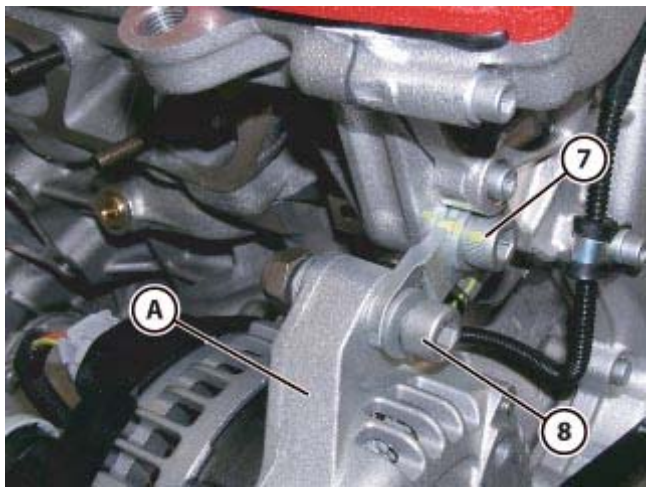
- Fit and screw in the lower screw **(2)** without tightening it.



FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

If the mounting bracket was removed during the procedure, ensure that it is positioned correctly during reassembly.

- ALWAYS check that the longer side (indicated by the arrows) of the bracket **(9)** is in contact with the alternator.

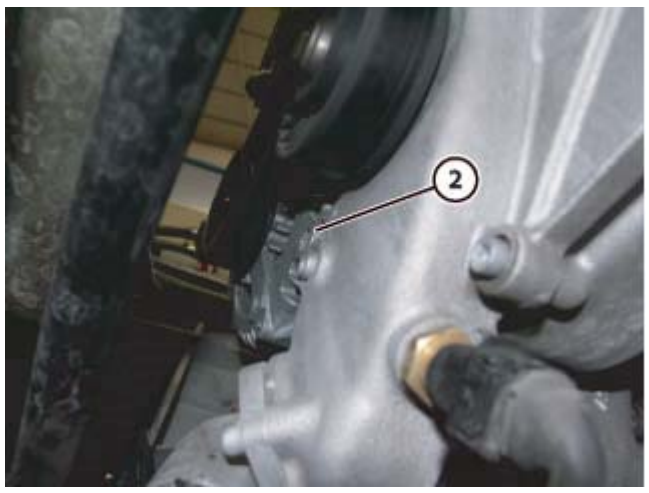


FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

- Loosely tighten the screw **(7)**, bring the alternator closer to the retainer bracket and fasten by tightening the screw **(8)** with relative washers and nut.
- Tighten the screw **(7)**.

Tightening torque	Nm	Class
Screw	49 Nm	B

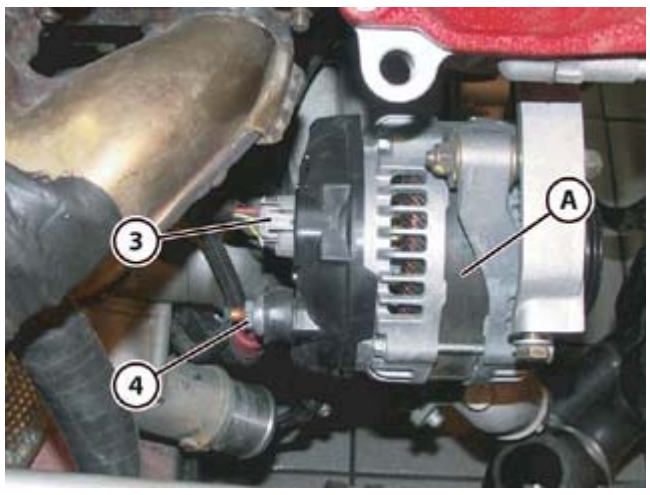
- Tighten the screw **(8)**.



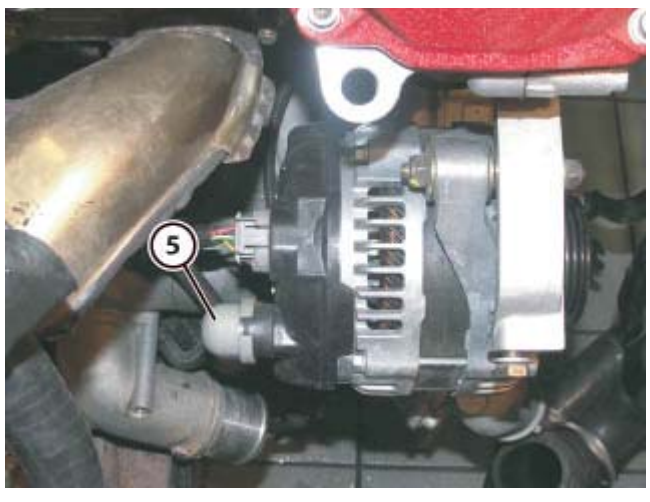
FROM REDUCED FUEL CONSUMPTION ENGINE Nr. 122779

- Tighten the lower screw **(2)** that retains the alternator.

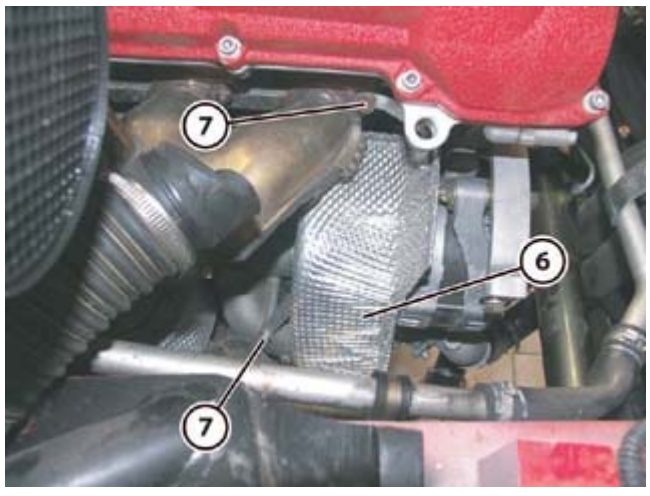
Tightening torque	Nm	Class
Screw	49 Nm	B



- Attach the connector **(3)** (B002)and, after positioning the spacers retrieved during removal, screw down the nut **(4)** that fastens the engine service cable to the alternator **(A)**.



- Reposition the cap on the nut that fastens the engine service cable **(5)**.



- Position the heat guard **(6)** in its seat and secure it by screwing in the two screws **(7)**.

➢ Refit the alternator drive belt (A3.12).
➢ Set the battery master switch to ON (L2.02).

L2.04 Starter motor

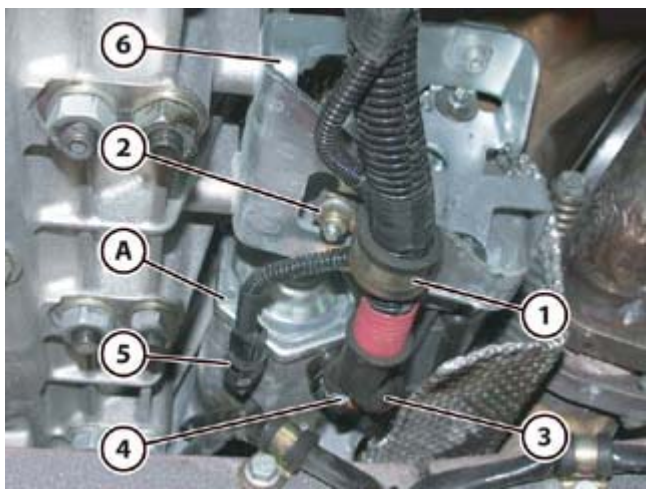
Starter motor

Brand: **DENSO**
Type: **228000 - 9970**
Power supply voltage: **12 Volt**

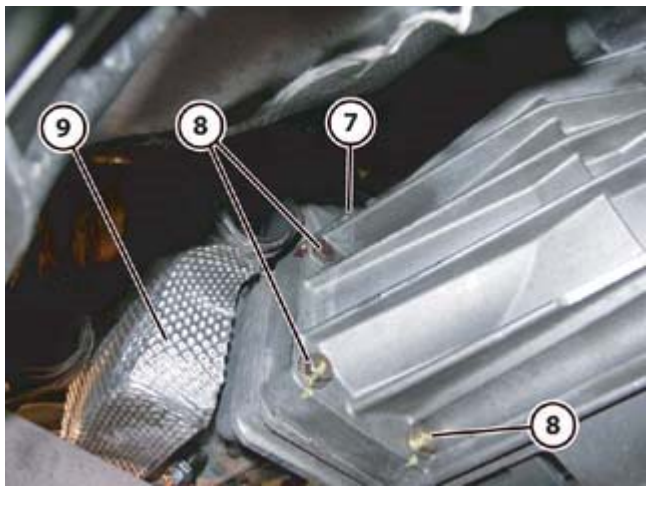
The starter motor is located on the left hand side of the engine and is electrically connected to the battery via the engine services cable.
The starter motor is supplied as a complete assembly, therefore, in the event of problems attributable to the starter motor alone, the motor must be replaced and cannot repaired.

Removing the starter motor

- Set the battery master switch to OFF (L2.02).
- Remove the front section of the underfloor (M2.12).
- Remove the exhaust branching (B6.06).
  - Remove the left hand branching.



- Working from underneath the vehicle, remove the engine services cable retainer clamp **(1)** by unscrewing the nut **(2)**.
- Use a screwdriver to lift the protective cap **(3)** and unscrew the nut **(4)** on the engine services cable.
- Disconnect the connector **(5)** (M020) and undo the two lateral fastener screws **(6)**.

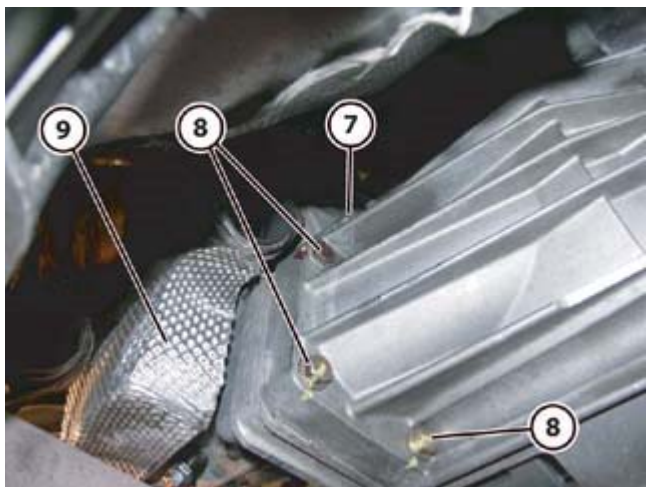


- Unscrew the nut **(7)** fastening the heat shield **(9)** and undo the three screws **(8)**.
- Lift out the starter motor complete with heat shield **(9)** and remove from the vehicle.

Refitting the starter motor

Tightening torque		**Nm**	**Class**
Clutch housing - starter motor	Screw	25 Nm	A
Starter motor mounting bracket - crankcase	Screw	25 Nm	B

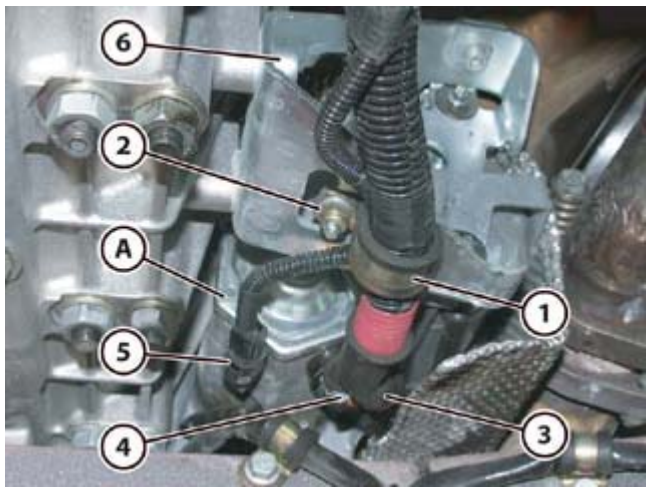
Check that the contact surfaces on the starter motor and on the clutch housing are clean and perfectly flat.



- Fit the starter motor complete with support bracket and heat shield **(9)** in its seat on the engine.
- Fasten the starter motor to the clutch housing by tightening the three screws **(8)**.

Tightening torque	**Nm**	**Class**
Screw	25 Nm	A

- Fasten the heat shield **(9)** to the clutch housing by tightening the nut **(7)**.



- Refit the exhaust branching (B6.06).
- Refit the front flat undertray section (M2.12).
- Set the battery master switch to ON (L2.02).

- Fasten the starter motor **(A)** to the engine by tightening the two lateral screws **(6)**.

Tightening torque	Nm	Class
Screw	25 Nm	B

- Connect the connector **(5)** (M020) and tighten the engine services cable fastener nut **(4)**.
- Refit the protector cap **(3)** on the nut **(4)** and the cable retainer clamp **(1)** with the nut **(2)**.

L2.05 Windscreen wiper motor

Checking and inspecting the windscreen wiper motor

The windscreen wiper motor is fastened to the levers and is covered by the windscreen shield.

In the event of noisy or abnormal operation, replace the complete windscreen wiper linkage.

The motor is connected to the windscreen wiper arms by linkages with ball joints. With exception of lubricating the joints during scheduled maintenance checks, the mechanism does not require special maintenance.

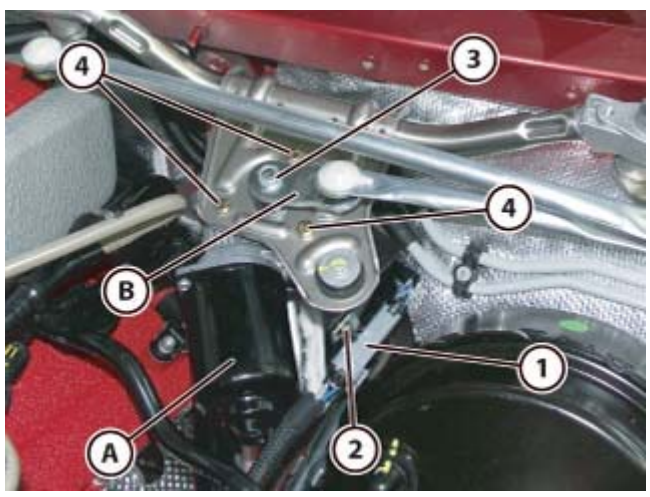
If the ball joints exhibit excessive backlash, replace the entire windscreen linkage set.



- The pulse is transmitted to the motor by an ECU **(A)**(E007), depending on the position of the control stalk.

Replacing the windscreen wiper motor

- Set the battery master switch to OFF (L2.02).
- Remove the windscreen wiper arms (M2.07).
- Remove the underwindscreen shields (M2.17).



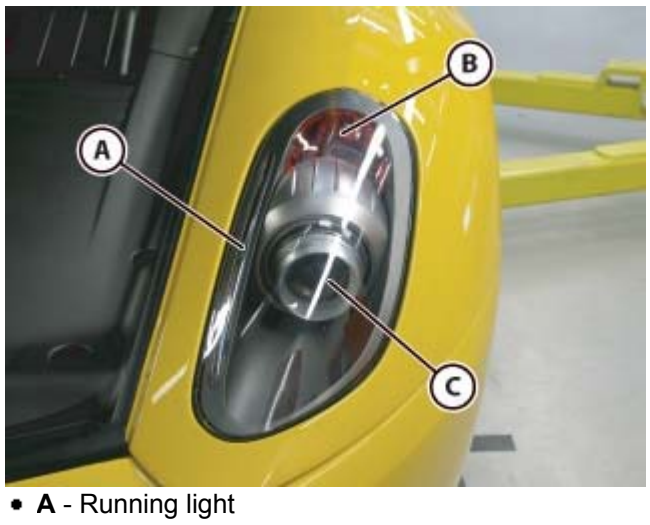
- Detach the connector **(1)** (M012)and undo the screw **(2)** that secures the connection to the bodywork.

In order to refit the lever **(B)** in its original position on the starter motor pin, mark the position of the two components with respect to each other.

- Unscrew the nut **(3)** holding the lever **(B)**.
- Undo the three screws **(4)** that secure the motor to the lever.
- Remove the windscreen wiper motor **(A)**.

L2.06 Front lights

Headlight position

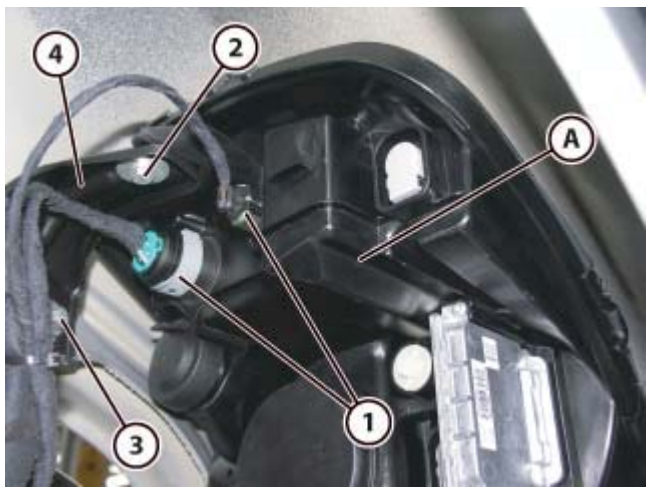


- **A** - Running light
- **B** - Turn indicator
- **C** - Low beam, high beam

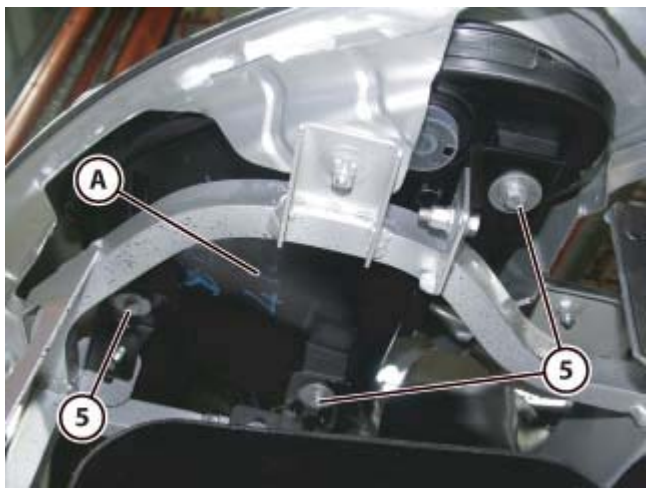
The headlight bulbs are accessible through the cover on the wheelhouse.

Removing the complete headlight

- Set the battery master switch to OFF (L2.02).
- Remove the wheel (F2.08).
- Remove the front bumper (M2.03).
- Remove the front wheelhouses (M2.05).



- Disconnect the two connectors **(1)** (I061) (I062) on the headlight **(A)**.
- Undo the upper screw **(2)** on the headlight.
- Undo the two screws **(3)** fastening the bracket **(4)**.
- Remove the bracket **(4)** from the wheel bay.

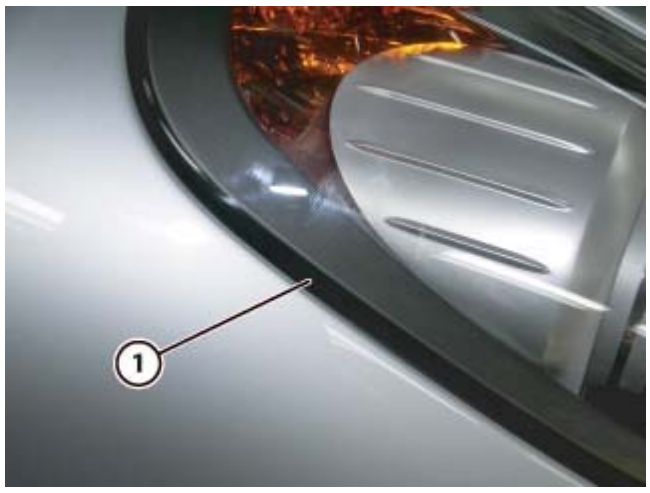


- Undo the three screws **(5)** fastening the headlight **(A)** to the bodywork.
- Remove the headlight **(A)** via the wheel bay, taking particular care not to scratch the lens.

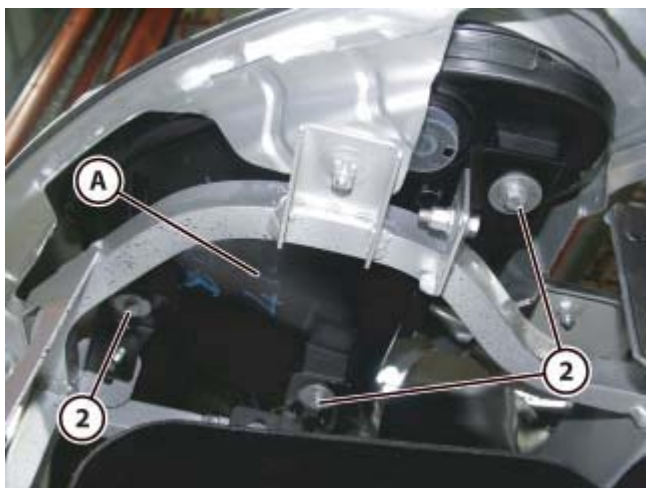
If necessary, protect headlight lens with masking tape.

Refitting the complete headlight

Tightening torque		Nm	Class
Lower headlight mounting bracket - bodywork	Screw	7.4 Nm	B
Lateral headlight mounting bracket - bodywork	Screw	7.4 Nm	B

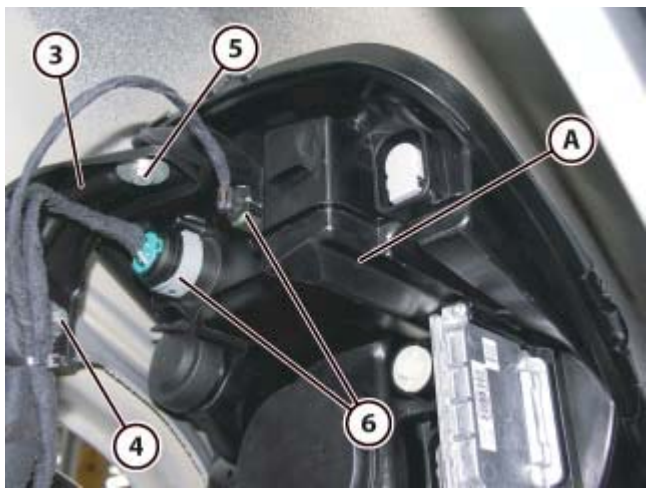


- Apply Vaseline grease to the surface of the headlight seal **(1)** in contact with the bodywork.



- Fit the headlight **(A)** in its seat on the chassis, introducing through the wheel bay.
- Apply and tighten the three headlight fastener screws **(2)**.

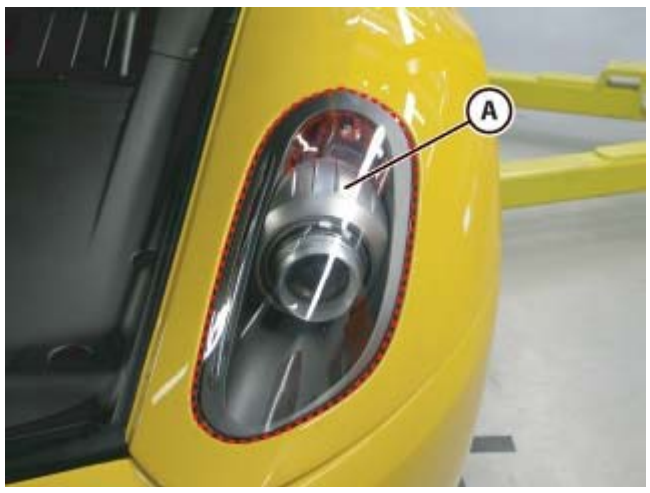
		
Tightening torque	**Nm**	**Class**
Screw	7.4 Nm	B



- Fit the bracket **(3)** on the bodywork and fasten by tightening the two screws **(4)**.
- Fasten the headlight **(A)** by tightening the screw **(5)**.
- Tighten the screws **(4)** and **(5)**.

		
Tightening torque	**Nm**	**Class**
Screw	7.4 Nm	B

- Connect the connectors **(6)** (I061) (I062).



- Check that the headlight is flush **(A)** with the bodywork.

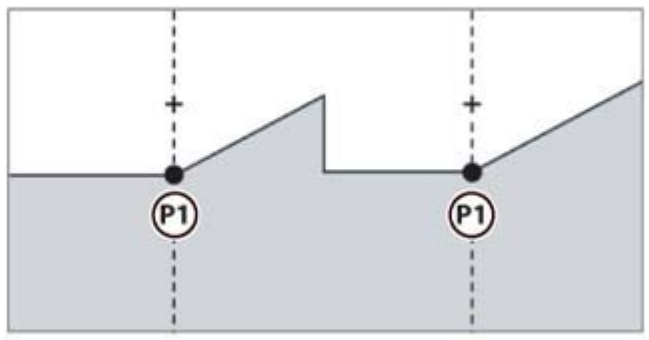
➢ Adjust the headlight beam (☞ L2.06).
i This operation must be performed only when fitting a new headlight.

➢ Refit the front bumper (☞ M2.03).
➢ Refit the front wheelhouses (☞ M2.05).
➢ Refit the wheel (☞ F2.08).
➢ Set the battery master switch to ON (☞ L2.02).

Adjusting the headlight beam

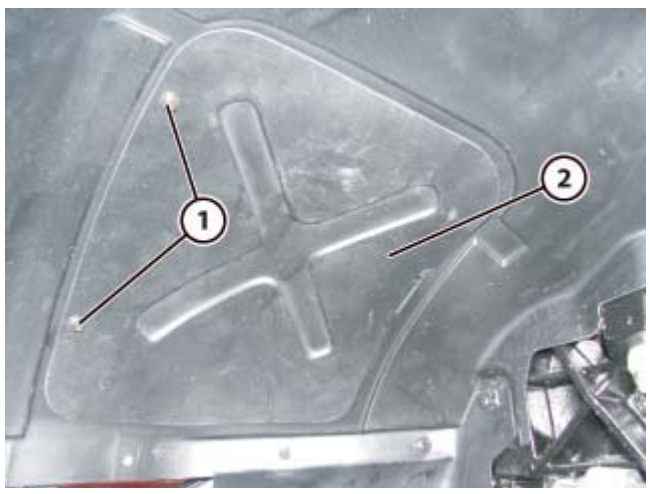
➢ Check the headlight beam as follows.

- Position the unloaded vehicle, with the tyres inflated to the indicated pressure, on a flat surface, facing a white, screen located in the shade.

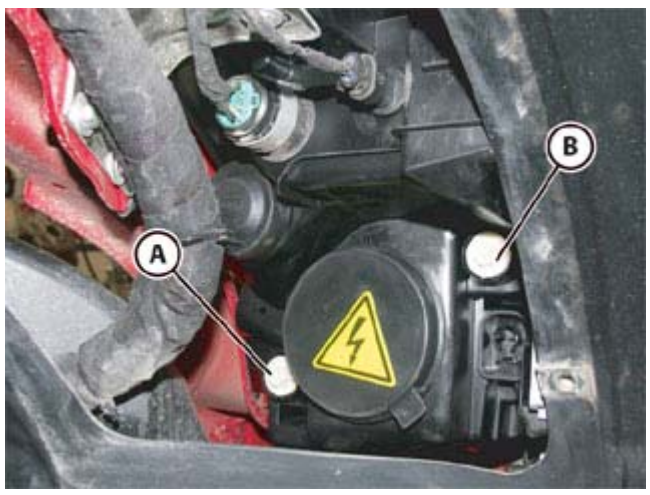


- Mark two crosses on the screen corresponding with the centres of the low beams.
- Move the car **10 metres** backward and turn on the low beams. The reference points **P1** of the light beam must be below the crosses, at **1/10** of the distance between the ground and the crosses.

The values above are relative to legislation currently in effect in Italy. For other countries, comply with the local legislation.



- Undo the two screws **(1)** fastening the door **(2)** to the gravel guard, then remove the guard.

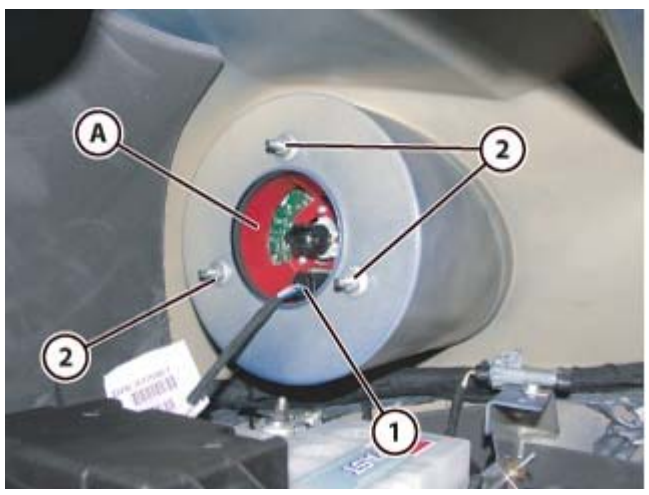


- Adjust front headlight beams with the relative adjuster screws:
- **A** - Horizontal light beam adjustment screw.
- **B** - Vertical light beam adjustment screw.

L2.07 Rear lights

Removing the taillight

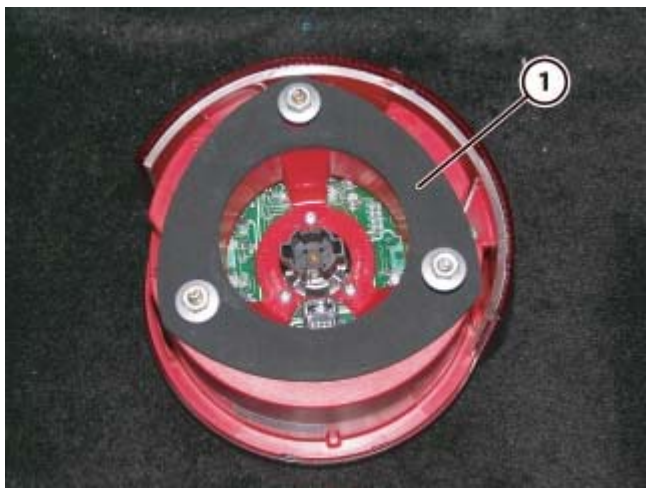
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the luggage compartment side trim panels (M2.23).



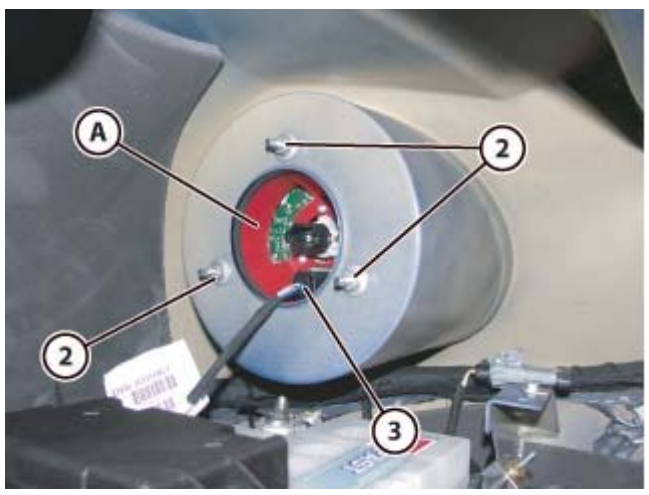
- Disconnect the wiring harness **(1)** (I007) (I008) from the taillight **(A)**.
- Unscrew the three nuts **(2)** that secure the taillight to the coachwork.
- Ease out and remove the taillight **(A)** from the outside of the vehicle.

Refitting the taillight

Tightening torque		Nm	Class
Taillight - bodywork	Nut	7.4 Nm	B



- Check the state of the seal **(1)** between the taillight and the bodywork; replace it if necessary.



- Fit the taillight **(A)** in its seat on the bodywork and tighten the three nuts **(2)**.

Tightening torque	Nm	Class
Nut	7.4 Nm	B

- Fit the connector **(3)** (I007) (I008).

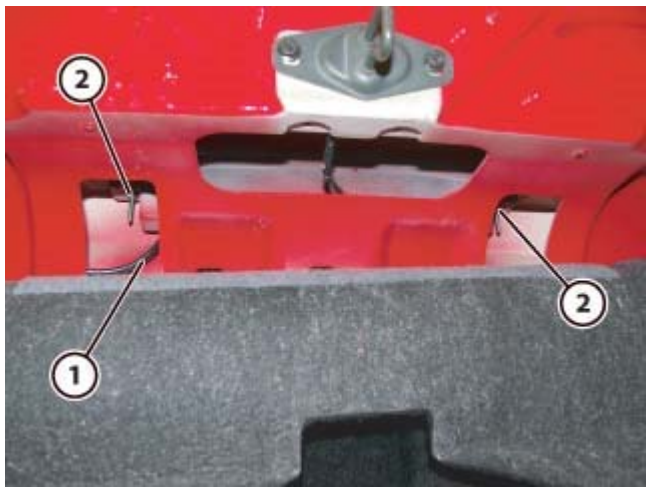
➢ Refit the luggage compartment side trim panels (M2.23).
➢ Set the battery master switch to ON (L2.02).

Replacing third stop light

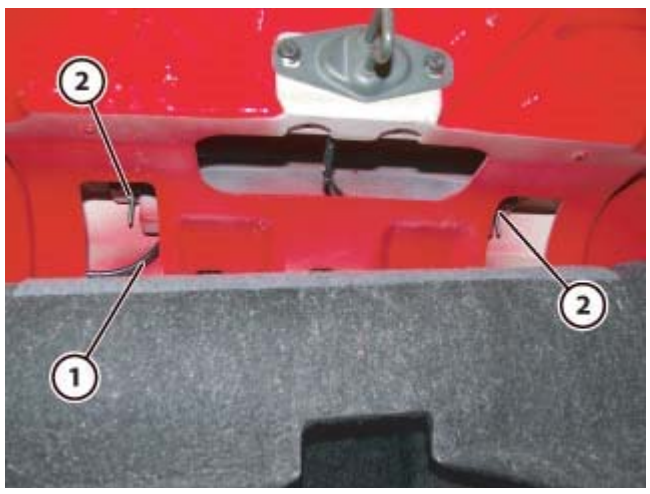
FROM Assembly Nr. 76258, a new third stop light is installed which uses LED lights instead of normal bulbs.

The installation of the new third stop light has also required the introduction of specific connector cables. The only difference between the old connector braid and the new connector braid is that the poles on the third stop light connector have been inverted. This is because the LED lights in the new stop light require a specific polarity to function, which is not necessary with the previous stop light with conventional bulbs.

➢ Remove the internal trim panel on the luggage compartment lid (M2.23).



- Disconnect the connector **(1)**(I011).
- Undo the nuts **(2)** and remove the third stop light from the outer side of the luggage compartment lid.



- To refit, fit the third stop light in its relative seat on the luggage compartment lid.
- Tighten the nuts **(2)** and connect the connector **(1)** (I011).

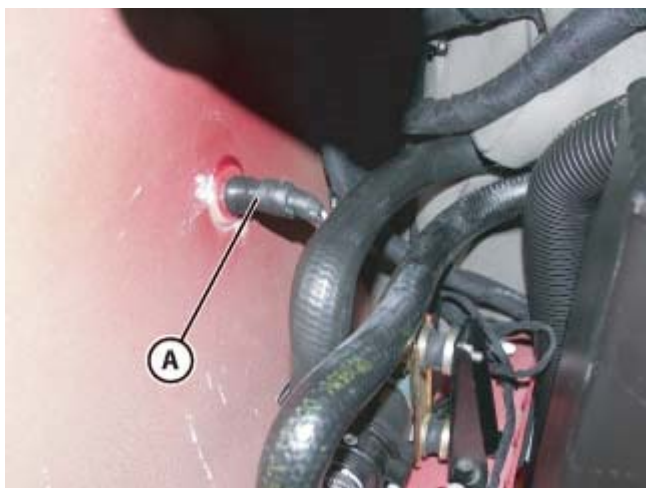
➢ Refit the internal trim panel on the luggage compartment lid (☞ M2.23).

L2.08 Side turn indicators

Removing the complete lateral turn indicator

- Set the battery master switch to OFF (L2.02).
- Remove the front wheelhouses (M2.05).

  Remove only the rear section

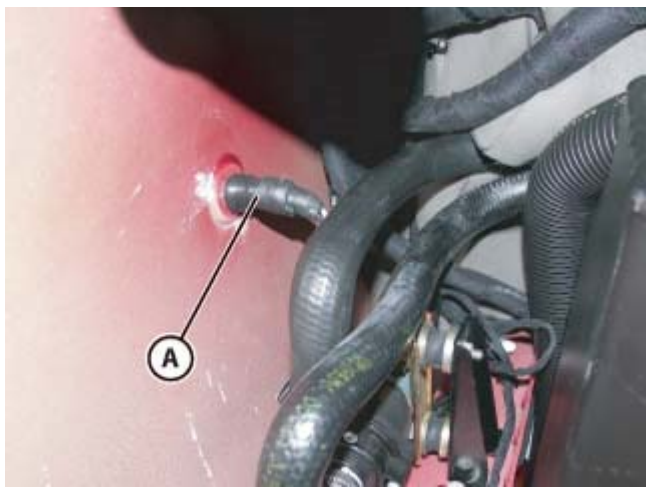


- Working inside the fender, detach the lateral turn indicator connector **(A)** (I005) (I006)from the front wiring harness.

  Take care not to damage the bodywork;

- Remove the complete indicator from the outside.

Refitting the complete lateral turn indicator



Take care not to damage the bodywork;

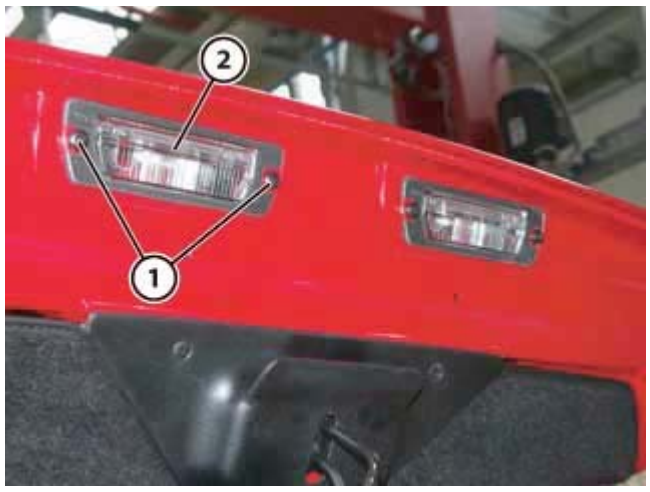
- Fit the complete lateral turn indicator **(A)** on the bodywork.
- Connect the relative connector (I005) (I006) to the wiring harness and fasten as originally installed.

- Refit the front wheelhouses (M2.05).
- Set the battery master switch to ON (L2.02).

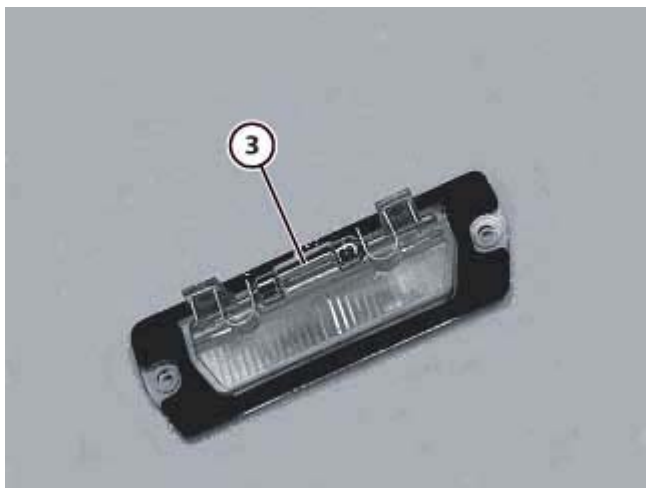
L2.09 Number plate lights

Removing the number plate lights

Before replacing the number plate light bulbs, check whether the relative fuse has blown.

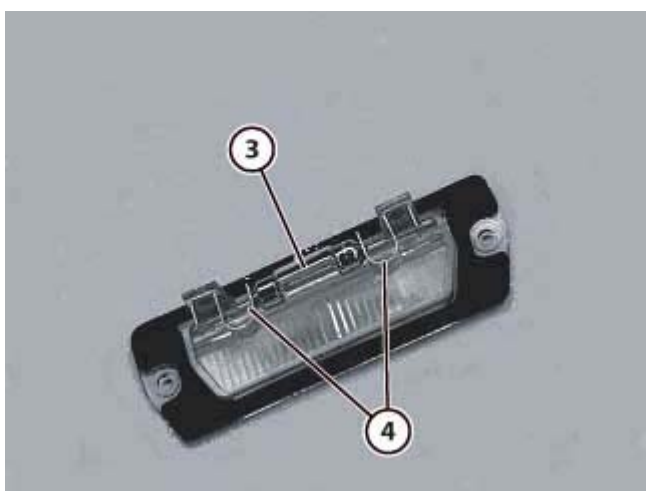


- Undo the two screws **(1)** and remove the bulb holder **(2)** from its seat on the luggage compartment lid.



- Remove the bulb **(3)** (I009) (I010) from the tabs, taking care not to bend the tabs.

Refitting the number plate lights



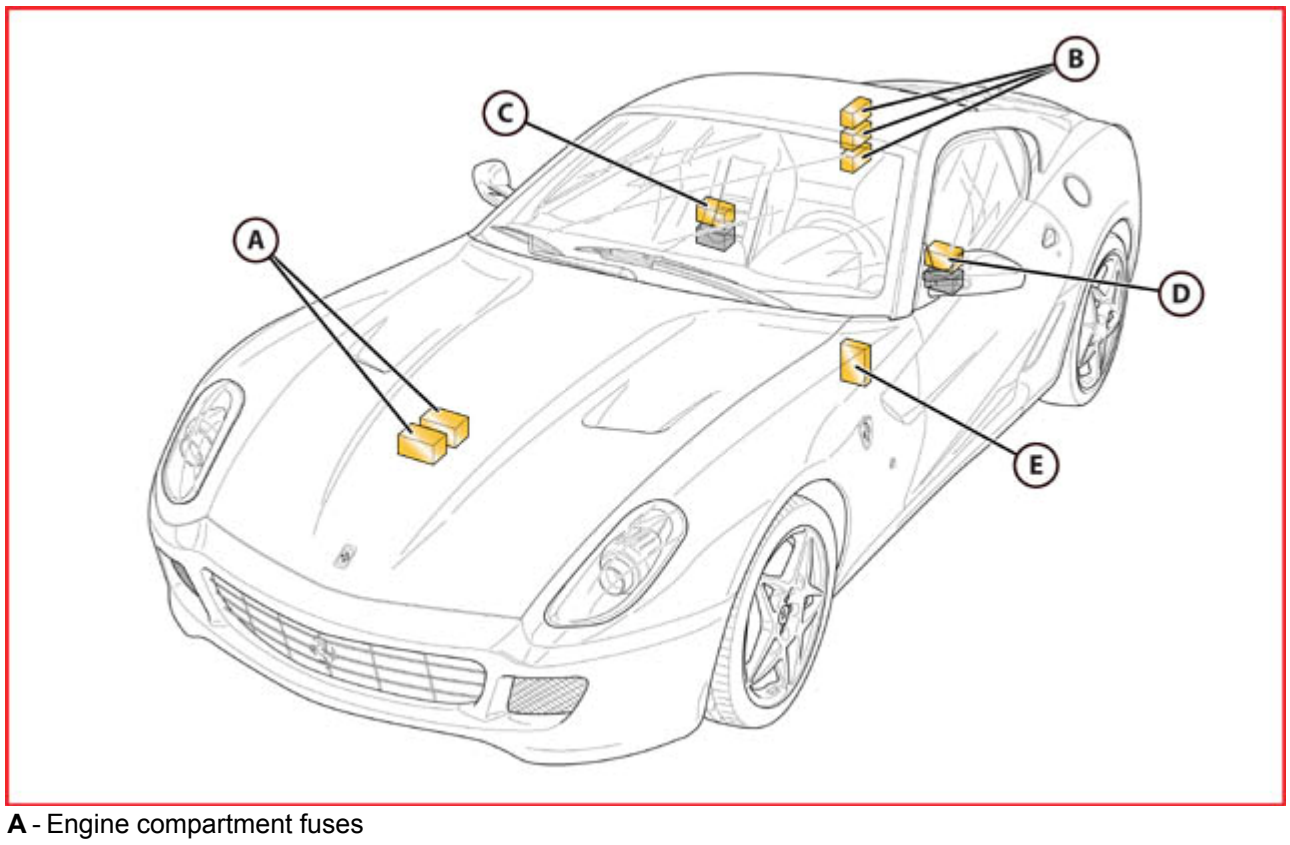
- Fit the bulb **(3)** in its seat between the tabs **(4)** (I009) (I010) of the bulb holder, taking care not to apply excessive force.



- Fit the bulb holder **(2)** in its seat on the luggage compartment lid.
- Fasten the bulb holder to the lid by tightening the two screws **(1)**.

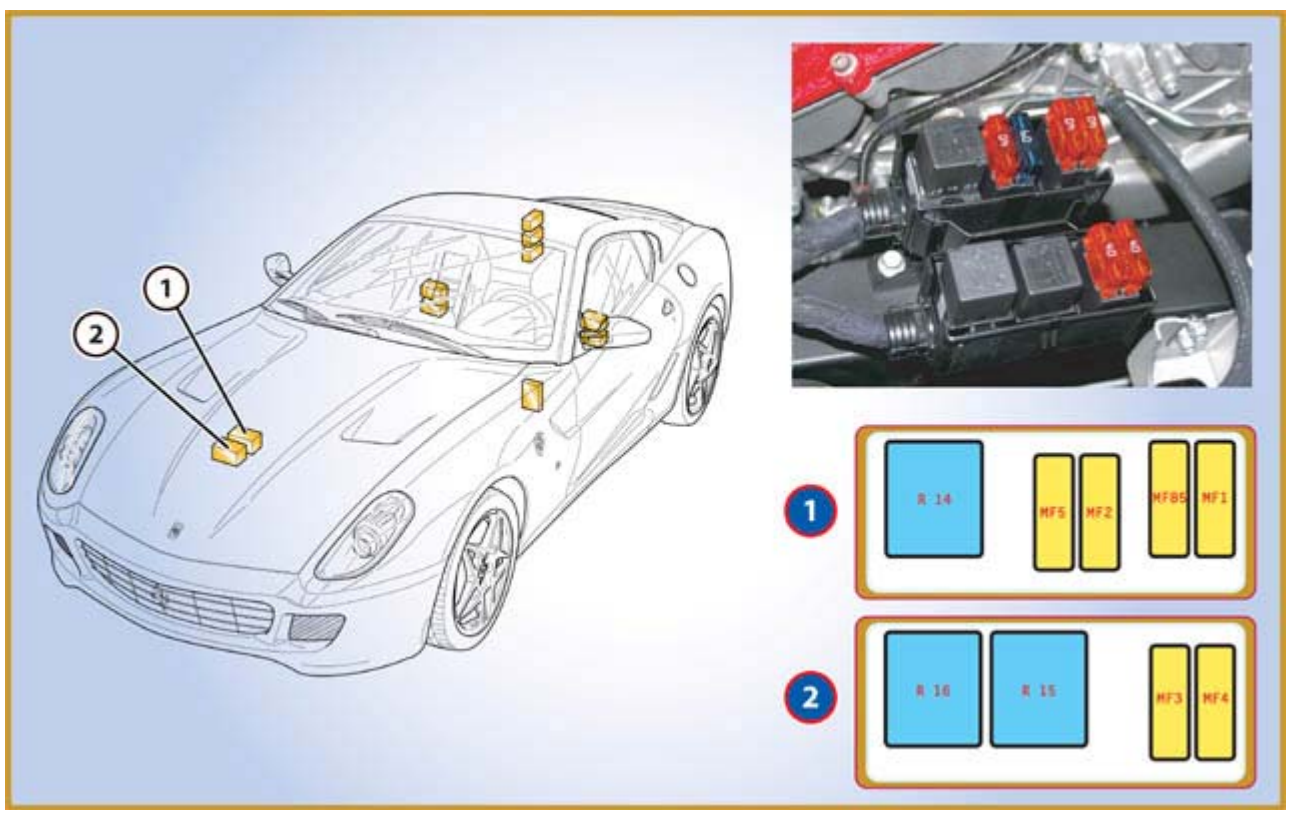
L2.10 Fuses and relays

Fuse box location



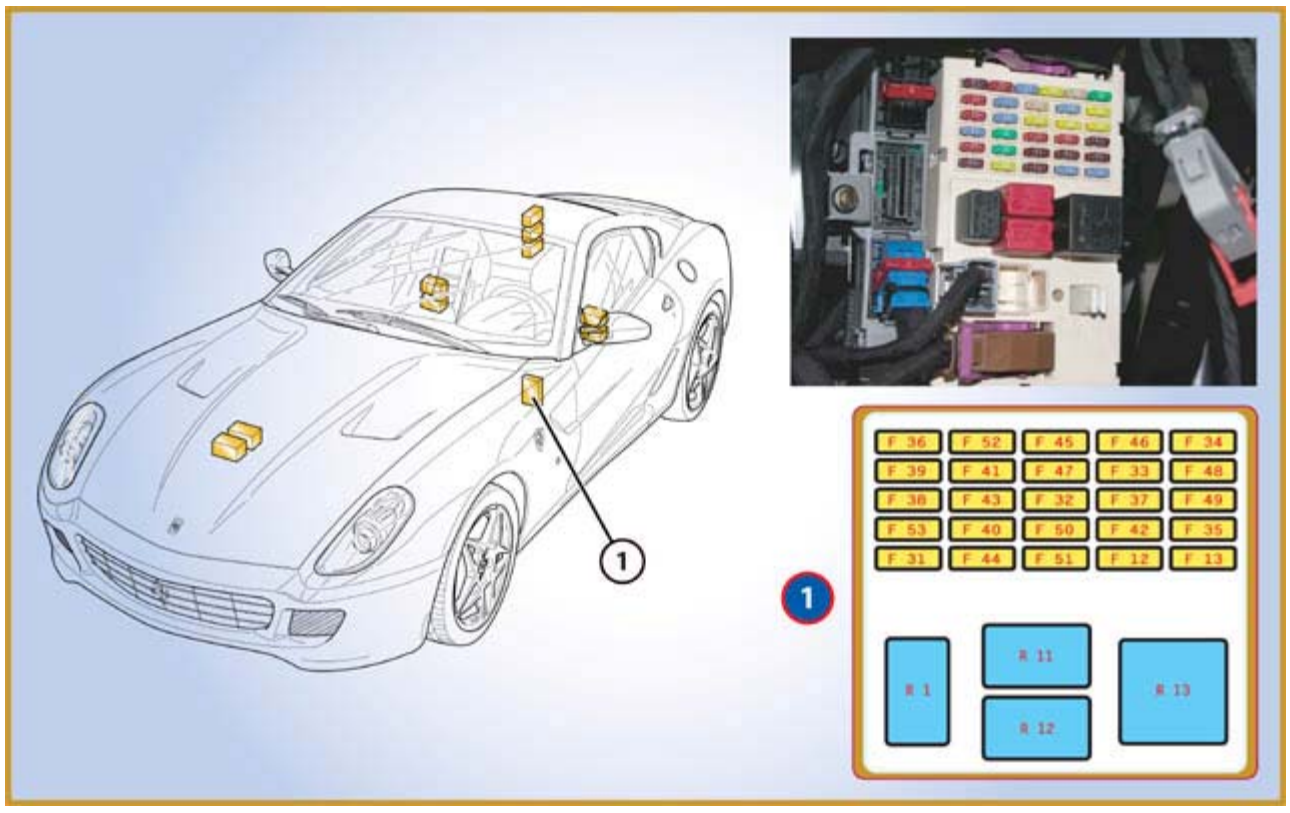
A - Engine compartment fuses
B - Luggage compartment fuses
C - Passenger compartment fuses - passenger side
D - Passenger compartment fuses - driver side
E - Passenger compartment fuses - under dashboard

Engine compartment fuses



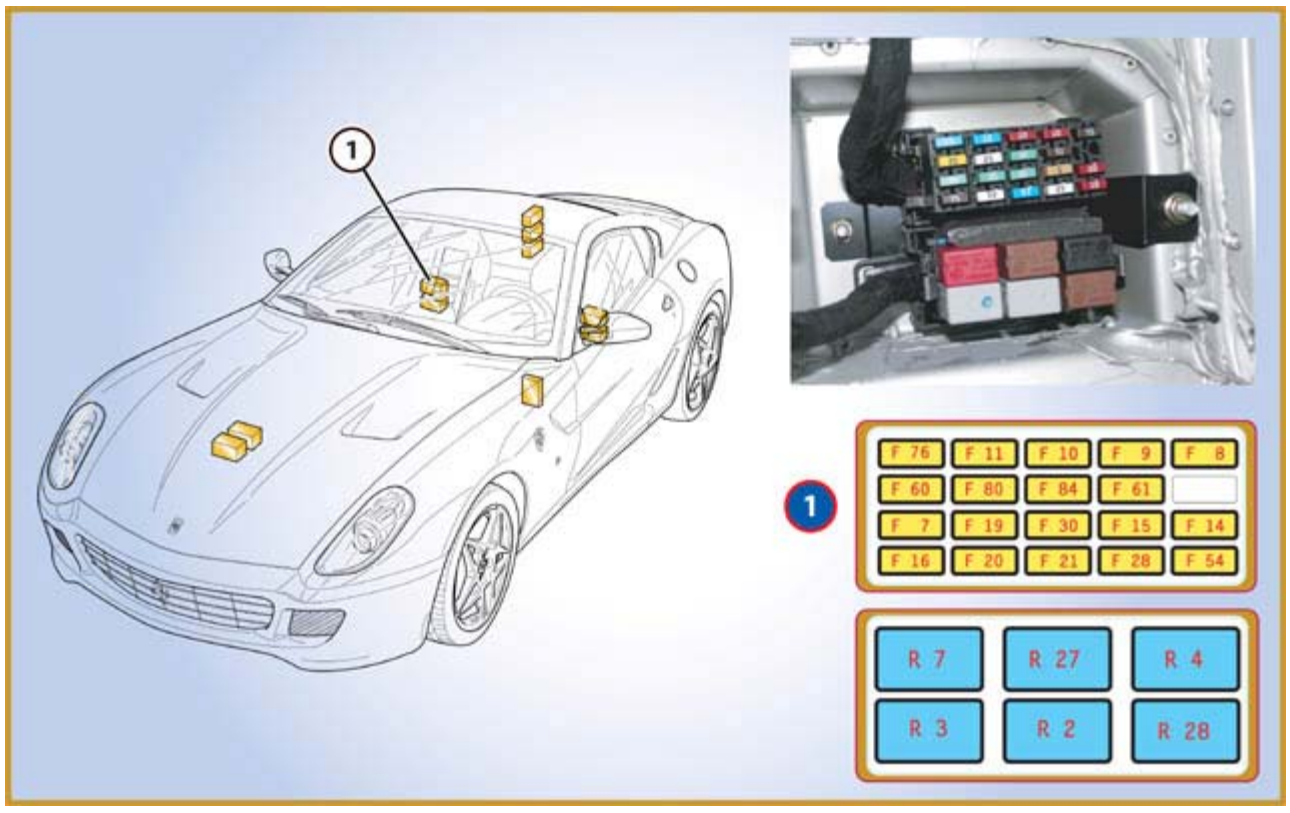
Ref	Amp.	Use
P300_M05	40	(MF5) Air-conditioning unit
P300_M02	60	(MF2) Air pump
P302_M85	40	(MF85) Fuse 2 - Passenger compartment connected devices
P302_M01	40	(MF1) ABS electric pump
P303_M03	40	(MF3) Right-hand electric fan
P303_M04	40	(MF4) Left-hand electric fan

Dashboard fuses (Body computer)



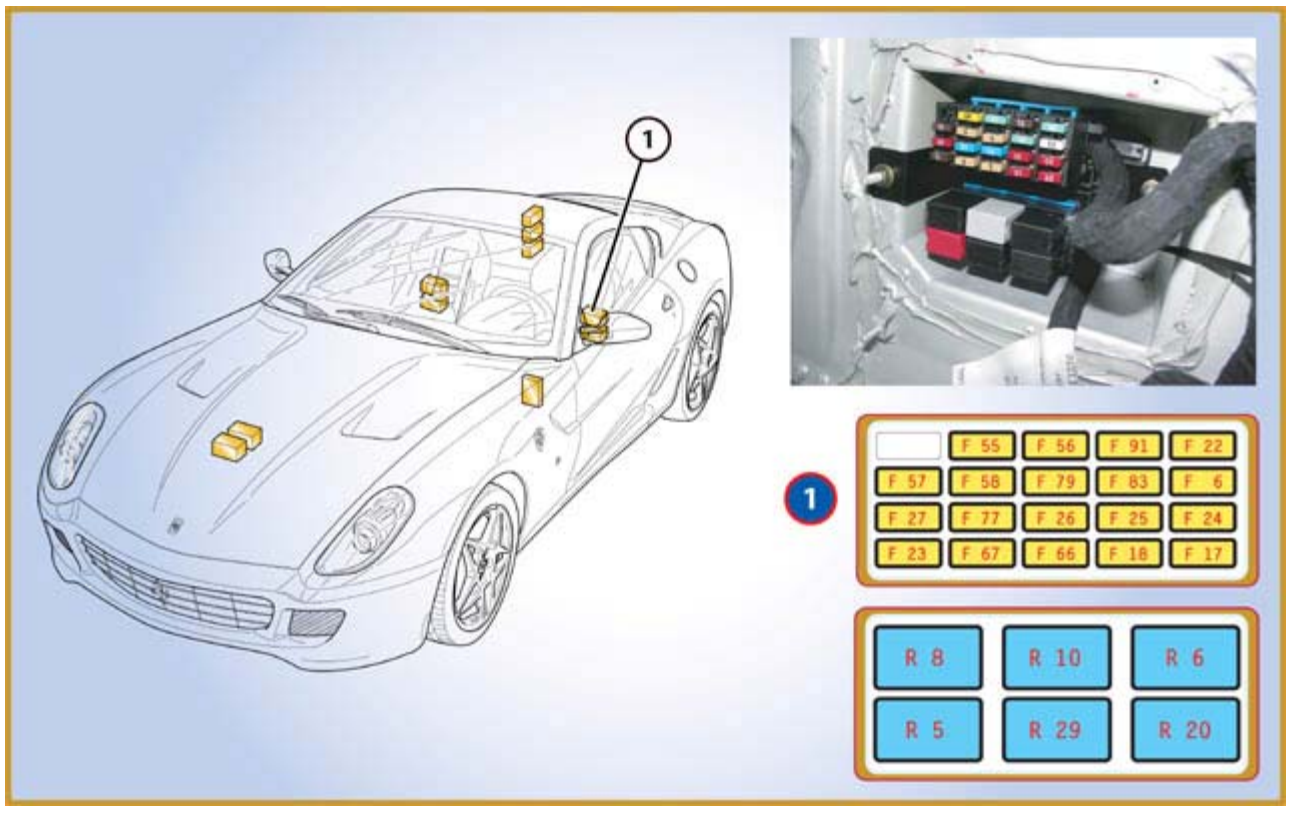
Ref	Amp.	Use
C003_F36	10	(F36) +30 fuse - glove compartment motor
C003_F52	15	(F52) Driver seat heater fuse (INT/A service relay)
C003_F45	25	(F45) NOT USED
C003_F46	15	(F46) NOT USED
C003_F34	20	(F34) NOT USED
C003_F39	10	+30 fuse for NIM, NCL, EOBD diagnostic socket, CSA, CAV, radio
C003_F41	15	(F41) NOT USED
C003_F47	20	(F47) NOT USED
C003_F33	20	(F33) NOT USED
C003_F48	20	(F48) NOT USED
C003_F38	15	(F38) +30 fuse - luggage compartment lock gear motor
C003_F43	30	(F43) Windscreen wiper/washer fuse (INT/A service relay)
C003_F32	10	(F32) +30 fuse - dome light
C003_F37	10	(F37) +15 fuse - NQS, +15 CLA (NO), third stop
C003_F49	7.5	(F49) +15 fuse for CSG, CSP, NIM, NCL, radio, CAN BOX interface, CEM, CRP, dome light fixing plate and windscreen wiper controls
C003_F53	10	(F53) +30 fuse - rear fog light
C003_F40	30	(F40) +30 fuse - heated rear window (INT/A relay)
C003_F50	7.5	(F50) +15 fuse - airbag system
C003_F42	7.5	(F42) +15 fuse - NFR
C003_F35	7.5	(F35) +15 fuse - CLA (NC), IFR, relay coils (headlight washer, reverse gear, high beams)
C003_F31	7.5	(F31) INT/A fuse for A.C. unit, NBC
C003_F44	20	(F44) +30 fuse - cigarette lighter, passenger seat heating (INT/A service relay)
C003_F51	7.5	(F51) +15 fuse - NCR
C003_F12	15	(F12) +30 fuse - right-hand low beam
C003_F13	15	(F13) +30 fuse - left-hand low beam

Passenger compartment fuses - passenger side



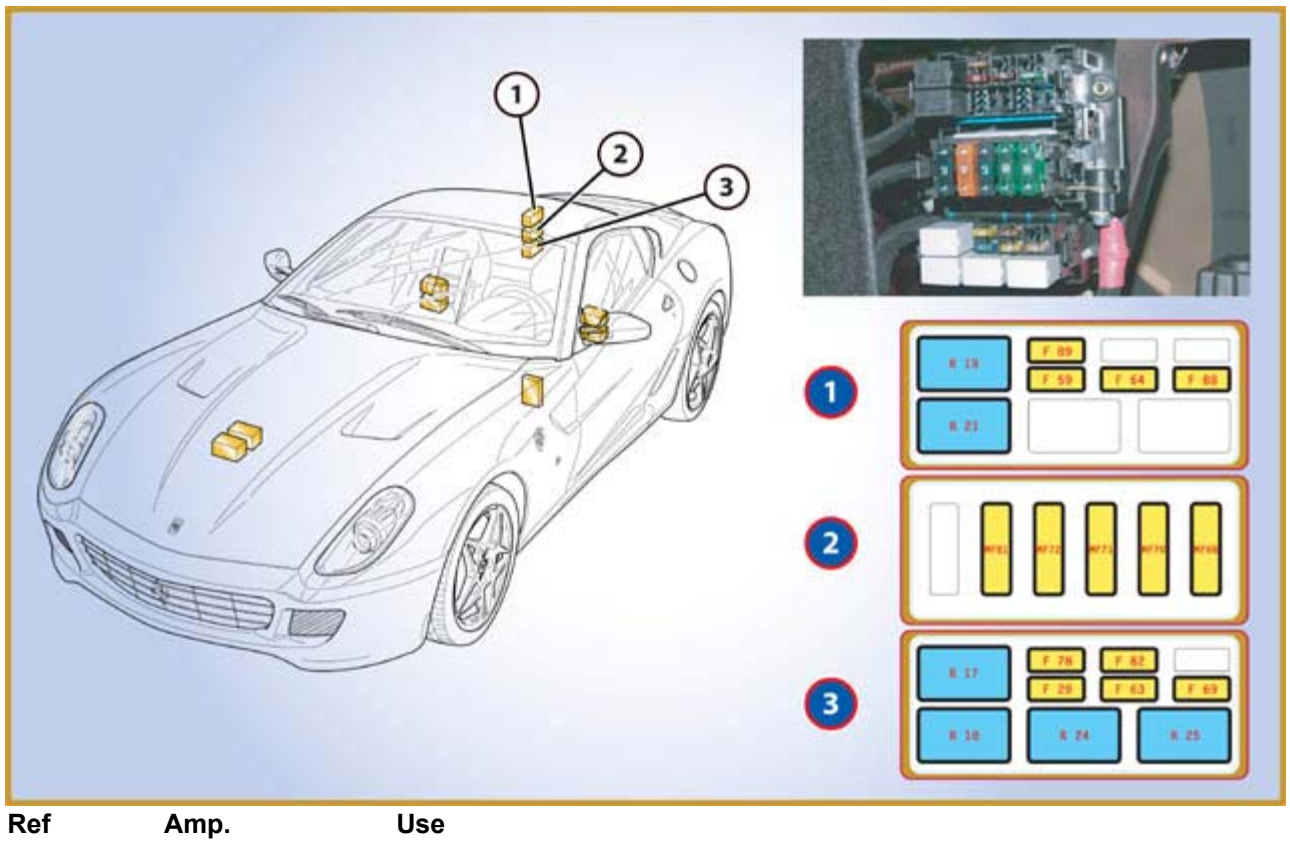
Ref	Amp.	Use
C317_F76	15	(F76) fuse - right hand oxygen sensor
C317_F11	15	(F11) +87 fuse - right hand main injector and coil relay
C317_F10	10	(F10) fuse - right hand solenoid valves and air flow meter
C317_F09	10	(F09) Fuse - Right hand injection (pin F03)
C317_F08	7.5	(F08) +30 fuse - Right hand injection (pin F62)
C317_F60	20	(F60) +30 fuse - door lock actuator
C317_F80	25	(F80) +30 fuse - Hi-Fi system (bass-box and subwoofer)
C317_F84	30	(F84) +30 fuse - passenger side door node power supply
C317_F61	7.5	(F61) +30 fuse - set-up (electronic)
C317_F07	30	(F07) +30 fuse - right hand injection, right hand main relay coil
C317_F19	30	(F19) +30 fuse - starter motor
C317_F30	30	(F30) +30 fuse - adjustable driver side seat (and powered steering column, with comfort seats only)
C317_F15	5	(F15) +15 fuse - weight sensor ECU (USA version only)
C317_F14	10	(F14) +15 fuse - right hand injection (coils and fuel pump relays) (pin F21)
C317_F16	7.5	(F16) +30 fuse - AC compressor
C317_F20	25	(F20) +30 fuse - headlight washer
C317_F21	15	(F21) +30 fuse - horn
C317_F28	25	(F28) +30 fuse - ABS (solenoid valves)
C317_F54	10	(F28) +30 fuse - ABS (electronic)

Passenger compartment fuses - driver side



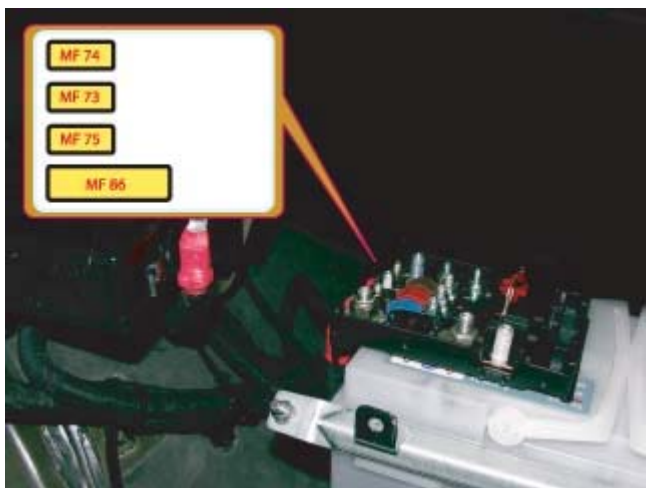
Ref	Amp.	Use
C316_F55	20	(F55) +30 fuse - powered steering column (only with basic seats)
C316_F56	30	(F56) +30 fuse - power adjustable passenger seat
C316_F91	7.5	(F91) +30 fuse - passenger seat setup ECU (electronic)
C316_F22	30	(F22) +30 fuse - main left hand injection, left hand main relay coil
C316_F57	7.5	(F57) +30 fuse - alternator, NVO and starter button
C316_F58	5	(F58) +30 fuse - tyre pressure monitoring fuse
C316_F79	5	(F79) +30 fuse - instrument panel node
C316_F83	30	(F83) +30 fuse - driver side door node power supply
C316_F06	25	(F06) +30 fuse - ignition switch
C316_F27	10	(F27) +15 fuse - left hand injection (pin F21)
C316_F77	15	(F77) Fuse - left hand oxygen sensor
C316_F26	15	(F7) +87 fuse - main injector relay and left hand coil relay
C316_F25	10	(F25) Fuse - left hand canister solenoid valve, air flow meter and diagnostic pump
C316_F24	10	(F24) Fuse - Left hand injection (pin F03)
C316_F23	7.5	(F23) +30 fuse - left hand injection (pin F62)
C316_F67	5	(F67) +30 fuse, front right and rear left side markers
C316_F66	5	(F66) +30 fuse - front left and rear right side markers
C316_F18	10	(F18) +30 fuse - right hand high beam
C316_F17	10	(F17) +30 fuse - left hand high beam

Luggage compartment fuse boxes



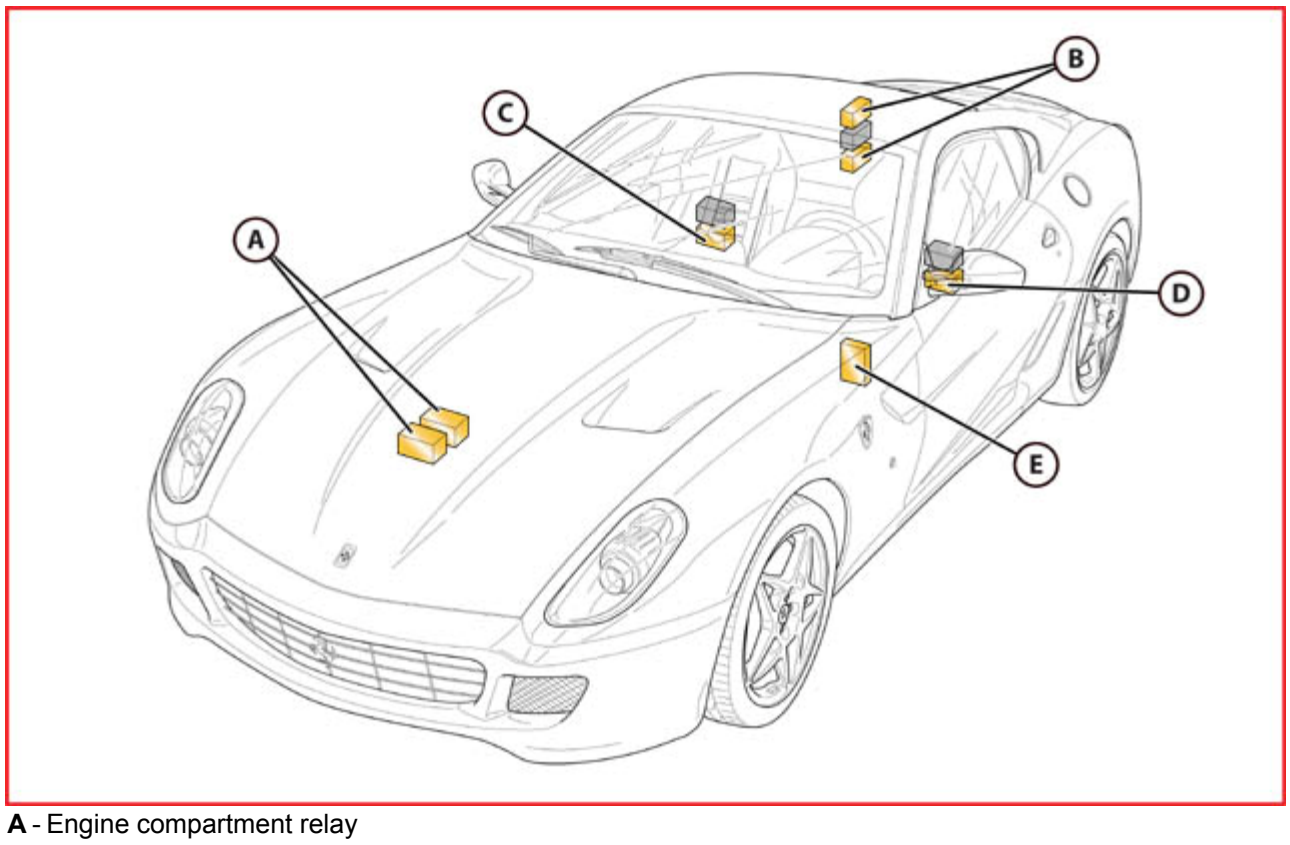
Ref	Amp.	Use
C303_F89	5	(F89) Parking sensor and shock absorber control
C303_F59	10	(F59) Fuel tank door fuse
C303_F64	7.5	(F64) Fuses - reverse gear, NSP
C303_F88	30	(F88) Fuse and shock absorber control
C301_M81	60	(MF81) Service fuse 1 - passenger compartment
C301_M72	40	(MF72) Luggage compartment fuse and side marker relay coil
C301_M71	60	(MF71) Service fuse 3 - passenger compartment
C301_M70	30	(MF70) F1 gearbox pump fuse
C301_M68	30	(MF68) HI-FI system fuse (amplifier)
C309_F78	20	(F78) Left-hand fuel pump fuse
C309_F82	5	(F82) Alternator sensing fuse
C309_F29	15	(F29) Battery charger fuse
C309_F63	20	(F63) Right-hand fuel pump fuse
C309_F69	25	(F69) F1 gearbox ECU fuse

Battery fuses



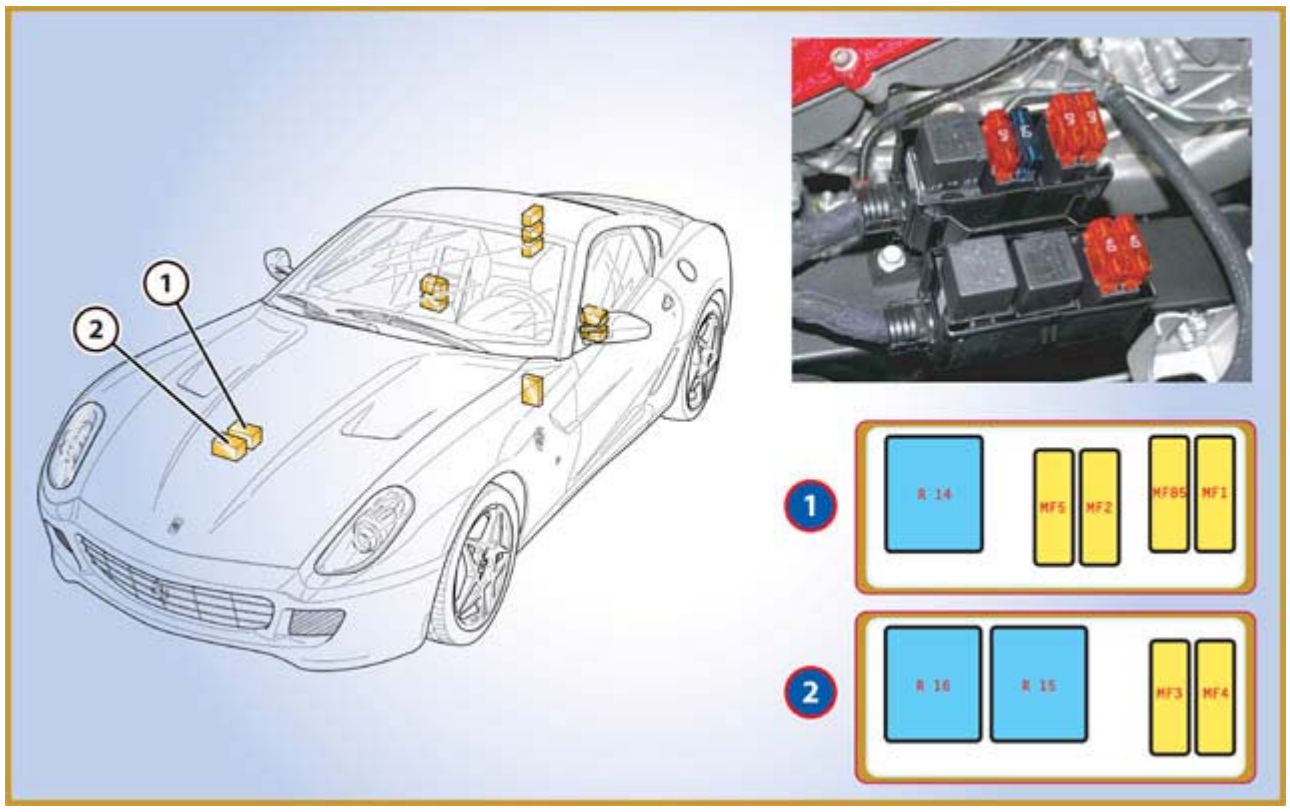
Ref	Amp.	Use
C002A_M74	70	(MF74) +30 CPL
C002B_M73	50	(MF73) +30 CPL (services 2) (predisposition)
C002C_M75	100	(MF75) +30 CVB
C002D_M86		(MF86) +30 CVM, starter motor

Relay box location



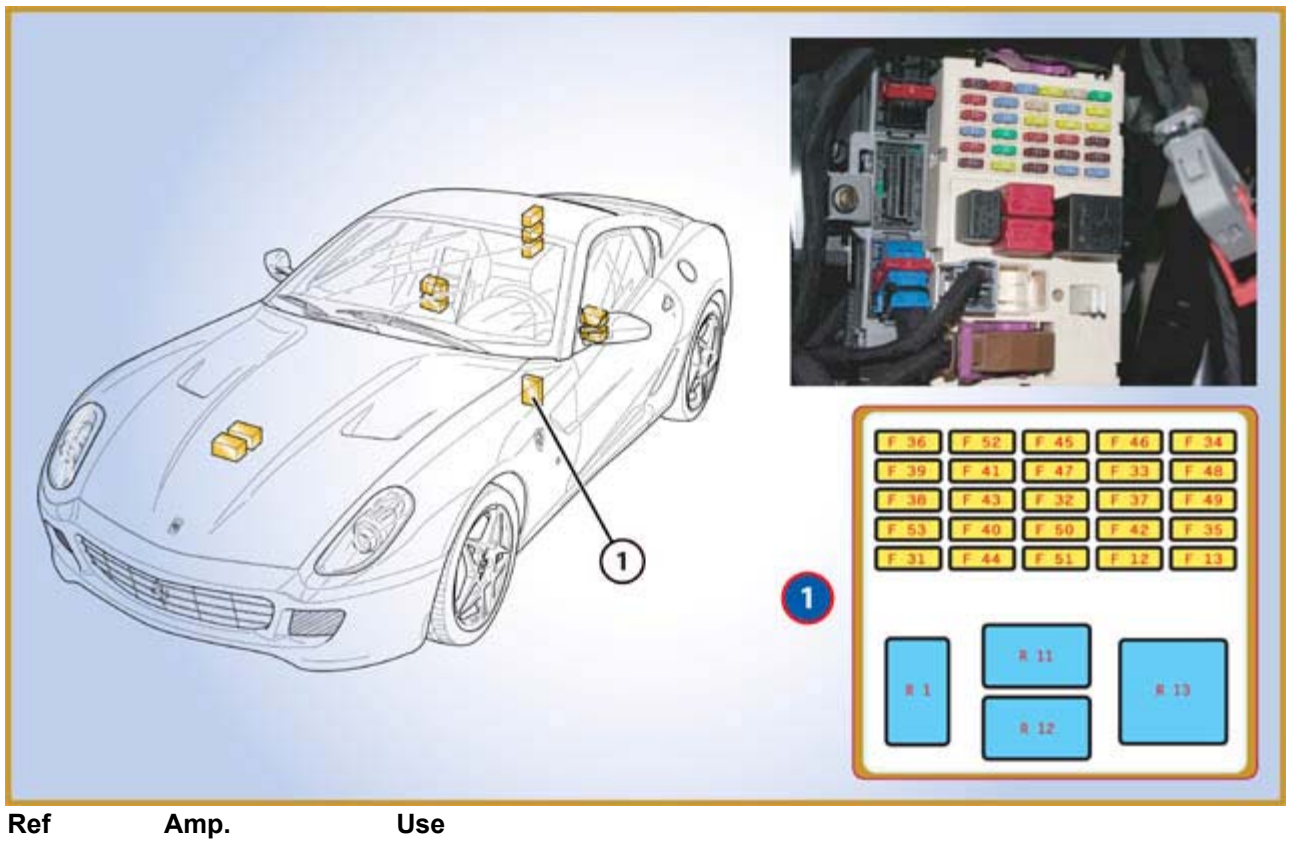
A - Engine compartment relay
B - Luggage compartment relay
C - Passenger compartment relay - passenger side
D - Passenger compartment relay - driver side
E - Passenger compartment relays - under dashboard

Engine compartment relay



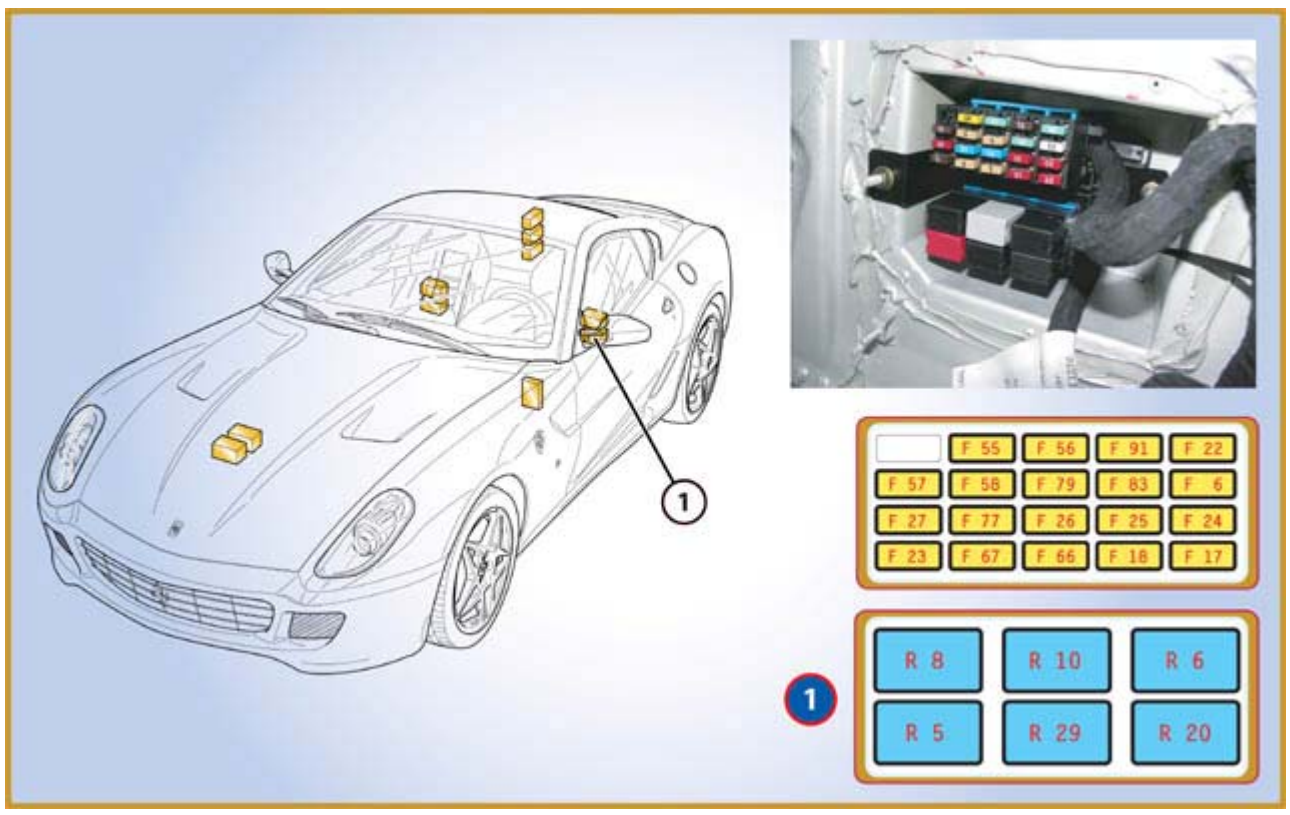
Ref	Amp.	Use
L301_R14	50	(R14) Air pump relay
L019_R16	50	(R16) Left-hand fan relay
L047_R15	50	(R15) Right-hand fan relay

Dashboard fuses (Body computer)



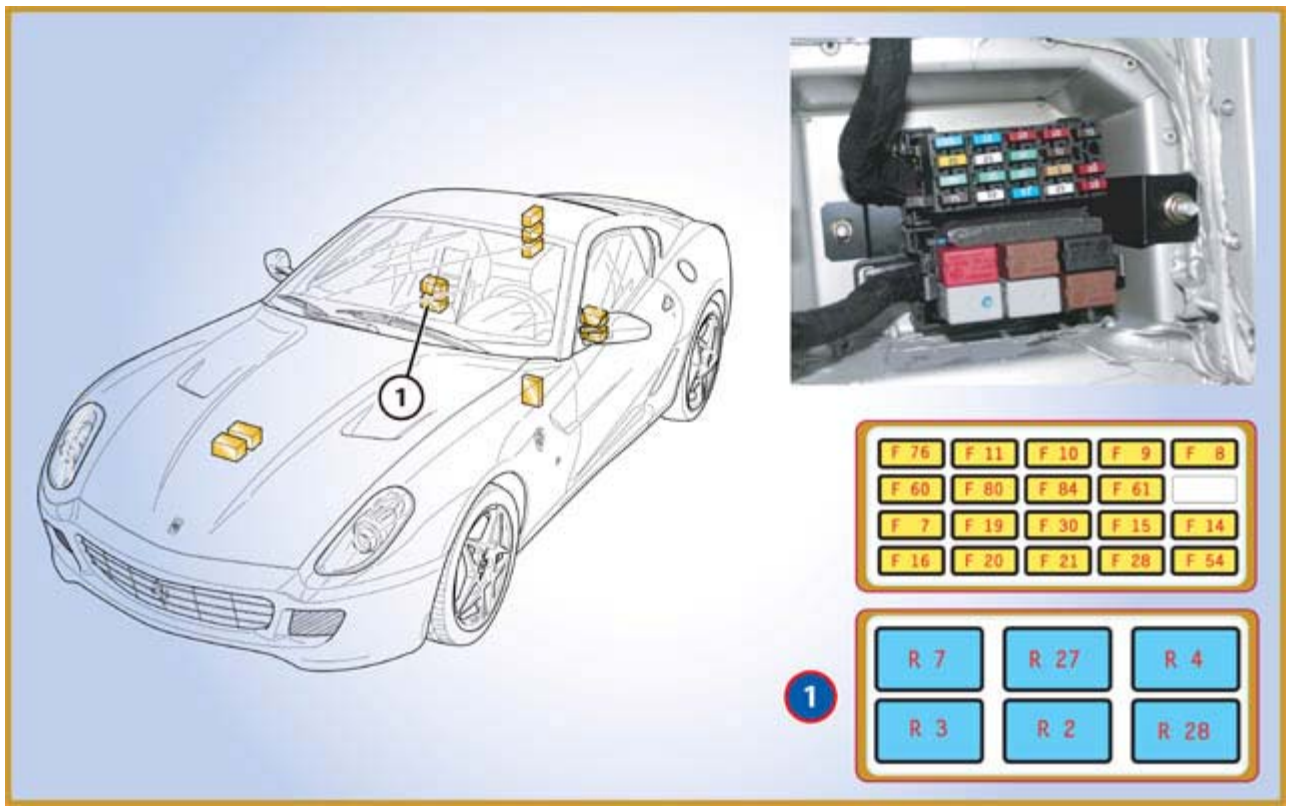
Ref	Amp.	Use
C003_T01	20	(T01) Low beam relay (R01)
C003_T11	30	(T11) Heated rear window relay (R11)
C003_T12	30	(T12) Service relay 1 (controlled by ignition switch INT/A) (R12)
C003_T13	50	(T13) Service relay 2 (controlled by NBC) (R13) (predisposition)

Passenger compartment relay - driver side



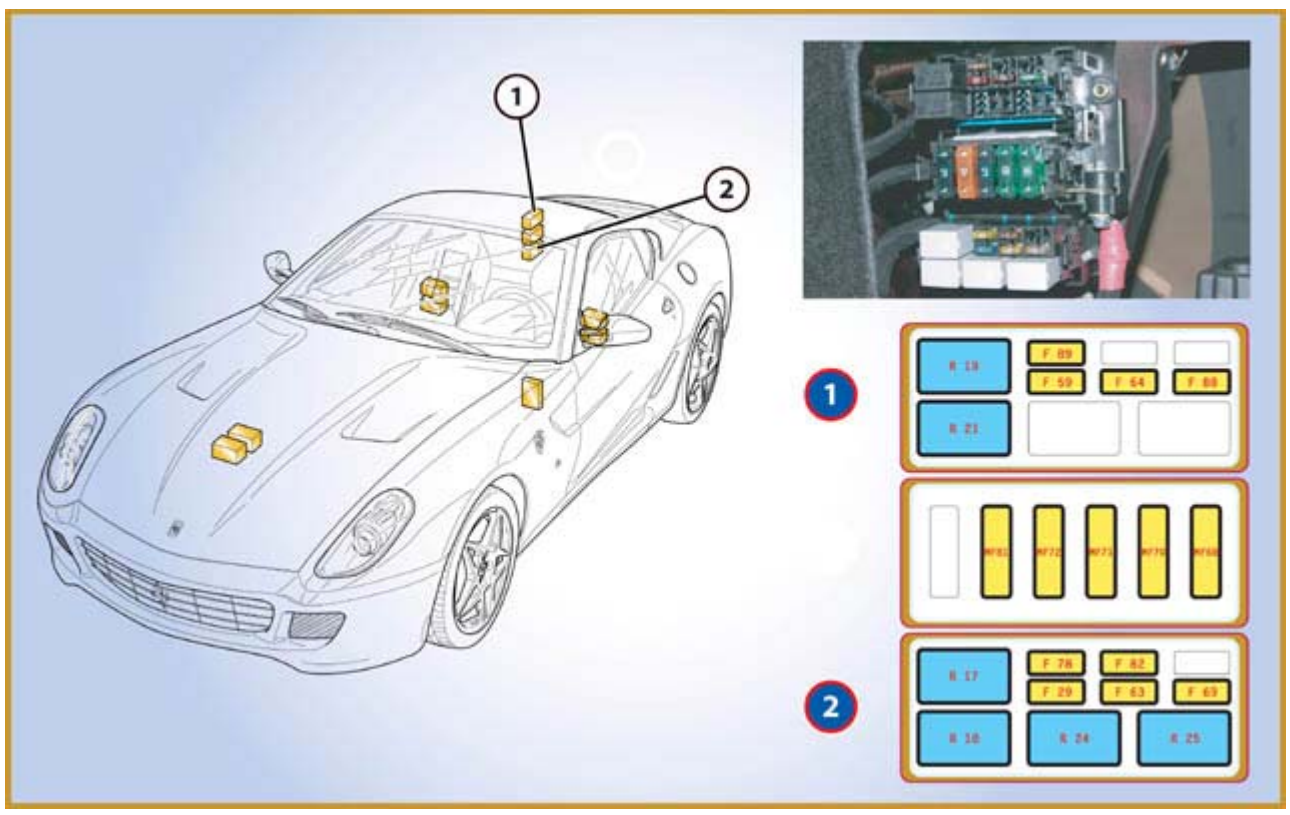
Ref	Amp.	Use
C315_R8	20	(R8) Horn relay
C315_R10	20	(R10) Left hand main injection relay
C315_R06	20	(R6) High beam relay
C315_R05	30	(R5) Headlight washer relay
C315_R29	20	(R29) Glove compartment motor relay
C315_R20	20	(R20) Side marker relay

Passenger compartment relay - passenger side

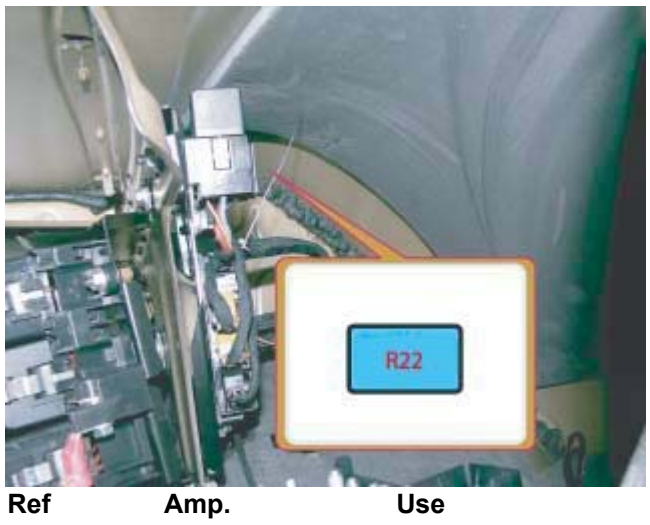


Ref	Amp.	Use
C318_R07	30	(R7) Starter motor relay
C318_R27	20	(R27) Relay for devices not connected upon starting
C318_R04	20	(R4) A.C. compressor relay
C318_R03		(R3) Immobiliser relay
C318_R02	20	(R2) Main right-hand injection relay
C318_R28	20	(R28) Ignition cut-out relay with battery charger

Luggage compartment relay



Ref	Amp.	Use
C303_R19	20	(R19) Reverse gear relay
C303_R21	20	(R21) Fuel tank door relay
C309_R17	20	(R17) Right-hand fuel pump relay - 1st speed
C309_R18	20	(R18) Right-hand fuel pump relay - 2nd speed
C309_R24	20	(R24) Left-hand fuel pump relay - 1st speed
C309_R25	20	(R25) Left-hand fuel pump relay - 2nd speed

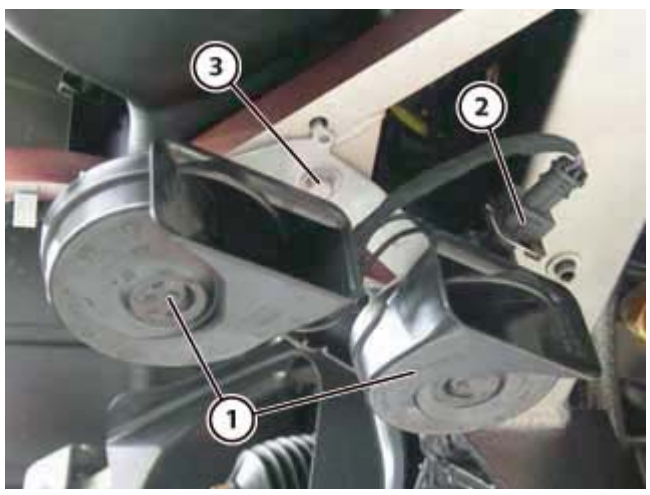


Ref	Amp.	Use
L040_R22	50	(R22) F1 pump relay

L2.11 Horn

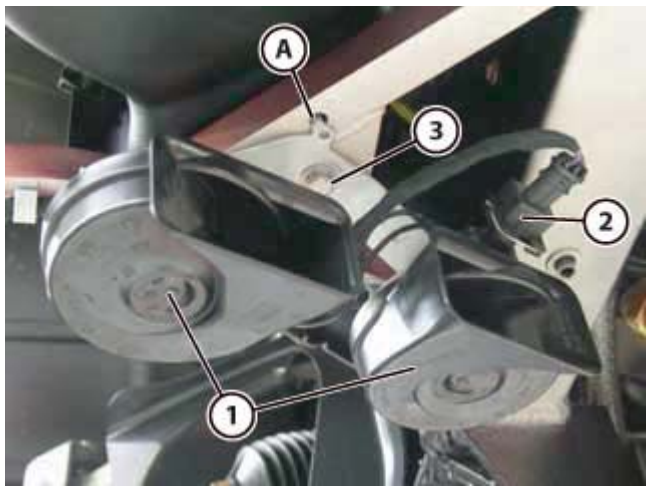
Removing the horn

- Set the battery master switch to OFF (L2.02).
- Remove the front section of the underfloor (M2.12).



- Disconnect the connector **(2)** (L020) to remove the complete horn **(1)**.
- Undo the screw **(3)**, fastening the mounting bracket to the chassis, and remove the horn.

Refitting the horn



- Fit the horn mounting bracket, inserting the reference tab **(A)** into the hole on the vehicle chassis.
- Tighten the screw **(3)** fastening the bracket to the chassis.
- Connect the connector **(2)** (L020).

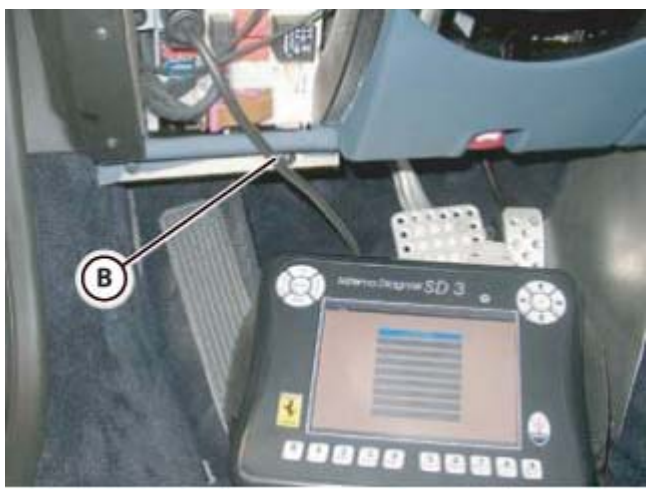
- Refit the front flat undertray section (M2.12).
- Set the battery master switch to ON (L2.02).

L2.12 Diagnostic socket

Connecting the diagnostic tester



- The vehicle is equipped with a dedicated connector **(A)** (E044)for the SD3 diagnostics tester. This connector is located underneath the fuse protection cover, on the left-hand side of the steering column.
- This connector allows the tester to interface with all the systems installed in the vehicle and perform diagnosis.



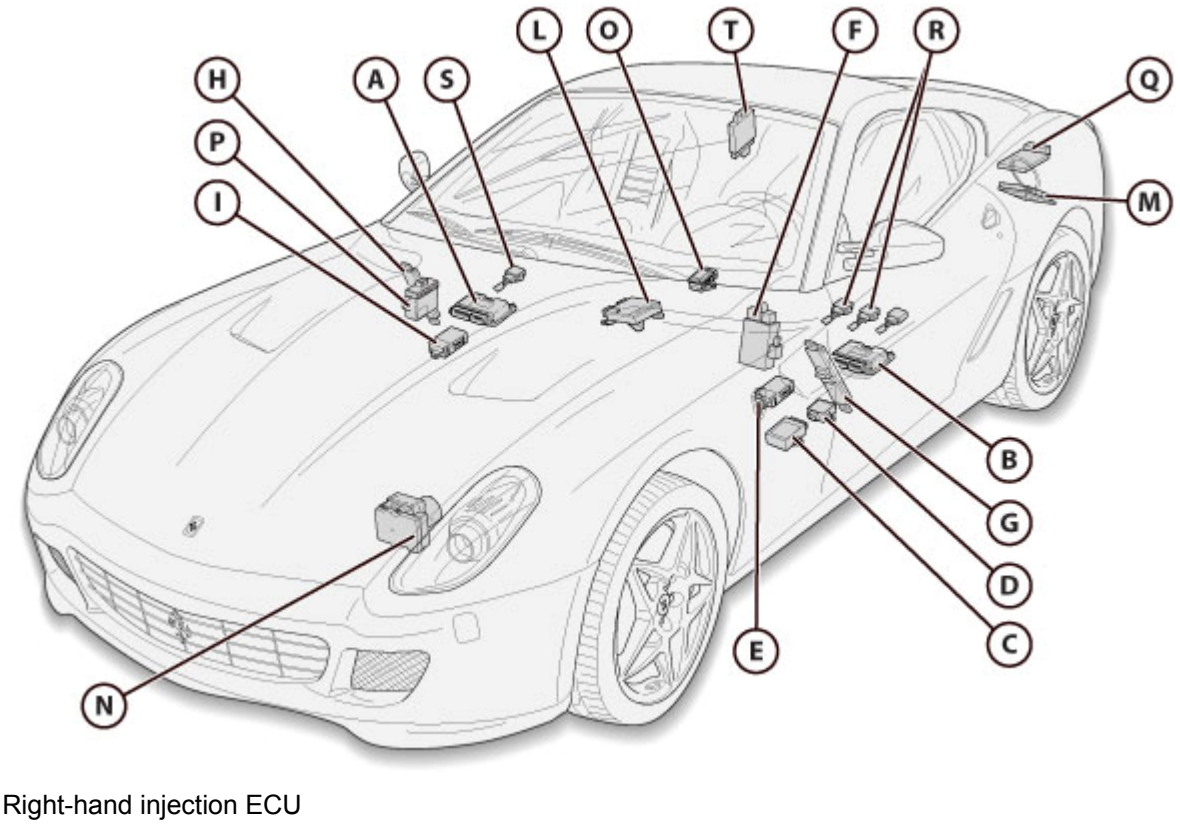
- Connect the tester to the connector **(A)** using the wiring braid **(B)** provided with the unit.



- In addition to the wiring braid, the SD3 tester comes equipped with a set of connection cables, a power adapter, a CD-ROM containing the diagnostic program, an instruction manual and a case.

L2.13 ECUs

Location of ECUs in vehicle



A - Right-hand injection ECU
B - Left-hand injection ECU
C - Tyre pressure ECU
D - Power steering ECU
E - Windscreen wiper control ECU
F - Body Computer Node
G - Left-hand power window ECU
H - Right-hand power window ECU
I - Main node
L - Airbag ECU
M - F1 gearbox ECU (versions with electronically controlled gearbox)
N - ABS ECU
O - Yaw ECU
P - Air conditioning and heating system ECU
Q - Shock absorber control ECU
R - Driver setup ECU
S - Passenger setup ECU
T - Parking sensor ECU

Replacing the left hand injection ECU

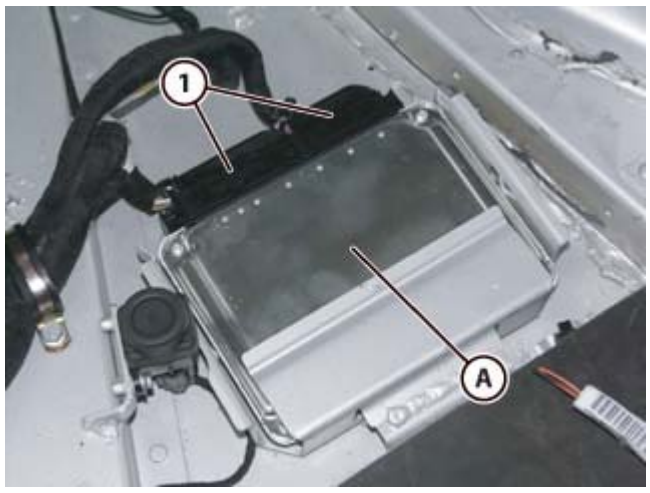
The injection ECUs must always be replaced in pairs to ensure correct immobiliser code transcription and software release updating.

Whenever replacing the injection (Motronic) ECUs or after downloading new software onto the ECUs, the automatic diagnostic cycle must be carried out with the SD3 tester.

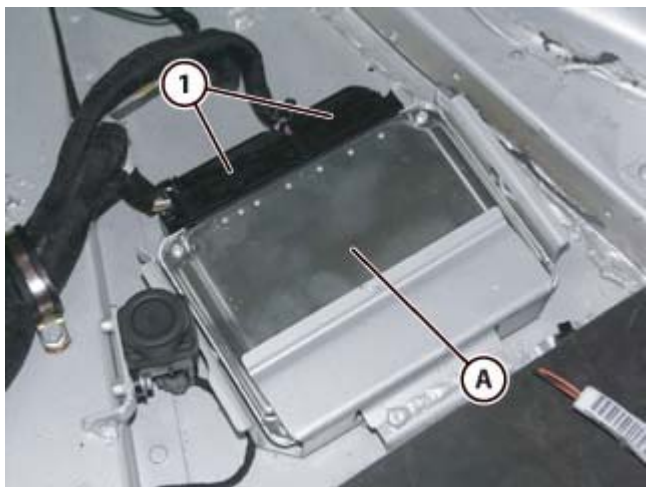
The ECU is located under the removable mat on the driver side.

➢ Set the battery master switch to OFF (L2.02).
This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the mats (M2.24).
Follow the disassembly procedure up to the removal of the driver side **removable mat**.



- Disconnect the two connectors **(1)** (E300), remove the left hand injection ECU **(A)** and replace.



- Fit and fasten the left hand injection ECU **(A)** in its respective seat and connect the two connectors **(1)** (E300).

➢ Refit the mats (M2.24).
➢ Set the battery master switch to ON (L2.02).

Replacing the right hand injection ECU

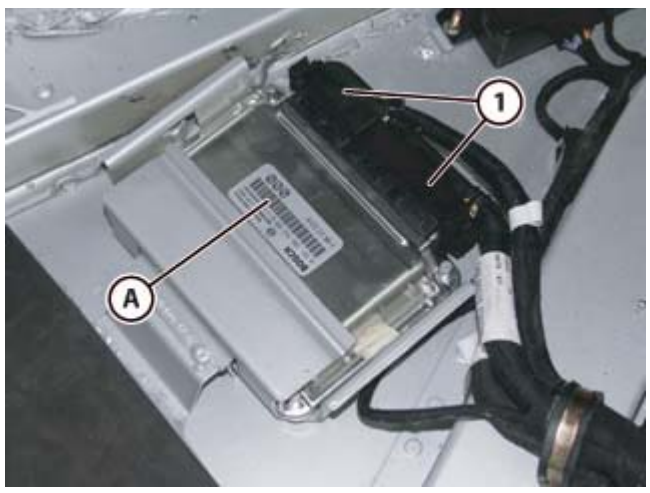
The injection ECUs must always be replaced in pairs to ensure correct immobiliser code transcription and software release updating.

Whenever replacing the injection (Motronic) ECUs or after downloading new software onto the ECUs, the automatic diagnostic cycle must be carried out with the SD3 tester.

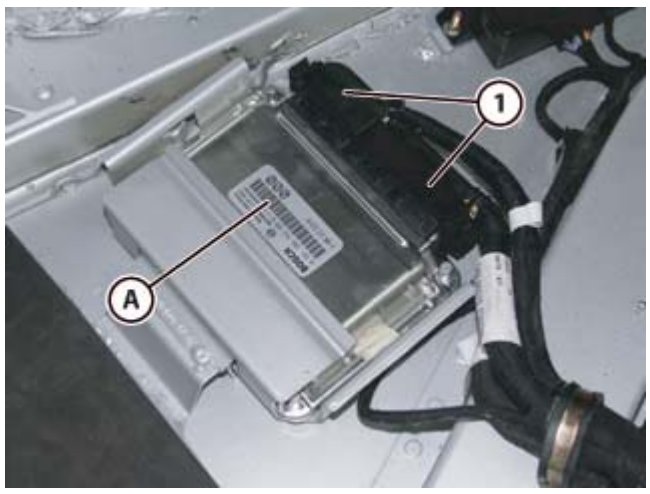
The ECU is located under the removable mat on the passenger side.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the mats (M2.24).
i Follow the disassembly procedure up to the removal of the passenger side **removable mat**.



- Disconnect the two connectors **(1)** (E006), remove the right hand injection ECU **(A)** and replace.



- Fit and fasten the right hand injection ECU **(A)** in its respective seat and connect the two connectors **(1)** (E006).

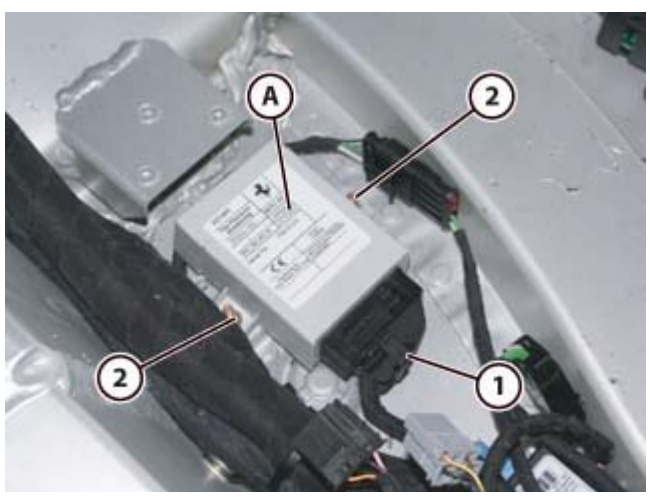
➢ Refit the mats (M2.24).
➢ Set the battery master switch to ON (L2.02).

Replacing the tyre pressure monitoring ECU

The ECU is located underneath the removable driver side mat and the sill trim panel.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the lateral trim panels (M2.24).
i Follow the removal sequence up to the removal of the **left hand sill trim panel**.



- Disconnect the connector **(1)**(E304).
- Unscrew the two fastener nuts **(2)** and remove the tyre pressure monitoring ECU **(A)**.
- Fit the tyre pressure monitoring system ECU **(A)** and fasten by tightening the two nuts **(2)**.
- Connect the connector **(1)** (E304).

➢ Set the battery master switch to ON (L2.02).
➢ Carry out the automatic EOL cycle for NTP ECU (Tyre Pressure Node) (L2.13).
➢ Refit the mats (M2.24).

Automatic EOL cycle for NTP ECU (Tyre Pressure Node)

The automatic NTP diagnostic cycle must be performed with the SD3 tester updated with the latest software version.

Carry out the following procedures, waiting at least 3 seconds between one operation and the next.

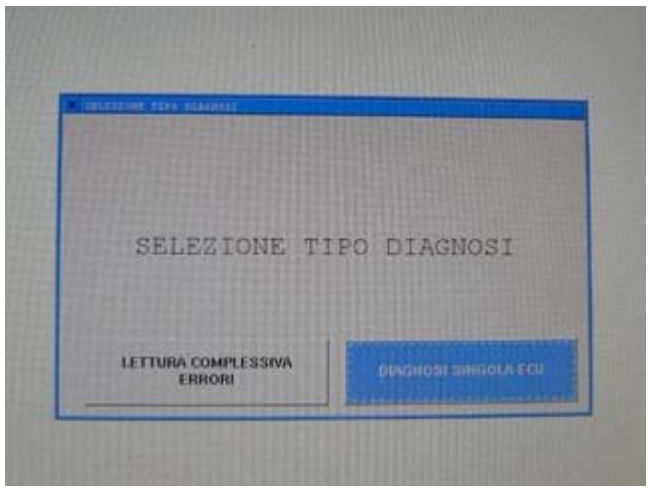
The following procedure must be carried out whenever any component of the tyre pressure monitoring system is replaced or whenever fitting tyres of a different brand or type.

➢ Connect the SD3 tester to the diagnostic socket (L2.12).
i Use the SWITCH MATRIX cable (Part. no. 900027430).

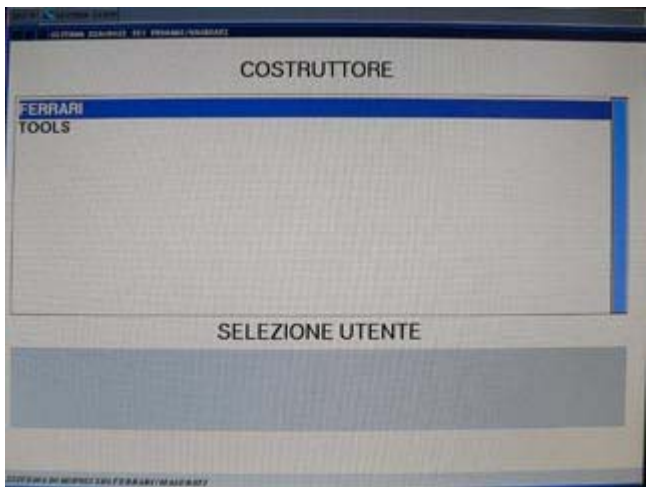
- Switch on the SD3 tester.



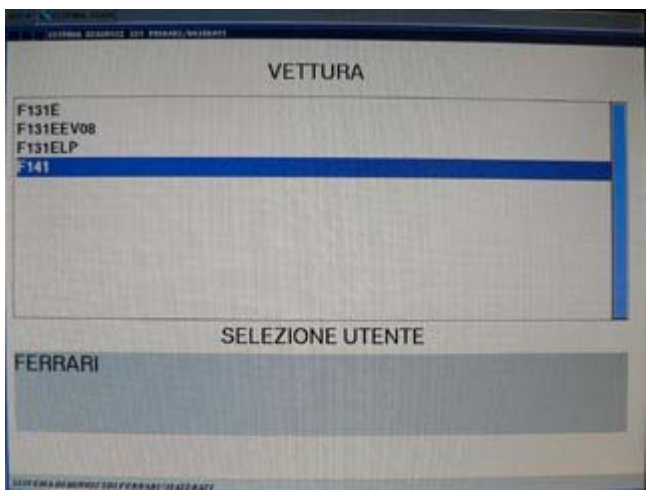
- Select "SERIAL DIAGNOSIS" and press Enter.



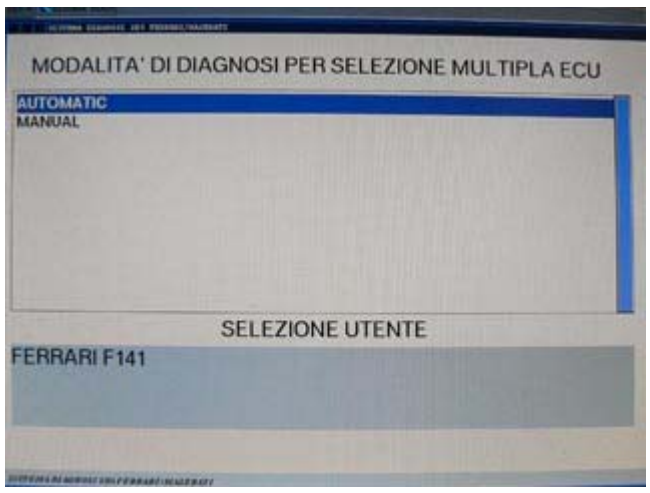
- Press “SINGLE ECU DIAGNOSIS”.



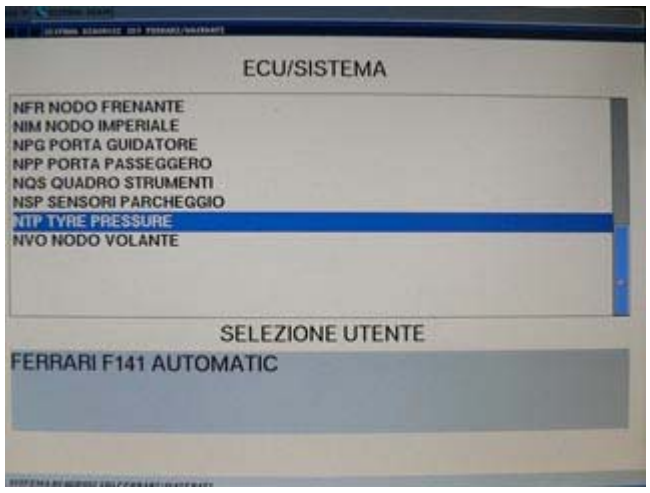
- Select "Ferrari" and press Enter.



- Select "F141" by pressing Tab then press Enter.



- Select "AUTOMATIC" and press Enter.



- Select the "NTP TYRE PRESSURE" node listed in the second page, then press Enter.
- The ECU initialisation process starts.



- Perform a key-on and press "CONTINUE".

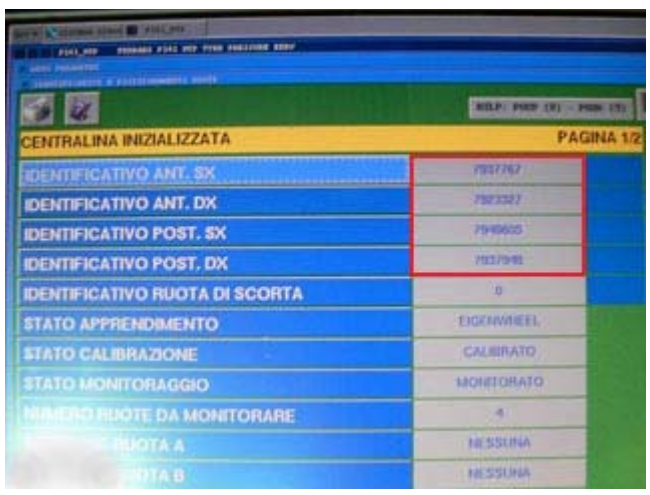
The ECU has been initialised.



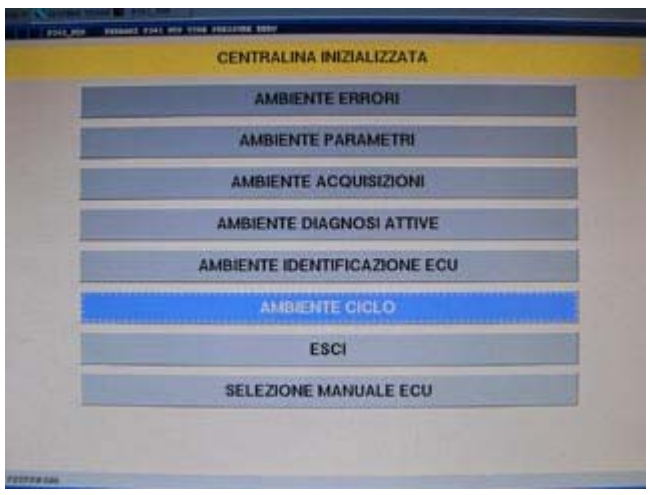
- Select "PARAMETERS ENVIRONMENT" by pressing Tab then press Enter.



- Select "WHEEL IDENTIFICATION CODES AND POSITIONING" by pressing Tab then press Enter.



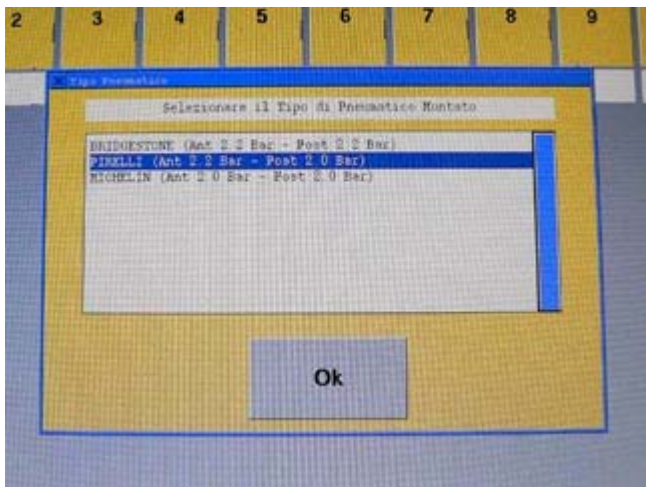
- Note the specific identification codes for the TPMS tyre pressure sensors installed on the vehicle.
- The relative area for these codes is included in the red box in the screen shown aside.



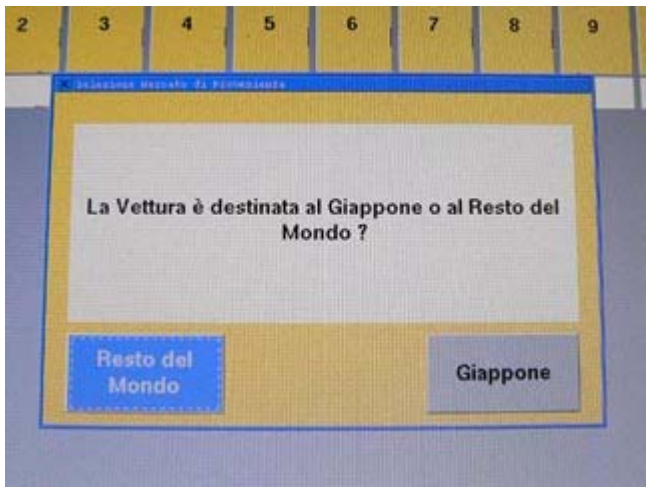
- Select "CYCLE ENVIRONMENT" by pressing Tab then press Enter.



- Perform a key-on and press "CONTINUE".



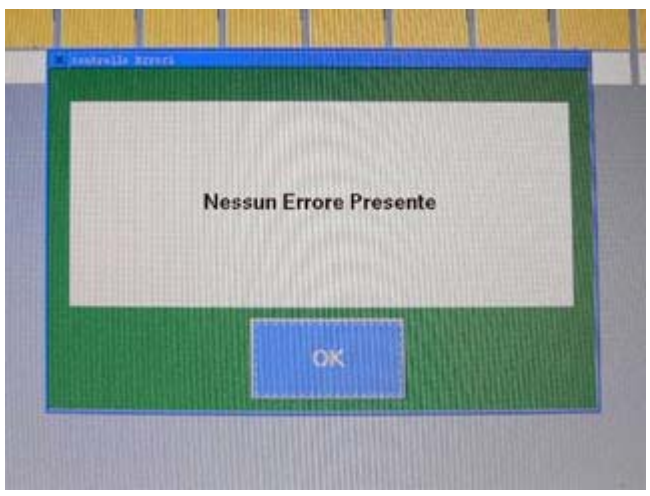
- Select the Currently Fitted Tyre Type, then press "OK".



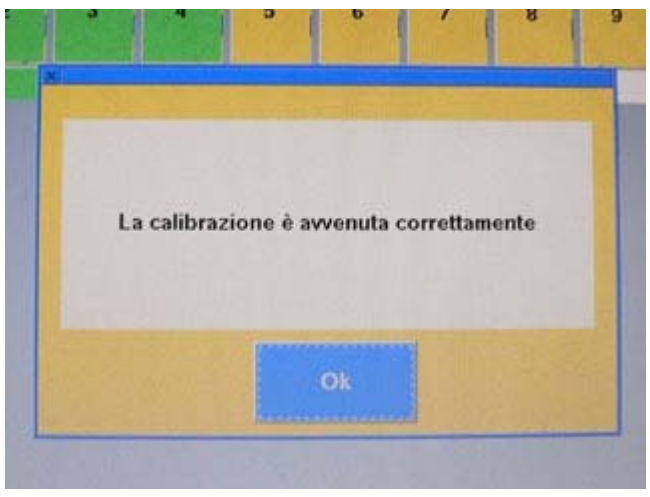
- Press the relative button for the brand.



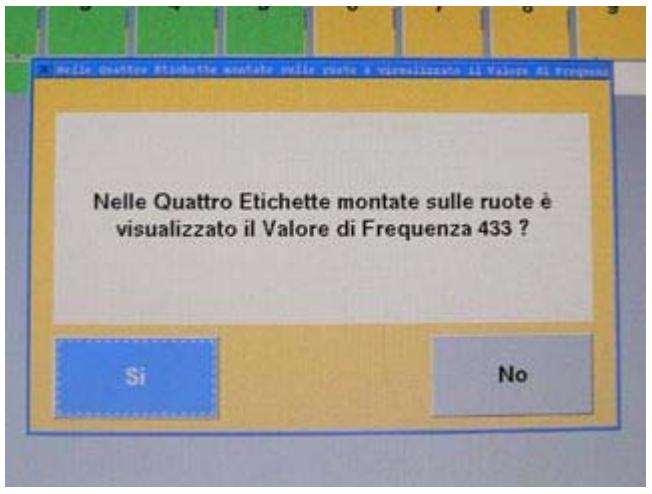
- Perform a key-off.



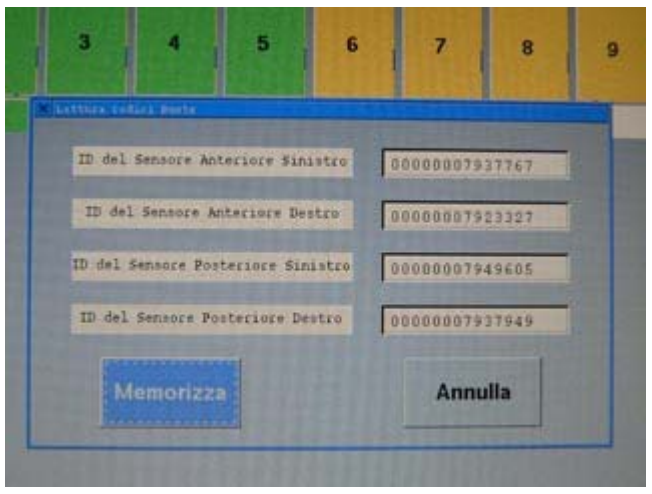
- The system runs a check and cancels any errors, after which press "OK".



- The SD3 Tester automatically performs the "LIN Interface Electronic Hardware Test", the "Frequency Matching Hardware Test" and the "ECU Calibration Procedure", after which press "OK".



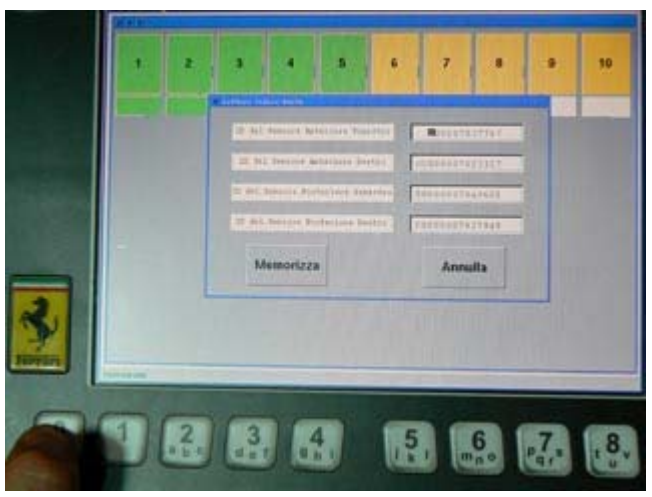
- The next procedure is "Programming IDs for the Four Installed Wheels".
- The system asks "Is a Frequency Value of 433 specified on the four Labels on the Wheels?". Press the relative button.



- Now set the Identification Codes for the individual tyre pressure sensors previously noted.

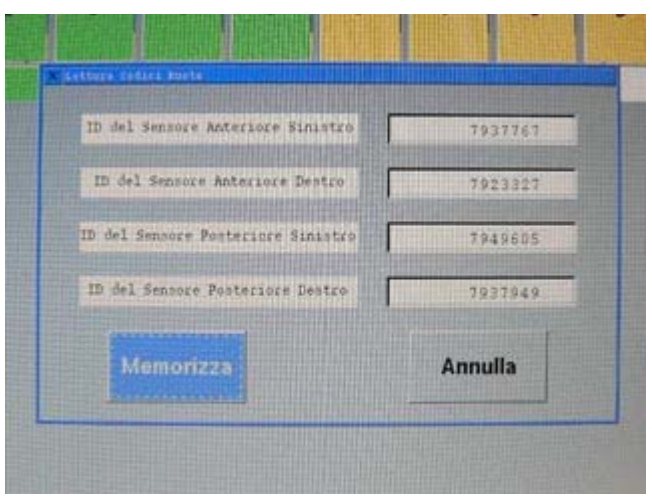
If one or more tyre pressure sensor has been replaced, note the new identification numbers in the appropriate boxes. The identification numbers are indicated on the specific label provided with the sensor.

- Enter all the specific sensor codes in the respective spaces on the right hand side of the data entry field, as shown in the screen aside.

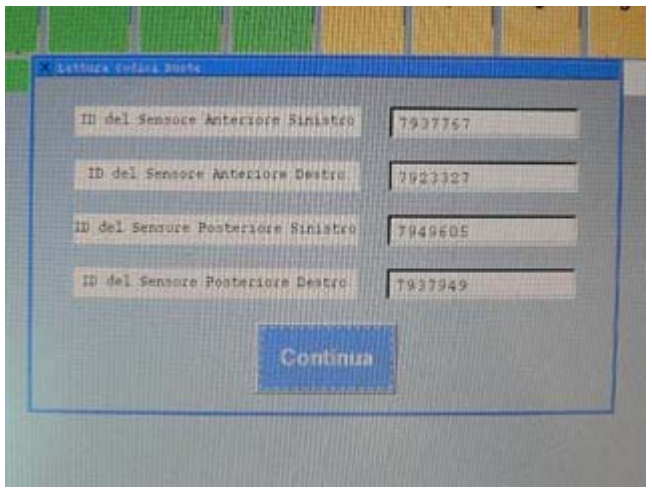


- Now cancel the remaining **"0"s** in each field, as described as follows.
- Select each "0" and press and hold the indicated button **0** on the tester until a beep is emitted.

If the button is held after the beep, the **"0"** reappears.

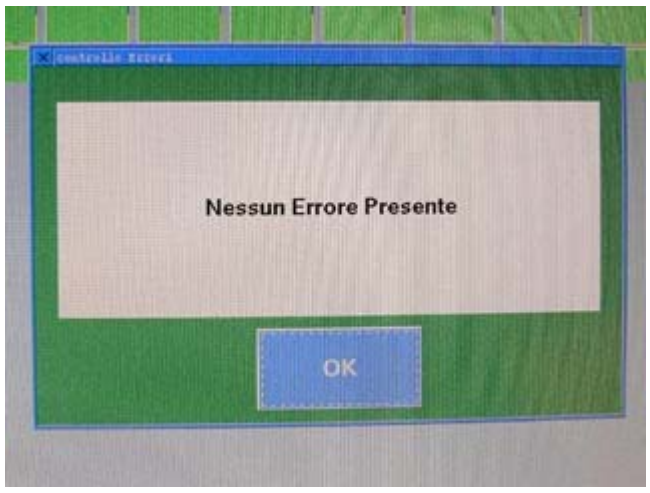


- After cancelling all the **"0"s**, the data entry fields will appear as shown in the screen aside.
- Press "STORE".



- The SD3 Tester automatically performs the "Write/Read Wheel Identification Codes" procedure.
- The screen shown aside is now displayed, containing a summary of the sensor IDs. Press "CONTINUE".

- The SD3 Tester automatically performs the "Nominal Pressure Values Programming" procedure, the "RF Signal Transmission Hardware Test" and the "Pressure Values Set Check".



- The system runs an "Error Check", after which press "OK".



- At the end of the cycle, the screen aside is displayed, indicating the individual steps performed and the relative results.
- Press "PRINT" to print out a hard copy of the cycle report for archiving.



- To print directly with the printer, the tester must be connected to SD3-NET installed on the active PC. Press "YES" to print.
- Press "NO" to save the Report on the SD3 tester.

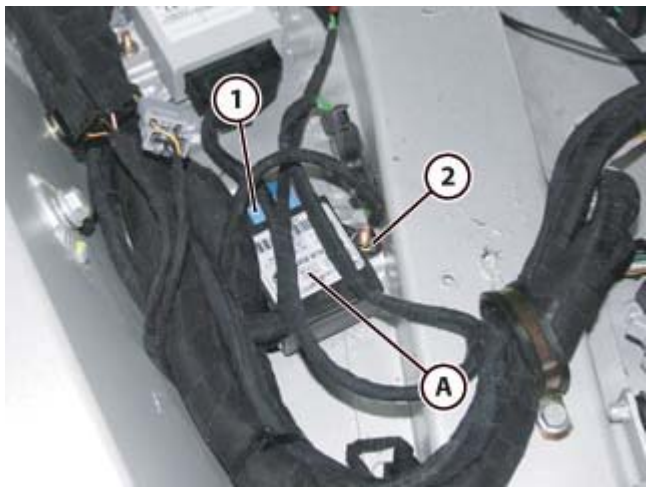
- End.

Replacing the hydraulic steering control ECU

The ECU is located underneath the removable driver side mat and the sill trim panel.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the lateral trim panels (M2.24).
i Follow the removal sequence up to the removal of the **left hand sill trim panel**.



- Disconnect the connector **(1)**(E081).
- Unscrew the two fastener nuts **(2)** and remove the hydraulic steering control ECU **(A)**.
- Fit the power steering ECU **(A)** and fasten by tightening the two nuts **(1)**.
- Connect the connector **(1)** (E081).

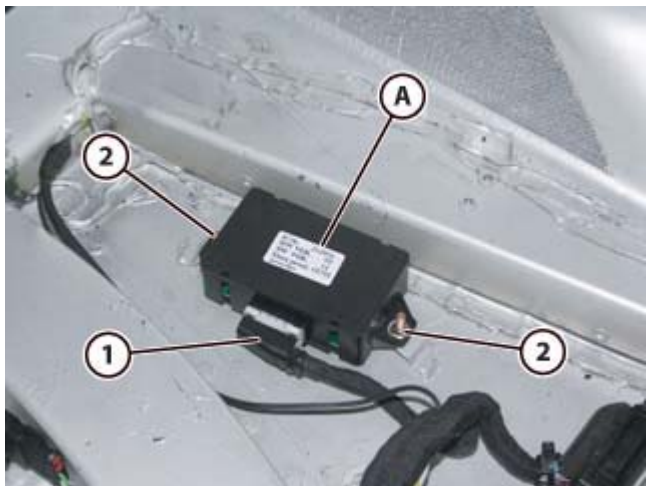
➢ Refit the lateral trim panels (M2.24).
➢ Set the battery master switch to ON (L2.02).

Replacing the windscreen wiper control ECU

The ECU is located under the removable mat on the driver side.

➢ Set the battery master switch to OFF (L2.02).
This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the mats (M2.24).
*Follow the disassembly procedure up to the removal of the driver side **removable mat**.*

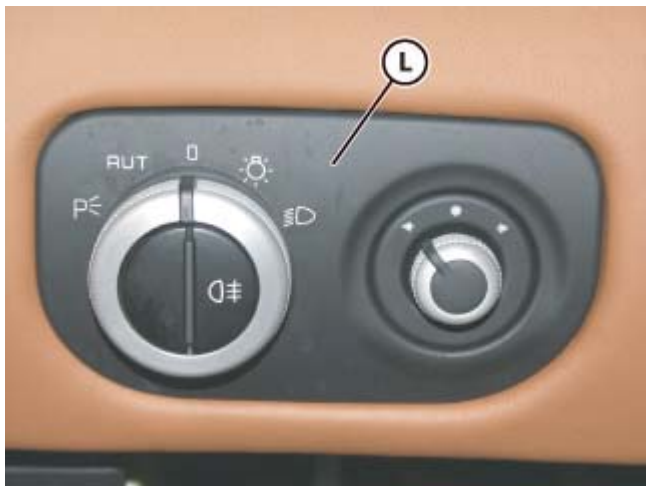


- Disconnect the connector **(1)**(E007).
- Unscrew the two fastener nuts **(2)** and remove the windscreen wiper control ECU **(A)**.

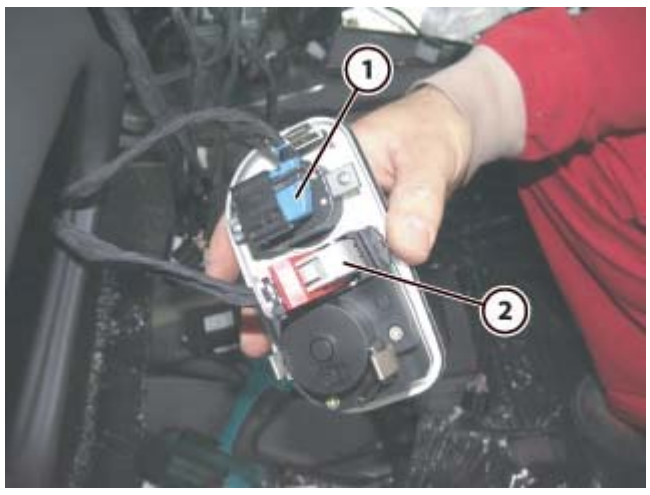
Replacing the Body computer Node

Located on the left hand side of the dashboard, behind the lower left hand trim panel.

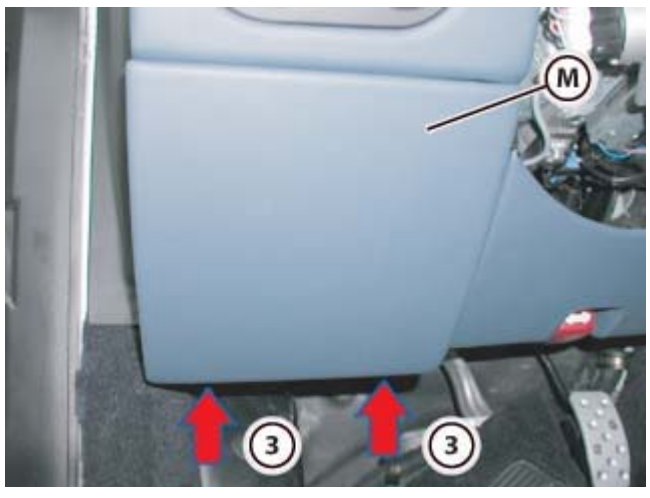
➢ Set the battery master switch to OFF (L2.02).
➢ Remove the central sides of the dashboard (M2.20).



- Prise out the console control panel **(L)** with a suitable tool, taking care not to damage the leather trim.



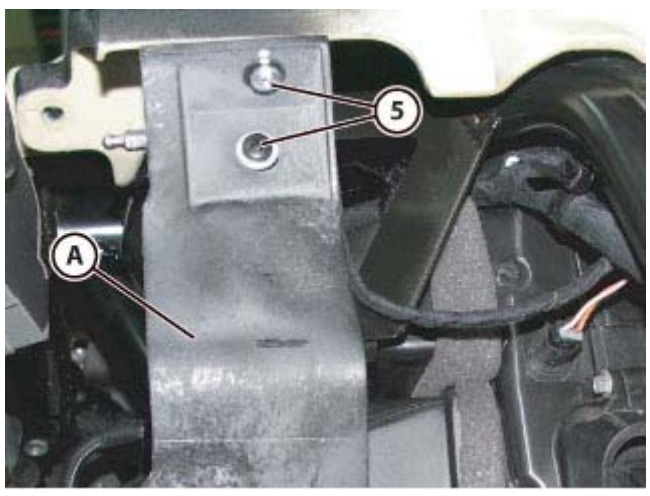
- Disconnect the connector **(1)** for the rear view mirror adjustment control.
- Disconnect the connector **(2)** for the external light switch.
- Remove the control panel from the vehicle.



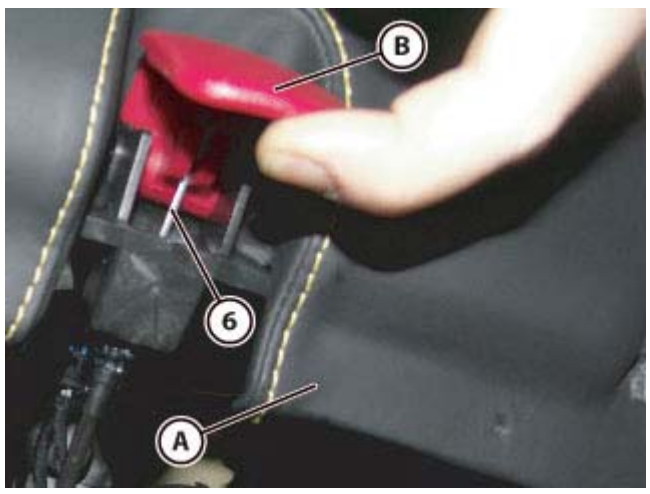
- Remove the Body computer Node trim panel **(M)**, by undoing the two fastening screws **(3)**.



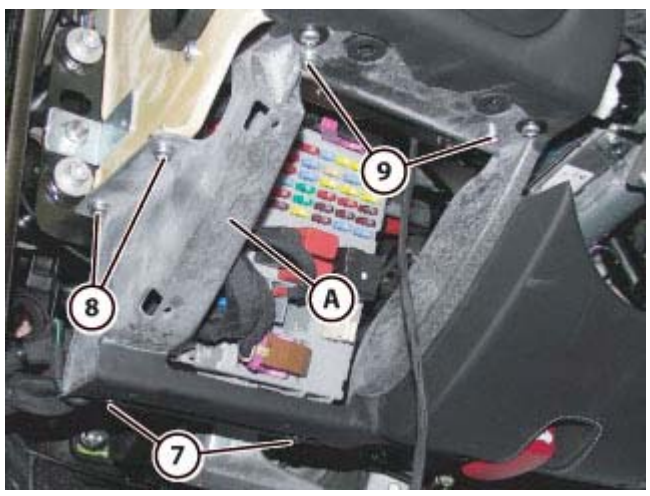
- Undo the lower right hand screw **(4)** fastening the lower left hand dashboard trim panel **(A)**.



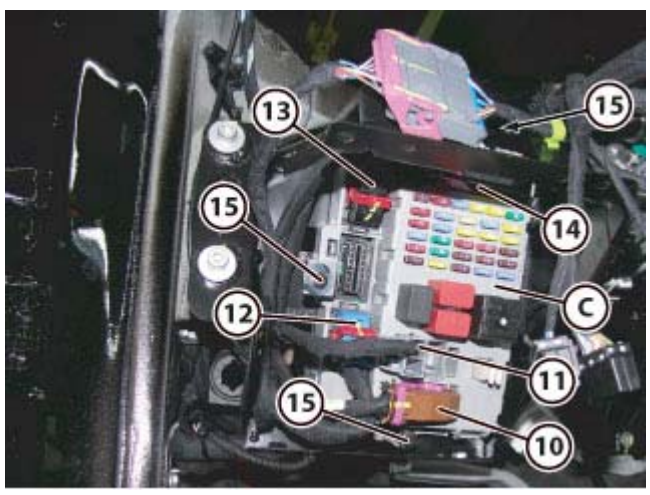
- Undo the two upper right hand screws **(5)** fastening the lower left hand dashboard trim panel **(A)**.



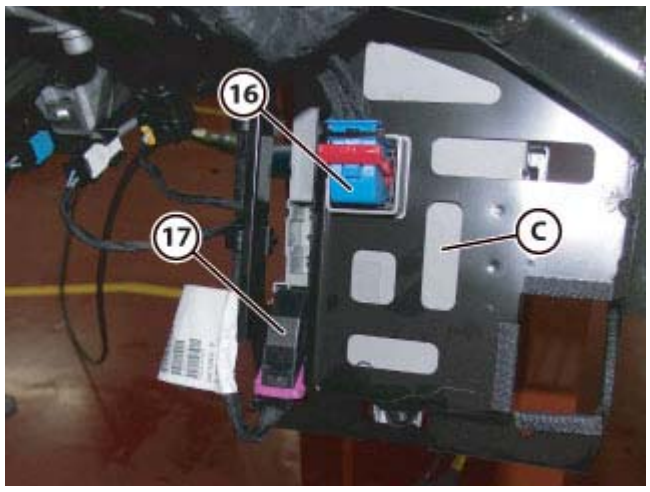
- Detach the cable **(6)** from the engine compartment lid release handle **(B)**, fastened to the lower left hand trim panel **(A)**.



- Undo the two lower left hand screws **(7)** fastening the lower left hand dashboard trim panel **(A)**.
- Undo the two lateral screws **(8)** fastening the lower left hand dashboard trim panel **(A)**.
- Undo the two upper left hand screws **(9)** fastening the lower left hand dashboard trim panel **(A)**.
- Remove the lower left hand trim panel **(A)** from the dashboard.



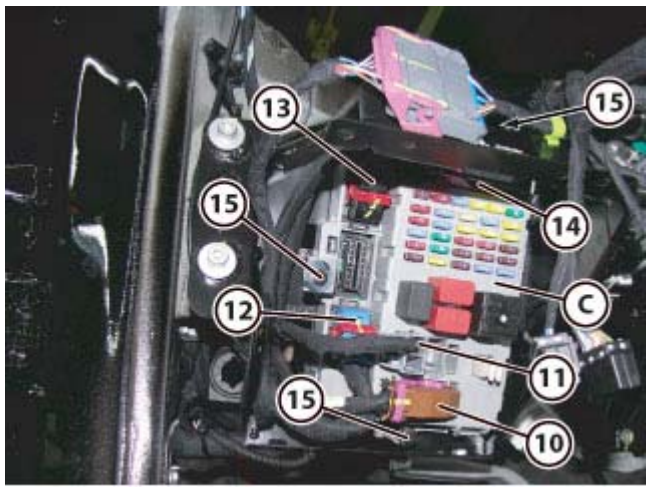
- Disconnect the connectors **(10)**, **(11)**, **(12)**, **(13)** and **(14)** from the front of the Body computer Node **(C)**.
- Undo the three screws **(15)** fastening the Body computer Node **(C)** to the dashboard subframe.
- Ease the Body computer Node **(C)** off the dashboard subframe.



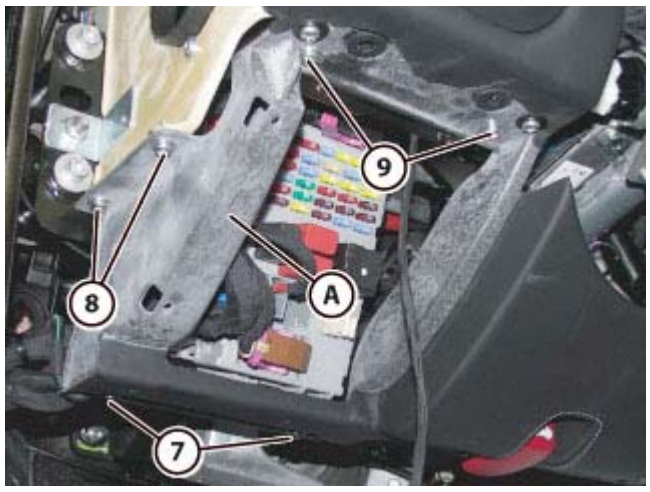
- Disconnect the connectors **(16)** and **(17)** from the rear of the Body computer Node **(C)**.

i Note that, to illustrate the operation more clearly, the photo aside shows the Body computer Node installed in a dashboard subframe that has been removed from the vehicle.

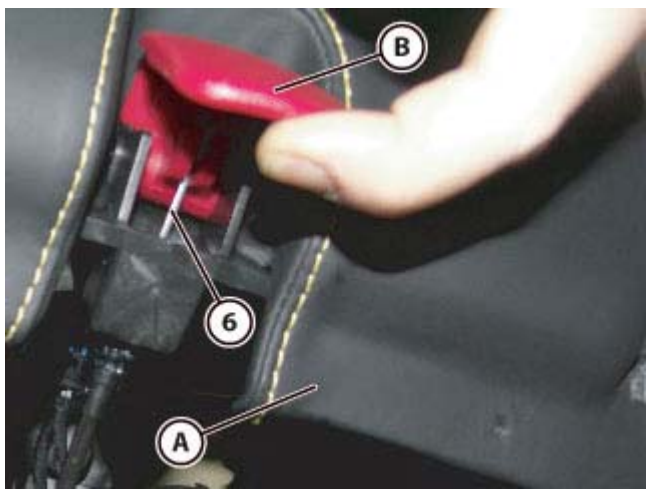
- Remove the Body computer Node **(C)** from the vehicle and replace.
- Connect the connectors **(16)** and **(17)** to the rear of the Body computer Node **(C)**.



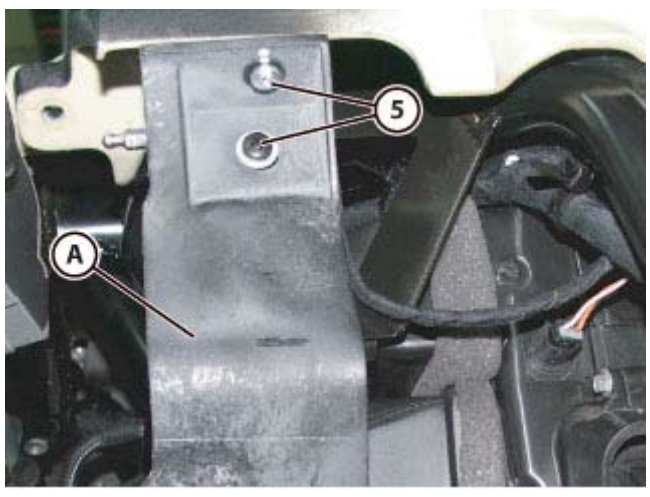
- Install the new Body computer Node **(C)** in the vehicle, on the dashboard subframe.
- Hand tighten the three screws **(15)** fastening the Body computer Node **(C)** to the dashboard subframe.
- Connect the connectors **(10)**, **(11)**, **(12)**, **(13)** and **(14)** to the front of the Body computer Node **(C)**.



- Fit the lower left hand trim panel **(A)** onto the dashboard.
- Hand tighten the two upper left hand screws **(9)** fastening the lower left hand dashboard trim panel **(A)**.
- Hand tighten the two lateral screws **(8)** fastening the lower left hand dashboard trim panel **(A)**.
- Hand tighten the two lower left hand screws **(7)** fastening the lower left hand dashboard trim panel **(A)**.



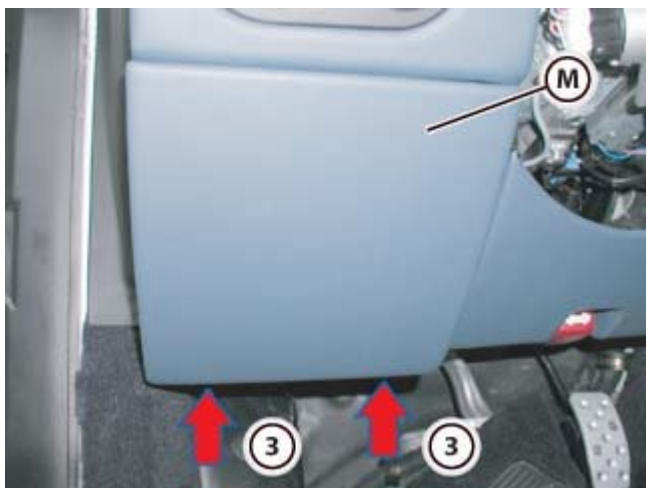
- Attach the cable **(6)** to the engine compartment lid release handle **(B)**, fastened to the lower left hand trim panel **(A)**.



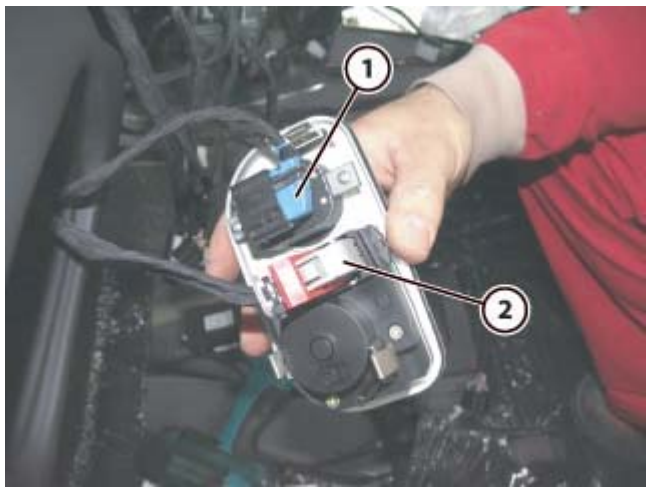
- Hand tighten the two upper right hand screws **(5)** fastening the lower left hand dashboard trim panel **(A)**.



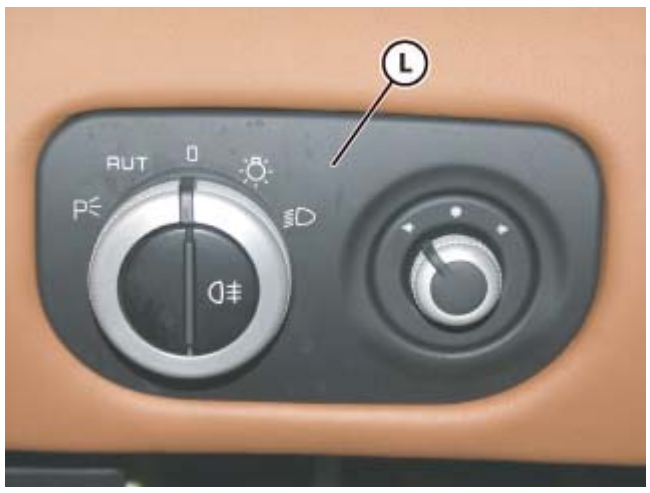
- Hand tighten the lower right hand screw **(4)** fastening the lower left hand dashboard trim panel **(A)**.



- Fit the Body computer Node trim panel **(M)** and hand tighten the two fastening screws **(3)**.



- Hold the control panel.
- Connect the connector **(2)** for the external light switch.
- Connect the connector **(1)** for the rear view mirror adjustment control.



- Install the control panel **(L)** in its relevant seat, taking care not to damage the leather trim.

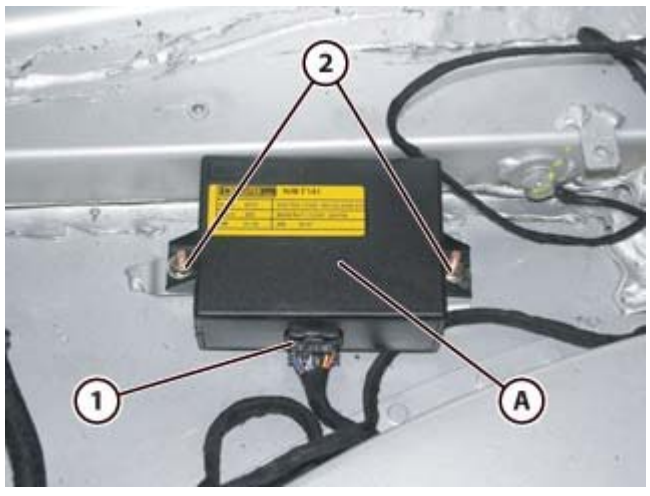
➢ Refit the central sides of the dashboard (M2.20).
➢ Set the battery master switch to ON (L2.02).

Replacing the inside roof node

The ECU is located under the removable mat on the passenger side.

➢ Set the battery master switch to OFF (L2.02).
This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the mats (M2.24).
Follow the disassembly procedure up to the removal of the passenger side **removable mat**.



- Disconnect the connector **(1)**(E015).
- Unscrew the two fastener nuts **(2)** and remove the inside roof node **(A)**.
- Fit the main node **(A)** and fasten by tightening the two nuts **(2)**.
- Connect the connector **(1)** (E015).

➢ Refit the mats (M2.24).
➢ Set the battery master switch to ON (L2.02).

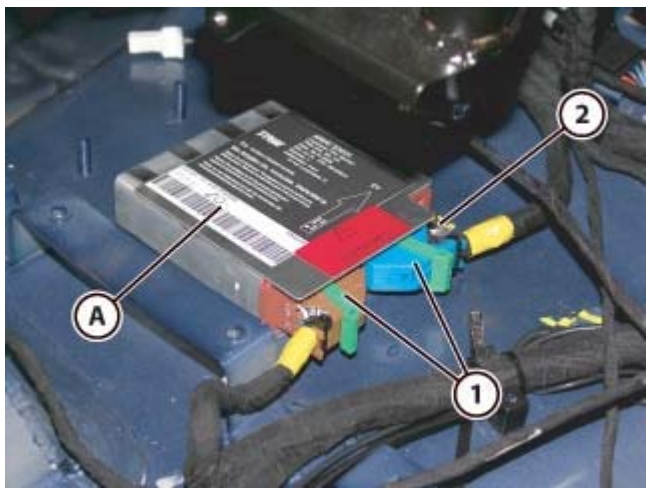
Replacing the airbag ECU

Tightening torque		**Nm**	**Class**
Airbag ECU - bodyshell	Screw	7.5 Nm	B

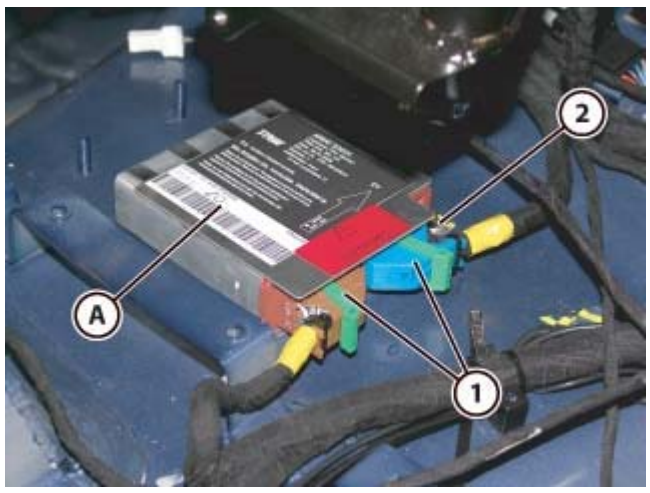
The ECU is located on the central console, underneath the console trim panel.

➢ Set the battery master switch to OFF (L2.02).
This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the console trim panel (M2.20).



- Remove the transparent plastic shield and disconnect the connectors **(1)** .
- Undo the three screws **(2)** and remove the airbag ECU **(A)**.



- Install the new ECU **(A)** in the same position as the ECU removed and connect the connectors **(1)** .
- Tighten the three screws **(2)** and refit the plastic cover.

Tightening torque	**Nm**	**Class**
Screw	7.5 Nm	B

➢ Refit the console trim panel (M2.20).
➢ Set the battery master switch to ON (L2.02).
➢ Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).

Automatic airbag NAB (Airbag Node) ECU diagnostic cycle

The automatic NAB diagnostic cycle may only be performed with the SD3 tester updated with the new software version.

Carry out the following procedures, waiting at least 3 seconds between one operation and the next.

Whenever replacing the NAB airbag (Airbag Node) unit or any of the system components, perform the relative automatic cycle with the SD3 tester.

➢ Before performing the diagnostic cycle, carry out the operations described as follows:
➢ Remove the driver side airbag (H4.02).
➢ Remove the door panel (M2.11).

Remove the centre panel from both doors and disconnect the connector from the side airbag.

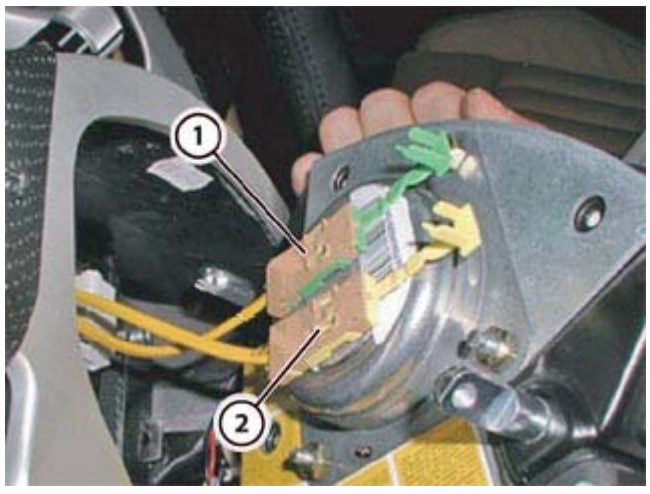
Disconnect the passenger side airbag connector.

- The following is the correct end of line procedure for airbag systems without airbag disable switch and without weight sensors.

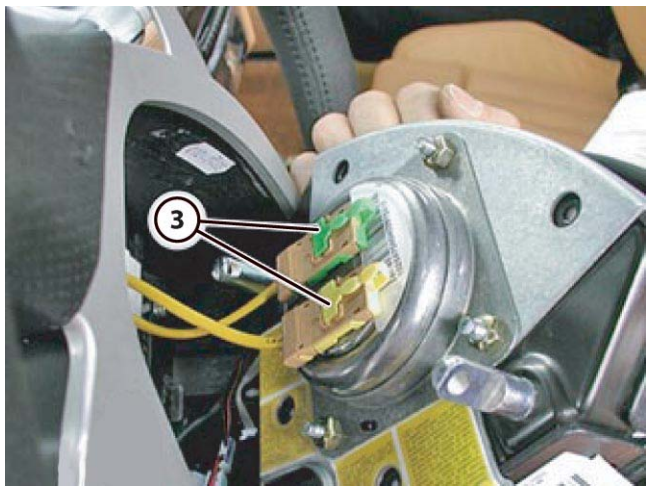
On cars with airbag disable switch, set the switch to **ON** before starting the automatic cycle.

On cars with passenger side weigh sensors, place a weight of more than **15 Kg** on the seat when requested by the SD3.

- Connect the SD3 tester to the relative diagnostic socket on the car.
- Switch on the SD3 tester.
- Access the "SERIAL DIAGNOSIS" environment:
- Select "SINGLE ECU DIAGNOSIS".
- Select "Ferrari F141".
- Select "NAB".
- KEY ON.
- Error cancellation: only 6 errors should remain - the two doors, the 1st and 2nd stages for the driver side and the 1st and 2nd stages for the passenger side.
- KEY OFF.
- Enter "CYCLE ENVIRONMENT".
- Press Continue.



- The SD3 will then prompt the operator to connect the green connector **(1)** to the driver side airbag.
- KEY ON.
- Wait at least 3 seconds and press Continue.
- KEY OFF.
- Connect the yellow driver side airbag connector **(2)**.
- KEY ON.
- Wait at least 3 seconds and press Continue.

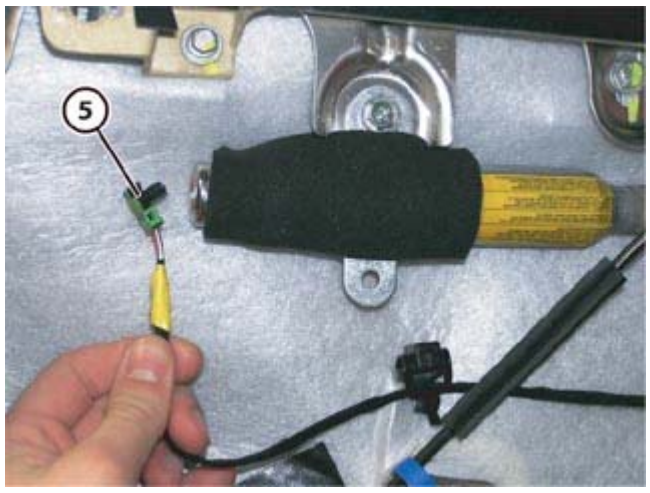


- Close the Secondary Locks **(3)** of the green and yellow connectors.
- KEY OFF.



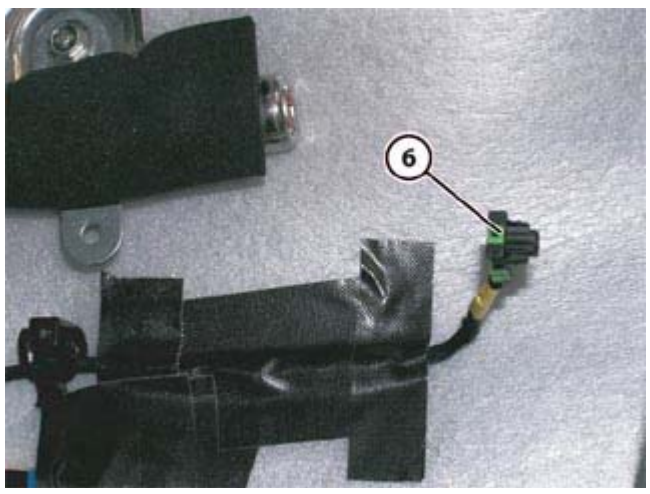
- The SD3 will prompt the operator to connect the resistor. On the passenger side there is a yellow connector on the 4-way wiring harness side for connection to the passenger side airbag; jumper the two brown wires with a **2.2 Ω** resistor.

- KEY ON.
- KEY OFF.
- Disconnect the jumper and connect the passenger airbag module.
- KEY ON.
- Wait at least 3 seconds and press Continue.
- KEY OFF.
- KEY ON.
- Check Error.
- KEY OFF.



- Connect the connector **(5)** to the driver side side airbag module.

- KEY ON.
- Wait at least 3 seconds and press Continue.
- KEY OFF.



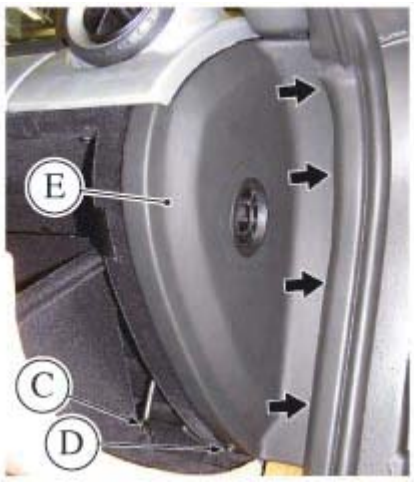
- Connect the connector **(6)** to the passenger side side airbag module.

- KEY ON.
- Checking Errors.
- Guided seatbelt check.
- Checking Errors.
- Guided airbag disable switch check.
- Checking Errors.
- End.

➢ Refit the door panel (M2.11).
➢ Refit the driver side airbag (H4.02).

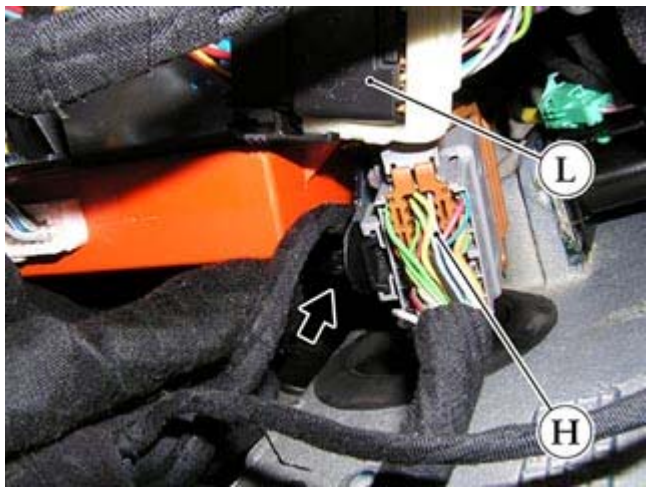
Removing the AC control unit

➢ Remove the lateral trim panels (M2.24).
Remove the right hand sill trim panel.

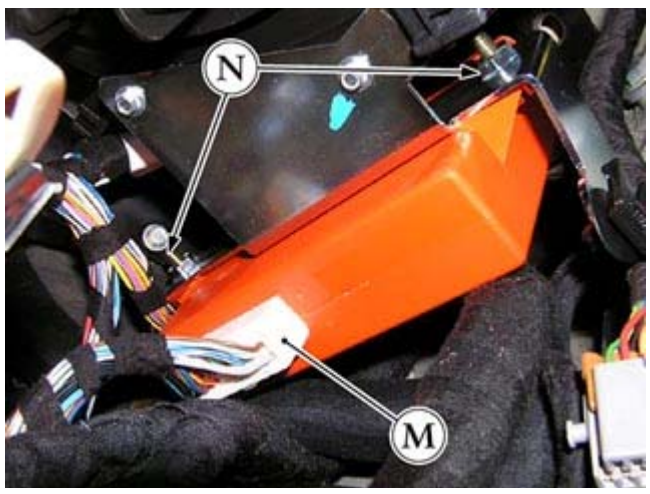


- Open the glove compartment and remove the screw **(C)** fastening the compartment door damper.
- Undo the screw **(D)** and remove the right hand side lateral dash trim **(E)**, detaching the relative length of door bay seal strip indicated by the arrows.
- Close the glove compartment without fastening the door damper.

- Set the battery master switch to OFF (L2.02).



- Disconnect and detach the vehicle system connectors **(H)** and **(L)** from the relative connector blocks fastening them to the ECU mounting bracket.



- Disconnect the lower connector **(M)** and detach the ECU from its relative mounting bracket, undoing the two screws **(N)**, with a reversible ratchet wrench (USAG 237 1/4") and socket head **(L 25 mm)** for **5 mm** hexagonal flush screws.



- Disconnect the upper connector **(P)** from the control unit and remove the AC control unit.

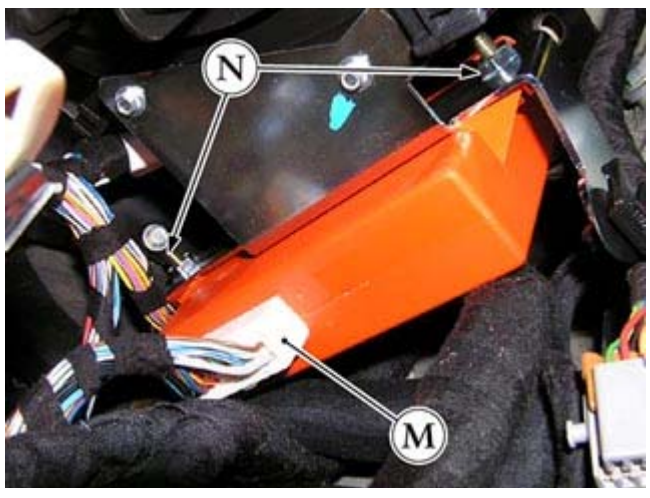
Photo taken with unit removed from vehicle.

Refitting the AC control unit

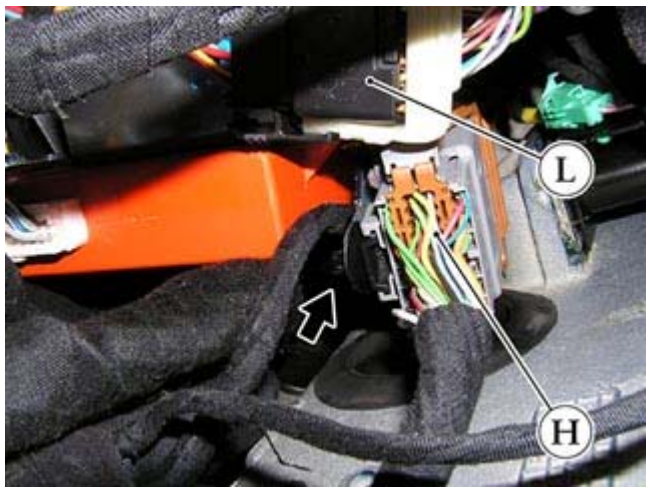


The two connectors must be connected to the ECU in the following sequence, otherwise the system will almost certainly incorrectly acquire the water valve travel values, meaning that the recovery values will be used, causing abnormal function until the subsequent key ON

- Fit the new ECU (NCL), connecting the upper yellow (26-way) connector **(P)** first.

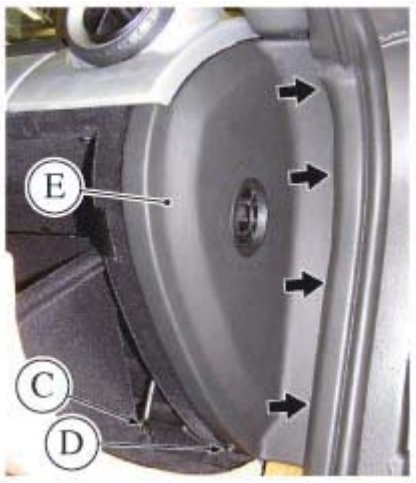


- Fasten the ECU by tightening the relative fastening screws **(N)**, then connect the lower white (20-way) connector **(M)**.



- Reconnect and refit the car system connectors **(H)** and **(L)** on the control unit mounting bracket.

- Set the battery master switch to ON (L2.02).



- Open the glove compartment and, supporting the weight of the door with a hand, accompany all the way down.
- Refit the right hand dash side trim **(E)**, tightening the relative screw **(D)** and fitting the length of door bay seal strip as originally mounted.
- Fasten the damper to the glove compartment with the screw **(C)**.

- Refit the lateral trim panels (M2.24).

- Connect the SD3 tester to the car diagnostic connector and perform the "Proxi" synchronising procedure (to allow the new control unit to recognise and dialogue with the CAN network).
- Perform a diagnostic cycle for the new ECU (NCL) with the SD3 tester.

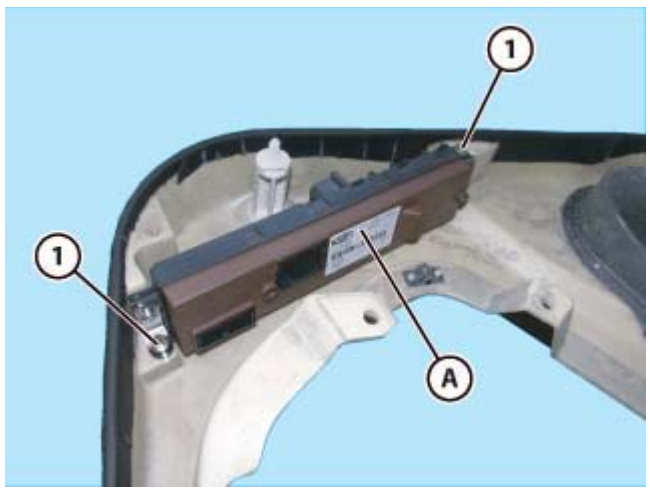
- When resetting the battery master switch to ON, wait at least 30 seconds with the key in position II before starting the engine, to allow the system controlling the motorised valves to self-acquire the parameters. Do not activate any other devices during this period. Turn the key back to 0 (OFF) then start the engine and leave idling for at least 10 minutes.
- Perform the satellite navigation system calibration procedure (if fitted).

Replacing the power window ECU

The left hand and right hand power window ECUs are located behind the respective door panels.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the door panel (M2.11).



- Undo the two fastener screws **(1)** on the outer door panel and remove the power window ECU **(A)**.
- Fit the power window ECU **(A)** and fasten by tightening the two screws **(1)**.

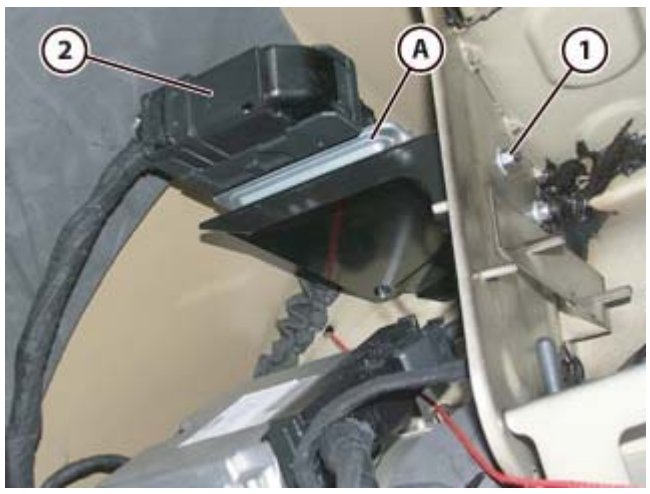
➢ Refit the door panel (M2.11).
➢ Set the battery master switch to ON (L2.02).

Removing the shock absorber control ECU

The ECU is located on the left-hand side of the luggage compartment, behind the lateral trim panel.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be carried out before replacing the ECUs to prevent short-circuiting.

➢ Remove the luggage compartment side trim panels (M2.23).
i Remove the left one only.



- Disconnect the connector **(2)**.
- Undo the three nuts **(1)** and remove the shock absorber control ECU **(A)**, complete with mounting bracket.
- Detach the shock absorber control ECU **(A)** from the bracket and replace.
- Assemble the new shock absorber control ECU **(A)** onto the bracket and install in the vehicle, tightening the three nuts **(1)**.
- Connect the connector **(2)**.

➢ Refit the luggage compartment side trim panels (M2.23).
➢ Set the battery master switch to ON (L2.02).

Automatic EOL cycle for NCS ECU (Suspension Control Node)

The automatic NCS diagnostic cycle must be performed with the SD3 tester updated with the latest software version.

Carry out the following procedures, waiting at least 3 seconds between one operation and the next.

The following procedure must be carried out whenever any component of the Magnetorheological suspension system is replaced.

➢ Connect the SD3 tester to the diagnostic socket (L2.12).
Use the SWITCH MATRIX cable (Part. no. 900027430).

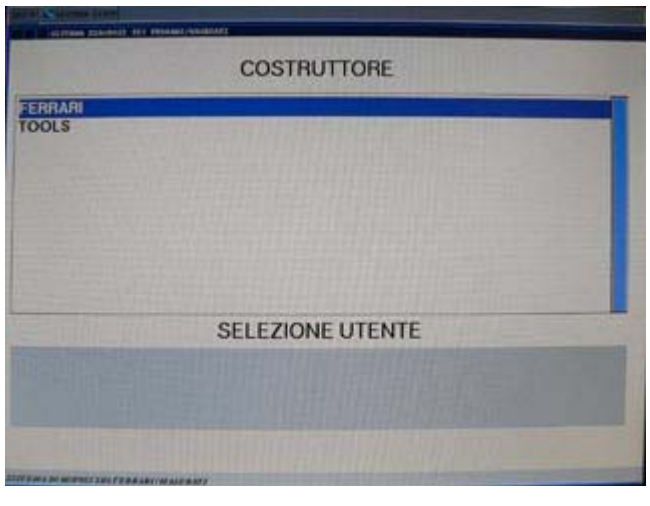
- Switch on the SD3 tester.



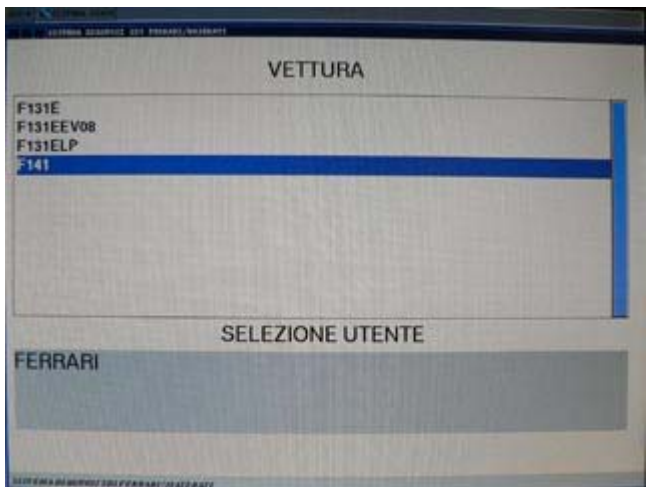
- Select "SERIAL DIAGNOSIS" and press Enter.



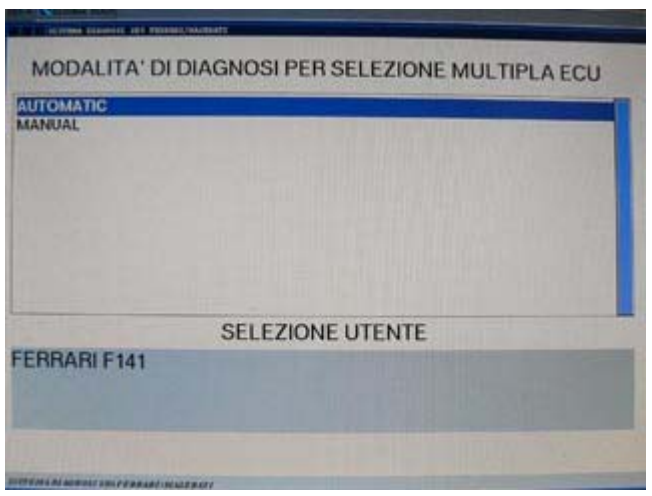
- Press “SINGLE ECU DIAGNOSIS”.



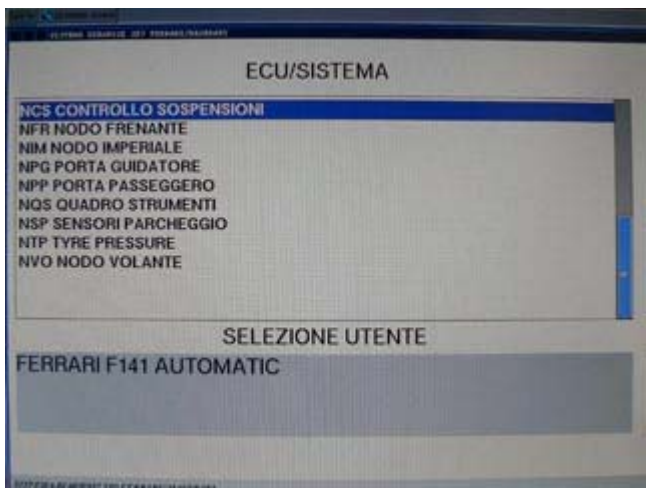
- Select "Ferrari" and press Enter.



- Select "F141" by pressing Tab then press Enter.



- Select "AUTOMATIC" and press Enter.



- Select the "NCS SUSPENSION CONTROL" node listed in the second page, then press Enter.
- The ECU initialisation process starts.



- Perform a key-on and press "CONTINUE".

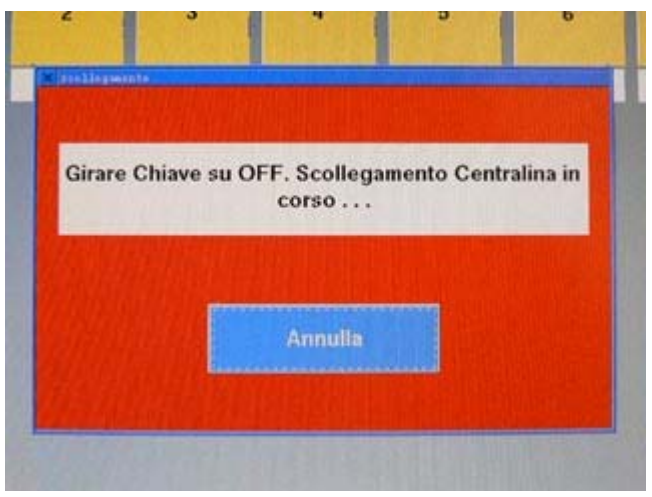
The ECU has been initialised.



- Select "CYCLE ENVIRONMENT" by pressing Tab then press Enter.



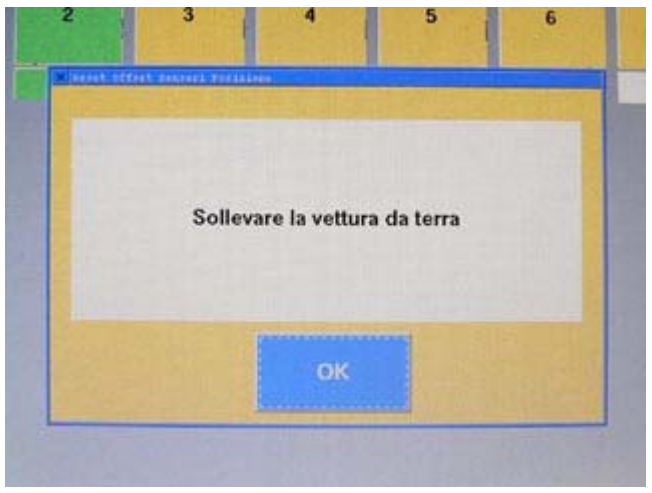
- Perform a key-on and press "CONTINUE".



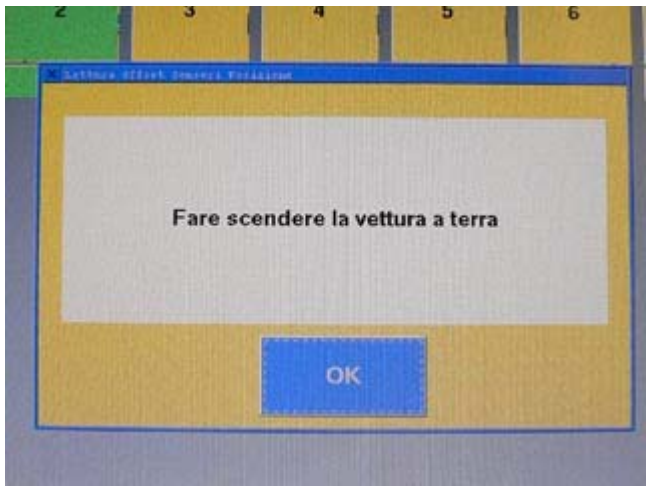
- Perform a key-off.



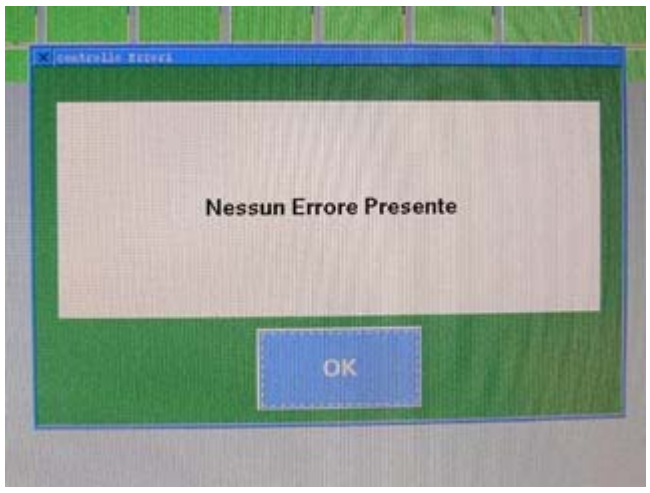
- The system runs a check and cancels any errors, after which press "OK".



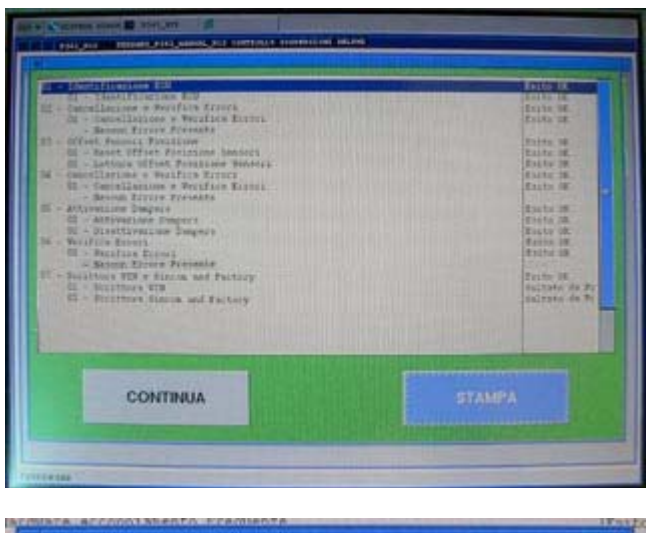
- Lift the vehicle from the ground then press "OK".
- The SD3 Tester automatically performs the "Reset and Sensor Position Offset reading"



- Lower the vehicle to the ground then press "OK".
- The SD3 Tester automatically performs the "Sensor Position Offset Reading", "Offset Position Reading" and "Damper Activation and Deactivation".



- The system runs an "Error Check", after which press "OK".



- At the end of the cycle, the screen aside is displayed, indicating the individual steps performed and the relative results.
- Press "PRINT" to print out a hard copy of the cycle report for archiving.



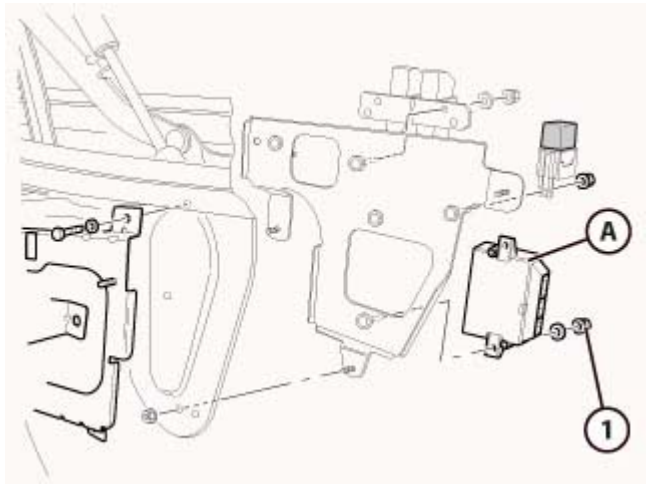
- To print directly with the printer, the tester must be connected to SD3-NET installed on the active PC. Press "YES" to print.
- Press "NO" to save the Report on the SD3 tester.
- End.

Replacing the parking sensor ECU

The ECU is located on the right hand side of the luggage compartment, fastened to the stiffener rib behind the right hand lateral luggage compartment trim panel.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the luggage compartment side trim panels (M2.23).
i Remove the right hand component.



- Detach the relative connectors and unscrew the two nuts **(1)** fastening the ECU to the stiffener rib on the bodywork.
- Remove the parking sensor ECU **(A)** from the luggage compartment.
- Fit the parking sensor ECU **(A)** and fasten by tightening the two nuts **(1)**.

➢ Refit the luggage compartment side trim panels (M2.23).
➢ Set the battery master switch to ON (L2.02).

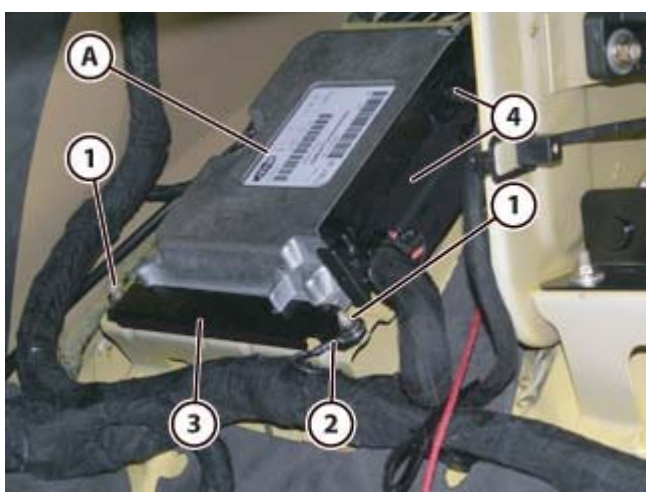
Replacing the F1 gearbox ECU (for versions with electronically-controlled gearbox.)

On cars up to Ass.ly Nr. 66181 equipped with gearboxes with a short ratio 6th gear, the ECU with part code 230865 must be used when replacing the gearbox ECU.

The ECU is located on the left-hand side of the luggage compartment, behind the lateral trim panel.

➢ Set the battery master switch to OFF (L2.02).
i This operation must be performed before replacing the ECUs to prevent short-circuiting.

➢ Remove the luggage compartment side trim panels (M2.23).
i Remove the left one only.



- Undo the two nuts **(1)** fastening the bracket **(3)** onto the ECU **(A)** and the earth cable **(2)**.
- Disconnect the two connectors **(4)**.
- Retrieve the bracket **(3)** and remove the F1 gearbox ECU from the luggage compartment.
- Connect the two connectors **(4)** to the new F1 gearbox ECU.
- Fit the ECU **(A)** in the relative seat.
- Fit the bracket **(3)** and fasten by tightening the nuts **(1)**.

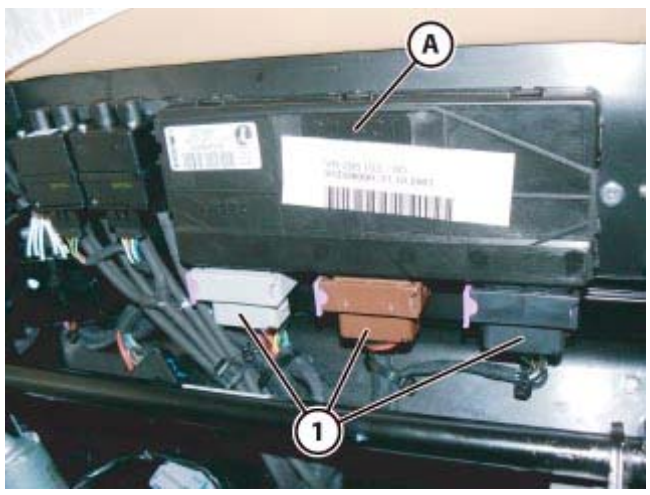
i The inner nut also fastens the ground cable **(2)**.

➢ Refit the luggage compartment side trim panels (M2.23).
➢ Set the battery master switch to ON (L2.02).
➢ After replacing the "F1" gearbox ECU, perform the **"Calibrating the gearbox"** specifications described in chapter "**D2.15 _ Calibrating the electronically-controlled gearbox.**".

Replacing the seat setting ECU

These units are installed under the driver seat and passenger seat respectively.

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the seat (M2.21).
i Remove the seat under which the ECU to be removed is installed.



- Disconnect the three connectors **(1)**.
- Remove the ECU **(A)** from its mounting.
- Fit the new ECU **(A)** in the relative mounting
- Connect the three connectors **(1)**.

➢ Refit the seat (M2.21).
➢ Set the battery master switch to ON (L2.02).

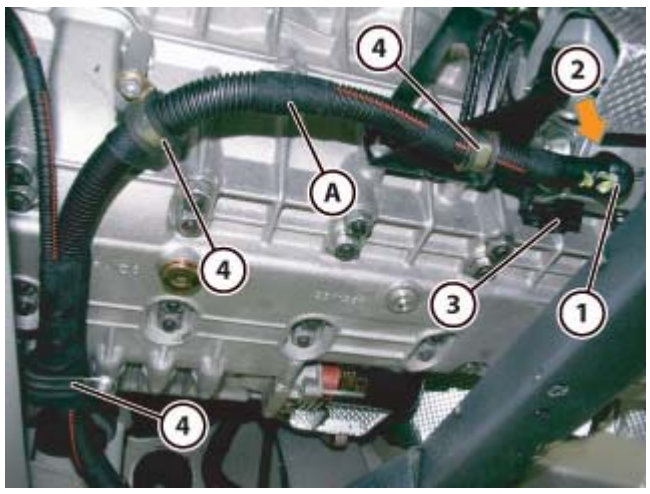
L2.14 Engine services cable

Replacing the engine services cable

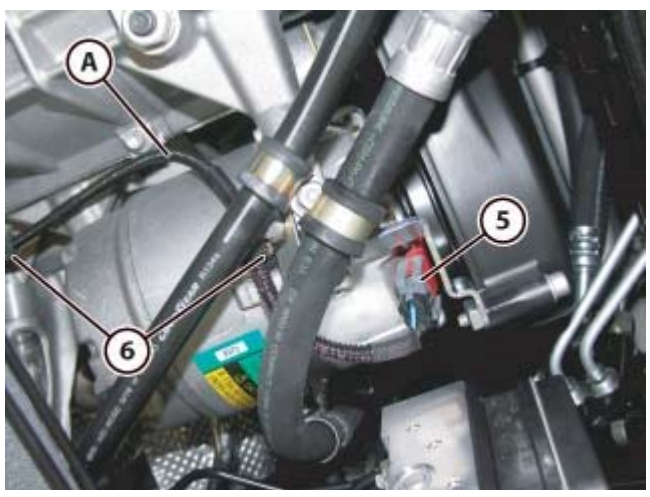
- Set the battery master switch to OFF (L2.02).
- Remove the engine compartment shields on the fenders (M2.17).
  Remove the right hand component.

- Remove the air intake (B6.03).
  Remove the right hand component.

- Remove the front section of the underfloor (M2.12).



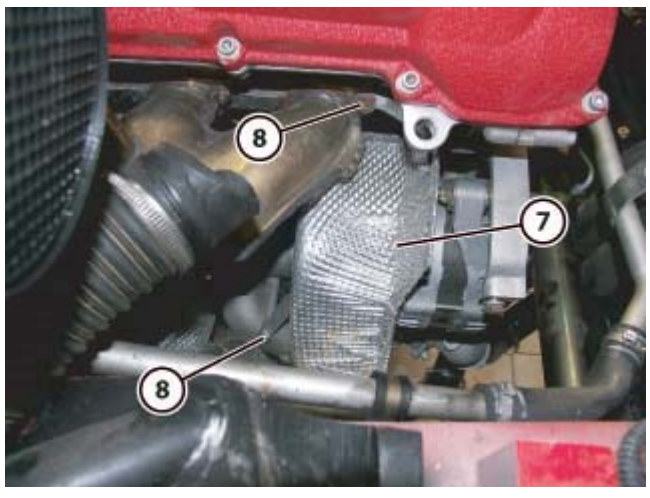
- Remove the engine services cable **(A)** from the starter motor, removing the protective cap **(1)** and undoing the nut **(2)**.
- Disconnect the connector **(3)** (M020) and remove the three clamps **(4)** fastening the engine services cable **(A)** to the crankcase.



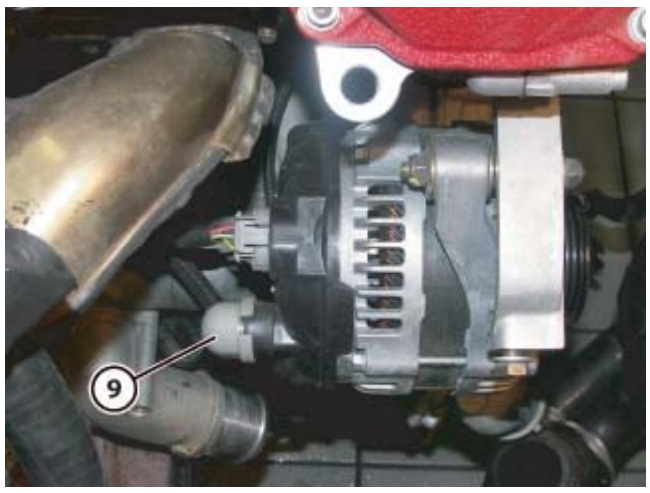
- Disconnect the connector **(5)** (M025) from the compressor and remove the engine services cable **(A,)** releasing from the clamps **(6)**.



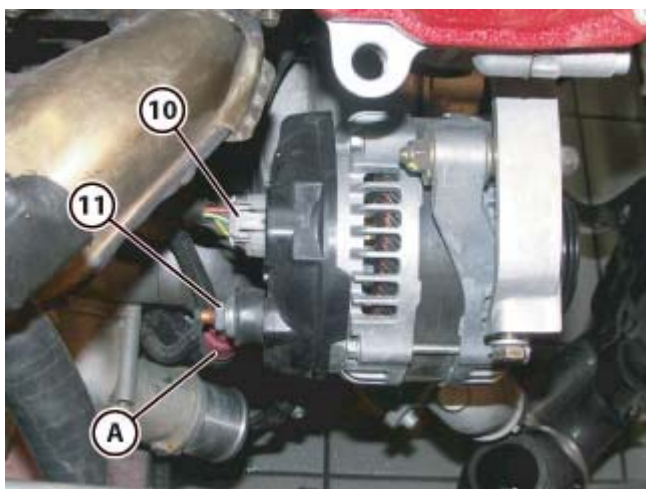
- Remove the clamp **(D)** fastening the engine services cable to the oil-water pump.



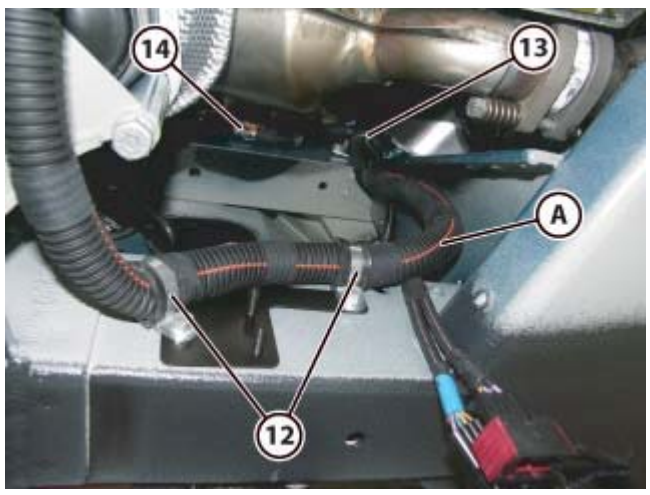
- Remove the heat shield **(7)** on the alternator by unscrewing the two fastener screws **(8)**.



- Remove the cover **(9)** from the nut fastening the engine services cable to the alternator.

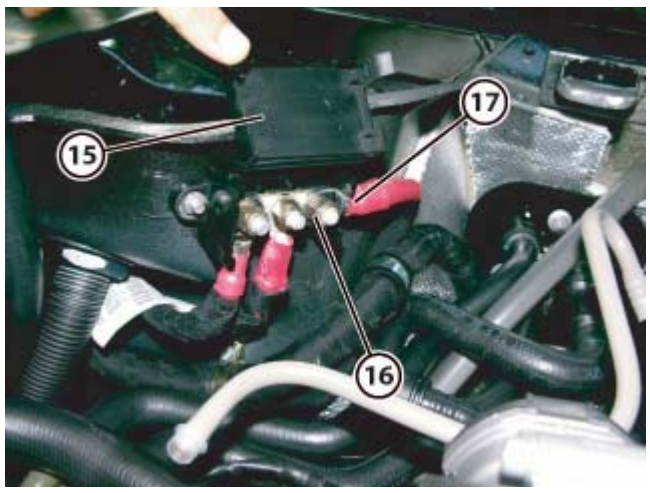


- Unscrew the engine services cable fastener nut **(11)(A)**, retrieving the washers, and disconnect the connector **(10)** (B002) on the alternator.



- Remove the two lower clamps **(12)** and the upper clamp **(13)** fastening the engine services cable **(A)** to the body, and disconnect the connector **(14)** (Y351) next to the TGK valves.

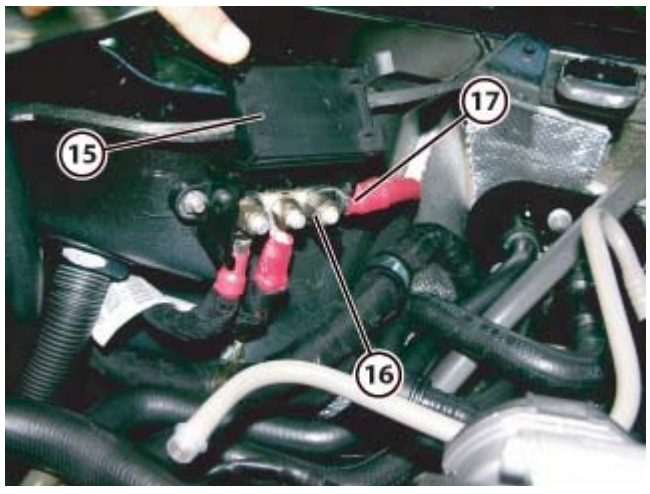
Note that the photo was taken with the oil lines and oxygen sensors removed to illustrate the operation more clearly .



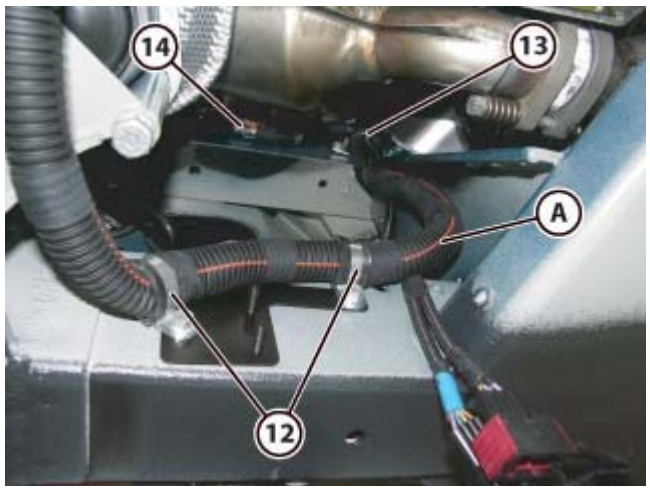
- Lift the protective cover **(15)**, located on the right hand of the engine compartment, and remove the branch terminal board **(17)** (B301) from the branch node by undoing the nut **(16)**.

- After removing all the clamps fastening the engine services cable to the body, remove cable from the vehicle and replace.

- Route the new engine services cable in the engine compartment, fastening to the body as originally installed.

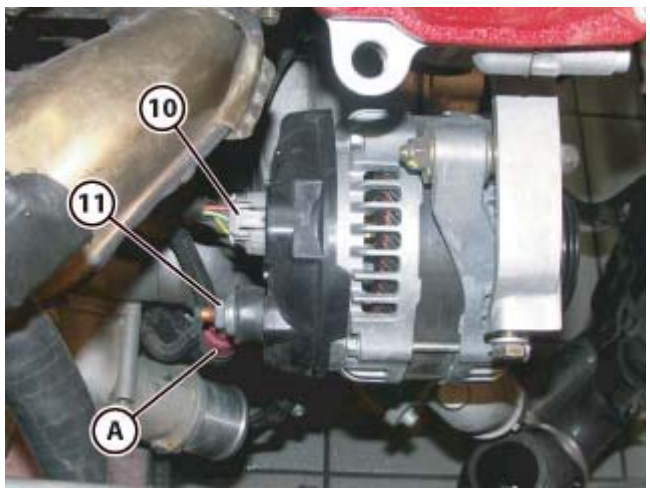


- Fit the branch terminal board **(17)** (B301) on the branch node and fasten by tightening the nut **(16)**.
- Fit and fasten the protective **(15)** cap in its relative seat.

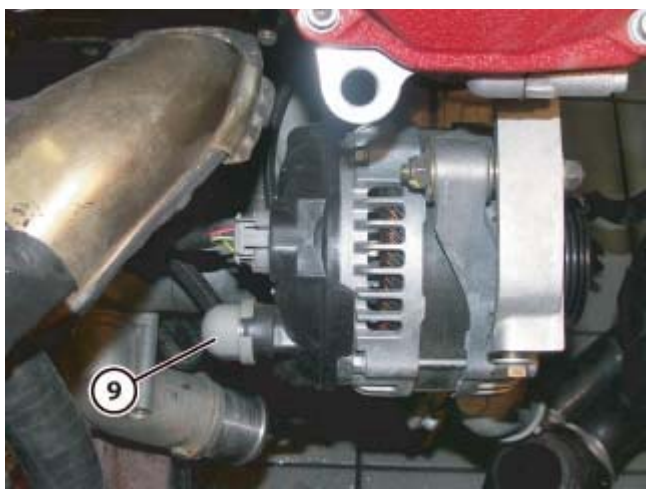


- Fasten the engine services cable **(A)** to the body with the two lower clamps **(12)** and the upper clamp **(13)** and connect the connector **(14)** (Y351) located next to the TGK valves.

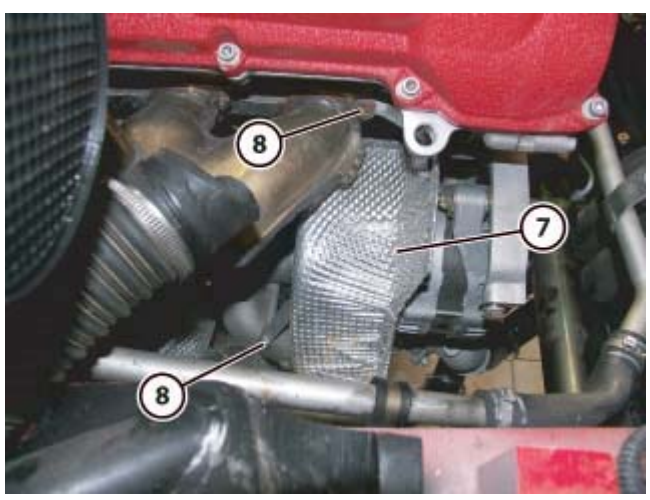
Note that the photo was taken with the oil lines and oxygen sensors removed to illustrate the operation more clearly .



- Connect the connector **(10)** (B002)and, after fitting the spacers retrieved during removal, tighten the nut **(11)** fastening the engine services cable **(A to the alternator.)**



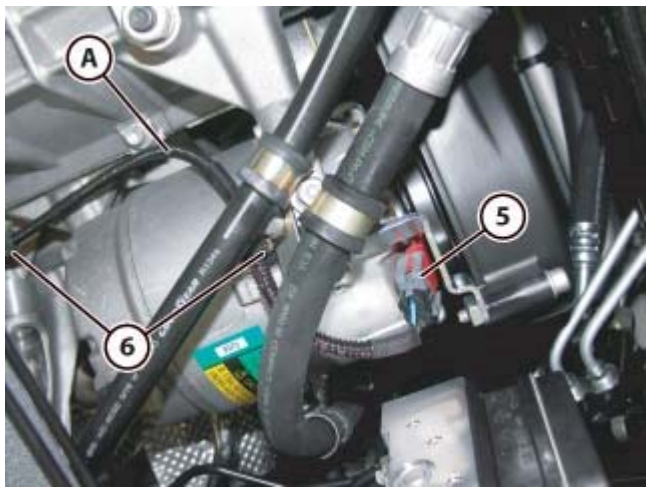
- Refit the cap on the nut fastening the engine services cable **(9)**.



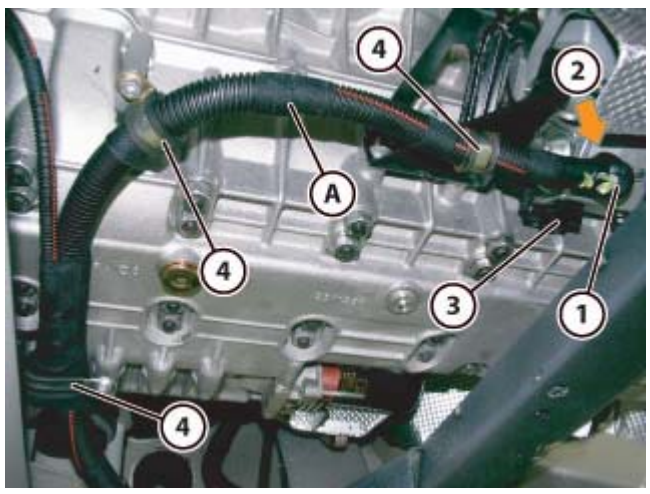
- Fit the heat shield **(7)** in its seat and fasten by tightening the two screws **(8)**.



- Fit the clamp **(D)** fastening the engine services cable to the oil-water pump as originally installed.



- Connect the connector **(5)** (M025) to the compressor and fasten the engine services cable **(A)** to the clamps **(6)**.



- Connect the connector **(3)** (M020) and fit the three clamps **(4)** fastening the engine services cable **(A)** to the crankcase.
- Fit the engine services cable **(A)** onto the starter motor, tighten the nut **(2)** and fit the protective cap in its relative seat **(1)**.

- Refit the front flat undertray section (☞ M2.12).
- Refit the air intake (☞ B6.03).
- Refit the engine compartment shields on the fenders (☞ M2.17).
- Set the battery master switch to ON (☞ L2.02).

L2.15 Rain/twilight sensor

Rain sensor

The rain sensor (forming a single unit with the twilight sensor) works in the infrared spectrum, with an operating principle based on the refraction of light. The sensor is used to automatically adjust the frequency of the windscreen wipers in proportion to the intensity of the rain.
The rain sensor is enabled by setting the windscreen wipers to automatic with the stalk on the steering column (stalk pushed down to first stop position). In automatic mode, the sensitivity of the rain sensor may be set to four different levels by turning the wheel at the end of the stalk.

Twilight sensor

The twilight sensor (forming a single unit with the rain sensor) controls automatic activation of the low-beam headlights and running lights in relation to the sensitivity setting selected by the user (with the light control set to AUTO). With the light control set to AUTO, the running lights and low beam headlights are switched off by the twilight sensor as follows:

- low beam off: upon reception of the relative command from the twilight sensor;
- running lights off: 10 seconds after low beam lights are switched off.

The sensitivity of the sensor is settable from the instrument panel.

Checking rain sensor function

This procedure must be performed on the vehicle with battery installed.

- Set the windscreen wiper control stalk to 'automatic' (the sensibility setting wheel may be in any position).
- Check that the windscreen wiper function is activated automatically by the rain sensor (with a dry screen, perform a washer cycle to test wiper function).
- Wet the windscreen slightly in the sensor area (with a sprayer bottle or sponge) and check that the wipers activate when the screen is wet and switch off when the sensor area of the windscreen is dry.

Rain sensor failure is indicated by the relative warning light on the instrument panel.

Checking twilight sensor function

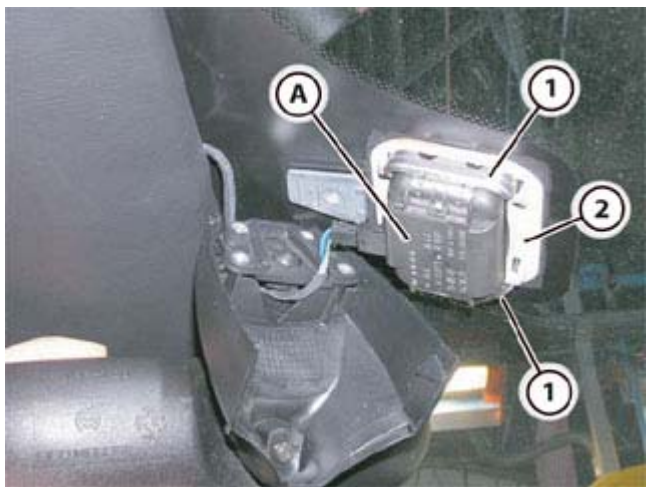
This procedure must be performed on the vehicle with battery installed.

- Place the vehicle in a brightly lit area (e.g. with a halogen lamp pointed directly at the windscreen, in the sensor area).
- Set the selector to 'automatic' and check that the lights remain off.
- Shade the sensor with a black screen and check that the lights switch on without a noticeable delay.
- Remove the black screen from the sensor and check that the lights turn off after a few seconds.

Twilight sensor failure is indicated the relative warning light on the instrument panel.

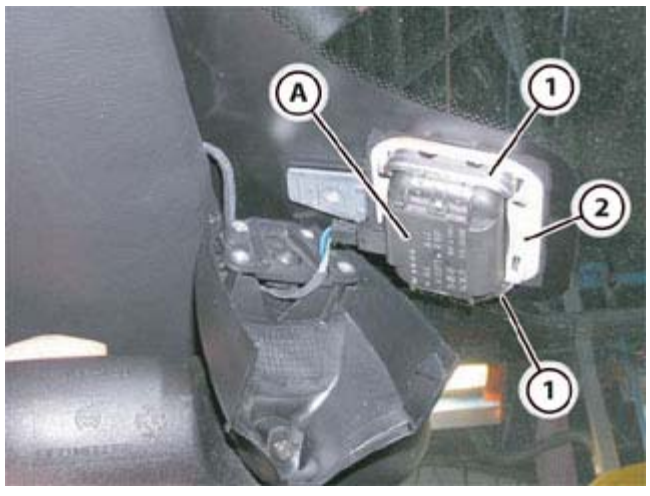
Removing the rain/twilight sensor

Remove the internal rear view mirror (H3.08).



- Simultaneously raise the two side tabs **(1)** and then remove the rain sensor **(A)** (Z006) from the base **(2)** on the windscreen.
- Place the sensor **(A)** in a closed box or use the special cover for the sensing area included in the sensor package.

Refitting the rain/twilight sensor



- Check that the sensor mating area on the windscreen is perfectly clean.
- Fit the rain/twilight sensor **(A)** (Z006) on the base **(2)** and fasten by simultaneously latching the two side tabs **(1)**.
- Press onto the sensor with the palm of the hand to ensure that it adheres fully to the windscreen.

➢ Refit the internal rear view mirror (H3.08).

L2.16 Electrical system absorption test

Measuring no-load current absorption

The current absorbed by the vehicle system may be measured with a digital multimeter or with an amperometric clamp meter.

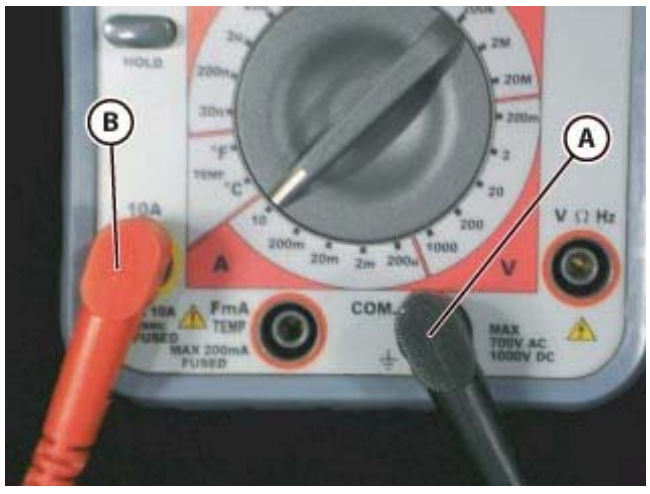
Use only amperometric clamp meters with mA scales.

The unit of measurement used for testing must be Amperes (A).

- With the battery master switch set to ON, ensure that the doors, engine compartment and luggage compartment lids are closed.
- The front compartment lid and doors may be opened if necessary to facilitate battery readings and to allow access to the battery master switch.

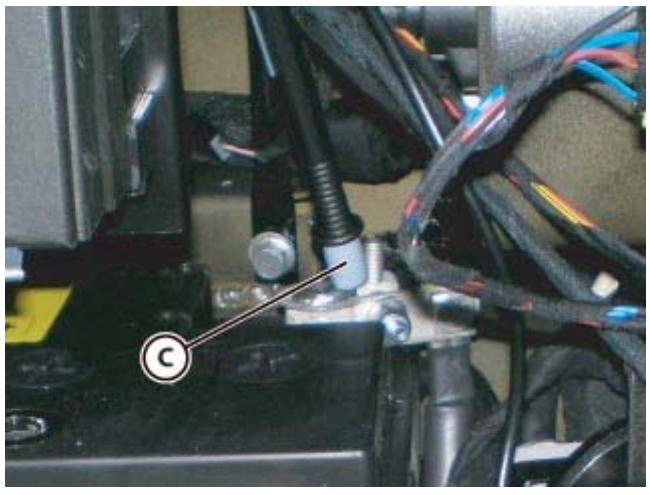
Ensure that the locks are blocked (See paragraph **"Blocking door and rear luggage compartment lid locks"**).

- Reference values for no-load absorption must be approximately **19 and 22 mA**; the value **MUST NOT** exceed **35 mA**.



PROCEDURE WITH DIGITAL MULTIMETER

- Connect the black wire **(A)** to the tester terminal marked Earth.
- Connect the second wire **(B)** (usually red) to the bushing marked with the unit of measurement A (Amperes).



- Connect the black probe **(C)** (common earth) to the negative battery terminal.



- Connect the second probe **(D)** to a chassis earth point.

Preferably use the threads of the nuts used to fasten the battery.

- Ensure that the area chosen is clean and is perfectly conductive.

Do not start the engine or turn the ignition key-on, as this may blow the instrument fuse.

- Once the multimeter is correctly positioned, switch off the battery master switch.

The current consumers will continue to receive power through the multimeter.

- Wait approximately **30 minutes**. This is necessary because the B-Can communication network operating in the Body computer, Tyre Pressure and Main Nodes keeps the system active for approximately 30 minutes and, until this period has elapsed, the absorption values read may far exceed the values specified by the manufacturer.
- Excessive values are only cause for concern if still read after the 30 minute wait time for system shut-off. High values before this 30 minute period has elapsed are normal, as a number of ECUs are still active.



PROCEDURE WITH AMPEROMETRIC CLAMP METER

The instrument used must have a current scale precision in mA.

- Fit the clamp ring around the cable being measured.

In this case, this is the earth cable leading from the battery negative terminal.

- The direction of the current measured is indicated on the clamp.

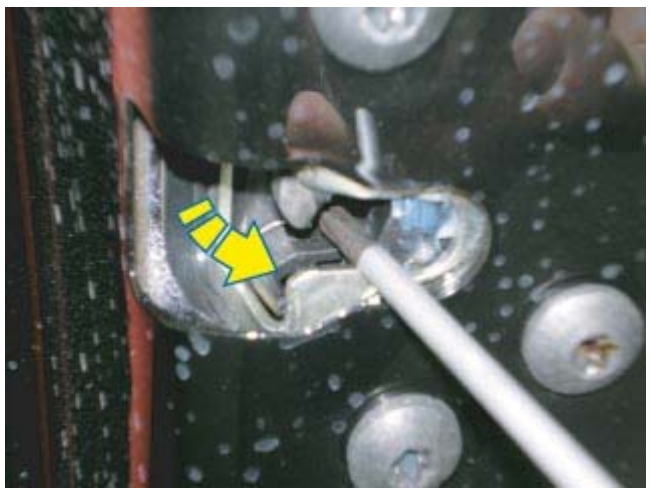
As in this case the current originates from the battery and discharges on the chassis, the arrow indicates a direction leading away from the battery toward the battery master switch.

- In this case, it is not necessary to switch off the battery master switch.

Possible causes of excessive absorption

- If the value read in the vehicle is higher than in the specifications, the battery will tend to discharge rapidly.
- The cause of this is probably one or more devices failing to switch off.
- To identify the cause of excessive absorption, disconnect the networked ECUs one by one
- while observing the absorption value. This will drop when the active ECU is disconnected.
- Another possible cause for excessive current absorption may be a short circuit to earth at some point in the wiring harness.

Blocking door and rear luggage compartment lid locks



DOORS

- Use a screwdriver to block the lock.

At the end of the test, pull the door release handles to unblock the locks.



REAR LUGGAGE COMPARTMENT

- Use a screwdriver to block the lock.

The measurement is taken in the luggage compartment, where the battery is located. The lid must therefore remain open to permit measurement.



- To prevent damage, unblock the lock at the end of the test by pulling the release cable **(A)** located under the central tunnel.

M1.01 Tightening torques



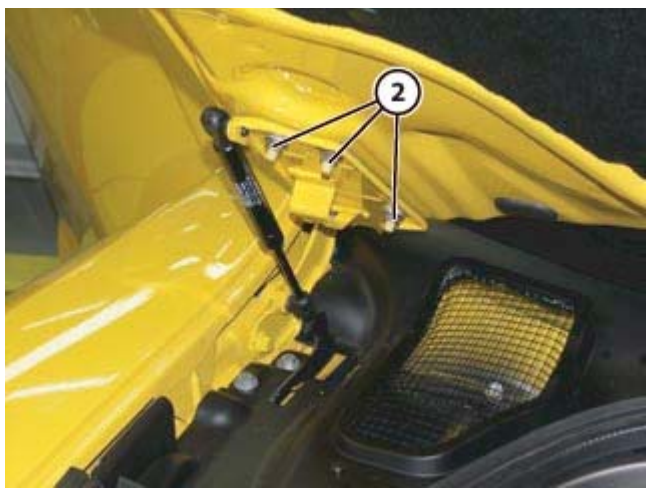
Tightening torque		Nm	Class
Engine compartment lid - hinge	Nut	15 Nm	B
Fastening engine compartment lid lock striker plate	Screw	8.5 Nm	B
Front bumper - chassis (lateral fastener)	Nut	10 Nm	B
Centre fastener between bumper and chassis	Nut	40 Nm	B
Fastening seat - bodyshell	Screw	40 Nm	B
Dashboard mounting cross member - bodyshell	Screw	25 Nm	B
Dashboard - chassis cross member	Nut	10 Nm	B
Passenger airbag module - dashboard	Screw	10 Nm	B
Glove compartment - dashboard (front fastener)	Screw	4.4 Nm	C
Instrument panel binnacle - dashboard	Screw	3.1 Nm	C
Safety block - door	Nut	2.6 Nm	C
External handle	Screw	2 Nm	C
Fastening of lock to door	Screw	14 Nm	B
Armrest mounting bracket - door	Screw	7.4 Nm	C
Armrest mounting bracket - door	Nut	7.4 Nm	C
External rear view mirror - door	Screw	6 Nm	B
External underdoor trim panel - bodyshell	Screw	4.4 Nm	C
Engine compartment wiring terminal block - bodyshell	Nut	5 Nm	C
Passenger compartment cable ground points - bodyshell	Screw	15 Nm	B
Outer door panel - door	Screw	6 Nm	C
Lateral rear bumper mounting bracket - bodyshell	Nut	50 Nm	B
Fuel filler flap - bodyshell	Screw	2.6 Nm	B
Fuel filler flap - hinge	Screw	3.2 Nm	B
Central reinforcement cross member - bodyshell	Screw	25 Nm	A
Structure connector plate - bodyshell	Screw	25 Nm	A
Lateral front bumper mounting bracket - bodyshell	Nut	50 Nm	B
Fastening of central section of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Front element of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Rear element of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Gearbox oil radiator inspection grille - bodyshell	Screw	5.8 Nm	C
Fastening for rear section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C
Fastening for front section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C
Door striker plate - bodyshell	Screw	30 Nm	B
Passenger footrest - bodyshell	Screw	4.1 Nm	C
Moulding - bodyshell fastening	Screw	2 Nm	C
Tunnel console trim panel - bodyshell	Screw	6 Nm	B
Front door pillar trim panels	Screw	4.1 Nm	B
Lower pin for aerodynamic flaps - bodyshell	Screw	7.5 Nm	B
Upper pin for aerodynamic flaps - bodyshell	Screw	7.5 Nm	B
Luggage compartment lid lock - bodyshell	Screw	24 Nm	B
Door tie-rod - bodyshell	Screw	9.5 Nm	B
Door striker plate - bodyshell fastening	Screw	30 Nm	B
Rear bumper - side bracket fastening	Nut	10 Nm	B
Rear bumper - bodyshell (central fastener)	Nut	40 Nm	B
Centre fastener between bumper and bodyshell	Nut	40 Nm	B
Power window unit - door	Screw	7.4 Nm	B
Power window unit - door	Nut	8.5 Nm	B
Armrest mounting bracket - door	Nut	7.4 Nm	C
External handle mechanism - door	Screw	2 Nm	C
Glove compartment - dashboard (upper fastener)	Screw	3.1 Nm	C
Roll-down window - power window guides	Screw	8.5 Nm	B
Engine compartment lid lock - chassis	Nut	24 Nm	B
Striker plate retainer bracket	Screw	7.4 Nm	B
Fastening four-point seat harnesses to bodyshell	Screw	40 Nm	B
Fastening seat belt to seat	Screw	40 Nm	B

M2.01 Engine compartment lid

Removing the engine compartment lid



- Pull the windscreen washer pipe **(1)** out of the hole on the engine compartment lid up to the connector, then detach the pipe from the connector.

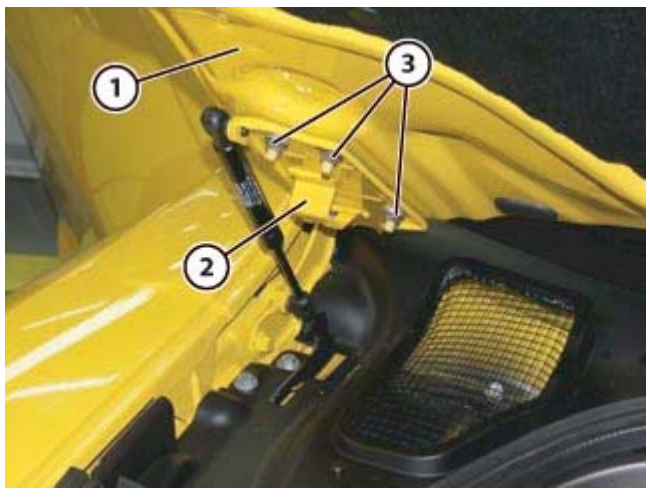


- Holding the lid firmly, unscrew the four nuts **(2)** fastening it to the hinges.
- Remove the complete lid and set down in a safe place.

Check if there are any spacers between the hinge and the lid and keep them for refitting.

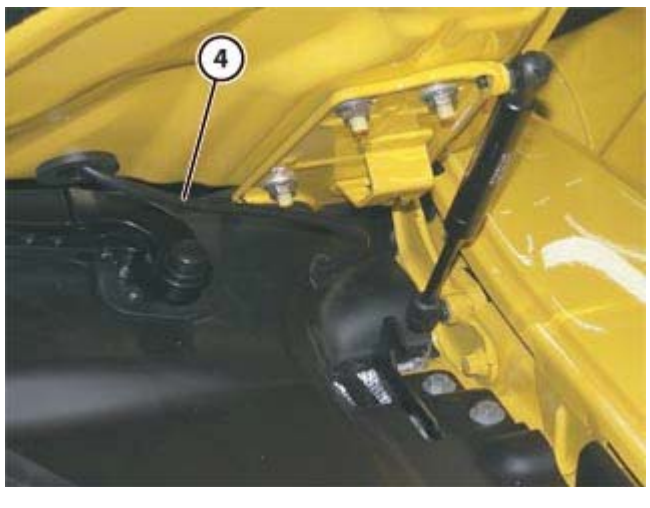
Refitting the engine compartment lid

Tightening torque		**Nm**	**Class**
Engine compartment lid - hinge	Nut	15 Nm	B



- Fit the complete engine compartment lid **(1)** inserting the stud bolts into the holes on the hinges **(2)**.
- Tighten the four nuts **(3)** fastening the engine compartment lid to the hinges.

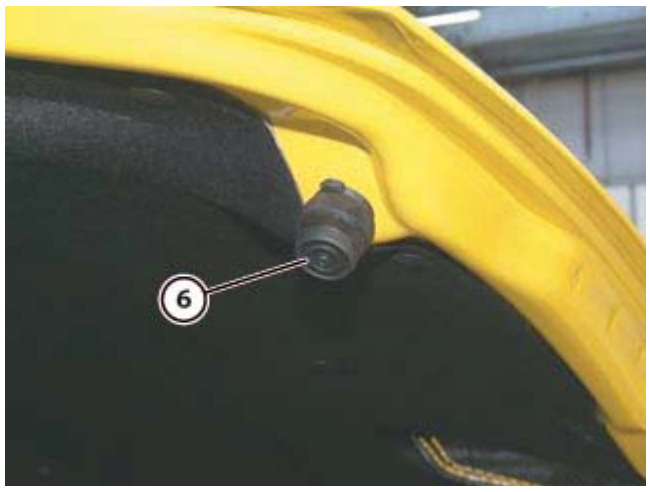
Tightening torque	**Nm**	**Class**
Nut	15 Nm	B



- Connect the pipe **(4)** to the windscreen washer system connector and fit in its respective seat on the engine compartment lid.
- Check that the pipe moves freely and is not to taut when the lid is fully opened.



- Check that the lid closes properly and that it is equidistant on all sides of the vehicle body and perfectly flush in height at the front, at point **(5)**.



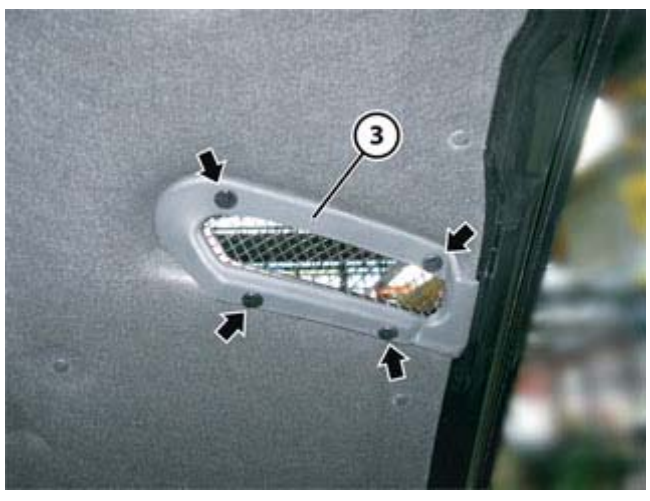
- If the height is incorrect, adjust the swivel spacers **(6)** at the front of the engine compartment lid, turning them to adjust the height to the correct position.
- Check the height once again with the lid closed.



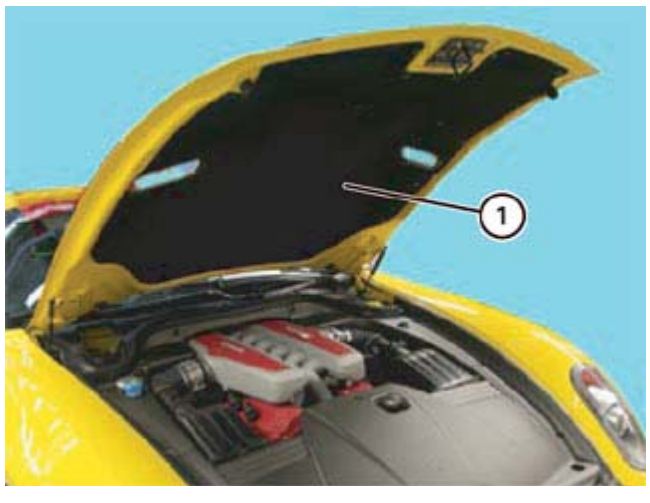
- Finally, check that the release mechanism **(7)** works properly by opening and closing the lid a few times.
- If the lid rubs or jams during opening or closing, check lid height and alignment.

➢ Adjust the engine compartment lid lock striker plate retainer bracket (☞ H3.13).

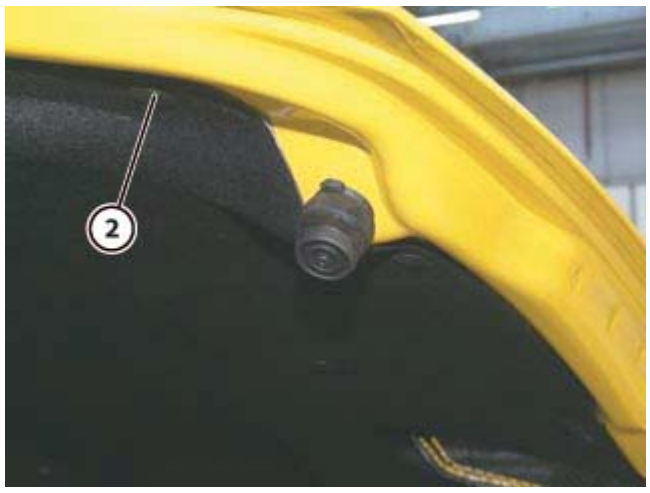
Removing the engine compartment lid shield



- Remove the two air vent surrounds **(3)**, undoing the four screws indicated.



- Open the lid completely to remove the engine compartment lid shield **(1)**.



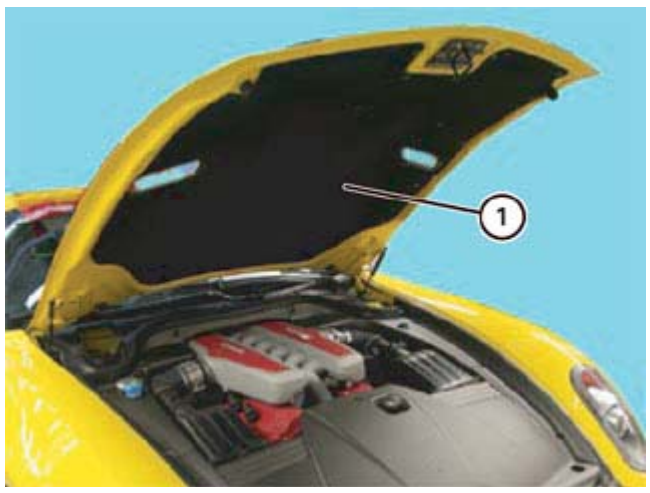
- Detach the press-fit plugs **(2)** installed around the entire perimeter of the shield.
- Remove the engine compartment lid shield.



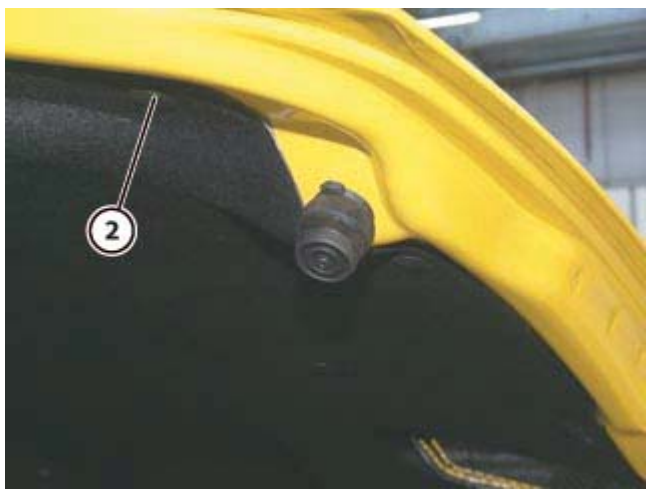
NEW SOLUTION

- Two central fasteners have been added securing the shield to the pressed engine compartment lid.

Refitting the engine compartment lid shield



- To refit the engine compartment lid shield **(1)** lift the lid completely and affix the shield to the internal surface of the lid.

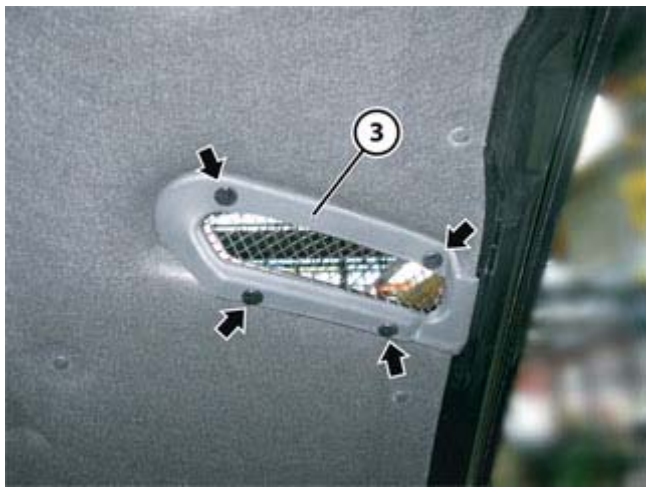


- Install the press-fit plugs **(2)** in all the holes on the shield and then on the lid.



NEW SOLUTION

- Two central fasteners have been added securing the shield to the pressed engine compartment lid.



- Fasten the two air vent surrounds **(3)**, tightening the four screws indicated.

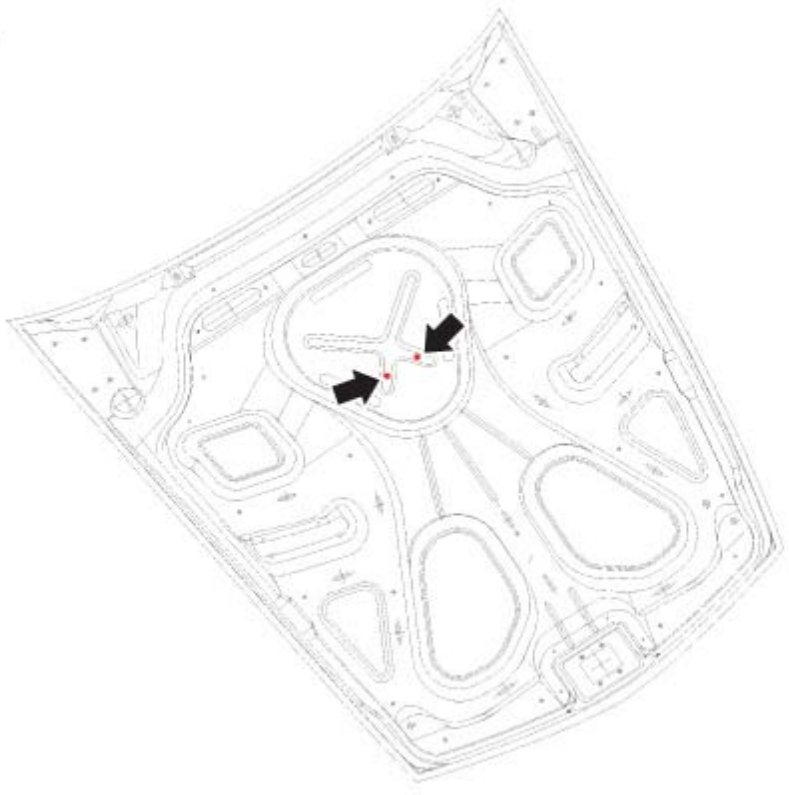
Replacing the engine compartment lid shield

Two additional fasteners have been added at the centre of the new engine compartment lid shield. As a result, when ordering a Spare Part for this part, two holes measuring 6.5 mm in diameter must be made in the engine compartment pressed lid to enable installation.

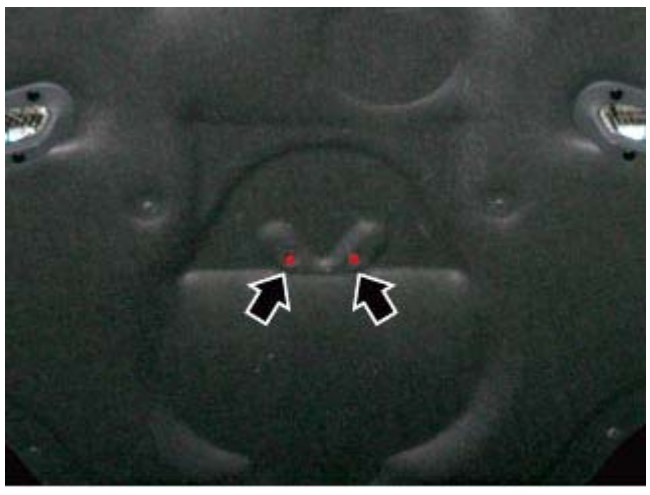
➢ Remove the engine compartment lid shield (M2.01).

Take particular CARE not to drill into the outer lid trim. We recommend fitting the bits with a drill depth stop.

- Use drill bits for metal to make the holes.



- The holes which must be made are highlighted in red and indicated by the arrows in the drawing above.



- To make the holes in exactly the correct positions on the engine compartment lid, proceed as follows.
- Refit the engine compartment lid shield (M2.01).

Fit the new trim panel, without fitting the two press fit plugs in the central holes, as the holes themselves have not been drilled yet.

- Make two markings in the positions on the engine compartment lid corresponding to the two additional holes in the new trim panel.
- Remove the engine compartment lid shield (M2.01).

Take particular CARE not to drill into the outer lid trim. We recommend fitting the bits with a drill depth stop.

- Now drill the holes using the markings made previously as reference. Make an initial hole using a smaller diameter bit (the final hole must be **6.5 mm** in diameter).
- Then complete the hole with a **6.5 mm** diameter bit.

- Then, as this is a concealed area, implement the painting cycle (chapter **M3.03 _ Preparing and painting aluminium sheets**) only up to the application of the **PRIMER D 831**.
- In this case, the **PRIMER D 831** may be applied by brush, drying with a hot heat gun for **10/15 minutes**.

➢ Refit the engine compartment lid shield (☞ M2.01).

M2.02 Luggage compartment lid

Removing the luggage compartment lid

➢ Set the battery master switch to OFF (L2.02).

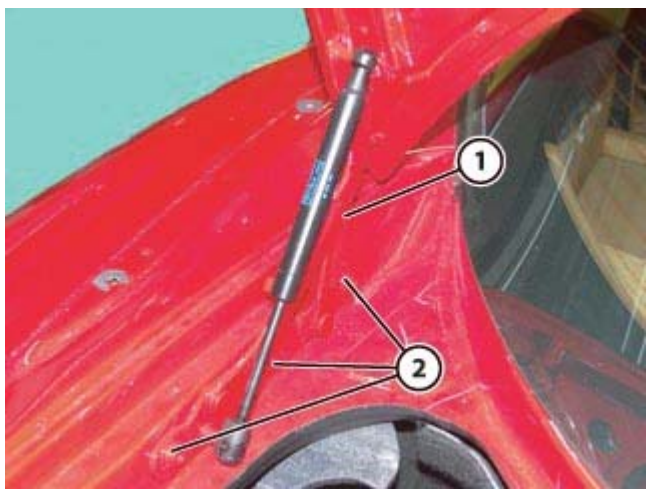


- To remove the complete luggage compartment lid **(1)**, remove the cable sheath **(2)** and detach the internal connector(X367) (Y367).



- Undo the three screws **(3)** fastening the two lid hinges.
- Remove the complete lid, taking care not to damage it and setting down in a safe place.

Refitting the luggage compartment lid



- Fit the complete luggage compartment lid, inserting the hinges **(1)** in the respective seats on the bodywork.
- Hand tighten the three screws **(2)** fastening both hinges to the bodywork.



- Connect the number plate light cable connector(X367) (Y367)and cover the cable with the sheath **(3)**.
- Fit the protective sheath in its respective seat on the luggage compartment lid.
- Check that the sheath **(3)** is not taut and that it can move freely when the lid is opened and closed.



- Close the lid and check that it is properly aligned with the bodywork; the lid must be equidistant from the bodywork along the entire perimeter.
- With the lid closed, also check the height relative to the bodywork. If necessary, adjust the height by turning the two spacers **(4)**.

i Also check that the lid release and locking mechanisms work correctly.

➢ Set the battery master switch to ON (L2.02).

Removing the luggage compartment seal strip



- To remove the luggage compartment seal strip **(1)** ease it out of its seat, taking care not to deform it.

Refitting the luggage compartment seal strip



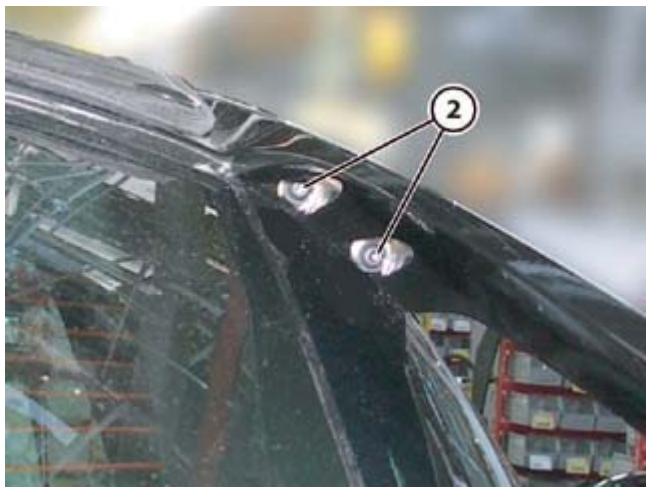
- To refit the luggage compartment seal strip **(1)**, clean the relative recess on the bodywork with a dry cloth.
- Prefit the seal strip against the entire length of the recess in the bodywork.
- Gently press the strip into the recess by hand until fully seated, taking care not to damage the strip.
- Replace the seal strip with a new strip if damaged.

Removing the side aerodynamic flaps

➢ Remove the luggage compartment side trim panels (M2.23).



- Loosen the screw **(1)** on the side of the luggage compartment.



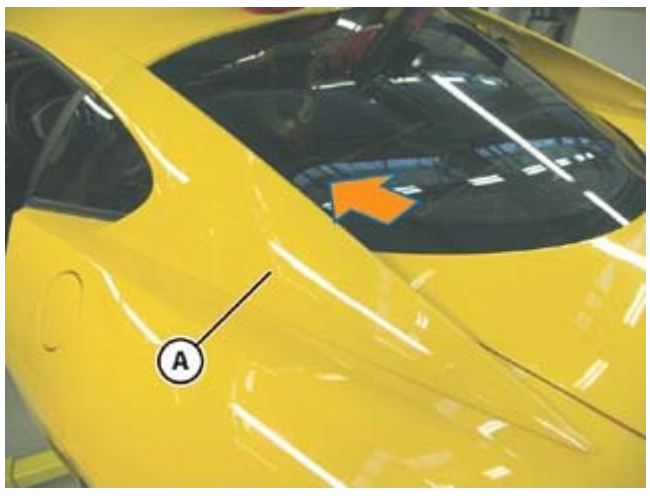
- Undo the two screws **(2)** fastening the aerodynamic flap to the bodywork.



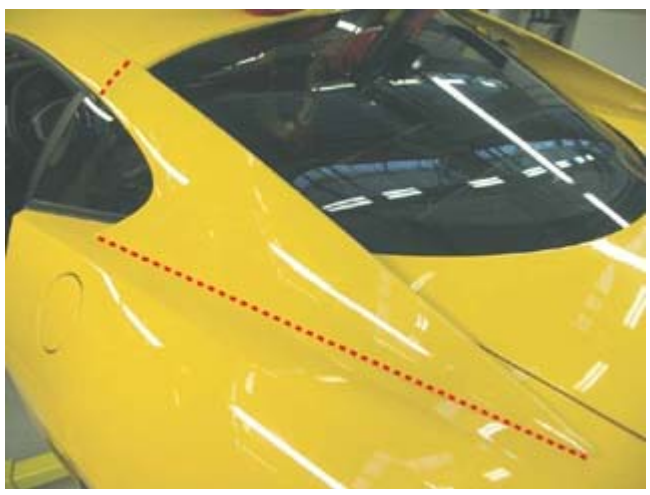
- To remove the side aerodynamic flap **(A)** from the vehicle, detach from the lower pins and shift it towards the rear of the vehicle.

Refitting the aerodynamic side flaps

Tightening torque		**Nm**	**Class**
Lower pin for aerodynamic flaps - bodyshell	Screw	7.5 Nm	B
Upper pin for aerodynamic flaps - bodyshell	Screw	7.5 Nm	B



- Fit the aerodynamic flap **(A)** in its seat on the fender and fasten onto the lower pins, sliding towards the front.



- Check that the aerodynamic flap is aligned with the coachwork.

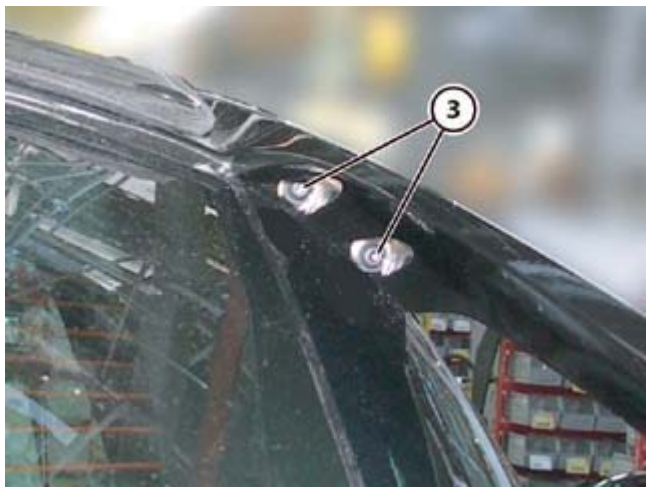


- Adjust with the pins **(1)** if necessary.



- Fasten the aerodynamic flap by tightening the lower screw **(2)**.

Tightening torque	**Nm**	**Class**
Screw	7.5 Nm	B



- Tighten the two upper screws **(3)** fastening the aerodynamic flap **(A)** to the bodywork.

Tightening torque	**Nm**	**Class**
Screw	7.5 Nm	B

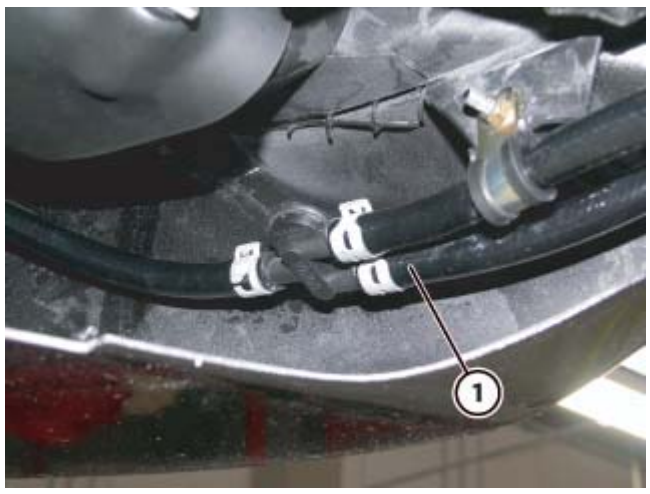
➢ Refit the luggage compartment side trim panels (M2.23).

M2.03 Front bumper

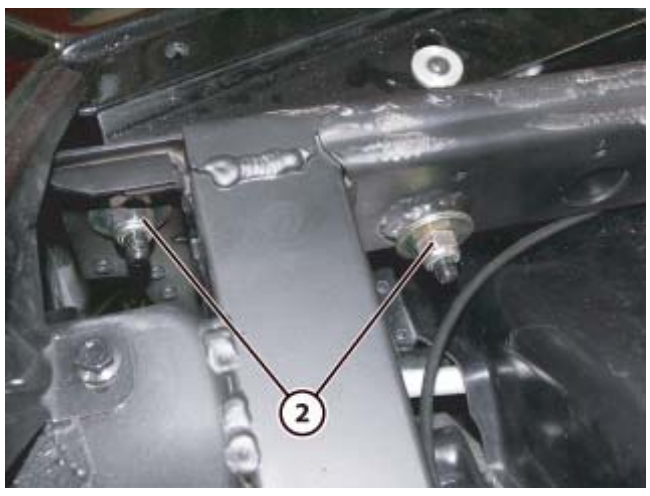
Removing the front bumper

➢ Remove the wheels (F2.08).
i Remove the front components.

➢ Remove the front section of the underfloor (M2.12).
➢ Remove the central engine compartment shield (M2.17).
➢ Remove the front wheelhouses (M2.05).
i Remove the front element only on either side of the vehicle.



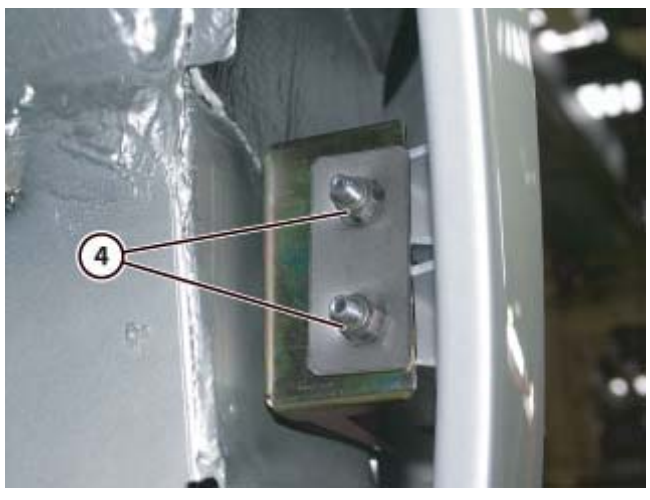
- If fitted, detach the headlight washer pipe **(1)** plugging the pump outlet to prevent fluid from leaking out.



- Unscrew the four upper nuts **(2)** fastening the bumper to the chassis.



- Unscrew the two lower nuts **(3)** fastening the bumper to the chassis.



- Unscrew the nuts **(4)** on the lateral screw fastening the bumper to the bodywork.
- Slowly remove the bumper and, if the vehicle is equipped with front parking sensors, detach the relative connector(Y322).

➢ Remove the bumper completely from the vehicle, leaving the spacers in place if possible, or fastening them to the mounts in to ensure that they are refit in the original position.

Refitting the front bumper

Tightening torque		Nm	Class
Front bumper - chassis (lateral fastener)	Nut	10 Nm	B
Centre fastener between bumper and chassis	Nut	40 Nm	B

If fitting a new bumper, use the original spacers as an initial reference.



- Temporarily fit the bumper on the bodywork, checking that the clearance is identical over the entire bumper and that the outer edge is aligned with that of the bodywork.

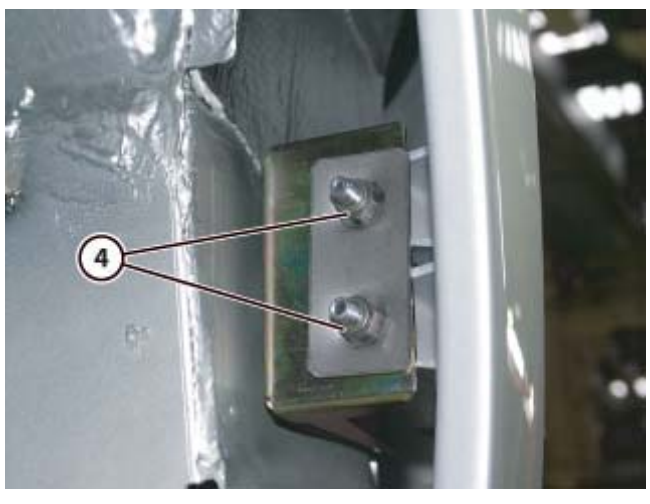


- If necessary, adjust the position of the bumper by reducing or increasing the number of spacers **(1)** in the upper part.



- Adjustments may also be made by changing the number of spacers **(2)** at the lower part of the bumper and adjusting height of the lateral fasteners.

- If the vehicle is equipped with front parking sensors, connect the relative connector(Y322).



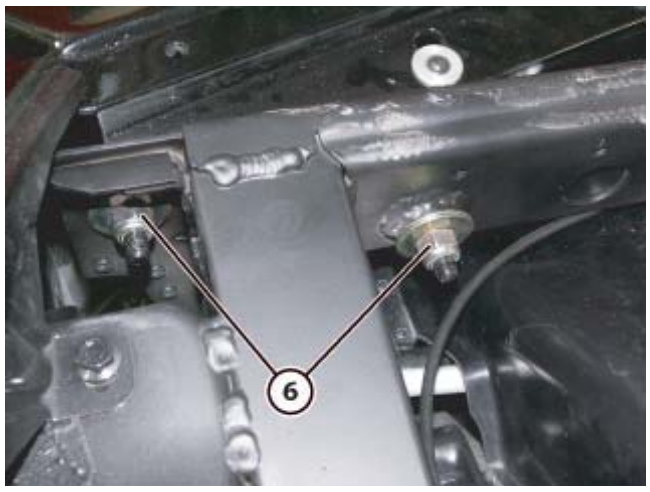
- Tighten the nuts **(4)** on the lateral fasteners fastening the bumper to the bodywork.

Tightening torque	Nm	Class
Nut	10 Nm	B



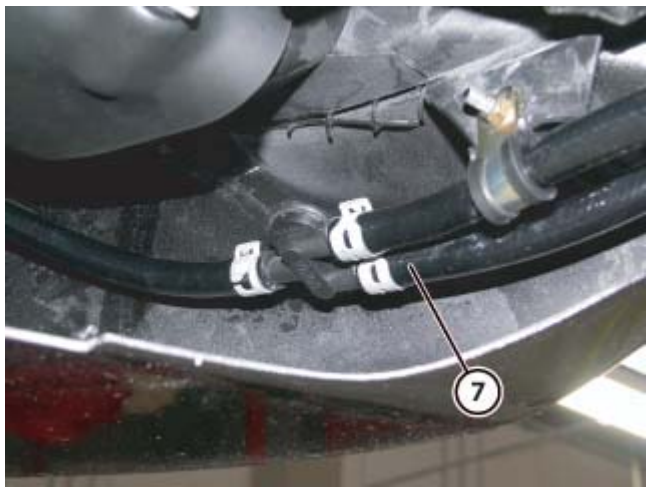
- Tighten the two lower nuts **(5)** fastening the bumper to the chassis.

Tightening torque	Nm	Class
Nut	40 Nm	B



- Tighten the four upper nuts **(6)** fastening the bumper to the chassis.

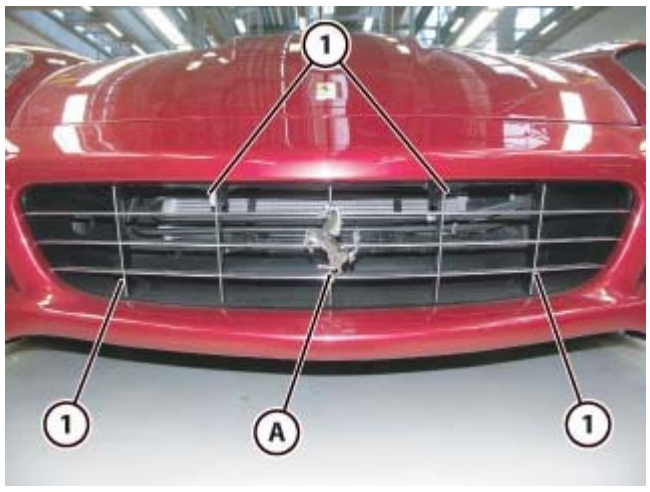
Tightening torque	Nm	Class
Nut	40 Nm	B



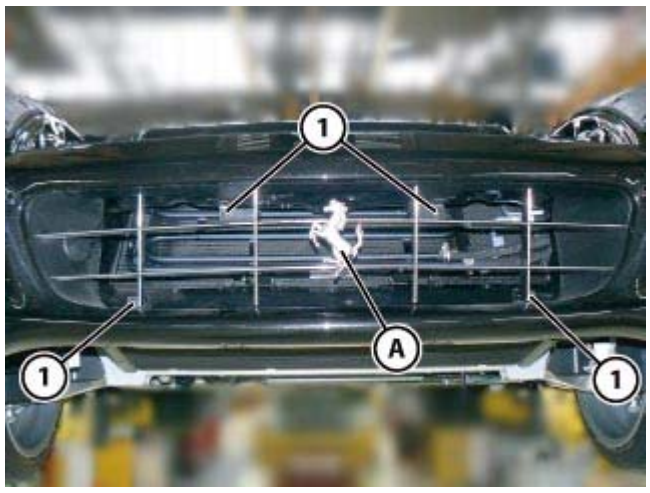
- If applicable, connect the windscreen washer pipe **()**7.

- Refit the front wheelhouses (M2.05).
- Refit the front flat undertray section (M2.12).
- Refit the wheels (F2.08).
- Refit the central engine compartment shield (M2.17).

Replacing the front bumper centre grille



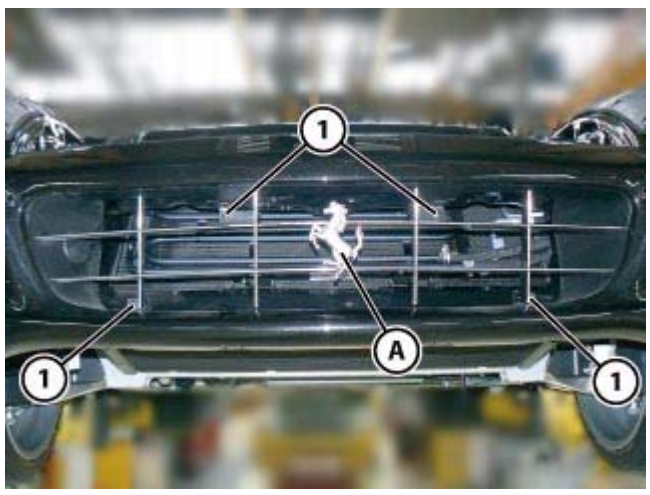
- Remove the centre grille **(A)**, undoing the four screws **(1)** fastening the grille to the bumper.



HGTE variant

- Remove the centre grille **(A)**, undoing the four screws **(1)** fastening the grille to the bumper.

- Replace the grille **(A)** and refit on the bumper, tightening the four fastener screws **(1)**.
- Check that the grille sits flush with the bumper.



HGTE variant

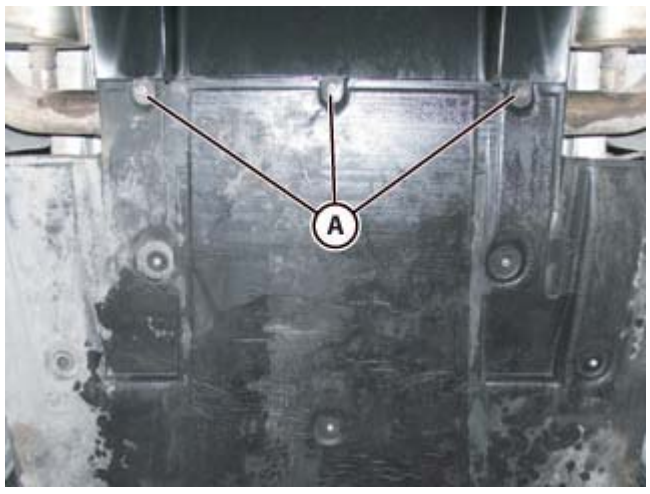
- Replace the grille **(A)** and refit on the bumper, tightening the four fastener screws **(1)**.
- Check that the grille sits flush with the bumper.

M2.04 Rear bumper

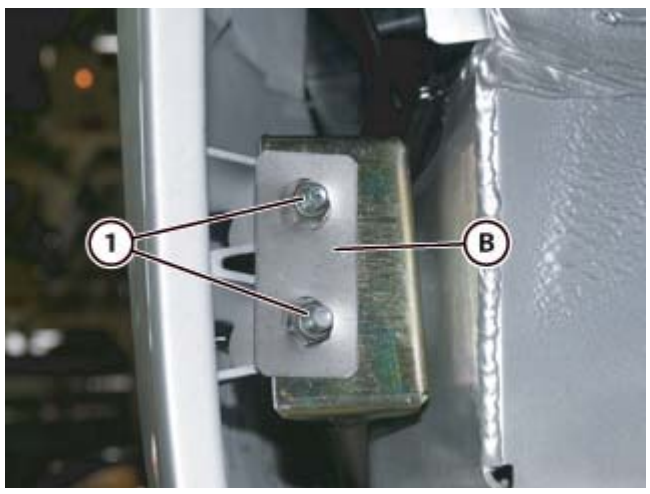
Removing the rear bumper

- Set the battery master switch to OFF (L2.02).
- Remove the luggage compartment floor trim panels (M2.23).
- Remove the rear left hand wheelhouse (M2.05).
  Remove the rear section only.

- Remove the rear right hand wheelhouse (M2.05).
  Remove the rear section only.



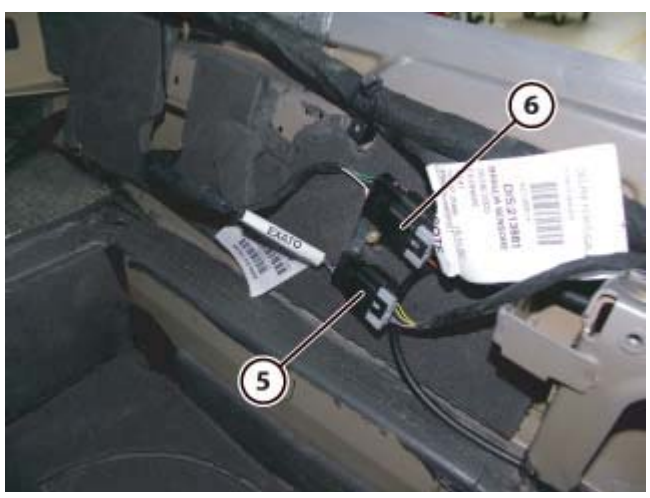
- Undo the three screws **(A)** fastening the bumper to the rear section of the flat undertray.



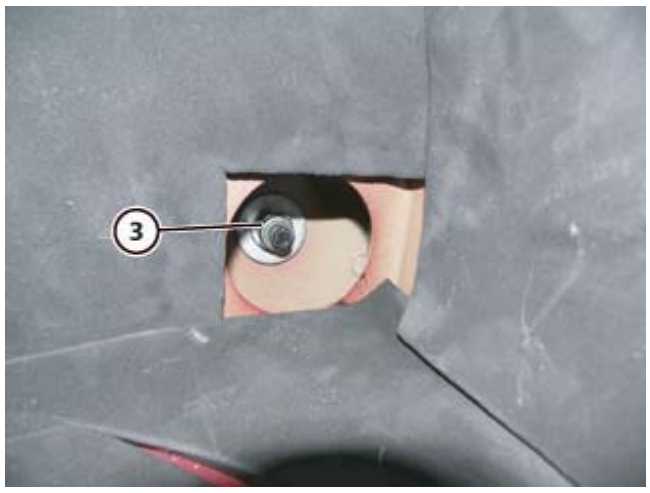
- Undo the four lateral nuts **(1)** fastening the rear bumper to the brackets, retrieving the plates **(B)**.



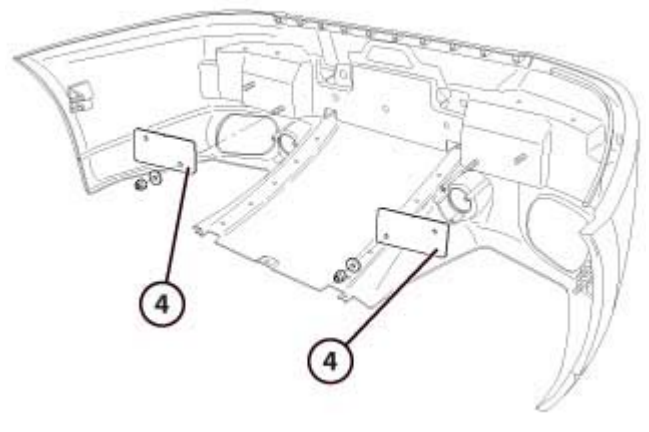
- Working from the wheel bay, tighten the two central nuts **(2)** fastening the rear bumper.



- Working from the luggage compartment, disconnect the rear fog light connectors **(5)** (Y083).
- On cars with rear parking sensors, disconnect the rear parking sensor connectors **(6)** (X364).
- Remove the two connectors from the two mounting lugs.



- Working from inside the luggage compartment, unscrew the two fastener nuts **(3)** in the central section of the rear bumper.



- Remove the rear bumper and retrieve the spacers **(4)**, fixing them to the rear bumper with adhesive tape so that they remain in the same position.

- Set the removed bumper down in a safe place, protecting adequately against damage.

Refitting the rear bumper

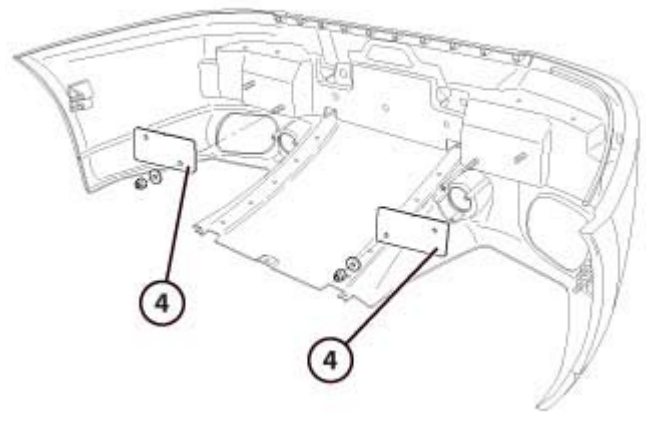
Tightening torque		**Nm**	**Class**
Rear bumper - bodyshell (central fastener)	Nut	40 Nm	B
Rear bumper - side bracket fastening	Nut	10 Nm	B

When fitting a new bumper, always use the original spacers removed during removal.

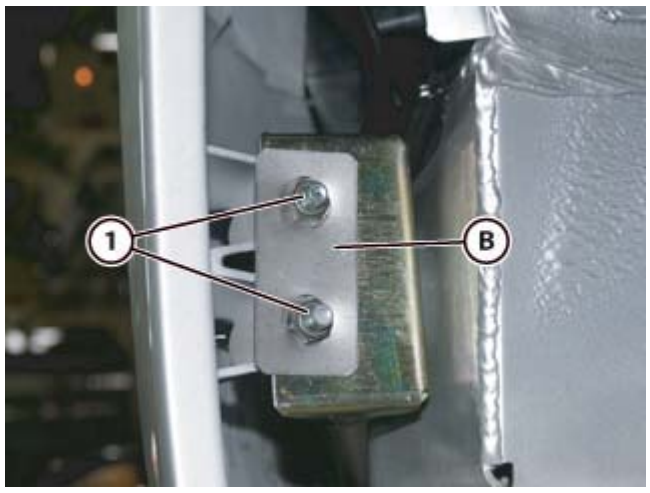
- With the spacers retrieved during removal refitted in their original positions, provisionally fit the bumper onto the bodywork.



- Check that the clearance is the same over the entire bumper and that its outer edge is aligned with that of the bodywork.

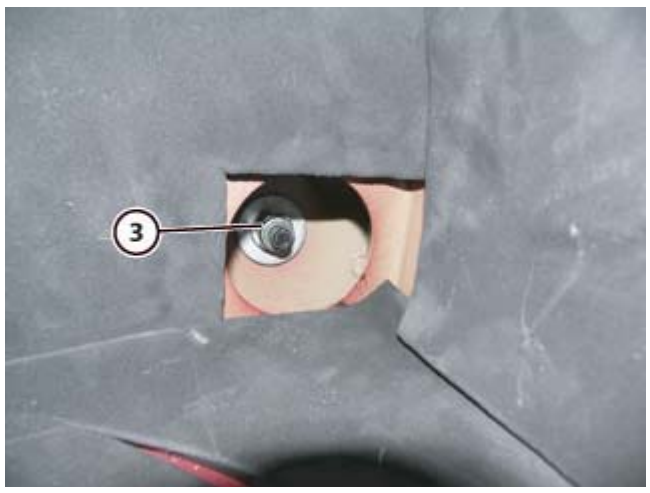


- If necessary, adjust the position of the bumper by reducing or increasing the number of spacers **(4)**.



- To adjust the lateral alignment of the bumper relative to the bodywork, change the position of the plates **(B)** relative to the brackets on the bodywork, fastening provisionally with the nuts **(1)**.

- Once the correct position has been identified, install the seal strip along the entire mating edge with the bodywork.



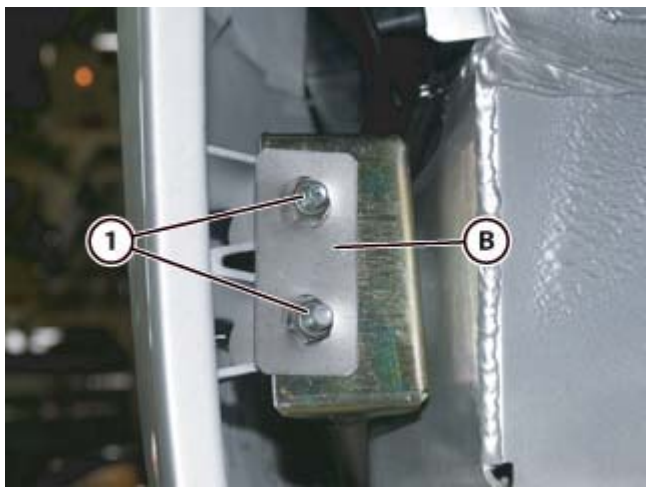
- Working from the luggage compartment, tighten the two bumper fastener nuts **(3)**.

Tightening torque	Nm	Class
Nut	40 Nm	B



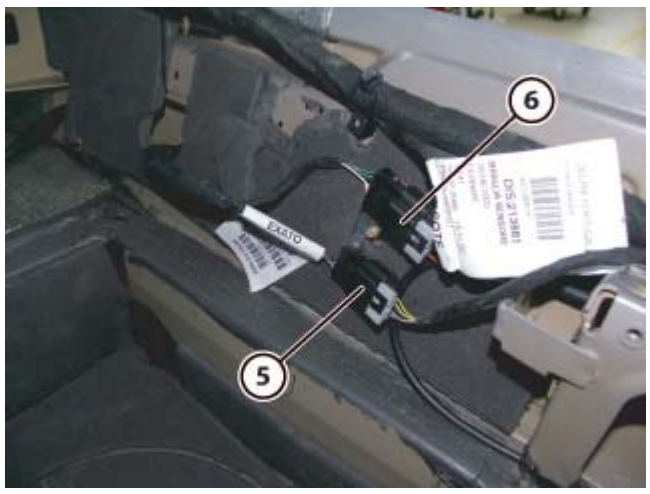
- Working from the wheel bay, tighten the two bumper fastener nuts **(2)**.

Tightening torque	Nm	Class
Nut	40 Nm	B

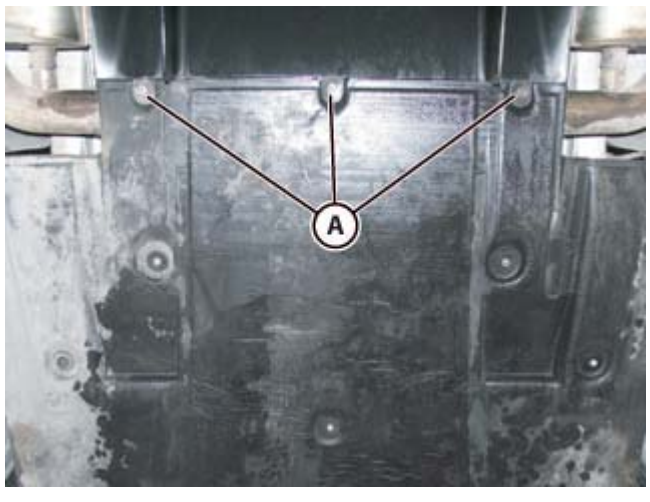


- Fasten the rear bumper on the sides by fitting the plates **(B)** and tightening the four nuts **(1)**.

Tightening torque	Nm	Class
Nut	10 Nm	B



- Connect the rear fog light connectors **(5)** (Y083).
- Where applicable, connect the rear parking sensor connectors **(6)** (X364).
- Fit the two connectors in the two mounting lugs.

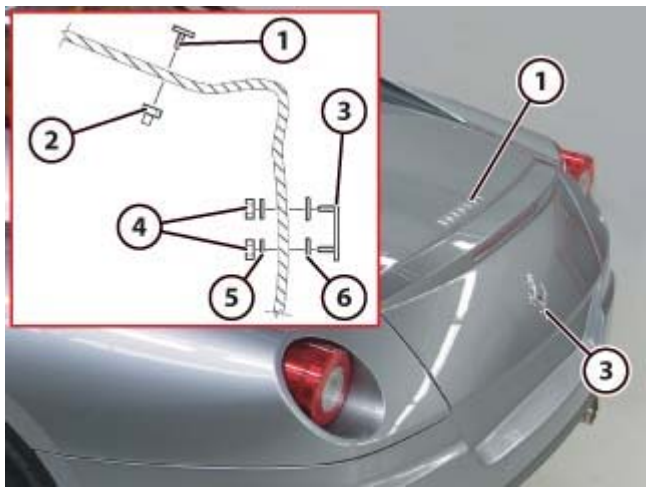


- Hand tighten the three fastener screws **(A)**, at the bottom of the rear bumper, into the rear section of the flat undertray.

➢ Refit the rear left hand wheelhouse (M2.05).
➢ Refit the rear right hand wheelhouse (M2.05).
➢ Refit the luggage compartment floor trim panels (M2.23).
➢ Set the battery master switch to ON (L2.02).

Replacing the badges

➢ Remove the internal trim panel on the luggage compartment lid (M2.23).



- To remove the badge **(1)** remove the three clips **(2)**.
- To remove the badge **(3)** undo the three nuts **(4)**, retrieving the washers **(5)** and rubber spacers **(6)**.
- Replace badges, refitting as originally mounted.

➢ Refit the internal trim panel on the luggage compartment lid (M2.23).

M2.05 Wheelhouse

Removing the front wheelhouses

- Decide on which side of the vehicle you need to work.

➢ Remove the front left hand wheelhouse (☞ M2.05).
➢ Remove the front right hand wheelhouse (☞ M2.05).

Refitting the front wheelhouses

- Choose the side of the vehicle to work on.

➢ Refit the front left hand wheelhouse (☞ M2.05).
➢ Refit the front right hand wheelhouse (☞ M2.05).

Removing the rear wheelhouses

- Decide on which side of the vehicle you need to work.

➢ Remove the rear left hand wheelhouse (☞ M2.05).
➢ Remove the rear right hand wheelhouse (☞ M2.05).

Refitting the rear wheelhouses

- Choose the side of the vehicle to work on.

➢ Refit the rear left hand wheelhouse (☞ M2.05).
➢ Refit the rear right hand wheelhouse (☞ M2.05).

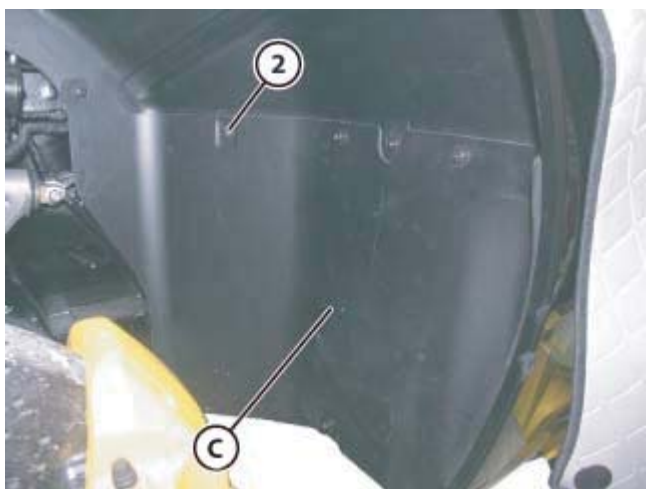
Removing the front left hand wheelhouse

The front left hand wheelhouse consists of three sections: front (A), centre (B) and rear (C).

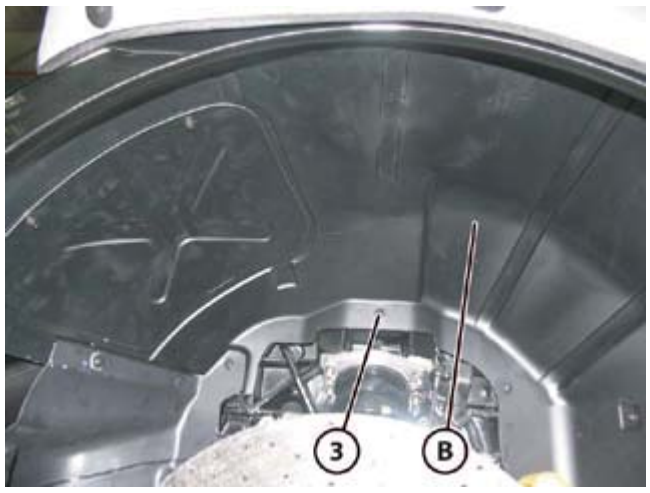
➢ Remove the wheel (☞ F2.08).



- Remove the front section **(A)** of the wheelhouse by undoing the seven screws **(1)**.



- Remove the rear section **(C)** of the wheelhouse, undoing the seven screws **(2)**.



- Remove the centre section **(B)** of the wheelhouse by undoing the five screws **(3)**.

Refitting the front left hand wheelhouse

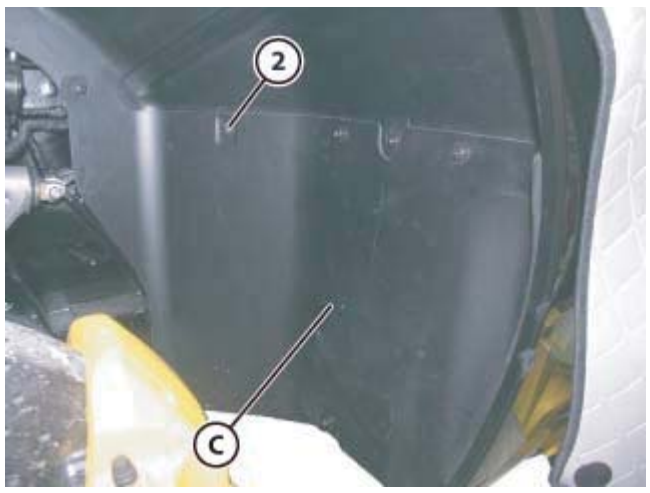
Tightening torque		**Nm**	**Class**
Fastening of central section of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Rear element of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Front element of front wheelhouse - bodyshell	Screw	4.1 Nm	C

All wheelhouse components on the side in contact with the bodywork are fitted with seals. These seals must always be replaced. When refitting the wheelhouse components, check adherence between the sealing gaskets and the bodywork. As the components are exposed to the weather, preferably apply water-repellent protective grease to the fastener screw threads.



- Fit the central section **(B)** of the wheelhouse in the wheel bay and tighten the five screws **(1)**.
- Tighten the five screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	4.1 Nm	C



- Fit the rear section **(C)** of the wheelhouse in the wheel bay and tighten the seven screws **(2)**.
- Tighten the six screws **(2)**.

Tightening torque	**Nm**	**Class**
Screw	4.1 Nm	C



- Fit the front part **(A)** of the wheelhouse in the wheel bay and tighten the seven screws **(3)**.
- Tighten the seven screws **(3)**.

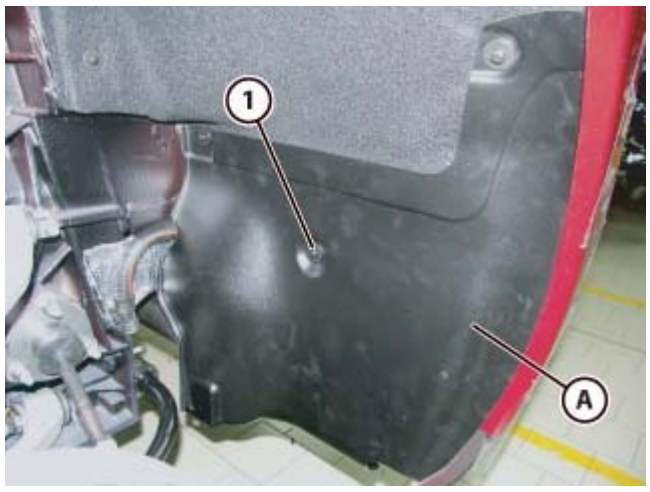
Tightening torque	**Nm**	**Class**
Screw	4.1 Nm	C

➢ Refit the wheel (F2.08).

Removing the rear left hand wheelhouse

The rear left hand wheelhouse consists of two sections: front (B) and rear (A).

➢ Remove the wheel (F2.08).



- Remove the rear section **(A)** of the wheelhouse by undoing the four screws **(1)**.



- Remove the front section **(B)** of the wheelhouse by undoing the eight screws **(2)**.

Refitting the rear left hand wheelhouse

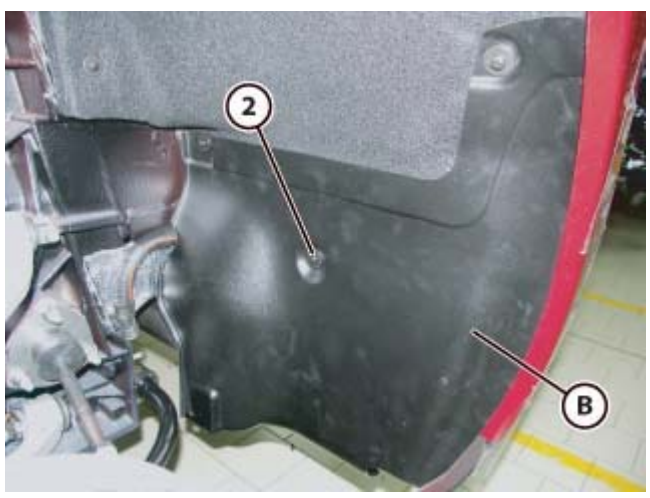
Tightening torque		Nm	Class
Fastening for rear section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C
Fastening for front section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C

All wheelhouse components on the side in contact with the bodywork are fitted with seals. These seals must always be replaced. When refitting the wheelhouse components, check adherence between the sealing gaskets and the bodywork. As the components are exposed to the weather, preferably apply water-repellent protective grease to the fastener screw threads.



- Fit the front section **(A)** of the wheelhouse in the wheel bay and tighten the eight fastener screws **(1)**.
- Tighten the eight screws **(1)**.

Tightening torque	Nm	Class
Screw	5.8 Nm	C



- Fit the rear section **(B)** of the wheelhouse in the wheel bay and tighten the four screws **(2)**.
- Tighten the four screws **(2)**.

Tightening torque	Nm	Class
Screw	5.8 Nm	C

➢ Refit the wheel (F2.08).

Removing the front right hand wheelhouse

The front right hand wheelhouse consists of three sections: front (A), centre (B) and rear (C).

➢ Remove the wheel (F2.08).



- Remove the front section **(A)** of the wheelhouse by undoing the seven screws **(1)**.



- Remove the rear section **(C)** of the wheelhouse, undoing the seven screws **(2)**.

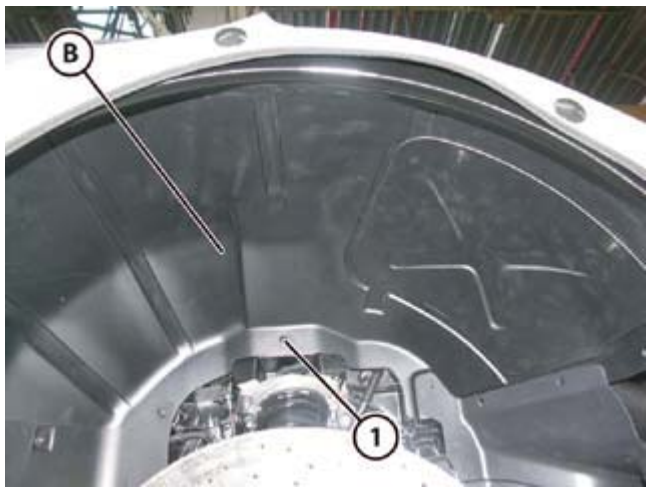


- Remove the centre section **(B)** of the wheelhouse by undoing the six screws **(3)**.

Refitting the front right hand wheelhouse

Tightening torque		**Nm**	**Class**
Fastening of central section of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Rear element of front wheelhouse - bodyshell	Screw	4.1 Nm	C
Front element of front wheelhouse - bodyshell	Screw	4.1 Nm	C

All wheelhouse components on the side in contact with the bodywork are fitted with seals. These seals must always be replaced. When refitting the wheelhouse components, check adherence between the sealing gaskets and the bodywork. As the components are exposed to the weather, preferably apply water-repellent protective grease to the fastener screw threads.



- Fit the central section **(B)** of the wheelhouse in the wheel bay and tighten the six screws **(1)**.
- Tighten the five screws **(1)**.

Tightening torque	Nm	Class
Screw	4.1 Nm	C



- Fit the rear section **(C)** of the wheelhouse in the wheel bay and tighten the seven screws **(2)**.
- Tighten the six screws **(2)**.

Tightening torque	Nm	Class
Screw	4.1 Nm	C



- Fit the front part **(A)** of the wheelhouse in the wheel bay and tighten the seven screws **(3)**.
- Tighten the seven screws **(3)**.

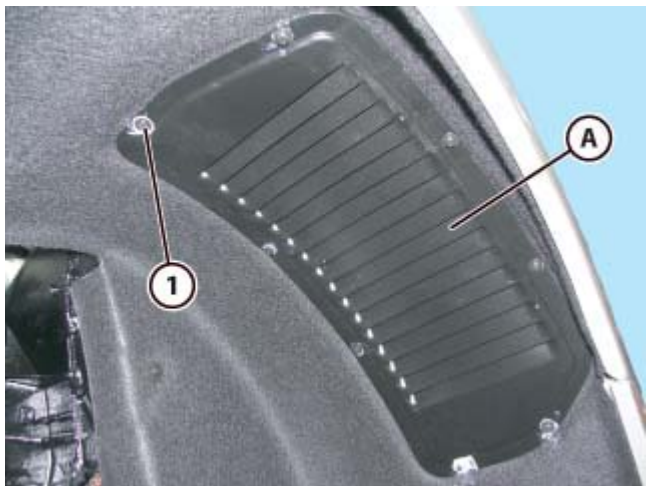
Tightening torque	Nm	Class
Screw	4.1 Nm	C

➢ Refit the wheel (F2.08).

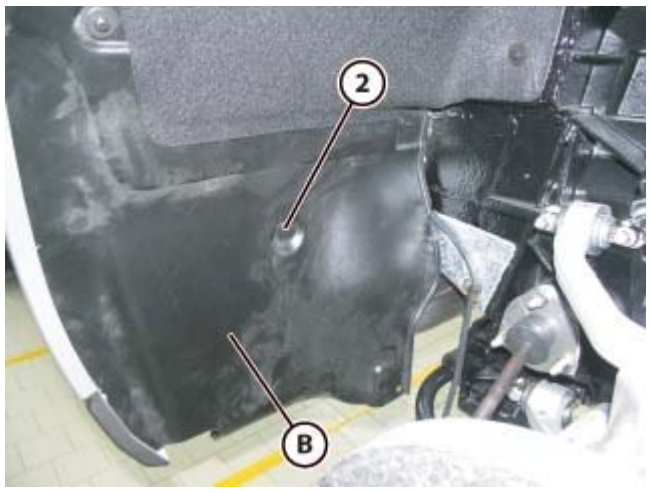
Removing the rear right hand wheelhouse

The rear right hand wheelhouse consists of two sections: front (C) and rear (B).

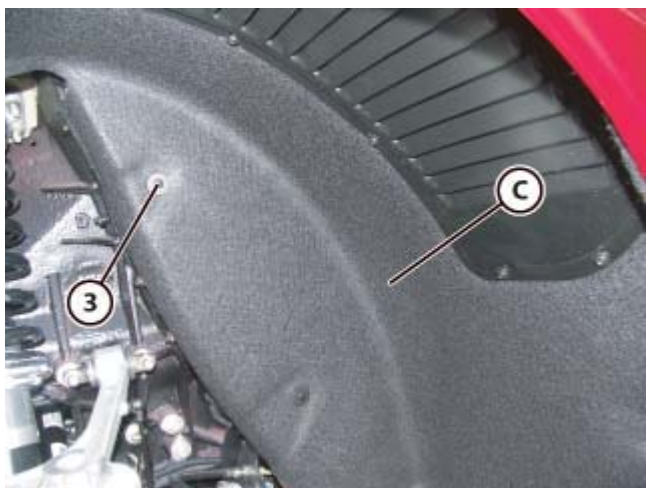
➢ Remove the wheel (F2.08).



- Remove the wheelhouse grille **(A)** by undoing the eight screws **(1)**.



- Remove the rear section **(B)** of the wheelhouse by undoing the four screws **(2)**.

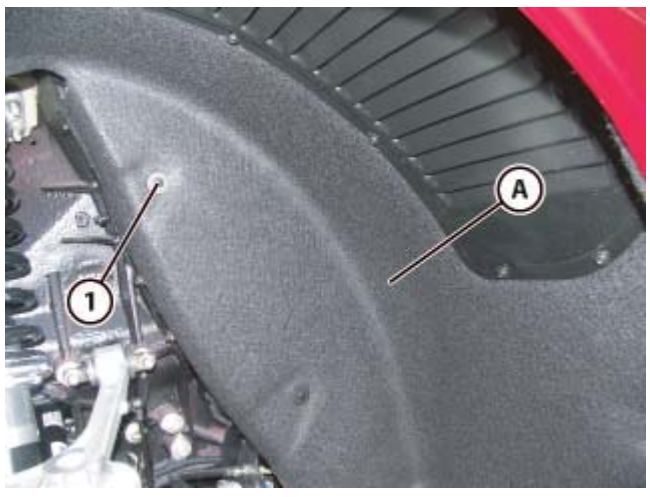


- Remove the front section **(C)** of the wheelhouse by undoing the seven screws **(3)**.

Refitting the right rear wheelhouse

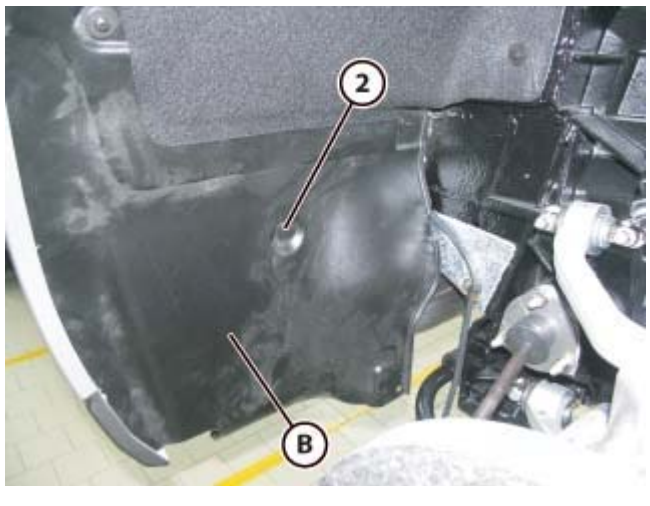
Tightening torque		**Nm**	**Class**
Fastening for front section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C
Fastening for rear section of rear wheelhouse - bodyshell	Screw	5.8 Nm	C
Gearbox oil radiator inspection grille - bodyshell	Screw	5.8 Nm	C

All wheelhouse components on the side in contact with the bodywork are fitted with seals. These seals must always be replaced. When refitting the wheelhouse components, check adherence between the sealing gaskets and the bodywork. As the components are exposed to the weather, preferably apply water-repellent protective grease to the fastener screw threads.



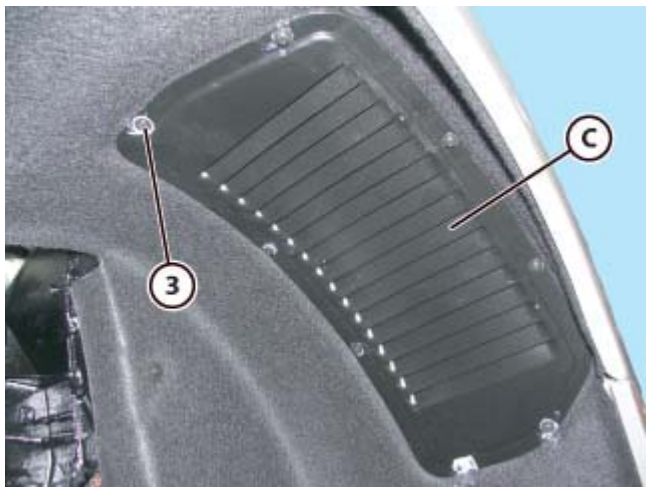
- Fit the front section **(A)** of the wheelhouse in the wheel bay and fasten with the seven screws **(1)**.
- Tighten the six screws **(1)**.

Tightening torque	**Nm**	**Class**
Screw	5.8 Nm	C



- Fit the rear section **(B)** of the wheelhouse in the wheel bay and fasten with the four screws **(2)**.
- Tighten the four screws **(2)**.

Tightening torque	**Nm**	**Class**
Screw	5.8 Nm	C



- Fit the grille **(C)** on the front section and fasten with the eight screws **(3)**.
- Tighten the eight screws **(3)**.



Tightening torque	Nm	Class
Screw	5.8 Nm	C

➢ Refit the wheel (F2.08).

M2.06 Windscreen

Replacing the windscreen

Protect all painted bodywork parts and the cabin to prevent damage when using cutting equipment and when installing the new windscreen.

- Replace the aerodynamic mouldings (M2.06).
  - Remove the front aerodynamic profiles.

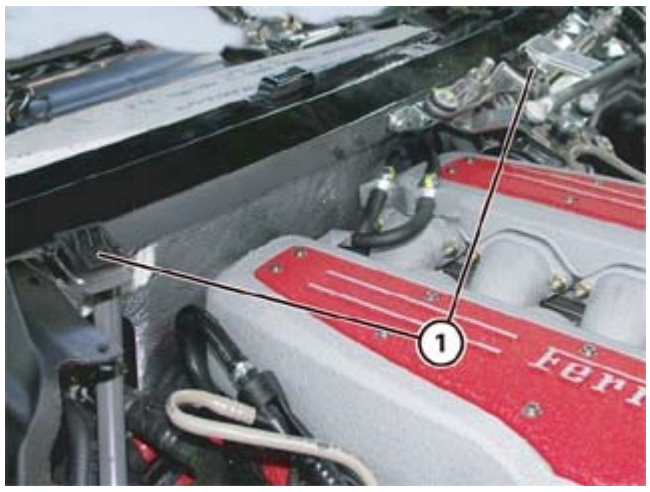
- Remove the engine compartment lid (M2.01).
- Remove the underwindscreen shields (M2.17).
- Remove the passenger compartment and roof trim panels (M2.22).
  - Follow the disassembly procedure up to the removal of the **upper windscreen cross member**.

- Remove the instrument panel (M2.19).
- Remove the internal rear view mirror (H3.08).
- Remove the rain/twilight sensor (L2.15).

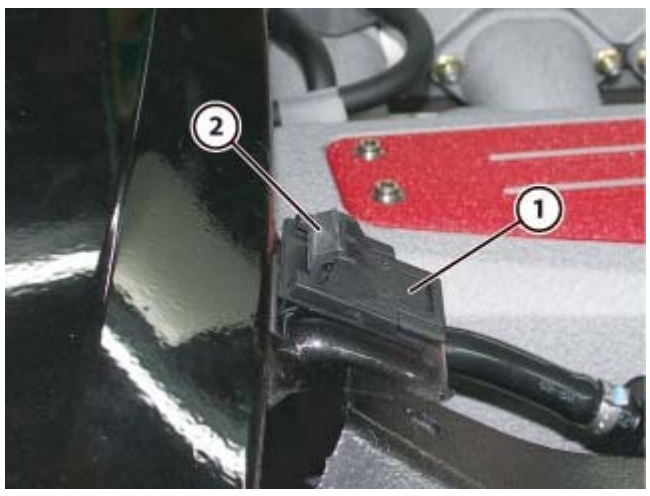
- The tool (BTB Premier Kit) is required to replace the windscreen.
- Using the thermal cutter fitted with a blade **WK4**, cut the sealant around the entire perimeter of the windscreen, working from inside the passenger compartment.
- Use suction cup handles to remove the windscreen from its seat.
- Use the thermal cutter to remove the layer of sealant remaining on the windscreen seat.
- Clean the mating surface of the windscreen thoroughly with compressed air, then degrease with heptane.

Before preparing the glass for installation, check there are no imperfections or scratches on the surface or around the perimeter.

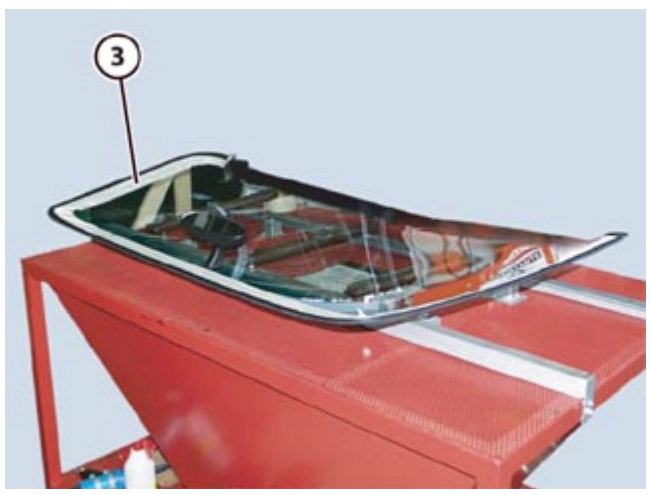
- Rest the glass on a stable surface, making sure that it cannot be scratched or damaged.
- Degrease the perimeter of the window with **BETACLEAN 3300** and the special **Kimberly-Clark WypAll X60 high absorption cloth**, which leaves no residue.



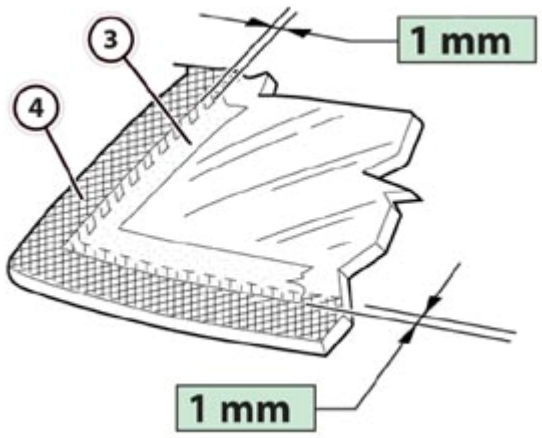
- Apply two locator tabs **(1)** in the positions indicated.



- Fit the shim **(2)** on the two locator tabs **(1)**.

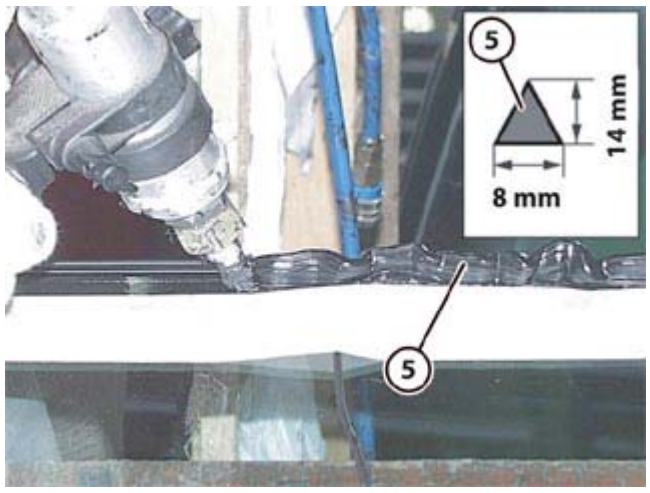


- Protect the surface of the windscreen with a strip of adhesive tape **(3)**.



- Apply a strip of adhesive tape **(3)**, overlapping the solid screen printed area **(4)** by approximately **1 mm**.

- Apply **BETAPRIME 5500 Green cap** around the perimeter of the glass panel and leave to dry for approximately **10 minutes**.



Apply adhesive primer in a uniform, uninterrupted bead.

- Using an extrusion gun fitted with a triangular section nozzle, apply a continuous bead **(5)** of **BETASEAL 1812**, starting from the bottom left hand corner.

The windscreen must be fitted onto the body within 10 minutes of applying the adhesive primer.

- Hold the windscreen parallel to the mating surface and fit onto the bodyshell.
- Press around the entire perimeter of the windscreen.
- Use a spatula to remove and press excess sealant.
- Repeat the same procedure from inside the vehicle, pressing excess sealant into the gap between the glass and the bodywork.
- Remove the adhesive tape taking care not to mark any nearby components or bodyshell.
- Apply a few strips of adhesive fabric tape **SYROM 90**, starting from the windscreen and fixing to the pillar and roof.
- Wait at least **3 hours**, remove the adhesive tape and remove any sealant residue from the perimeter of the windscreen with heptane.



- Working from the engine compartment, lay and flatten out a bead of **biSil** in the gap between the bodyshell and the lower edge of the glass.

- Refit the rain/twilight sensor (L2.15).
- Refit the internal rear view mirror (H3.08).
- Refit the instrument panel (M2.19).
- Refit the passenger compartment and roof trim panels (M2.22).
- Refit the underwindscreen shields (M2.17).
- Refit the engine compartment lid (M2.01).
- Replace the aerodynamic mouldings (M2.06).

Refit the front aerodynamic profiles.

Replacing the aerodynamic mouldings

- REAR AERODYNAMIC MOULDING

- Remove the rear aerodynamic moulding to be replaced using a thermal cutter.

Remove any adhesive residue.



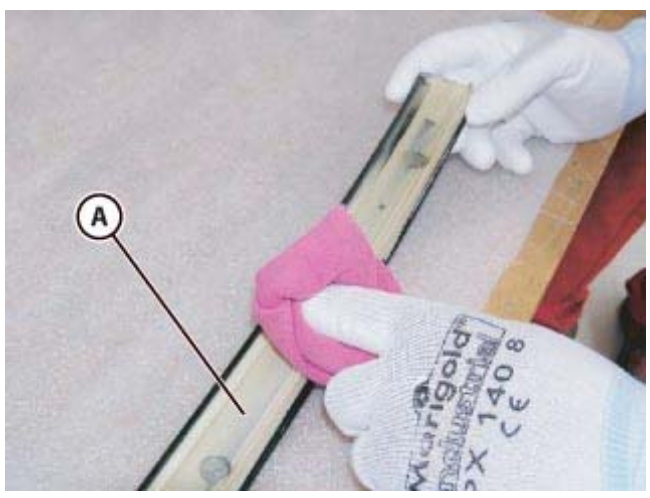
- Spray **BETACLEAN 3300** along the entire top edge of the rear screen.



- Clean and dry the rear screen thoroughly with a clean cloth.

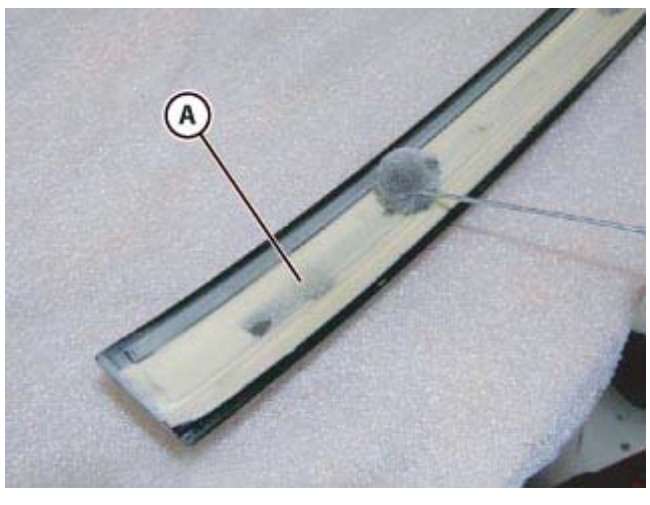


- Apply **BETAPRIME 5500 Green cap** along the top edge of the rear screen using the special pad, covering an area equal in size to the pad itself - approximately **25 mm**.
- Leave the primer to activate for at least **5 minutes**.

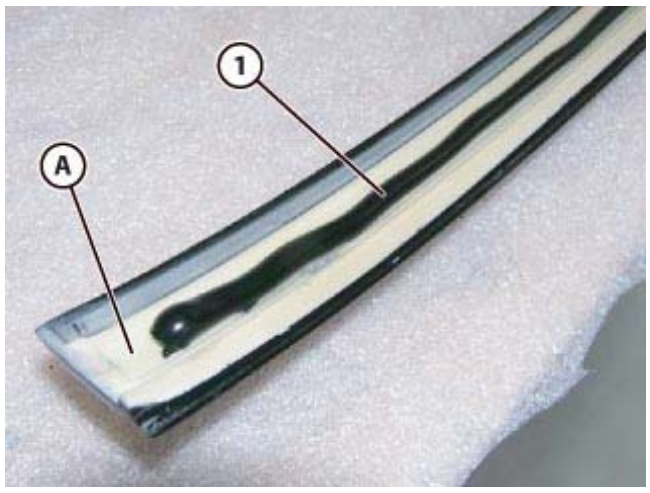


- Clean the entire inner surface of the rear aerodynamic moulding **(A)** thoroughly with a clean cloth soaked in degreaser fluid.

To prevent damage to the rear aerodynamic moulding **(A)**, place the moulding on a safe surface.



- Apply **BETAWIPE 4000 Blue cap** over the entire inner surface of the rear aerodynamic moulding **(A)** with the special pad.
- Leave the primer to activate for at least **1 minute**.



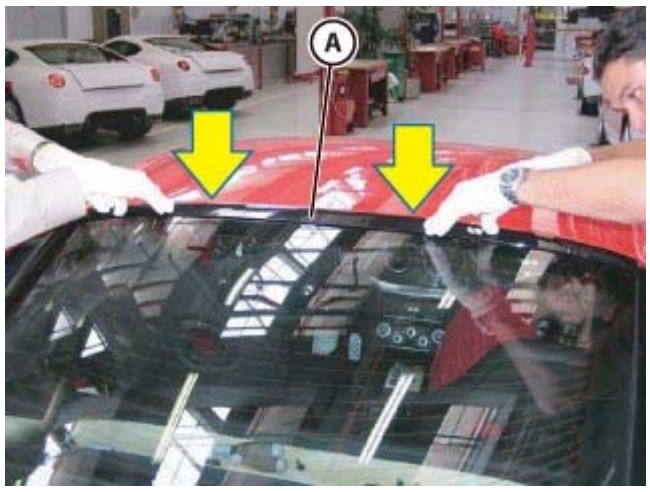
- Apply a bead **(1)** of **BETASEAL 1703** approximately **7-8 mm** thick along the entire inner surface of the rear aerodynamic moulding **(A)**.

The bead **(1)** of adhesive must be uninterrupted.

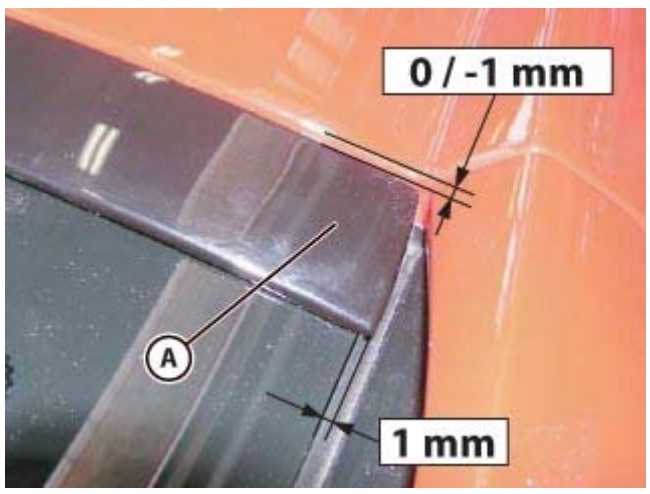


Components must be fitted within 10 minutes of applying the bead of adhesive.

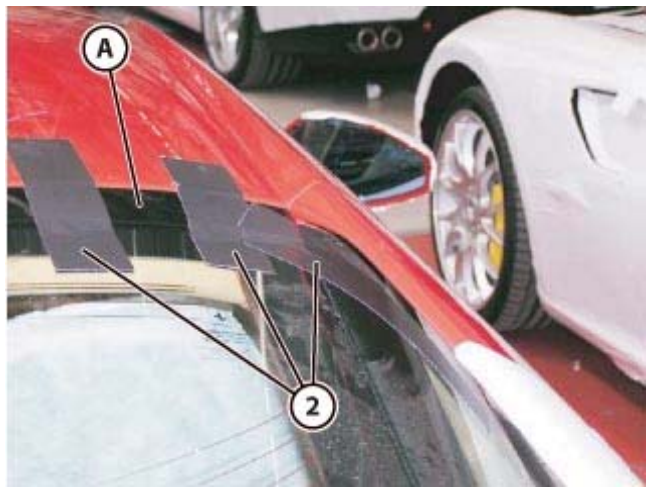
- Fit the rear aerodynamic moulding **(A)** on the car, positioning correctly relative to the roof.



- Press along the full length of the rear aerodynamic moulding **(A)**.



- The rear aerodynamic moulding **(A)** must be against the step in bodyshell at the rear of the roof, it must be flush with or within at least **1 mm** of the roof and must extend by approximately **1 mm** from either side of the rear screen.



- Apply, pressing with some force, eight strips **(2)** of black 3M fabric adhesive tape between the rear aerodynamic moulding **(A)** and the roof, and two strips **(2)** on both outer sides of the rear aerodynamic moulding **(A)**, along the side fins.

- FRONT AERODYNAMIC MOULDINGS

- Remove the front aerodynamic moulding to be replaced using a thermal cutter.

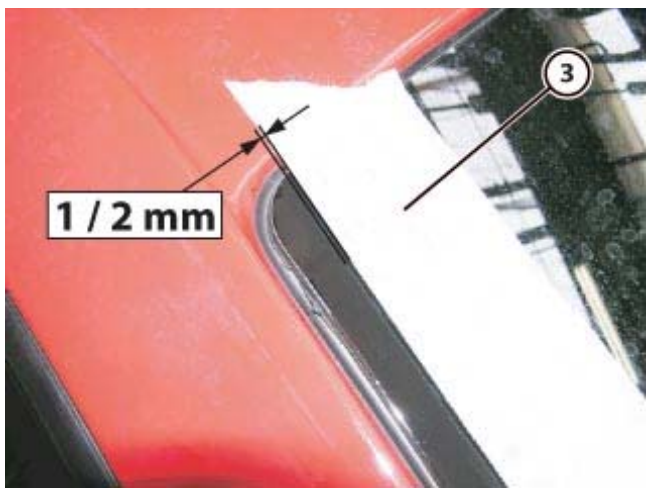
Remove any adhesive residue.



- Spray **BETACLEAN 3300** along the edges of the windscreen and the relative pillars.
- Clean and dry thoroughly with a clean cloth.



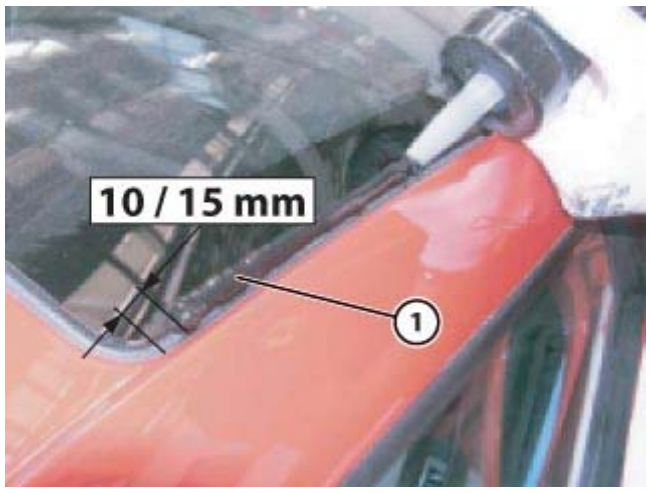
- Correctly fit the right hand front aerodynamic moulding **(B)** on the right hand side of the windscreen, ensuring that it is flush with the relative pillar.
- Apply a strip **(3)** of masking tape onto the windscreen along the full length of the inner edge of the right hand front aerodynamic moulding **(B)**.



- Remove the right hand front aerodynamic moulding **(B)**.

Take particular care not to let the primer come into contact with the pillar and the masking tape; leave a gap of approximately 1-2 mm from the masking tape.

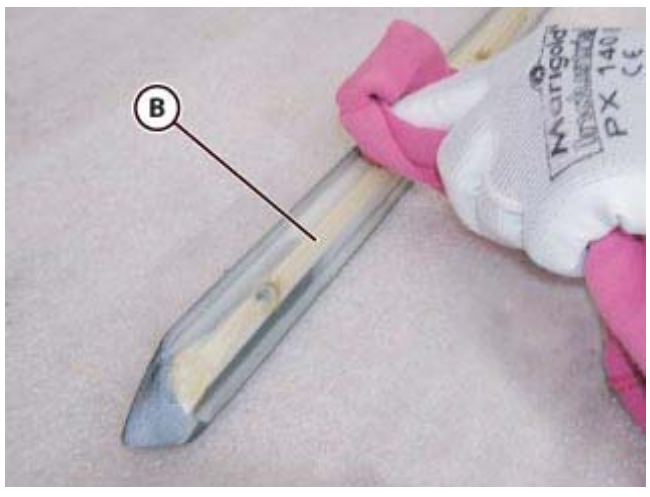
- Apply **BETAPRIME 5500 Green cap** along the entire surface at the side of the windscreen demarcated by the strip **(3)** of masking tape using the special pad.
- Leave the primer to activate for at least **5 minutes**.
- Remove the strip **(3)** of masking tape.



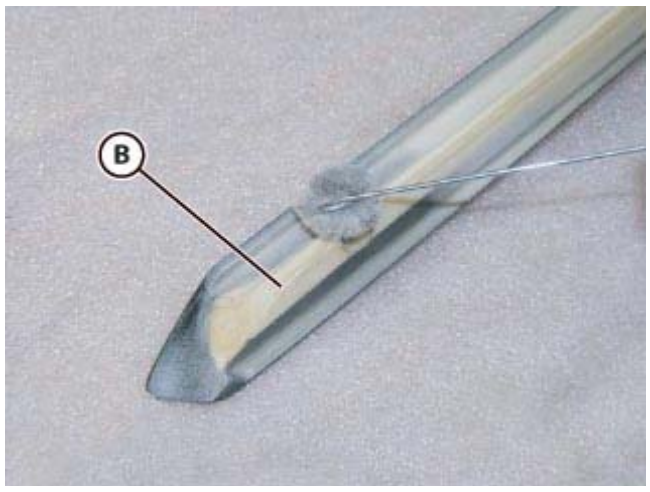
Apply adhesive, leaving approximately 10-15 mm of primer uncovered at the top and bottom edges of the windscreen.

- Apply a bead **(1)** of **BETASEAL 1703** approximately **7-8 mm** thick, over the primer and along the entire right hand side of the windscreen, using the special manual applicator gun.

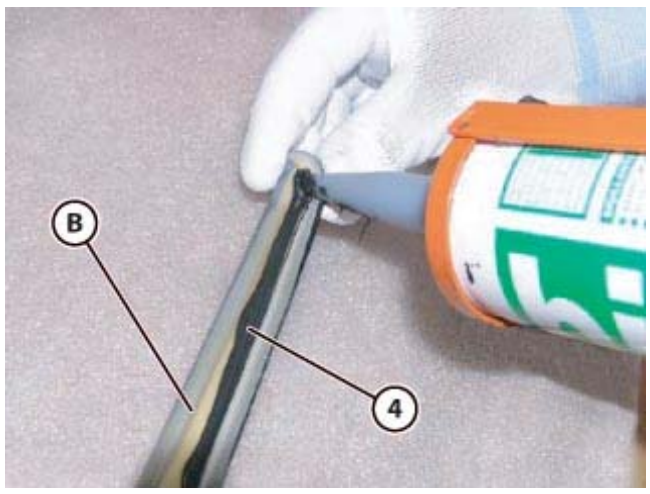
The bead **(1)** of adhesive must be uninterrupted.



- Clean the entire inner surface of the right hand front aerodynamic moulding **(B)** thoroughly with a clean cloth soaked in degreaser fluid.



- Apply **BETAWIPE 4000 Blue cap** over the entire inner surface of the right hand front aerodynamic moulding **(B)** with the special pad.
- Leave the primer to activate for at least **1 minute**.



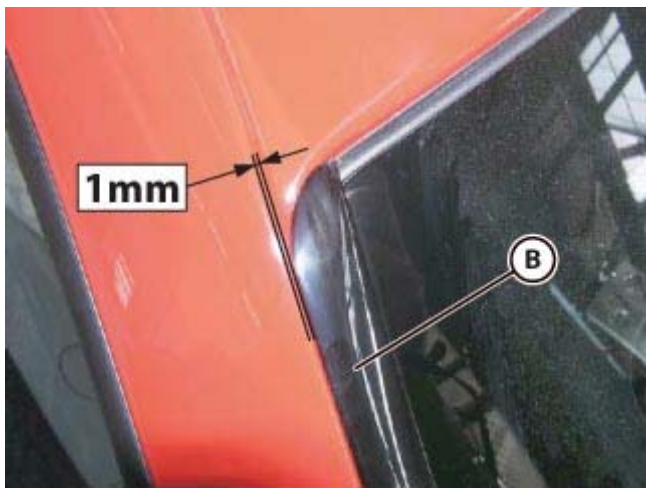
- Apply a bead **(4)** of **biSil** approximately **4-5 mm** thick along the entire inner surface of the right hand front aerodynamic moulding **(B)** that will be in contact with the right hand pillar, using the special manual applicator gun.

The bead **(4)** of adhesive must be uninterrupted.

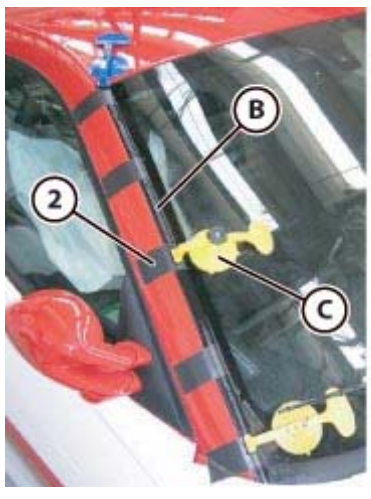


Components must be fitted within 10 minutes of applying the bead of adhesive.

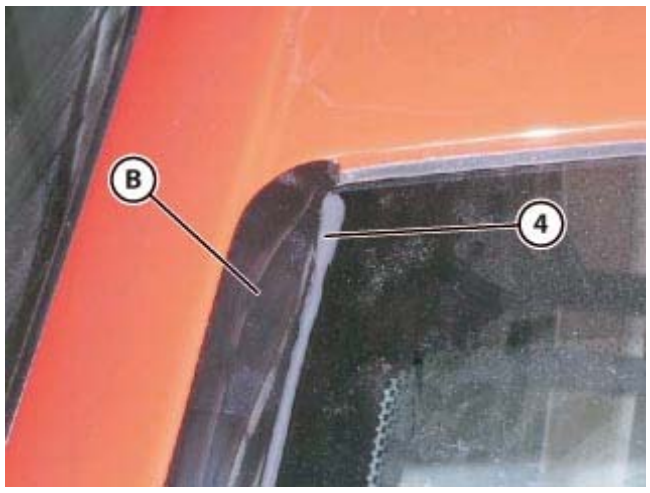
- Fit the right hand front aerodynamic moulding **(B)** onto the right hand side of the windscreen, flush with the relative pillar and aligning the top edge with the radius between the roof and the pillar.
- Press along the full length of the right hand front aerodynamic moulding **(B)** to adhere correctly to the windscreen and to ensure that it is not flush with the pillar.



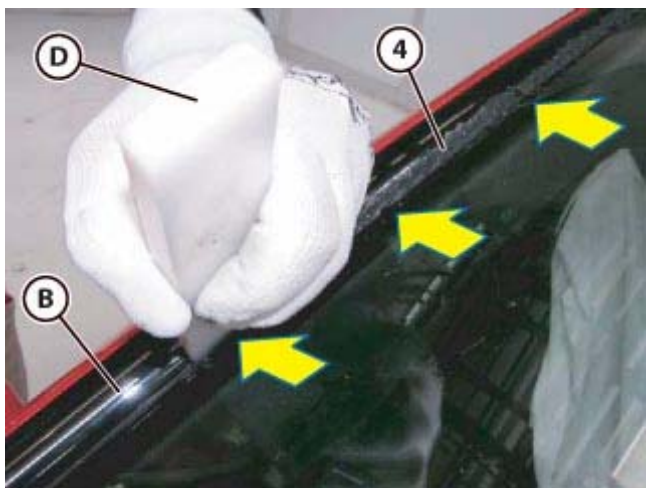
- There must be a slight step of approximately **1 mm** between the moulding and the windscreen.
- Clean and excess adhesive immediately with a suitable spatula and a clean cloth soaked in degreaser fluid.



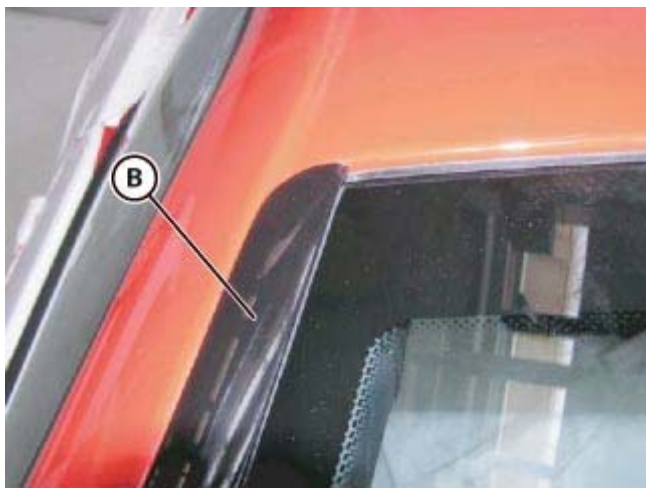
- Apply, pressing with some force, five strips **(2)** of black 3M fabric adhesive tape between the right hand front aerodynamic moulding **(B)** and the right hand pillar.
- Apply the three suction cup compression tools **(C)** onto the three strips **(2)** of black 3M fabric adhesive tape.
- Keep the suction cup compression tools **(C)** in place for at least **2 hours**.



- Apply a bead **(4)** of **biSil** approximately **4-5 mm** thick, between the right hand front aerodynamic moulding **(B)** and the windscreen, using the special manual applicator gun.



- Press to allow the adhesive to penetrate between the right hand front aerodynamic moulding **(B)** and the windscreen, using a suitable spatula **(D)**.
- Remove any excess adhesive with a suitable spatula **(D)**.



- Clean both the right hand front aerodynamic moulding **(B)** and the windscreen thoroughly with a clean, dry cloth.

i There must only be a thin line of adhesive remaining to seal the contact line between the right hand front aerodynamic moulding **(B)** and the windscreen.

- Carry out the same procedure used to replace the right hand front aerodynamic moulding to replace the left hand front aerodynamic moulding.
- Do not use the vehicle for at least **48 hours**.

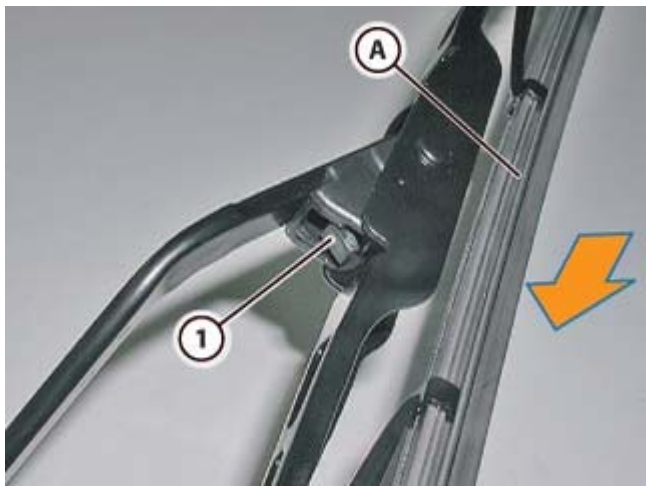
M2.07 Windscreen wiper

Replacing the windscreen wiper blades

➢ Turn on the windscreen wiper and stop (ignition key turned to **0**) when the wiper blades are vertical.

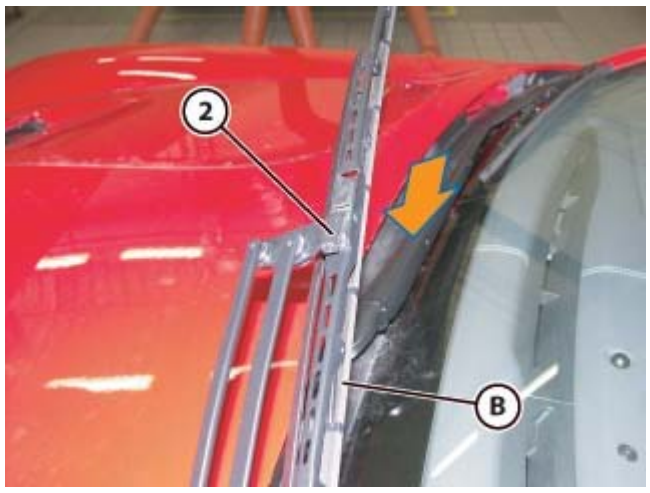
To avoid contact with the edge of the engine compartment lid, lift the windscreen wiper arms only when in the vertical position.

- Lift the two windscreen wiper arms



- To detach the wiper blade **(A)** from the right hand arm, lift the tab **(1)** and then push the wiper blade in the direction indicated by the arrow and slide it off.

Fit the new wiper blade **(B)** inserting (in the direction opposite to the arrow) the end of the arm fully into its retainer and then lock the tab **(1)**.

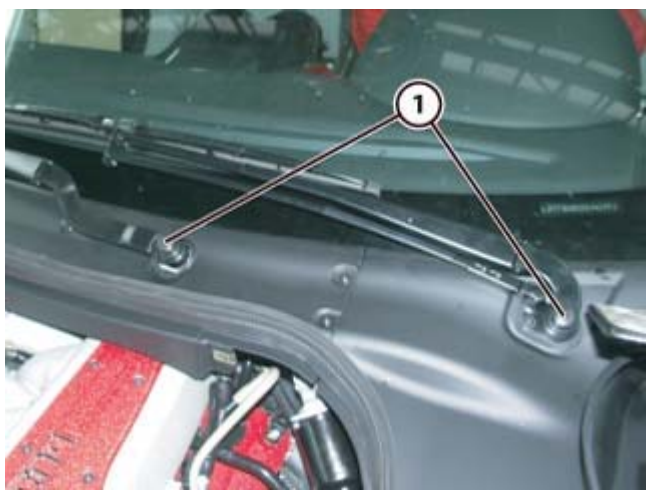


- To detach the wiper blade **(B)** from the left hand arm, lift the tab **(2)** and then push the wiper blade in the direction indicated by the arrow and slide it off.

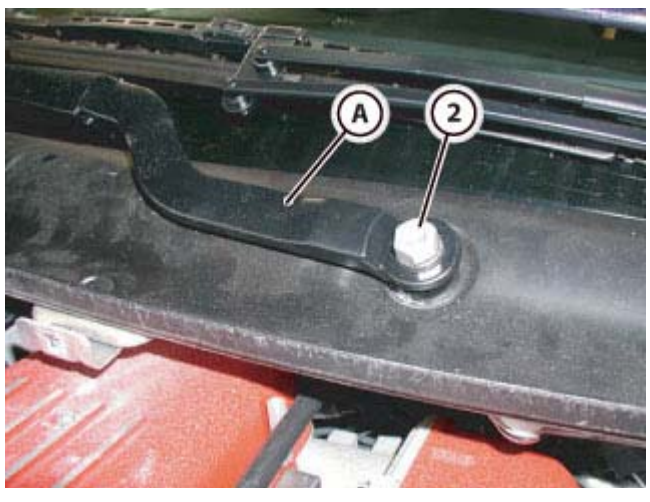
Fit the new wiper blade **(B)** inserting (in the direction opposite to the arrow) the end of the arm fully into its retainer and then lock the tab **(2)**.

Removing the windscreen wiper arms

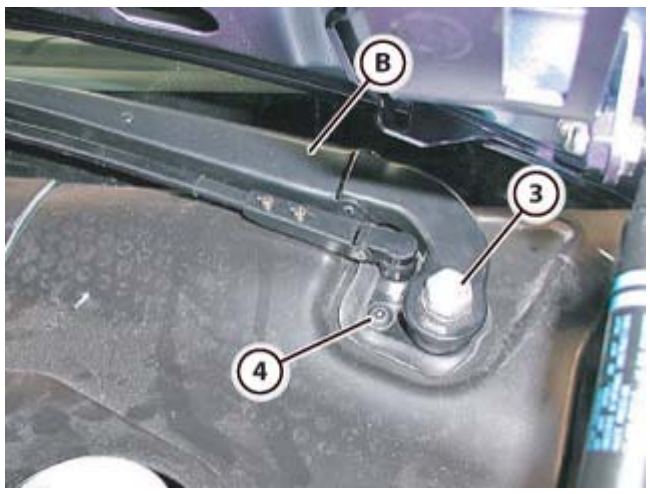
To ensure that the wiper arm is located correctly on the spindle during reassembly, mark the position of the wiper blades on the windscreen.



- Remove the two covering caps **(1)**, prising out with a pointed tool.



- Unscrew the arm fastener nut **(2) (A)** and remove the right arm complete with windscreen wiper blade.



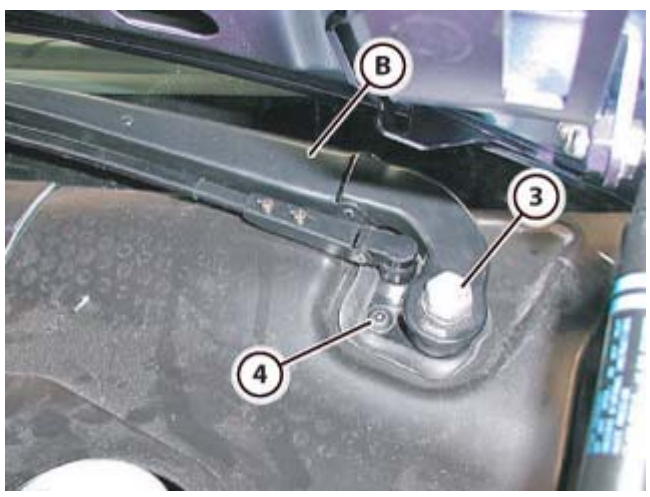
- Unscrew the nut **(3)** and the screw **(4)** fastening the arm **(B)**, then ease off the left hand arm complete with the windscreen wiper blade.

Refitting the windscreen wiper arms

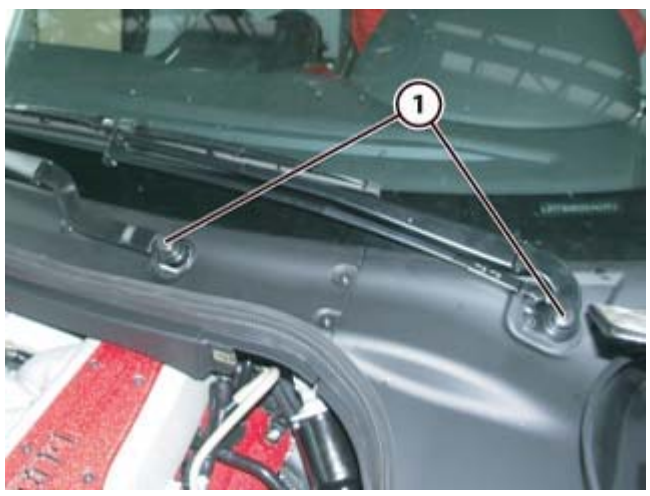
Fit both windscreen wiper arms on the relative spindles, using the marks made during removal as reference.



- Tighten the nut **(2)** on the right hand arm **(A)**.



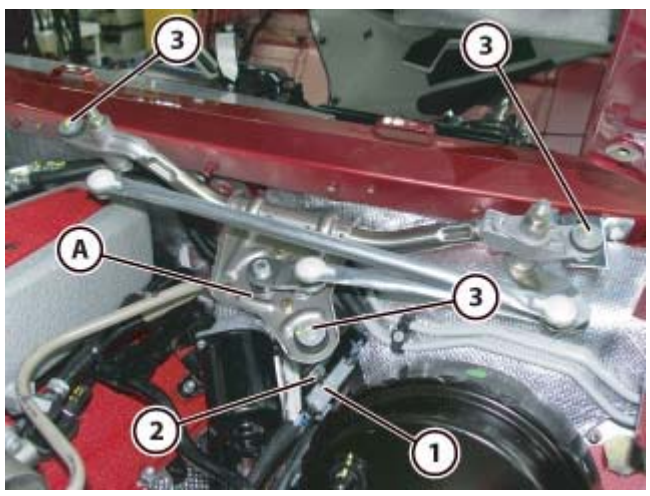
- Tighten the nut **(3)** and the screw **(4)** on the left hand arm **(B)**.



- Refit the cover caps **(1)**.

Removing the windscreen wiper arms

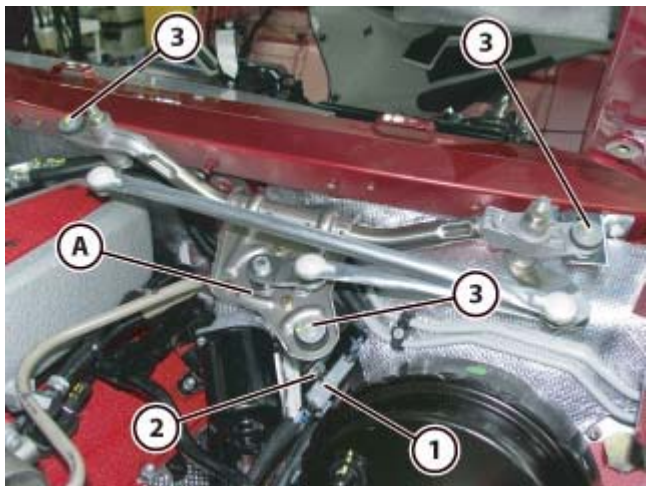
- Set the battery master switch to OFF (L2.02).
- Remove the underwindscreen shields (M2.17).



- Disconnect the connector **(1)** (M012)and undo the screw **(2)** fastening the connector to the bodywork.
- Undo the three screws **(3)** fastening the arms **(A)** and remove from the vehicle.

Refitting the windscreen wiper arms

			
Tightening torque		**Nm**	**Class**
Windscreen wiper arms	Screw	10 Nm	B



- Fit the windscreen wiper arms **(A)** on their mountings on the bodywork.
- Tighten the three screws **(3)**.

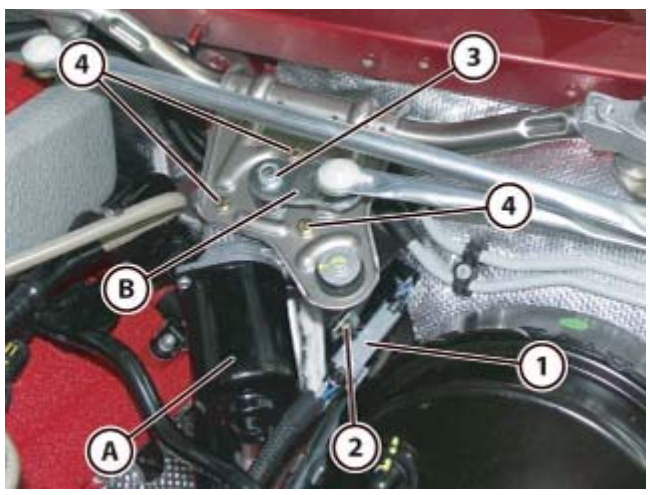
		
Tightening torque	**Nm**	**Class**
Screw	10 Nm	B

- Fit the connector **(1)** (M012) and fasten to the bodywork with the screw **(2)**.

➢ Refit the underwindscreen shields (M2.17).
➢ Set the battery master switch to ON (L2.02).

Replacing the windscreen wiper motor

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the windscreen wiper arms (M2.07).
➢ Remove the underwindscreen shields (M2.17).



- Detach the connector **(1)** (M012)and undo the screw **(2)** that secures the connection to the bodywork.

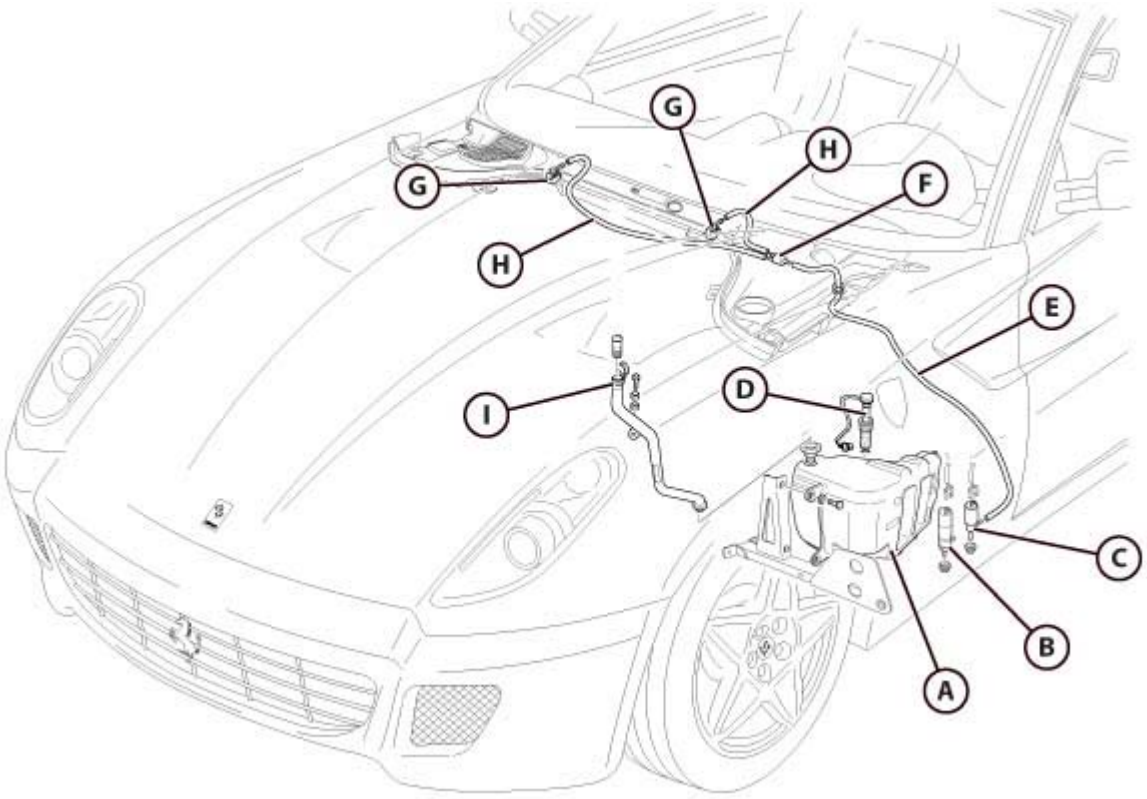
i In order to refit the lever **(B)** in its original position on the starter motor pin, mark the position of the two components with respect to each other.

- Unscrew the nut **(3)** holding the lever **(B)**.
- Undo the three screws **(4)** that secure the motor to the lever.
- Remove the windscreen wiper motor **(A)**.

M2.08 Windscreen washer

Windscreen wiper system layout

The windscreen washer fluid tank **(A)**is located behind the rear section of the front left wheelhouse and is fixed to the chassis.
The pump **(C)** supplying the spray nozzles **(G)** and the fluid level sensor **(D)** are installed on the tank.
A check valve **(F is installed on the pipe (E connecting the pump and spray nozzles. The valve is concealed in the hollow space in the engine compartment and connected to the spray nozzles (G by the pipes (H))))**.
The fluid is topped up via a filler neck **(I)**, which is accessible from the engine compartment.
On versions with headlight washers, a second pump **(B)**, supplying the spray nozzles installed in the bumper, is also connected to the system. This pump is mounted on the washer fluid tank.



A - Tank
B - Headlight washer pump
C - Windscreen washer pump
D - Fluid level sensor
E - Spray nozzle pump connector pipe
F - Check valve
G - Spray nozzles
H - Pipes
I - Filler neck

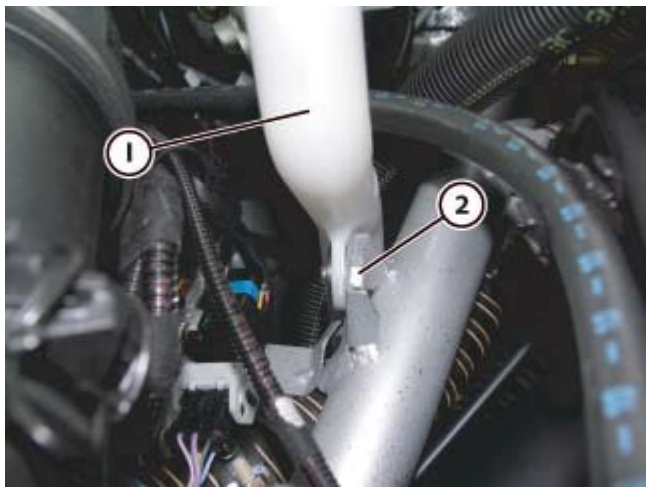
Removing the windscreen washer-headlight washer tank

➢ Remove the engine compartment shields on the fenders (M2.17).
Remove the left hand component.

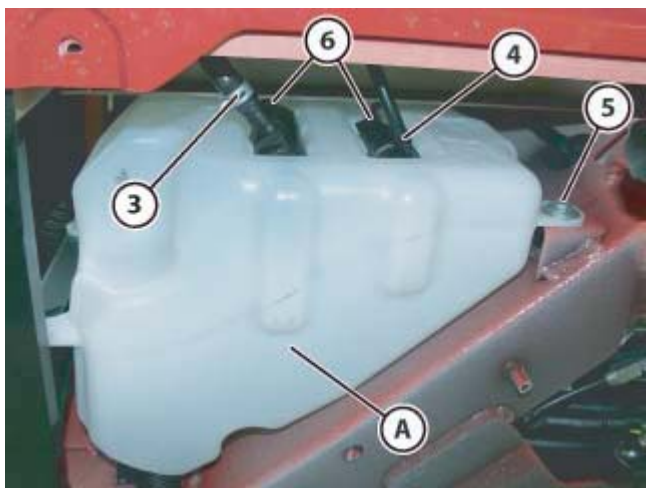
➢ Remove the front section of the underfloor (M2.12).
➢ Remove the front left hand wheelhouse (M2.05).
Remove the rear section only.



- Working from the wheel bay, disconnect the windscreen washer-headlight washer fluid level sensor connector **(1)** (S045).



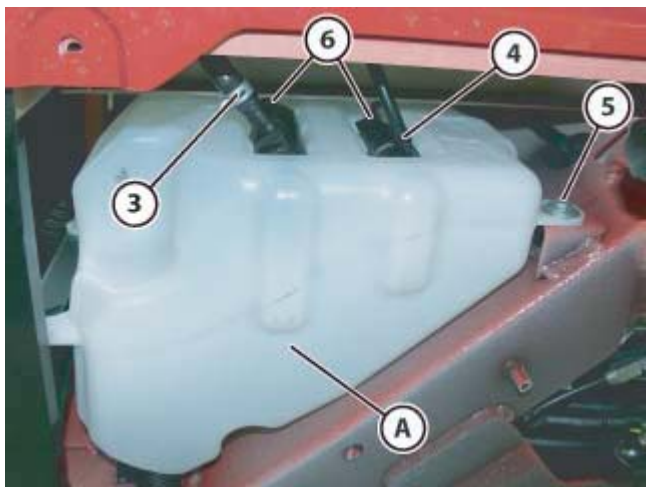
- Working from the engine compartment, undo the screw **(2)** fastening the filler neck **(I)** to the body.



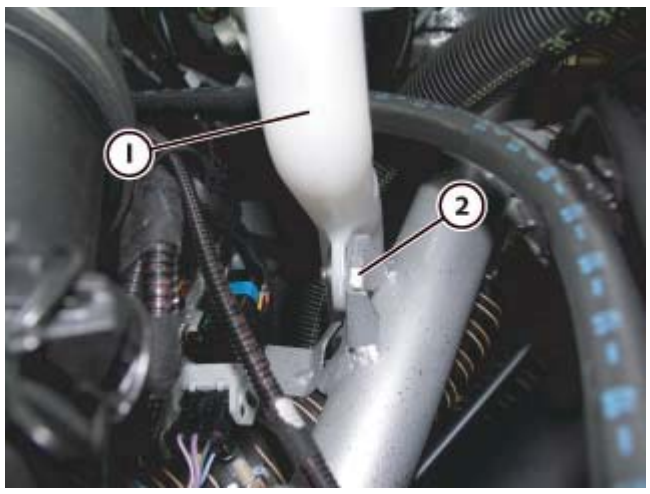
- Detach the two windscreen washer-headlight washer fluid delivery lines **(3)** and **(4)** leading from the pumps
- Undo the four screws **(5)** fastening the tank to the chassis and slower lower the tank **(A)** in order to disconnect the connectors **(6)** (M015) (M016) from the two pumps.

- Remove the windscreen washer-headlight washer fluid tank, complete with filler neck, from the vehicle.

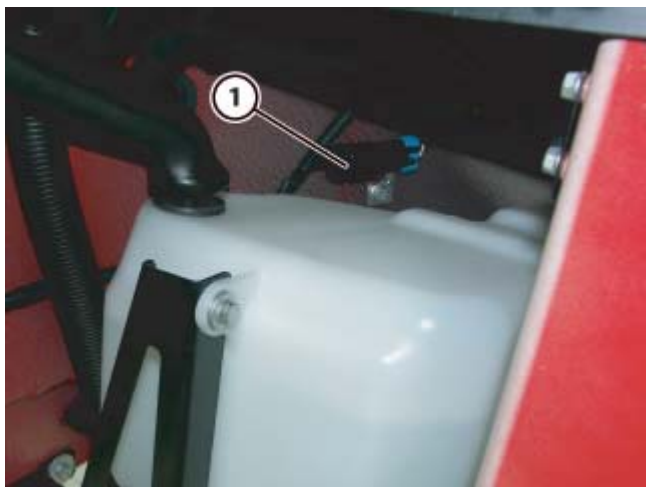
Refitting the windscreen washer-headlight washer tank



- Working from underneath the vehicle, fit the windscreen washer-headlight washer fluid tank **(A)** into its relative seat on the chassis after connecting the connectors **(6)** (M015) (M016) for the two pumps.
- Fit the tank **(A)** and fasten to the vehicle chassis with the four screws **(5)**.
- Connect the delivery pipes **(3)** and **(4)** to the respective pumps.



- Working from the engine compartment, fasten the filler neck **(I)** tightening the screw **(2)**.



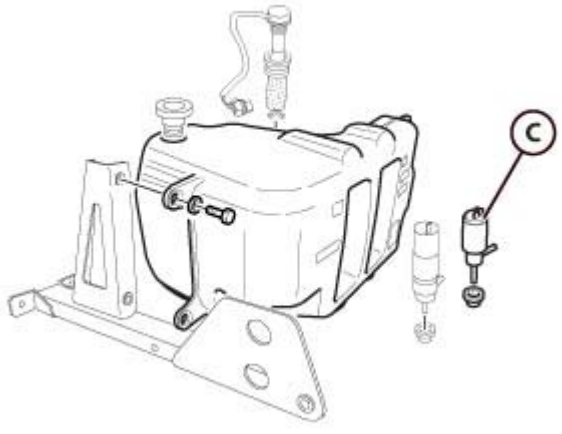
- Working from the wheel bay, connect the windscreen washer-headlight washer fluid level sensor connector **(1)** (S045).

➢ Refit the front left hand wheelhouse (M2.05).

➢ Refit the front flat undertray section (M2.12).
➢ Refit the engine compartment shields on the fenders (M2.17).

Replacing the windscreen washer pump

➢ Remove the windscreen washer-headlight washer tank (M2.08).

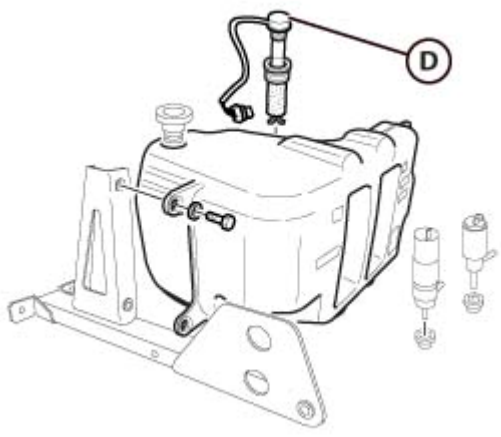


- Remove the windscreen washer pump **(C)** from the tank and replace.
- Refit the pump **(C)** onto the tank as originally mounted.

➢ Refit the windscreen washer-headlight washer tank (M2.08).

Replacing the windscreen washer fluid level sensor

➢ Remove the windscreen washer-headlight washer tank (M2.08).



- Remove the windscreen washer liquid level sensor **(D)** from the tank and replace.
- Refit the sensor **(D)** onto the tank as originally mounted.

➢ Refit the windscreen washer-headlight washer tank (M2.08).

M2.09 Rear screen

Replacing the rear screen

Protect all painted bodywork parts and the cabin to prevent damage when using cutting equipment and when installing the new windscreen.

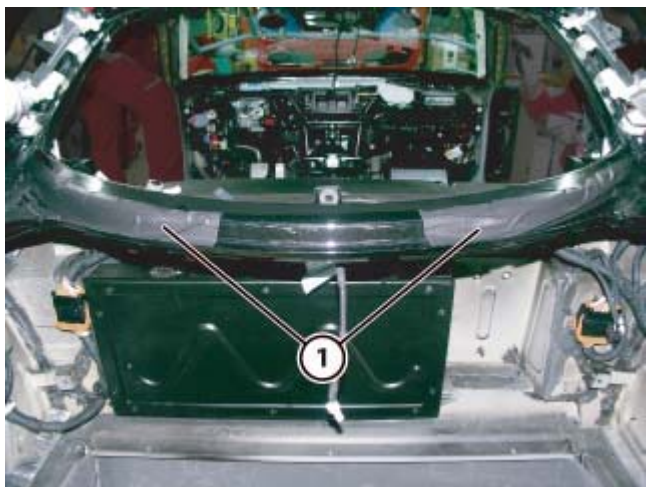
➢ Replace the aerodynamic mouldings (M2.06).
Remove the rear aerodynamic moulding.

➢ Remove the side aerodynamic flaps (M2.02).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Follow the removal procedure up to the removal of the **parcel shelf** trim panel.

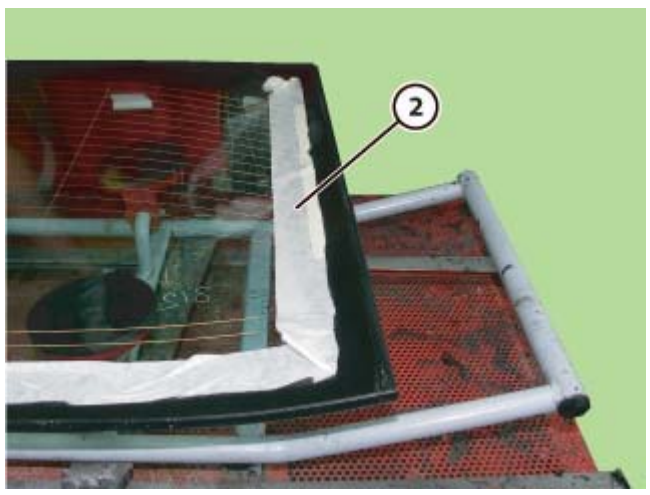
- The tool (BTB Premier Kit) is required to replace the rear screen.
- Disconnect the connectors for the antenna cable and the rear screen defrosting elements.
- Using a thermal cutter fitted with the **WK4** blade and working from inside the passenger compartment, cut the sealant around the entire perimeter of the rear screen, taking particular care not to damage the sealant for the adjacent quarterlights.
- Use suction cup handles to remove the rear screen from its seat.
- Use the thermal cutter to remove the layer of sealant remaining on the rear screen seat.
- Clean the mating surface of the rear screen thoroughly with compressed air, then degrease with heptane.

Before preparing the glass for installation, check there are no imperfections or scratches on the surface or around the perimeter.

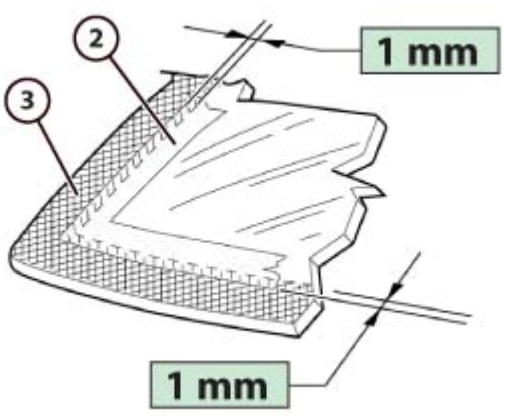
- Rest the glass on a stable surface, making sure that it cannot be scratched or damaged.
- Degrease the perimeter of the window with **BETACLEAN 3300** and the special **Kimberly-Clark WypAll X60 high absorption cloth**, which leaves no residue.



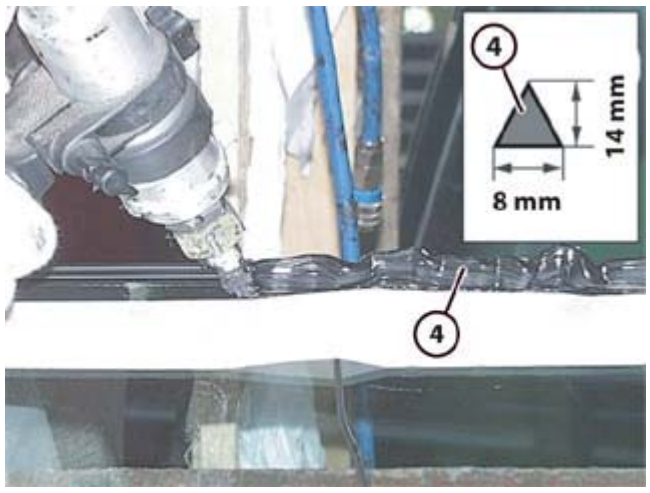
- Apply two strips **(1)** of adhesive tape in the positions indicated on the bodyshell.



- Fit the radio antenna connector cables on the rear screen.
- Protect the surface of the rear screen with a strip of adhesive tape **(2)**.

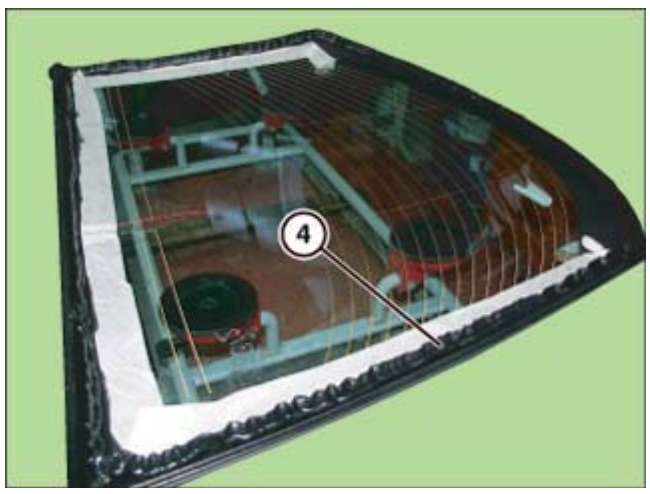


- Apply a strip of adhesive tape **(2)**, overlapping the solid screen printed area **(3 by approximately 1 mm.)**
- Apply **BETAPRIME 5500 Green cap** around the perimeter of the glass panel and leave to dry for approximately **10 minutes**.

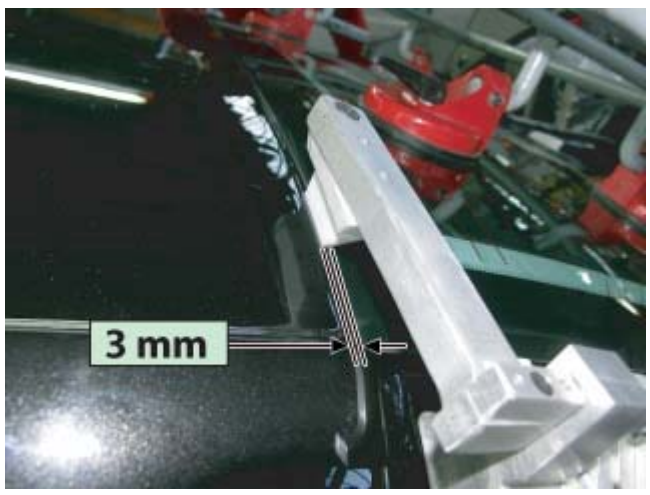


Apply adhesive primer in a uniform, uninterrupted bead.

- Using an extrusion gun fitted with a triangular section nozzle, apply a continuous bead **(4)** of **BETASEAL 1812** around the entire perimeter of the rear screen, starting from the bottom side of the glass and completing by continuing with a **20 - 30 mm** length of bead applied alongside the start of the bead.



- Even out the bead **(4)** with a spatula, making sure that there are no gaps or air bubbles. Fill any gaps or air bubbles with additional material.



The windscreen must be fitted onto the body within 10 minutes of applying the adhesive primer.

- Hold the rear screen parallel to the mating surface and fit onto the bodyshell, ensuring that the gaps on either side are equal and uniform.
- Insert a support tool at the bottom centre of the rear screen to bring the top edge of the screen to **3 mm** from the bodywork.
- Use a spatula to remove and press excess sealant.
- Repeat the same procedure from inside the vehicle, pressing excess sealant into the gap between the glass and the bodywork.
- Remove the adhesive tape applied previously to the rear screen and bodywork, taking care not to mark the bodywork.
- Apply a few strips of adhesive fabric tape **SYROM 90**, starting from the rear screen and fixing to the quarterlights and roof.
- Wait at least **3 hours**, remove the adhesive tape and remove any sealant residue from the perimeter of the rear screen with heptane.
- Reconnect the antenna cable and rear screen defroster element connectors.

➢ Refit the passenger compartment and roof trim panels (M2.22).
➢ Refit the aerodynamic side flaps (M2.02).
➢ Replace the aerodynamic mouldings (M2.06).
Refit the rear aerodynamic moulding.

Replacing the aerodynamic mouldings

- REAR AERODYNAMIC MOULDING

- Remove the rear aerodynamic moulding to be replaced using a thermal cutter.

Remove any adhesive residue.



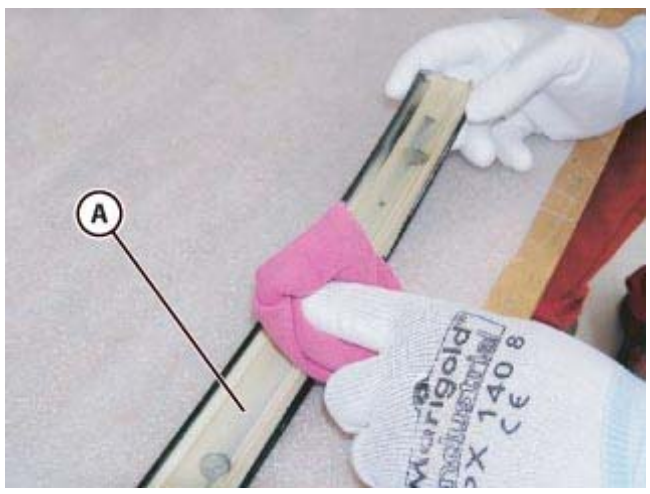
- Spray **BETACLEAN 3300** along the entire top edge of the rear screen.



- Clean and dry the rear screen thoroughly with a clean cloth.

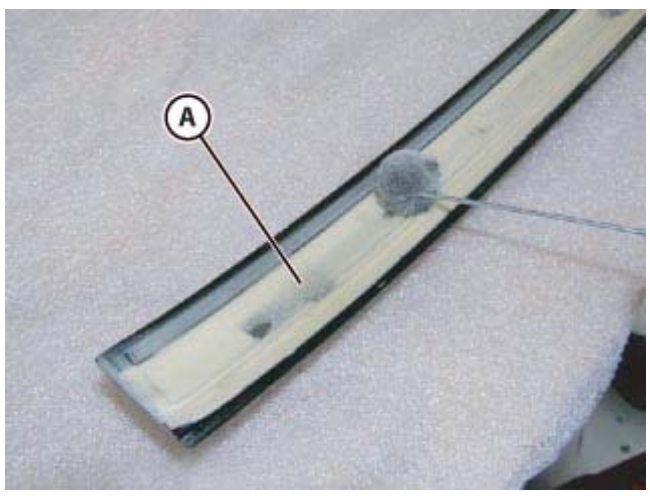


- Apply **BETAPRIME 5500 Green cap** along the top edge of the rear screen using the special pad, covering an area equal in size to the pad itself - approximately **25 mm**.
- Leave the primer to activate for at least **5 minutes**.

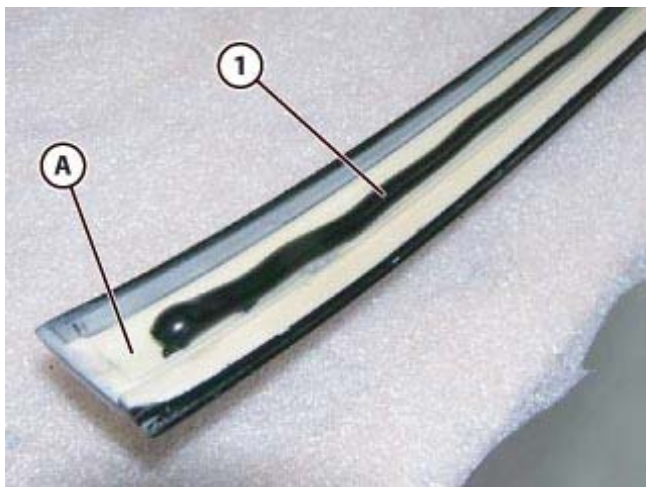


- Clean the entire inner surface of the rear aerodynamic moulding **(A)** thoroughly with a clean cloth soaked in degreaser fluid.

i To prevent damage to the rear aerodynamic moulding **(A)**, place the moulding on a safe surface.



- Apply **BETAWIPE 4000 Blue cap** over the entire inner surface of the rear aerodynamic moulding **(A)** with the special pad.
- Leave the primer to activate for at least **1 minute**.



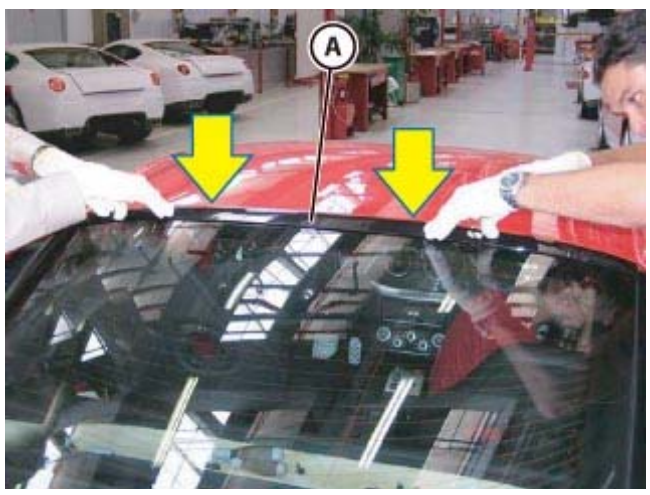
- Apply a bead **(1)** of **BETASEAL 1703** approximately **7-8 mm** thick along the entire inner surface of the rear aerodynamic moulding **(A)**.

i The bead **(1)** of adhesive must be uninterrupted.

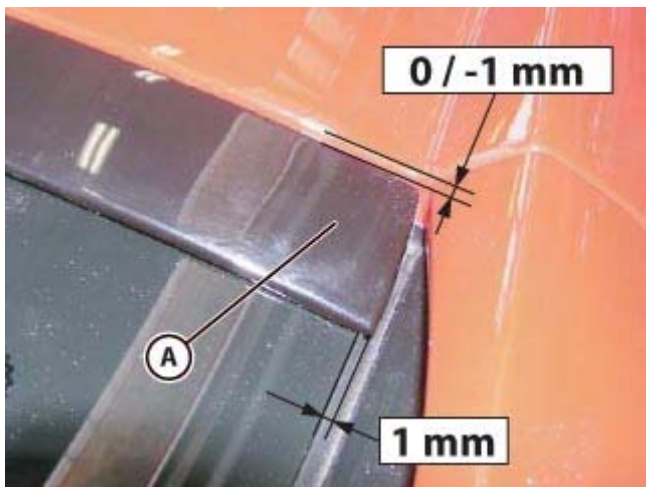


Components must be fitted within 10 minutes of applying the bead of adhesive.

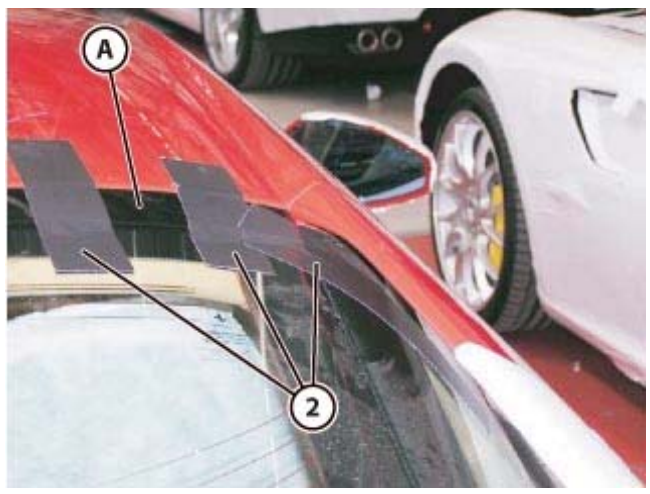
- Fit the rear aerodynamic moulding **(A)** on the car, positioning correctly relative to the roof.



- Press along the full length of the rear aerodynamic moulding **(A)**.



- The rear aerodynamic moulding **(A)** must be against the step in bodyshell at the rear of the roof, it must be flush with or within at least **1 mm** of the roof and must extend by approximately **1 mm** from either side of the rear screen.



- Apply, pressing with some force, eight strips **(2)** of black 3M fabric adhesive tape between the rear aerodynamic moulding **(A)** and the roof, and two strips **(2)** on both outer sides of the rear aerodynamic moulding **(A)**, along the side fins.

- FRONT AERODYNAMIC MOULDINGS

- Remove the front aerodynamic moulding to be replaced using a thermal cutter.

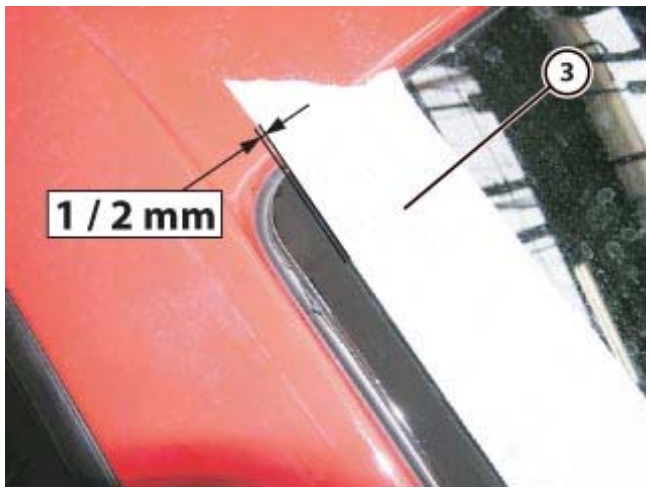
Remove any adhesive residue.



- Spray **BETACLEAN 3300** along the edges of the windscreen and the relative pillars.
- Clean and dry thoroughly with a clean cloth.



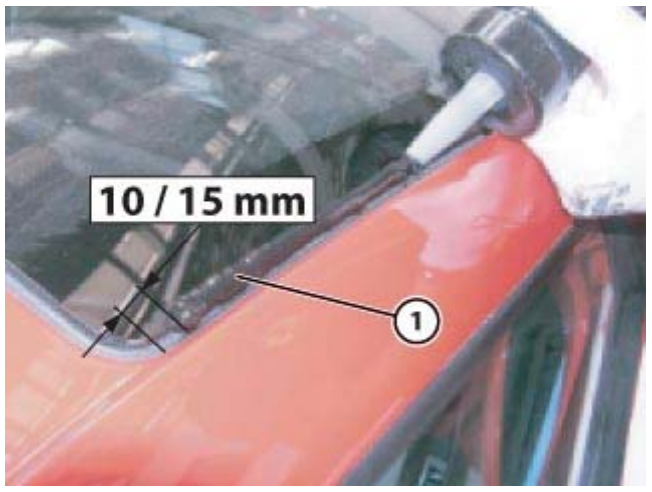
- Correctly fit the right hand front aerodynamic moulding **(B)** on the right hand side of the windscreen, ensuring that it is flush with the relative pillar.
- Apply a strip **(3)** of masking tape onto the windscreen along the full length of the inner edge of the right hand front aerodynamic moulding **(B)**.



- Remove the right hand front aerodynamic moulding **(B)**.

Take particular care not to let the primer come into contact with the pillar and the masking tape; leave a gap of approximately 1-2 mm from the masking tape.

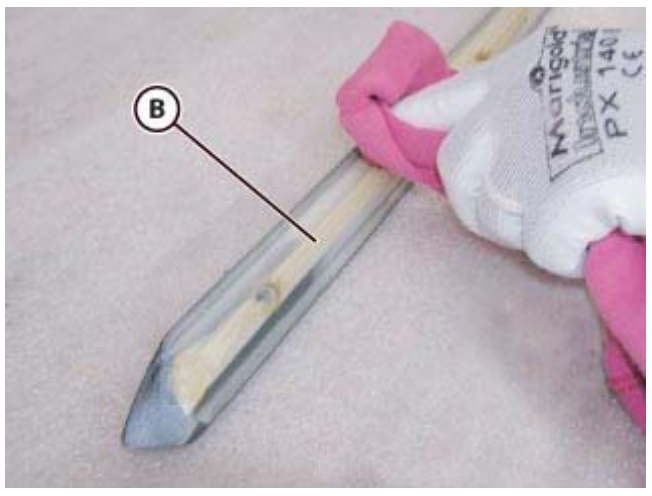
- Apply **BETAPRIME 5500 Green cap** along the entire surface at the side of the windscreen demarcated by the strip **(3)** of masking tape using the special pad.
- Leave the primer to activate for at least **5 minutes**.
- Remove the strip **(3)** of masking tape.



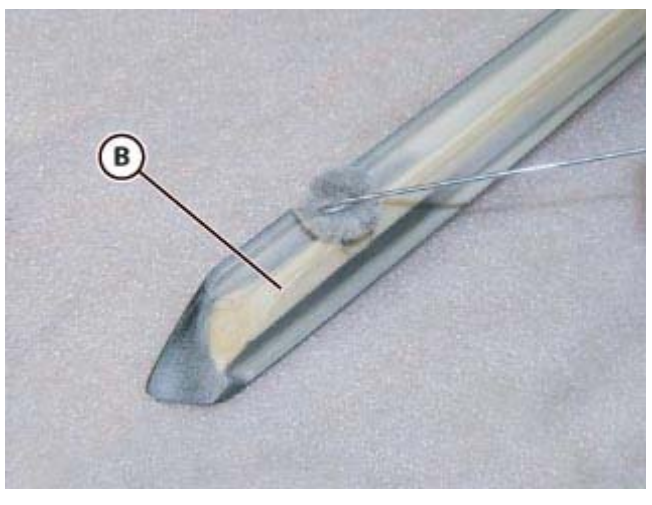
Apply adhesive, leaving approximately 10-15 mm of primer uncovered at the top and bottom edges of the windscreen.

- Apply a bead **(1)** of **BETASEAL 1703** approximately **7-8 mm** thick, over the primer and along the entire right hand side of the windscreen, using the special manual applicator gun.

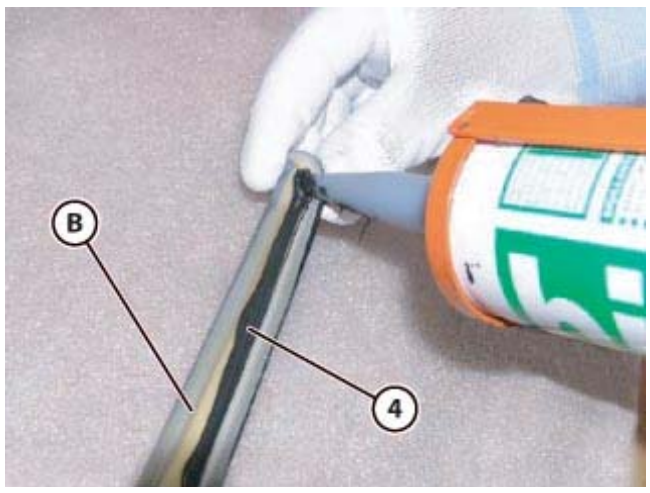
The bead **(1)** of adhesive must be uninterrupted.



- Clean the entire inner surface of the right hand front aerodynamic moulding **(B)** thoroughly with a clean cloth soaked in degreaser fluid.



- Apply **BETAWIPE 4000 Blue cap** over the entire inner surface of the right hand front aerodynamic moulding **(B)** with the special pad.
- Leave the primer to activate for at least **1 minute**.



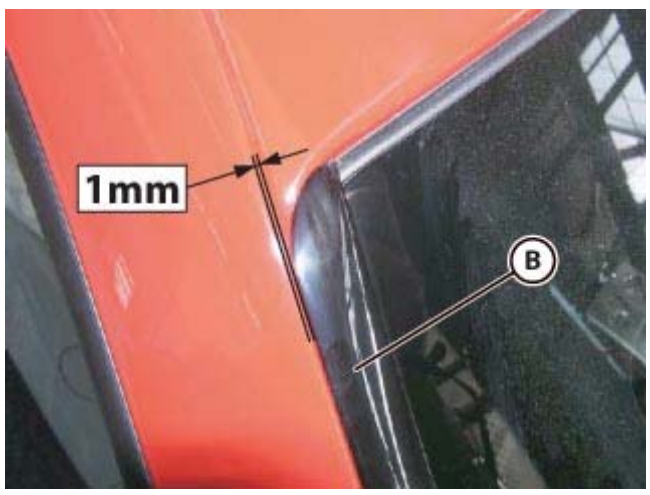
- Apply a bead **(4)** of **biSil** approximately **4-5 mm** thick along the entire inner surface of the right hand front aerodynamic moulding **(B)** that will be in contact with the right hand pillar, using the special manual applicator gun.

The bead **(4)** of adhesive must be uninterrupted.

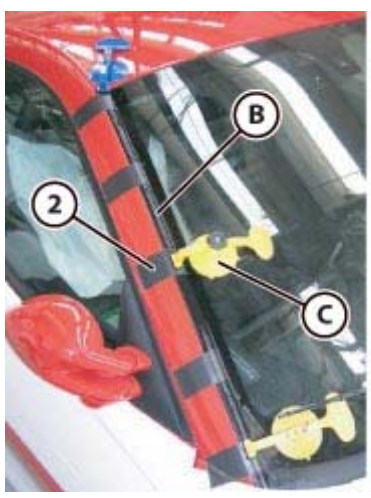


Components must be fitted within 10 minutes of applying the bead of adhesive.

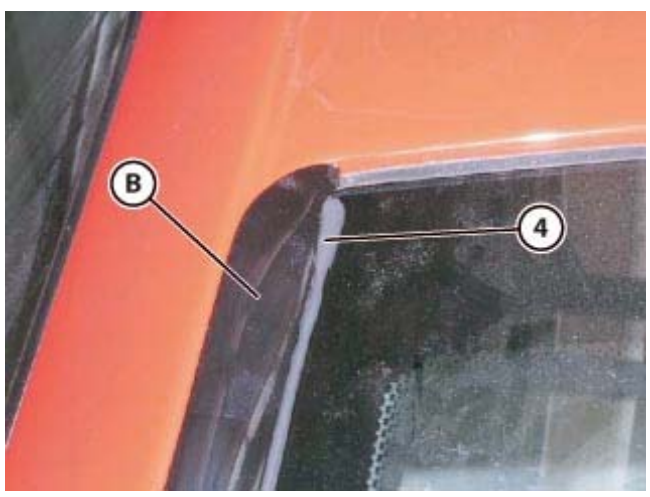
- Fit the right hand front aerodynamic moulding **(B)** onto the right hand side of the windscreen, flush with the relative pillar and aligning the top edge with the radius between the roof and the pillar.
- Press along the full length of the right hand front aerodynamic moulding **(B)** to adhere correctly to the windscreen and to ensure that it is not flush with the pillar.



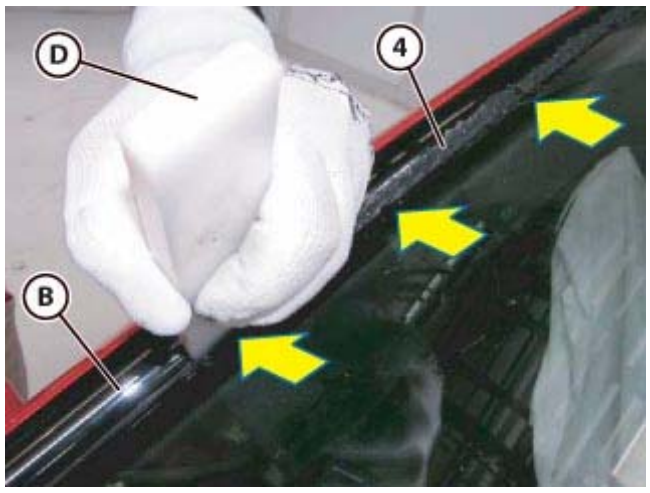
- There must be a slight step of approximately **1 mm** between the moulding and the windscreen.
- Clean and excess adhesive immediately with a suitable spatula and a clean cloth soaked in degreaser fluid.



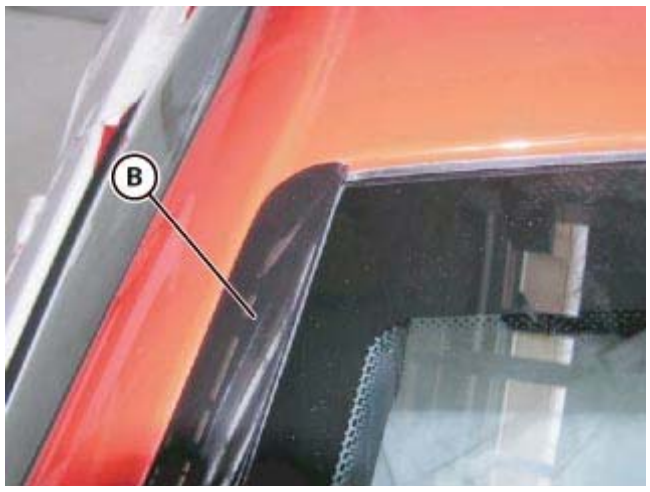
- Apply, pressing with some force, five strips **(2)** of black 3M fabric adhesive tape between the right hand front aerodynamic moulding **(B)** and the right hand pillar.
- Apply the three suction cup compression tools **(C)** onto the three strips **(2)** of black 3M fabric adhesive tape.
- Keep the suction cup compression tools **(C)** in place for at least **2 hours**.



- Apply a bead **(4)** of **biSil** approximately **4-5 mm** thick, between the right hand front aerodynamic moulding **(B)** and the windscreen, using the special manual applicator gun.



- Press to allow the adhesive to penetrate between the right hand front aerodynamic moulding **(B)** and the windscreen, using a suitable spatula **(D)**.
- Remove any excess adhesive with a suitable spatula **(D)**.



- Clean both the right hand front aerodynamic moulding **(B)** and the windscreen thoroughly with a clean, dry cloth.

i There must only be a thin line of adhesive remaining to seal the contact line between the right hand front aerodynamic moulding **(B)** and the windscreen.

- Carry out the same procedure used to replace the right hand front aerodynamic moulding to replace the left hand front aerodynamic moulding.
- Do not use the vehicle for at least **48 hours**.

M2.10 Quarterlights

Replacing quarterlights in Lexan

The rear quarterlights are in Lexan. Do NOT use harsh products to clean.

Protect all painted bodywork parts and the cabin to prevent damage when using cutting equipment and when installing the new windscreen.

➢ Remove the passenger compartment and roof trim panels (M2.22).
Follow the removal procedure up to the removal of the trim panels adjacent to the quarterlight perimeter.

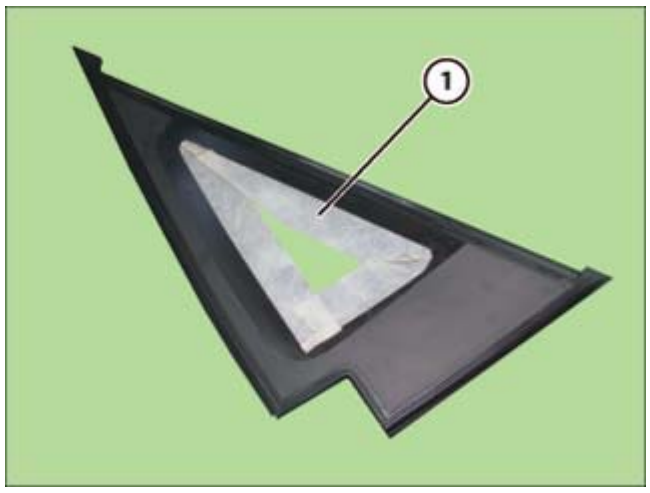
➢ Remove the side aerodynamic flaps (M2.02).

- The tool (BTB Premier Kit) is required to replace the quarterlights.
- Using a thermal cutter fitted with the **WK4** blade, cut the sealant around the entire perimeter of the quarterlight, taking particular care not to damage the sealant for the adjacent rear screen.
- Use suction cup handles to remove the quarterlight from its seat.
- Use the thermal cutter to remove the layer of sealant remaining on the quarterlight seat.
- Clean the mating surface of the quarterlight thoroughly with compressed air, then degrease with heptane.

Before preparing the glass for installation, check there are no imperfections or scratches on the surface or around the perimeter.

- Place the glass on a stable surface and protect against scratching and damage.
- Degrease the edge of the glass and the relative seat on the bodywork with the towelette **KENT SCREENPREP code 67119000**.

Wipe the glass with the towelette in a single direction to collect all dirt.



- Apply a strip of adhesive tape **(1)**, overlapping the solid screen printed area by approximately **1 mm**.



- Using an extrusion gun, apply **KENT SCREENFIX COMP. A 212MPP83748 code 67116000** to the rear corner of the quarterlight seal, as shown in the image.

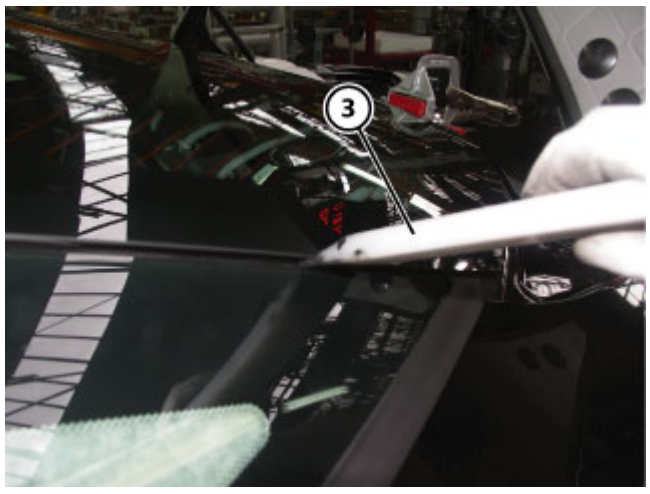


The adhesive must be applied in an even and uninterrupted bead.

- Use an extrusion gun with a triangular section nozzle to apply a continuous bead **(2)** of **KENT SCREENFIX COMP. A 212MPP83748 code 67116000** around the entire perimeter of the quarterlight, ensuring that there are no interruptions or air bubbles in the bead: apply additional material if necessary.

The glass must be fitted onto the bodywork within 4 minutes of applying the adhesive.

- Place the quarterlight in a parallel position relative to the mating surface and fit onto the bodyshell, ensuring that it is correctly aligned with the moulding, the upper door edge and the rear screen.



- Using a bone gasket jammer **(3)**, push the upper seal against the rear screen, underneath the rear screen itself, and check that the seal is flush with the bodyshell and the moulding.

- Working from inside the passenger compartment, remove and press excess sealant into the gap between the glass and the bodywork.
- Apply constant pressure to the entire perimeter of the quarterlight. Apply a few strips of adhesive tape **SYROM 90** to apply pressure to and fix the quarterlight in the desired position.

Also apply constant pressure to the rear corner of the quarterlight seal, to ensure that it adheres correctly to the bodyshell.

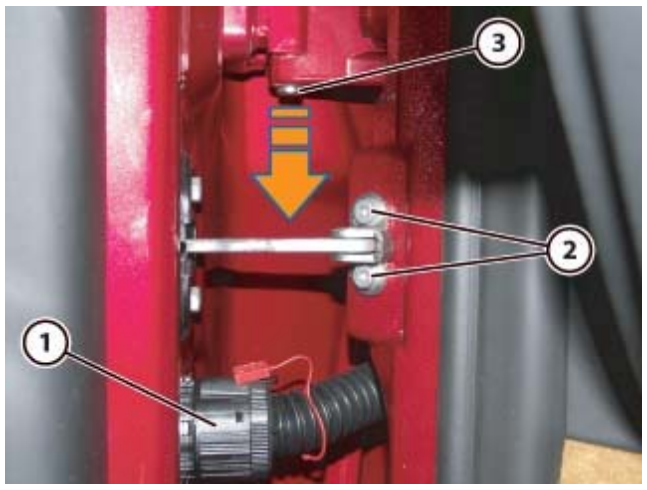
- Wait at least **4 hours**, remove the adhesive tape and clean off any sealant residue from the perimeter of the quarterlight.

➢ Refit the aerodynamic side flaps (☞ M2.02).
➢ Refit the passenger compartment and roof trim panels (☞ M2.22).

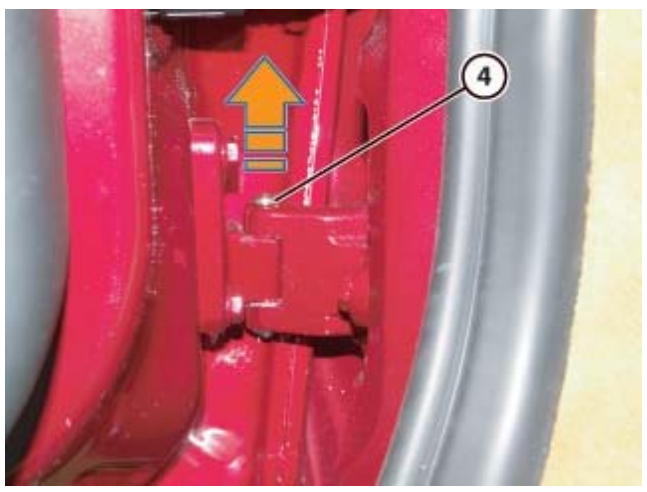
M2.11 Doors

Removing the complete door

➢ Set the battery master switch to OFF (L2.02).



- Disconnect the dashboard wiring harness connector **(1)** (X323) (X324) (Y323) (Y324) from the door.
- Undo the two screws **(2)** fastening the door tie-rod to the bodywork.
- Ease the upper pin **(3)** out of the hinge, pulling downwards.



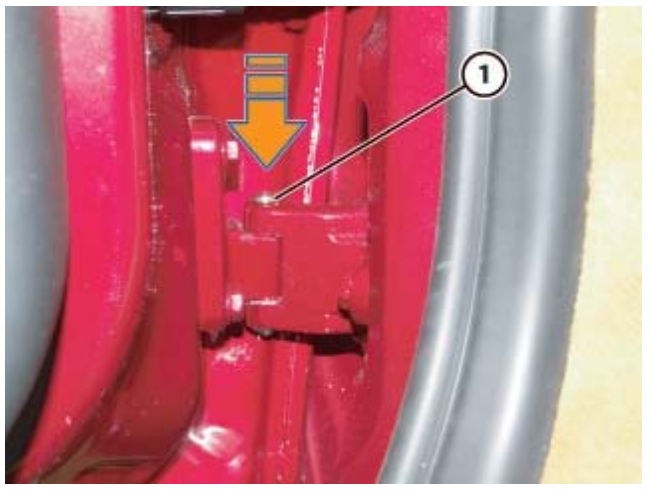
- Ease out the lower pin **(4)**, pulling upward.
- Remove the entire door from the vehicle and set down on a wheeled trestle.

Refitting the complete door

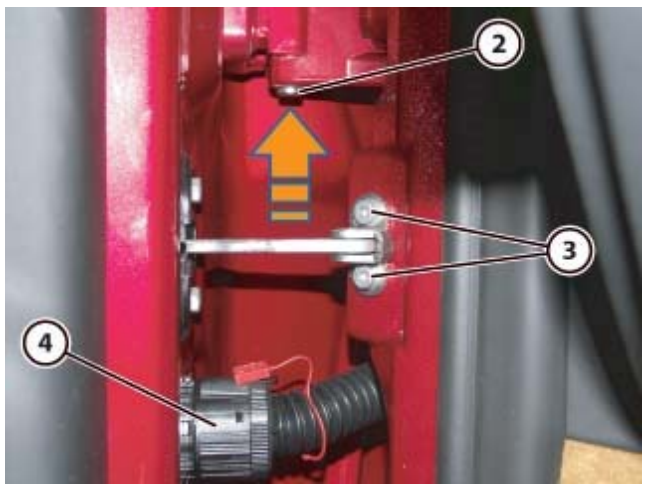
Tightening torque		**Nm**	**Class**
Door stop tie-rod - door	Screw	9.5 Nm	B

When fitting the doors, ensure that the battery master switch is OFF.

- Lubricate the tie-rods and hinges on both the door and the bodywork with **AREXONS SVITOL TECHNIK SILIKON SPRAY**.



- Fit the door onto the hinges on the vehicle chassis.
- Fit the lower pin **(1)** from the top (as indicated by the arrow).



- Fit the upper pin **(2)** from the bottom (as indicated by the arrow) and fasten the tie-rod by tightening the fastener screws **(3)**.

Tightening torque	Nm	Class
Screw	9.5 Nm	B

- Connect the door wiring harness connector **(4)** (X323) (X324) (Y323) (Y324).

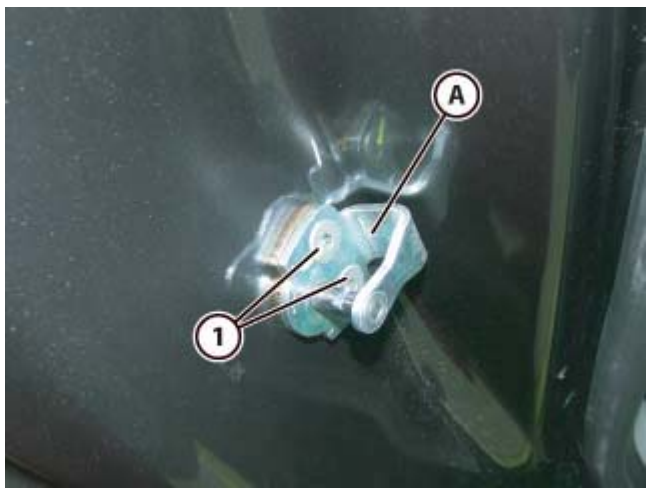
➢ Check and adjust door closure (M2.11).

Checking and adjusting door closure

Tightening torque		Nm	Class
Door striker plate - bodyshell	Screw	30 Nm	B



- Check that the door closes properly; the door must open and close without jamming.
- Check that the door is properly aligned with the external bodywork.
- If these conditions are not met, adjust the door.



- Loosen the two screws **(1)** fastening the door striker plate **(A)**.
- Position the striker plate correctly, checking that the door opens and closes without impediment.

When refitting the door striker plate after removal, ensure that the relative shim is oriented so that the side with the protective film is in contact with the pilaster strip cover.

- Tighten the two screws **(1)** on the bodyshell to **80%** of the rated tightening torque.

Tightening torque	Nm	Class
Screw	30 Nm	B



- Check that the door closes properly and check alignment, as done previously.
- If the above conditions are not met, repeat the previous steps.
- If alignment is correct and the door opens and closes without jamming, tighten the two striker plate fastener screws to the final tightening torque.

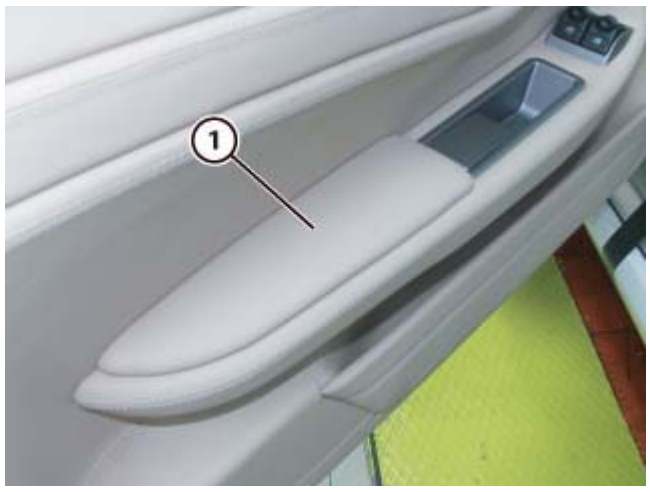
Tightening torque	Nm	Class
Screw	30 Nm	B

Removing the door panel

The door panel trim is very delicate: protect with appropriate means and do not use harsh cleaning products.

➢ Lower the window completely.

➢ Set the battery master switch to OFF (L2.02).



- Remove the cushion strip, **(1)** levering out first from the rear then detaching from its seat along the centre panel.



- Undo the two screws **(2)** on the underside of the outer door panel.



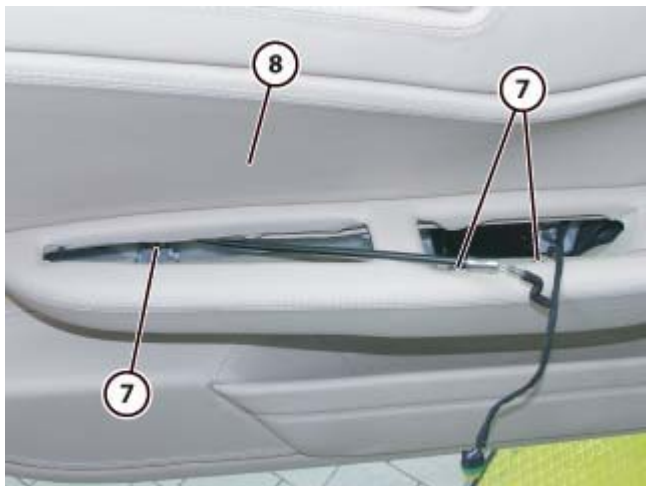
- Undo the screw **(3)** fastening the internal door handle **(4)**.



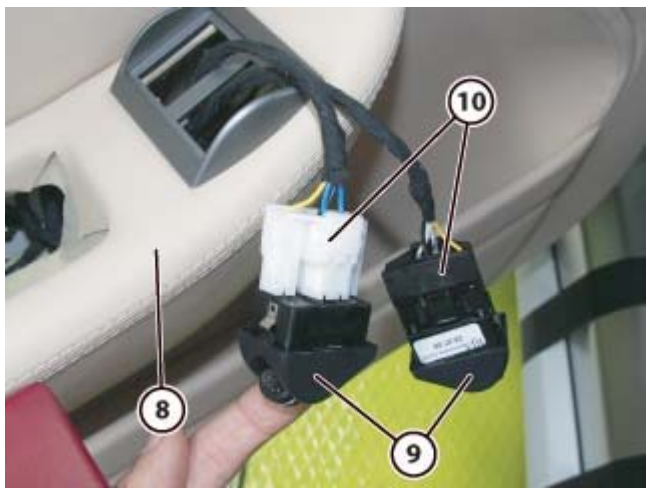
- Remove the internal door handle **(4)** from its seat and detach the door lock cable **(5)**.



- Disconnect the internal door handle microswitch connector **(6)** (D314) (D315) from the door wiring harness.



- Undo the three screws **(7)** inside the central panel **(8)**.



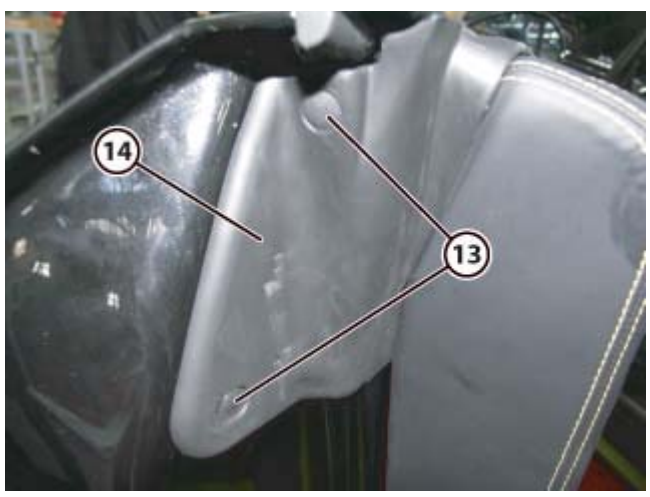
- Using a plastic lever, remove the central panel **(8)**, starting from the underside then proceeding counterclockwise to detach from all fasteners (8 in total).
- Remove the electric window buttons **(9)** from the relative fixing plate, pressing out from inside the central panel, then disconnect the two connectors **(10)** (D022) (D026) (D061).
- Remove the central door panel **(8)** and lay down in a safe place, taking particular care not to damage the trim.



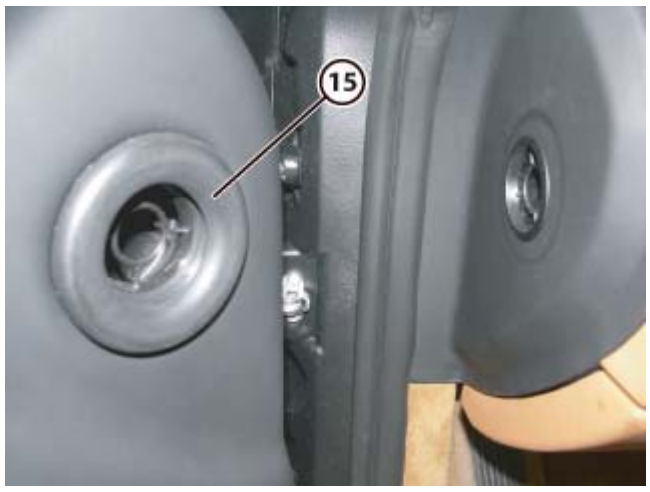
- Remove the internal fixing plate **(11)** , detaching from the top first and then from the bottom.



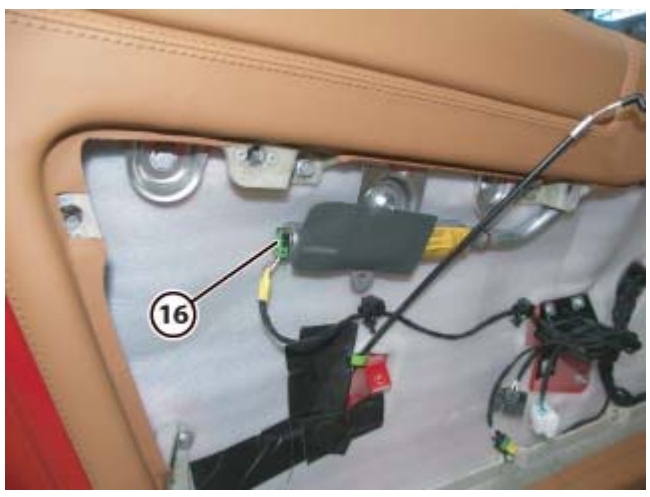
- Disconnect the tweeter loudspeaker connector **(12)** (L062) (L065).



- Using a plastic lever, detach the two snap fasteners **(13)** for the window scraper seal **(14)**, located on the rear side of the door.



- Turn the air ring nut **(15)** counterclockwise and remove from its seat on the outer door panel.



- Disconnect the side airbag connector **(16)** (R010) (R011).

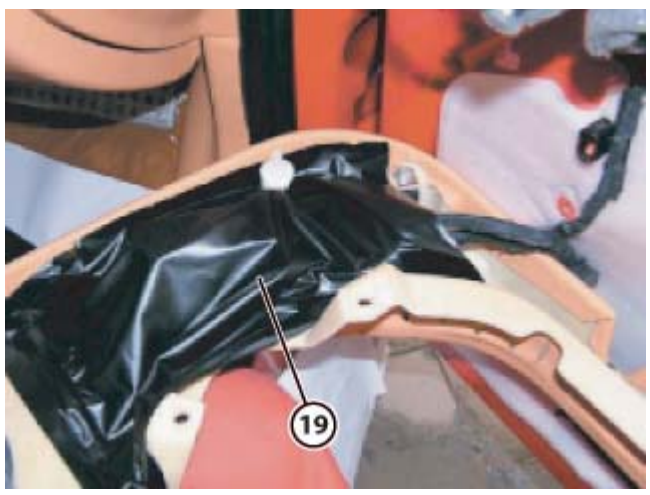


- Undo the 15 external door panel securing screws **(17)** indicated in the figure.

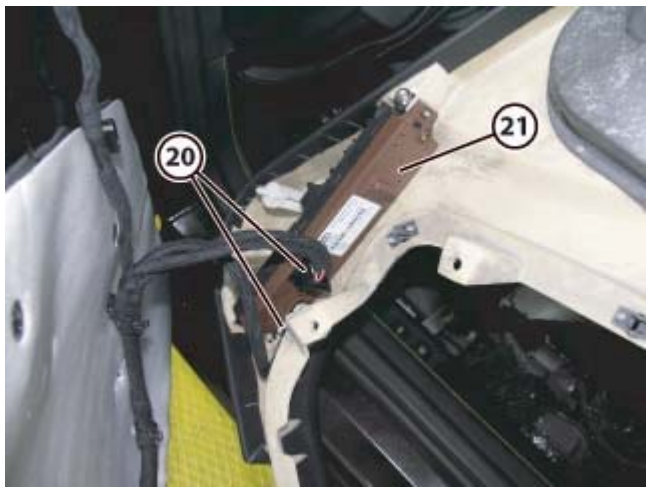


- Remove the underdoor light **(18)** from its seat on the outer door panel and disconnect the relative connector (I019) (I020).

- With due care, pull the lower front side of the outer door panel towards yourself, detaching from the relative clip.
- Shift the door panel up, pushing from the lower rear side, to detach the internal tabs at the top.



- Remove the protective liner **(19)** covering the power window ECU.

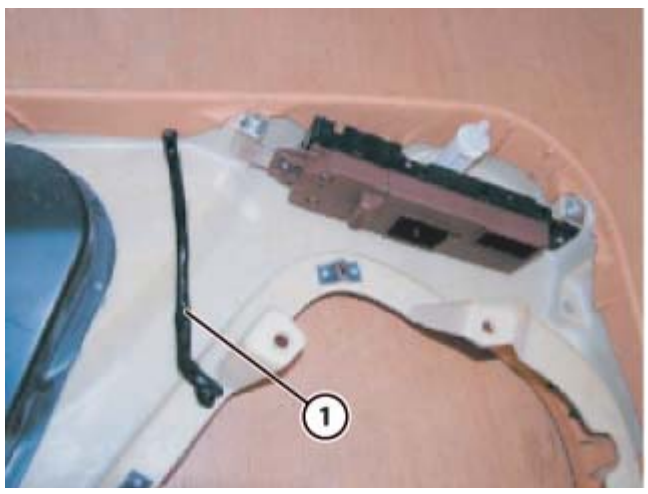


- Disconnect the two connectors **(20)** (E021) (E022) from the power window ECU **(21)**.

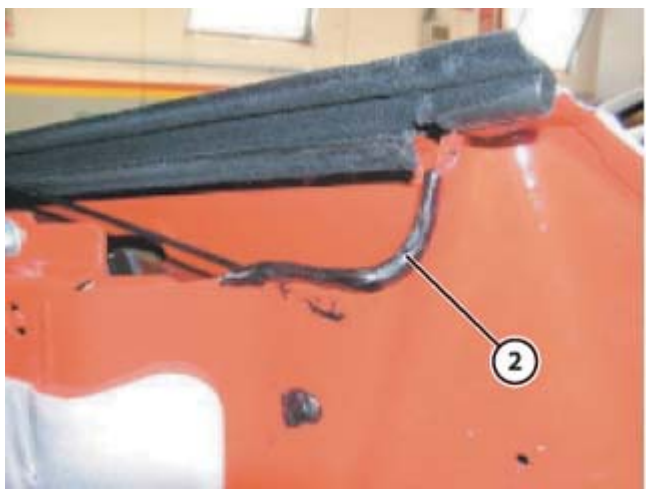
- Remove the outer door panel and lay down in a safe place, taking particular care not to damage the trim.

Refitting the door panel

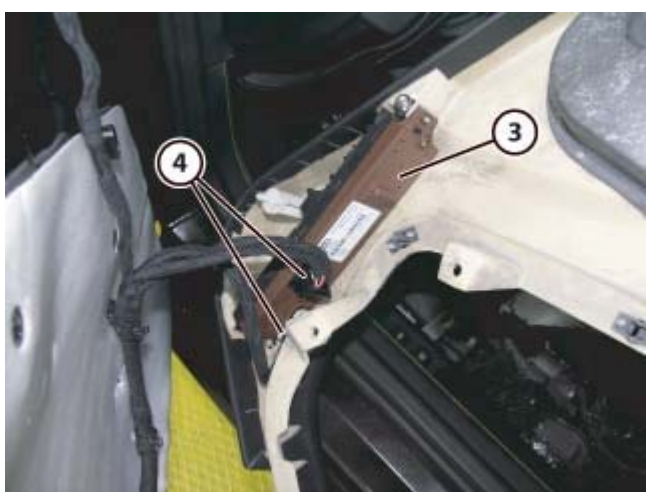
Tightening torque		**Nm**	**Class**
Outer door panel - door	Screw	6 Nm	C



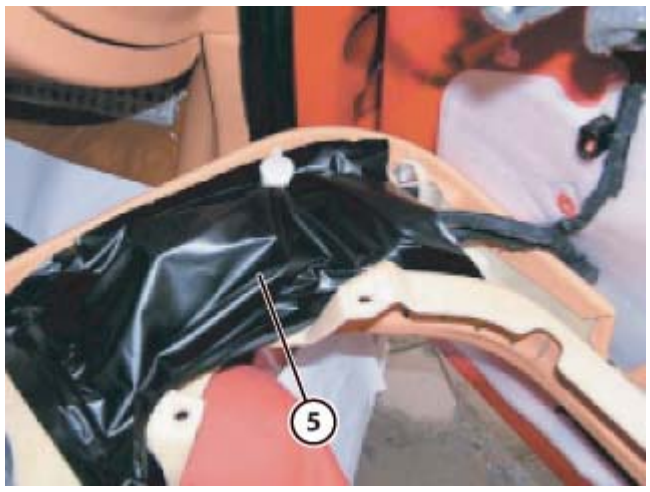
- Remove the strip of adhesive **(1)** from the interior surface of the door panel and clean with a cloth dipped in fluid degreaser (heptane).
- Spray anticorrosion spray on the door wiring harness connector pins and on the relative power window ECU connections.
- Apply a new strip **(1)** of adhesive **3M** as before.



- Remove the strip of adhesive **(2)** from the upper rear side of the door panel and clean with a cloth dipped in fluid degreaser (heptane).
- Apply a new strip **(2)** of adhesive **3M** as before.



- On the outer door panel, connect the two connectors **(4)** (E021) (E022) to the power window ECU **()**3.

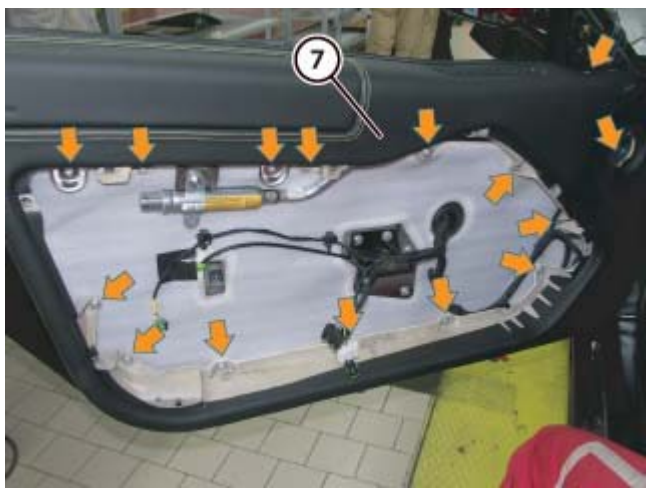


- Fit the protective liner **(5)**, applying the adhesive parts to the door panel and ensuring that the top of the liner bonds correctly with the previously applied strip of adhesive.

- Bring the outer door panel towards the door and, working from above, insert and fasten the underdoor light cable in its relative seat on the panel.



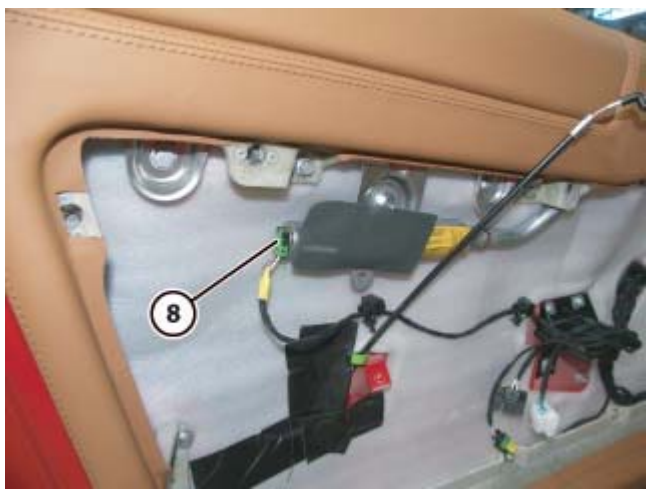
- Fit the underdoor light **(6)** in its relative seat, connecting the connector (I019) (I020), and fit into the outer door panel.



- Fit the outer door panel **(7)** and fasten by tightening the 15 screws indicated in the figure.

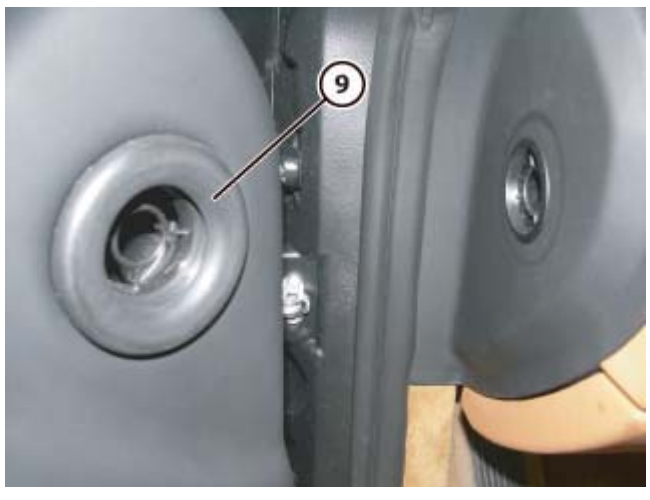


Tightening torque	Nm	Class
Screw	6 Nm	C

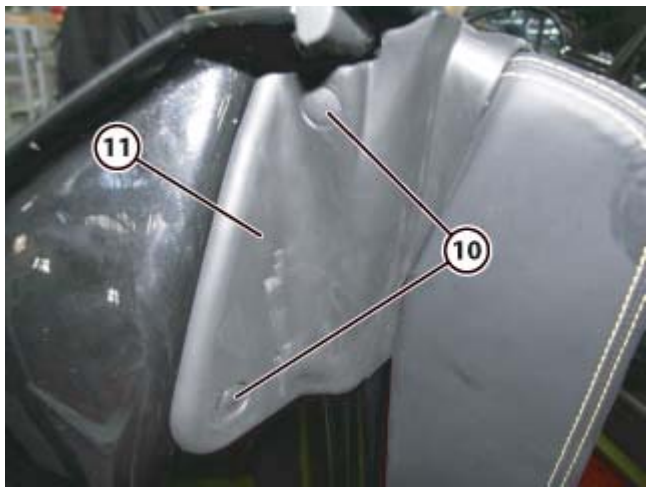


- Connect the side airbag connector **(8)** (R010) (R011).

- Perform automatic Airbag NAB (Airbag Node) ECU diagnostic cycle (L2.13).



- Fit the air ring nut **(9)** on the outer door panel and turn clockwise to fasten.



- Fasten the window scraper seal **(11)** to the door, pushing the two snap fasteners **(10)** into place.

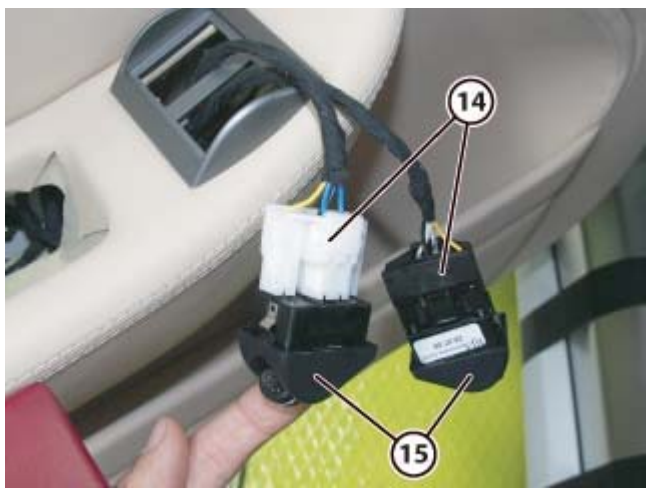


- Hold the internal fixing plate **(12)** and connect the tweeter loudspeaker connector **(13)** (L062) (L065).

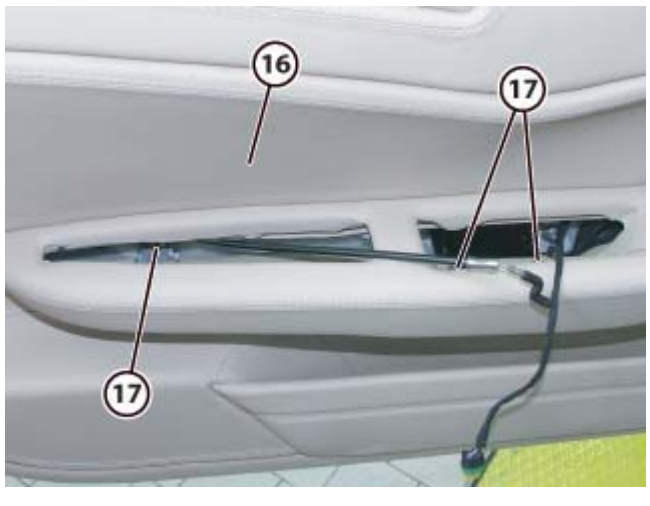


- Fit the internal fixing plate **(12)** into its relative seat on the door.

- Fit the central panel in its relative seat on the door and, after routing out the electric window cables, fasten all fasteners (8 in all).



- Connect the two connectors **(14)** (D022) (D026) (D061) to the respective power window buttons **(15)**.
- Fit the power window buttons **(15)** in their relative mountings in the fixing plate.



- Fasten the central panel **(16)** tightening the three screws **(17)**.



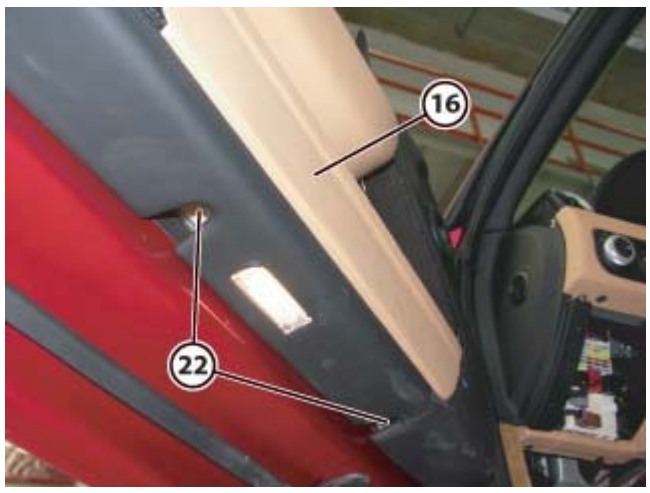
- Connect the internal door handle microswitch **(19)** connector **(18)** (D314) (D315).



- Fit the door lock cable **(19)** into the internal door handle **(20)**.



- Fit the internal door handle **(19)** in its relative seat on the central door panel and fasten by tightening the screw **(21)**.



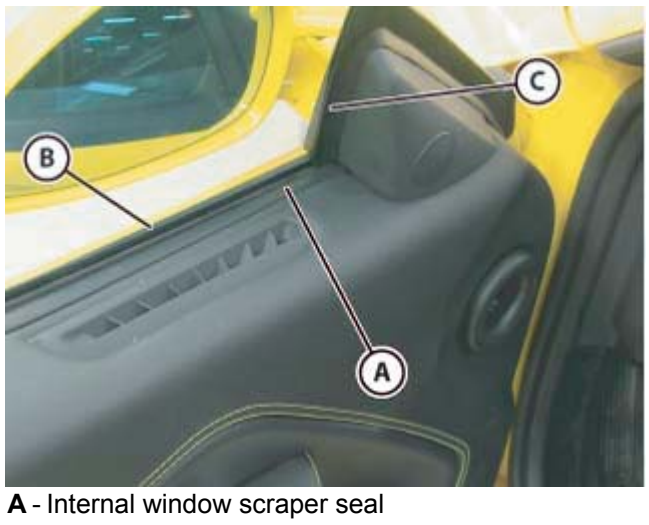
- Fasten the central panel **(16)** tightening the two lower screws **(22)**.



- Fit the cushion strip **(23)** on the central door panel, inserting the front part first and then fitting the rear.

➢ Set the battery master switch to ON (L2.02).

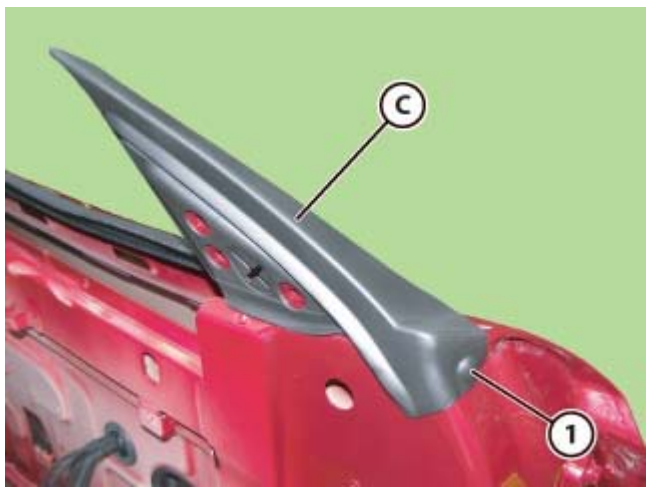
Installing window scraper seals



A - Internal window scraper seal
B - External window scraper seal
C - Triangular window scraper seal

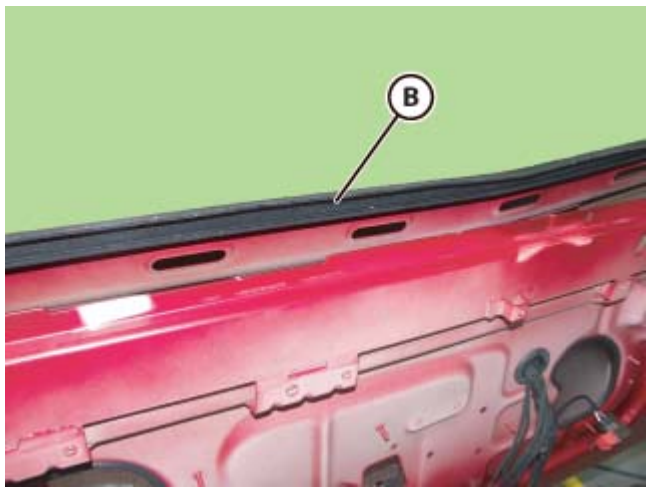
Replacing the window scraper gaskets

➢ Remove the external rear-view mirror (☞ H3.08).

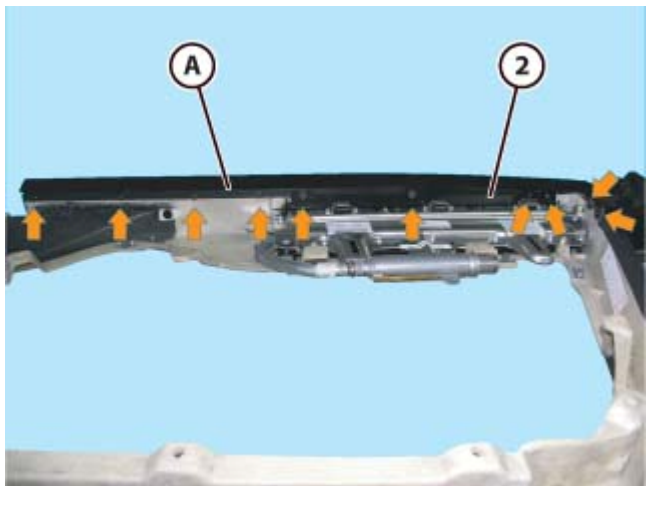


- To remove the triangular window scraper seal **(C)**, simply prise out the snap fastener **(1)** then pull the seal out.

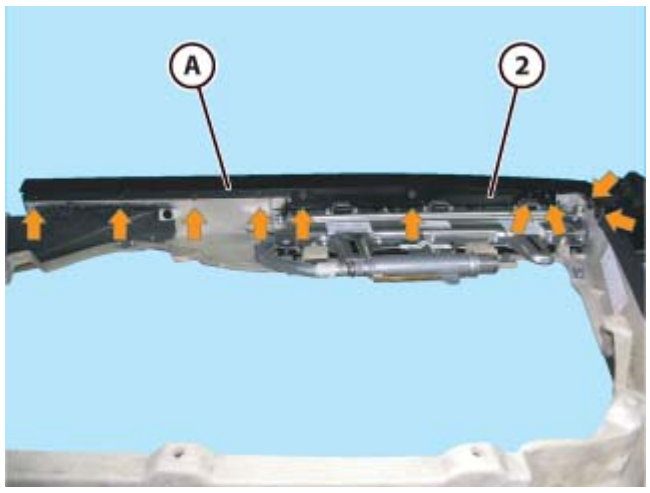
- Remove the door panel (☞ M2.11).



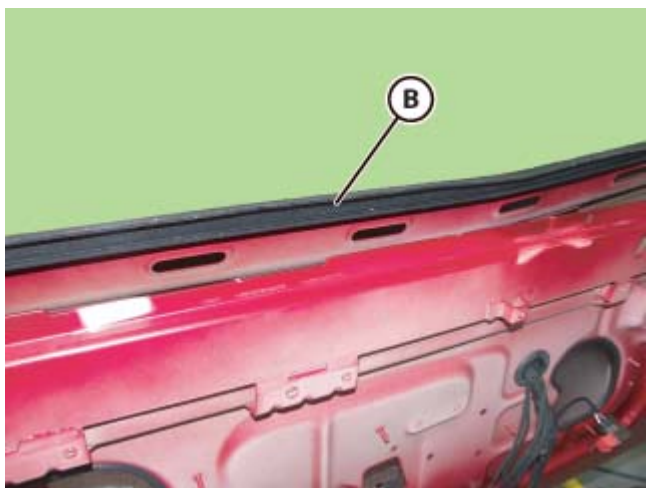
- To remove the outer window scraper seal **(B)**, pull out from the door framework.



- To remove the internal window scraper seal **(A)**, undo the 10 screws indicated in the figure, retrieving the retainer plate **(2)**.

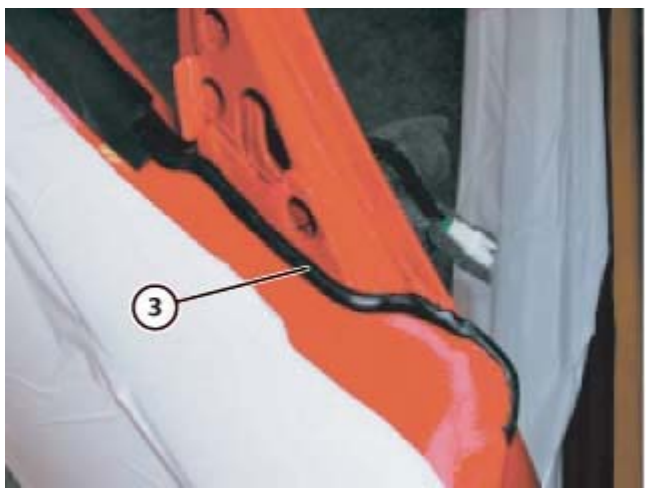


- To refit the internal window scraper seal **(A)**, fit into the relative seat on the outer door panel, fit the retainer plate **(2)** and fasten with the 10 screws indicated in the figure.

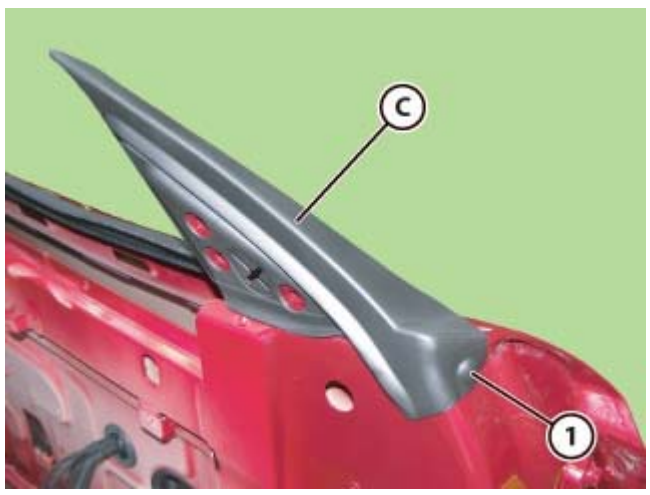


- To refit the outer window scraper seal **(B)**, fit onto the ribbing on the door. Check seal integrity and settle in position with a plastic hammer.

- Refit the door panel (M2.11).



- To refit the triangular window scraper seal, remove the adhesive strip **(3)** and, after degreasing the area with heptane, apply a new adhesive strip **3M** as before.



- Fit the triangular window scraper seal **(C)**, refitting the snap fastener **(1)** and ensuring that the lower side of the seal bonds correctly with the previously applied adhesive strip.



- Close the door, taking care not to crush the cables, and tap the seal very carefully with a plastic hammer to align correctly with the bodywork.

➢ Refit the external rear view mirror (H3.08).

Replacing the underdoor light

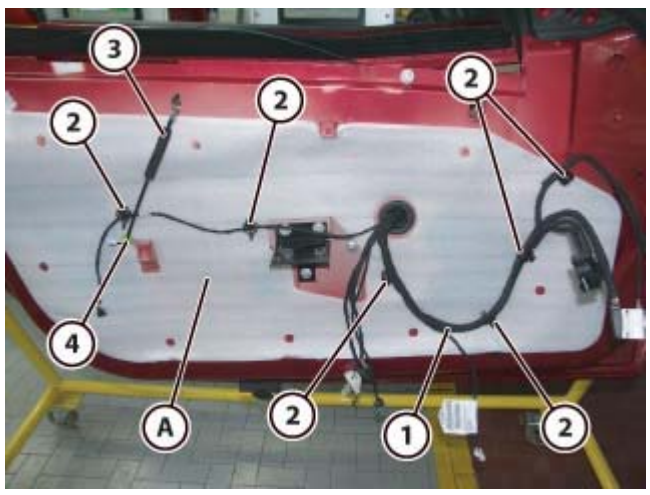


- Use a screwdriver to prise the underdoor light **(A)** out of its seat, taking care not to damage the leather trim.
- Disconnect the connector and remove the light (I019) (I020).

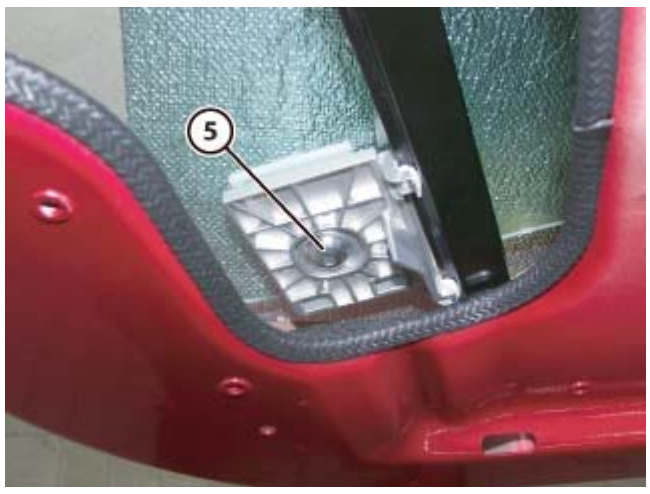
- When refitting the underdoor light, ensure that it adheres properly to the leather upholstery and be careful not to damage it.

Removing the roll-down window

➢ Remove the door panel (M2.11).



- Separate the door wiring harness **(1)** from the waterproof canvas **(A)**, removing the clamps **(2)**.
- Detach the door release tie-rod **(3)** by detaching the clamp **(4)**.
- Detach the waterproof canvas **(A)**.

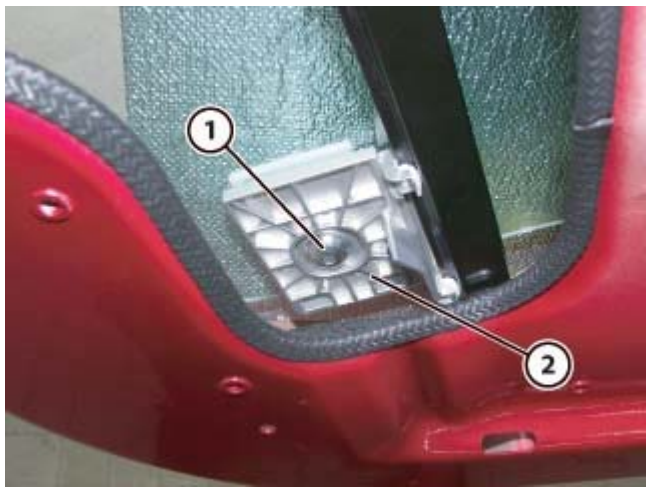


- Lower the window so that you can access the fasteners on the lower side.
- Undo and remove the rear screw **(5)** fastening the roll-down window to the power window unit mounts.

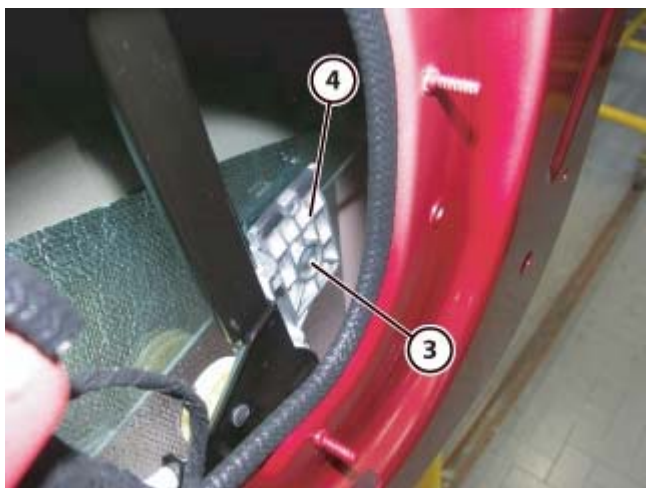


- Undo and remove the front screw **(6)** fastening the roll-down window to the power window unit mounts.
- Remove the roll-down window from the top of the door.

Refitting the roll-down window

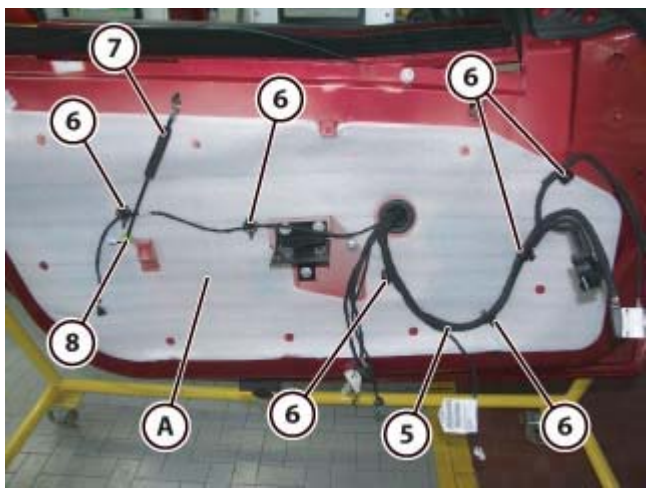


- Fit the roll-down window on the relative mountings in the door.
- Fasten the window by applying and tightening the screw **(1)** on the rear window mounting **(2)**.



- Fasten the window by applying and tightening the screw **(3)** on the front window mounting **(4)**.

- Check and adjust the door window (M2.11).



- Fit a new waterproof canvas **(A)** on the door, matching the holes.
- To ensure that the waterproof canvas adheres correctly, apply a few beads of **SILOTEC 12.7x15**.
- Fasten the door cable **(5)** with the clamps **(6)**.
- Fasten the door release tie-rod **(7)** with the clamp **(8)**.

➢ Refit the door panel (M2.11).

Checking and adjusting the door window

Tightening torque		**Nm**	**Class**
Power window unit - door	Screw	7.4 Nm	B
Roll-down window - power window guides	Screw	8.5 Nm	B

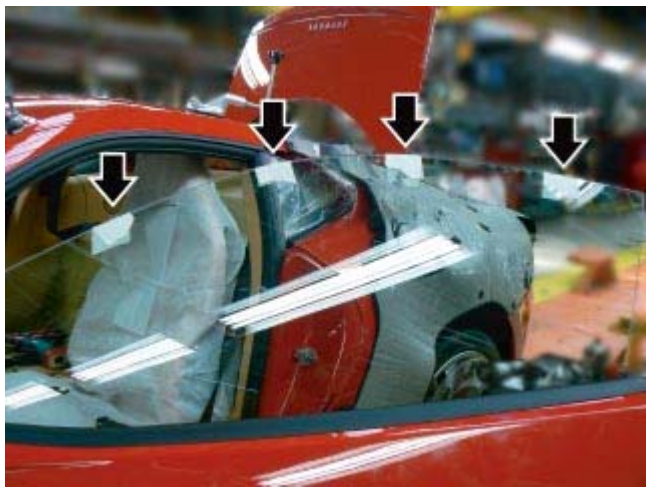
All the procedures described as follows must be performed in order to adjust the door window.

➢ Remove the door panel (M2.11).

- The first procedure is to check that the window lift mechanism functions correctly with the door panel removed.

Checking Intrusion

- This operation consists in measuring the intrusion distance of the window into the gutter. Measure intrusion as follows:



- Apply four pieces of rubber-coated paper to the door window.
- Close the door.
- Raise the door window with the power window control.



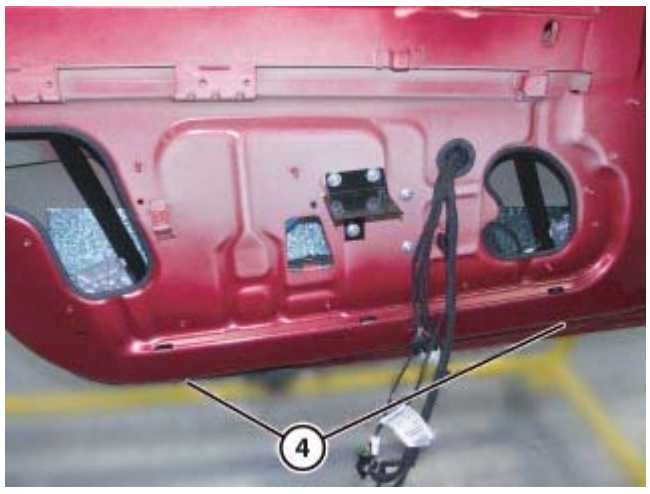
- Mark the intrusion distance on the strips of tape.
- Lower the door window.



- Check that the intrusion distance is **6.5 mm**.

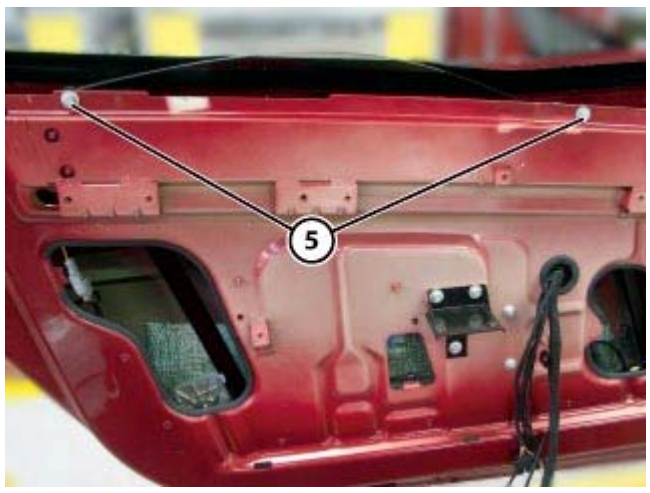
Adjusting the Door Window

- This operation consists in setting the correct intrusion of the window into the gutter, and checking that the window is perpendicular to and correctly spaced from the quarterlight seal



- Adjust the door window as follows:
- Remove the caps covering the lower fasteners fixing the guides to the door.
- Adjust the window to obtain the correct intrusion distance; to adjust, loosen the two bottom screws **(4)** fastening the guides to the door, moving the guides either inward or outward.

In general, to ensure that the intrusion distance and preload are correctly set, the lower guide fastening points must be pushed out completely.



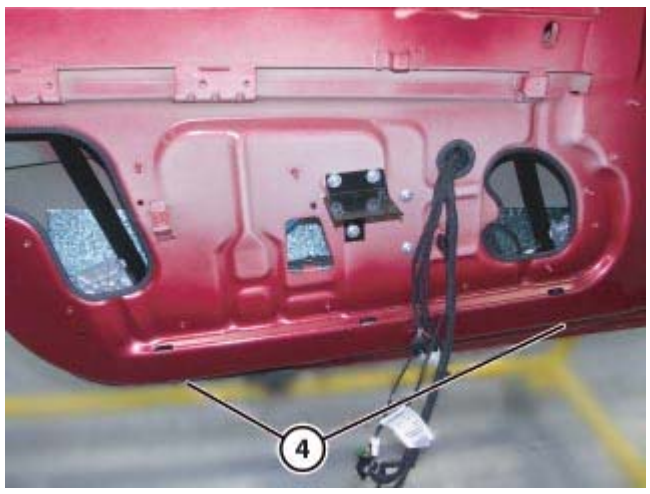
- Now detension the mechanism by closing the door, raising the door window and loosening, from inside the vehicle, the two upper screws **(5)** fastening the guides to the door, then retighten the screws.

The screws may move slightly when loosened; this indicates that the mechanism was under tension.

Tightening torque	**Nm**	**Class**
Screw	7.4 Nm	B



- Check that the door window is perfectly perpendicular to the quarterlight when the window is raised with the door closed.



- If necessary, correct by loosening the two screws **(4)** and moving the guides outward to reduce the distance between the window and the seal, or moving inwards to increase the distance.

In general, to ensure that the intrusion distance and preload are correctly set, the lower guide fastening points must be pushed out completely.

- Once adjustment is complete, tighten the two screws **(4)**.



- Check that, with the door close and the window raised, the distance between the quarterlight seal and the door window is **7 ± 2 mm**.
- If necessary, correct by loosening the two screws fastening the window to the slider shoes as follows.

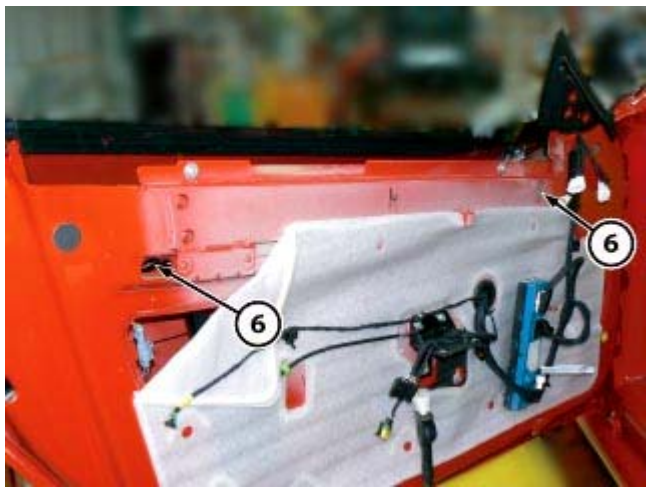


- Open the door.

As the door window is now raised completely to its upper travel limit, remember to pull the door handle to bring the window into the "threshold" position before closing the door.

- Block the lock with a screwdriver. The window automatically raises to its travel limit.

This is necessary in order to gain access to the window fastener screws.



- Detach the rear part of the waterproof liner sheet to access the rear window fastener screw.
- Supporting the weight of the window, loosen the two fastener screws **(6)** and adjust the position of the window to bring the distance between the quarterlight seal and the window within the specified range.

In general, to adjust the position of the window correctly, the rear fastener screw must be at the centre of the relative slot on the shoe.

- Once adjustment is complete, tighten the two screws **(6)**.

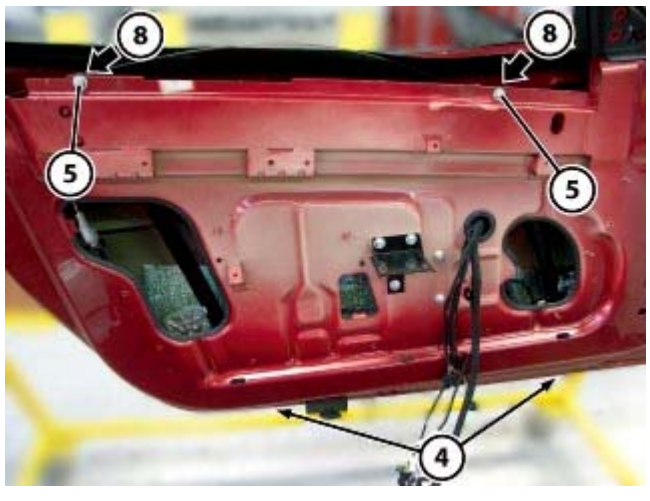
Tightening torque	Nm	Class
Screw	8.5 Nm	B

Checking the door window preload

- After adjusting the position of the door window, check that the preload is correct as follows:



- Close the door slowly with the window completely raised until the top edge of the window touches the door seal.
- Check that the distance between the door and the fender is **18 - 20 mm** with the door panel removed, (the distance should be **10 - 12 mm** with the door panel fitted).



- If the value measured is not within the correct range, loosen the two screws **(4)** and adjust the two guides, moving outward to reduce the distance between the window and the seal (increase preload), or inward to increase the distance (reduce preload).

In general, to ensure that the preload is correctly set, the lower guide fastening points must be pushed out completely.

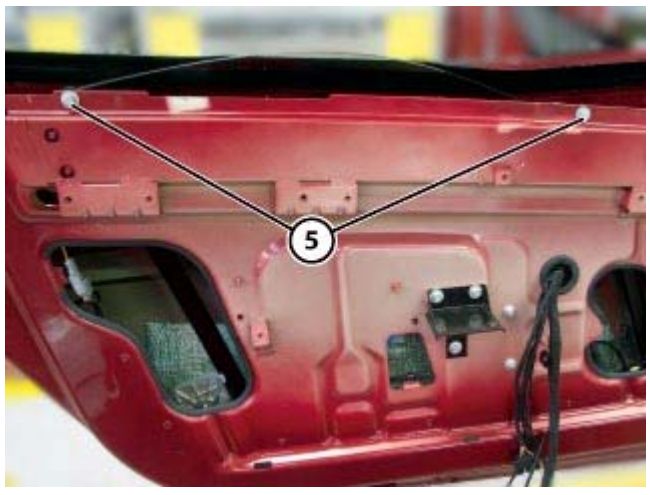
- If the value is still not within the correct range, add or remove the necessary quantity of shims **(8)** measuring **1 mm** to the upper fastenings **(5)** of the guides.
- When adjustment is complete, tighten the lower **(4)** and upper **(5)** guide fastener screws.

Tightening torque	Nm	Class
Screw	7.4 Nm	B

- Fit the protective caps on the lower guide fastening as originally mounted.

Noise

- After adjusting the position and preload of the window, check that the mechanism lifts and lowers the window without producing noise.



- If the mechanism does produce noise, close the door, lift the door window completely and, from inside the passenger compartment, loosen the two upper screws **(5)** fastening the guides to the door, then retighten.

The screws may move slightly when loosened; this indicates that the mechanism was under tension.

Tightening torque	Nm	Class
Screw	7.4 Nm	B

- Check the intrusion distance, the distance between the window and the seal and the preload again.
- Apply the waterproof liner sheet as originally fitted, ensuring that the membrane is watertight by applying beads of **SILOTEC 12.7x15** if necessary.

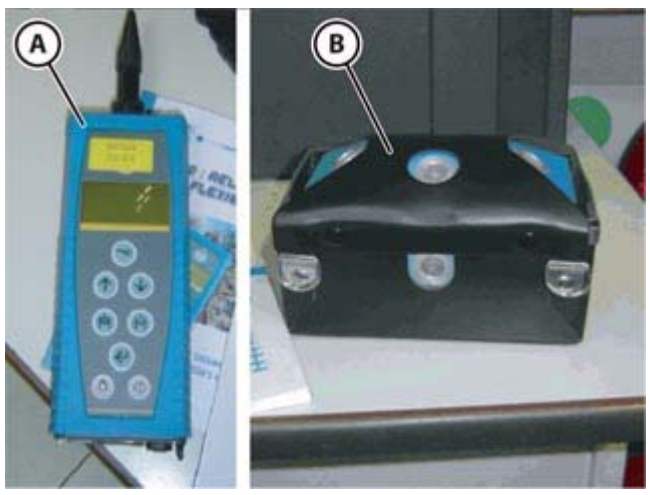
➢ Refit the door panel (M2.11).

Checking for water or air infiltration via the door window

This procedure consists in using the sonar device to check for water or air infiltration into the passenger compartment around the entire perimeter of the window. The maximum permissible measurement is 40 db.



- Air infiltration, especially along the rear edge of the door window in contact with the door seal (area indicated in the photo aside), may also indicate possible water infiltration.



- The devices needed to carry out the following operation are a **Detector (brand: STD - Model: STD 170) (A)** for checking the outer perimeter of the window, and an **Ultrasonic multi-trasmitter (Brand: STD - Model: Type STD 8) (B)**, for generating the signal inside the passenger compartment.



- Place the **Ultrasonic multi-trasmitter Type STD 8** inside the passenger compartment.
- Ensure that the windows are raised to their travel limits.
- Take measurements from the outside of the vehicle, moving the **Detector STD 170** along the red line indicated in the photo aside.
- The values must be less than **40 db** at all points tested.

- Should the values be equal to or exceed **40 db**, the seal must be adjusted as follows.
- If the water tightness test reveals water infiltration, the seal must be adjusted as follows.



- If water or air infiltration is noted, bend the door seal fastener tab.
- Detach the door seal **(C)** in the area involved.



- Bend the door seal fastener tab **(D)** outward to reduce the gap between the door window and the tab itself, then use the sonar device to check that the value is below **40 db**.

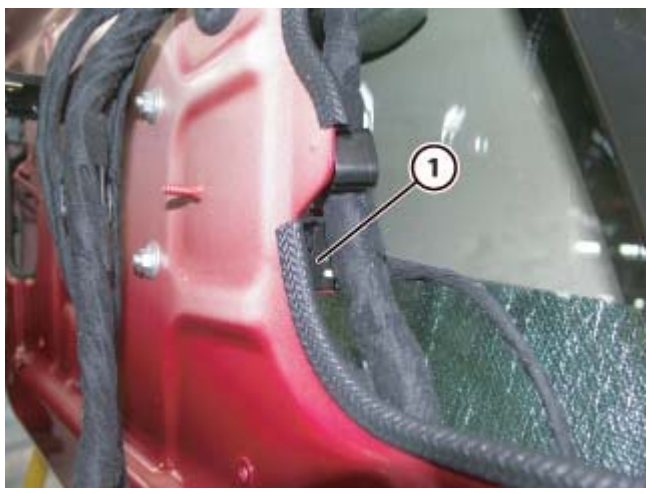


- Fit the door seal **(C)** on the fastener tab as originally installed.
- Close the door and raise the window completely.

- Repeat the test with the sonar device and the water tightness test as described previously to check that the adjustment is correct.

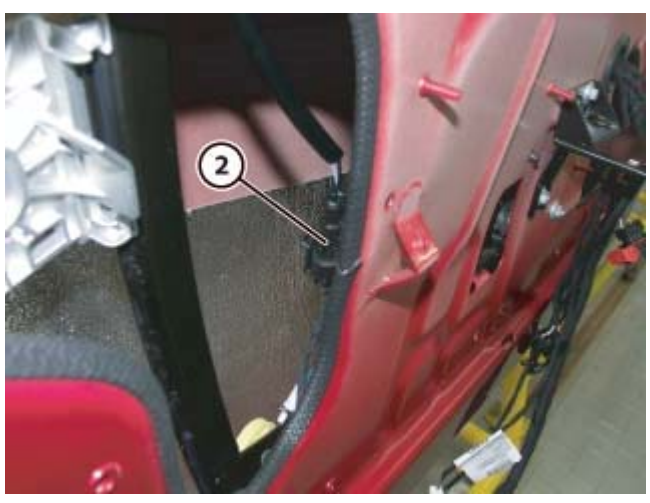
Removing the power window unit

➢ Remove the roll-down window (M2.11).

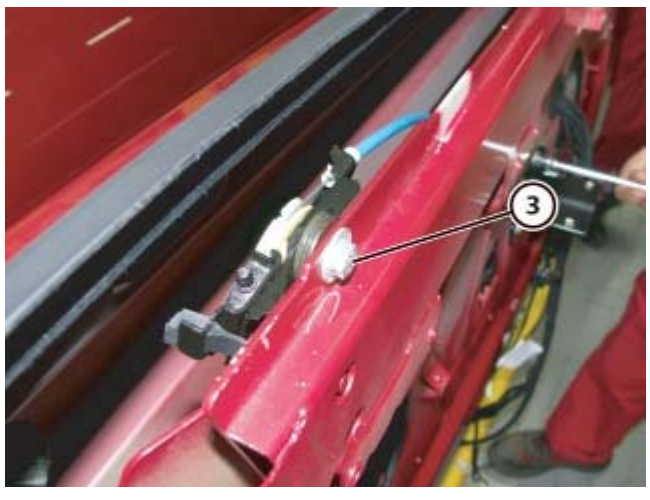


CAUTION
Always disconnect the motor connector first to prevent the power window unit from lowering when the microswitch is disconnected, injuring the operator.

- Disconnect the motor connection **(1)**.



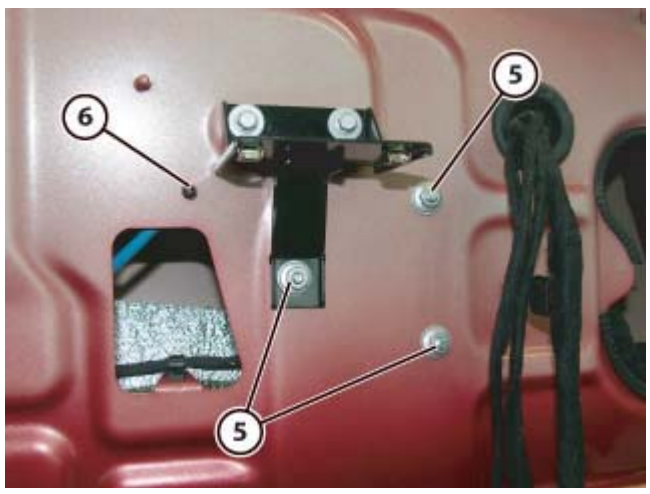
- Disconnect the microswitch connection **(2)**.



- Undo the two upper screws **(3)** fastening the guides to the door and retrieve the spacers.



- Undo the two lower screws **(4)** fastening the guides to the door.



- Unscrew the nuts **(5)** fastening the power window unit motor
- Remove the clip **(6)** from the door framework.

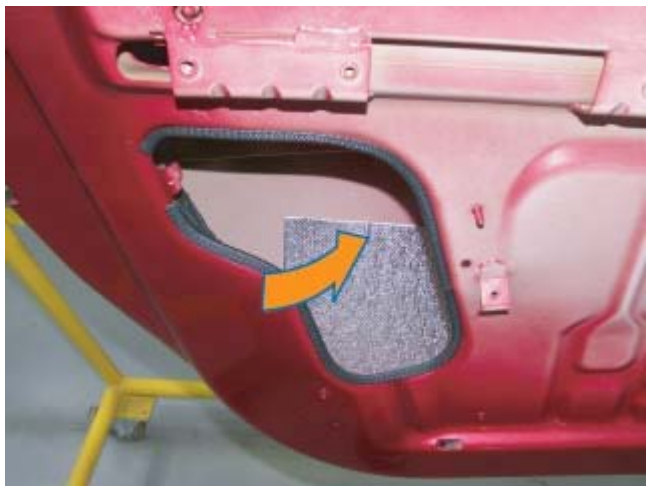
- Remove the power window unit, easing it out of the door framework through the hole, passing the rear guide through the hole first, then the motor and finally the front guide.

Refitting the power window unit

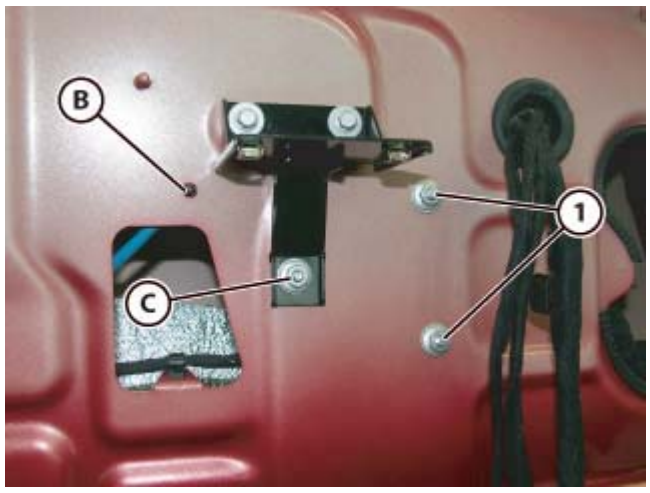
Tightening torque		**Nm**	**Class**
Power window unit - door	Nut	8.5 Nm	B
Armrest mounting bracket - door	Nut	7.4 Nm	C



- Unpack the power window unit.
- Cross tighten the tie-rods as shown in the image aside and apply grease **Z2 PROTECTION** to all moving parts.



- Install the unit in its respective seat in the internal door framework, passing it through the hole at the rear of the door.
- Fit the front guide first, then the power window motor, and then the rear guide.
- Centre the power window motor stud bolts in the holes on the door framework, taking care not to damage the BOWDEN cable sheath.

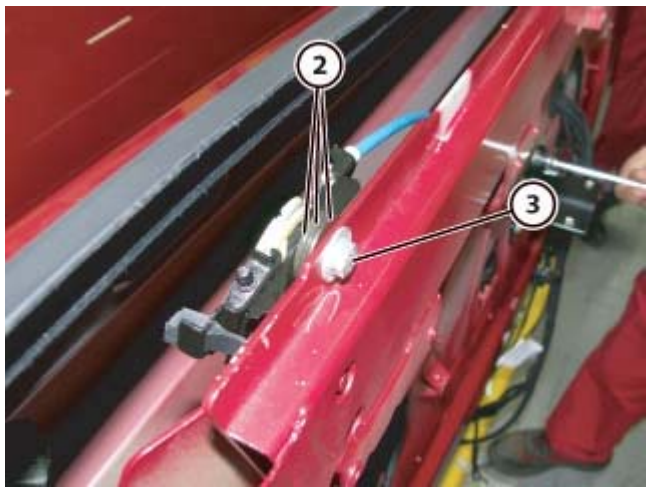


- Tighten the nuts **(1)** fastening the power window motor to the door framework and fit the power window unit retainer clip **(B)**.

Tightening torque	Nm	Class
Nut	8.5 Nm	B

- Tighten the nut **(C)** fastening the power window motor bracket.

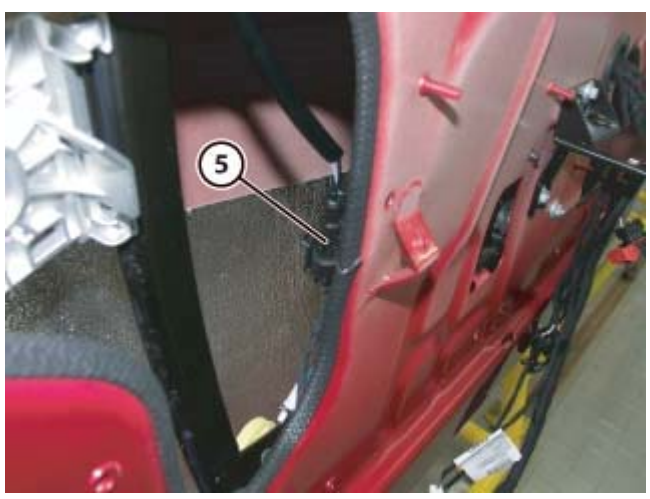
Tightening torque	Nm	Class
Nut	7.4 Nm	C



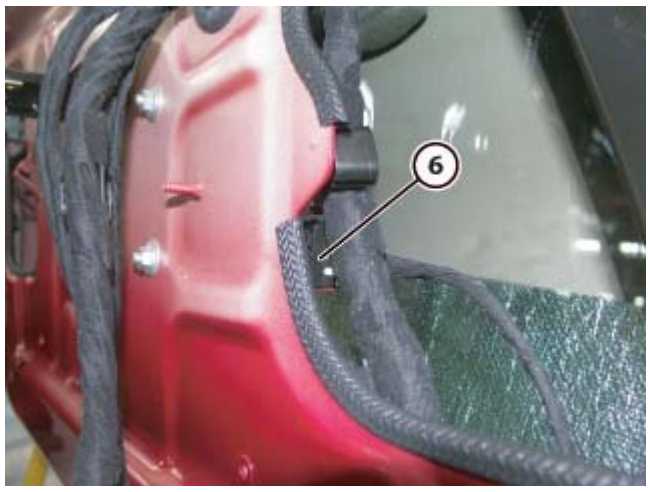
- On each upper screw, fit the three shims **(2)** retrieved during removal.
- Tighten the two upper screws **(3)** fastening the guides to the door framework.



- Fasten the power window unit guides with the two lower screws **(4)**, ensuring that they are correctly positioned in the middle of the slot on the door framework.



- Connect the microswitch connector **(5)**.



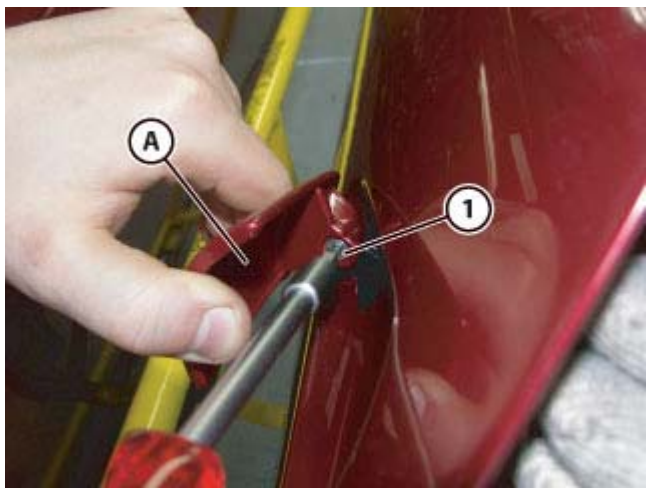
- Connect the power window motor connector **(6)**.

➢ Refit the roll-down window (☞ M2.11).
➢ Refit the door panel (☞ M2.11).

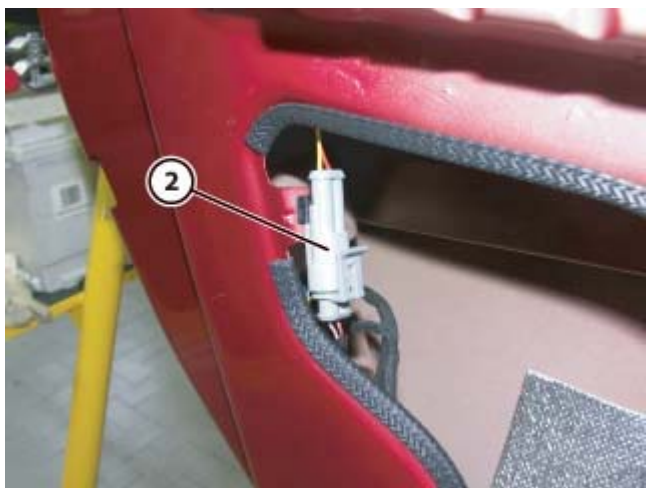
Replacing the external door handle

Tightening torque		**Nm**	**Class**
External handle mechanism - door	Screw	2 Nm	C
External handle	Screw	2 Nm	C

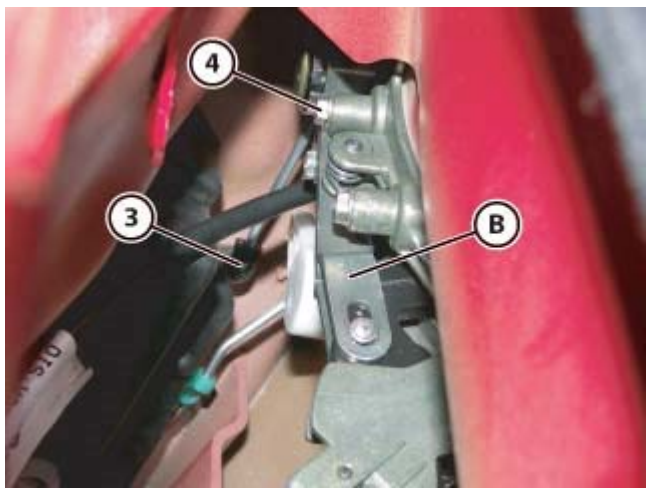
➢ Remove the roll-down window (M2.11).



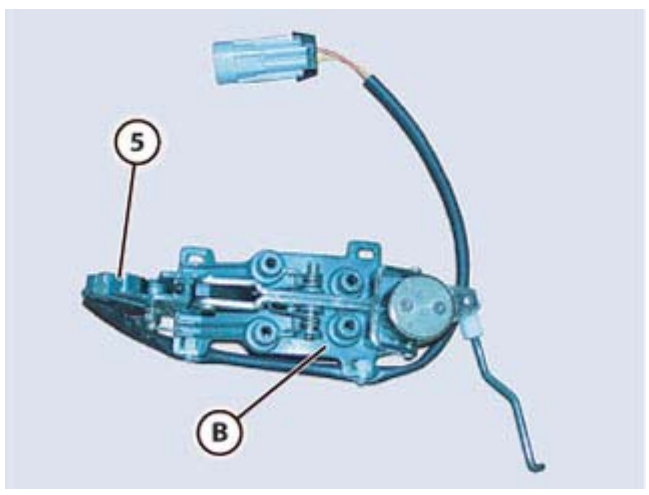
- Undo the screw **(1)** and take out the movable part of the external handle **(A)**.



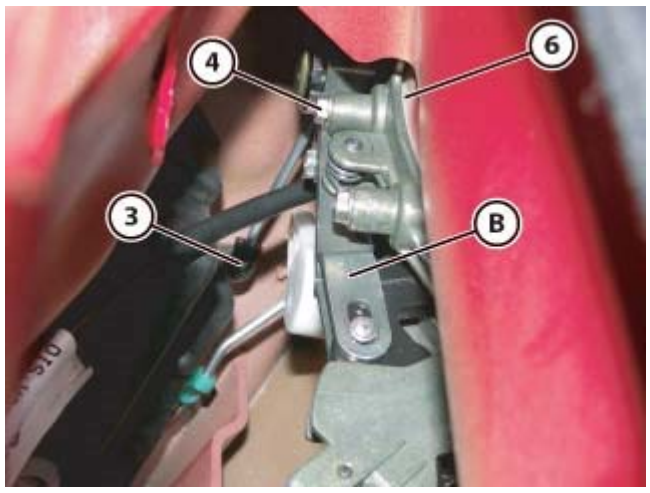
- Disconnect the connector **(2)** from the external handle mechanism.



- Remove the tie-rod **(3)**.
- Undo the four screws **(4)** and remove the external handle mechanism **(B)**, retrieving any spacers.



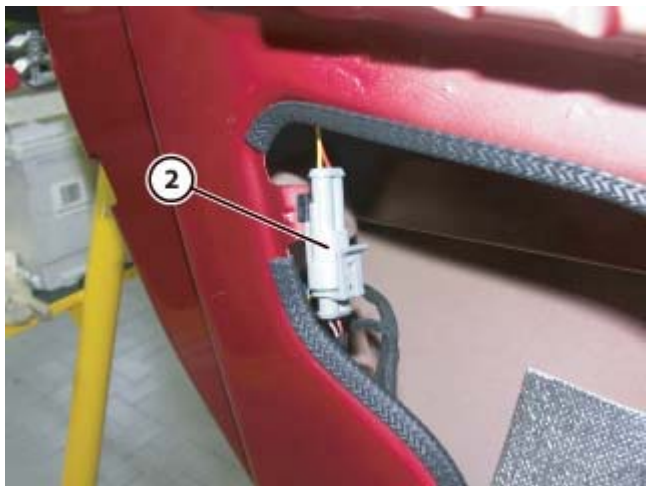
- The microswitch **(5)** may be replaced once the handle is removed.



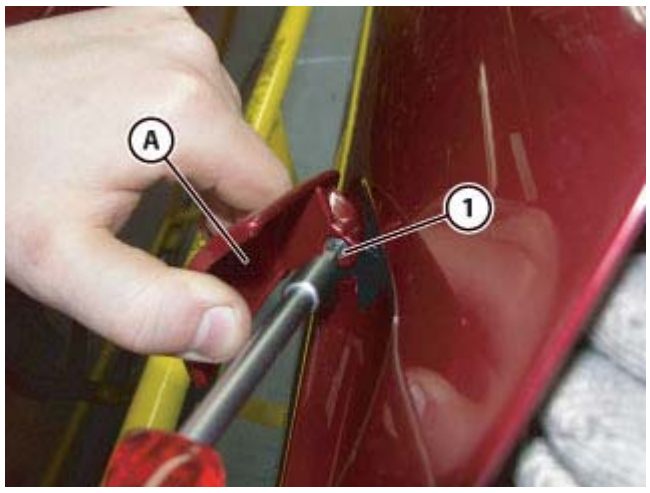
- Replace the external handle mechanism **(B)** and fit on the door, after fitting the plate **(6)** and any spacers retrieved during removal.
- Fasten the external handle mechanism by tightening the four screws **(4)**.

Tightening torque	Nm	Class
Screw	2 Nm	C

- Attach the tie-rod **(3)** onto the door lock.

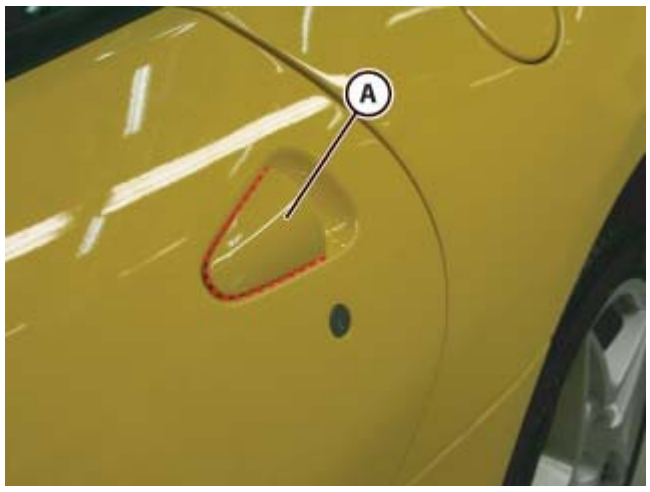


- Attach the connector **(2)** for the external handle mechanism.



- Fit the moving part of the external handle **(A)** and tighten the screw **(1)**.

Tightening torque	Nm	Class
Screw	2 Nm	C



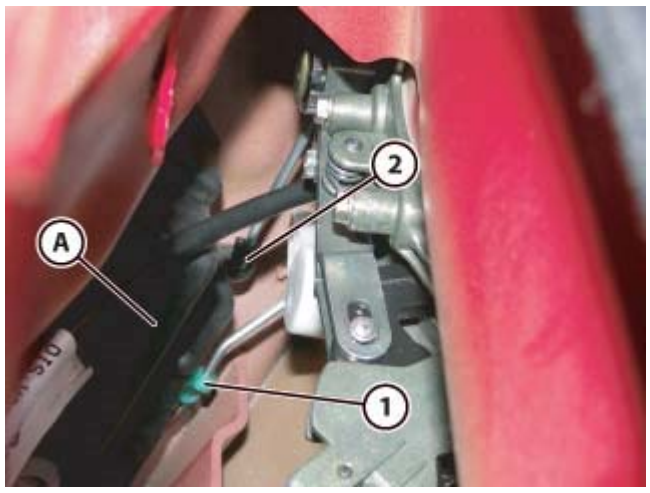
- Check that the external handle **(A)** is aligned with the door coachwork.
- Any corrections can be made by adding or removing spacers between the external handle mechanism and the door framework.

➢ Refit the roll-down window (M2.11).
➢ Refit the door panel (M2.11).

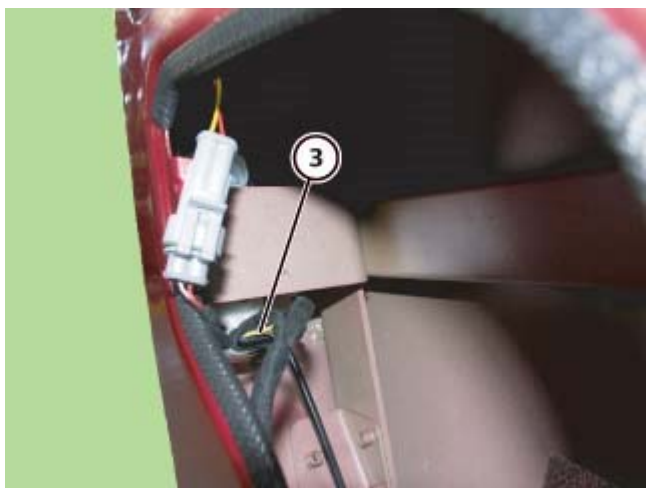
Replacing the door lock

Tightening torque		Nm	Class
Fastening of lock to door	Screw	14 Nm	B

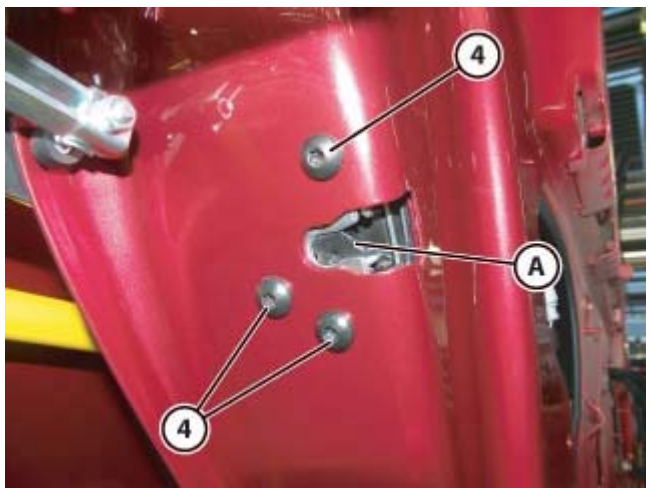
➢ Remove the roll-down window (M2.11).



- Detach the tie-rods **(1)** and **(2)** from the lock linkage.



- Disconnect the connector **(3)**.



- Undo the three screws **(4)** and remove the door lock **(A)**.
- When refitting, fasten the screws **(4)** and check that the door lock opens properly. If necessary, adjust the handle tie-rod.

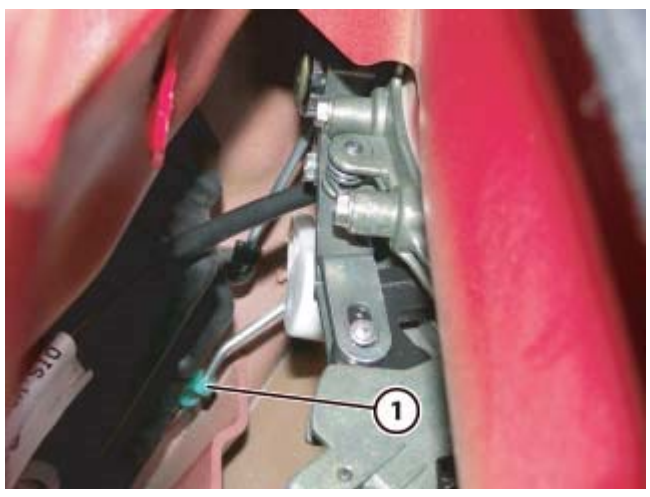
Tightening torque	Nm	Class
Screw	14 Nm	B

Replacement of the lock control block

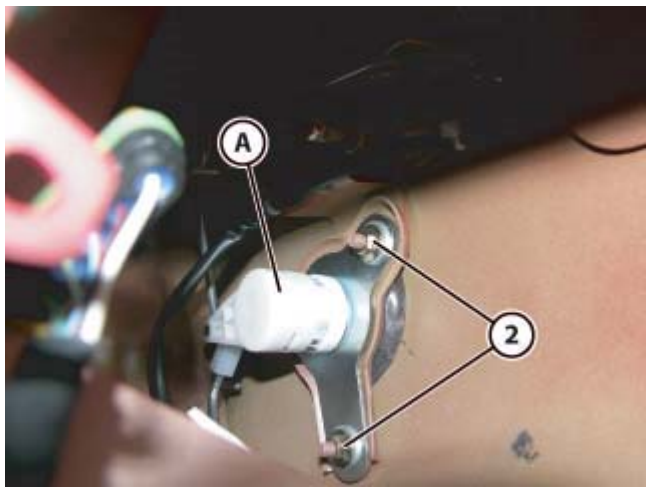
Tightening torque		Nm	Class
Safety block - door	Nut	2.6 Nm	C

The Replacement Parts Service supplies locks as complete kits. When replacing the door lock control block, all the locks on the vehicle must be replaced.

➢ Remove the roll-down window (M2.11).

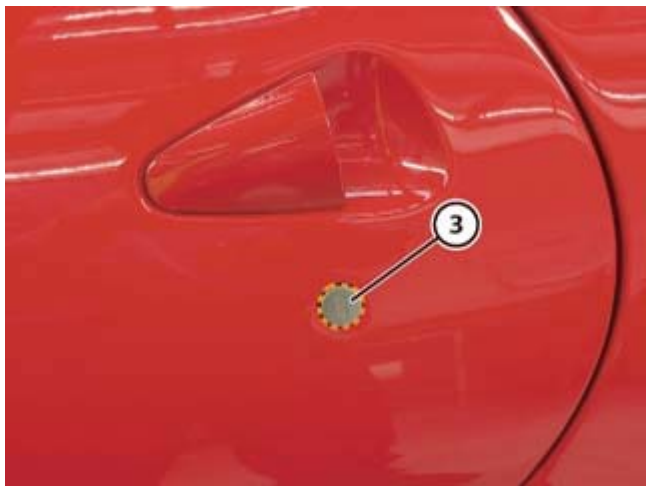


- Detach the tie-rod **(1)** from the lock linkage.



- Unscrew the two nuts **(2)** and remove the entire lock control block **(A)** from the door framework.
- When refitting, tighten the nuts **(2)**.

Tightening torque	**Nm**	**Class**
Nut	2.6 Nm	C



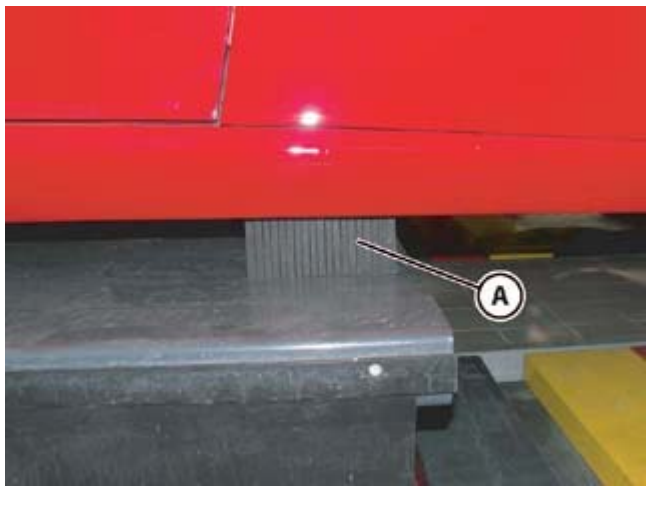
- Check that the door latch **(3)** is properly centred with respect to the door framework.

M2.12 Flat undertray parts and vehicle lifting

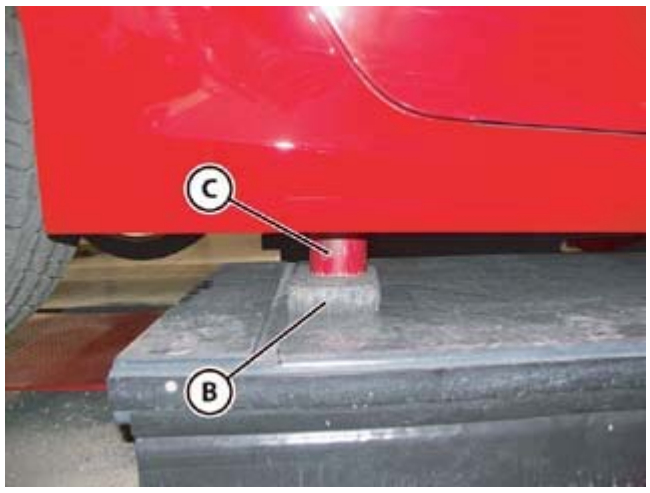
Lifting the vehicle

CAUTION

Failure to observe the operations given below may pose a serious risk of injury to persons working on or standing in the vicinity of the vehicle.



- Place the two front rubber bushings **(A)** in the positions indicated.

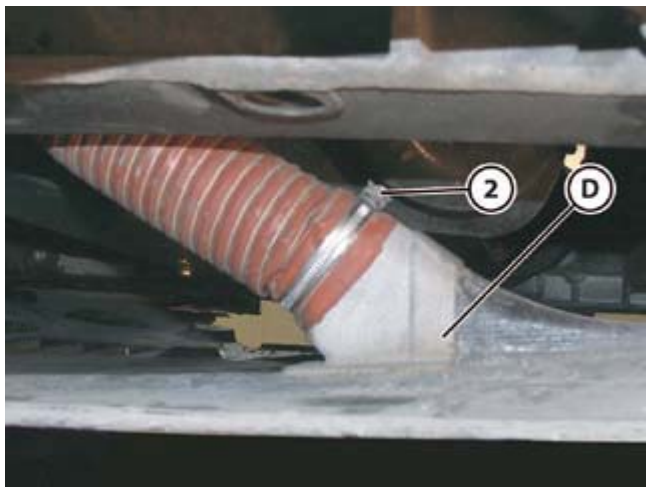


- Place the two pairs of rear rubber pads **(B)** and **(C)** in the positions indicated and then lift the vehicle.

Removing the front section of the underfloor



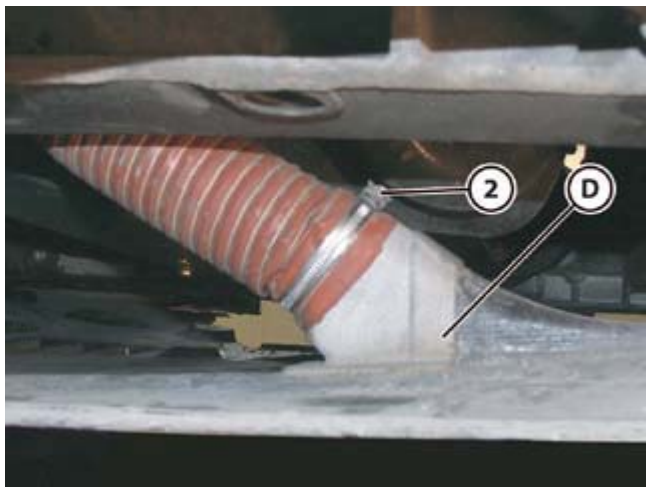
- To remove the front section **(D)** of the underfloor, undo the 29 screws **(1)**.



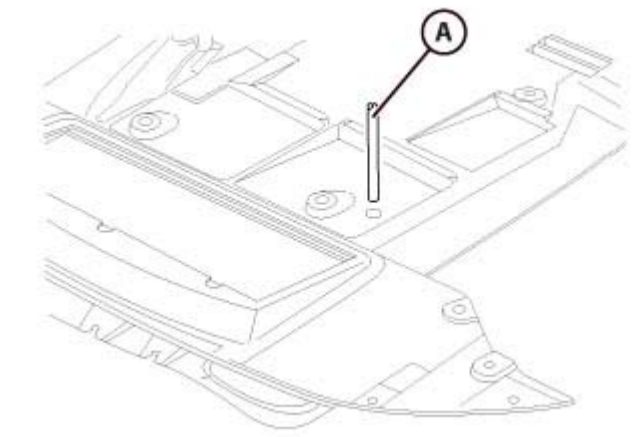
- Slowly lower the front section of the underfloor **(D)**.
- Loosen the clamp **(2)** fastening the drainage pipe.
- Remove the underfloor from the vehicle.

Refitting the front flat undertray section

To prevent damaging aerodynamic components during reassembly, use the special washers with an extra large contact surface.



- Fit the front section of the flat undertray **(D)** to the underside of the vehicle and fasten the drainage pipe to the underfloor with the clamp **(2)**.



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- Feed the lower end of the power steering tank breather pipe **(A)** through the relative pipe grommet in the front element of the flat undertray.

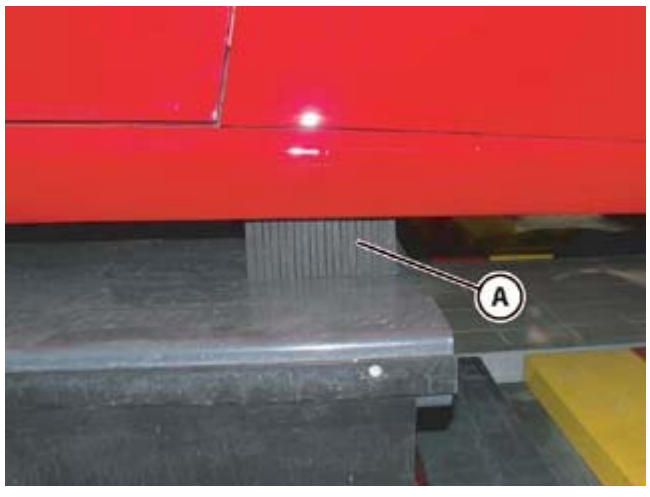


- Fit the front section of the flat undertray **(D)**, tightening the 29 screws **(1)**.
- Lower the vehicle and remove the lift point rubber pads.

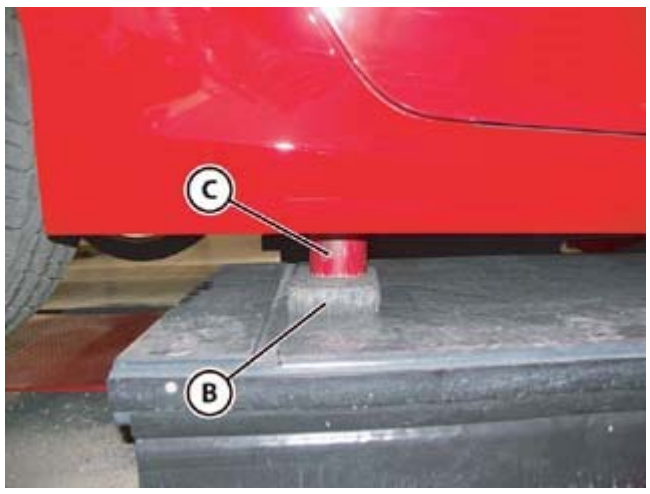
Lifting the vehicle

CAUTION

Failure to observe the operations given below may pose a serious risk of injury to persons working on or standing in the vicinity of the vehicle.

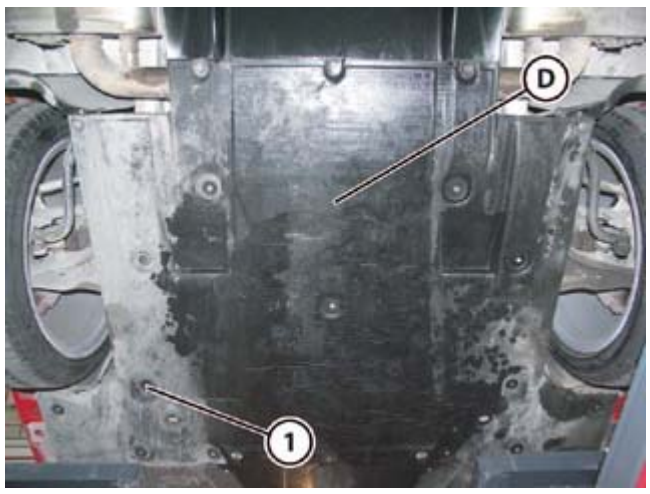


- Place the two front pads **(A)** in the positions indicated.

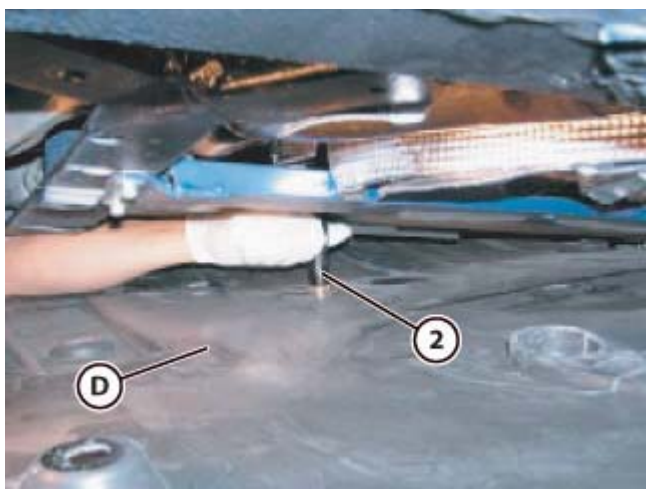


- Place the two pairs of rear pads **(B)** and **(C)** in the positions indicated, then lift the vehicle.

Removing the undertray section



- Undo the 18 screws **(1)** fastening the rear undertray section **(D)**, holding up in the centre with a hand.

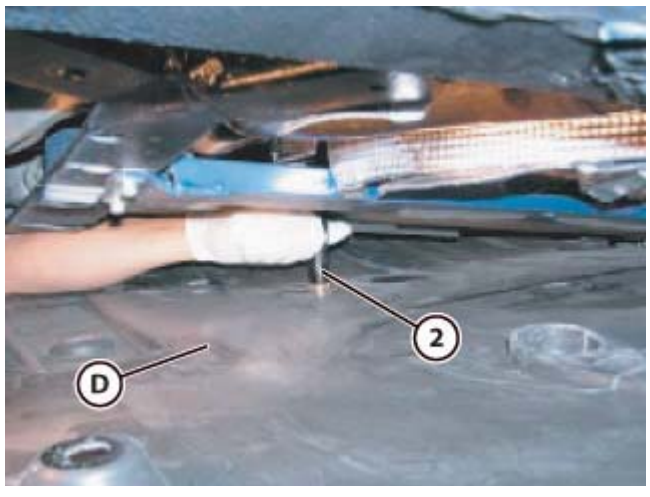


- Slowly lower the rear undertray section **(D)** and, working from the rear, remove the breather pipe **(2)** from the F1 gearbox oil tank.

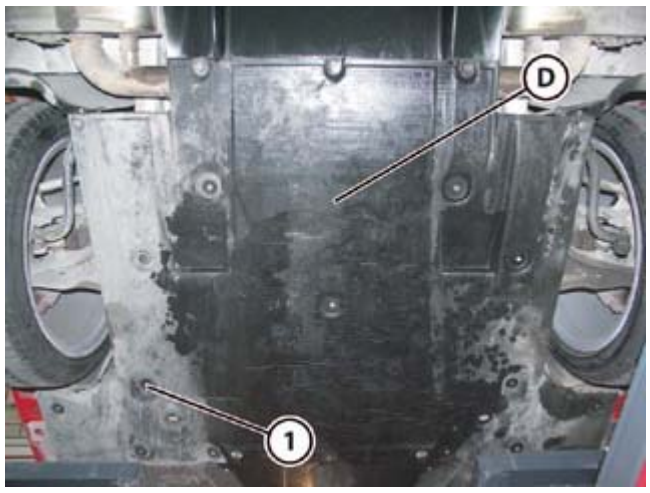
- Remove the undertray from the vehicle.

Refitting the rear underfloor section

To prevent damaging aerodynamic components during reassembly, use the special washers with an extra large contact surface.



- Bring the rear flat underfloor **(D)** towards the underside of the vehicle and push the F1 gearbox oil tank breather pipe **(2)** in completely.



- Fasten the rear section of the flat underfloor **(D)**, tightening the 18 screws **(1)**.
- Lower the vehicle and remove the rubber lift bushings.

M2.13 Door perimeter seals and trim panel

Removing the door bay perimeter seal strip



- The door bay perimeter seal strip **(A)** is a single piece and is installed in the recess in the door bay perimeter panels.
- The door bay perimeter seal strip **(A)** may need to be removed in order to remove nearby components; detach the seal strip from recess where necessary.

Refitting the door bay perimeter seal strip

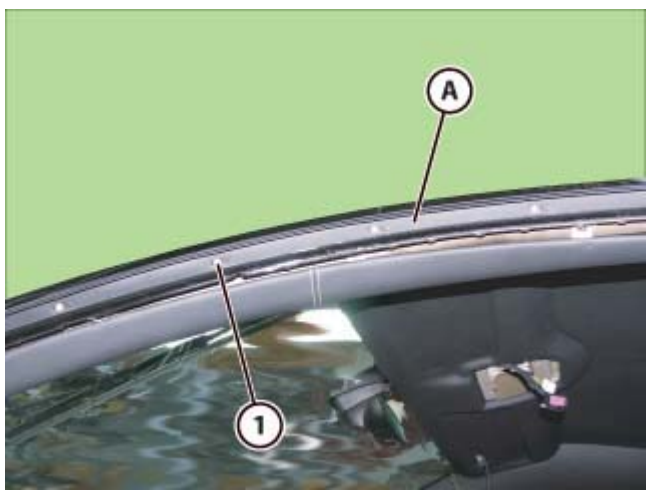


- The door bay perimeter seal strip**()** is installed without sealant or adhesive.
- Fit the door bay perimeter seal strip**()** completely in relative recess, tapping evenly around its entire length with a plastic hammer. Work with particular caution near parts of the bodywork with plated rivets.

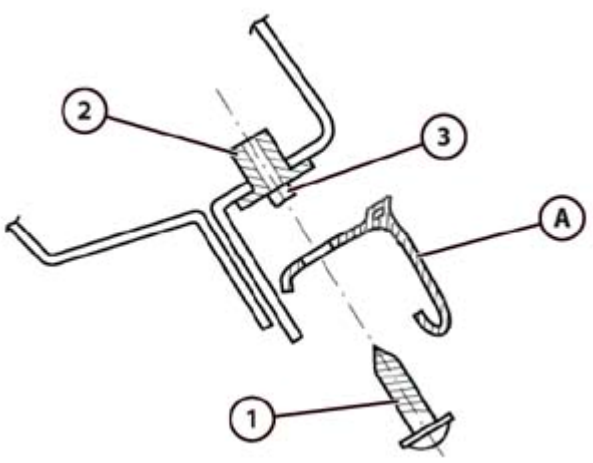
Replacing the upper door bay moulding

Tightening torque		**Nm**	**Class**
Moulding - bodyshell fastening	Screw	2 Nm	C

➢ Remove the door bay perimeter seal strip (M2.13).
Remove the upper section only.

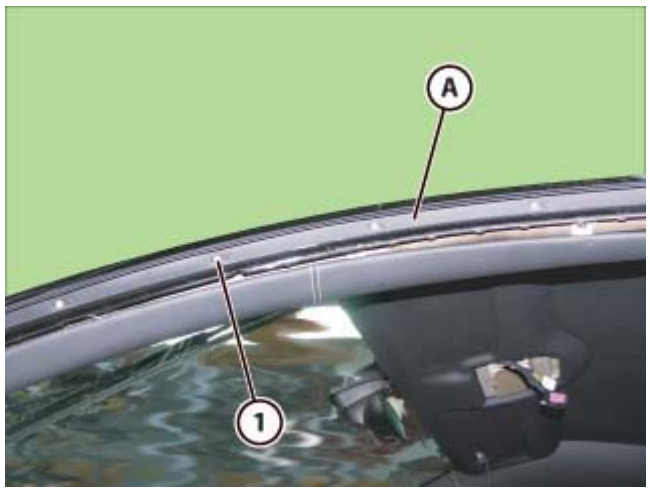


- Mark the position of the rear end of the upper door bay moulding **(A)** relative to the body to ensure that it is correctly refitted in its original position.
- Remove the upper door bay moulding **(A)**, undoing the eight screws **(1)**, and replace.



- Before fitting the new upper door bay moulding **(A)**, check the state of the blocks **(2)** near the fastener screws **(1)**.

The blocks **(2)** are fitted with guide pins **(3)** that must be inserted into the respective mounting slots. Position the blocks correctly **(2)** to prevent the guide pins **(3)** from being pushed under the upper door bay moulding**(A)**, compromising the integrity of the door seal.



- Fasten the upper door bay moulding **(A)** by aligning the rear end with the marking made during removal and tightening the eight screws **(1)**.

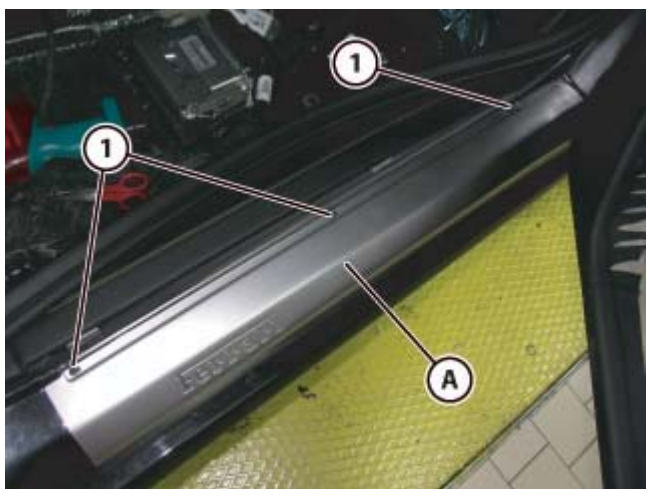
Tightening torque	Nm	Class
Screw	2 Nm	C

- Ensure that the upper door bay moulding **(A)** fits perfectly against the body.

➢ Refit the door bay perimeter seal strip (M2.13).

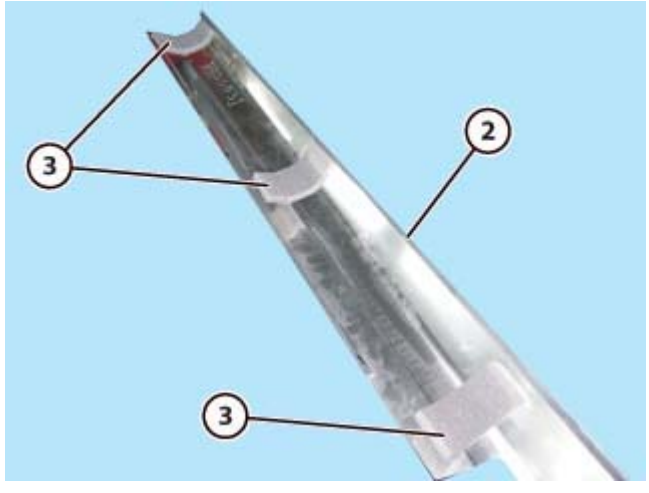
Removing the sill seal strip

➢ Remove the door bay perimeter seal strip (M2.13).
Remove the lower section only.

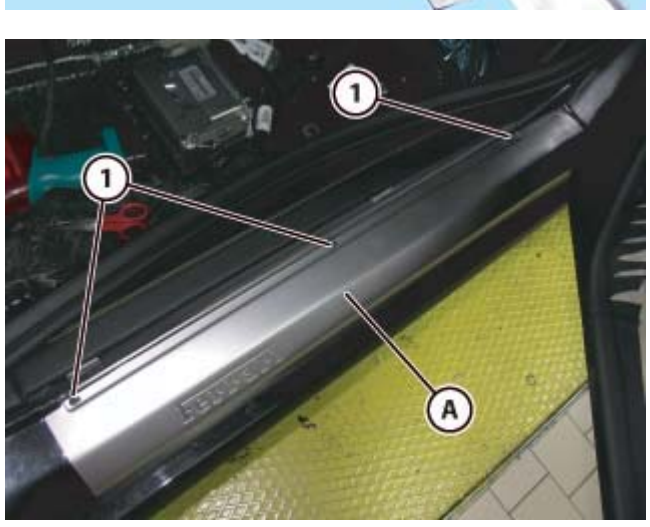


- Remove the sill seal strip **(A)** by undoing the three screws **(1)**.

Refitting the sill strip



- If the sill strip has been replaced, fit the seal **(2)** and the three sections of foam **(3)** onto the new sill strip **(A)**.



- Fit the sill strip **(A)** in its seating on the body and fasten by tightening the three screws **(1)**.

➢ Refit the door bay perimeter seal strip (M2.13).

Removing the door sill trim panel

➢ Remove the front wheelhouses (M2.05).
Remove the rear element.

➢ Remove the rear wheelhouses (M2.05).

Remove the front element.

- Remove the sill seal strip (M2.13).
- Remove the passenger compartment and roof trim panels (M2.22).

Remove the centre pillar trim panel.



- At the front of the vehicle, undo the lower fastener screw indicated.



- Inside the front fender, undo the two upper fastener nuts indicated.



- At the rear of the vehicle, undo the lower fastener screw indicated.



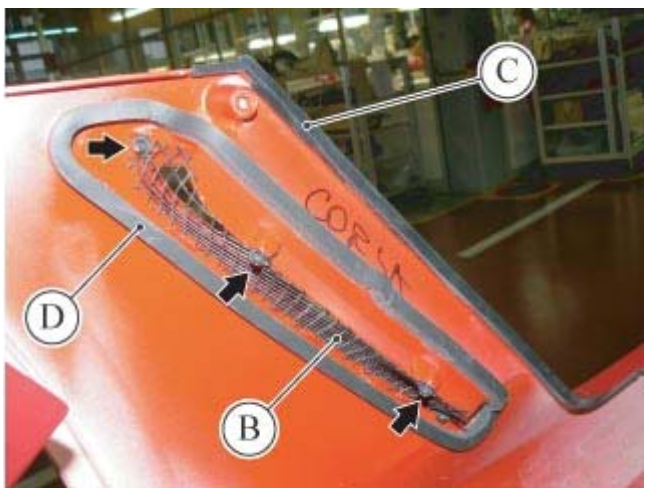
- Inside the rear fender, undo the two upper fastener nuts indicated.



- In the passenger compartment, undo the internal fastener nut indicated.



- In the middle of the vehicle, undo the four centre fastener screws indicated.
- Remove the sill trim **(A)**.



- If necessary, replace the grille **(B)**, undoing the three fastener screws.
- If necessary, replace the seal **(C)**.
- If necessary, replace the seal **(D)**.

Refitting the sill trim

Tightening torque		**Nm**	**Class**
External underdoor trim panel - bodyshell	Screw	4.4 Nm	C



- Fit the door sill trim panel **(A)** in the vehicle.
- In the middle of the vehicle, tighten the four centre fastener screws indicated.

Tightening torque	**Nm**	**Class**
Screw	4.4 Nm	C



- In the passenger compartment, tighten the internal fastener nut indicated.

Tightening torque	**Nm**	**Class**
Screw	4.4 Nm	C



- Inside the rear fender, tighten the two upper fastener nuts indicated.

Tightening torque	Nm	Class
Screw	4.4 Nm	C



- At the rear of the vehicle, tighten the lower fastener screw indicated.

Tightening torque	Nm	Class
Screw	4.4 Nm	C



- Inside the front fender, tighten the two upper fastener nuts indicated.

Tightening torque	Nm	Class
Screw	4.4 Nm	C



- At the front of the vehicle, tighten the lower fastener screw indicated.

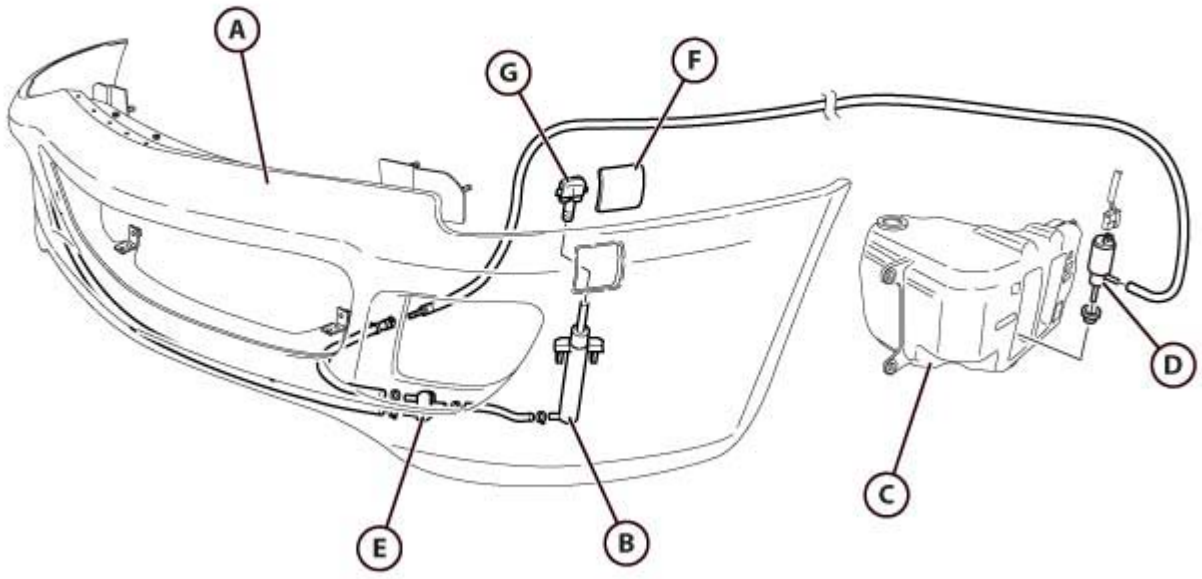
Tightening torque	Nm	Class
Screw	4.4 Nm	C

- Refit the passenger compartment and roof trim panels (M2.22).
- Refit the sill strip (M2.13).
- Refit the rear wheelhouses (M2.05).
- Refit the front wheelhouses (M2.05).

M2.14 Headlight washer

Headlight washer system layout

The headlight washer system consists of an electric pump, a timer and two telescopic retractable spray nozzles housed in the front bumper.
The electric pump **(D)** is installed on the tank **(C)** containing the fluid shared with the windscreen washer system.
The entire headlight washer and nozzle lifting mechanism **(B)** is housed in the bumper; when not in use, the telescopic spray nozzles **(G)** are concealed by a protective cover **(F)**, mounted onto the nozzle itself.
To wash the headlight correctly, operate the stalk on the steering wheel twice in succession, with the low beam lights switched on.
The system exploits the pressure created by the pump in the circuit to raise the spray nozzles **(G)** and optimise jet orientation. The cycle is determined by a timer; once the cycle is completed, the pump is deactivated and the spray nozzles fall back into the rest position.
Check that the spray nozzle outlets **(G)** are clean.
As the pump is not self priming, the fluid pickup duct must be immersed at all times to ensure correct function.



A - Bumper
B - Headlight washer nozzles
C - Tank
D - Pump
E - Three-way union
F - Cover

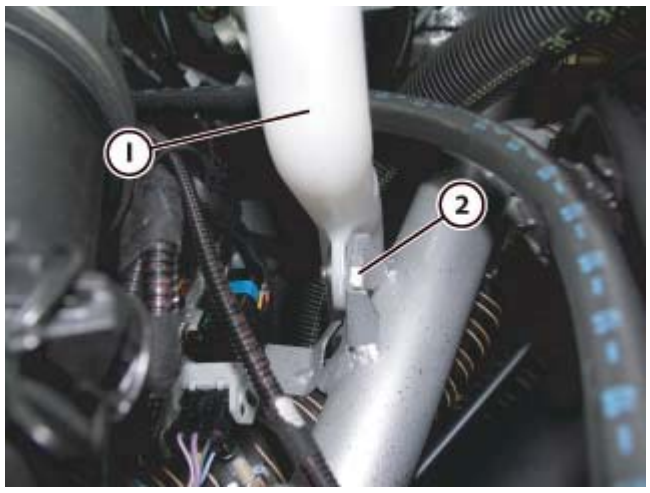
Removing the windscreen washer-headlight washer tank

- Set the battery master switch to OFF (L2.02).
- Remove the engine compartment shields on the fenders (M2.17).
  Remove the left hand component.

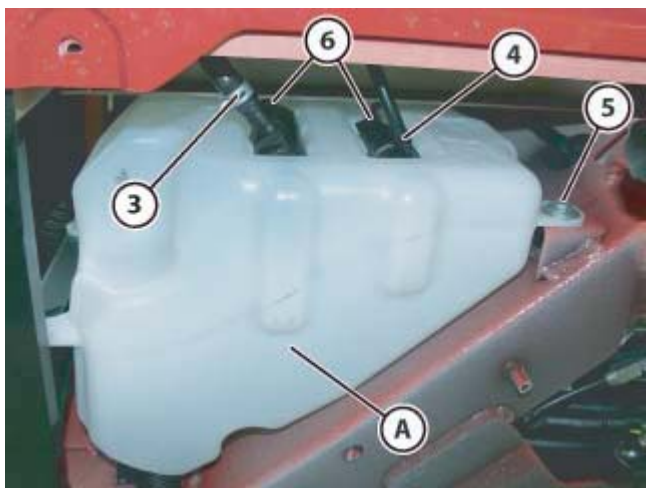
- Remove the front section of the underfloor (M2.12).
- Remove the front left hand wheelhouse (M2.05).
  Remove the rear section only.



- Working from the wheel bay, disconnect the windscreen washer-headlight washer fluid level sensor connector **(1)** (S045).



- Working from the engine compartment, undo the screw **(2)** fastening the filler neck **(I)** to the bodywork.



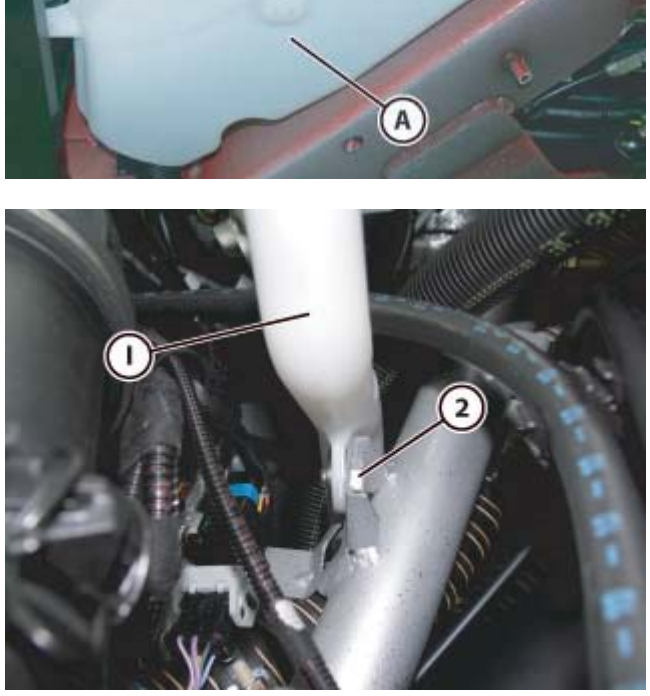
- Detach the two windscreen washer-headlight washer fluid delivery lines **(3)** and **(4)** leading from the pumps
- Undo the four screws **(5)** fastening the tank to the chassis and slower lower the tank **(A)** in order to disconnect the connectors **(6)** (M015) (M016) from the two pumps.

- Remove the windscreen washer-headlight washer fluid tank, complete with filler neck, from the vehicle.

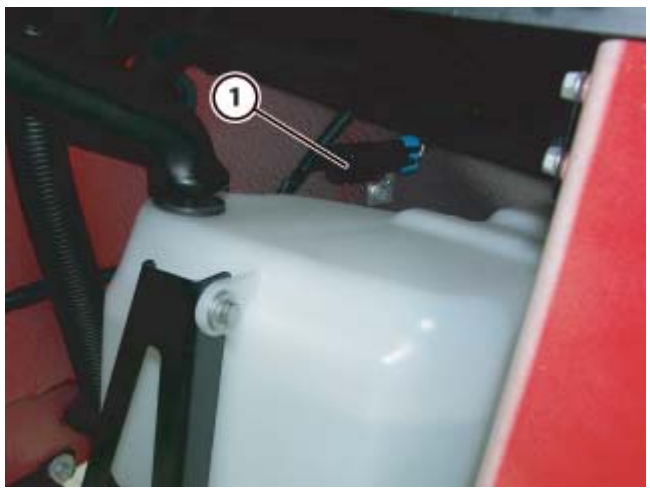
Refitting the windscreen washer-headlight washer tank



- Working from underneath the vehicle, fit the windscreen washer-headlight washer fluid tank **(A)** into its relative seat on the chassis after connecting the connectors **(6)** (M015) (M016) for the two pumps.
- Fit the tank **(A)** and fasten to the vehicle chassis with the four screws **(5)**.
- Connect the delivery pipes **(3)** and **(4)** to the respective pumps.



- Working from the engine compartment, fasten the filler neck **(I)** by hand tightening the screw **(2)**.



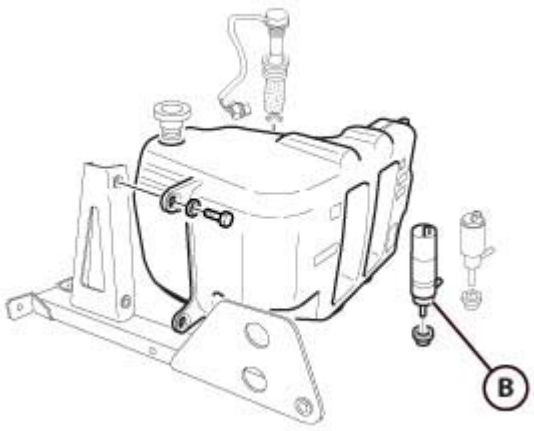
- Working from the wheel bay, connect the windscreen washer-headlight washer fluid level sensor connector **(1)** (S045).

➢ Refit the front left hand wheelhouse (M2.05).

➢ Refit the front flat undertray section (M2.12).
➢ Refit the engine compartment shields on the fenders (M2.17).
➢ Set the battery master switch to ON (L2.02).

Replacing the headlight washer pump

➢ Remove the windscreen washer-headlight washer tank (M2.08).

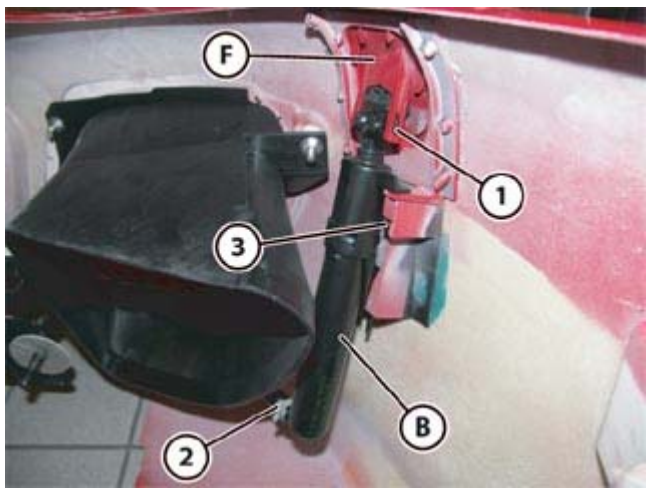


- Remove the headlight washer pump **(B)** from the tank and replace.
- Refit the pump **(B)** onto the tank as originally mounted.

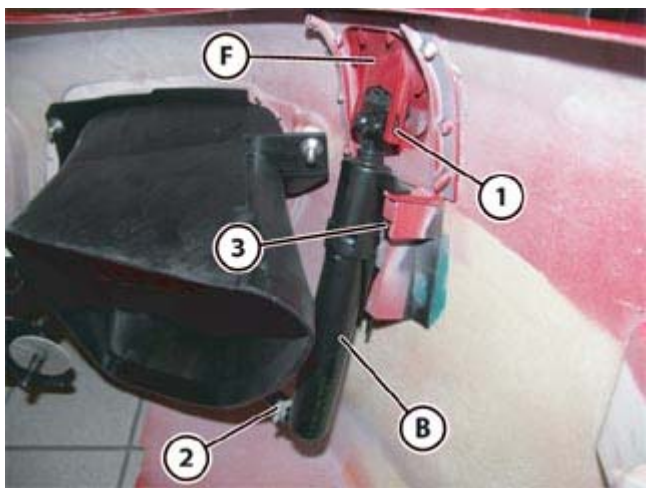
➢ Refit the windscreen washer-headlight washer tank (M2.08).

Replacing the headlight washer

➢ Remove the front bumper (M2.03).



- Push the two lugs **(1)** of the cover **(F)** outward to release from the telescopic spray nozzle.
- Remove the cover **(F)** from the outer surface of the bumper.
- Disconnect the pipe **(2)** from the headlight washer **(B)**.
- Push the two lugs **(3)** towards the bumper wall and lift the headlight washer to detach it from the bracket on the bumper.
- Remove the headlight washer **(B)** and replace.

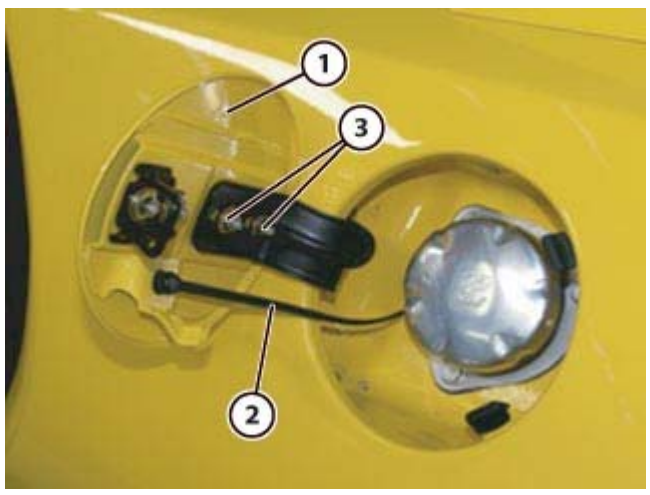


- To refit, push the headlight washer **(B)** onto the relative bracket on the bumper until the two lugs **(3)** snap into place.
- Fit the headlight washer fluid pipe **(2)** onto the headlight washer **(B)**.
- Working from outside the bumper, fit the cover **(F)** into its relative seat and fasten to the telescopic sprayer nozzle, press-fitting the two lugs **(1)**.

➢ Refit the front bumper (M2.03).

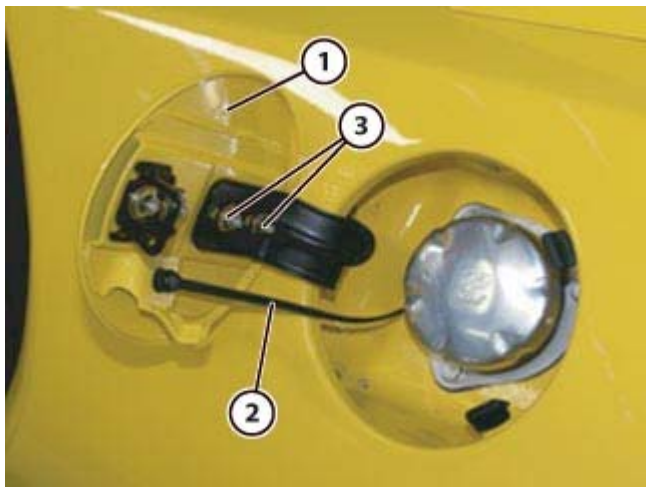
M2.15 Fuel filler flap

Removing the fuel filler flap



- To remove the flap **(1)**, detach the strap **(2)** securing the cap to the flap.
- Unscrew the two nuts **(3)** and remove the flap complete with fastener bracket.

Refitting the fuel filler flap



- Fit the flap **(1)**, inserting the stud bolts in their respective seats on the hinge.
- Tighten the nuts **(3)**.
- Fit the slot in the strap **(2)** over the pin on the flap.
- Check that the flap closes properly and that when closed, the outer edges of the flap are equidistant from the bodywork.
- If the flap is not centred correctly in the recess, loosen the nuts **(3)** and shift the flap slightly into the correct position.
- Lastly, check that the lock/release mechanism functions correctly.

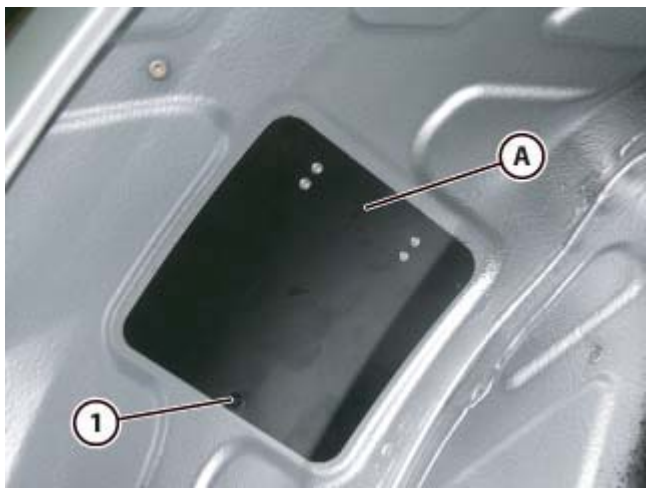
M2.16 Fuel tank filler neck

Replacing the fuel tank filler neck

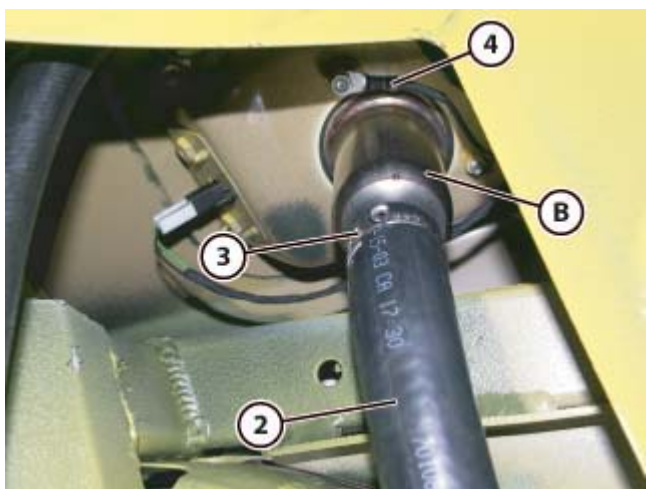
Tightening torque		**Nm**	**Class**
Ground cable to fuel filler neck	Nut	4.5 Nm	B

CAUTION
Fuel is highly flammable.

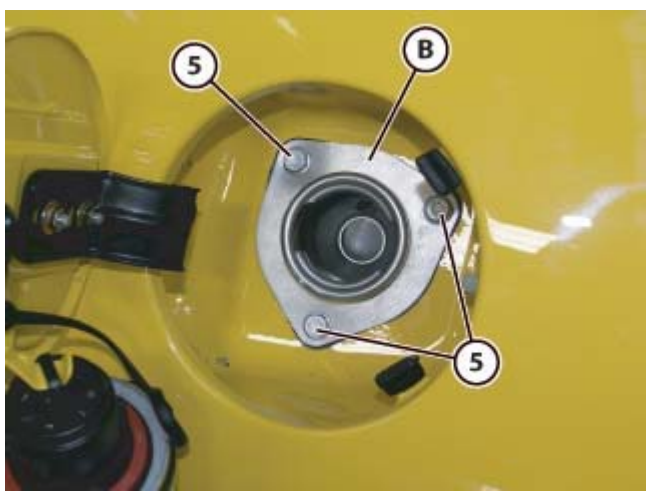
➢ Remove the rear left hand wheelhouse (M2.05).



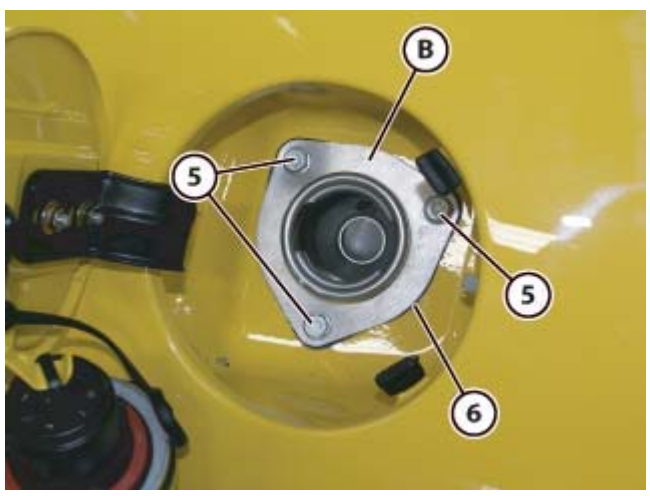
- Working from the rear left wheel bay, remove the fuel filler flap **(A)** undoing the screw **(1)** fastening the component to the body.



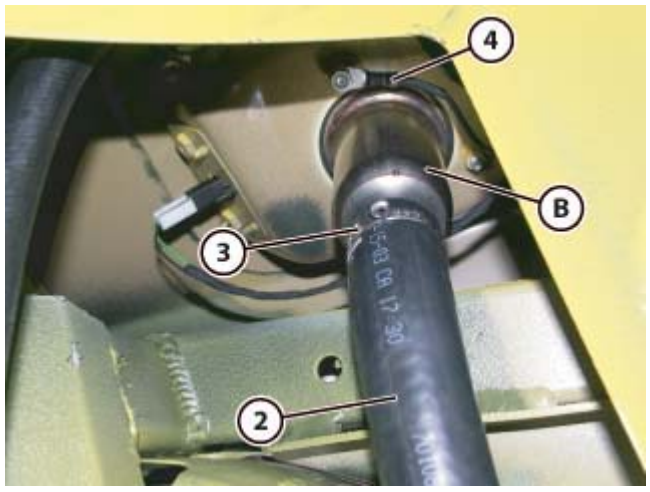
- Detach the tube **(2)** from the fuel filler neck **(B)** removing the clamp **(3)**.
- Remove the earth cable **(4)** (G325) from the body undoing the relative fastener nut.



- After removing the filler cap, undo the three screws **(5)** fastening the fuel filler neck **(B)** to the body.
- Pull the fuel filler neck **(B)** out upwards and replace.

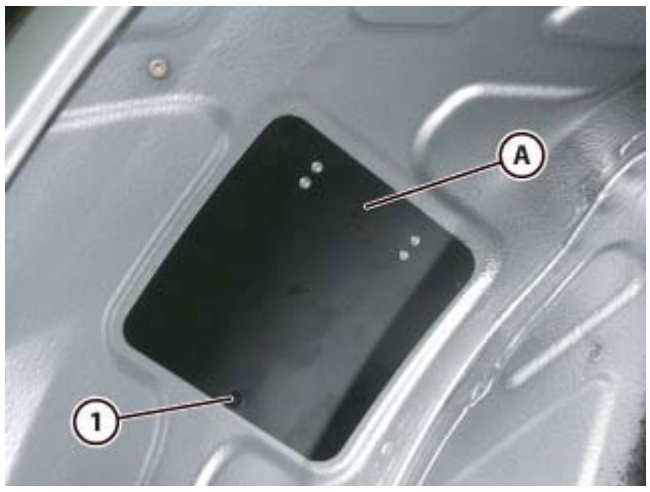


- When refitting, fit the seal **(6)** correctly on as originally installed on the body, then fit the fuel filler neck **(B)** into its respective seat.
- Fasten the fuel filler neck **(B)** to the body by tightening the three screws **(5)**.
- Screw on the filler cap and close the fuel filler flap.



- Working from the rear wheelbay, fasten the earth cable **(4)** (G325) to the body, tightening the relative nut; fit the pipe **(2)** onto the fuel tank filler neck **(B)** and fasten with the clamp **(3)**.

Tightening torque	Nm	Class
Nut	4.5 Nm	B

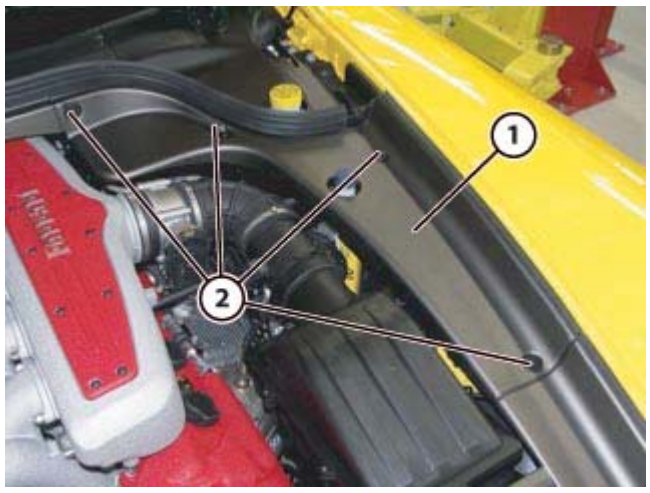


- Fit the filler flap **(A)** and fasten with the screw **(1)**.

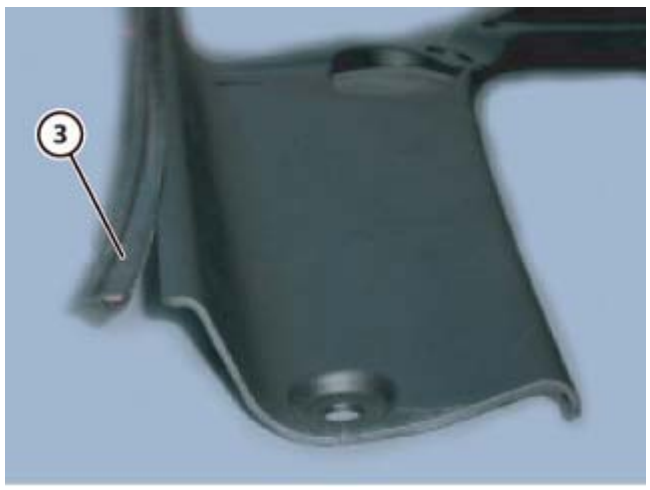
➢ Refit the rear left hand wheelhouse (☞ M2.05).

M2.17 Engine compartment guards

Removing the engine compartment shields on the fenders

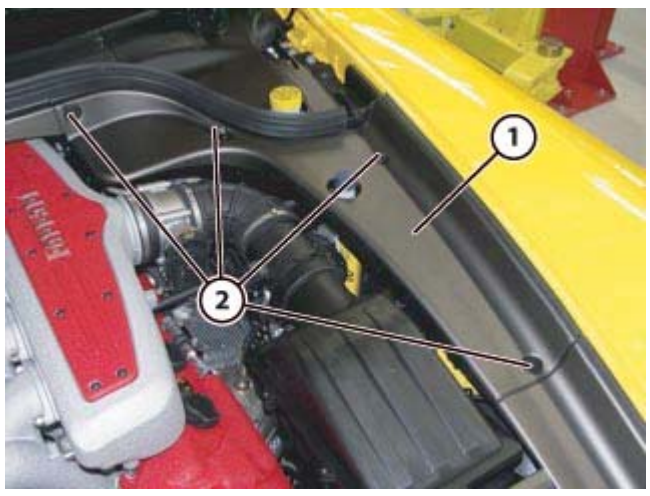


- To remove the lateral shield, **(1)** undo the four screws **(2)** fastening it to the vehicle bodyshell.



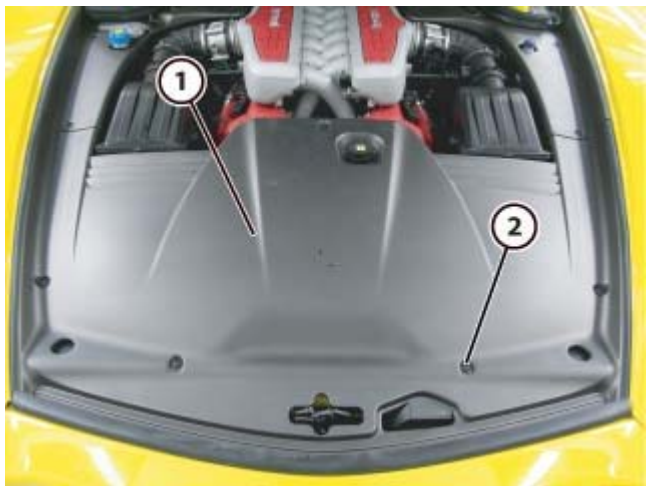
- The side seal strip **(3)** may be removed from the bumper wall with the bumper wall removed from the vehicle.
- To refit, apply the adhesive side of the seal **(3)** to the top of the lateral tab on the wall; remove the adhesive lining and bond the seal to the wall.

Refitting the engine compartment shields on the fenders

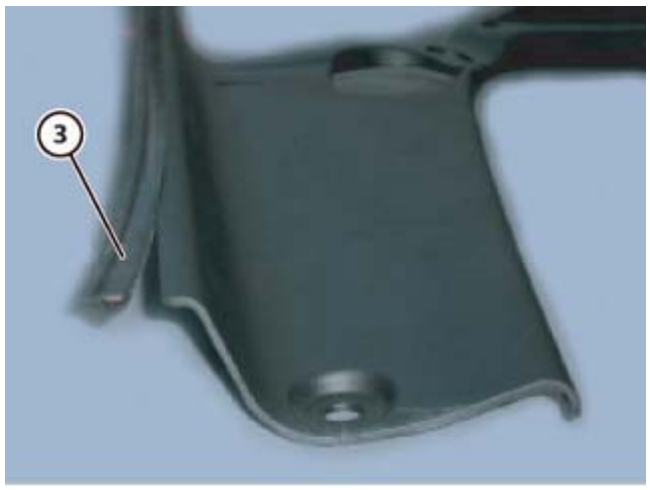


- Fit the shield **(1)** on the bodywork and check that it is properly aligned with the bodywork and with the other shields.
- Tighten the four screws **(2)** fastening the shield.

Removing the central engine compartment shield

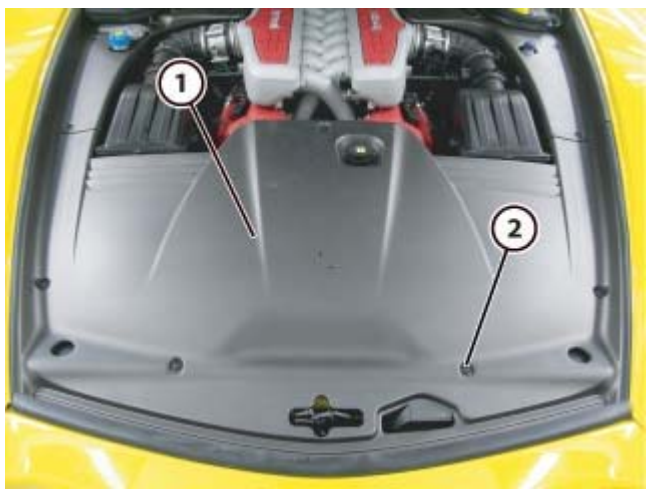


- To remove the central shield **(1)**, undo the six screws **(2)** along the perimeter of the shield.



- The seals **(3)** on the right hand edge of the wall may be replaced once the wall has been removed.
- To refit, apply the adhesive side of the seals **(3)** to the top of the tabs on the left and right hand edges of the wall; remove the adhesive lining and bond the seal to the wall.

Refitting the central engine compartment shield



- Fit the central shield **(1)**, fitting the rear portion underneath the fenders and ensuring that the shield is equidistant from the body on all sides, and fasten by tightening the six screws **(2)**.

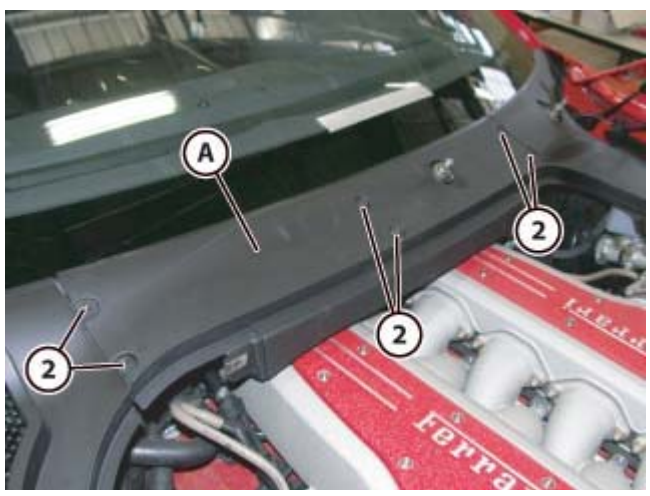
Removing the underwindscreen shields

The windscreen shields consist of three elements, fixed to one another and to the vehicle chassis: central part (A), left hand side (B) and right hand side (C).

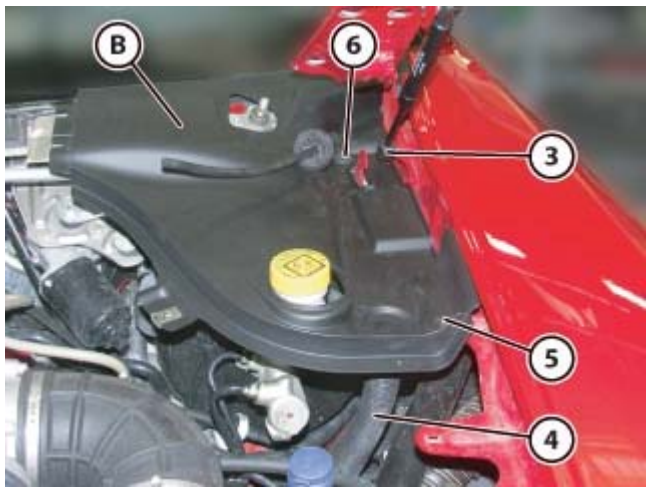
- Remove the engine compartment lid (M2.01).
- Remove the engine compartment shields on the fenders (M2.17).
- Remove the windscreen wiper arms (M2.07).



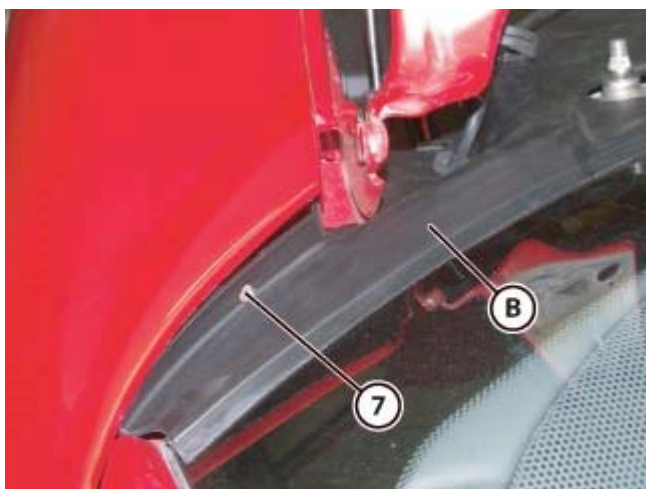
- Remove the gasket **(1)** from the guards.



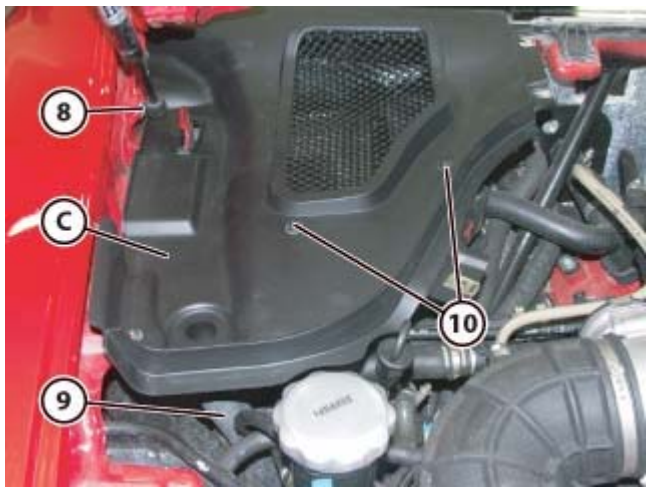
- Undo the screws **(2)** and remove the central shield **(A)**.



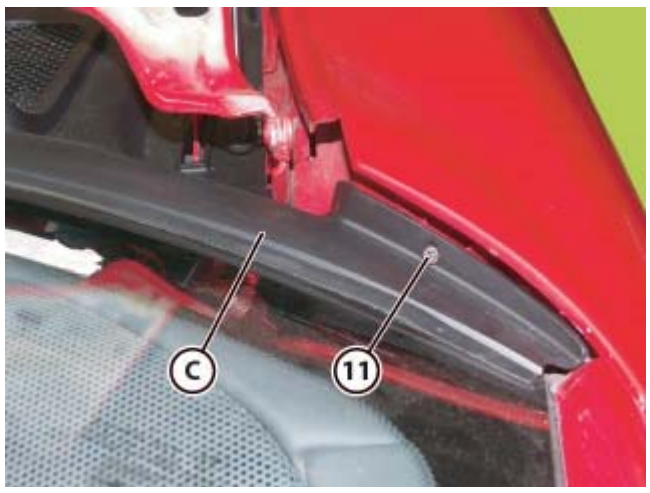
- Remove the gas strut **(3)** from the coachwork and undo the relative fastener pin.
- Remove the drainage pipe **(4)** from the shield, undo the screw **(5)** and pull out the windscreen washer fluid pipe **(6)**.



- Undo the screw **(7)** under the windscreen and remove the left hand side shield **(B)**.



- Detach the gas strut **(8)** from the bodywork and undo the relative fastener pin.
- Detach the drainage pipe **(9)** and undo the screws **(10)** fastening the shield **(C)**.



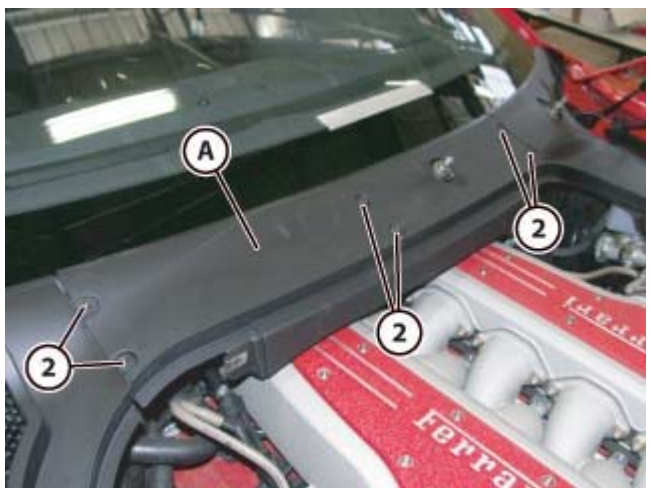
- Undo the screw **(11)** under the windscreen and remove the right hand side shield **(C)**.

Removing the central windscreen shield

- Remove the engine compartment shields on the fenders (☞ M2.17).
- Remove the windscreen wiper arms (☞ M2.07).
  - Remove the right hand component only.



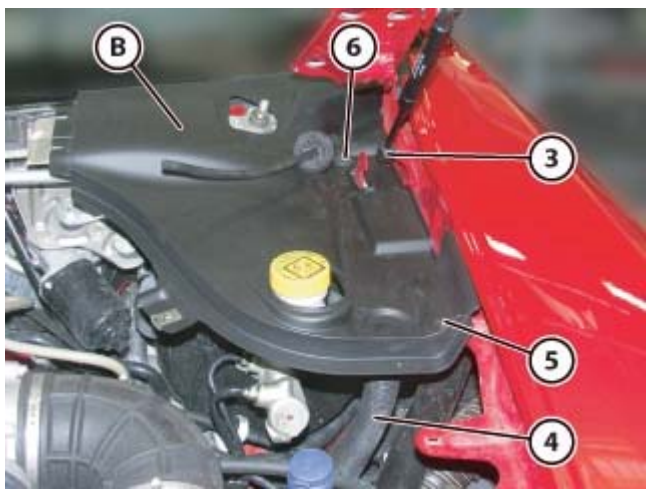
- Remove the seal **(1)** from the shields.



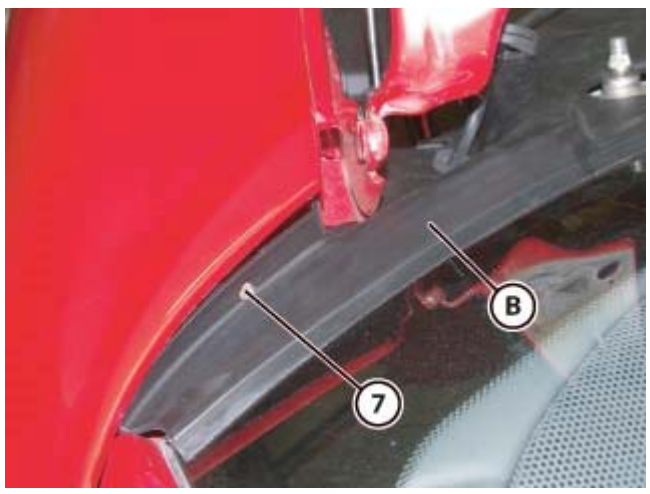
- Undo the screws **(2)** and remove the central shield **(A)**.

Removing the left hand side windscreen shield

➢ Remove the engine compartment lid (☞ M2.01).
➢ Refit the central windscreen shield.
➢ Remove the windscreen wiper arms (☞ M2.07).



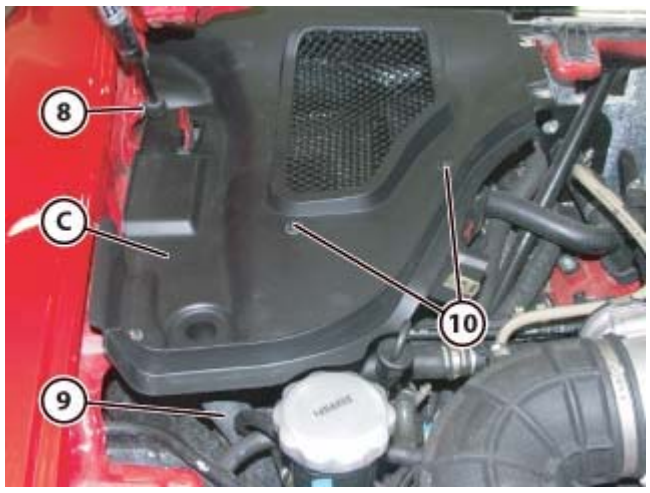
- Remove the gas strut **(3)** from the bodywork and undo the relative fastener pin.
- Remove the drainage pipe **(4)** from the shield, undo the screw **(5)** and pull out the windscreen washer fluid pipe **(6)**.



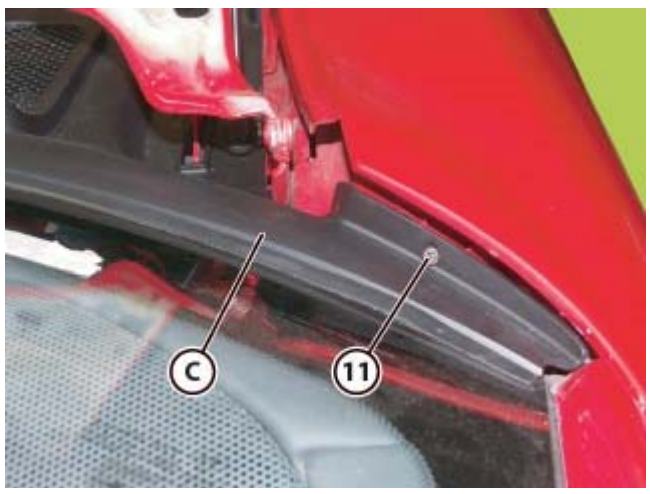
- Undo the screw **(7)** under the windscreen and remove the left hand side shield **(B)**.

Removing the right hand side windscreen shield

➢ Remove the engine compartment lid (☞ M2.01).
➢ Refit the central windscreen shield.

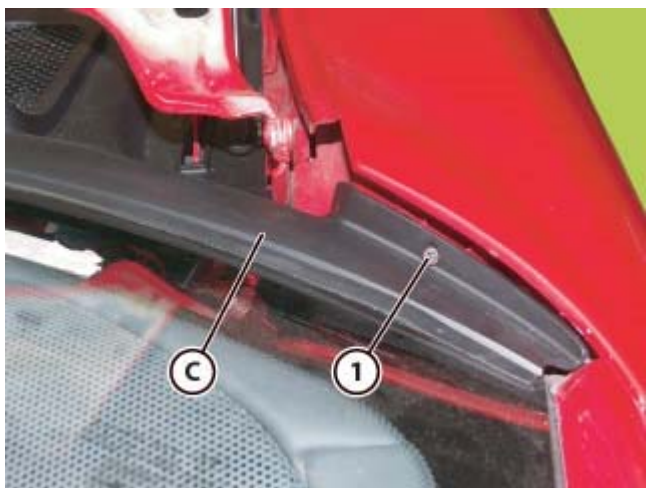


- Detach the gas strut **(8)** from the bodywork and undo the relative fastener pin.
- Detach the drainage pipe **(9)** and undo the screws **(10)** fastening the shield **(C)**.

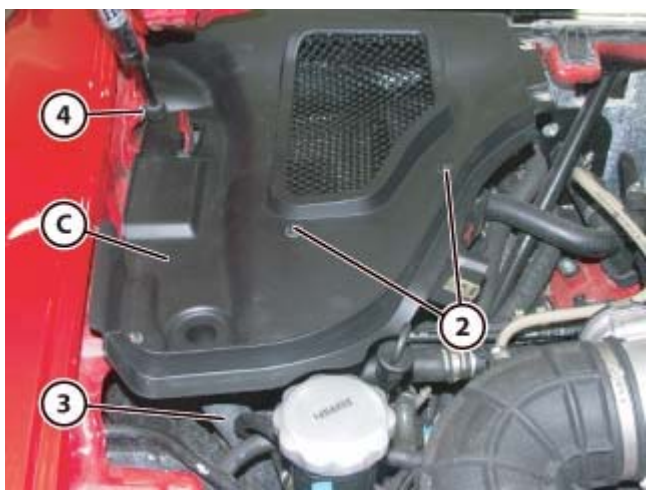


- Undo the screw **(11)** under the windscreen and remove the right hand side shield **(C)**.

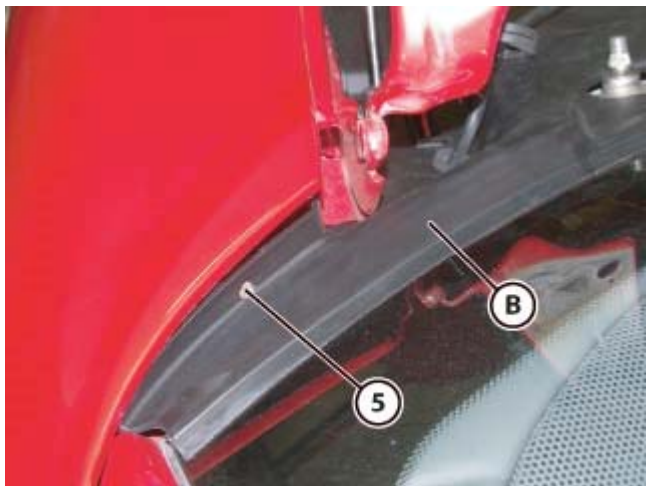
Refitting the underwindscreen shields



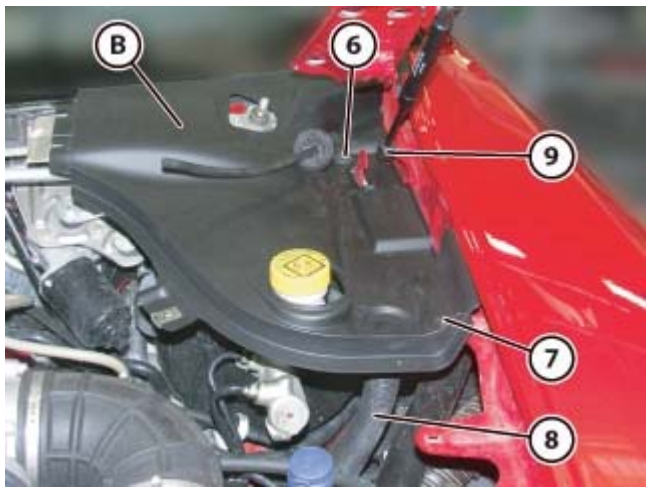
- Fit the right hand side shield **(C)** and fasten by tightening the screw **(1)**.



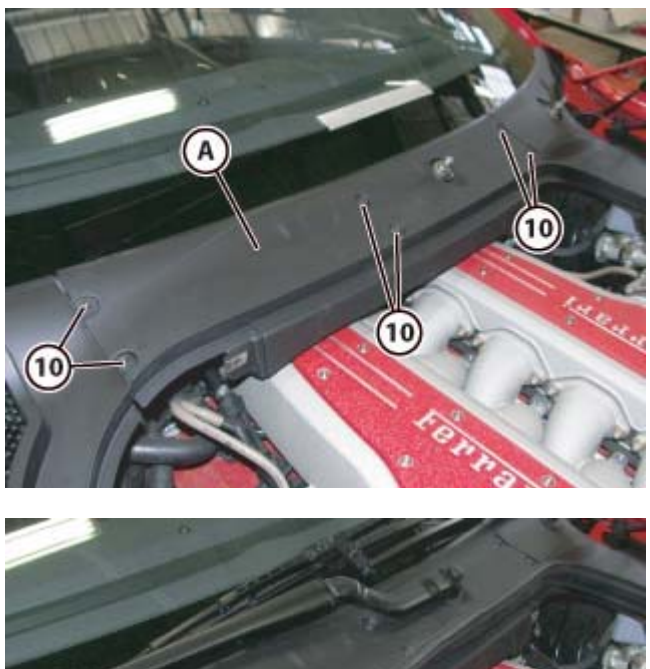
- Tighten the screws **(2)** on the shield **(C)**, connect the drainage pipe **(3)**, fit the gas strut fastener pin and fit the gas strut **(4)** in its seat.



- Fit the left hand side shield **(B)** and fasten by tightening the screw **(5)**.



- Fit the windscreen washer pipe **(6)** and tighten the screw **(7)** on the shield **(B)**.
- Connect the drainage pipe **(8)**, fit the gas strut fastening pin and fit the gas strut **(9)** in its seat on the shield.



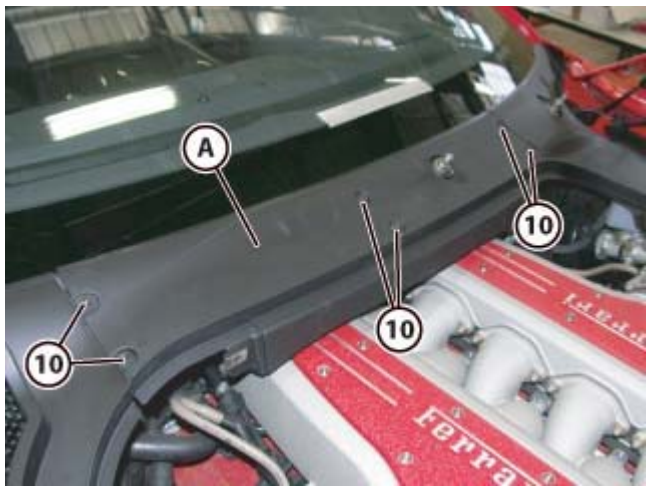
- Fit the central shield **(A)** and fasten by tightening the screws **(10)**.



- Refit the seal **(11)** as originally installed.

- Refit the windscreen wiper arms (M2.07).
- Refit the engine compartment shields on the fenders (M2.17).
- Refit the engine compartment lid (M2.01).

Refitting the central underwindscreen shield



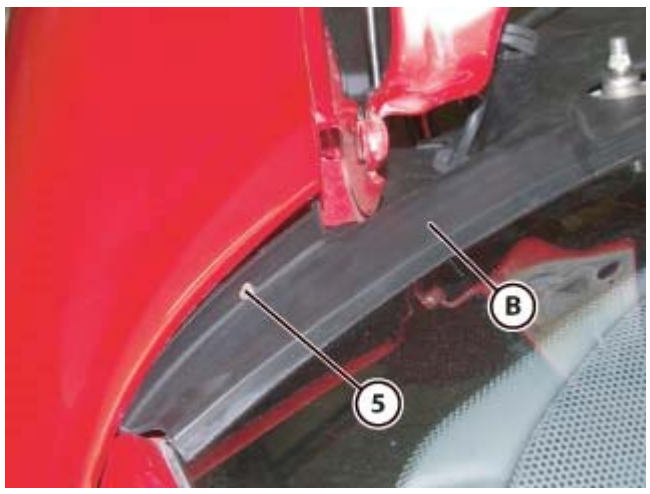
- Fit the central shield **(A)** and fasten by tightening the screws **(10)**.



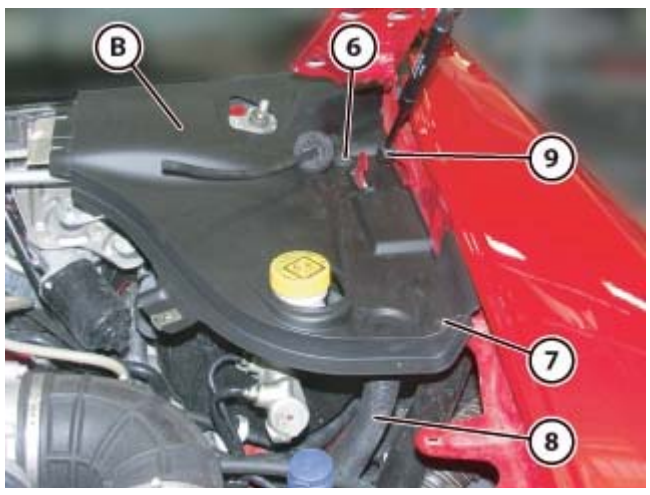
- Refit the seal **(11)** as originally installed.

➢ Refit the windscreen wiper arms (M2.07).
➢ Refit the engine compartment shields on the fenders (M2.17).

Refitting the left hand side underwindscreen shield



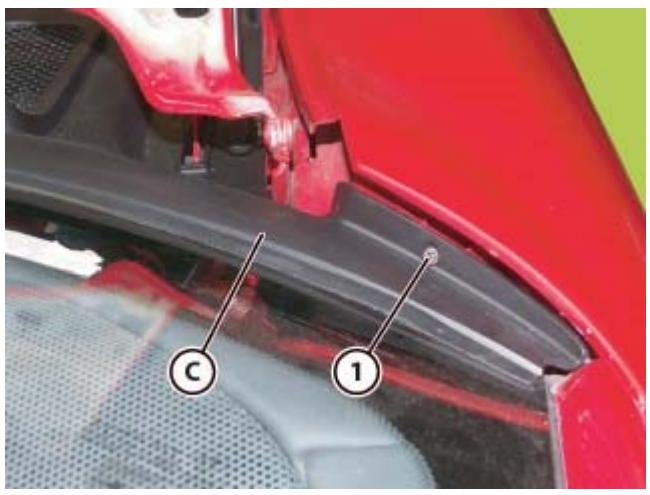
- Fit the left hand side shield **(B)** and fasten by tightening the screw **(5)**.



- Fit the windscreen washer pipe **(6)** and tighten the screw **(7)** on the shield **(B)**.
- Connect the drainage pipe **(8)**, fit the gas strut fastening pin and fit the gas strut **(9)** in its seat on the shield.

➢ Refit the central windscreen shield.
➢ Refit the windscreen wiper arms (M2.07).
➢ Refit the engine compartment lid (M2.01).

Refitting the right hand side underwindscreen shield



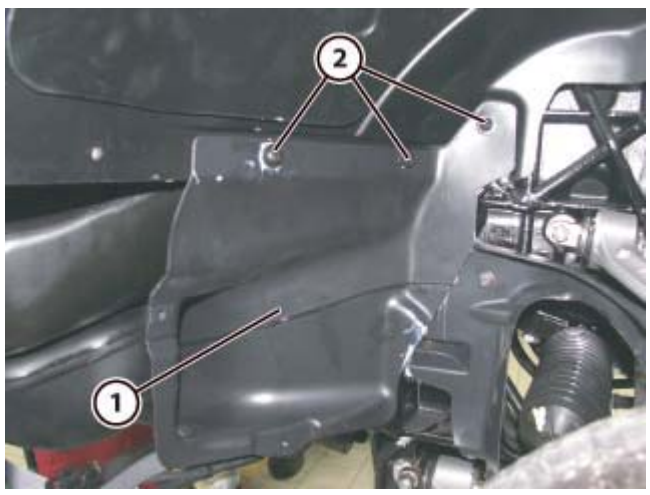
- Fit the right hand side shield **(C)** and fasten by tightening the screw **(1)**.

- Tighten the screws **(2)** on the shield **(C)**, connect the drainage pipe **(3)**, fit the gas strut fastener pin and fit the gas strut **(4)** in its seat.

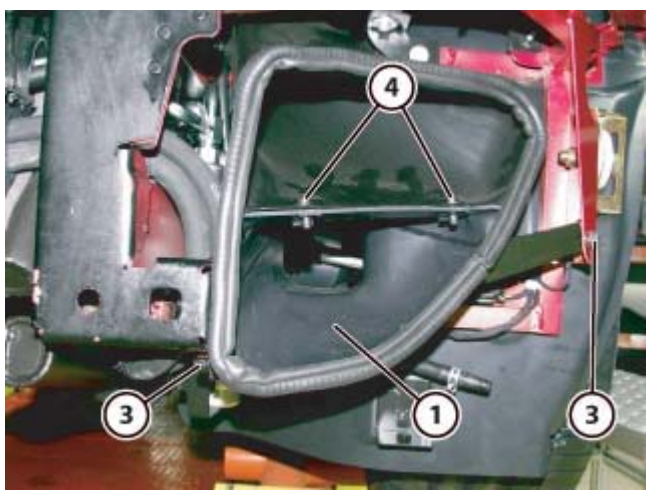
➢ Refit the central underwindscreen shield.
➢ Refit the engine compartment lid (M2.01).

Removing the engine compartment subchassis stiffener bar

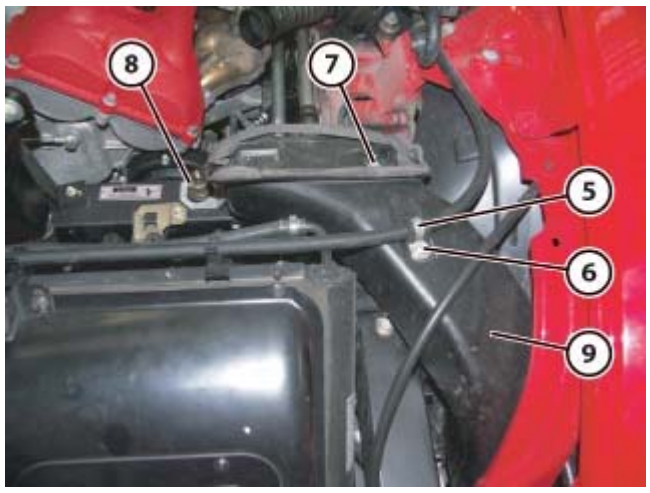
➢ Remove the air intake (B6.03).
➢ Remove the central engine compartment shield (M2.17).
➢ Remove the front bumper (M2.03).



- Undo the three screws **(2)** fastening the lower air duct **(1)** to the bodywork.

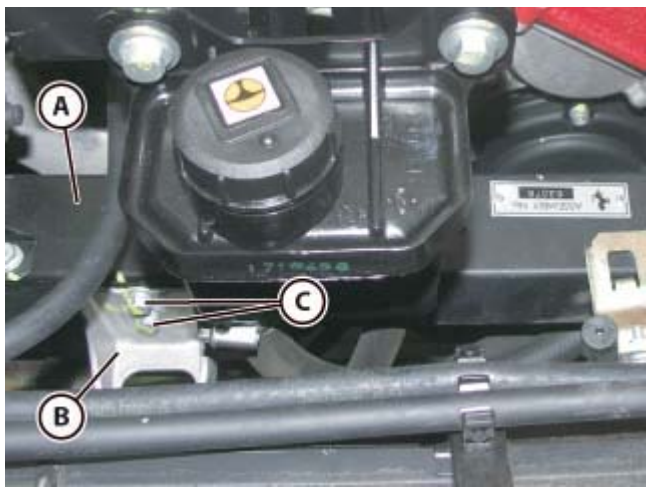


- Undo the screws **(3)** and the fastener screws **(4)** on the bodywork and on the upper air duct.
- Remove the air duct gasket.
- Remove the lower air duct from the wheel bay **(1)**.

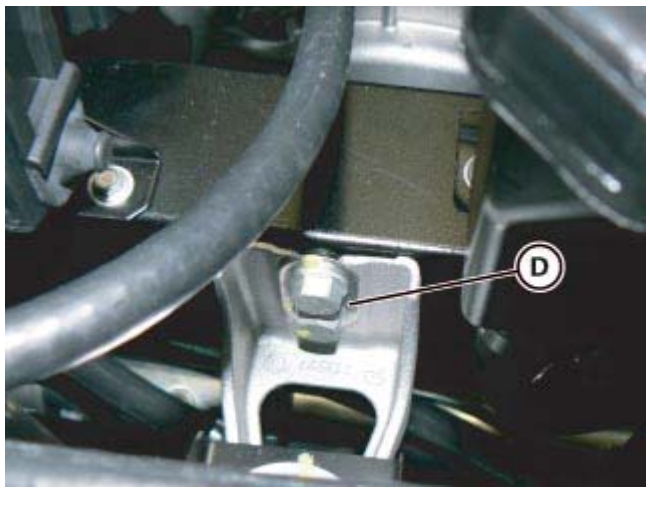


- Remove the clamp **(5)** by unscrewing the nut **(6)** and release the pipe.
- Undo the screw **(7)** and the bushing **(8)**, then move the upper air duct **(9)** out of the way, without removing it from the vehicle, so that it does not interfere with the subsequent operations.

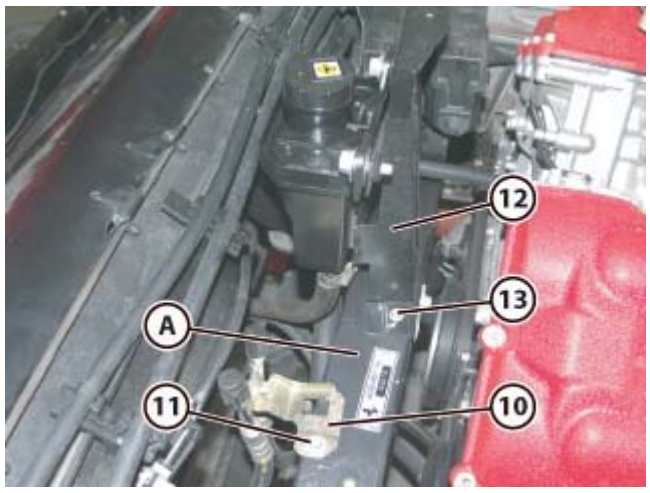
- Repeat the above procedures for the other two air ducts on the right hand side of the vehicle.



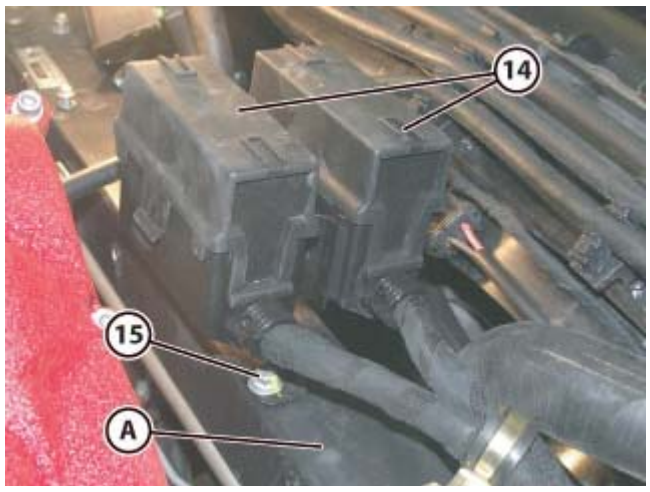
- Remove the coolant radiator mounting bracket **(B)** from the stiffener bar **(A)** by undoing the screws **(C)**.



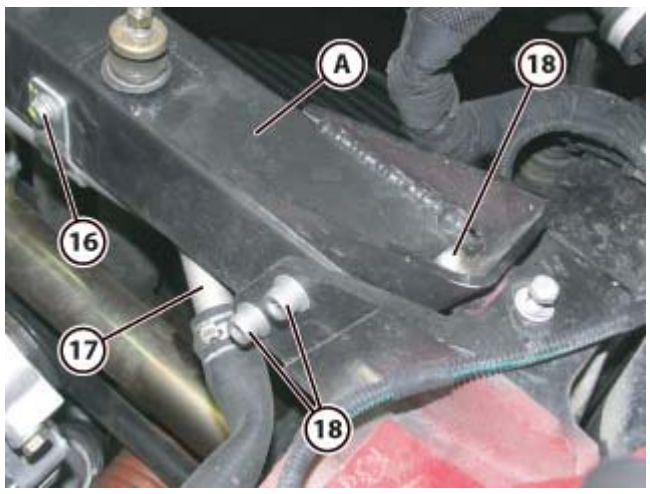
- The plate **(D)** has been installed to strengthen the connection between the coolant radiator mounting bracket and the stiffener bar.



- Remove the air-conditioning filler pipe mounting bracket **(10)** from the bar **(A)**, undoing the screw **(11)**, and move it out of the way so that it does not interfere with the subsequent operations.
- Remove the bracket **(12)** complete with hydraulic steering oil tank by undoing the two screws **(13)** and move it out of the way so that it does not interfere with the subsequent operations.



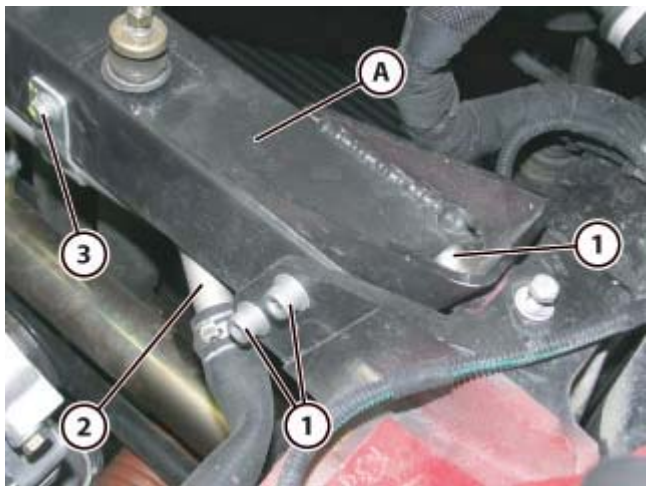
- Remove the two fuse boxes **(14)** from the bar **(A)** by undoing the two screws **(15)** and move them out of the way so that they do interfere with the subsequent operations.



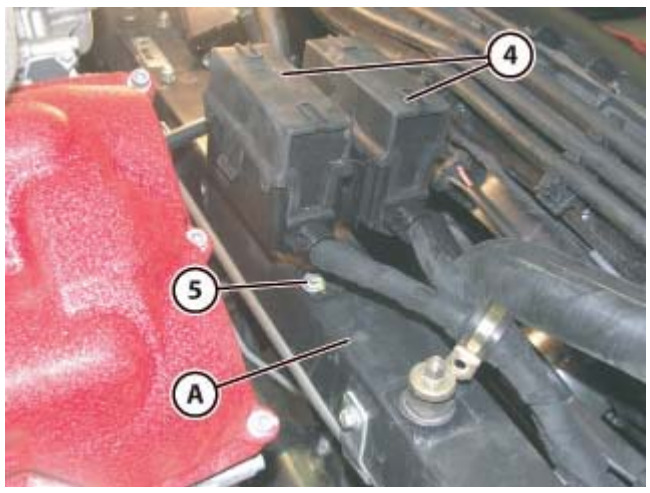
- Remove the chassis stiffener bar from the engine compartment **(A)** by undoing the two screws **(16)** fastening the secondary air pipe **(17)**.
- Undo the eight chassis fastener screws **(18)** then remove the engine compartment subchassis stiffener bar **(A)** from the vehicle.

Refitting the engine compartment chassis stiffener bar

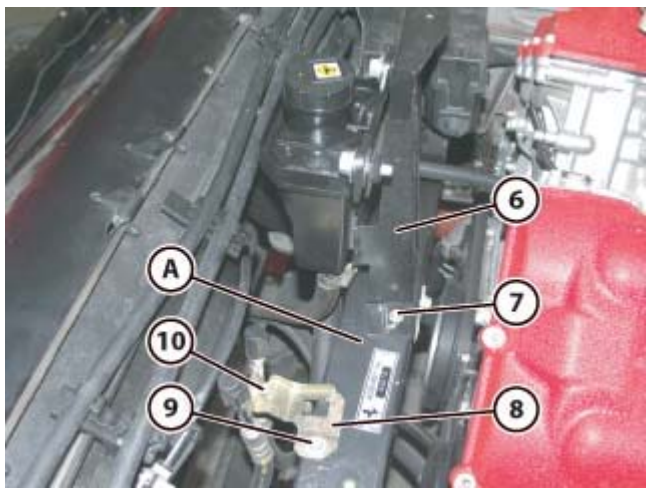
Tightening torque		**Nm**	**Class**
Central radiator mounting bracket - bodywork	Screw	10 Nm	B



- compartment chassis stiffener bar **(A)** in its relative seating and tighten the eight screws **(1)** fastening the bar to the chassis.
- Fasten the secondary air pipe **(2)**, tightening the two screws **(3)**.



- Fit the two fuse boxes **(4)** complete with bracket, and fasten to the stiffener bar **(A)** with the two screws **(5)**.



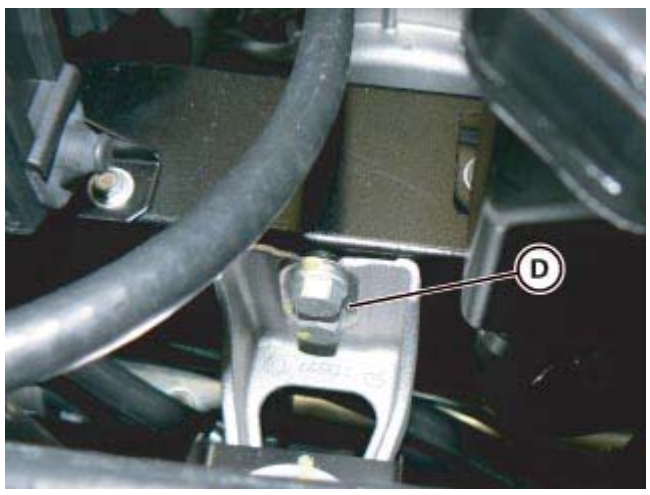
- Fit the bracket **(6, complete with hydraulic steering oil tank, onto the bar (A), and fasten with)**the two screws **(7)**.
- Fasten the air-conditioning filler pipe mounting bracket **(8)** with the screw **(9)**.
- Fasten the two filler pipes to the bracket **(8)** with the screw **(10)**.



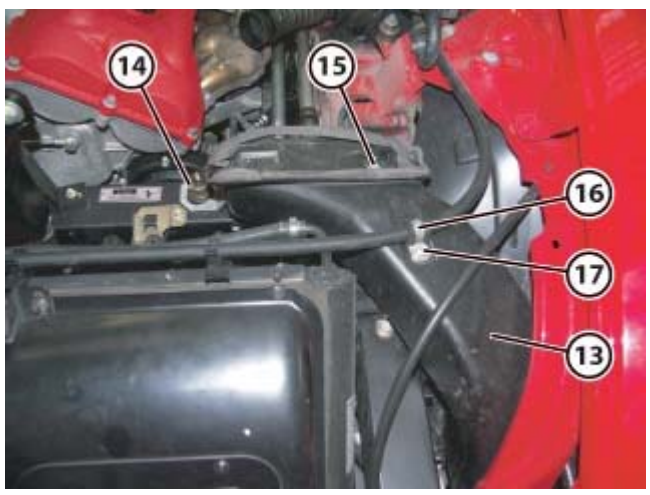
- Fasten the support bracket **(11)** onto the bar **(A)** and tighten the screws **(12)**.



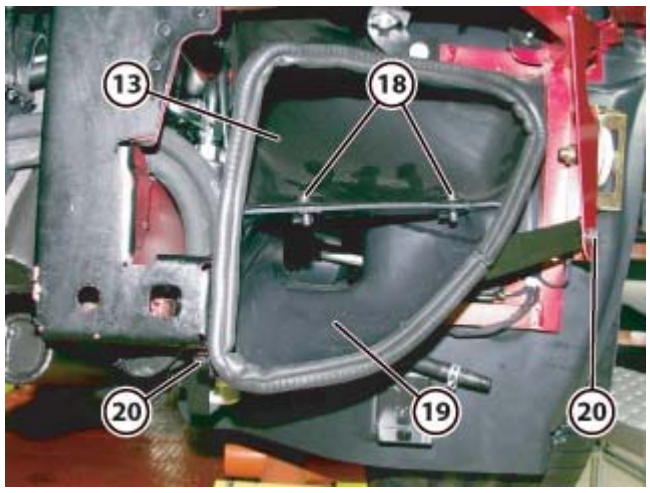
Tightening torque	Nm	Class
Screw	10 Nm	B



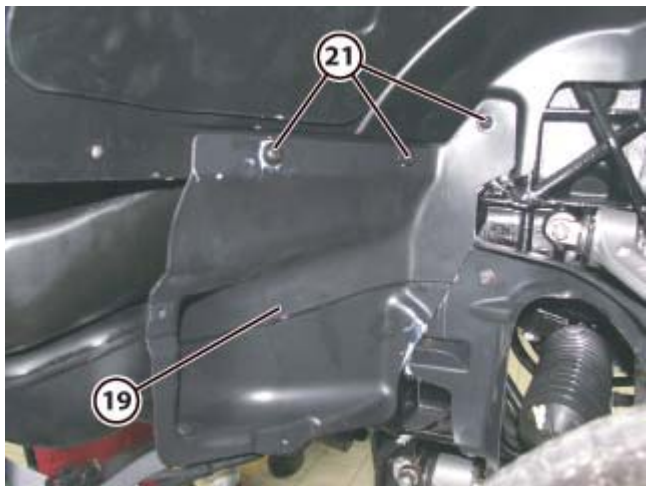
- The plate **(D)** has been installed to strengthen the connection between the coolant radiator mounting bracket and the stiffener bar.



- Fit the upper air duct **(13)** in its seat and fasten to the bar with the bushing **(14)** and the screw **(15)**.
- Fit the clamp **(16)** and fasten with the screw **(17)**.



- Working from the wheel bay, fit the lower air duct **(19)** in its seat.
- Fasten the upper air duct **(13)** to the lower duct **(19)** with the two screws **(18)**.
- Fasten the lower air duct **(19)** to the bodywork with the two screws **(20)**.
- Check that the gasket is in good condition and replace if necessary, refitting as originally installed on the duct inlets.



- Fasten the lower air duct **(19)** definitively with the screws **(21)**.

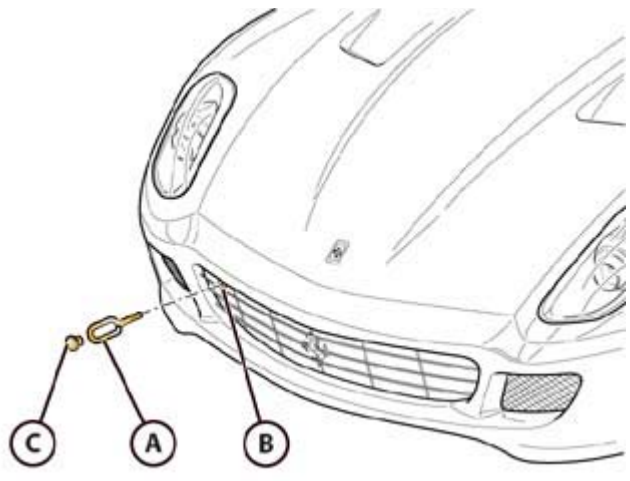
- Refit the front bumper (M2.03).
- Refit the central engine compartment shield (M2.17).
- Refit the air intake (B6.03).

M2.18 Tow hook

Tow hook

CAUTION

Always comply with road safety legislation when towing the vehicle.
Do not connect toe lines to suspension arms, suspension components or wheels. Connect only to the specific tow hook, after fitting the toe hook in its relative mounting.
Remember that the power steering and brake servo do not function with the engine off.



- Do not use any other anchor points other than the tow hook **(A)**, fixed in its respective mounting point **(B)**.
- Remove the tow hook **(A)** from the tool bag.
- Remove the cap **(C)** from the seat **(B)**.
- Screw the hook fully into the seat **(B)**.

- Put the gearbox in neutral (position **"N"** for cars with **"F1" gearb**ox).
- Keep the ignition key in position **II** to allow the lights to work and to prevent the steering wheel from locking if turned.

M2.19 Dashboard

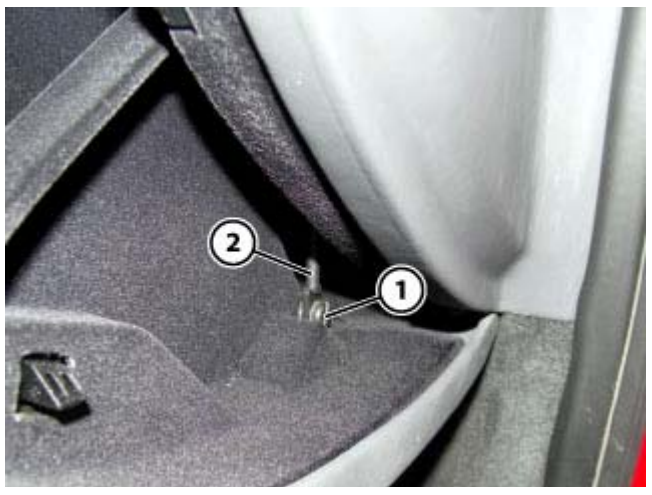
Dashboard



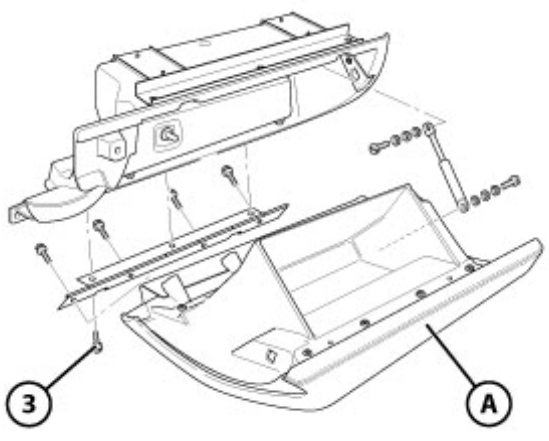
A - Dashboard
B - Glove compartment
C - Console trim panel
D - Passenger side airbag
E - Air vents
F - Engine compartment lid release handle
G - Binnacle
H - A.C. control panel
I - Steering column trim
L - External light control panel
M - Body Computer cover panel
N - Dashboard side cover
O - Dashboard centre sides

Removing the glove compartment lid

➢ Set the battery master switch to OFF (L2.02).

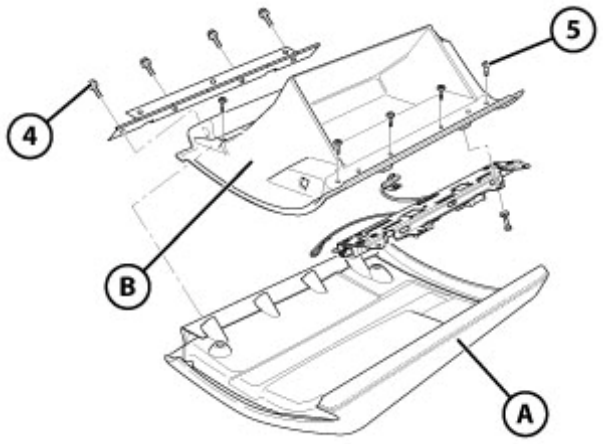


- Open the glove compartment lid.
- Undo the screw **(1)** fastening the tie-rod **(2)** to the glove compartment lid.
- Disconnect the tie-rod **(2)** from the glove compartment lid.

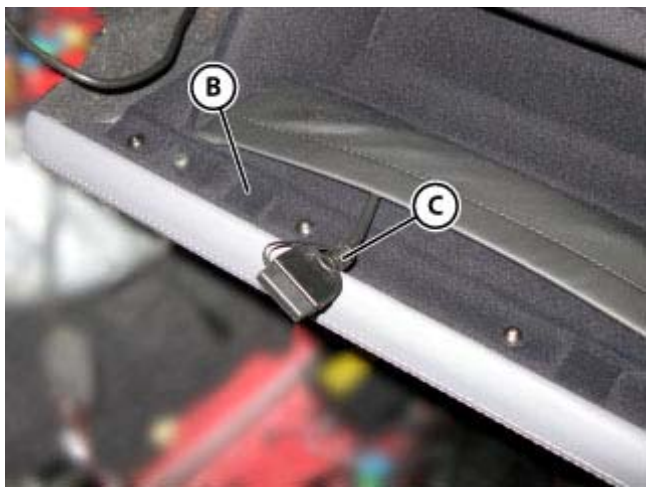


- Undo the three screws **(3)** fastening the lid **(A)** to the glove compartment and remove it from the relative seat, disconnecting the flap lock connector.

- Glove compartment lid with iPod adapter



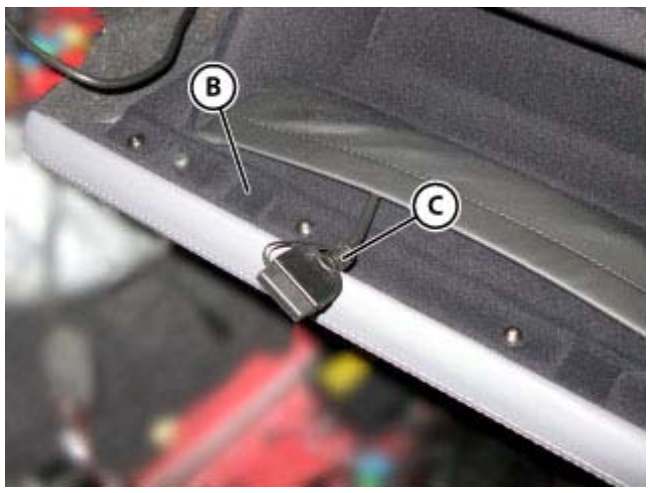
- Undo the four rear screws **(4)** fastening the counter flap **(B)** to the glove compartment lid **(A)**.
- Undo the six upper screws **(5)** fastening the counter flap **(B)** to the glove compartment lid **(A)**.
- Detach the counter flap **(B)** from the lid **(A)**.



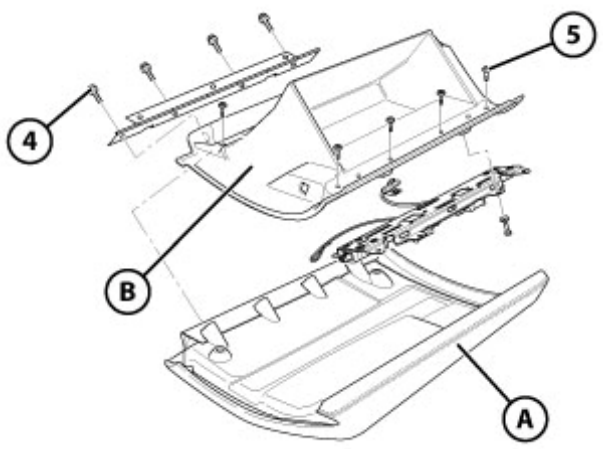
- Carefully remove the cable **(8)** of the iPod adapter from the counter flap **(B)**.

Refitting the glove compartment lid

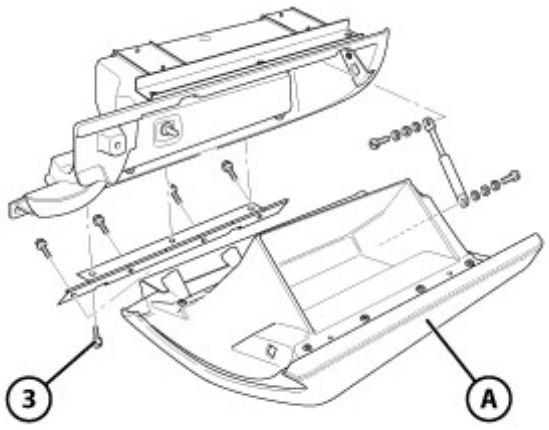
- Glove compartment lid with iPod adapter



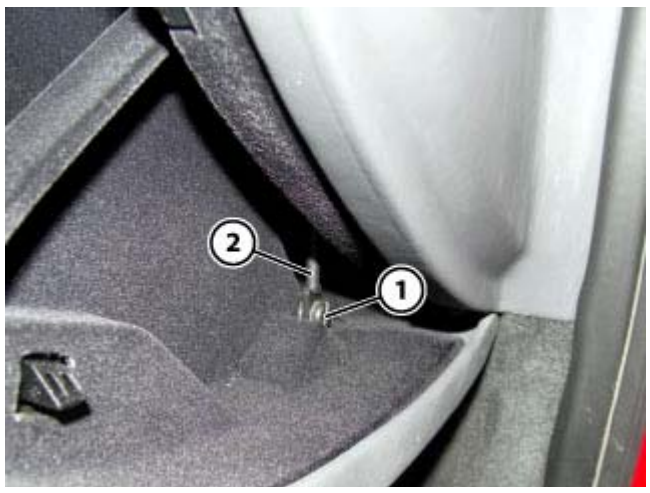
- Carefully insert the cable **(8)** of the iPod adapter into the counter flap **(B)**.



- Attach the counter flap **(B)** to the lid **(A)**.
- Hand tighten the six upper screws **(5)** fastening the counter flap **(B)** to the glove compartment lid **(A)**.
- Hand tighten the four rear screws **(4)** fastening the counter flap **(B)** to the glove compartment lid **(A)**.



- Place the door **(A)** in the relative seat, connect the flap lock connector and tighten the three screws **(3)** fastening the door to the glove compartment.

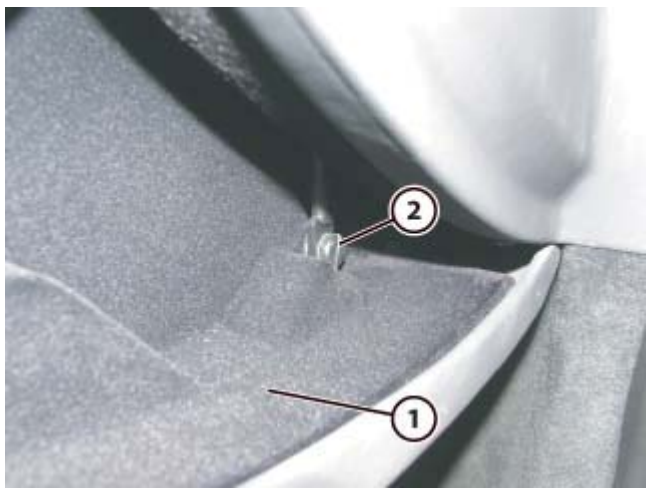


- Connect the tie-rod **(2)** to the glove compartment lid.
- Hand tighten the screw **(1)** fastening the tie-rod **(2)** to the glove compartment lid.

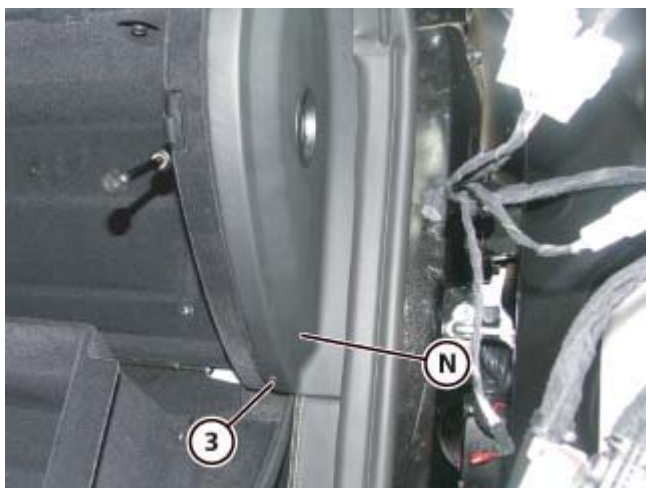
➢ Set the battery master switch to ON (L2.02).

Removing the complete glove compartment

➢ Set the battery master switch to OFF (L2.02).
➢ Remove the central sides of the dashboard (M2.20).

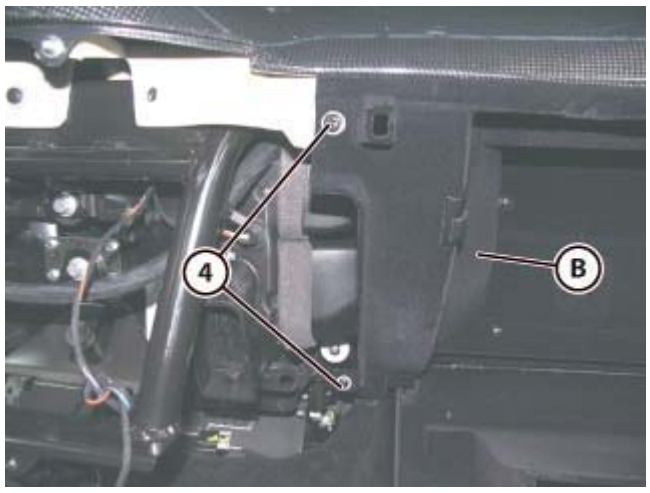


- Open the glove compartment door **(1)** and undo the screw **(2)**, holding the glove compartment door with your hand.

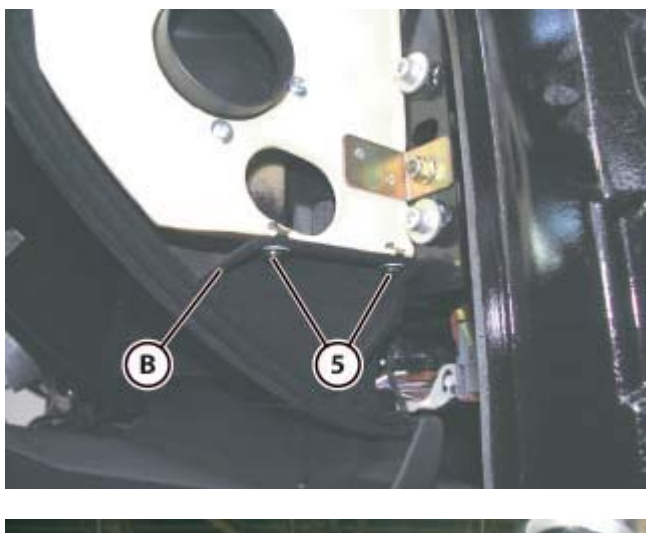


- Remove the right-hand side of the dashboard **(N)** undoing the screw **(3)**.
- Remove the passenger airbag disable switch (H4.02).

i This operation is only necessary on vehicles equipped with this specific component.



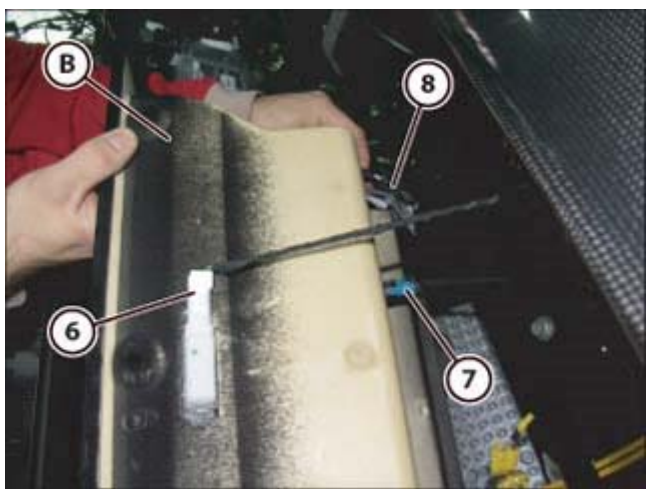
- Undo the two side screws **(4)** fastening the glove compartment **(B)**.



- Undo the two lower side screws **(5)** fastening the glove compartment **(B)**.



- Undo the eight central glove compartment fastener screws **(B)** and slowly remove the compartment from its seat on the dashboard.



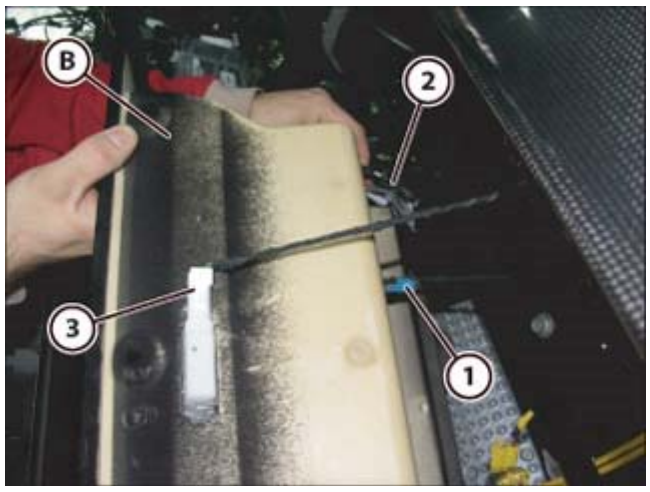
- Disconnect the glove compartment light bulb connector **(6)** (I024), the glove compartment light button junction connector **(7)**, and the glove compartment opening motor connector **(8)** (M038) (M308).
- Ease out the complete glove compartment **(B)** and remove from the passenger compartment.
- Remove the glove compartment lid (M2.19).

Only perform if the vehicle is fitted with an iPod adapter.

Refitting the glove compartment and compartment door



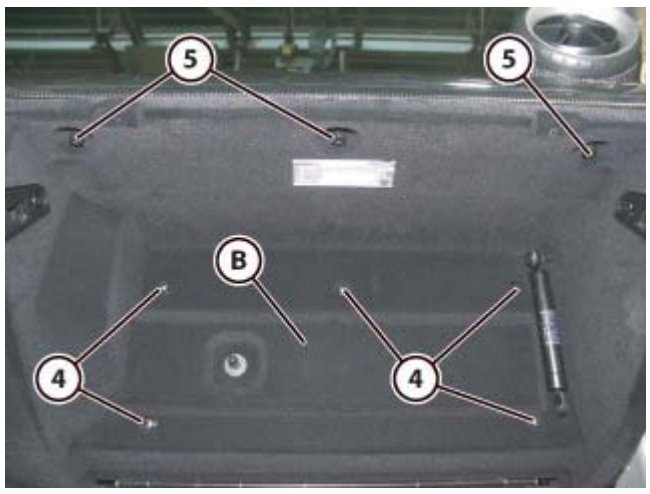
Tightening torque		Nm	Class
Glove compartment - dashboard (front fastener)	Screw	4.4 Nm	C
Glove compartment - dashboard (upper fastener)	Screw	3.1 Nm	C



- Refit the glove compartment lid (M2.19).

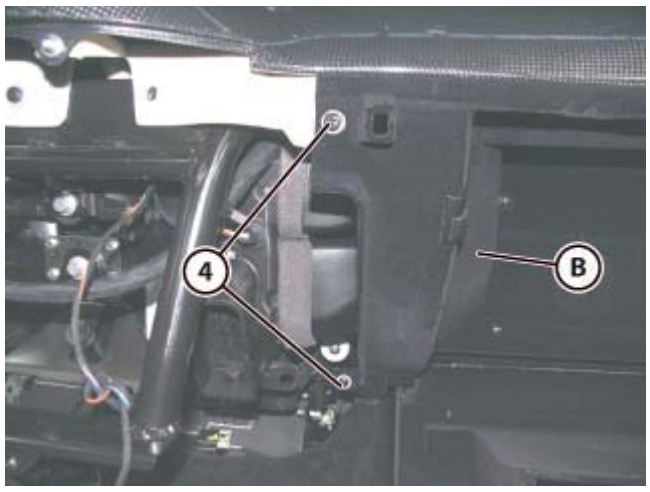
Perform only if it has been removed since the vehicle is fitted with an iPod adapter.

- Fit the complete glove compartment **(B)** in the passenger compartment and connect the junction connectors **(1)** for the glove compartment light button, the junction connector **(2)** for the glove compartment opener motor (M038) (M308) and the connector **(3)** for the glove compartment light bulb (I024).

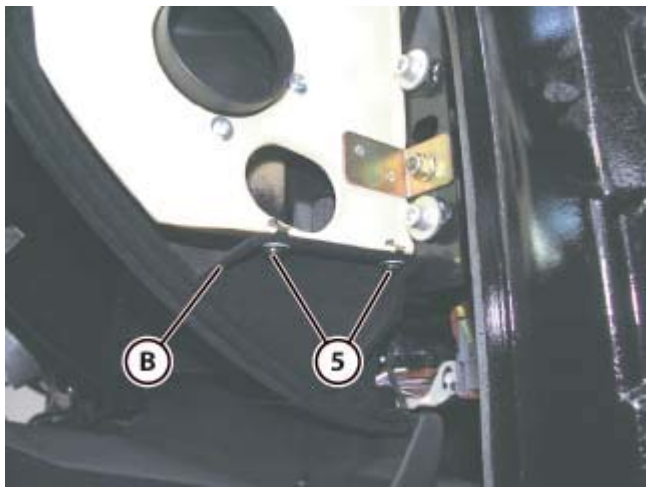


- Fasten the glove compartment **(B)** to the dashboard cross-member by tightening the front screws **(4)** and the upper screws **(5)**.

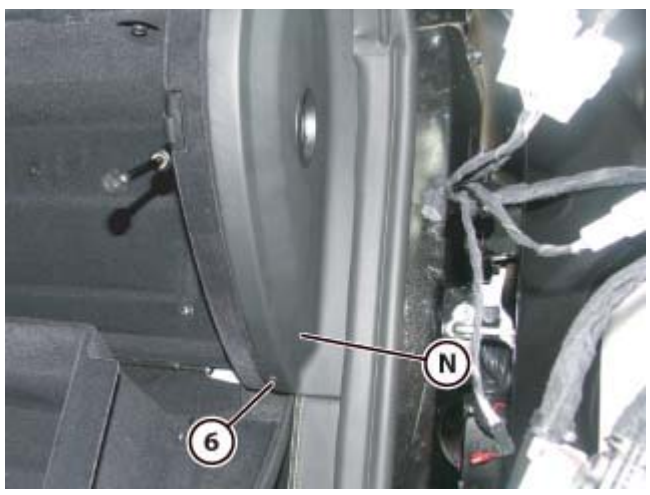
Tightening torque	Nm	Class
Screw	4.4 Nm	C
Screw	3.1 Nm	C



- Fasten the glove compartment **(B)** by tightening the side screws **(4)**.

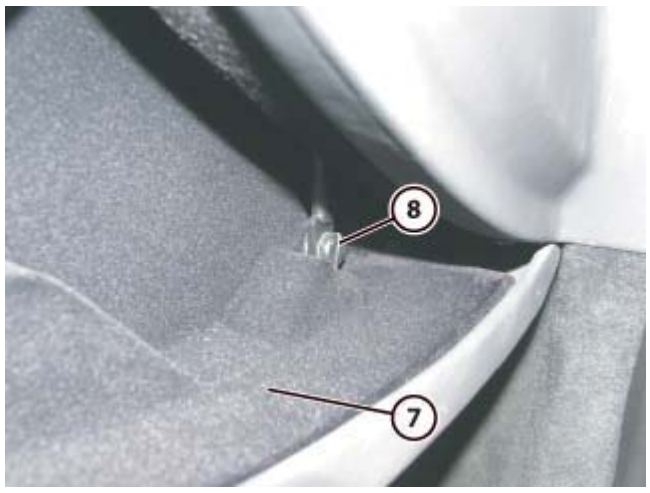


- Fasten the glove compartment **(B)** by tightening the lower screws **(5)**.



- Fit the right-hand side of the dashboard **(N)** in its seat and fasten to the dashboard subframe with the screw **(6)**.
- Check that it is properly aligned with the dashboard and with the glove compartment lid when closed.
- Refit the passenger airbag disable switch (H4.02).

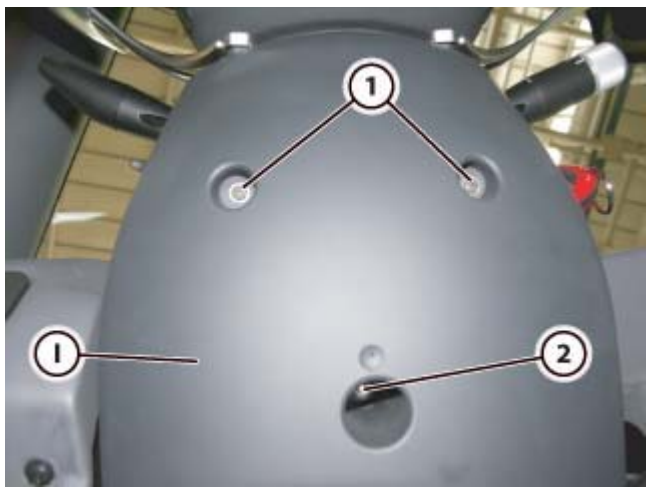
This operation is only necessary on vehicles equipped with this specific component.



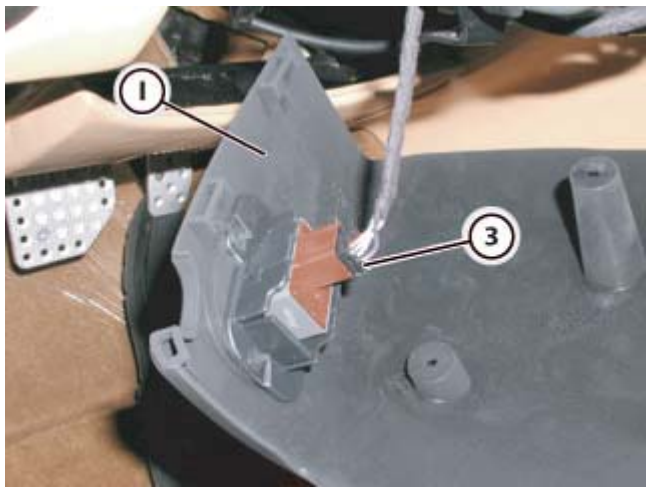
- Lift the glove compartment door **(7)** and fasten to the tie-rod with the screw **(8)**.

➢ Refit the central sides of the dashboard (M2.20).
➢ Check that the glove compartment door is properly aligned with the central sides of the dashboard.
➢ Set the battery master switch to ON (L2.02).

Removing the steering column trim panel

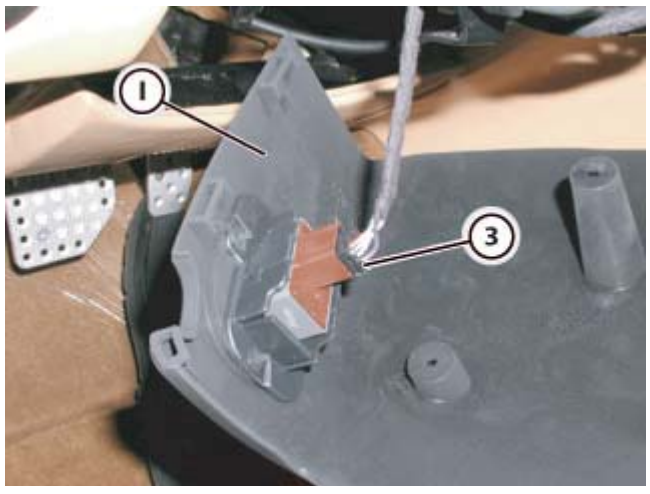


- To remove the steering column trim panel **(I)**, undo the two screws **(1)** and the nut **(2)** at the bottom of the panel.

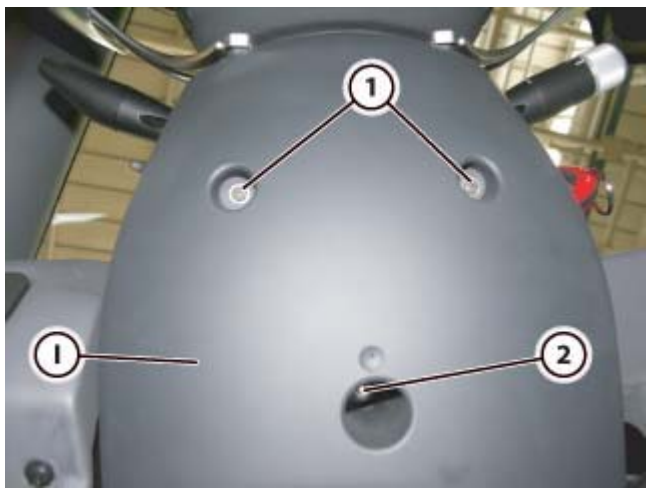


- Detach the connector **(3)** (D058) for the steering column adjustment switch.
- Remove the steering column trim panel **(I)** from the passenger compartment.

Refitting the steering column trim panel



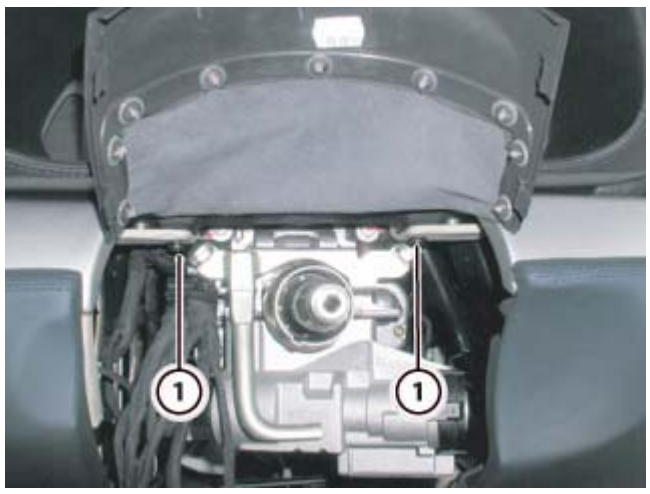
- Fit the steering column trim panel **(I)** and connect the connector **(3)** (D058)for the steering column adjustment switch.



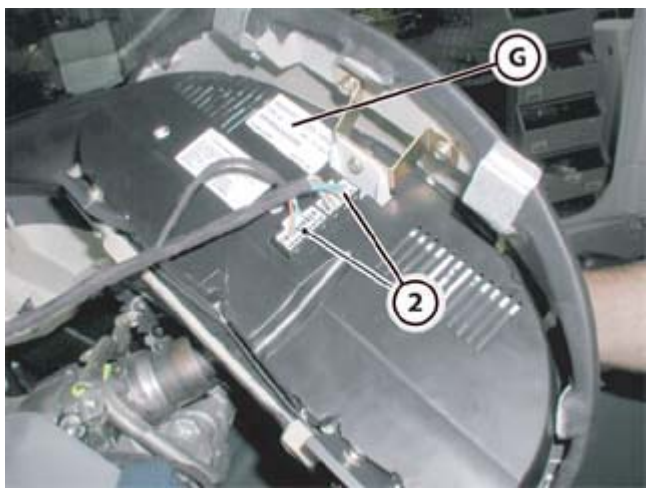
- Fasten the steering column trim panel **(I)** to the steering column, tightening the two screws **(1)** and the nut **(2)**.

Removing the dashboard binnacle

- Set the battery master switch to OFF (L2.02).
- Remove the steering column trim panel (M2.19).
- Remove the steering wheel (H3.06).
- Remove the gear selector paddles (H3.11).
  This operation is only necessary on vehicles with electronically controlled gearboxes.
- Remove the steering column switch (E2.06).



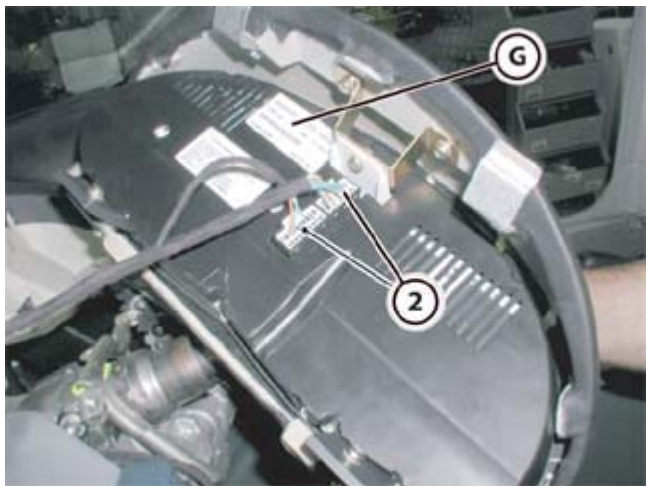
- Undo the two screws **(1)** fastening the instrument panel to the dashboard.



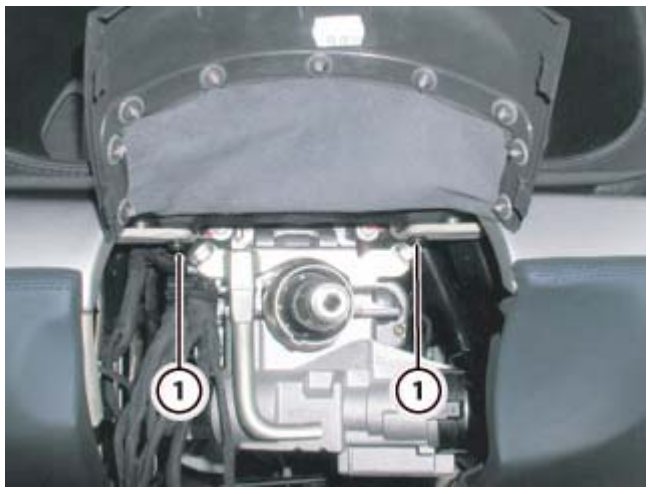
- Slowly ease the binnacle **(G)** out of the dashboard, to allow the two connections **(2)** (E003) on the instrument panel to be disconnected.
- Remove the binnacle **(G)** from the passenger compartment.

Refitting the binnacle

Tightening torque		**Nm**	**Class**
Instrument panel binnacle - dashboard	Screw	3.1 Nm	C



- Fit the binnacle **(G)** on the dashboard in the cabin and connect the two instrument panel connectors **(2)** (E003).



Take the utmost care not to excessively bend or crush the instrument panel cables during fitting.

- Fit the binnacle on the dashboard fastener brackets and fasten by tightening the two screws **(1)**.

Tightening torque	Nm	Class
Screw	3.1 Nm	C

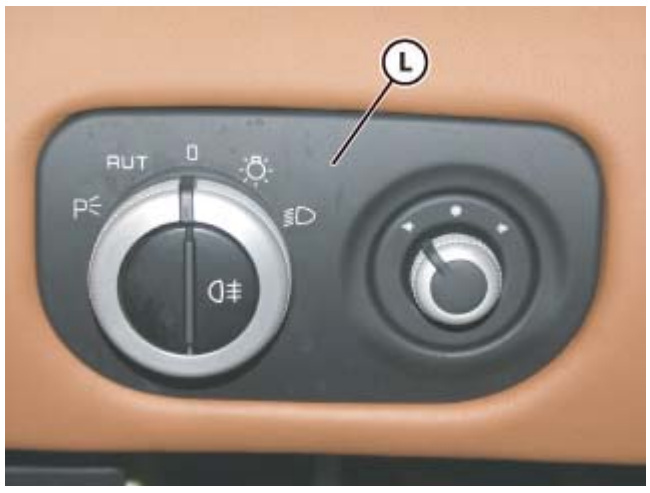
- Check that the binnacle is correctly aligned with the dashboard.

➢ Refit the steering column switch (E2.06).
➢ Refit the gear selector paddles (H3.11).
This operation is to be performed only on vehicles with electronically controlled gearboxes.

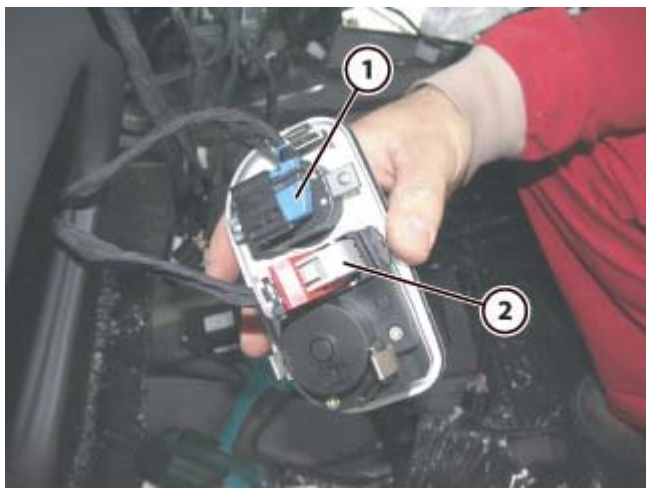
➢ Refit the steering wheel (H3.06).
➢ Refit the steering column trim panel (M2.19).
➢ Set the battery master switch to ON (L2.02).

Removing the instrument panel

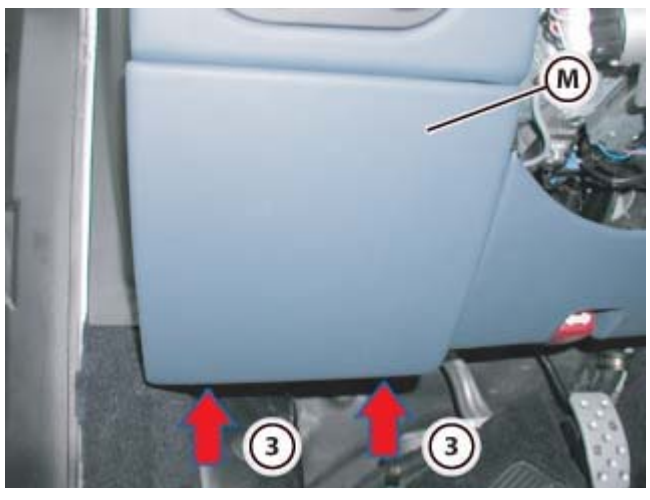
➢ Remove the complete glove compartment (M2.19).
➢ Remove the dashboard binnacle (M2.19).
➢ Remove the seat (M2.21).
➢ Remove the console trim panel (M2.20).
➢ Remove the central sides of the dashboard (M2.20).
➢ Remove the passenger compartment and roof trim panels (M2.22).
Follow the removal sequence up to the removal of the **front door pillar panels**.



- Use a screwdriver to prise the external light control panel **(L)** out of its seat, taking care not to damage the leather trim.

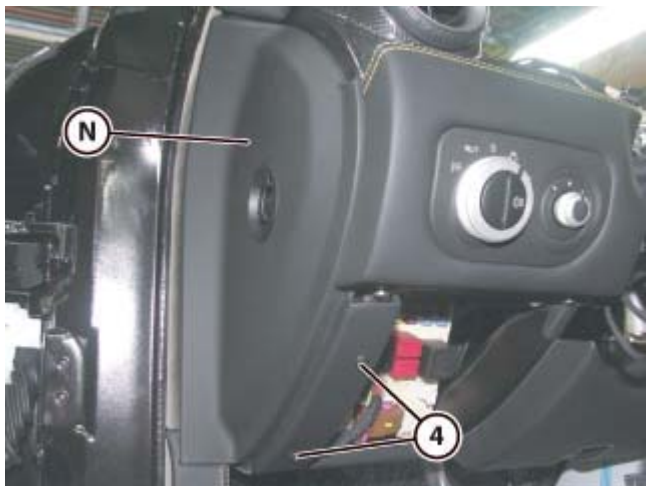


- Detach the external rear-view mirror adjustment connector **(1)** and the external light control connector **(2)**.
- Remove the light control panel **(L)**.



- Remove the Body Computer cover panel **(M)**, undoing the two lower screws **(3)**.

Note that the photograph was taken with the external light control panel still installed.

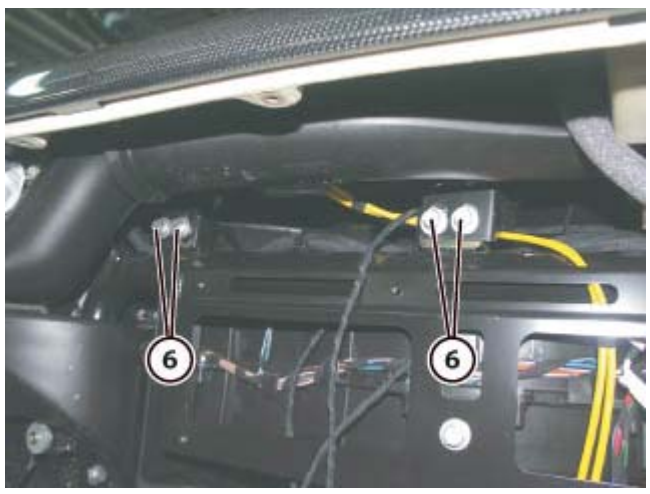


- Remove the lateral dashboard panel **(N)**, undoing the two screws **(4)**.

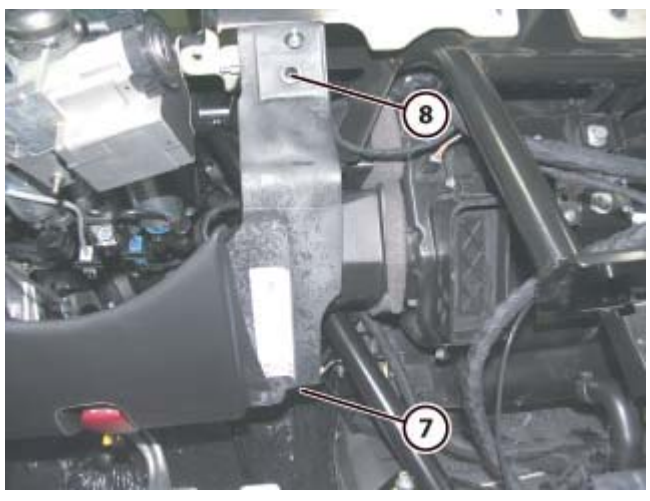
Note that the photograph was taken with the external light control panel still installed.



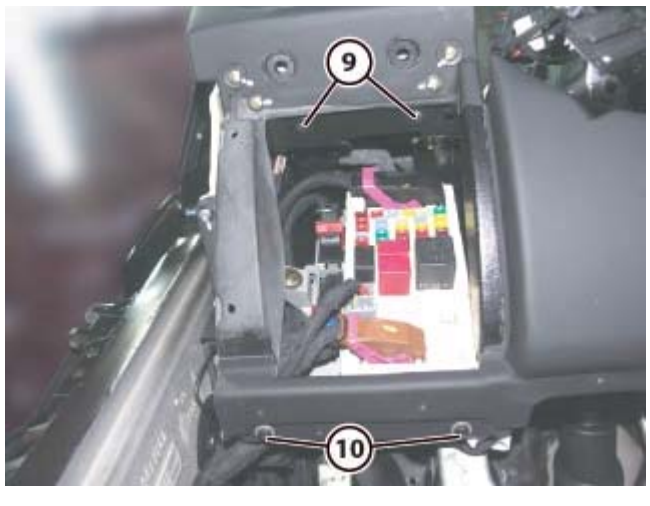
- Detach the engine compartment lid release cable **(5)** from the relative release handle.



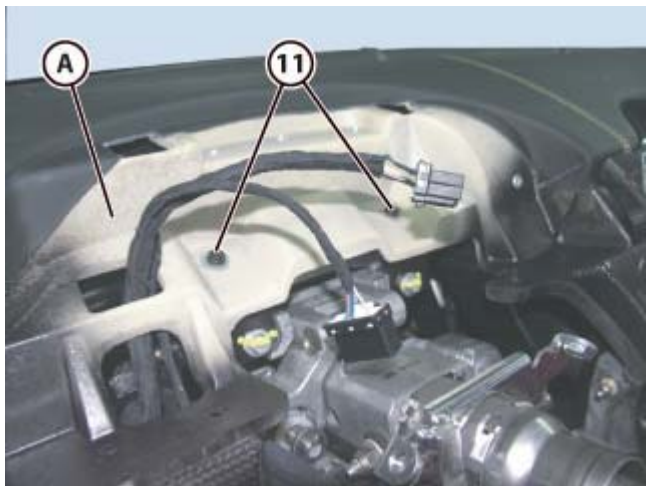
- Undo the four screws **(6)** fastening the passenger-side airbag module to the dashboard subframe, then detach the relative connector.



- Undo the screws **(7)** and **(8)** at the centre of the dashboard.



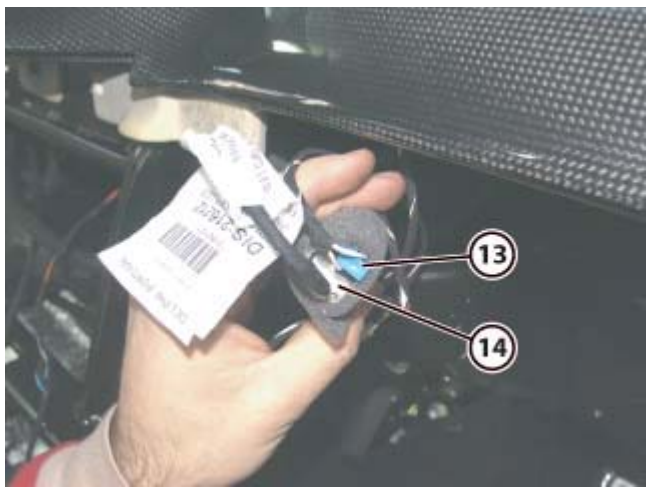
- Undo the screws **(9)** and **(10)** below and above the body computer.



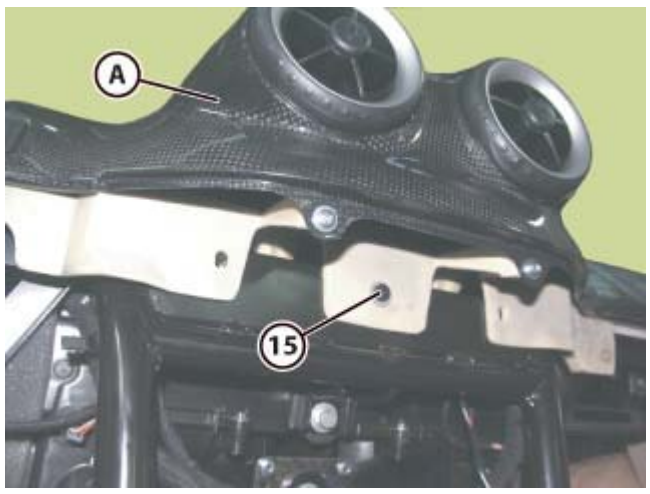
- Undo the two upper screws **(11)** fastening the dashboard **(A)** to the steering column.



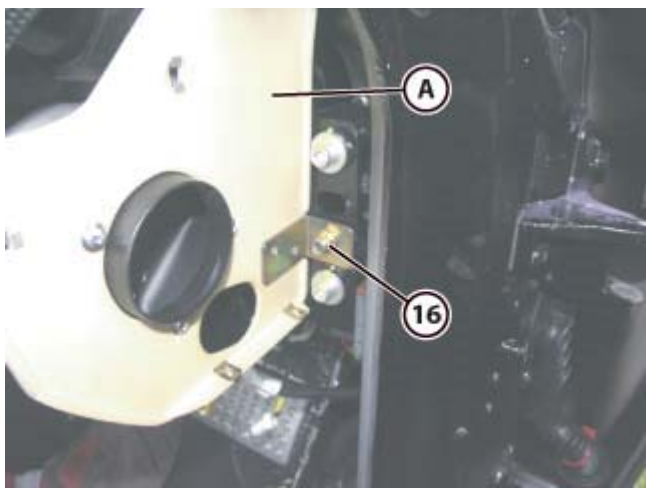
- Disconnect the connector **(12)** for the right hand tweeter and the connectors for the central and left hand tweeters.



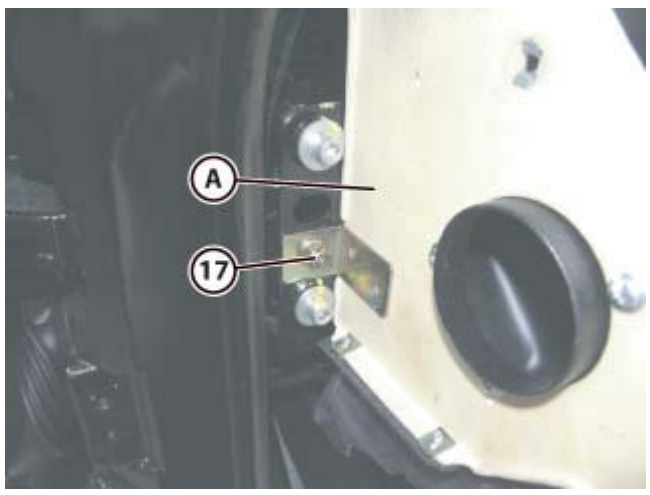
- Detach the two connectors **(13)** and **(14)** for the InfoLED sensor and the sunlight sensor.



- Undo the central screw **(15)** located under the air vents, fastening the dashboard **(A)** to the dashboard cross member.



- Unscrew the right hand lateral nut **(16)** retaining the mounting bracket of dashboard **(A)**.



- Unscrew the left hand lateral nut **(17)** and start removing the dashboard **(A)** from its seat in the passenger compartment.

- Detach the instrument panel connectors for the TFT display "MODE" and "DISP" buttons.

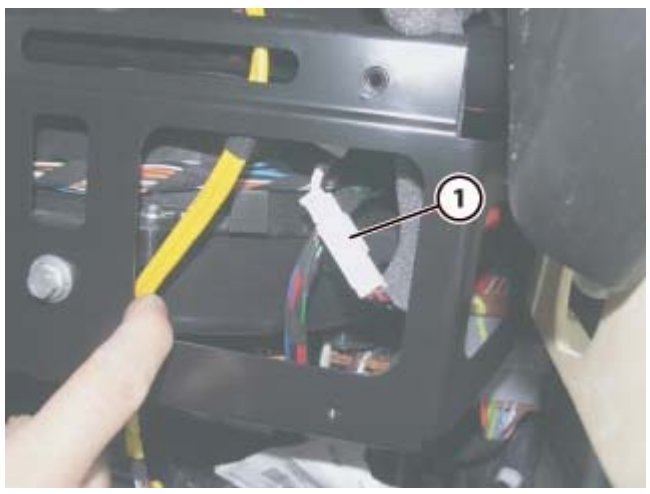
The instrument panel may deform when removed from its mounting; preferably refit as soon as possible.

- Remove the instrument panel **(A)**, easing off the air distribution ducts and remove from the passenger compartment.

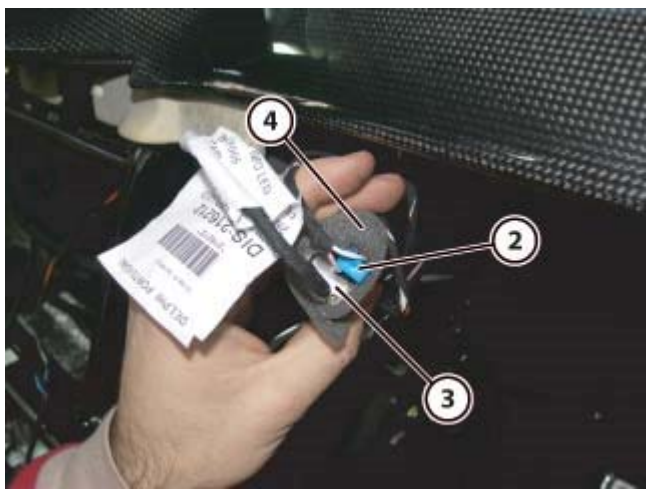
Refitting the instrument panel

Tightening torque		**Nm**	**Class**
Dashboard - chassis cross member	Nut	10 Nm	B
Passenger airbag module - dashboard	Screw	10 Nm	B

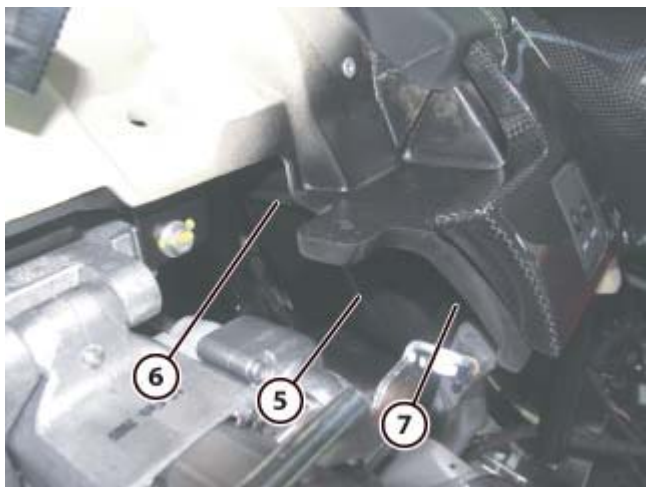
- Fit the instrument panel on the dashboard cross member in the vehicle. Pull the instrument connection cables out of the panel, as these will later be connected to the dashboard.
- Connect the instrumental panel connectors for the TFT display MODE and DISP buttons.



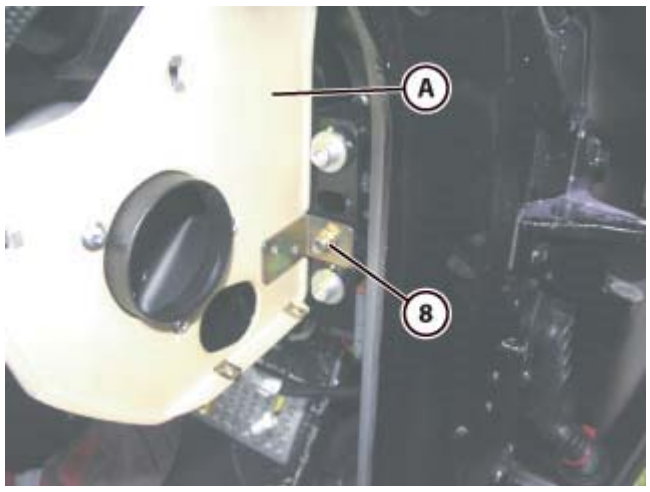
- Connect the right hand tweeter connector **(1)** and the central and left hand tweeter connectors.
- Wrap the connectors in adhesive foam rubber.



- Connect the connector **(2)** for the Infoled sensor and the connector **(3)** for the sun sensor.
- Wrap both connectors in adhesive foam rubber **(4)**.

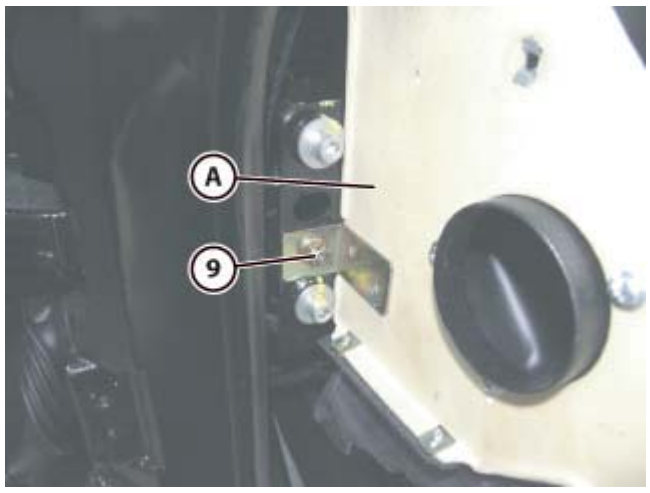


- Check the state of the noise damper foam on the two lateral air duct connectors **(5)**; if damaged, replace and install as originally fitted.
- Fit the two connectors **(5)** and press-fit onto the side air duct **(6)** already installed on the dashboard, fitting the opposite end in the respective seats **(7)** on the AC unit.



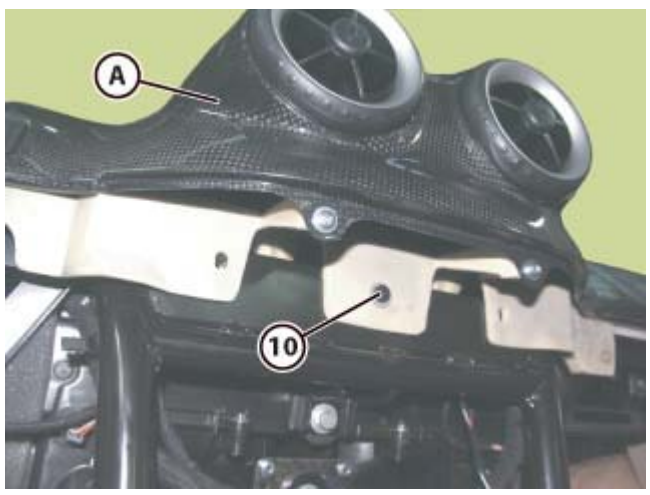
- Fasten the instrument panel **(A)** by tightening the right hand side nut **(8)**.

Tightening torque	Nm	Class
Nut	10 Nm	B

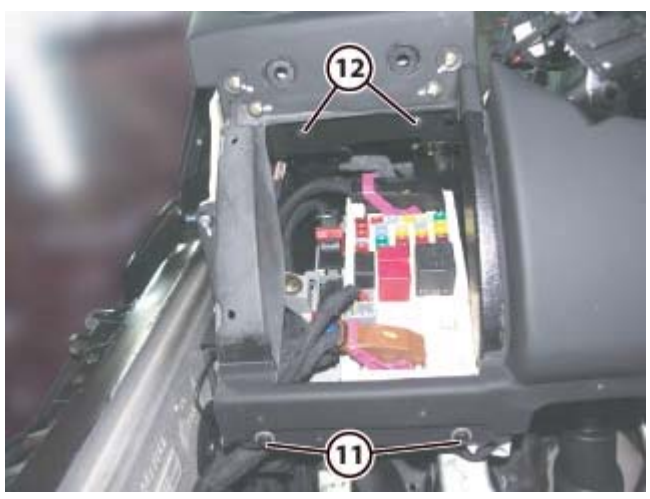


- Fasten the instrument panel **(A)** on the opposite side by tightening the side nut **(9)**.

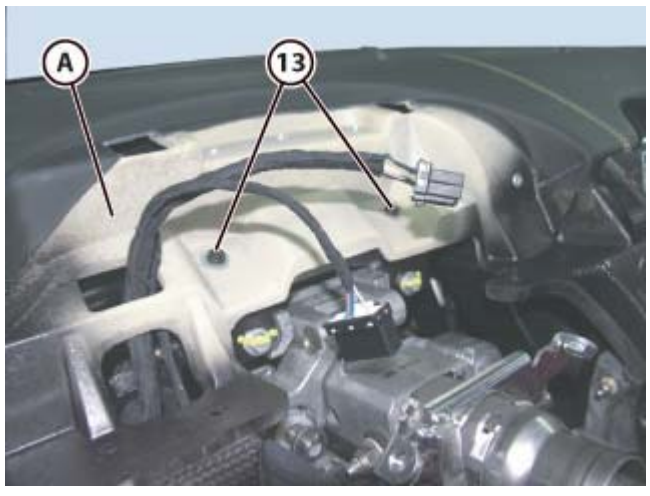
Tightening torque	Nm	Class
Nut	10 Nm	B



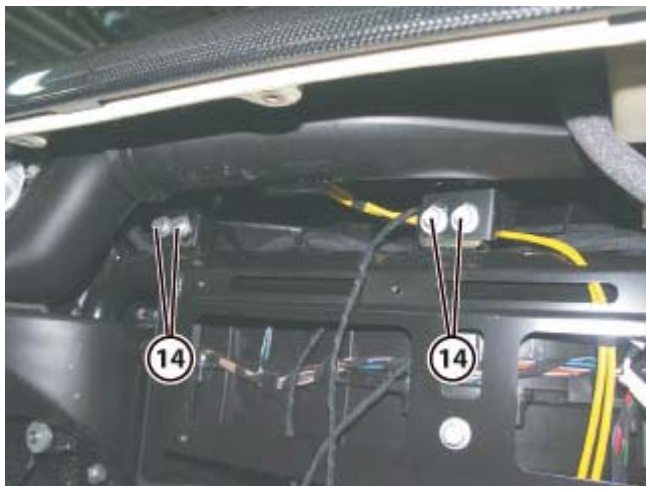
- Fasten the centre of the dashboard **(A)**, tightening the screw **(10)**.



- Tighten the screws **(11)** and **(12)** above and below the body computer.



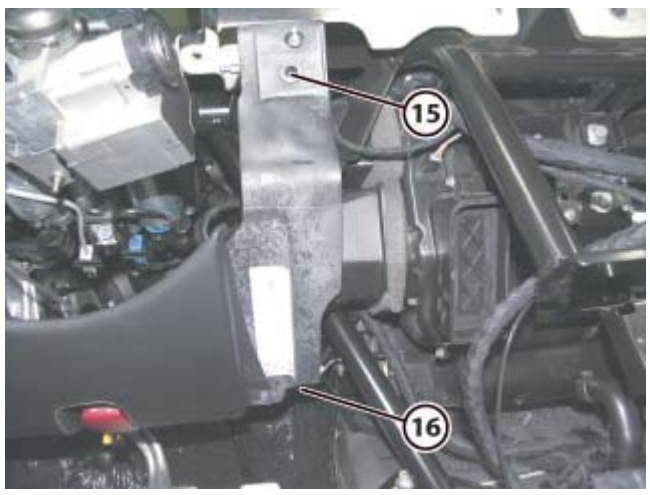
- Fasten the dashboard **(A)**, tightening the two upper screws **(13)**.



- Fit and tighten the four screws **(14)** fastening the passenger side airbag module to the dashboard cross member.

Tightening torque	**Nm**	**Class**
Screw	10 Nm	B

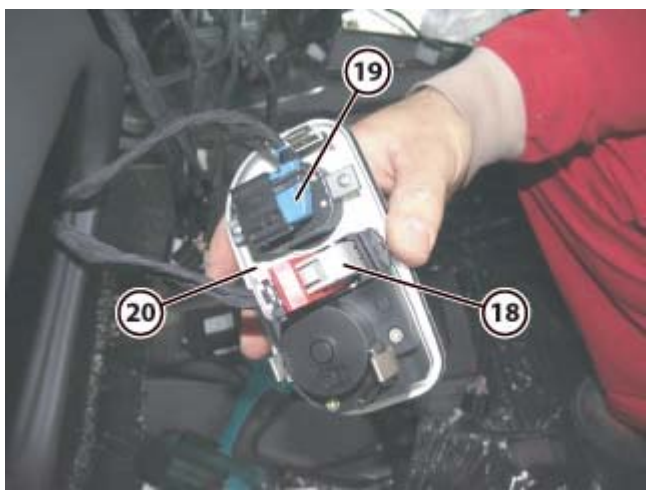
- Connect the yellow connector for the passenger side airbag module.



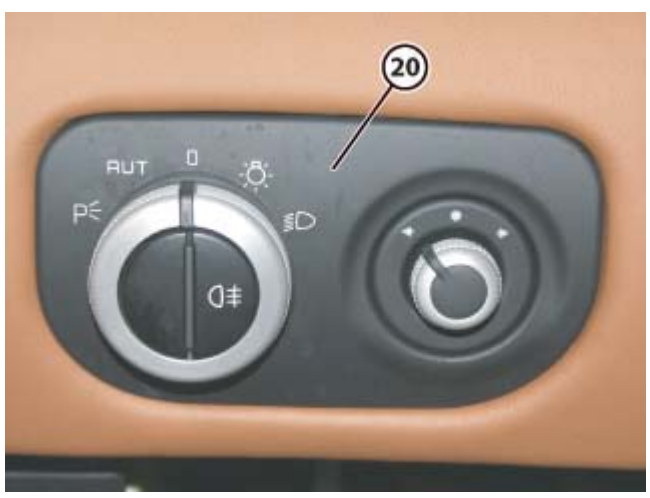
- Tighten the central screws **(15)** and **(16)** to the right of the steering column.



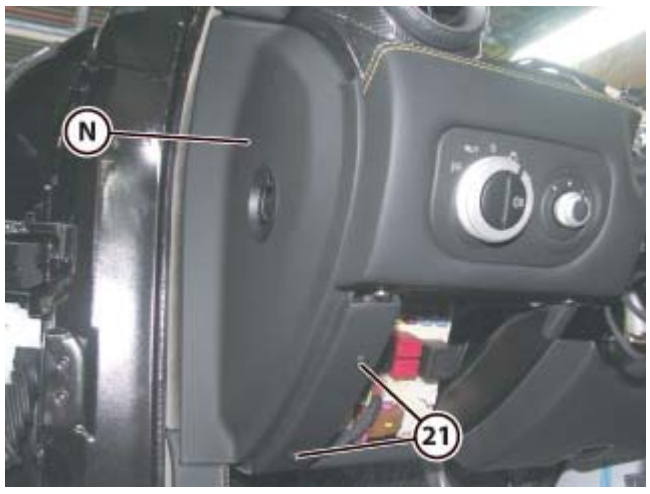
- Connect the engine compartment lid release cable **(17)** to the relative release handle.



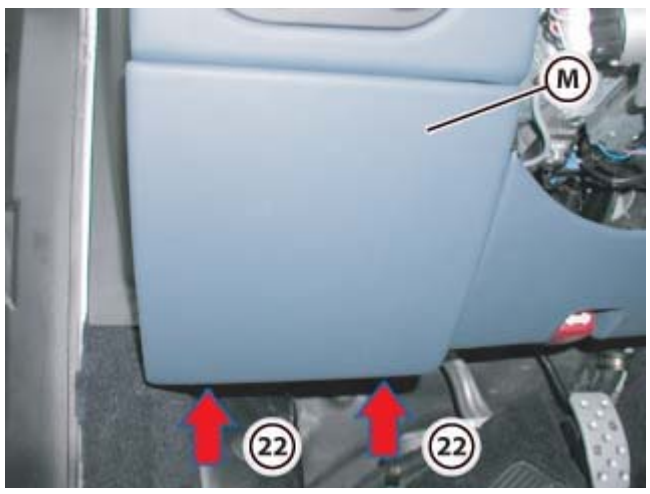
- Connect the external light control connector **(18)** and the external rear-view mirror adjustment connector **(19)** to the external light control panel **()**20.



- Press-fit the external light control panel **(20)** onto the dashboard and check that it is properly aligned.



- Fasten the left hand side of the dashboard **(N)** to the dashboard subframe with the two screws **(21)**.



- Fit the Body Computer cover panel **(M)**, tightening the two lower screws **(22)**.

- Check that the instrument panel is aligned with the doors closed.

- Refit the passenger compartment and roof trim panels (☞ M2.22).
- Refit the central sides of the dashboard (☞ M2.20).
- Refit the console trim panel (☞ M2.20).
- Refit the seat (☞ M2.21).
- Refit the binnacle (☞ M2.19).
- Refit the glove compartment and compartment door (☞ M2.19).
- Check again that the panel is aligned correctly with all adjacent components.

M2.20 Tunnel console trim panel and A.C. control panel

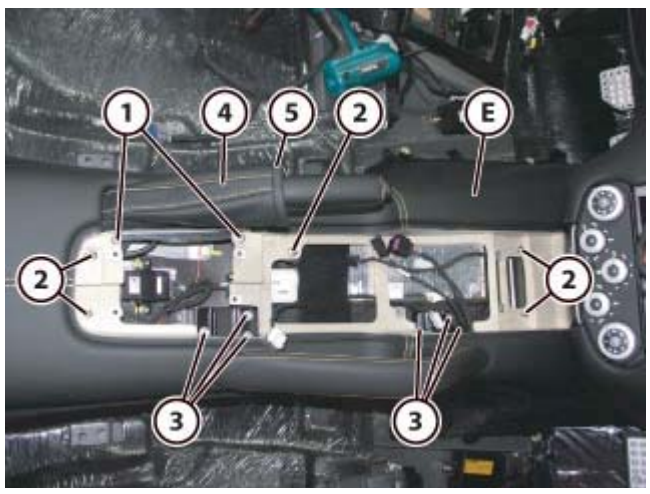
Console trim panel



A - Tunnel console
B - Ashtray - Cigarette lighter
C - Gearbox control panel
D - Tunnel console cover
E - Console trim panel
F - A.C. control panel
G - Dashboard centre sides

Removing the console trim panel

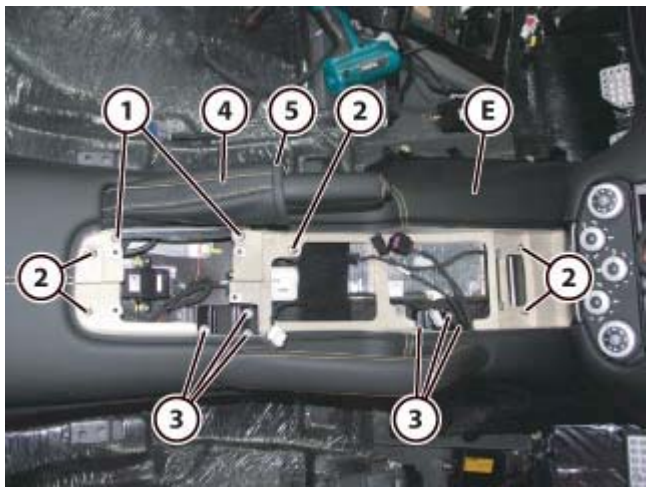
➢ Remove the console cover (M2.20).



- Undo the two screws **(1)** fastening the parking brake trim **(4)** to the console trim panel **(E)**.
- Undo the five screws **(2)** and the six screws **(3)**.
- Lift the parking brake lever and remove the clamp **(5)** fastening the trim panel **(4)** onto the lever.
- Remove the console trim panel **(E)** from the passenger compartment.

Refitting the console trim panel

			
Tightening torque		**Nm**	**Class**
Tunnel console trim panel - bodyshell	Screw	6 Nm	B



- Fit the console trim panel **(E)** on the centre console in the passenger compartment.
- Fasten the console trim panel by tightening the six screws **(3)**.

		
Tightening torque	**Nm**	**Class**
Screw	6 Nm	B

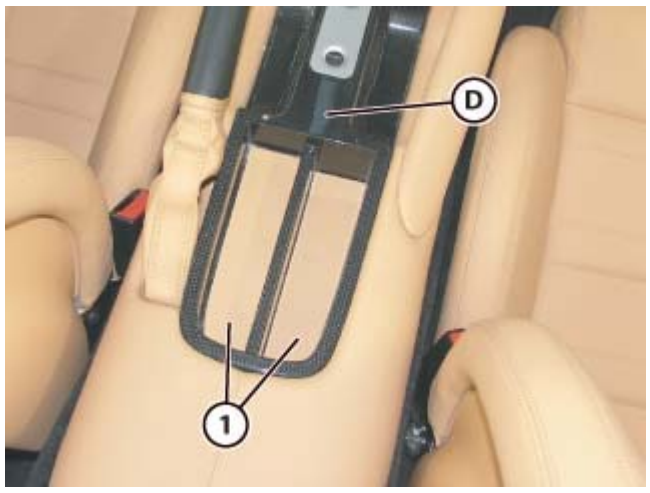
- Tighten the five screws **(2)**.
- Tighten the two screws **(1)** fastening the parking brake trim **(4)** to the console trim panel **(E)**.
- Refit the clamp **(5)** fastening the trim panel **(4)** on the handbrake lever.
- Check proper alignment with the central side panels of the dashboard.

➢ Refit the console cover (M2.20).

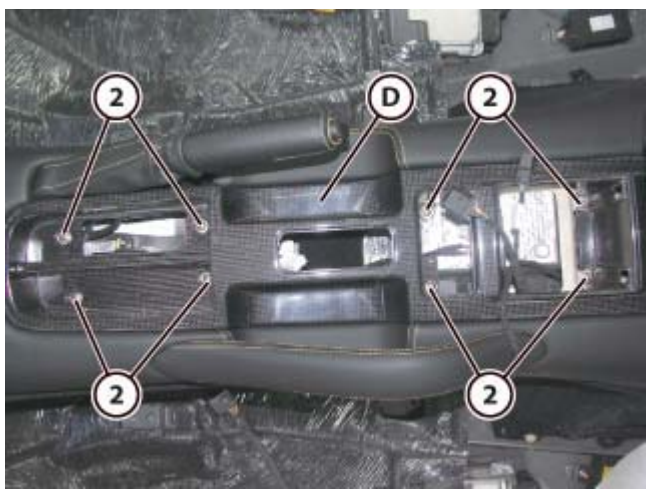
Removing the console cover

➢ Remove the gearbox panel (F1 gearbox) (H3.03).

➢ Remove the ashtray (H3.12).
➢ Remove the centre console control panel (H3.03).

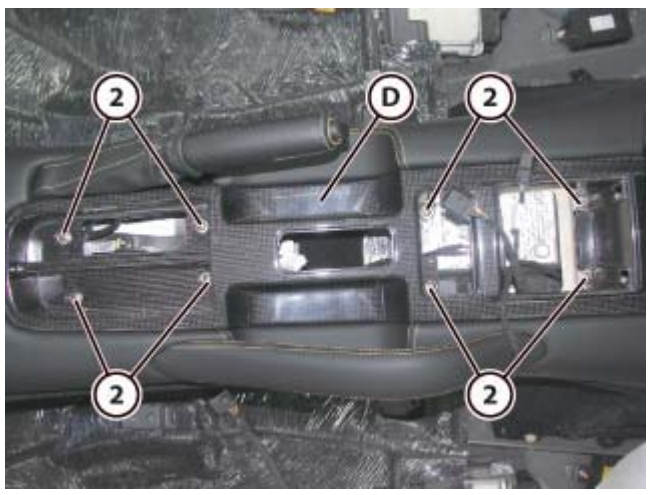


- Remove the pocket change tray **(1)** from the console cover **(D)**.

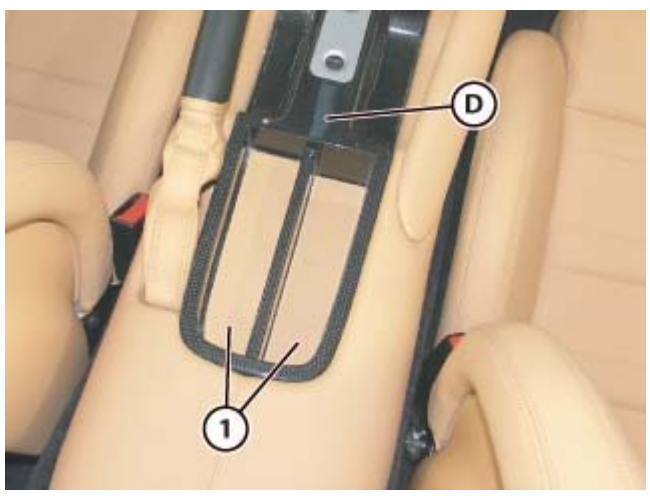


- Undo the eight screws **(2)** fastening the console cover **(D)** to the console trim panel.
- Remove the console cover **(D)** from the passenger compartment.

Refitting the console cover



- Fit the console cover **(D)** on the console trim panel.
- Tighten the eight screws **(2)** and check alignment with the console trim panel.



- Press-fit the two oddment bin bases **(1)** onto console cover **(D)**.

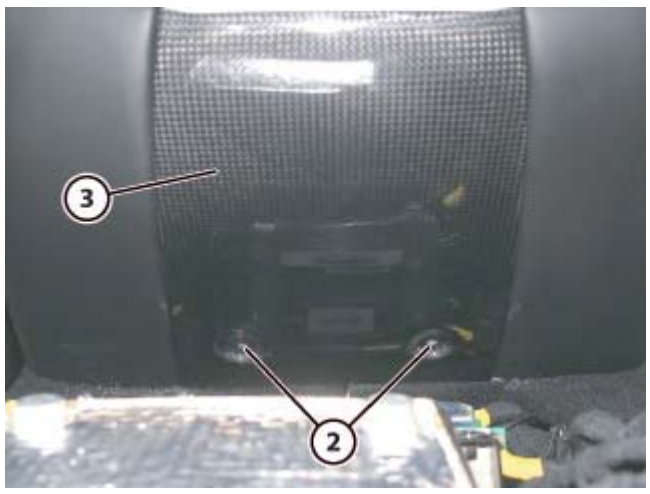
➢ Refit the centre console control panel (H3.03).
➢ Refit the ashtray (H3.12).
➢ Refit the gearbox panel (F1 gearbox) (H3.03).

Removing the central sides of the dashboard

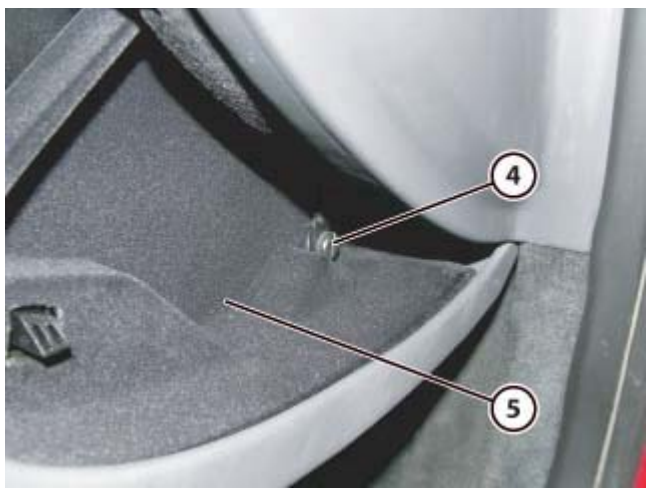
➢ Remove the console trim panel (M2.20).
➢ Remove the steering column switch (E2.06).
➢ Remove the car stereo (H3.15).



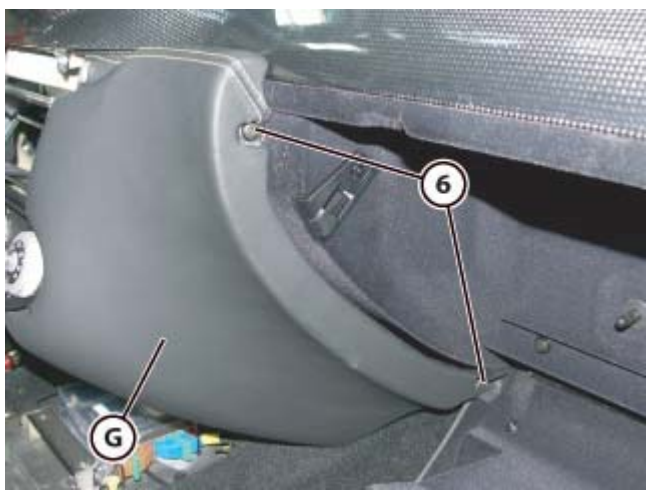
- Prise out the central dashboard fixing plate **(1)** with a pointed tool.



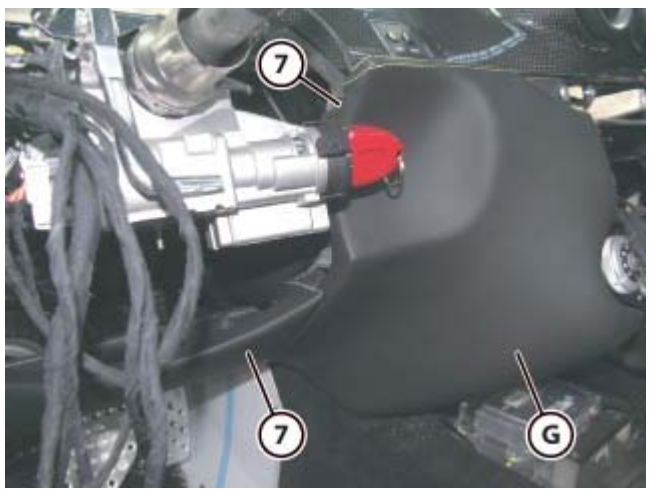
- Remove the lower central moulding **(3)** by undoing the screws **(2)**.



- Undo the screw **(4)** that fastening the glove compartment door tie-rod to the door **(5)**.



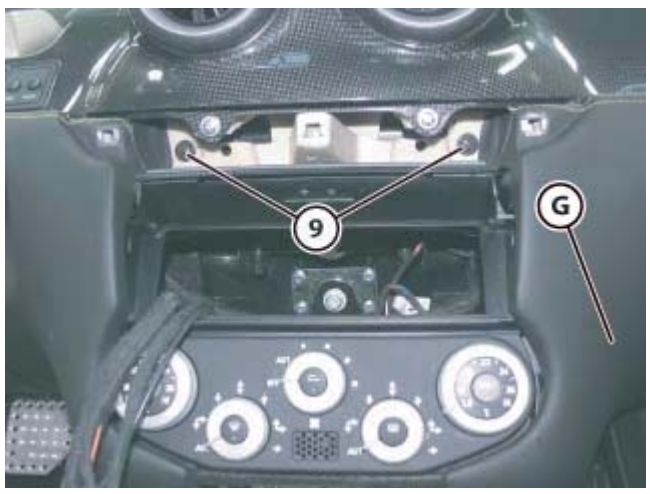
- Undo the two lateral screws **(6)** fastening the central sides of the dashboard **(G)** to the dashboard cross member.



- Undo the two lateral screws **(7)** fastening the central sides of the dashboard **(G)** to the dashboard cross member.



- Undo the three lower screws **(8)**.



- Undo the two upper screws **(9)** fastening the central side panels of the dashboard **(G)** to the dashboard cross member.



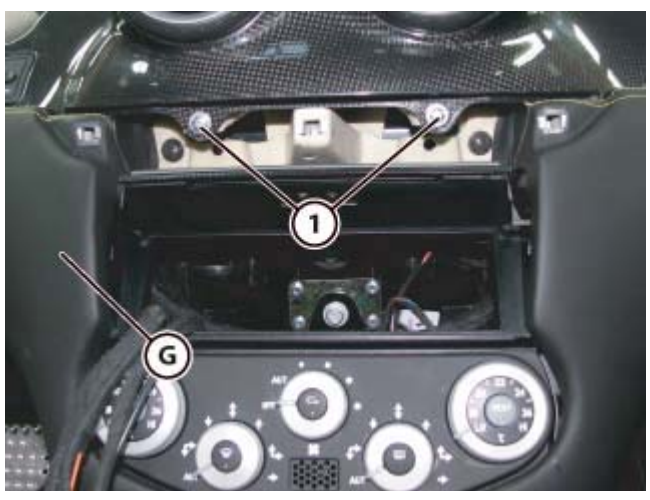
- Move the central side panels of the dashboard and disconnect the connector **(10)** (D851) from the AC control panel

- Remove the central side panels of the dashboard from the passenger compartment.

Refitting the central sides of the dashboard



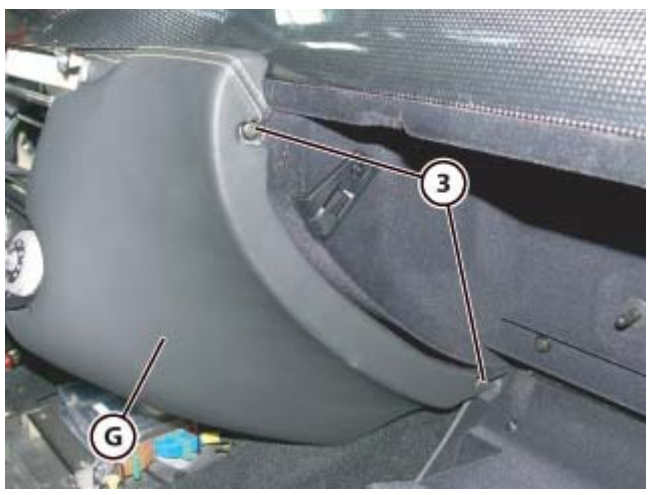
- Fit the central side panels of the dashboard and connect the connector **(10)** (D851) for the AC control panel



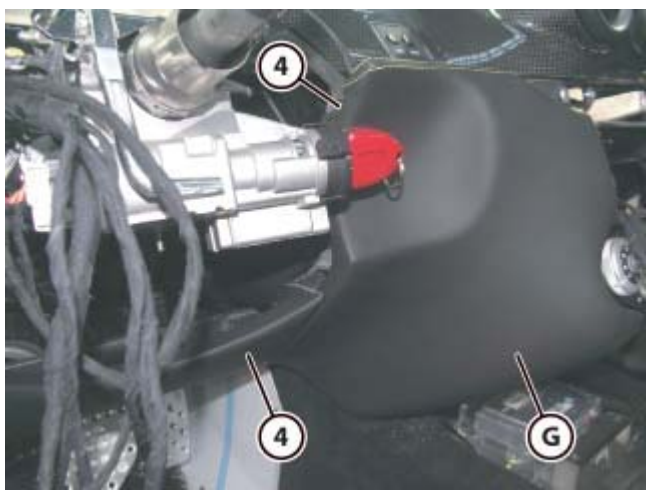
- Fit the central sides of the dashboard **(G)** on the dashboard and tighten the two upper screws **(1)**.



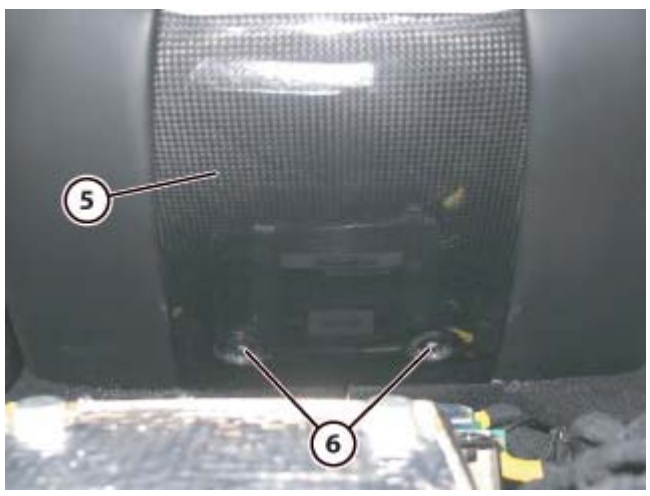
- Tighten the three lower screws **(2)**.



- Tighten the two side screws **(3)** fastening the central sides of the dashboard **(G)** to the dashboard cross member.

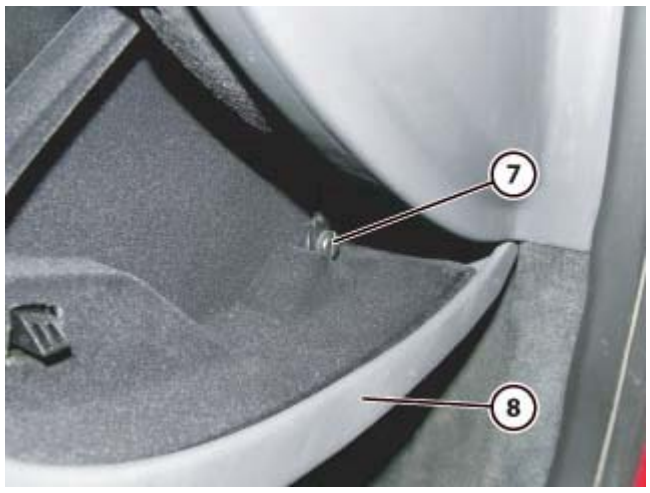


- Tighten the two side screws **(4)** fastening the central sides of the dashboard **(G)** to the dashboard cross member.



- Fit the lower central moulding **(5)** and fasten by tightening the two screws **(6)**.

- Check proper alignment of the central sides of the dashboard with the glove compartment door closed.



- Fasten the glove compartment door **(8)** to the glove compartment release tie-rod with the screw **(7)**.

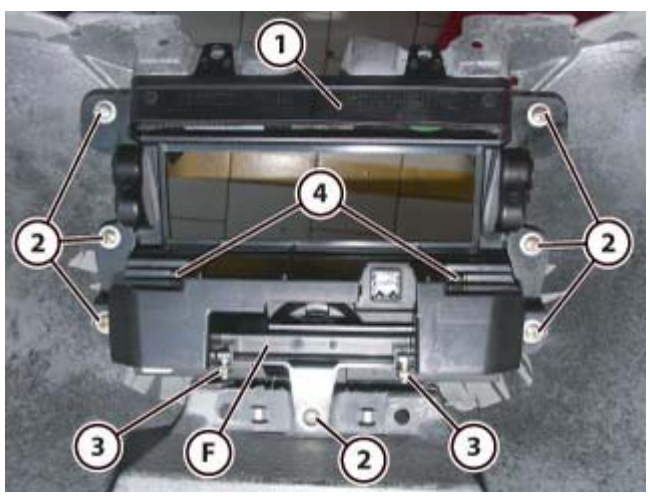


- Fit the central dashboard face plate **(9)** on the dashboard, pressing manually until it clicks into place.

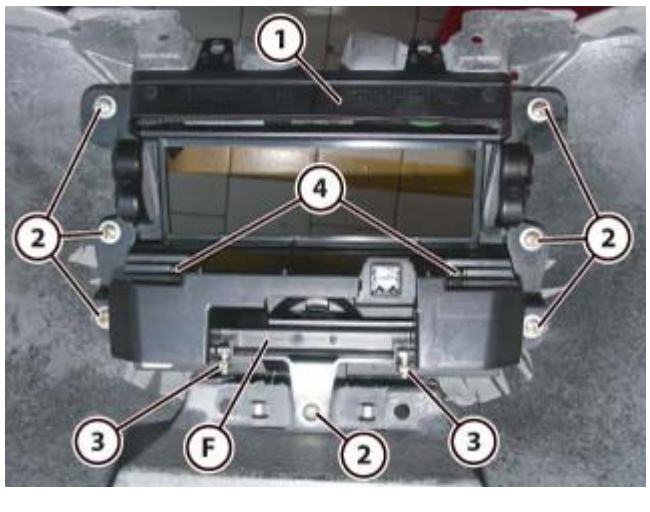
➢ Refit the car stereo (H3.15).
➢ Refit the steering column switch (E2.06).
➢ Refit the console trim panel (M2.20).

Replacing the AC control panel

➢ Remove the central sides of the dashboard (M2.20).



- Undo the screws **(2)** and remove the car stereo fixing plate **(1)**, complete with AC control panel **(F)**.
- To remove the AC control panel **(F)**, undo the nuts **(3)** and release the two clips **(4)**.
- Remove the AC control panel and replace.

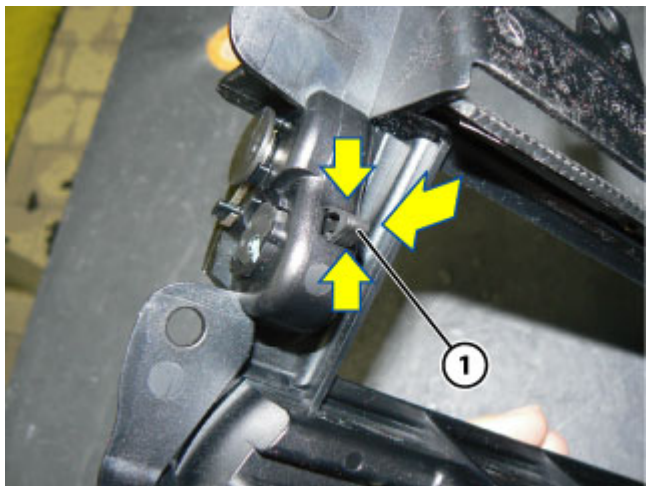


- To refit, assemble the AC control panel **(F)** onto the car stereo fixing plate **(1)**, fixing with the two clips **(4)** and fastening by tightening the nuts **(3)**.
- Fit and fasten the control panel assembly to the central side panels of the dashboard and fixing plate by tightening the screws **(2)**.

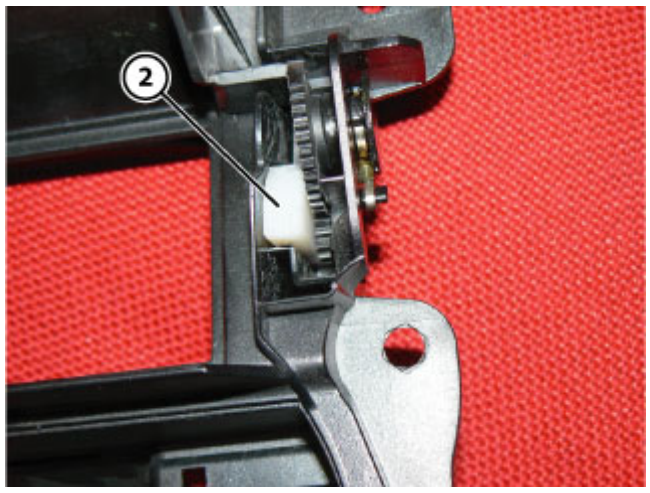
➢ Refit the central sides of the dashboard (M2.20).

Replacing the car stereo system cover door dumper mechanism

➢ Replace the AC control panel (M2.20).
Remove the car stereo system fixing plate.



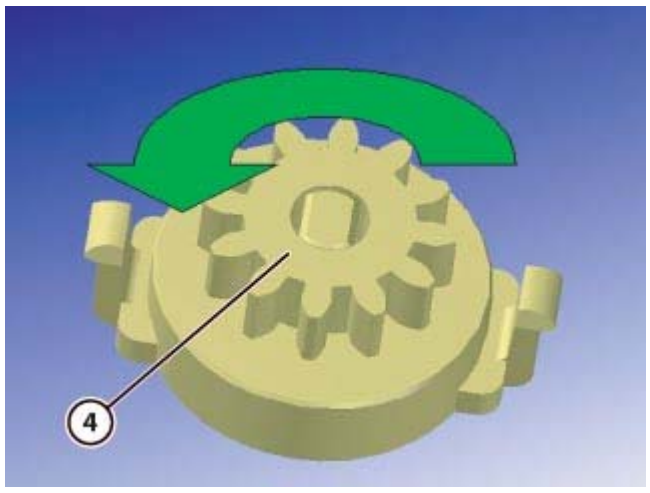
- Press the two clips on the hook **(1)** retaining the pinion detent.
- Push the hook **(1)** out of its seat to release the pinion detent.



- Remove the pinion detent **(2)** from its seat.



- Insert a suitably sized screwdriver in the cover door open/close mechanism.
- Applying leverage with the screwdriver, gently push the dumper **(A)** out of its seat.
- Remove the dumper **(A)** from its seat and replace.

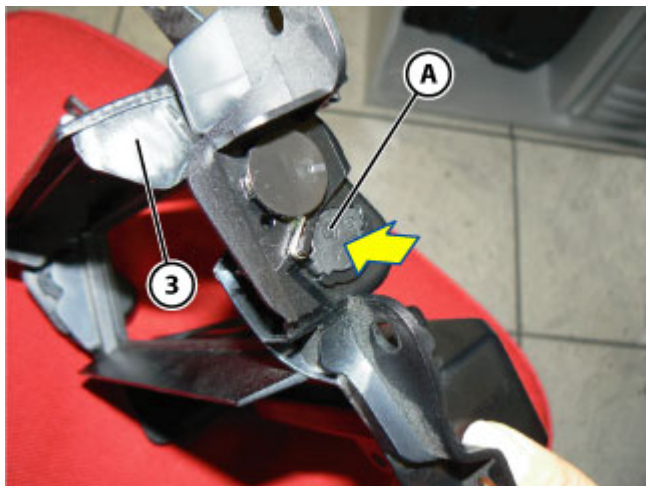


- Check that the new dumper is in the stop position, turning the pinion **(4)** counterclockwise.
- Turn the pinion **(4)** clockwise to reach the mechanism lock position.

If the pinion on the new dumper is not in the lock position.

- Turn the pinion **(4)** counterclockwise to reach the mechanism lock position.

If the pinion on the new dumper is not in the lock position.



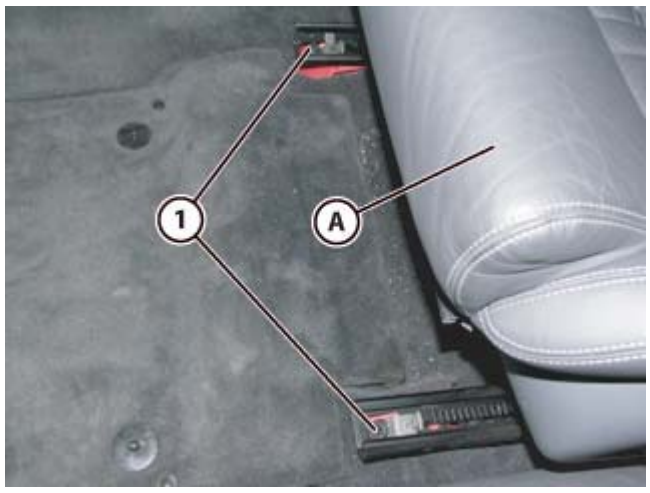
- Close the cover door **(3)** almost completely.
- Fit the dumper **(A)** gently in its seat, locating with the pinion facing inwards.
- Check that the cover door **(3)** closes correctly.
- Press the cover door **(3)** to check that it opens and closes correctly.

➢ Replace the AC control panel (M2.20).

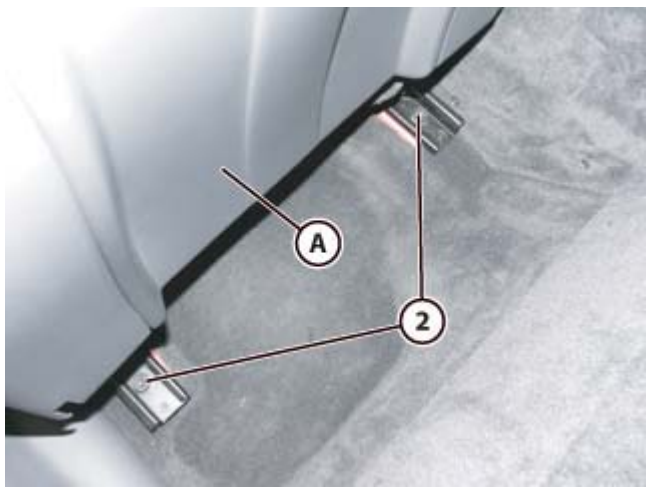
Refit the car stereo system fixing plate.

M2.21 Seats

Removing the seat



- Move the seat backward **(A)** to the end of its travel and undo the two front screws **(1)** fastening the rails to the floor.



- Move the seat forward **(A)** until the end of its travel and undo the two rear screws **(2)** fastening the rails to the floor.



- Tilt the seat sideways and remove the screw **(3)** fastening the seat belt **(4)** from the seat.
- Lift the front part of the seat and detach the seat belt locking device connector and the electrical seat connectors.
- Remove the seat from the passenger compartment.

Refitting the seat

Tightening torque		Nm	Class
Fastening seat belt to seat	Screw	40 Nm	B
Fastening seat - bodyshell	Screw	40 Nm	B

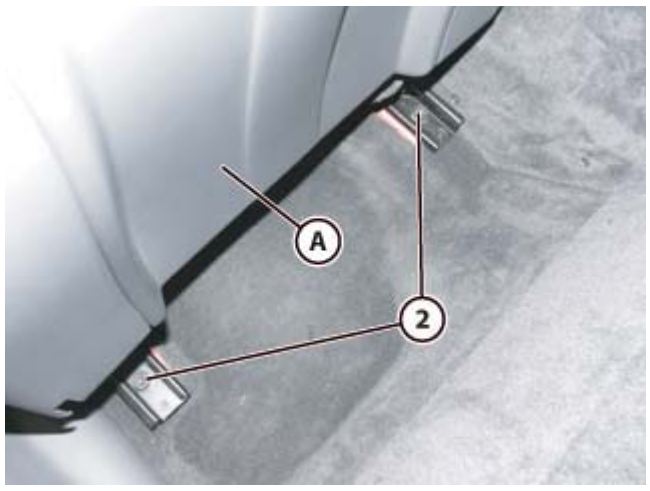
When refitting, lubricate the sliding surfaces of the rails.



- Fit the seat in the passenger compartment and fasten the seat belt **(4)** by tightening the screw **(3)**.

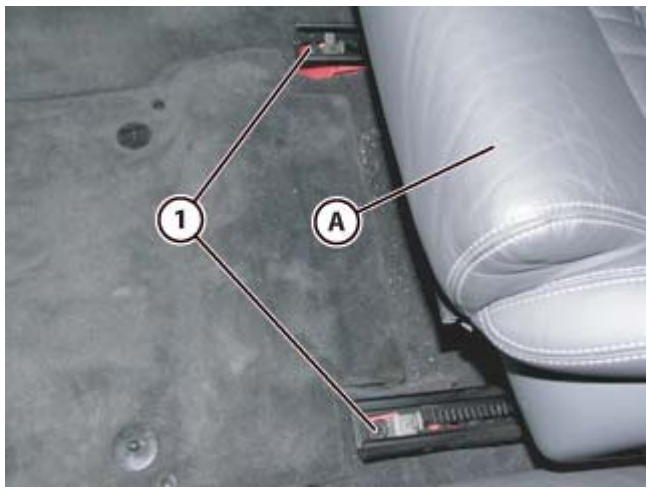
Tightening torque	Nm	Class
Screw	40 Nm	B

- Holding the front of the seat raised, connect the seat belt locking mechanism connectors and the relative seat connectors.



- Move the seat forward **(A)** to the end of its travel and tighten the two rear screws **(2)** fastening the rails to the floor.

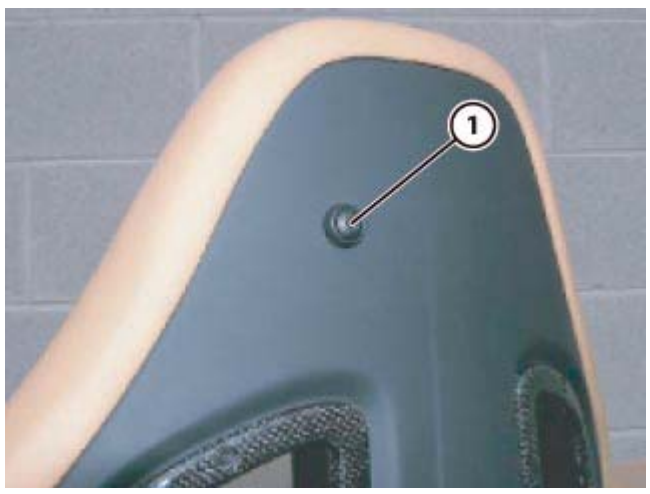
Tightening torque	Nm	Class
Screw	40 Nm	B



- Move the seat **(A)** back to the end of its travel and tighten the two front screws **(1)** fastening the rails to the floor.

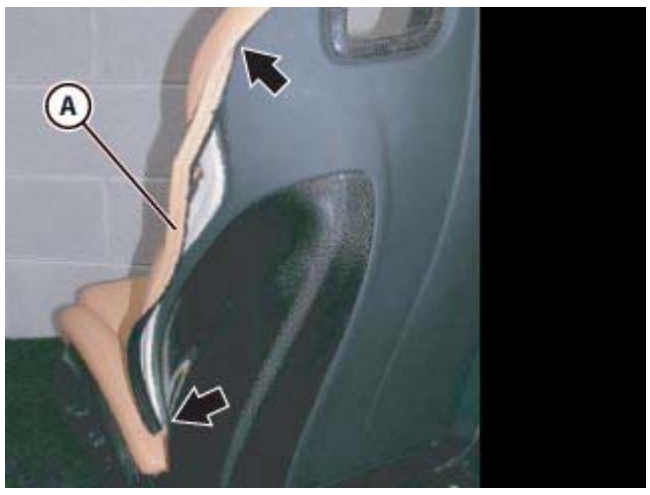
Tightening torque	Nm	Class
Screw	40 Nm	B

Reaffixing detached upholstery from seat backrest



DO NOT use the electric backrest rake control as this may damage the internal mechanism.

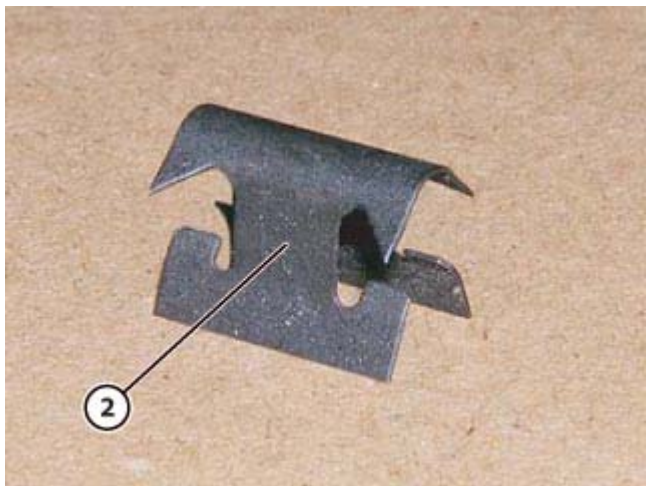
- Tip the seat forward by pressing the relative button **(1)** on the rear side.



- If the upholstery has only partially detached **(A)**, working with due caution, manually detach the upholstery from the midway point of the upper lateral curve to the bottom of the lateral backrest moulding.



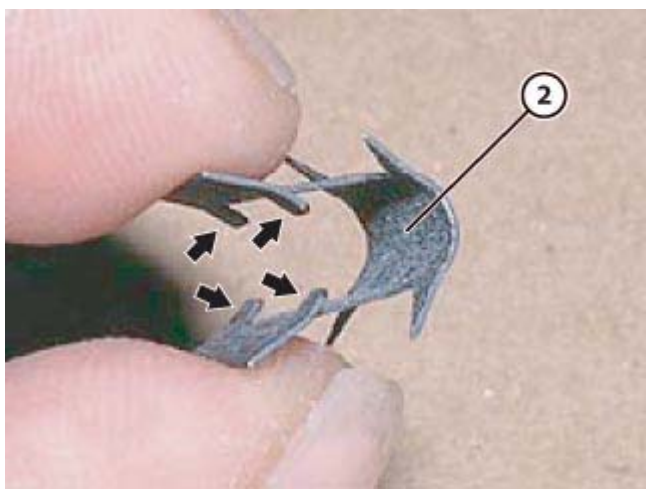
- Protect the lateral shell **(B)** in carbon fibre with adhesive tape and/or adhesive film, taking particular care in the area indicated on the side of the seat where the reaffixing procedure is to be carried out.



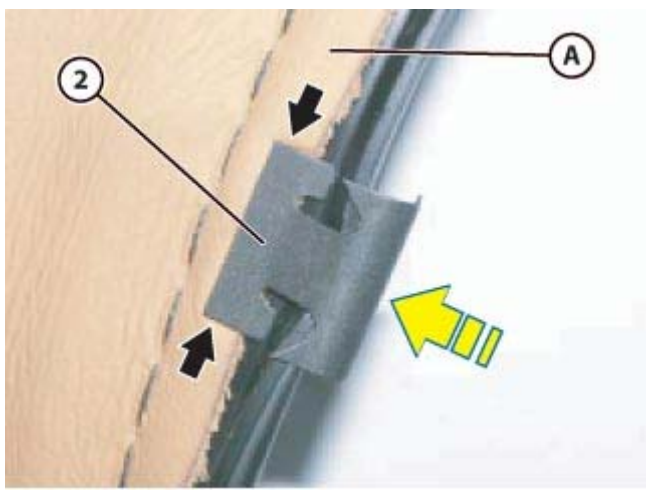
- To reaffix the upholstery, use five specific upholstery moulding fastener clips **(2)**.



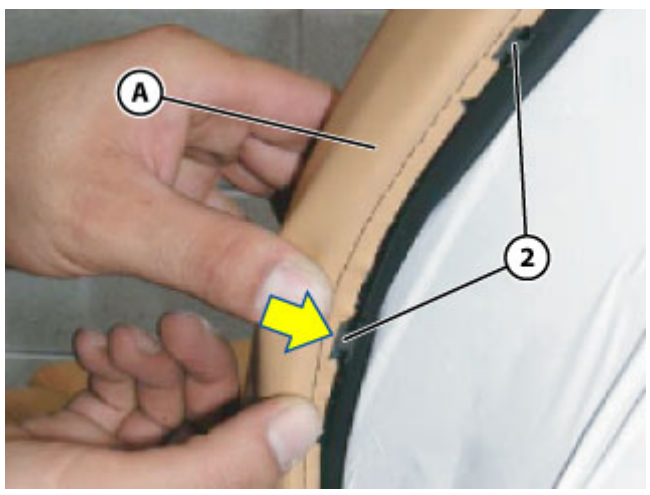
- These clips must be fitted equidistantly in the positions indicated on the plastic moulding **(C)** stitched onto the hide.



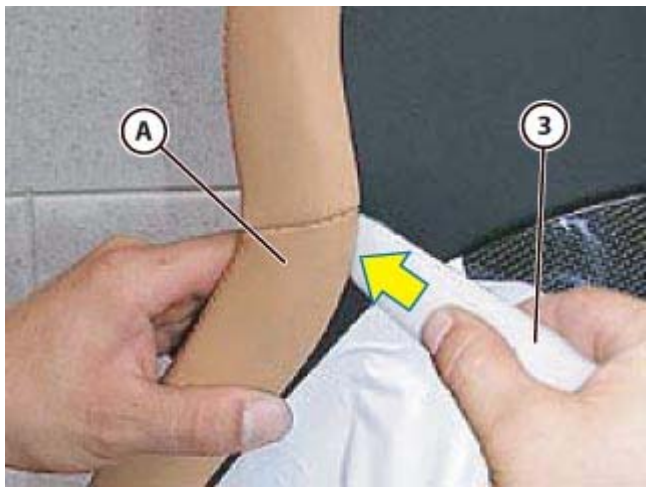
- The lower four tabs indicated for anchoring the clip **(2)** must be fixed onto the plastic moulding.



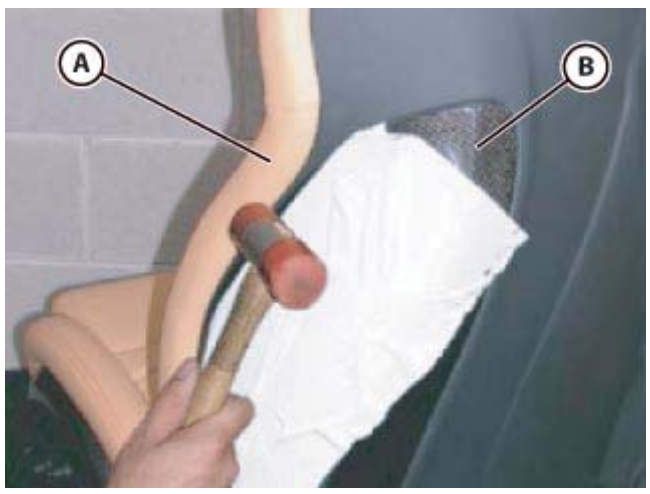
- The bottom side of the clip **(2)** must fit over the hide on the outer side of the upholstery moulding **(A)**.



- Starting from the bottom, manually fit the upholstery moulding **(A)**, turning the moulding inward and pushing the five anchor clips **(2)** into the relative seats in the backrest frame.



- Push the upholstery moulding **(A)** on the five anchor clips to definitively fix the clips onto the backrest frame, working with due caution and using a spatula **(3)** of suitable thickness and made of an appropriate material (wood or Teflon).



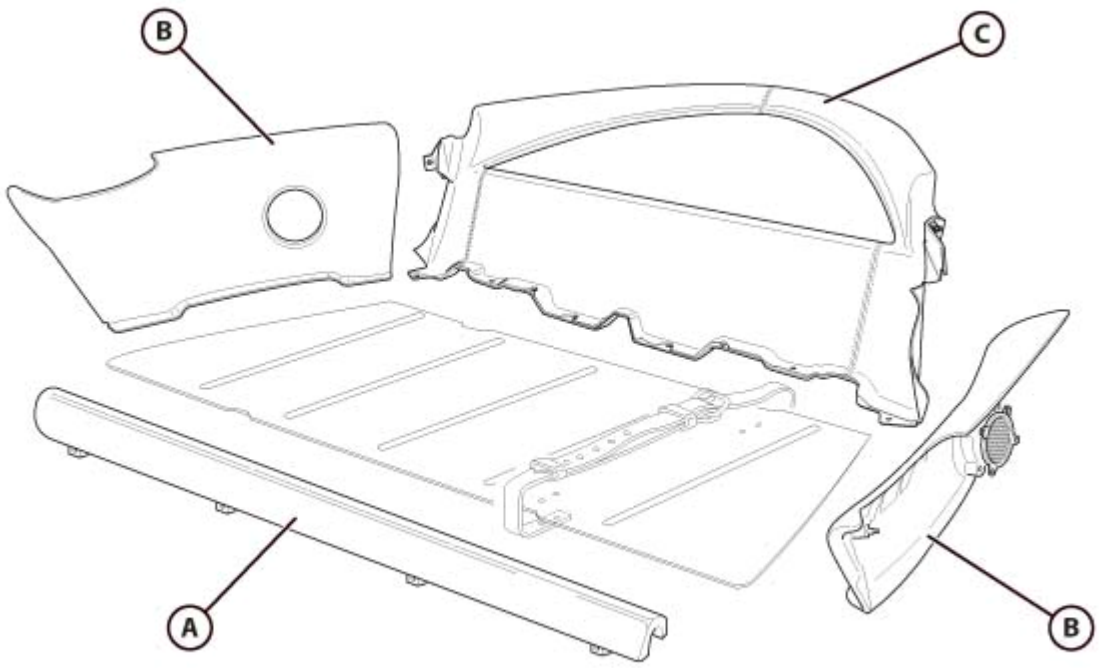
- Tap lightly over the whole section of reaffixed upholstery **(A)** to align correctly with the rest of the seat and to ensure that it is securely anchored to the backrest frame.
- Remove the protective film or tape applied to the lateral carbon fibre shell **(B)**.

DO NOT use the electric backrest rake control as this may damage the internal mechanism.

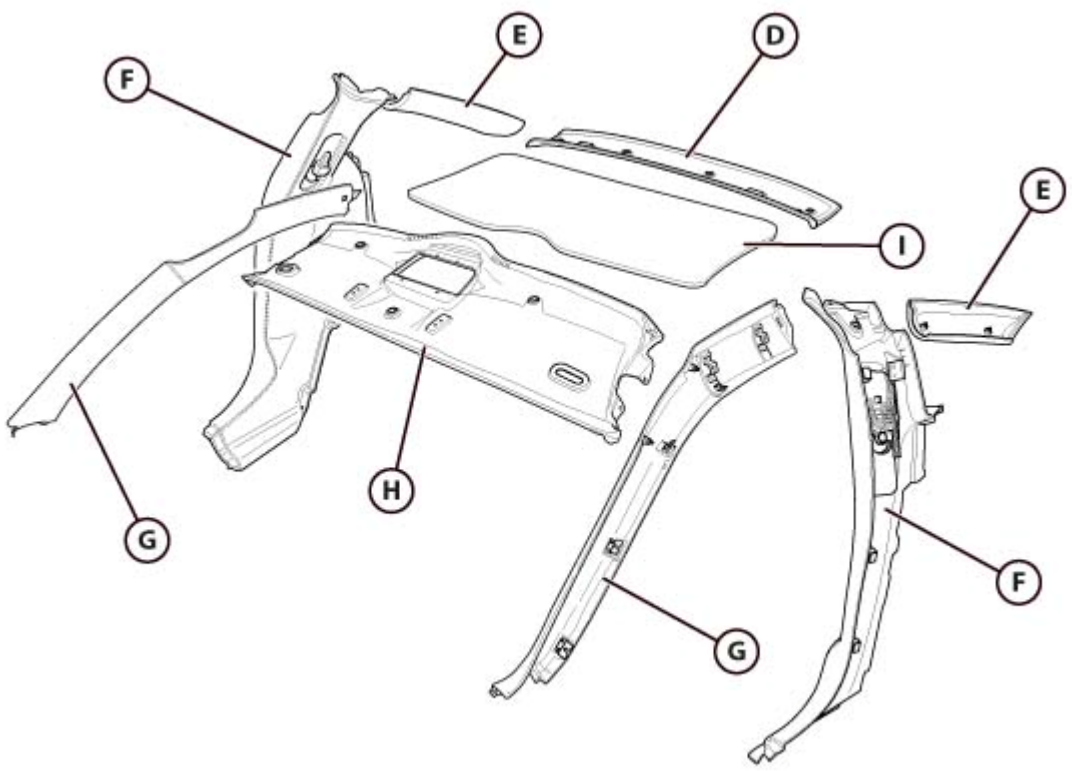
- Press the relative button to bring the backrest back into the upright position.

M2.22 Passenger compartment and roof trim panels

Passenger compartment and roof trim panels



A - Luggage retainer lip
B - Rear trim panel
C - Parcel shelf trim panel

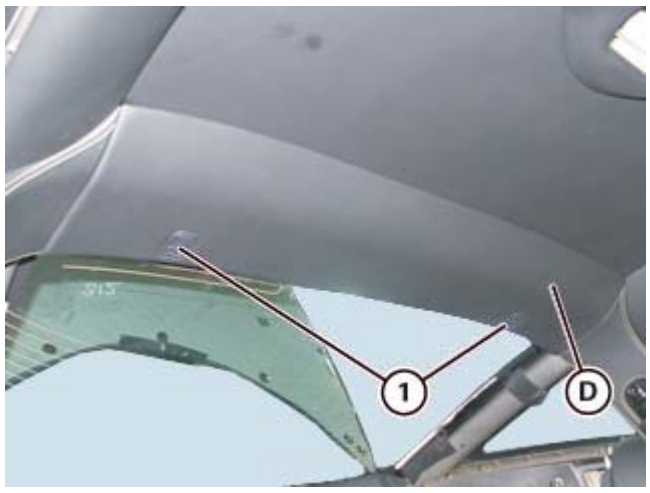


D - Upper rear screen cross member trim panel
E - Rear pillar trim panel
F - Centre pillar trim panel
G - Front pillar trim panel
H - Upper windscreen cross member
I - Roof trim panel

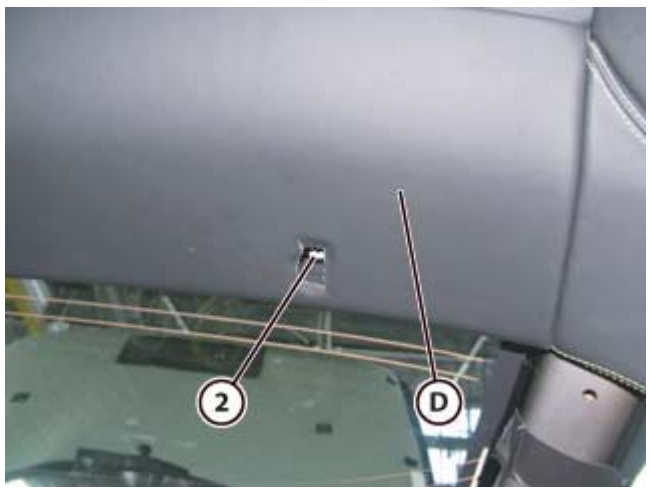
Removing the passenger compartment and roof trim panels

The following set of operations is for the removal of all the roof trim panels, which must be removed and refitted in a precise sequence. Always follow the sequence given, even when only carrying out partial jobs, to prevent damaging the components and fasteners.

The roof trim panels are also fastened with inserts which must be press-fit into the corresponding seats on the bodywork. To remove these trim panels, prise out with a pointed plastic blade, taking particular care not to damage the trim panels.



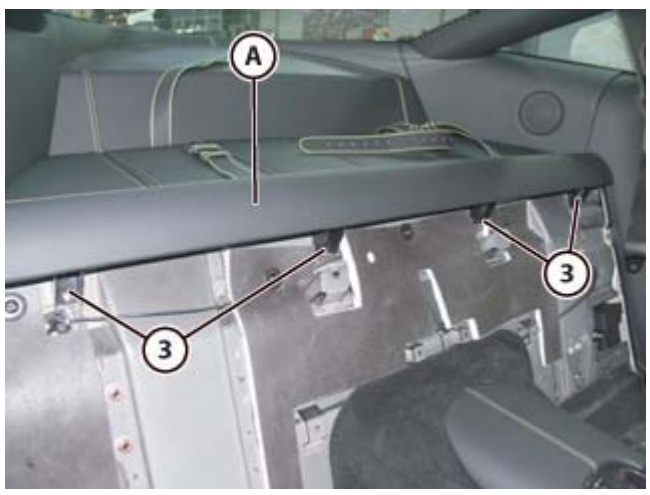
- The upper rear screen cross member trim panel **(D)** is independent of the other trim panels, and may be removed alone at any time.
- Remove the two coat hanger hooks and undo the two screws **(1)** fastening them to the cross member.



- Remove the two coat hanger hooks and undo the two screws **(2)** fastening the trim panel **(D)** to the bodywork.
- Remove the upper rear screen cross member trim panel **(D)**.

- Remove the rear trim panels (M2.24).

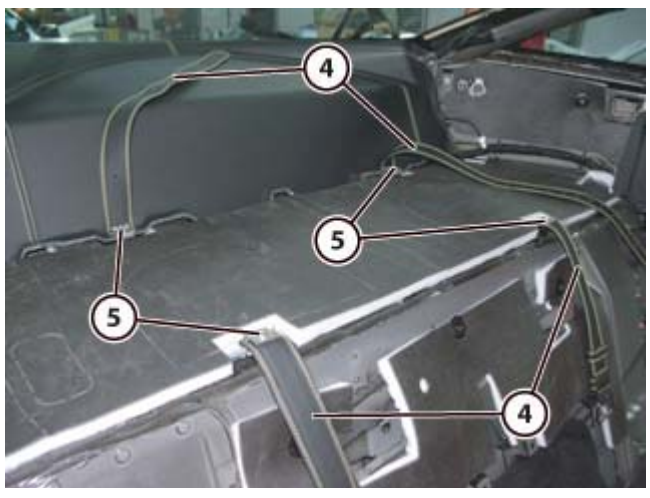
Follow the removal sequence up to the removal of the **backrest trim panel**.



- Remove the luggage shelf **(A)** by undoing the four pairs of screws **(3)**.

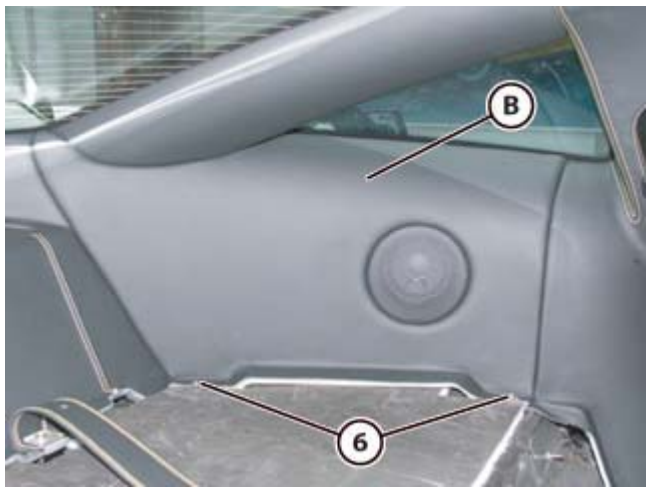
- Remove the rear trim panels (M2.24).

Follow the removal sequence up to the removal of the **luggage shelf**.

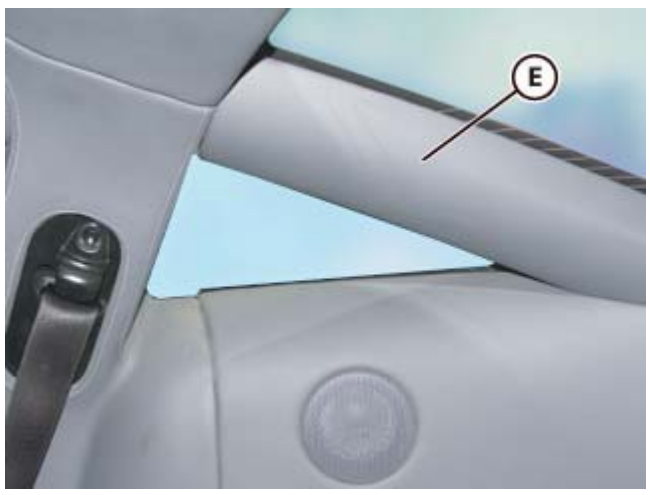


- Remove the luggage retainer straps **(4)** by undoing the four screws **(5)**.

Note that the photograph was taken with the rear trim panel and the rear door pillar panel already removed.

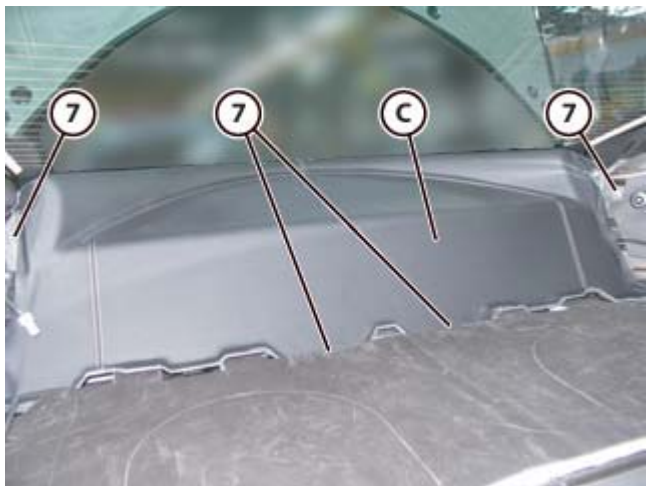


- Remove the rear cover **(B)** undoing the two screws **(6)** fastening the cover to the bodyshell and disconnect the woofer connector.
- Remove the rear trim panel **(B)**.



- Prise the rear door pillar trim panel from the bodywork **(E)** using a plastic blade (the panel is fixed with snap fasteners only).

Note that the photograph was taken with the rear trim panel and the upper rear screen cross member trim panel still installed.



- Remove the parcel shelf trim panel **(C)**, undoing the four screws **(7)** and disconnecting the woofer connectors.
- Remove the parcel shelf trim panel **(C)** from the vehicle, easing out towards the front.



For vehicles with four-point seat harnesses

- Remove the brackets **(15)** by undoing the indicated screws.



For vehicles with four-point seat harnesses

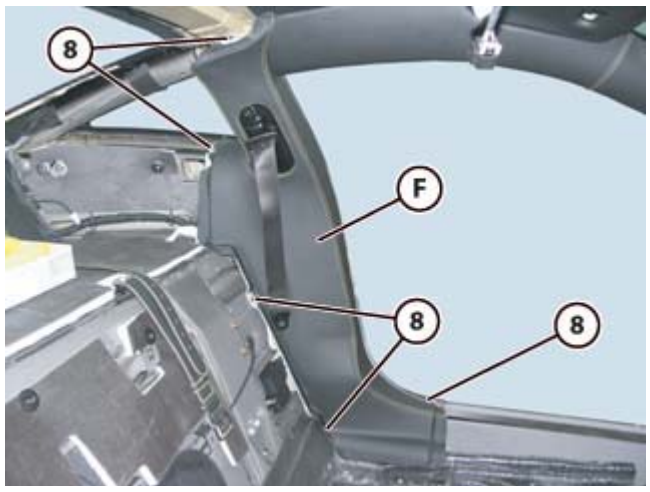
- Undo the indicated screws fastening the seat belt buckles **(16)**.
- Prise out the surrounds **(18)**.
- Pull the anchor tabs **(16)** of the seat harness straps out from the parcel shelf trim **(C)**.
- Remove the parcel shelf trim panel **(C)**.

- Remove the lateral trim panels (M2.24).

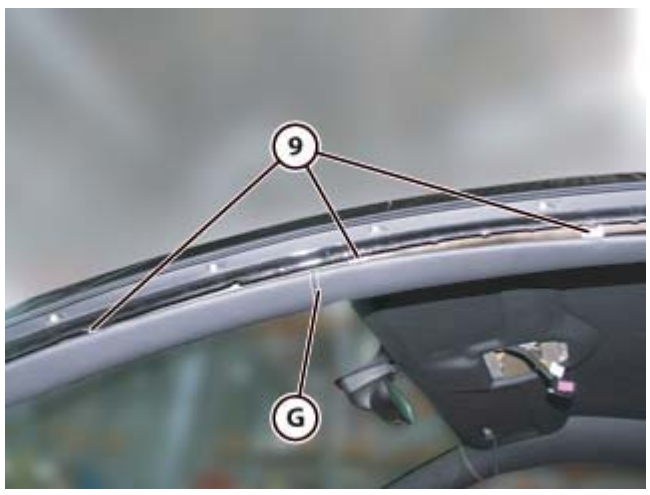
Remove the component on the side where you will be working.

- Remove the door bay perimeter seal strip (M2.13).

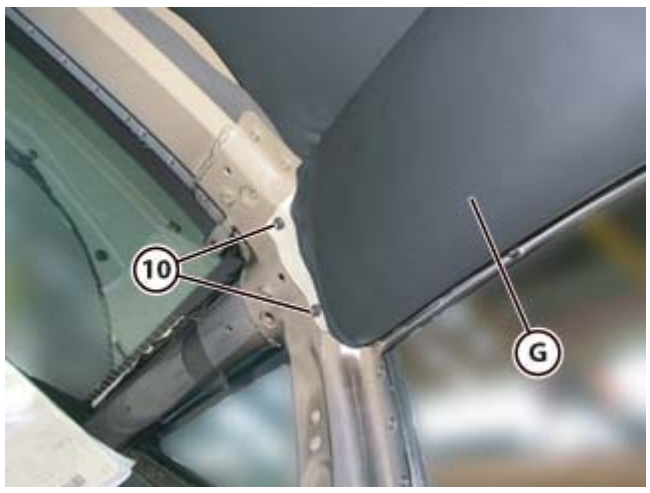
Detach from its relative seat on the door bay, only in the area near the components to be removed.



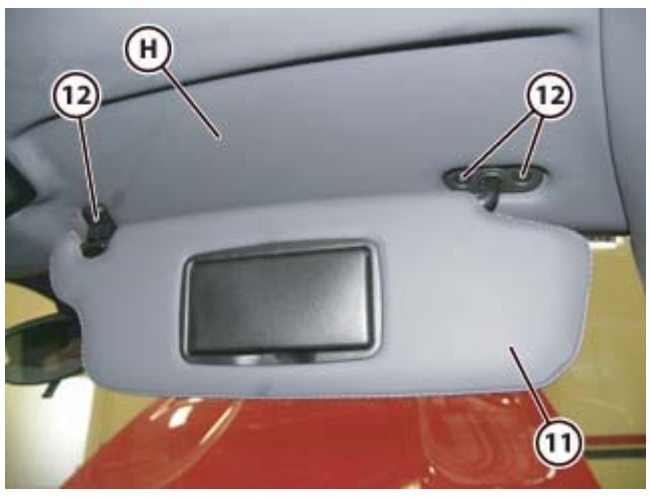
- Remove the central pillar trim panel **(F)** by undoing the five screws **(8)**.
- Remove the seat belt and the central pillar trim panel **(F)** from the vehicle.



- To remove the front pillar trim panel **(G)**, undo the three external screws **(9)**.



- Undo the two internal screws **(10)** and remove the front pillar trim panel **(G)**.



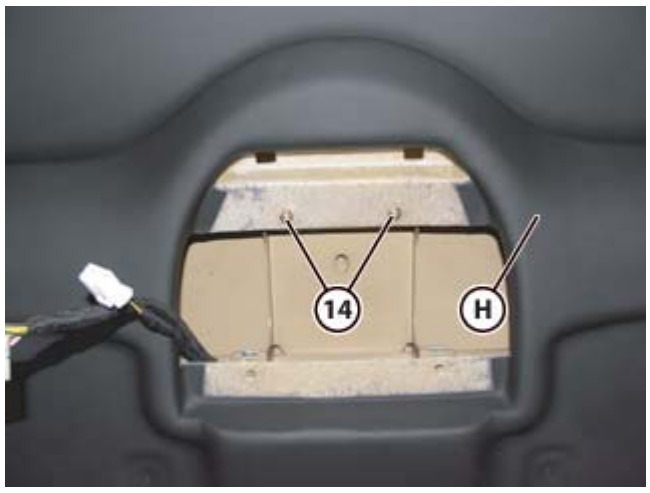
- Remove the sun visors **(11)** by undoing the three screws **(12)** fastening them to the upper windscreen cross member **(H)**.

Repeat the same procedure for the driver side sun visor.

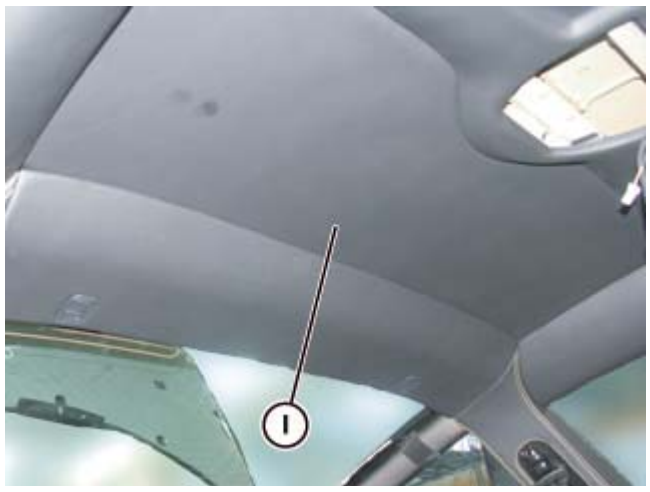


- Disconnect the connector **(13)** (I023)for the courtesy light on the passenger side sun visor.

- Remove the dome light (H3.09).



- To remove the upper windscreen cross member **(H)**, undo the four lateral screws (two per side) on the pillars and the two central screws **(14)**.
- Remove the upper windscreen cross member **(H)** from the vehicle.



- Remove the roof trim panel **(I)** (the panel is simply glued onto the bodywork).

Note that the photograph was taken with the trim panels adjacent to the roof trim panel still installed.

Refitting passenger compartment and roof trim panels

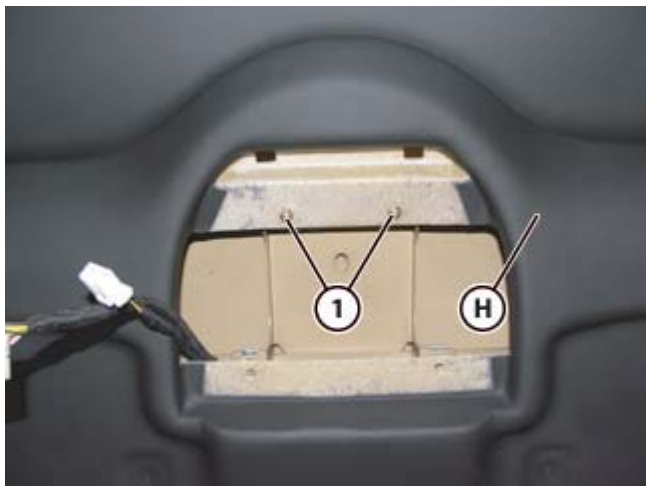
Tightening torque		**Nm**	**Class**
Fastening four-point seat harnesses to bodyshell	Screw	40 Nm	B

Before refitting the trim panels removed previously, replace all the inserts for the components removed and check that they are securely fastened in their seats on the bodywork. Also check that the clips and the fastener brackets are correctly shaped.

When refitting, check that each single component is properly fitted and aligned with all the adjacent parts before fitting the next part.



- Fit and glue the roof trim panel **(I)** on the bodywork ceiling, pressing in place to adhere correctly.

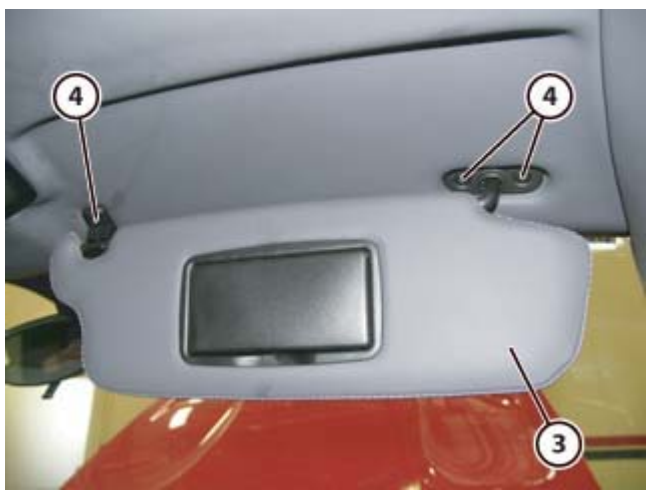


- Fit the upper cross member of the windscreen **(H)** on the bodywork and fasten with the two central screws **(1)** and the four lateral screws (two per side) on the pillars.

- Refit the internal dome light (H3.09).

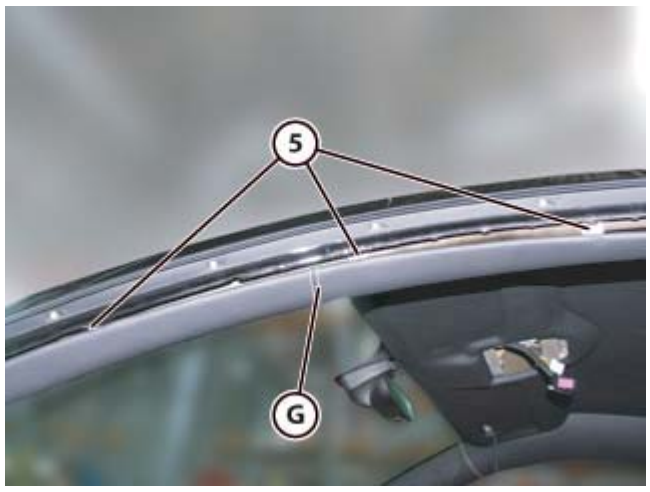


- Refit the passenger-side sun visor and connect the courtesy light connector **(2)** (I023).

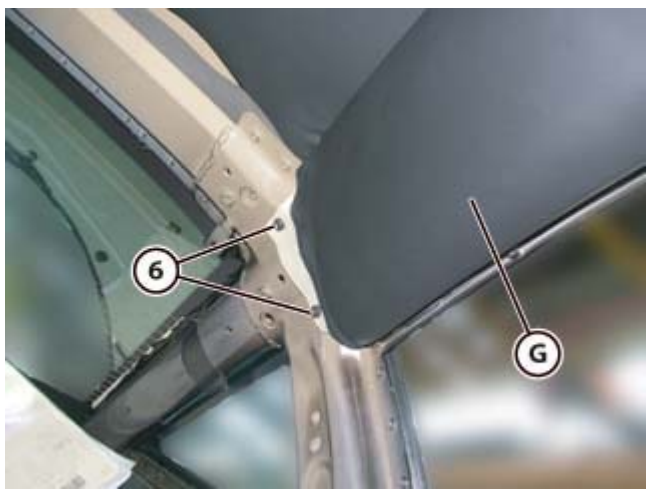


- Fasten the sun visor **(3)**, tightening the three screws **(4)** fastening the visor to the upper cross member of the windscreen.

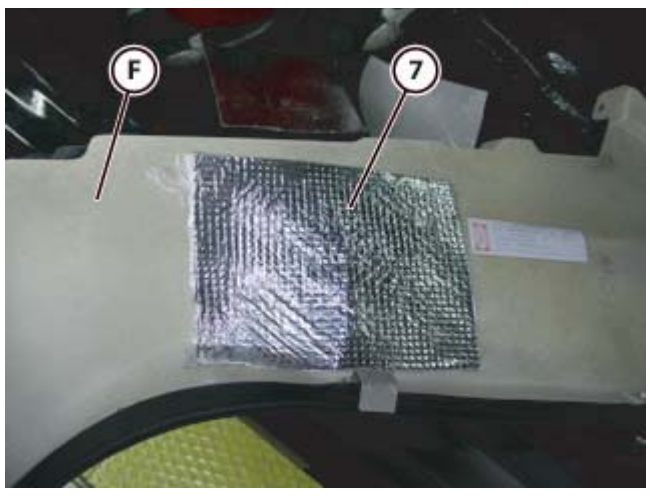
i Repeat the same procedure for the driver-side sun visor.



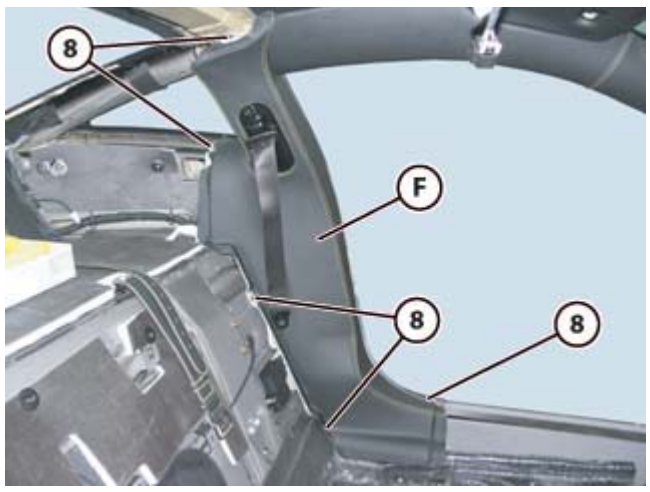
- Fit the front pillar outer panel **(G)** on the bodywork and fasten with the three external screws **(5)**.



- Fasten the front pillar outer panel **(G)** definitively, tightening the two internal screws **(6)** on the bodywork.



- Check that the fireproof trim **(7)** glued near the seat belt pretensioner on the inner side of the centre pillar trim panel **(F)**, is intact.



- Feed the seatbelt through the in the trim panel.
- Fasten the central pillar trim panel **(F)** with the five screws **(8)**.

- Refit the lateral trim panels (M2.24).
- Refit the door bay perimeter seal strip (M2.13).



For vehicles with four-point seat harnesses

- Feed the anchor tabs **(16)** of the seat harness straps through the relative slots in the parcel shelf trim **(C)**.
- Tighten the screws indicated.



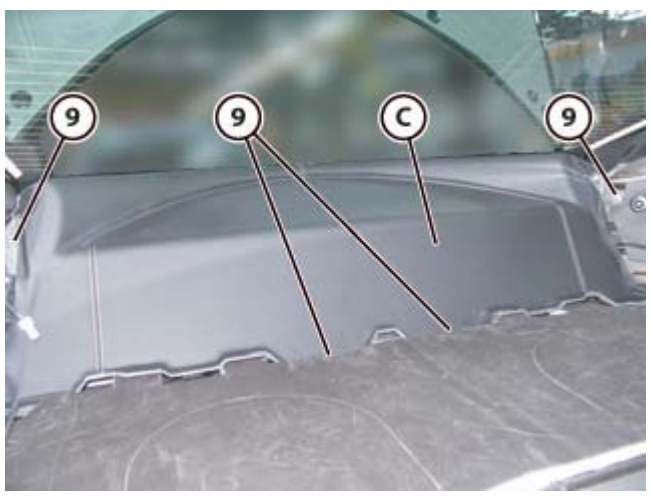
Tightening torque	Nm	Class
Screw	40 Nm	B

- Fit the surrounds **(18)**.

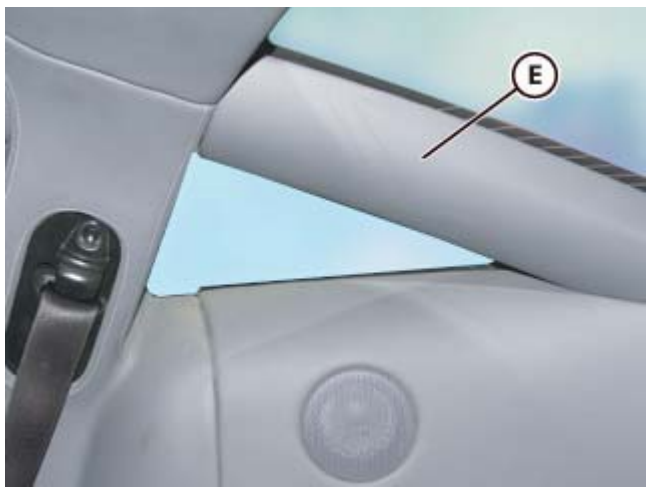


For vehicles with four-point seat harnesses

- Fit the brackets **(15)** and tighten the indicated screws.

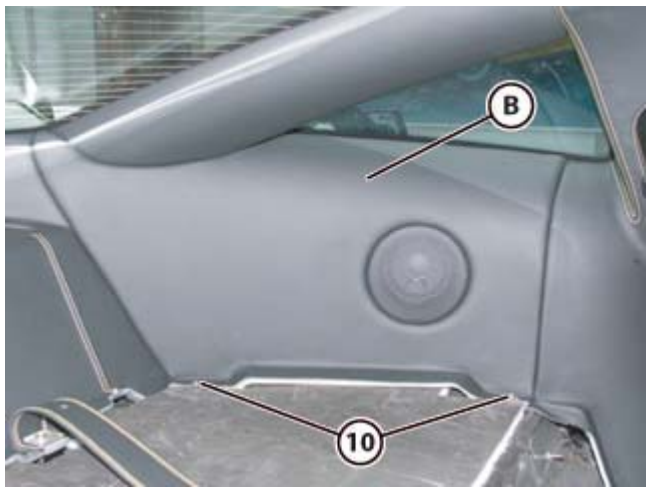


- Introduce the parcel shelf trim panel **(C)** into the passenger compartment and connect the woofer connectors.
- Fit the parcel shelf trim panel **(C)**, inserting its rear pins in the relative seats on the bodywork and fastening with the four screws **(9)**.



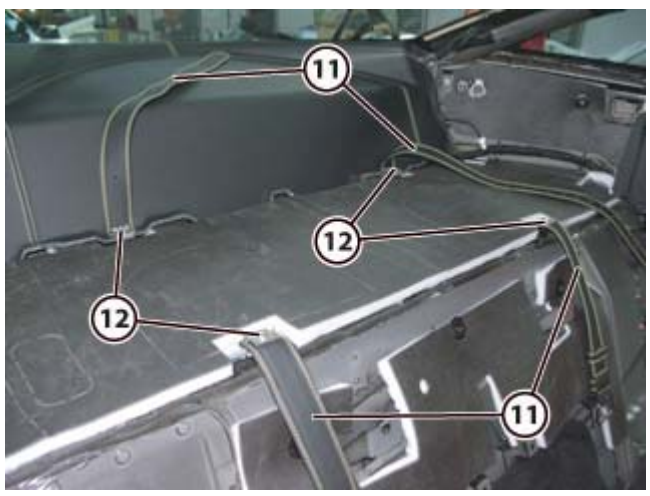
- Press-fit the outer rear pillar trim panel **(E)** on the bodywork (the panel is fastened by snap fasteners only).

Note that the photograph was taken with the rear trim panel and the upper rear screen cross member trim panel already installed.



- Introduce the rear trim panel **(B)** into the passenger compartment and connect the woofer connector.
- Fit the rear trim panel **(B)** onto the bodywork and fasten with the two screws **(10)**.

- Refit the seat (M2.21).

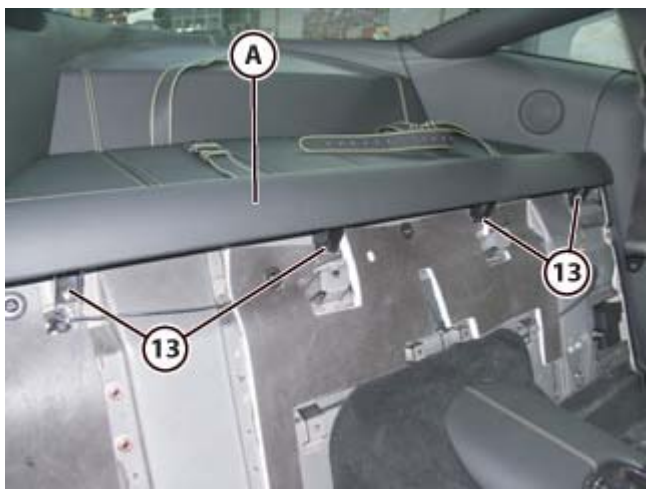


- Refit the luggage retainer straps **(11)** by tightening the four screws **(12)**.

Note that the photograph was taken with the rear covering panel and the rear pillar outer panel already installed.

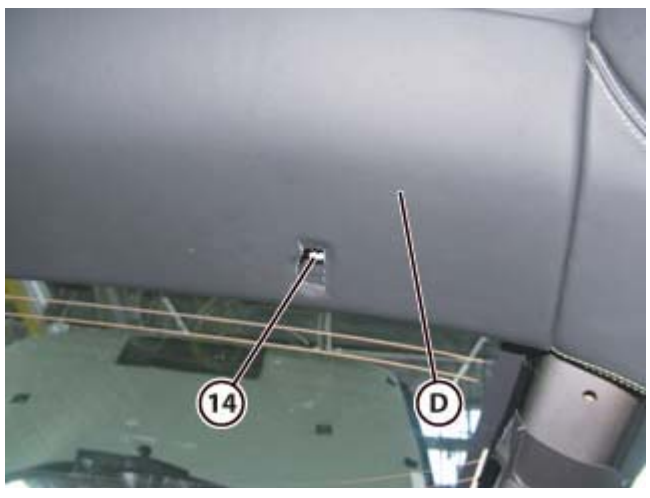
- Refit the rear trim panels (M2.24).

Carry out the refitting sequence up to the installation of the **luggage shelf**.

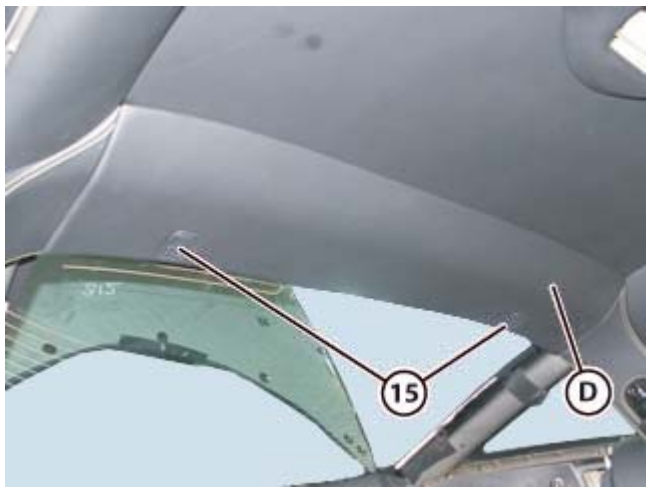


- Fit the luggage shelf **(A)** on the bodywork and fasten with the four pairs of screws **(13)**.

- Refit the rear trim panels (M2.24).



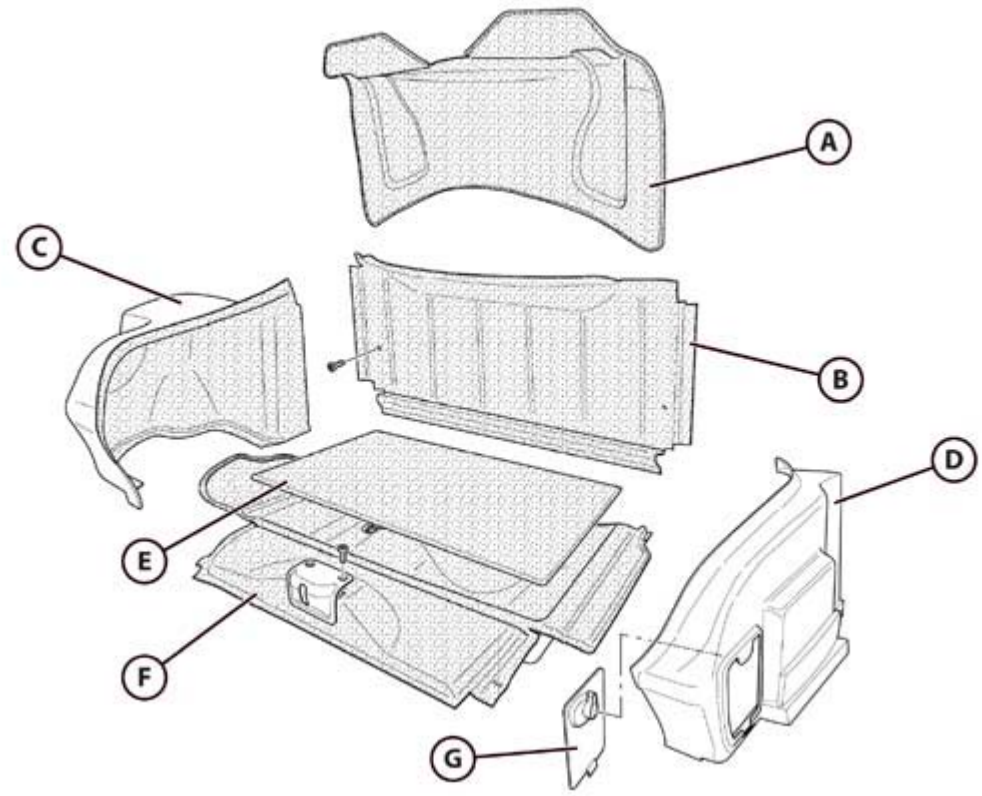
- Fit the upper rear screen cross member **(D)** in its seat on the bodywork.
- Fasten the upper rear screen cross member **(D)** by tightening the two screws **(14)**.



- Fit the two coat hooks **(D)** on the upper rear screen cross member and fasten with the two screws **(15)**.

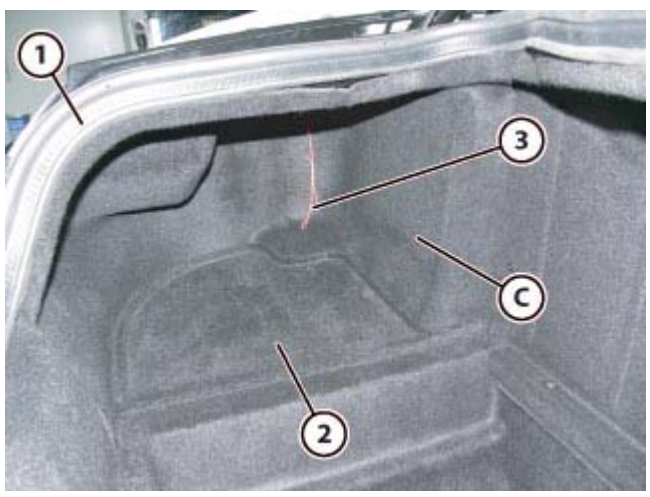
M2.23 Luggage compartment trim panels

Luggage compartment trim panels

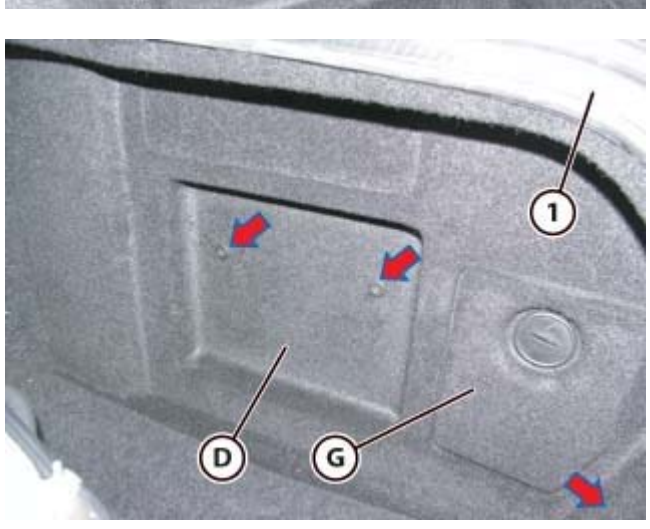


A - Internal luggage compartment trim panel
B - Trim panel for luggage compartment tank wall
C - Left hand taillight cover mat
D - Right hand taillight cover mat
E - Luggage compartment floor cover
F - Luggage compartment floor mat
G - Battery master switch panel

Removing the luggage compartment side trim panels



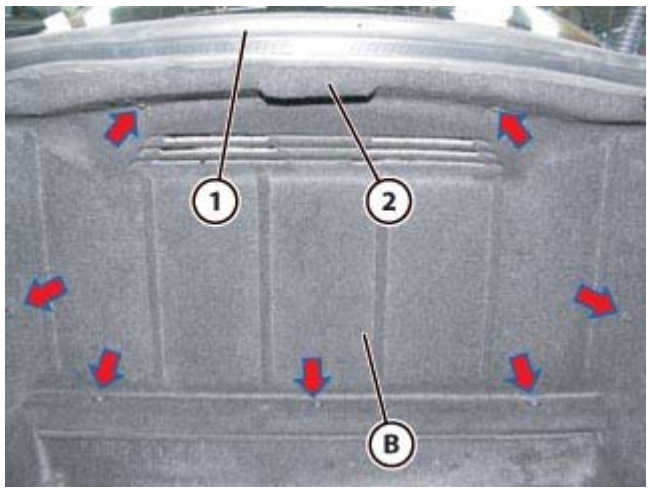
- To remove the left hand tail light cover panel **(C)** lift the perimeter seal strip **(1)** in the relative area and then lift the flap **(2)** of the luggage compartment floor mat.
- Detach the adhesive strip from the bodywork lip at the top of the trim panel.
- Remove the tail light cover panel **(C)** from the luggage compartment by, pulling out the fuel filler flap release cable **(3)**.



- To remove the right hand tail light cover panel **(D)** complete with battery master switch cover **(G)**, lift the perimeter seal strip **(1)** and undo the three screws indicated by the arrows.
- Detach the adhesive strip from the bodywork lip at the top of the trim panel.
- Remove the tail light cover panel from the luggage compartment **(D)**.

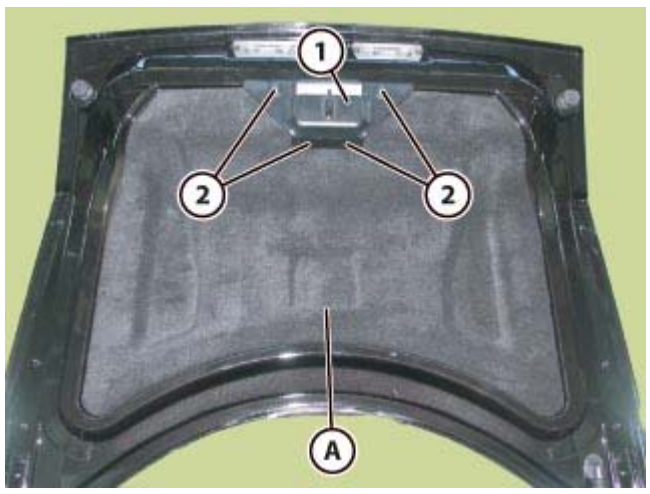
Removing the tank panel trim panel from the luggage compartment

➢ Remove the luggage compartment side trim panels.
➢ Lift and remove the luggage compartment floor cover.



- Lift the perimeter seal strip **(1)** in the relative area and remove the luggage compartment light **(2)**.
- Undo the seven screws indicated by the arrows and remove the tank panel trim **(B)**.

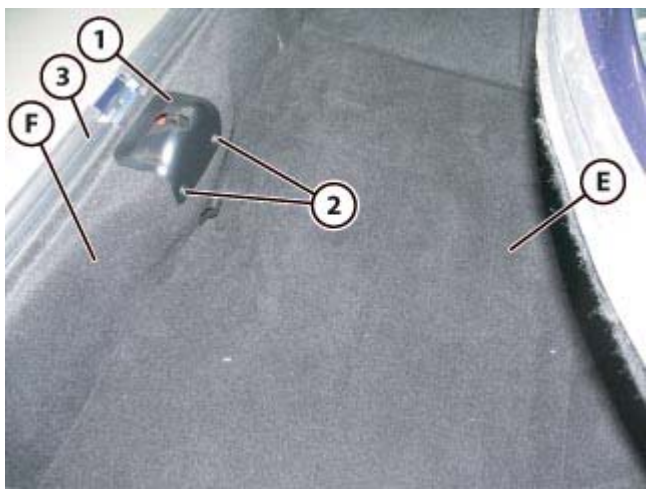
Removing the internal trim panel on the luggage compartment lid



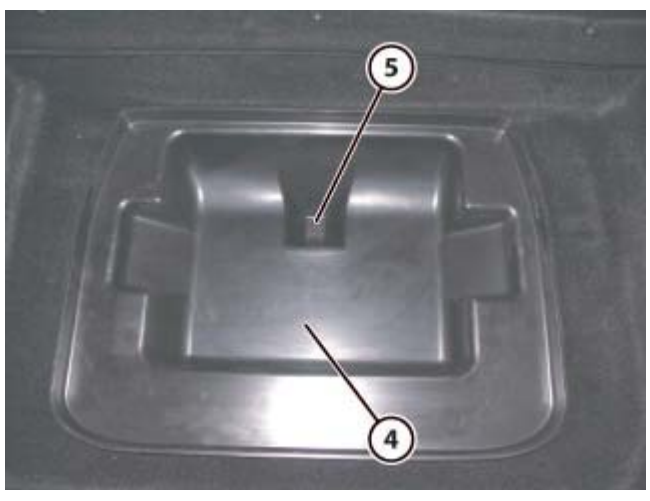
- Remove the lock cover **(1)** by undoing the four screws **(2)**.
- Remove the internal trim panel of the luggage compartment lid **(A)** using a plastic blade to release the snap-fittings.

Removing the luggage compartment floor trim panels

Remove the side trim panels and the tank panel mat.

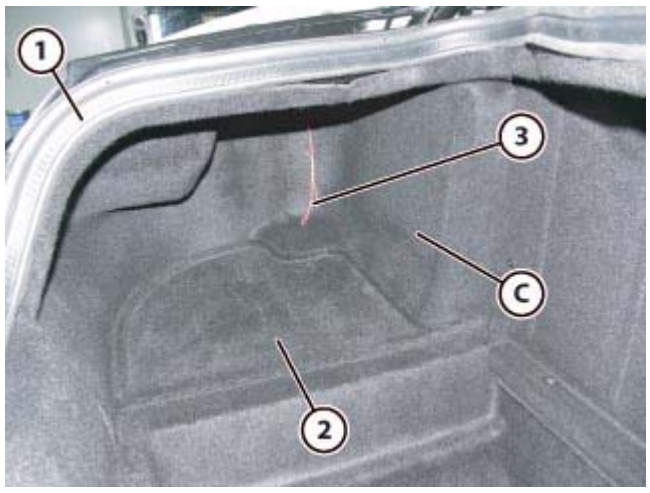


- Remove the luggage compartment floor cover **(E)** lifting it with the tab.
- Remove the luggage compartment lid lock cover **(1)** by undoing the two screws **(2)**.
- Lift the perimeter seal strip **(3)** in the relative area and remove the luggage compartment floor mat **(F)**.

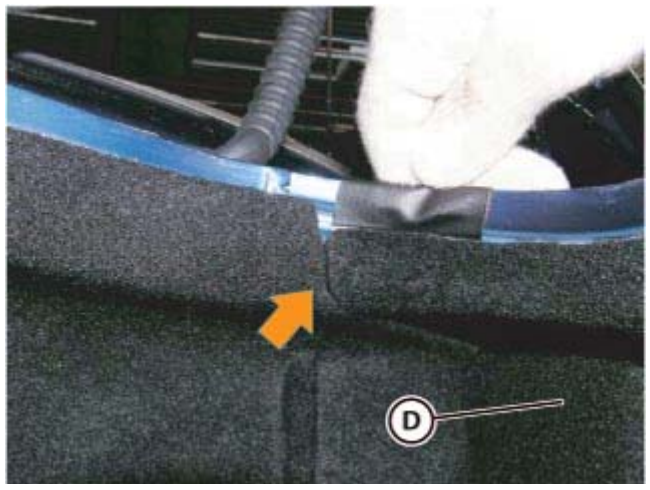


- On vehicles with (optional) space saver spare wheel, to remove the wheel mounting **(4)** on the luggage compartment floor, undo the screw **(5)**.

Refitting the luggage compartment side trim panels



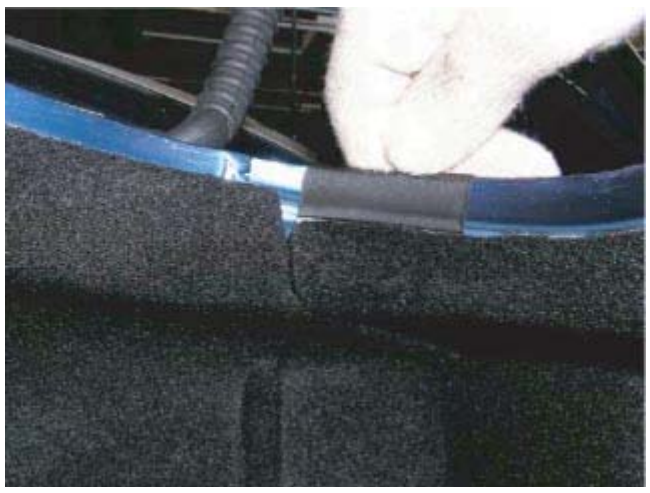
- Fit the left hand tail light cover mat **(C)** in the luggage compartment, running the cable **(3)** through the fuel filler flap recess.
- Fix the adhesive strip onto the bodywork lip as originally installed (see following procedure for refitting the right hand tail light cover mat).
- Fit the mat **(C)**, inserting the upper flap underneath the perimeter seal strip **(1)** and the front flap into the seat in the luggage compartment tank panel mat.
- Fit the flap **(2)** of the luggage compartment floor mat as originally installed.



- Fit the right hand tail light cover mat **(D)** correctly in the luggage compartment, taking particular care to ensure that the upper front edge in contact with the fuel tank panel is correctly aligned.



- Glue the adhesive strip onto the bodywork lip for fitting the luggage compartment perimeter seal strip.



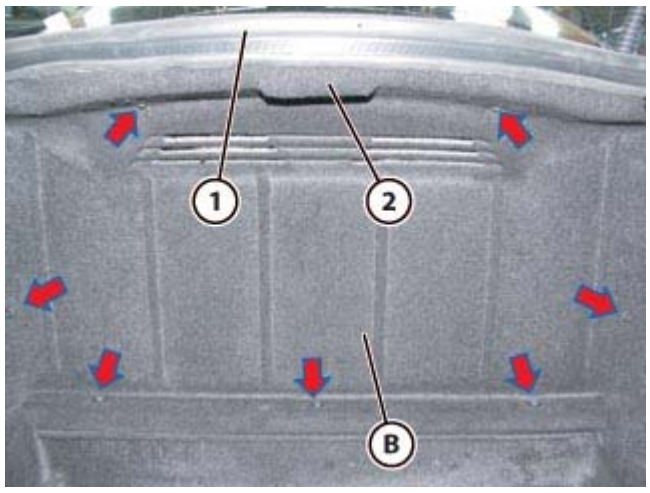
- Similarly, glue the short adhesive strip on the front side of the trim panel.



- Refit the perimeter seal strip correctly, then fasten the right hand tail light cover mat **(D)** to the wall panel with two screws **(3)** and the press-fit plug **(4)**.

Refitting the luggage compartment tank panel trim

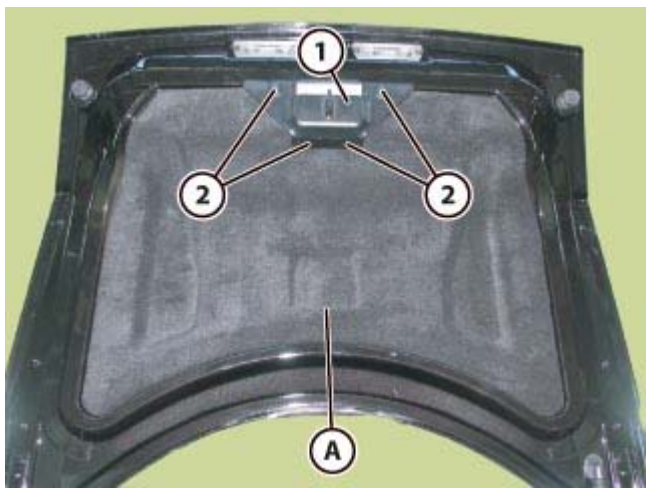
Before refitting, replace all the inserts on the internal trim panel of the luggage compartment lid and check that they are securely fastened in the relative retaining brackets.



- Fit the tank panel trim **(B)** in the luggage compartment and pass the luggage compartment dome light **(2)** through the hole.
- Tighten the seven screws indicated by the arrows, fit the dome light **(2)** in its seat and insert the upper tab of the trim under the perimeter seal strip **(1)**.

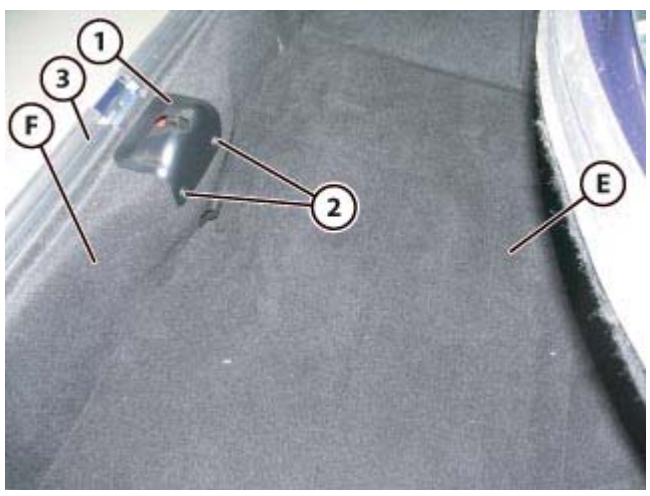
➢ Refit the luggage compartment floor trim and the luggage compartment side mats.

Refitting the internal trim panel on the luggage compartment lid

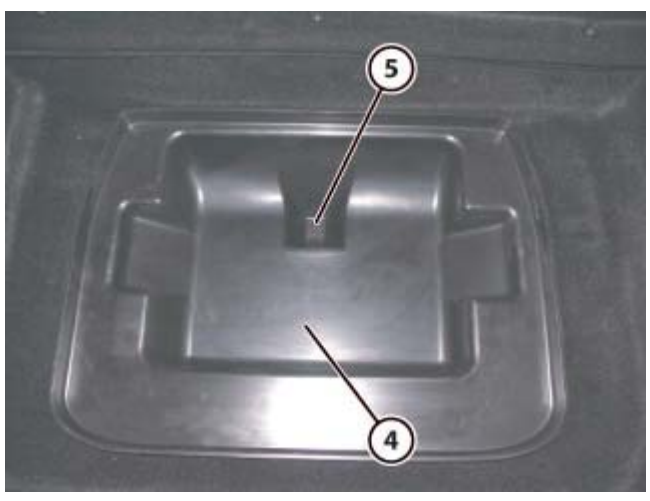


- Fit the internal trim panel **(A)** on the luggage compartment lid and fasten with the fittings.
- Fit the lock cover **(1)** and fasten by tightening the four screws **(2)**.

Refitting the luggage compartment floor trim panels



- Fit the luggage compartment floor mat in the luggage compartment **(F)**.
- Fit the luggage compartment lid lock cover **(1)** on the mat and tighten the two screws **(2)**.
- Fit the outer tabs of the mat underneath the perimeter strip **(3)**.
- Fit the luggage compartment floor cover in the luggage compartment **(E)**.

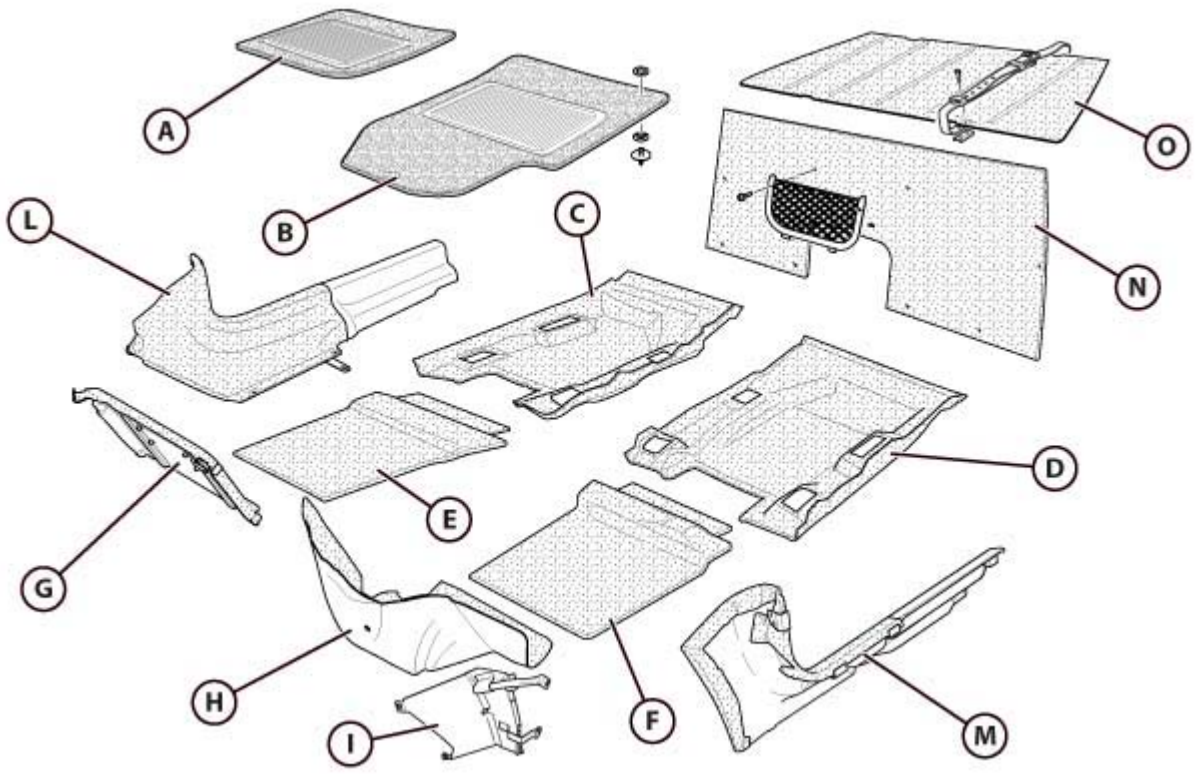


- If the vehicle is equipped with a spare wheel, fasten the wheel mount **(4)** by tightening the screw **(5)**.

➢ Refit the tank panel mat and the side mats.

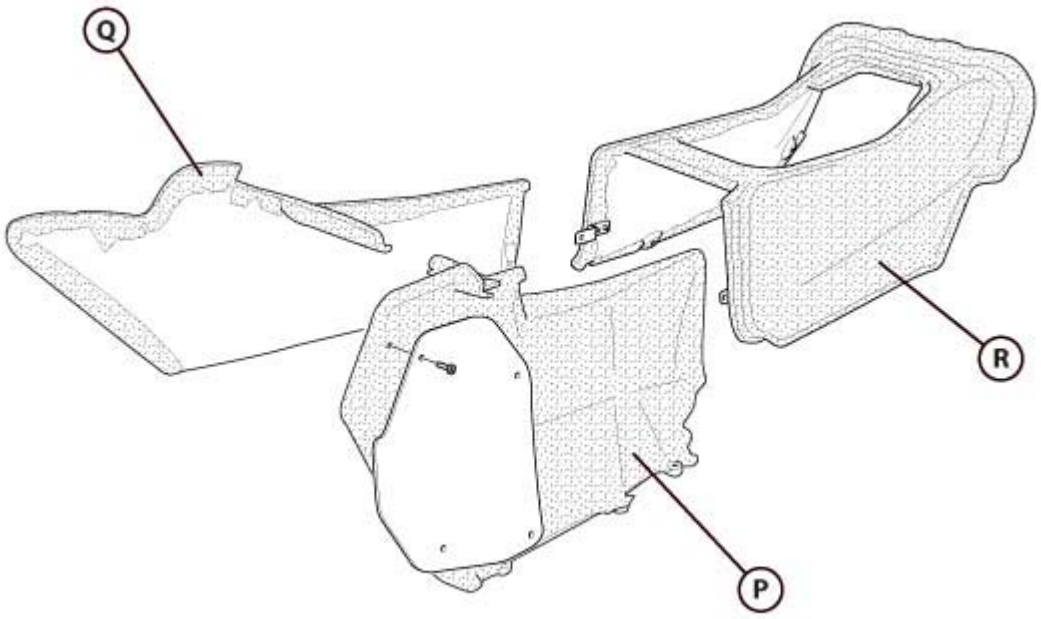
M2.24 Trim panels and mats

Covering panels and mats



A - Passenger side removable mat
B - Driver side removable mat
C - Passenger side floor mat
D - Driver side floor mat
E - Passenger side floor mat fastener
F - Driver side floor mat fastener
G - Passenger side footrest
H - Front left hand performed mat
I - Driver side footrest
L - Right hand sill trim panel
M - Left hand sill trim panel
N - Backrest trim
O - Luggage shelf

Tunnel console trim panels



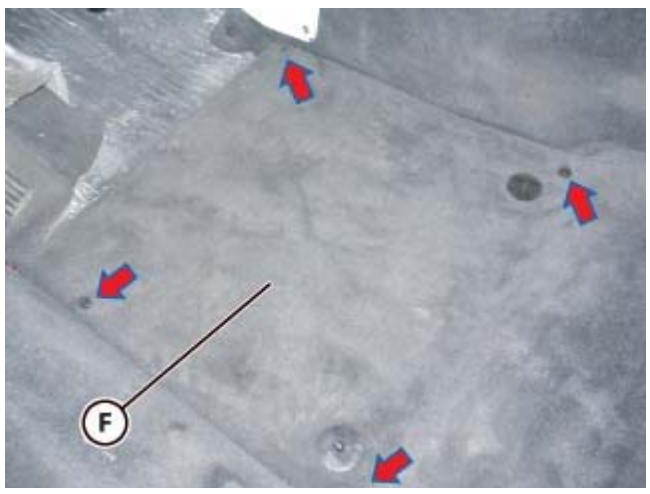
P - Front left hand side tunnel console trim
Q - Front right hand side tunnel console trim
R - Rear tunnel console trim panel

Removing the mats

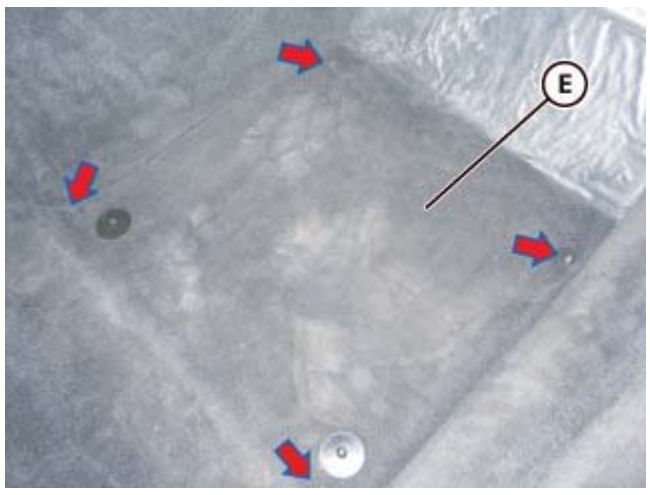


- The mat **(B)** may be easily removed for cleaning and washing; push on the fastener **(1)** and remove the mat **(B)**.

Use the same procedure for the passenger side mat.



- To remove the driver side floor mat fastener **(F)** undo the four screws indicated by the arrows.



- To remove the passenger side floor mat fastener **(E)** undo the four screws indicated by the arrows.

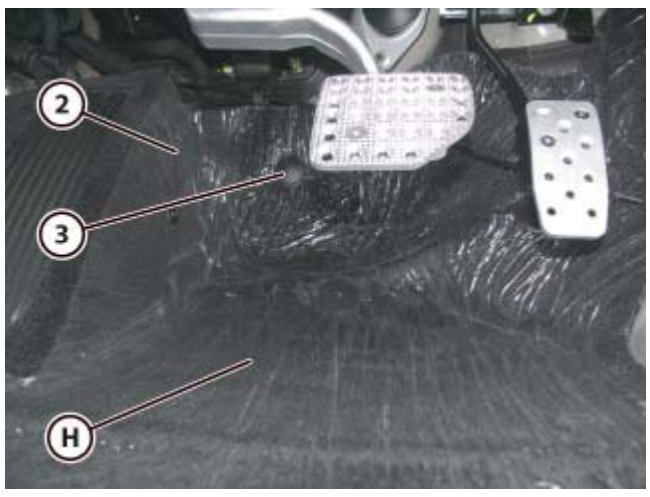
- Remove the **right hand sill trim panel** as described below.
- Remove the **front right hand lateral console c**over as described below.



- To remove the passenger footrest **(G)**, undo the four screws fastening it to the bodywork.

Note that the photograph was taken with the right hand lateral console cover still installed.

- Remove the passenger footrest **(G)** from the vehicle.



- Remove the **left hand sill trim panel** as described below.
- Remove the **front left hand lateral console cove**r as described below.
- To remove the front left moulded mat **(H)**, undo the screws **(2)** and remove the plug **(3)**.
- Remove the front left moulded mat **(H)** from the car.

➢ The floor mats are glued to the vehicle, and the adjacent components are laid over their edges to restrict movement.
➢ When removing the floor mats, undo the screws on the components around their outer edges to facilitate removal.

Refitting the mats

Tightening torque		Nm	Class
Passenger footrest - bodyshell	Screw	4.1 Nm	C

- Fit the floor mats in the relative seats and on the stud bolts, fixing the adhesive areas to the passenger compartment.
- Insert the outer tabs of the mats underneath the adjacent components, in order to restrict mat movement.
- Fit and tighten all the screws of the adjacent components removed during mat removal.

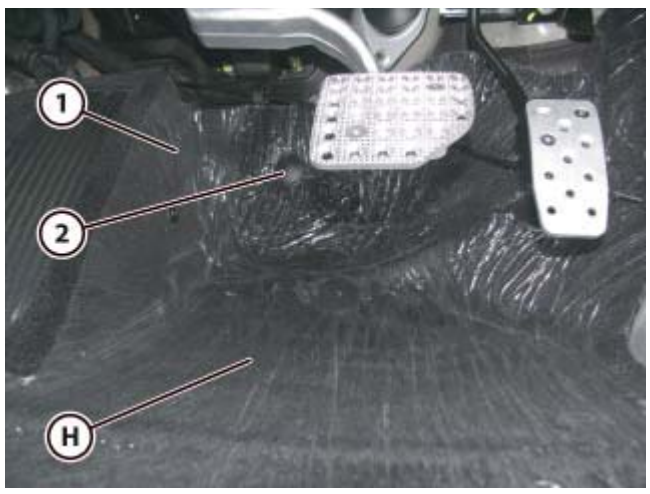


- Fit the passenger-side footrest **(G)** and fasten with the four screws indicated by the arrows.

Note that the photograph was taken with the right hand side trim already installed.

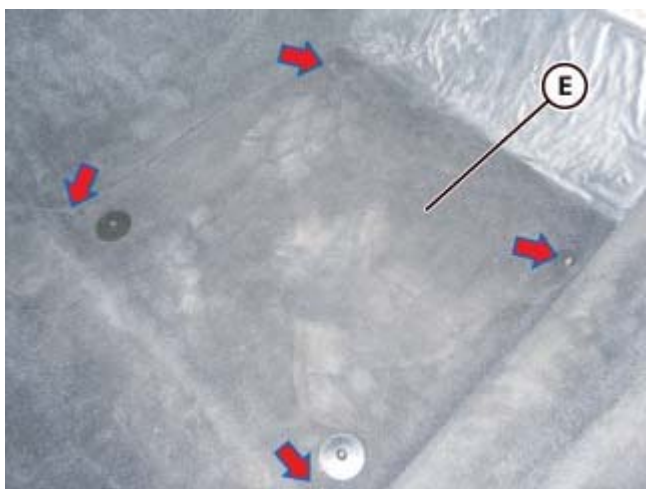
Tightening torque	Nm	Class
Screw	4.1 Nm	C

- Refit the **front right hand lateral console trim** and the **right hand sill trim panel** as described below.

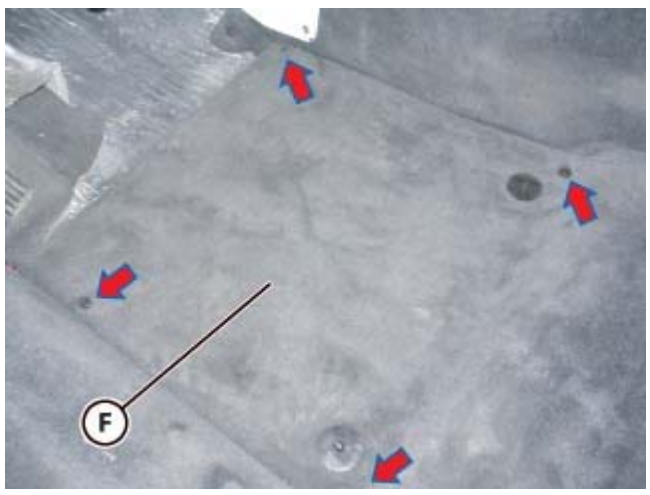


- Fit the driver side moulded mat **(H)** and adhere to the front bulkhead and footrest after applying hot glue to both the bulkhead and the mat.
- Fasten with the screw **(1)** and the closing the cap **(2)**.

- Refit the **front left hand lateral console trim** and the **left hand sill trim panel** as described below.



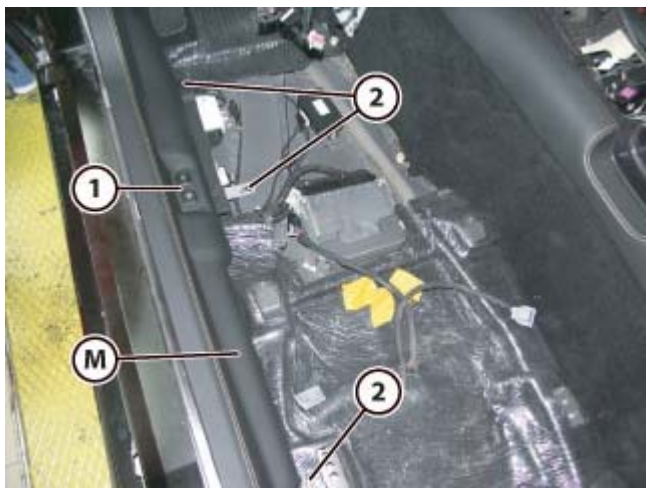
- Fit the passenger-side floor mat fastener **(E)** and fasten by tightening the four screws indicated by the arrows.



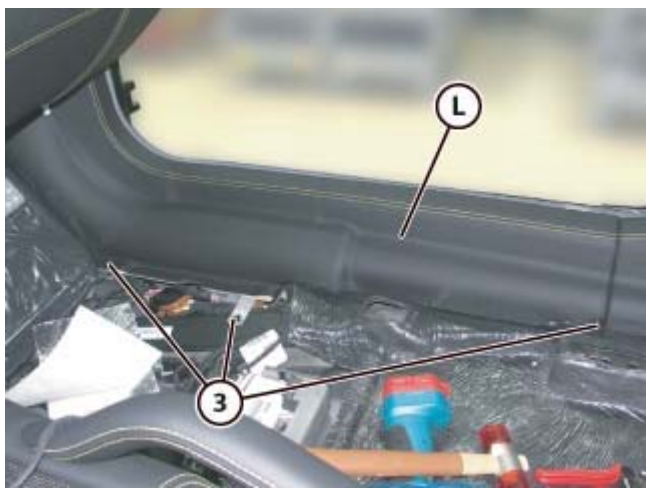
- Fit the driver-side floor mat fastener **(F)** and fasten by tightening the four screws.
- Then fit the removable mats on their respective fasteners and fasten.

Removing the lateral trim panels

➢ Remove the seat (M2.21).
➢ Remove the **removable mat** and the **floor mat fastener** on both sides as described above.

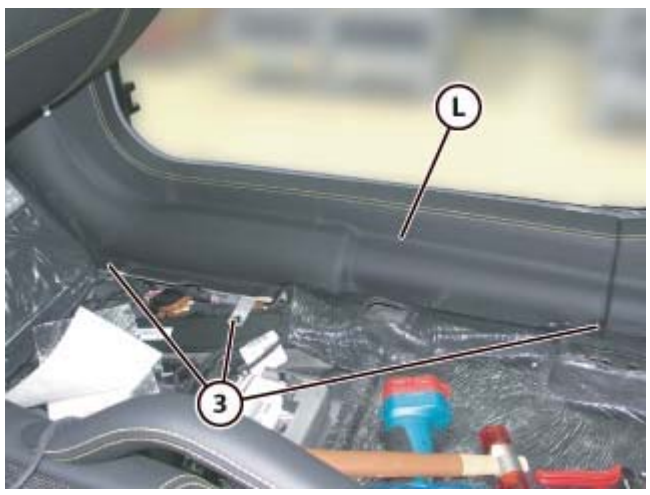


- Lift the door bay perimeter seal strip in the area involved and undo the three screws **(2)**.
- To remove the left hand sill trim panel **(M)**, prise the button plate **(1)** out with a pointed tool and disconnect the relative connectors(D046) (D316).

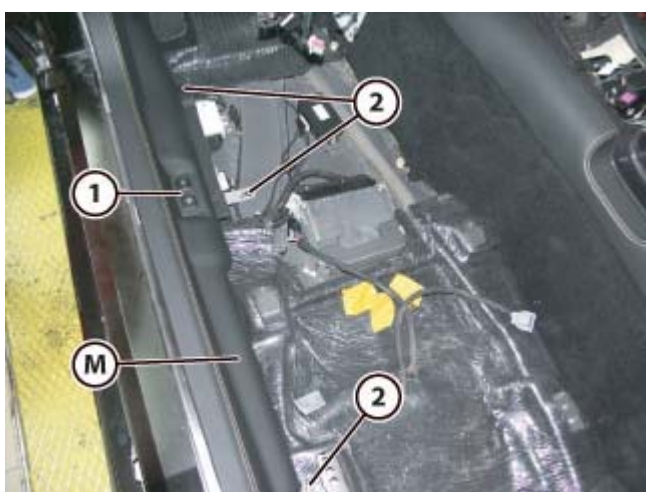


- Lift the perimeter seal strip of the door bay in the area involved in the procedure.
- To remove the right hand sill trim panel **(L)**, undo the three screws **(3)** and remove from the vehicle.

Refitting the lateral trim panels



- Fit the right hand sill trim panel **(L)** and fasten with the three screws **(3)**.

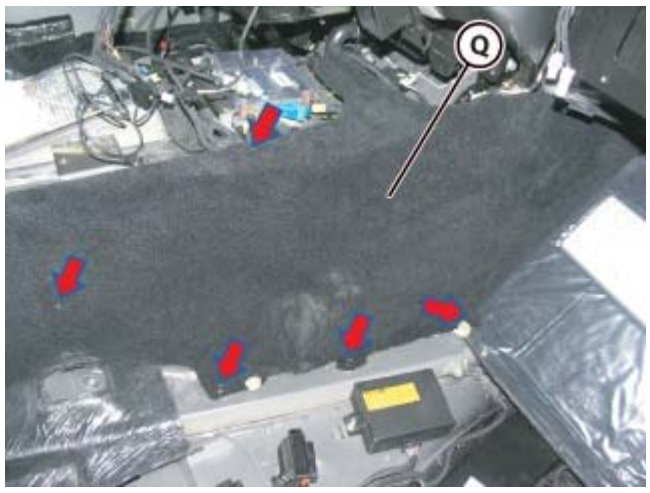


- Fit the left hand sill trim panel **(M)**, pulling out the luggage compartment(D046)and fuel filler flap release connectors (D316), and fasten with the three screws **(2)**.
- Connect the two connectors (D046) (D316) and fit the button fixing plate **(1)** onto the sill trim panel.

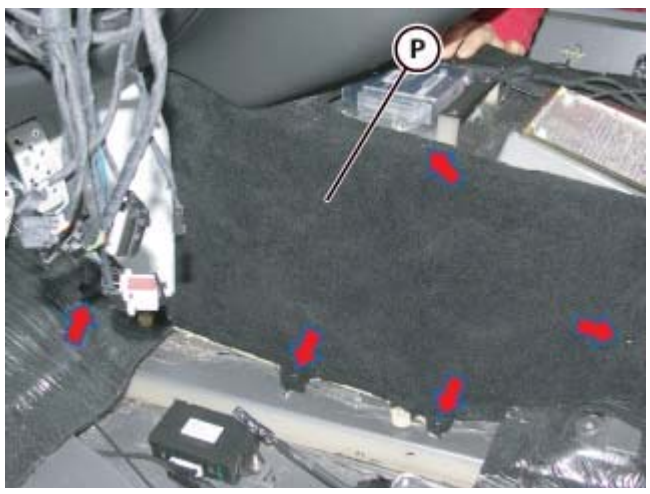
➢ Refit the **floor mat fastener** and the **removable mats** as described above.
➢ Refit the seat (M2.21).

Removing the console trim

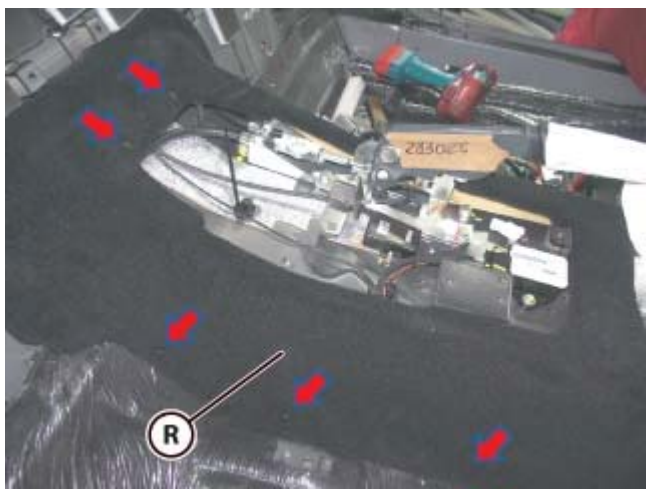
➢ Remove the seat (M2.21).
➢ Remove the console trim panel (M2.20).
➢ Remove the **floor mat fastener** on both sides as described above.



- Remove the left hand lateral trim **(Q)** by undoing the five fastener screws indicated by the arrows.

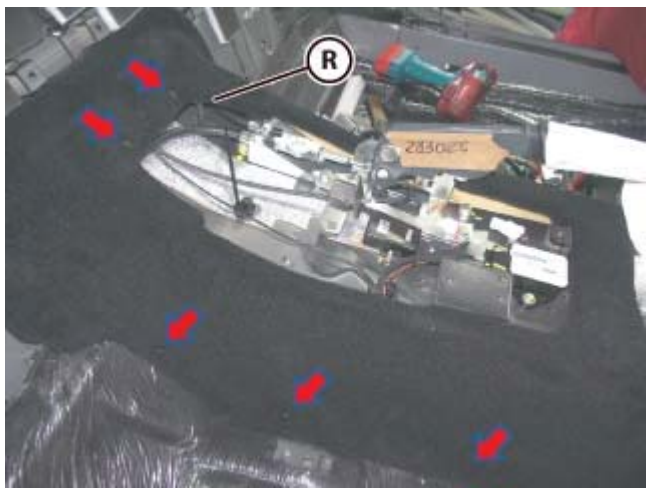


- Remove the right hand lateral trim **(P)** by undoing the five fastener screws indicated by the arrows.

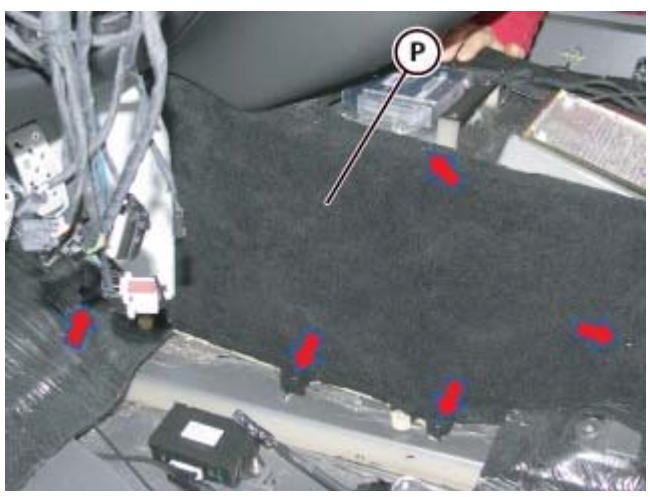


- To remove the rear console trim panel **(R)** first remove the **backrest trim panel** as described below.
- Undo the eight screws and remove the rear console trim panel **(R)** from the vehicle.

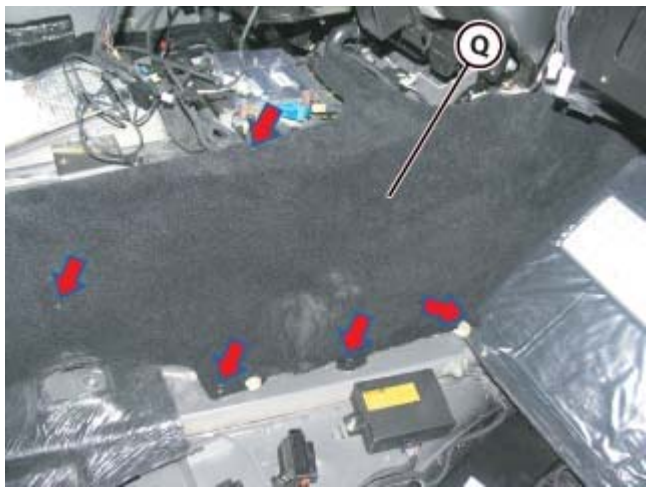
Refitting the console trim panels



- Fit the rear console trim panel **(R)** in the vehicle and, after fitting the floor mats correctly underneath the trim panel, fasten with the eight screws indicated by the arrows.



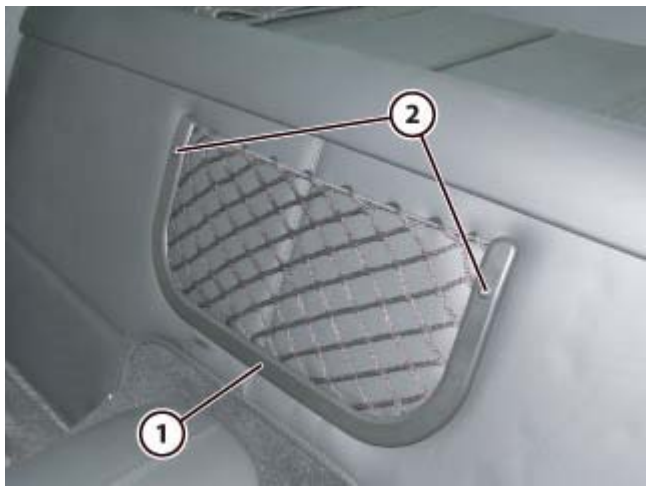
- Fit and fasten the left hand lateral trim **(P)**, tightening the five screws indicated by the arrows.



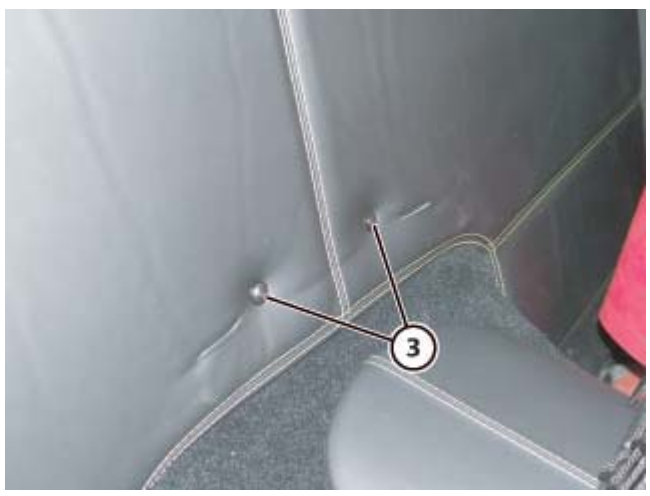
- Fit and fasten the right hand lateral trim **(P)**, tightening the five screws indicated by the arrows.

➢ Refit the **floor mat fastener** and the **removable mats** as described above.
➢ Refit the **backrest t**rim panel as described below.
➢ Refit the console trim panel (M2.20).
➢ Refit the seat (M2.21).

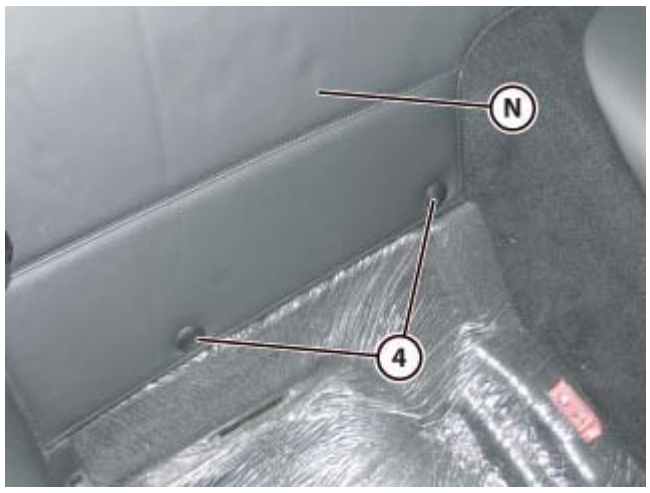
Removing the rear trim panels



- Remove the map pocket **(1)** by undoing the two screws **(2)**.



- Undo the two central screws **(3)**.



- Undo the four lateral screws **(4)** and remove the backrest trim panel **(N)** from the vehicle.

- Remove the seat (M2.21).
- Remove the passenger compartment and roof trim panels (M2.22).

Follow the removal sequence up to the removal of the **luggage r**etainer lip.



- Unfasten the luggage retainer straps and remove the luggage shelf **(O)** from the vehicle.

i Note that the photograph was taken with the luggage retainer lip still installed in the vehicle.

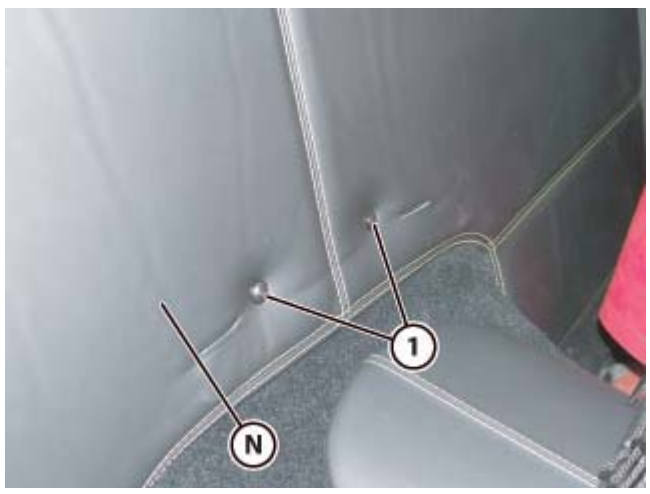
Refitting the rear trim panels



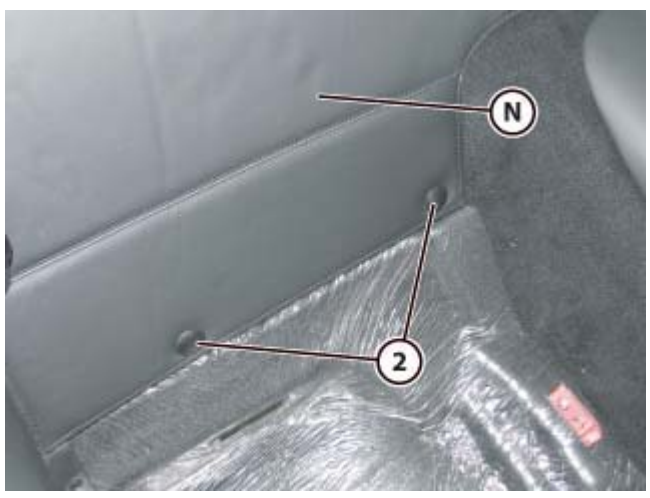
- Fit the luggage shelf on the rear shelf mount **(O)**.

i Note that the photograph was taken with the luggage retainer lip already installed.

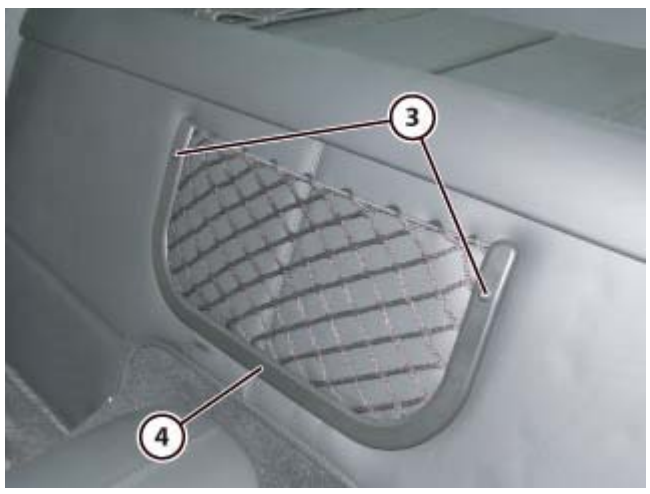
- Refit the passenger compartment and roof trim panels (M2.22).



- Fit the backrest trim panel **(N)**, inserting underneath the luggage shelf sides, and fasten at the centre with the two screws **(1)**.



- Fit the four side caps **(2)** fastening the backrest trim panel **(N)** to the vehicle.

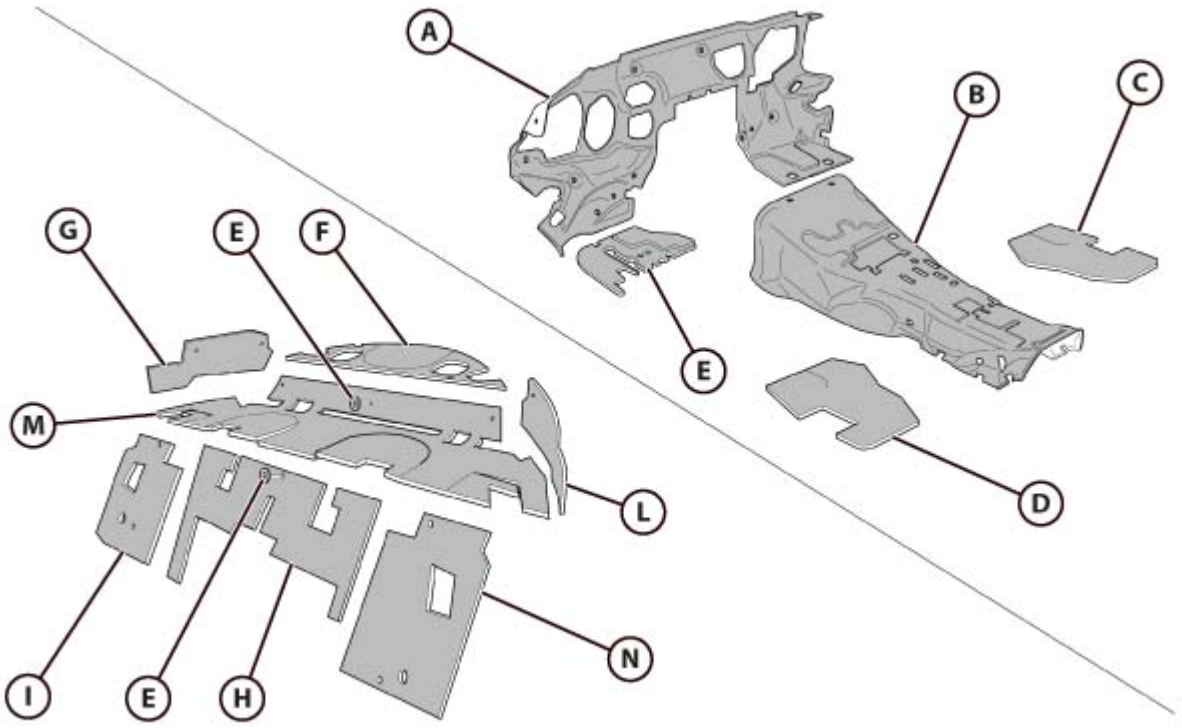


- Fit the map pocket **(4)** into place on the backrest trim panel and fasten with the two screws **(3)**.

M2.25 Passenger compartment soundproofing panels

Passenger compartment soundproofing panels

Soundproofing trim panels are installed in the passenger compartment to reduce noise while driving



A - Firewall insulation
B - Front tunnel console insulation
C - Rear right hand floor insulation
D - Rear left hand insulation
E - Fastener button
F - Parcel shelf insulation
G - Right hand side insulation
H - Central backrest insulation
I - Right hand backrest insulation
L - Left hand side insulation
M - Rear shelf insulation
N - Left hand backrest insulation

M2.26 Leather

Treating interior leather upholstery

Proper and regular treatment (at least once a year) will preserve the natural qualities and softness of Ferrari leather trim.
For this precise purpose, a range of specific leather care products (Cleaner and Cream), developed and tested by Ferrari, is also available. These products may be ordered through the Ferrari Spare Parts Department, either individually or as part of the "Care Kit", which includes a complete set of car cleaning products.
For the instructions on how to use the products contained in the "Care Kit", see the "User's Manual, Carrozzeria Scaglietti Programme" and the instructions included with the Kit.
Never use acidic detergents, turpentine, liquid stain removers, petrol, solvents or domestic cleaning products to clean leather as these will damage the natural material.

M3.01 Sanding and cleaning

Pre-Cleaning

Steel. Remove rust by sandblasting, wire brush or coarse sanding paper (P16 to P80) to achieve a bare substrate. For rust through areas tinning is recommended. In case of larger damaged areas it might be necessary to weld in a new sheet or to replace the whole part. Remove any remains like scale from welding, tinning or any parting compounds and fluxing agents thoroughly.



Cleaning

Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. **D837 DX330 Spirit Wipe** o **D845 DX310 High Strength Degreaser**. If there is any VOC legislation in force, use **D842 DX380 low VOC Cleaner** or **D8401 Waterborne low VOC Cleaner**. If using **D842**, rinse the surface with **T494 Envirobase thinner** immediately after degreasing, then dry the panel surface.



Dry Sanding (rotary-orbital machine)

Use the following paper grades depending on the substrate. Start with the coarsest grade and carry on down to the finest grade. Fleeces and pads are especially recommended for edges and borders. Use a guide coat for best results:

TM	™ red pad, 3M Soft Pad ultrafine
TM	™ grey pad, 3M Soft Pad ultrafine
Tinned Steel	P80-P220
TM	™ red pad, 3M Soft Pad ultrafine
E-Coat (spare parts)	P280 - P400, 3M Scotch-Brite ™ grey pad, 3 M Soft Pad ultrafine (faultless E-Coat requires only cleaning)
OE Finish / Repair Coatings	P240 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
Putty / Filler	Coarse sanding: P80 - P150, fine sanding: P240 - P320
Spray Polyester	Coarse sanding: P150, fine sanding: P240 - P320
Primer	P320 - P400, 3M Soft Pad ultrafine
Surfacer	P320 - P400, 3M Soft Pad ultrafine
Topcoat (blending areas)	P800 - P1500, 3M Soft Pad ultrafine, 3M Scotch-Brite ™ pad superfine
Clearcoat (blending areas)	P800 - P1500, 3M Soft Pad ultrafine, 3M Scotch-Brite ™ pad superfine



Dry Sanding (rotary-orbital machine)

Use the following paper grades depending on the substrate. Start with the coarsest grade and carry on down to the finest grade. Fleeces and pads are especially recommended for edges and borders:

E-Coat (spare parts)	P600 - P800, 3M Soft Pad ultrafine (faultless E-Coat requires only cleaning)
OE Finish / Repair Coatings	P320 - P400, 3M Soft Pad ultrafine
Putty / Filler	**NEVER USE** wet sanding for putties!
Spray Polyester	**NEVER USE** wet sanding for putties!
Primer	P320 - P400, 3M Soft Pad ultrafine
Surfacer	P320 - P400, 3M Soft Pad ultrafine
Topcoat (blending areas)	P320 - P400, 3M Soft Pad ultrafine
Clearcoat (blending areas)	P1000 - P1200, 3M Soft Pad ultrafine



Cleaning

Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. **D837 DX330 Spirit Wipe** o **D845 DX310 High Strength Degreaser**. If there is any VOC legislation in force, use **D842 DX380 low VOC Cleaner** or **D8401 Waterborne low VOC Cleaner**. If using **D842**, rinse the surface with **T494 Envirobase thinner** immediately after degreasing, then dry the panel surface.

M3.02 Use of hardeners and diluents

The following tables show which hardeners and thinners have to be used together with the corresponding PPG products depending on the ambient temperature.

Deltron D821 – 2K HS Chip Resistant Primer				
Temperature	HS Hardeners		MS Hardeners	
	HS-Hardener	Thinner	MS-Hardener	Thinner
Up to 18°C	D884 / D897	D808	D841	D808
18 – 25°C	D884 / D897	D866 / D807	D841	D866 / D807
25 – 35°C	D884 / D897	D812	D861	D812
Above 35°C	D884 / D897	D869	D861	D869
N.B.: When using Deltron D821 primer as non-sand surfacers, it is recommended that the same hardener is used in subsequently applied direct gloss colour or clearcoat. Consult the appropriate technical datasheet(s) to identify a suitable common hardener.				

Deltron BC – Solventborne Basecoat	
Temperature	Thinner
Up to 18°C	D808
18 – 25°C	D807
25 – 35°C	D812
Above 35°C	D869
Spot Repair	D851 / for detailed information see technical datasheet "02 – Deltron BC"
	For optimum durability and adhesion it is recommended to mix Deltron BC 10 : 1 with D841 MS Hardener, and then thin 1 : 1 with GRS Thinner prior to application. Potlife of the activated basecoat is in excess of 48 hours. Application and drying properties are unchanged.

Deltron D8109 – UHS low VOC Clearcoat		
Temperature	HS Hardeners	
	HS-Hardener	Thinner
Up to 18°C	D897	D808
18 – 25°C	D897	D807
25 – 35°C	D897	D812
Above 35°C	D897	D869
Spot Repair	D8208	D808
	D868 / for detailed information see technical datasheet "171 – Deltron D8109"	
Enhanced	D865 / for detailed information see technical datasheet "171 – Deltron D8109"	
Extended	D886 / for detailed information see technical datasheet "171 – Deltron D8109"	

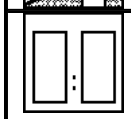
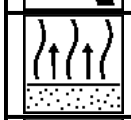
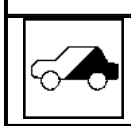
Deltron D8105 – CeramiClear™		
Temperature	HS Hardeners	
	HS-Hardener	Thinner
Up to 18°C	D8215	-
18 – 25°C	D8215	-
25 – 35°C	D8215	-
Above 35°C	D8215	-
Spot Repair	D8215	-
Extended	D886 / for detailed information see technical datasheet "171 – Deltron D8105"	

M3.03 Preparing and painting the aluminium sheets

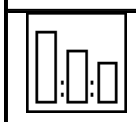
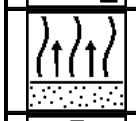
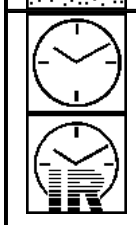
CeramiClearTM warranty repair system, conventional with sanding,for Aluminium substrates, total or partly respray, for stonechipping areas and tintable surfacer.

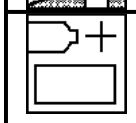
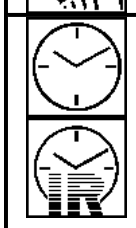
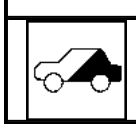
	Substrates
	Aluminium / Magnesium
Cleaning / Sanding	see below
Primer	Universal D831
Surfacer (if polyester filler is necessary)	Deltron D821
Putty / Filler (If necessary)	Galvaplast 77
Surfacer	Deltron D821
Basecoat(s)	Deltron BC
Clearcoat(s)	Deltron D8105, Deltron D8109

Substrate Preparation and Cleaning	
	for detailed information see chapter / section “Sanding and Cleaning”.
	**Cleaning** Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. D837 (DX330) Spirit Wipe o D845 (DX310) High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner.
	**Dry Sanding (rotary-orbital machine)** Use the following paper grades depending on the substrate. Use a guide coat for best results: Aluminium / Magnesium — P150 - P220, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine OE Finish / Repair Coatings — P240 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
	**Wet Sanding (manual)** Do not wet sand
	**Cleaning** Clean with a suitable pre-cleaner, e.g. D837 DX330 Spirit Wipe o D845 DX310 High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner. Overcoat any exposed Aluminium within 4 hours.

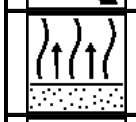
Deltron D831 – Universel	
	For detailed information see technical datasheet "10 – Universel D831"
	For detailed information see chapter / section “Sanding and Cleaning”
	Mixing Ratio — D831: 1 vol; D832 / D833 *: 1 vol * For exceptional conditions of temperature and humidity (> 35°C / > 70%) and for large areas use Slow Reactive Thinner D833
	Number of coats: 2-3
	Flash-off between coats at 20°C: 5 minutes
	Drying times: Dustfree: 5 minutes Dry to sand at 20°C: 30 - 45 minutes (D832) Dry to sand at 35°C: 30 - 45 minutes (D833) Total dry film build: 15 - 20 µm
	Repair / Recoating: with P400 (dry), if necessary Overcoat / Re-coat time at at 20°C (airdrying): 30 – 40 minutes

Deltron D821 – 2K HS Chip Resistant Primer [Primer Surfacer]	
	For detailed information see technical datasheet "104 – Deltron D821"

	For detailed information see chapter / section “Sanding and Cleaning”
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”
	Mixing Ratio **Untinted** D821 5 vol — D821 3 vol HS-Hardener 1 vol — MS-Hardener 1 vol Thinner 1 vol — Thinner 1 vol **Tinted** D821 3 vol — D821 3 vol DG 1 vol — DG 1 vol HS-Hardener 1 vol — MS-Hardener 1,5 vol Thinner 1 vol — Thinner 1 vol
	Number of coats: 2-3
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes
	Drying times: Dustfree at 20°C — 35 minutes Touch dry at 20°C — 1,5 - 2 hours (tinted: 2 – 2.5 hours) Through dry at 20°C — Overnight Through dry at 60°C — 20 – 25 minutes tinted: 30 minutes (metal temperature) Through dry (IR) — 10 - 15 min Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)
	Sand with P400 (dry) or P800 (wet)

Galvaplast 77	
	For detailed information see technical datasheet "76 - Fillers"
	For detailed information see chapter / section “Sanding and Cleaning”
	Addition of hardeners (A665, A666, A667) from □°C to 10°C — 2,5 % - 3,0 % from 10 °C to 20 °C — from □,0°C to 2,5°C from □°C to 30°C — from □,5°C to 2,0°C (by weight)
	Application: use a suitable knife or spreader. Apply one or more coats as necessary, allowing 5 – 10 minutes at 20°C between coats. Galvaplast 77 can be used directly on the bare metal.
	Dry to sand: from □°C to 10°C — 25 – 35 minutes from 10 °C to 20 °C — 20 – 30 minutes from □°C to 30°C — 15 – 20 minutes IR medium — 5 – 6 minutes IR short — 4 – 5 minutes
	Dry sanding paper grades: P80 - P120 - P240 Overcoating at 20° C: 30 minutes

Primer Deltron D821 – 2K HS Chip Resistant [low VOC Primer Surfacer]	
	D104 /For detailed information see technical datasheet "104 – Deltron D821"
	For detailed information see chapter / section “Sanding and Cleaning”
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”
	Mixing Ratio

	**Untinted**			
	D821	5 vol	D821	3 vol
	HS-Hardener	1 vol	MS-Hardener	1 vol
	Thinner	1 vol	Thinner	1 vol
	Tinted			
	D821	3 vol	D821	3 vol
	DG	1 vol	DG	1 vol
	HS-Hardener	1 vol	MS-Hardener	1,5 vol
	Thinner	1 vol	Thinner	1 vol
	Number of coats: 2-3			
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes			
 	Drying times: Dustfree at 20°C: 35 minutes Touch dry at 20°C: 1,5 - 2 hours (tinted: 2 – 2.5 hours) Through dry at 20°C: Overnight Through dry at 60°C: 20 – 25 minutes; tinted: 30 minutes (metal temperature) Through dry (IR): 10 - 15 min Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)			
	Sand with P400 (dry) or P800 (wet)			

Approved Topcoats to be used with this Repair System	
Deltron BC Deltron D8105	see technical datasheet "02 – Deltron BC" see technical datasheet "170 – Deltron D8105"
Deltron BC Deltron D8109	see technical datasheet "02 – Deltron BC" see technical datasheet "171 – Deltron D8109"

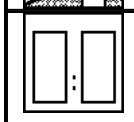
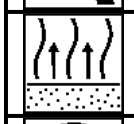
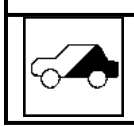
Notes:
- D8105 can be replaced by D8109 if the Fade-out technique is required .
- The following system is required if on the car the Colour Code label indicates “WATERBORNE TECHNOLOGY”.
- If a damaged part has to be repaired without replacing it, it is absolutely necessary to sand the OE Clear thoroughly. Superficial sanding can result in adhesion problems.
- Panel repair - also of adjacent parts – is recommended for optimum scratch resistance!

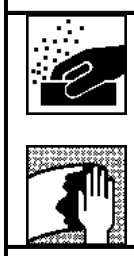
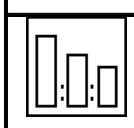
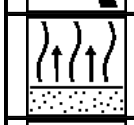
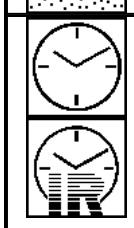
CeramiClearTM warranty repair system, conventional with sanding,for Aluminium substrates, total or partly respray, for stonechipping areas and tintable surfacer.

	Substrates
	Aluminium / Magnesium
Cleaning / Sanding	see below
Primer	Universal D831
Surfacer (if polyester filler is necessary)	Deltron D821 HS
Putty / Filler (If necessary)	Galvaplast 77
Surfacer	Deltron D821 HS
Basecoat(s)	Deltron BC
Clearcoat(s)	Deltron D8105, Deltron D8109

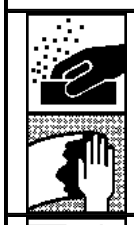
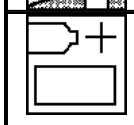
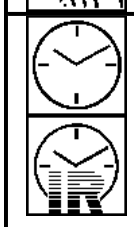
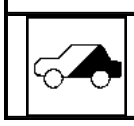
Substrate Preparation and Cleaning	
	for detailed information see chapter / section “Sanding and Cleaning”.
	**Cleaning** Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. D837 (DX330) Spirit Wipe o D845 (DX310) High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner.
	**Dry Sanding (rotary-orbital machine)** Use the following paper grades depending on the substrate. Use a guide coat for best results: Aluminium / Magnesium: P150 - P220, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine OE Finish / Repair Coatings: P240 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
	Wet Sanding (manual)

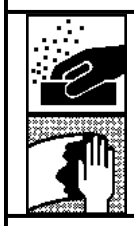
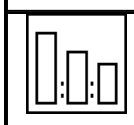
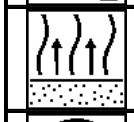
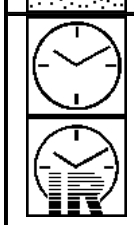
	Do not wet sand
	**Cleaning** Clean with a suitable pre-cleaner, e.g. D837 DX330 Spirit Wipe o D845 DX310 High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner. Overcoat any exposed Aluminium within 4 hours.

Deltron D831 – Universel	
	for detailed information see chapter / section “Sanding and Cleaning”.
 VOC	For detailed information see technical datasheet "10 – Universel D831"
	For detailed information see chapter / section “Sanding and Cleaning”
	Mixing Ratio D831 1 vol D832 / D833 * 1 vol * For exceptional conditions of temperature and humidity (> 35°C / > 70%) and for large areas use Slow Reactive Thinner D833
	Number of coats: 2-3
	Flash-off between coats at 20°C: 5 minutes
	Drying times: Dustfree 5 minutes Dry to sand at 20°C 30 - 45 minutes (D832) Dry to sand at 35°C 30 - 45 minutes (D833) Total dry film build: 15 - 20 µm
	Repair / Recoating: with P400 (dry), if necessary Overcoat / Re-coat time at at 20°C (airdrying): 30 – 40 minutes

Primer Deltron D821 – 2K HS Chip Resistant [low VOC Primer Surfacer]	
	D104 /For detailed information see technical datasheet "104 – Deltron D821"
	For detailed information see chapter / section “Sanding and Cleaning”
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”
	Mixing Ratio **Untinted** D821 5 vol — D821 3 vol HS-Hardener 1 vol — MS-Hardener 1 vol Thinner 1 vol — Thinner 1 vol **Tinted** D821 3 vol — D821 3 vol DG 1 vol — DG 1 vol HS-Hardener 1 vol — MS-Hardener 1,5 vol Thinner 1 vol — Thinner 1 vol
	Number of coats: 2-3
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes
	Drying times: Dustfree at 20°C 35 minutes Touch dry at 20°C 1,5 - 2 hours (tinted: 2 – 2.5 hours) Through dry at 20°C Overnight Through dry at 60°C 20 – 25 minutes; tinted: 30 minutes (metal temperature) Through dry (IR) 10 - 15 min Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)
	Sand with P400 (dry) or P800 (wet)

Galvaplast 77			
	For detailed information see technical datasheet "76 - Fillers"		
	For detailed information see chapter / section “Sanding and Cleaning”		
	Addition of hardeners (A665, A666, A667)	from □°C to 10°C from 10 °C to 20 °C from □°C to 30°C	2,5 % - 3,0 % from □,0°C to 2,5°C from □,5°C to 2,0°C (by weight)
	Application: use a suitable knife or spreader. Apply one or more coats as necessary, allowing 5 – 10 minutes at 20°C between coats. Galvaplast 77 can be used directly on the bare metal.		
	Dry to sand: from □°C to 10°C from 10 °C to 20 °C from □°C to 30°C IR medium IR short	 25 – 35 minutes 20 – 30 minutes 15 – 20 minutes 5 – 6 minutes 4□ minutes	
	Dry sanding paper grades: Overcoating at 20° C:	P80 - P120 - P240 30 minutes	

Primer Deltron D821 – 2K HS Chip Resistant [low VOC Primer Surfacer]				
	D104 /For detailed information see technical datasheet "104 – Deltron D821"			
	For detailed information see chapter / section “Sanding and Cleaning”			
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”			
	Mixing Ratio **Untinted** D821 HS-Hardener Thinner **Tinted** D821 DG HS-Hardener Thinner	 5 vol 1 vol 1 vol 3 vol 1 vol 1 vol 1 vol	 D821 MS-Hardener Thinner D821 DG MS-Hardener Thinner	 3 vol 1 vol 1 vol 3 vol 1 vol 1,5 vol 1 vol
	Number of coats: 2-3			
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes			
	Drying times: Dustfree at 20°C Touch dry at 20°C Through dry at 20°C Through dry at 60°C Through dry (IR) Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)	 35 minutes 1,5 - 2 hours (tinted: 2 – 2.5 hours) Overnight 20 – 25 minutes; tinted: 30 minutes (metal temperature) 10 - 15 min		
	Sand with P400 (dry) or P800 (wet)			

Approved Topcoats to be used with this Repair System		
VOC	Envirobase Deltron D8105	see technical datasheet "125 – Envirobase" see technical datasheet "170 – Deltron D8105"
	Envirobase	

VOC	Deltron D8105	see technical datasheet "125 – Envirobase" see technical datasheet "171 – Deltron D8109"

Notes:

- D8105 can be replaced by D8109 if the Fade-out technique is required .
- The following system is required if on the car the Colour Code label indicates “WATERBORNE TECHNOLOGY”.
- If a damaged part has to be repaired without replacing it, it is absolutely necessary to sand the OE Clear thoroughly. Superficial sanding can result in adhesion problems.
- Panel repair - also of adjacent parts – is recommended for optimum scratch resistance!

M3.04 Preparing and painting the steel sheets

CeramiClearTM warranty repair system, conventional with sanding,for Steel substrates, total or partly respray, for stonechipping areas and tintable surfacer.

	Substrates			
	Bare Steel	**Galvanized Steel**	**E-Coat (spare parts)**	**OE Finish**
Cleaning / Sanding	see below	see below	see below	see below
Putty / Filler	Galvaplast 77	Galvaplast 77		
Primer	Universal 831	Universal 831		
Surfacer	Deltron D821 MS / HS	Deltron D821 MS / HS	Deltron D821 MS / HS	
Basecoat(s)	Deltron BC	Deltron BC	Deltron BC	Deltron BC
Clearcoat(s)	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109

Substrate Preparation and Cleaning

for detailed information see chapter / section “Sanding and Cleaning”.



Cleaning

Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. D837 (DX330) Spirit Wipe o D845 (DX310) High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner.



Dry Sanding (rotary-orbital machine)

Use the following paper grades depending on the substrate. Use a guide coat for best results:

Steel	P80 - P220, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
Galvanized Steel	P320 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
Tinned Steel	P80-P220
Aluminium / Magnesium	P150 - P220, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
E-Coat (spare parts)	P280 - P400, 3M Scotch-Brite ™ grey pad, 3M Soft Pad ultrafine (faultless E-Coat requires only cleaning)
OE Finish / Repair Coatings	P240 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine



Wet Sanding (manual)

Use the following paper grades depending on the substrate

E-Coat (spare parts)	P600 - P800, 3M Soft Pad ultrafine (faultless E-Coat requires only cleaning)
OE Finish / Repair Coatings	P600 - P800, 3M Soft Pad ultrafine



Cleaning

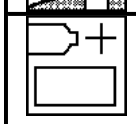
After wet sanding rinse thoroughly with clear water. Clean with a suitable pre-cleaner, e.g. D837 DX330 Spirit Wipe o D845 DX310 High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner. Overcoat any exposed Aluminium within 4 hours.

Galvaplast 77

For detailed information see technical datasheet "76 - Fillers"



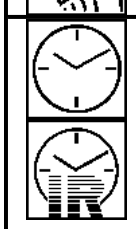
For detailed information see chapter / section “Sanding and Cleaning”



Addition of hardeners (A665, A666, A667)	from □°C to 10°C	2,5 % - 3,0 %
	from 10 °C to 20 °C	from □,0°C to 2,5°C
	from □°C to 30°C	from □,5°C to 2,0°C
		(by weight)



Application: use a suitable knife or spreader. Apply one or more coats as necessary, allowing 5 – 10 minutes at 20°C between coats. Galvaplast 77 can be used directly on the bare metal.



Dry to sand:

from □°C to 10°C	25 – 35 minutes
from 10 °C to 20 °C	20 – 30 minutes
from □°C to 30°C	15 – 20 minutes
IR medium	5 – 6 minutes
IR short	4 – 5 minutes

	Dry sanding paper grades: P80 - P120 - P240 Overcoating at 20° C: 30 minutes

Deltron D831 – Universel	
VOC	For detailed information see technical datasheet "10 – Universel D831"
	For detailed information see chapter / section “Sanding and Cleaning”
	Mixing Ratio D831 1 vol D832 / D833 * 1 vol * For exceptional conditions of temperature and humidity (> 35°C / > 70%) and for large areas use Slow Reactive Thinner D833
	Number of coats: 2-3
	Flash-off between coats at 20°C: 5 minutes
	Drying times: Dustfree 5 minutes Dry to sand at 20°C 30 - 45 minutes (D832) Dry to sand at 35°C 30 - 45 minutes (D833) Total dry film build: 15 - 20 µm
	Repair / Recoating: with P400 (dry), if necessary Overcoat / Re-coat time at at 20°C (airdrying): 30 – 40 minutes

Deltron D821 – 2K HS Chip Resistant Primer [Primer Surfacer]				
	D104 / For detailed information see technical datasheet "104 – Deltron D821"			
	For detailed information see chapter / section “Sanding and Cleaning”			
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”			
	Mixing Ratio			
	Untinted			
	D821	5 vol	D821	3 vol
	HS-Hardener	1 vol	MS-Hardener	1 vol
	Thinner	1 vol	Thinner	1 vol
	Tinted			
	D821	3 vol	D821	3 vol
	DG	1 vol	DG	1 vol
	HS-Hardener	1 vol	MS-Hardener	1,5 vol
	Thinner	1 vol	Thinner	1 vol
	Number of coats: 2-3			
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes			
	Drying times: Dustfree at 20°C 35 minutes Touch dry at 20°C 1,5 - 2 hours (tinted: 2 – 2.5 hours) Through dry at 20°C Overnight Through dry at 60°C 20 – 25 minutes; tinted: 30 minutes (metal temperature) Through dry (IR) 10 - 15 min Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)			
	Sand with P400 (dry) or P800 (wet)			

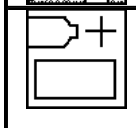
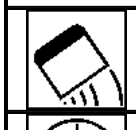
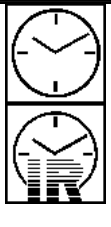
Approved Topcoats to be used with this Repair System	
Deltron BC Deltron D8105	see technical datasheet "02 – Deltron BC" see technical datasheet "170 – Deltron D8105"
Deltron BC Deltron D8109	see technical datasheet "02 – Deltron BC" see technical datasheet "171 – Deltron D8109"

Notes:
- D8105 can be replaced by D8109 if the Fade-out technique is required .
- The following system is required if on the car the Colour Code label indicates “WATERBORNE TECHNOLOGY”.
- If a damaged part has to be repaired without replacing it, it is absolutely necessary to sand the OE Clear thoroughly. Superficial sanding can result in adhesion problems.
- Panel repair - also of adjacent parts – is recommended for optimum scratch resistance!

CeramiClearTM warranty repair system, compliant (low VOC, european legislation) with sanding, for Steel substrates, total or partly respray, for stonechipping areas and tintable surfacer.

	Substrates			
	Bare Steel	**Galvanized Steel**	**E-Coat (spare parts)**	**OE Finish**
Cleaning / Sanding	see below	see below	see below	see below
Putty / Filler	Galvaplast 77	Galvaplast 77		
Primer	Universal 831	Universal 831		
Surfacer	Deltron D821 HS	Deltron D821 HS	Deltron D821 HS	
Basecoat(s)	Envirobase	Envirobase	Envirobase	Envirobase
Clearcoat(s)	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109	Deltron D8105 Deltron D8109

Substrate Preparation and Cleaning	
	for detailed information see chapter / section “Sanding and Cleaning”.
	**Cleaning** Clean any old paint (OE finish) thoroughly with water first to remove any water soluble dirt. Clean with a suitable pre-cleaner, e.g. D837 (DX330) Spirit Wipe o D845 (DX310) High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner.
	**Dry Sanding (rotary-orbital machine)** Use the following paper grades depending on the substrate. Use a guide coat for best results: Aluminium / Magnesium: P150 - P220, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine OE Finish / Repair Coatings: P240 - P400, 3M Scotch-Brite ™ red pad, 3M Soft Pad superfine
	**Wet Sanding (manual)** Do not wet sand
	**Cleaning** Clean with a suitable pre-cleaner, e.g. D837 DX330 Spirit Wipe o D845 DX310 High Strength Degreaser. If there is any VOC legislation in force, use D8401 Waterborne low VOC Cleaner. Overcoat any exposed Aluminium within 4 hours.

Galvaplast 77		
	For detailed information see technical datasheet "76 - Fillers"	
	For detailed information see chapter / section “Sanding and Cleaning”	
	Addition of hardeners (A665, A666, A667)	from □°C to 10°C: 2,5 % - 3,0 % from 10 °C to 20 °C: from □,0°C to 2,5°C from □°C to 30°C: from □,5°C to 2,0°C (by weight)
	Application: use a suitable knife or spreader. Apply one or more coats as necessary, allowing 5 – 10 minutes at 20°C between coats. Galvaplast 77 can be used directly on the bare metal.	
	Dry to sand: from □°C to 10°C: 25 – 35 minutes from 10 °C to 20 °C: 20 – 30 minutes from □°C to 30°C: 15 – 20 minutes IR medium: 5 – 6 minutes IR short: 4 – 5 minutes	

Dry sanding paper grades:	P80 - P120 - P240
Overcoating at 20° C:	30 minutes

Deltron D831 – Universel	
	for detailed information see chapter / section “Sanding and Cleaning”.
VOC	For detailed information see technical datasheet "10 – Universel D831"
	For detailed information see chapter / section “Sanding and Cleaning”
	Mixing Ratio D831 1 vol D832 / D833 * 1 vol * For exceptional conditions of temperature and humidity (> 35°C / > 70%) and for large areas use Slow Reactive Thinner D833
	Number of coats: 2-3
	Flash-off between coats at 20°C: 5 minutes
	Drying times: Dustfree 5 minutes Dry to sand at 20°C 30 - 45 minutes (D832) Dry to sand at 35°C 30 - 45 minutes (D833) Total dry film build: 15 - 20 µm
	Repair / Recoating: with P400 (dry), if necessary Overcoat / Re-coat time at at 20°C (airdrying): 30 – 40 minutes

Primer Deltron D821 – 2K HS Chip Resistant [low VOC Primer Surfacer]				
	D104 /For detailed information see technical datasheet "104 – Deltron D821"			
	For detailed information see chapter / section “Sanding and Cleaning”			
	Hardener and thinner selection: for detailed information see chapter / section “Hardeners and Thinners”			
	Mixing Ratio			
	Untinted			
	D821	5 vol	D821	3 vol
	HS-Hardener	1 vol	MS-Hardener	1 vol
	Thinner	1 vol	Thinner	1 vol
	Tinted			
	D821	3 vol	D821	3 vol
	DG	1 vol	DG	1 vol
	HS-Hardener	1 vol	MS-Hardener	1,5 vol
	Thinner	1 vol	Thinner	1 vol
	Number of coats: 2-3			
	Flash-off between coats at 20°C: 10 – 15 minutes Flash-off before stoving at 20°C: 10 – 15 minutes			
	Drying times: Dustfree at 20°C 35 minutes Touch dry at 20°C 1,5 - 2 hours (tinted: 2 – 2.5 hours) Through dry at 20°C Overnight Through dry at 60°C 20 – 25 minutes; tinted: 30 minutes (metal temperature) Through dry (IR) 10 - 15 min Total dry film build: 70 – 110 µm (tinted: 60 – 90 µm)			
	Sand with P400 (dry) or P800 (wet)			

Approved Topcoats to be used with this Repair System		
VOC	Envirobase Deltron D8105	see technical datasheet "125 – Envirobase" see technical datasheet "170 – Deltron D8105"
VOC	Envirobase Deltron D8105	see technical datasheet "125 – Envirobase" see technical datasheet "171 – Deltron D8109"

Notes:

- D8105 can be replaced by D8109 if the Fade-out technique is required .
- The following system is required if on the car the Colour Code label indicates “WATERBORNE TECHNOLOGY”.
- If a damaged part has to be repaired without replacing it, it is absolutely necessary to sand the OE Clear thoroughly. Superficial sanding can result in adhesion problems.
- Panel repair - also of adjacent parts – is recommended for optimum scratch resistance!

M3.05 Restoring the cataphoresis coating

Restoring the cataphoresis coating

Any damage to the cataphoresis coating must be protected immediately as follows.

Only mix the amount necessary to restore the coating, as once mixed, the product must be used within 1 hour.

- Prepare the product, mixing equal volumes of the two components (**50%** epoxy primer **PPG Universel D831** and **50%** catalyst **PPG Universel D832**).
- Clean the area to be treated thoroughly with a clean cloth soaked in **R107/S**.
- The repair product may be applied by airbrush or with a standard brush:

Airbrush application

Protect the surrounding areas and nearby components against heat.

- Apply 2 or 3 coats of product, waiting **5 minutes** between coats.

The dry film must measure between 15 µ and 20 µ in thickness.

- Dry until dust free for **5 minutes** or with a hot air gun for automotive paint shops at maximum power and at a distance of 20 cm for **10 minutes**.

Brush application

Protect the surrounding areas and nearby components against heat.

- Apply a thin coating of product.
- Dry until dust free for **5 minutes** or with a hot air gun for automotive paint shops at maximum power and at a distance of 20 cm for **10 minutes**.