

Workshop Manual Audi A8 2003 >

Motronic injection and ignition system (6-cyl.)								
Engine ID	ASN	BBJ						

Edition 06.2003



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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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24 – Mixture preparation - injection

1 Servicing motronic injection system

1.1 Safety measures

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If you want to crank engine at starting speed without actually starting it (for example, in order to test compression pressure), first unplug connectors from ignition coils and also from injectors.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. Therefore, interrogate and, if necessary, delete the fault memory after all repairs and tests.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.



Caution

The fuel system is pressurised. Before opening the system place a cloth around the connection. Then dissipate pressure by carefully unfastening the connection.

Note the following if testers and measuring instruments have to be used during a road test:



Caution

- ◆ **Test equipment must always be secured on the rear seat and operated from that position by a second person.**
- ◆ **If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, the person sitting in this seat could be seriously injured when the airbag is triggered.**

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1.2 Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following "6 rules":

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ◆ Carefully cover or seal opened components if repairs are not to be performed immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).



- ◆ When the system is open: Do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.
- ◆ Unplugged electrical connectors; keep them clean and dry. Make sure connections are dry when attaching.

1.3 Technical data

Engine code letters		ASN (3.0 ltr. / 5V / 162 kW engine)	BBJ (3.0 ltr. / 5V / 160 kW engine)
Idling speed Cannot be adjusted; regulated by idling speed stabilisation		700 ... 800 rpm ¹⁾	700 ... 800 rpm ¹⁾
Speed governing by deactivation of fuel injectors		approx. 6800 rpm	approx. 6800 rpm
Fuel pressure at idling speed	Vacuum hose connected	3.2 ... 3.8 bar	3.2 ... 3.8 bar
	Vacuum hose disconnected	3.8 ... 4.2 bar	3.8 ... 4.2 bar
Residual pressure after 10 minutes	Engine cold	approx. 2.2 bar	approx. 2.2 bar
Residual pressure after 10 minutes		approx. 3.0 bar	approx. 3.0 bar
Fuel injectors	Spray pattern	Two-hole nozzle / same for all injectors	Two-hole nozzle / same for all injectors
	Injection quantity (30 s)	90 ... 125 ml	90 ... 125 ml
	Resistance (room temperature)	11 ... 13 Ω	11 ... 13 Ω

1) Depending on engine oil temperature / gearbox oil temperature an engine speed increase up to 980 rpm is possible.

1.4 Overview - fitting locations



Note!

The illustration does not show the electric fuel pump II relay -J49-.
Fitting location ⇒ [page 8](#).



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1 - Solenoid valve 1 for activated charcoal filter -N80-

- Fitting location
⇒ [page 10](#)

2 - Fuel pump relay -J17-

- Fitting location
⇒ [page 7](#)

3 - Hall sender 3 -G300-

- for exhaust camshaft bank 1
- Fitting location
⇒ [page 11](#)

4 - Coolant temperature sender -G62-

- Fitting location
⇒ [page 11](#)

5 - Hall sender -G40-

- for inlet camshaft bank 1
- Fitting location
⇒ [page 11](#)

6 - Bracket for connectors - rear centre

- Assignment
⇒ [page 9](#)

7 - Hall sender 2 -G163-

- for inlet camshaft bank 2
- Fitting location
⇒ [page 11](#)

8 - Hall sender 4 -G301-

- for exhaust camshaft bank 2
- Fitting location
⇒ [page 11](#)

9 - Ignition coils with output stages, bank 2

- Cylinder 4 ignition coil 4 with output stage -N292-
- Cylinder 5 ignition coil 5 with output stage -N323-
- Cylinder 6 ignition coil 6 with output stage -N324-

10 - Valve 2 for camshaft adjustment, exhaust -N319-

- Bank 2

11 - Valve 2 for camshaft adjustment -N208-

- Bank 2

12 - Fuel pressure regulator

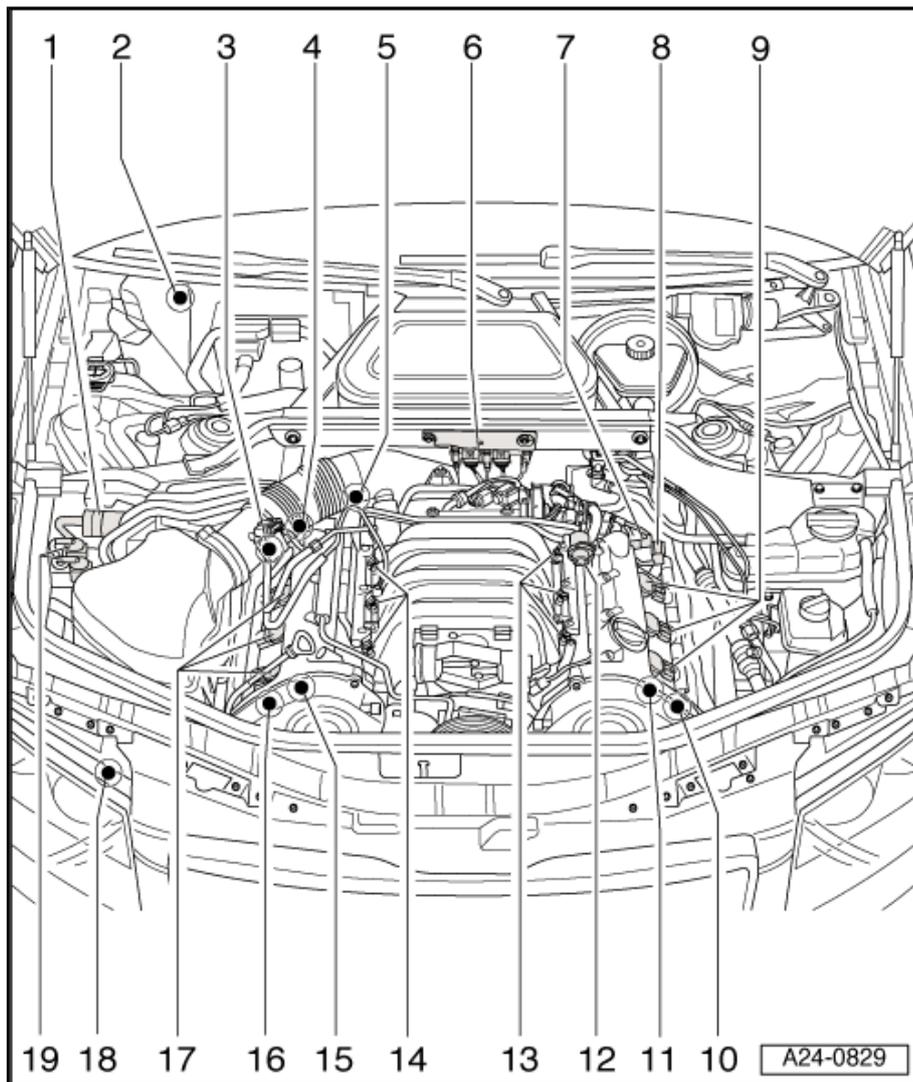
- Checking ⇒ [page 23](#)

13 - Injectors, bank 2

- Cylinder 4 injector, cylinder 4 -N33-
- Cylinder 5 injector, cylinder 5 -N83-
- Cylinder 6 injector, cylinder 6 -N84-
- Checking injection quantity and spray pattern; checking for leaks ⇒ [page 30](#)
- Removing and installing ⇒ [page 28](#)

14 - Injectors, bank 1

- Cylinder 1 injector, cylinder 1 -N30-



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- Cylinder 2 injector, cylinder 2 -N31-
- Cylinder 3 injector, cylinder 3 -N32-
- Checking injection quantity and spray pattern; checking for leaks => [page 30](#)
- Removing and installing => [page 28](#)

15 - Valve 1 for camshaft adjustment, inlet -N205-

- Bank 1

16 - Valve 1 for camshaft adjustment, exhaust -N318-

- Bank 1

17 - Ignition coils with output stages, bank 1

- Cylinder 1 ignition coil 1 with output stage -N70-
- Cylinder 2 ignition coil 2 with output stage -N127-
- Cylinder 3 ignition coil 3 with output stage -N291-

18 - Secondary air pump motor -V101-

- Fitting location => [page 10](#)

19 - Bracket for connectors - right side of vehicle

- Assignment => [page 8](#)

20 - Lambda probe, before catalytic converter -G39- with Lambda probe heater -Z19-

- Bank 1, probe 1
- Continuous-action Lambda probe
- Fitting location => [page 9](#)
- Removing and installing => [page 32](#)

21 - Lambda probe, after catalytic converter -G130- with Lambda probe heater 1, after catalytic converter -Z29-

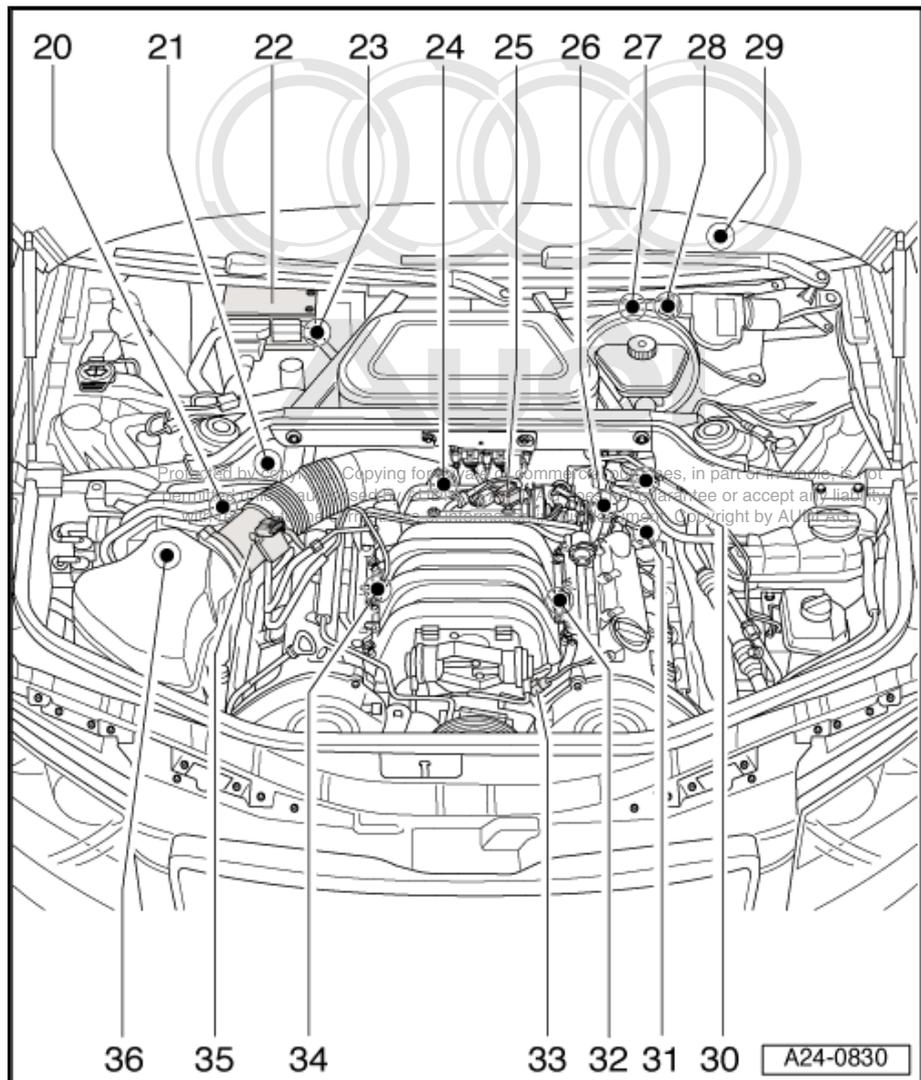
- Bank 1, probe 2
- Two-state Lambda probe
- Fitting location => [page 9](#)
- Removing and installing => [page 35](#)

22 - Engine control unit -J623-

- Fitting location => [page 8](#)
- Removing and installing => [page 21](#)

23 - Electronics box, plenum chamber

- Fitting location for secondary air pump relay -J299-, Motronic current supply relay -J271- and secondary air pump fuse -S130- (50 amp) => [page 8](#)



24 - Throttle valve module -J338-

- Including throttle valve drive (electric throttle operation) -G186- , angle sender for throttle valve drive -G187- and angle sender 2 for throttle valve drive -G188-

25 - Secondary air inlet valve -N112-

- Fitting location ⇒ [page 10](#)

26 - Engine speed sender -G28-

- Fitting location ⇒ [page 9](#)

27 - Accelerator pedal sender -G79- and accelerator pedal sender 2 -G185-

Fitting location ⇒ [page 7](#)

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28 - Brake light switch -F- and brake pedal switch -F47-

- Fitting location ⇒ [page 7](#)

29 - Instrument cluster

- Fitting location for exhaust emissions warning lamp -K83- ⇒ [page 6](#) and electronic power control fault lamp -K132- (EPC lamp) ⇒ [page 6](#)

30 - Lambda probe 2, after catalytic converter -G131- with Lambda probe heater 2, after catalytic converter -Z30-

- Bank 2, probe 2
- Two-state Lambda probe
- Fitting location ⇒ [page 9](#)
- Removing and installing ⇒ [page 37](#)

31 - Lambda probe 2, before catalytic converter -G108- with Lambda probe heater 2 -Z28-

- Bank 2, probe 1
- Continuous-action Lambda probe
- Fitting location ⇒ [page 9](#)
- Removing and installing ⇒ [page 32](#)

32 - Knock sensor II -G66-

- Bank 2
- Beneath intake manifold

33 - Intake manifold change-over valve -N156-

- Fitting location ⇒ [page 10](#)

34 - Knock sensor I -G61-

- Bank 1

35 - Air mass meter -G70- with intake air temperature sender -G42-

36 - Earth connection

- On longitudinal member (right-side)

Fitting location of exhaust emissions warning lamp -K83-

- ◆ In instrument cluster.

Function

After switching on the ignition the engine control unit switches on the exhaust emissions warning lamp -K83-. Shortly after engine is started, the exhaust emissions warning lamp -K83- goes out if engine control unit has not recognised any faults detrimental to the emission values and there is also no problem with actuation of the lamp by the engine control unit.

Fault messages

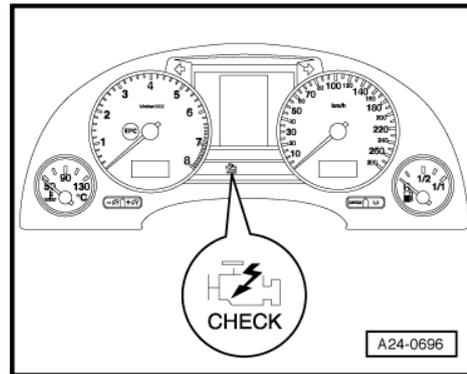
If faults which cause the exhaust emissions to deteriorate are detected when the engine is on, the engine control unit switches on the exhaust emissions warning lamp -K83-, which will then either flash or light up constantly. At the same time a fault code is stored in the fault memory of the engine control unit.

If lamp stays lit:

A fault detrimental to emissions has occurred. The fault memory of the engine control unit has to be interrogated.

If lamp flashes:

A fault has occurred which, under these driving conditions, will cause damage to the catalytic converter (e.g. misfiring). In this case the vehicle may only be driven with reduced power.



Note!

Fault memory must be interrogated in the event of engine running problems or a customer complaint, even if exhaust emissions warning lamp -K83- does not light up. The fault memory may include faults which do not activate the exhaust emissions warning lamp immediately, but only if fault is detected again following the next engine start.

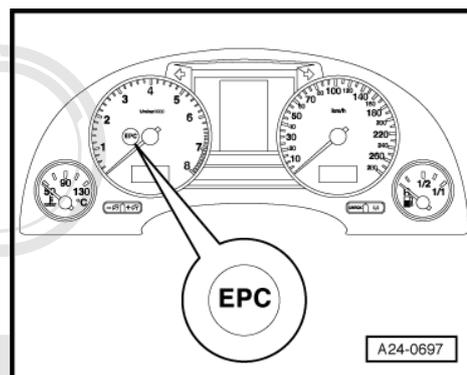
Fitting location of electronic power control fault lamp -K132- (EPC lamp)

- ◆ In instrument cluster.

“EPC” is the abbreviation for “Electronic Power Control”.

After switching on the ignition the engine control unit switches on the electronic power control fault lamp -K132-. Shortly after engine is started, the electronic power control fault lamp -K132- goes out if engine control unit has not recognised any faults in EPC system and there is also no problem with actuation of the lamp by the engine control unit.

If a fault is detected in the EPC system while the engine is running, the engine control unit switches on the electronic power control fault lamp -K132- (EPC lamp). At the same time a fault code is stored in the fault memory of the engine control unit.



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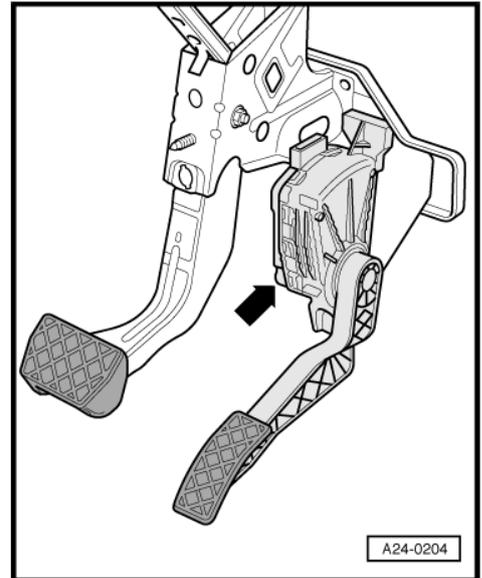
Fitting location of accelerator pedal sender -G79- and accelerator pedal sender 2 -G185-

- ◆ Integrated in accelerator pedal module -arrow-.

 Note!

- ◆ *Diagram shows set-up on left-hand drive vehicles.*
- ◆ *The accelerator pedal position sender -G79- and accelerator pedal position sender -2- -G185- are integrated in the accelerator pedal module and cannot be renewed individually.*

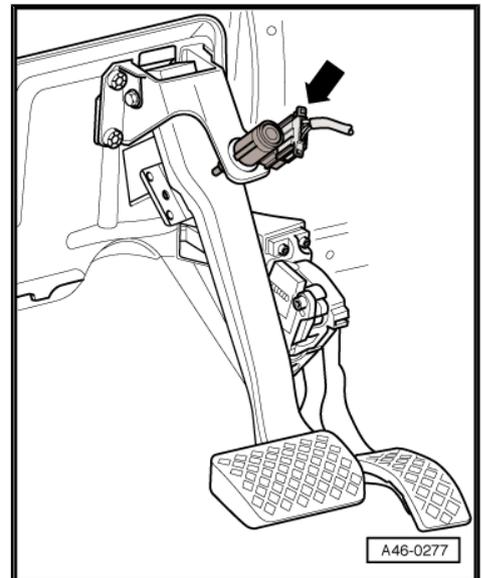
Removing and installing accelerator pedal module ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 .



Fitting location of brake light switch -F- and brake pedal switch -F47-

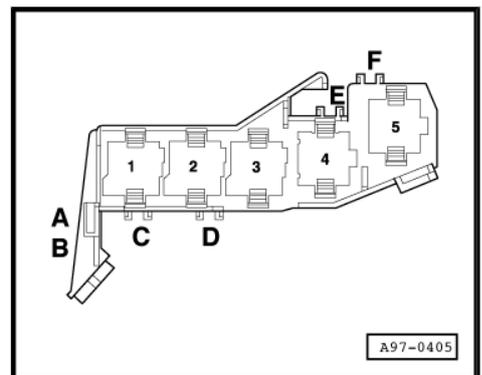
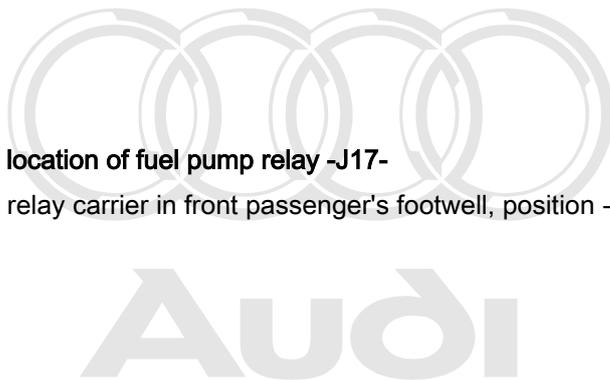
- ◆ On pedal bracket -arrow-.

Removing and installing switch ⇒ Brake system; Rep. Gr. 46 .



Fitting location of fuel pump relay -J17-

- ◆ On relay carrier in front passenger's footwell, position -4-.

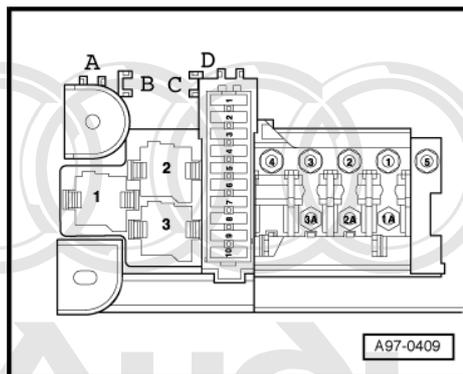


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Fitting location of electric fuel pump II relay -J49-

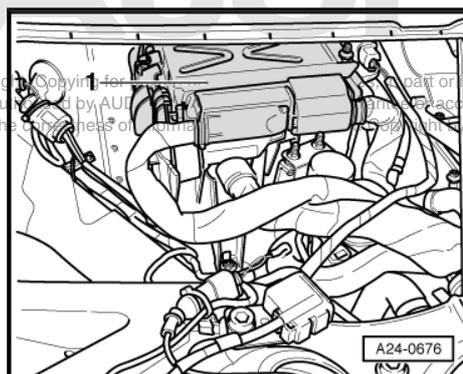
- ◆ On relay and fuse carrier on right side of boot, position -3-.



Fitting location of engine control unit -J623-

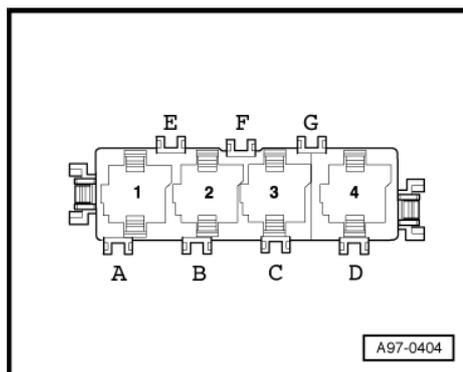
- ◆ The engine control unit -J623- -Item 1- is located on top of electronics box at plenum chamber.

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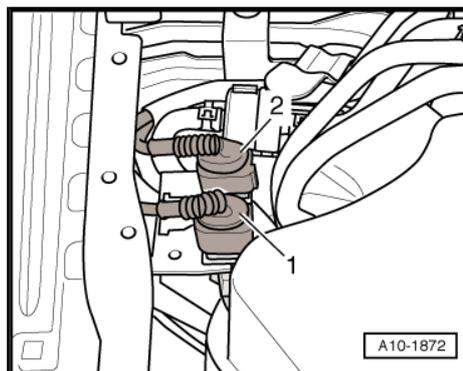
Fitting locations in electronics box (plenum chamber).

- 1 - Secondary air pump relay -J299-
- 3 - Motronic current supply relay -J271-
- B - Secondary air pump relay -S130- (50 amp)



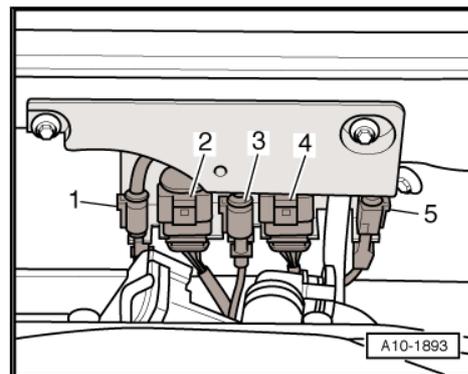
Coonector allocation on bracket - right side of vehicle

- 1 - Electrical connector (dark brown) for Lambda probe -G39- (before catalytic converter) and Lambda probe heater -Z19-
- 2 - Electrical connector (black) for Lambda probe II -G108- (before catalytic converter) and Lambda probe heater 2 -Z28-



Connector allocation on bracket - rear centre

- 1 - Electrical connector (blue) for knock sensor I -G61-
- 2 - Electrical connector (green) for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29-
- 3 - Electrical connector (grey) for engine speed sender -G28-
- 4 - Electrical connector (brown) for Lambda probe II after catalytic converter -G131- and Lambda probe 2 heater, after catalytic converter -Z30-
- 5 - Electrical connector (blue) for knock sensor II -G66-

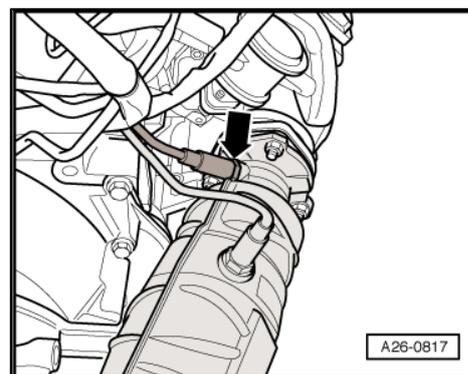


Fitting location of Lambda probes before catalytic converter

- ◆ In front exhaust pipe -arrow-.

i Note!

The illustration shows the Lambda probe -G39- for cylinder bank 1 (right-side).

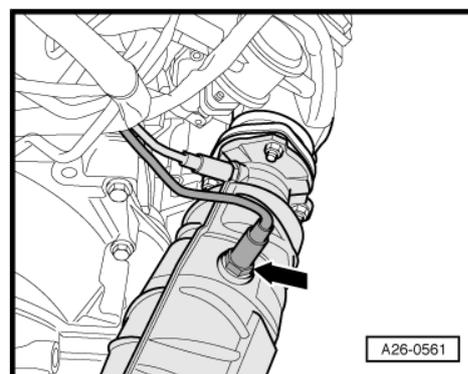


Fitting location of Lambda probes after catalytic converter

- ◆ In catalytic converter -arrow-.

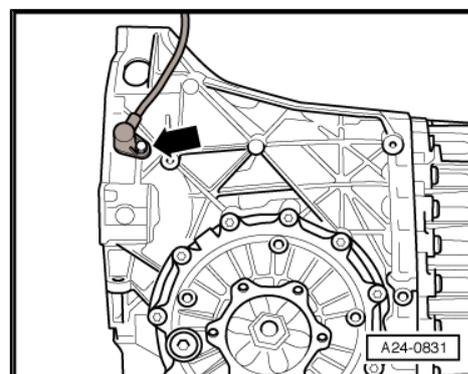
i Note!

The illustration shows the Lambda probe after catalytic converter -G130- for cylinder bank 1 (right-side).



Fitting location of engine speed sender -G28-

- ◆ On top left of gearbox housing -arrow-.

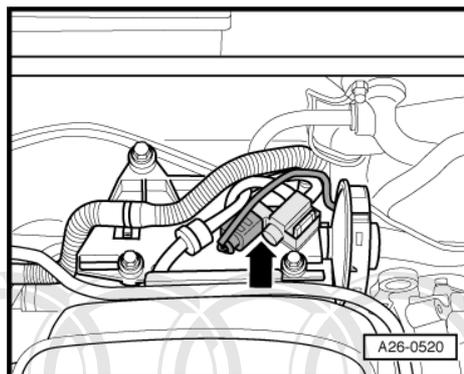


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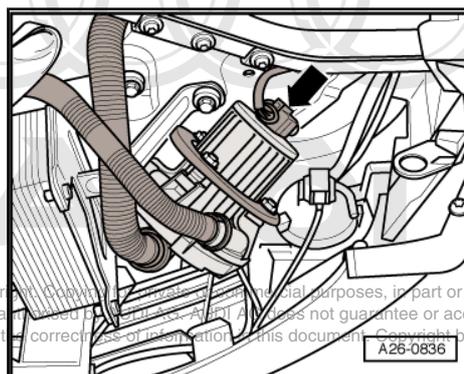
Fitting location of secondary air inlet valve -N112-

- ◆ Inserted on retainer plate for solenoid valves at rear of engine -arrow-.



Fitting location of secondary air pump motor -V101-

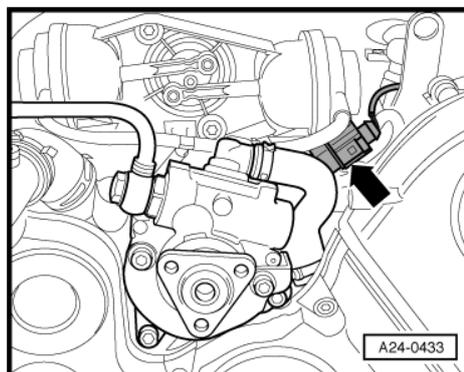
- ◆ On bottom right of longitudinal member -arrow-.



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Fitting location of intake manifold change-over valve -N156-

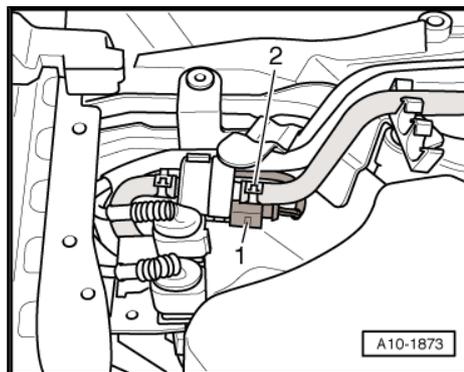
- ◆ Clipped onto vacuum unit at front of intake manifold -arrow-.



Fitting location of activated charcoal filter system solenoid valve I -N80-

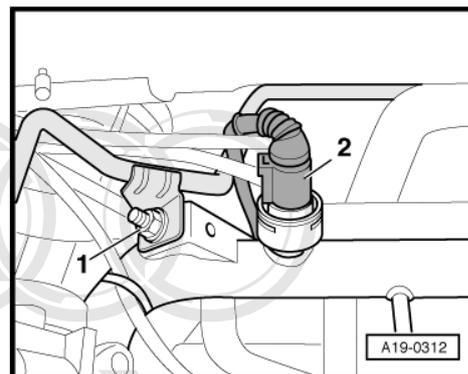
- ◆ At rear right in engine compartment.

- 1 - Electrical connector
- 2 - Vacuum hose



Fitting location of coolant temperature sender -G62-

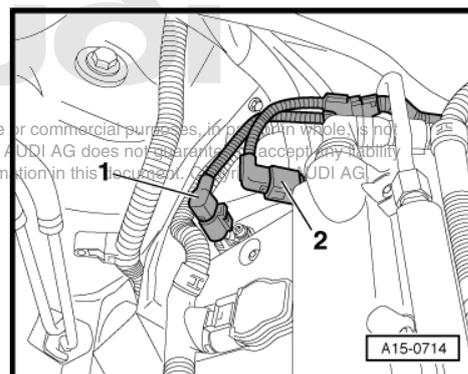
- ◆ At rear of coolant pipe (right-side).
- 2 - Coolant temperature sender -G62-



Fitting location of Hall sender -G40- and Hall sender 3 -G300-

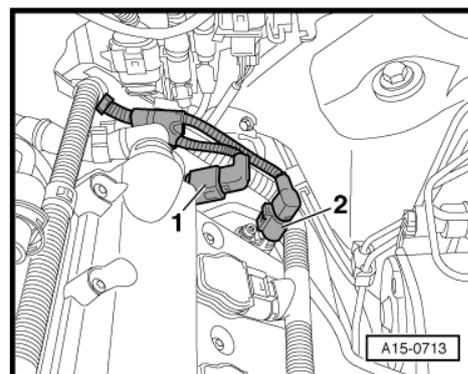
- ◆ At rear of cylinder head (right-side).
- 1 - Hall sender 3 -G300-
- 2 - Hall sender -G40-

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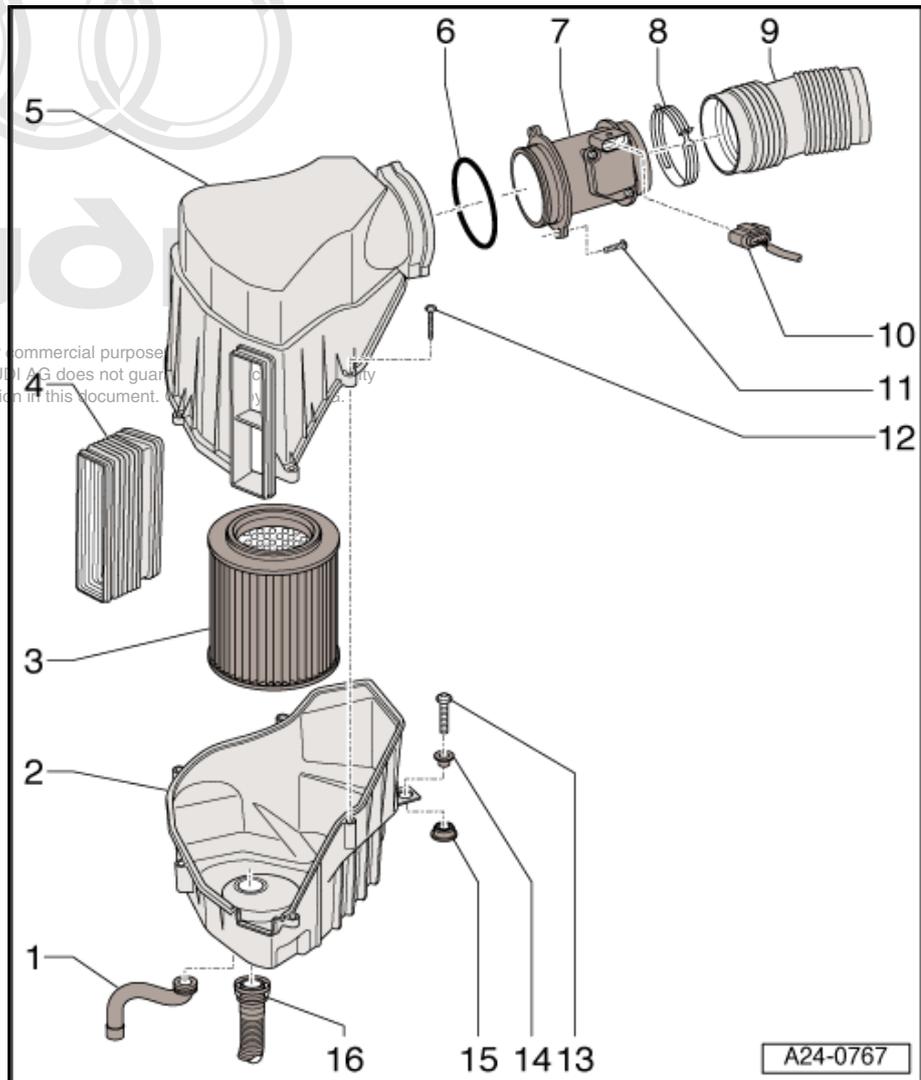
Fitting location of Hall sender 2 -G163- and Hall sender 4 -G301-

- ◆ At rear of cylinder head (left-side).
- 1 - Hall sender 2 -G163-
- 2 - Hall sender 4 -G301-



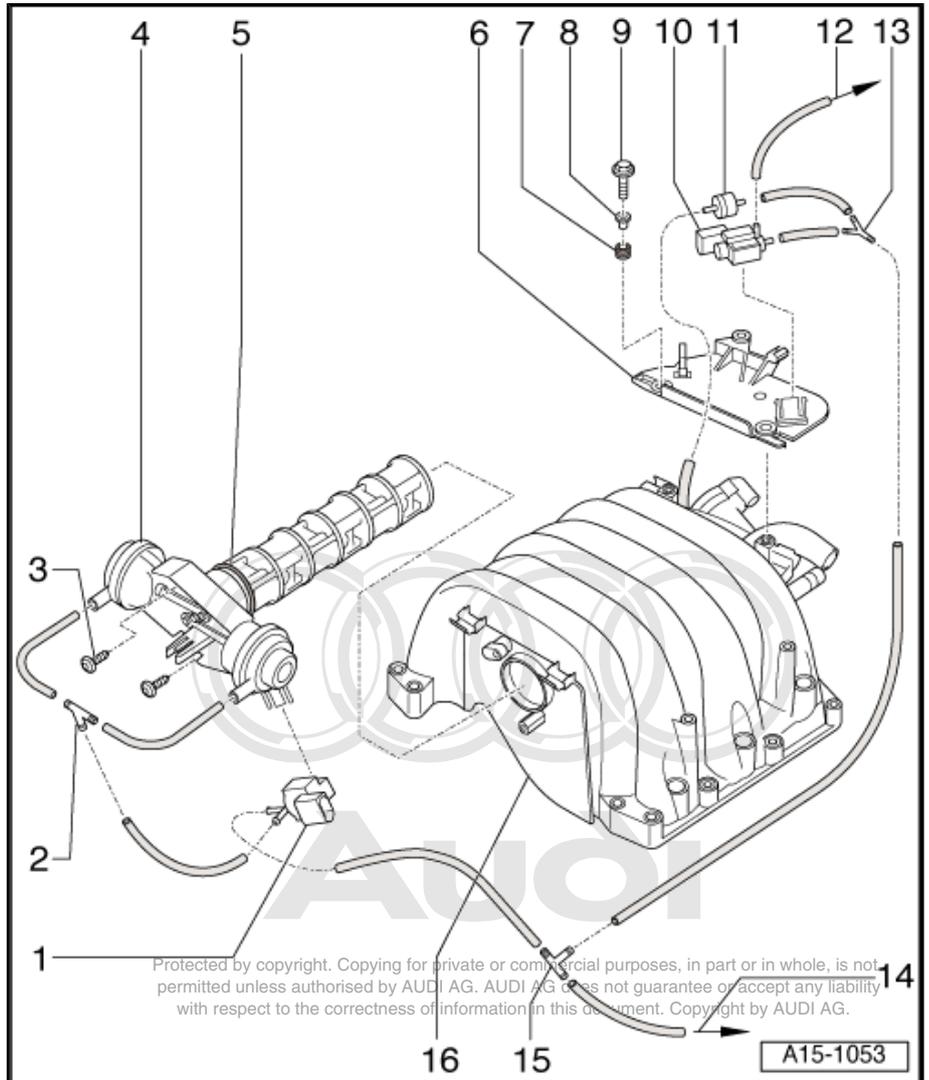
1.5 Dismantling and assembling air cleaner

- 1 - Water drain hose
- 2 - Air cleaner housing (lower section)
- 3 - Filter element
- 4 - Air duct
- 5 - Air cleaner housing (upper section)
- 6 - O-ring
- 7 - Renew
Air mass meter -G70-
- 8 - Spring clip
- 9 - Air intake hose
- 10 - 5-pin electrical connector
- 11 - Cross-head screw
- 12 - Cross-head screw
- 13 - 5 Nm
- 14 - Spacer sleeve
- 15 - Rubber grommet
- 16 - Air hose to secondary air pump motor -V101-



1.6 Intake manifold change-over - exploded view of components

- 1 - Intake manifold change-over valve -N156-
- 2 - Y piece
- 3 - 7 Nm
- 4 - Vacuum unit with change-over barrel
- 5 - O-ring
 - Renew if damaged
- 6 - Securing plate
- 7 - Rubber grommet
- 8 - Spacer sleeve
- 9 - 10 Nm
- 10 - Secondary air inlet valve - N112-
- 11 - Non-return valve
 - Installation position: blue end faces Y piece
- 12 - To combination valves for secondary air inlet
- 13 - Y piece
- 14 - To vacuum reservoir
- 15 - T piece
- 16 - Intake manifold



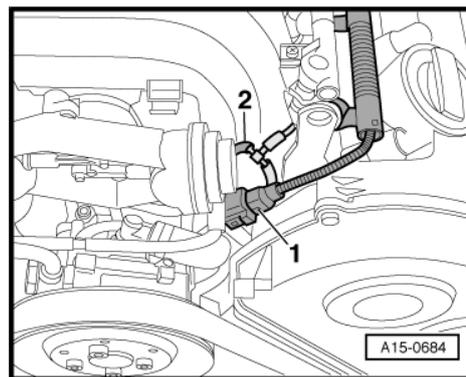
1.7 Removing and installing change-over barrel for intake manifold change-over

1.7.1 Removing

- Move lock carrier into its service position ⇒ General body repairs, exterior; Rep. Gr. 50 .
- Remove poly V-belt ⇒ 6-cylinder engine, mechanics; Rep. Gr. 13 .
- Remove vane pump for power assisted steering ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. Gr. 48 .



- Detach electrical connector -1-.
- Detach vacuum hose -2- from T piece.
- Unscrew bolts and remove vacuum unit with change-over barrel from intake manifold.



1.7.2 Installing

Installation is carried out in the reverse order; note the following:

- Install vane pump for power assisted steering ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. Gr. 48 .
- Install poly V-belt ⇒ 6-cylinder engine, mechanics; Rep. Gr. 13 .
- Install lock carrier ⇒ General body repairs, exterior; Rep. Gr. 50 .

1.7.3 Tightening torque

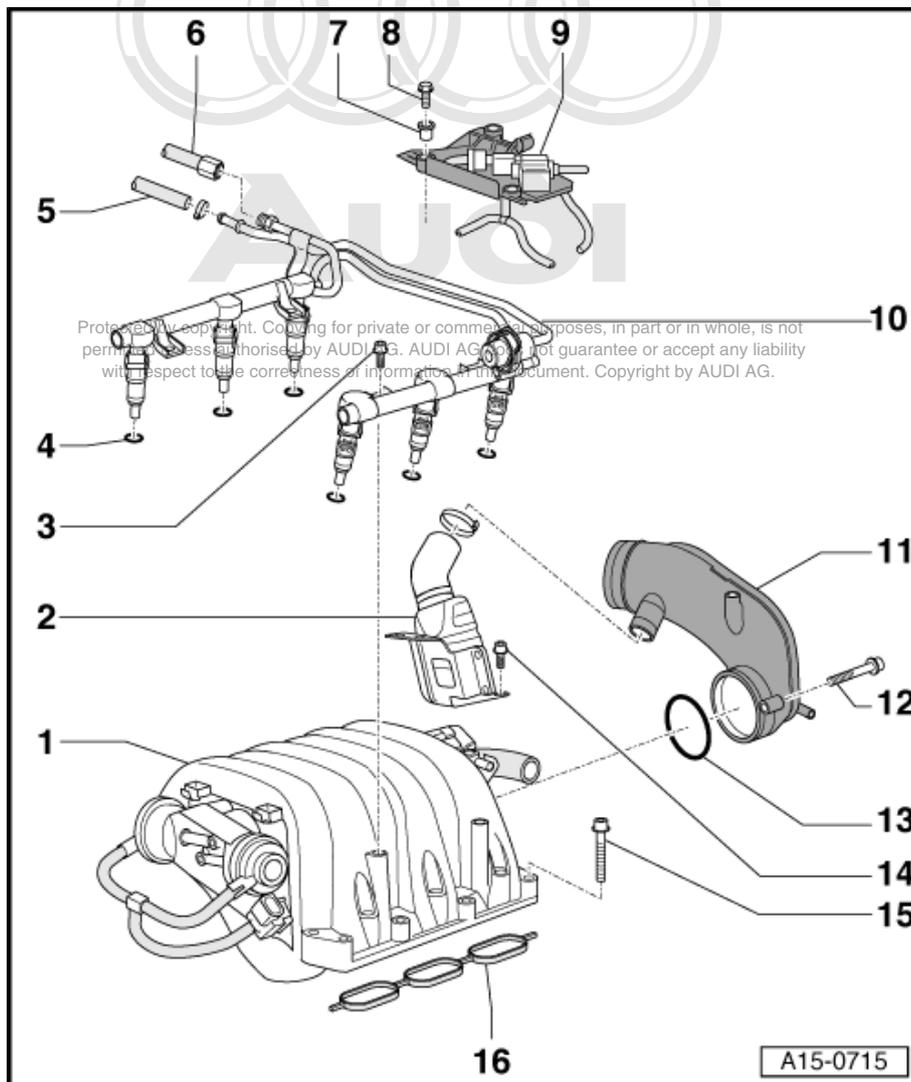
Component	Nm
Vacuum unit with change-over barrel to intake manifold	7



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1.8 Intake manifold - exploded view of components

- 1 - Intake manifold
 - Removing and installing
- 2 - Resonator
- 3 - 10 Nm
- 4 - O-rings
- 5 - Fuel return pipe
- 6 - Fuel supply pipe
 - Tighten union nut to 25 Nm.
- 7 - Bush
- 8 - 10 Nm
- 9 - Retaining plate for solenoid valve
- 10 - Fuel rail
- 11 - Air duct
- 12 - 10 Nm
- 13 - O-ring
 - Renew
- 14 - 10 Nm
- 15 - 10 Nm
 - Tighten in stages and in diagonal sequence
- 16 - Intake manifold gasket
 - Renew



1.9 Removing and installing intake manifold

1.9.1 Removing

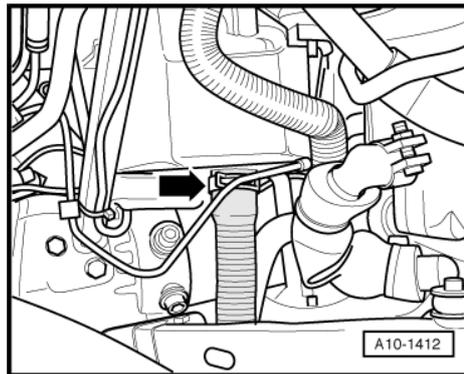
 **Note!**

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

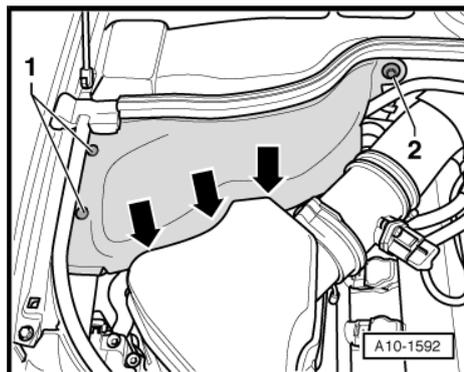
- Drain off coolant ⇒ 6-cylinder engine, mechanics; Rep. Gr. 19.



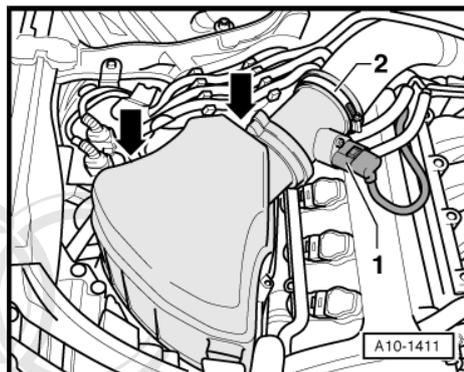
- Detach hose -arrow- to secondary air pump at bottom of air cleaner housing.



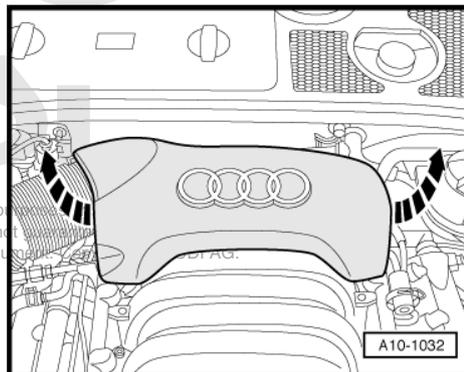
- Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew nut -2-.
- Pull cover out of retainers -arrows-.



- Detach electrical connector -1-.
- Detach air intake hose -2- at air cleaner housing.
- Unscrew bolts -arrows- and remove air cleaner housing.

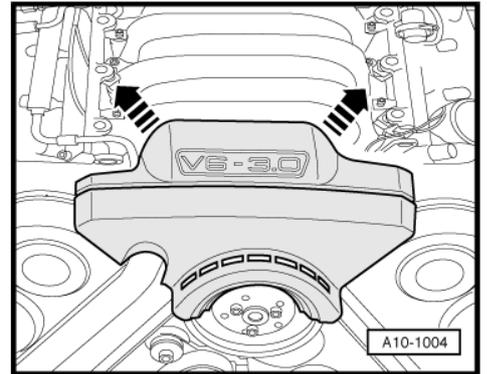


- Pull off rear engine cover -arrows- ...

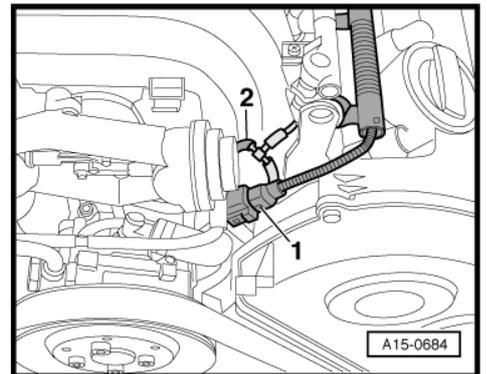


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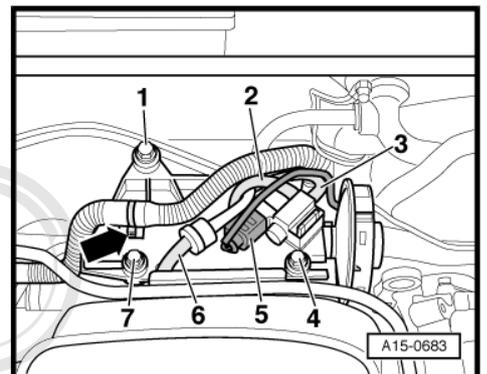
- ... as well as front engine cover -arrows-.



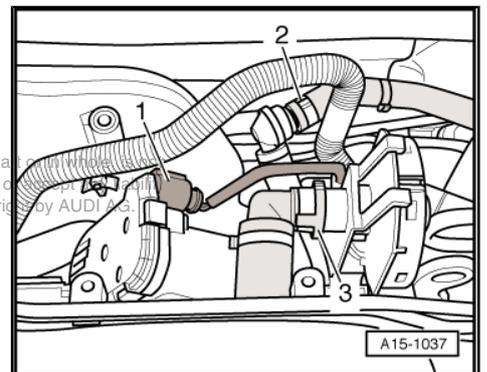
- Detach electrical connector -1-.
- Detach vacuum hose -2- from T piece.



- Detach vacuum hoses -2- and -3- at intake manifold change-over valve -N156- .
- Detach vacuum hose -6- from non-return valve.
- Detach electrical connector -5-.
- Move the crankcase breather hose -arrow- clear.
- Unscrew and remove bolts -1-, -4- and -7- on retaining plate for solenoid valves.
- Detach retaining plate for solenoid valves from intake manifold.
- On underside of retaining plate, pull vacuum hose off T piece.



- Detach electrical connector -1- at throttle valve module - J338- .
- Disconnect vacuum hoses -2- and -3-.



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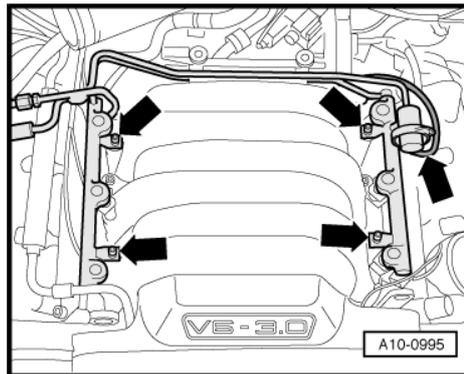
- Unplug electrical connectors at all injectors.
- Detach vacuum hose at fuel pressure regulator and unscrew securing bolts on fuel rail -arrows-.
- Pull fuel rail together with injectors off intake manifold (pull off evenly from the top) and place it on a clean cloth in the engine compartment.



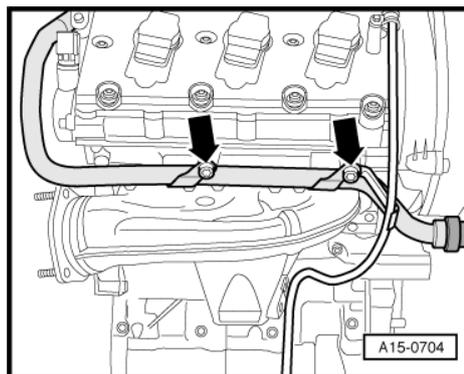
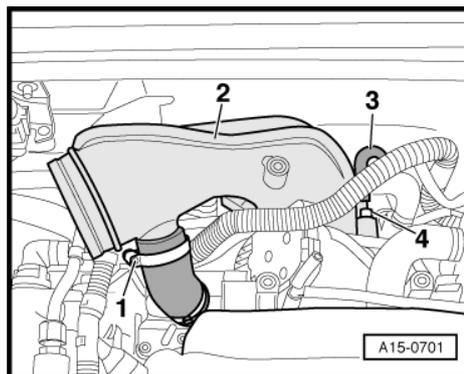
Note!

Make sure the removed injectors do not become soiled.

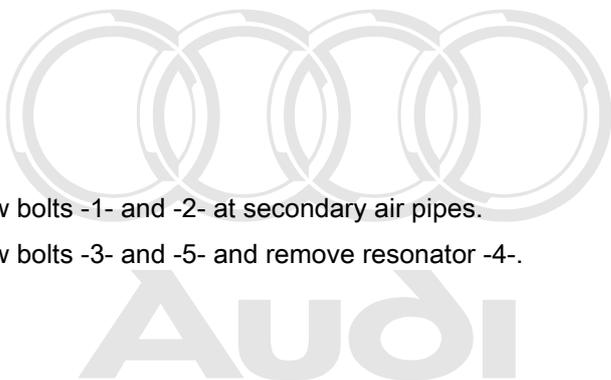
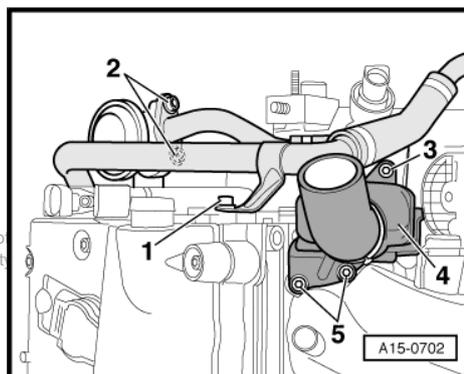
- Pull hose -1- off air duct.
- Unscrew bolt -4- and pull air duct -2- off throttle valve module -J338- .
- If fitted, pull vacuum hose -3- off at lower part of air duct.



- On right side of engine, unscrew and remove bolts -arrows- at secondary air pipe.

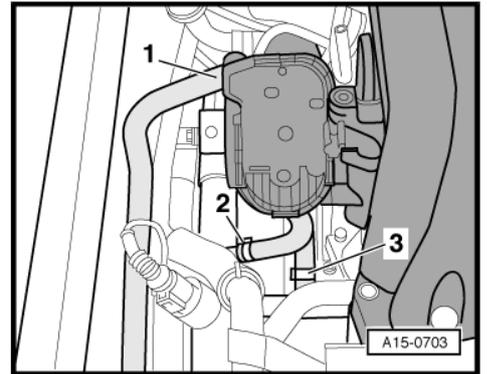


- Unscrew bolts -1- and -2- at secondary air pipes.
- Unscrew bolts -3- and -5- and remove resonator -4-.



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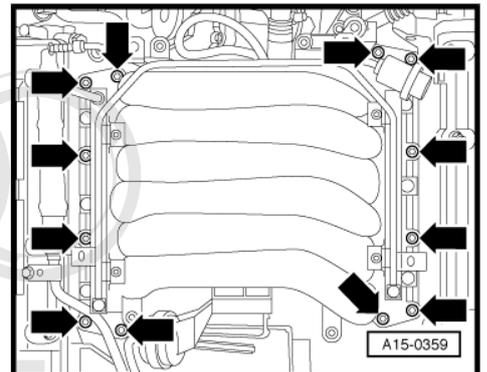
- Detach vacuum hose -1- leading to solenoid valve 1 for activated charcoal filter system -N80- .
- Detach coolant hoses -2- and -3-.



- Unscrew and remove intake manifold -arrows-.

i Note!

Seal intake ports on cylinder heads with clean cloths.



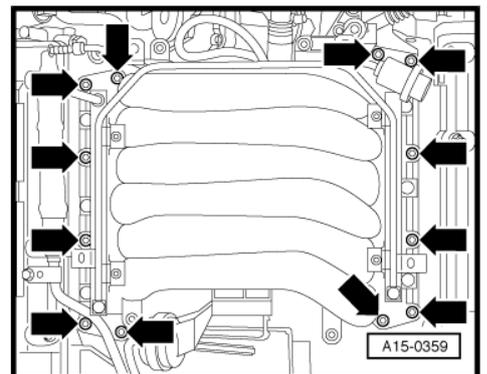
1.9.2 Installing

Installation is carried out in the reverse order; note the following:

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i Note!

- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Parts catalogue*.
- ◆ Always renew seals and gaskets.
- ◆ Adhere to the instructions for installing the fuel rail ⇒ [page 29](#) .
- Tighten bolts on intake manifold in stages and in diagonal sequence -arrows-.
- Fill up coolant ⇒ 6-cylinder engine, mechanics; Rep. Gr. 19 .



1.9.3 Tightening torques

Component		Nm
Intake manifold to cylinder head		10
Resonator to coolant pipe / to cylinder head		10
Secondary air pipe	M 6	10



Component		Nm
to cylinder head	M 8	23
Secondary air pipe to combination valve for secondary air		10
Air duct to intake manifold		10
Retaining plate for solenoid valves to intake manifold / air duct		10

1.10 Wiring and component check on engine control unit with test box - V.A.G 1598/31-

Special tools and workshop equipment required

- ◆ Test box -V.A.G 1598/31-

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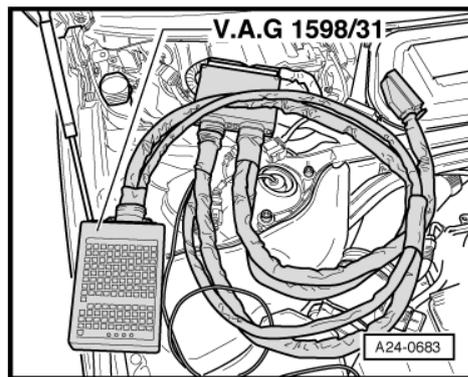
Note!

- ◆ *The test box -V.A.G 1598/31- is designed in such a way that it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- ◆ *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- ◆ *The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.*
- ◆ *Always use adapter set -V.A.G 1594 A- to connect test equipment (e.g. voltage tester -V.A.G 1527 B-, hand-held multimeter -V.A.G 1526 A- etc.).*

1.10.1 Procedure

- Remove engine control unit ⇒ [page 21](#) .

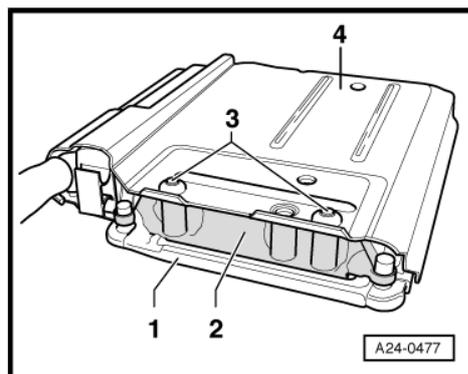
- Connect test box -V.A.G 1598/31- to wiring harness connectors.
- Connect earth clip of test box to earth.
- The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in relevant repair procedures.
- After completing test, re-install engine control unit
=> page 21 .



1.11 Removing and installing engine control unit

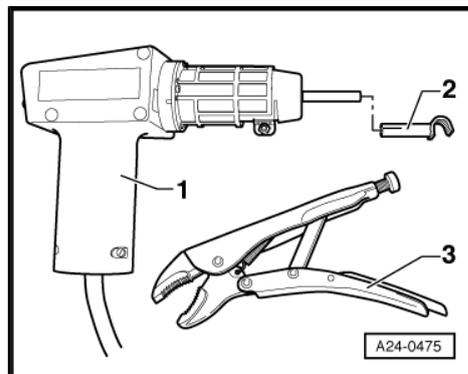
The 60-pin connector of engine control unit -1- is equipped with a protective housing -4- that is secured with a latch -2- and shear bolts -3-. To make it more difficult to unscrew the shear bolts, the threads have additionally been coated with locking fluid.

The protective housing has to be removed before the 60-pin connector can be unplugged from engine control unit (e.g. to connect test box or replace engine control unit).



Special tools and workshop equipment required

- ◆ Hot air blower from the wiring harness repair set -VAS 1978-



- ◆ Nozzle for hot air blower from the wiring harness repair set -VAS 1978-

- ◆ Vice-grip pliers (commercially available)

1.11.1 Removing

- When replacing engine control unit, select diagnosis object "Renew engine control unit" in "Guided Fault Finding".

For this purpose, use vehicle diagnostic, testing and information system -5051 A- .

- Switch off ignition and remove ignition key.

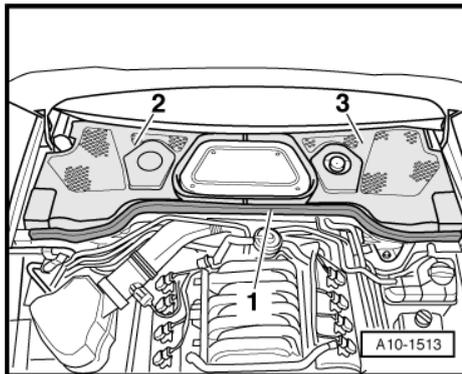


- Detach plenum chamber cover (right-side) -2-.



Note!

Ignore items marked -1- and -3-.

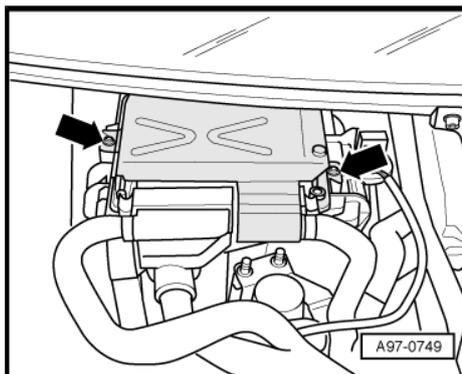


- Unscrew bolts -arrows- and pull out engine control unit towards front.
- Disconnect 81-pin connector at engine control unit.



Note!

- ◆ The 60-pin connector is secured with the protective housing and remains attached when removing engine control unit.
- ◆ When the engine control unit is disconnected, the learnt values are erased but the contents of the fault memory remain intact.



Caution

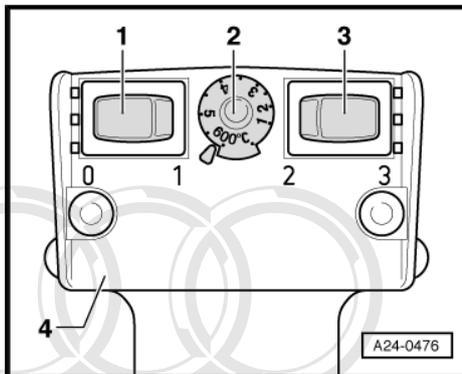
The following procedure must be followed exactly to prevent any damage (burning) to wiring, connectors, insulation and control units. Observe operating instructions for hot air blower.

- Select settings on hot-air blower as shown in illustration, i.e. set temperature potentiometer -2- to max. heat output and two-stage air flow switch -3- to position "3".



Note!

The hot air blower will then heat thread on protective housing into which shear bolts have been screwed. This step reduces inhibiting action of locking fluid on shear bolt thread and makes it easier to unscrew these bolts.

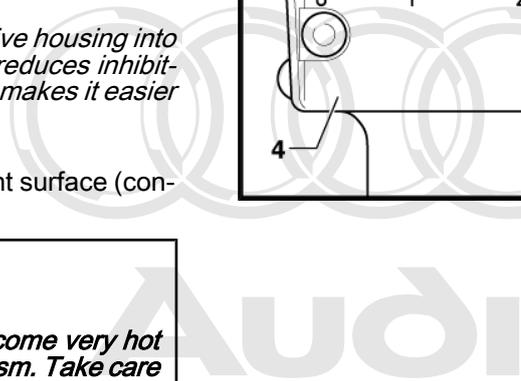


- Place the engine control unit on a heat-resistant surface (connectors remain attached).



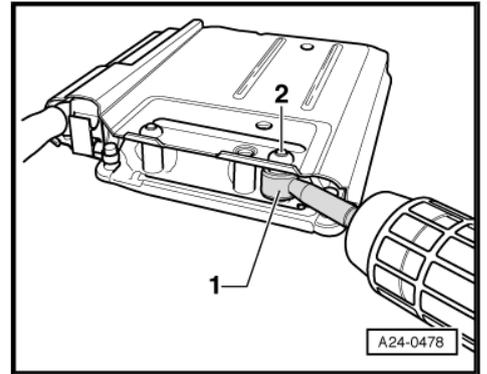
Caution

The shear bolts and protective housing also become very hot when heating the threads of the locking mechanism. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

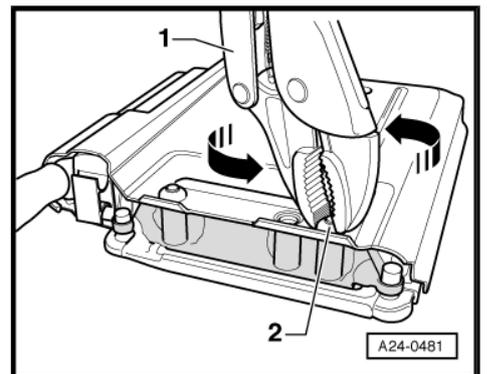


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- Direct nozzle -1- of hot air blower at bolt -2- of locking mechanism. You can rest the nozzle on the top section of the protective housing.
- Switch on the hot air blower and heat the thread for approximately 20 to 25 seconds.



- Grasp head of bolt -2- with vice-grip pliers -1- and unscrew shear bolt -arrows-.
- Repeat the procedure for the 2nd shear bolt.



 **Note!**

Be particularly careful here, as this shear bolt is in the immediate vicinity of control unit connector.

- Release the retaining tab and detach the 60-pin connector for engine control unit.

1.11.2 Installing

Installation is carried out in the reverse order; note the following:

- Reinstall the engine control unit into the protective housing.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. Cleaning can be performed using a thread tap. Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.
- Use new shear bolts.

After installing a new engine control unit, the following operations must be performed:

- Activate engine control unit in "Guided Fault Finding" under diagnosis option "Replace engine control unit".

For this purpose, use vehicle diagnostic, testing and information system -VAS 5051 A- .

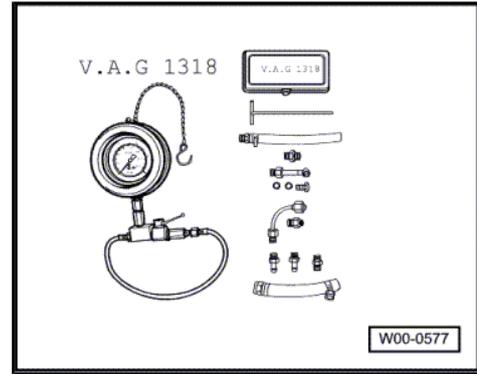
1.12 Checking system pressure, fuel pressure regulator and residual pressure

Fuel pressure is controlled by the fuel pressure regulator in accordance with intake pressure. As a result, the pressure drop at the injectors remains constant at every engine speed and load range.

Special tools and workshop equipment required



◆ K-Jetronic pressure gauge -V.A.G 1318-



1.12.1 Test conditions

- Fuel pump relay OK.
- Fuel pump OK; checking: ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 .
- Fuel filter OK
- Battery voltage at least 12.7 V
- Selector lever for automatic gearbox in position "P".
- Electrical consumers switched off (radiator fan must not run during the test).
- Air conditioner switched off.

1.12.2 Checking system pressure

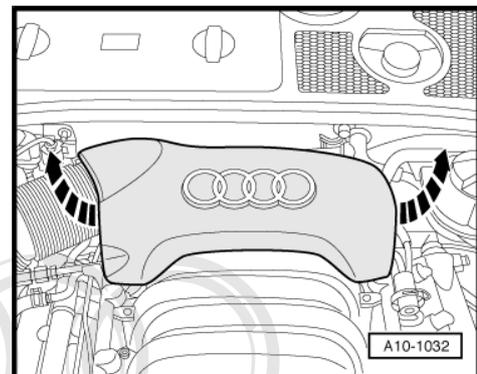
- Pull off rear engine cover -arrows-.
- Briefly open the fuel tank filler cap (to release pressure).



Caution

The fuel system is pressurised. Before opening the system place a clean cloth around the connection. Then dissipate pressure by carefully unfastening the connection.

- Detach fuel supply pipe.



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- Connect K-Jetronic pressure gauge -V.A.G 1318- with adapters -V.A.G 1318/6- and -V.A.G 1318/7- to the fuel supply pipe.
- Open cut-off valve on pressure gauge.
- Lever must point in direction of flow.

Check fuel pressure

- Disconnect vacuum hose at fuel pressure regulator and seal it.

Note!

If fuel flows out at the vacuum connection on the fuel pressure regulator during the following pressure test, the fuel pressure regulator will have to be renewed.

- Start the engine and run at idling speed.
- Measure the fuel pressure.
- Specification: 3.8 ... 4.2 bar.

If specification is not reached:

- Check the supply pipe for damage (e.g. pinching).
- Check quantity of fuel supplied by fuel pump ⇒ Fuel supply system, petrol engines; Rep. Gr. 20

If specification is exceeded:

- Check the return pipe for damage (e.g. pinching).

Note!

During the following test, do not allow the engine to run for too long with the vacuum hose disconnected, otherwise the increased fuel pressure will enrich the air/fuel mixture and may cause the Lambda control limits to be exceeded. This would be stored as a fault in the fault memory.

- Fit the vacuum hose onto the fuel pressure regulator and watch the pressure gauge.
- Fuel pressure should drop by approx. 0.5 bar.
- Switch off ignition.

If the pressure does not drop:

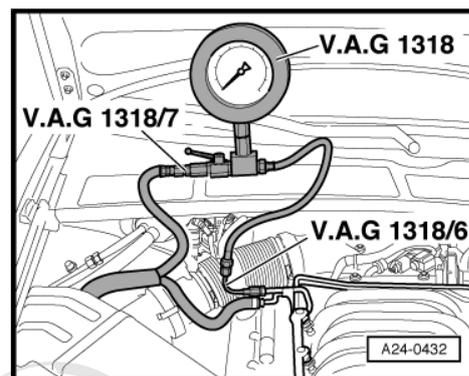
- Check vacuum hose for cracks and other damage.
- Test vacuum hose for blockages at intake manifold. To do this, disconnect hose at fuel pressure regulator and blow into it.

Checking residual pressure

- Check leak-tightness and residual pressure by watching the drop in pressure on the pressure gauge.
- Specification after 10 minutes (engine cold): approx. 2.2 bar.
- Specification after 10 minutes (engine warm): approx. 3.0 bar.

Note!

When engine has reached operating temperature fuel expansion results in higher pressure.





If pressure drops below specification:

- Start the engine and run at idling speed.
- Allow pressure to build up, then switch off ignition. Simultaneously close the cut-off valve of the K-Jetronic pressure gauge -V.A.G 1318- (lever perpendicular to direction of flow -arrow-).
- Observe pressure drop on pressure gauge.

If the pressure now does not drop:

- Check fuel pump non-return valve

If the pressure drops again:

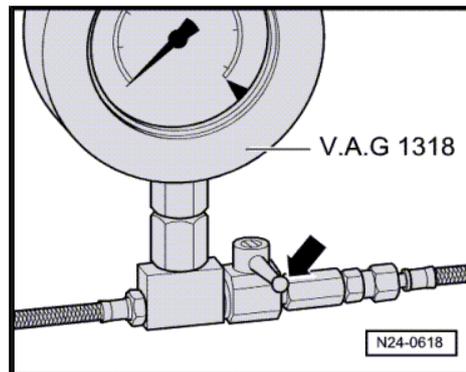
- Open cut-off valve on pressure gauge (lever points in direction of flow).
- Start the engine and run at idling speed.
- Allow pressure to build up, then switch off ignition. At the same time tightly clamp off the return hose.

If the pressure now does not drop:

- Renew the fuel pressure regulator.

If the pressure drops again:

- Check pipe connections, O-rings on fuel rail and injectors for leaks.
- Check pressure gauge for leaks.



Note!

Before removing the pressure gauge, release the fuel pressure by opening the cut-off valve. Hold a container under the connection.



Audi

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1.13 Dismantling and assembling fuel rail with injectors

1 - Retaining clip

- Ensure it is positioned correctly on injector and fuel rail

2 - O-ring

- Removing and installing ⇒ [page 28](#)
- Renew
- Lubricate with clean engine oil

3 - Fuel injector

- Removing and installing ⇒ [page 28](#)

4 - O-ring

- Removing and installing ⇒ [page 28](#)
- Renew
- Lubricate with clean engine oil

5 - Fuel return pipe

6 - Fuel supply pipe

- Tighten union nut to 25 Nm.

7 - Hexagon socket head bolt - 10 Nm

8 - Fuel rail

9 - Bolt -10 Nm-

10 - Retaining clip

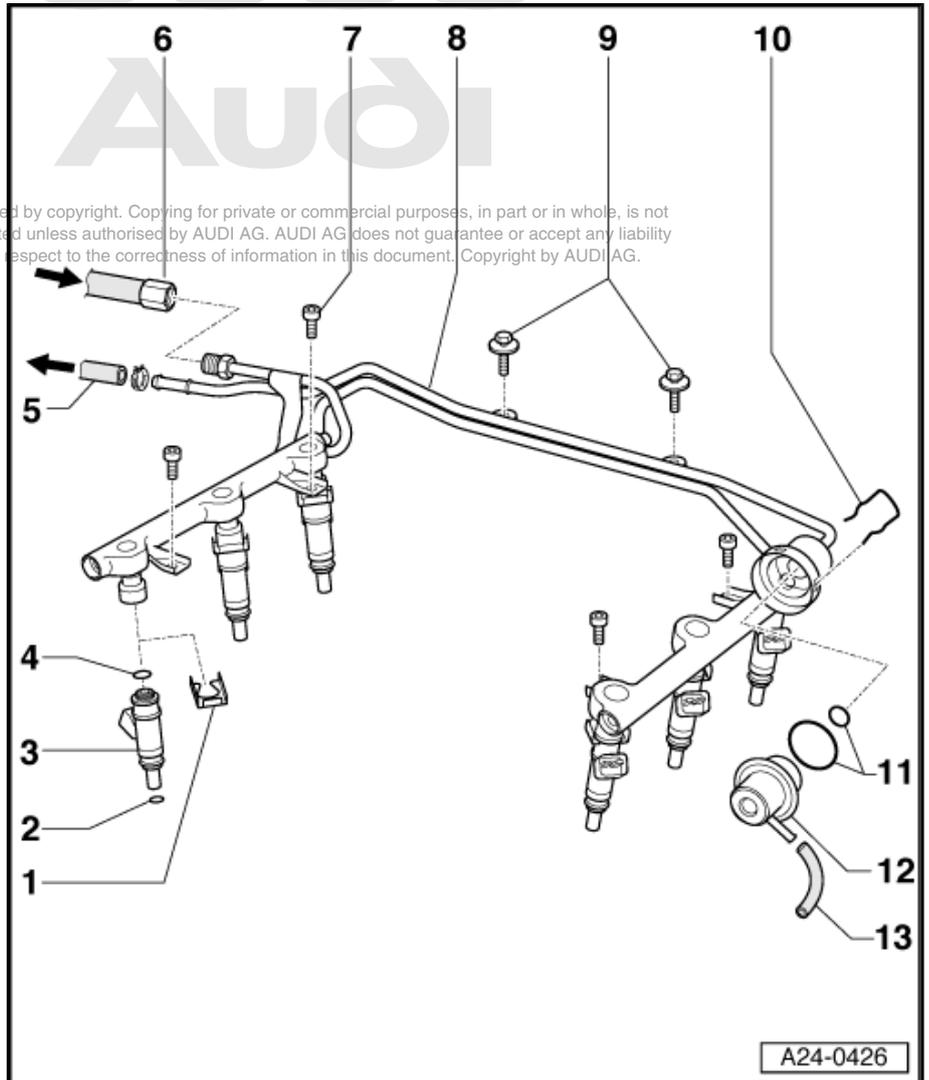
- Check for correct fit on fuel pressure regulator

11 - O rings

- Renew
- Lubricate with clean engine oil

12 - Fuel pressure regulator

13 - Vacuum hose



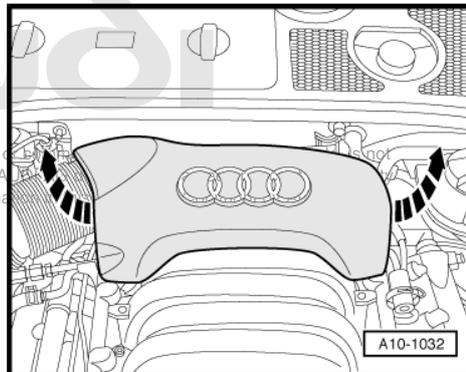


1.14 Removing and installing fuel rail and injectors

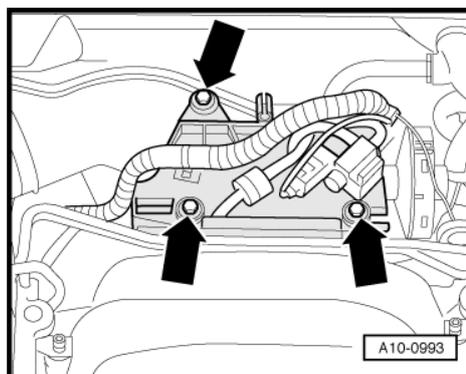
1.14.1 Removing

- Pull off rear engine cover -arrows-.

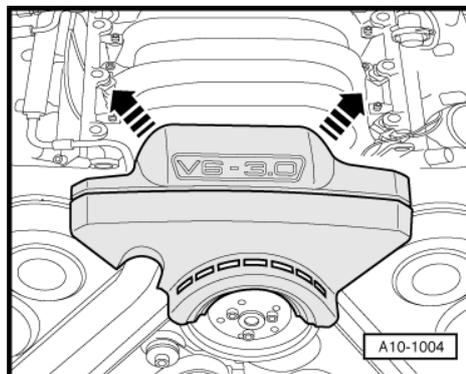
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- Unscrew bolts for solenoid valve retaining plate -arrows-.



- Pull off front engine cover -arrows-.

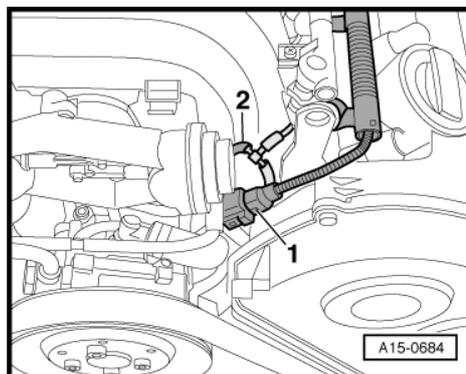


- Unplug electrical connector at intake manifold change-over valve -N156- -Item 1-.

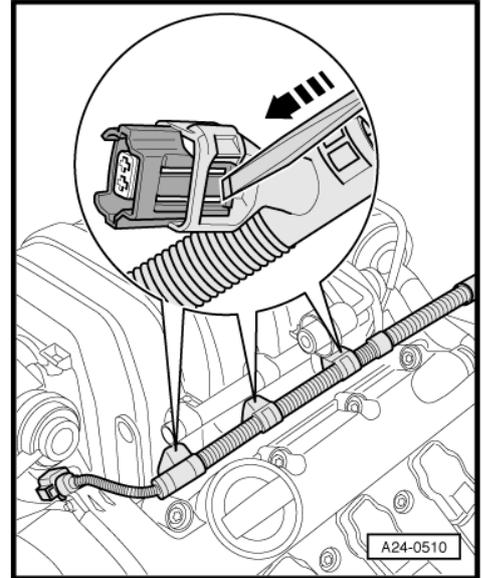


Note!

Ignore item marked -2-.



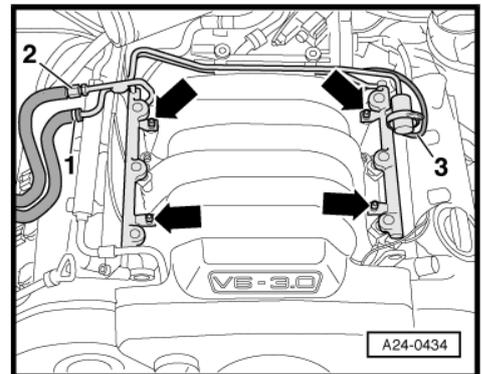
- Unplug all electrical connectors at all injectors; to do so, release connectors on underside -arrow-.



- Disconnect vacuum hose -3- from fuel pressure regulator.

i Note!

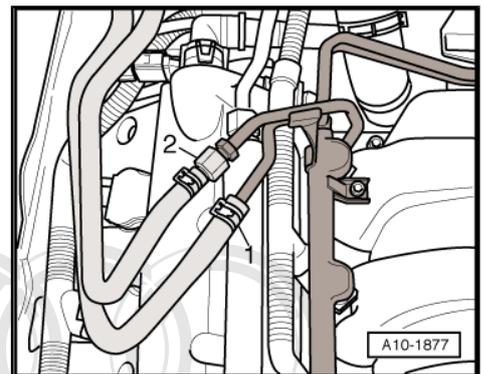
To renew fuel rail you must disconnect fuel supply pipe -2- and fuel return pipe -1-.



! Caution

The fuel system is pressurised. Before opening the system place a cloth around the connection. Then dissipate pressure by carefully unfastening the connection.

- Disconnect fuel return pipe -1- and fuel supply pipe -2- from fuel rail.
- Pull fuel rail together with injectors off intake manifold evenly and set it aside on a clean cloth in rear of engine compartment.
- To take off the injectors first pull off the retaining clips.



1.14.2 Installing

Installation is carried out in the reverse order; note the following:

- Renew the O-rings at all opened connections. (When renewing the front O-ring, ensure that the plastic cap is not removed from the injector head. The O-ring must be pulled off over the plastic cap).
- Lubricate the O-rings with clean engine oil.
- Make sure injectors are installed in correct position.
- Make sure retaining clips are properly connected.

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- Position fuel rail with secured injectors on intake manifold and press evenly into place.

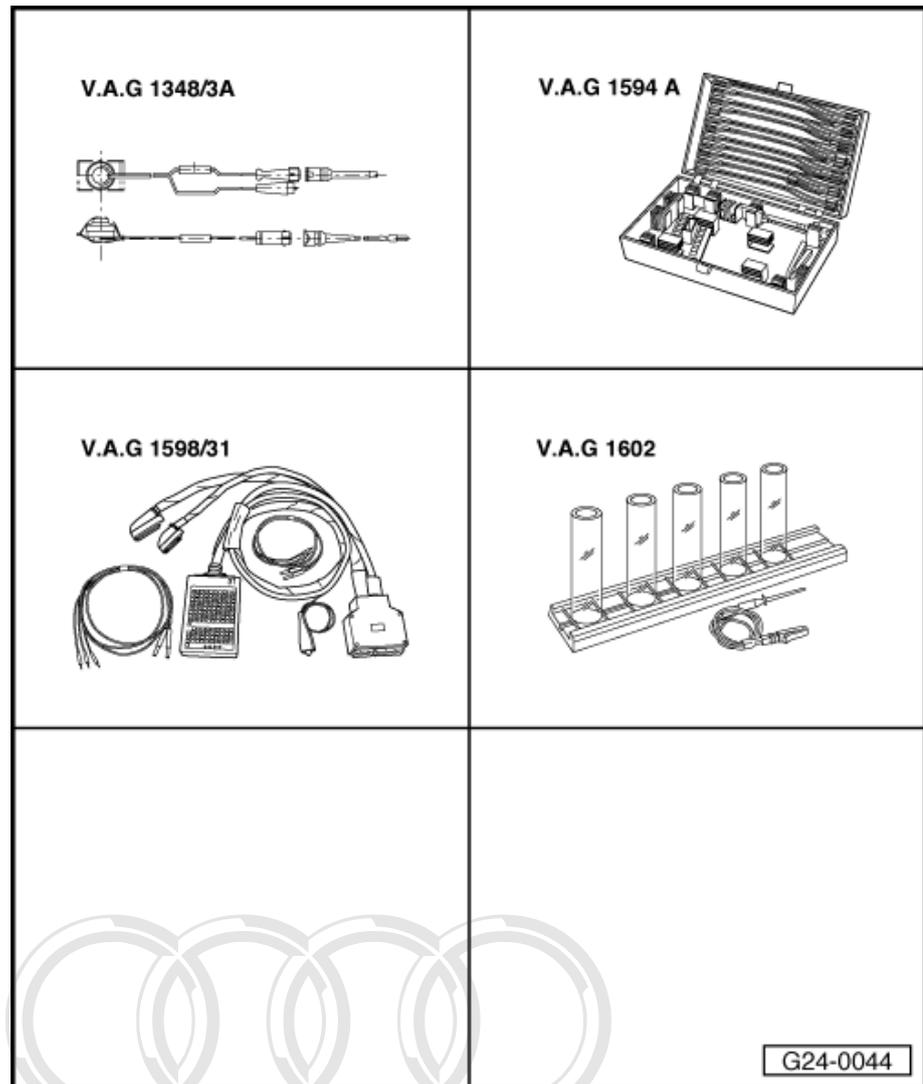
1.14.3 Tightening torque

Component	Nm
Fuel rail to intake manifold	10

1.15 Checking injection quantity and spray pattern of injectors; checking for leaks

Special tools and workshop equipment required

- ◆ Remote control - V.A.G 1348/3 A- with adapter cable - V.A.G 1348/3-2-
- ◆ Adapter set -V.A.G 1594 A-
- ◆ Injection rate tester - V.A.G 1602-
- ◆ Test box -V.A.G 1598/31-



1.15.1 Test condition

- Fuel pressure OK; testing ⇒ [page 23](#).

1.15.2 Preparation for test

- Remove fuel rail (together with injectors) from intake manifold ⇒ [page 28](#) . Fuel hoses remain connected.
- Connect test box -V.A.G 1598/31- to wiring harness for engine control unit ⇒ [page 20](#) . The engine control unit is not connected.
- Use leads from adapter set -V.A.G 1594 A- to bridge contacts 1 and 65 at test box.

1.15.3 Checking for leaks

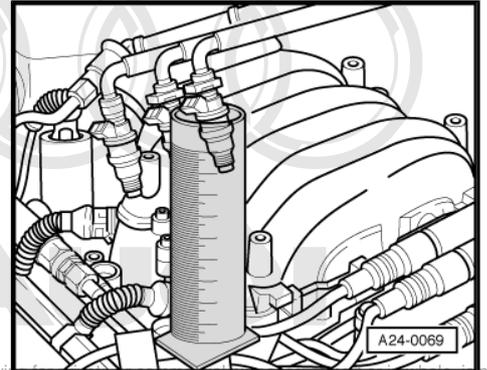
- Switch on ignition.
- The fuel pump should run.
- Visually check the fuel injectors for leaks.
- When the fuel pump is running, no more than 1 to 2 drops a minute should escape from any one of the injectors.

If the fuel loss is greater:

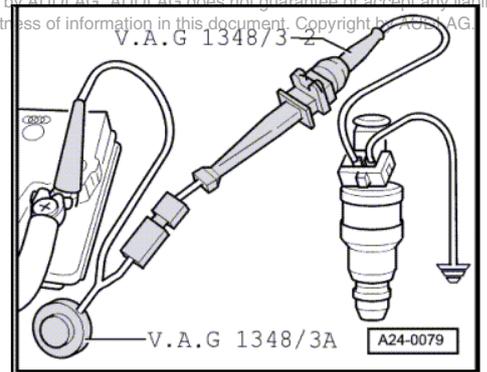
- Renew defective fuel injector ⇒ [page 28](#) .

1.15.4 Checking injection quantity

- Place a fuel injector in a measuring glass for injection rate tester -V.A.G 1602- .



- Connect one of the contacts of fuel injector to engine earth using test lead and crocodile clamp from adapter set -V.A.G 1594 A- .
- Connect second contact of fuel injector to the remote control -V.A.G 1348/3 A- with adapter cable -V.A.G 1348/3-2- .
- Connect crocodile clamp to positive (+) battery terminal.
- Switch on ignition.
- The fuel pump should run.
- Press the remote control -V.A.G 1348/3 A- for 30 seconds.
- Carry out test for all fuel injectors using a new test glass each time.



Note!

Also check the spray pattern when testing the injection rate. The spray pattern should be the same for all injectors.

- Once all 6 injectors have been actuated, place measuring glasses on a level surface.
- Specification: 90 ... 125 ml for each injector
- Switch off fuel pump (switch off ignition).

If the measured values for one or more of the fuel injectors are outside of the specification:

- Renew defective fuel injector ⇒ [page 28](#) .

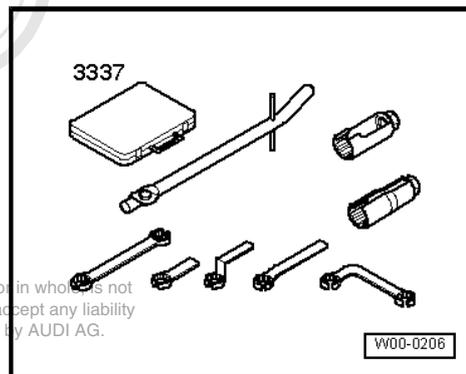
If the measured values for all the injectors are outside the specification:

- Check fuel pressure ⇒ [page 23](#) .
- Install injectors together with fuel rail ⇒ [page 29](#) .

1.16 Removing and installing Lambda probe before catalytic converter - bank 1 (right)

Special tools and workshop equipment required

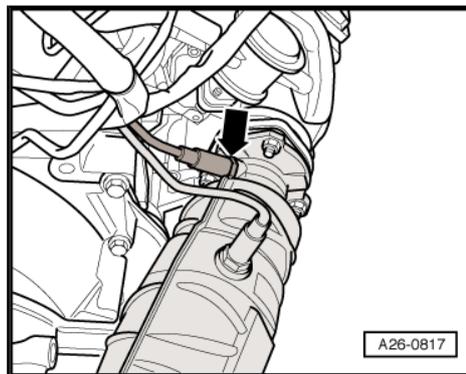
- ◆ Lambda probe open ring spanner set -3337-



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1.16.1 Removing

- Remove front exhaust pipe (right-side) ⇒ 6-cylinder engine, mechanics; Rep. Gr. 26 .
- Unscrew Lambda probe using socket -3337/7- .



1.16.2 Installing

Installation is carried out in the reverse order; note the following:



Note!

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
 - ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
 - ◆ *When installing, the Lambda probe wires must always be re-attached at the same locations to prevent probe wires from coming into contact with exhaust pipe.*
- Install front exhaust pipe (right-side) ⇒ 6-cylinder engine, mechanics; Rep. Gr. 26 .

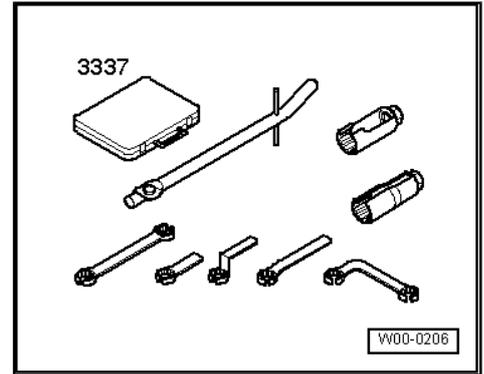
1.16.3 Tightening torque

Component	Nm
Lambda probe in front exhaust pipe	55

1.17 Removing and installing Lambda probe before catalytic converter - bank 2 (left)

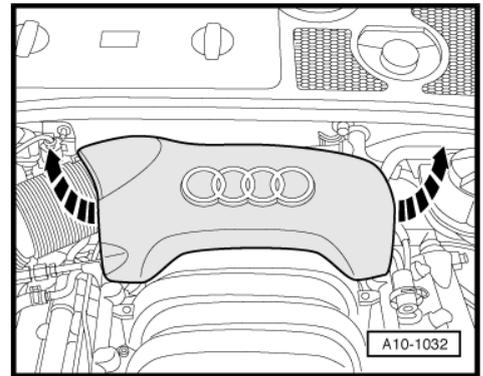
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

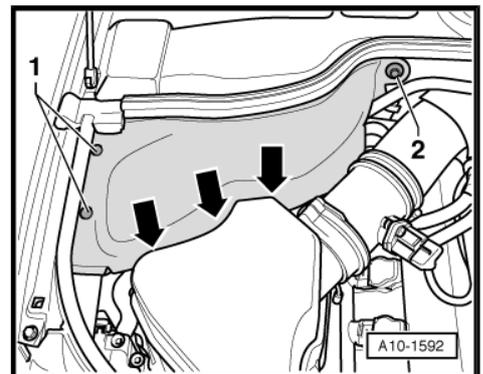


1.17.1 Removing

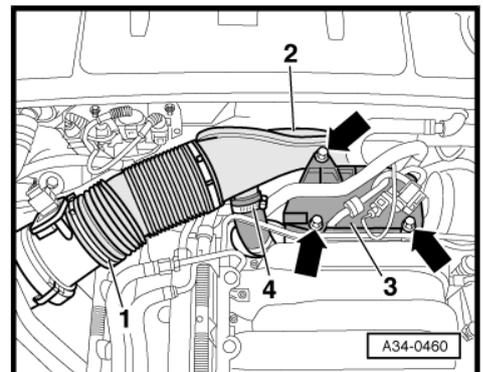
- Pull off rear engine cover -arrows-.



- Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew bolted joint -2-.
- Pull cover out of retainers -arrows-.



- Unscrew bolts for solenoid valve retaining plate -3- (-arrows-).
- Detach air intake hose -1- at air mass meter.
- Pull hose -4- off air duct -2-.



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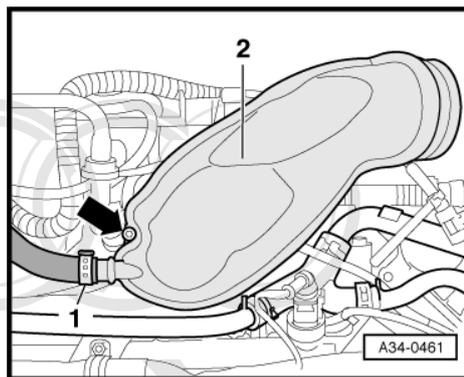


- Unscrew bolt -arrow- and disconnect air duct -2- from throttle valve module -J338- .
- If fitted, pull hose -1- off at air duct.



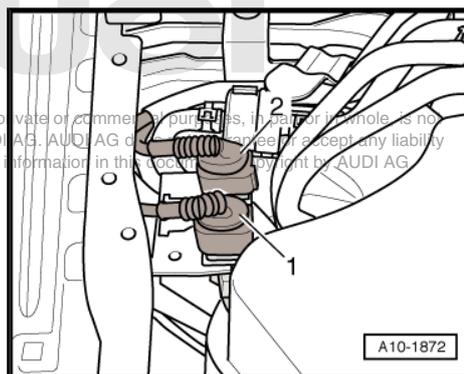
Note!

For illustration purposes, the air duct is shown from rear and with engine removed.



- Detach electrical connector -2- from bracket and unplug.
- Move wire clear.

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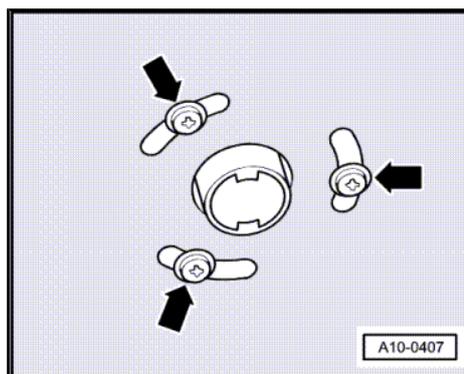
- Unbolt front left wheel.



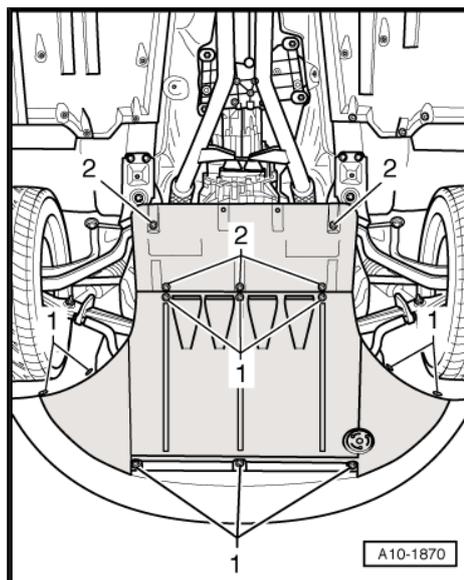
Note!

Secure brake disc with wheel bolts.

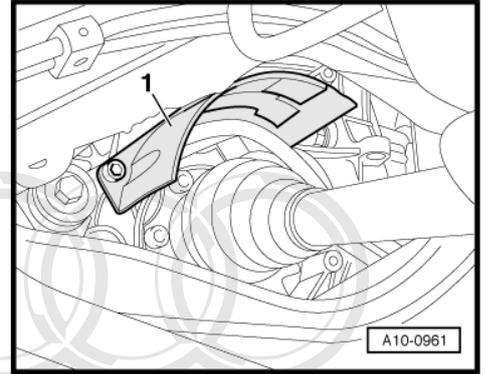
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



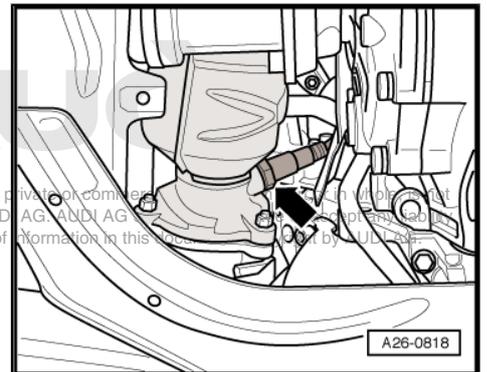
- Loosen quick release fasteners -1- and -2- and remove noise insulation parts.



- Unbolt heat shield -1- for drive shaft (left-side).



- Use ring spanner -3337/3- to unscrew Lambda probe -arrow-.



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1.17.2 Installing

Installation is carried out in the reverse order; note the following:

Note!

- ◆ *Renew O-ring.*
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste => Parts catalogue . The paste must not get into the slots on the probe body.*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent probe wire from coming into contact with exhaust pipe.*

1.17.3 Tightening torques

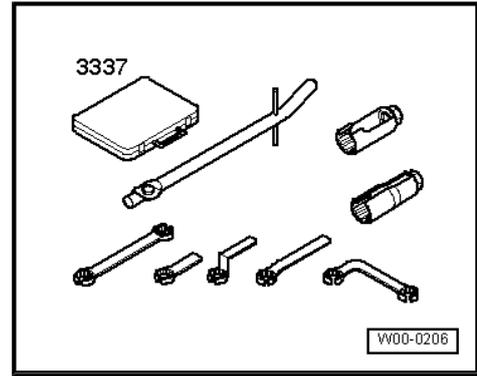
Component		Nm
Lambda probe in front exhaust pipe		55
Drive shaft heat shield to gearbox		23
Air duct to intake manifold		10
Retaining plate to	Intake manifold	10
	Air duct	10

1.18 Removing and installing Lambda probe after catalytic converter - bank 1 (right)

Special tools and workshop equipment required

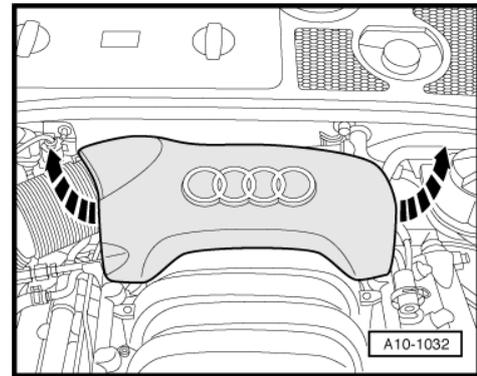


- ◆ Lambda probe open ring spanner set -3337-

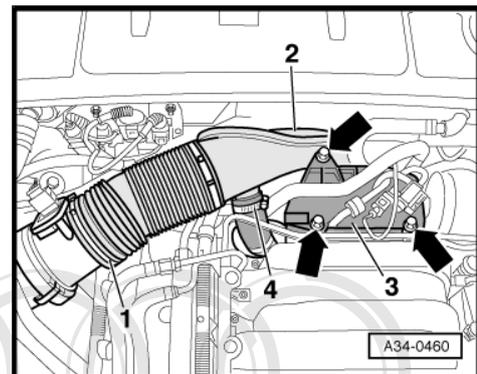


1.18.1 Removing

- Pull off rear engine cover -arrows-.



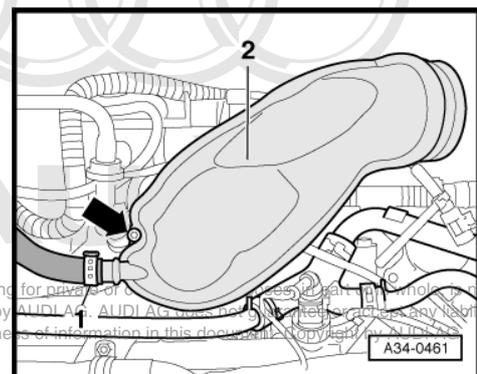
- Unscrew bolts for solenoid valve retaining plate -3- (-arrows-).
- Detach air intake hose -1- at air mass meter.
- Pull hose -4- off air duct -2-.



- Unscrew bolt -arrow- and disconnect air duct -2- from throttle valve module -J338- .
- If fitted, pull hose -1- off at air duct.

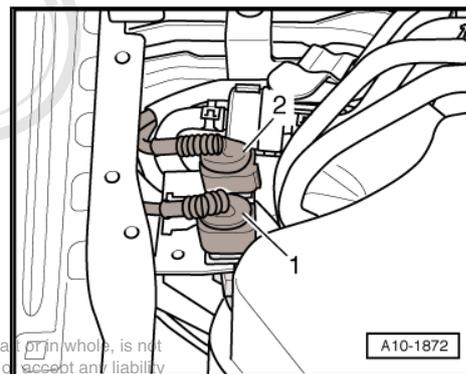


For illustration purposes, the air duct is shown from rear and with engine removed.



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- Take electrical connector -1- out of retainer and unplug.
- Move wire clear.

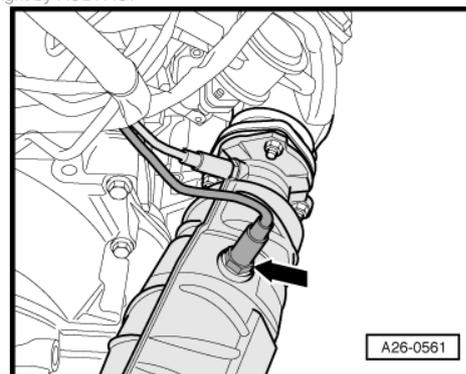


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- Unscrew Lambda probe using socket -3337/7- .

 **Note!**

Shown from rear with engine removed for illustration purposes.



1.18.2 Installing

Installation is carried out in the reverse order; note the following:

 **Note!**

- ◆ *Renew O-ring.*
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste => Parts catalogue . The paste must not get into the slots on the probe body.*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent probe wire from coming into contact with exhaust pipe.*

1.18.3 Tightening torques

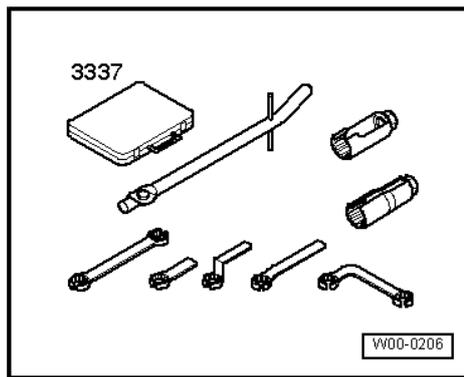
Component		Nm
Lambda probe in front exhaust pipe		55
Air duct to intake manifold		10
Retaining plate to	Intake manifold	10
	Air duct	10

1.19 Removing and installing Lambda probe after catalytic converter - bank 2 (left)

Special tools and workshop equipment required

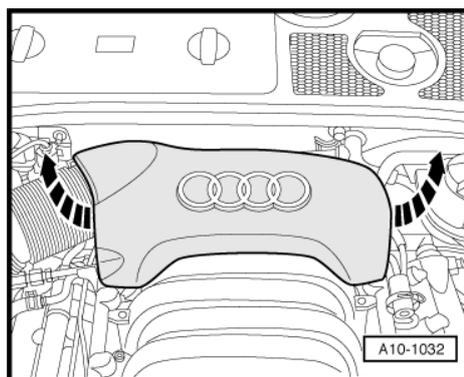


- ◆ Lambda probe open ring spanner set -3337-

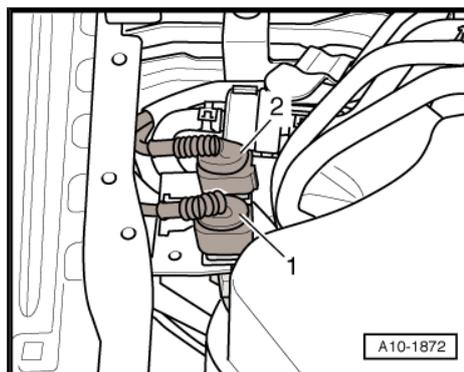


1.19.1 Removing

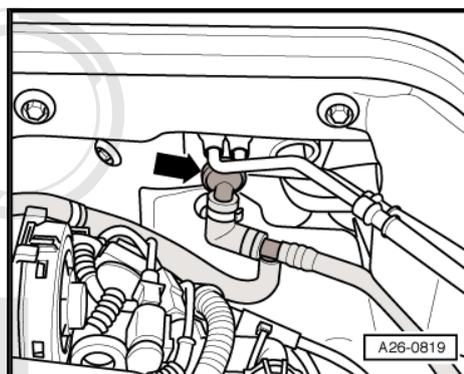
- Pull off rear engine cover -arrows-



- Detach electrical connector -4- from bracket on bulkhead and unplug.
- Move wire clear.



- Detach vacuum hose -arrow- going to brake servo at bulkhead.

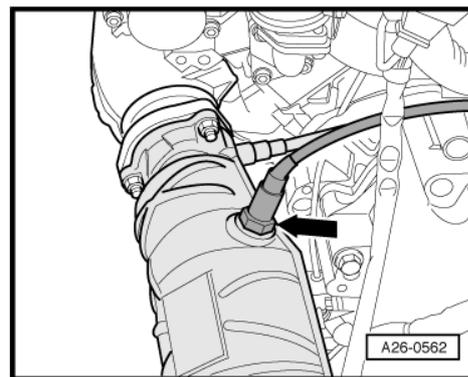


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- Unscrew Lambda probe using socket -3337/7- .

 **Note!**

Shown from rear with engine removed for illustration purposes.



1.19.2 Installing

Installation is carried out in the reverse order; note the following:

 **Note!**

- ◆ *Renew O-ring.*
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent probe wire from coming into contact with exhaust pipe.*

1.19.3 Tightening torque

Component	Nm
Lambda probe in front exhaust pipe	55

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28 – Ignition system

1 Checking ignition system

1.1 General notes on ignition system

- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ A voltage of at least 12.7 V is required for proper operation of electrical components.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the engine starts, runs for a short period and then cuts off after completing fault finding, repairs or component tests, this may be due to the immobiliser blocking the engine control unit. The fault memory must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety measures

Note the following to avoid injuries or damage to the fuel injection system or ignition system:

- ◆ Do not touch or detach the ignition wires when the engine is running or when starting the engine.
- ◆ The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- ◆ If you want to crank engine at starting speed without actually starting it (for example, in order to test compression pressure), first unplug connectors from ignition coils and also from injectors.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. Therefore, interrogate and, if necessary, delete the fault memory after all repairs and tests.
- ◆ Always switch off the ignition before cleaning the engine.

1.3 Technical data

Engine code letters	ASN (3.0 ltr. / 5V / 162 kW engine)	BBJ (3.0 ltr. / 5V / 160 kW engine)
Ignition timing Not adjustable (determined by control unit)		
Ignition system	Individual coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors	Individual coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs ²⁾	Tightening torque 30 Nm	Tightening torque 30 Nm
Firing order	1-5-3-6-2-4	1-5-3-6-2-4

2) Current values ⇒ Data sheets for exhaust emission test