WARNING:
The "145-146 - INSTRUCTIONS FOR REPAIR" manual refers to both models according to the following logic:

for the parts in common, the information refers to model 145, while for the parts specific to model 146 special pages, or, where necessary, whole groups, have been added.

For further details refer to the indexes (blue cards) at the beginning of each group.

INTRODUCTION

The "145-146 - Repair Instructions" Manual is composed of three volumes as follows:

Volume I
- Technical Data;
- Engines;
- Mechanical Groups.

Volume II
- Heating-Ventilation;
- Bodywork.

Volume III
- Electric system;
- Electrical system diagnosis.

For overhauling engines and mechanical groups refere to the following manuals:

- PA493600000000 REPAIR INSTRUCTIONS - ENGINE OVERHAUL.
- PA494200000000 REPAIR INSTRUCTIONS - OVERHAULING MECHANICAL GROUPS.

In order to facilitate consultation, the structure of the manual mirrors the functional groups already defined for the "Repair Fiat-rate Manual" in use by Alfa Romeo Authorized Service Network.

The characteristic data and the tables for vehicles identification are contained in the "Technical Data" at the beginning of Volume I.

The "Model identification" tables should be consulted before carrying out repair work in order to identify the model of the vehicle, the engine size and the groups which form the vehicle.

How to use this manual

The aim of this manual is to supply the Alfa Romeo Service Personnel with a tool enabling them to rapidly identify faults and to render the corrective interventions precise and efficient.

The manual shows the procedures relative to the removal and refitting and dismontling operations and the checks relative to the various groups forming the vehicle.

The procedures are illustrated in detail as are the procedures for using the tools. An appropriate symbology and explanatory texts next to the fundamental technical drawings make a complete and rapid consultation of the manual possible.

The procedures illustrate complete component disassembly procedures and should only be carried out in their entirety when absolutely unavoidable. The procedures for "assembly" and "refitting" are normally obtained by reversing the procedure followed for disassembly or removal in reverse and only the reassembly procedures which are significantly different are illustrated.

For information relative to the electrical systems onboard the vehicle refer to section 55 "ELECTRIC SYSTEM" and to the successive 55 "ELECTRIC SYSTEM DIAGNOSIS" which gives the wiring diagrams and the description of each function, the connector tables, the location of the components, the tables for fault diagnosis and the technical data for checking the components.

All the information contained in this manual is updaded at the time of publication.

Alfa Romeo reserves the right to make any modifications to its products that it deems necessary without warning. However the technical information and updates to this manual will be supplied as soon as possible.

Warnings for the operator

All the operations must be carried out with the greatest care to prevent damage occurring to the vehicle or persons.

- The use of Alfa Romeo specific tools are indicated for some procedures. These tools must be used to ensure safety and to avoid damaging parts involved in the procedure.
- To free parts which are solidly stuck together, tap with an aluminium or lead mallet if the parts are of metal. Use a wooden or resin mallet for light alloy parts.
- When dismantling ensure parts are marked correctly if required.
- When refitting lubricate the parts, if necessary, to prevent seizing and binding during the initial period of operation.
- Using adhesive paper or clean rags cover those parts of the engine which, following disassembly, present openings which may allow dust or foreign material to enter.
- When refitting, the tightening torques and adjustment data must be respected.
- When substituting the main component(s) the seal rings, oil seals, flexible washers, safety plates, self-locking nuts and all worn parts must also be replaced.
- Avoid marking the internal coverings in the passenger compartment.

Substitution of groups or disconnected parts must be carried out using original spare parts only. Only in this way can the suitability and perfect operation of each organ be guaranteed.

- The words **CAUTION** and **WARNING** accompany those procedures where particular care should be taken to prevent damage occurring to people or vehicle parts.

CAUTION:
used when insufficient care could cause damage to people

WARNING:
used when insufficient care could cause damage to the vehicle or its component parts.

- The safety regulations applied to workshops should be respected. Where necessary the manual also lists the specific precautions to be taken to prevent dangerous situations from arising.

When using chemical products follow the safety indications given on the safety cards which the supplier is obliged to deliver to the user (in Italy in compliance with D.M. n.46/1992).

NOTE:
It is possible that for certain subjects were not completed in time for printing.
However these subjects are given and highlighted in the indices of the single groups.
It is the duty of the Technical Services to supply documentation regarding these subjects as soon as possible through updates or "Technical Bulletins".

ELECTRIC SYSTEM

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ACCENSIONE - T. Spark 16V Engine
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ELECTRIC SYSTEM

THIS GROUP ONLY CONTAINS THE SPECIFIC SUBJECTS FOR 146 MODELS 146; FOR ITEMS NOT GIVEN HERE, REFER TO GROUP 55 OF 145 MODELS.

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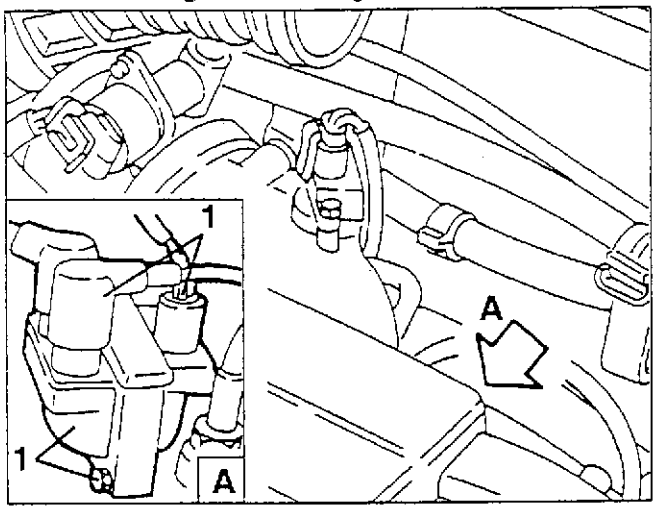
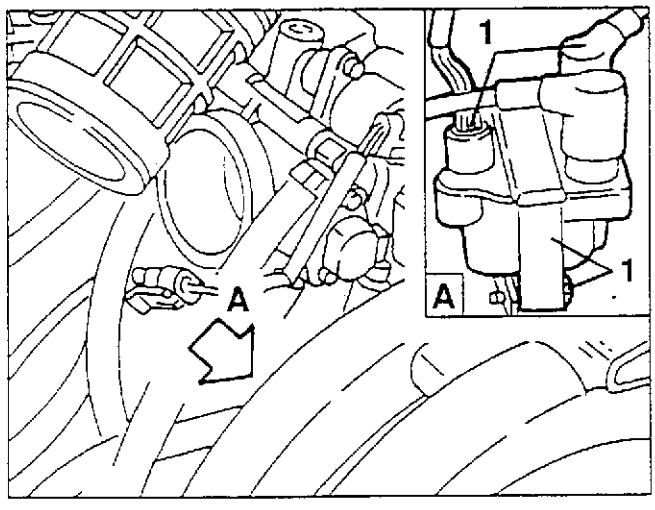
IGNITION COILS
(1351 IAW)

REMOVING REFITTING

- Disconnect the battery (-) terminal.
1. Disconnect the electrical connection and the spark plug cables from the left ignition coil, then remove it after slackening the fastening screws.



- Remove the resounder, air intake pipe and corrugated sleeve (see specific paragraphs).
1. Disconnect the electrical connection and spark plug cables from the right ignition coil, then remove it after slackening the fastening screws.



CHECKS AND INSPECTIONS

- Check that the characteristics of the ignition coils are within the specified limits. If not, change the coils.

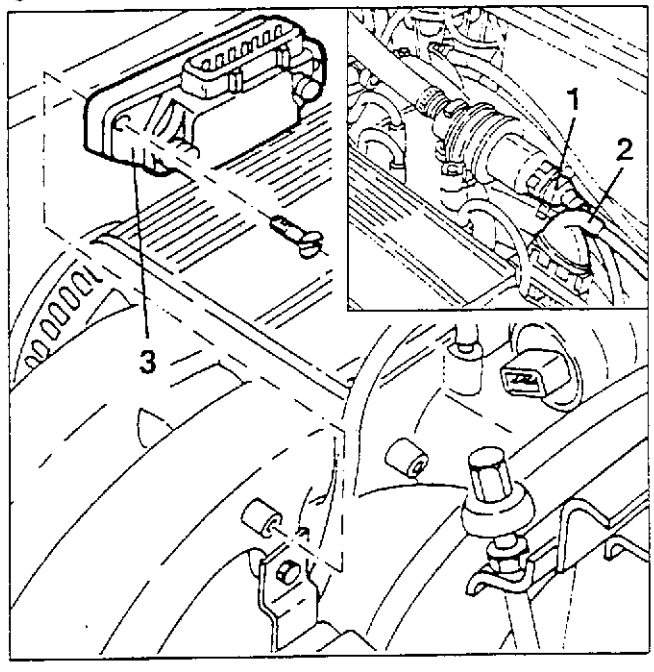
Characteristics	Resistence (*)
Main winding	550 mΩ ± 10%
Secondary winding	7.4 kΩ ± 10%

(*): At a temperature of 23°C ± 5°C

IGNITION MODULE
(1596 MP3.1)

REMOVING REFITTING

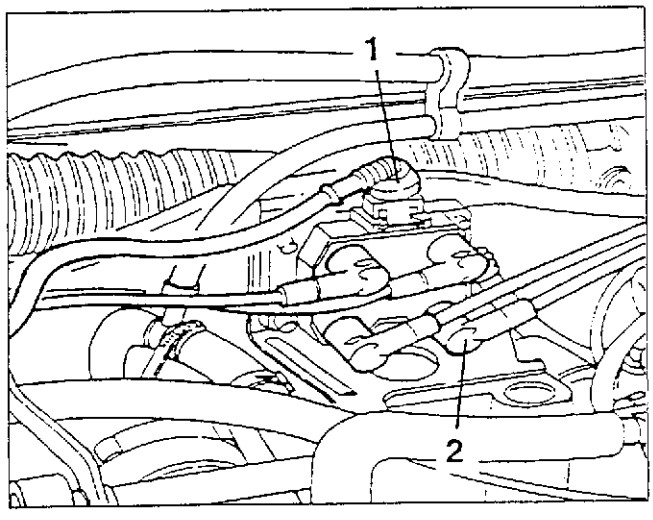
- Disconnect the battery (-) terminal.
1. Disconnect the electrical connection from the constant idle speed actuator.
2. Disconnect the electrical connection from the ignition module.
3. Slacken the two fastening screws and remove the ignition module complete with support.



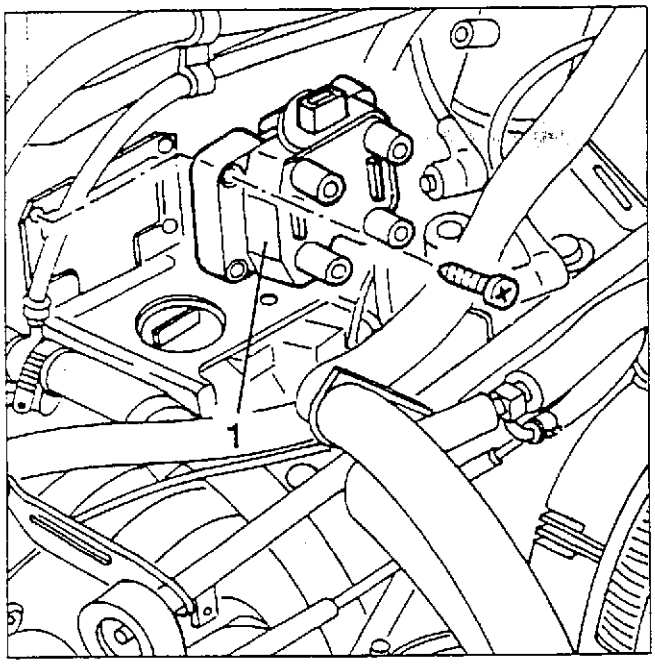
IGNITION COILS
(1596 MP3.1 - 1712 M2.10.3)

REMOVING REFITTING

- Remove the intake box (see GROUP 10).
1. Disconnect the electrical connection supplying the ignition coils.
2. Disconnect the spark plug cables from the ignition coils.



1. Slacken the four fastening screws and remove the ignition coils from the support bracket.



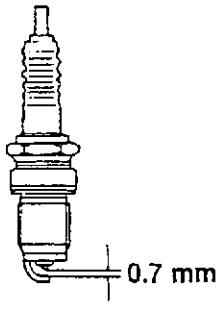
CHECKS AND INSPECTIONS

- Check that the characteristics of the ignition coils are within the specified limits. If not change the coils.

Characteristics	Resistence
Primary winding	0.5 Ω
Secondary winding	13.3 kΩ

SPARK PLUGS

The standard spark plugs fitted may be of the type with surface discharge with four peripheral points and a centre electrode for 8V engines and one point and central electrode for 16V engines.
The former does not need adjustment of the gap between the electrodes, while the latter has a precise dimension to be respected as illustrated.

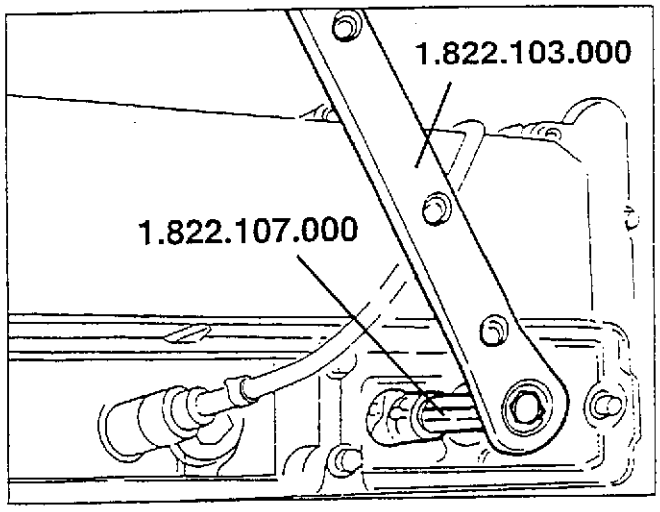


Firing order	1 - 3 - 2 - 4

CHECKING AND REPLACEMENT

- With the engine cold disconnect the spark plug cables
- Blow in the cavities to remove any impurities and traces of dirt.
- Slacken and remove the spark plugs.

For the BOXER 16V engine use tools no. N° 1.822.103.000 and no.1.822.107.000.



- Check the state of cleaning, or for any breaks of the ceramic insulation. In which case replace the spark plugs.

WARNING:
The use of spark plugs with specifications and size other than those specified may cause serious damage to the engine and alter the level of harmful emission at the exhaust.

WARNING:
A dirty or burnt spark plug is often a symptom of malfunctioning of the engine supply system.
For example:
- **traces of carbon dust: incorrect mixture, air cleaner very dirty;**
- **oil stains: oil leaks from the piston rings;**
- **formation of ash: presence of aluminium materials, to be found particularly in the oil;**
- **melted electrodes: overheating due to unsuitable fuel, faults in the valves;**
- **high electrode wear: harmful additives in the fuel or in the oil, pinging in the head, overheating;**
- **etc.**

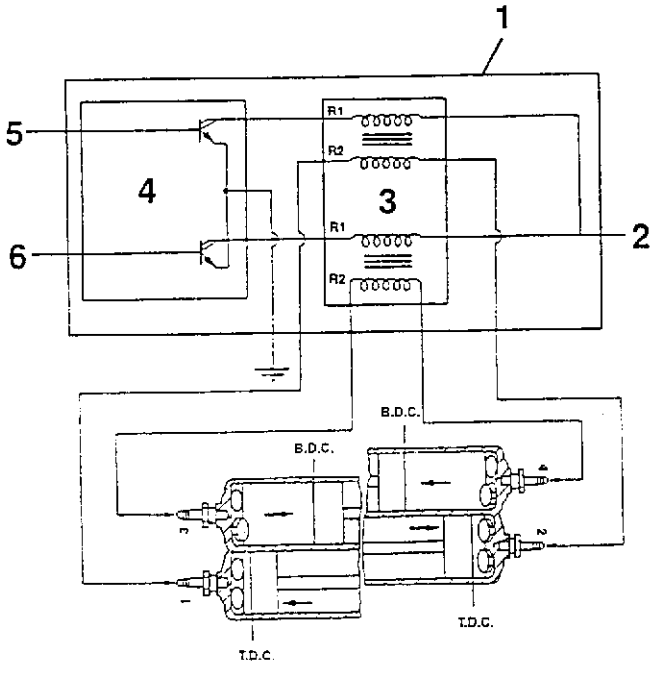
- When refitting tighten the spark plugs to a torque of:

25 ÷ 30 Nm 2.5 ÷ 3.1 kgm

IGNITION MODULE (1596 c.c. Rochester)

The ignition system is of the static, lost spark type, managed together with injection by the Rochester control unit. Static ignition no longer includes the distributor to distribute high voltage to the spark plugs; there are two coils integrated in a single unit with the corresponding power modules.
Each secondary winding of the coils is connected to the two spark plugs of the cylinders which, kynematically, move together (1-2 e 3-4).
The more important advantages are:
- higher power of the spark
- greater reliability
- reduction of radio distrubances
- smaller dimensions.

The control unit detects the angular position and speed of the crankshaft through the rpm and timing sensor.
Additionally, by processing the signals concerning the engine temperature and load, it calculates the spark advance governing the power module of the coil concerned.



1. Ignition module
2. Supply (+)
3. Coil unit
4. Power module
5. Command 1-2
6. Command 3-4

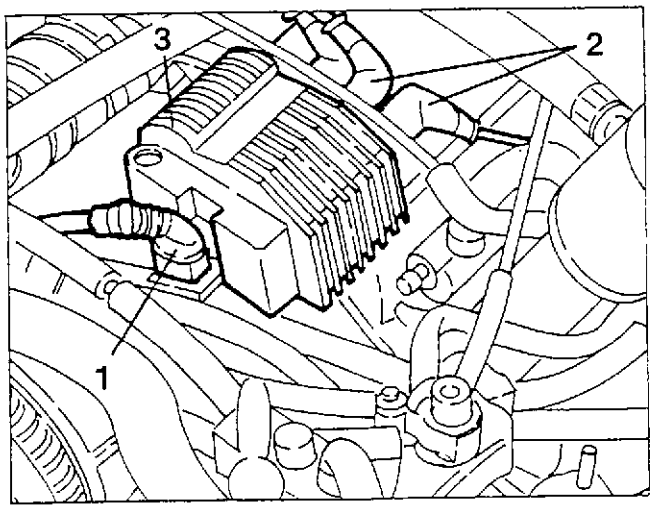
When the control unit removes the command from the power module, energy is transferred from the primary winding to the secondary.
This transfer instantaneously determines the presence of an induced voltage at the ends of the secondary winding, which will always have the same polarity (one end will have a positive potential and the other a negative potential).

These potentials will therefore also be taken by the central electrodes of the spark plugs connected to them (1-2 or 3-4).
Since the voltage induced on the secondary winding always has the same polarity, the discharge current of the coil on the two spark plugs concerned will always flow in the same direction, thus the sparks will strike in an opposed manner to one another: on the spark plug with the central electrode, with positive voltage, the spark strikes from the earth electrode towards the central electrode, whereas on the spark plug with central electrode, with negative voltage, the spark strikes from the central electrode towards the erath electrode.
The result of this, is that after a few thousand kilometers, analysing the spark plugs, the level of wear of the elctrodes may differ: on one, the central electrode with a higher level of wear and on the other, more wear on the earth electrode (this is normal).
The intensity of the sparks is determined by the working conditions of the spark plugs themselves.
In fact, in the cylinder at the T.D.C. at the end of the exhaust stroke, the spark will be very weak (lost spark) due to the presence of uncompressed exhaust gas (lower dielectric), while in the cylinder at the B.D.C. at the end of the compression stroke, there will be an intense spark (useful spark), due to the presence of the compressed air-fuel mixture (higher dielectric).

REMOVAL/REFITTING

- Disconnect the battery terminal (-).
- Remove the air intake box (see GROUP 10).

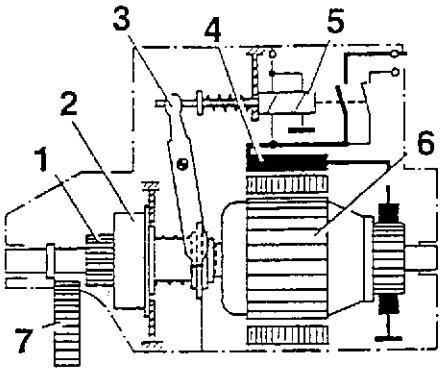
1. Disconnect the electrical connection from the ignition coil.
2. Disconnect the spark plugs from the ignition coil.
3. Slacken the three fastening screws and remove the ignition coil.



BLANK

STARTER MOTOR

Overcoming the inertia and frictions, the starter motor cranks the engine to a set number of revolutions in order to begin the formation of the mixture necessary for combustion and subsequent autonomous movement of the engine. The motion is transmitted by a direct current electric motor, powered by the battery current, through a coupling pinion which turns the ring gear on the flywheel.

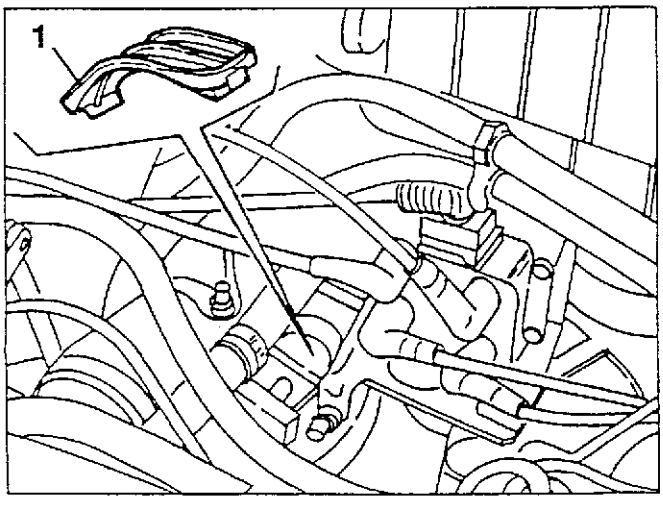


1. Pinion
2. Roller type freewheel
3. Coupling lever
4. Excitation coil
5. Relay
6. Rotor
7. Flywheel
8. Ring gear

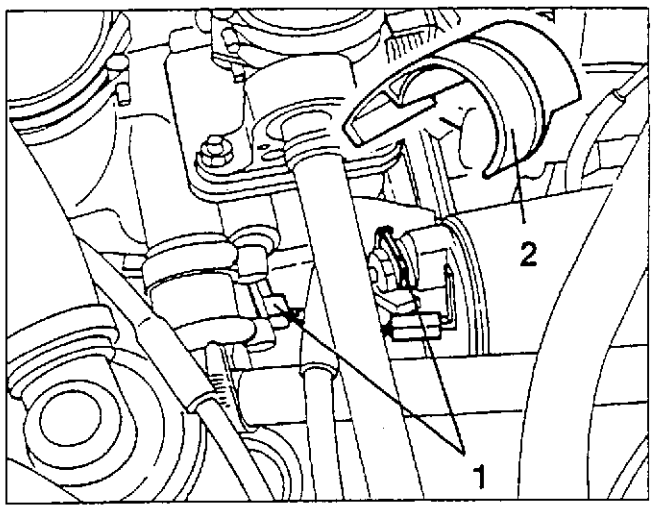
Due to a freewheel coupling, the pinion disengages when the main engine unit turns faster than the motor. A relay energized by the motor current engages the pinion through a fork. The starter motor installed is of the translating screw pinion type with relay housed directly above the starter motor.

REMOVING/REFITTING

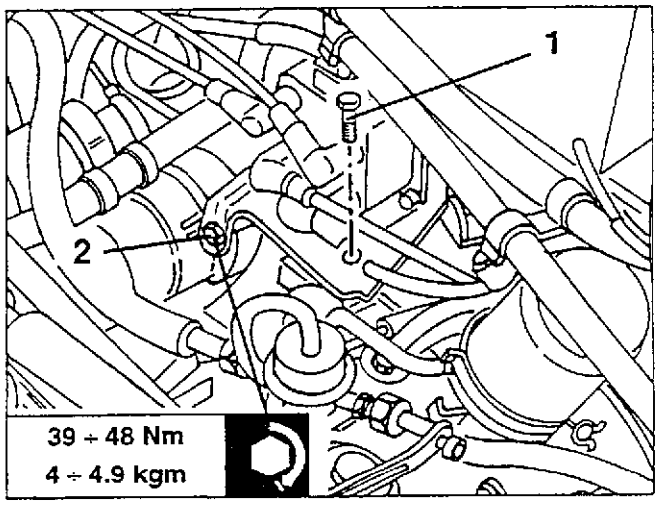
- Remove the intake box (see GROUP 10).
1. Remove starter motor inspection cover.



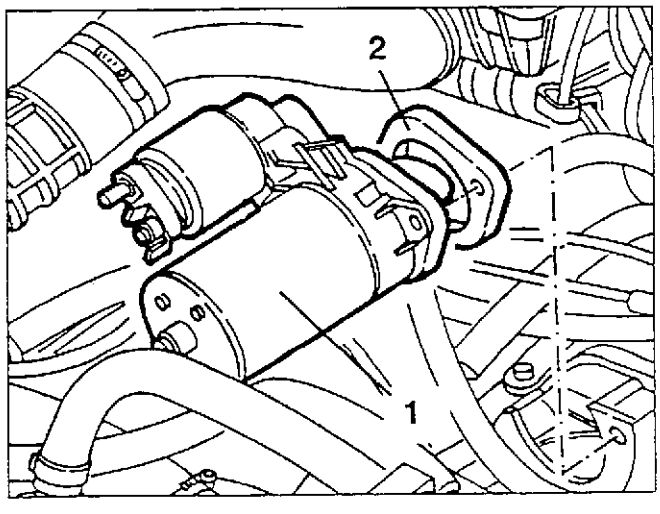
1. Disconnect the electrical connections from the starter motor.
2. Remove the plastic protection from the starter motor.



1. Slacken the screw fastening the ignition coil support bracket to the crankcase.
2. Slacken the two bolts fastening the starter motor (one bolt also fastens the ignition coil support bracket).

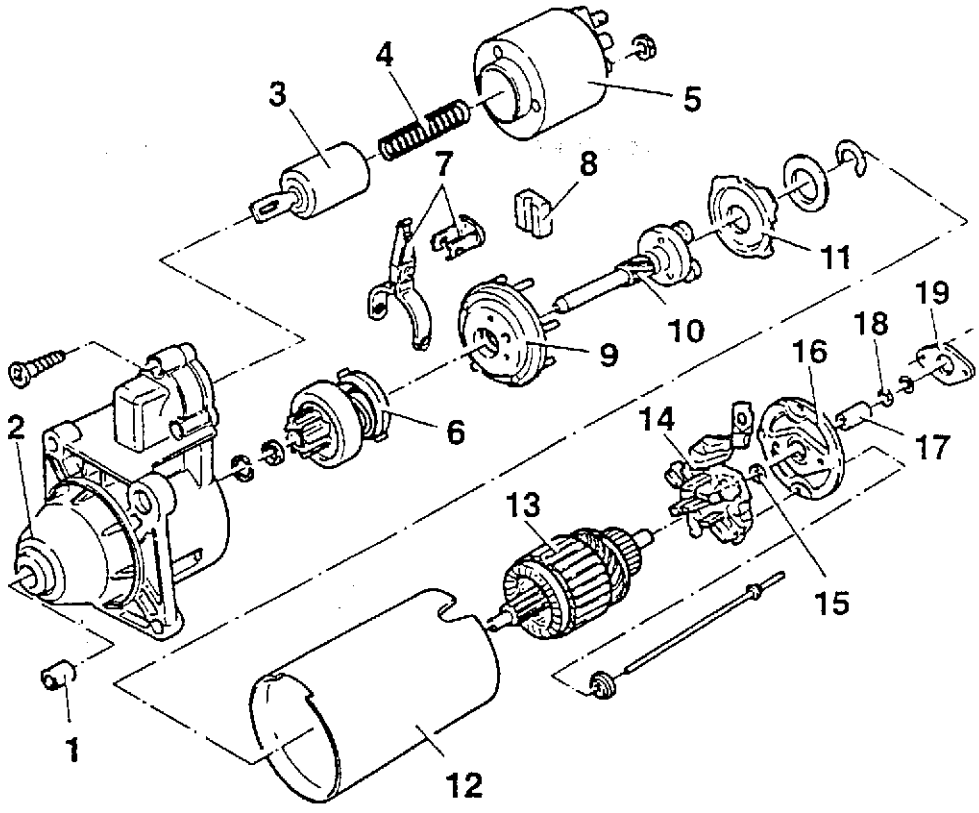


1. Remove the starter motor.
2. Remove the spacer.



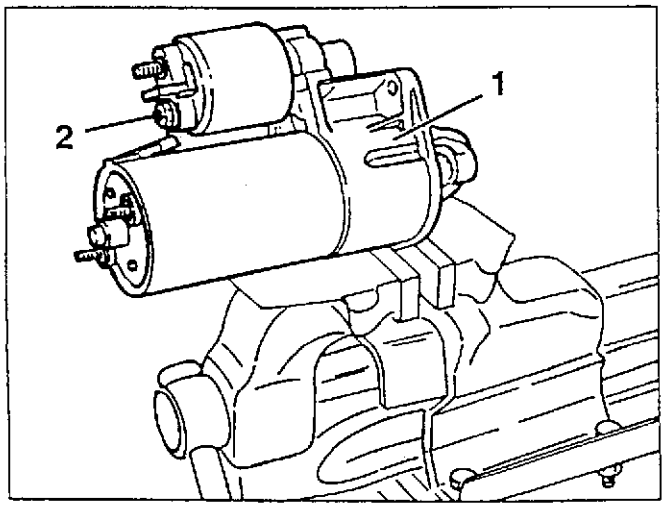
DIS-ASSEMBLY

1. *Bush*
2. *Support on drive side*
3. *Coupling relay rotor*
4. *Return spring*
5. *Coupling relay*
6. *Starting coupling*
7. *Fork levers*
8. *Rubber pad*
9. *Differential control gear*
10. *Inverter*
11. *Protection plate*
12. *Pole frame*
13. *Rotor*
14. *Brush holder plate*
15. *Felt ring*
16. *Collector side support*
17. *Bush*
18. *Compensation washer*
19. *Dust guard*

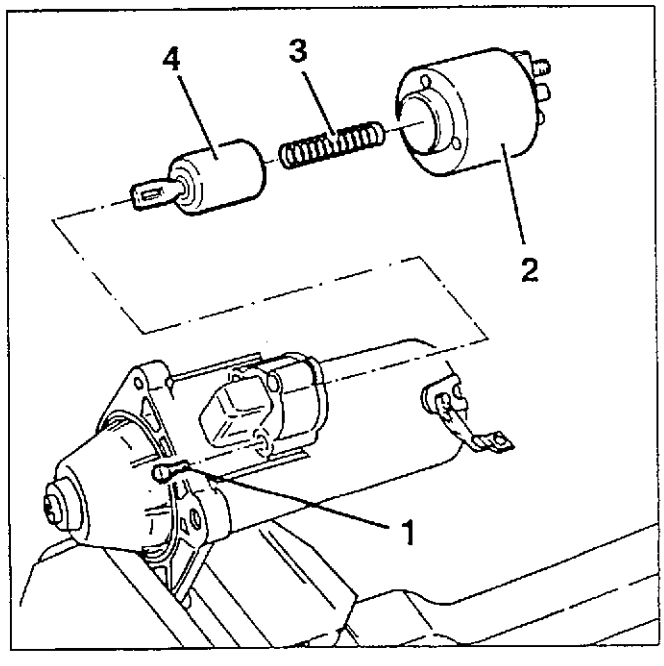


CAUTION:
Because of their structure these starter motors are more sensitive to knocks, blows and squashing than the previous versions.
Consequently, thay must be fastened only locking them in the clamp on the flange (not on the pole frame).

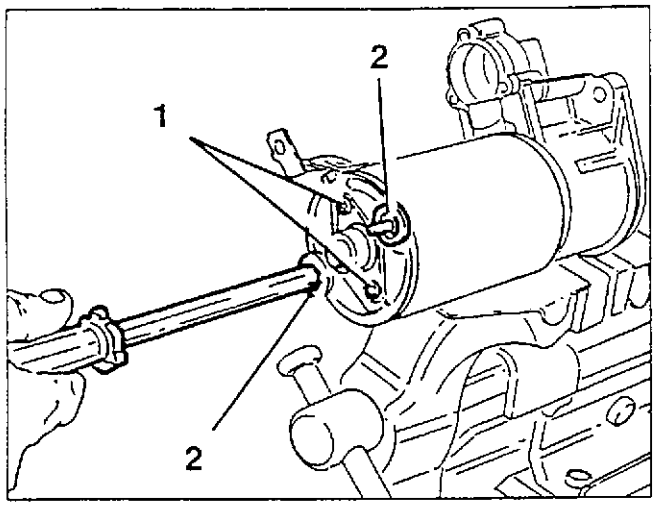
1. Fasten the starter motor on a vice with protective clamps as shown in the figure.
2. Slacken the nut fastening the terminal to thecoupling relay.



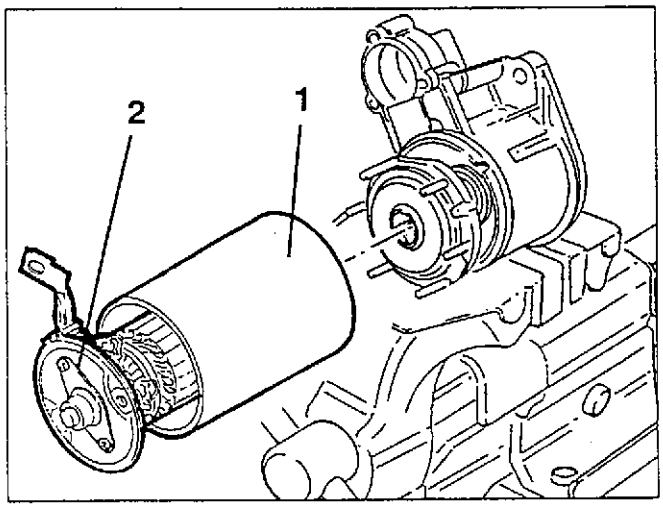
1. Slacken the three screws fastening the coupling relay to the drive side support.
2. Remove the coupling relay.
3. Retrieve the return spring.
4. Remove the coupling relay rotor.



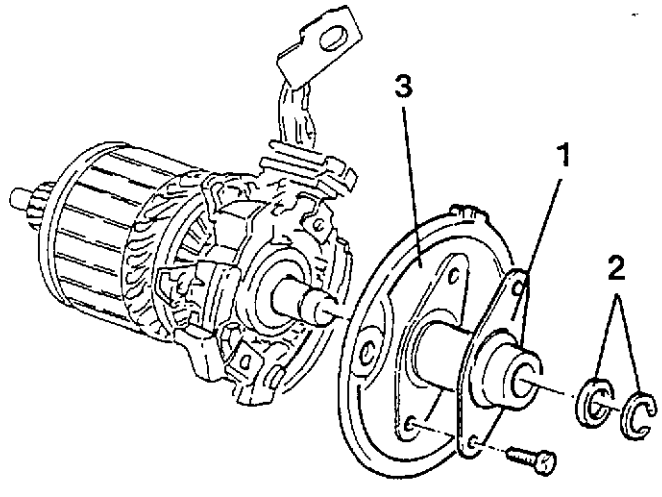
1. Slacken the two screws fastening the dust cover without removing them.
2. Slacken and renove the two thru screws.



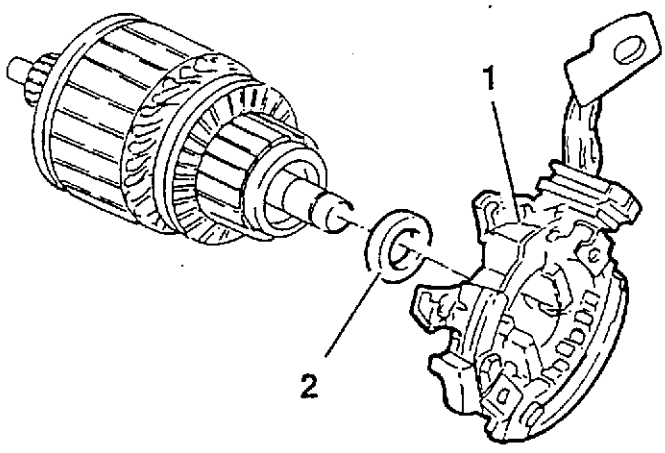
1. Remove the pole frame complete with rotor and collector side support.
2. Press the rotor carefully from the pole frame and at the same time push the seal out of the clamp.



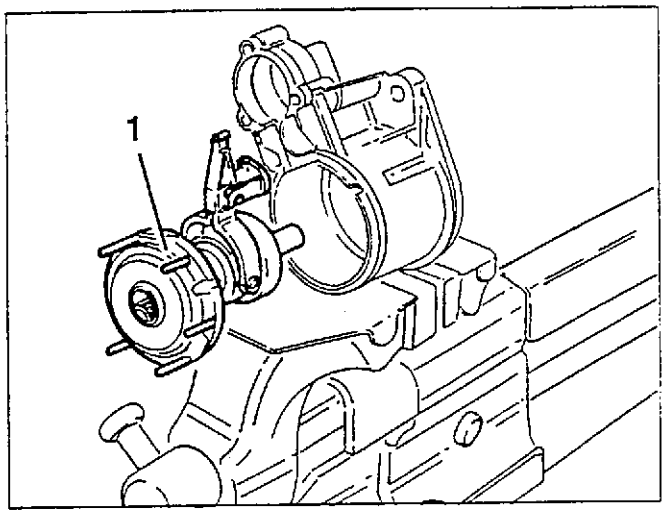
1. Completely slacken the fastening screws and remove the dust guard.
2. Remove the rest and compensation washers.
3. Remove the collector side support.



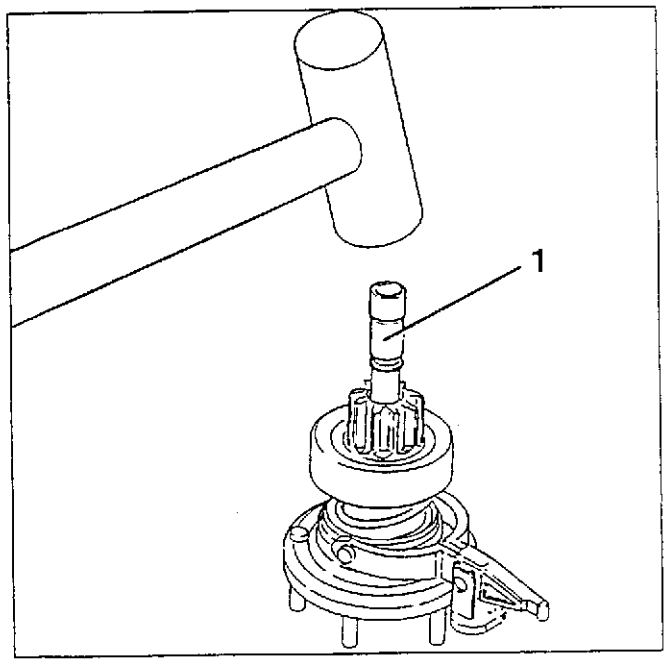
1. Remove the brush holder plate from the rotor.
2. Remove the felt seal.



- Remove the rubber pad using a screwdriver.
1. From the drive side support remove the spur gear with transmission and fork levers.

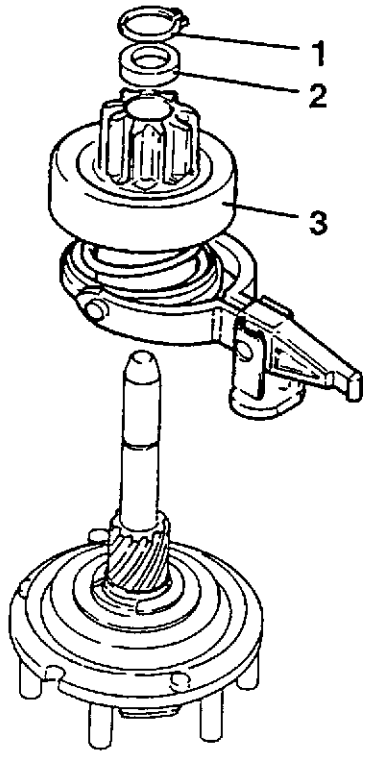


1. Hammer the starter coupling stop ring with a suitable bush and rubber mallet.

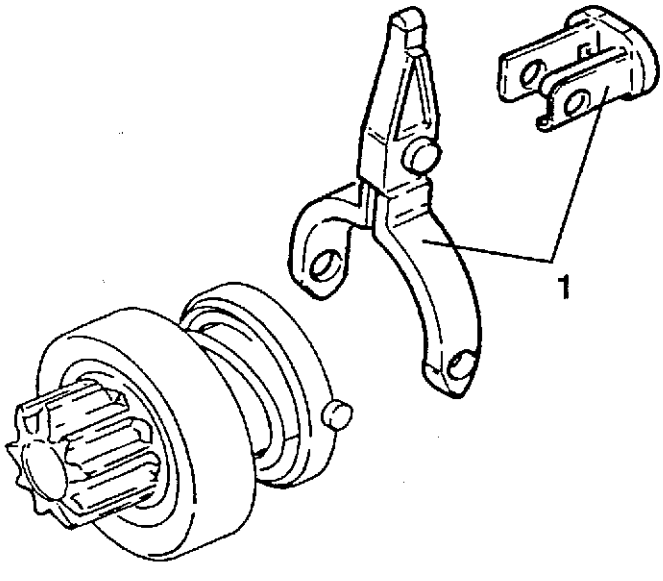


1. Using suitable pliers remove the split ring.
2. Remove the stop ring.
3. Remove the starter coupling from the reversing shaft.

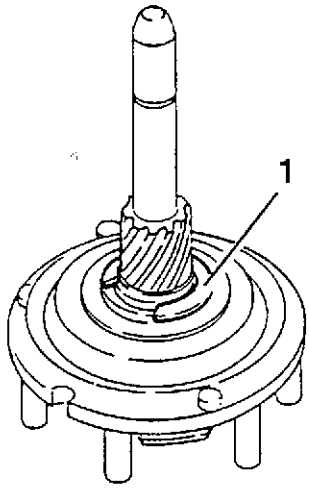
CAUTION:
Avoid damaging the reversing shaft when removing the split ring.
If necessary, accurately deburr the reversing shaft groove, otherwise the gear bush will be damaged.



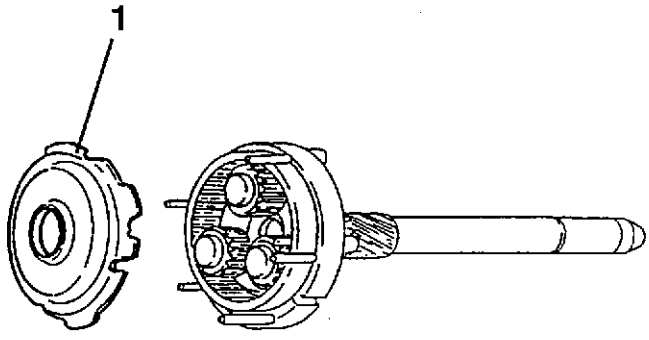
1. If necessary, remove the fork levers from the starter coupling.



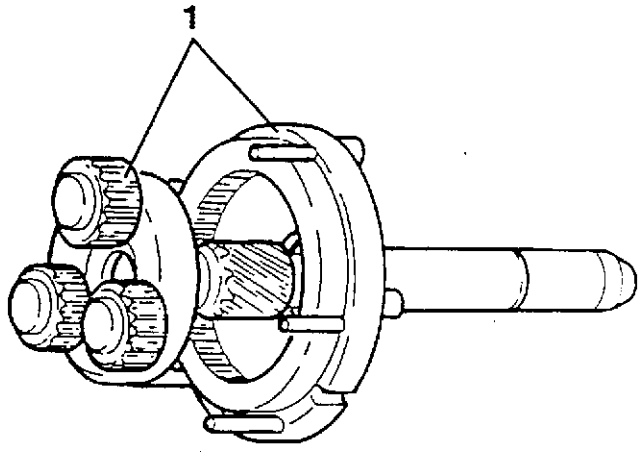
1. Remove the split ring fastening the reversing gear.



1. Remove the protection plate from the differential drive gear.



1. Separate the differential drive gear from the reversing gear.



- If necessary, using special punches replace the bushes on the collector side support and drive side support..

CHECKS AND INSPECTIONS

- Clean the rotor, ring gear with internal teeth, the gear with transmission and the relay using only compressed air (max 4 bar) and a clean cloth. Never use liquid detergents. The other parts, such as for example screws and the rotor shaft may be washed with non inflammable liquid detergents to be found normally in commerce.

CAUTION:
Carefully dry any washed parts, otherwise they might form explosive gases inside the sealed starter motor.

Checking the outside of the collector

- Check for any worn points; if necessary, proceed as follows:
• Tighten the rotor on the collector side and drive side support taking care not to damage the rotor shaft.

CAUTION:
When turning do not tighten the rotor shaft in the chuck.

• Turn the collector using suitable tools ensuring that its diameter is within the specified measurements.

Minimum collector diameter
31.2 mm

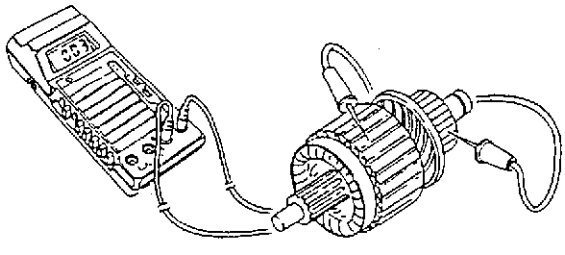
- Also check that the eccentricity of the collector and of the pack of plates is within the specified values.

Collector eccentricity	≤ 0.01 mm
Eccentricity of pack of plates	≤ 0.05 mm

- If there are annealed points or interruptions on the collector, change the rotor.

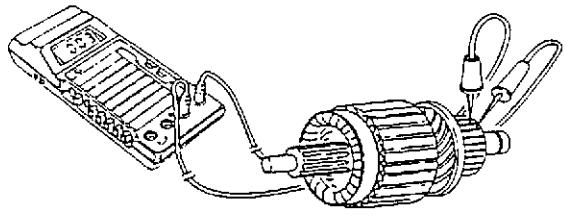
Collector continuity test

- Place the tester prods on the collector blades and check that the tester indicates the passage of current. In the lack of continuity, change the rotor.
- Repeat the above-mentioned operations for all the corresponding pairs of blades.



Rotor insulation test

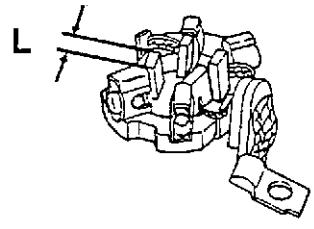
- Place one tester prod on the collector and the other on the blade pack or on the shaft and check that the tester does not indicate the passage of current. If insulation is lacking (short circuit), change the rotor.
- Repeat the above-mentioned tests for all the collector blades.



Checking brush wear

- To check the brushes, release the brush holder from its plate.
- Check that the length of the brushes is within the specified values and that they are not damaged; if necessary, change the whole brush holder plate.

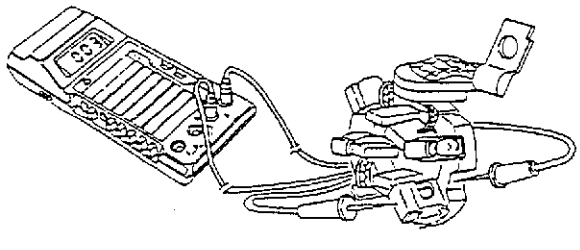
Minimum brush length
L = 8 mm



- Also check that the brush springs are not strained and are stiff enough to warrant good contact of the brushes on the collector.

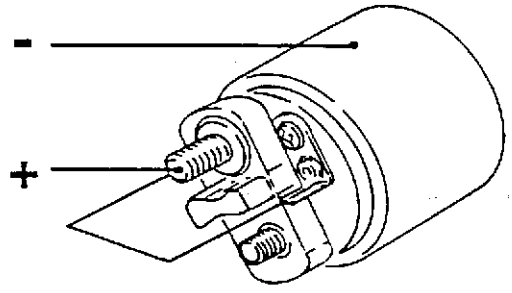
Brush holder insulation test

- Connect one prod of the tester to the brush holder support plate and the other on a positive brush holder and check that the tester does not indicate the passage of current.
- Repeat the test for the other positive brush holder.
- If insulation is lacking, change the brush holder plate.



Checking the efficiency of the coupling relay

- Set the coupling relay on the test bench and power the bench surface negatively (alternatively connect the relay frame to the battery (-) terminal). - Connect the positive terminal of the test bench or of the battery to the positive terminal of the short circuited relay with the starter pin. - The prod of the coupling relay that actuates the starter control fork must be triggered; if not, change the electromagnet.

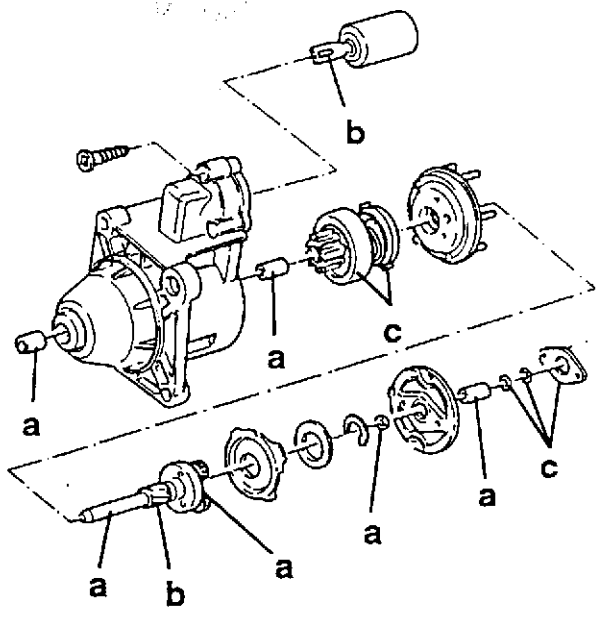


Checking the bush wear

- Check that the two bushes, the first one on the drive side support and the second on the collector side support are not excessively or unevenly worn.
- If necessary change them using special punches.

RE-ASSEMBLY

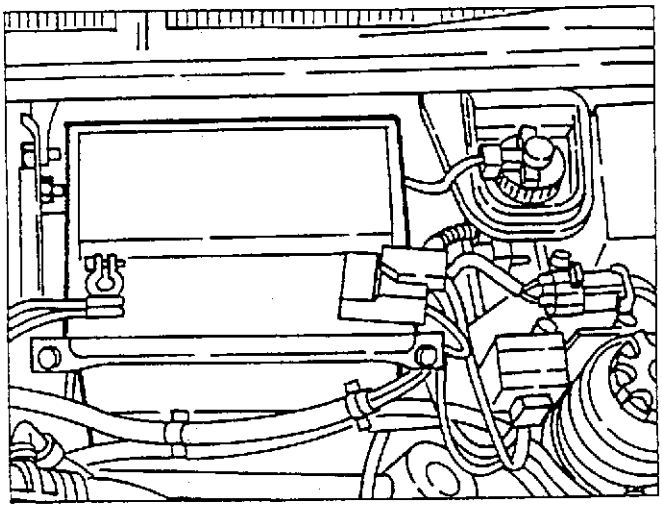
- Re-assemble the starter reversing the sequence followed for dis-assembly. - Lubricate the components shown in the following figure with the products described.



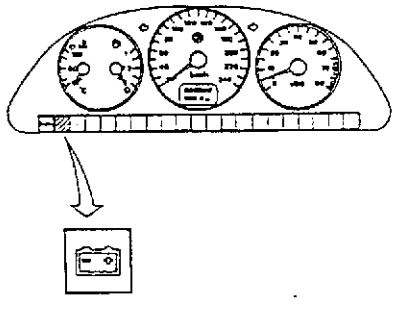
a. Oil
b. Grease
c. Silicone grease

BATTERY

The battery is located in the engine compartment supported by the power steering box support cross-smember.



It has been designed to ensure that the engine starts in the shortest time possible. For this reason a high torque and a predefined engine rpm are required. This is ensured by the optimal sizing of the 6 elements contained inside the battery, each of which delivers a voltage of – 2 V (12 V in all).
The battery adopted does not need periodical maintenance.
It maintains the charge much longer and also contains diluted sulphuric acid; for this reason it is necessary to keep it in the upright position even when it is not installed on the car. The battery body also has small ventilation holes to minimise the formation of gas during charging. Due to the reduction in the volume of gas produced, there is no corrosion and good contact at the terminals is ensured. The advantages of this battery are:
- highly reduced water consumption due to the new type of alloy used in the manufacture of the grills and plates, for which reason it is no longer necessary to top up the battery; - excellent starting capacity, as a result of very low self- discharging of up to 7 months thus enabling long term storage (at temperatures below 28°C).
When the vehicle is travelling the alternator recharges the battery. Whenever the charge is insufficient or the connection between the alternator and the battery is cut off, a warning light on the instrument cluster turns on to indicate a circuit failure.



If the battery appears to be flat, check the charge measuring the loadless voltage on the terminals using a Voltmeter.
If the voltage is below 12.30 V it is 50% charged; if it reaches 12.48 V it is 75% charged; and at 12.66 V it is 100% charged.

CAUTION:
If the electrolyte level in one of the cells of the battery has fallen below the minimum level mark on the plastic container, carefully open the cap cover and add de-ionized water, as with ordinary batteries.

NOTE:
It is highly unadvisable to recharge the battery quickly at voltages above 15.5 V.
When recharging use a normal 12 V battery charger, connecting the positive cable (red) to the battery (+) terminal and the negative cable (black) to the battery (-) terminal.
If the battery of the vehicle is connected temporarily to an external battery, connect the positive terminal to the positive terminal and the negative terminal to the negative terminal.

CAUTION:
- Do not connect or disconnect the battery to or from the electric system of the car when the engine is running.
- Do not invert the terminal connections (even for a moment) as this would damage the alternator rectifier.
- When connecting the battery charger to the battery, firstly connect the cables and then start the battery charger.
- if it becomes necessary to start the engine with temporary cables and with an auxiliary battery, the voltage of the latter must not exceed 12V.
- Before charging the battery the clamp should be removed from the negative terminal.
- When charging make sure that the temperature of the electrolyte does not exceed 45°C.
- Do not touch the positive and negative terminals at the same time with the hands.
- Keep all naked flames away from the battery when recharging.

When replacing the battery follow the directions for use.
If the charge of the replacement battery is potentially higher than that of the old one, the higher voltage might cause melting of the starter motor induction coil, or damage to the pinion or crown gear.

MAINTENANCE

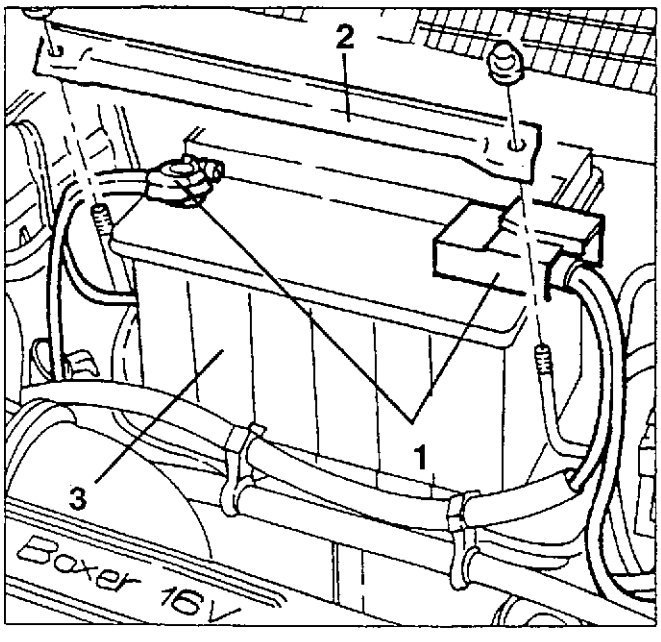
The capacity of the battery to start the engine depends on the charge within it; it is therefore necessary to check it regularly and carry out any maintenance, especially during the winter due to the greater load required by the starter motor and the reduced battery capacity at low temperatures. Clean the surfaces of the battery, the terminals and clamps with a solution of water and sodium bicarbonate. Before reconnting the clamps, coat them with a layer of grease.

CAUTION:
Do not let any of the fluid used for cleaning get into the battery as it will react with the electrolyte. The electrolyte fluid is an acid, therefore dangerous for eyes, hands and clothes.

NOTE:
Batteries stored in a warehouse or installed on cars left unused for long periods will slowly lose their charge so it will be necessary to recharge them before use.

REMOVAL/REFITTING

1. Disconnect the battery (-) terminal and then the (+) terminal.
2. Slacken the nuts and remove the battery fastening bracket.
3. Remove the battery.



- If necessary, remove the battery acid drain tray.

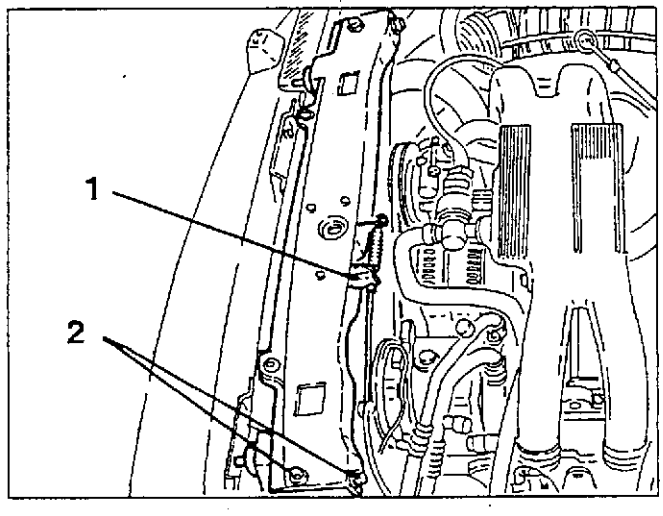
ALTERNATOR

The alternator supplies electrical energy to the electronic control units and to the various services when the engine is running. It also charges the accumulator (battery) so that it can deliver current when the engine is stationary. The electric current is produced by a stator which "cuts" the magnetic field generated by a rotary coil (rotor). The rotor is integral with a pulley operated directly by the crankshaft through a belt. The contact brushes supply the rotor with the excitation current.
The alternate current generated by the alternator is rectified by the diodes and adjusted by the voltage regulator located on the alternator body. The electronic voltage regulator used is compact in size and it warrants constant voltage in all fields of operation of the engine, regardless of the changes in load and rpm. A cooling fan turns together with the pulley to prevent it from reaching dangerous temperatures that might adversely affect its operation. The alternator installed is of the type with claw terminals and collector rings; it is light and very compact. It is fastened to the engine by brackets, one of which is slotted to simplify tensioning of the drive belt (see GROUP 00).

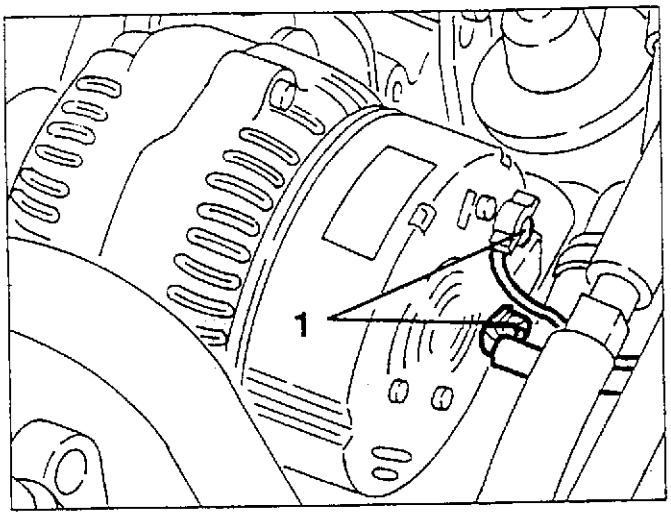
CAUTION:
The fan will correctly cool the alternator if it turns clockwise (seen from pulley side).

REMOVAL/REFITTING

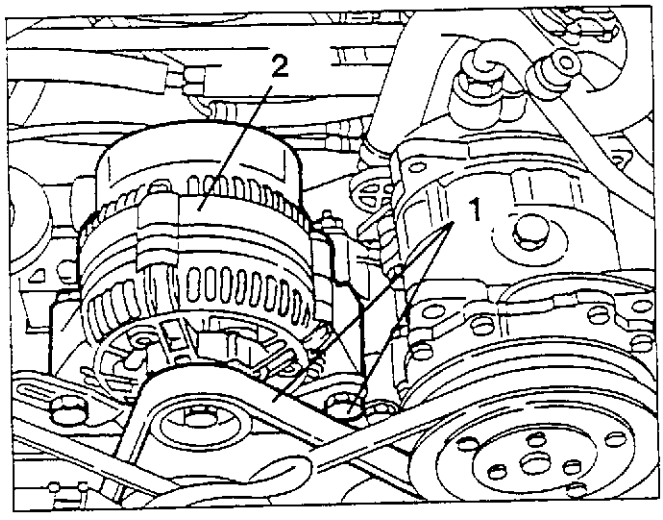
- Disconnect the battery (-) terminal.
- Remove the radiator grille (see GROUP 70).
1. Disconnect the opening cable from the bonnet lock.
2. Slacken the fastening screws and remove the upper radiator crossmember.



- Remove the intake box (see GROUP 10).
1. Disconnect the electrical connections from the alternator.

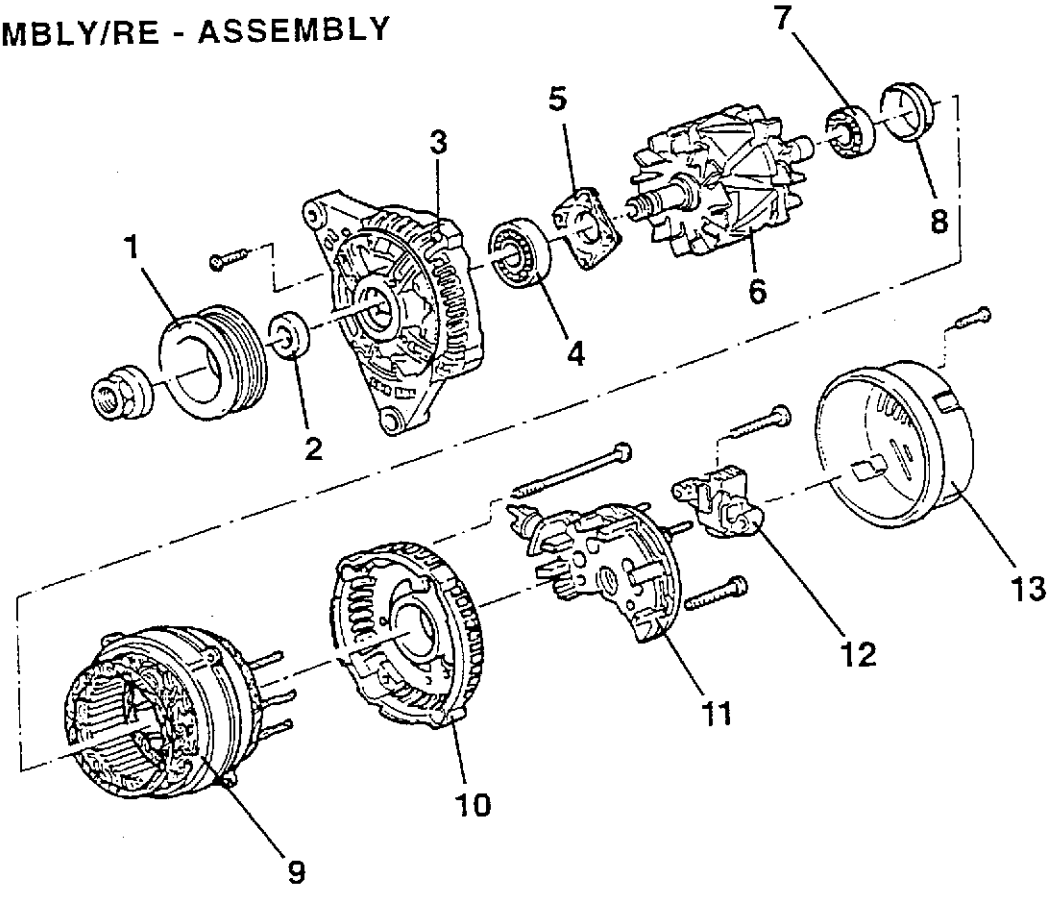


1. Slacken the two bolts fastening the alternator and prise off the drive belt without removing it.
2. Slacken the fastening bolts completely and remove the alternator.



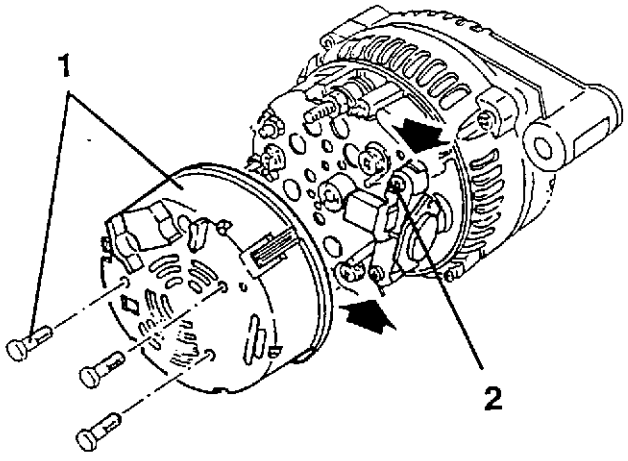
When refitting, tension the alternator - water pump drive belt (see GROUP 00).

DIS - ASSEMBLY/RE - ASSEMBLY

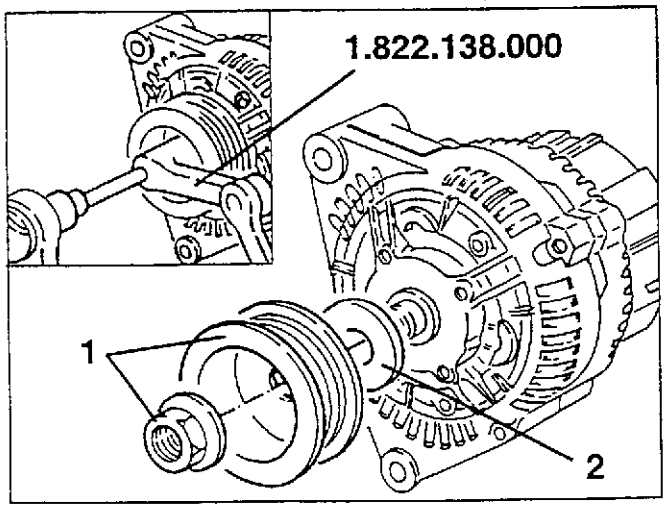


1. *Pulley*
2. *Spacer*
3. *Drive side support*
4. *Drive side bearing*
5. *Cover plate*
6. *Rotor*
7. *Regulator side bearing*
8. *Centering ring*
9. *Stator*
10. *Support for collector rings*
11. *Rectifier unit*
12. *Voltage regulator - brush holder*
13. *Protection cap*

- Fasten the alternator on a special support tool.
1. Slacken the three fastening screws and remove the protection cap releasing the lock clips.
2. Slacken the two screws fastenings the voltage regulator then remove it releasing it from the side catches.



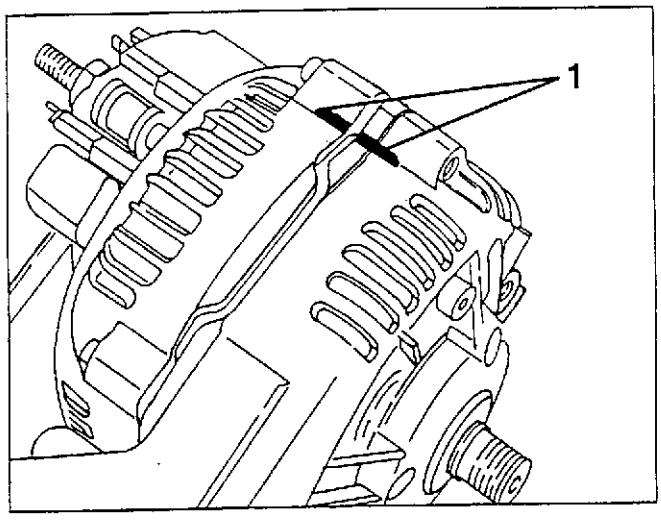
1. Using tool No. 1.822.138.000 together with wrench USAG XZN M10L, slacken the nut fastening the alternator pulley and remove it.
2. Retrieve the spacer.



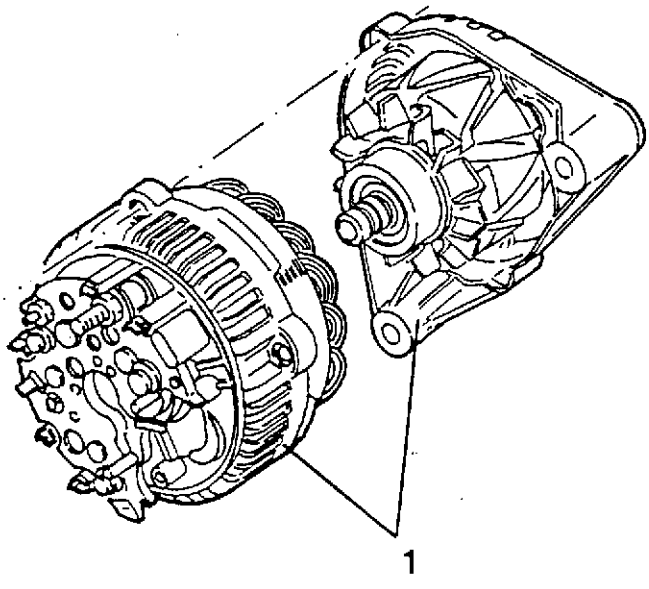
- When tightening the retaining nut with extension spanner N° 1.822.137.000, the torque values become:

300 mm for dynamometer spanner with arm	65 ÷ 74 Nm 6.6 ÷ 7.5 kgr
400 mm for dynamometer spanner with arm	67 ÷ 76 Nm 6.9 ÷ 7.8 kgr

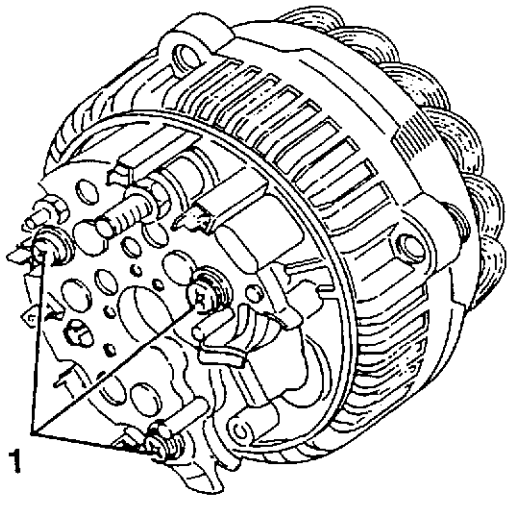
1. Make reference notches on the drive side support and on the connector ring support.



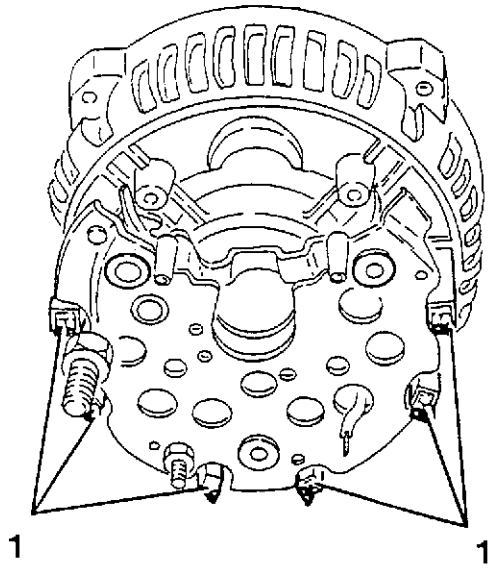
1. Slacken the four fastening screws and remove the drive side support with rotor from the collector ring support.



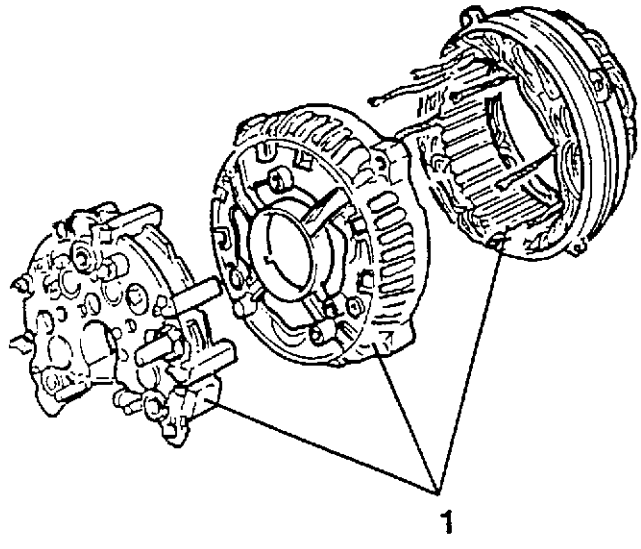
1. Slacken the three screws fastening the rectifier unit to the support.



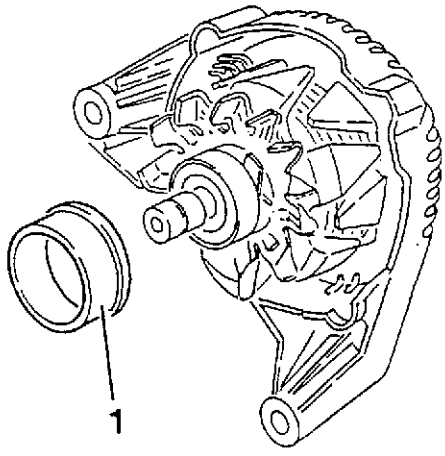
1. Using a screwdriver open the clamps fastening the stator wires.



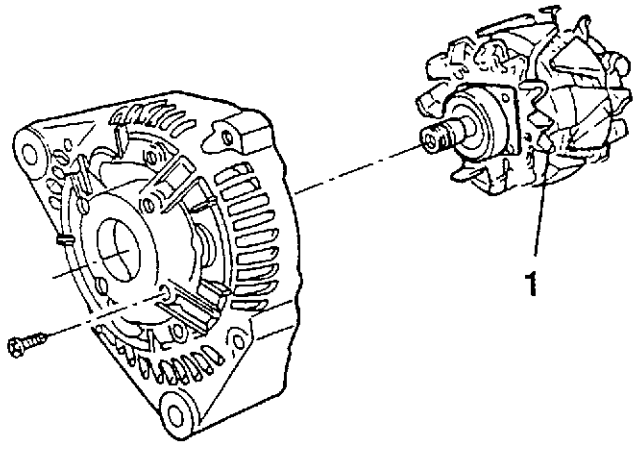
1. Separate the rectifier unit from the collector ring support and from the stator.



1. Remove the centering ring from the bearing on the regulator side.

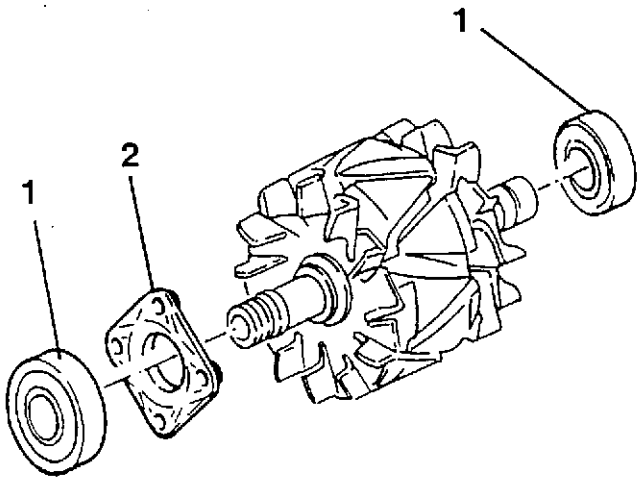


1. Slacken the four fastening screws and remove the rotor complete with bearings from the drive side support.



1. Using a suitable puller tool, remove the rotor bearings.
2. Retrieve the cover plate.

CAUTION:
When removing the regulator side bearing, do not use the shaft as a reference plane, as this is made from plastic and might be damaged.



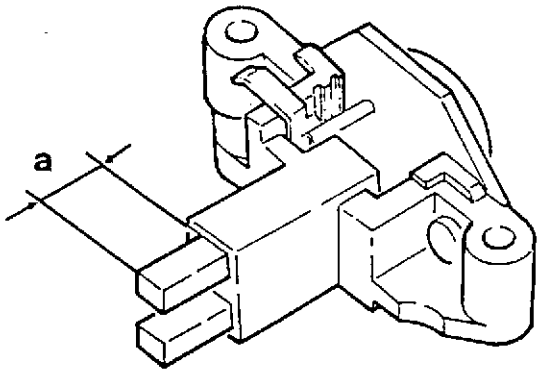
CHECKS AND INSPECTIONS

CAUTION:
The alternators are fitted with long life storage condensers for the suppression of receivers and transmitting systems.
When washing parts of the alternator, the condenser can discharge in contact with the cleaning fluid and this may set fire to inflammable liquids.

Checking the brush wear

- Check the outside of the voltage regulator for damage.
- Change the regulator if the brushes are split or if the protrusion dimension "a" is below the specified value.

Minimum brush length
a = 7 mm

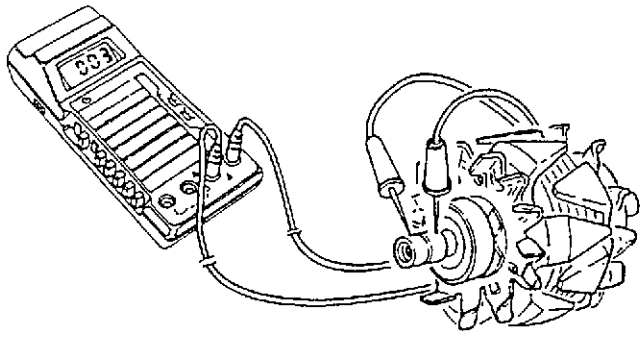


- Also check that the brushes run smoothly and that their springs are rigid enough to ensure good contact of the brushes on the collectors.

Continuity test of the rotor winding

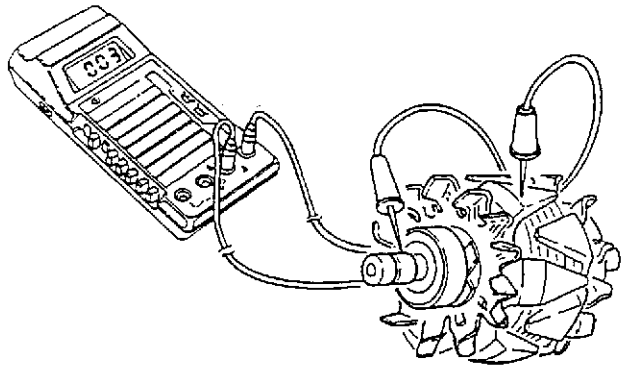
- Check that the resistance of the rotor winding is within the specified ratings connecting the prods of the tester on the collector rings.

Rotor winding resistance
2.6 ÷ 2.8 Ω



Rotor insulation test

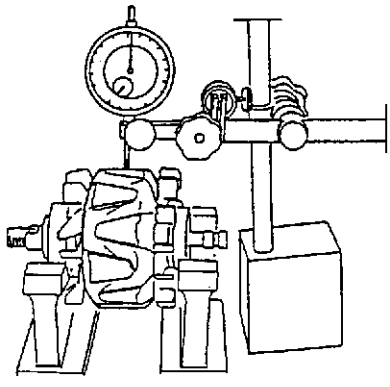
- Place one tester prod on a collector ring and the other one on the rotor core, then check that the tester does not signal the passage of current.
- Repeat the operation for the second collector ring.



Measuring the concentricity of the rotor and collector rings.

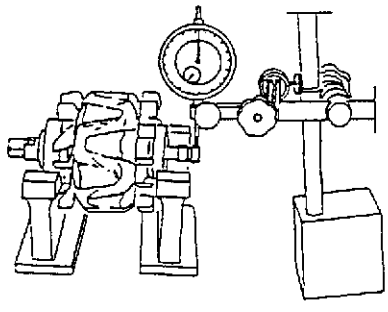
- Set the rotor on special supports and using a dial gauge on a magnetic support base, check that the eccentricity of the rotor outside diameter does not exceed the specified value.

Eccentricity of rotor outside diameter
≤ 0.05 mm



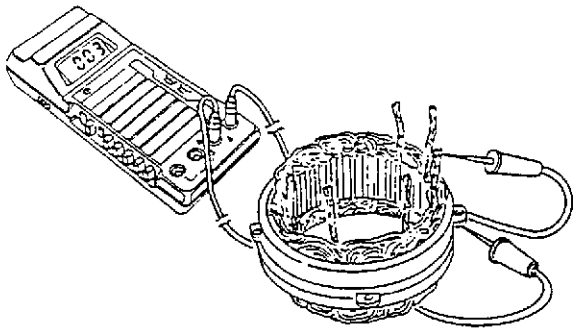
- In the same way, check that the difference on the collector rings does not exceed the specified value. If necessary, turn the outsides of the collector rings.

Eccentricity of collector rings
≤ 0.03 mm



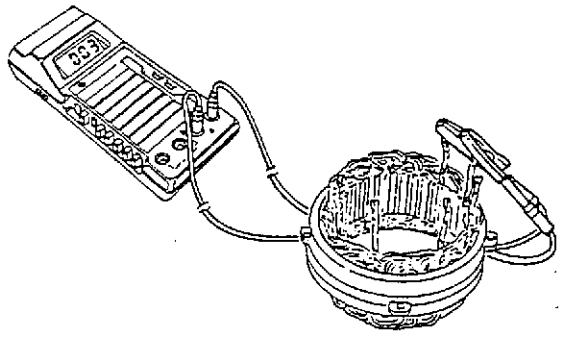
Insulation test for stator windings

- Place one prod of the tester on the stator pack and the other on the terminals of the first phase, then of the second and third. Check that the tester does not signal the passage of current.
Change the stator if insulation is insufficient.



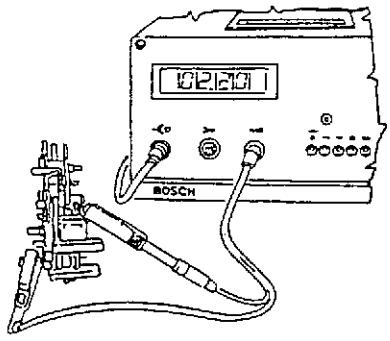
Continuity test of stator windings

- Check the tester termnals respectively on the terminals of phases 1-2, 1-3 and 2-3 and check that in all three cases the tester signals the passage of current.
In the lack of continuity in the windings, change the stator.



Checking the anti-disturbance condenser on the rectifier

- Slacken the antidisturbance condenser connection tab (-) on the rectifier.
- Connect the tester to B+ of the rectifier and to the slackened connection tab of the condenser and check that the electrical capacity is 1.8 ÷ 2.6 microfarad.

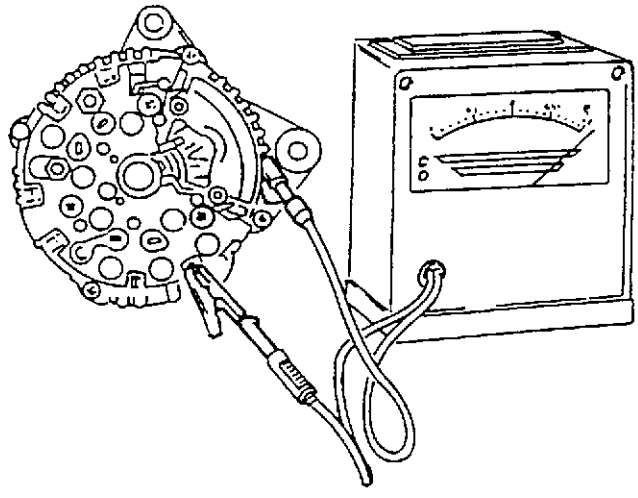


- If not, change the rectifier complete with anti- disturbance condenser.

CAUTION:
After this check, discharge the condenser by short circuit to prevent the liquid detergent from setting on fire when cleaning the components.

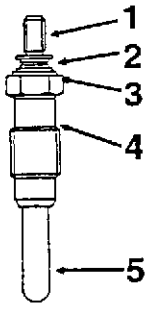
Checking the rectifier

- Check that the wired rectifier is working properly using special equipment.
- Connect the terminals of the test equipment to the following points of measurement:
a) Stator frame and connection weldings.
b) B+ and stator connection welding point.
c) D+ stator connection welding point.
The rectifier is in order if the tester dial is in the sector of both measurements.
If one or more dodes are faulty, change the complete rectifier.



GLOW PLUGS

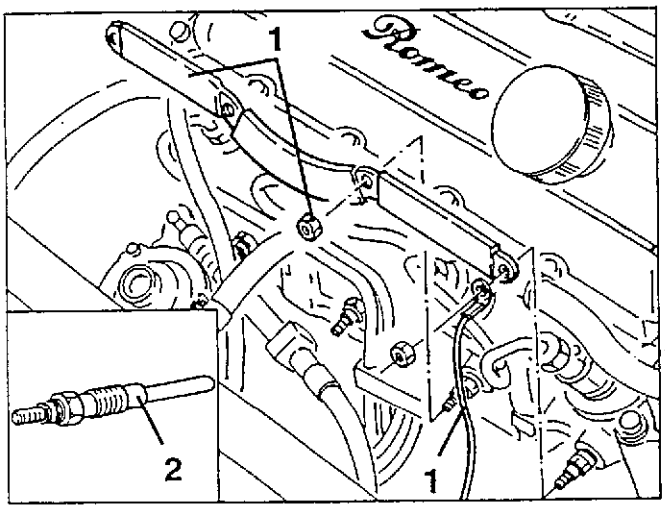
These are of the rapid incandescence bulb type and they reach a temperature of 850°C in the nominal time of ~ 7 seconds.
They have a resistance coil in "Alferon" with high resistivity and "Nickel" with low resistivity welded by laser. The outer bulb is in "Inconel 601" with a thickness of 0.7 mm.



1. *Threaded terminal*
2. *Spacer*
3. *Insulant*
4. *Body*
5. *Filament protection*

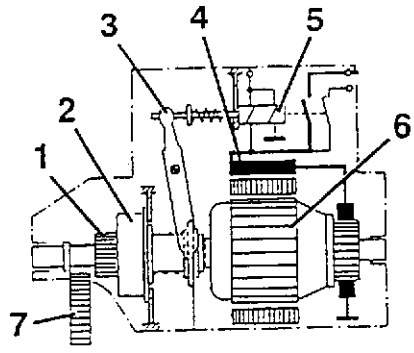
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
1. Slacken the fastening nuts and remove the bar and the glow plug supply cable.
2. Remove the glow plugs.



STARTER MOTOR

Overcoming the inertia and frictions, the starter motor cranks the engine to a set number of revolutions in order to begin the formation of the mixture necessary for combustion and subsequent autonomous movement of the engine.
The motion is transmitted by a direct current electric motor, powered by the battery current, through a coupling pinion that turns the ring gear on the flywheel.
Due to a freewheel coupling, the pinion disengages when the main engine unit turns faster than the motor.

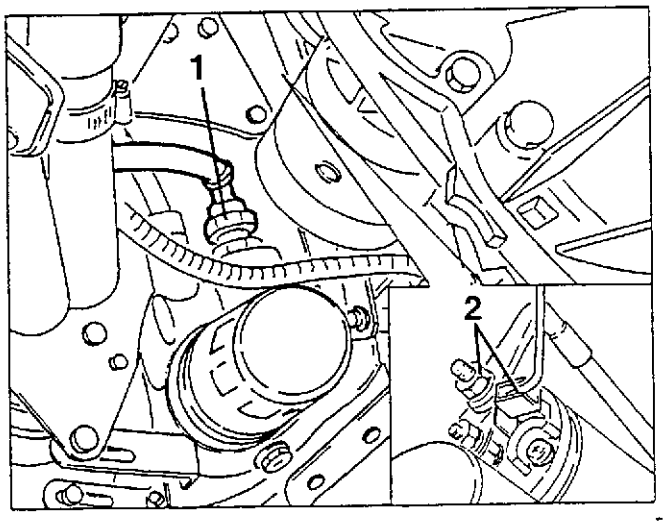


1. *Pinion*
2. *Roller free wheel*
3. *Coupling lever*
4. *Energizing coil*
5. *Relay*
6. *Rotor*
7. *Flywheel ring gear*

A relay energized by the motor current engages the pinion through a fork.
The starter motor installed is of the translating screw pinion type with relay housed directly above the motor.

REMOVAL/REFITTING

- Set the car on a lift.
- Disconnect the battery (-) terminal.
1. Disconnect the radiator return pipe from the oil filter support.
2. Disconnect the starter motor electrical connections.



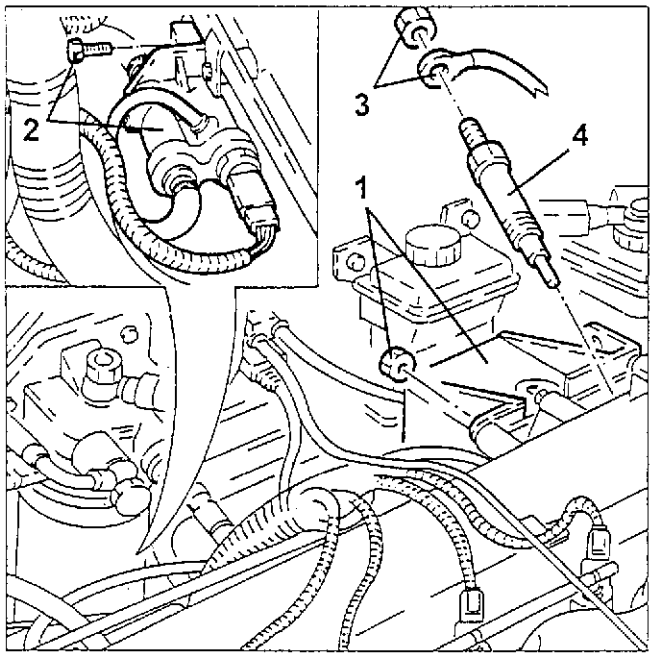
Slacken the three screws fastening the starter motor to the gearbox and remove it.

- For Dis-assembly/Re-assembly Checks and Inspections, proceed as described for the Boxer engines.

GLOW PLUGS

REMOVAL/REFITTING (for 1910 JTD version)

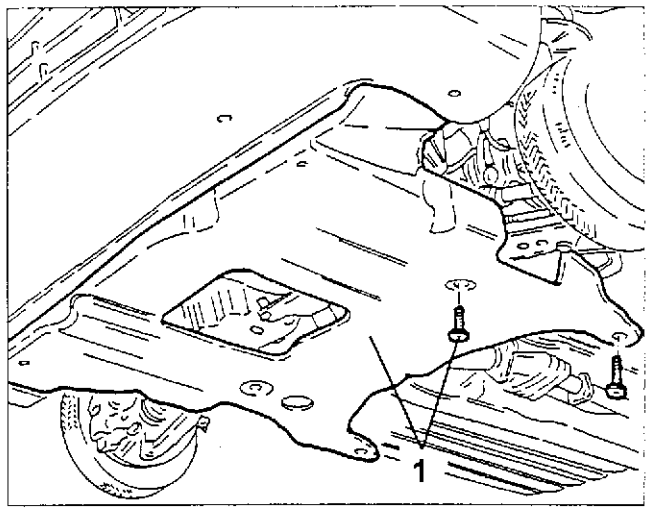
- Make sure that the ignition key is in the «STOP» position, then disconnect the (-) battery terminal.
1. Slacken the fastening nuts and move aside the oil vapour separator.
2. Slacken the fastening screws and move aside the fuel return manifold pipe.
3. Disconnect the electrical connections from the glow plugs.
4. Slacken and remove the glow plugs.



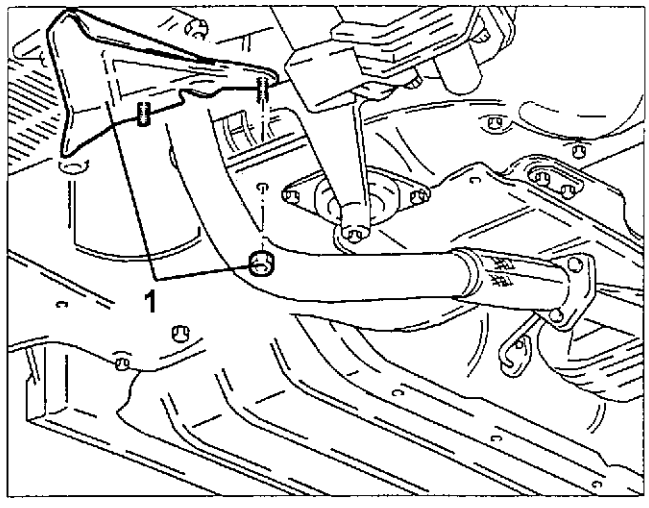
STARTER MOTOR

REMOVAL/REFITTING (for 1910 JTD version)

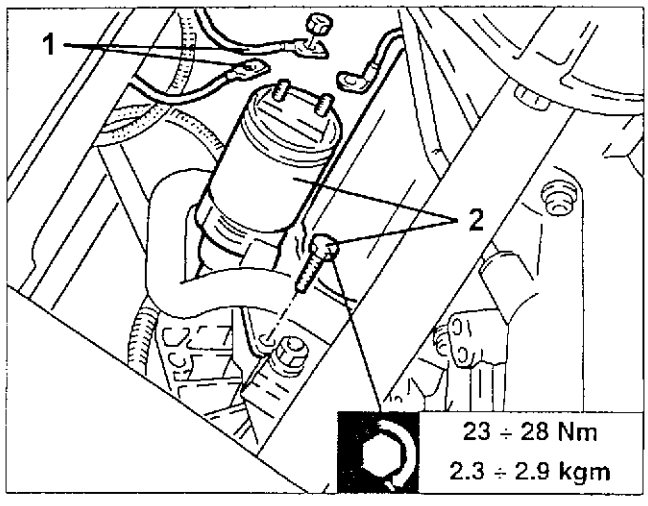
- Set the car on a lift.
- Make sure that the ignition key is in the «STOP» position, then disconnect the (-) battery terminal.
1. Slacken the fasteners and remove the under engine guard.



1. Slacken the nuts and remove the power steering box heat shield.



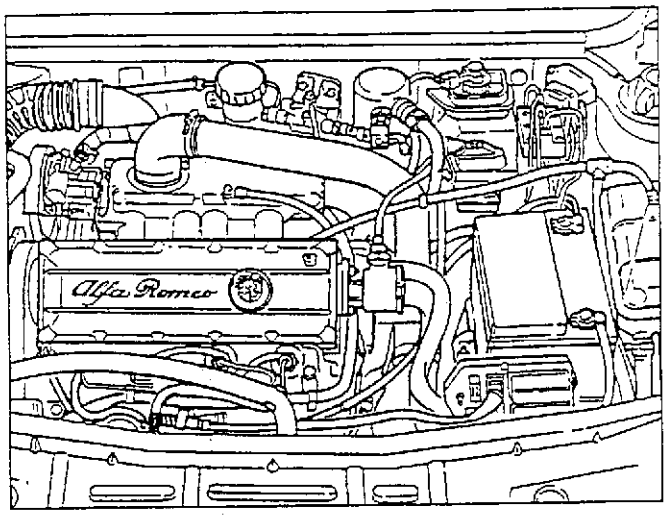
1. Disconnect the electrical connections from the starter motor.
2. Slacken the fastening screws and remove the starter motor.



WHITE

BATTERY

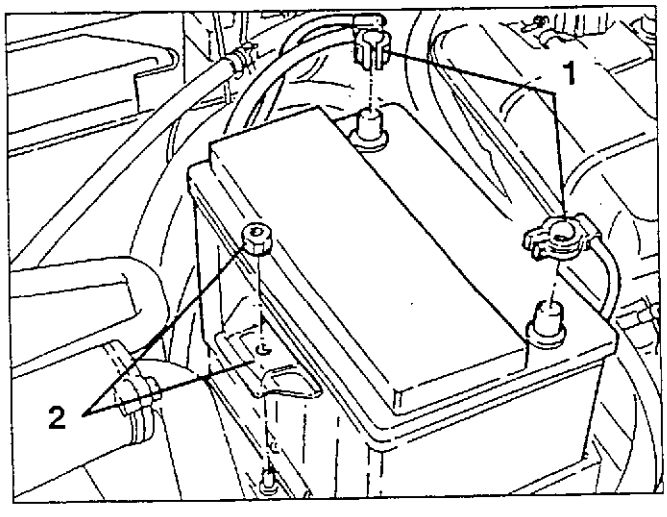
The battery is located in the left hand side of the engine compartment.



For the description, recharging and maintenance refer to the instructions for the Boxer engines.

REMOVAL/REFITTING

1. Disconnect the battery terminals.
2. Slacken the fastening nut and remove the battery clamp.
- Remove the battery.



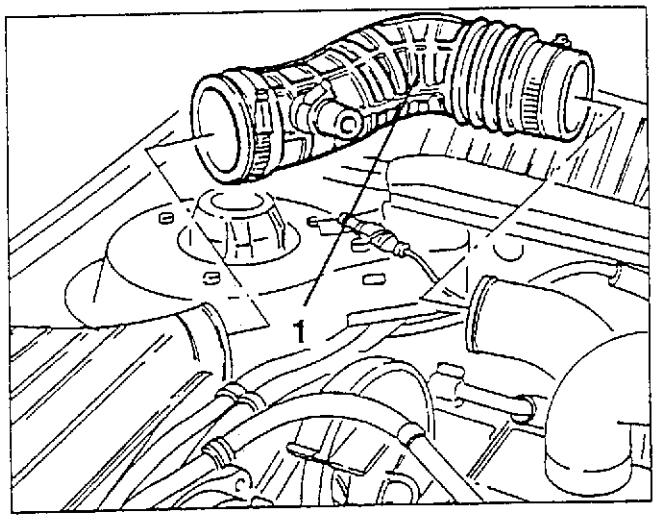
ALTERNATOR

Refer to the section on Boxer engines for the description.

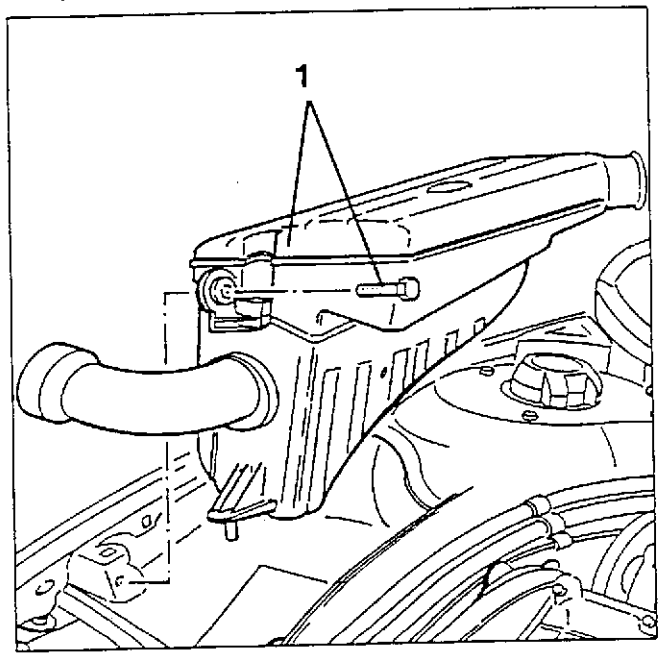
REMOVAL/REFITTING

- Set the car on a lift.
- Disconnect the battery (-) cable.
- Disconnect the oil vapour recirculation hose from the corrugated air intake sleeve.

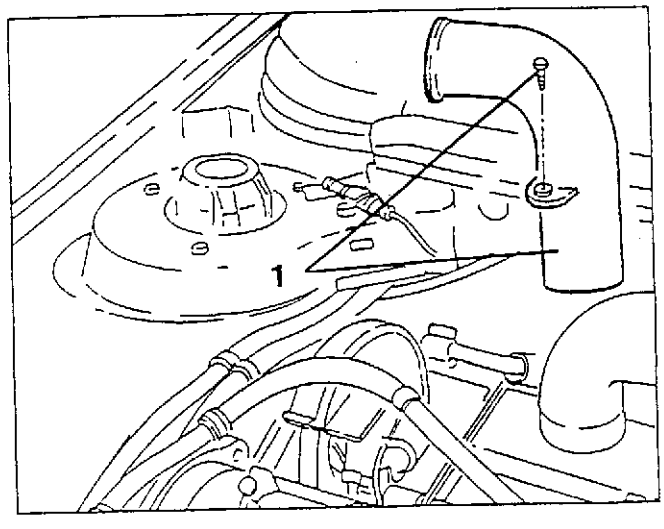
1. Remove the corrugated sleeve between the cleaner and the turbocharger.



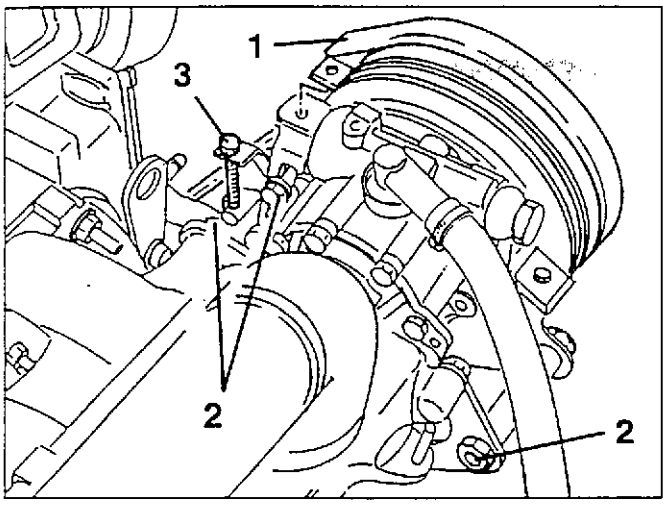
1. Slacken the fastening screws and remove the complete air cleaner.



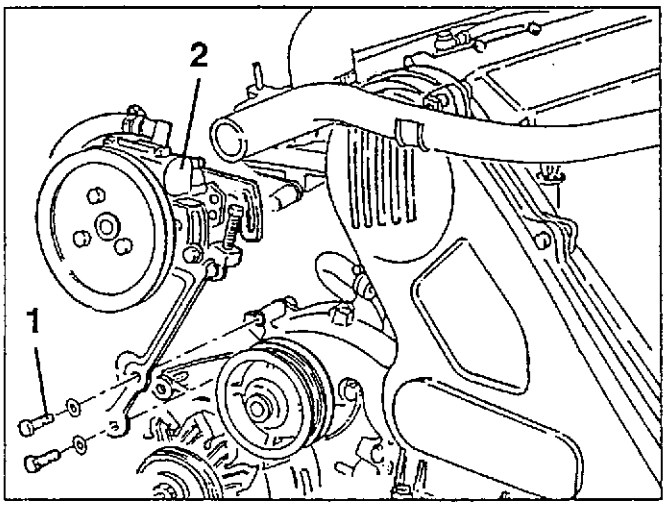
1. Remove the air intake pipe from the turbocharger.



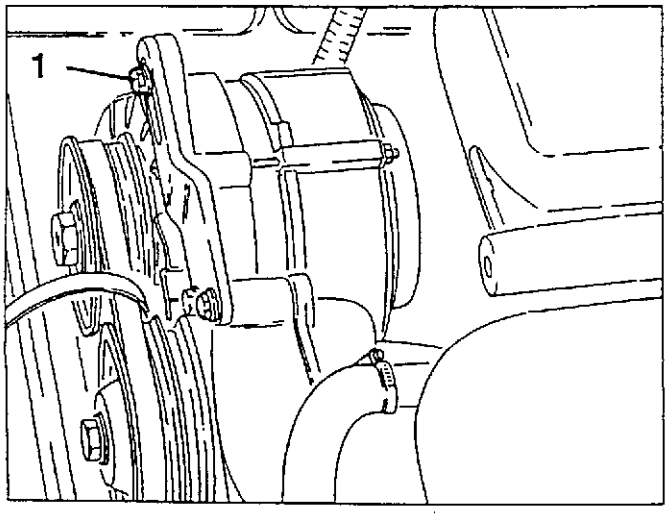
1. Remove the power steering pump belt guard.
2. Slacken the alternator fastening screws.
3. Lower the tension of the power steering pump drive belt working on the micrometric tensioner, then remove it.



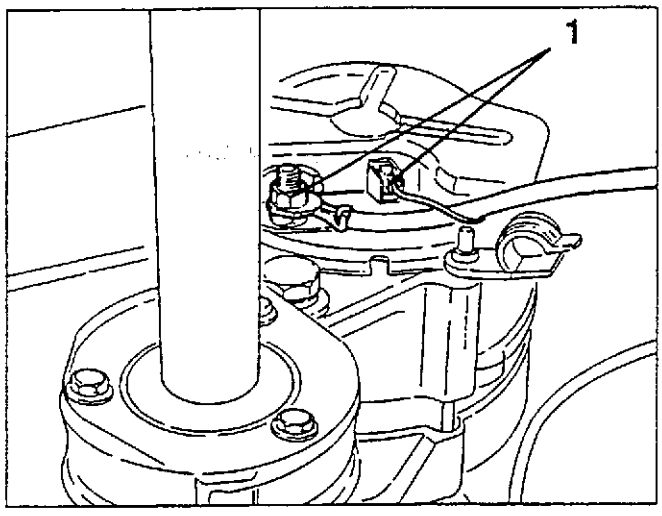
1. Back off the screws slackened previously and the two screws shown in the figure.
2. Remove the power steering pump complete with bracket without disconnecting the hoses.



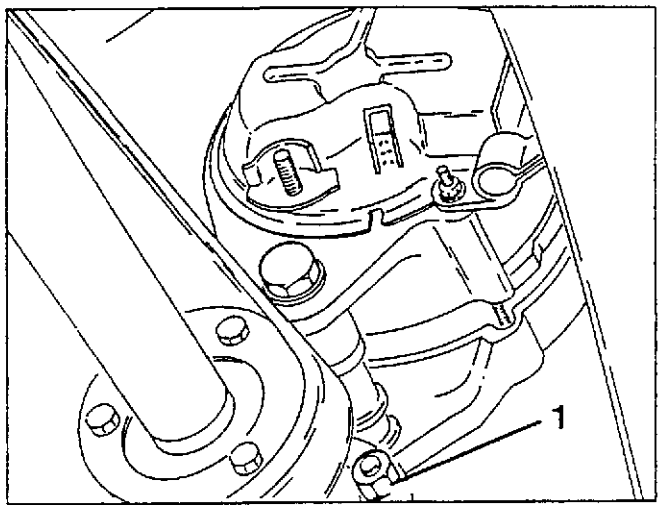
1. Slacken and remove the upper alternator fastening bolt.



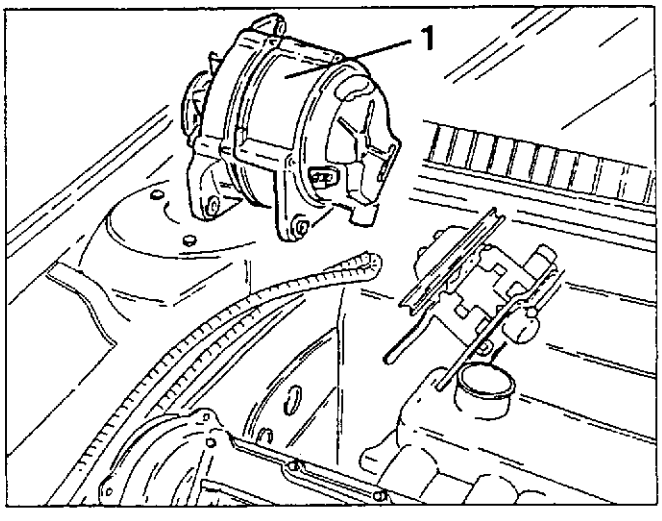
- Raise the car.
1. Disconnect the alternator connections.



1. Slacken and remove the lower alternator fastening bolt.



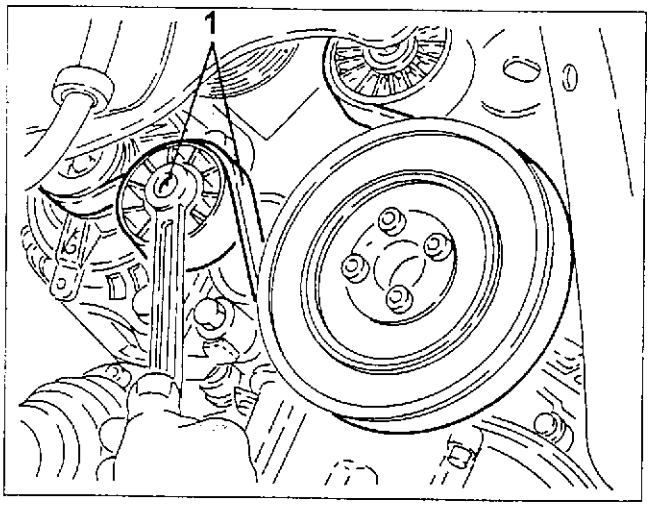
- Lower the car.
- Remove the alternator - water pump drive belt and retrieve the power steering pump drive belt.
- Remove the alternator upper support bracket.
1. Remove the alternator pulling it upwards.



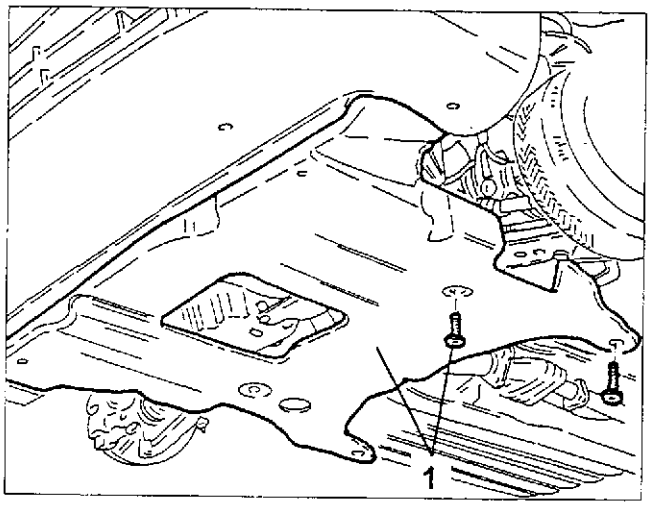
REMOVAL/REFITTING (for 1910 JTD version)

- Set the car on a lift.
- Make sure that the ignition key is at the "STOP" position, then disconnect the battery (-) terminal.
- Remove the right front wheel and dust guard.

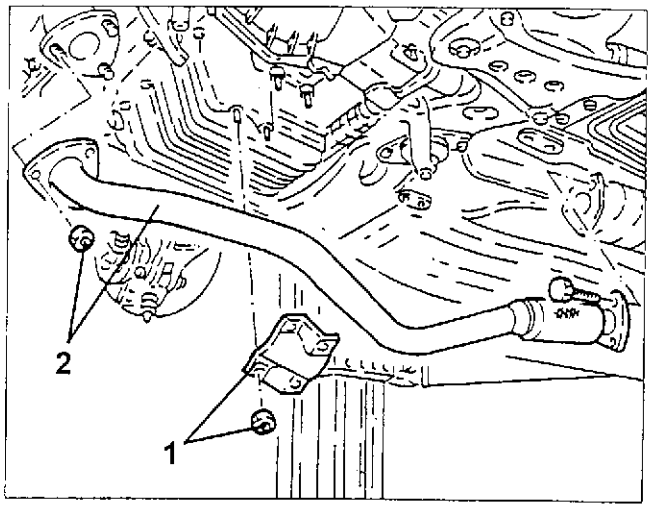
1. Working as illustrated, on the tensioner, loosen the tension of the engine components belt and remove it.



1. Slacken the fastenings and remove the under engine guard.

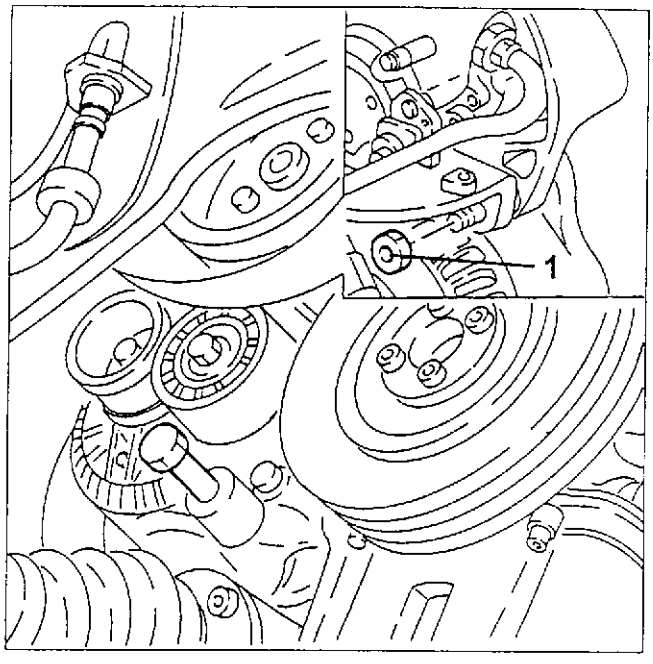


1. Slacken the fastening nuts and remove the reinforcement bracket.
2. Slacken the nuts and screws, then remove the front section of the exhaust pipe.

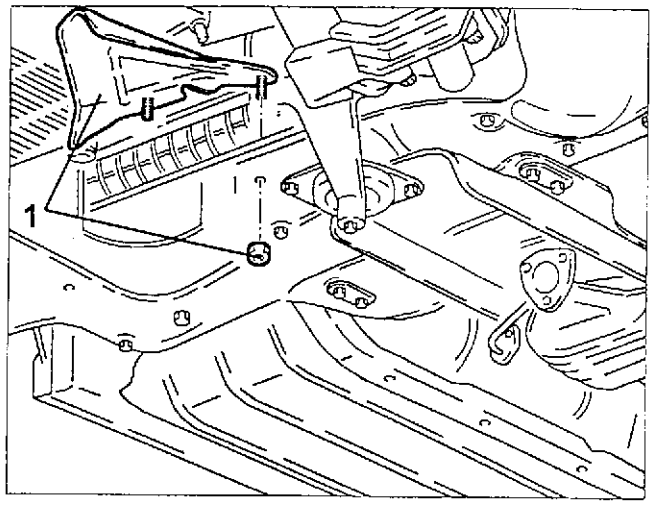


- Disconnect the electrical connections from the alternator.

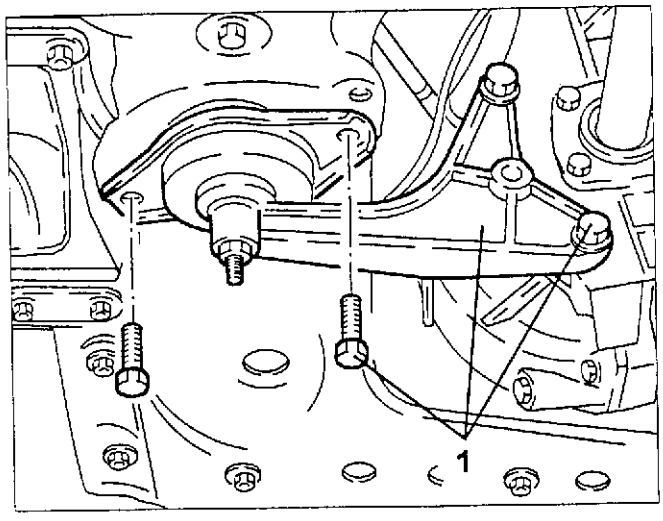
1. Slacken the alternator fastening bolts, then position it temporarily.



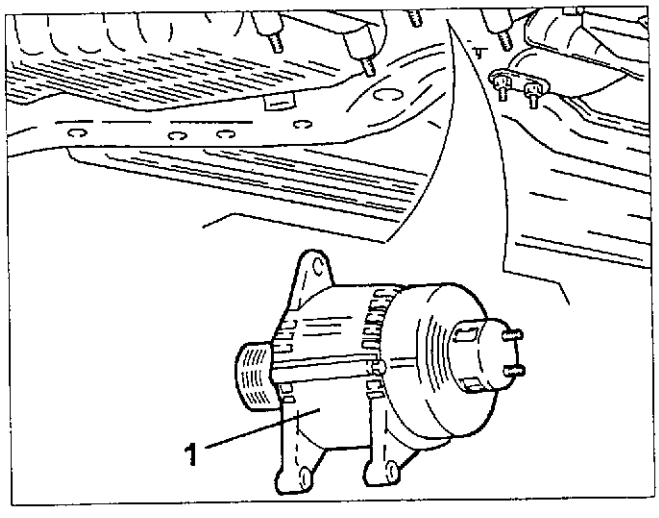
1. Slacken the fastening nuts and remove the heat shield from the power steering box.



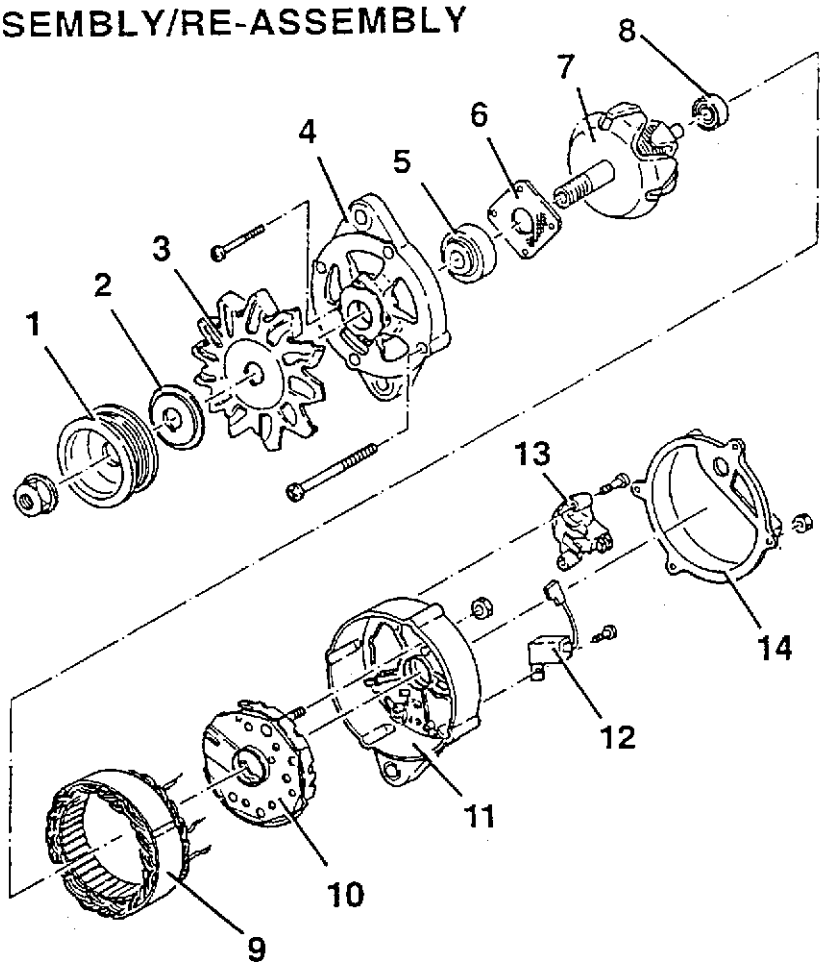
- Set a hydraulic jack under the engine.
1. Slacken the fastening screws and remove the complete power unit rear support.



1. Lower the hydraulic jack supporting the engine just enough to withdraw the alternator.
NOTE: To make it easier to remove the alternator lever on the front suspension crossmember to move the engine forward and make more room for removal.

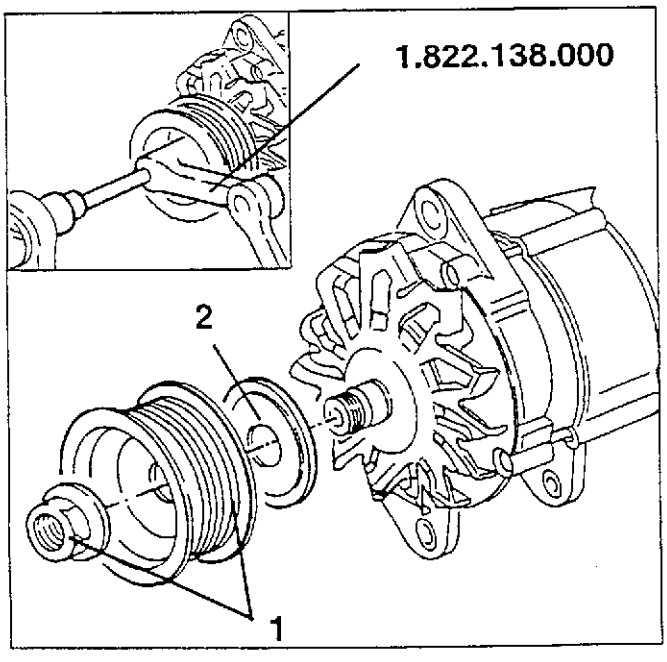


DIS-ASSEMBLY/RE-ASSEMBLY



1. *Pulley*
2. *Spacer*
3. *Fan*
4. *Drive side support*
5. *Drive side bearing*
6. *Cover plate*
7. *Rotor*
8. *Regulator side bearing*
9. *Stator*
10. *Rectifying unit*
11. *Collector ring support*
12. *Anti-disturbance condenser*
13. *Voltage regulator - brush holder*
14. *Protective cap*

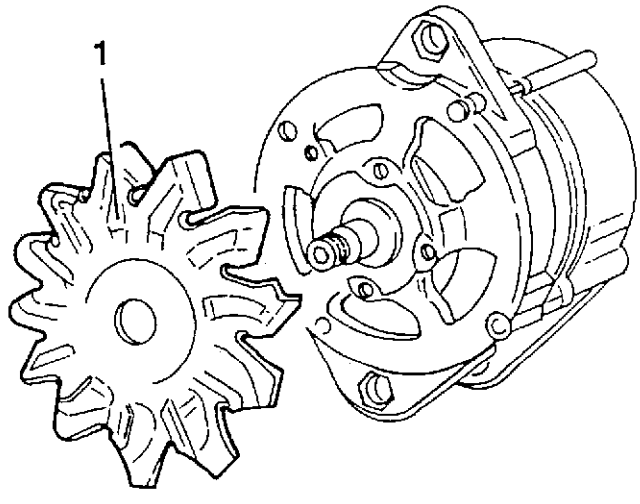
1. Using tool N. 1.822.138.000 together with wrench USAG XZN M10L slacken the nut fastening the alternator pulley and remove it.
2. Retrieve the spacer.



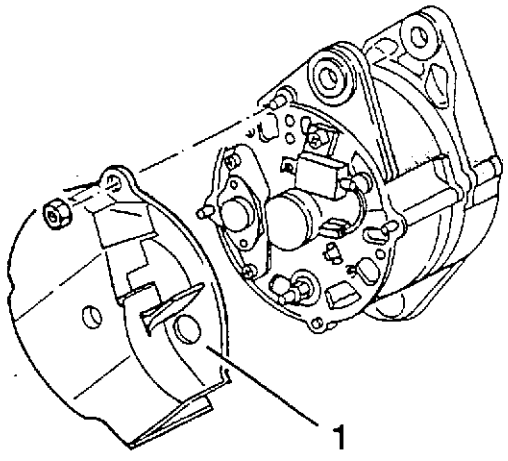
- When tightening the retaining nut with extension spanner N° 1.822.137.000, the torque values become:

300 mm for dynamometer spanner with arm	65 ÷ 74 Nm 6.6 ÷ 7.5 kgr
400 mm for dynamometer spanner with arm	67 ÷ 76 Nm 6.9 ÷ 7.8 kgr

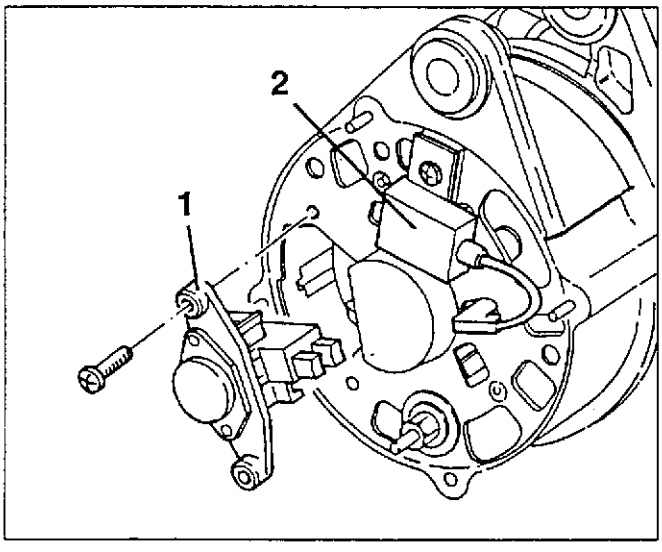
1. Take the cooling fan off the rotor shaft.



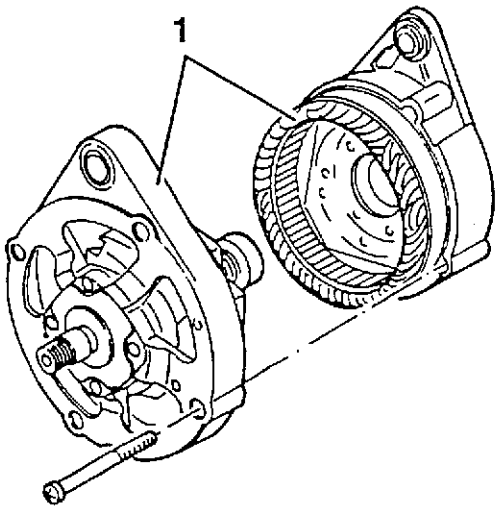
1. Slacken the three fastening nuts and remove the protective cap.



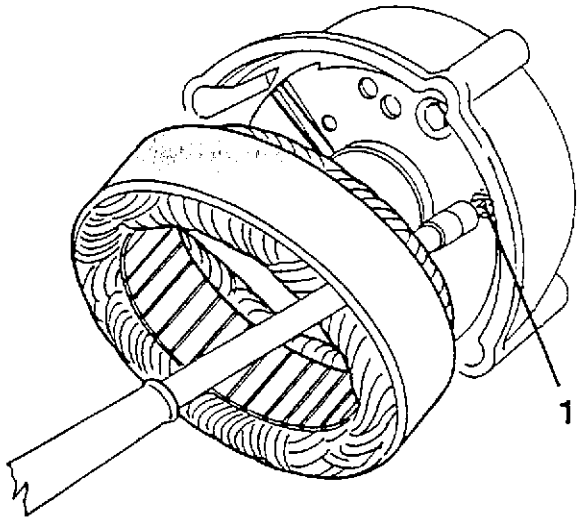
1. Slacken the two fastening screws and remove the brush holder voltage regulator.
2. Slacken the fastening screw, disconnect the electrical connection and remove the anti-disturbance condenser.



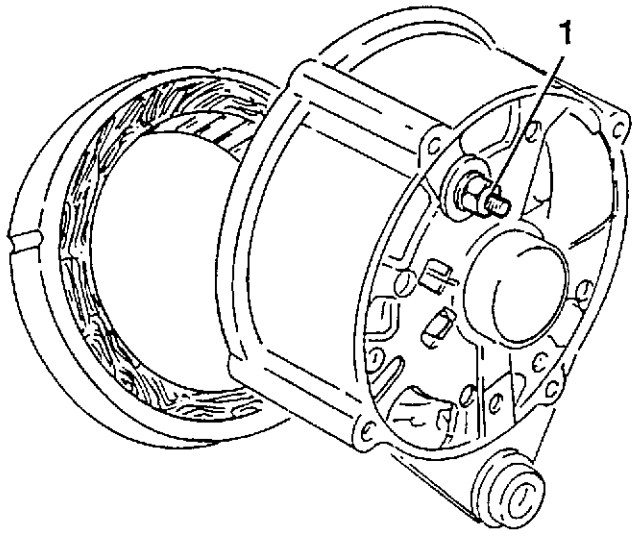
1. Slacken the four fastening screws and separate the drive side support complete with rotor from the collector rings support complete with stator and rectifying unit.



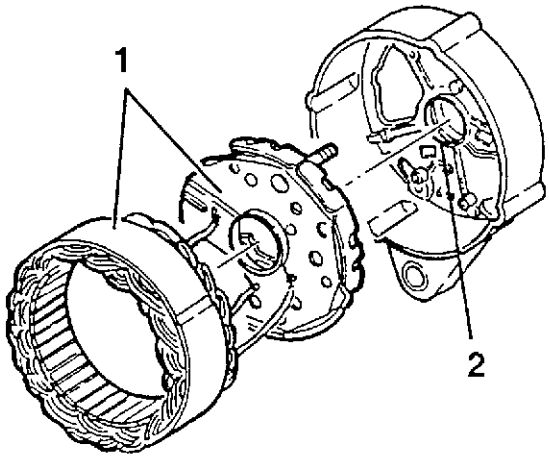
1. Slacken the three screws fastening the rectifying unit to the collector rings support.



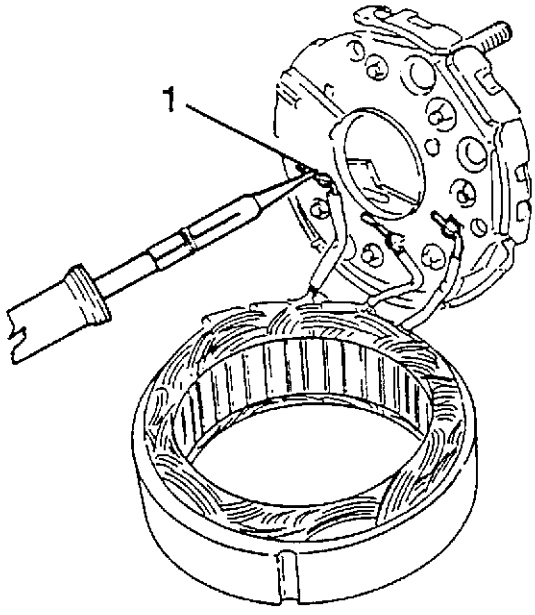
1. Slacken the nut fastening the pin for connecting the positive terminal.



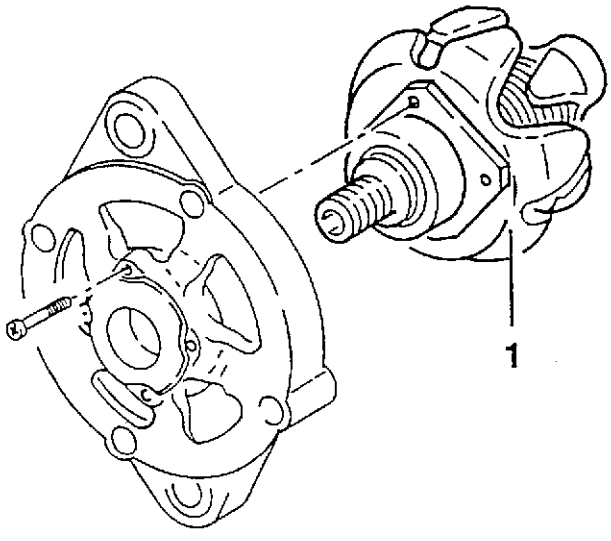
1. Remove the stator complete with rectifying unit from the collector rings support.
2. If necessary, remove the O-Ring from the collector rings support.



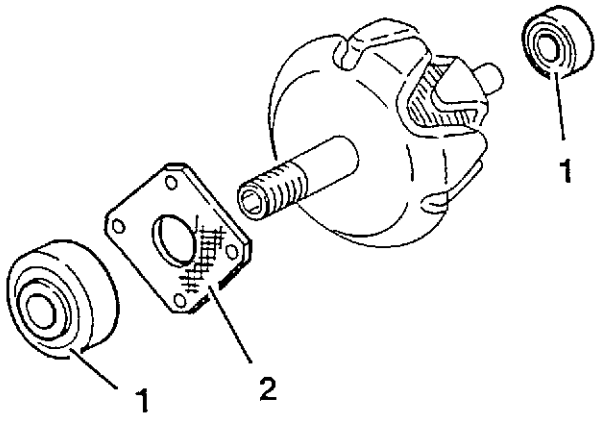
1. Unweld the connections of the three stator phases to the rectifying unit, then separate them.



1. Slacken the four fastening screws and remove the rotor complete with bearings from the drive side support.



1. Using a suitable puller tool, remove the rotor bearings.
2. Retrieve the cover plate.



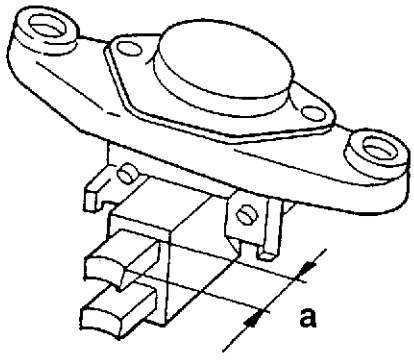
CHECKS AND INSPECTIONS

CAUTION:
Accurately clean the components with a jet of compressed air before proceeding with electrical tests.

Checking brush wear

- Check the outside of the voltage regulator for signs of damage.
- Change the regulator if the brushes are broken or if the protrusion " a " is lower than specified.

	Minimum brush length
	a = 7 mm

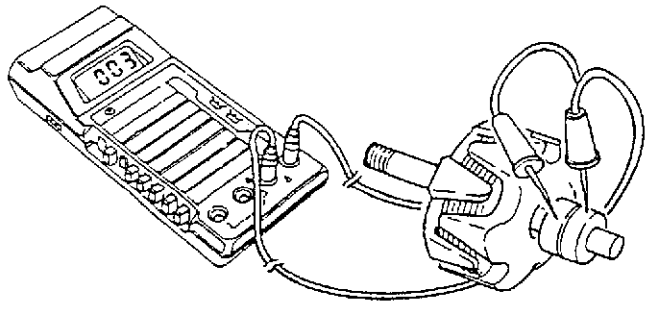


- Also check that the brushes run smoothly and that their springs are stiff enough to ensure good contact of the brushes on the collectors.

Continuity tests for the rotor winding

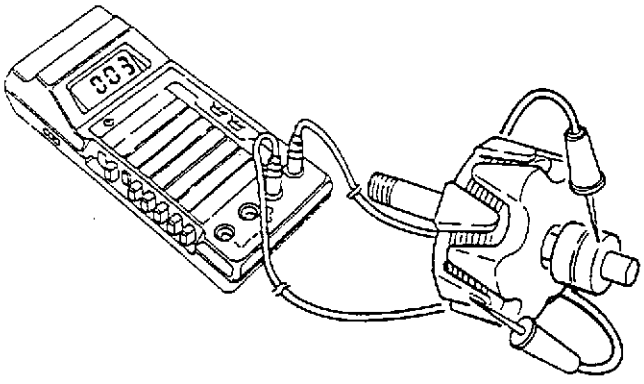
- Check that the resistance of the rotor winding is within the specified rates connecting the tester prods on the collector rings.

Rotor winding resistance (at 25°C)	
Cars without air conditioner	2.83 ± 0.28 Ω
Cars with air conditioner	2.6 ± 0.15 Ω



Rotor insulation test

- Place one tester prod on a collector ring and the other on the rotor core and check that the tester does not indicate the passage of current.
- Repeat the operation for the second collector ring.



Measuring concentricity of the rotor and collector rings

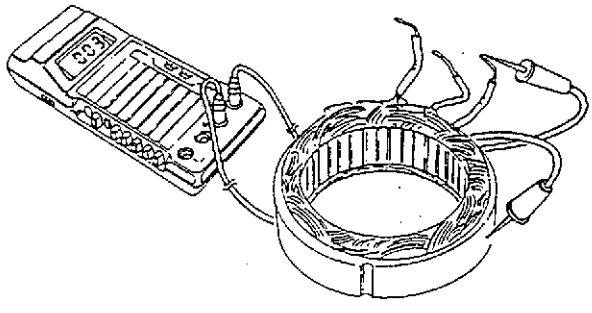
- Position the rotor on special supports and using a dial gauge on a magnetic base check that the eccentricity of the rotor outside diameter does not exceed 0.05 mm.
- In the same way, check that the movement on the collector rings does not exceed 0.03 mm.

Otherwise, turn the outside of the collector rings.

Stator winding insulation test

- Place one tester prod on the stator pack and the other on the terminal of the first phase, then on that of the second and third phase and check that the tester does not indicate the passage of current.

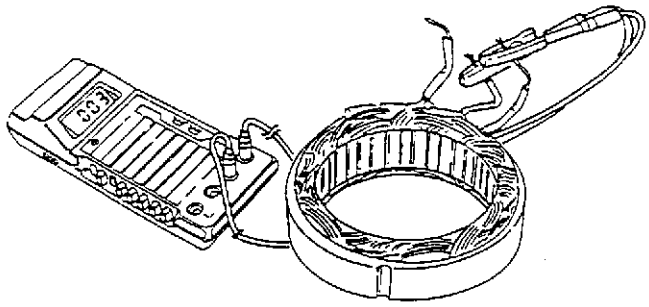
If insulation is lacking, change the stator.



Stator winding continuity test

- Connect the tester terminals respectively on the terminals of phases 1-2, 1-3 and 2-3 and check that the tester indicates the passage of current in all three phases.

In the lack of continuity, change the stator.

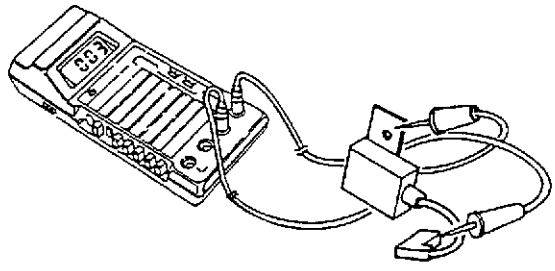


Checking the anti-disturbance condenser

- Connect the tester prods to the electrical connection and to the fastening plate of the condenser and check that the electrical capacity is within the specified rate.

Anti-disturbance condenser electrical capacity
2.2 μF

- In the lack of the specified rates, change the anti-disturbance condenser.



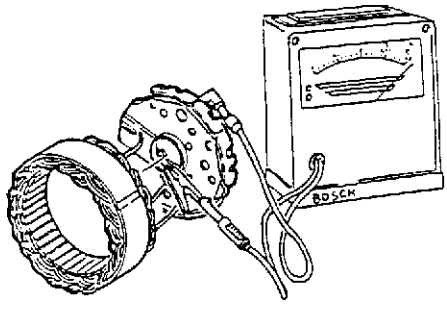
Checking the rectifier

- Check the operation of the cabled rectifier using suitable equipment.
- Connect the terminals of the test equipment to the following measurement points:

a) Winding frame and terminals
b) B+ and winding terminals
c) D+ and winding terminals

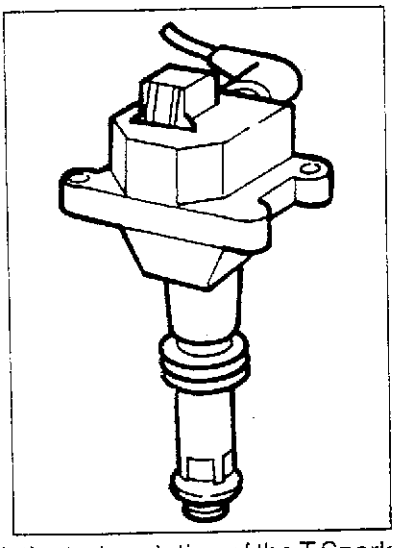
The rectifier is in order if the tester dial is in the sector in both measurements.

Change the whole rectifier if one or more diodes are faulty.



IGNITION COILS

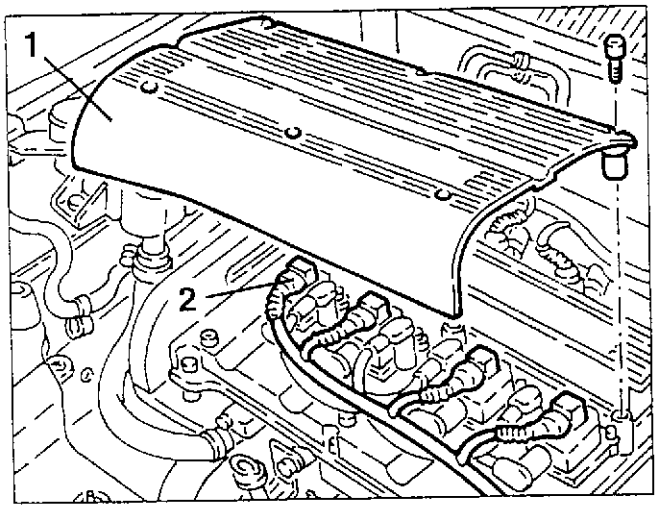
Ignition is ensured by means of two spark plugs per cylinder. The spark plugs are asymmetric and their sizes are different. This is a lost spark static distribution system in which four coils each power the spark plug of the cylinder located underneath it and that of the cylinder coupled to it, at the same time (1-4) (2-3).



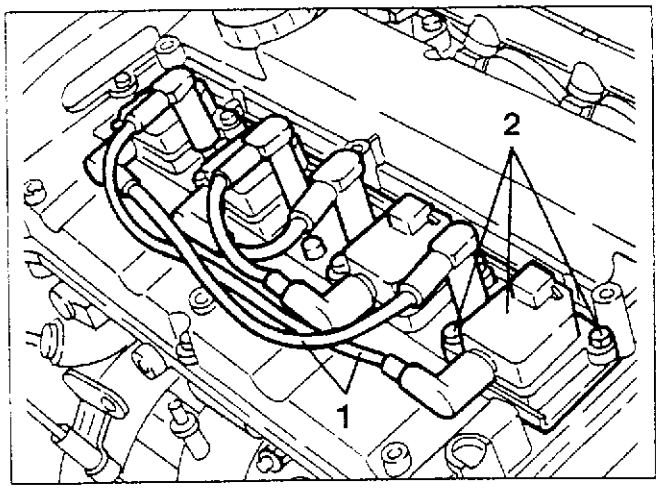
This system is a sophisticated evolution of the T.Spark ignition system. It offers the following advantages:
- reduced amount of high voltage wires consequently increasing reliability and reducing electric interference;
- the position and the length of the wires avoid accidental inversion of spark plug wires during servicing.

REMOVAL/REFITTING (Specific for pre-modification versions)

- Disconnect the (-) battery terminal.
1. Remove the fastening screws and remove the ignition coil cover.
2. Disconnect the ignition coil electric connections.

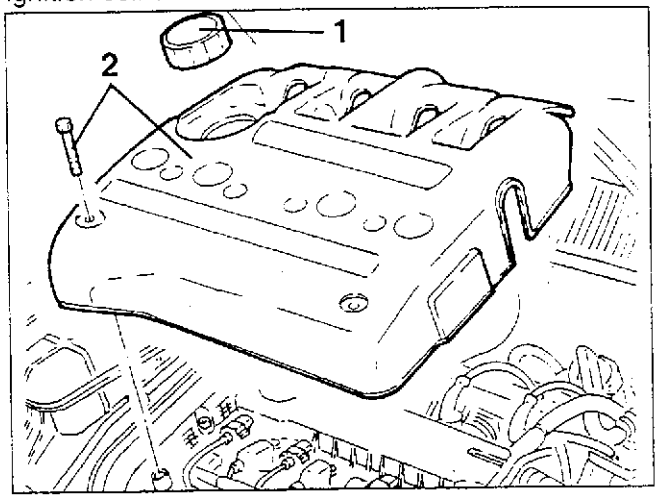


1. Remove the high voltage wires.
2. Remove the fastening screws and remove the ignition coils.
- If required, remove the fastening screws and remove the ignition coil support rod.

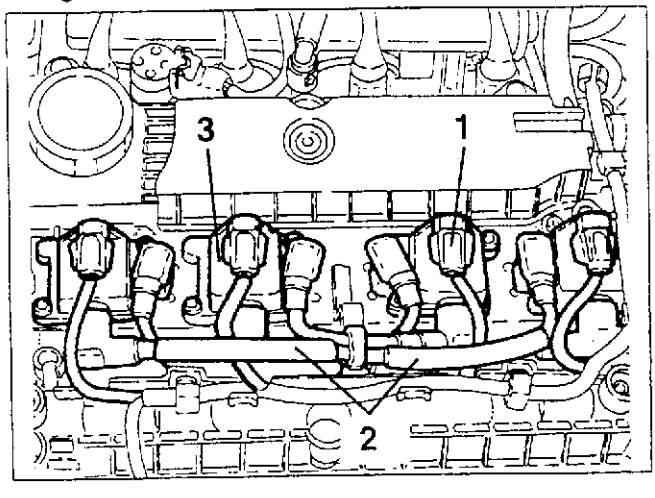


REMOVAL/REFITTING (Specific for post-modification versions)

- Disconnect the (-) battery terminal.
1. Remove the engine oil filler cap.
2. Remove the fastening screws and remove the ignition coil cover.



- Refit the engine oil filler cap.
1. Disconnect the ignition coil electric connections.
2. Remove the high voltage wires.
3. Remove the fastening screws and remove the ignition coils.
- If required, remove the fastening screws and remove the ignition coil support rod.



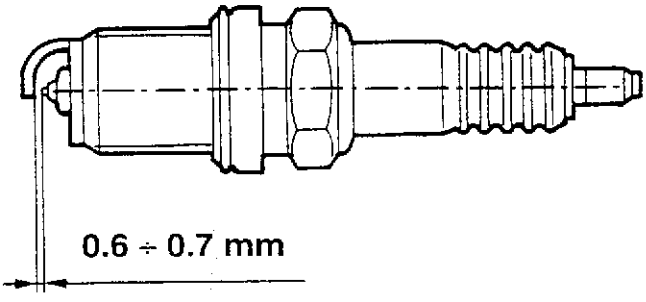
TESTING AND CHECKING

- Check whether the ignition coil features are those prescribed. If not, replace the coils.

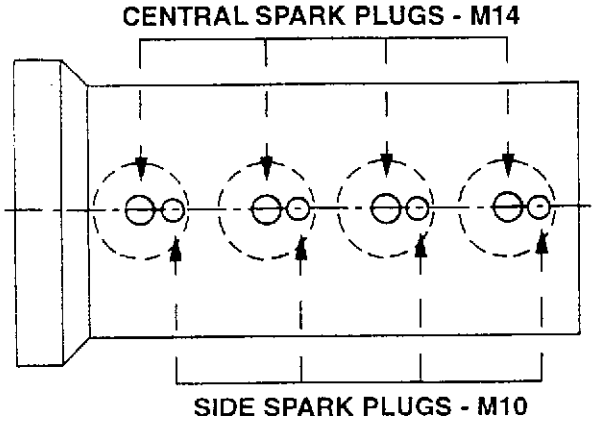
Technical features	
Primary coil resistance	0.3 Ω ± 12%
Secondary coil resistance	7 kΩ ± 12%

SPARK PLUGS

The spark plugs fitted in this vehicle are surface discharge spark plugs with central point and electrode.
The electrode distance must be respected in order for this type of spark plug to work.



The spark plugs are located in the combustion chamber asymmetrically. Their sizes are different, as can be seen in the following illustration.

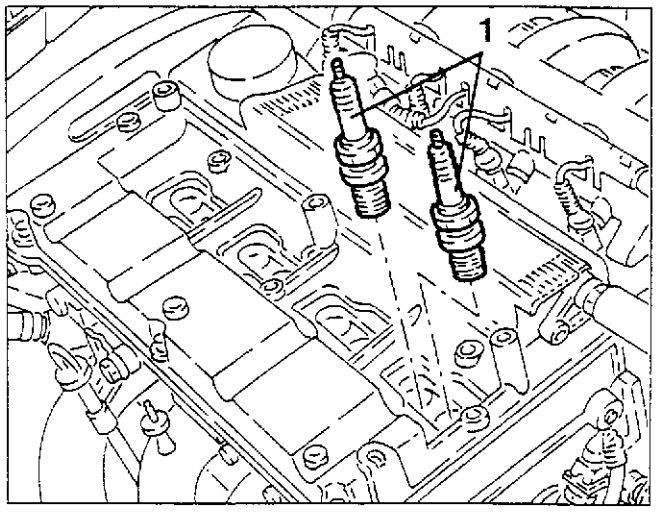


Firing order
1 - 3 - 4 - 2

CHECKING AND REPLACING

- When the engine is cold, remove the ignition coils (see specific paragraph).

1. Unscrew and remove the spark plugs after blowing air in the respective seats to remove dirt and debris.



- Check the ceramic insulator is clean and not cracked. If it is, replace the spark plugs.

IMPORTANT:
The use of spark plugs with different features or dimensions can severely damage the engine and alter the level of pollutants in exhaust.

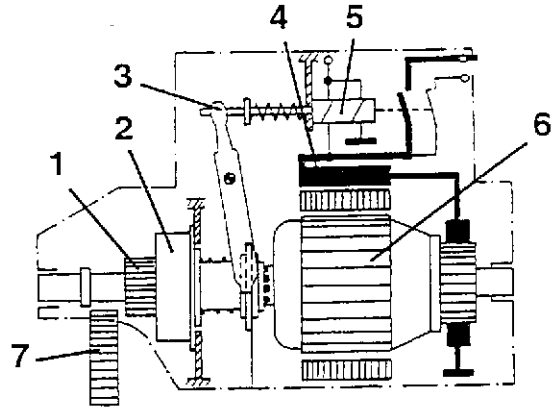
IMPORTANT:
A dirty or burnt spark plug is often the symptom of faulty engine fuel feeding.
- **Traces of dust and soot: incorrect mixture, air cleaner very dirty;**
- **Oil stains: oil leaking from gas rings;**
- **Ash forming: presence of aluminium material contained especially in the oil;**
- **Fused electrodes: overheating due to unsuitable fuel, faulty valves;**
- **High electrode wear: harmful additives in fuel or oil, engine knocking, overheating;**
- **Etc.**

- To refit, torque the spark plugs as follows:

Central spark plugs (large - M14)	25 ÷ 35 Nm 2.6 ÷ 3.6 kgm
Side spark plugs (small - M10)	10 ÷ 12 Nm 1.0 ÷ 1.2 kgm

STARTER MOTOR

Tht starter motor cranks the engine overcoming its inertial forces and frictions and bringing it to a determinate rpm to start the formation of the mixture necessary for combustion and thus autonomous motion of the engine.
The motion is transmitted by a d.c. electric motor, operated by the battery, through a coupling pinion which turns the toothed gear on the engine flywheel.



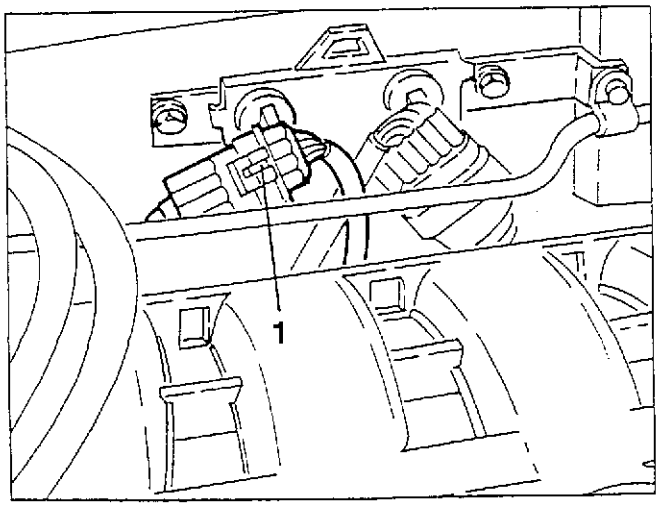
1. *Pinion*
2. *Idle roller gear*
3. *Engagement lever*
4. *Energising winding*
5. *Relay*
6. *Rotor*
7. *Flywheel toothed gear*

Due to an idle gear coupling, the pinion is disengaged when the main engine turns faster than the motor.
A relay energised by the motor current engages the pinion through a fork.
The starter motor installed is of the type with translation and screwing of the pinion with a relay housed directly above the motor itself.

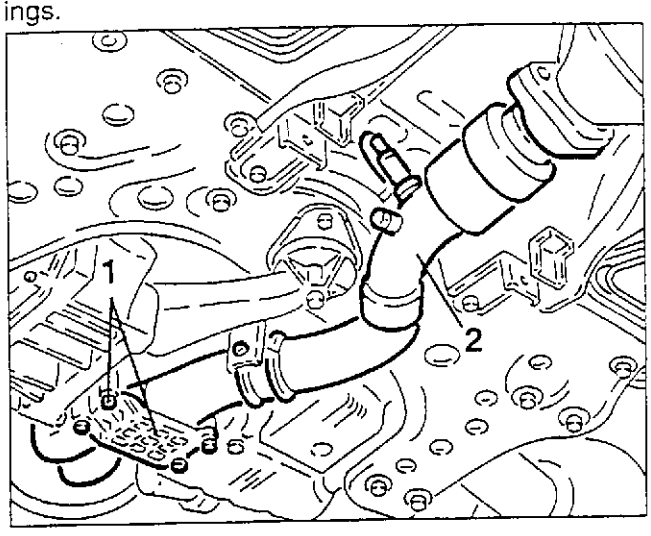
REMOVING/REFITTING

- Set the car on a lift.
- Disconnect the battery (-) terminal.

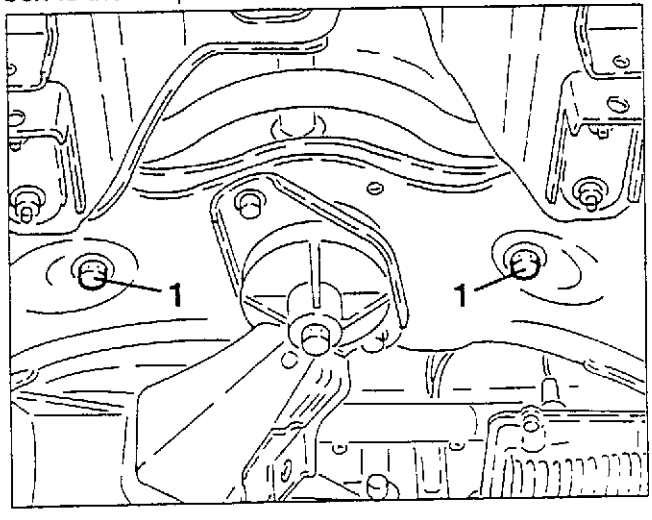
1. Disconnect the electrical connection of the lambda sensor.



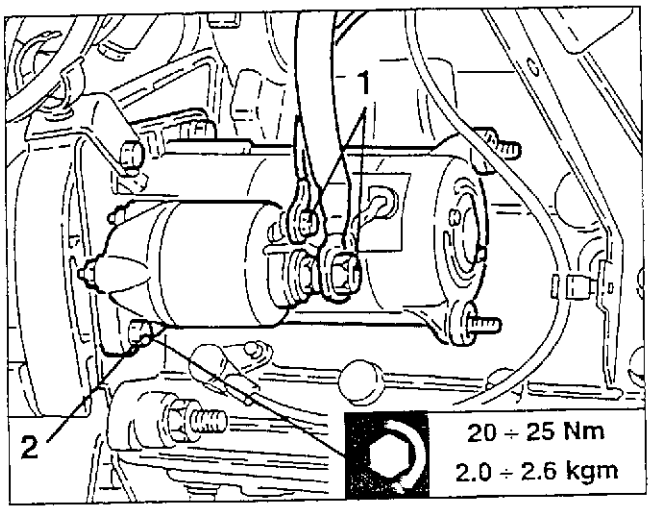
1. Raise the car, slacken the fastening screws and remove the reinforcement bracket.
2. Remove the front section of the exhaust pipe complete with lambda sensor after slackening the fastenings.



1. Slacken the screws fastening the power steering box to the suspension crossmember.



1. Disconnect the electrical connections from the starter motor.
2. Slacken the three fastening screws and remove the starter motor.

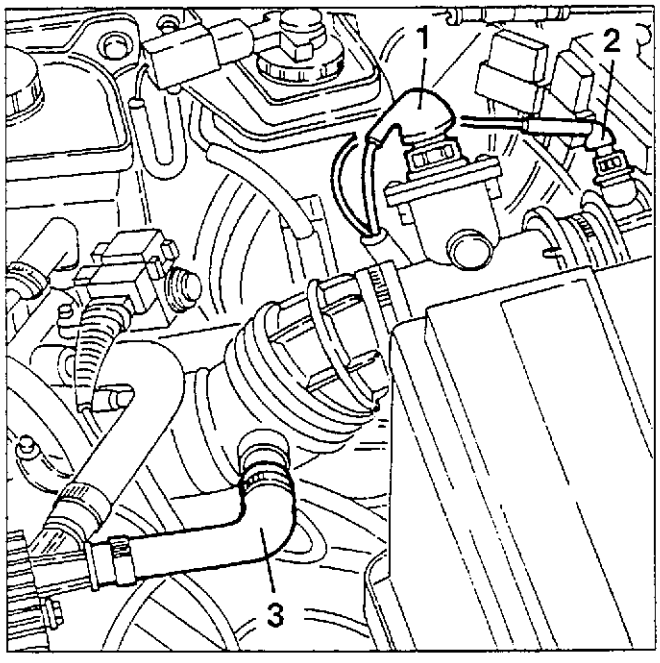


REMOVING/REFITTING

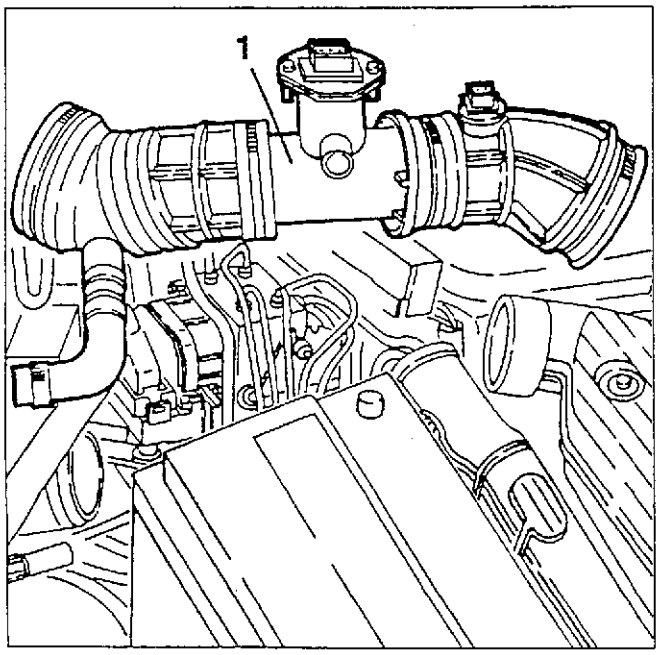
(Specific for 1370 T. SPARK 16V with gearbox C513.5 from chassis no.....)

- Set the car on a lift.
- Disconnect the battery (-) terminal.

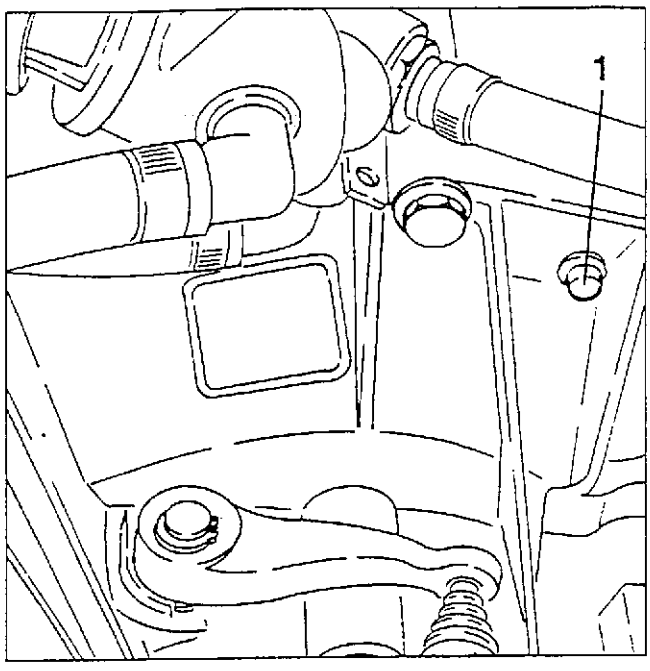
1. Disconnect the electrical connection from the air flow meter.
2. Disconnect the electrical connection from the intake air temperature sensor.
3. Slacken the fastening clamp and disconnect the oil vapour recirculation pipe from the cylinder head cover.



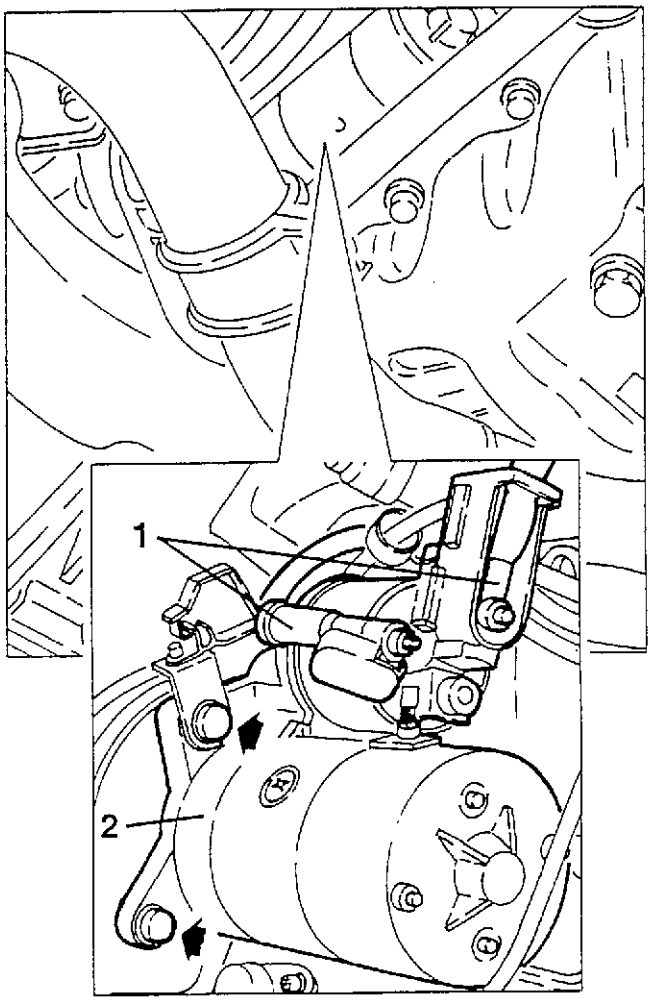
1. Slacken the two fastening clamps, then remove the corrugated sleeve complete.



1. Working from the space obtained by removing the corrugated sleeve, slacken the screw illustrated fastening the starter motor to the gearbox.



1. Raise the car then disconnect the electrical connections from the starter motor.
2. Slacken the remaining two fastening screws and remove the starter motor.

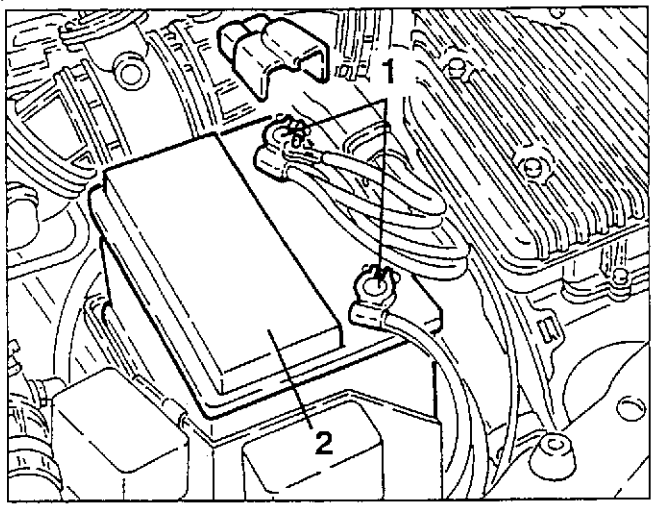


BATTERY

NOTE: For the complete description of the battery, see Boxer engines.

REMOVING/REFITTING

1. Disconnect the battery (-) terminal and then the (+) terminal.
2. Slacken the fastening bracket screw and remove the battery.

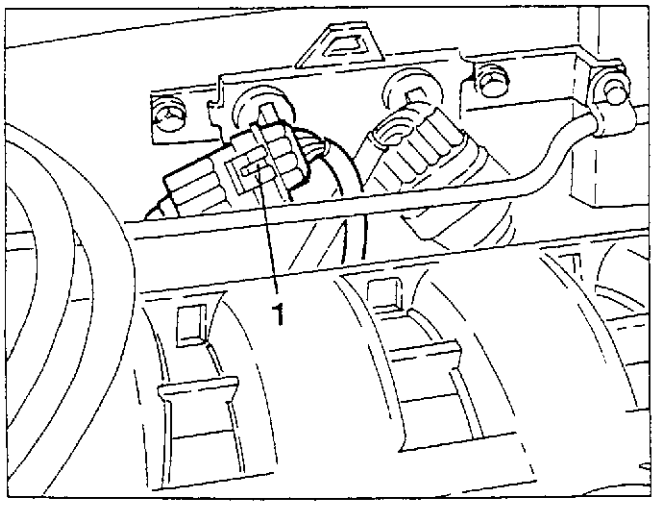


ALTERNATOR

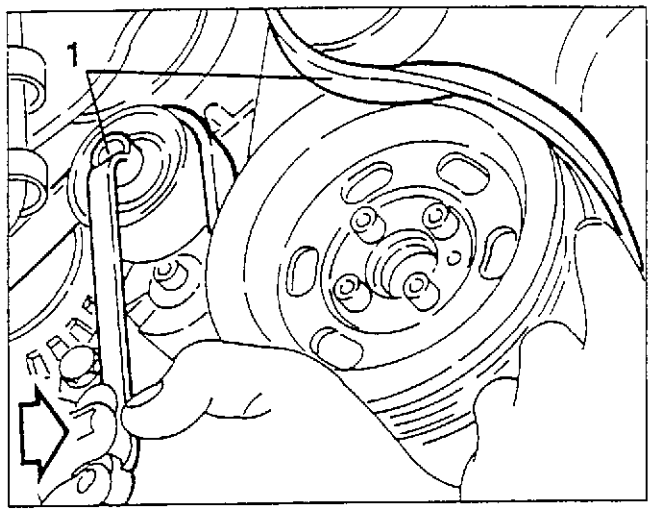
NOTE: For the complete description of the alternator see Boxer engines.

REMOVING/REFITTING

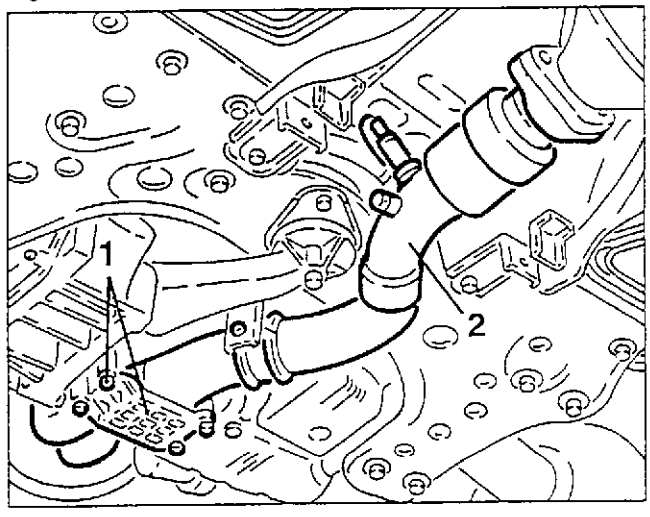
- Set the car on a lift.
- Disconnect the battery (-) terminal.
1. Disconnect the lambda sensor electrical connection.



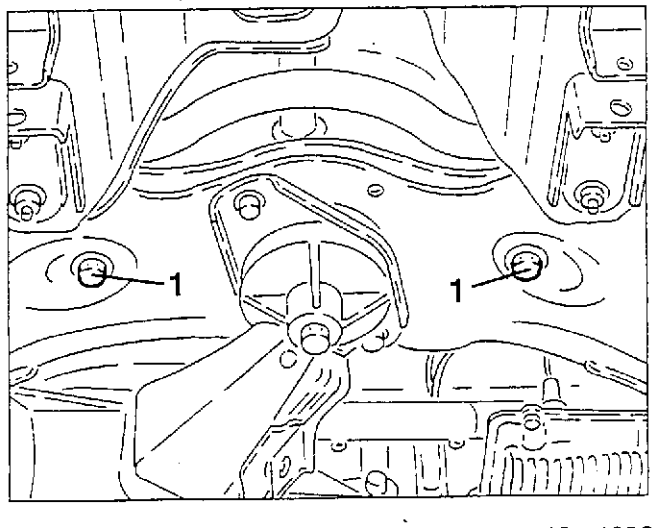
- Raise the car.
- Remove the right front wheel and mud flap.
1. Working as illustrated on the pulley guide, slacken the tension of the auxiliary components drive belt and remove it.



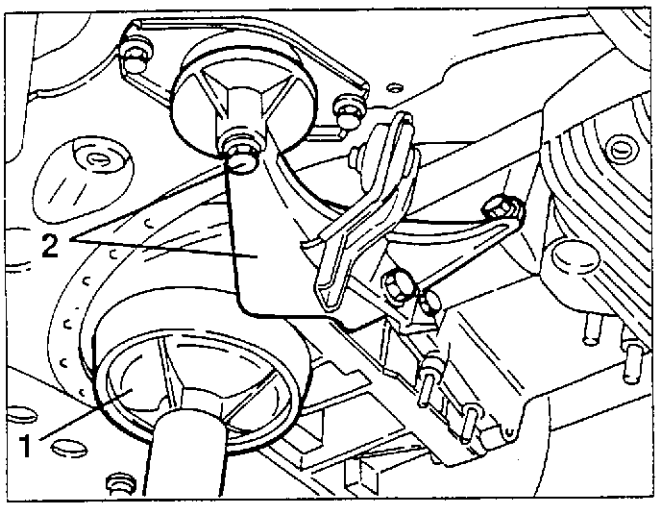
1. Slacken the fastening screws and remove the reinforcement bracket.
2. Remove the front section of the exhaust pipe complete with lambda sensor after slackening the fastenings.



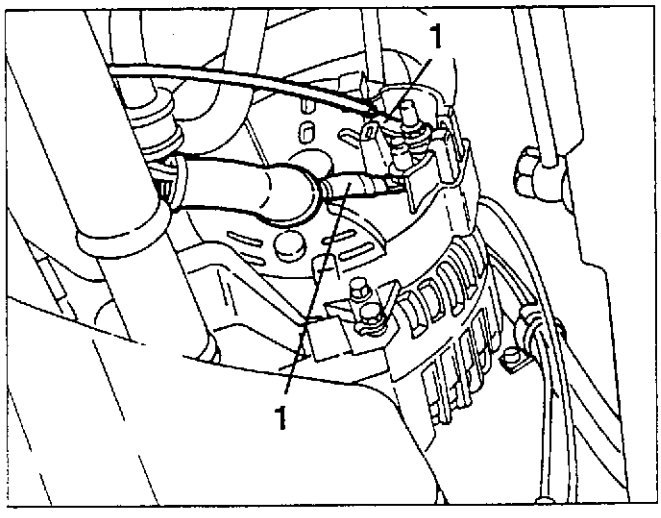
1. Slacken the screws fastening the power steering box to the suspension crossmember.



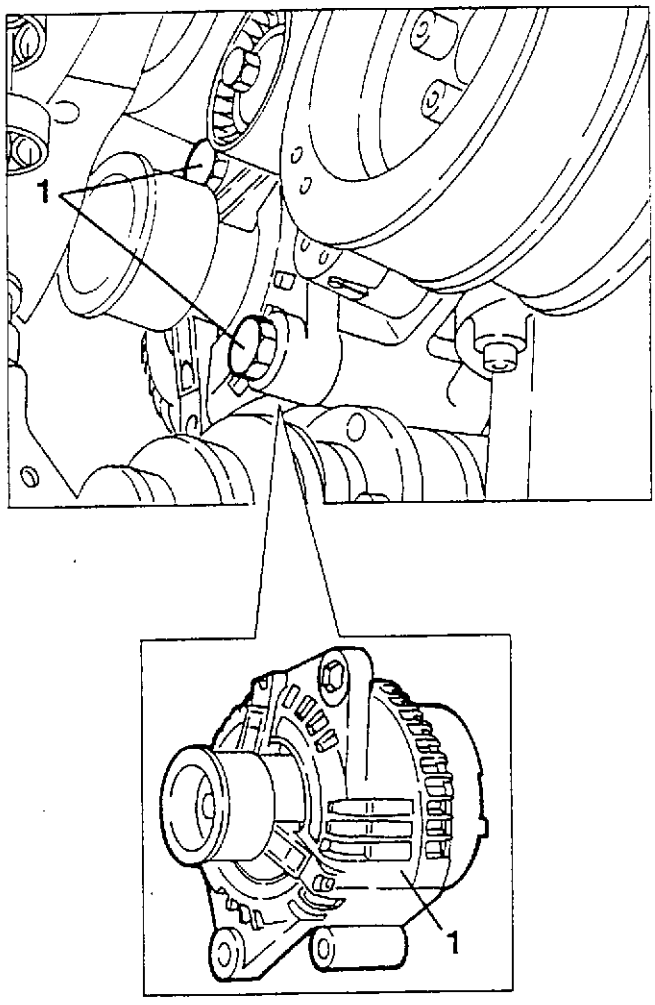
1. Set a hydraulic jack under the gearbox as illustrated.
2. Slacken the fastening screws and remove the rear power unit support.



1. Disconnect the electrical connections from the alternator.



1. Slacken the two fastening bolts and remove the alternator retrieving it from under the car withdrawing it from the recess obtained by removing the rear power unit support.

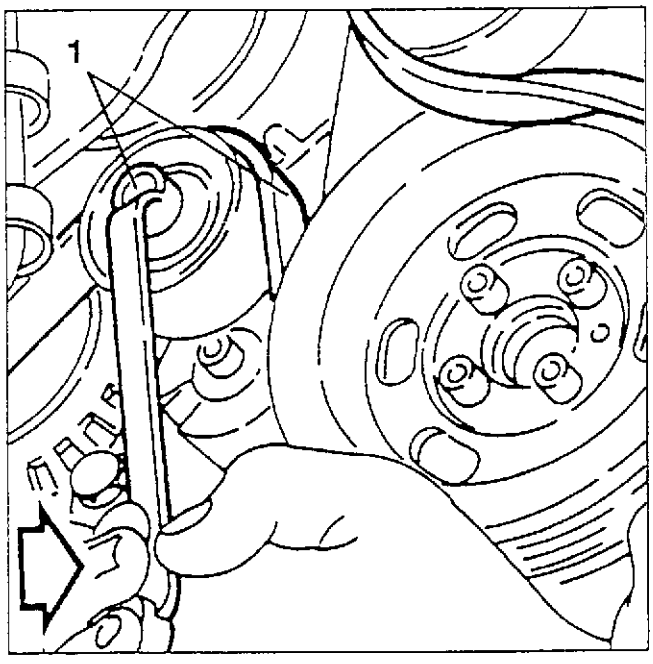


REMOVING/REFITTING

(Specific for 1370 T. SPARK 16V with gearbox C513.5 from chassis no. .....)

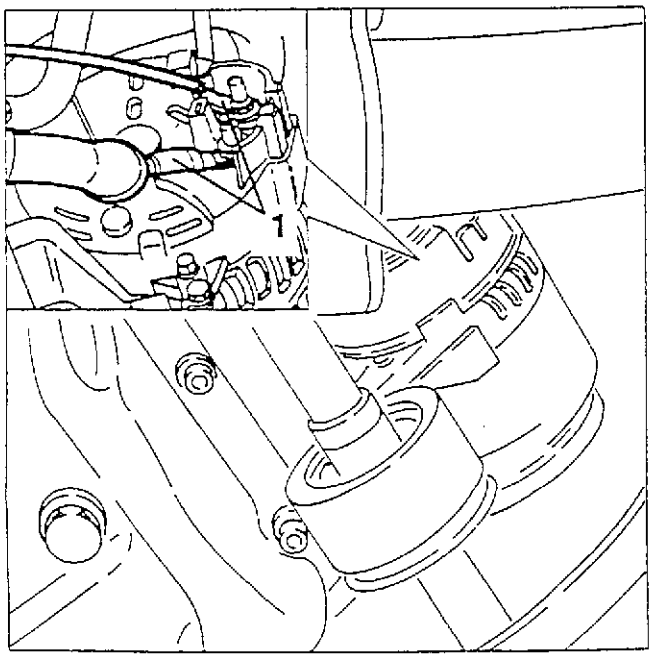
- Set the car on a lift.
- Disconnect the battery (-) terminal.
- Raise the car and remove the right front wheel and mud flap.

1. Working as illustrated on the pulley guide, slacken the tension of the auxiliary components drive belt and remove it.

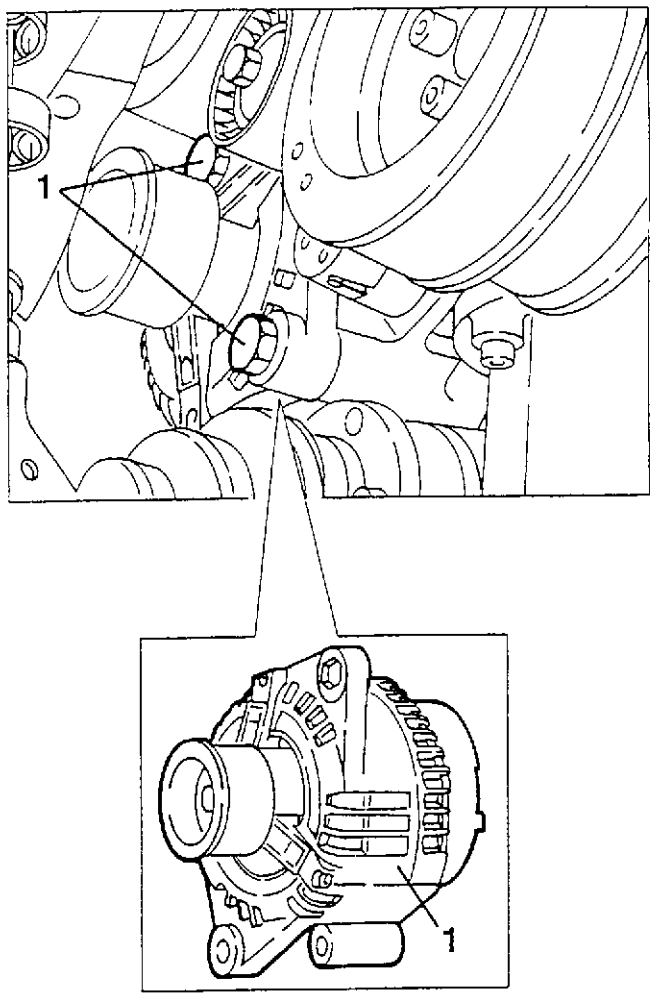


- Remove the right axle shaft (see GROUP 27).

1. Disconnect the electrical connections from the alternator.

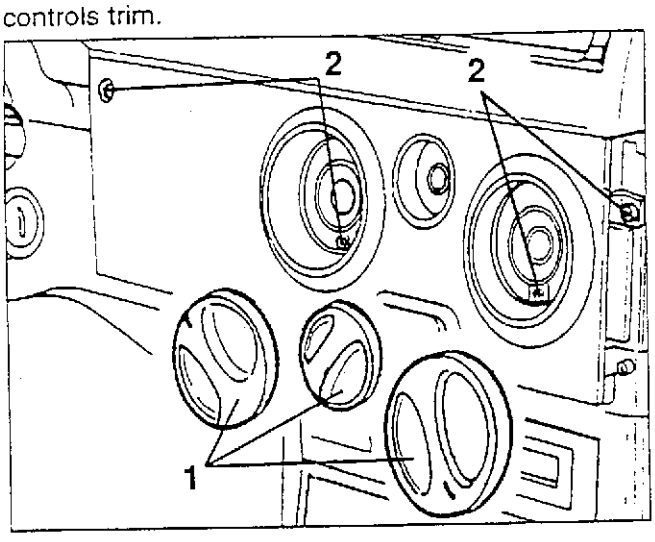


1. Slacken the two fastening bolts and remove the alternator withdrawing it from under the car.

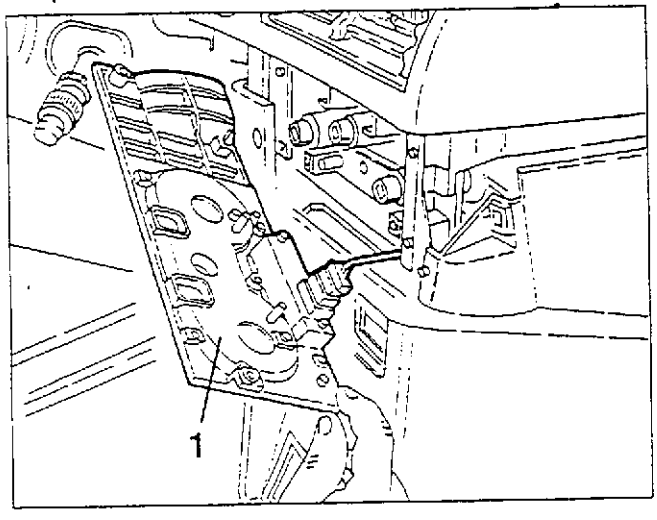


WHITE

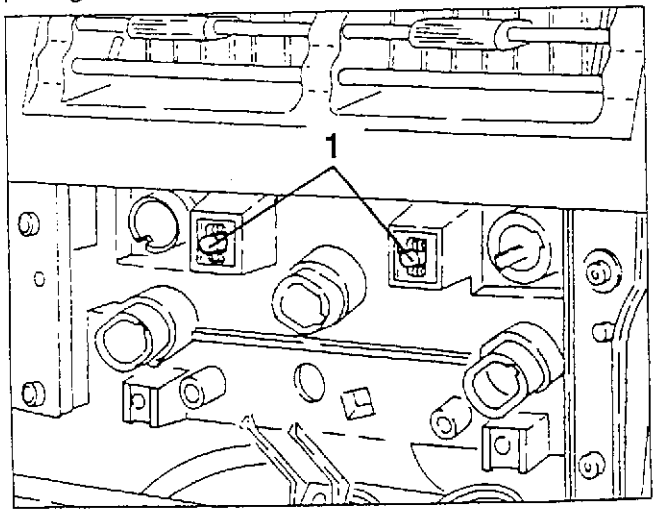
1. Prise and remove the climate control unit knobs.
2. Slacken the four screws fastening the climate unit controls trim.



1. Remove the climate control unit controls trim from the plastic rivet, then tilt it forwards.

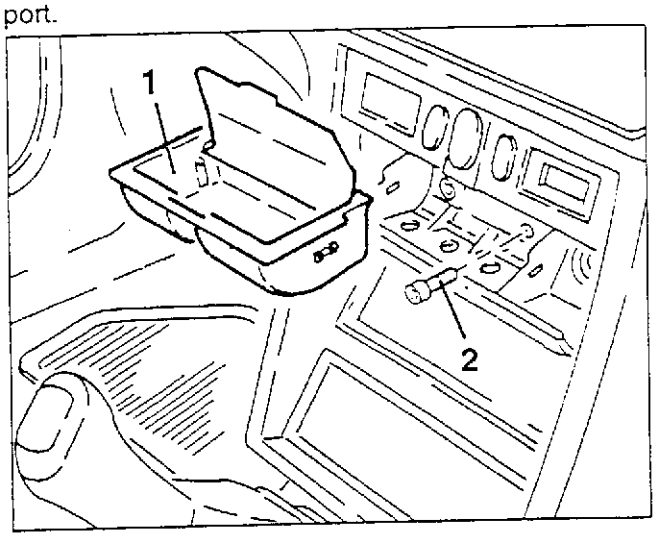


1. Remove the two climate unit controls light bulbs pulling outwards.

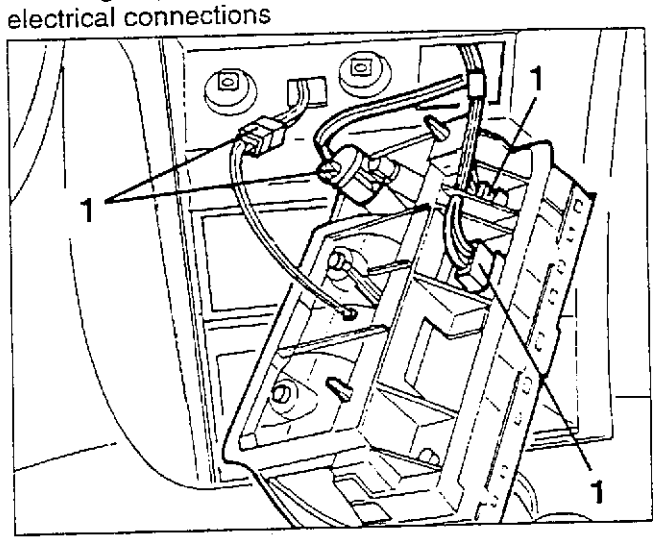


REPLACING ASHTRAY AND CIGAR LIGHTER BULBS

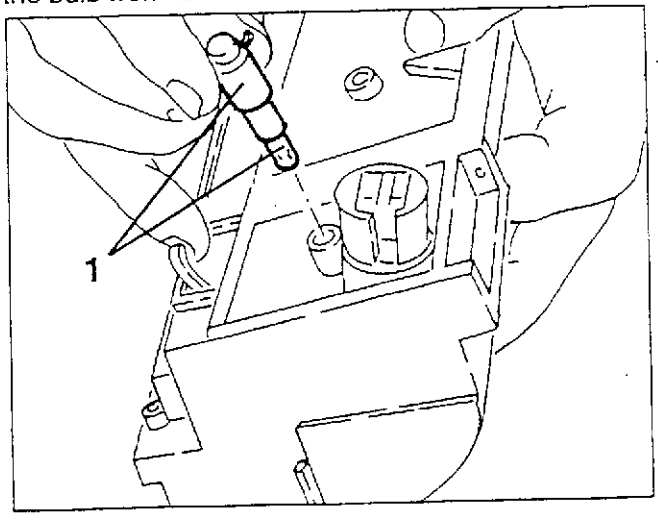
1. Remove the ashtray.
2. Slacken the two screws fastening the ashtray support.



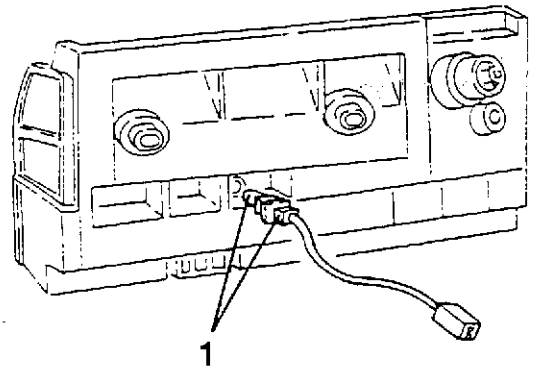
1. Prise the ashtray support complete with services control group and remove it after disconnecting the electrical connections

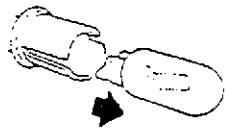
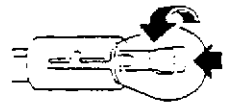
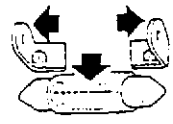
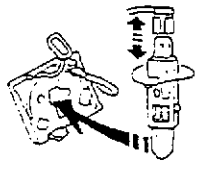


1. On the bench, withdraw the bulb holder and remove the bulb from it.



1. Remove the bulb holder complete with wiring and withdraw the ashtray bulb from it.



TYPES OF BULBS	
A 	**"All glass" bulbs** are snap fastened. To remove them, pull.
B 	**Bayonet bulbs** To remove them from the bulb holder: press the bulb, turn it counter-clockwise, then remove it.
C 	**Cylindrical bulbs** To remove them, release from the side contacts.
D 	**Halogen bulbs** To remove the bulb, release the fastening clip of the bulb from its housing.

BULB TABLE

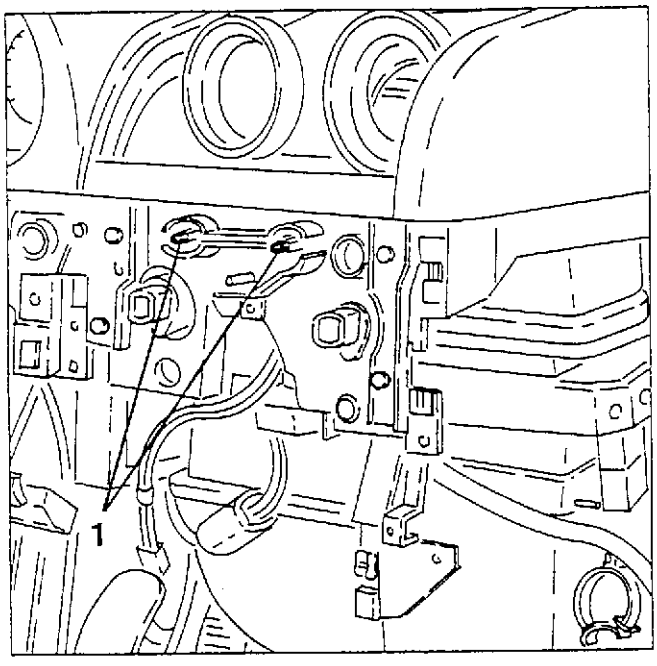
SERVICE	POWER RATING (W)	TTPE
HIGH BEAM	55	D
LOW BEAM	55	D
FRONT SIDE LIGHT	5	A
FRONT DIRECTION INDICATOR	21	B
SIDE REPEATERS	5	A
REAR DIRECTION INDICATORS	21	B
REAR STOP/ SIDE LIGHT	21/5	B
REVERSING LIGHT	21	B
REAR FOG GUARD	21	B
ROOF LIGHTS	10	C
NO. PLATE LIGHT	5	A
FOG LAMPS	55	D
READING SPOT LAMP	5	B
CONTROLS LIGHTING	1.2	A
THIRD STOP LIGHT	5	A

CAUTION:
When changing a bulb always replace it with one of the same type.

REPLACING CLIMATE CONTROL UNIT CONTROLS BULBS

- Remove the climate control unit controls module (see GROUP 50).

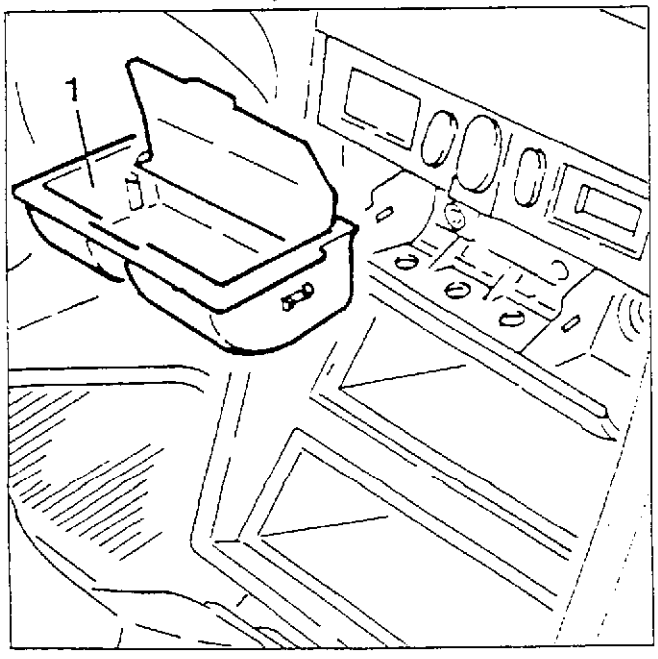
1. Remove the the two bulbs of the climate control unit controls pulling them outwards.



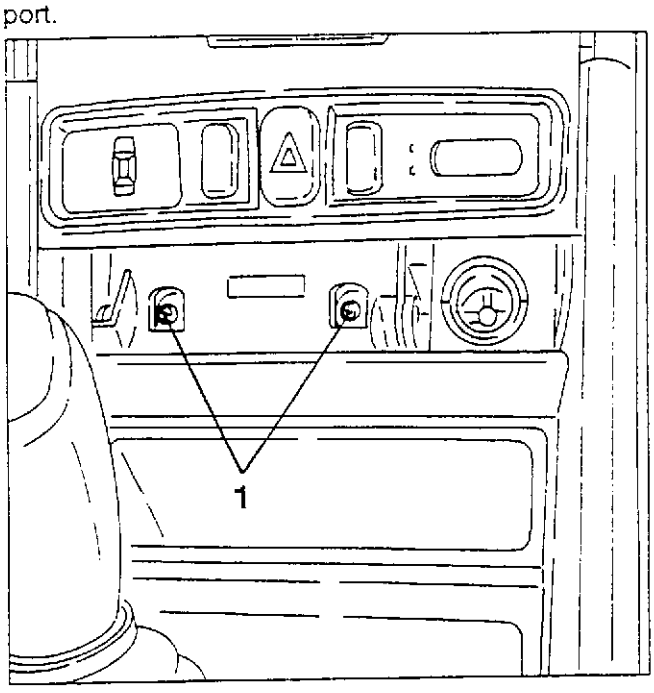
REPLACING ASHTRAY AND CIGAR LIGHTER BULBS

- Disconnect the battery (-) terminal.

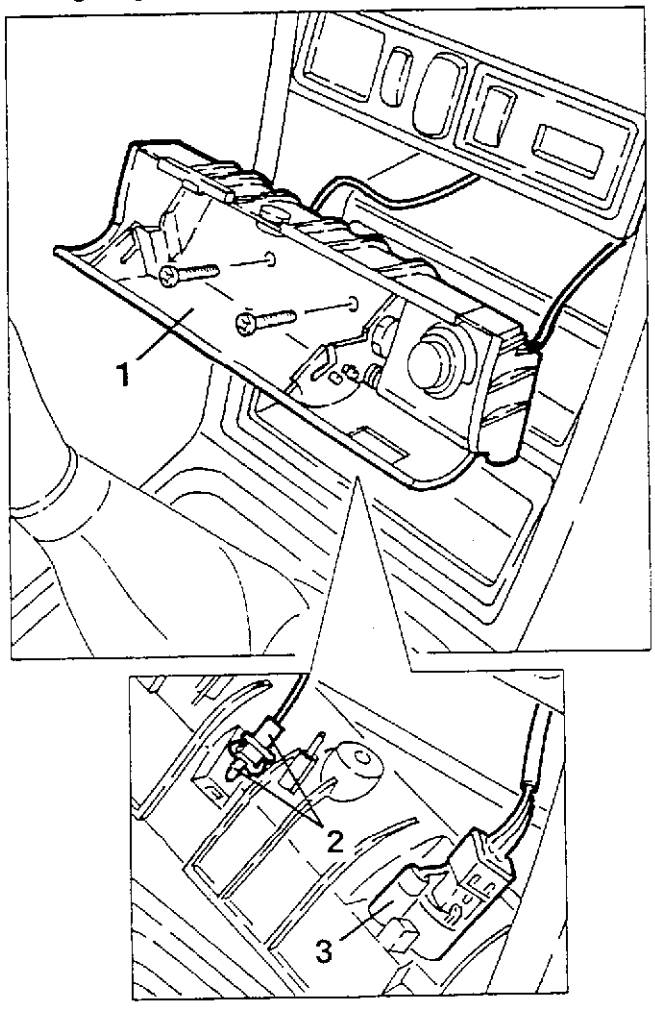
1. Remove the ashtray.



1. Slacken the two screws fastening the ashtray support.



1. Withdraw the ashtray support just enough to gain access to the electrical connections.
2. Withdraw the bulb holder complete with wiring and withdraw the ashtray bulb from it.
3. Remove the bulb holder and withdraw the bulb from the cigar lighter.

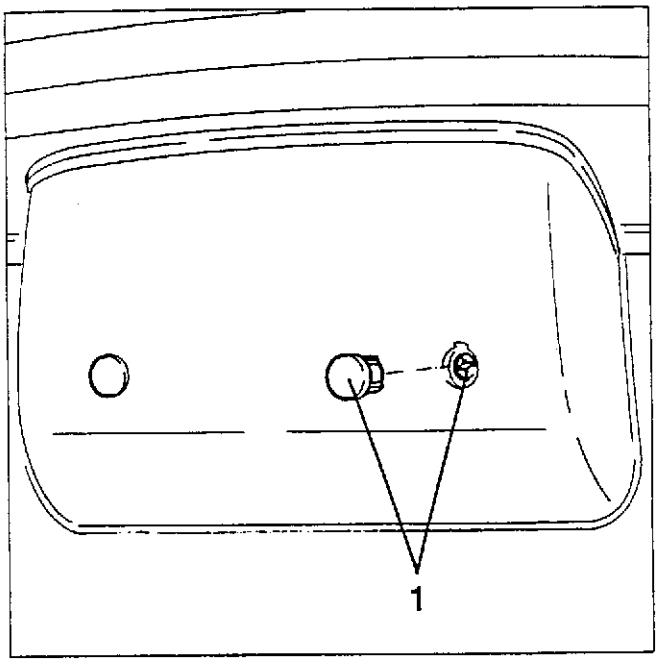


THIRD STOP LIGHT

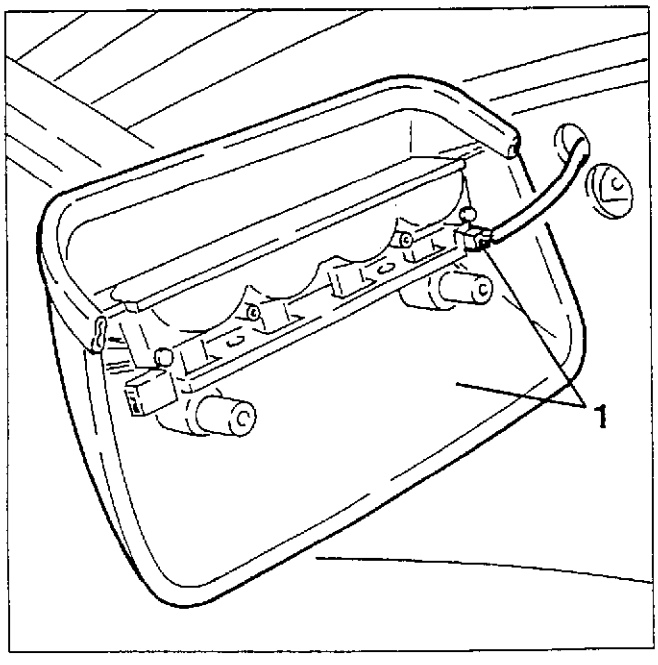
REMOVING/REFITTING

- Disconnect the battery (-) terminal.

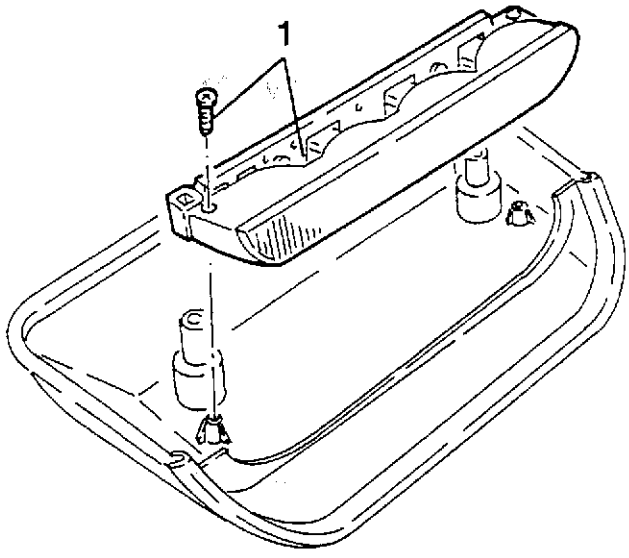
1. Working with the boot lid open, remove the two plastic caps and slacken the fastening screws below.



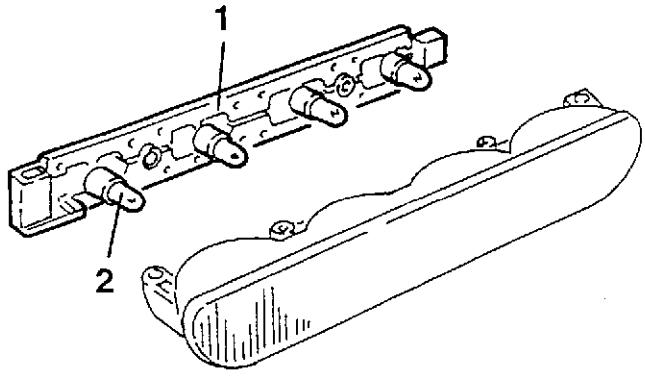
1. Move back the third stop light just enough to disconnect the electrical connection, then remove it.



1. On the bench, if necessary, slacken the two fastening screws and remove the bulb support unit.



1. Separate the bulb support base.
2. If necessary remove any bulbs to be changed pressing and turning them counter-clockwise.

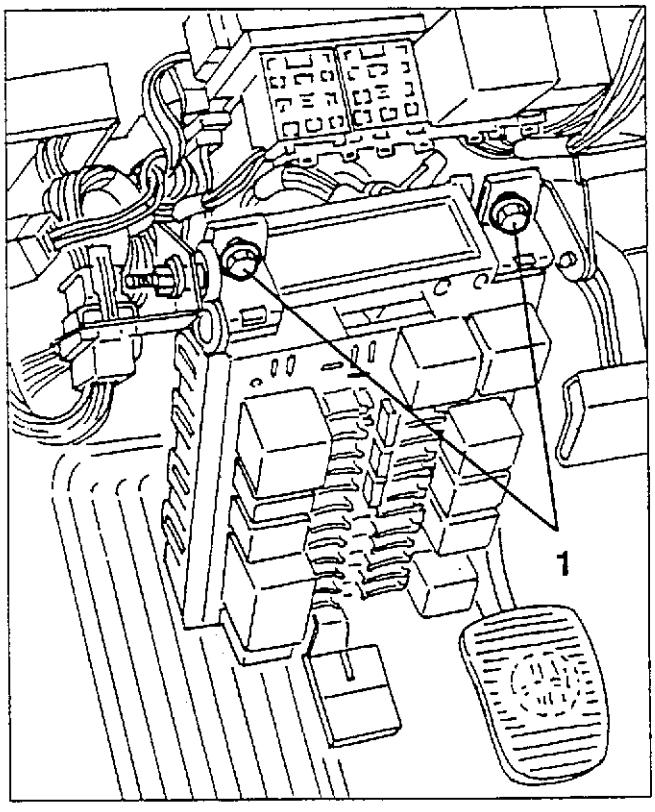


FUSE BOX

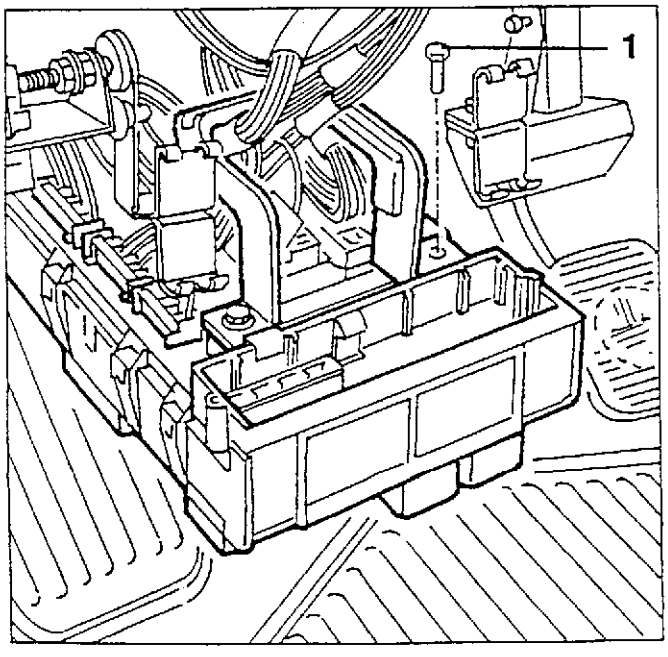
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
- Remove the valve cover trim (see GROUP 70).

1. Loosen the two bolts fastening the fuse box to the support hinges.



1. Slacken the two screws fastening the cable bracket.
- Disconnect the electrical connections from the fuse box and remove it; retrieve the cable bracket.

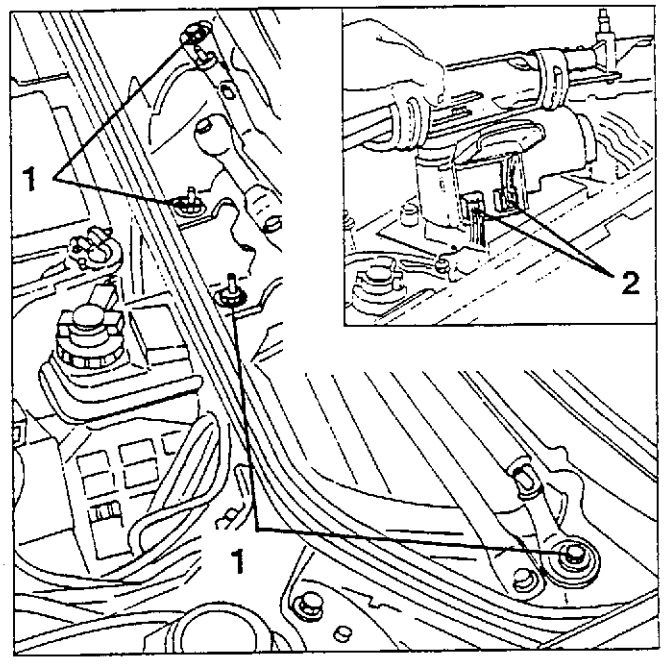


WINDSCREEN WIPER UNIT

REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
- Remove the air inlet grilles (see GROUP 70).

1. Slacken the two nuts and two screws fastening the windscreen wiper unit.
2. Raise the windscreen wiper unit just enough to disconnect the two electrical connections, then remove it.

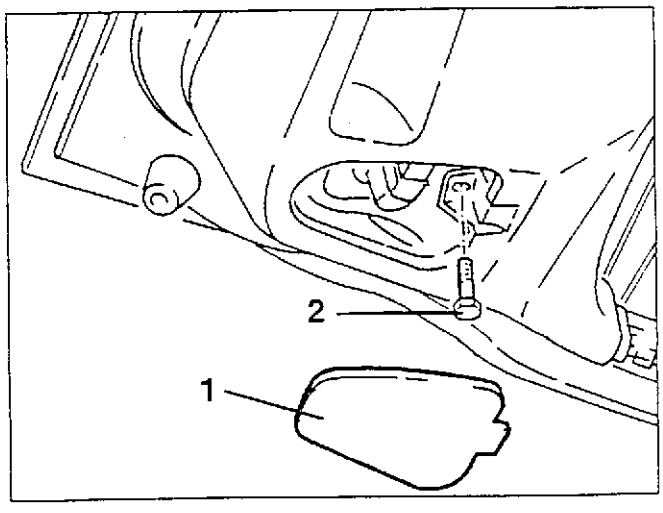


REARSCREEN WIPER UNIT

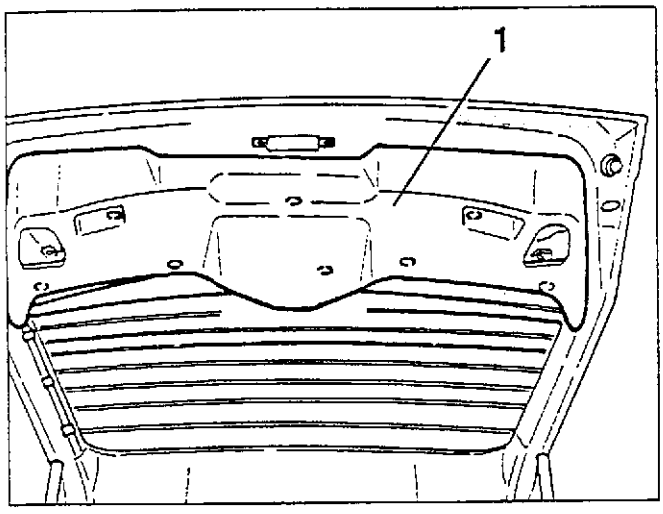
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.

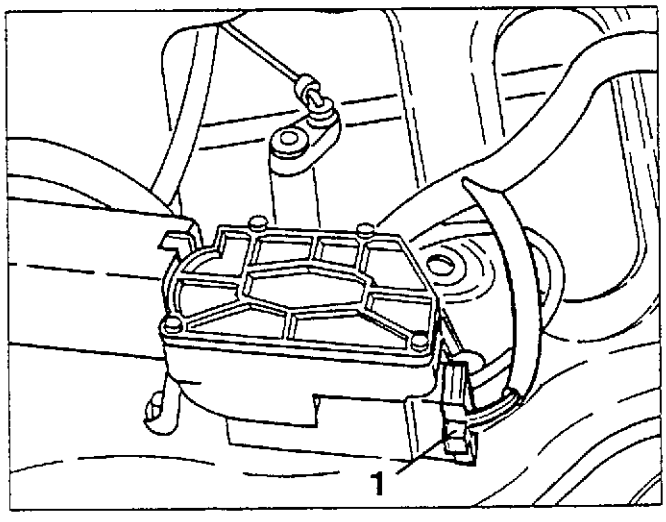
1. Remove the two bulb lids.
2. Slacken the two screws fastening the inner trim.



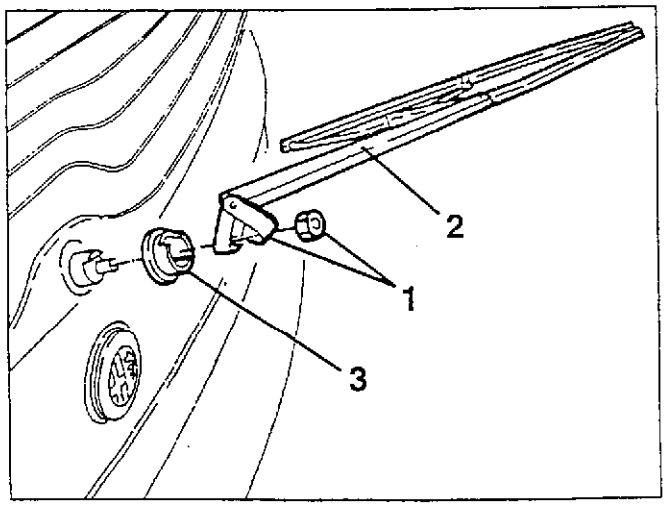
1. Remove the inner trim from the plastic nails positioned as shown in the figure and remove it.



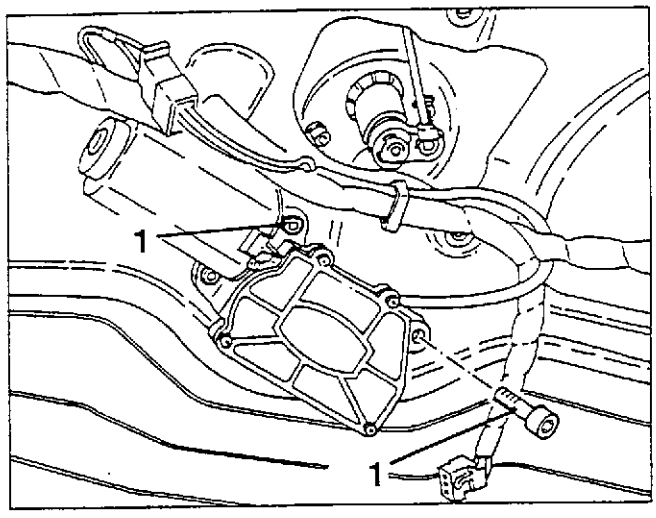
1. Disconnect the electrical connection of the rearscreen wiper.



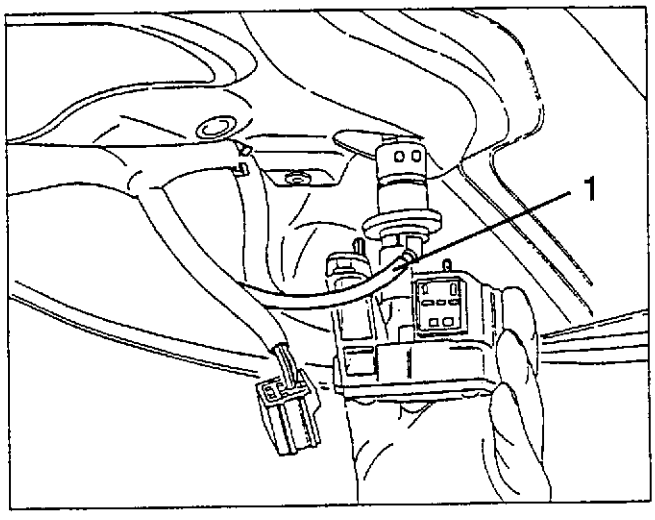
1. Lower the tailgate, raise the protection cap and slacken the nut fastening the rearscreen wiper arm.
2. Remove the rearscreen wiper arm.
3. Remove the rearscreen wiper protection rubber.



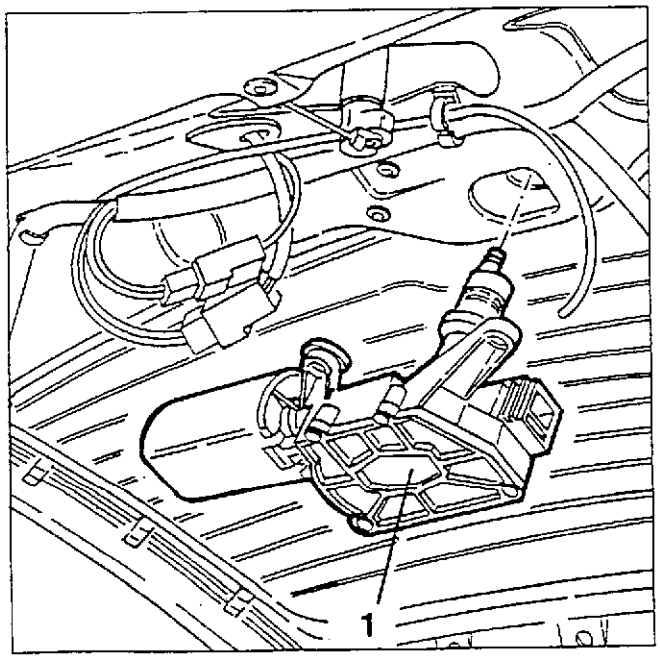
1. Raise the tailgate and slacken the three screws fastening the rearscreen wiper motor.



1. Pull out the rearscreen motor just enough to disconnect the cleaning fluid tube.



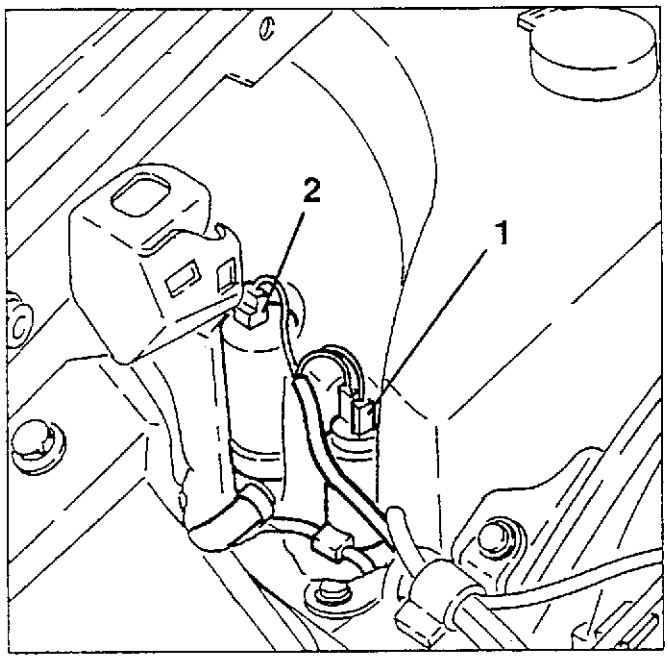
1. Remove the rearscreen motor.



WINDSCREEN WASHER & REARSCREEN WASHER PUMP AND HEADLIGHT WASHER PUMP

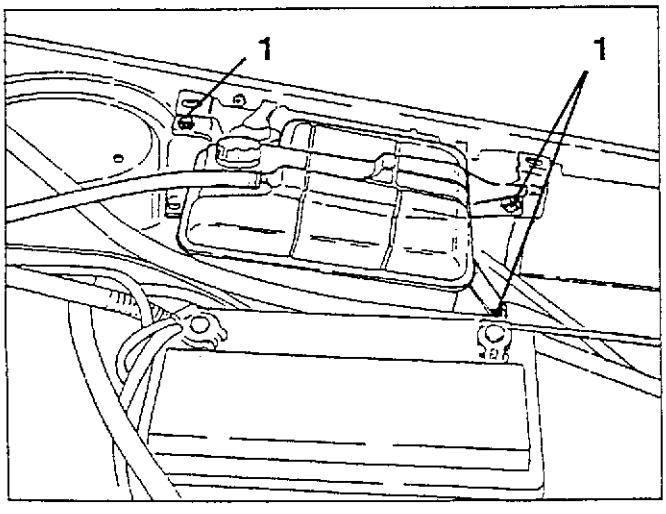
REMOVAL/REFITTING (Boxer versions)

- Disconnect the battery (-) terminal.
1. Disconnect the electrical connections from the windscreen and rearscreen washer pump and remove it from its housing.
2. Disconnect the electrical connections from the headlight washer pump and remove it from its housing.

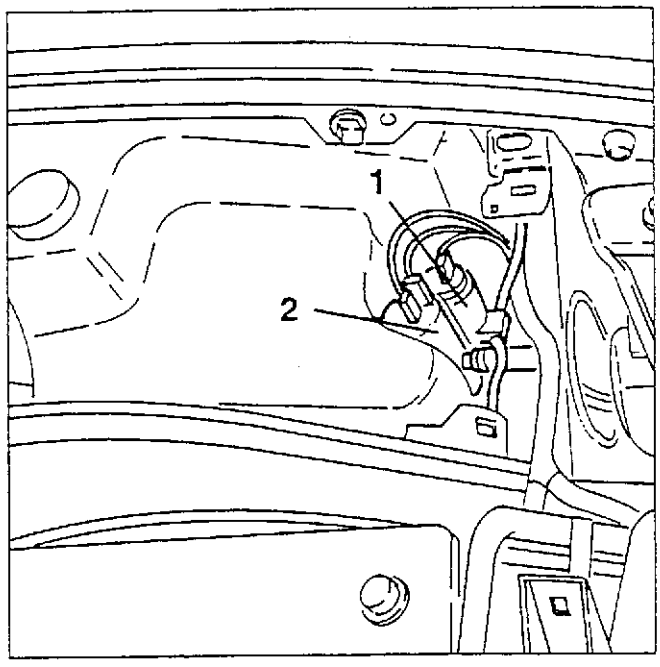


REMOVAL/REFITTING (Turbodiesel version)

1. Slacken the expansion tank fastening screws and move it to one side.



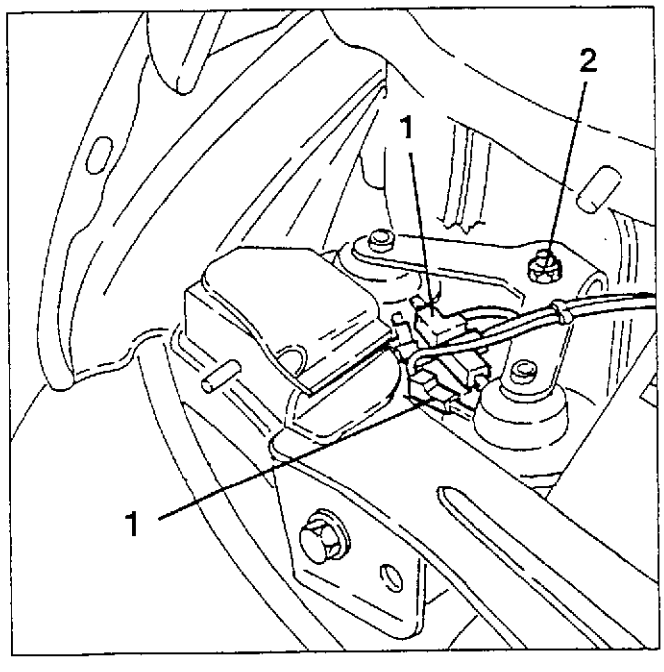
- Remove the windscreen/rear windscreen electric washer pump (1) and headlight electric washer pump (2) by proceeding as indicated for the Boxer versions.



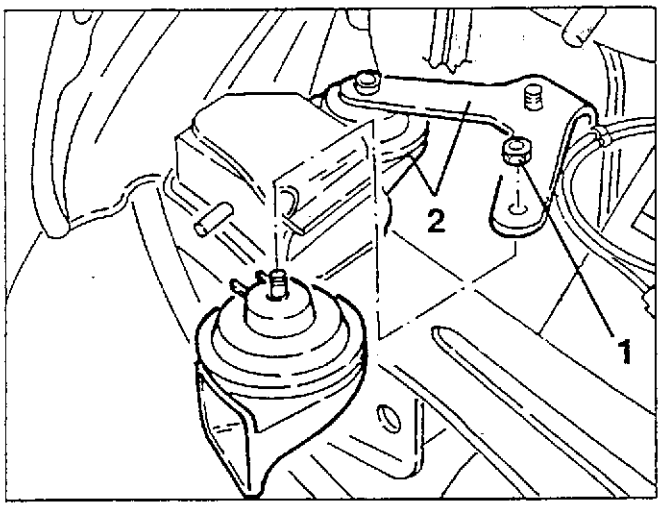
HORNS

REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
- Remove the radiator grille (see GROUP 70).
- Remove the right headlight (see specific paragraph).
1. Disconnect the electrical connections from the horns.
2. Slacken the nut fastening the horn support bracket to the body.



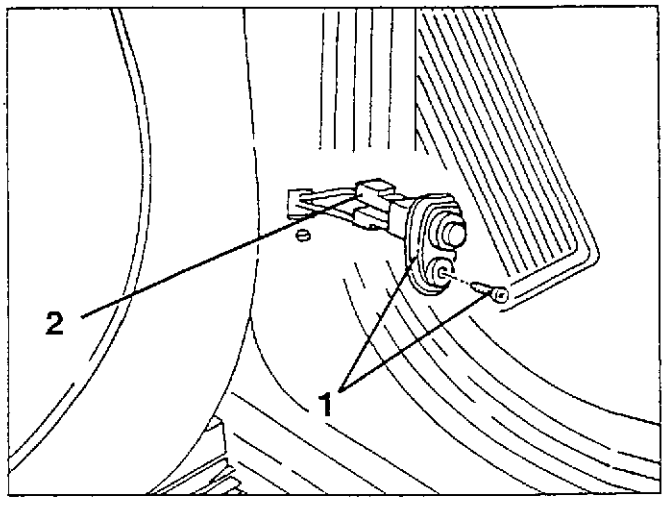
1. Slacken the nut fastening one horn to the bracket, then remove it.
2. Remove the other horn complete with support bracket.



CEILING LAMP CONTROL SWITCH ON DOOR PILLARS

REMOVAL/REFITTING

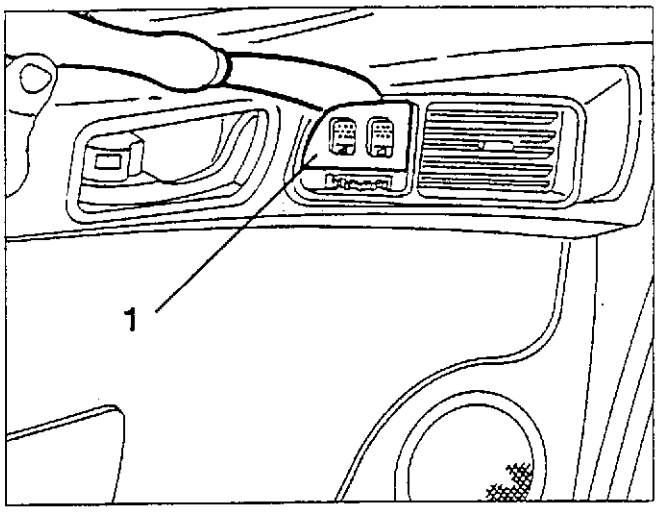
- Disconnect the battery (-) terminal.
1. Slacken the fastening screws and take the switch out of its housing.
2. Disconnect the two electrical connections and remove the ceiling lamp control switch.



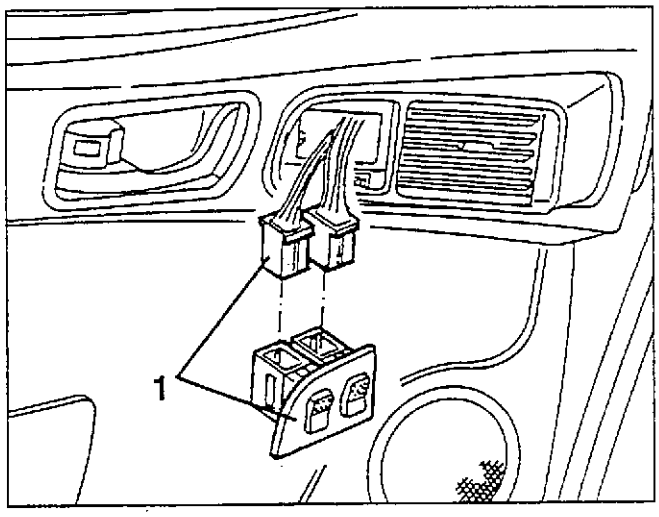
FRONT POWER WINDOW SWITCHES

REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
1. Remove the switches from the door panel.



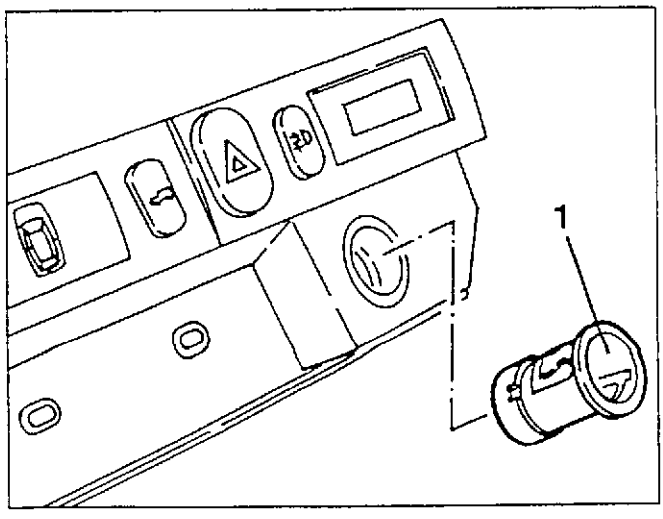
1. Disconnect the two electrical connections and remove the front power window switches.



CIGAR LIGHTER

REMOVAL/REFITTING

- Proceed as for the first three steps of the procedure described in the paragraph "CHANGING THE ASHTRAY AND CIGAR LIGHTER BULBS".
1. Working on the bench remove the cigar lighter.

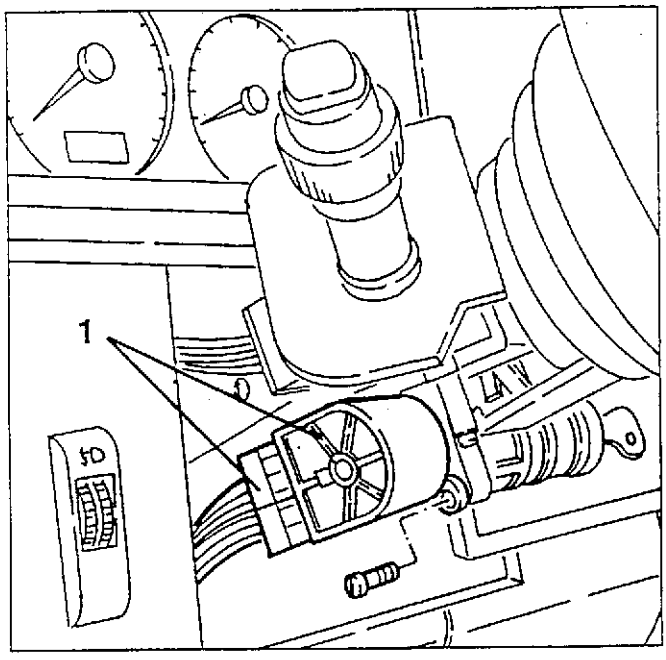


IGNITION SWITCH

REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
- Remove the steering column half cover.

1. Slacken the fastening screw, take the ignition switch off the starter block shaft, then remove it after disconnecting the electrical connections.

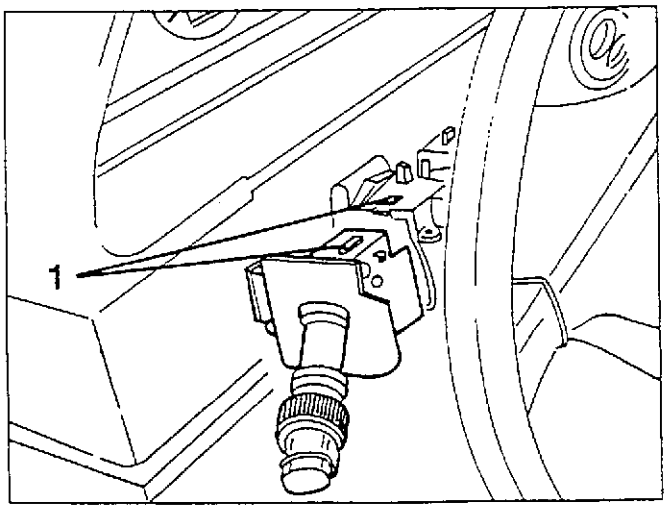


STEERING COLUMN LEVER UNIT

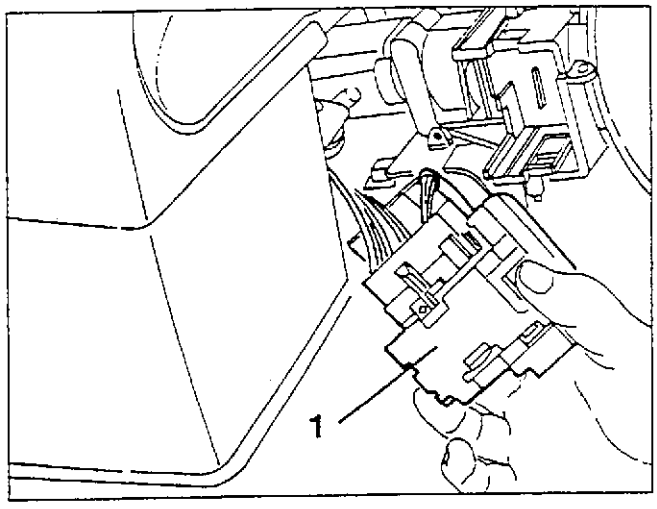
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
- Remove the steering column half covers (see GROUP 70).

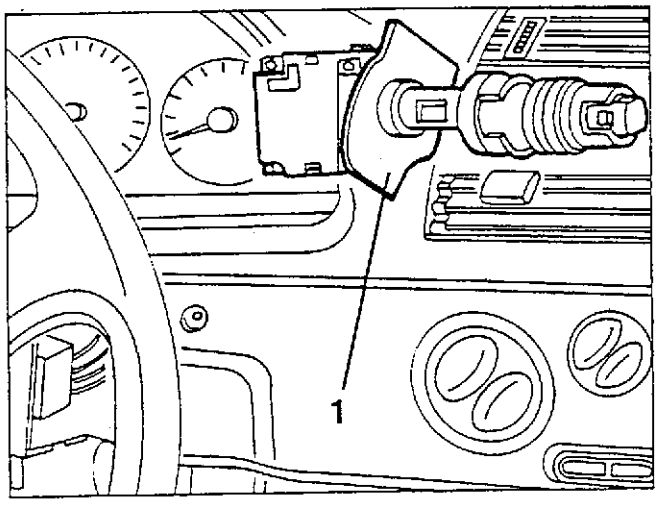
1. Contemporaneously press the two fastening tabs and remove the left control lever pulling it outwards.



1. Disconnect the electrical connection from the left control lever and remove it.



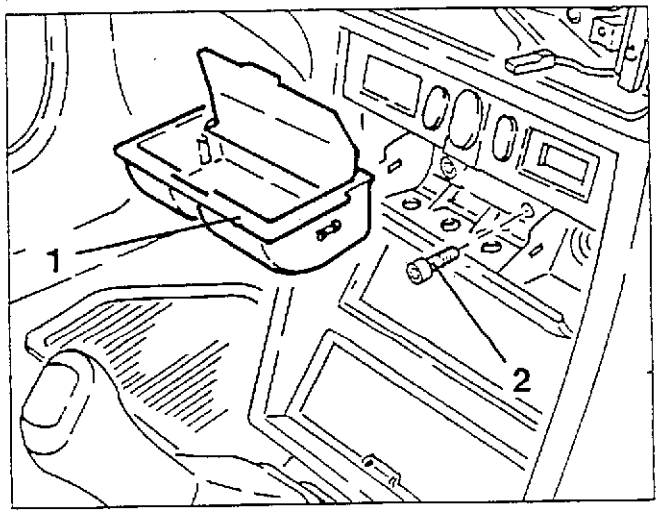
1. Proceed in the same way to remove the right control lever.



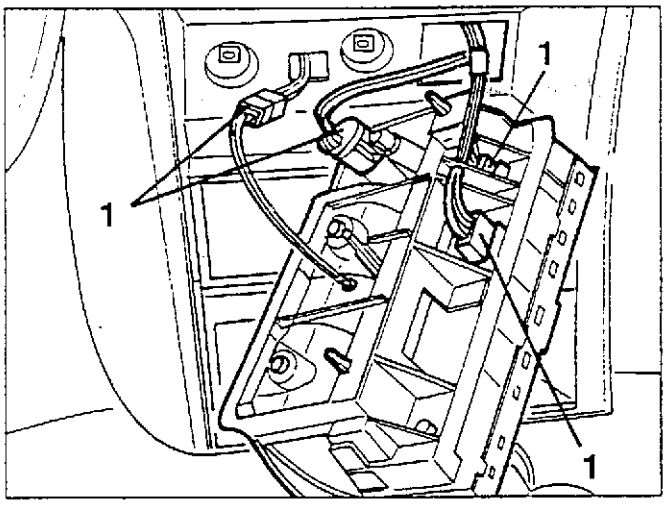
SERVICES CONTROL UNIT

REMOVAL/REFITTING

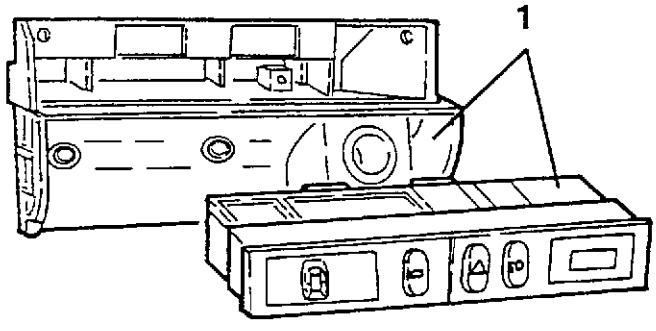
1. Remove the ashtray.
2. Slacken the two screws fastening the ashtray support.



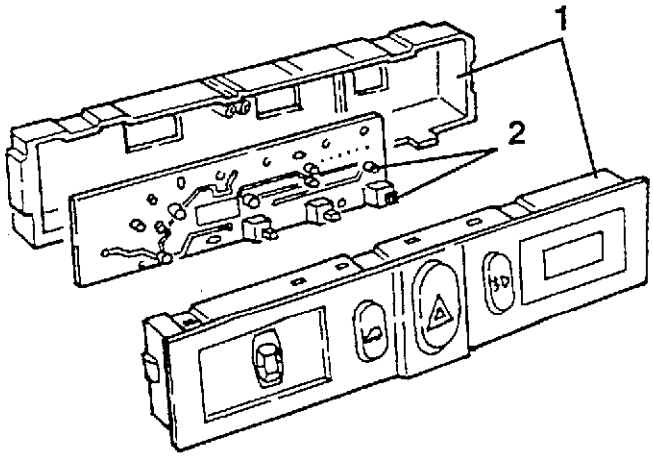
1. Remove the ashtray support complete with services control unit and remove it after disconnecting the electrical connections.



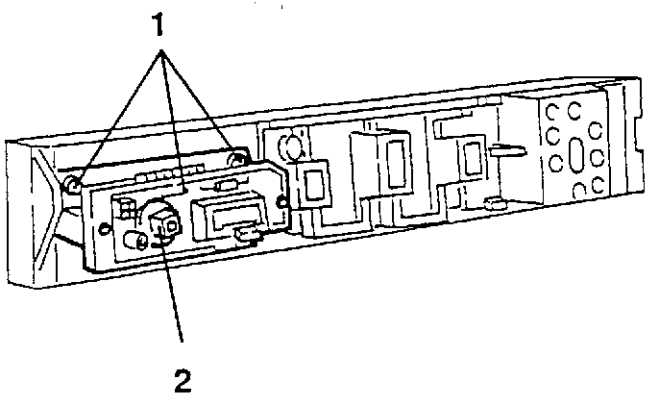
1. Release the clips and separate the ashtray from the services control unit.



1. Release the clips and open the services control unit.
2. If necessary, change the leds and switches.



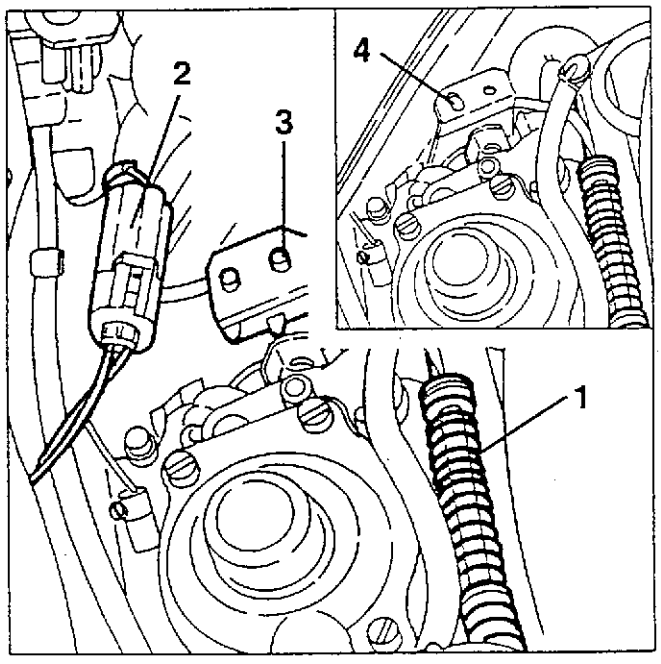
1. Slacken the fastening screws and remove the clock.
2. If necessary, take out the bulb holder and remove the clock light bulb.



FULL LOAD SWITCH FOR DISENGAGING THE CONDITIONER COMPRESSOR (1929 TD)

REMOVAL/REFITTING

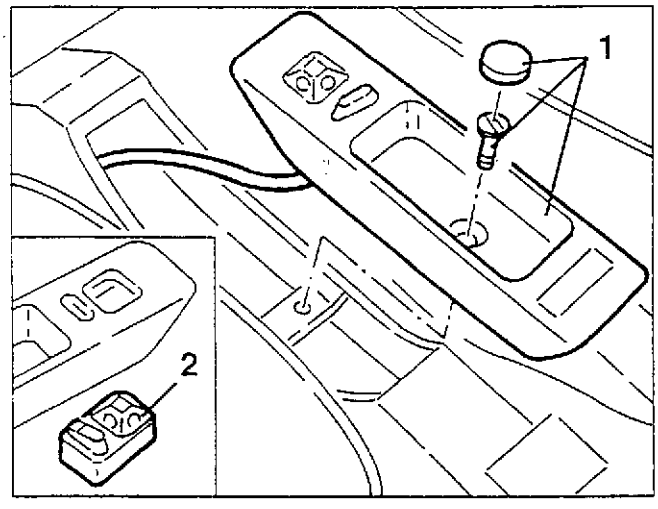
- Disconnect the battery (-) terminal.
1. Disconnect the accelerator control cable from the injection pump.
2. Disconnect the electrical connection of the full load switch.
3. Slacken the two fastening screws and remove the full load switch.
4. When refitting adjust the position of the full load switch through the slot on the support bracket.



DOOR REARVIEW MIRROR ADJUSTMENT SWITCH

REMOVAL/REFITTING

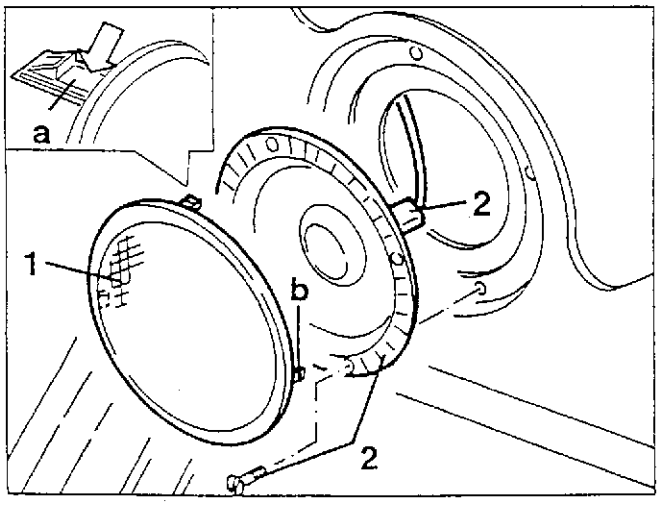
- Disconnect the battery (-) terminal.
1. Remove the plastic cap, slacken the fastening screw and raise the plate just enough to disconnect the electrical connection, then remove it.
2. On the bench, remove the door mirror double adjustment switch from the plate.



SPEAKERS

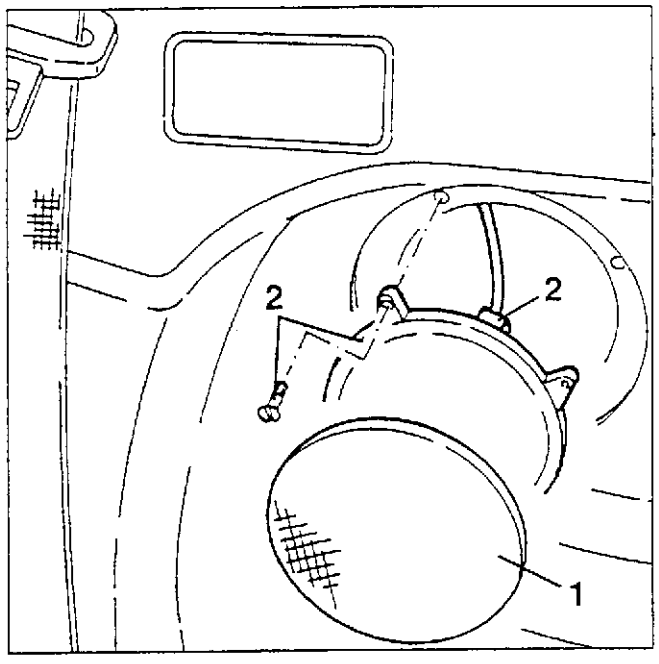
REMOVAL/REFITTING FRONT SPEAKERS

1. Remove the speaker protection grille proceeding as follows:
- using a suitable tool (eg. small flat screwdriver) press on the upper catch (a) hooking the grille to the door panel;
- proceed as described in the previous point on the rear catch (b);
- remove the grille.
2. Slacken the four fastening screws, withdraw the speaker just enough to disconnect the electrical connection, then remove it.



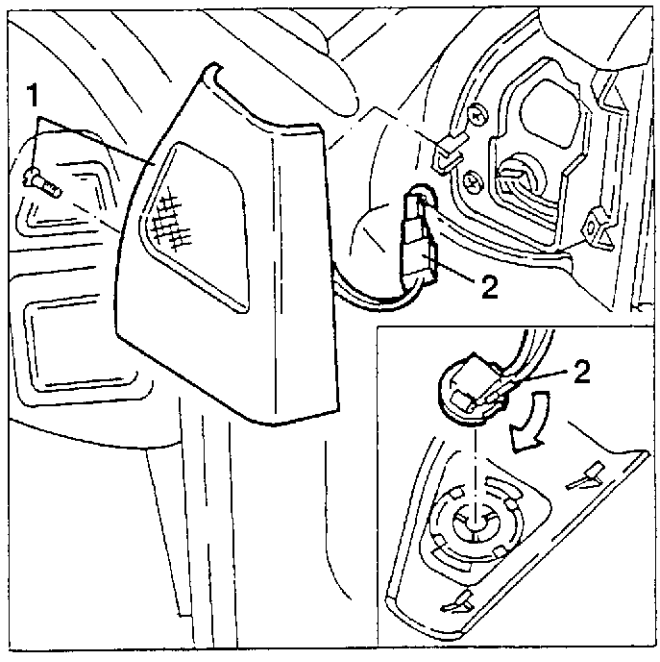
REMOVAL/REFITTING REAR SPEAKERS

1. Prise and remove the speaker protection grille.
2. Slacken the four fastening screws, withdraw the speaker just enough to disconnect the electrical connection, then remove it.



REMOVAL/REFITTING TWEETER

1. Slacken the fastening screw and remove the cover complete with tweeter.
2. Disconnect the electrical connection, turning it, remove the tweeter from the cover.



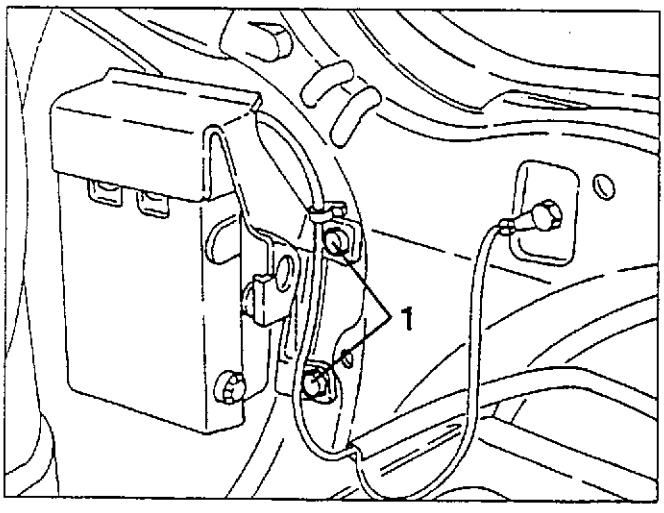
ANTI-THEFT DEVICE

For the description and diagnosis see "Electric system Diagnosis".

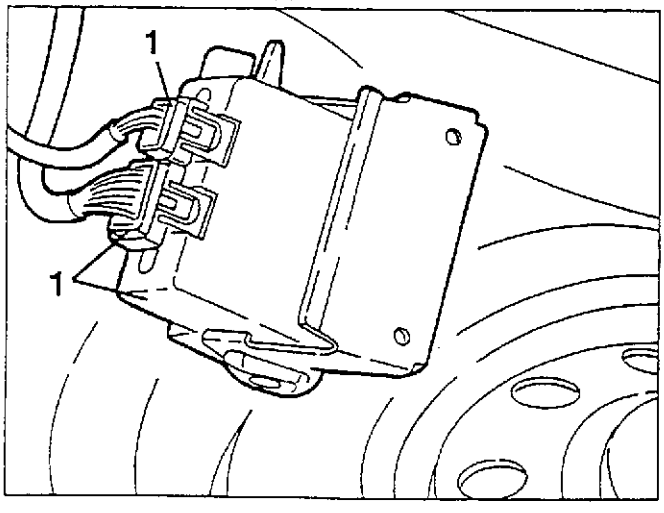
REMOVAL/REFITTING CONTROL UNIT-SIREN

- Disconnect the battery (-) terminal.
- Remove the luggage compartment protective trim (see GROUP 70).

1. Remove the trim just enough and slacken the two screws fastening the alarm system control unit-siren support bracket.



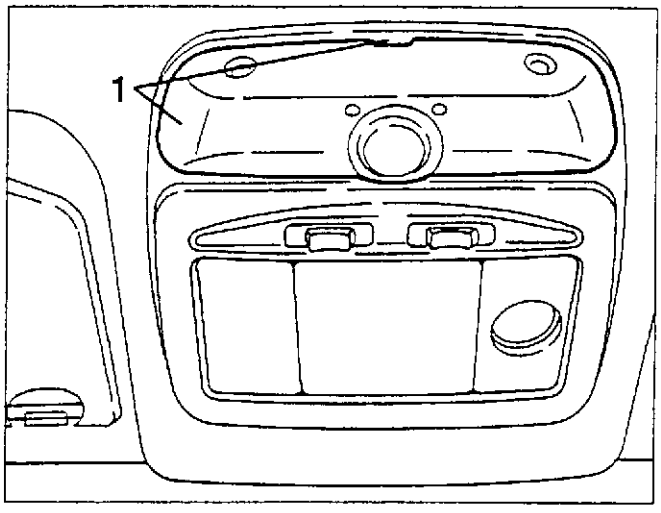
1. Disconnect the two electrical connections and remove the control unit-siren complete with support bracket.
- On the bench, if necessary, separate the control unit-siren from the support bracket.



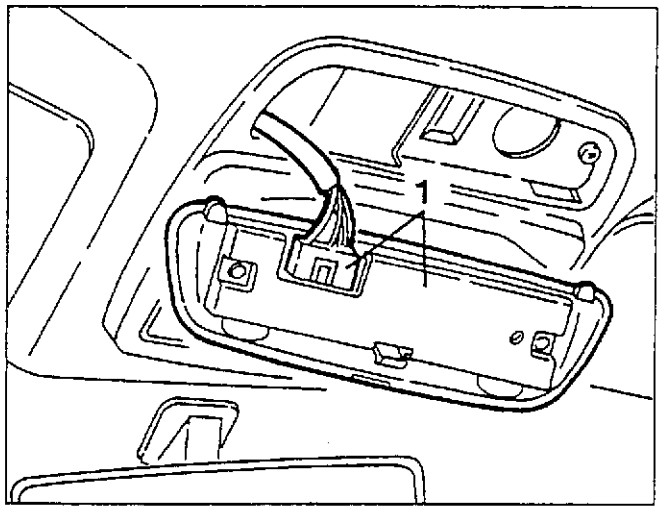
REMOVAL/REFITTING RECEIVER FOR REMOTE CONTROL AND VOLUMETRIC SENSORS

- Disconnect the battery (-) terminal.

1. Working on the points illustrated, remove the receiver and volumetric sensor support plate.



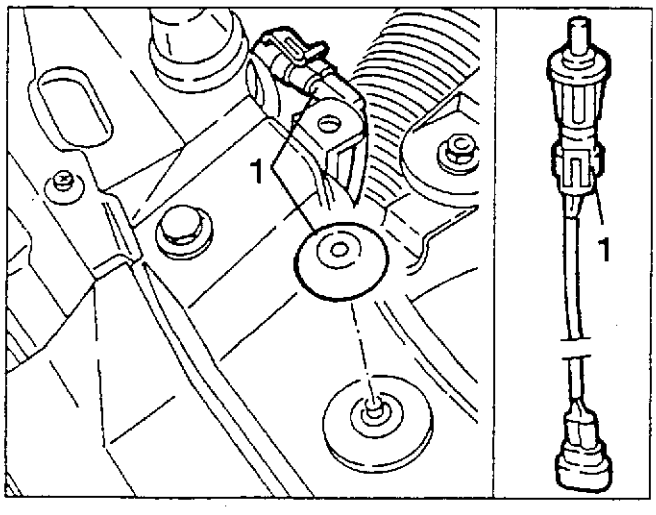
1. Disconnect the connection and remove the receiver-sensor assembly complete with plate.
- On the bench, slacken the two fastening screws and separate the plate from the receiver - volumetric sensors.



REMOVAL/REFITTING BONNET OPEN DETECTION SWITCH

- Disconnect the battery (-) terminal.

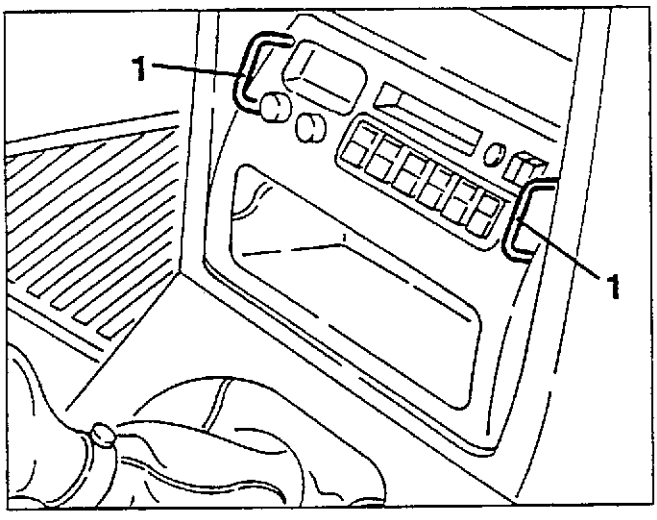
1. Disconnect the electrical connection, remove the upper finishing, then prise and remove the switch complete with wiring from its housing.



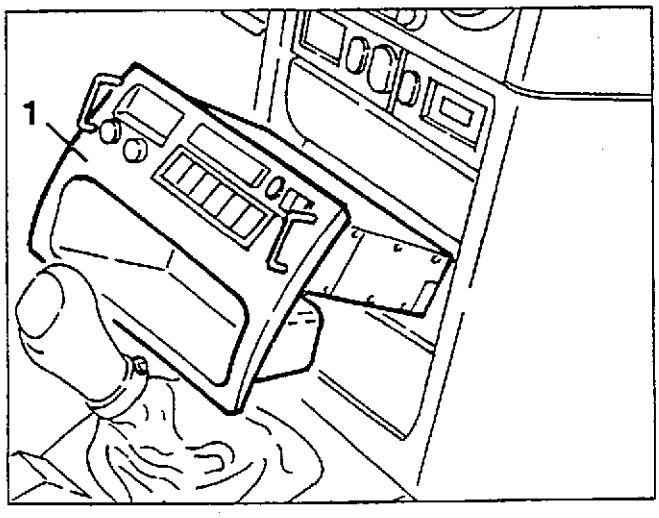
CAR RADIO

REMOVAL/REFITTING

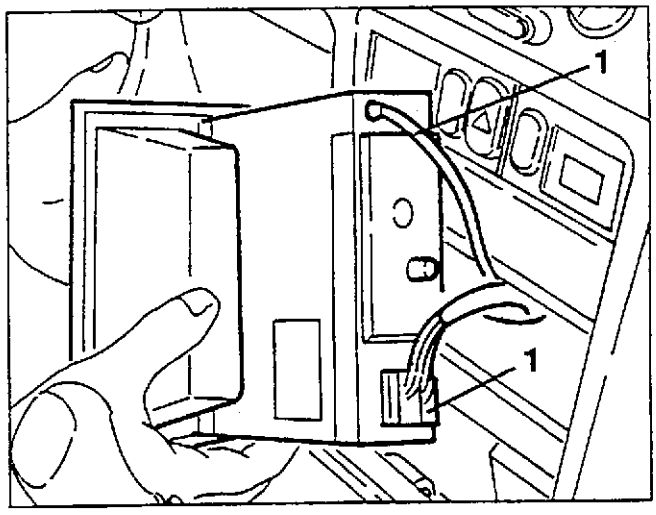
- Disconnect the battery (-) terminal.
1. Insert the special removal brackets in the holes provided on the radio as illustrated.



1. Withdraw the radio from its compartment just enough.



1. Disconnect the electrical connection and the radio aerial coaxial cable from the radio, then remove the radio.

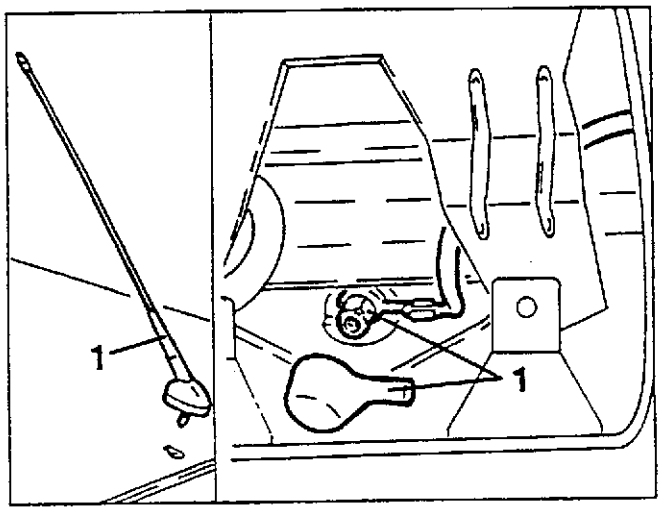


- On the bench, if necessary, separate the front frame
- utility compartment from the radio.

CAR RADIO AERIAL

REMOVAL/REFITTING

- Remove the front passenger compartment roof lamp (see GROUP 55).
1. Remove the protection cap, slacken the nut fastening the coaxial cable and aerial, then working from outside the car, remove the aerial.



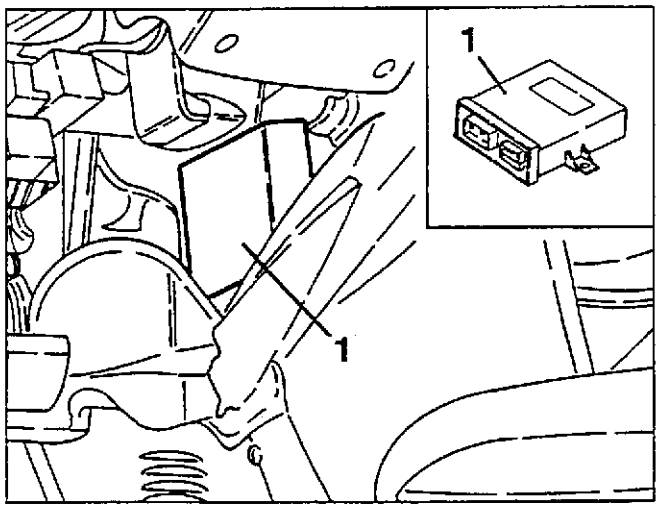
ALFA ROMEO CODE

NOTE: For the detailed description and operation of the Alfa Romeo Code see "Group 55 - ELECTRIC SYSTEM DIAGNOSIS".

REMOVING/REFITTING THE CONTROL UNIT

- Disconnect the battery (-) terminal.
- Remove the fusebox trim (see GROUPO 70).

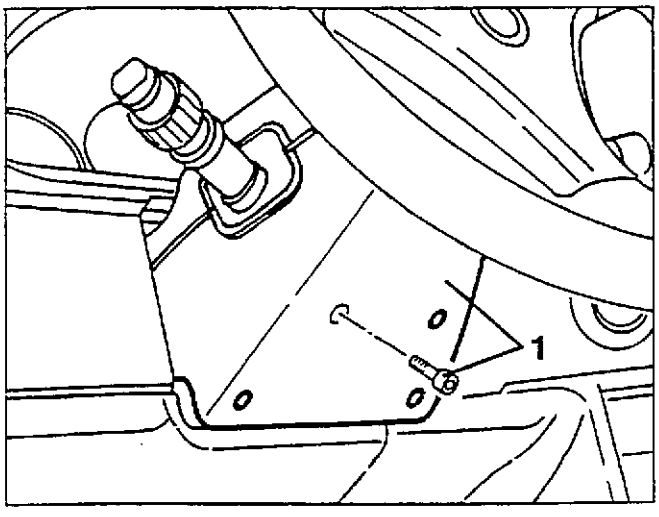
1. Slacken the two fastening bolts, withdraw the Alfa Romeo Code control unit, then remove it after disconnecting the two electrical connections.



REMOVING/REFITTING THE ANTENNA

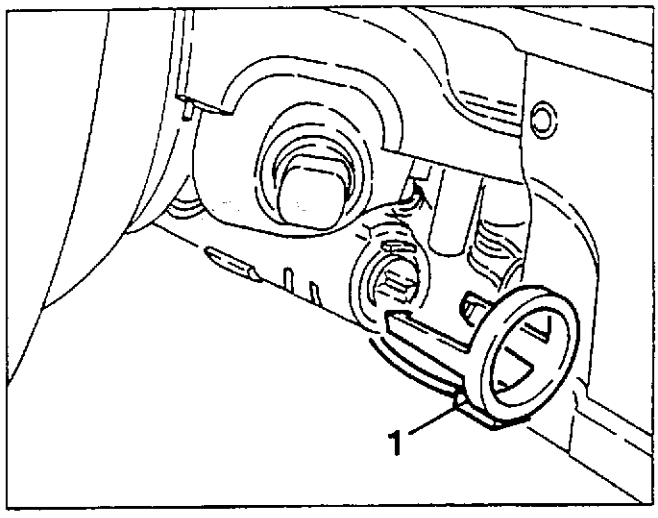
- Disconnect the battery (-) terminal.

1. Slacken the four fastening screws and remove the lower steering column half box.



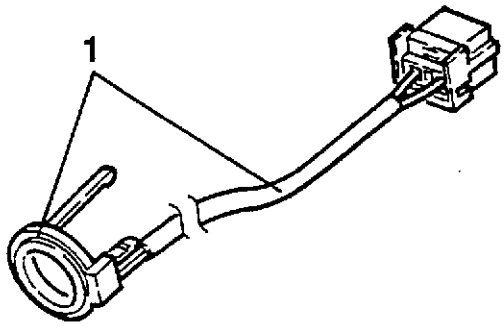
- Remove the fusebox cover (see GROUPO 70).

1. Release the fastening clips and withdraw the Alfa Romeo Code antenna from the steering block.



- Remove the Alfa Romeo Code control unit (see specific paragraph).

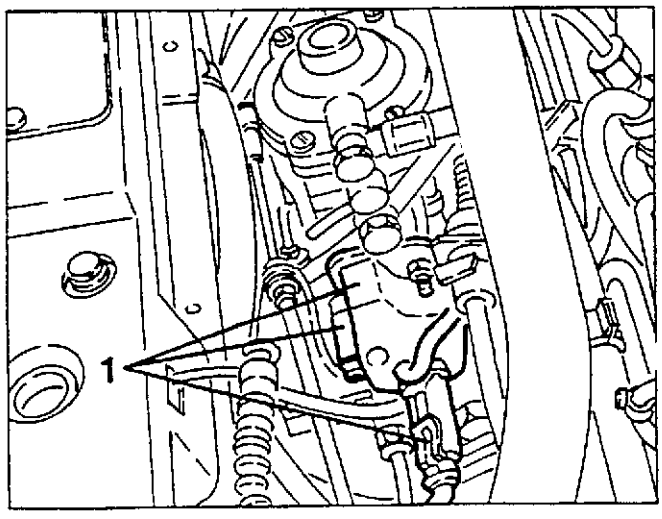
1. Remove the Alfa Romeo Code antenna complete with the wiring connecting to the control unit.



REMOVING/REFITTING THE ENGINE ELECTROSTOP VALVE (Specific for Turbodiesel engine)

- Disconnect the battery (-) terminal.

1. Disconnect the electrical connection, slacken the fastenings and remove the engine electrostop valve.

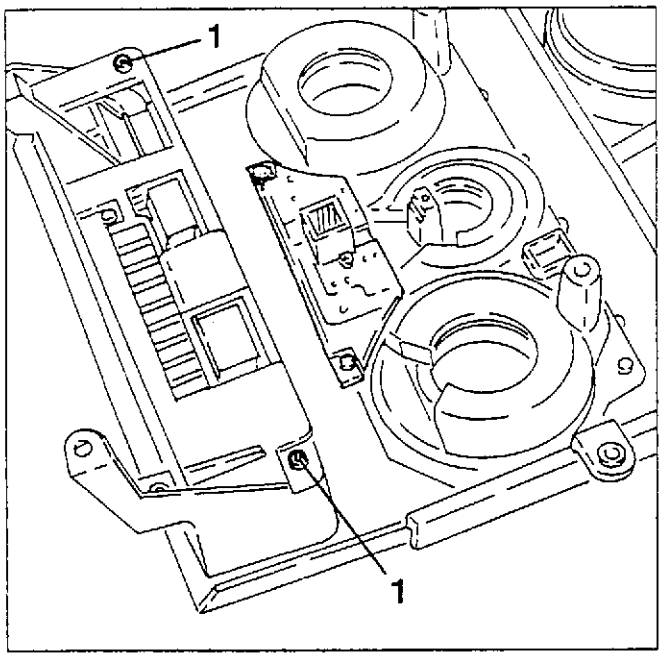


SERVICES CONTROL UNIT

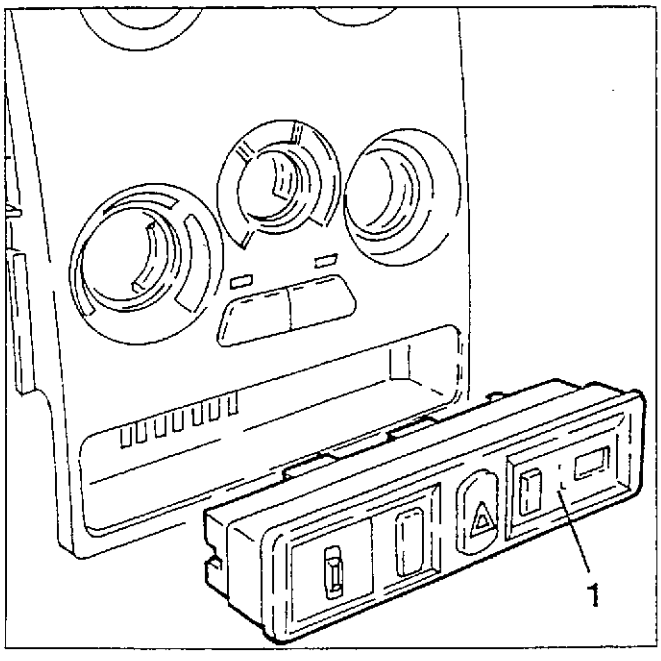
REMOVING/REFITTING

- Disconnect the battery (-) terminal.
- Remove the climate control unit controls module (see GROUP 50).

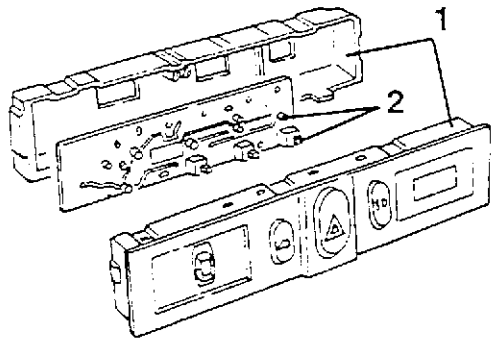
1. On the bench, slacken the two screws fastening the services control unit from the climate control unit controls module.



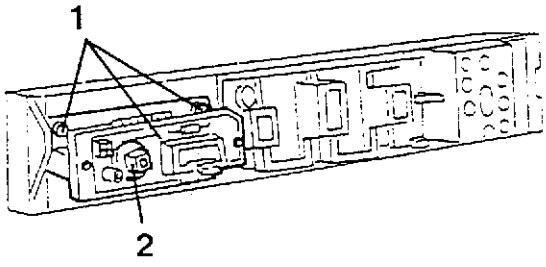
1. Remove the services controls unit from the climate control unit controls module.



1. If necessary, release the catches and open the services control unit.
2. Replace the leds and switches on the board.



1. Slacken the fastening screw and remove the clock.
2. Withdraw the bulb holder and remove the clock light bulb.

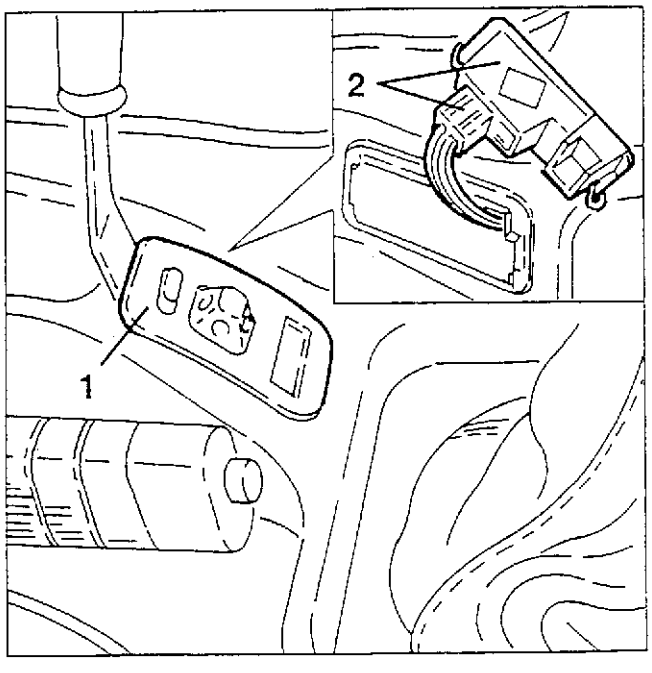


WING MIRROR ADJUSTMENT DOUBLE SWITCH

REMOVING/REFITTING

- Disconnect the battery (-) terminal.

1. Working as illustrated, remove the wing mirror double switch from its housing.
2. Disconnect the electrical connection and remove the wing mirror adjustment double switch.



WHITE

GENERAL

Before starting to work, make sure that the ignition key is in the "parking" position and the battery cable is disconnected and, in any case:

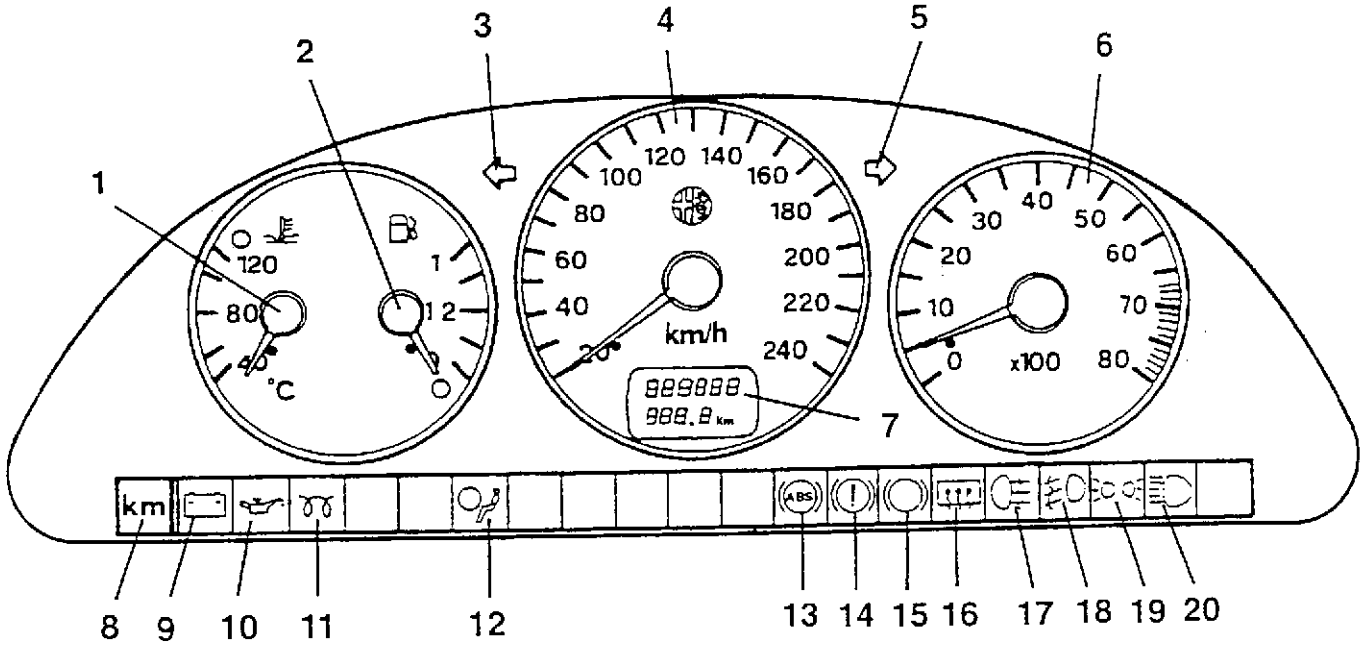
- avoid connecting the control unit output directly to the load;

- absolutely avoid working directly on devices with cables connected to "positivr" or earth without firstly disconnecting the control units;

- avoid short circuiting the sensors of the system unless otherwise specified;

- before doing any electric welding disconnect the control units to avoid damage to the electrical components due to induced current.

WARNINGS:
Work on systems foreseeing the possible consequences and avoid working on them when you are not perfectly aware of the characteristics of the components concerned.
After changing a component of the electric system, you are recommended to replenish your stock with original Alfa Romeo spares.
The use of other brands, with even only slightly different characteristics, may adversely affect reliability and safety in service.

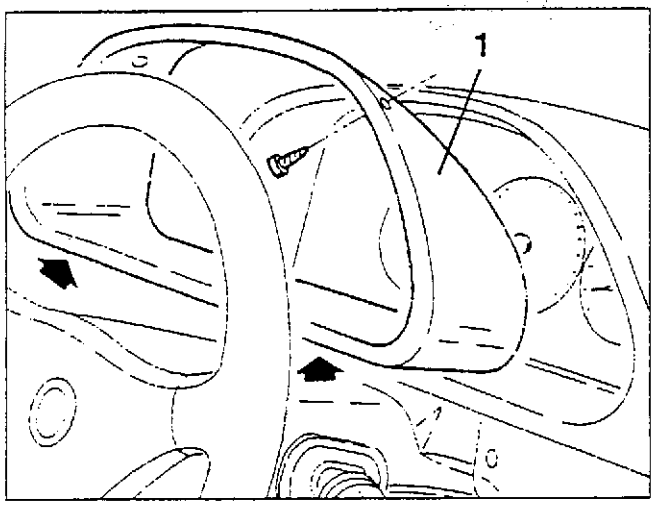


1. Coolant fluid temperature gauge with maximum temperature indicator
2. Fuel level gauge with reserve indicator
3. Left direction indicator
4. Speedometer
5. Right direction indicator
6. Rev counter
7. Digital mileage recorder and trip meter
8. Trip meter reset
9. Low battery charge warning light
10. Low engine oil pressure warning light
11. Glow plug warming light
12. Air-Bag failure warning light
13. A.B.S. inefficient warning light
14. Hand brake on warning light/low brake fluid warning light
15. Brake pad wear warning light
16. Heateed rearscreen warning light
17. Rear fog guards warning light
18. Fog lamps warning light
19. Side lights and low beam warning light
20. High beam warning light

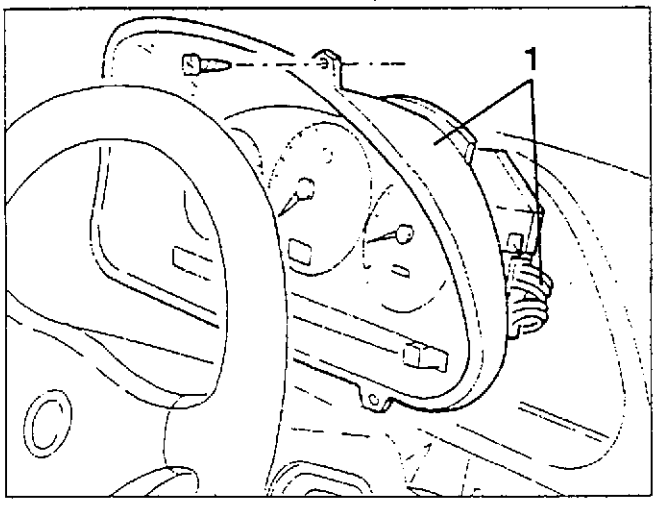
REMOVING/REFITTING

- Disconnect the battery (-) terminal.

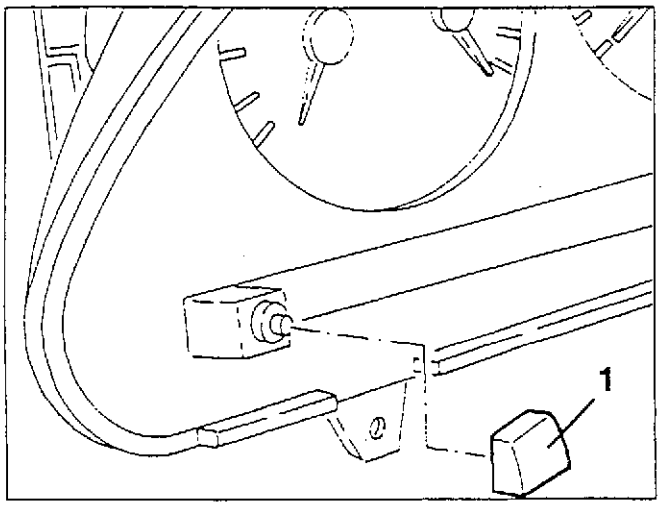
1. Slacken the two fastening screws and remove the control panel trim plate, prising in the points shown by the arrows.



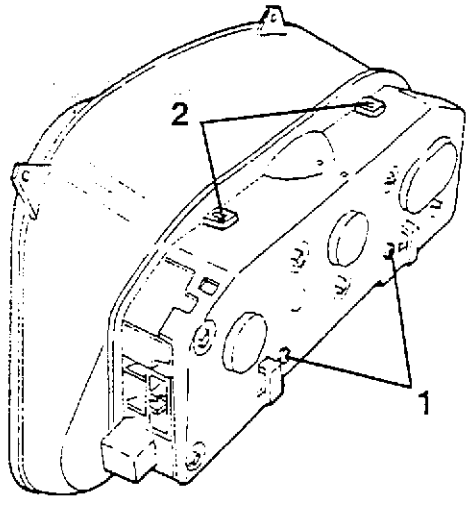
1. Slacken the four screws fastening the control panel and remove it from its housing jus enough to disconnect the two side connections, and remove it.



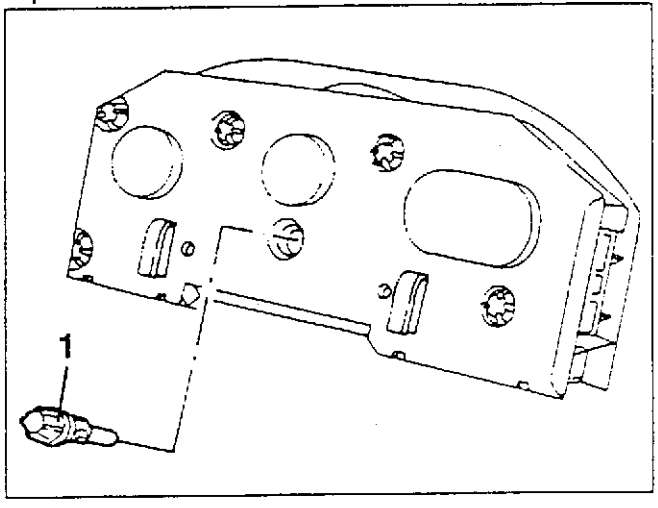
1. On the bench, remove the trip meter reset button.



1. Slacken the two control panel fastening screws from the transparent piece.
2. Release the two catches and separate the panel from the transparent piece.



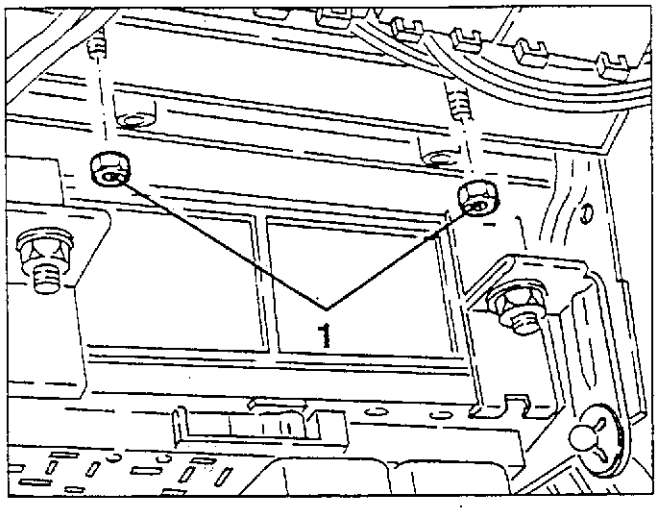
1. If necessary replace the panel lighting bulbs removing the bulb holder and removing the bulbs to be replaced.



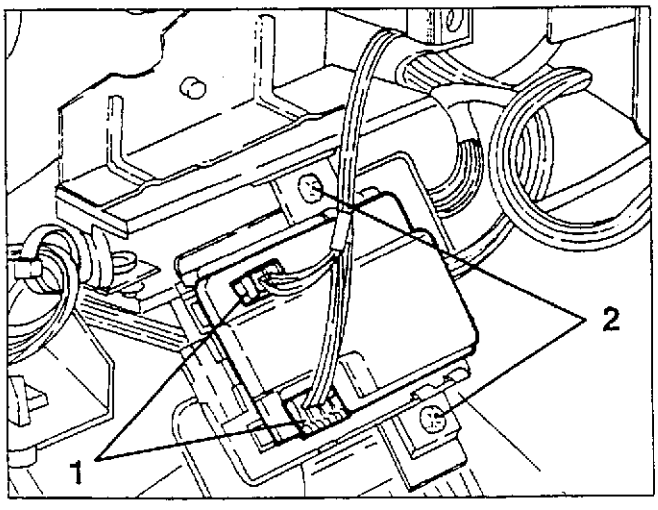
POWER WINDOW CONTROL UNIT

REMOVAL/REFITTING

The control unit is located under the dashboard on the lefthand side next to the main fuse box.
- Disconnect the battery (-) terminal.
- Remove the fuse box cover (see GROUP 70).
1. Slacken the two nuts fastening the power window control unit support.



1. Disconnect the two electrical connections of the power window control unit.
2. Slacken the two fastening nuts and remove the power window control unit.



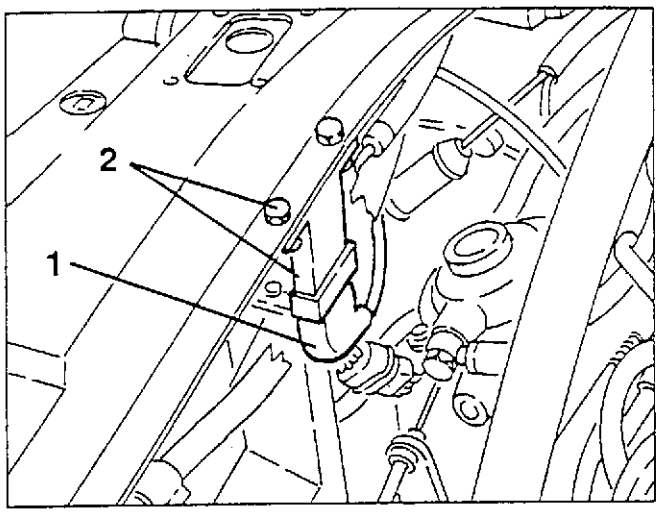
ALARM SYSTEM CONTROL UNIT

The vehicle alrm system is integrated with the siren and cannot therefore be removed separately. For Removal/Refitting operations see specific paragraph "Alarm System".

HEATING AND VENTILATION CONTROL UNIT (1929 TD)

REMOVAL/REFITTING

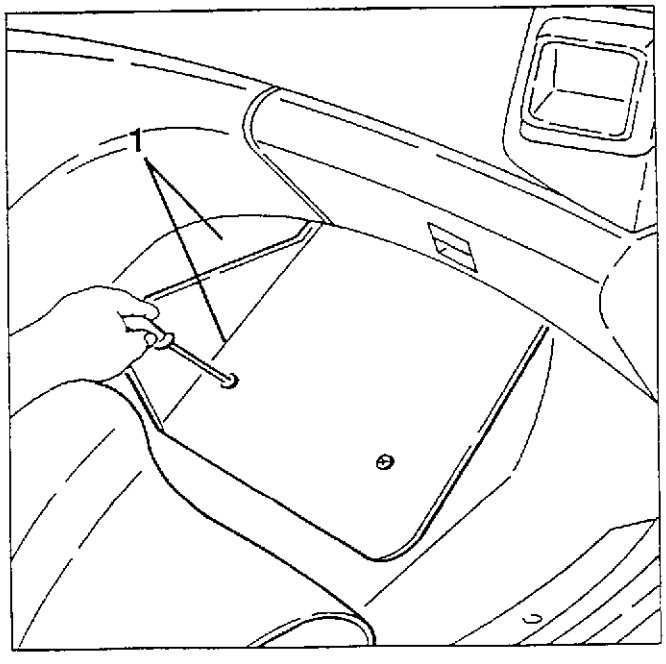
- Disconnect the battery (-) terminal..
1. Disconnect the control unit electrical connection.
2. Slacken the two screws fastening the control unit and remove it.



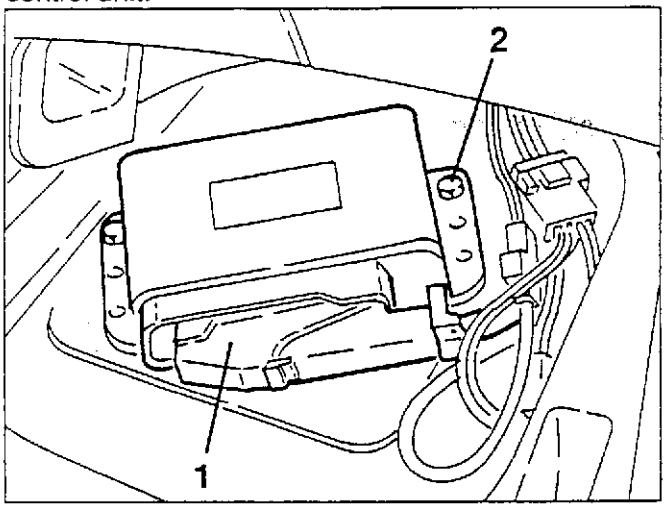
IGNITION-INJECTION CONTROL UNIT (Boxer versions)

REMOVAL/REFITTING

The following procedure refers to the MOTRONIC M2.10.3 system; and it is also valid for the IAW and MOTRONIC MP3.1 system.
1. Working in the front passenger floor area, turn back the specially cut mat, slacken the two fastening screws and remove the control unit cover.



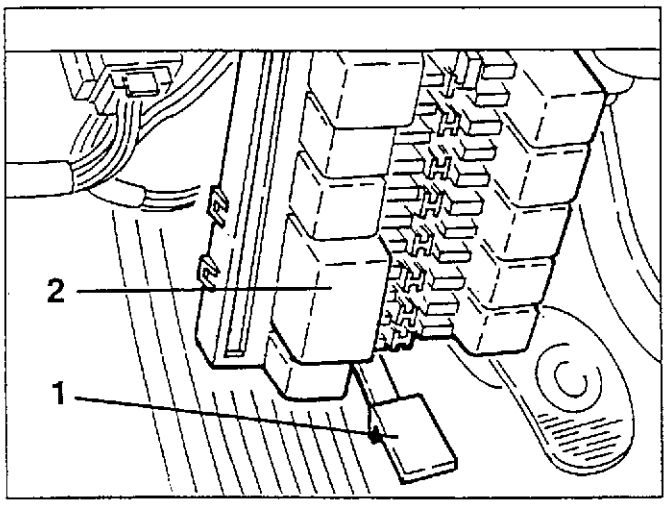
1. Disconnect the combs from the control unit.
2. Slacken the fastening screws and remove the control unit.



DOOR LOCK CONTROL UNIT

REMOVAL/REFITTING

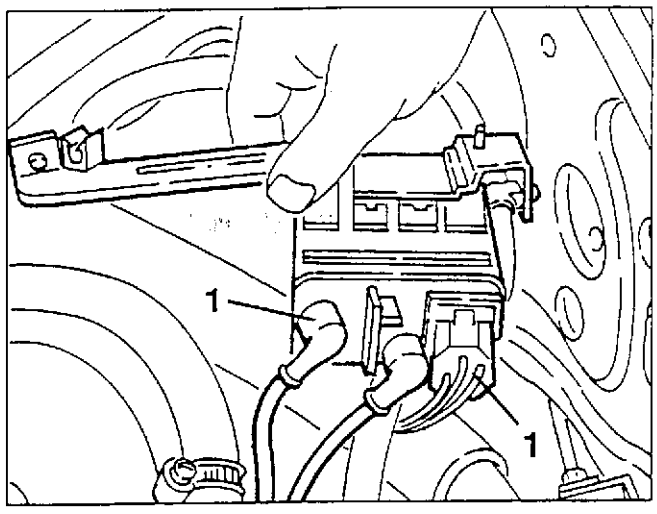
- Disconnect the battery (-) terminal.
1. Use the special lever to lower the fuse box.
2. Remove the door lock control unit.



GLOW PLUG WARMING CONTROL UNIT (1929 TD)

REMOVAL/REFITTING

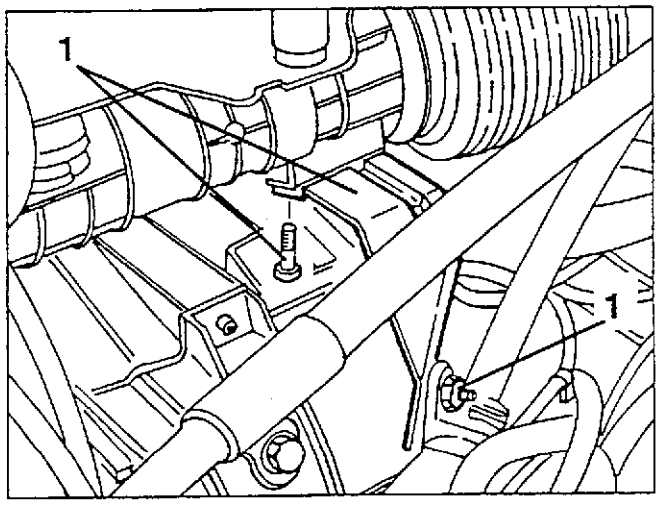
- Remove the battery and its support bracket.
1. Suitably turn the glow plug warming control unit and disconnect the electrical connections.
2. Remove the glow plug warming control unit complete with bracket, if necessary separate them on the bench.



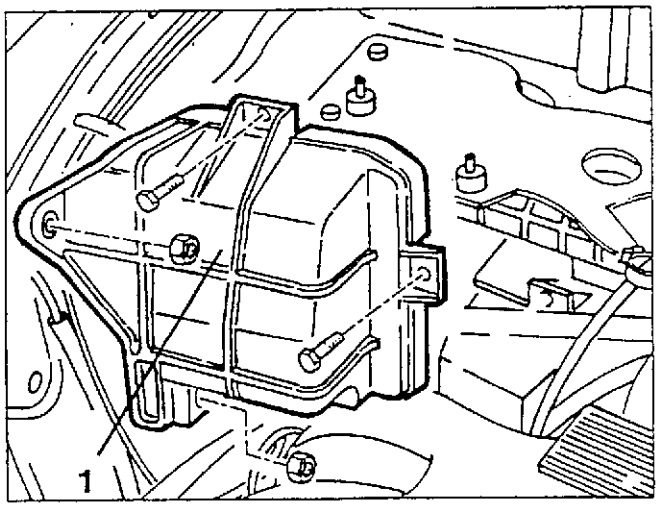
A.B.S. CONTROL UNIT

REMOVAL/REFITTING (Boxer versions)

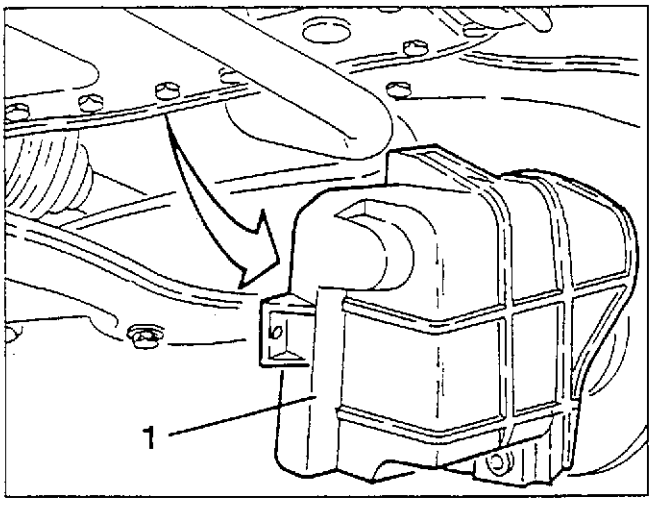
- Disconnect the battery (-) terminal..
- Remove the complete air cleaner (see GROUP 10).
1. Remove the power steering hose support bracket.



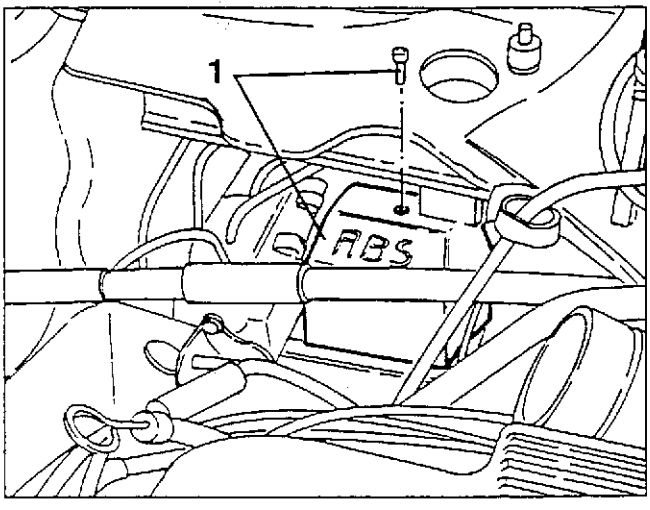
1. Slacken the screws and fastening nuts and remove the front half box of the A.B.S. hydraulic unit.



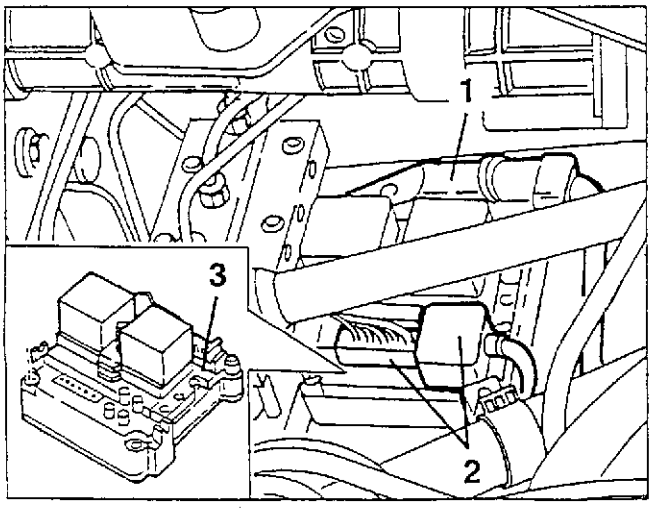
- Raise the car.
1. Slacken the remaining fastening nut and remove the rear half box of the A,B,S, hydraulic aggregate.



- Lower the car.
1. Slacken the fastening screw and remove the cover from the A.B.S. control unit.

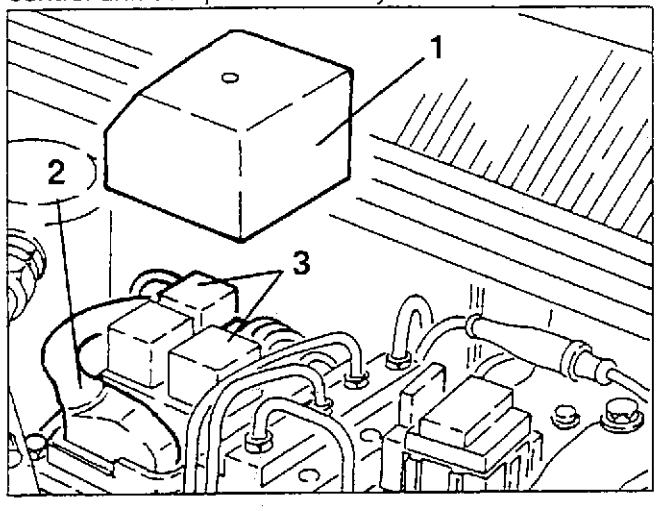


1. Disconnect the combs from the A.B.S. control unit.
2. Disconnect the two electrical connections.
3. Slacken the fastening screws and remove the A.B.S. A.B.S. control unit complete with relays.



REMOVING/REFITTING (1929 TD - T. SPARK 16V)

- Disconnect the battery (-) terminal.
- Slacken the fastening screw and raise the brake-clutch fluid reservoir as far as necessary.
1. Slacken the fastening screw and remove the cover from the A.B.S. electronic control unit.
2. Disconnect the electric wiring combs from the A.B.S. control unit.
3. Disconnect the two electrical connections illustrated from the A.B.S. control unit
- Slacken the fastening screws and remove the A.B.S. control unit complete with relays.

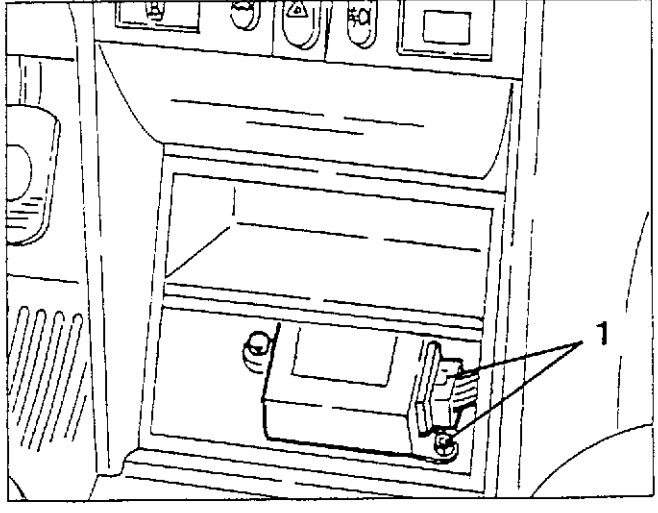


NOTE: The '97 versions with T. SPARK and TD engines have a BOSCH 5.3 ABS system which does not have the possibility to disassemble the hydraulic aggregate and this removal of the control unit; in the event of a fault the hydraulic aggregate must be replaced entirely (see GROUP 33).

AIR-BAG CONTROL UNIT

REMOVING/REFITTING

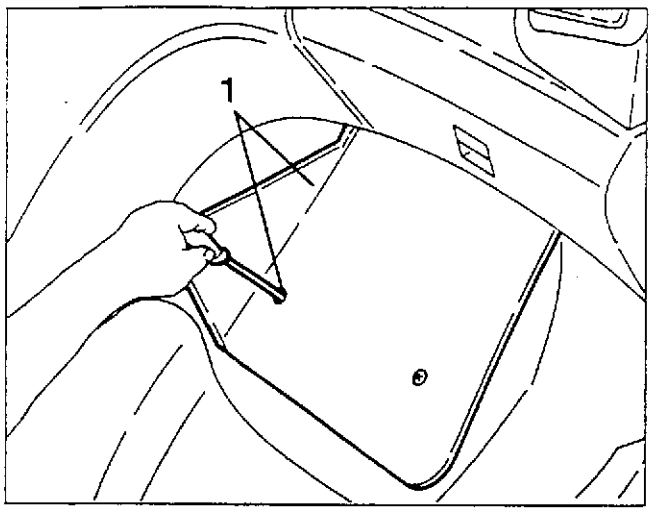
- Disconnect the battery (-) terminal.
- Remove the glovebox.
1. Disconnect the connection, slacken the two fastening nuts and remove the control unit.



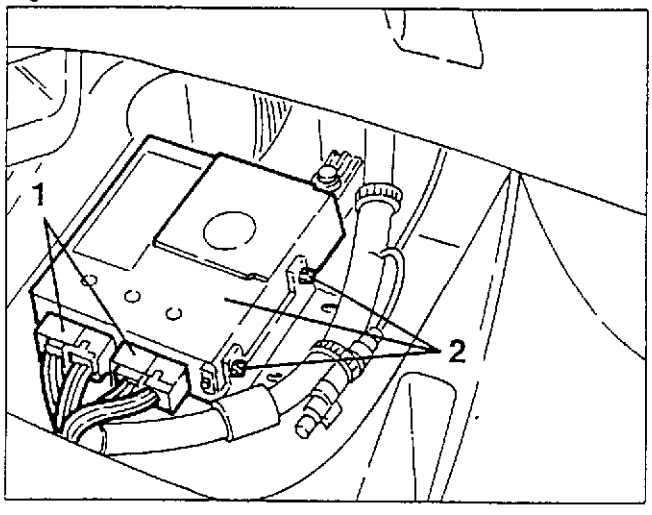
INJECTION - IGNITION CONTROL UNIT ROCHESTER (Boxer version 1596)

REMOVING/REFITTING

- Disconnect the battery (-) terminal.
1. Working in the front passenger floor area, overturn the mat, slacken the two fastening screws and remove the control unit cover.



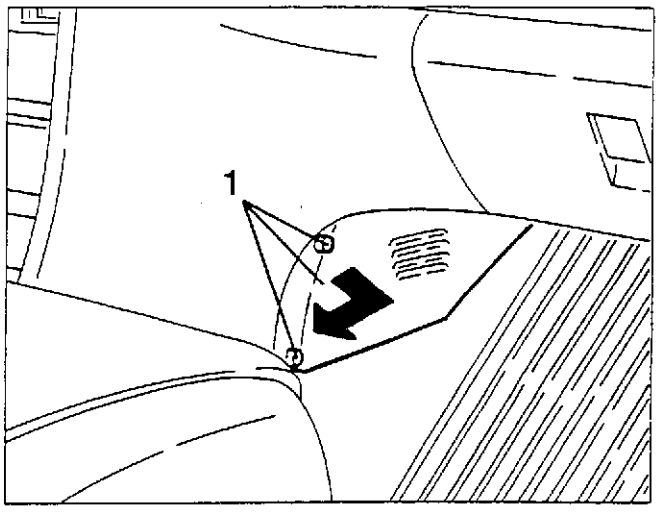
1. Disconnect the two electrical connections from the control unit.
2. Slacken the fastening nuts and remove the injection - ignition control unit.



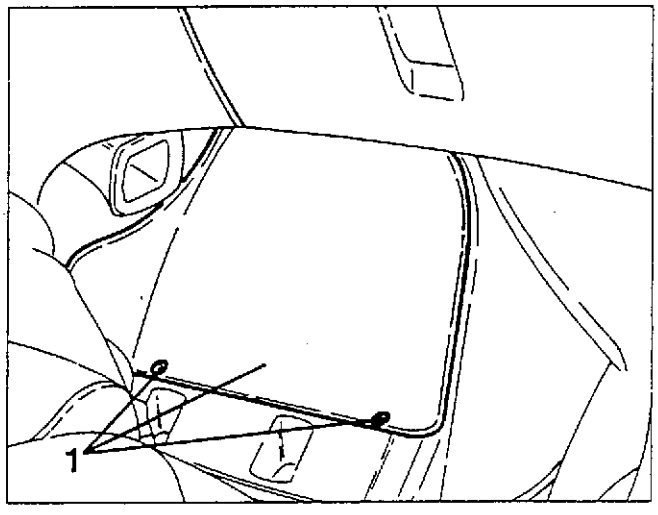
INJECTION - IGNITION CONTROL UNIT M2.10.3/M2.10.4 (T. Spark 16V versions)

REMOVING/REFITTING

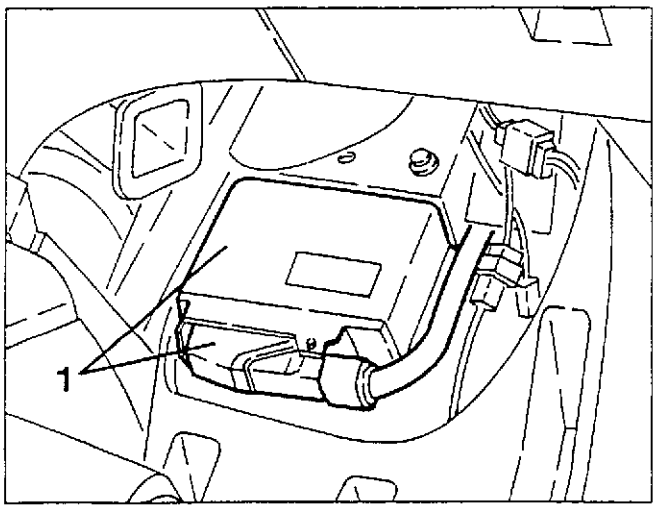
- Disconnect the battery (-) terminal.
1. Slacken the two fastening screws then remove the trim of the air vent to the front passenger feet area.



1. Overturn the mat, slacken the two fastening screws and remove the control unit cover.



1. Disconnect the combs from the control unit, then remove it after slackening the two fastening screws.



E.G.R. SYSTEM CONTROL UNIT

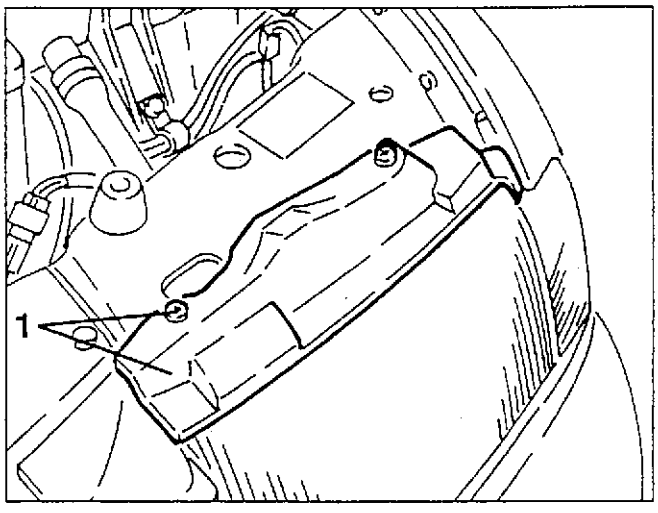
(1929 TD Cat)

NOTE:
For the operating logic of the control unit and the description of the exhaust gas recirculation system, refer to the corresponding paragraph in Group 10 specific for this car.

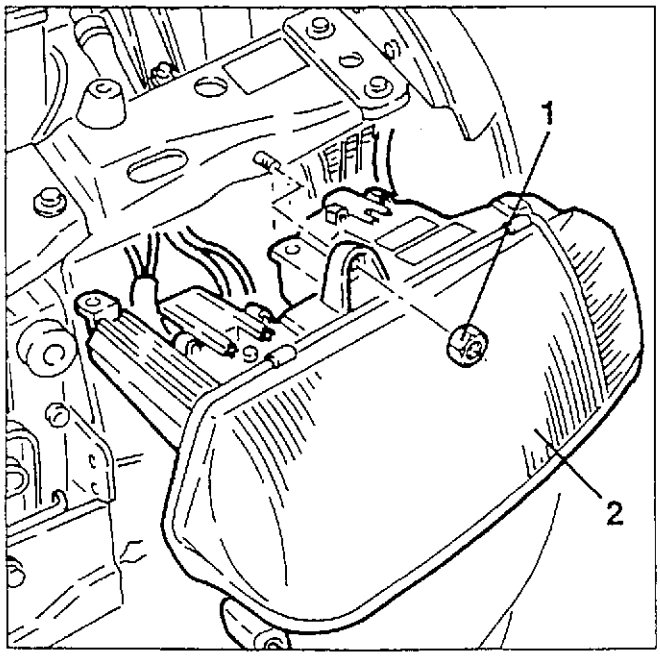
REMOVING/REFITTING

- Disconnect the battery (-) terminal.
- Remove the radiator grille (see GROUP 70).

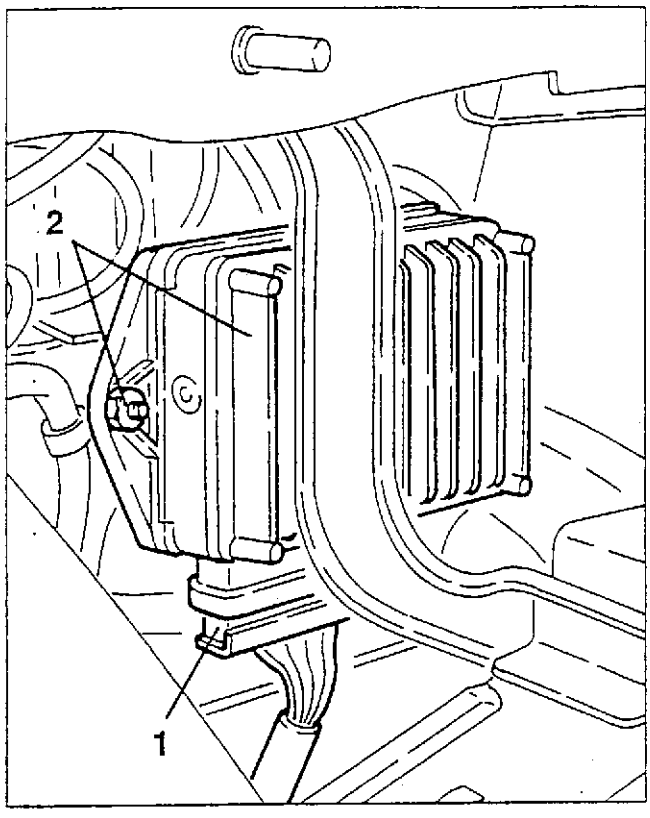
1. Slacken the fastening screws and remove the left front headlamp upper cover.



1. Slacken the three nuts fastening the left headlamp to the body.
2. Move the headlamp forward just enough to disconnect the electrical connections, then remove it complete with direction indicator.



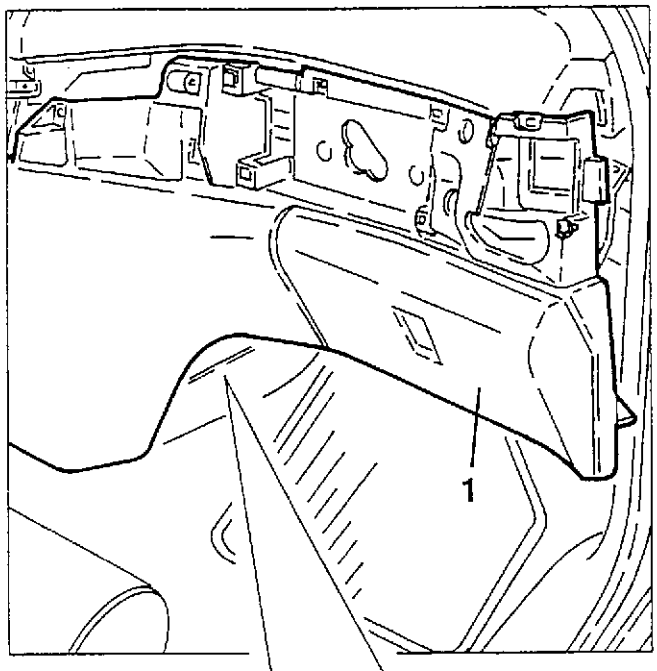
1. Working from the recess obtained by removing the headlamp, disconnect the electrical connection from the control unit.
2. Slacken the two fastening nuts, then remove the control unit.

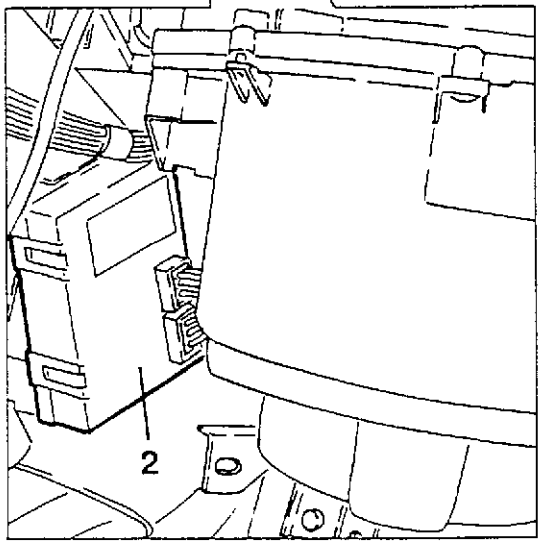


AUTOMATIC CLIMATE CONTROL SYSTEM CONTROL UNIT

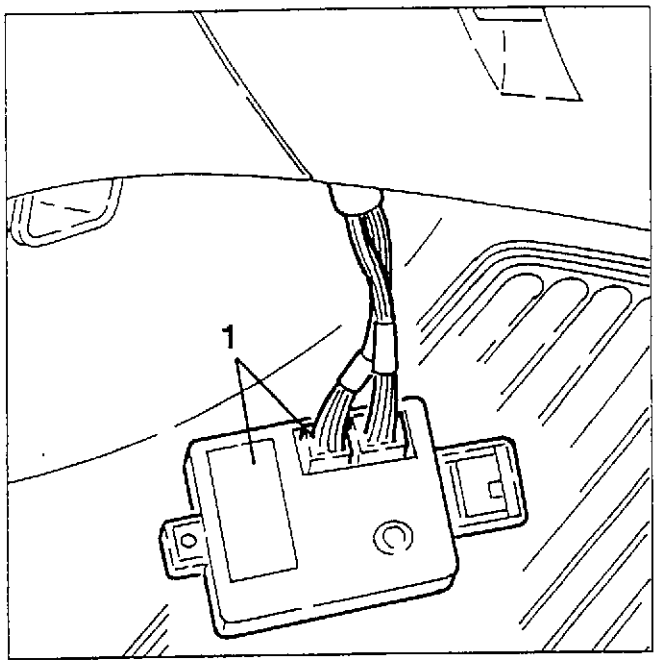
REMOVING/REFITTING

- Disconnect the battery (-) terminal.
1. Move away the lower part of the dashboard as illustrated (see GROUP 70).
2. Release the control unit from the fastening catch and withdraw it to gain access to the electrical connections.





1. Disconnect the electrical connections from the control unit, then remove it.

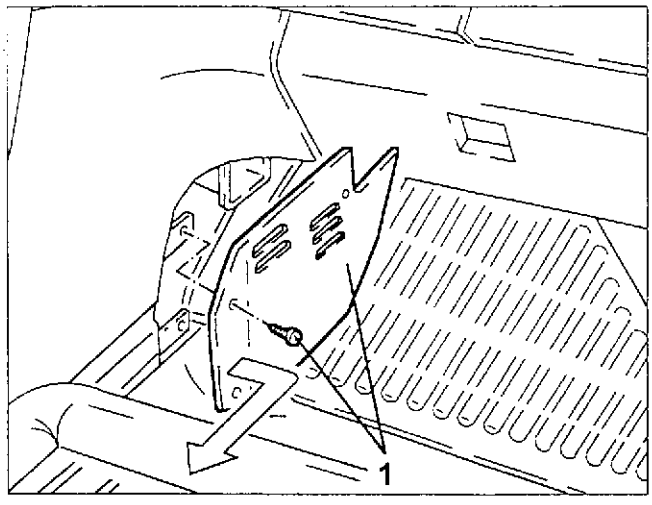


INJECTION CONTROL UNIT (1910 JTD Version)

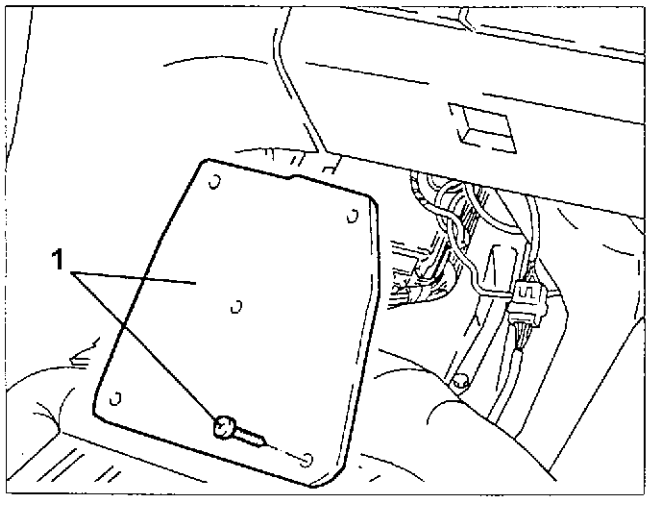
REMOVAL/REFITTING

- Make sure that the ignition key is in the «STOP» position, then disconnect the (-) battery terminal.

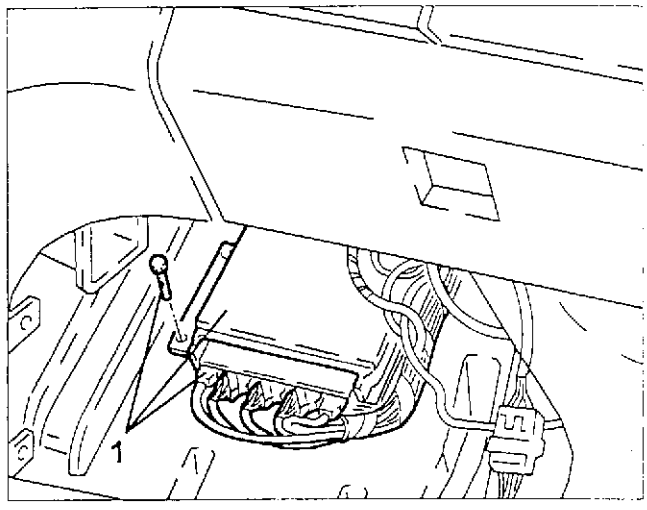
1. Slacken the two fastening screws, then remove the trim of the air delivery vent to the feet of the front passenger.



1. Move aside the mat, then remove the control unit cover after slackening the fastening screws.



1. Slacken the fastening screws, disconnect the electrical connections and remove the injection control unit.

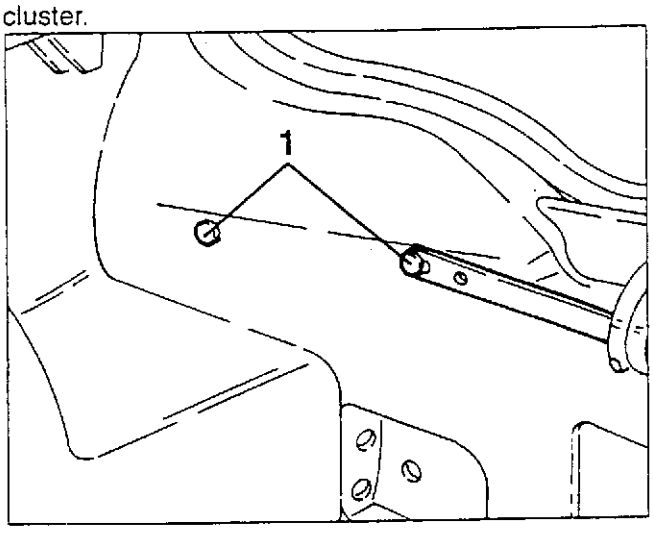


TAIL LIGHT CLUSTERS

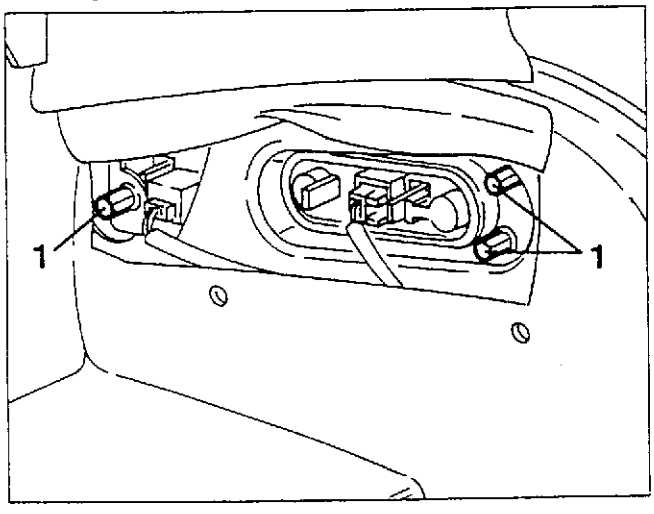
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.

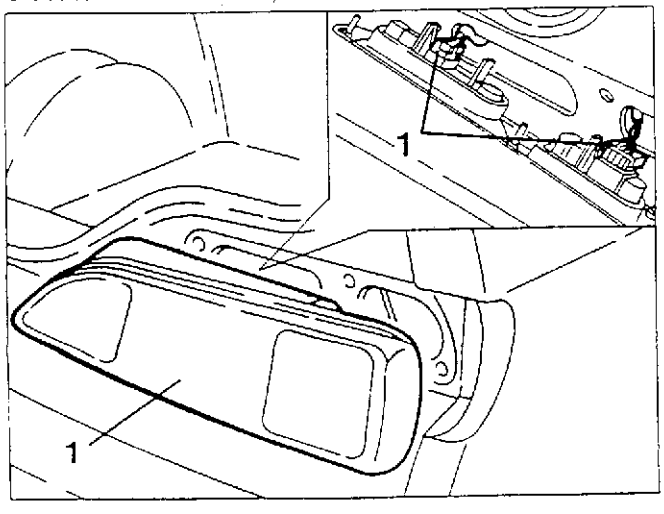
1. Working from the luggage compartment remove the two plastic buttons to gain access to the tail light cluster.



1. Raise the edge of the specially arranged trim, then slacken the four nuts fastening the tail light cluster to the body.



1. Working from the outside of the car, withdraw the tail light cluster just enough to disconnect the two electrical connections, then remove it.

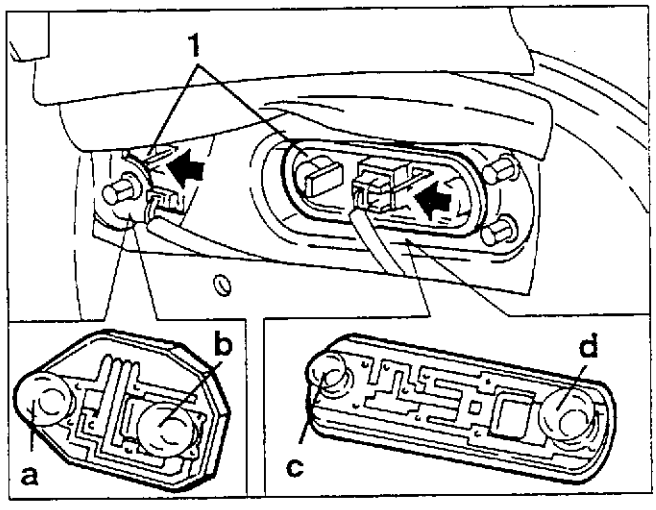


REPLACING TAIL LIGHT CLUSTER BULBS

- Working from the luggage compartment remove the two plastic buttons to gain access to the tail light cluster.

1. Raise the edge of the specially arranged trim, then pressing the special tabs as illustrated, remove the two bulb holders.

2. Remove the direction indicator bulb (**a**), the fog guard bulb (**b**) (for the left-hand lamp it is the reversing light bulb), the side light bulb (**c**) and the stop light bulb (**d**) pressing and twisting them counter-clockwise.



REAR CEILING LAMP

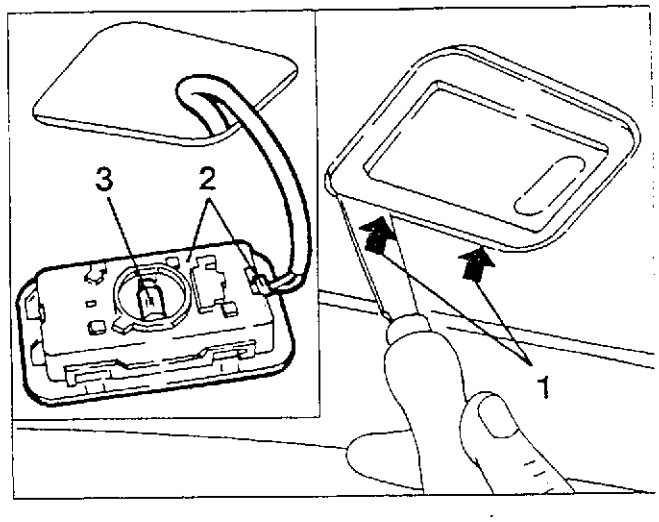
REMOVAL/REFITTING

- Disconnect the battery (-) terminal.

1. Working on the two catch teeth, positioned as illustrated, prise and pull out the rear ceiling lamp.

2. Disconect the electrical connection and remove the rear ceiling lamp.

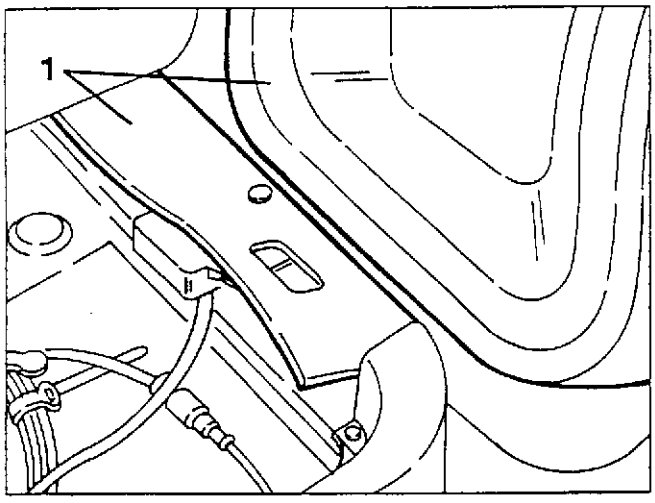
3. If necessary, remove the bulb pulling it outwards and releasing it from the side contacts.



CEILING LAMP TIMER

REMOVAL/REFITTING

- Disconnect the battery (-) terminal.
1. Raise the raight-hand side rear cushion and move aside the floor trim to gain access to the ceiling lamp timer.



1. Disconnect the electrical connection, slacken the two fastening screws and remove the ceiling lamp timer.