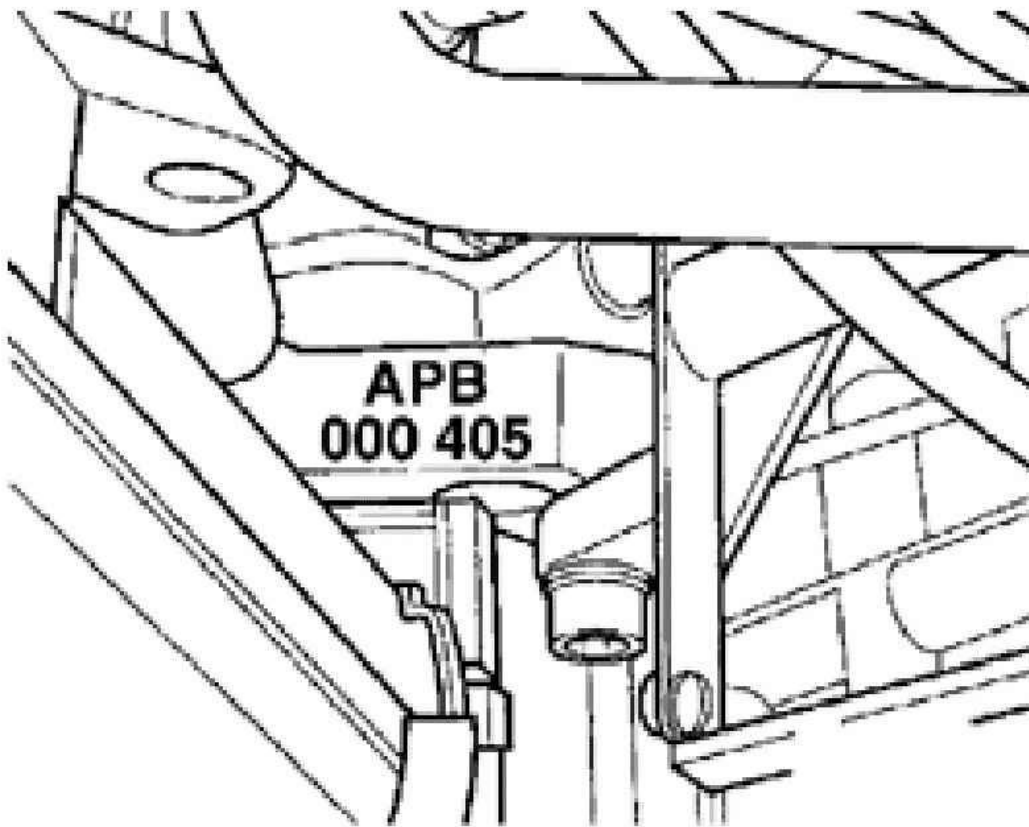


2000-2004 ENGINE**2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad****TECHNICAL DATA****VIN NUMBER**

The VIN number (engine code and serial number) is on the machined surface on the cylinder block, at the front of the right cylinder bank.

The engine code is also indicated on the vehicle data sticker.



G02724900

Fig. 1: Identifying VIN Number
Courtesy of AUDI OF AMERICA, INC.

ENGINE DATA

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

Engine code		APB
Manufactured		09.99 ➤
Capacity	cm ³	2671
Power output	HP at RPM	250/5800
Torque	ft. lbs at RPM	258/1800-4500
Bore	dia. mm	81
Stroke	mm	86.4
Compression ratio		9.3
RON	at least	98 RON ¹⁾
Firing order		1-4-3-6-2-5
Fuel injection system		Motronic
Self-diagnosis		yes
Lambda closed-loop control		yes
Secondary air injection		no
Camshaft timing control		yes

¹⁾ Fuel with not less than 95 RON can also be used, but this will cause a loss of power.

G02724901

Fig. 2: Engine Data Chart (1 Of 2)

Courtesy of AUDI OF AMERICA, INC.

¹⁾ Fuel with not less than 95 RON can also be used, but this will cause a loss of power.

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

Engine code		APB
Catalytic converter		yes
Exhaust gas recirculation		no
Charging		yes
Exhaust regulation		E3
Valve timing		
At 1 mm valve lift and 0 mm valve clearance, camshaft timing control not active		
Inlet opens after TDC		10°
Inlet closes after BDC		20°
Exhaust opens before BDC		38°
Exhaust closes before TDC		8°

G02724902

Fig. 3: Engine Data Chart (2 Of 2)

Courtesy of AUDI OF AMERICA, INC.

ENGINE - ASSEMBLY

ENGINE, REMOVING AND INSTALLING

CAUTION: Before beginning repairs on the electrical system:

- Obtain the anti-theft radio security code.
- Switch the ignition off.
- Disconnect the battery Ground (GND) strap.
- On vehicles equipped with Audi Telematics by OnStar®, switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting vehicle battery. See **EMERGENCY (BACK-UP) BATTERY, SWITCH ON/OFF, RESET TIME REGISTER**.
- After reconnecting vehicle battery, re-code and check operation of anti-theft radio. Also check operation of clock and power windows according to Repair Manual and/or Owner's Manual.
- After reconnecting vehicle battery on vehicles equipped with Audi Telematics by OnStar®, switch-on the emergency (back-up) battery for the Telematic/Telephone Control Module. See **EMERGENCY**

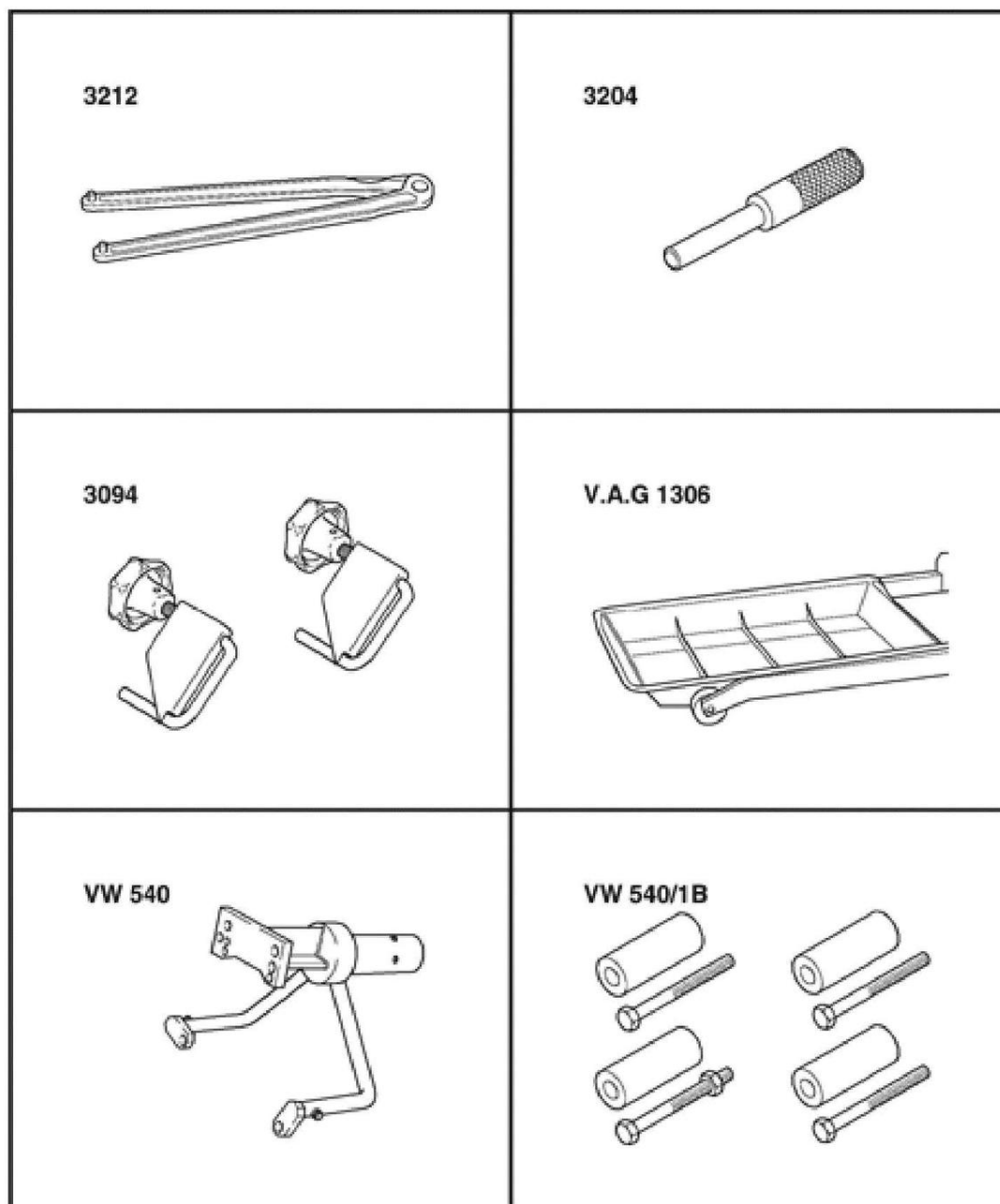
(BACK-UP) BATTERY, SWITCH ON/OFF, RESET TIME REGISTER .

Engine, removing and installing

Special tools and equipment

- Special tool 3204
- Special tool 3212
- VAG 1306
- Special tool 3094
- Special tool VW 540
- Special tool VW 540/1B

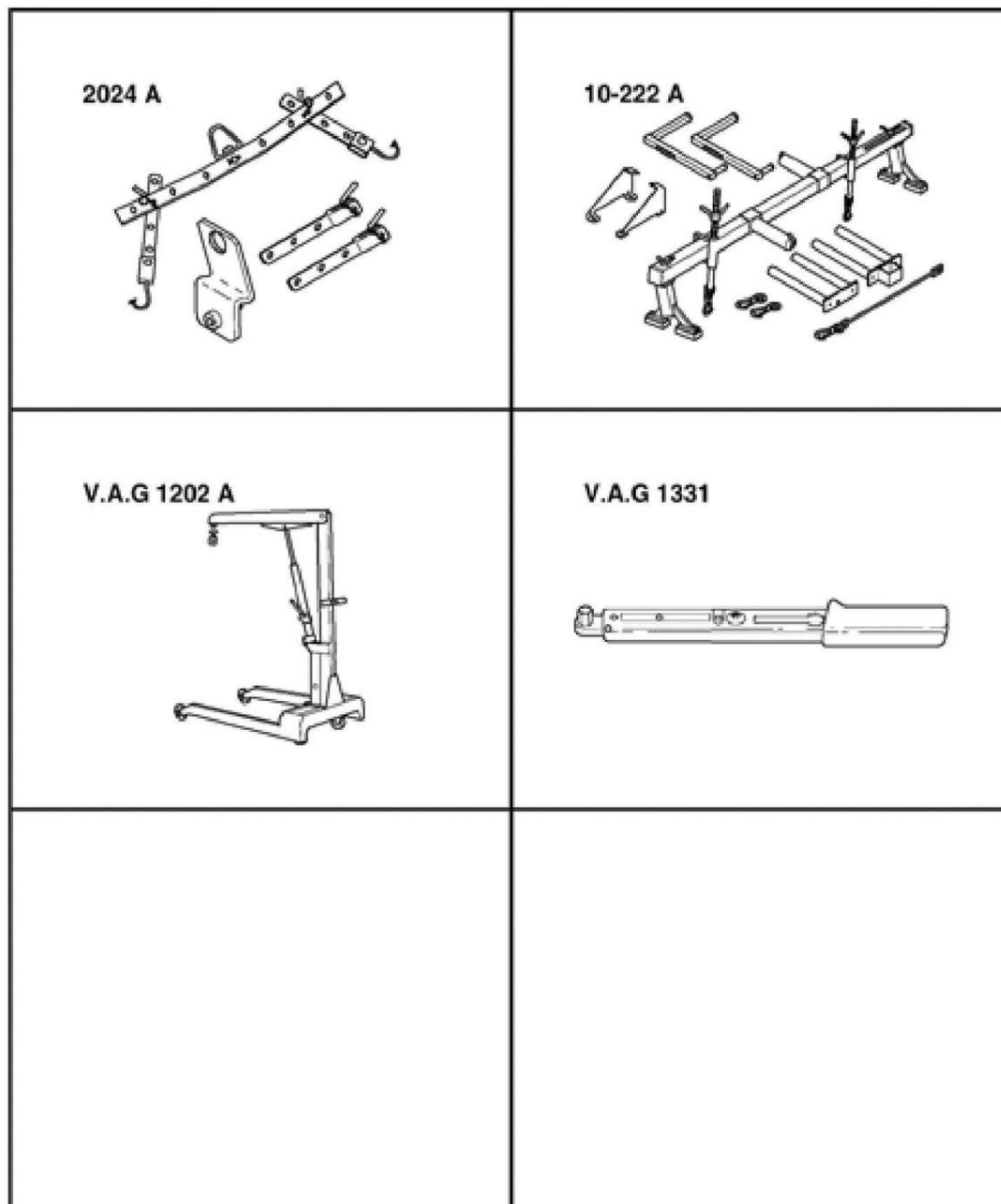
Assembly



G02724903

Fig. 4: Engine Removing Special Tool (1 Of 2)
 Courtesy of AUDI OF AMERICA, INC.

- Special tool 10-222A and 10-222A/1 and 0-222A/3
- Special tool 2024 A
- VAG 1202 A
- VAG 1331



G02724904

Fig. 5: Engine Removing Special Tool (2 Of 2)
 Courtesy of AUDI OF AMERICA, INC.

Engine, removing

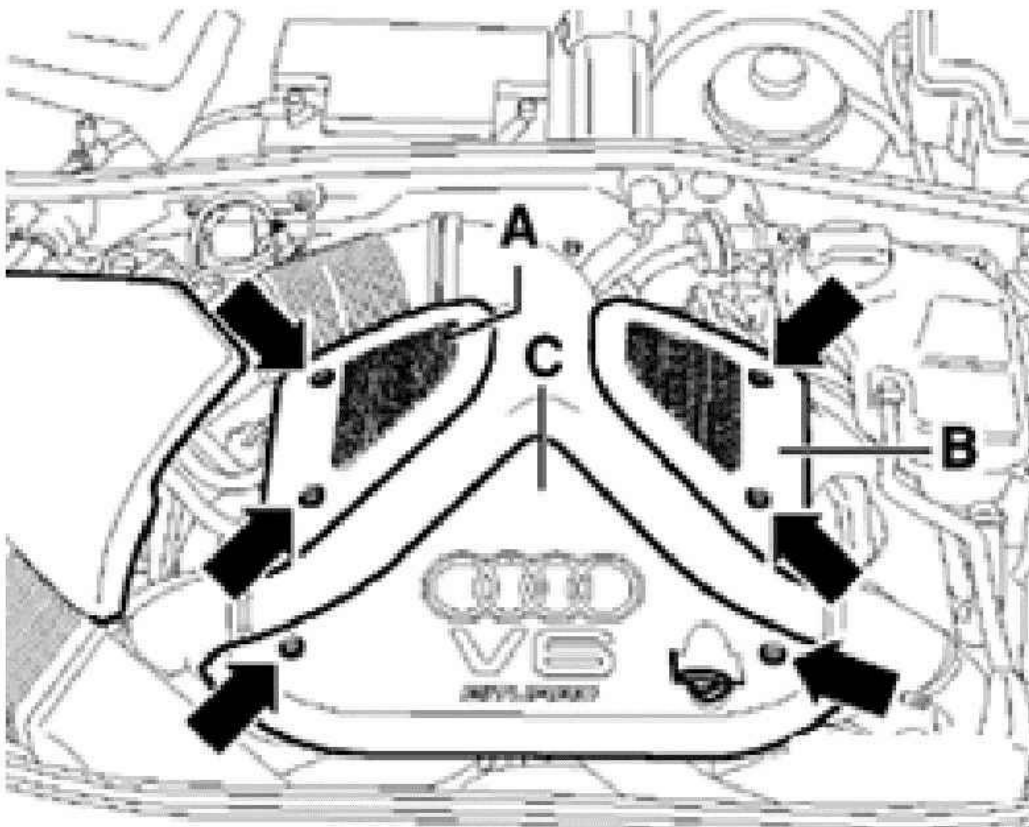
NOTE:

- All cable ties opened or cut during engine removal must be reinstalled at the same locations.

- Remove engine without transmission toward the front.
- Drained coolant must be stored in a clean container for disposal or reuse.
- Always replace seals and gaskets.
- Do not open coolant circulation system.

See Caution before beginning repairs on the electrical system under **ENGINE, REMOVING AND INSTALLING**.

- Remove plenum cover.
- Switch ignition off and disconnect battery Ground (GND) strap.
- Remove bolts (arrows) and remove engine covers -A- and -C-.
- Remove cover above air filter.



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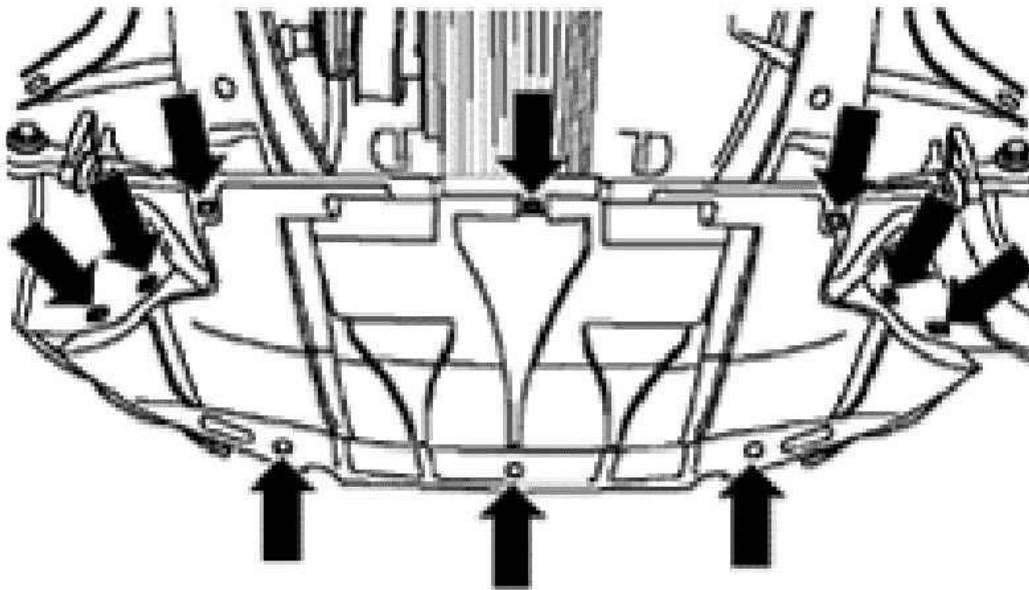
Fig. 6: Removing Engine Covers
Courtesy of AUDI OF AMERICA, INC.

- Remove sound-proofing material (arrows).
- Remove bracket for sound-proofing at unit support.
- Drain engine coolant. See **COOLING SYSTEM, DRAINING AND FILLING** .
- Remove bumper:

See **FRONT BUMPER** .

- Remove lock carrier:

LOCK CARRIER WITH ATTACHMENTS, REMOVING AND INSTALLING .

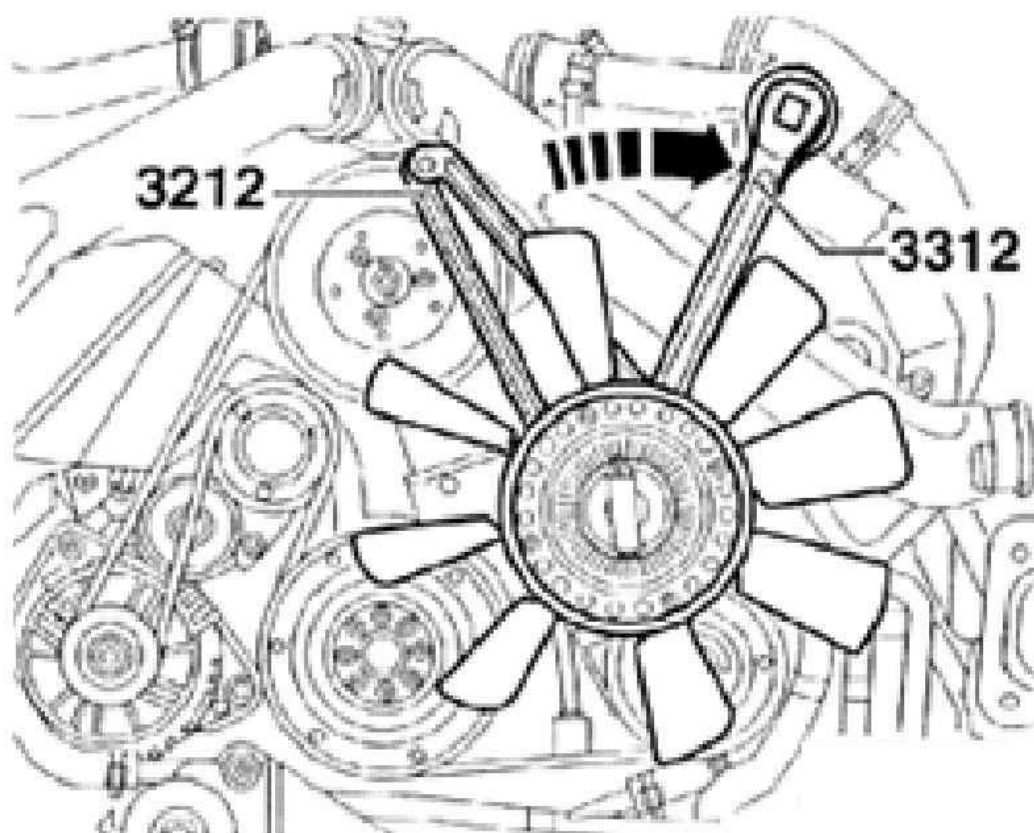


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Fig. 7: Removing Sound-Proofing Material
Courtesy of AUDI OF AMERICA, INC.

- Remove viscous fan counter-hold using 3212 wrench.

NOTE: **The viscous fan has a LEFT-HANDED thread.**



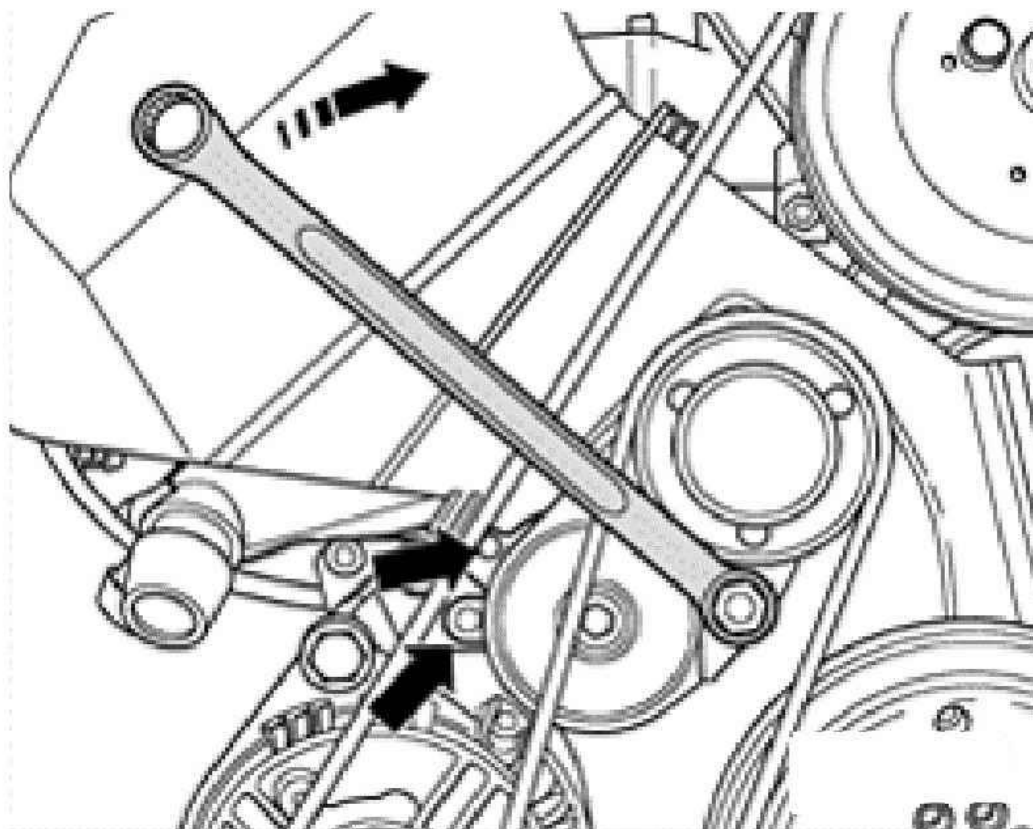
G02724907

Fig. 8: Removing Viscous Fan Using 3212 Wrench
Courtesy of AUDI OF AMERICA, INC.

- Mark direction of rotation of ribbed belt
- To loosen ribbed belt, turn clockwise using 17 mm box wrench until two holes are aligned (arrow). Counter-hold in position using 3204 drift.

NOTE: Mark direction of rotation of ribbed belt. Reversing the direction in which it runs can ruin it.

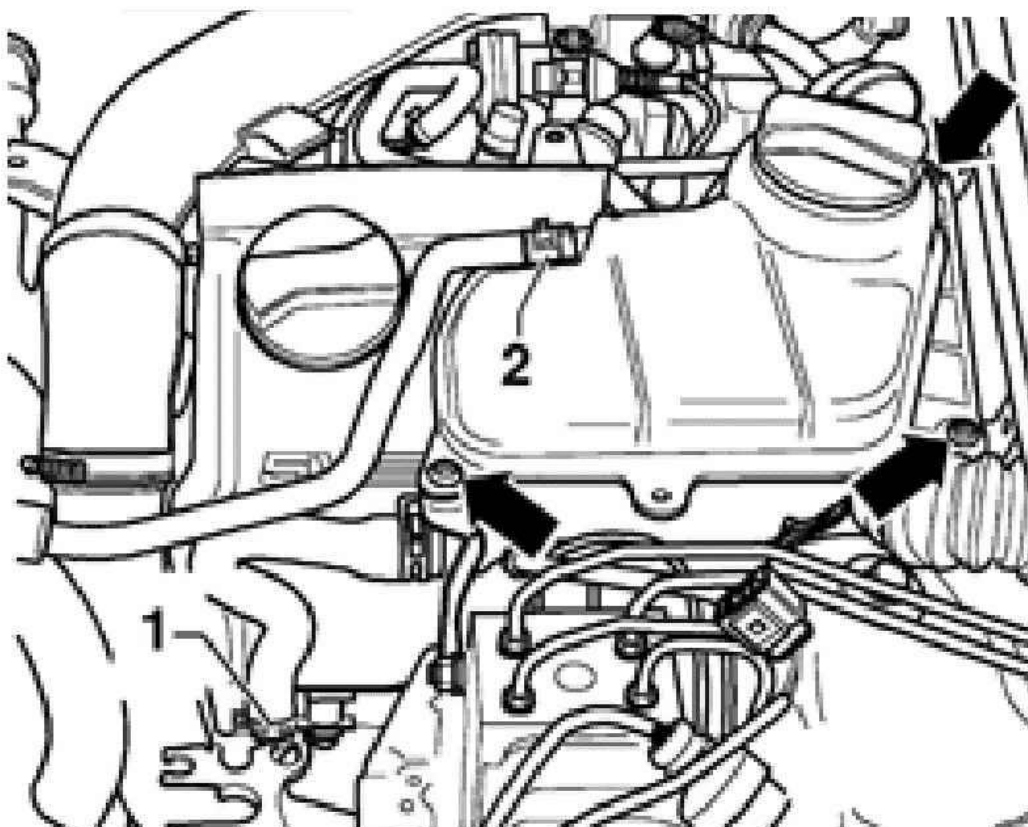
- Remove ribbed belt.



G02724908

Fig. 9: Turning Ribbed Belt Tensioner Clockwise
Courtesy of AUDI OF AMERICA, INC.

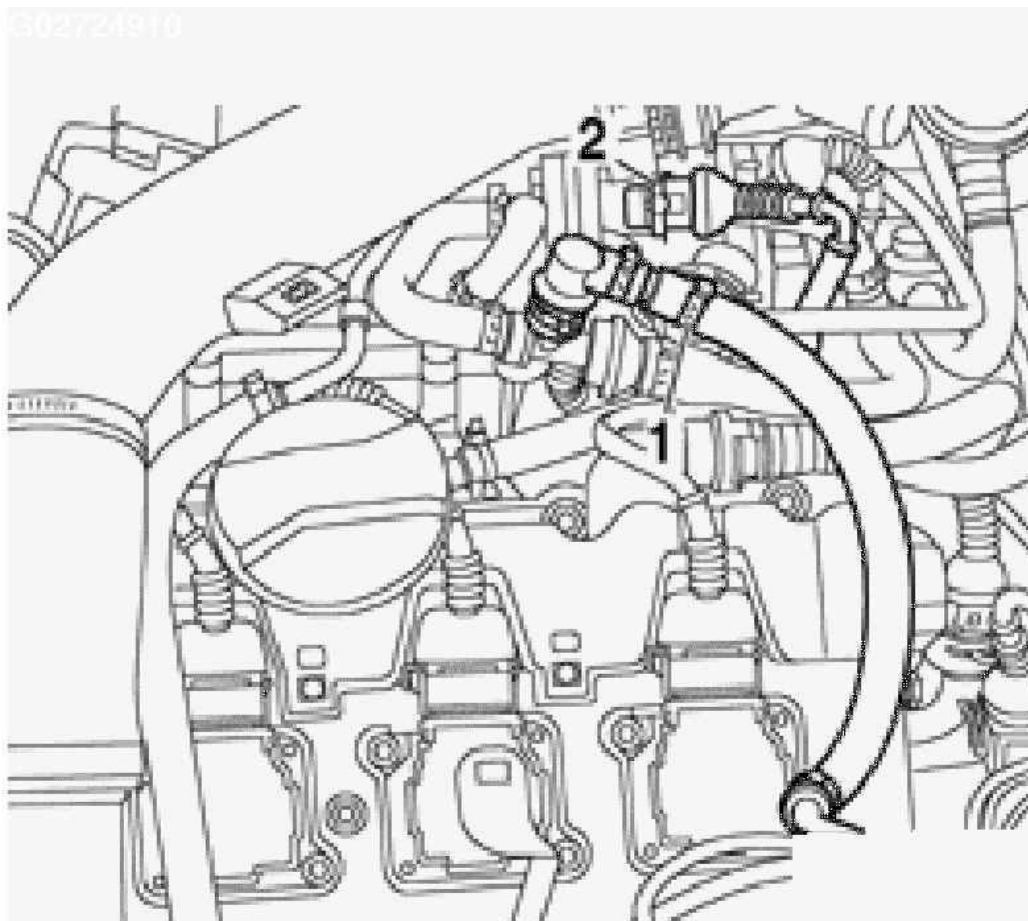
- Cut coolant hoses -1- and -2-
- Remove coolant reservoir (arrows).
- Disconnect connector for coolant level display.
- Remove valve cover (cylinder bank 4-6).



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Fig. 10: Removing Coolant Reservoir
Courtesy of AUDI OF AMERICA, INC.

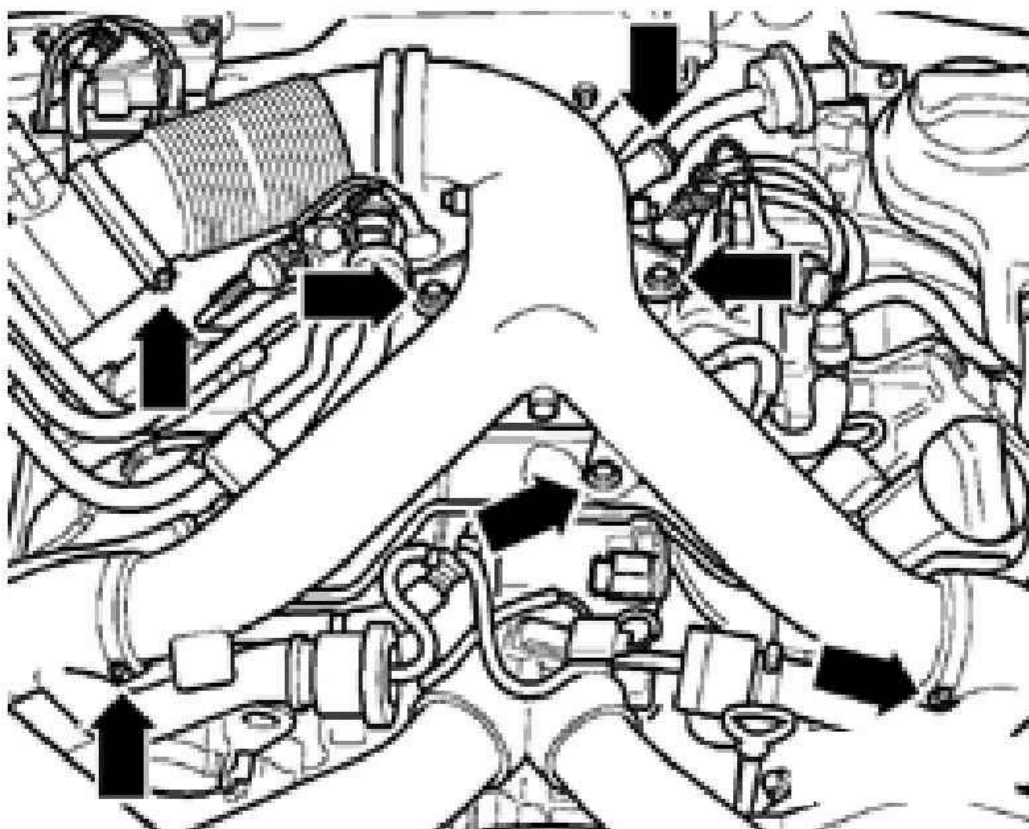
- Remove hose -1- to vacuum reservoir.



G02724910

Fig. 11: Removing Hose From Vacuum Reservoir
Courtesy of AUDI OF AMERICA, INC.

- Remove air distributor (arrows).

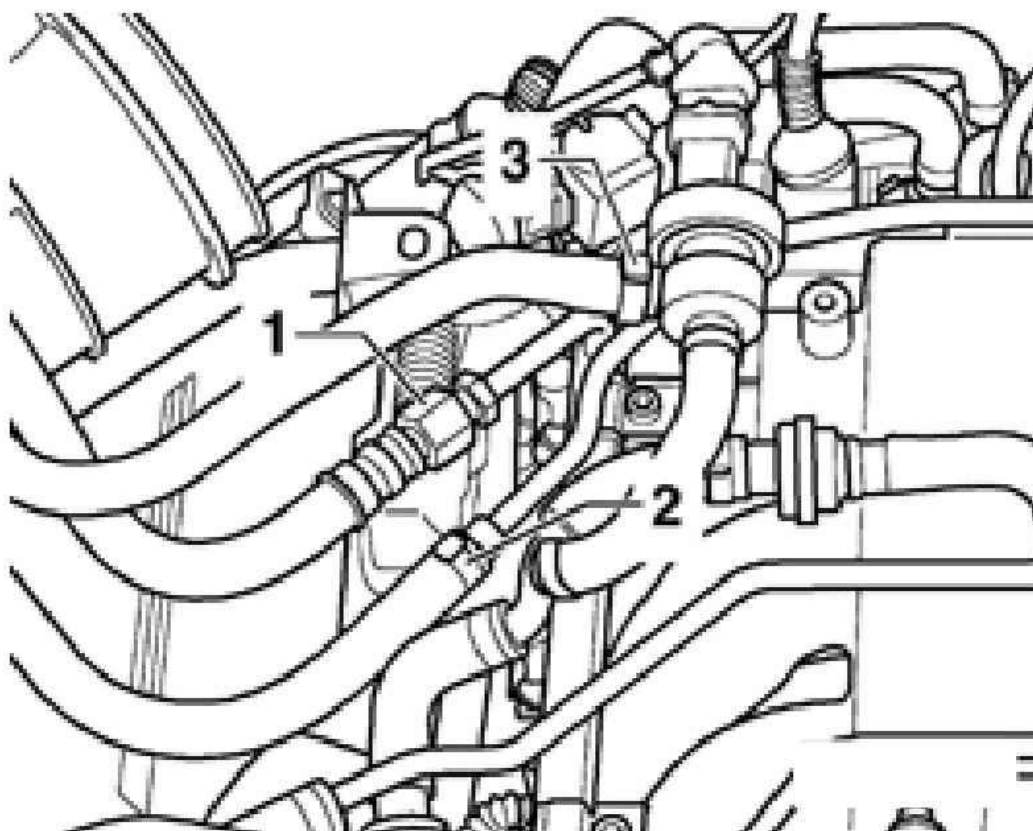


G02724911

Fig. 12: Removing Air Distributor
Courtesy of AUDI OF AMERICA, INC.

WARNING: Fuel system is under pressure! Before opening the system place a rag around the connection. Then release pressure by carefully loosening the connection.

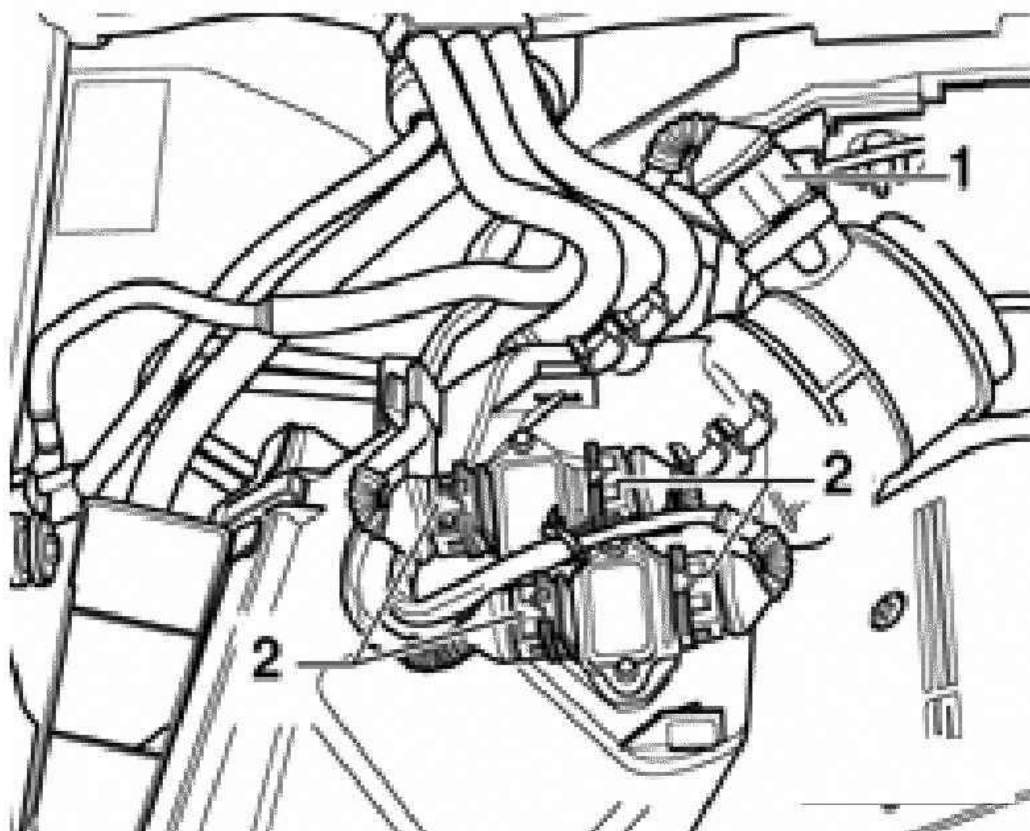
- Disconnect fuel supply and return lines -1- and -2- and move aside.
- Remove hose from Evaporative Emission (EVAP) canister purge regulator valve -3-.



G02724912

Fig. 13: Disconnect Fuel Supply Lines And Hose From EVAP Canister Purge Regulator Valve
Courtesy of AUDI OF AMERICA, INC.

- Disconnect connector -1- at Mass Air Flow (MAF) sensor. See **Fig. 14**
- Disconnect connectors -2- from power output stage and move cables aside.
- Remove air filter.

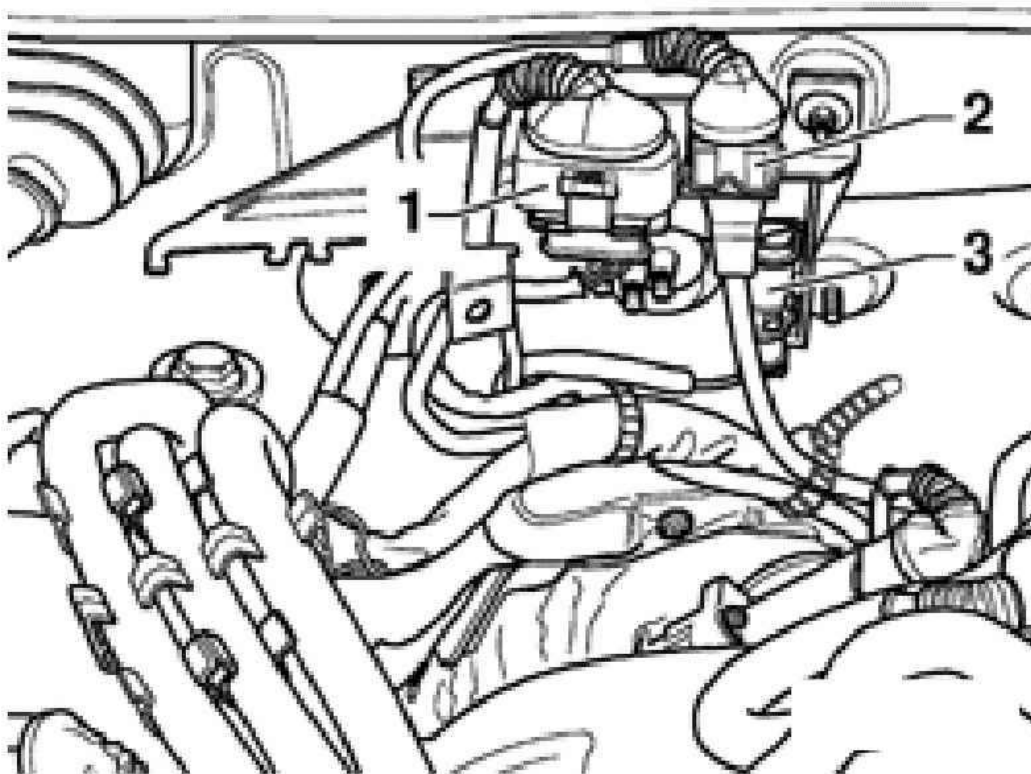


G02724913

Fig. 14: Removing Air Filter

Courtesy of AUDI OF AMERICA, INC.

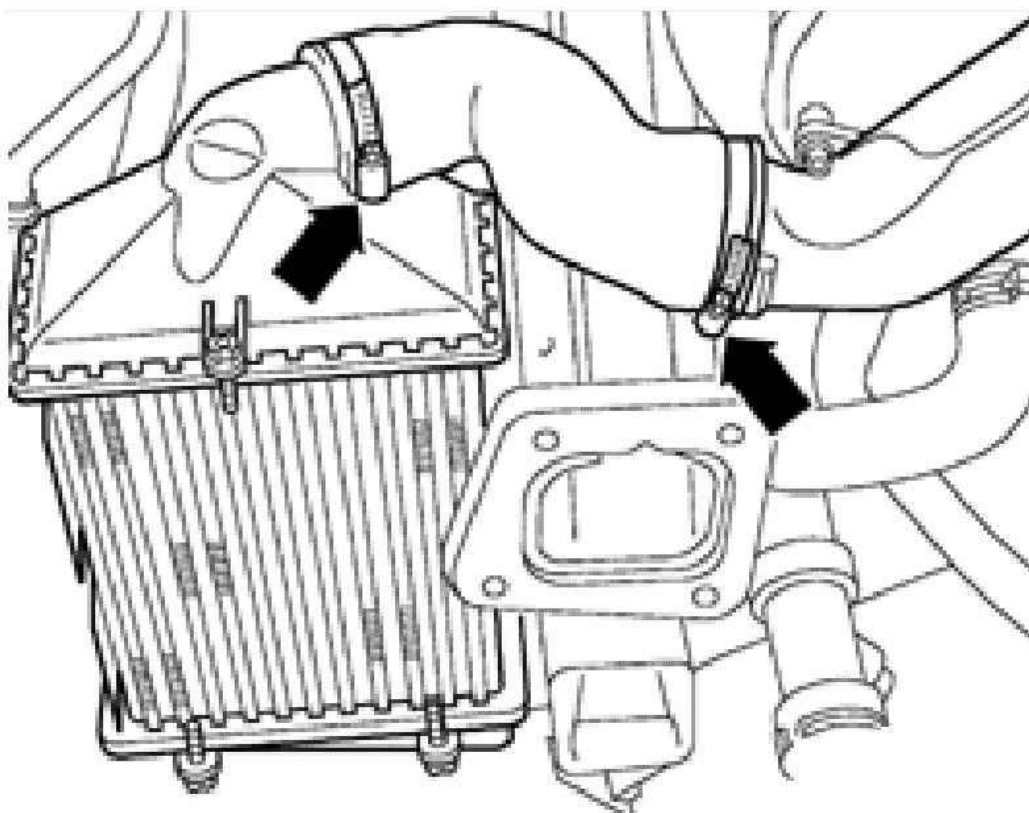
- Disconnect connector -1- for oxygen sensor at bulkhead. See **Fig. 15**.
- Disconnect connector -2- for knock sensor.
- Disconnect harness connector -3-.
- Move cables clear.



G02724914

Fig. 15: Disconnecting Harness Connectors At Bulkhead
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure hoses (arrows) from charge air cooler to left and right pressure lines.



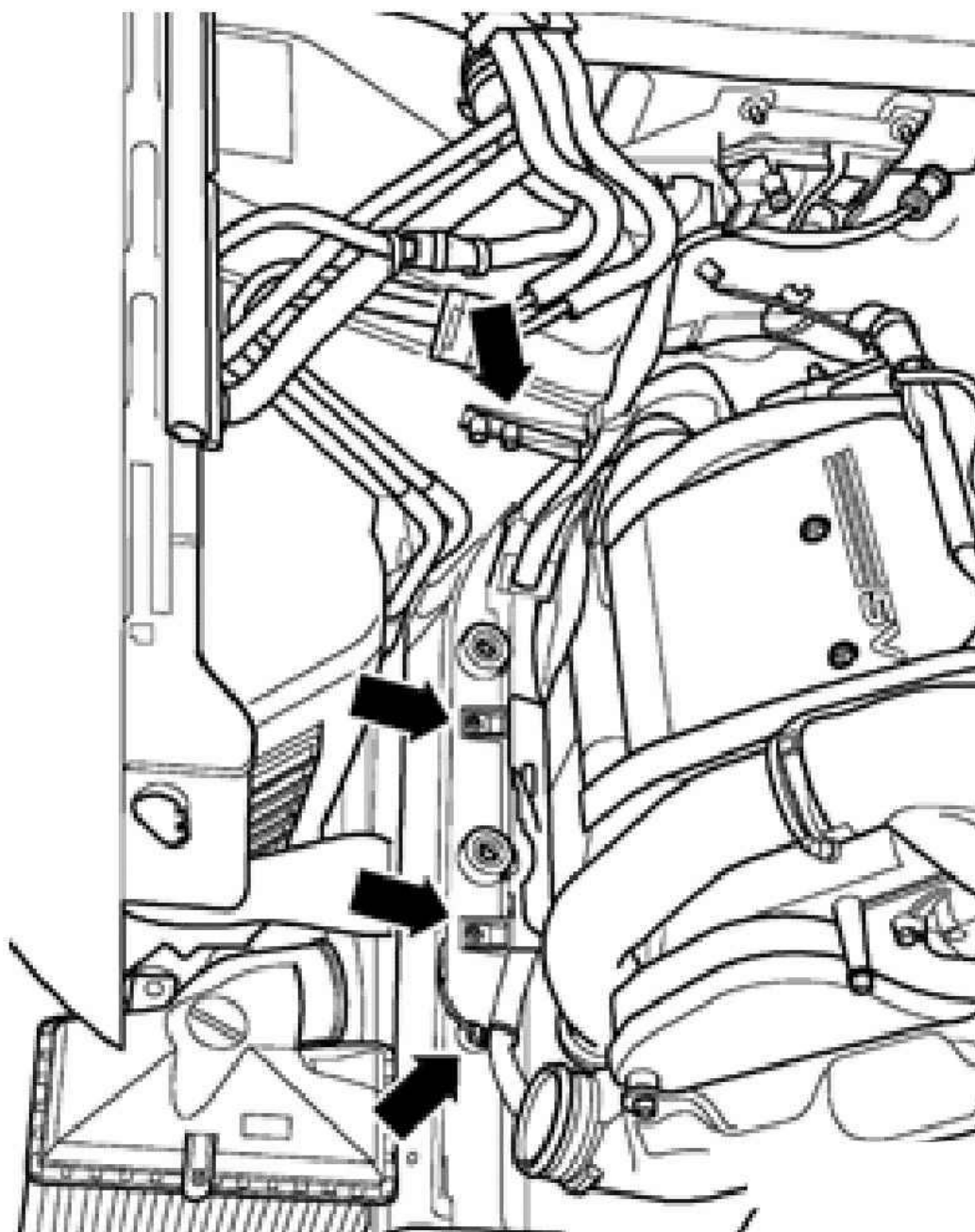
G02724915

Fig. 16: Removing Pressure Hoses (Arrows) From Charge Air Cooler To Left And Right Pressure Lines

Courtesy of AUDI OF AMERICA, INC.

See Caution before beginning repairs on the electrical system under **ENGINE, REMOVING AND INSTALLING.**

- Disconnect cable at B+ on battery.
- Disconnect B+ battery cable.
- Move cables to starter aside together with cable channels (arrows).

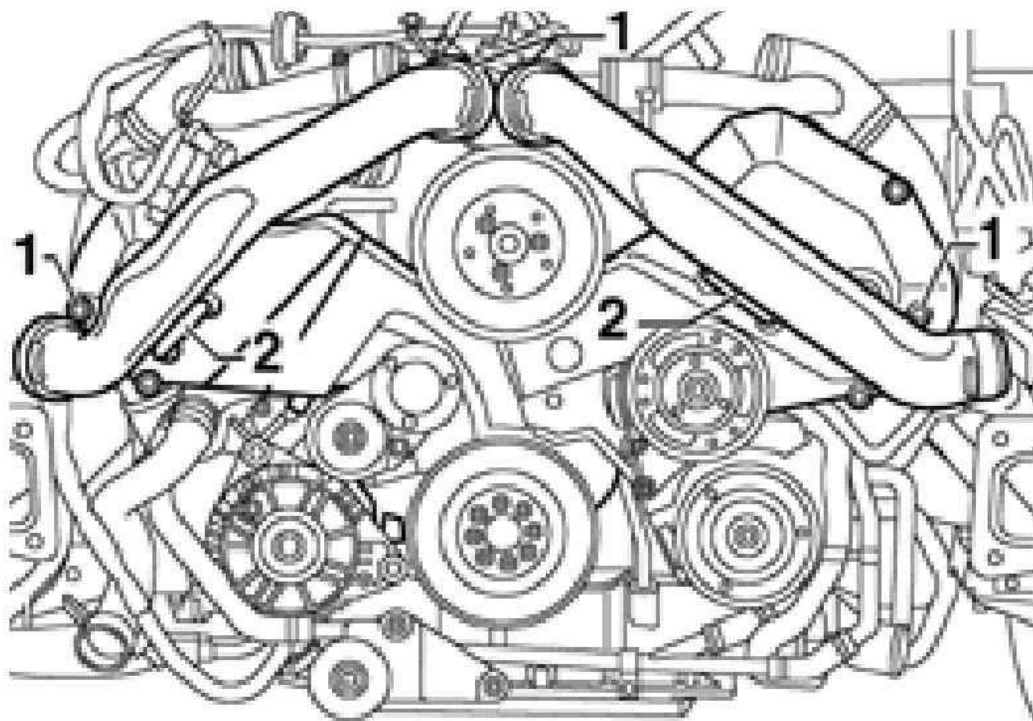


G02724916

Fig. 17: Moving Cables To Starter Aside Together With Cable Channels
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure lines -1-.

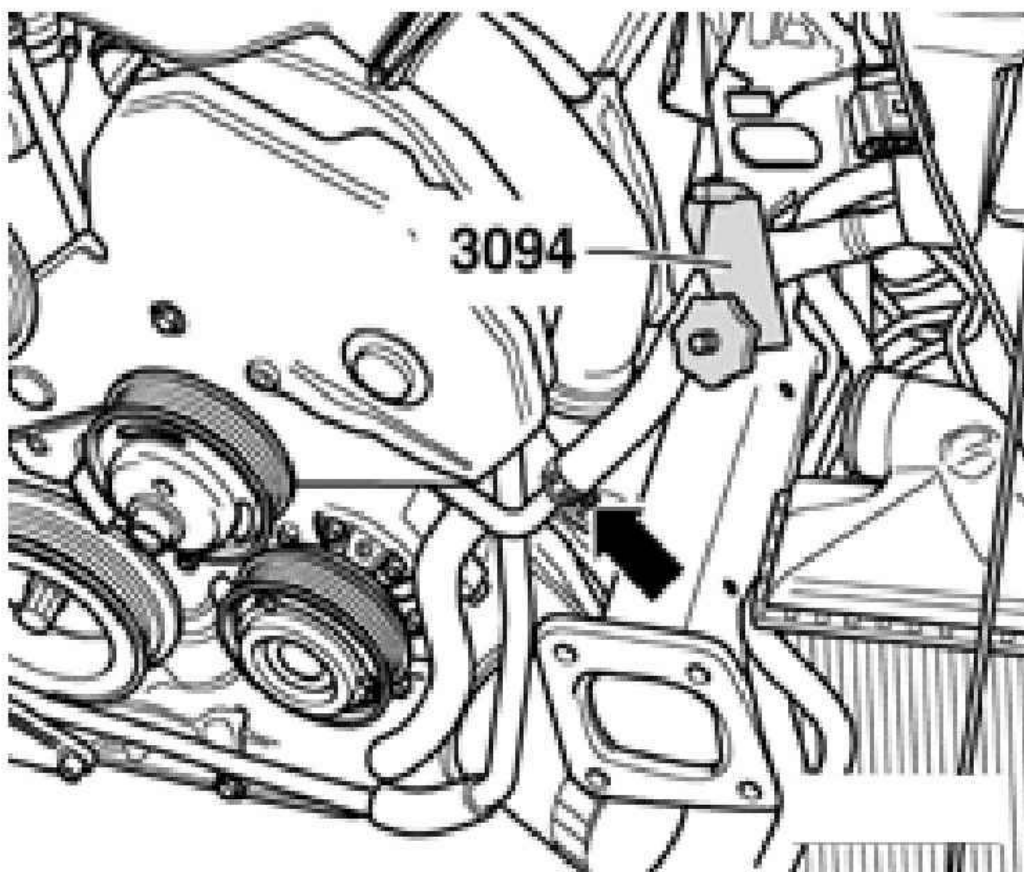
NOTE: Watch position of retaining strips -2-.



G02724917

Fig. 18: Removing Pressure Lines
Courtesy of AUDI OF AMERICA, INC.

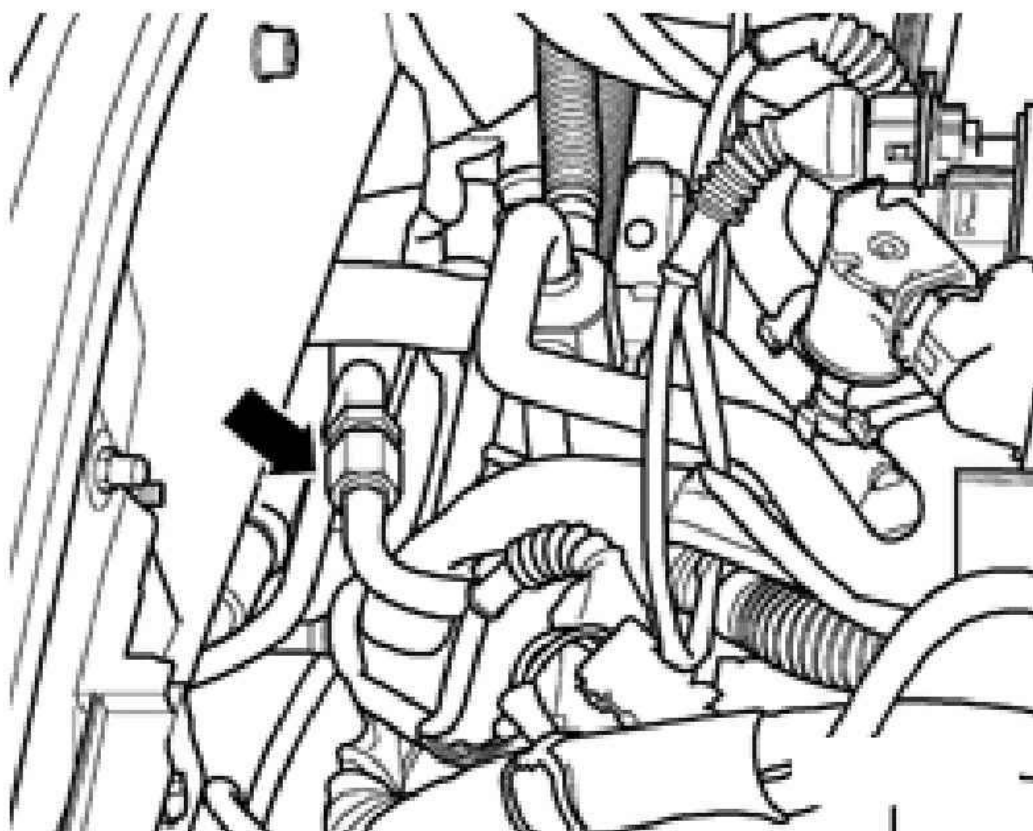
- Disconnect hose from power steering reservoir to power steering pump with special tool 3094. See **Fig. 19.**
- Disconnect power steering hose (arrow).



G02724918

Fig. 19: Disconnecting Power Steering Hose (Arrow)
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hydraulic line (arrow).
- Disconnect harness connector from vehicle speed sensor.
- Disconnect harness connector from reverse gear switch.

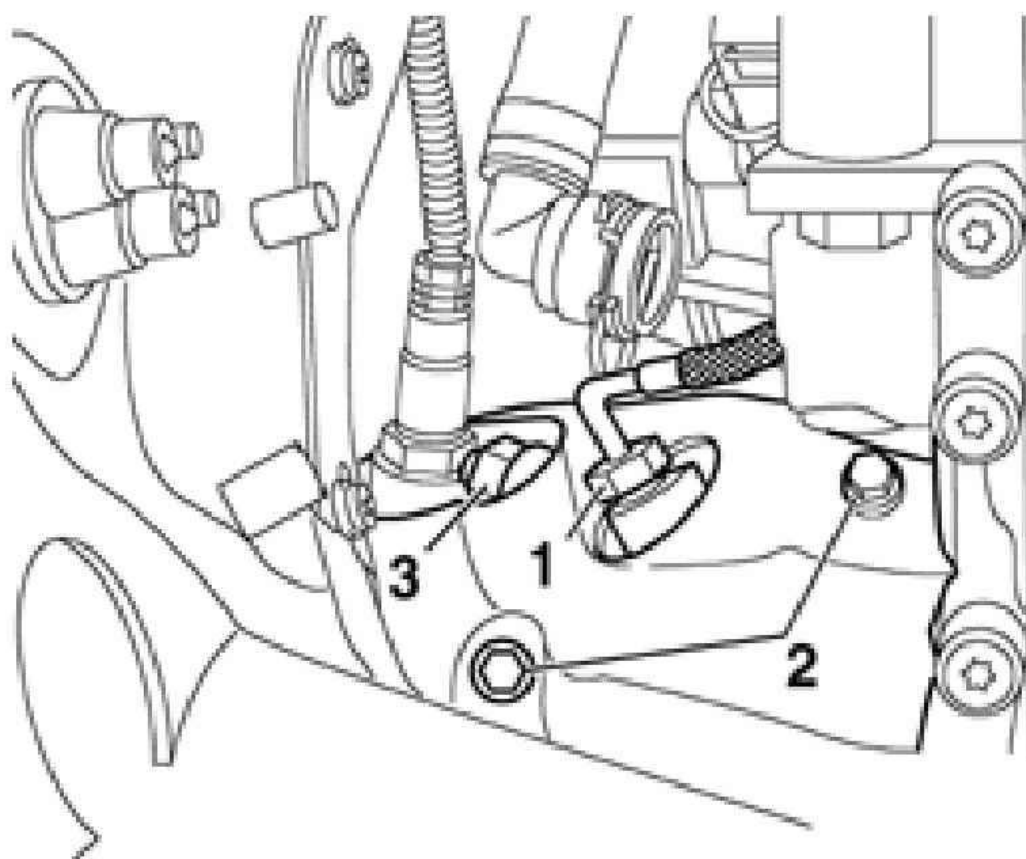


G02724919

Fig. 20: Disconnecting Hydraulic Line (Arrow)

Courtesy of AUDI OF AMERICA, INC.

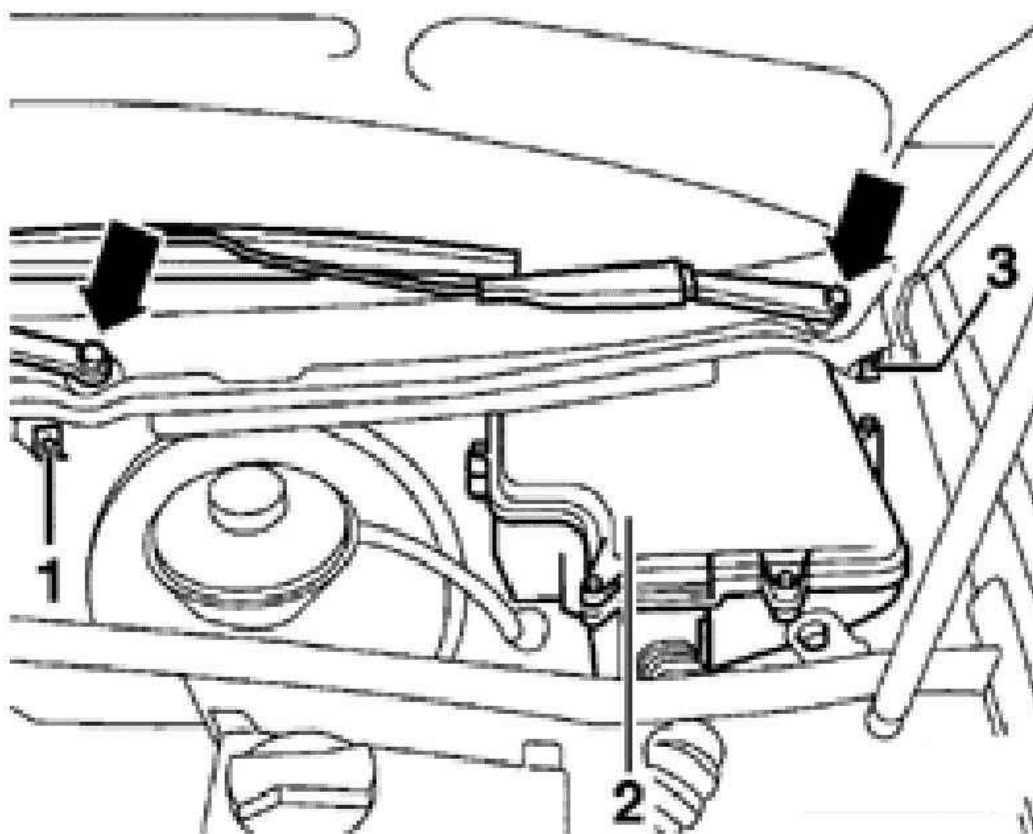
- Unscrew heat sensor -1- from right-hand turbocharger using 3035.
- Detach heat shield -2- from left and right turbochargers.
- Unscrew upper bolts -3- from front exhaust pipes at left and right turbochargers.



G02724920

Fig. 21: Detaching Heat Shield -2- From Left And Right Turbochargers
 Courtesy of AUDI OF AMERICA, INC.

- Remove wiper arms (arrows).
- Disconnect retaining clip -1- at water deflector.
- Pull off left and right retaining clips -3- on water deflector.
- Remove water deflector.
- Remove cover -2- from E-box (electronics box).
- Open E-box in plenum.

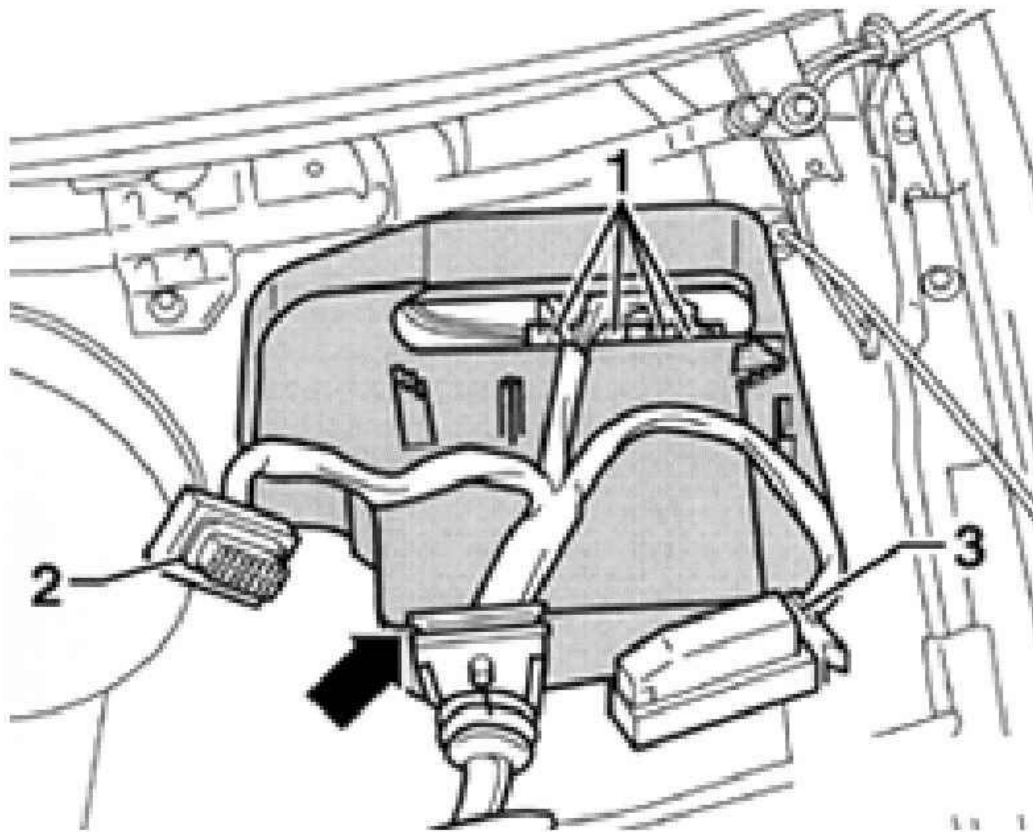


G02724921

Fig. 22: Removing Wiper Arms

Courtesy of AUDI OF AMERICA, INC.

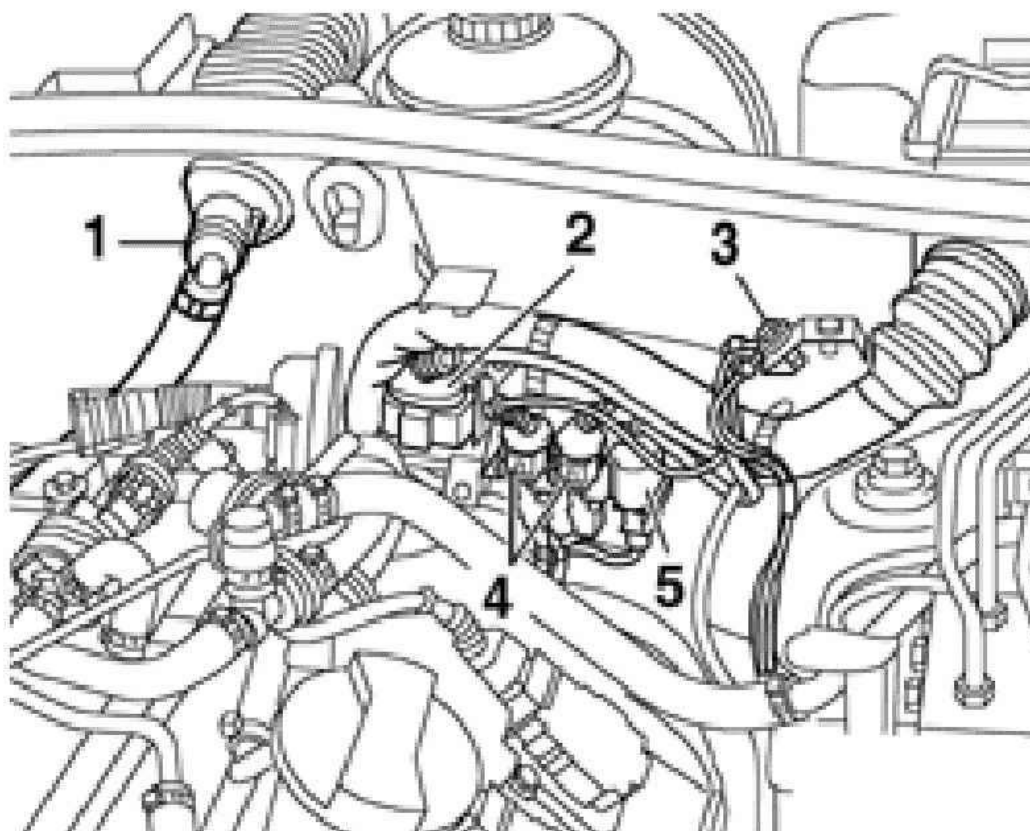
- Unclip ECM retaining bracket.
- Remove ECM, disconnect harness connectors -2- and -3- and remove.
- Disconnect harness connectors -1-.



G02724922

Fig. 23: Removing ECM Of Disconnect Harness Connectors
 Courtesy of AUDI OF AMERICA, INC.

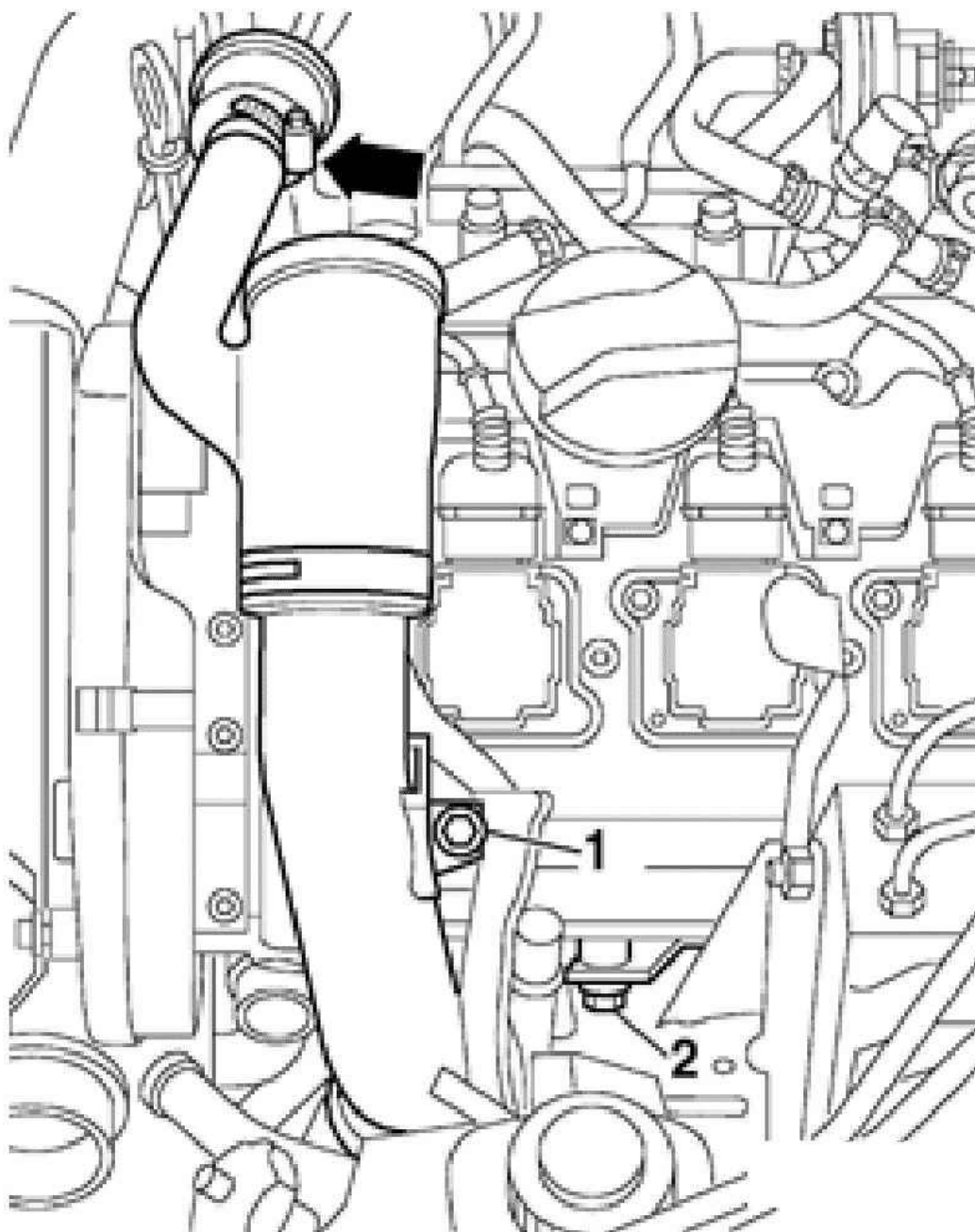
- Remove hose -1- to power brake booster at bulkhead.
- Disconnect ground (GND) -3-. See **Fig. 24**.
- Disconnect connectors -2- and -5- at bulkhead and remove lower part of connectors from bracket.
- Pull connector -4- out of bracket and move wiring clear.
- Remove bracket for cable plug.
- Remove both coolant hoses to heat exchanger at engine by un-clipping retaining clips on flange.



G02724923

Fig. 24: Locating Power Brake Booster And Connectors At Bulkhead
Courtesy of AUDI OF AMERICA, INC.

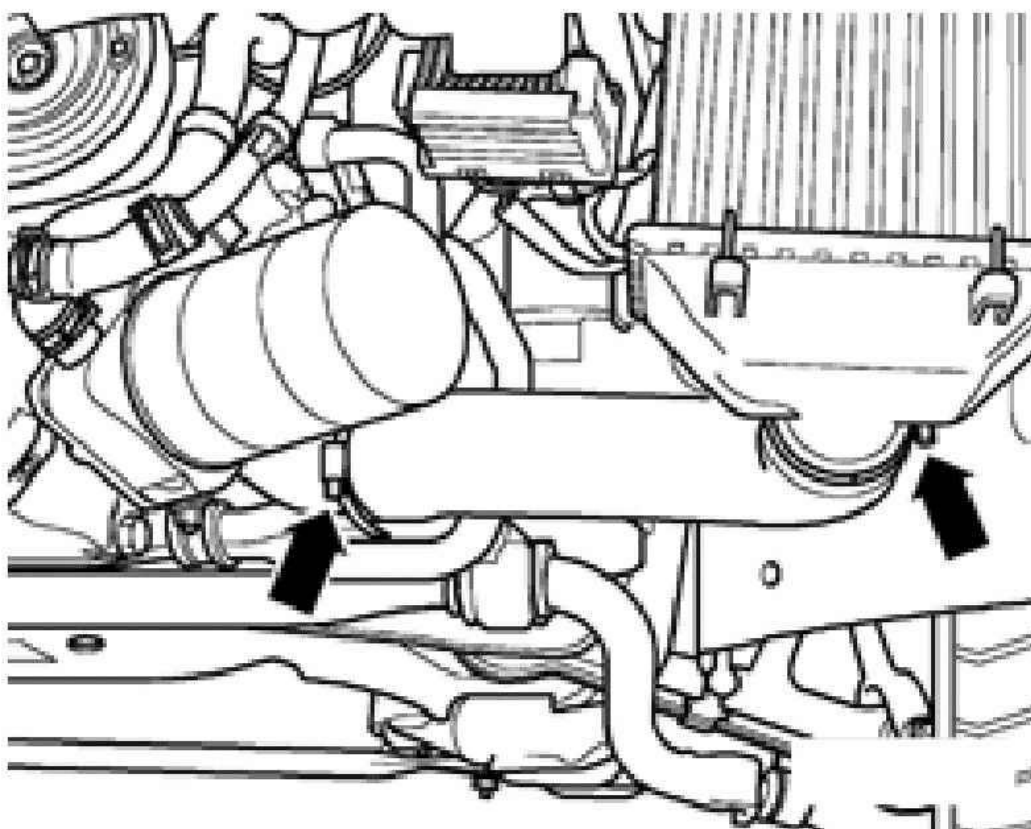
- Remove both coolant hoses to heat exchanger at engine by un-clipping retaining clips on flange.
- Release hose clamp -arrow-.
- Remove intake line -1-.
- Remove water line -2-.



G02724924

Fig. 25: Removing Both Coolant Hoses To Heat Exchanger At Engine
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure hoses -arrows- between turbocharger and charge air cooler (left and right sides).

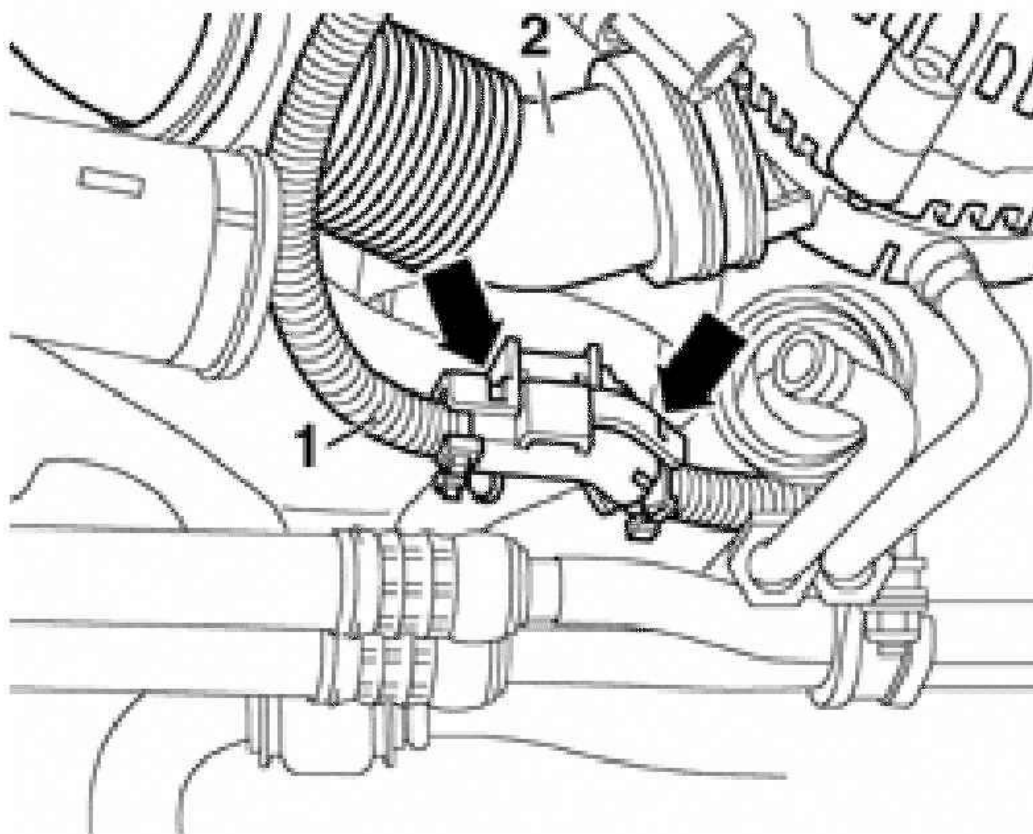


G02724925

Fig. 26: Removing Pressure Hoses -Arrows- Between Turbocharger And Charge Air Cooler (Left And Right Sides)

Courtesy of AUDI OF AMERICA, INC.

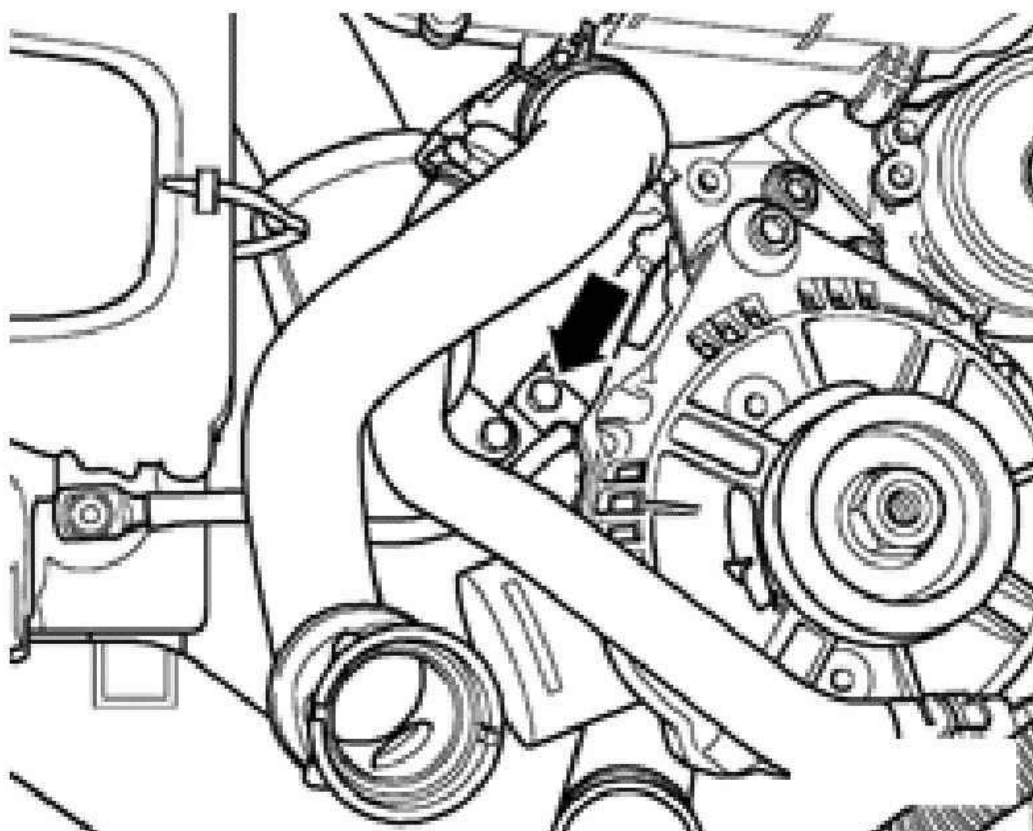
- Move aside cable -1- to starter by cutting cable tie and unclipping bracket (arrow).
- Remove hose -2- for cooling generator.



G02724926

Fig. 27: Removing Hose -2- For Cooling Generator
Courtesy of AUDI OF AMERICA, INC.

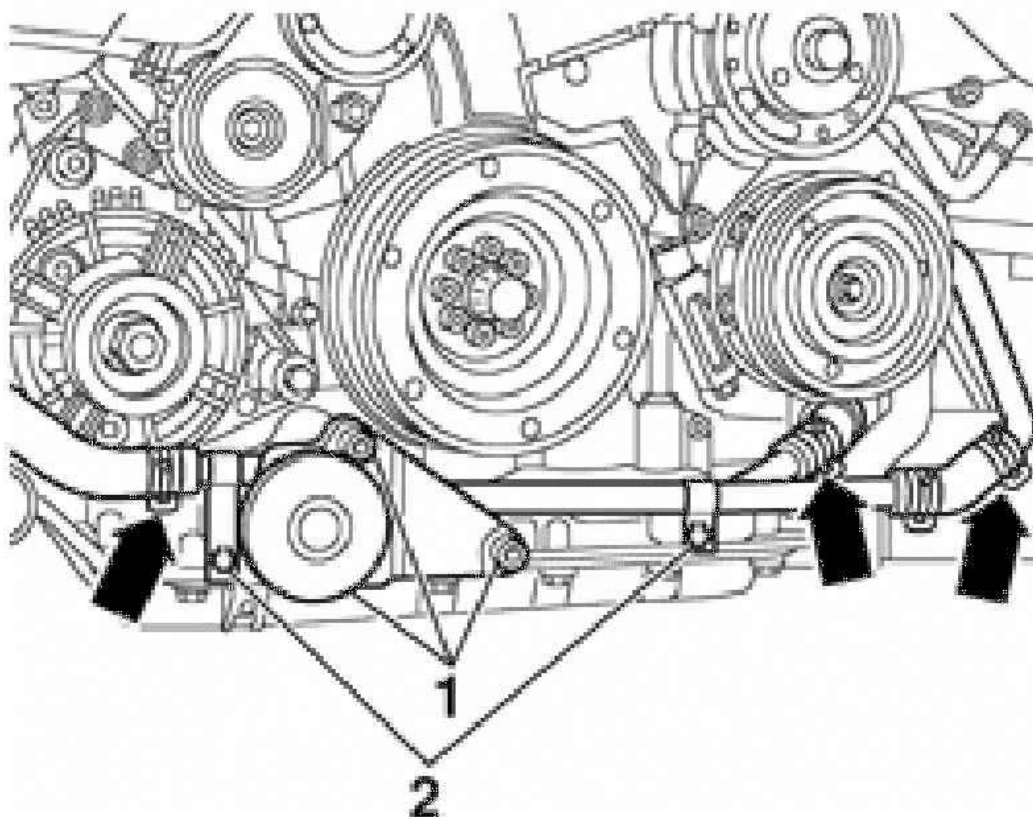
- Disconnect ground (GND) (arrow) from engine support.



G02724927

Fig. 28: Disconnecting Ground (Arrow) From Engine Support
Courtesy of AUDI OF AMERICA, INC.

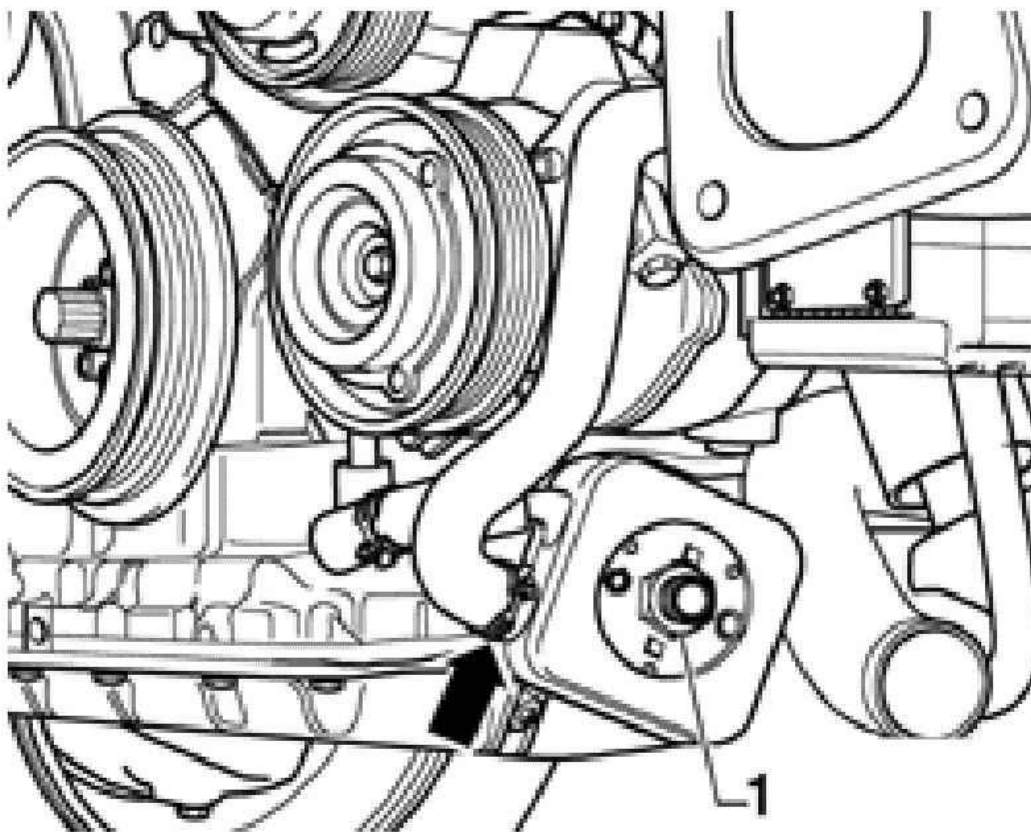
- Remove torque support -1-.
- Remove hose clamps (arrows).
- Remove coolant line -2-. See **Fig. 29**.
- Place VAG 1306 Drip Tray beneath engine.
- Remove oil filter.



G02724928

Fig. 29: Removing Hose Clamps At Front Of Engine
Courtesy of AUDI OF AMERICA, INC.

- Remove hose clamps (arrow).
- Remove oil cooler -1-.

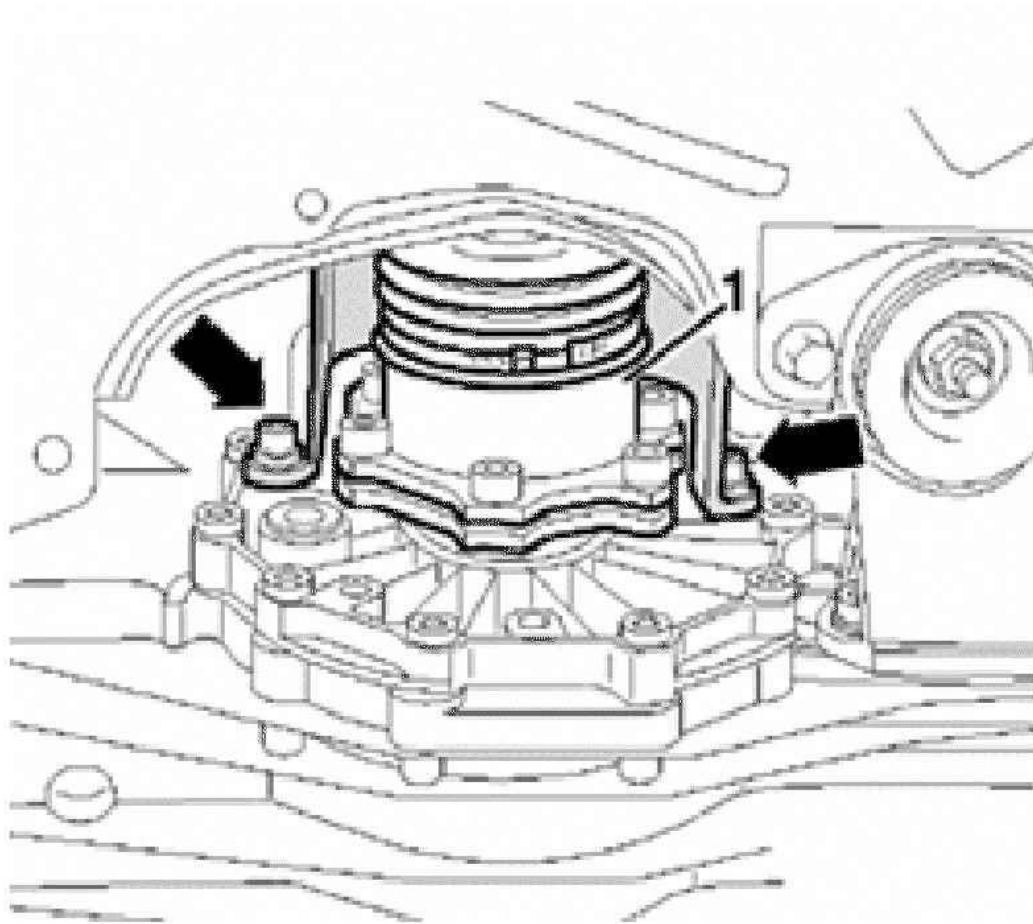


G02724929

Fig. 30: Removing Oil Cooler

Courtesy of AUDI OF AMERICA, INC.

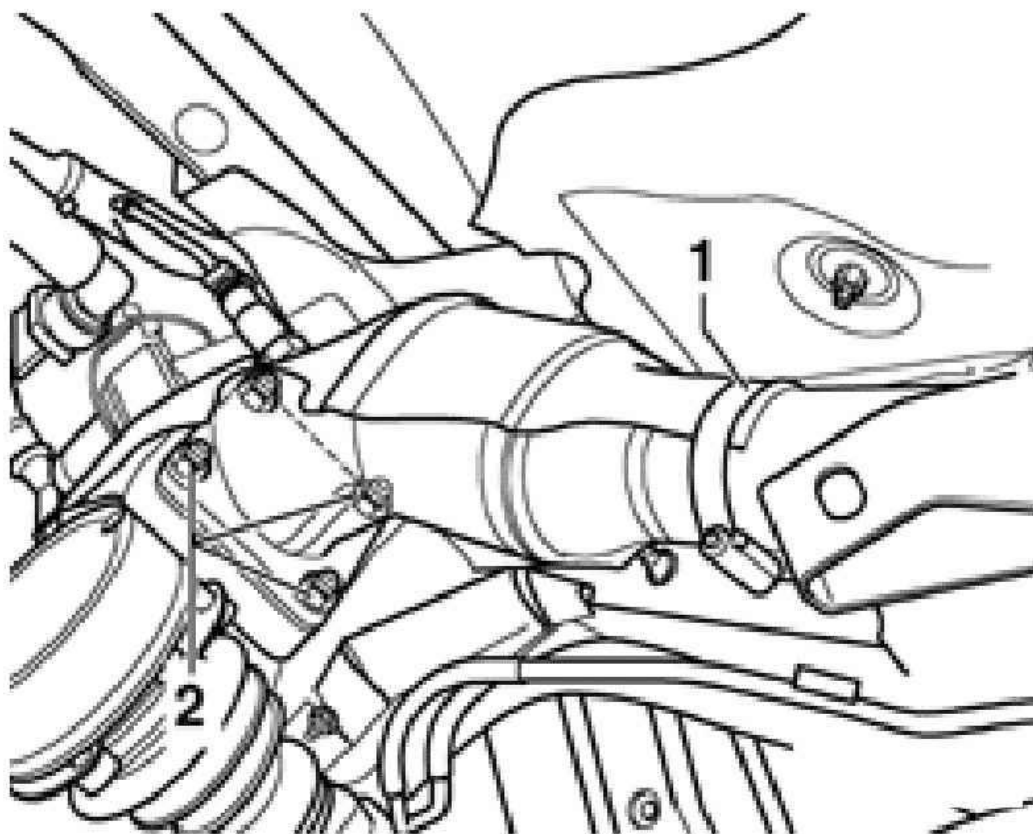
- Remove heat shield (arrows) above left and right drive axle to transmission.



G02724930

Fig. 31: Removing Heat Shield Above Left And Right Drive Axle
Courtesy of AUDI OF AMERICA, INC.

- Remove hose clamp -1- from left and right heat shield for turbocharger.
- Unbolt left and right exhaust pipes -2- from turbocharger.

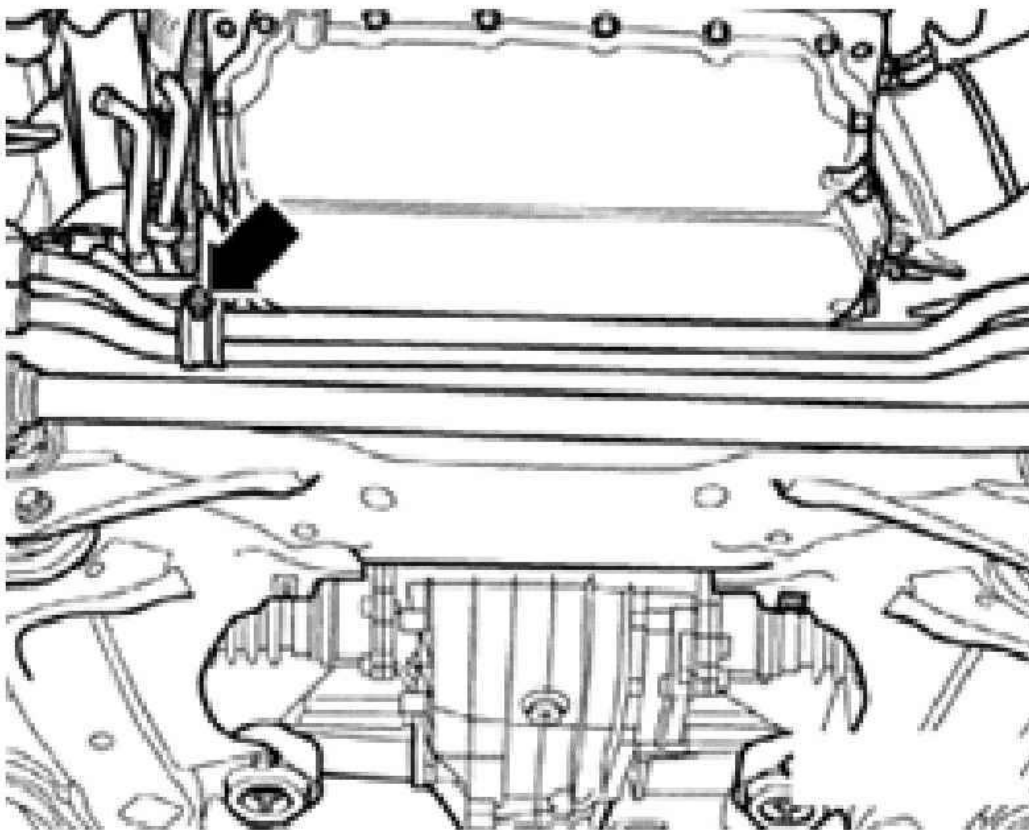


G02724931

Fig. 32: Removing Hose Clamp -1- From Left And Right Heat Shield For Turbocharger
Courtesy of AUDI OF AMERICA, INC.

- Detach air conditioner line from oil pan -arrow-.

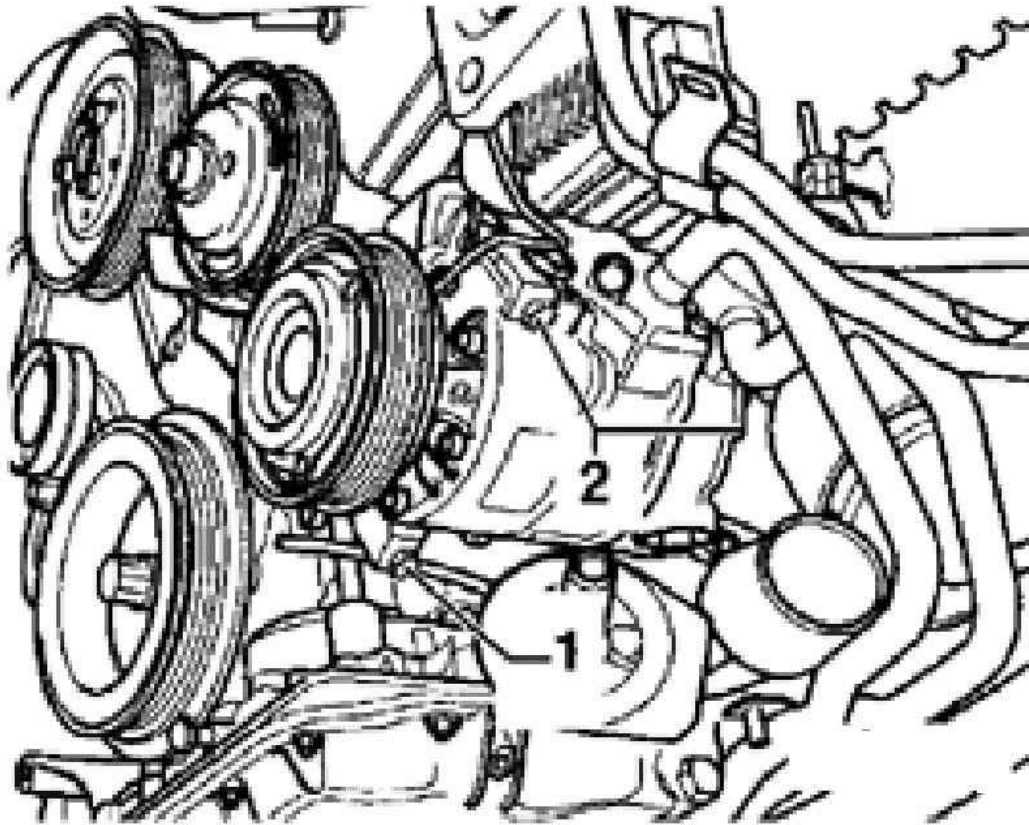
CAUTION: Do not open the refrigerant circuit of the AC system.



G02724932

Fig. 33: Detaching Air Conditioner Line From Oil Pan
Courtesy of AUDI OF AMERICA, INC.

- Remove A/C compressor -1...2-.
- Attach A/C compressor (with refrigerant hoses attached) to vehicle using wire.



G02724933

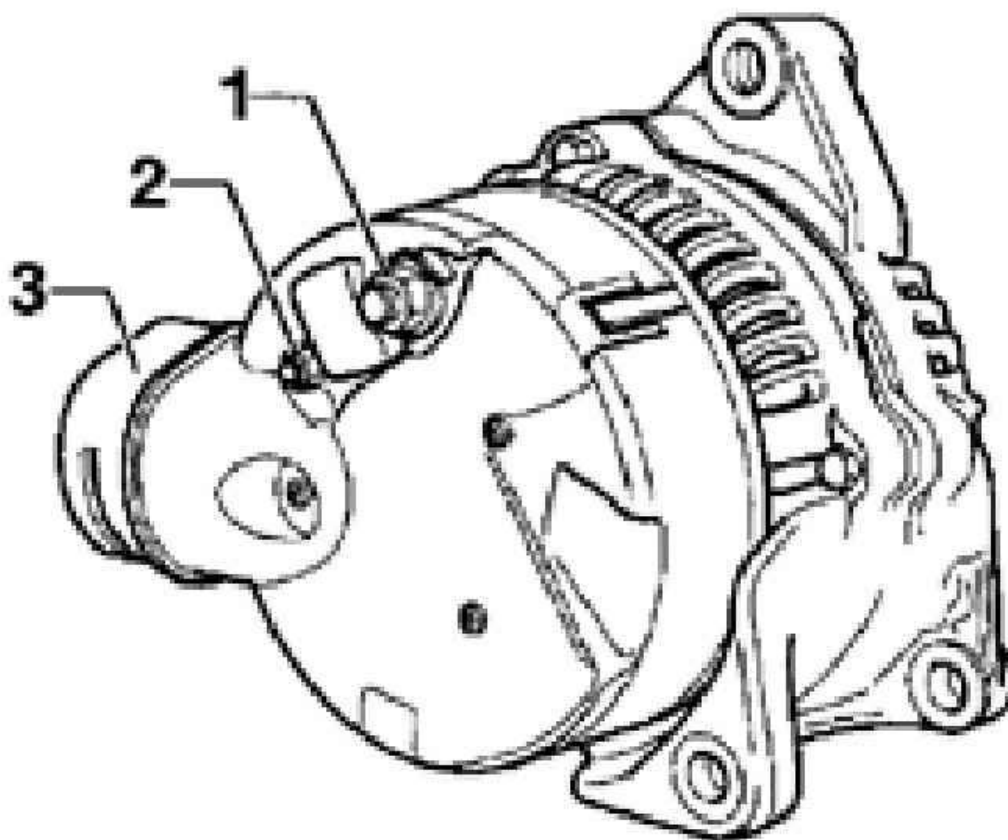
Fig. 34: Removing A/C Compressor
Courtesy of AUDI OF AMERICA, INC.

NOTE:

- When installing pay attention to guide bushings.
- When installing first insert bolt -1- in A/C compressor.
- Do not bend or stretch lines or hoses as condenser and/or refrigerant lines/hoses may be damaged.

Vehicles with automatic transmission:

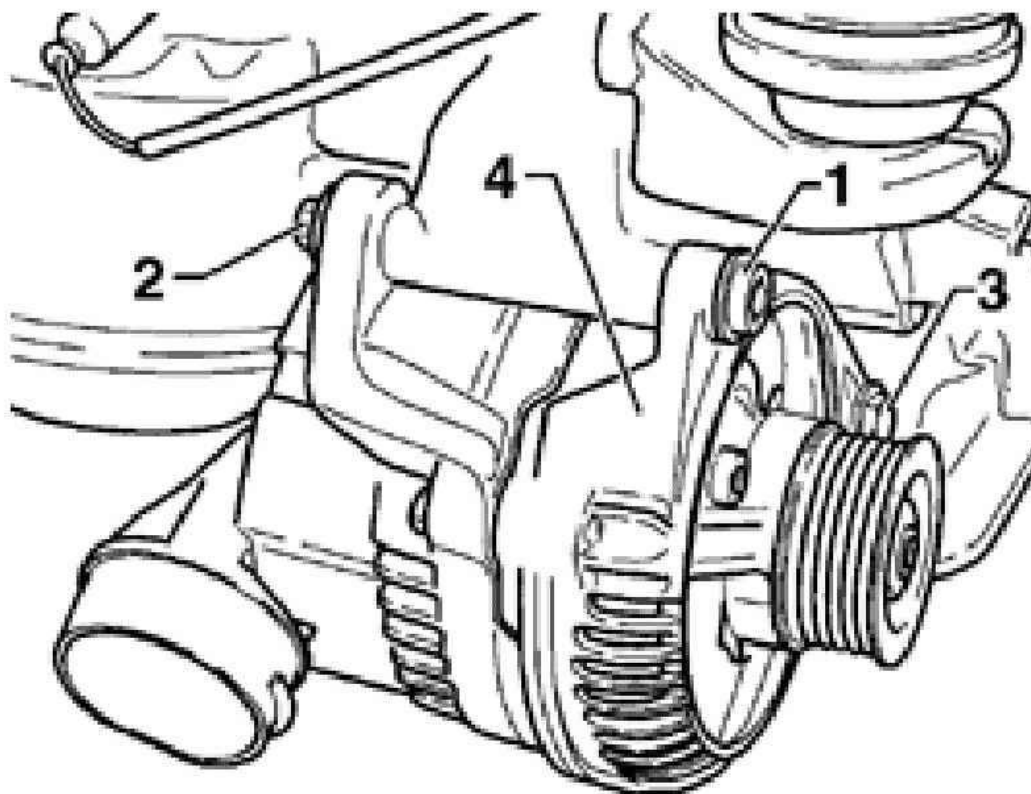
- Remove right charge air cooler by disconnecting upper hose connection; charge air cooler supported in 3x rubber bearings.
- Disconnect air guide at generator support -3-.
- Unbolt cable at terminal 30/B+ -1-. Tightening torque: 16 Nm
- Unbolt cable at terminal D+ -2-. Tightening torque: 4 Nm



G02724934

Fig. 35: Disconnecting Air Guide At Generator Support
Courtesy of AUDI OF AMERICA, INC.

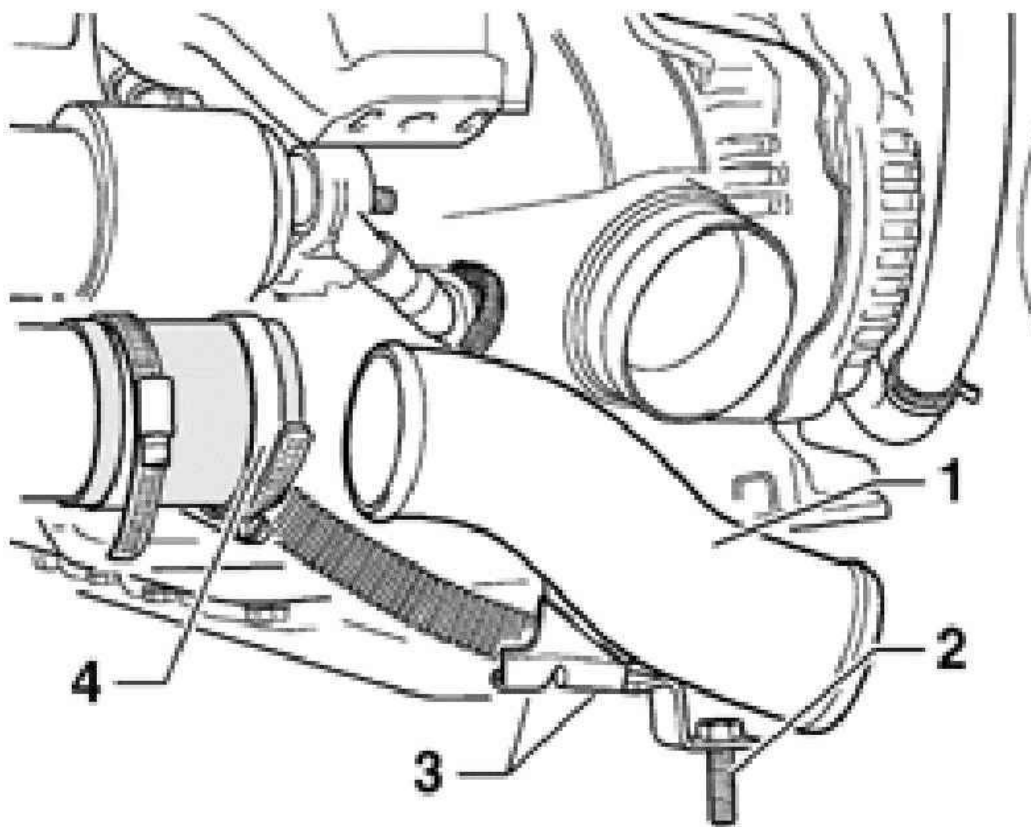
- Remove hex socket bolt -1-, retaining nut -2-. Tightening torque: 45 Nm. See **Fig. 36**.
- Remove bolt -3-. Tightening torque: 22 Nm
- Remove generator -4- downward and out.



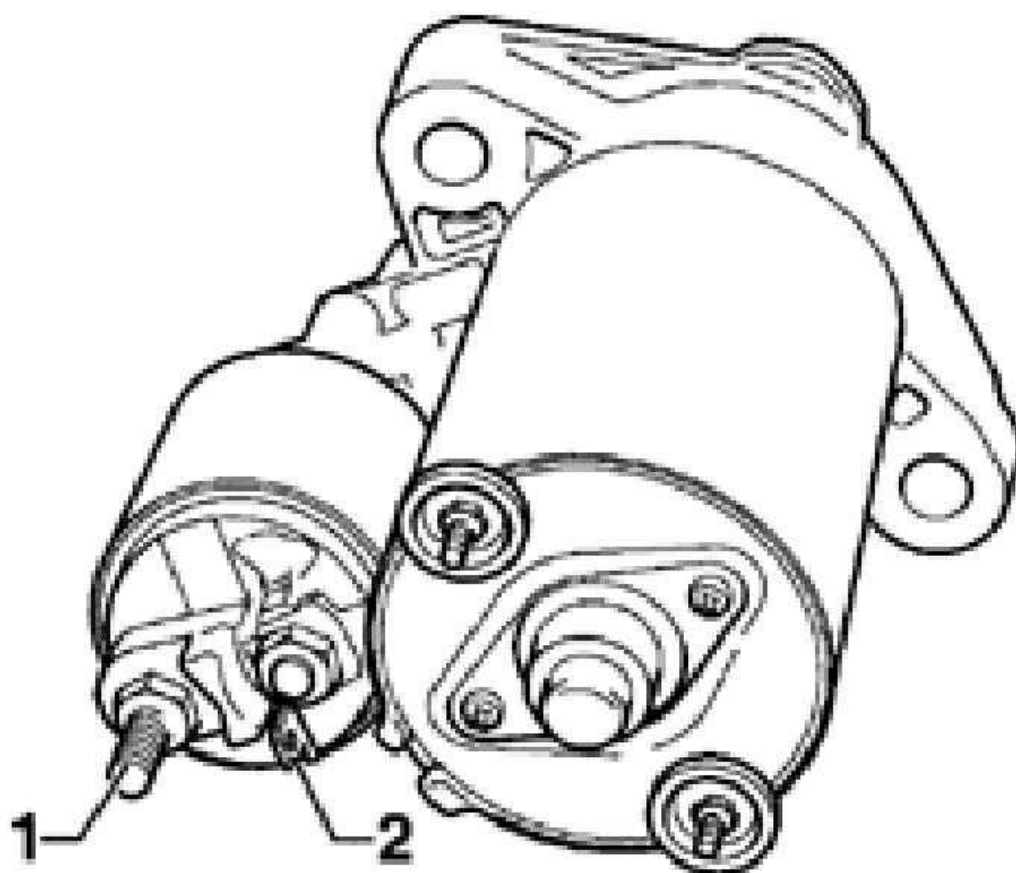
G02724935

Fig. 36: Removing Generator
Courtesy of AUDI OF AMERICA, INC.

1. - Remove air intake -1-.
2. - Securing points for oil and A/C lines
3. - Securing point to engine block
4. - Remove hose clamp

**G02724936****Fig. 37: Removing Air Intake****Courtesy of AUDI OF AMERICA, INC.**

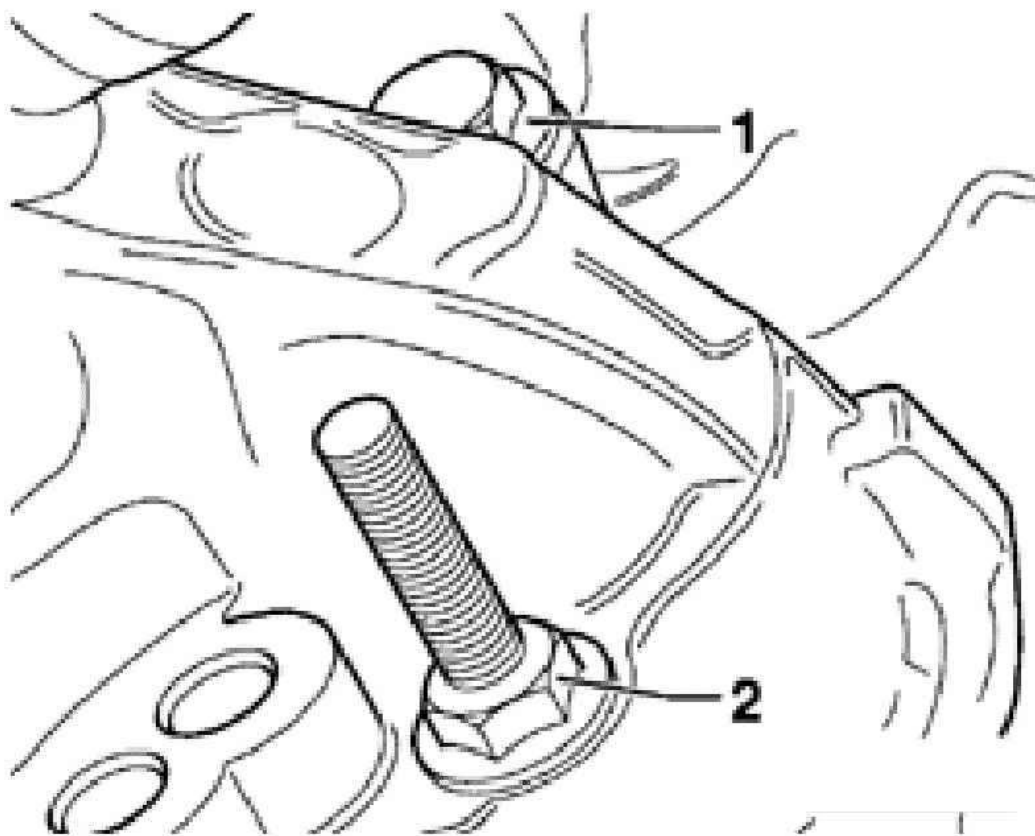
- Unbolt cable for terminal 30/B+ -1-. Tightening torque: 16 Nm
- Disconnect connector for terminal 50 -2-.



G02724937

Fig. 38: Unbolting Cable For Starter Terminals
 Courtesy of AUDI OF AMERICA, INC.

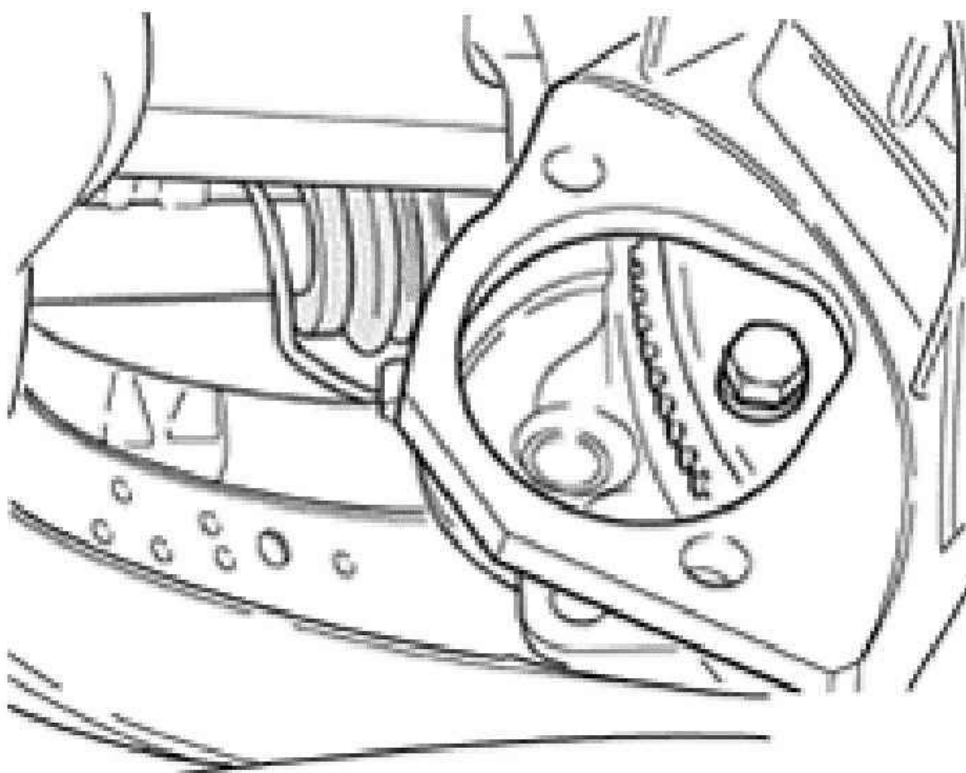
- Remove right wheel.
- Remove upper bolt -1- through right wheelhousing. Tightening torque: 65 Nm. See **Fig. 39**.
- Remove lower bolt from engine side. Tightening torque: 65 Nm
- Remove starter forward and out.



G02724938

Fig. 39: Removing Upper Bolt -1- Through Right Wheelhousing
Courtesy of AUDI OF AMERICA, INC.

- Using special tool V175 disconnect torque converter from drive plate.



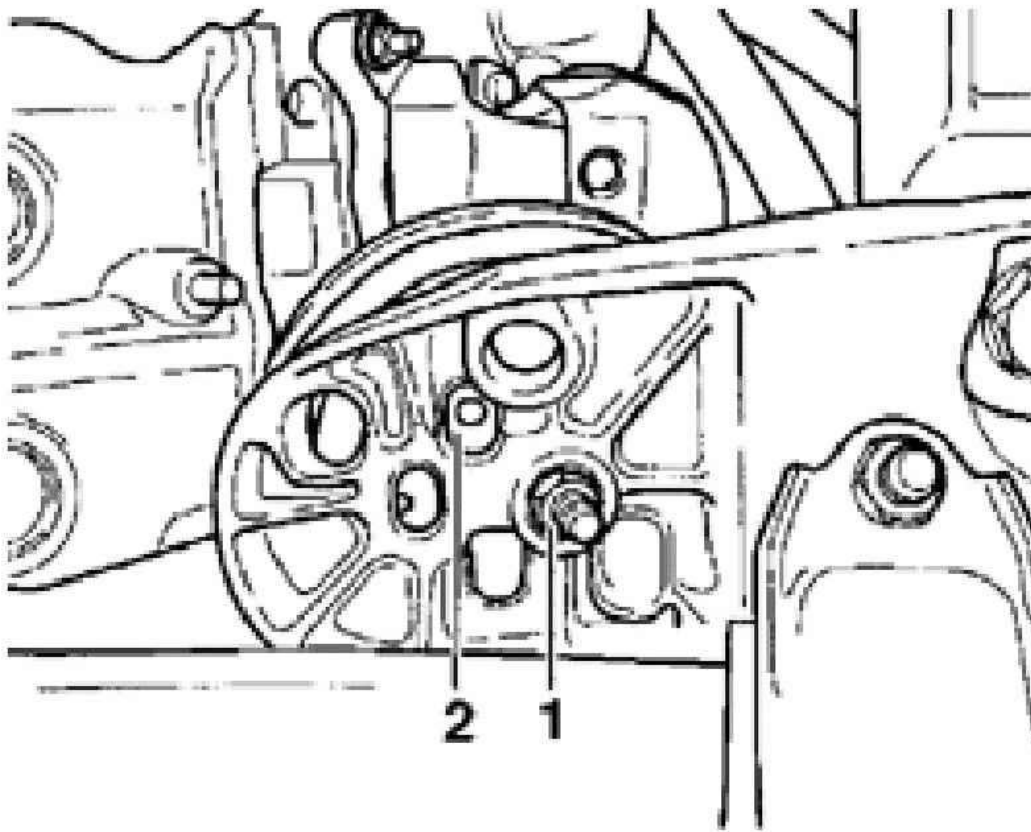
G02724939

Fig. 40: Disconnecting Torque Converter From Drive Plate
Courtesy of AUDI OF AMERICA, INC.

All models

- Mark positions of securing points -1- and locating sleeves -2- under engine mountings on right and left sides.
- Remove nuts -1- at engine mountings on left and right sides.

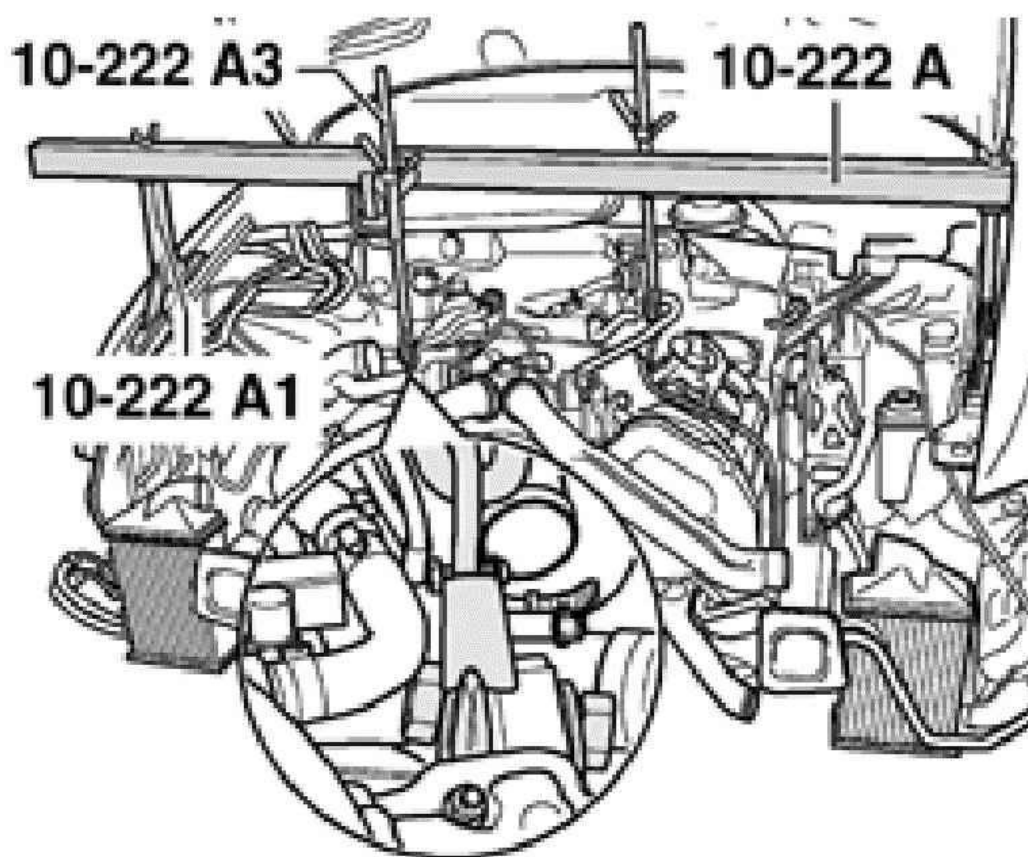
NOTE: When installing, make sure that locating sleeves -2- engage in position.



G02724940

Fig. 41: Removing Nuts At Engine Mountings On Left And Right Sides
Courtesy of AUDI OF AMERICA, INC.

- Set up support bar 10-222 A on bolted flanges of wing panels using 10-222A1 and extension 10-222A3.
- Lift engine upward with support bar 10-222A.
- Remove engine/transmission bolts from underneath.
- Remove support bar.
- Remove engine/transmission bolts from above.



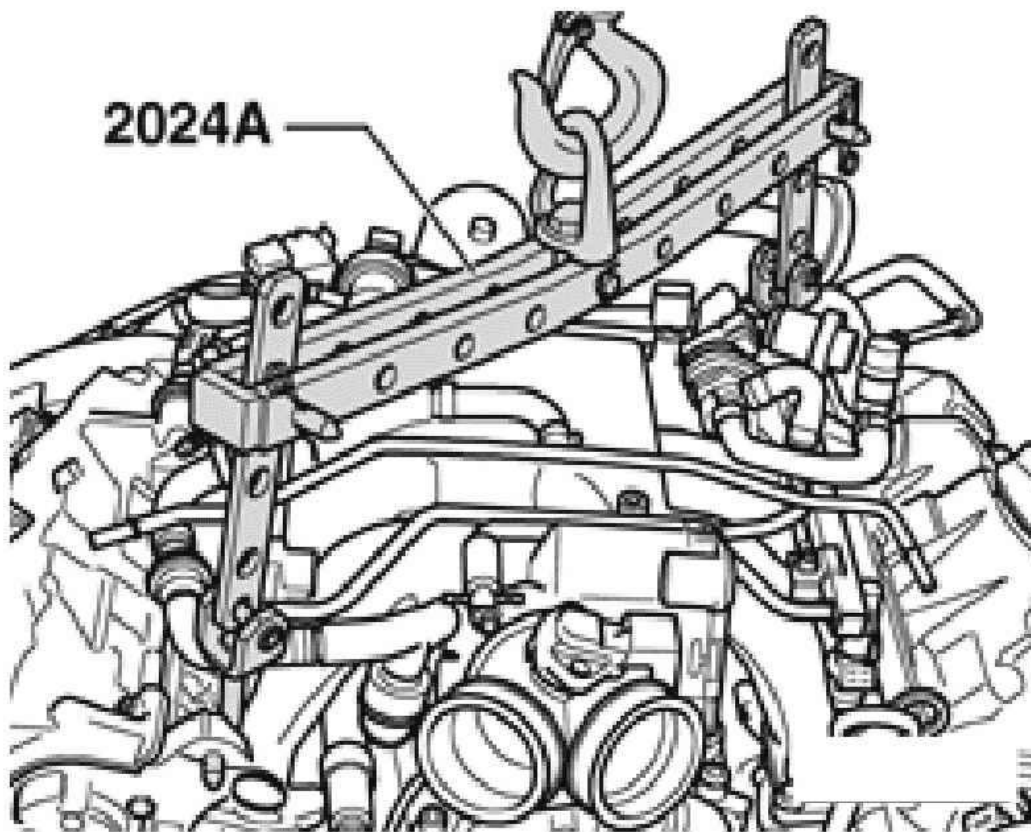
G02724941

Fig. 42: Lifting Engine Upward With Support Bar 10-222A
Courtesy of AUDI OF AMERICA, INC.

- Attach lifting tackle 2024 A at rear right and front left, and secure attachment points.

NOTE: To balance the center of gravity of the engine, secure the hook attachments in the positions shown in the illustration.

WARNING: The hook attachments and locating pins on the lifting tackle must be secured with locking pins.



G02724942

Fig. 43: Attaching Lifting Tackle At Rear Right And Front Left
Courtesy of AUDI OF AMERICA, INC.

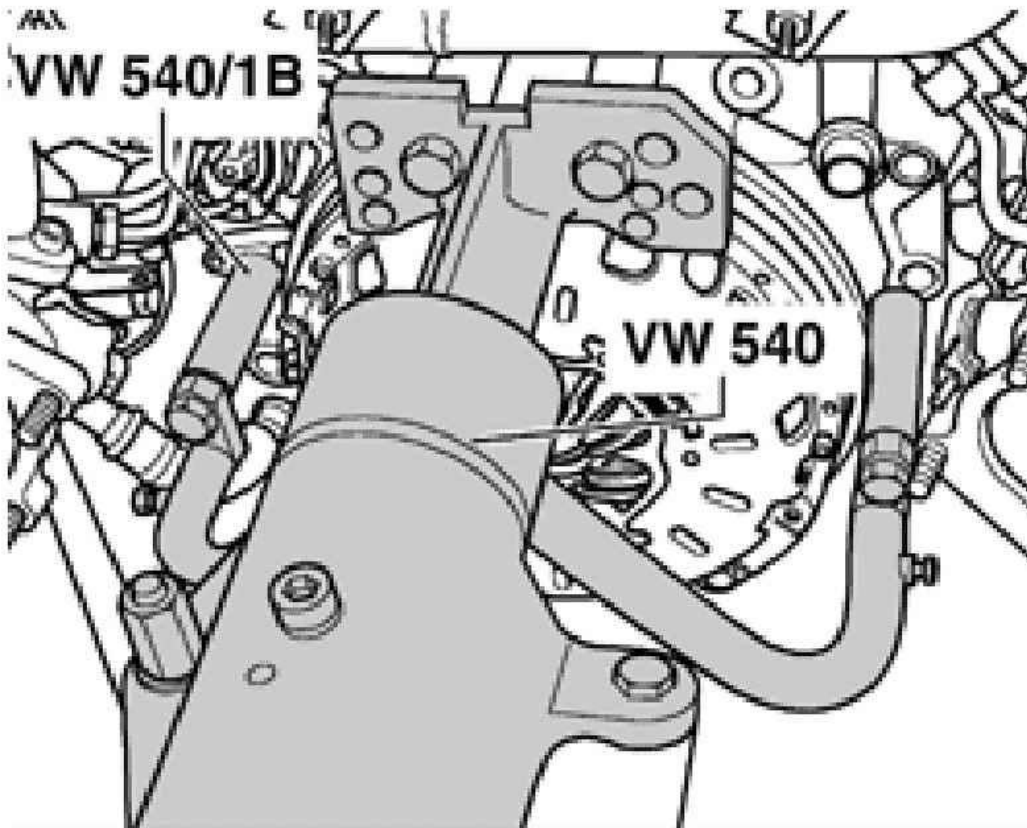
- Remove front left wheel.
- Support transmission using floor jack.
- Push engine crane VAG1202A into position and attach to engine sling.

NOTE: **Verify that all hoses and lines between engine and transmission have been disconnected.**

- Carefully pull engine out toward front until free.
- Guide engine forward out of engine compartment.
- Remove spacer between engine and transmission.

Engine, attaching to engine stand

For engine disassembly and assembly, mount engine to an assembly stand using VW 540 Holding Fixture together with VW540/1B auxiliary pieces.



G02724943

Fig. 44: Identifying Engine Stud
Courtesy of AUDI OF AMERICA, INC.

Engine, installing

Installation is reverse of removal, noting the following:

NOTE: Always replace self-locking nuts, bolts as well as gaskets and O-rings.

- Install clutch

All drive vehicles:

See **CLUTCHES - 01E, AWD** .

- Make sure centering sleeves for engine to transmission are correctly installed in cylinder block. Install or replace if necessary.
- Lubricate splines on transmission input shaft lightly using thin coating of G 000 100. Do not lubricate guide sleeve for release bearing.
- Check centering of clutch disc.
- For vehicles with manual transmission, a pilot needle bearing must be installed in crankshaft. Install if necessary. See **NEEDLE BEARING IN DUAL-MASS FLYWHEEL, REMOVING AND INSTALLING**.
- For vehicles with automatic transmission, install bushing in flywheel.
- Install spacer between engine and transmission.
- Install ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.
- Fill with coolant. See **COOLING SYSTEM, DRAINING AND FILLING**.

NOTE:

- Only reuse drained coolant if cylinder head or engine block was not replaced.
- Dirty coolant cannot be reused.

- Install engine mounts without tension or preload by aligning engine with shaking motions before tightening engine mounts.
- Install lock carrier with attachments.

See **LOCK CARRIER WITH ATTACHMENTS, REMOVING AND INSTALLING**.

- Install bumper.

See **FRONT BUMPER**.

- Align exhaust system so it is free of stress. See **EXHAUST SYSTEM, ALIGNING FREE OF STRESS**.
- Attach vacuum lines. See **VACUUM DIAGRAM - COMPLETE**.

NOTE: Only remove and install spark plugs using 3122B spark plug removal tool.

- For harness connectors and routing:

See System Wiring Diagrams .

See **Caution for connecting Telematics battery** under **ENGINE, REMOVING AND INSTALLING**.

- After connecting battery, enter anti-theft code for radio.

See Radio operating manual.

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

- Fully close front power windows to stop.
- Activate all power window switches ("up" for at least one second to activate automatic window raising/lowering).
- Set clock to correct time.
- Check engine oil level before starting engine.

Tightening torques

NOTE:

- Tightening torques are valid only for nuts and bolts that are lightly greased, oiled, covered with a thin coat of phosphate or blackened.
- Additional lubricants such as engine or transmission oil may be used as long as they do not contain graphite
- Do not use any degreased parts.
- Permissible deviations for tightening torques " 15%.

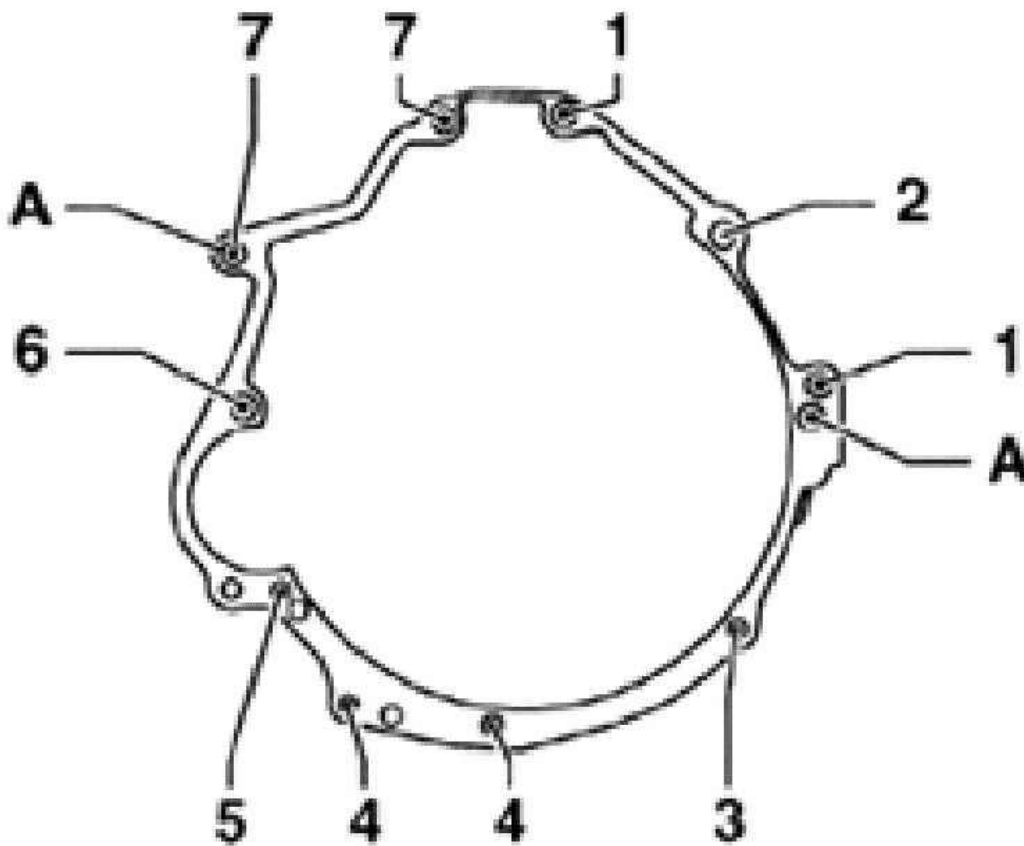
Manual transmission

Transmission to engine (6-cylinder)

MANUAL TRANSMISSION-TO-ENGINE TIGHTENING TORQUES

Item No.	Bolt	Number	Nm
1	M 12 x 90	2	65
2	M 12 x 100	1	65
3	M 10 x 60	1	45
4	M 10 x 60	2	45
5	M 10 x 150	1	65
6	M12 x 130	1	65
7	M12 x 80	2	65

-A- Centering sleeves



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Fig. 45: Identifying Engine-To-Transmission Bolt Holes - Manual Transmission
 Courtesy of AUDI OF AMERICA, INC.

Automatic transmission

Engine/transmission mountings (6-cylinder engine)

AUTOMATIC TRANSMISSION-TO-ENGINE TIGHTENING TORQUES

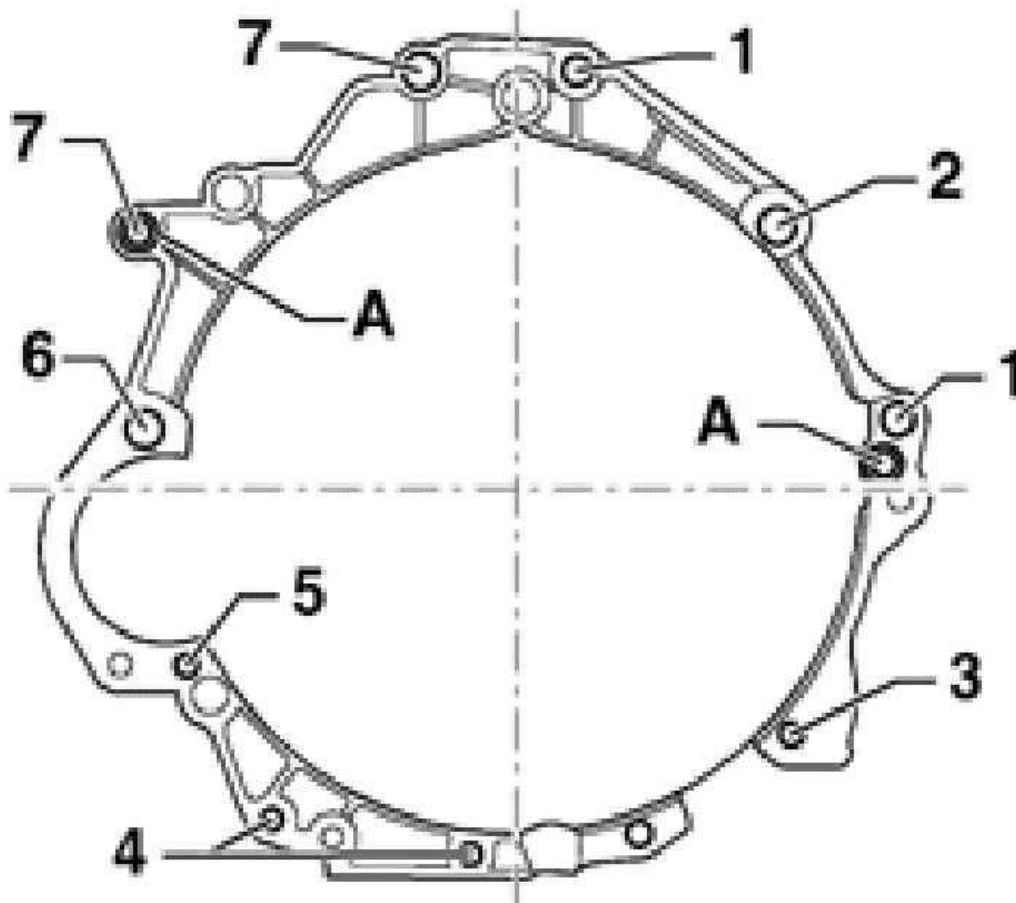
Item No.	Bolt	Number	Nm
1	M 12 x 90	2	65
2	M 12 x 100	1	65
3	M 10 x 70	1	45
4	M 10 x 60	2	45
5	M 10 x 100	1	65
6	M12 x 110	1	65

7

M12 x 80

2

65



G02724945

Fig. 46: Identifying Engine-To-Transmission Bolt Holes - Automatic Transmission
 Courtesy of AUDI OF AMERICA, INC.

-A- Dowel sleeves for centering

TIGHTENING TORQUES: ENGINE INSTALLATION

Threaded assemblies	Tightening torque
Nuts and bolts M6	10 Nm
Nuts and bolts M8	20 Nm
Nuts and bolts M10	45 Nm
Nuts and bolts M12	60 Nm

Except for the following:

Head line to turbocharger	25 Nm
Heat shield to turbocharger	10 Nm
Clamp for exhaust pipe	40 Nm
Engine support to engine mount M10	45 Nm
A/C Compressor to bracket	25 Nm
Torque support	45 Nm
Heat shields above drive axles to transmission	25 Nm
Torque converter	85 Nm

For fan, see **VISCOUS FAN, REMOVING AND INSTALLING.**

VACUUM HOSE DIAGRAM(S)

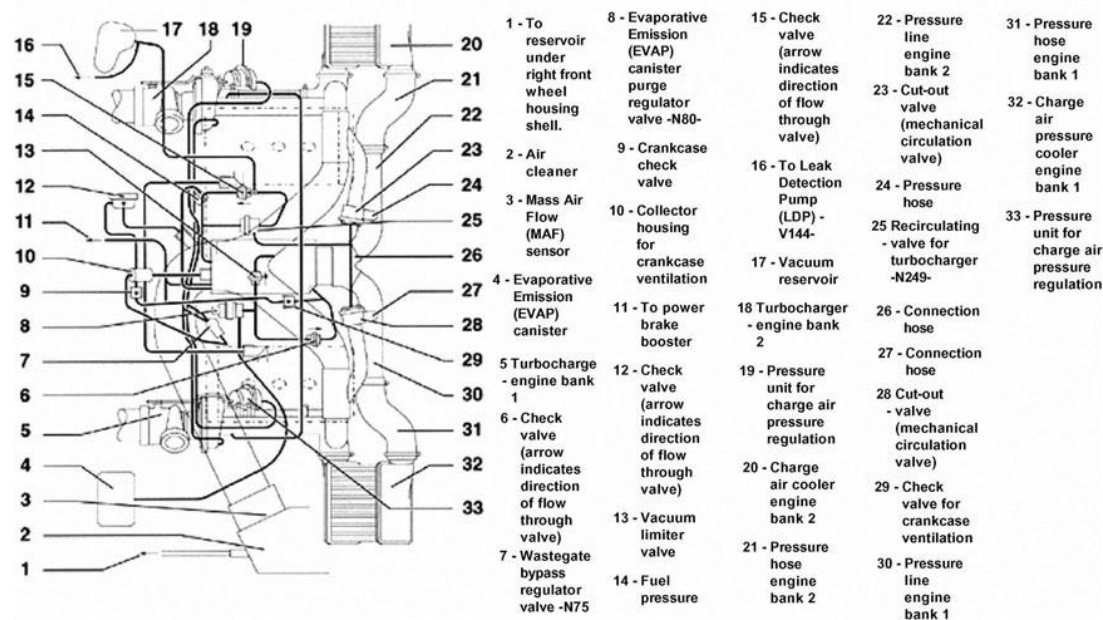
NOTE: For vacuum diagram (partial systems), see **VACUUM LAYOUT - PARTIAL SYSTEMS.**

Vehicles without Secondary Air Injection (AIR)

NOTE: The following list refers to items in **Fig. 47.**

1. - To reservoir under right front wheel housing shell.
2. - Air cleaner
3. - Mass Air Flow (MAF) sensor
4. - Evaporative Emission (EVAP) canister
5. - Turbocharger engine bank 1
6. - Check valve (arrow indicates direction of flow through valve)
7. - Wastegate bypass regulator valve -N75
8. - Evaporative Emission (EVAP) canister purge regulator valve -N80-
9. Crankcase check valve
10. - Collector housing for crankcase ventilation
11. - To power brake booster
12. - Check valve (arrow indicates direction of flow through valve)
13. - Vacuum limiter valve
14. - Fuel pressure regulator
15. - Check valve (arrow indicates direction of flow through valve)
16. - To Leak Detection Pump (LDP) -V144-
17. - Vacuum reservoir
18. - Turbocharger engine bank 2
19. - Pressure unit for charge air pressure regulation
20. - Charge air cooler engine bank 2

21. - Pressure hose engine bank 2
22. - Pressure line engine bank 2
23. - Cut-out valve (mechanical circulation valve)
24. - Pressure hose
25. - Recirculating valve for turbocharger - N249-
26. - Connection hose
 - For both charge air coolers
27. - Connection hose
28. - Cut-out valve (mechanical circulation valve)
29. - Check valve for crankcase ventilation
30. - Pressure line engine bank 1
31. - Pressure hose engine bank 1
32. - Charge air pressure cooler engine bank 1
33. - Pressure unit for charge air pressure regulation



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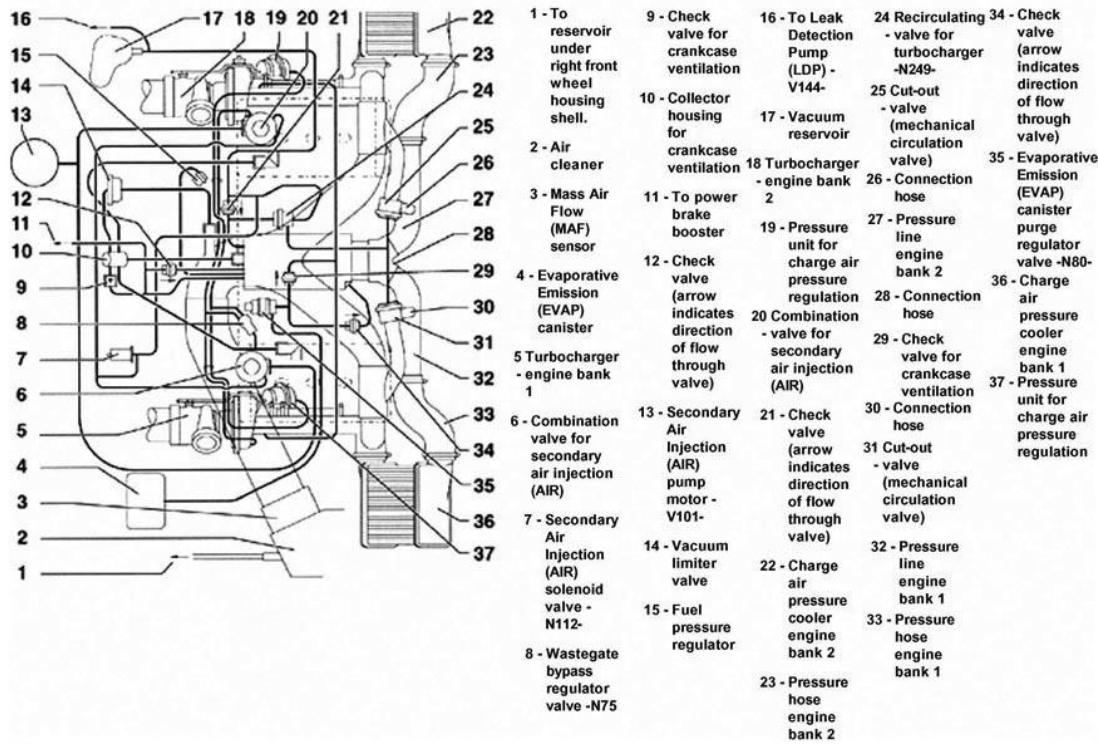
Fig. 47: Vacuum Diagram, Complete - Vehicles Without Secondary Air Injection (AIR)
 Courtesy of AUDI OF AMERICA, INC.

Vehicles with Secondary Air Injection (AIR)

NOTE: The following list refers to items in Fig. 48.

1. - To reservoir under right front wheel housing shell.

2. - Air cleaner
3. - Mass Air Flow (MAF) sensor
4. - Evaporative Emission (EVAP) canister
5. - Turbocharger engine bank 1
6. - Combination valve for secondary air injection (AIR)
7. - Secondary Air Injection (AIR) solenoid valve - N112-
8. - Wastegate bypass regulator valve -N75
9. - Check valve for crankcase ventilation
10. - Collector housing for crankcase ventilation
11. - To power brake booster
12. - Check valve (arrow indicates direction of flow through valve)
13. - Secondary Air Injection (AIR) pump motor -V101-
14. - Vacuum limiter valve
15. - Fuel pressure regulator
16. - To Leak Detection Pump (LDP) -V144-
17. - Vacuum reservoir
18. - Turbocharger engine bank 2
19. - Pressure unit for charge air pressure regulation
20. - Combination valve for secondary air injection (AIR)
21. - Check valve (arrow indicates direction of flow through valve)
22. - Charge air pressure cooler engine bank 2
23. - Pressure hose engine bank 2
24. - Recirculating valve for turbocharger -N249-
25. - Cut-out valve (mechanical circulation valve)
26. - Connection hose
27. - Pressure line engine bank 2
28. - Connection hose
 - for both charge air coolers
29. - Check valve for crankcase ventilation
30. - Connection hose
31. - Cut-out valve (mechanical circulation valve)
32. - Pressure line engine bank 1
33. - Pressure hose engine bank 1
34. - Check valve (arrow indicates direction of flow through valve)
35. - Evaporative Emission (EVAP) canister purge regulator valve -N80-
36. - Charge air pressure cooler engine bank 1
37. - Pressure unit for charge air pressure regulation



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Fig. 48: Vacuum Diagram, Complete - Vehicles With Secondary Air Injection (AIR)
Courtesy of AUDI OF AMERICA, INC.

Vacuum layout - partial systems

Air flow diagram (general)

NOTE: The following list refers to items in Fig. 49.

1. - Air filter
2. - Mass Air Flow (MAF) Sensor-G70-
3. - Intake side of turbocharger, Bank 1
4. - Turbocharger, Bank 1
5. - Pressure side of turbocharger, Bank 1
6. - Air duct
7. - Intake side of turbocharger, Bank 2
8. - Turbocharger, Bank 2
9. - Pressure side of turbocharger, Bank 2
10. - Charge air cooler, Bank 2
11. - Intake manifold
12. - Throttle valve control module -J338-

13. - Charge air pressure cooler, Bank 1

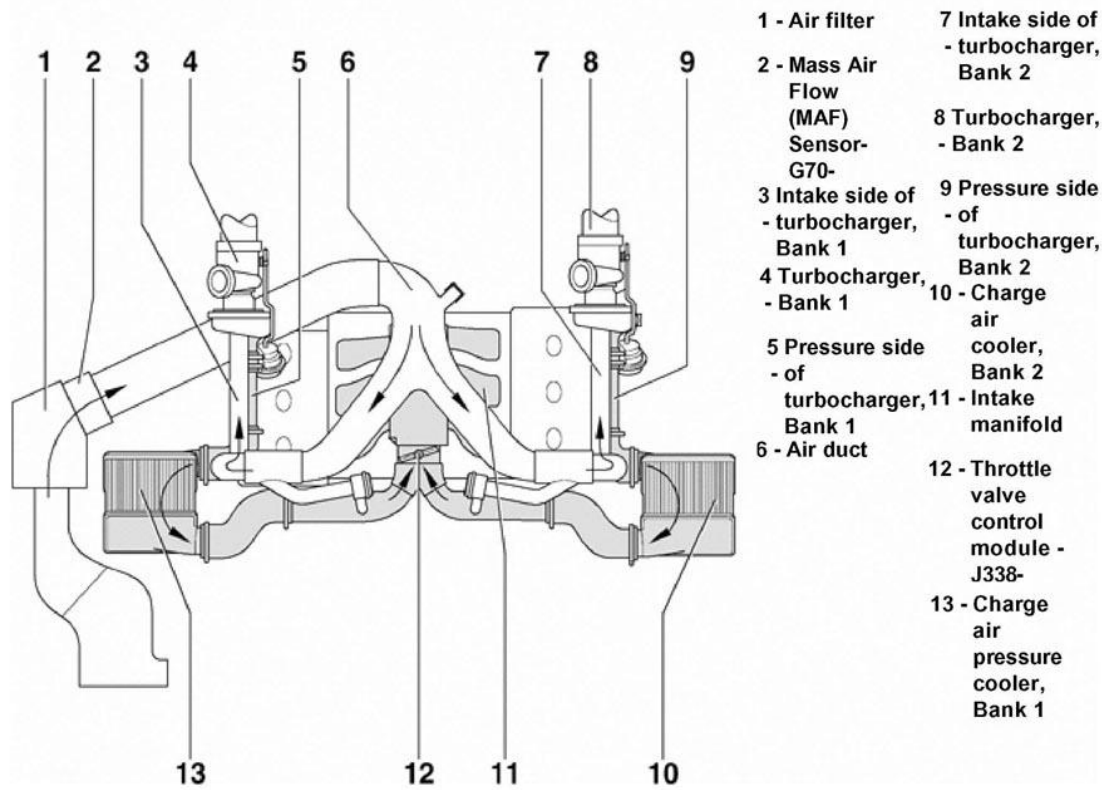


Fig. 49: Air flow Vacuum Diagram (General)
Courtesy of AUDI OF AMERICA, INC.

Charge air pressure control system

NOTE: The following list refers to items in Fig. 50.

1. - Turbocharger, Bank 1
2. - Wastegate Bypass Regulator Valve -N75-
3. - Distributor piece
4. - Turbocharger, Bank 2

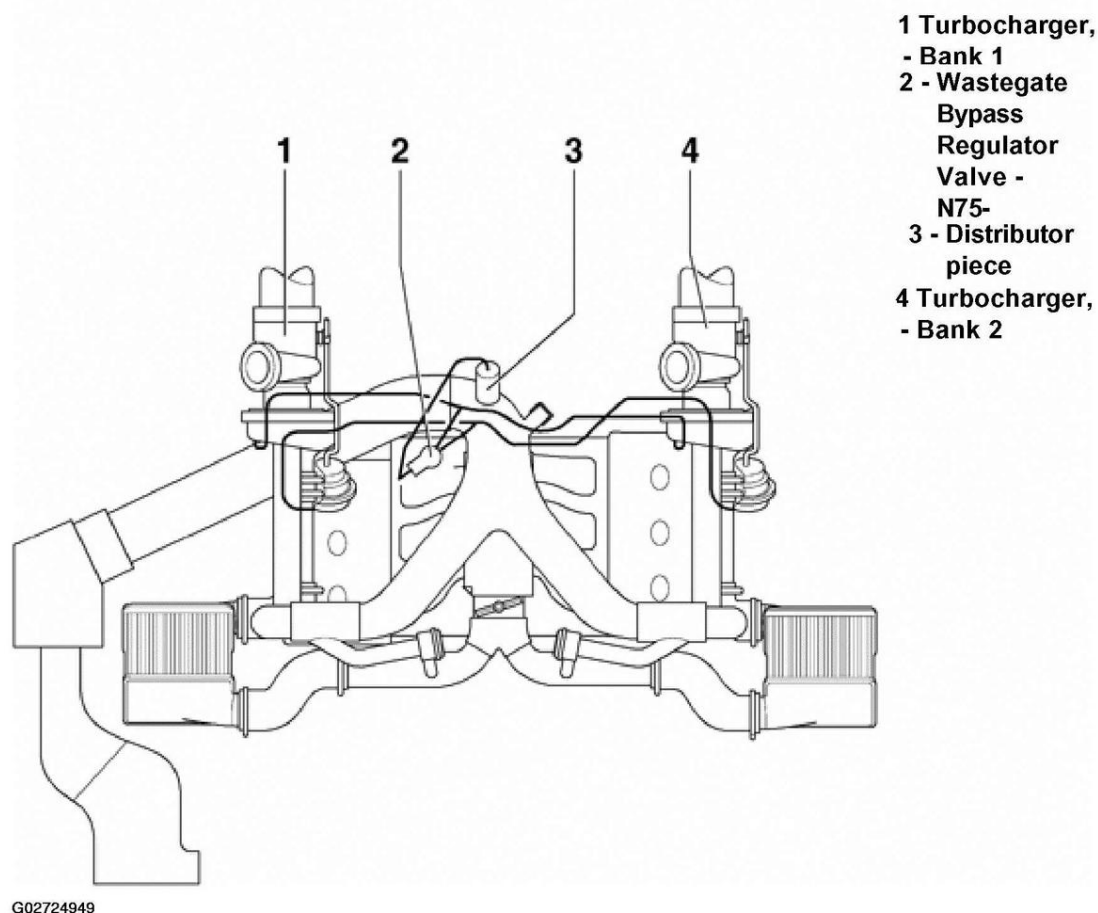
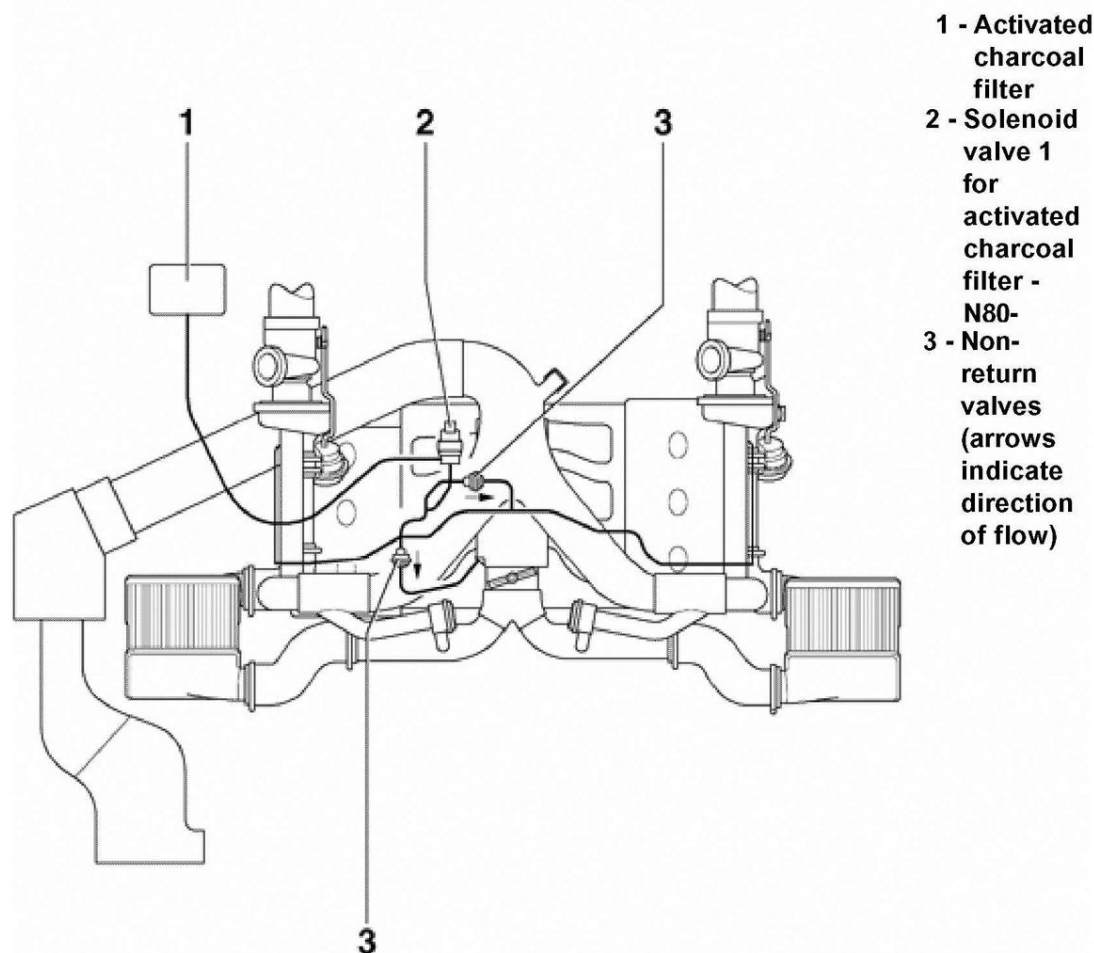


Fig. 50: Identifying Charge Air Pressure Control System With Vacuum Diagram
Courtesy of AUDI OF AMERICA, INC.

Fuel tank breather system (EVAP system)

NOTE: The following list refers to items in Fig. 51.

1. - Activated charcoal filter
2. - Solenoid valve 1 for activated charcoal filter - N80-
3. - Non-return valves (arrows indicate direction of flow)



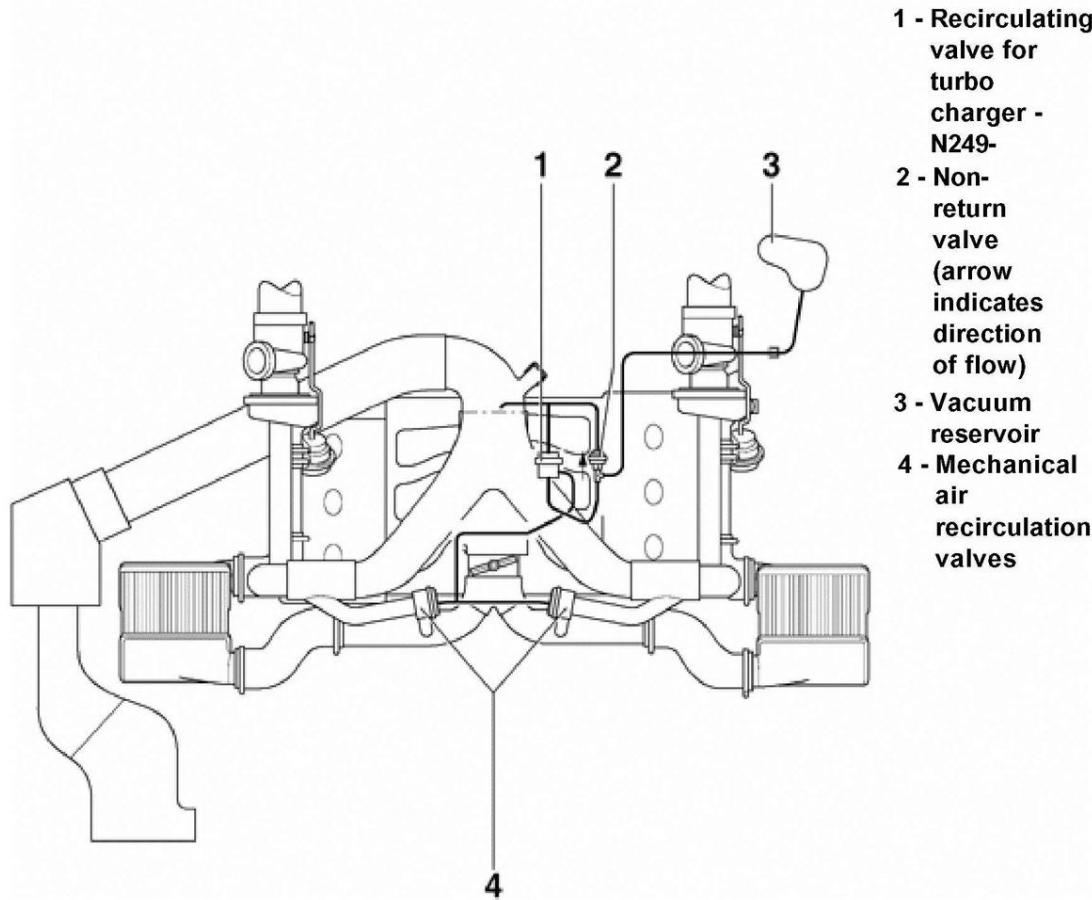
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Fig. 51: Identifying Fuel Tank Breather (EVAP) System Components With Vacuum Diagram
 Courtesy of AUDI OF AMERICA, INC.

Air diversion system (air "recirculation" on overrun)

NOTE: The following list refers to items in Fig. 52.

1. - Recirculating valve for turbo charger -N249-
2. - Non-return valve (arrow indicates direction of flow)
3. - Vacuum reservoir
4. - Mechanical air recirculation valves



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Fig. 52: Identifying Air Diversion System Components With Vacuum Diagram
Courtesy of AUDI OF AMERICA, INC.

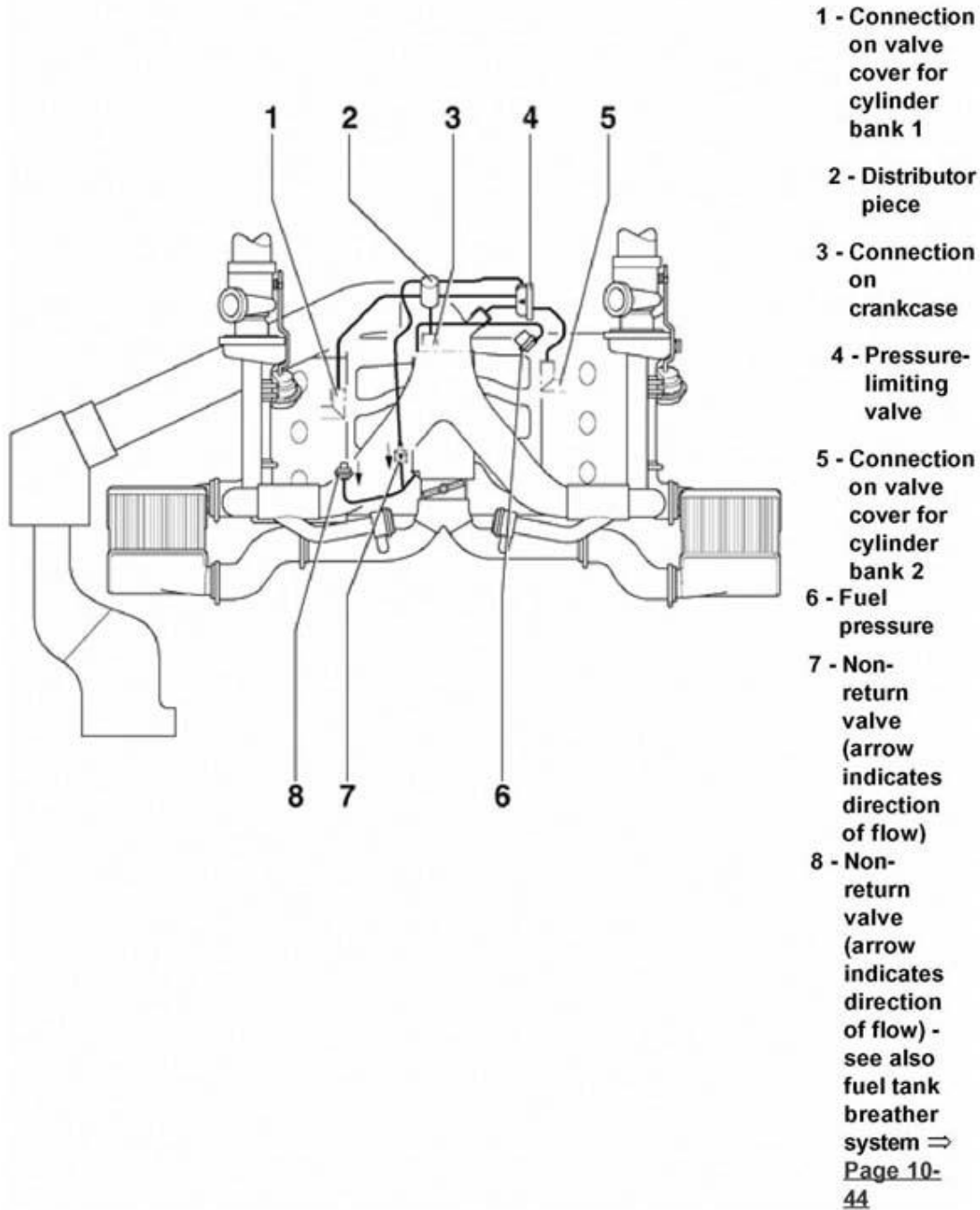
Crankcase breather system

NOTE: Depending on whether the vehicle has a manual transmission or an automatic transmission, the hose layout around the distributor piece (Item 2) will be different. This is because vehicles with automatic transmission also have a suction jet pump. See SUCTION JET PUMP (VEHICLES WITH AUTOMATIC TRANSMISSION).

NOTE: The following list refers to items in Fig. 53.

1. - Connection on valve cover for cylinder bank 1
2. - Distributor piece
3. - Connection on crankcase
4. - Pressure-limiting valve
5. - Connection on valve cover for cylinder bank 2

6. - Fuel pressure regulator
7. - Non-return valve (arrow indicates direction of flow)
8. - Non-return valve (arrow indicates direction of flow) . See also **FUEL TANK BREATHER SYSTEM (EVAP SYSTEM).**



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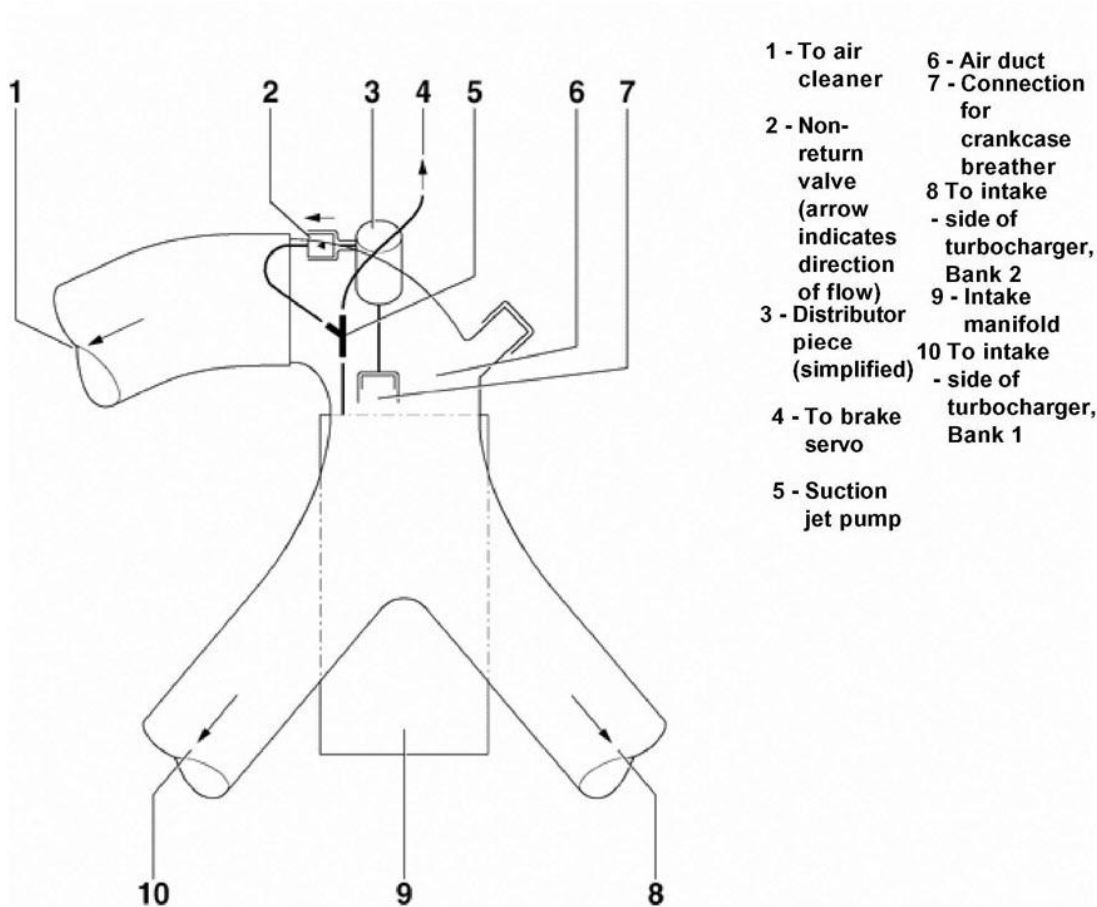
Fig. 53: Identifying Crankcase Breather System Components With Vacuum Diagram

Courtesy of AUDI OF AMERICA, INC.

Suction jet pump (vehicles with automatic transmission)

NOTE: The following list refers to items in Fig. 54.

1. - To air cleaner
2. - Non-return valve (arrow indicates direction of flow)
3. - Distributor piece (simplified)
4. - To brake servo
5. - Suction jet pump
6. - Air duct
7. - Connection for crankcase breather
8. - To intake side of turbocharger, Bank 2
9. - Intake manifold
10. - To intake side of turbocharger, Bank 1



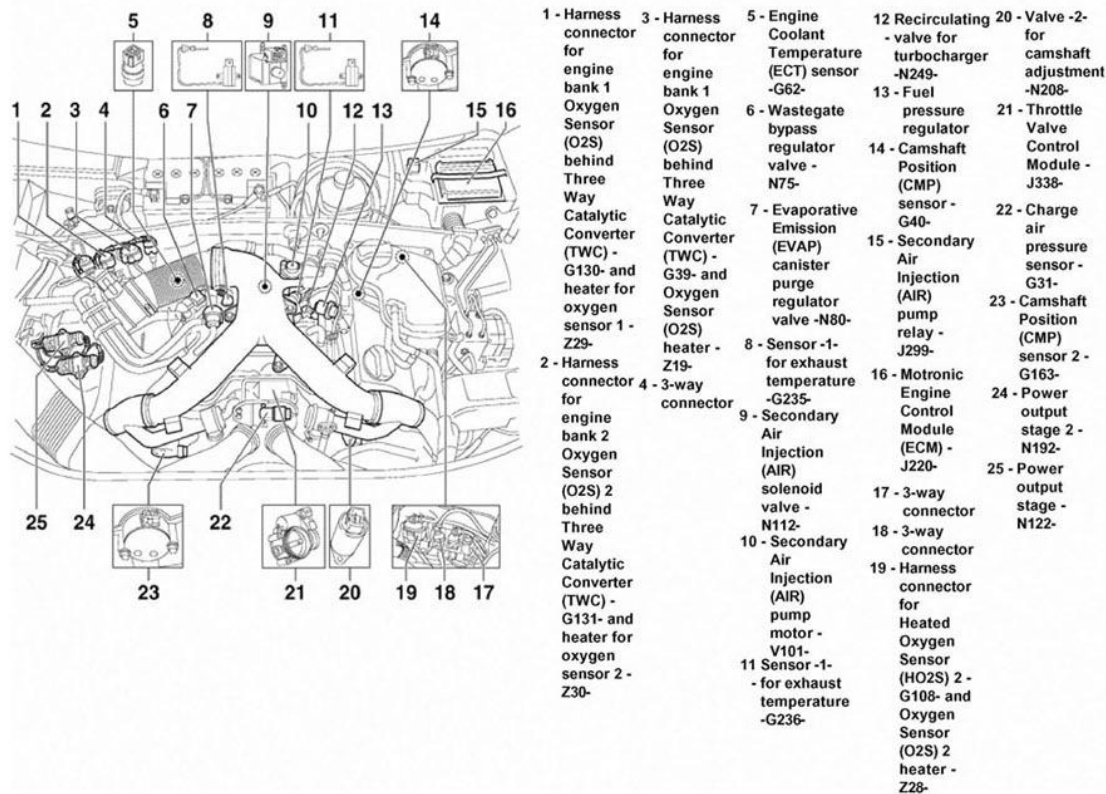
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Fig. 54: Identifying Suction Jet Pump System Components With Vacuum Diagram (Vehicles With

Automatic Transmission)**Courtesy of AUDI OF AMERICA, INC.****Installation position, overview****NOTE: The following list refers to items in Fig. 55.**

1. - **Harness connector for engine bank 1 Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC) -G130- and heater for oxygen sensor 1 -Z29-**
 - 4-pin/green
2. - **Harness connector for engine bank 2 Oxygen Sensor (O2S) 2 behind Three Way Catalytic Converter (TWC) -G131- and heater for oxygen sensor 2 -Z30-**
 - 4pin/brown
3. - **Harness connector for engine bank 1 Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC) -G39- and Oxygen Sensor (O2S) heater -Z19-**
 - 4-pin/black
4. - **3-way connector**
 - For Knock Sensor (KS) 1 -G61-
5. - **Engine Coolant Temperature (ECT) sensor -G62-**
 - At coolant line behind cylinder head engine bank 1
6. - **Wastegate bypass regulator valve -N75-**
7. - **Evaporative Emission (EVAP) canister purge regulator valve -N80-**
8. - **Sensor -1- for exhaust temperature -G235-**
 - At the left rear of the intake manifold; for vehicles with automatic transmission sensor -2-, exhaust temperature -G236- is also installed at this position.
9. - **Secondary Air Injection (AIR) solenoid valve -N112-**
 - Only for vehicles with automatic transmission
10. - **Secondary Air Injection (AIR) pump motor -V101-**
 - Only for vehicles with automatic transmission
11. - **Sensor -1- for exhaust temperature -G236-**
 - For vehicles with automatic transmission, this sensor is located at position -8- along with sensor -1- for exhaust temperature -G235-. The two sensors are installed in series.
12. - **Recirculating valve for turbocharger -N249-**
13. - **Fuel pressure regulator**
14. - **Camshaft Position (CMP) sensor -G40-**
 - Engine bank 2
15. - **Secondary Air Injection (AIR) pump relay -J299-**
 - Only for vehicles with automatic transmission
16. - **Motronic Engine Control Module (ECM) -J220-**
17. - **3-way connector**

- For Engine Speed (RPM) sensor -G28-
 - Gray
18. - **3-way connector**
- For Knock Sensor (KS) 2 -G66-
19. - **Harness connector for Heated Oxygen Sensor (HO2S) 2 -G108- and Oxygen Sensor (O2S) 2 heater -Z28-**
- 4-pin/black
20. - **Valve -2- for camshaft adjustment -N208-**
21. - **Throttle Valve Control Module -J338-**
- With throttle drive (power accelerator actuation) -G186-, angle sensor -1- for throttle drive (power accelerator actuation) -G187-, and angle sensor -2- for throttle drive (power accelerator actuation) -G188-
22. - **Charge air pressure sensor -G31-**
- Located in rubber shroud in front of throttle valve control module
23. - **Camshaft Position (CMP) sensor 2 -G163-**
- Engine bank 1
24. - **Power output stage 2 -N192-**
- For ignition coils engine bank 2
25. - **Power output stage -N122-**
- For ignition coils engine bank 1



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Fig. 55: Identifying Fuel Injection & Ignition System Components (Engine Compartment) - Items 1 Through 25

Courtesy of AUDI OF AMERICA, INC.

NOTE: The following list refers to items in **Fig. 56**.

- 26. - Valve -1- for camshaft adjustment -N205-
- 27. - Engine bank 1, Heated Oxygen Sensor (HO2S) -G39- -Z19-
- 28. - Knock Sensor (KS) 1 - G61-
- 29. - Knock Sensor (KS) 2 - G66-
- 30. - Engine Speed (RPM) sensor -G28-
 - Located in transmission housing above sensor disk
- 31. - Engine bank 2, Heated Oxygen Sensor (HO2S) 2 -G108- -Z28-
- 32. - Ignition coils engine bank 2
 - Ignition coil 4 -N163-
 - Ignition coil 5 -N164-
 - Ignition coil 6 -N189-
- 33. - Fuel injectors

Cylinder bank 2

- Cylinder 4 fuel injector -N33-
- Cylinder 5 fuel injector -N83-
- Cylinder 6 fuel injector -N84-

34. - **Intake Air Temperature (IAT) sensor -G42-**

- On the lower front part of the intake manifold, near the throttle valve control module

35. - **2-way connector**

- For Intake Air Temperature (IAT) sensor (measurements are made at this connector)

36. - **Fuel Injectors**

Cylinder bank 1

- Cylinder 1 fuel injector -N30-
- Cylinder 2 fuel injector -N31-
- Cylinder 3 fuel injector -N32-

37. - **Ignition coils engine bank 1**

- Ignition coil 1 -N-
- Ignition coil 2 -N128-
- Ignition coil 3 -N158-

38. - **Mass Air Flow (MAF) sensor -G70-**

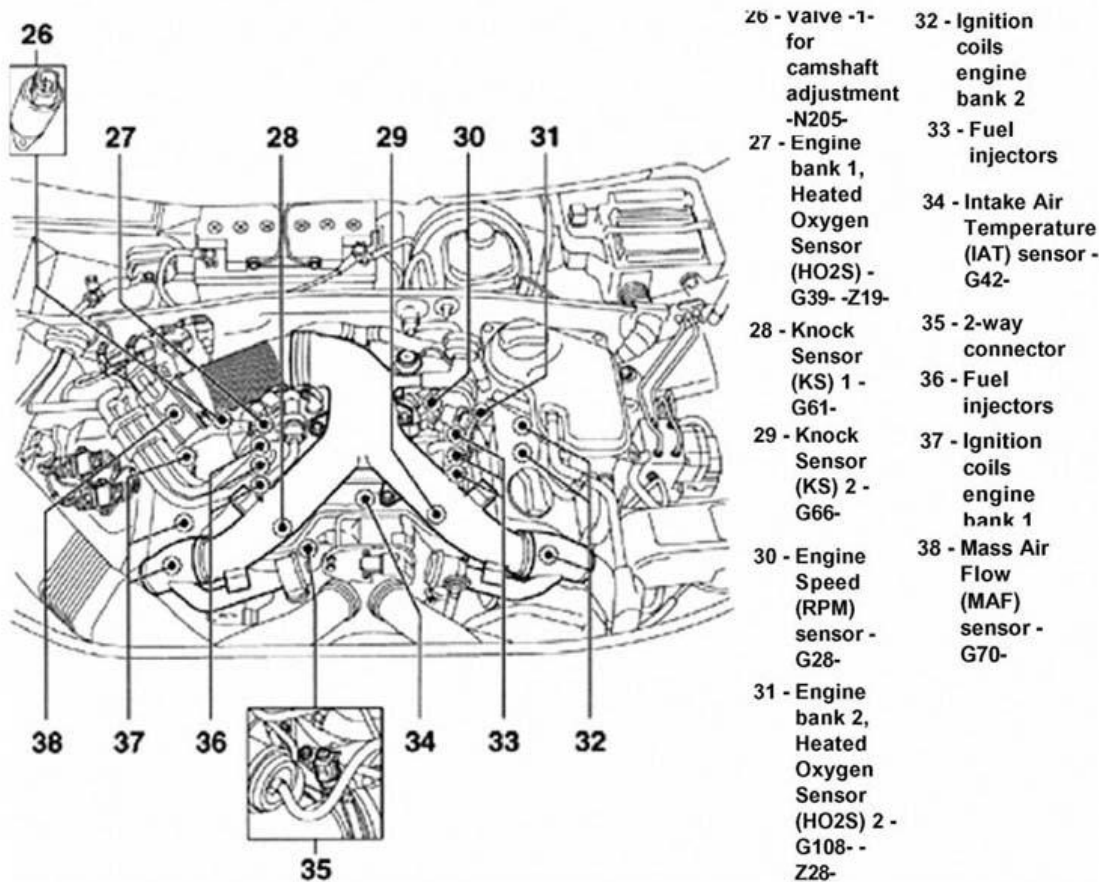


Fig. 56: Identifying Fuel Injection & Ignition System Components (Engine Compartment) - Items 26 Through 38

Courtesy of AUDI OF AMERICA, INC.

ENGINE - CRANKSHAFT, CYLINDER BLOCK

ENGINE CRANKSHAFT/CRANKCASE, DISASSEMBLY AND ASSEMBLY

Ribbed belt, removing and installing

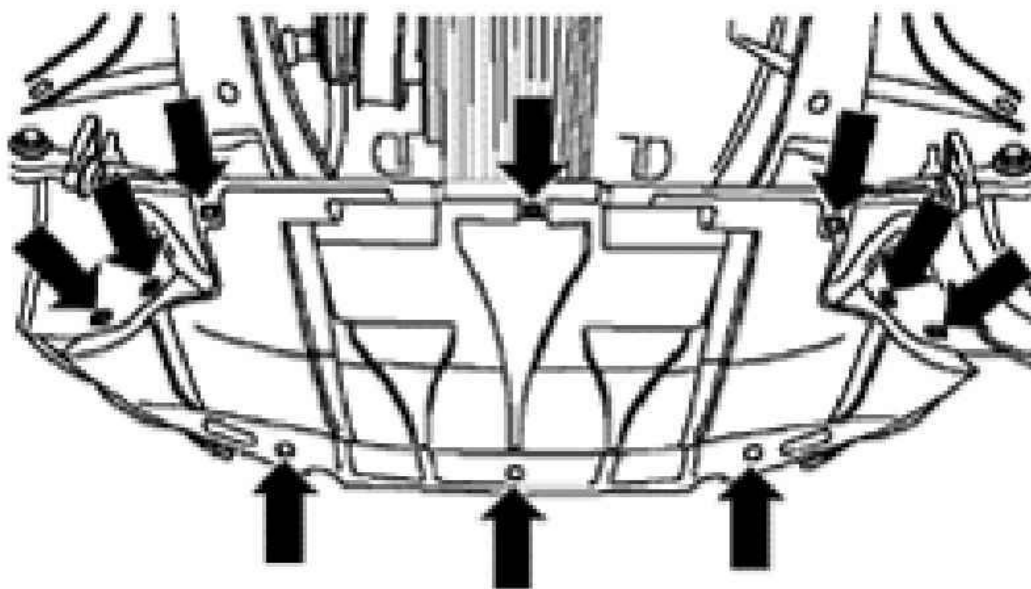
Removing

- Remove noise insulation -arrows-.
- Remove bumper.

See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .



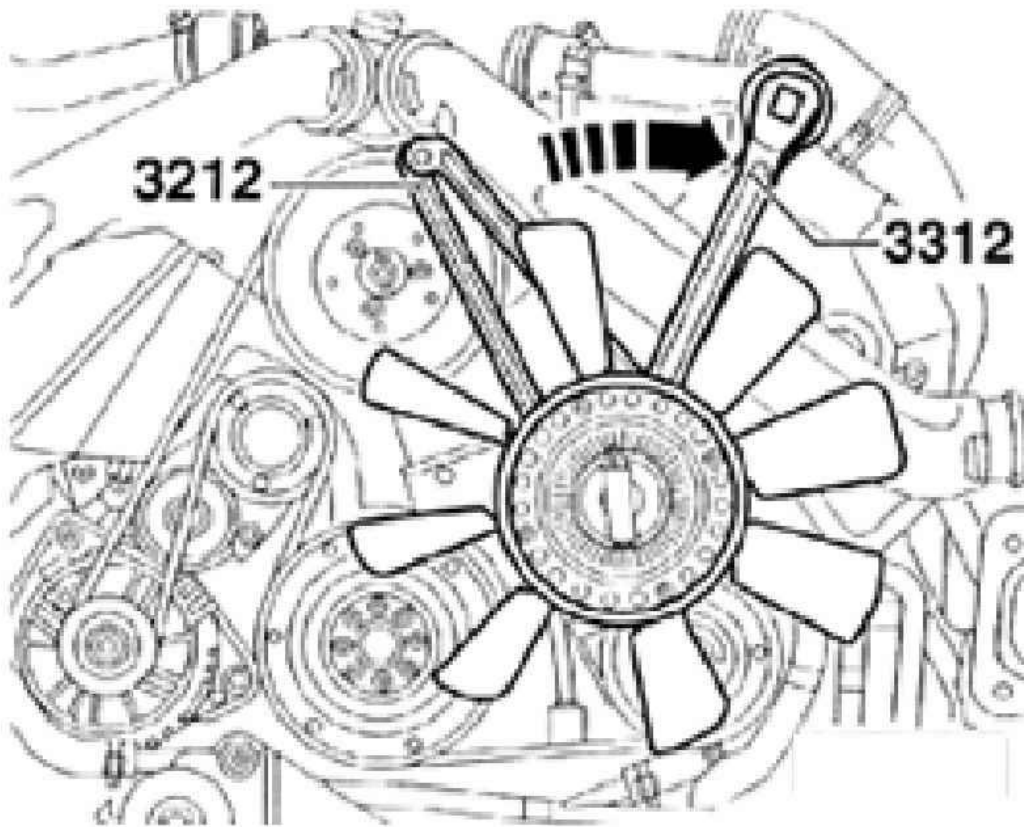
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Fig. 57: Removing Noise Insulation

Courtesy of AUDI OF AMERICA, INC.

- Remove viscous fan (counter-hold with pin wrench 3212).

NOTE: **Viscous fan has LEFT-HAND thread: turn in direction indicated.**



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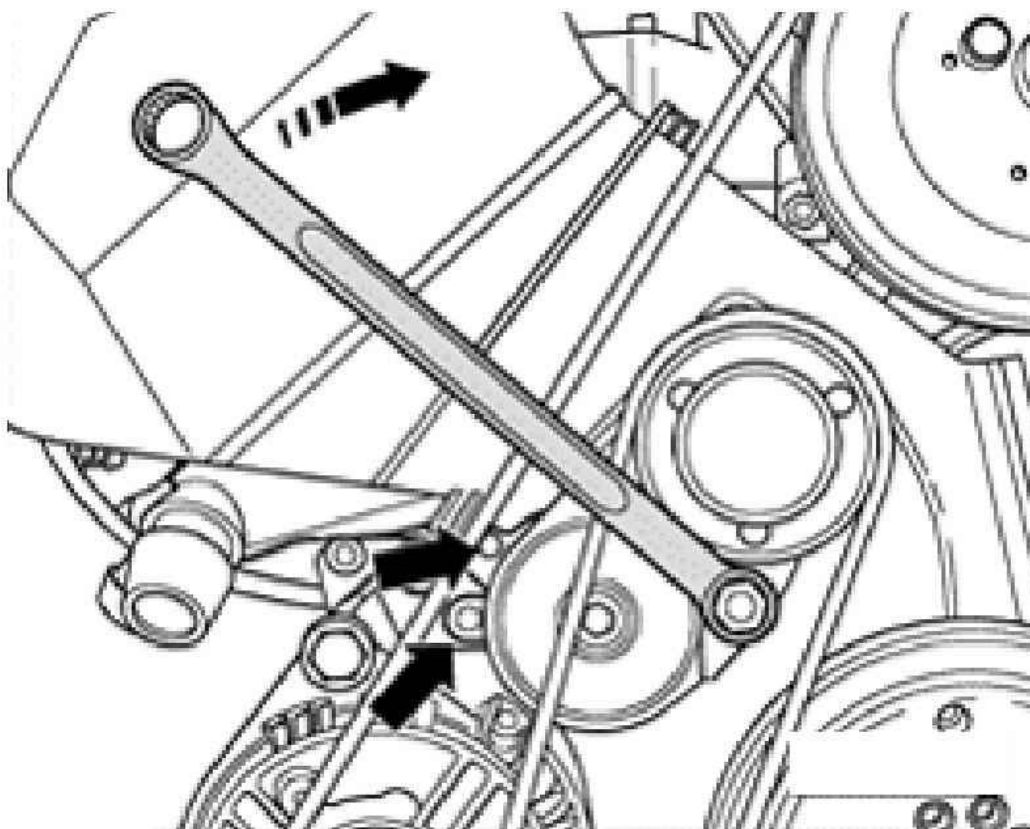
Fig. 58: Removing Viscous Fan With Pin Wrench 3212

Courtesy of AUDI OF AMERICA, INC.

- Mark direction of rotation of ribbed belt.
- Loosen ribbed belt by turning to right using a 17 mm box wrench until two holes are aligned with each other -arrow- and hold in position with mandrel 3204.

NOTE: **Mark the direction of rotation of the ribbed belt with chalk or felt pen before removing. A used belt can break if it rotates in the opposite direction when reinstalled.**

- Remove ribbed belt.



G02724296

Fig. 59: Loosening Ribbed Belt By Turning Tensioner To Right Using A 17 mm Box Wrench
Courtesy of AUDI OF AMERICA, INC.

Installing

- D1 - vehicles without air conditioner
- D2 - vehicles with air conditioner.

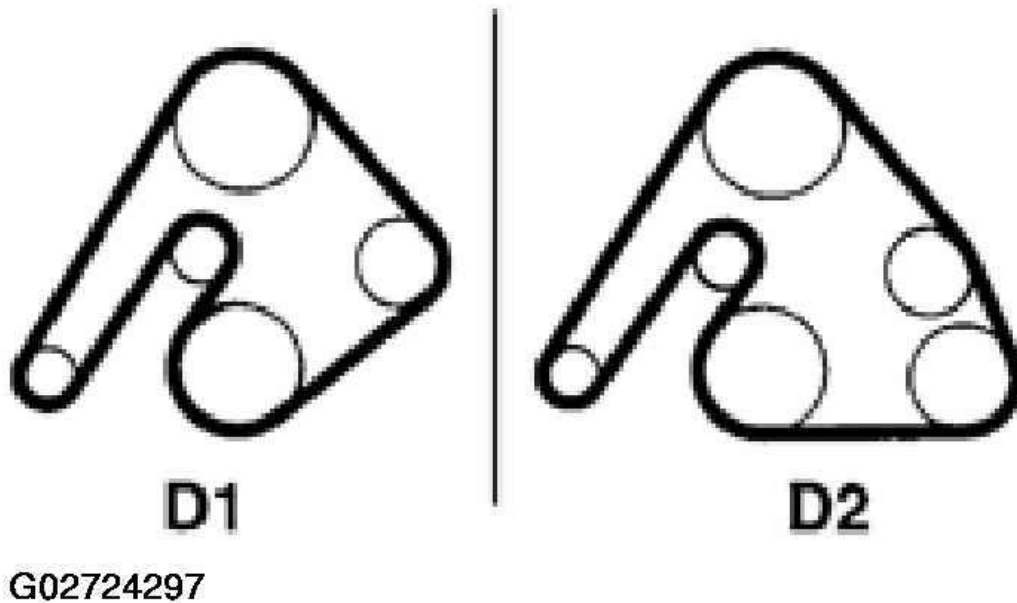
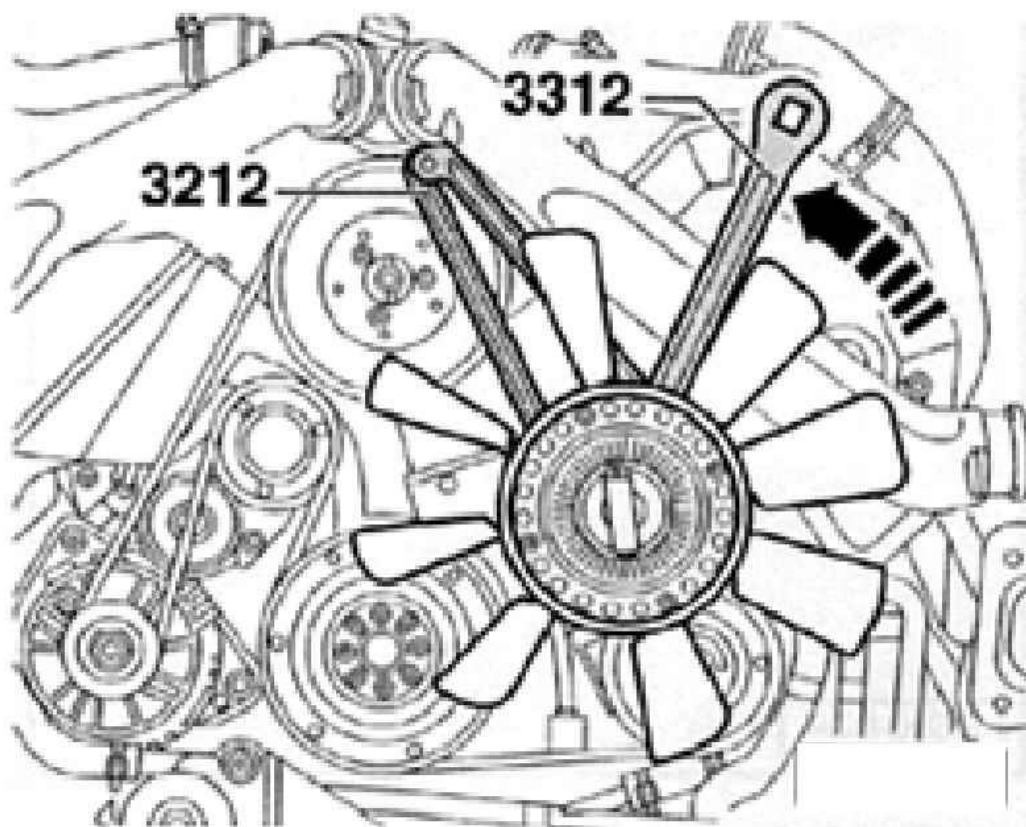


Fig. 60: Identifying Ribbed Belt Routing (With & Without A/C)
 Courtesy of AUDI OF AMERICA, INC.

- Install ribbed belt onto crankshaft pulley and idler wheel first, and push belt onto tensioning roller last.
- Take out mandrel 3204.

NOTE: **Viscous fan has LEFT-HAND thread: turn against direction indicated.**

- Counter-hold belt pulley for viscous fan using wrench 3212 and tighten viscous fan using open-end wrench 3312 and torque wrench 1331 (left hand thread).



G02724298

Fig. 61: Holding Belt Pulley For Viscous Fan Using Wrench 3212
Courtesy of AUDI OF AMERICA, INC.

- Install lock carrier.

See **LOCK CARRIER WITH ATTACHMENTS, REMOVING AND INSTALLING** .

- Install bumper.

See **FRONT BUMPER** .

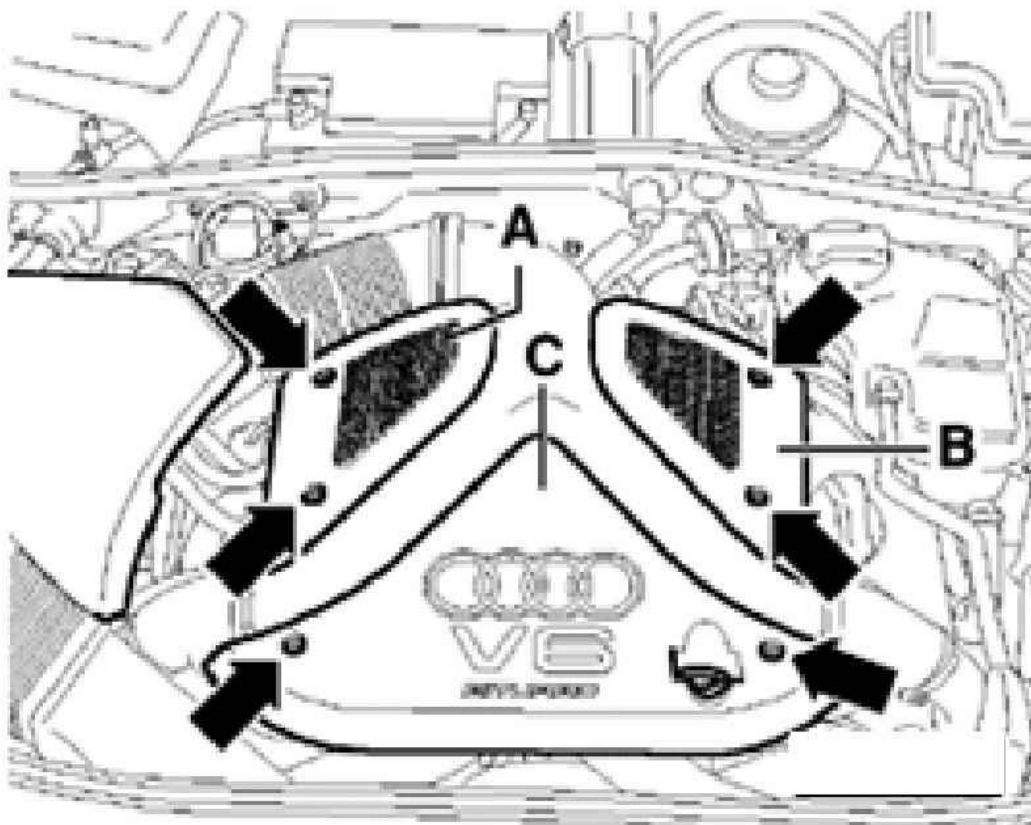
- Install noise insulation.

Tightening torque of viscous fan, see **VISCOUS FAN, REMOVING AND INSTALLING**

Toothed belt, removing and installing

Removing

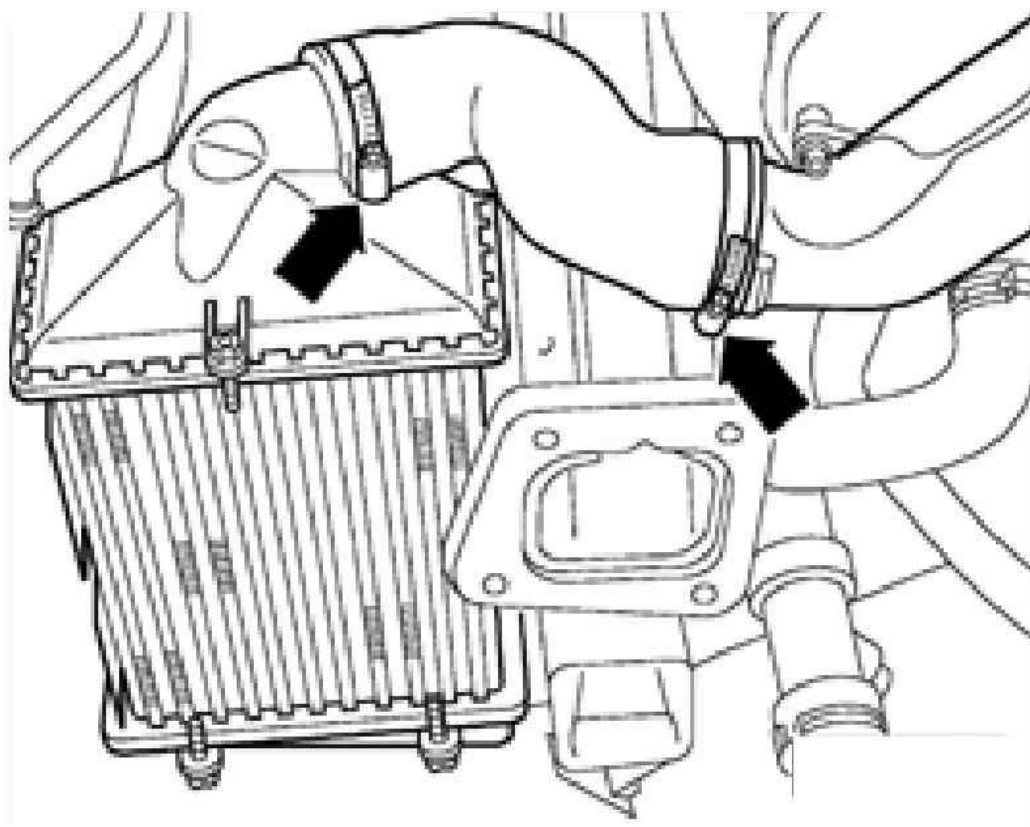
- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.
- Remove bolts -arrows- and remove engine cover panel -C-.



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Fig. 62: Removing Bolts And Engine Cover Panel
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure hoses -arrows- between charge air coolers and pressure lines (left and right sides).

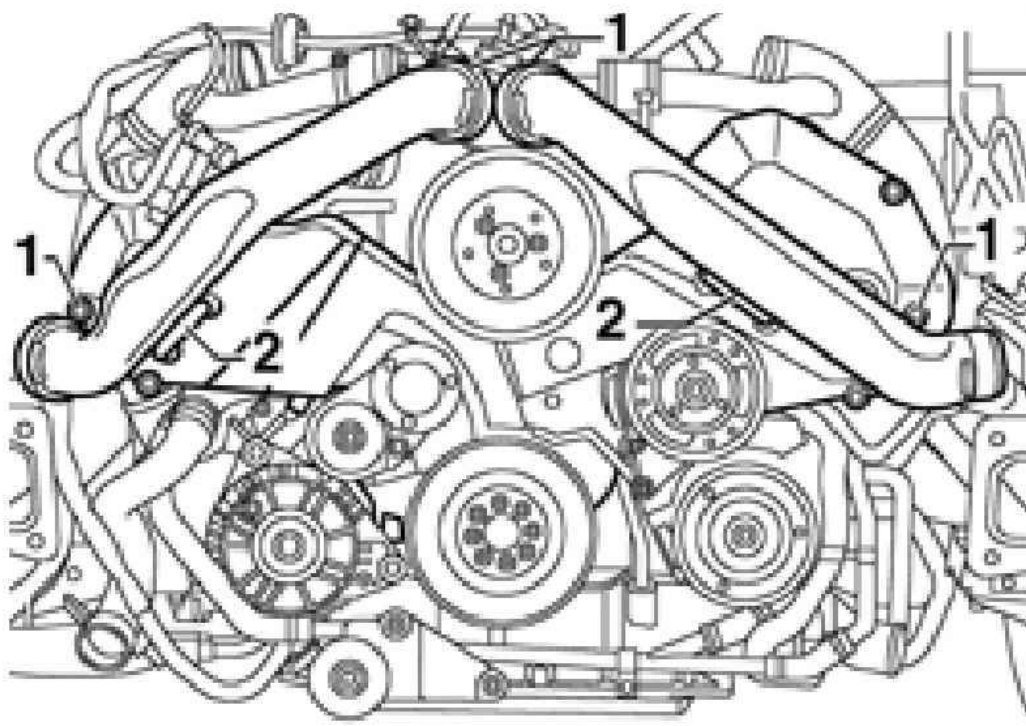


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Fig. 63: Removing Pressure Hoses Between Charge Air Coolers And Pressure Lines
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure lines -1-.

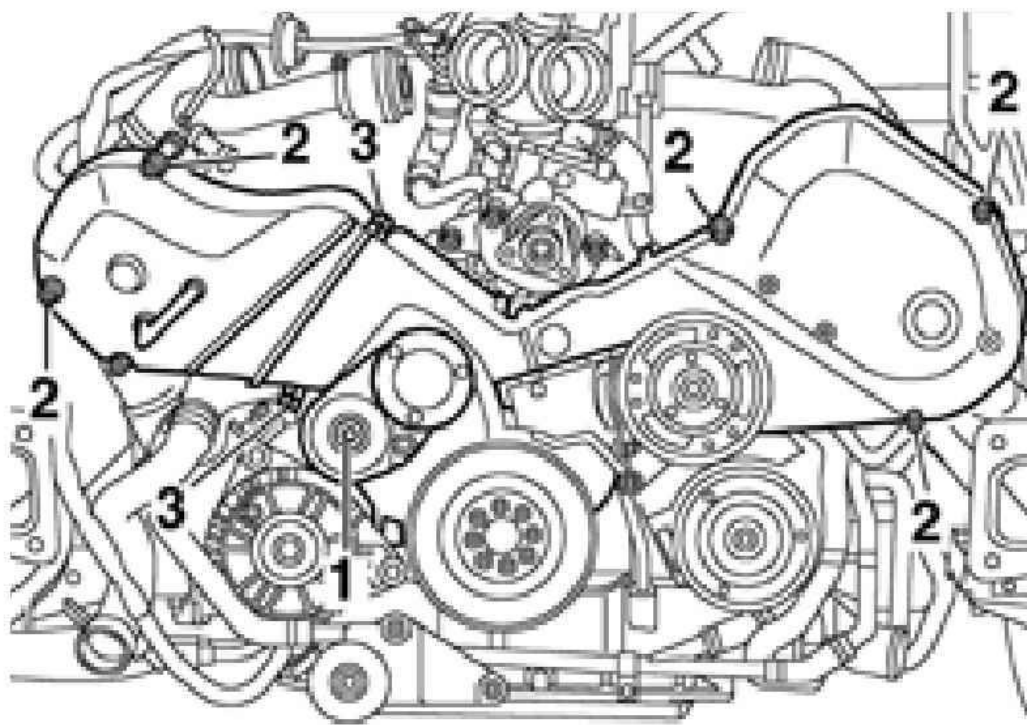
NOTE: Watch position of retaining strips -2-.



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Fig. 64: Removing Pressure Lines
Courtesy of AUDI OF AMERICA, INC.

- Remove tensioner -1- for ribbed belt. See **Fig. 65**.
- Remove left and right toothed belt guards -2-.
- Remove center toothed belt guard -3-.

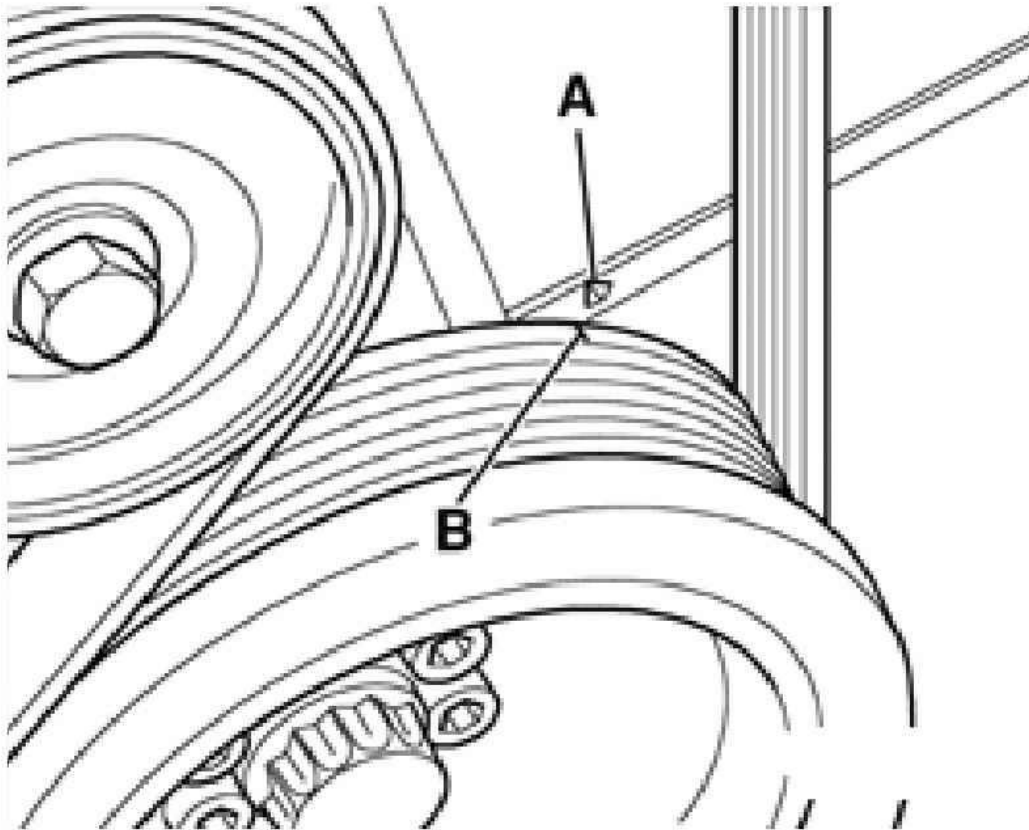


G02724302

Fig. 65: Removing Tensioner For Ribbed Belt
Courtesy of AUDI OF AMERICA, INC.

- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned. See **Fig. 66**.

NOTE: Turn over the engine at the central bolt on the crankshaft.



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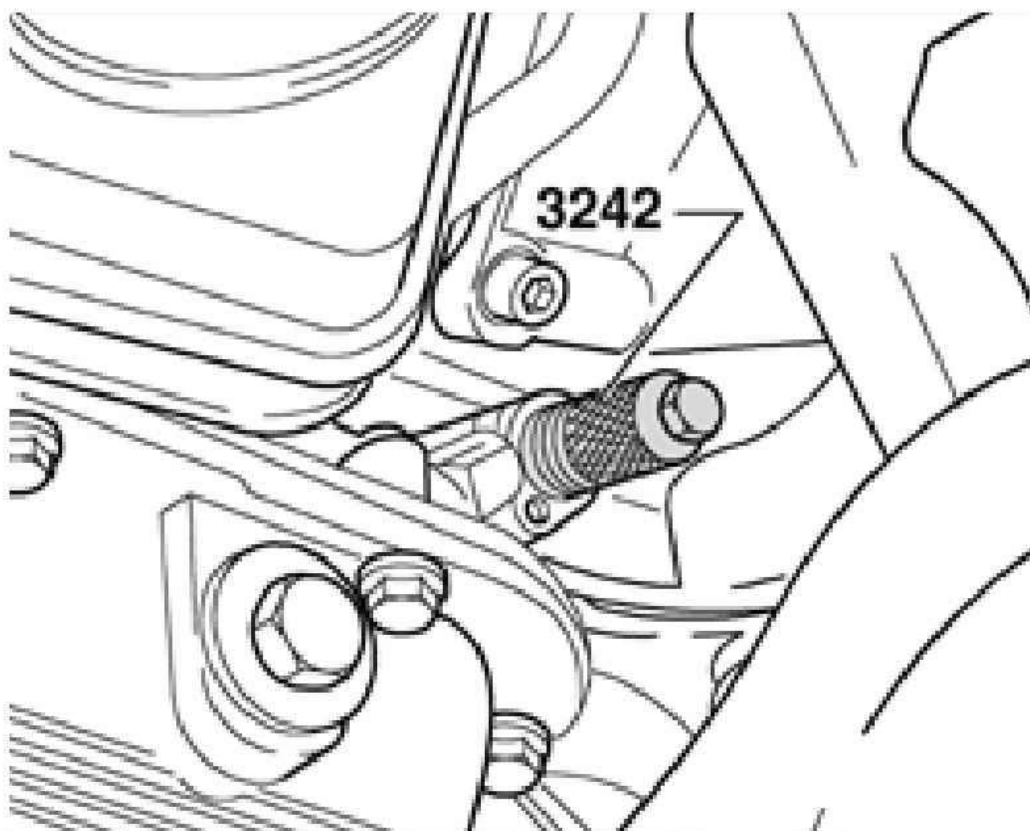
Fig. 66: Turning Crankshaft To TDC By Hand
Courtesy of AUDI OF AMERICA, INC.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on the inside. If not, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.

TDC drilling in the crankshaft must be visible (or able to be felt) in line with the sealing plug hole.

CAUTION: Injury risk - do not turn engine while feeling for TDC drilling.

- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.

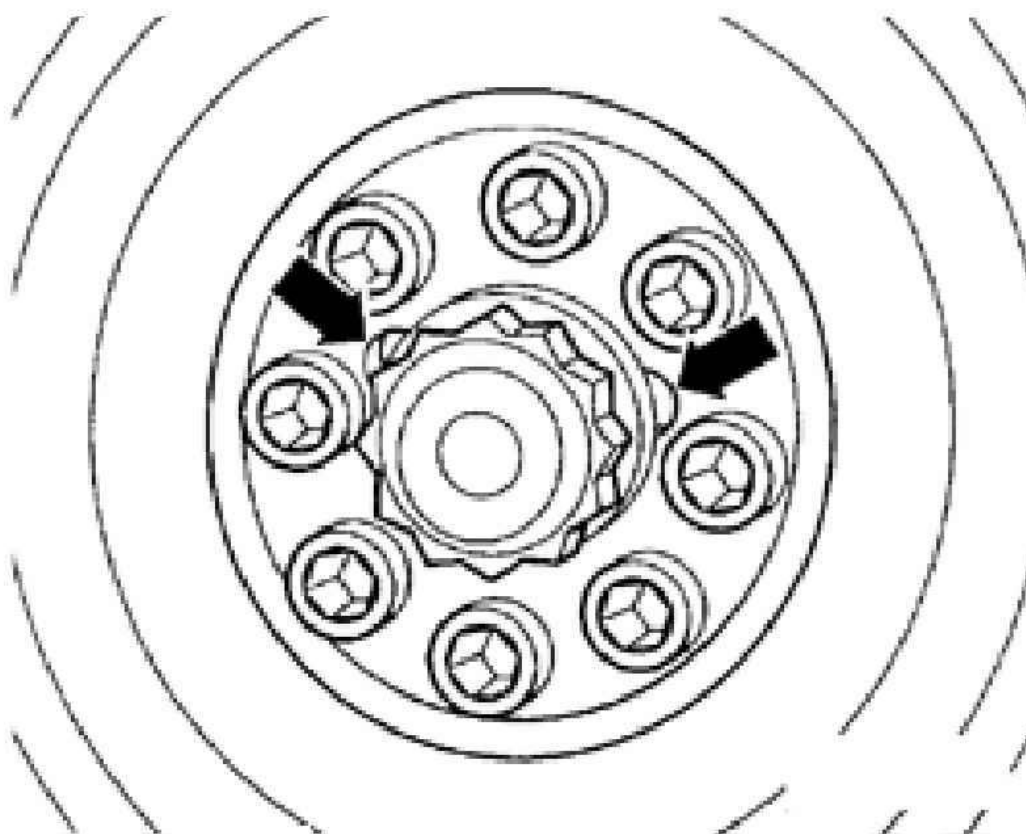


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Fig. 67: Screwing Clamping Bolt 3242 For Crankshaft Into Sealing Plug Hole
Courtesy of AUDI OF AMERICA, INC.

- Remove vibration damper on crankshaft.

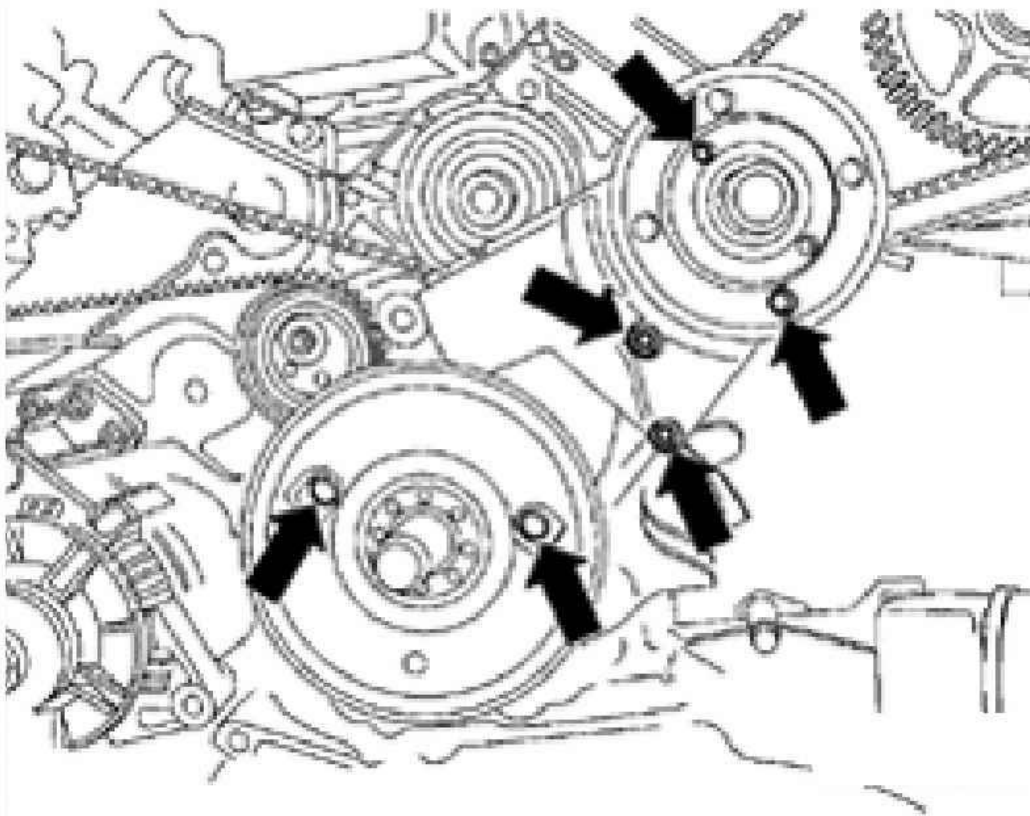
NOTE: **The central bolt does not have to be loosened to remove the vibration damper.**



G02724305

Fig. 68: Removing Vibration Damper On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

- Remove idler wheel for ribbed belt -arrows-.
- Remove toothed belt guard behind vibration damper -arrows-.



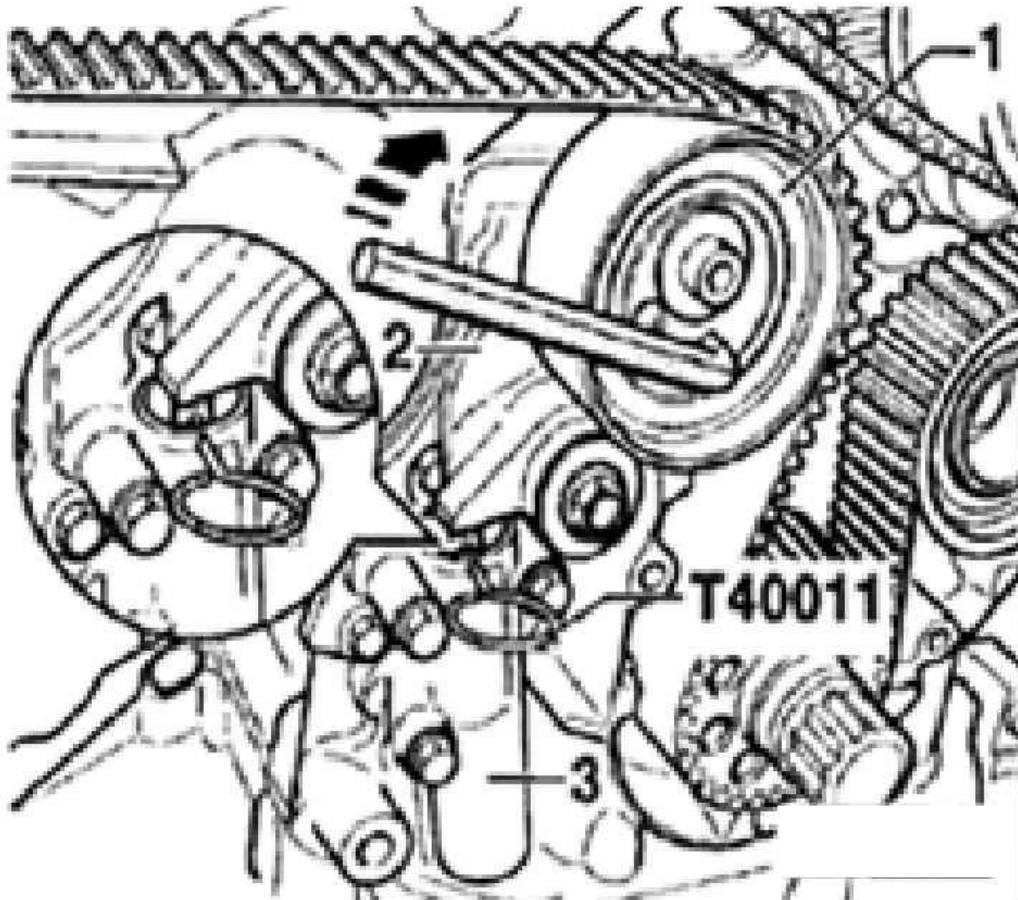
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Fig. 69: Removing Idler Wheel For Ribbed Belt And Toothed Belt Guard Behind Vibration Damper

Courtesy of AUDI OF AMERICA, INC.

NOTE:

- Mark the direction of rotation of the toothed belt with chalk or felt pen before removing. A used belt can break if it rotates in the wrong direction when reinstalled.
 - The toothed belt tensioning element is oil-damped and can therefore only be compressed slowly by applying constant pressure.
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until tensioning lever -2- compresses tensioning element -3- sufficiently to enable special tool T400 11 to be fitted in drilling and in plunger.



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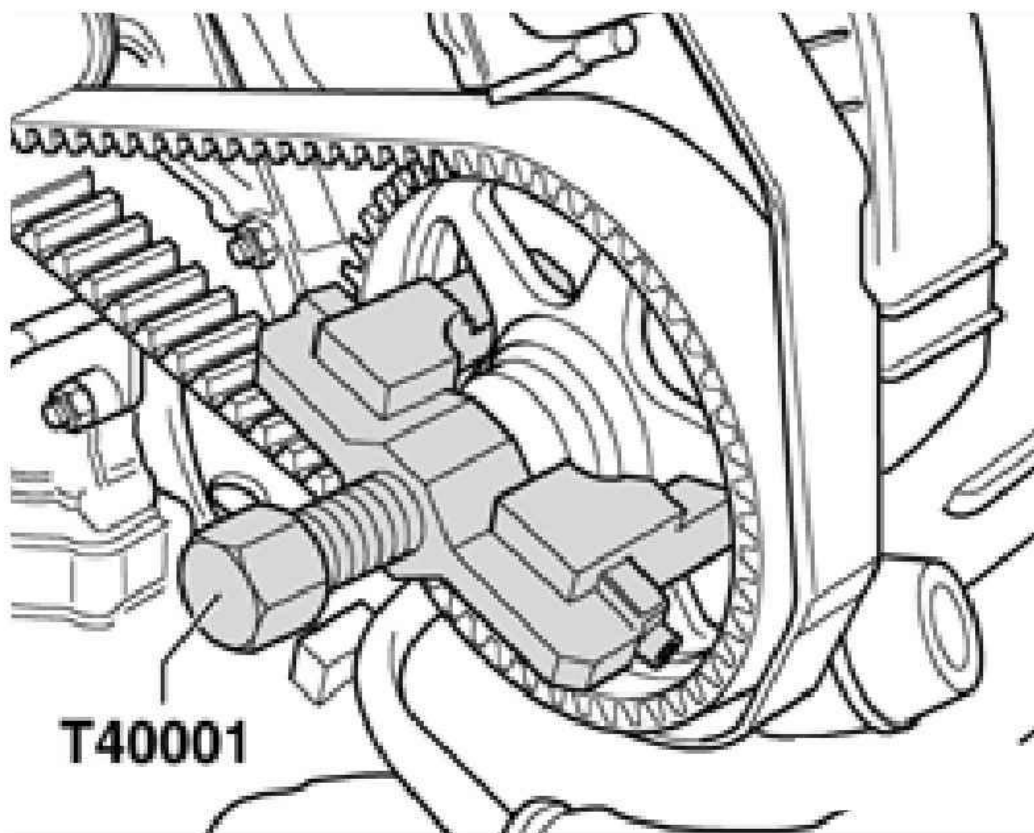
Fig. 70: Turning Toothed Belt Tensioning Roller Using A Hex Key
Courtesy of AUDI OF AMERICA, INC.

- Insert special tool T 400 11, release toothed belt tensioning roller.
- Remove toothed belt.

Installing

- Insert camshaft clamp 3391 in securing plates of two camshafts.
- Loosen both camshaft bolts and remove approx. 5 turns.
- Take out camshaft clamp 3391.
- Pull off both camshaft sprockets with special tool T40001.
- Reinstall both camshaft sprockets with securing plates and tighten hand-tight again.

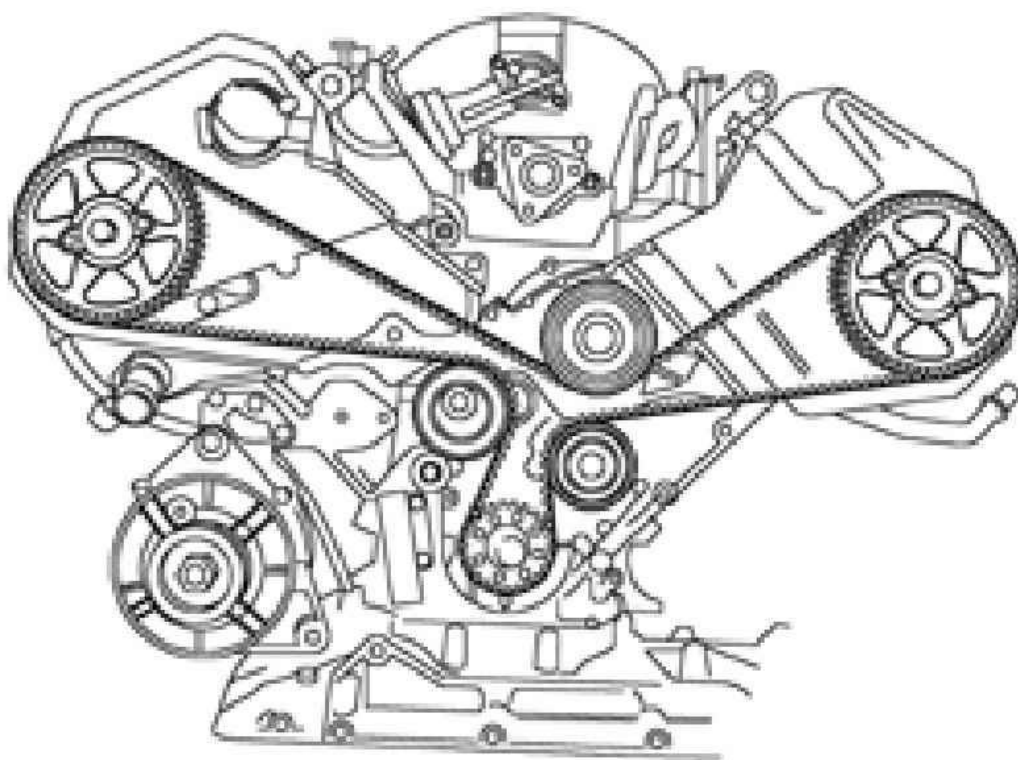
NOTE: The camshaft sprockets should be just tight enough on the camshaft tapers so that they can still be turned but do not move axially.



G02724308

Fig. 71: Pulling Camshaft Sprockets With Special Tool T40001
Courtesy of AUDI OF AMERICA, INC.

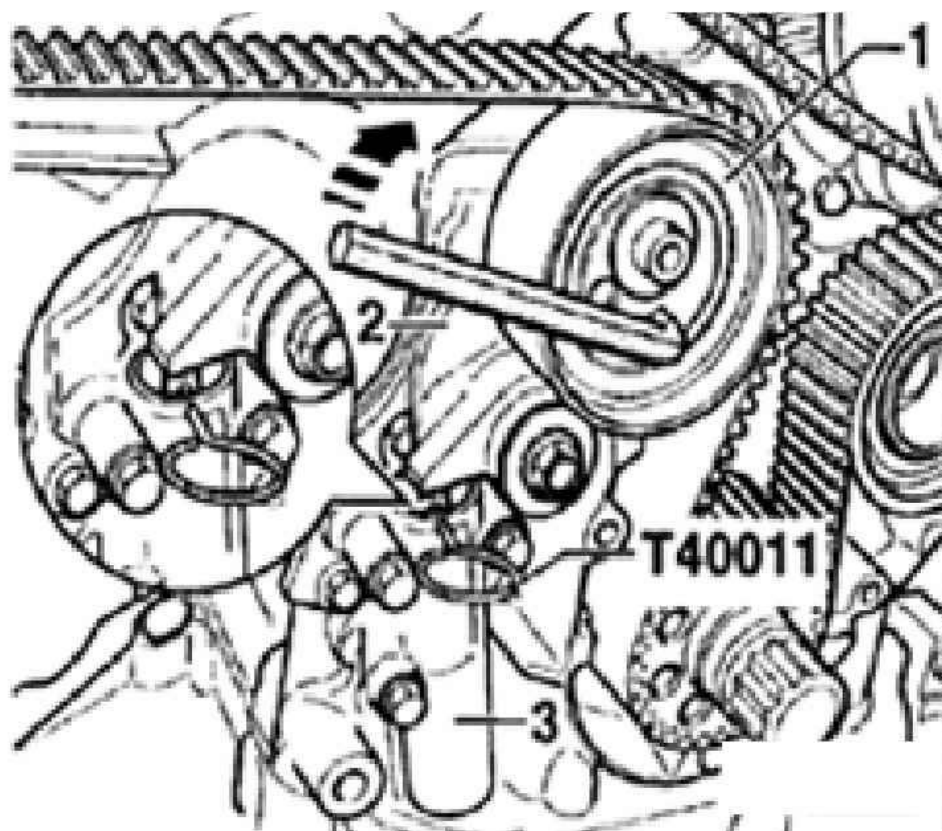
- Install toothed belt on all sprockets as illustrated.
- Install camshaft clamp 3391.



G02724309

Fig. 72: Installing Toothed (Timing) Belt On All Sprockets
Courtesy of AUDI OF AMERICA, INC.

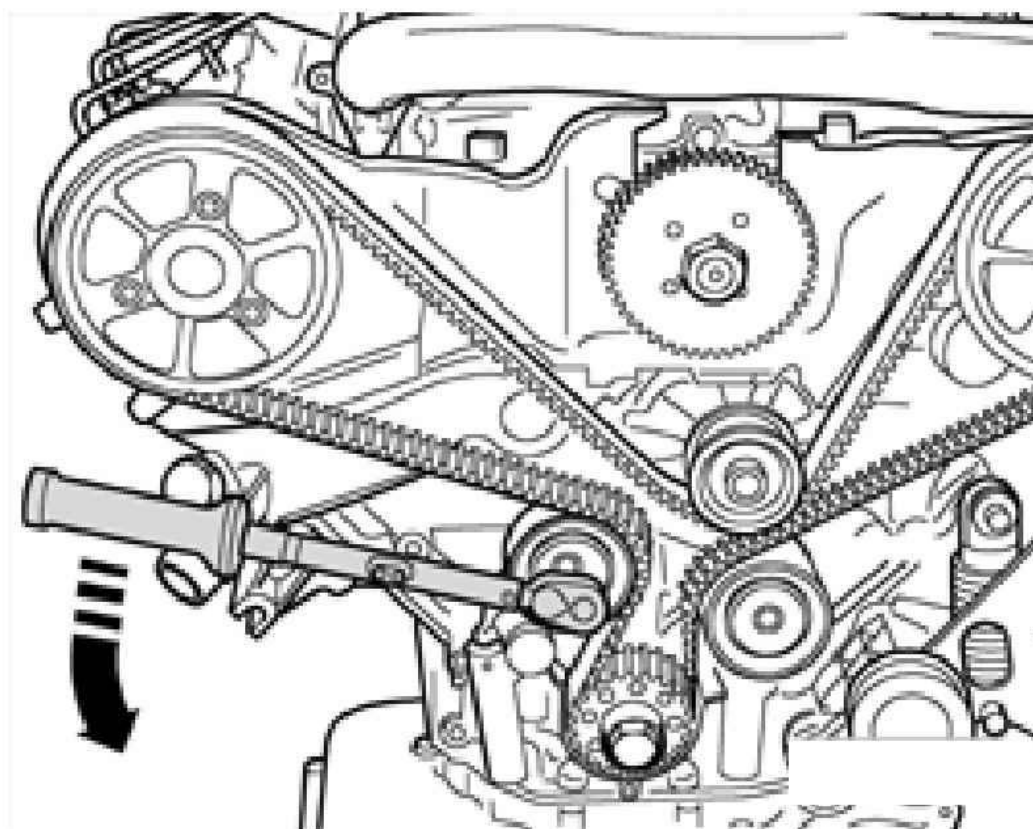
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until special tool T 400 11 can be removed.



G02724310

Fig. 73: Turning Toothed Belt Tensioning Roller Clockwise Using Hex Key
Courtesy of AUDI OF AMERICA, INC.

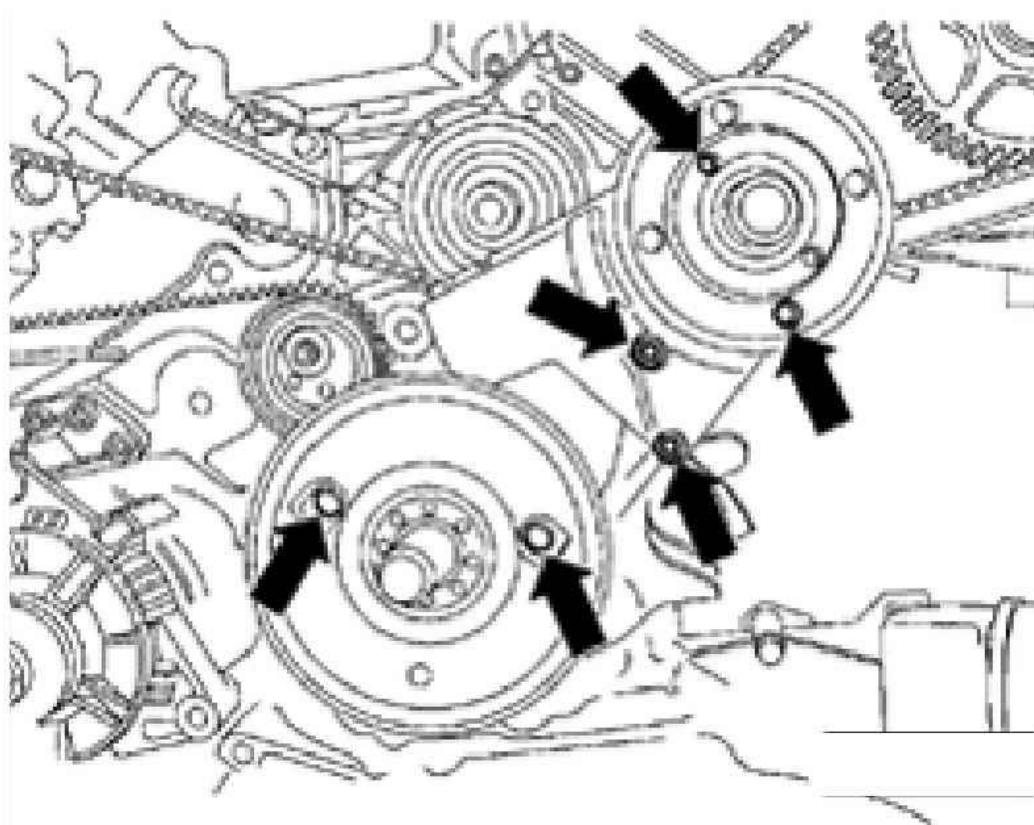
- Pre-tension toothed belt by turning in direction of arrow with a torque of 15 Nm using a torque wrench.
- Tighten bolts on camshaft sprockets.



G02724311

Fig. 74: Pre-Tension Toothed Belt By Turning In Direction Of Arrow/caption>
Courtesy of AUDI OF AMERICA, INC.

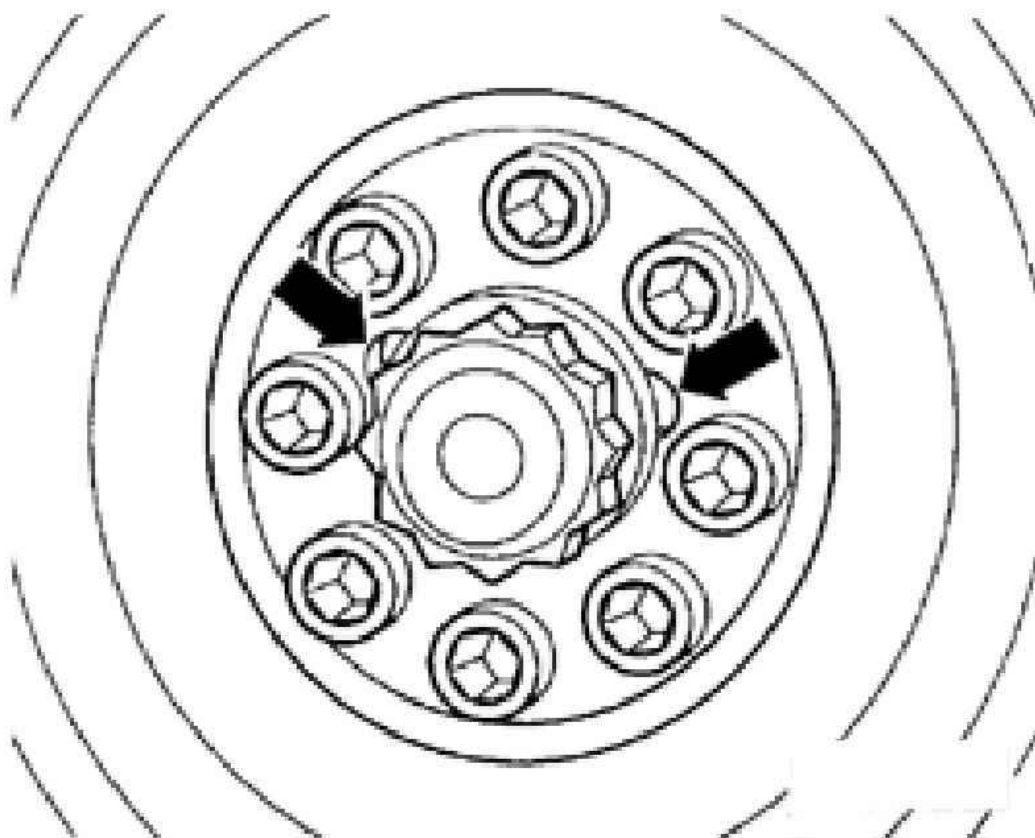
- Install idler wheel for ribbed belt -arrows-.
- Install toothed belt guard behind vibration damper -arrows-.



G02724312

Fig. 75: Installing Idler Wheel For Ribbed Belt And Toothed Belt Guard Behind Vibration Damper
Courtesy of AUDI OF AMERICA, INC.

- Install vibration damper. Note positions of locating lugs -arrows- on belt sprocket.



G02724313

Fig. 76: Installing Vibration Damper
 Courtesy of AUDI OF AMERICA, INC.

- Install toothed belt guard.
- Install ribbed belt. See **INSTALLING**.

TIGHTENING TORQUES: TOOTHED BELT

Component	Torque
Toothed belt sprocket to camshaft	55 Nm
Idler wheel	45 Nm
Toothed belt tensioning roller	20 Nm
Pulley to crankshaft	20 Nm
Toothed belt tensioning element	10 Nm
Central bolt to crankshaft ⁽¹⁾	200 Nm + 180 Degree Turn ⁽²⁾
(1) The central bolt must always be replaced.	

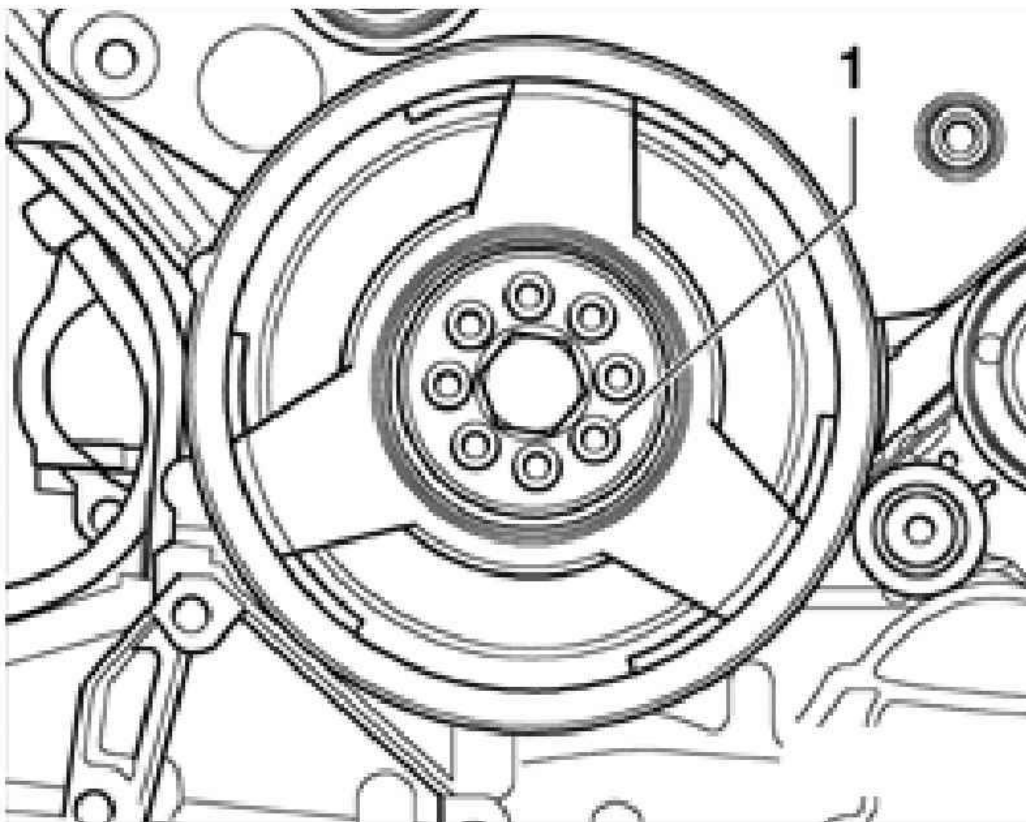
(2) Turning in two stages of 90° is also permissible.

Vibration damper, removing and installing

- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.

NOTE: The central bolt does not have to be loosened to remove the vibration damper.

- Remove vibration damper.

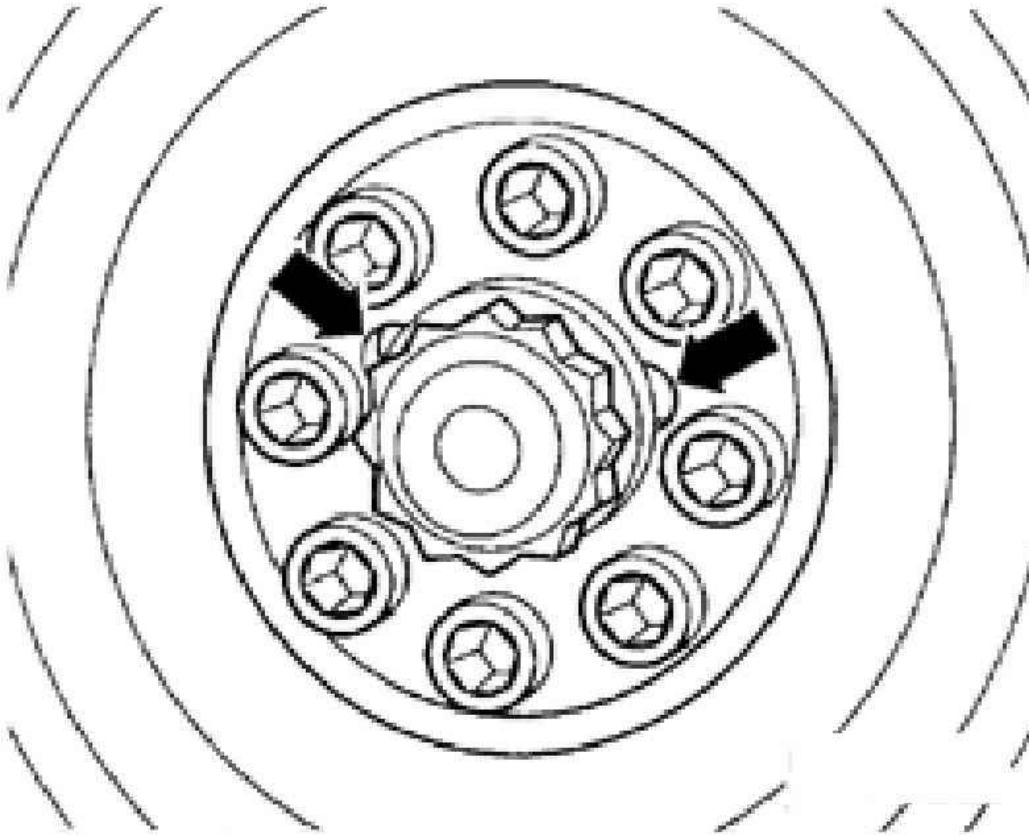


G02724314

Fig. 77: Removing Vibration Damper
Courtesy of AUDI OF AMERICA, INC.

- When installing, make sure that notches -arrows- in vibration damper are aligned with locating lugs on toothed belt sprocket.

- Tightening torque: 25 Nm



G02724315

Fig. 78: Aligning With Locating Lugs On Toothed Belt Sprocket
Courtesy of AUDI OF AMERICA, INC.

Cylinder block, crankshaft and flywheel, disassembling and assembling

NOTE: Replace all gaskets and seals.

NOTE: The following list refers to items in Fig. 79.

1. Thrust washers

- Measuring axial clearance of crankshaft. See AXIAL AND RADIAL CLEARANCE OF CRANKSHAFT, MEASURING.
- Thrust washer only fitted on 4th crankshaft bearing

2. Special bolt (double hex)

- Always replace
 - Dual-mass flywheel: 60 Nm + 180° (1/2 turn)
3. **Dual-mass flywheel**
 - Removing and installing. See **DUAL-MASS FLYWHEEL/DRIVE PLATE; INSTALLATION DIMENSIONS, REMOVING AND INSTALLING.**
 - Removing and installing needle bearing. See **NEEDLE BEARING IN DUAL-MASS FLYWHEEL, REMOVING AND INSTALLING.**
 4. **Crankshaft bearing**
 - Checking axial and radial clearance. See **AXIAL AND RADIAL CLEARANCE OF CRANKSHAFT, MEASURING.**
 5. **Bolt, tightening torque 10 Nm**
 6. **Oil spray jet**
 - For piston cooling.
 7. **Oil seal for rear sealing flange**
 - Replacing. See **CRANKSHAFT OIL SEALS, REPLACING.**
 8. **Bolt, tightening torque 10 Nm**
 9. **Rear sealing flange**
 10. **Gasket**
 11. **Bolt, tightening torque 25 Nm**
 - Screw in bolts on left and right sides finger-tight before tightening bolts on main bearing caps.
 12. **Cylinder block**
 13. **Gasket**
 14. **Collar bolt, tightening torque 30 Nm**
 - Apply Loctite when installing
 15. **Bolt, tightening torque 10 Nm**
 16. **Front sealing flange**
 17. **Expansion pins**
 18. **Crankshaft**
 - Checking. See **AXIAL AND RADIAL CLEARANCE OF CRANKSHAFT, MEASURING.**
 19. **Chain sprocket for oil pump**
 - Removing and installing. See **CHAIN SPROCKET FOR OIL PUMP ON CRANKSHAFT, REMOVING AND INSTALLING.**
 20. **Pistons**
 - Checking. See **PISTONS AND PISTON RINGS, CHECKING.**
 21. **Piston rings**
 - Checking, see **PISTONS AND PISTON RINGS, CHECKING**
 22. **Circlip for piston pin**
 23. **Piston pin**

24. Connecting rod

- Mark cylinder number and installation position of matching connecting rods and bearing caps before removing
- Installation position: wider, slightly convex machined surfaces on the same side

25. Connecting rod bearing

- Do not interchange used bearing shells.
- Connecting rods, connecting rod bearings, see **CONNECTING RODS, CONNECTING ROD BEARINGS, CHECKING**

26. Connecting rod bearing bolts

- Always replace
- Tightening torque: 30 Nm + 90° (1/4 turn)
- When measuring radial clearance, tighten to 20 Nm but do not turn further.

27. Main bearing cap

- Marking -1- on oil pump side
- Replace bolts for main bearing caps
- Watch position of dowel sleeves
- Checking bearing clearance, see **AXIAL AND RADIAL CLEARANCE OF CRANKSHAFT, MEASURING**

28. Bolts for main bearing caps

- Always replace
- Tightening torque, see **TIGHTENING SEQUENCE**
- Tightening sequence, see **TIGHTENING SEQUENCE**

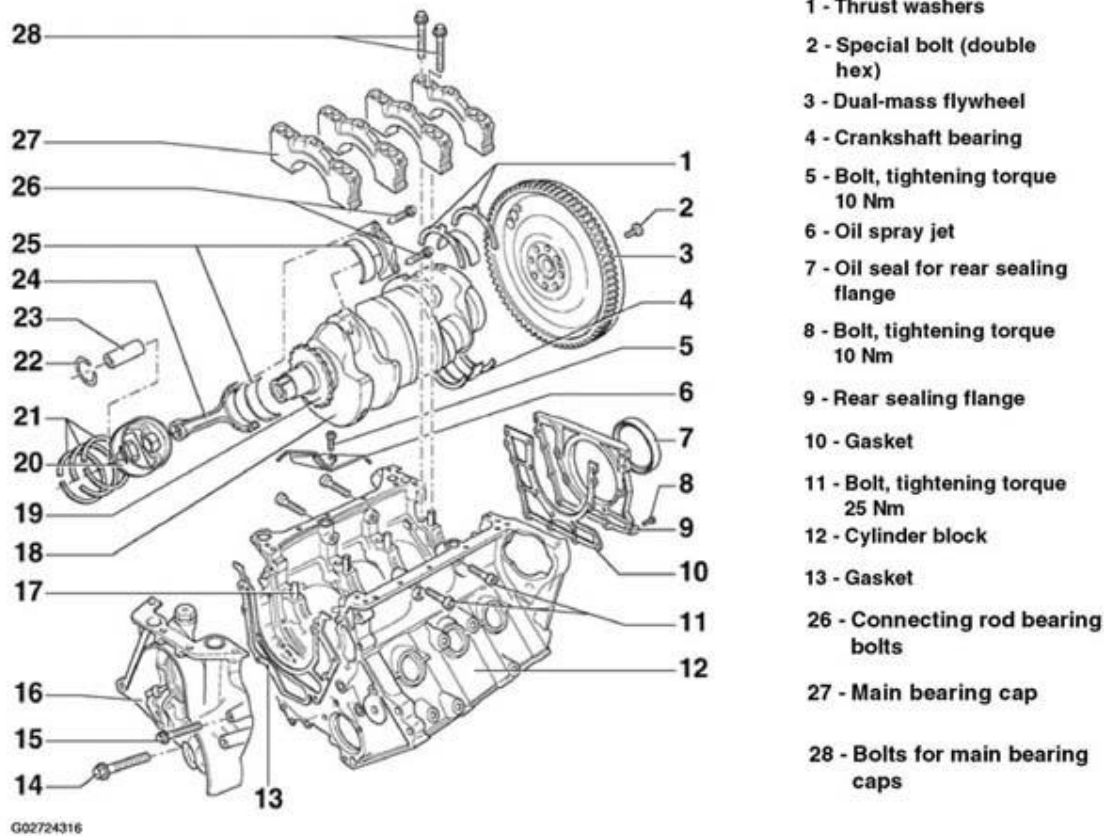


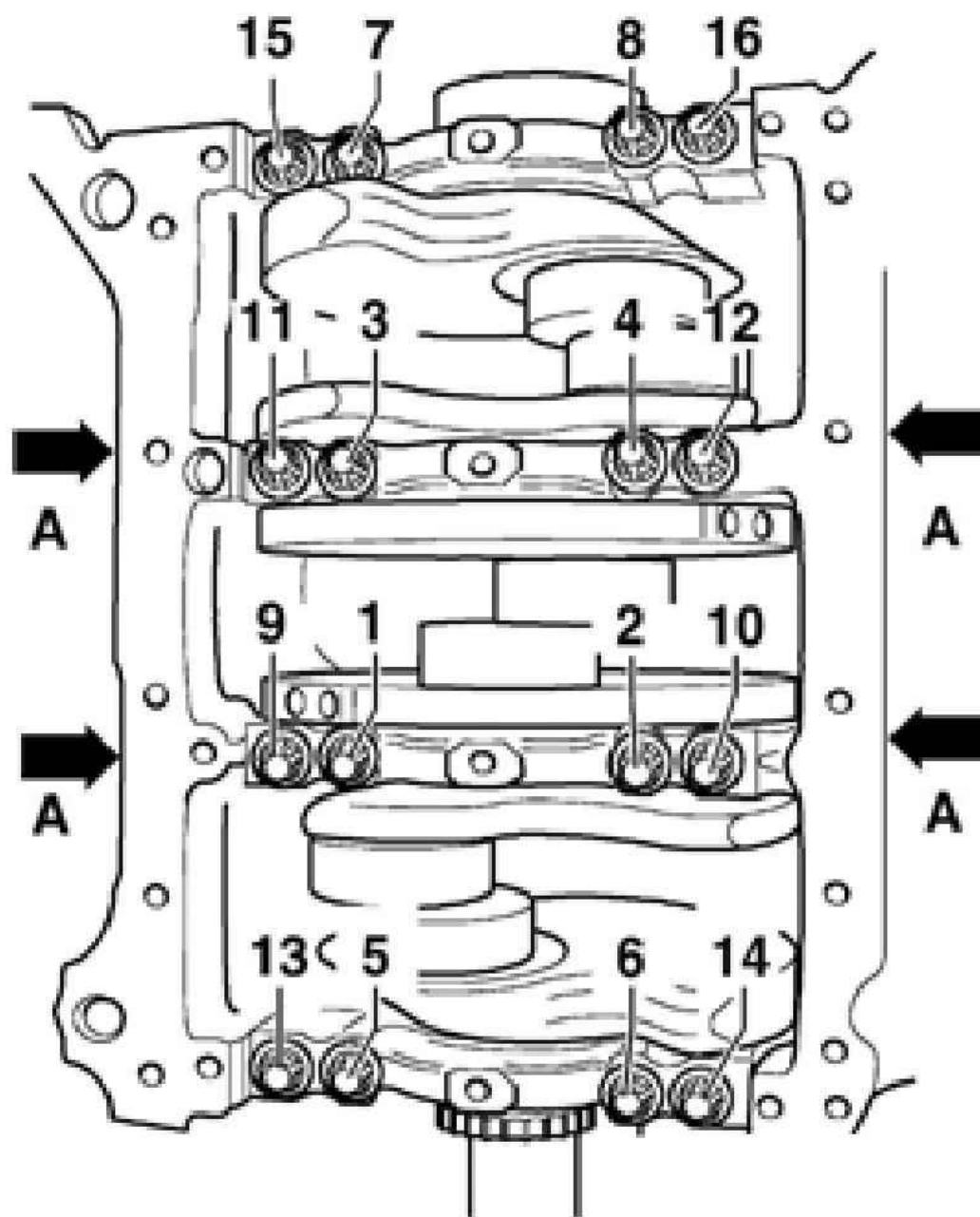
Fig. 79: Exploded View Of Cylinder Block, Crankshaft And Flywheel
 Courtesy of AUDI OF AMERICA, INC.

Crankshaft bearing caps, installing

NOTE: Bearing -1- is at the toothed belt end; bearing -4- is at the flywheel end.

Tightening sequence

- Stage 1 - Tighten all bolts in sequence shown (1 - 16) to 30 Nm.
- Stage 2 - Tighten all bolts in sequence shown (1 - 16) to 60 Nm.
- Stage 3 - Using a fixed wrench, turn all bolts in sequence shown (1 - 16) 90° further.
- Tighten bolts -A- to 25 Nm.



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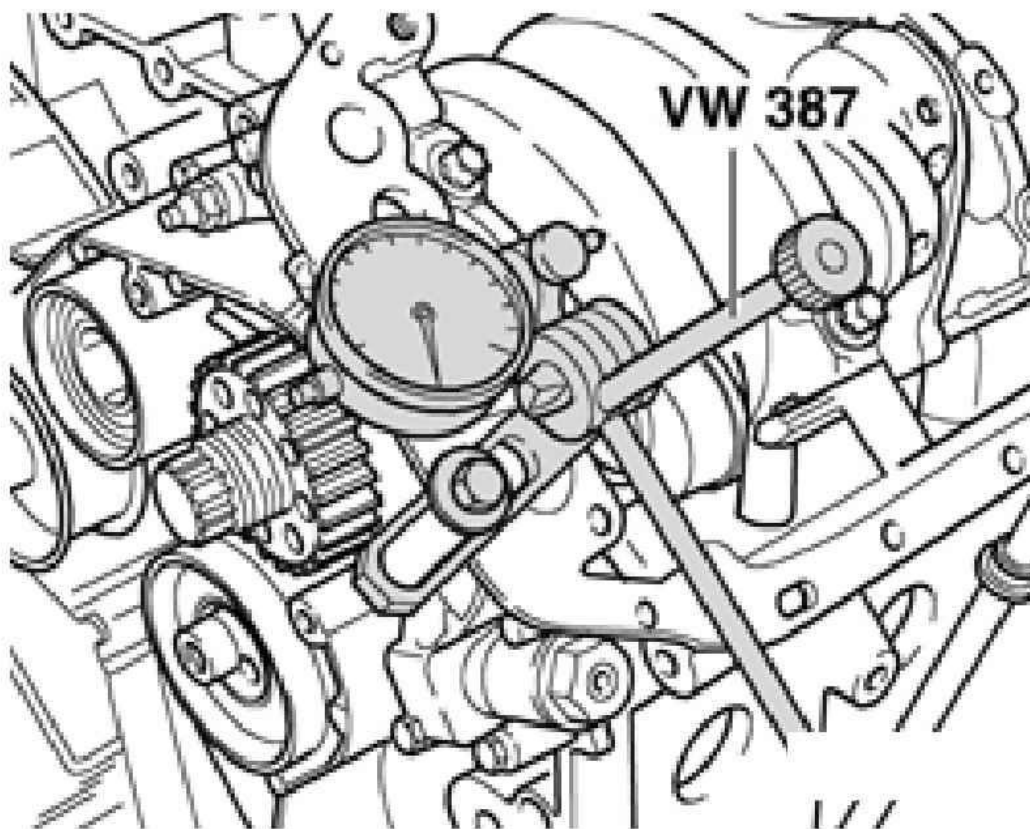
Fig. 80: Tightening Sequence Of Crankshaft Bearing Caps
 Courtesy of AUDI OF AMERICA, INC.

Axial and radial clearance of crankshaft, measuring

Axial clearance

NOTE: Do not interchange used bearings.

- Attach dial indicator with universal dial indicator bracket VW 387 to oil pump and bring it into contact with crank web. See **Fig. 81**.
- Press crankshaft against dial indicator by hand and set gauge to -0-.
- Press crankshaft away from dial indicator.
- Note reading:



G02724318

Fig. 81: Measuring Axial Clearance Of Crankshaft
Courtesy of AUDI OF AMERICA, INC.

CRANKSHAFT AXIAL CLEARANCE (END PLAY) SPECIFICATIONS

Clearance when new	Wear limit
0.090 - 0.251 mm	0.28 mm

Radial clearance

- Measure radial clearance with Plastigage
- Read value:

CRANKSHAFT RADIAL CLEARANCE SPECIFICATIONS

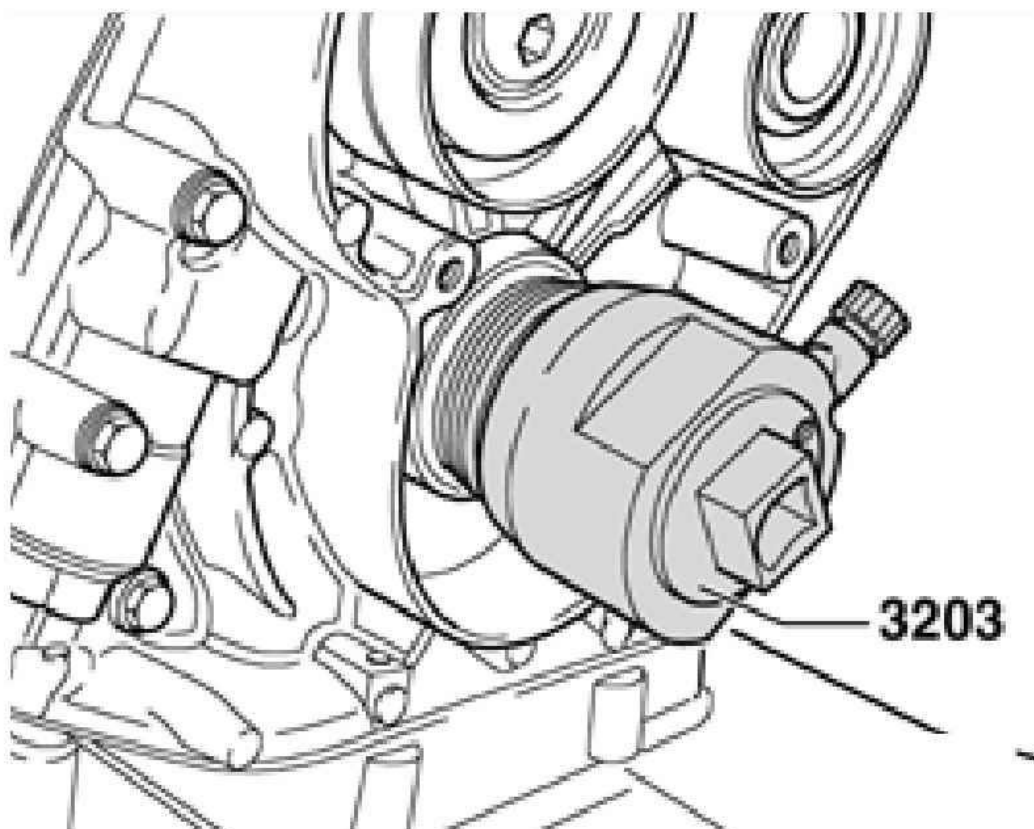
Clearance when new	Wear limit
0.018 - 0.045 mm	0.10 mm

Crankshaft oil seals, replacing**A - Toothed belt end**

- Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING.**
- Remove toothed belt sprocket from crankshaft
- Pull out oil seal with oil seal extractor 3203.
- Clean contact surface and sealing surface.

NOTE: **Do not lubricate sealing lip or outer circumference of seal before pressing in.**

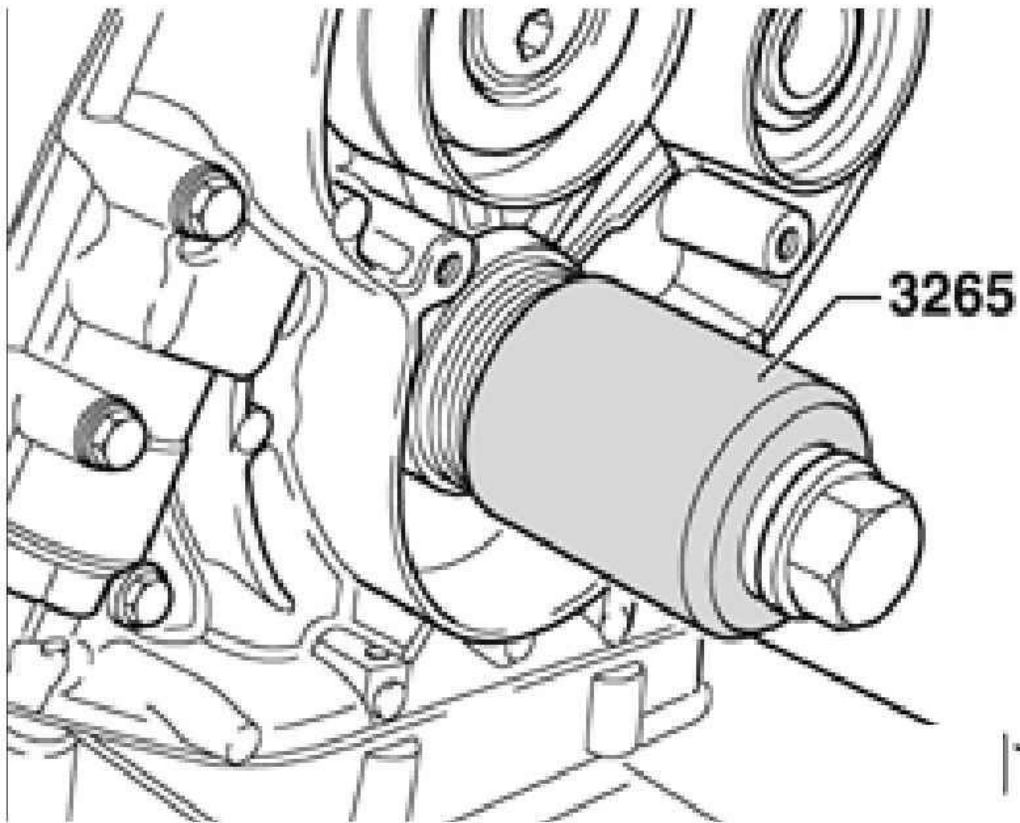
- Push on seal using fitting sleeve 3202/1.



G02724319

Fig. 82: Pulling Out Crankshaft Front Oil Seal With Oil Seal Extractor 3203
Courtesy of AUDI OF AMERICA, INC.

- Press in seal until flush using fitting sleeve 3265 and central bolt.



G02724320

Fig. 83: Pressing In Crankshaft Front Oil Seal
Courtesy of AUDI OF AMERICA, INC.

B - Flywheel end

NOTE: Replace oil seal together with sealing flange.

Vehicles with manual transmission

- Drain coolant. See COOLING SYSTEM, DRAINING AND FILLING .
- Remove transmission

Vehicles with four-wheel drive

See 6 SPD. MANUAL TRANSMISSION 01E .

- Remove clutch.

- With crankshaft at TDC, screw in clamping bolt 3242.
- Mark position of flywheel relative to engine -arrows-.
- Remove dual-mass flywheel.
- Remove sealing flange.

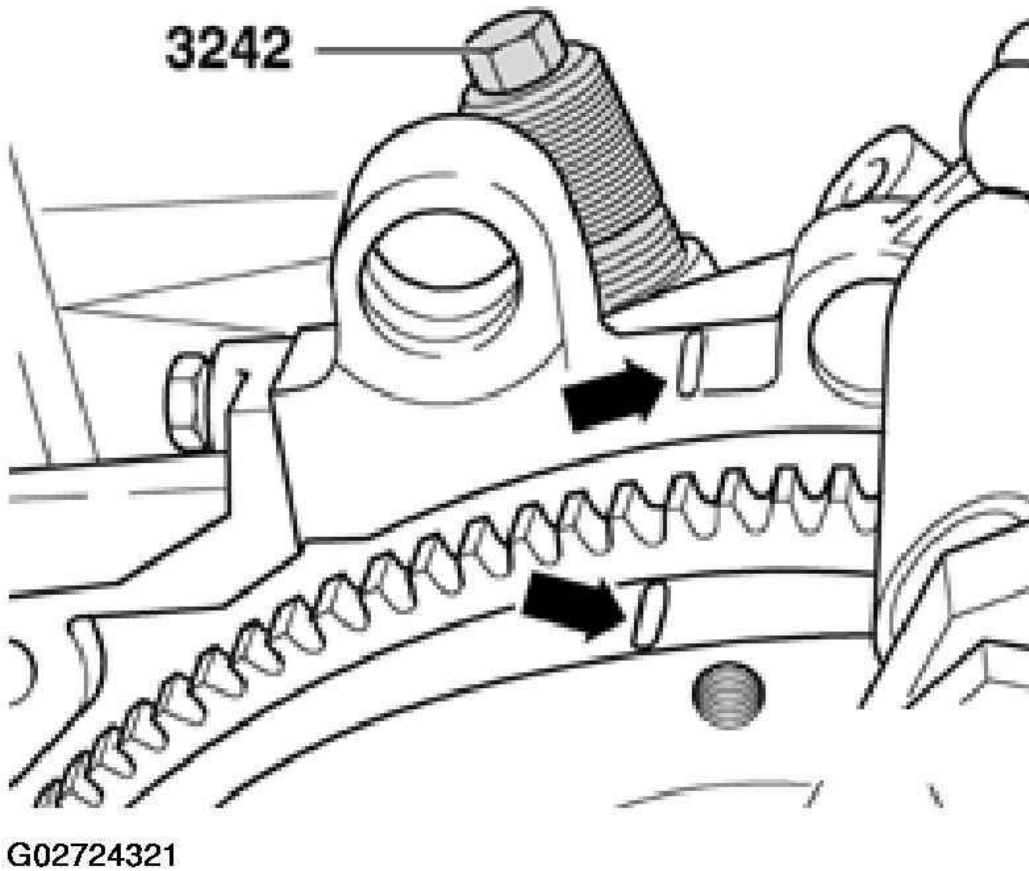


Fig. 84: Screwing In Clamping Bolt 3242 To Secure Crankshaft At TDC
Courtesy of AUDI OF AMERICA, INC.

Installing

- Install sealing flange.
- Install dual-mass flywheel with new bolts.
- Install clutch.

Vehicles with all-wheel drive

See 6 SPD. MANUAL TRANSMISSION 01E .

TIGHTENING TORQUE: DUAL-MASS FLYWHEEL

Component	Tightening torques
Dual-mass flywheel to crankshaft	60 Nm + 180 Degree Turn ⁽¹⁾
Clutch to dual-mass flywheel	20 Nm
(1) Always replace securing bolts for dual-mass flywheel.	

NOTE: Always replace securing bolts for dual-mass flywheel.

Vehicles with automatic transmission

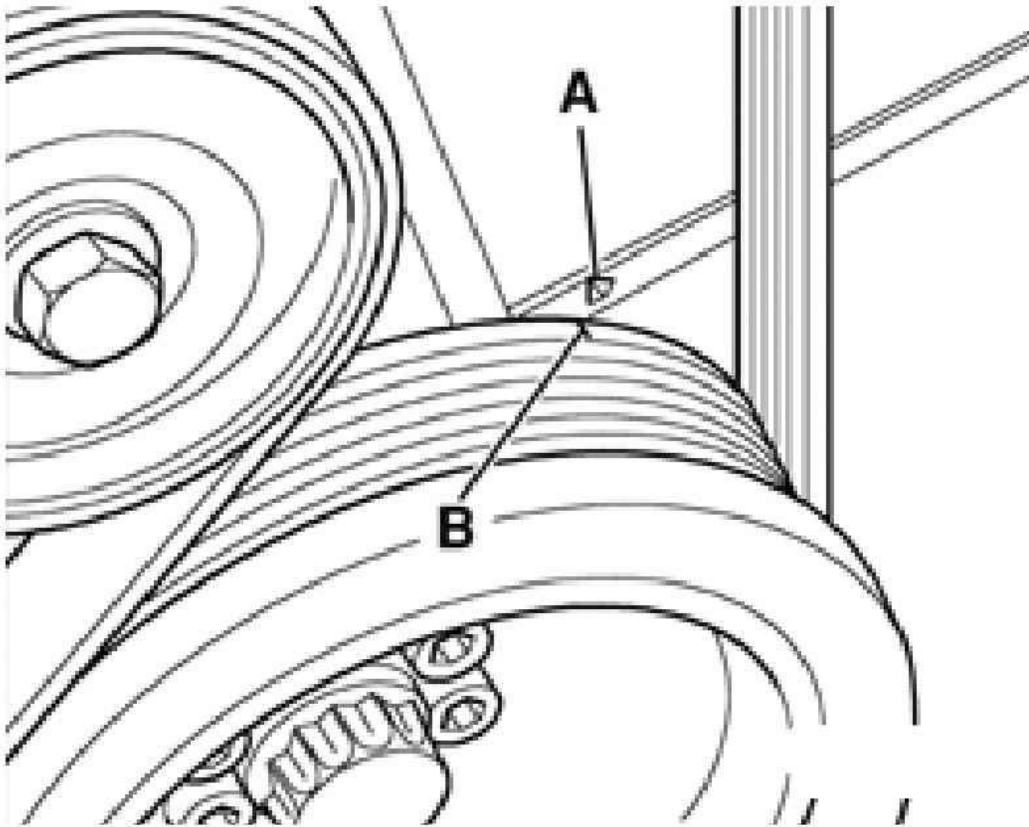
- Remove transmission.

See 5 SPD, AUTOMATIC TRANSMISSION 0 1V .

- Drain off coolant. See **COOLING SYSTEM, DRAINING AND FILLING** .
- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

NOTE: Turn over the engine at the central bolt on the crankshaft.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If not, turn crankshaft one revolution further.



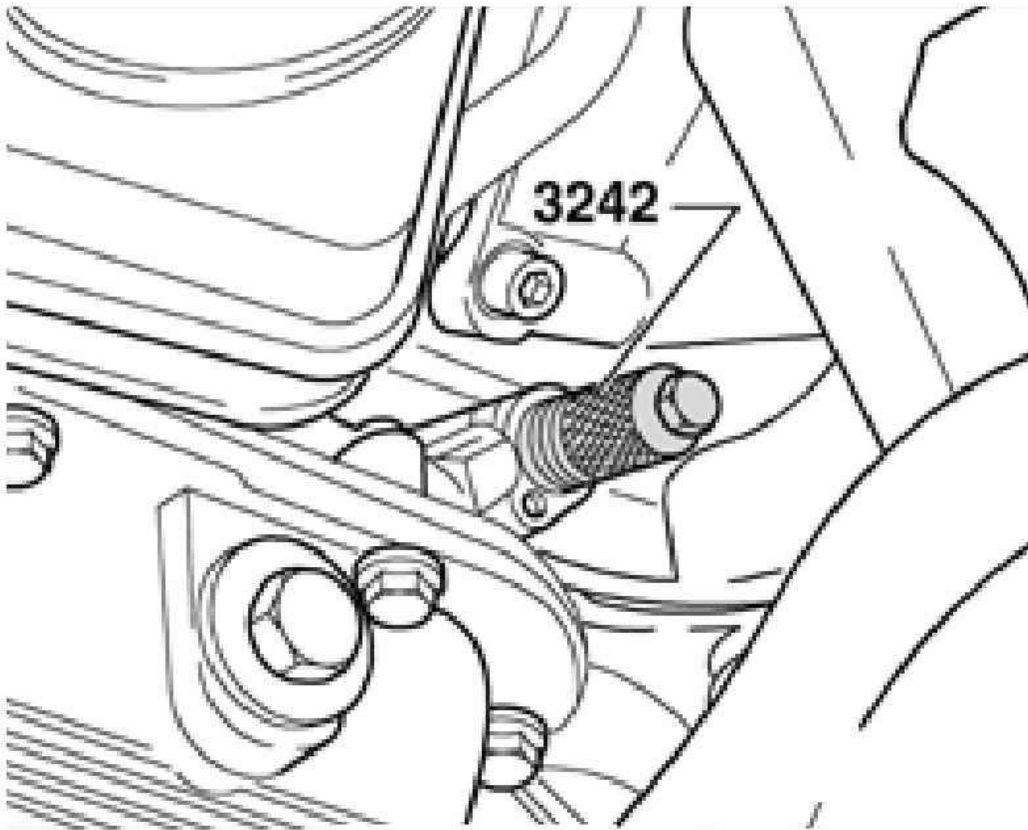
G02724322

Fig. 85: Turning Crankshaft To TDC By Hand
Courtesy of AUDI OF AMERICA, INC.

- Remove sealing plug from cylinder block, left.
- TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.

CAUTION: Injury risk - do not turn engine while feeling for TDC drilling.

- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.
- Mark positions of holes in drive plate, shim -1- and washer -2- in relation to crankshaft.
- Mark positions of shim -1- in front of drive plate and washer -2- behind drive plate.



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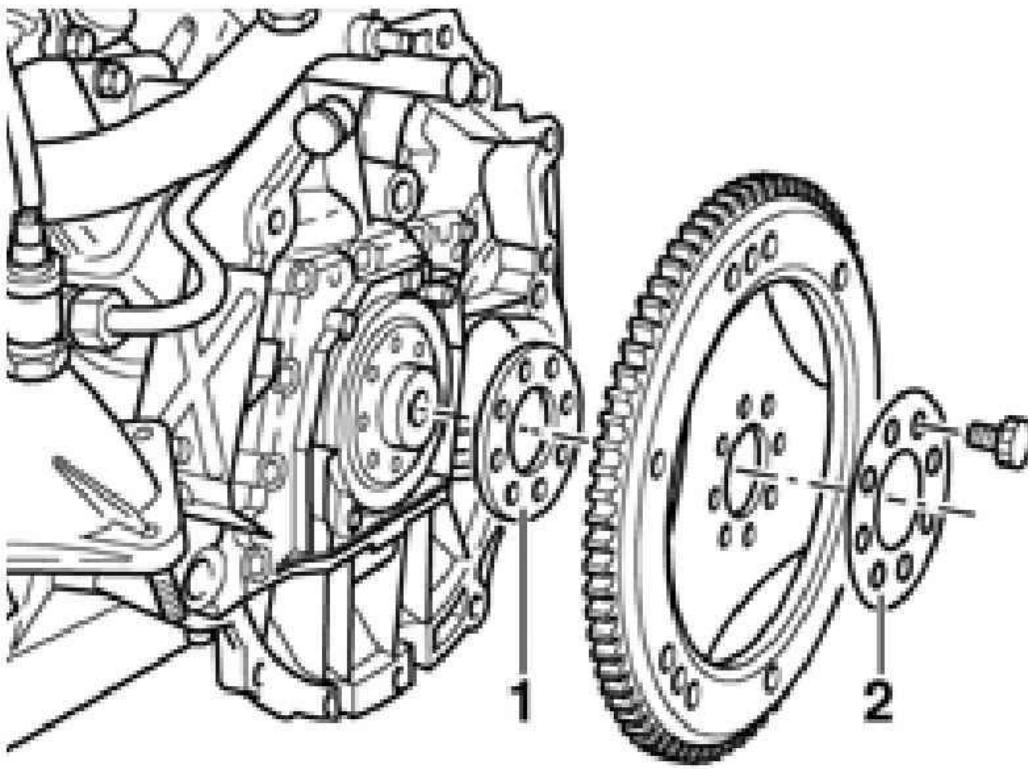
Fig. 86: Screwing Clamping Bolt 3242 For Crankshaft Into Sealing Plug Hole
Courtesy of AUDI OF AMERICA, INC.

Installing

- Install drive plate with washer -2- and shim -1- (3.0 mm or 4.0 mm).

NOTE:

- Short engines and exchange engines are supplied without a bushing in the crankshaft. On vehicles with an automatic transmission, always install a new bushing before installing the drive plate.
- Always replace drive plate securing bolts.



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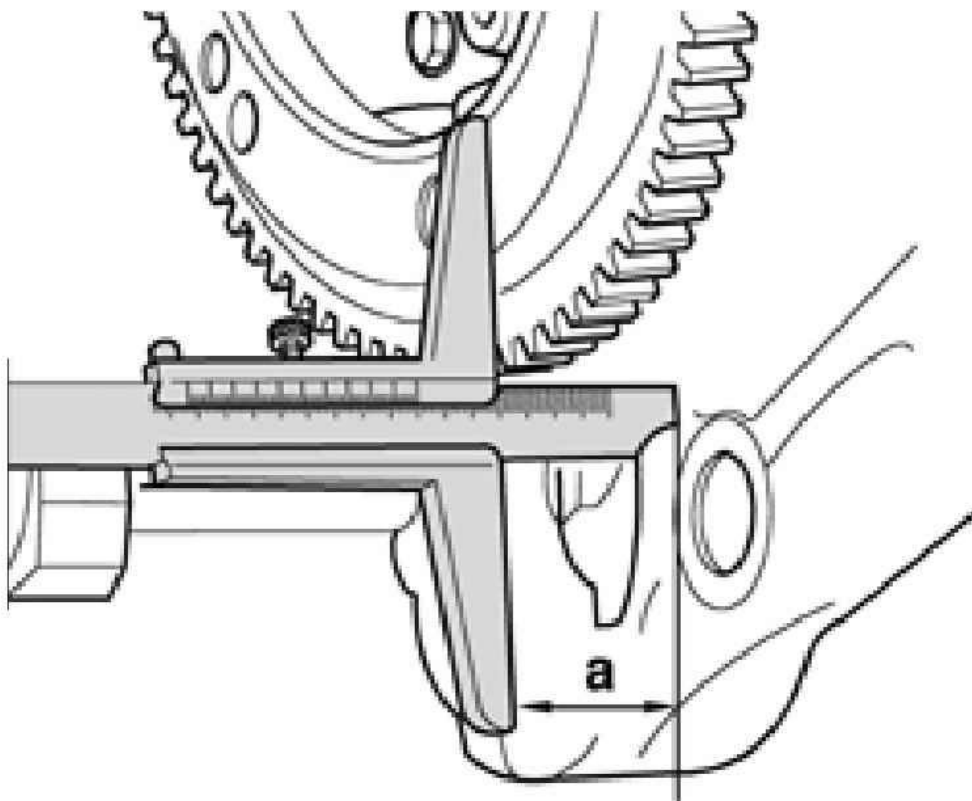
Fig. 87: Installing Drive Plate With Washer
 Courtesy of AUDI OF AMERICA, INC.

TIGHTENING TORQUE: AUTOMATIC TRANSMISSION DRIVE PLATE

Component	Tightening torques
Drive plate to crankshaft	60 Nm + 90 Degree Turn ⁽¹⁾
(1) Always replace securing bolts for drive plate.	

NOTE: Always replace securing bolts for drive plate.

- Measure distance -a- at three points and calculate average value.
 - Distance -a- = approx. 29.9 mm.
- Install a different shim if necessary.



G02724325

Fig. 88: Measuring Drive Plate Installed Distance -a-
 Courtesy of AUDI OF AMERICA, INC.

NOTE: Before installing the transmission, check that the dowel sleeves for locating engine/transmission are installed in the engine flange.

- Install transmission.

See 5 SPD, AUTOMATIC TRANSMISSION 01V .

Dual-mass flywheel/drive plate; installation dimensions, removing and installing

A - Flywheel

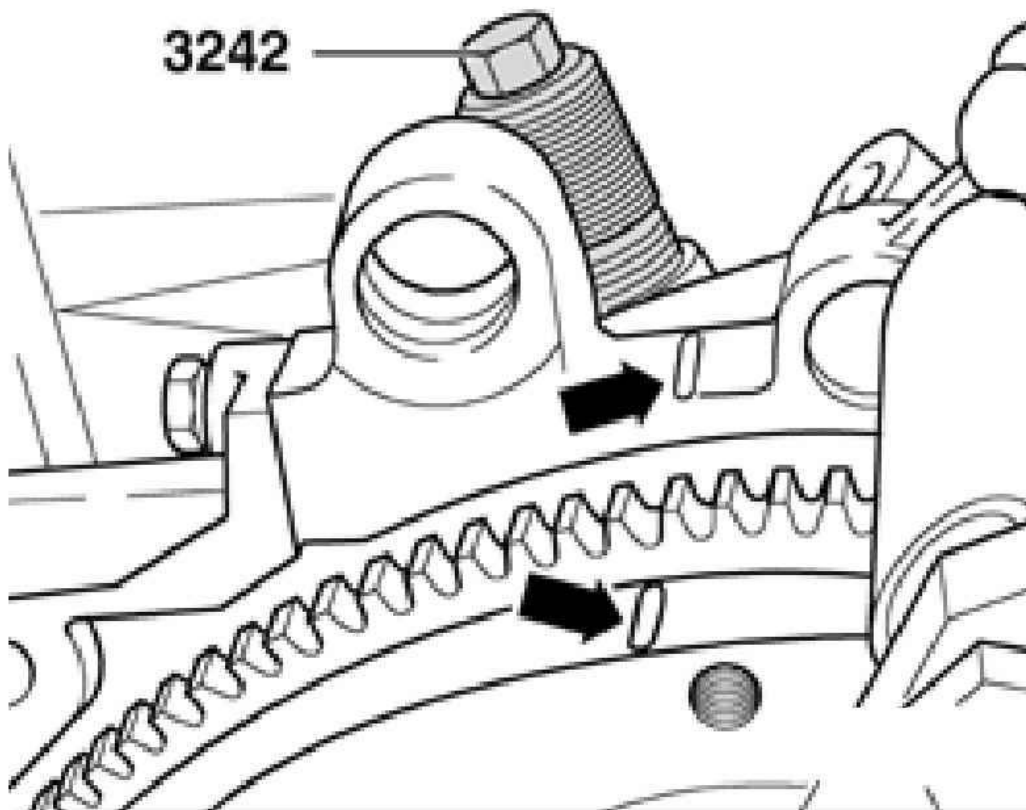
Removing

- Remove transmission.

Vehicles with four-wheel drive

See 6 SPD. MANUAL TRANSMISSION 01E .

- Remove clutch.
- With crankshaft at TDC, screw in clamping bolt 3242.
- Mark position of flywheel relative to engine -arrows-.
- Unscrew bolts (bolts must be replaced).



G02724326

Fig. 89: Screwing In Clamping Bolt 3242 With Crankshaft At TDC
Courtesy of AUDI OF AMERICA, INC.

NOTE: The needle bearing is located in the flywheel and must be pressed in if a new flywheel is installed. See **NEEDLE BEARING IN DUAL-MASS FLYWHEEL, REMOVING AND INSTALLING.**

Installing

- Install dual-mass flywheel.

NOTE: Always replace flywheel securing bolts.

- Install clutch.

Vehicles with all-wheel drive.

See 6 SPD. MANUAL TRANSMISSION 01E .

- Install transmission.

Vehicles with all-wheel drive

See 6 SPD. MANUAL TRANSMISSION 01E .

TIGHTENING TORQUE: DUAL-MASS FLYWHEEL

Component	Tightening torques
Dual-mass flywheel to crankshaft	60 Nm + 180 Degree Turn
Clutch to dual-mass flywheel	20 Nm
() Always replace securing bolts for dual-mass flywheel.	

B - Drive plate**Removing**

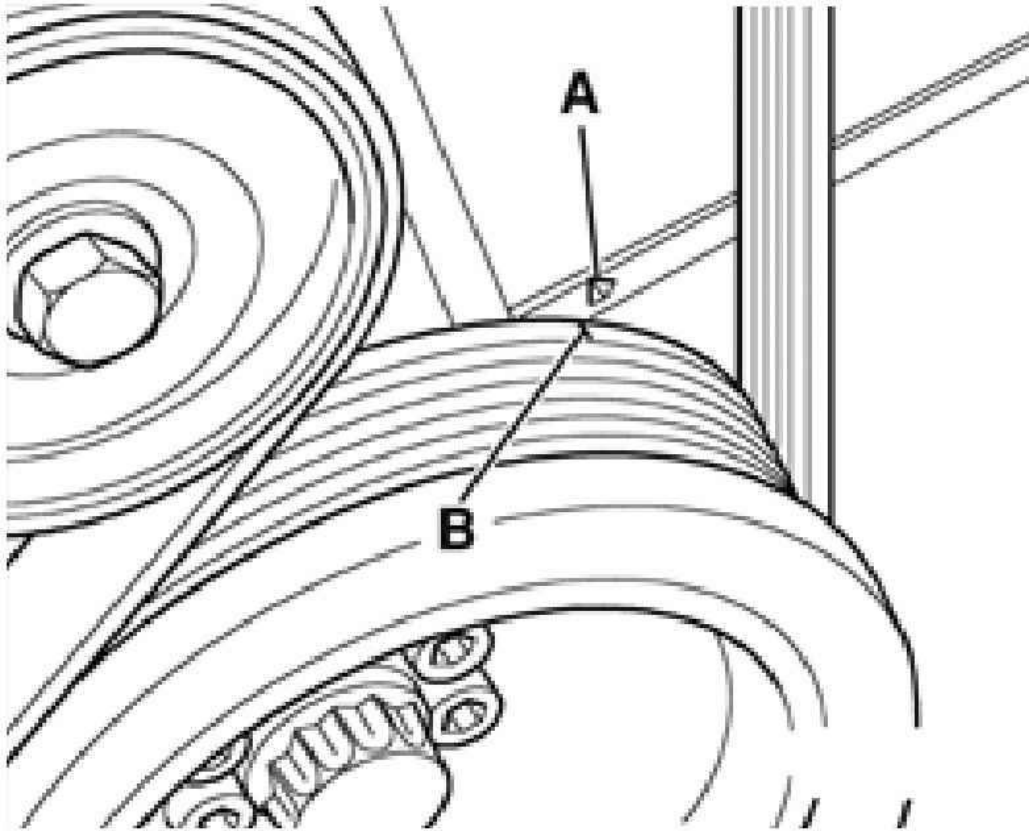
- Remove transmission.

See 5 SPD, AUTOMATIC TRANSMISSION 01V .

- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

NOTE: Turn over the engine at the central bolt on the crankshaft.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If not, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.



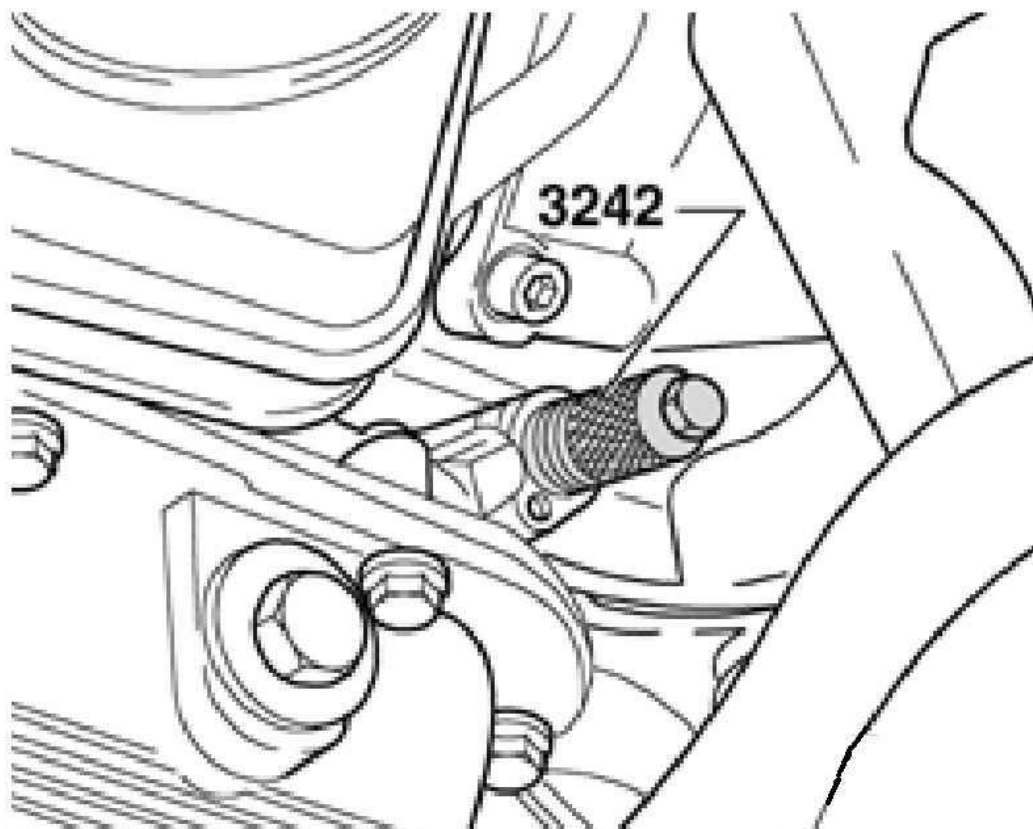
G02724327

Fig. 90: Turning Crankshaft To TDC By Hand
Courtesy of AUDI OF AMERICA, INC.

TDC drilling in crankshaft must be visible (or able to be felt) in line with the sealing plug hole.

CAUTION: Injury risk - do not turn engine while feeling for TDC drilling.

- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.
- Mark positions of holes in drive plate, shim -1- and washer -2- in relation to crankshaft.
- Mark positions of shim -1- in front of drive plate and washer -2- behind drive plate.



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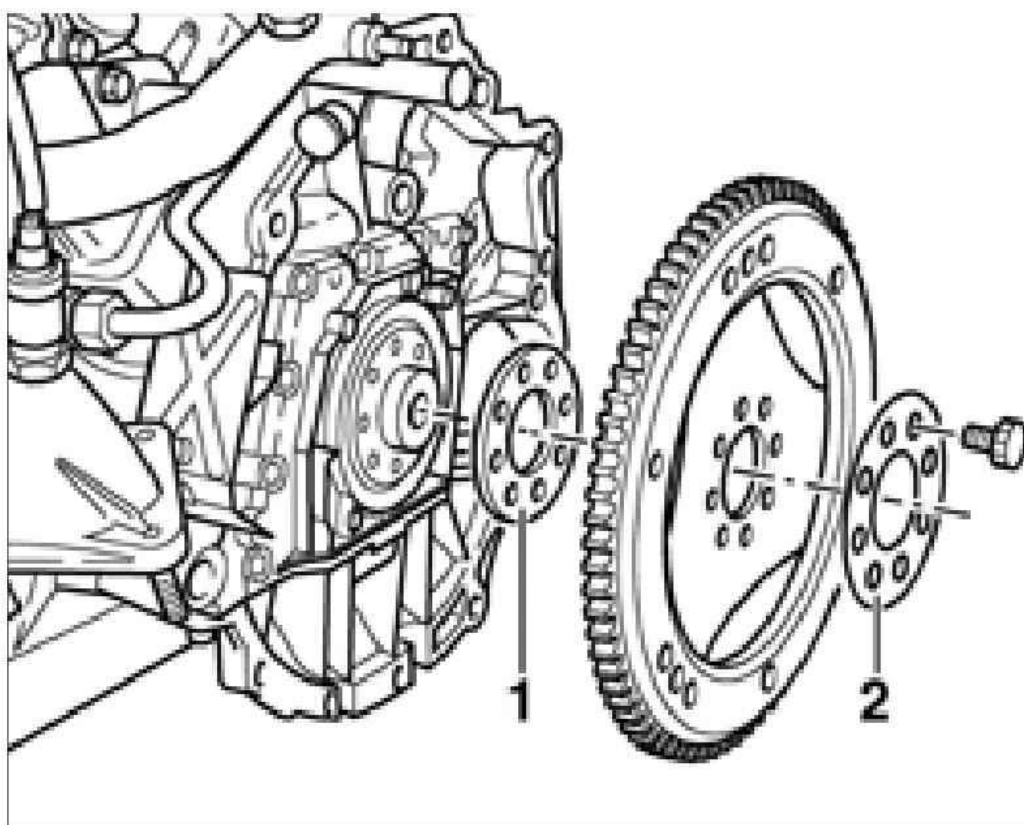
Fig. 91: Screwing Clamping Bolt 3242 For Crankshaft Into Sealing Plug Hole
Courtesy of AUDI OF AMERICA, INC.

Installing

- Install drive plate with washer -2- and shim -1- (3.0 mm or 4.0 mm).

NOTE:

- Short-engines and exchange engines are supplied without a bushing in the crankshaft. On vehicles with an automatic transmission, always install a new bushing before installing the drive plate.
- Always replace drive plate securing bolts.



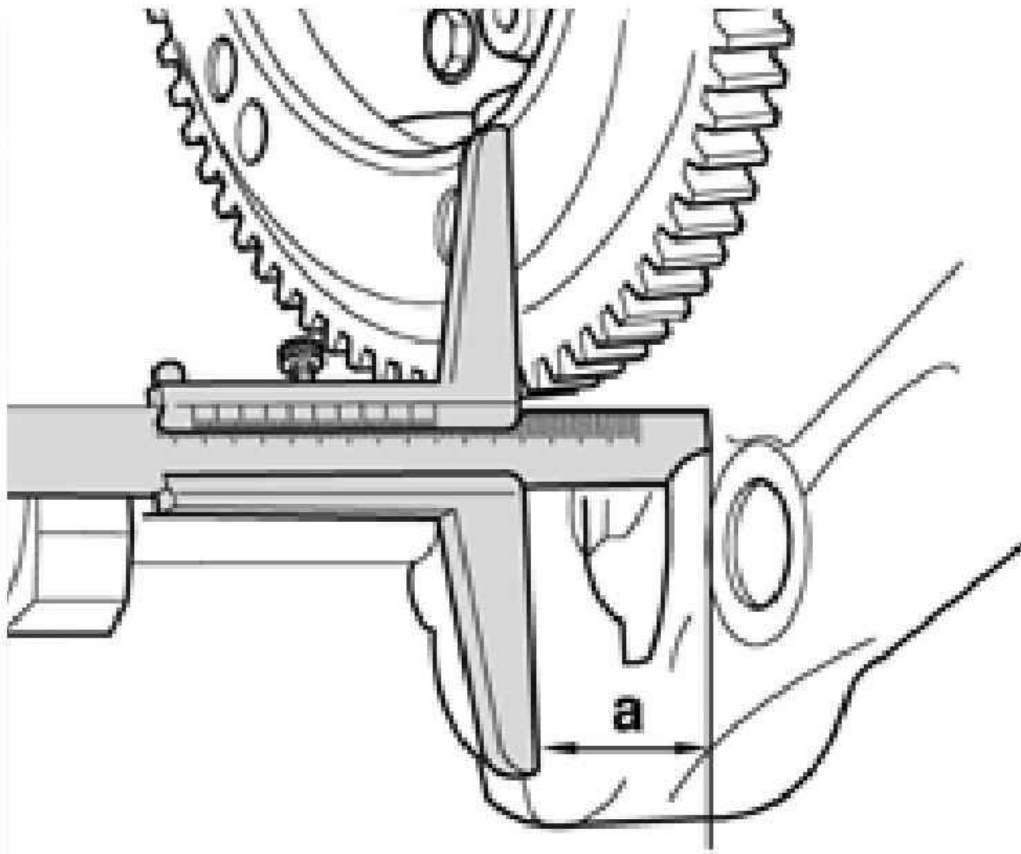
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Fig. 92: Installing Drive Plate With Washer
 Courtesy of AUDI OF AMERICA, INC.

TIGHTENING TORQUE: DRIVE PLATE

Component	Tightening torques
Drive plate to crankshaft	60 Nm + 90 Degree Turn ⁽¹⁾
(1) Always replace drive plate securing bolts.	

- Measure distance -a- at three points and calculate average value.
 - Distance -a- = approx. 12.3 mm.
- Install a different shim if necessary.



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Fig. 93: Measuring Drive Plate Installed Distance -a- At Three Points
 Courtesy of AUDI OF AMERICA, INC.

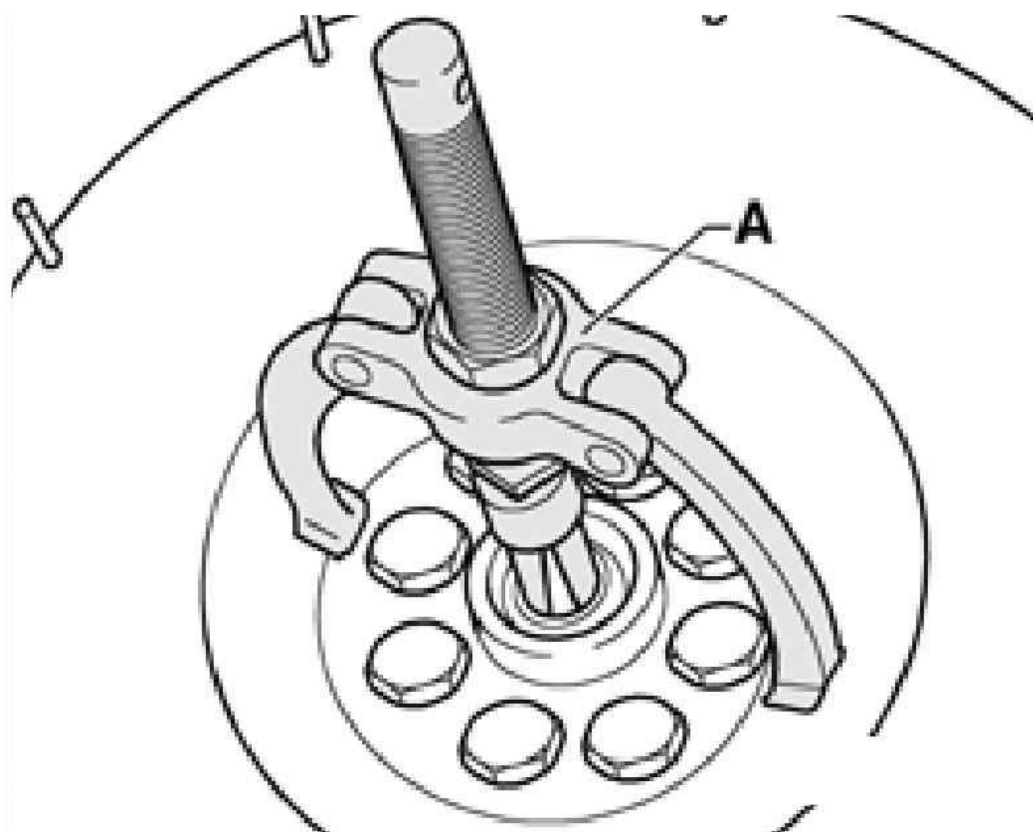
NOTE: Before installing the transmission, check that the dowel sleeves for locating engine/transmission are installed in the engine flange.

- Install transmission.

See 5 SPD, AUTOMATIC TRANSMISSION 01V .

Needle bearing in dual-mass flywheel, removing and installing

- Pull out needle bearing with puller, such as KUKKO 21/2 and KUKKO 22/1.
- Drive in with drift 3264.



G02724331

Fig. 94: Pulling Out Crankshaft Needle (Pilot) Bearing With Puller
 Courtesy of AUDI OF AMERICA, INC.

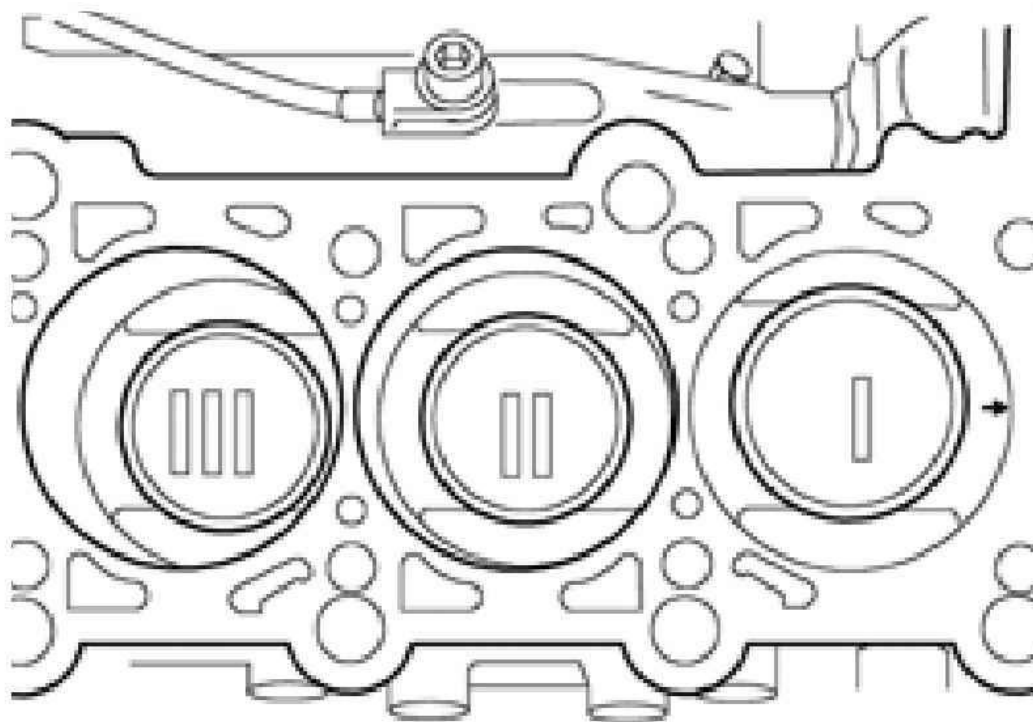
Pistons and piston rings, checking

Pistons

Position: arrow on piston crown must always face in direction of travel.

- Mark cylinder number on piston crown with waterproof felt pen.

NOTE: Do not use a center-punch or similar, as pistons have a special coating.

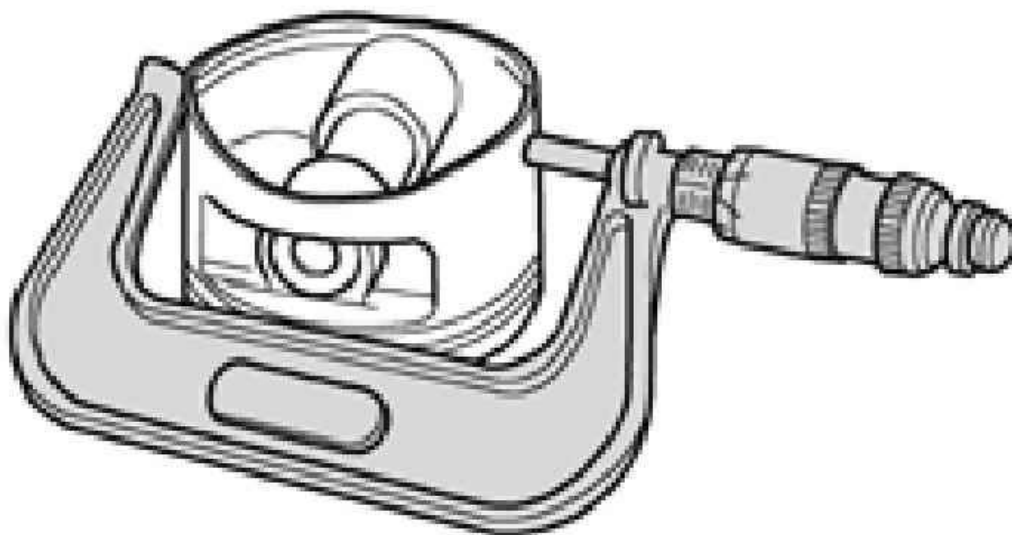


G02724332

Fig. 95: Marking Cylinder Number On Piston Crown
Courtesy of AUDI OF AMERICA, INC.

Checking piston diameter

- Measure pistons approx. 10 mm from bottom of skirt, at 90° to piston pin axis.
 - Difference between actual and nominal diameter: not more than 0.04 mm.



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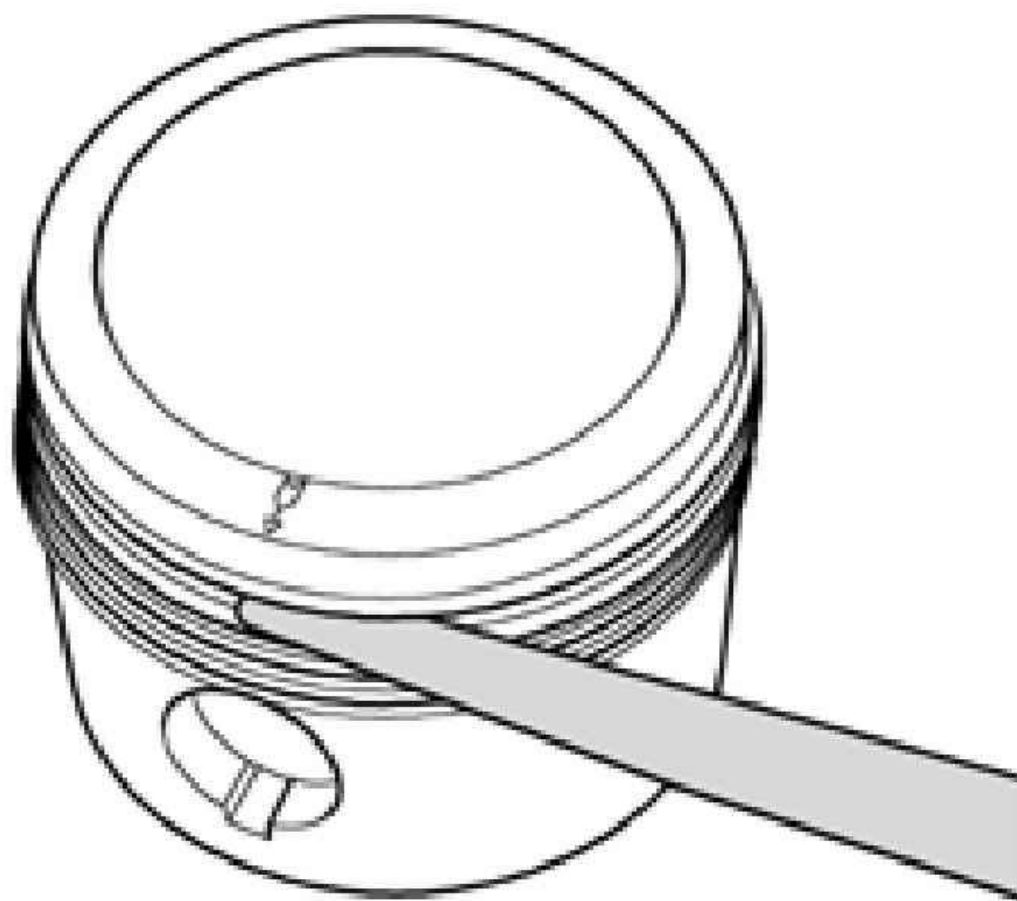
Fig. 96: Checking Piston Diameter

Courtesy of AUDI OF AMERICA, INC.

Ring-to-groove clearance

PISTON RING-TO-GROOVE CLEARNCE

Clearance when new	Wear limit
0.02 - 0.08 mm	0.10 mm



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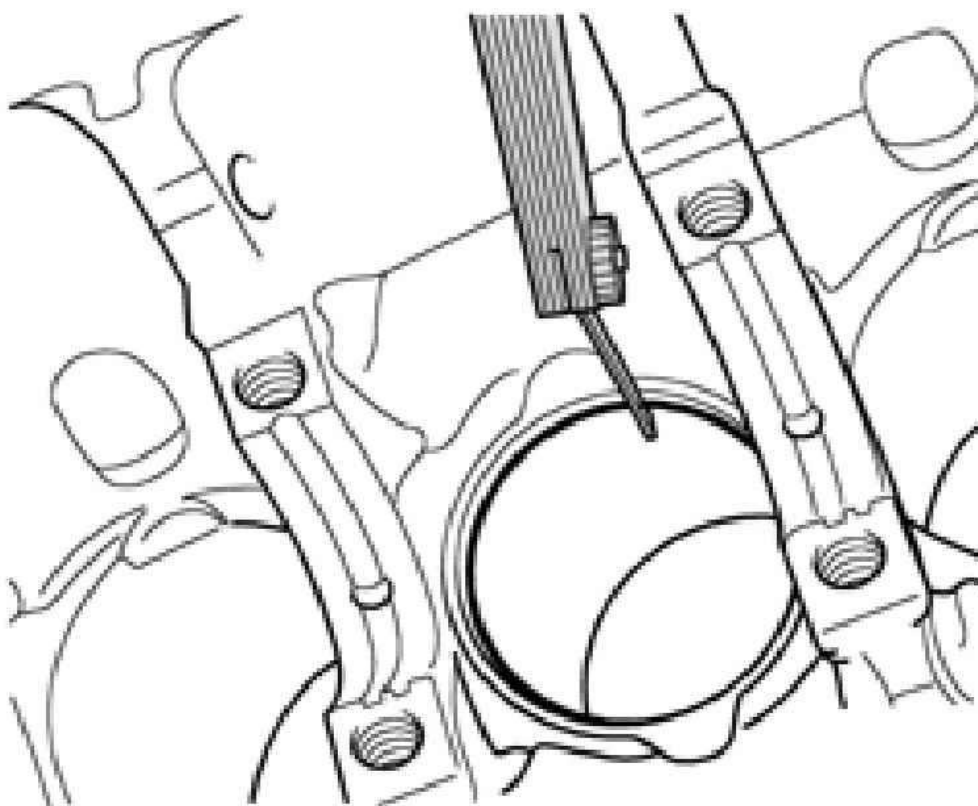
Fig. 97: Checking Piston Ring Side Clearance
 Courtesy of AUDI OF AMERICA, INC.

Checking piston ring gap

- Push ring in squarely to a position approx. 15 mm from bottom end of cylinder.

PISTON RING GAP SPECIFICATIONS

Piston ring	Gap when new	Wear limit
1	0.35 - 0.50 mm	1.0 mm
2	0.50 - 0.70 mm	1.4 mm
3	0.25 - 0.50 mm	0.8 mm



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Fig. 98: Checking Piston Ring End Gap
 Courtesy of AUDI OF AMERICA, INC.

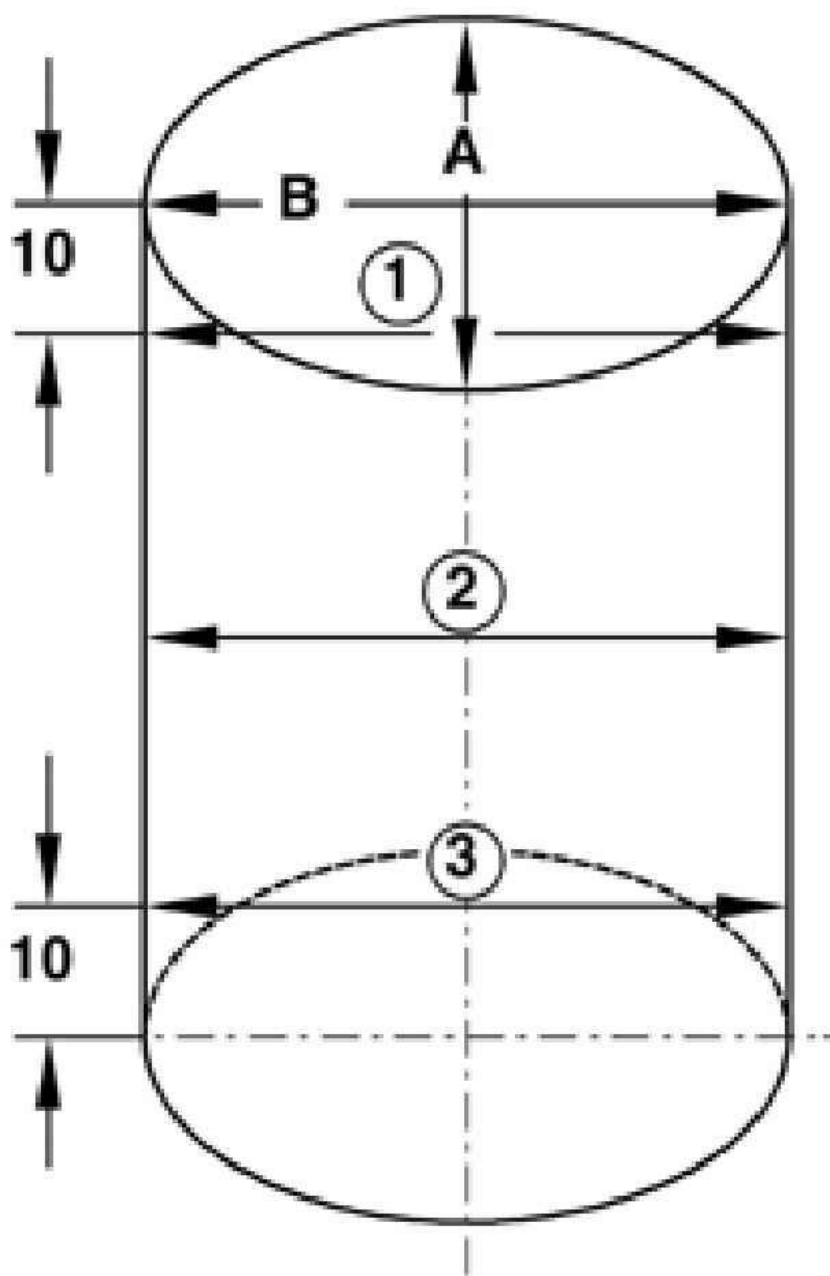
Cylinder bores, checking

- Measure bores at three points in both directions: across engine -A- and in line with crankshaft -B-.
- Use internal dial indicator 50 - 100 mm.
 - Difference between actual and nominal diameter: not more than 0.08 mm.

Piston and cylinder dimensions

PISTON AND CYLINDER BORE DIMENSIONS

Honing dimension	Piston dia.	Cyl. bore dia.
Basic dimension	80.95 mm	81.01 mm



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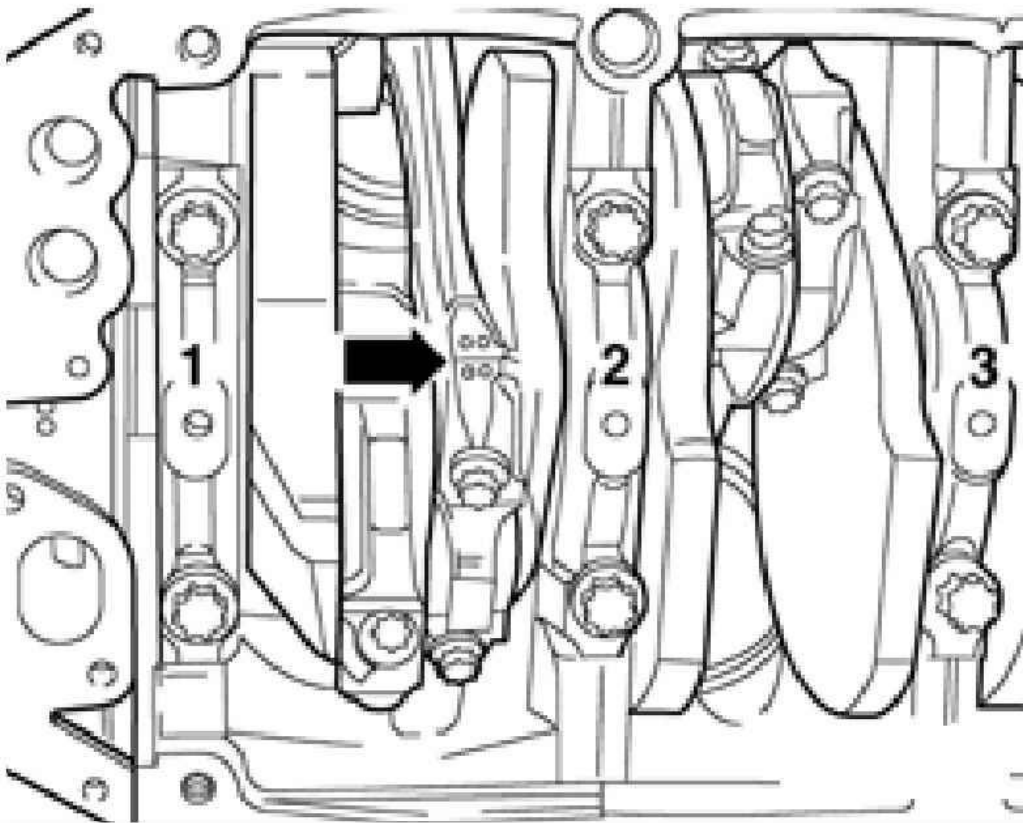
Fig. 99: Cylinder Bore Checking Points
Courtesy of AUDI OF AMERICA, INC.

NOTE: Replacement pistons are only available with basic dimension.

Connecting rods, connecting rod bearings, checking

NOTE:

- Only replace complete sets of connecting rods
 - Do not interchange connecting rod bearings.
- Before removing, mark positions of connecting rod bearing caps with a felt pen or similar.



G02724337

Fig. 100: Placing Alignment Marks On Connecting Rod Bearing Caps
Courtesy of AUDI OF AMERICA, INC.

Checking radial clearance

- Remove connecting rod bearing cap. Clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to width of bearing on the bearing journal or bearing shell.
- Install connecting rod bearing cap and tighten to 20 Nm. Do not rotate crankshaft.
- Remove connecting rod bearing cap again.

- Compare width of Plastigage with calibrated scale.

CONNECTING ROD BEARING RADIAL CLEARANCE

Clearance when new	Wear limit
0.015 - 0.062 mm	0.12 mm

- Install new connecting rod bearing bolts.

ENGINE - CYLINDER HEAD, VALVETRAIN**VALVE GEAR, SERVICING****NOTE:**

- Cylinder heads which have cracks between the valve seats or between valve seat inserts and the spark plug thread can be used further without reducing service life, provided the cracks do not exceed a maximum of 0.3 mm in width, or when no more than the first 4 turns of the spark plug threads are cracked.
- After installing new lifters the engine must not be started for about 30 minutes (otherwise valves will strike pistons). Turn crankshaft two complete revolutions before starting.
- Carefully apply a small amount of sealant D 454 300 A2 at the four end points of the sealing surfaces on the cylinder head, using a small screwdriver. See SEALING END POINTS OF JOINTS BETWEEN BEARING CAPS AND CYLINDER HEAD.

NOTE: The following list refers to items in Fig. 101.

1. Double bearing cap

- Lightly coat with sealant 454 300 A2 before installing. See INSTALLING.

2. Exhaust camshaft bearing cap

- With connection for oil feed line
- Watch position of dowel sleeve
- Note installation position and numbering. See CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.
- Lightly coat last bearing cap (after the chain) with sealant D454 300 A2 before installing

3. 10 Nm**4. Exhaust camshaft**

- Checking axial clearance. See CAMSHAFT AXIAL CLEARANCE, CHECKING
- Removing and installing. See CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.
- Check radial clearance with in Plastigage™ (lifters removed) Wear limit: 0.1 mm Runout: 0.01 mm (maximum)

5. Cap

- Always replace

6. Inlet camshaft bearing cap

- With connection for oil feed line
- Note installation position and numbering. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**

7. Inlet camshaft

- Checking axial clearance. See **CAMSHAFT AXIAL CLEARANCE, CHECKING.**
- Removing and installing. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**
- Check radial clearance with Plastigage™ (lifters removed)

Wear limit: 0.1 mm

Run-out: 0.01 mm (maximum)

8. Drive chain

- Installing. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**

9. 10 Nm**10. Mechanical camshaft adjuster**

- With camshaft adjustment valve -N205
- Secure with special tool 3366 before removing. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**

11. Hydraulic bucket lifter

- Notes, see **HYDRAULIC VALVE LIFTERS, CHECKING**
- Removing and installing with cylinder head installed, see **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING**

12. Valve keepers**13. Valve spring plate****14. Valve spring****15. Valve stem seal**

- Replacing with cylinder head installed, see **VALVE STEM SEALS, REPLACING**

16. Rubber/metal gasket

- Always replace

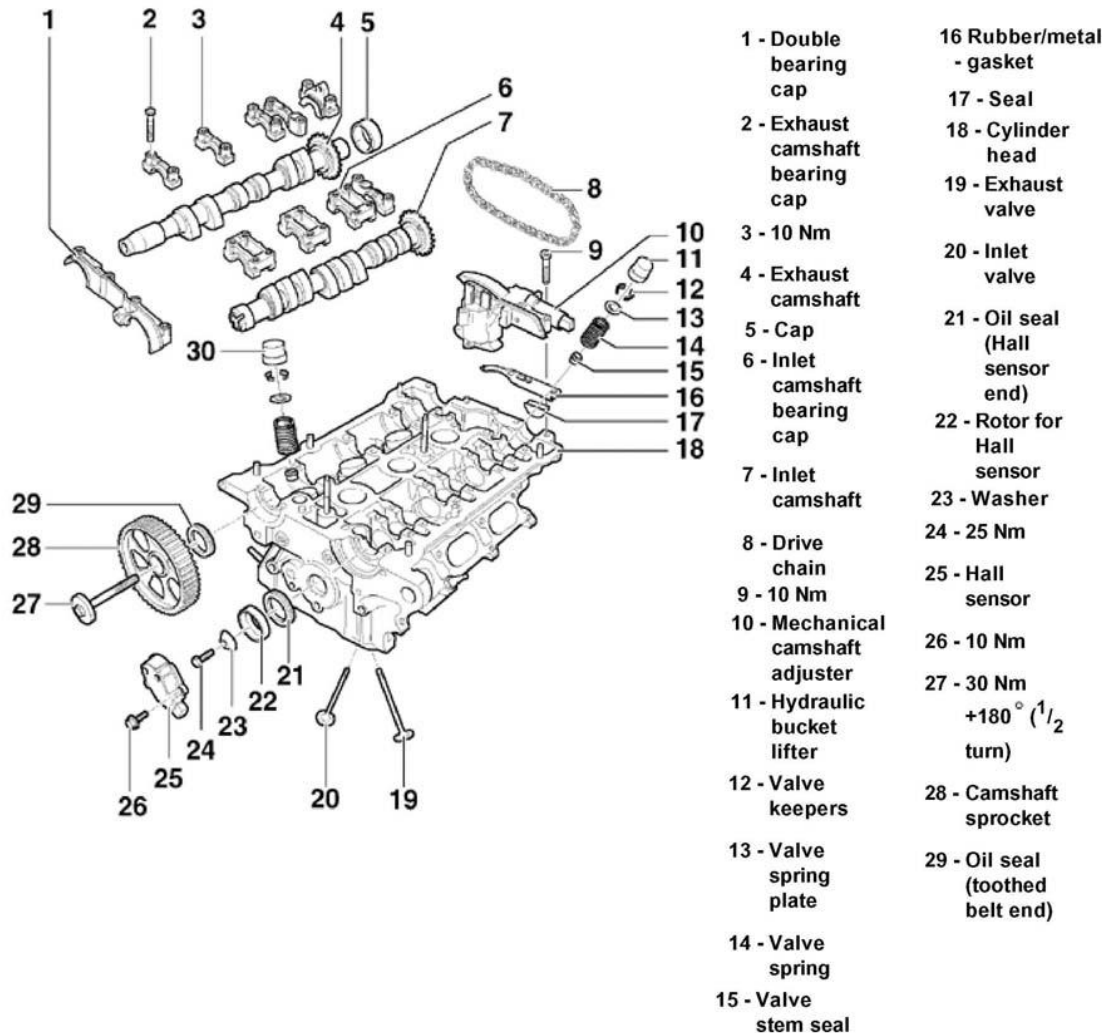
17. Seal

- Always replace

18. Cylinder head

- Checking for distortion, see **CYLINDER HEAD, CHECKING FOR DISTORTION**
- Reworking, see **CYLINDER HEAD, REWORKING**

19. **Exhaust valve**
20. **Inlet valve**
21. **Oil seal (Hall sensor end)**
 - Always replace. See **OIL SEALS IN CYLINDER HEADS, REPLACING.**
22. **Rotor for Hall sensor**
 - Note position (notch on camshaft)
23. **Washer**
 - Conical
24. **25 Nm**
25. **Hall sensor**
26. **10 Nm**
27. **30 Nm +180° (1/2 turn)**
28. **Camshaft sprocket**
29. **Oil seal (toothed belt end)**
 - Replacing, see **OIL SEALS IN CYLINDER HEADS, REPLACING**

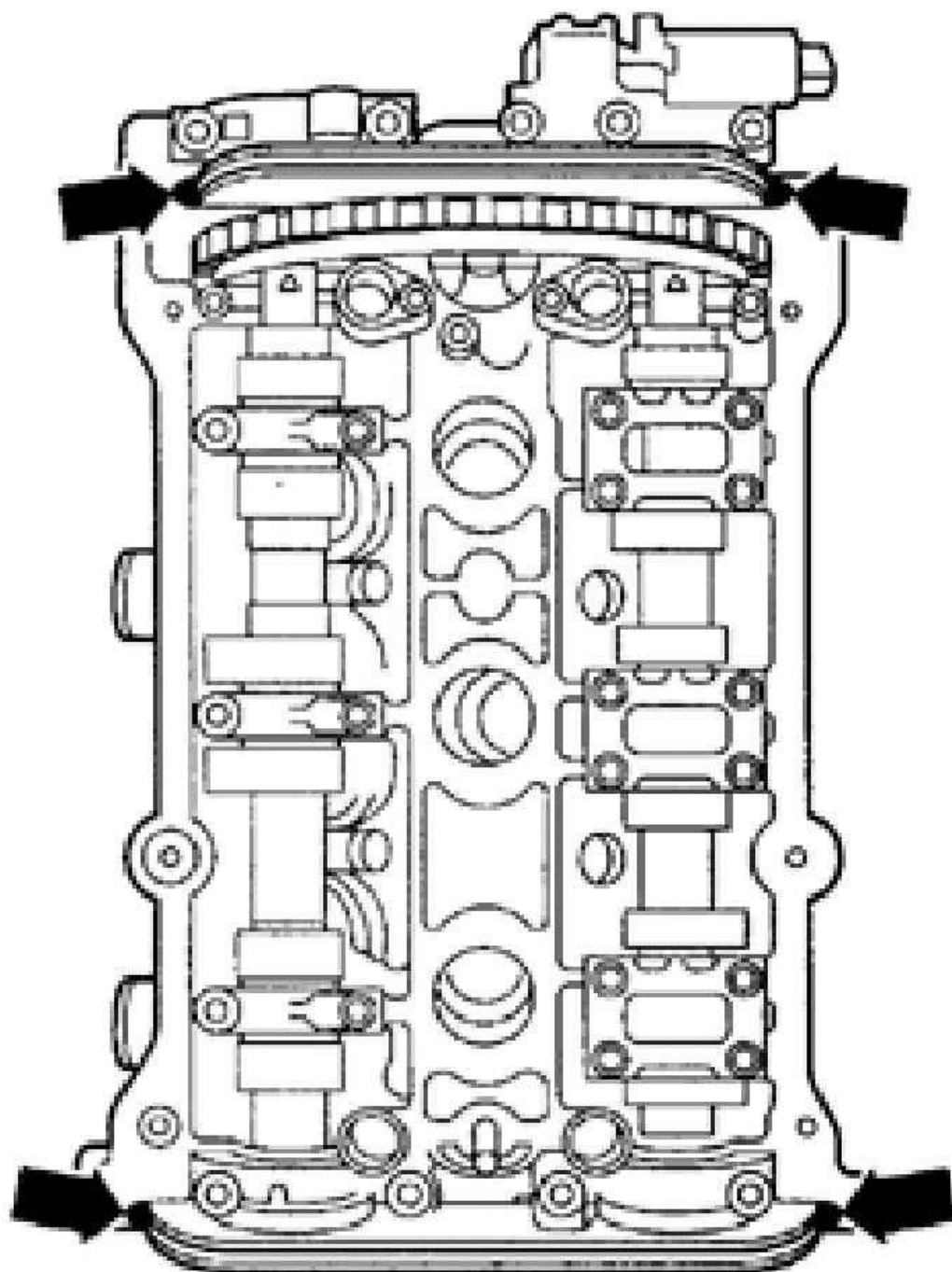


G02724956

Fig. 101: Exploded View Of Cylinder Head Assembly
Courtesy of AUDI OF AMERICA, INC.

Sealing end points of joints between bearing caps and cylinder head

- Carefully apply small quantity of sealant D 454 300 A2 at four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02724957

Fig. 102: Locating Sealing End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Oil seals in cylinder heads, replacing**Oil seal for camshaft drive (left and right cylinder heads)**

NOTE: If the oil seal on one side is leaking it is advisable to replace the seals on both sides.

- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING.**
- Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING.**
- Remove rear toothed belt guard.
- Remove oil seal with oil seal extractor 3240.
- Clean contact surface and sealing surface.
- Do not apply oil to sealing lip or outer circumference of seal.
- Install guide sleeve 3241/2 (from tool set 3241) onto camshaft.

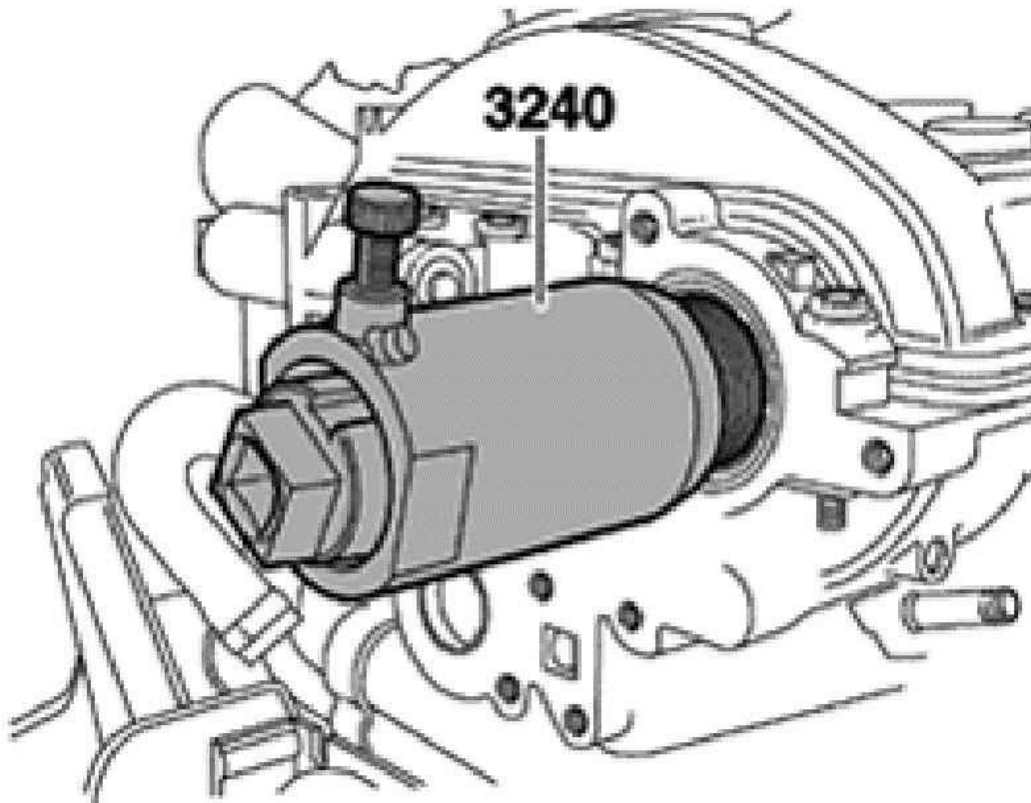
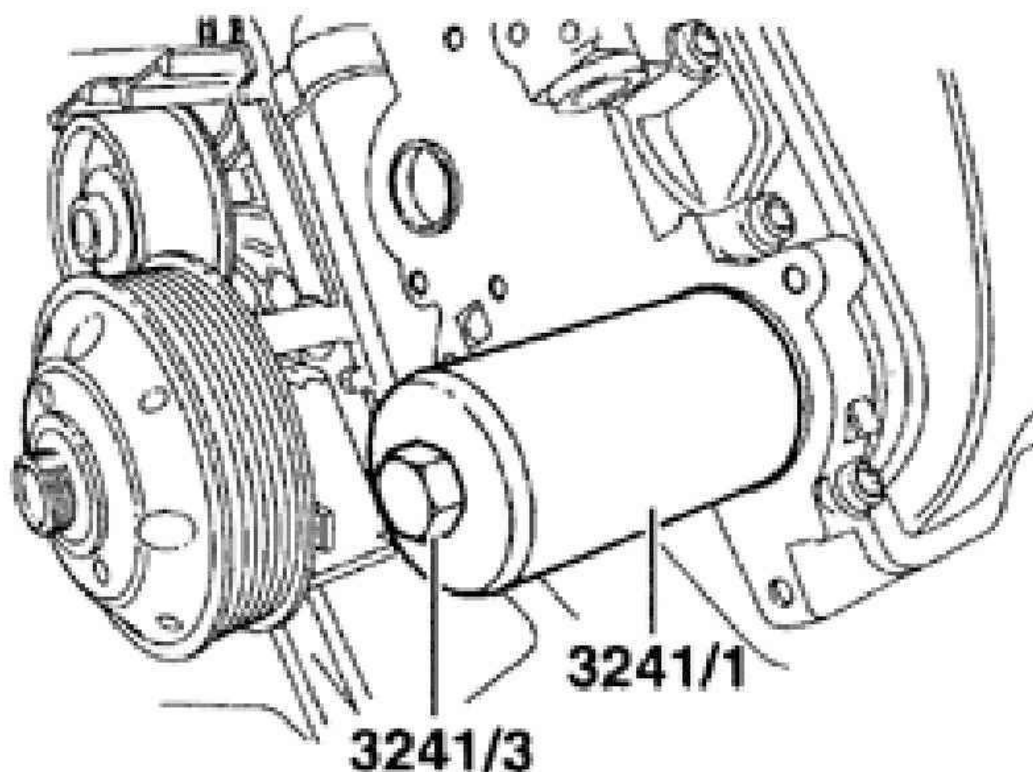
**G02724958**

Fig. 103: Removing Camshaft Oil Seal From Cylinder Head

Courtesy of AUDI OF AMERICA, INC.

- Press seal flush into cylinder head using press sleeve 3241/1 and bolt 3241/3.

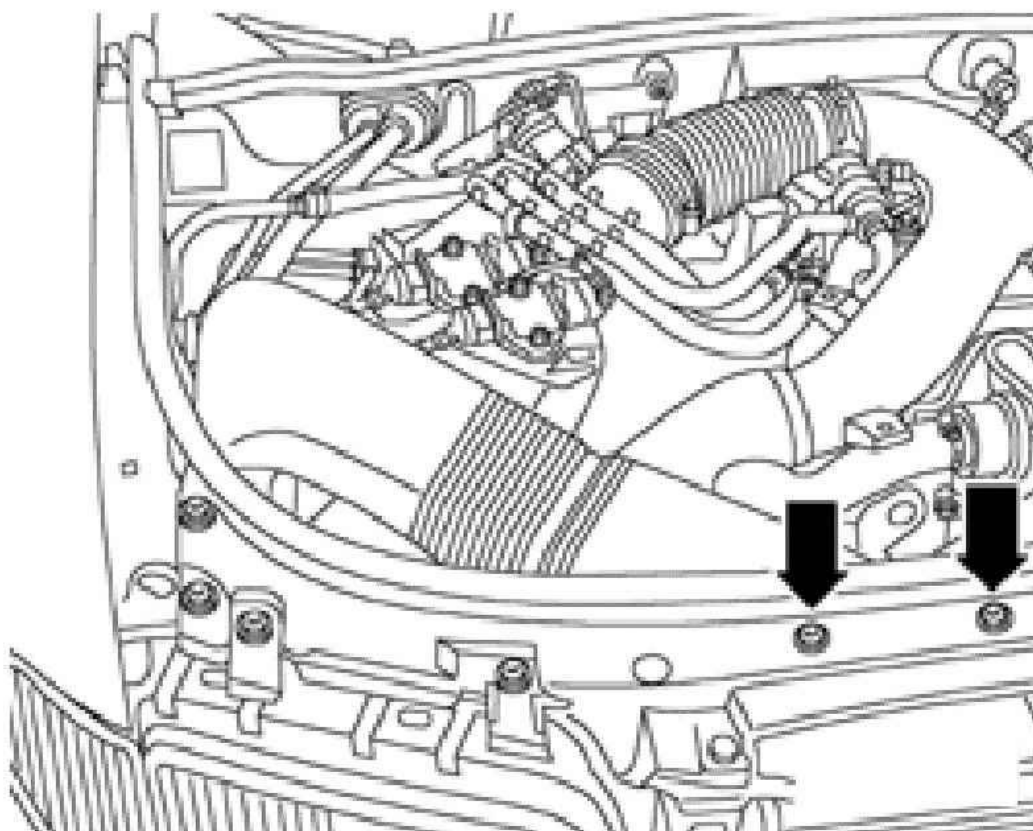


G02724959

Fig. 104: Installing Oil Seal Into Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Oil seal at Hall sensor (right cylinder head)

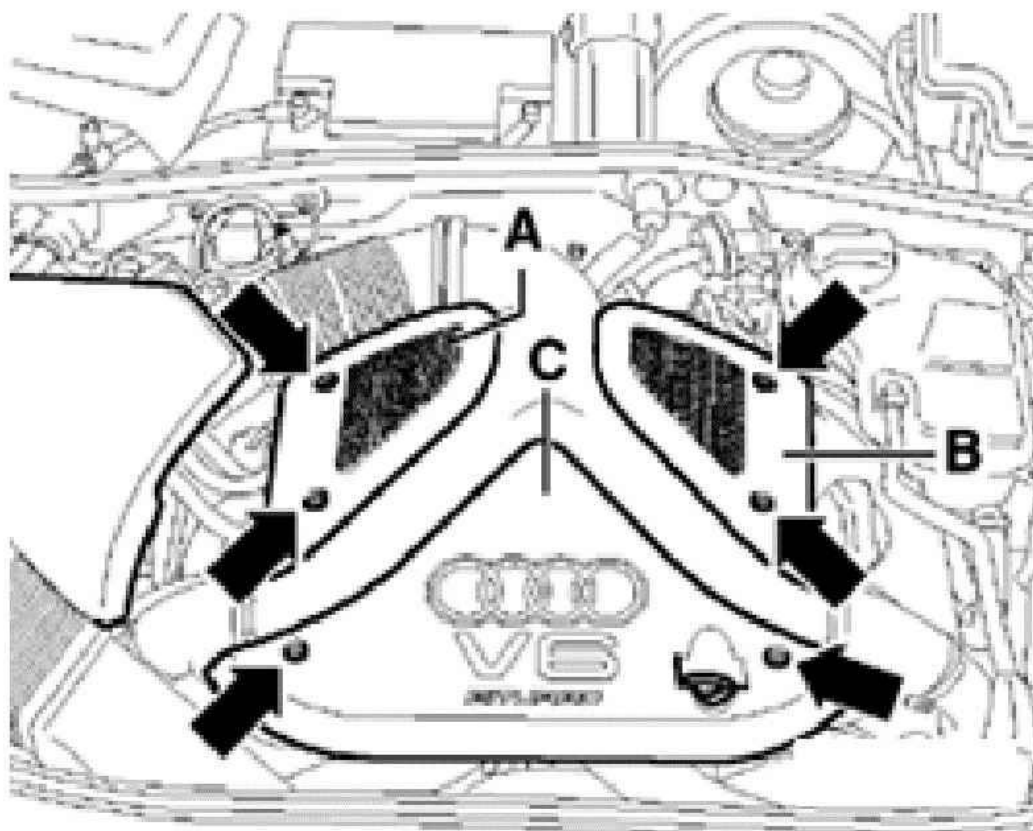
- Remove intake hose going to air cleaner (arrows).



G02724960

Fig. 105: Removing Intake Hose Going To Air Cleaner
Courtesy of AUDI OF AMERICA, INC.

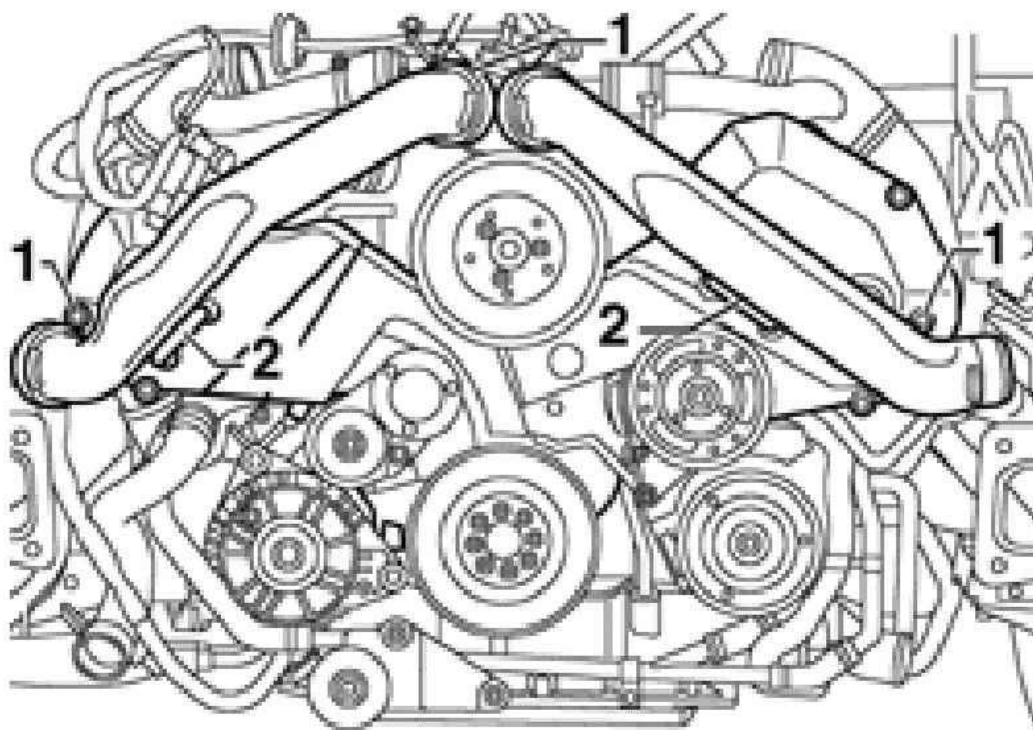
- Remove bolts -arrows- and remove engine cover panel -C-.



G02724961

Fig. 106: Removing Engine Cover Panel
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure line -1- (right side).

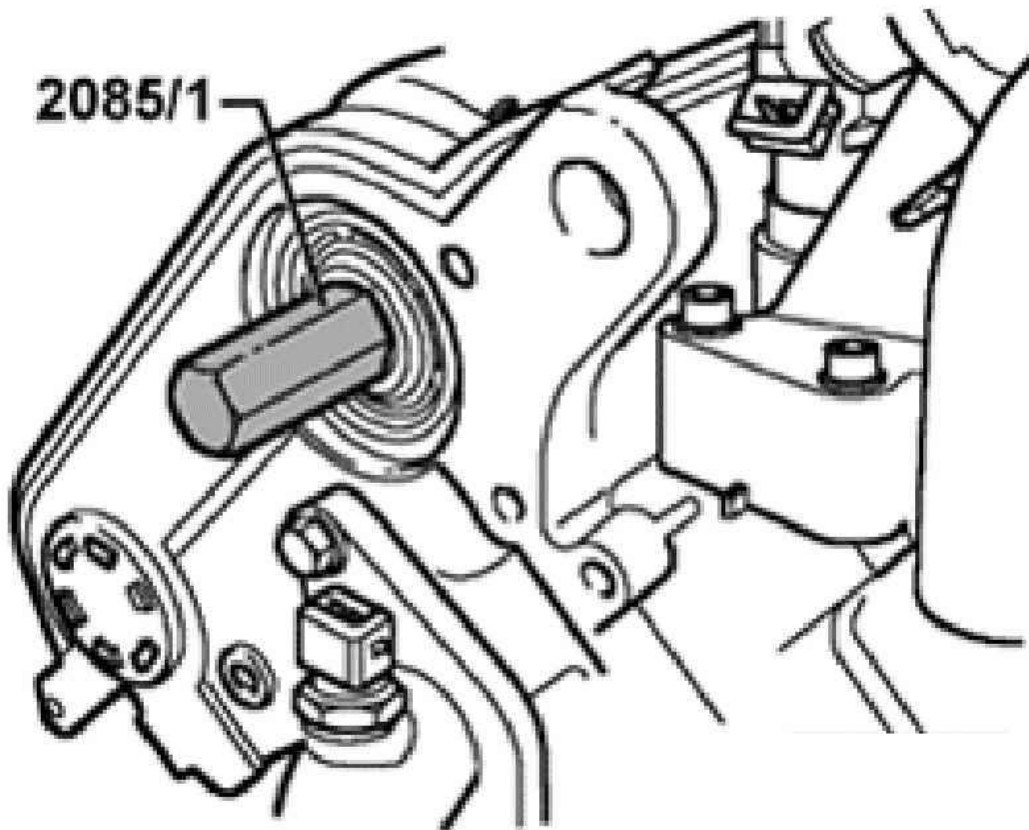


G02724962

Fig. 107: Removing Pressure Line
 Courtesy of AUDI OF AMERICA, INC.

NOTE: Watch position of retaining strip -2-.

- Unbolt Hall sensor housing (10 Nm).
- Remove bolt securing Hall sensor rotor (20 Nm) and carefully pry off rotor with a screwdriver.
- Screw in bolt from oil seal extractor 2085/1. See **Fig. 108**.

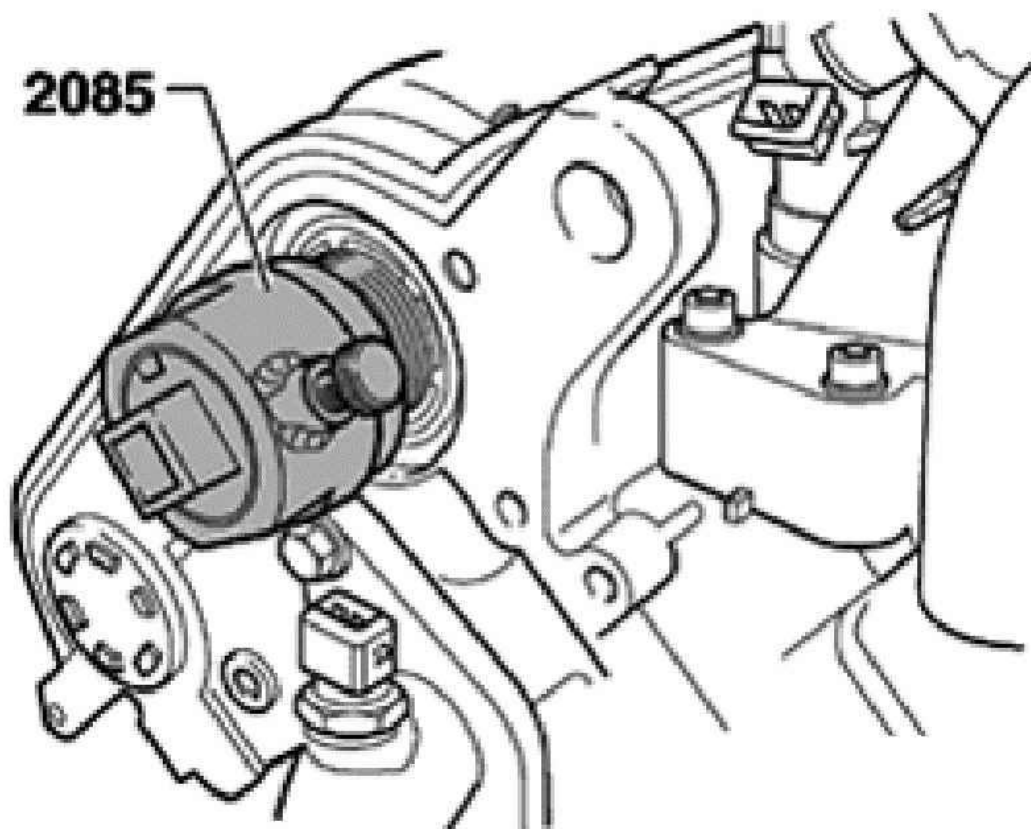


G02724963

Fig. 108: Screwing In Bolt From Oil Seal Extractor 2085/1 - Oil Seal At Hall Sensor (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, INC.

- Disconnect out seal with oil seal extractor 2085 and bolt 2085/1.
- Clean contact surface and sealing surface.
- Do not apply oil to sealing lip or outer circumference of seal before installing.
- Install guide sleeve (from tool set 3241) onto camshaft.



G02724964

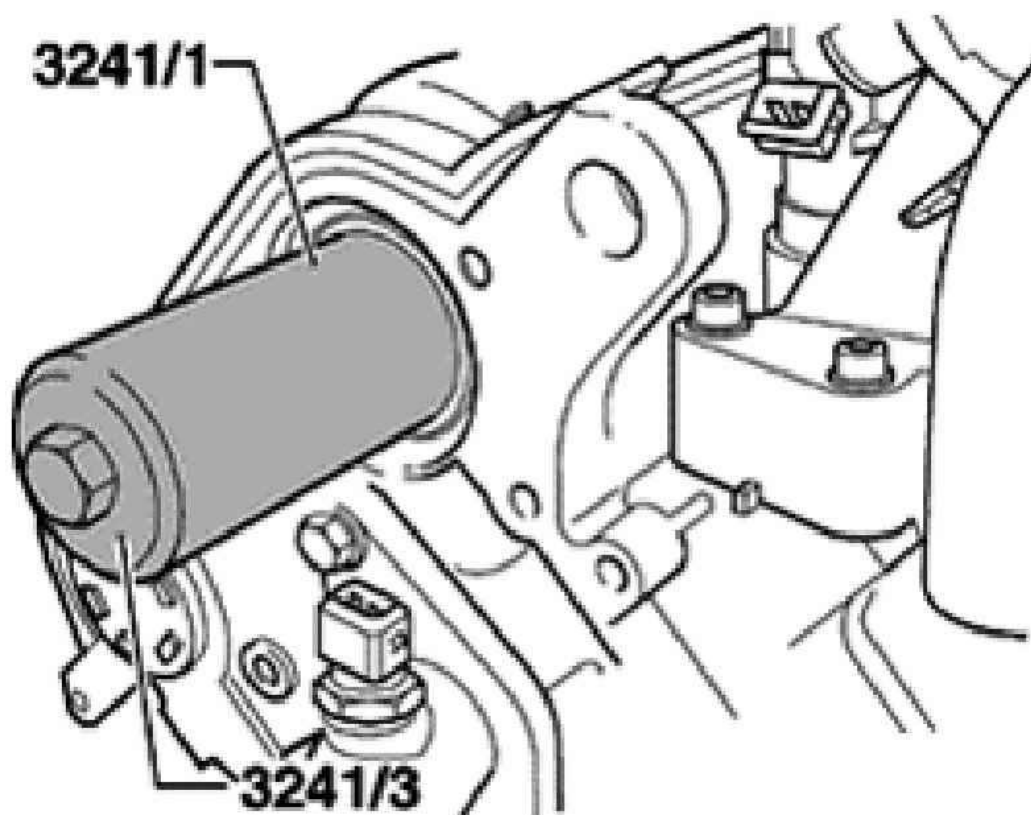
Fig. 109: Removing Oil Seal At Hall Sensor Using Oil Seal Extractor 2085 (Right Cylinder Head)
Courtesy of AUDI OF AMERICA, INC.

- Press in seal until flush using press sleeve 3241/1 and bolt 3241/3.

Installing

Install in reverse sequence.

NOTE: When installing Hall sensor rotor, make sure that locating lug engages in slot in camshaft.



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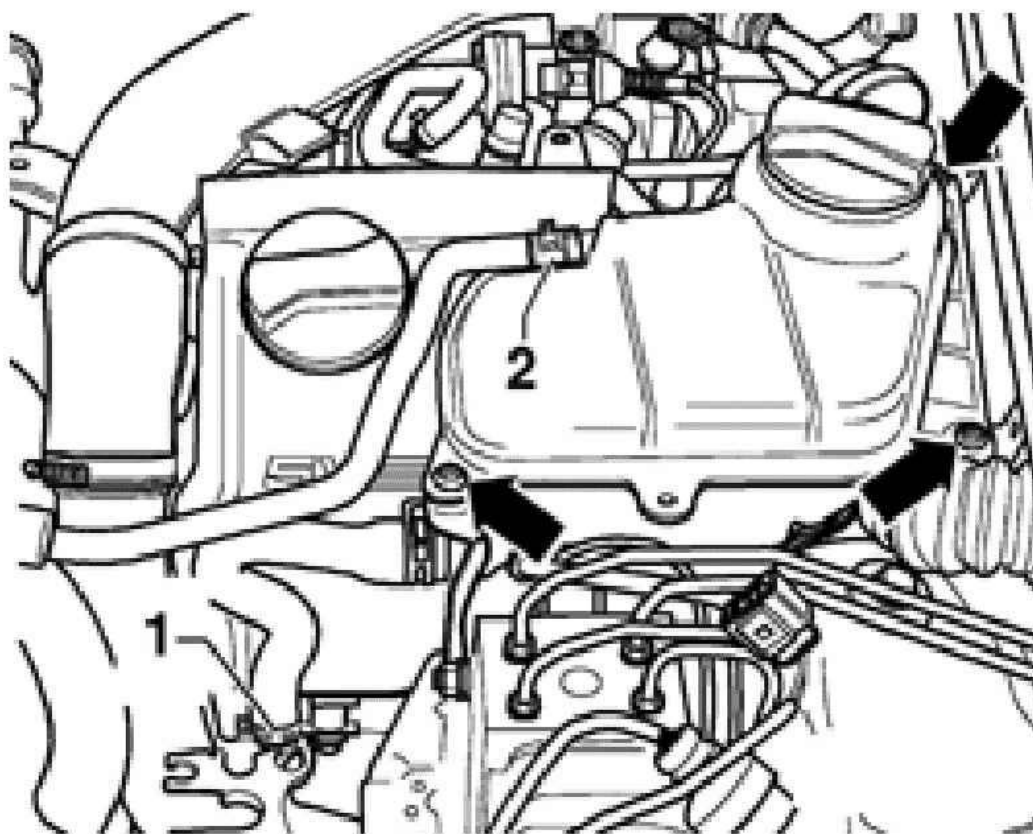
Fig. 110: Installing Oil Seal At Hall Sensor (Right Cylinder Head)
Courtesy of AUDI OF AMERICA, INC.

Removing oil seal at Hall sensor (left cylinder head)

- Detach coolant reservoir -arrows- and move it clear to side.

NOTE: **Leave coolant hoses connected.**

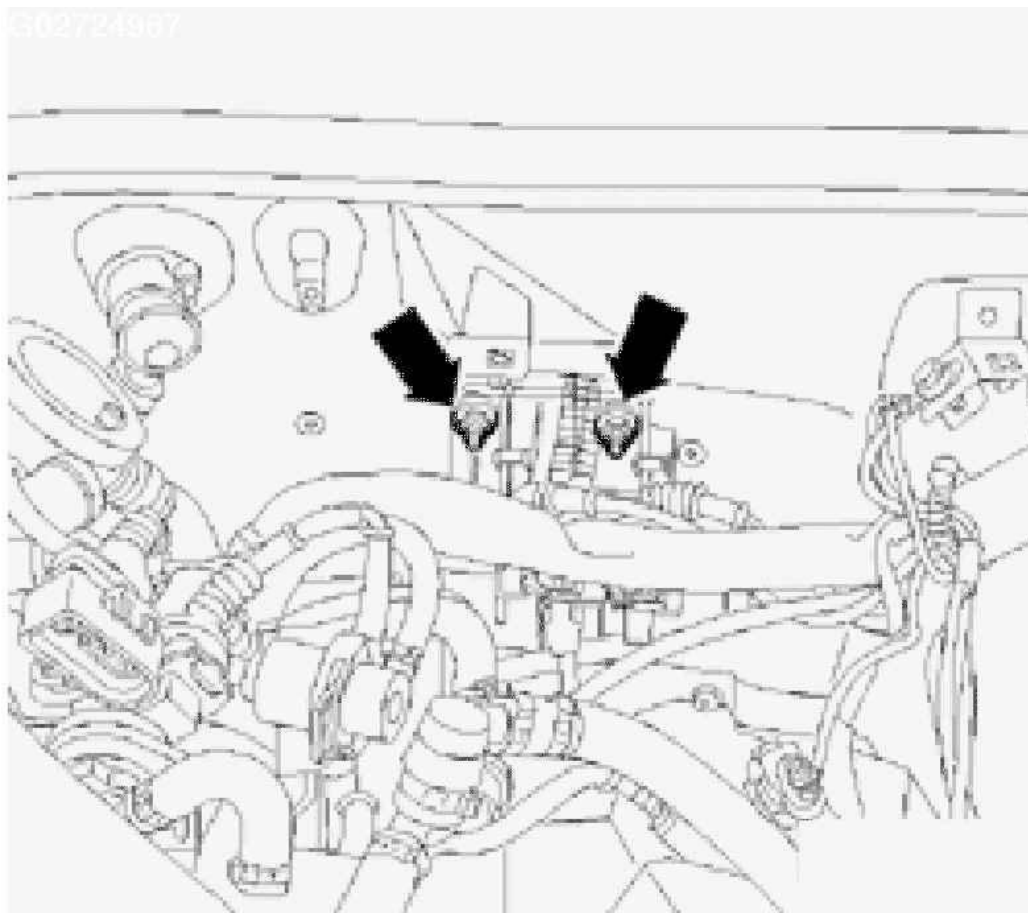
- Disconnect electrical connector from coolant level monitor.
- Move wiring harness clear at bulkhead



G02724966

Fig. 111: Disconnecting Electrical Connector From Coolant Level Monitor
Courtesy of AUDI OF AMERICA, INC.

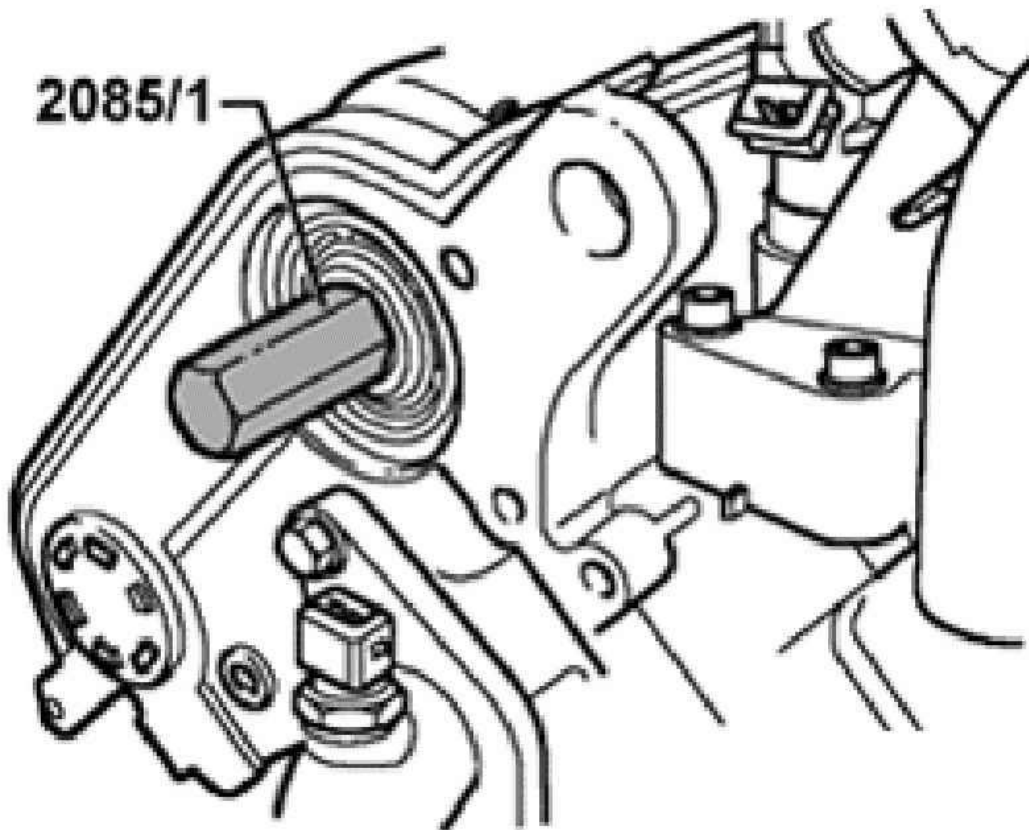
- Unbolt bracket -arrows- for plug connectors on bulkhead and move clear to side.



G02724967

Fig. 112: Removing Plug Connectors On Bulkhead
Courtesy of AUDI OF AMERICA, INC.

- Unbolt Hall sensor housing (10 Nm).
- Unbolt Hall sensor rotor (20 Nm) and carefully pry off rotor using a screwdriver.
- Screw in bolt from 2085/1 oil ring extractor.



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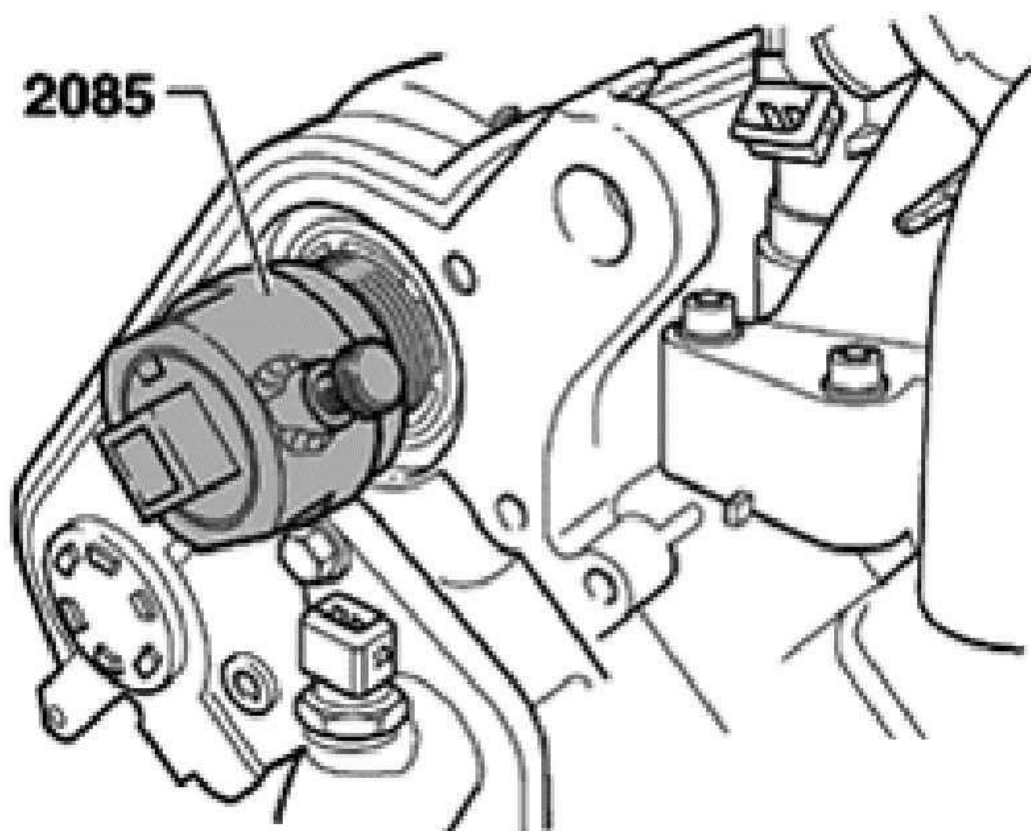
Fig. 113: Screwing In Bolt From 2085/1 Oil Ring Extractor - Oil Seal At Hall Sensor (Left Cylinder Head)

Courtesy of AUDI OF AMERICA, INC.

- Disconnect out seal with oil seal extractor 2085 and bolt 2085/1.
- Clean contact surface and sealing surface.

NOTE: Do not apply oil to sealing lip or outer circumference of seal before installing.

- Install guide sleeve (from tool set 3241) onto camshaft.



G02724969

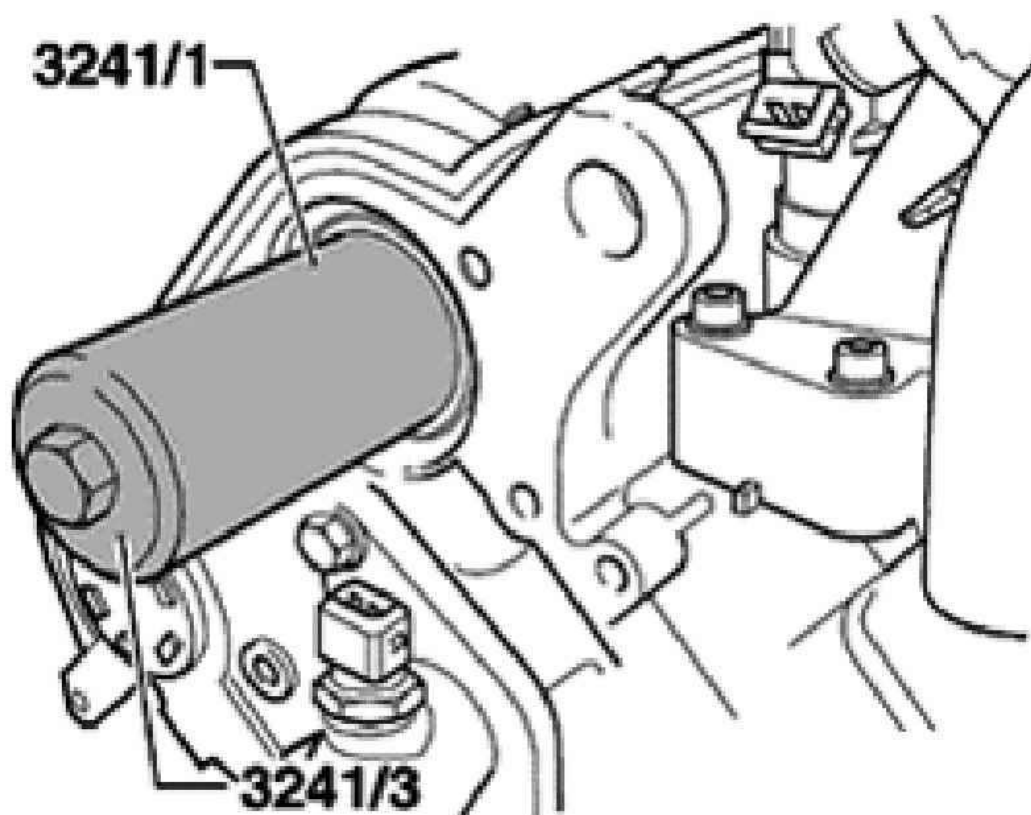
Fig. 114: Removing Oil Seal At Hall Sensor Using Oil Seal Extractor 2085 (Left Cylinder Head)
Courtesy of AUDI OF AMERICA, INC.

- Press in seal until flush using press sleeve 3241/1 and bolt 3241/3.

Installing

Install in reverse sequence.

NOTE: When installing Hall sensor rotor, make sure that locating lug engages in slot in camshaft.



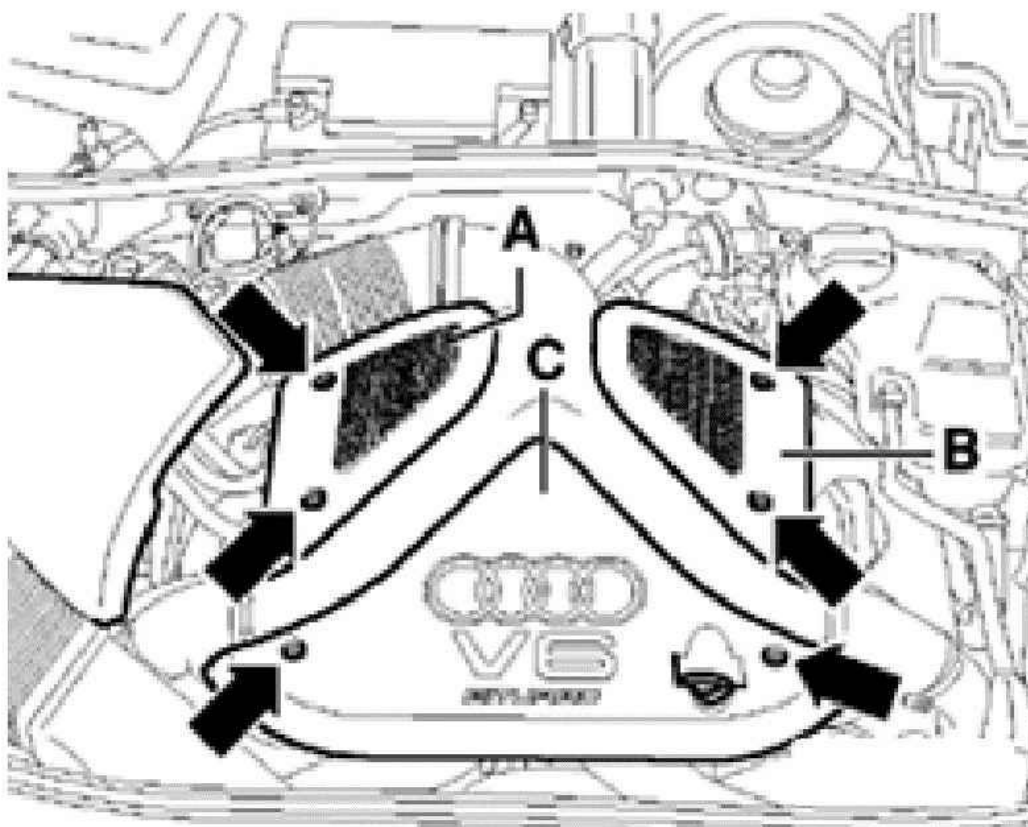
G02724970

Fig. 115: Installing Oil Seal At Hall Sensor Using 3241 (Left Cylinder Head)
Courtesy of AUDI OF AMERICA, INC.

Rear oil seal and sealing flange (left cylinder head)

NOTE: **Rear sealing flange and oil seal on left-hand cylinder head must be replaced together as follows:**

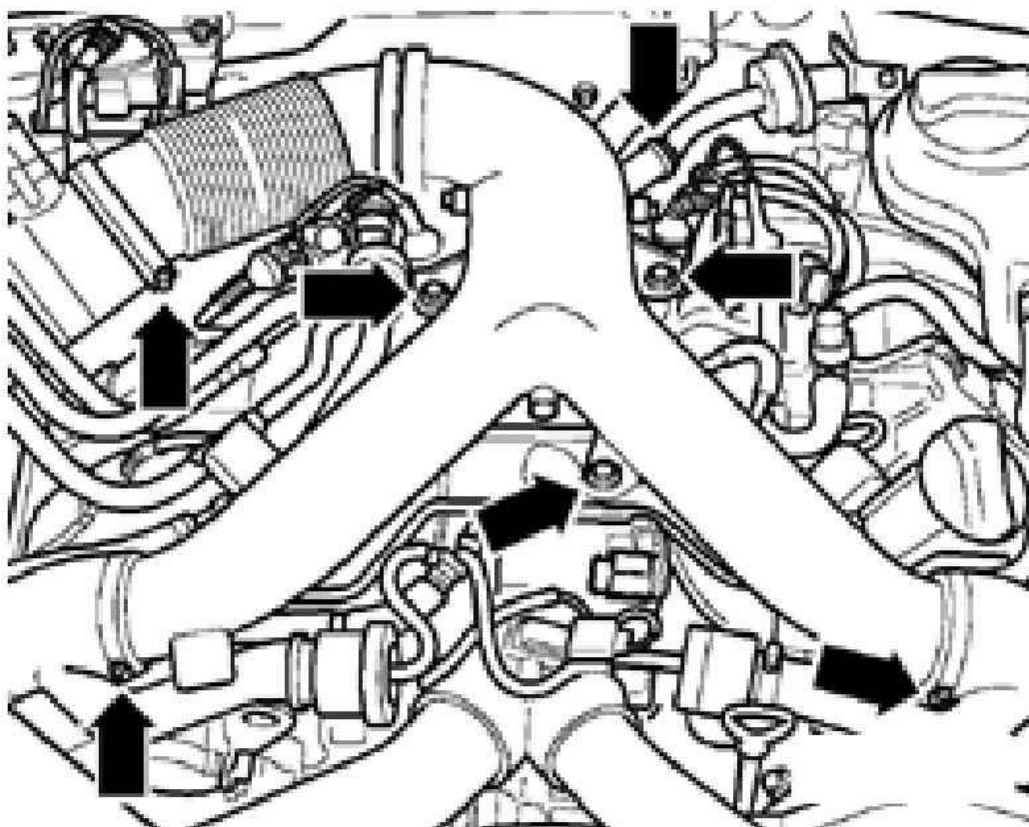
- Remove bolts -arrows- and remove engine cover panels -A and C-.



G02724971

Fig. 116: Removing Engine Cover Panels
Courtesy of AUDI OF AMERICA, INC.

- Remove air duct -arrows-.



G02724972

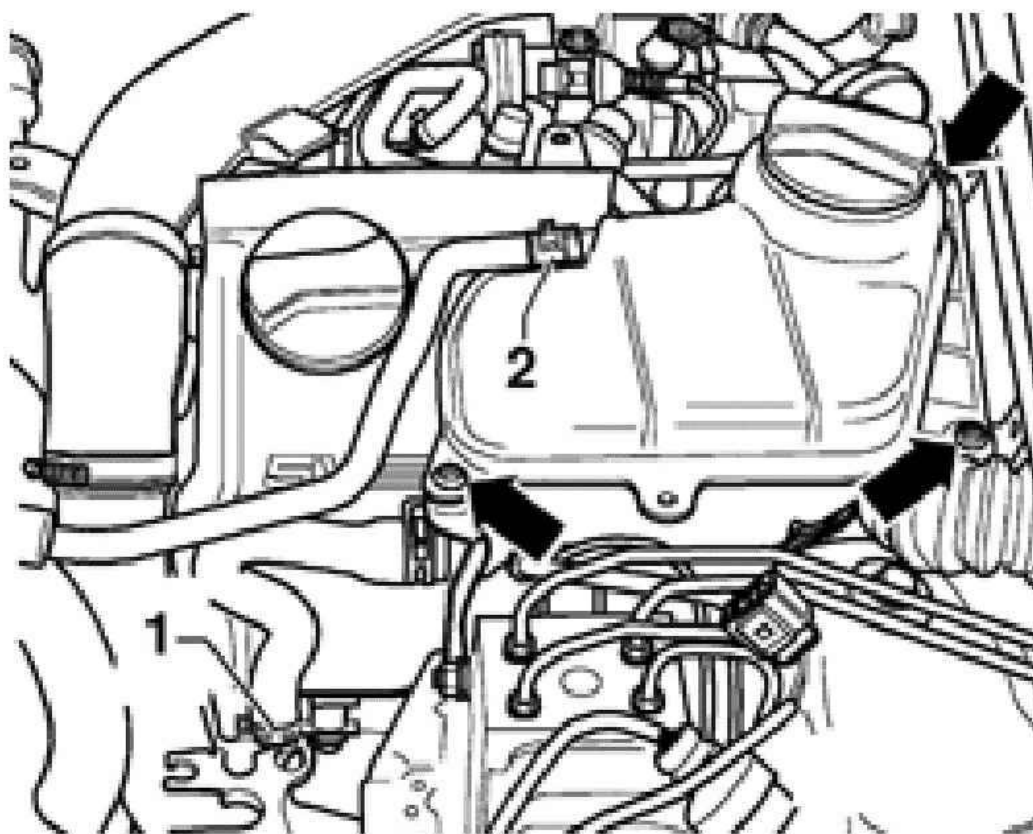
Fig. 117: Removing Air Duct

Courtesy of AUDI OF AMERICA, INC.

- Remove coolant reservoir -arrows- and move it clear to the side.

NOTE: Leave coolant hoses connected.

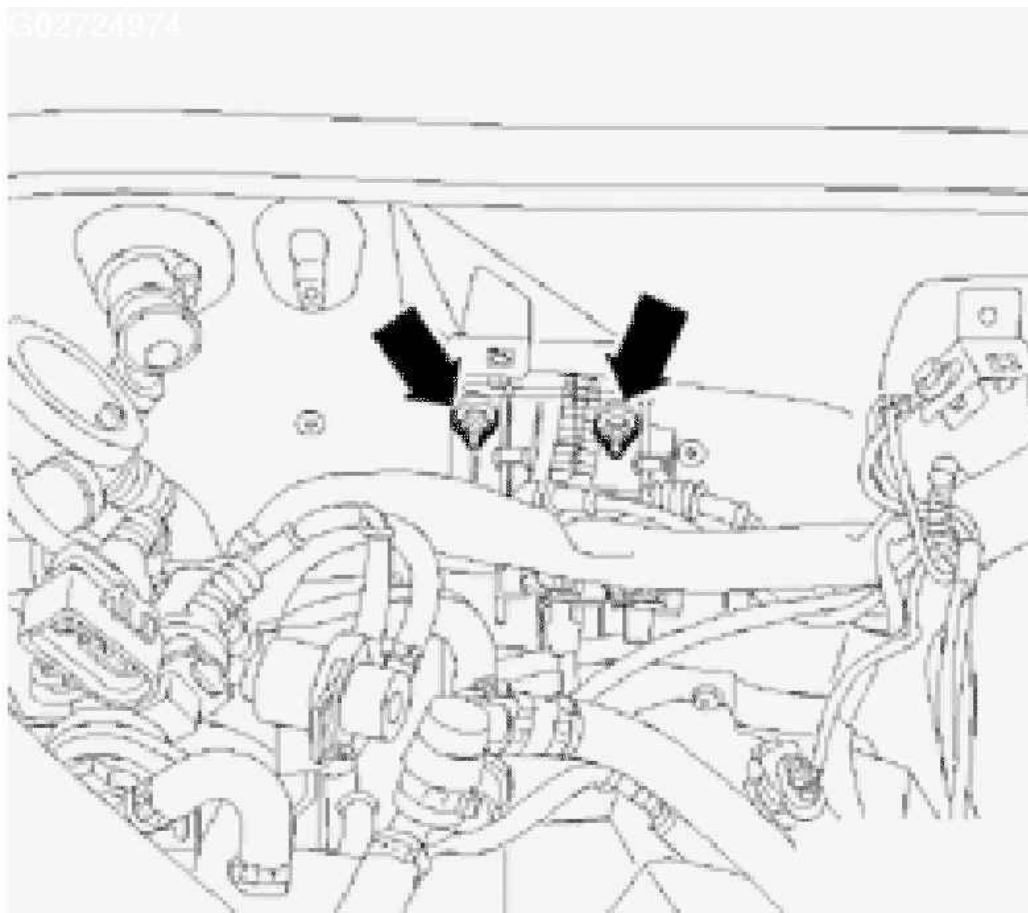
- Disconnect electrical connector from coolant level monitor.
- Move wiring harness clear at bulkhead.



G02724973

Fig. 118: Removing Coolant Reservoir
Courtesy of AUDI OF AMERICA, INC.

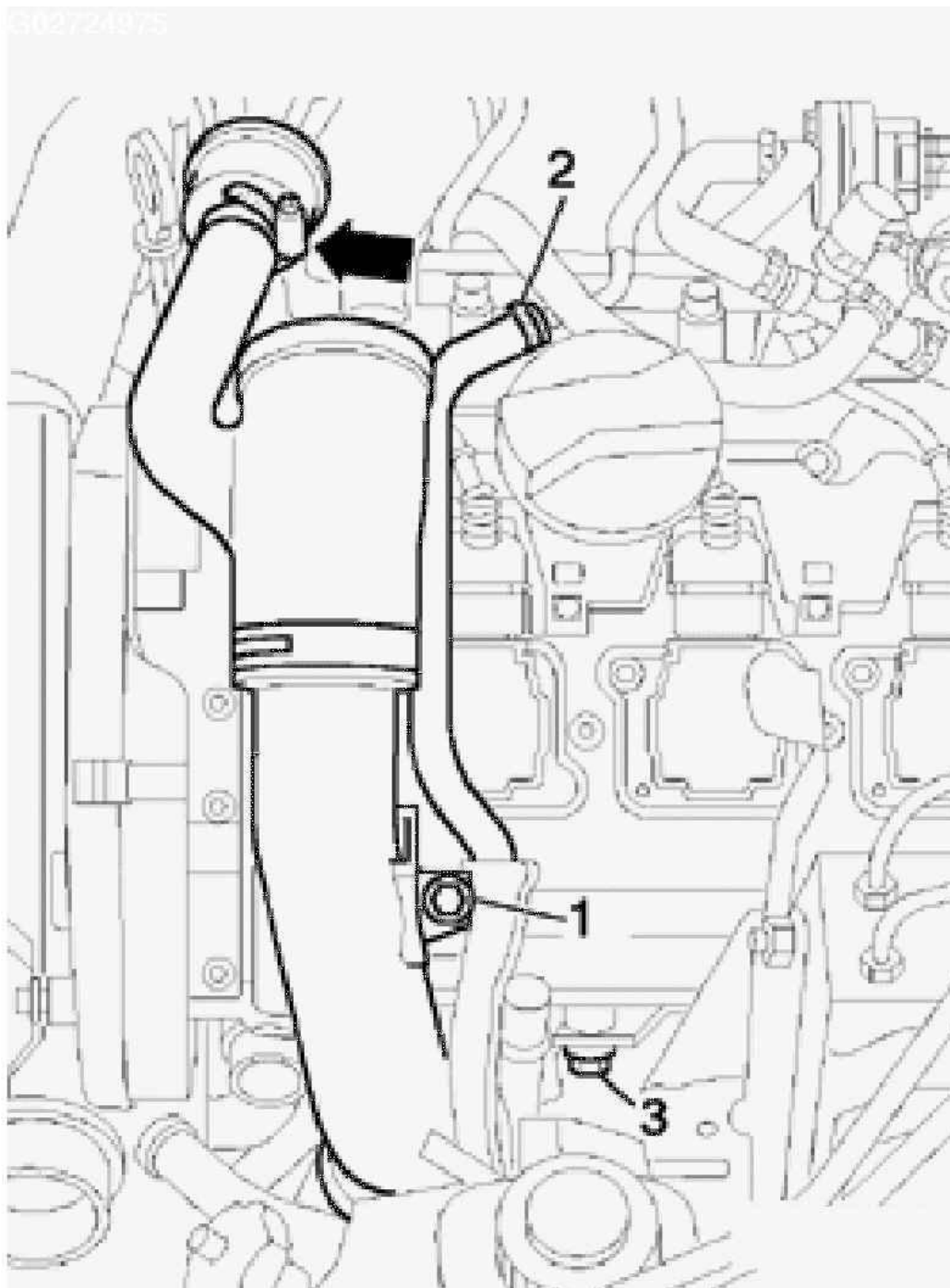
- Unbolt bracket -arrows- for plug connectors on bulkhead and move clear to side.
- Unbolt Hall sensor housing (10 Nm).
- Remove bolt securing Hall sensor rotor (20 Nm) and carefully pry off rotor using a screwdriver.



G02724974

Fig. 119: Removing Connectors On Bulkhead
Courtesy of AUDI OF AMERICA, INC.

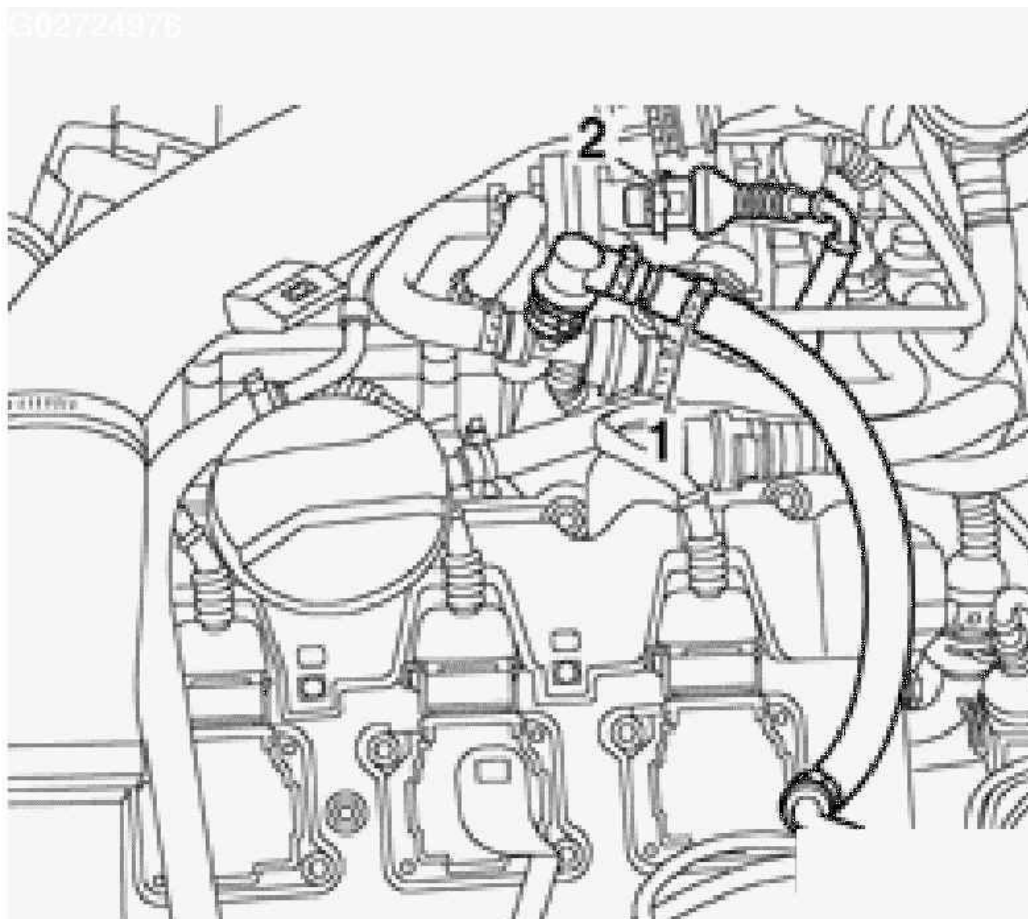
- Remove cover panel from cylinder head cover (cylinder bank 4-6).
- Release hose clamp -arrow-. See **Fig. 120**.
- Remove upper section of intake line -1-.
- Disconnect hose -2-.
- Plug lower section of intake line.



G02724975

Fig. 120: Removing Hose Clamp And Upper Section Of Intake Hose
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1-(arrow).

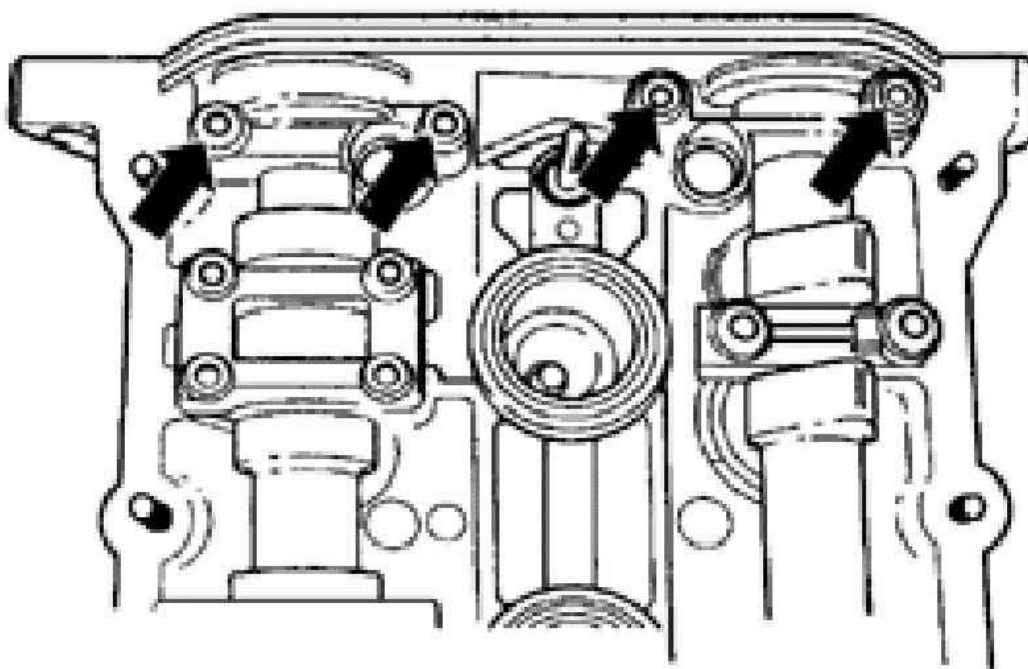


G02724976

Fig. 121: Disconnecting Hose

Courtesy of AUDI OF AMERICA, INC.

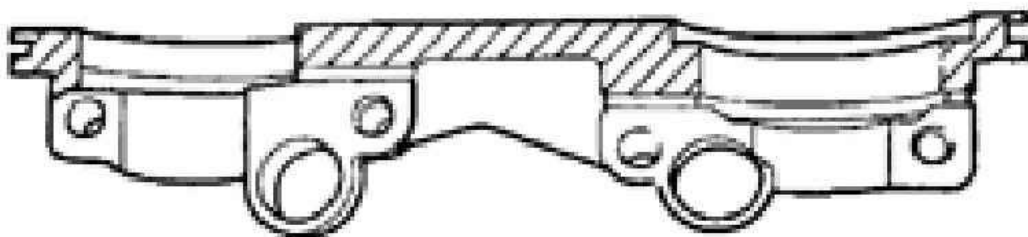
- Remove bolt securing toothed belt guard from cylinder head cover.
- Disconnect plug connectors off ignition coils.
- Disconnect crankcase breather off cylinder head cover.
- Remove cylinder head cover.
- Remove double bearing cap -arrows-.
- Take out oil seal and sealing flange.
- Clean contact surfaces and sealing surfaces of double bearing cap.



G02724977

Fig. 122: Removing Double Bearing Cap
 Courtesy of AUDI OF AMERICA, INC.

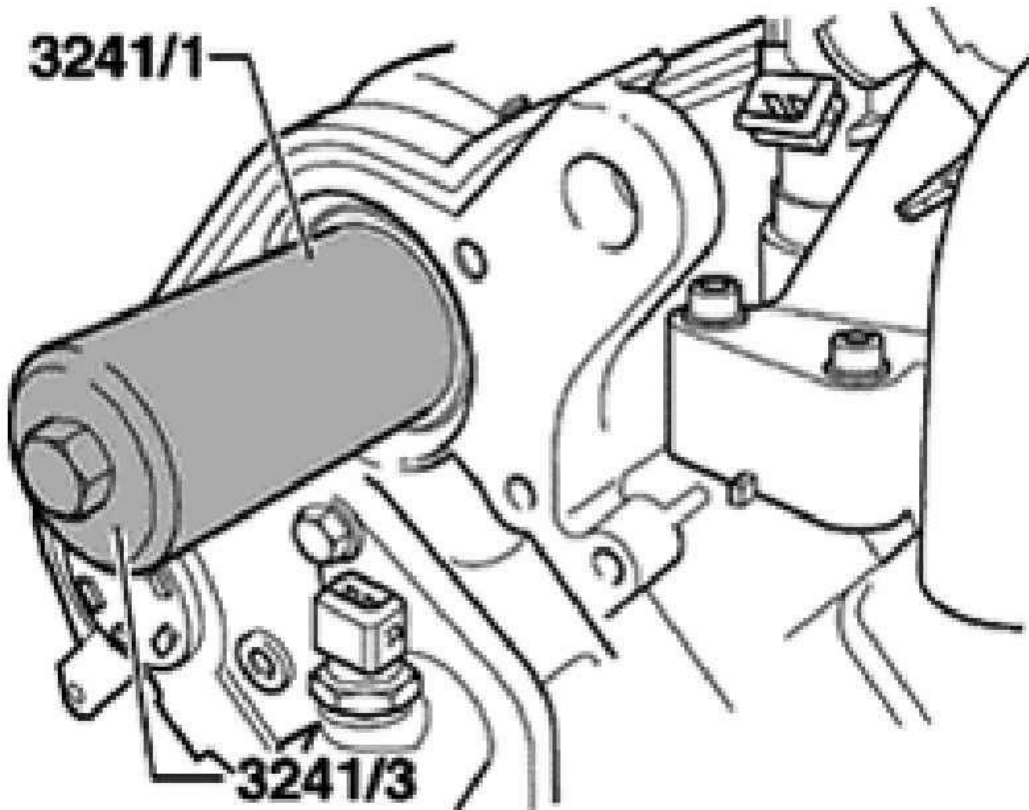
- Apply a thin coating of sealant, Part No. 454 300 A2, to shaded areas on double bearing cap (see illustration), install bearing cap and tighten bolts to 10 Nm.



G02724978

Fig. 123: Applying Thin Coating Of Sealant To Shaded Areas On Double Bearing Cap
 Courtesy of AUDI OF AMERICA, INC.

- Install guide sleeve (from tool set 3241) onto camshaft.



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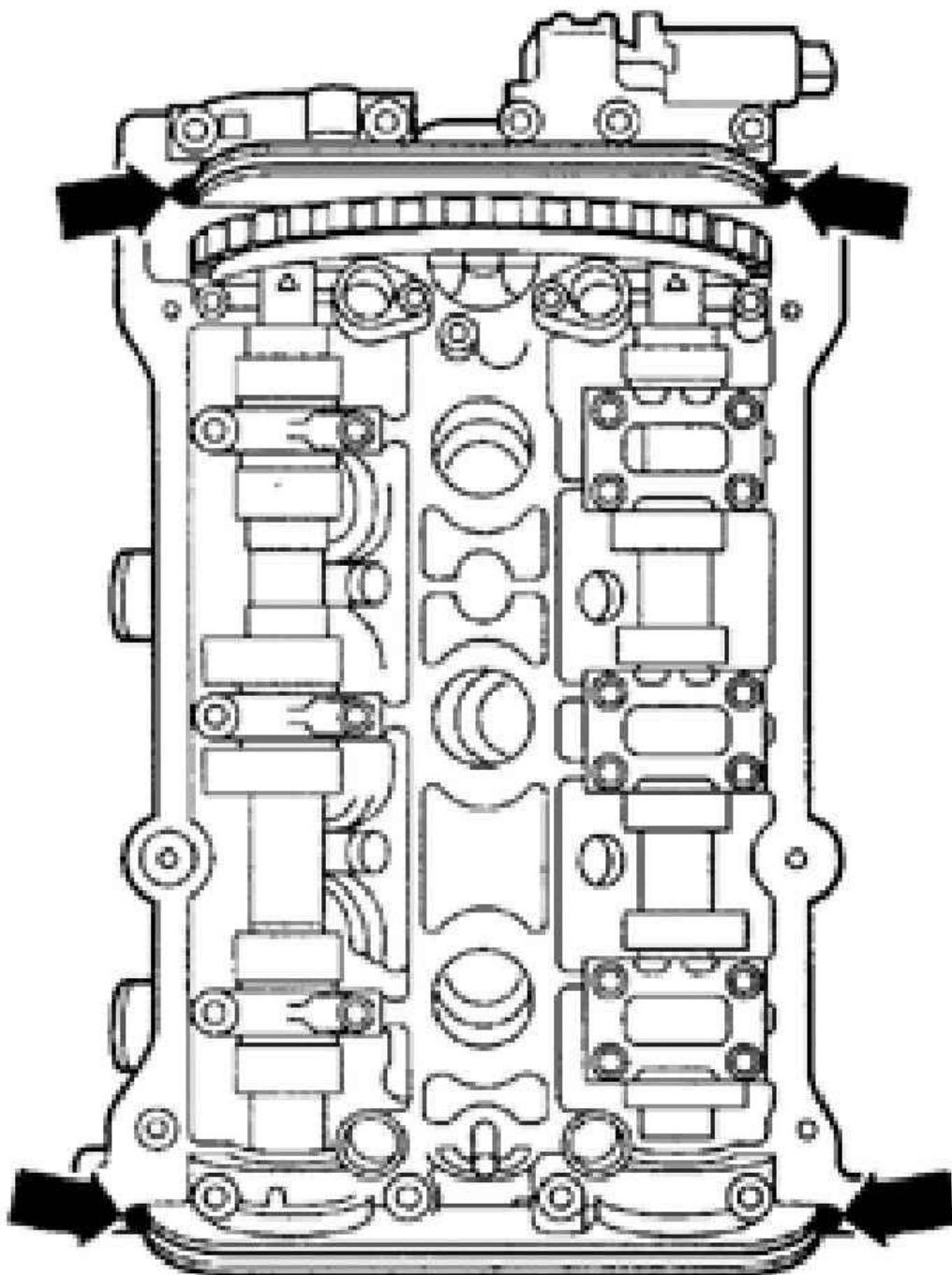
Fig. 124: Installing Guide Sleeve 3241/1 Onto Camshaft
Courtesy of AUDI OF AMERICA, INC.

- Press in oil seal until flush using press sleeve 3241/1 and bolt 3241/3.
- Carefully knock in sealing flange against stop using 3202 and a plastic hammer.

Installing

Install in reverse sequence; note the following points:

- Seal end points of joints between bearing caps and cylinder head.
- Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02724980

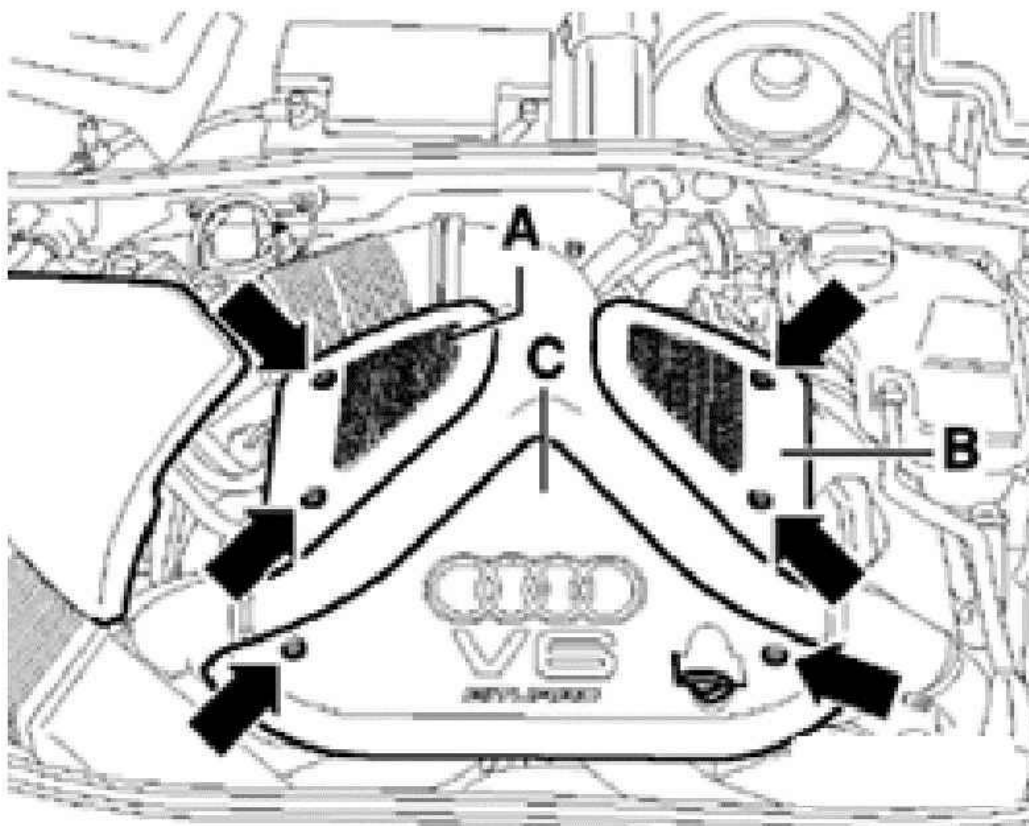
Fig. 125: Locating Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Cylinder head covers, removing and installing

Removing and installing left cylinder head cover

Removing

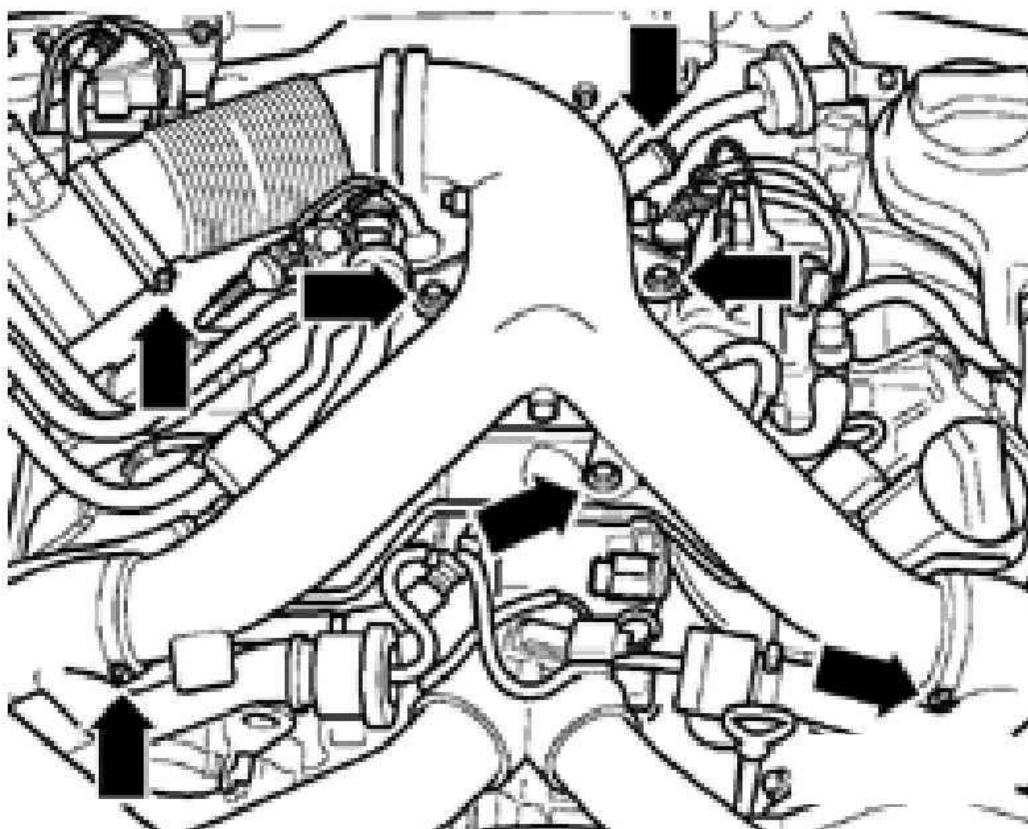
- Remove bolts -arrows- and remove engine cover panels -A and C-.



G02724981

Fig. 126: Removing Engine Cover Panels
Courtesy of AUDI OF AMERICA, INC.

- Remove air duct -arrows-.



G02724982

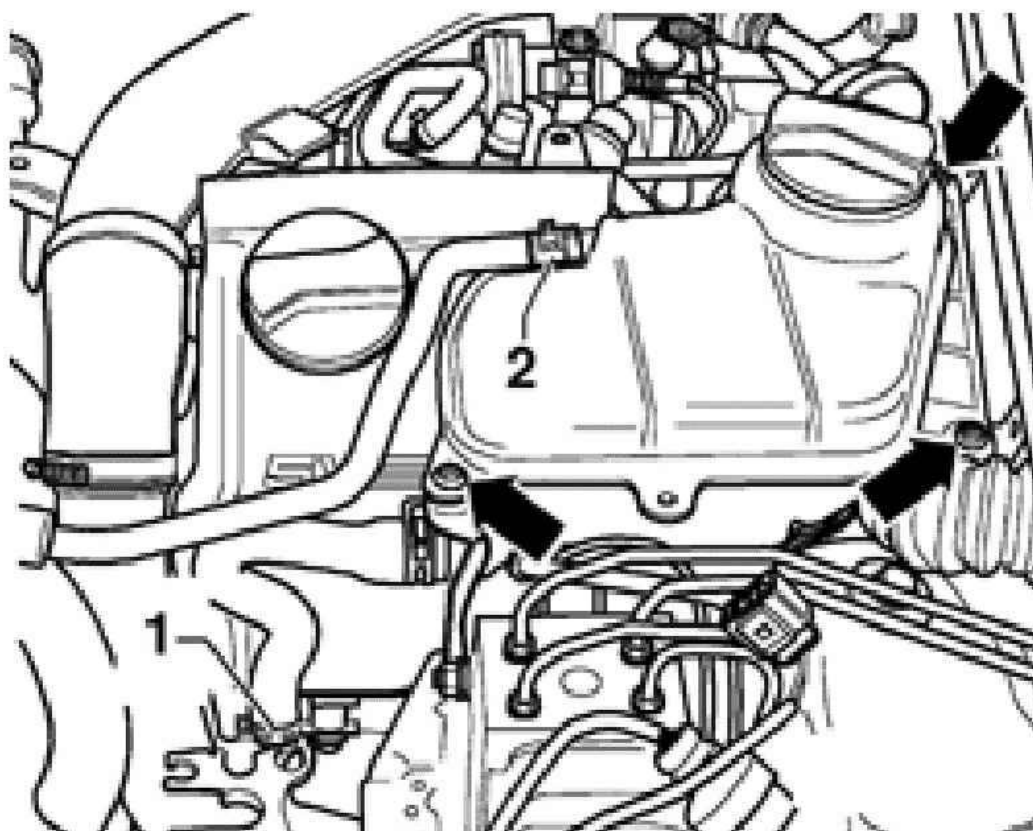
Fig. 127: Removing Air Duct

Courtesy of AUDI OF AMERICA, INC.

- Remove coolant reservoir -arrows- and move it clear to side.

NOTE: Leave coolant hoses connected.

- Disconnect electrical connector from coolant level monitor.
- Remove cover panel from cylinder head cover (cylinder bank 4-6).

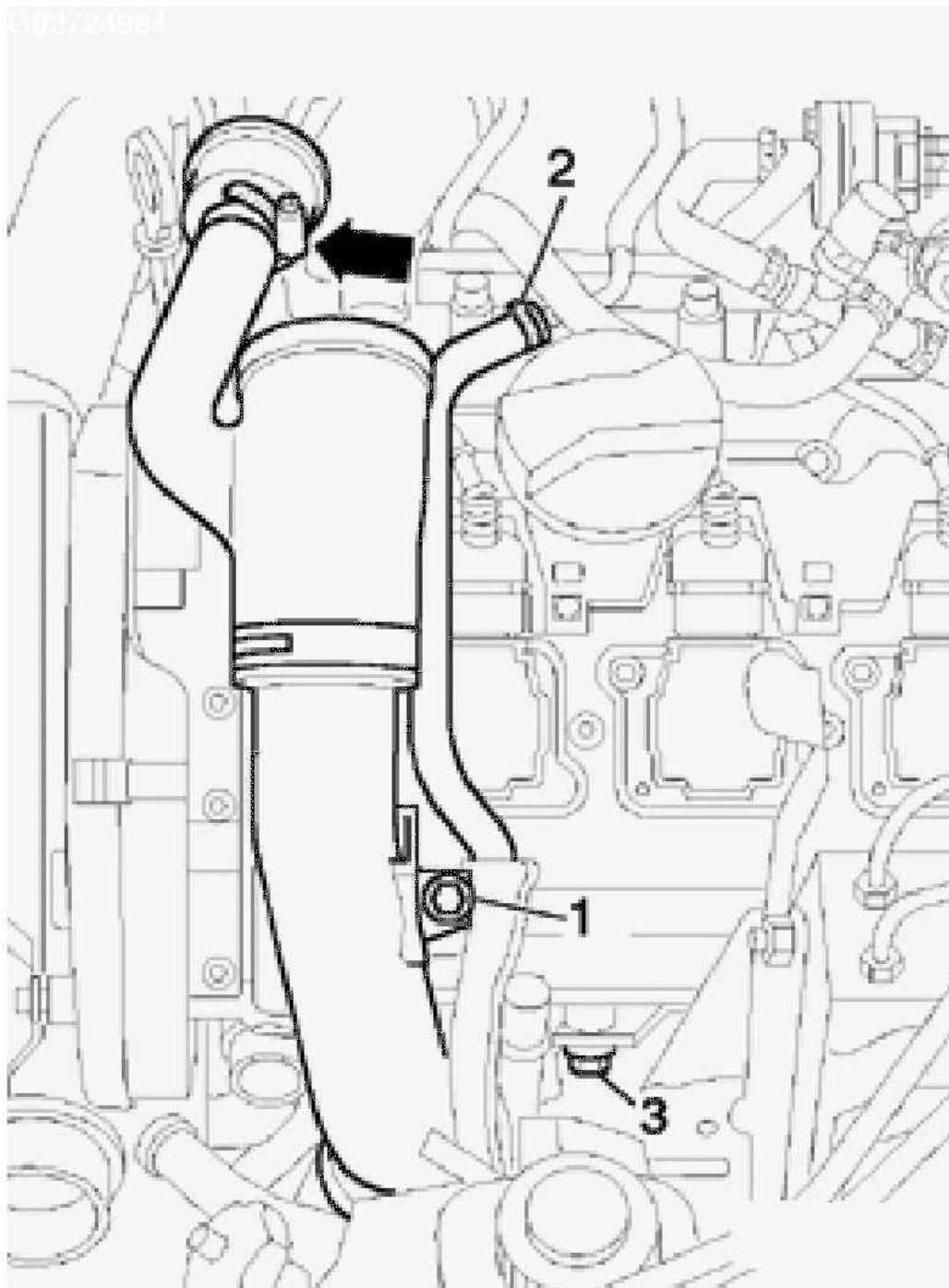


G02724983

Fig. 128: Removing Coolant Reservoir
Courtesy of AUDI OF AMERICA, INC.

- Release hose clamp -arrow-. See **Fig. 129**.
- Remove intake line -1-.
- Disconnect hose -2-.
- Detach water line -3-.

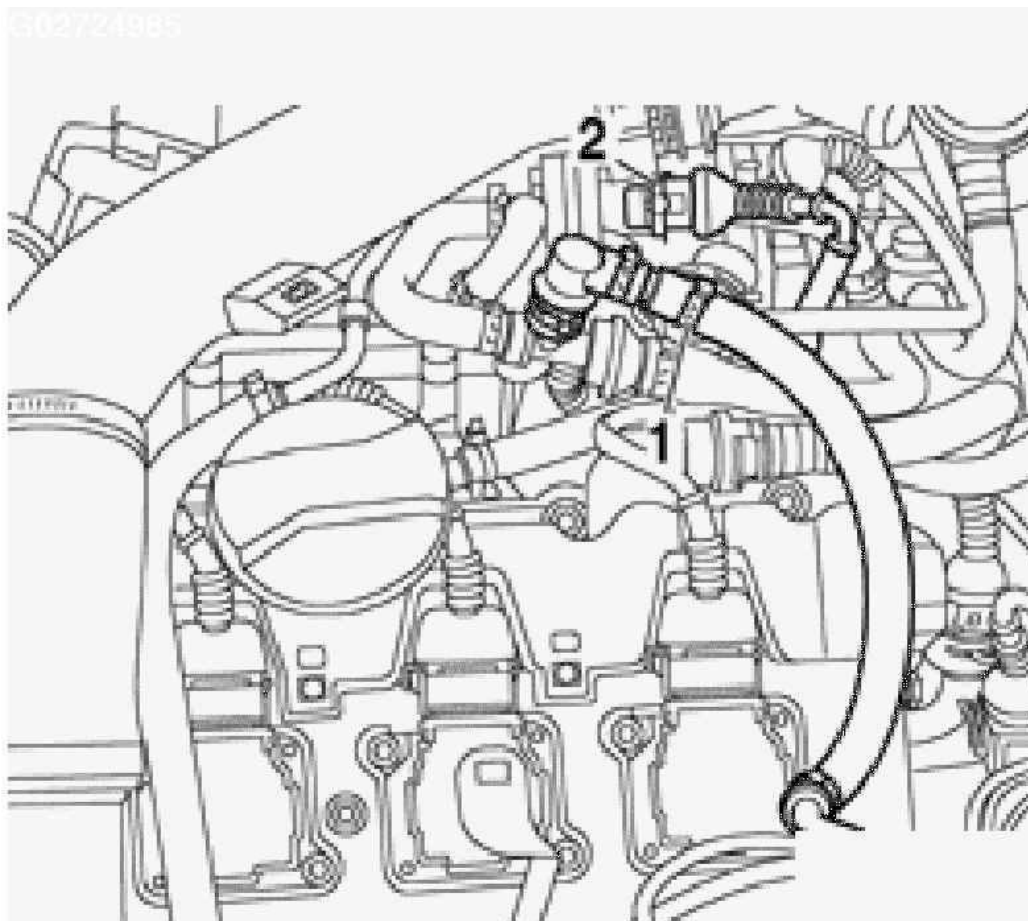
NOTE: Plug lower section of intake line.



G02724984

Fig. 129: Removing Hose Clamp And Intake Line
Courtesy of AUDI OF AMERICA, INC.

- Disconnect from hose -1-



G02724985

Fig. 130: Disconnecting Hose

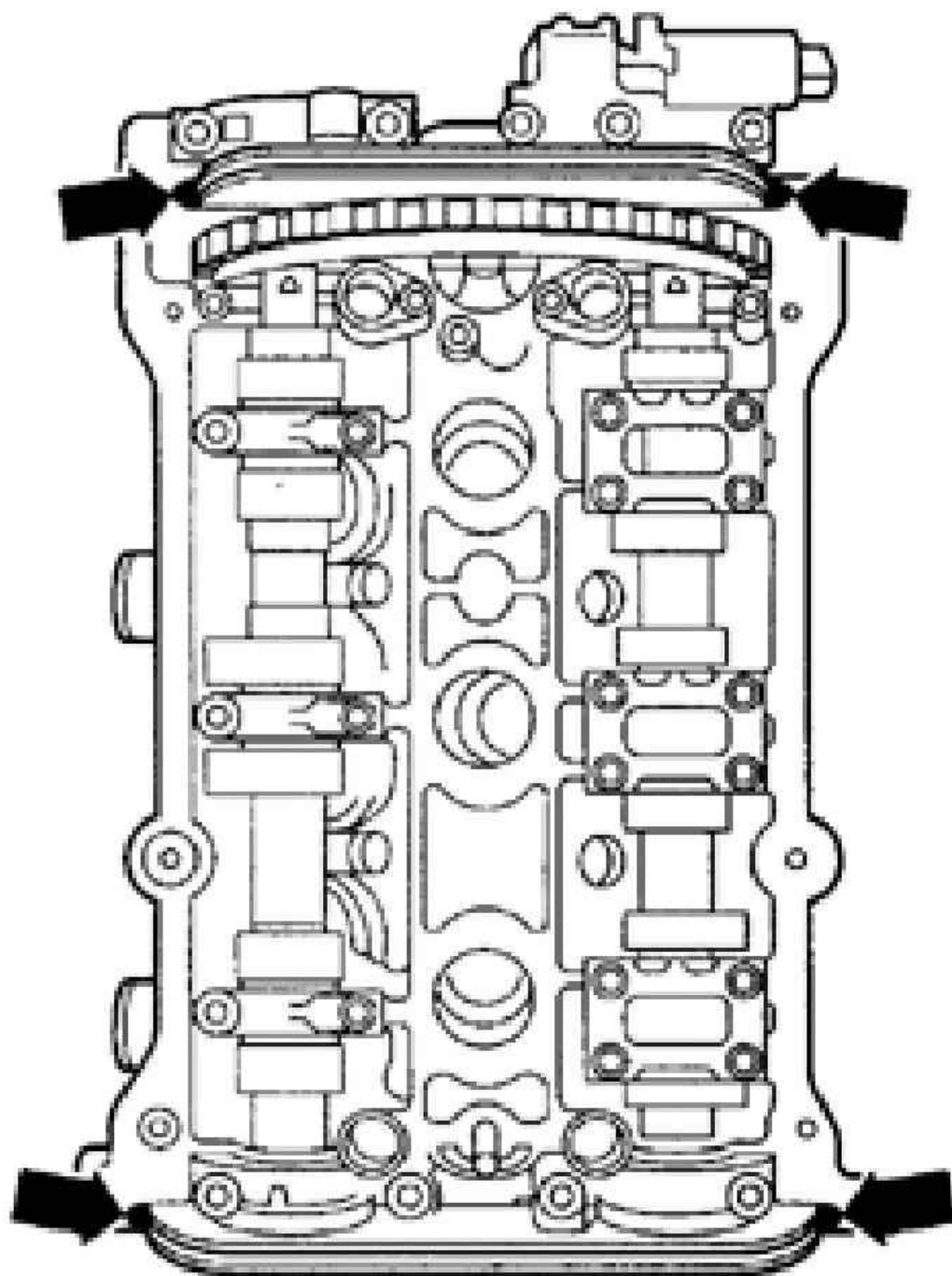
Courtesy of AUDI OF AMERICA, INC.

- Disconnect plug connectors from ignition coils.
- Disconnect crankcase breather from cylinder head cover.
- Remove ignition coils.
- Remove cylinder head cover.

Installing

Install in reverse sequence; note the following points:

- Seal end points of joints between bearing caps and cylinder head.
- Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.

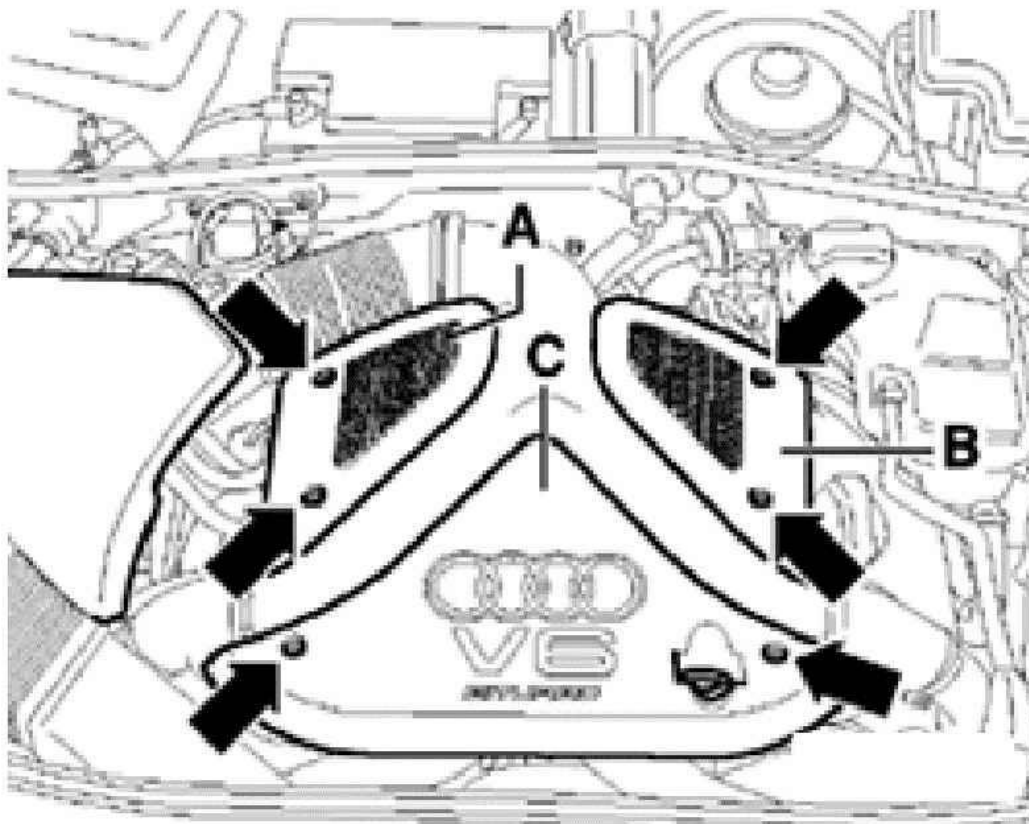


G02724986

Fig. 131: Locating Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Right cylinder head cover, removing and installing**Removing**

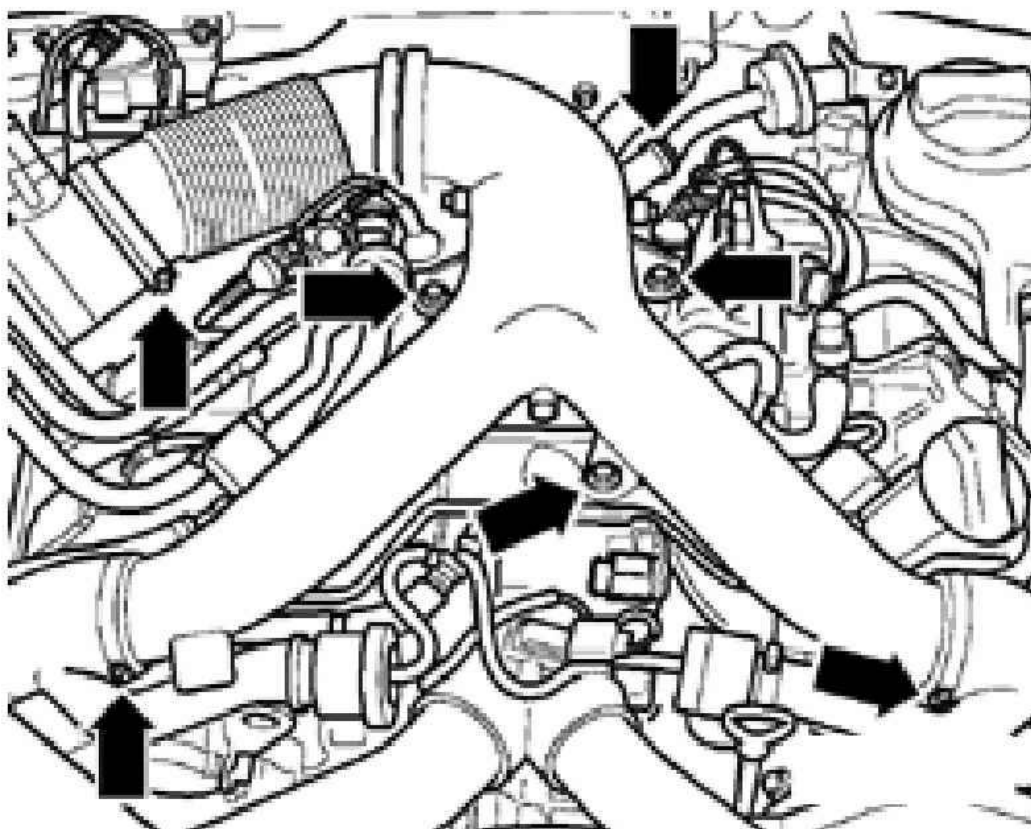
- Remove bolts -arrows- and remove engine cover panels -A...C-.
- Remove cover above air cleaner.



G02724987

Fig. 132: Removing Engine Cover Panels
Courtesy of AUDI OF AMERICA, INC.

- Remove air duct -arrows-.



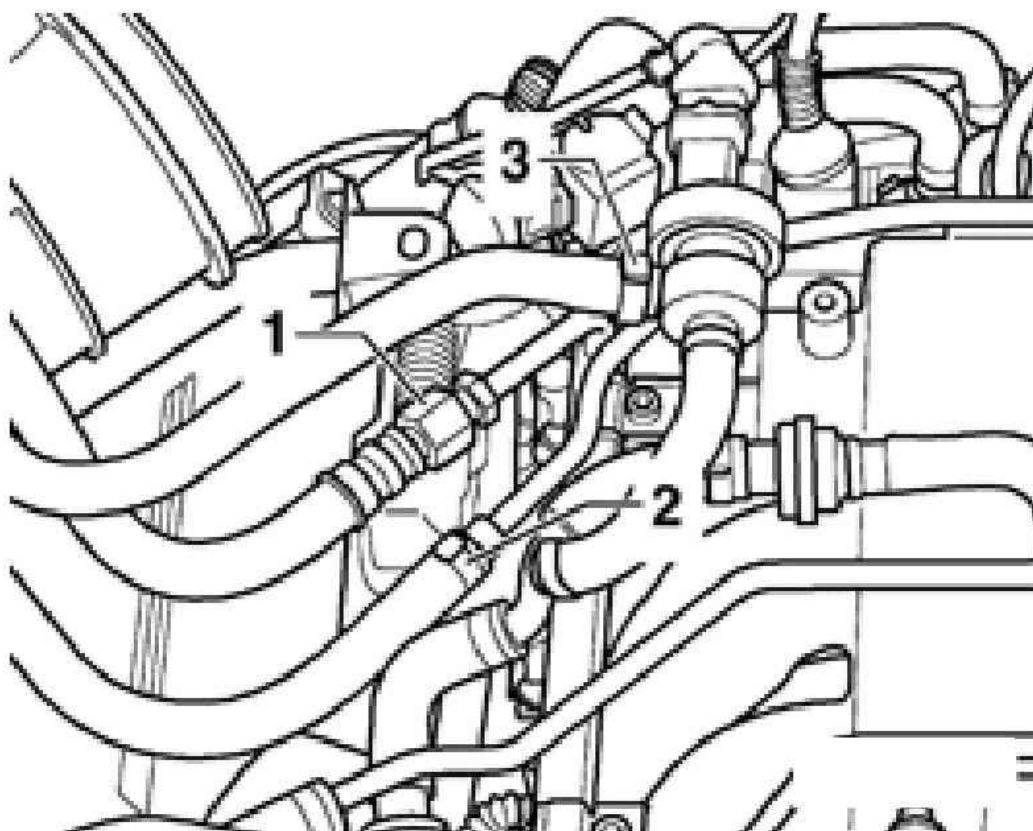
G02724988

Fig. 133: Removing Air Duct

Courtesy of AUDI OF AMERICA, INC.

WARNING: Fuel system is under pressure. Before opening the system, place a cloth around the connection. Then release pressure by carefully loosening the connection.

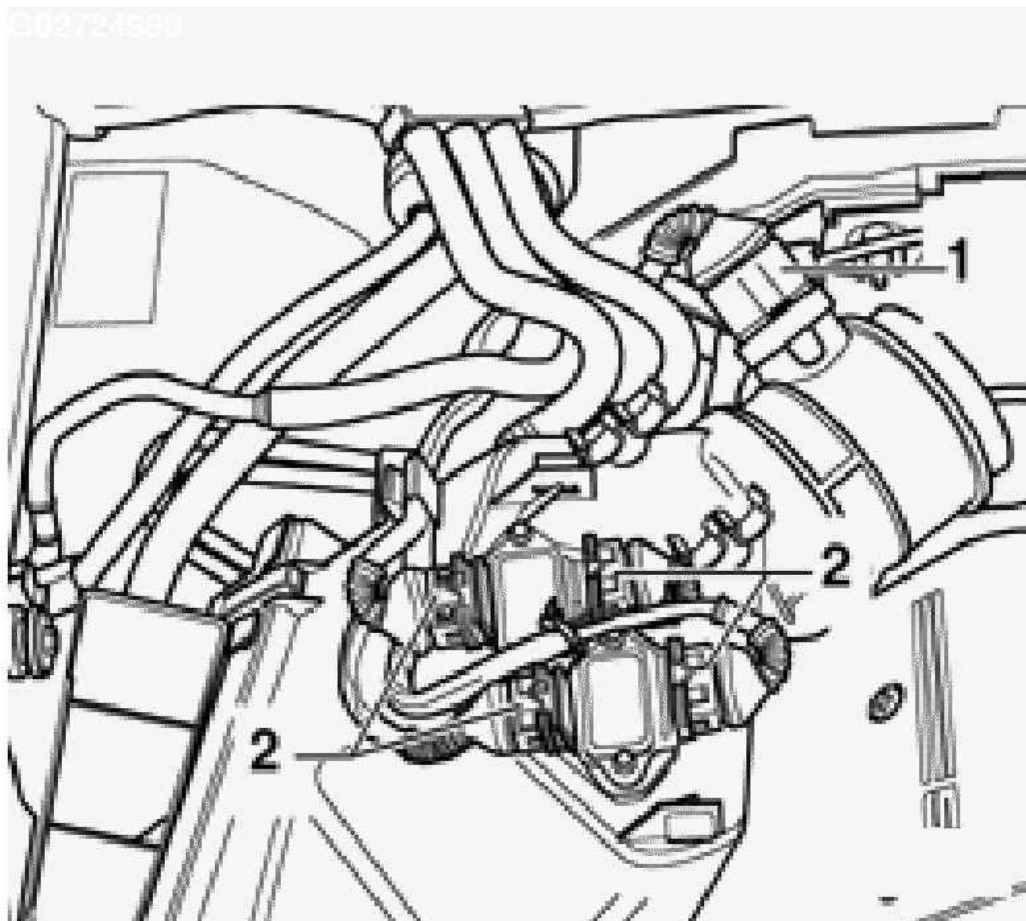
- Disconnect fuel supply line and fuel return line -1- and -2-, and move fuel lines clear.
- Disconnect hose from EVAP valve -3-. See **Fig. 134**.



G02724989

Fig. 134: Disconnecting Fuel Supply Line And Fuel Return Lines
Courtesy of AUDI OF AMERICA, INC.

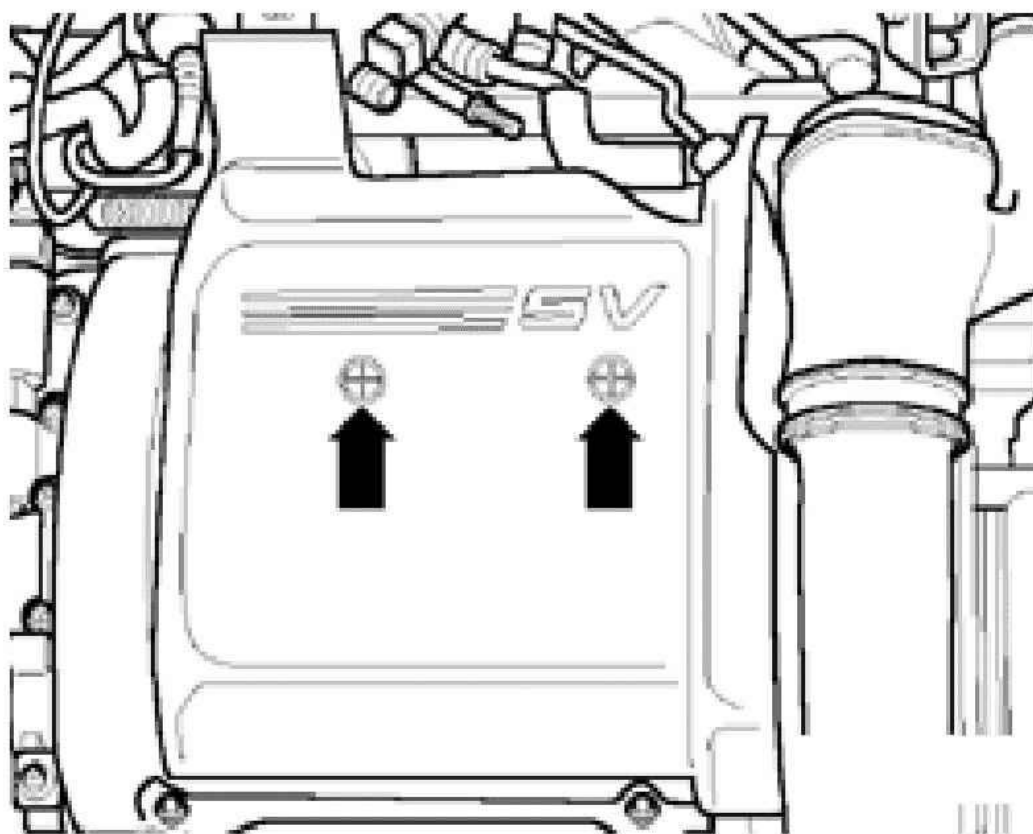
- Disconnect electrical connector -1- from mass air flow (MAF) sensor.
- Disconnect electrical connectors -2- from ignition output stages, and move wiring clear.
- Remove air cleaner.



G02724990

Fig. 135: Disconnecting Electrical Connectors From MAF Sensor And Ignition Output Stages
Courtesy of AUDI OF AMERICA, INC.

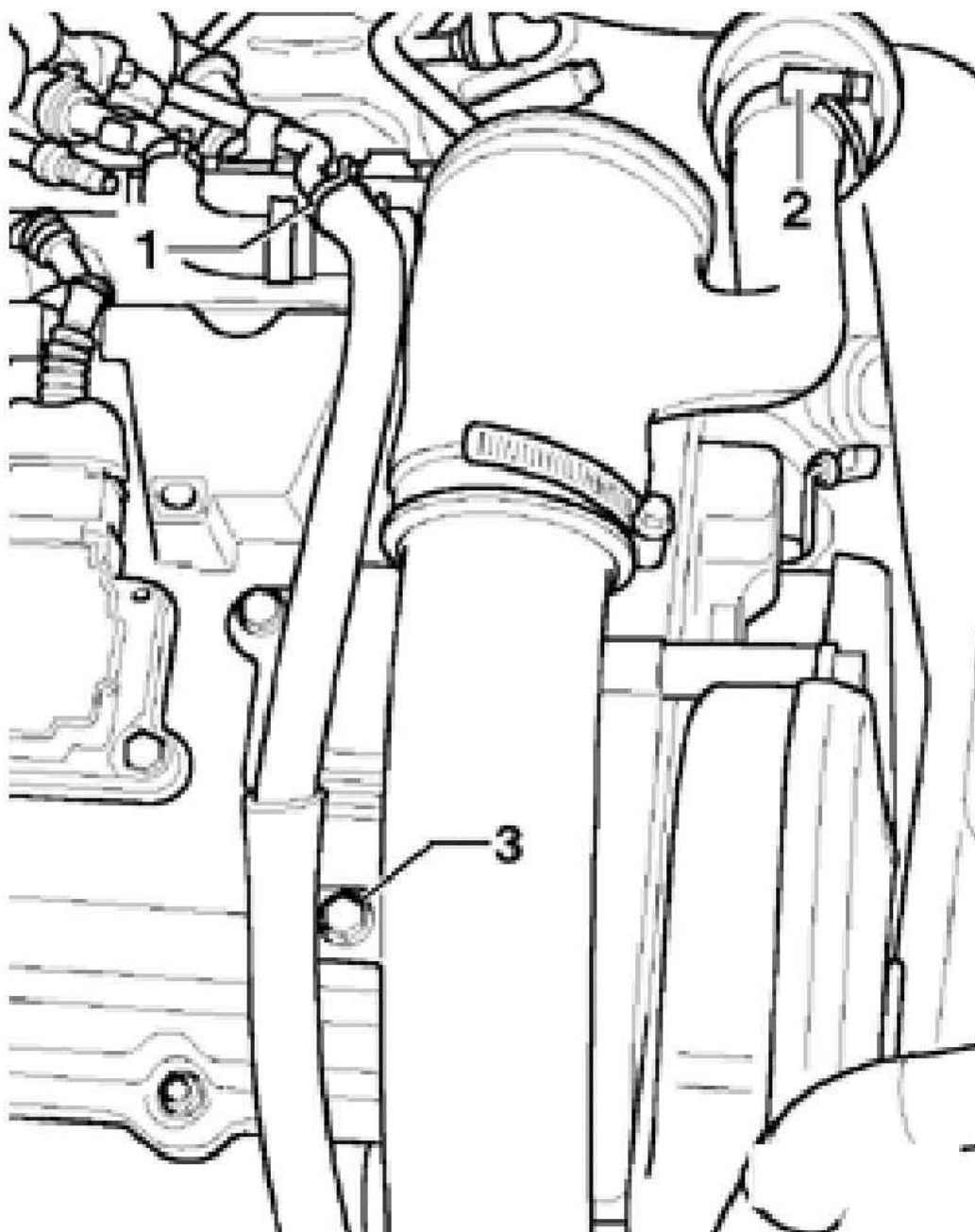
- Remove cover panel from right-hand cylinder head cover -arrows-.



G02724991

Fig. 136: Removing Cover Panel From Right-Hand Cylinder Head Cover
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1-.
- Disconnect hose -2-.
- Detach upper section of intake line -3-.



G02724992

Fig. 137: Disconnecting Hoses And Upper Section Of Intake Line
Courtesy of AUDI OF AMERICA, INC.

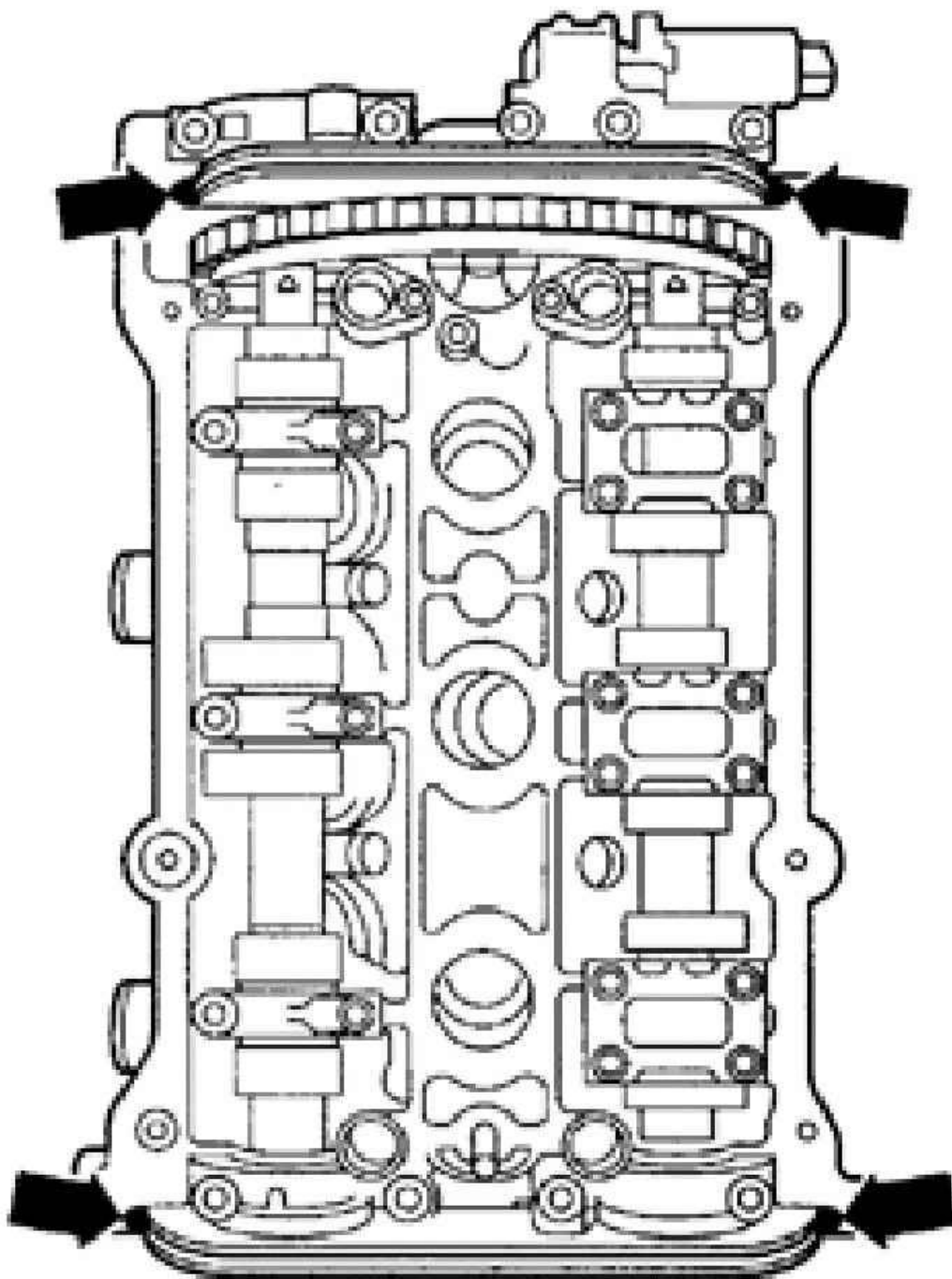
NOTE: Plug lower section of intake line.

- Remove bolt securing toothed belt guard from cylinder head cover.
- Disconnect electrical connectors from ignition coils.
- Disconnect crankcase breather off cylinder head cover.
- Remove ignition coils.
- Remove cylinder head cover.

Installing

Install in reverse sequence; note the following points.

- Seal end points of joints between bearing caps and cylinder head.
- Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at four points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02724993

Fig. 138: Installing Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Cylinder head, removing and installing**Removing and installing left cylinder head****NOTE:**

- All hose connections are secured with clips.
- Charge air pressure system must be free of leaks.
- Replace all seals and gaskets

Removing

- Remove engine. See **ENGINE, REMOVING AND INSTALLING**.
- Disconnect electrical connector from air recirculation valve -2-.

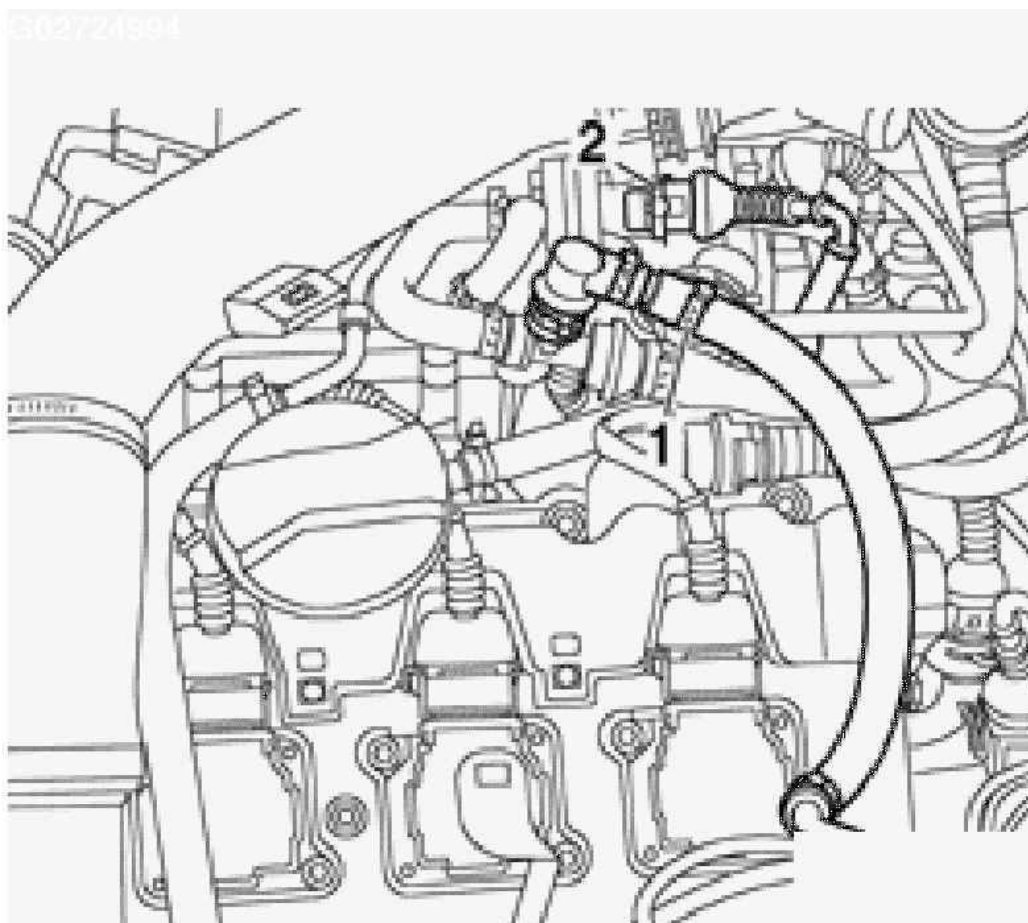
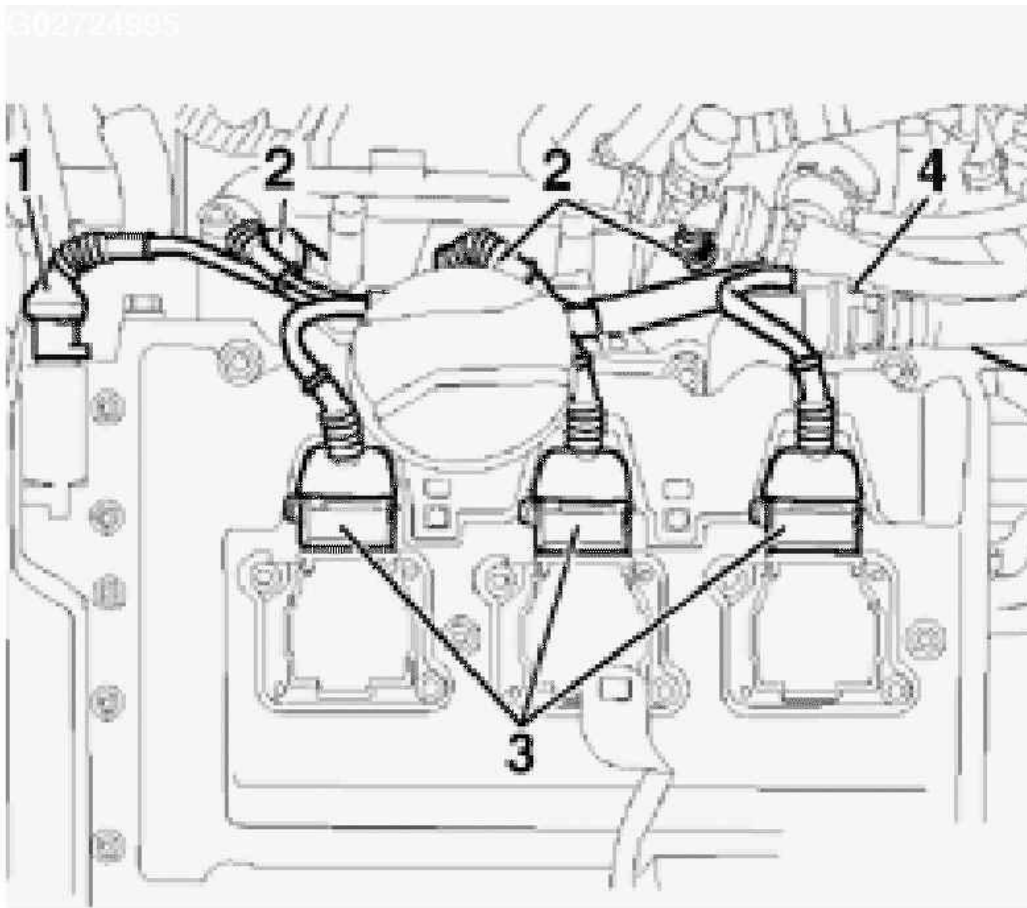
**G02724994**

Fig. 139: Disconnecting Electrical Connector From Air Recirculation Valve
Courtesy of AUDI OF AMERICA, INC.

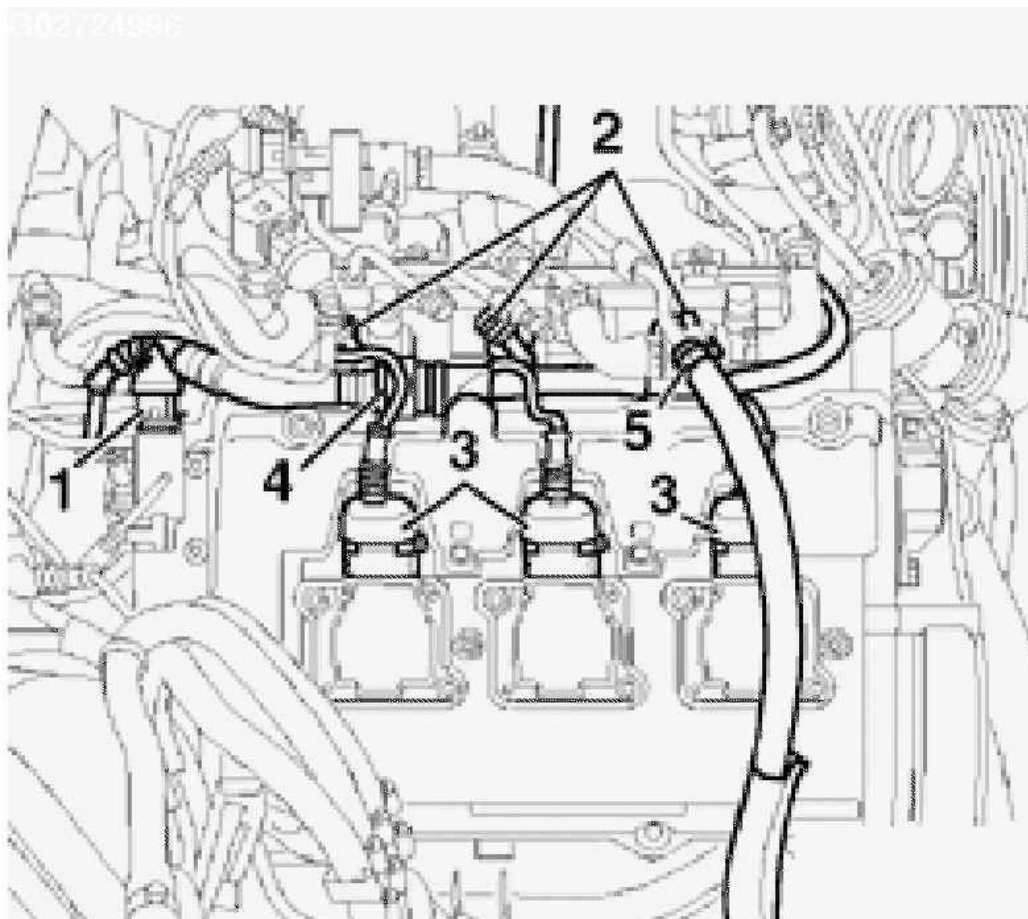
- Disconnect electrical connector from camshaft timing control -1- (cylinder bank 4..6). See **Fig. 140**.
- Disconnect electrical connectors from injectors -2- (cylinder bank 4..6).
- Disconnect electrical connectors from ignition coils -3- and move wiring harness clear (cylinder bank 4..6).
- Disconnect crankcase breather -4- from cylinder head cover (cylinder bank 4..6).
- Remove ignition coils.



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Fig. 140: Disconnecting Electrical Connectors At Cylinder Head (Cylinder Bank 4, 5, 6)
 Courtesy of AUDI OF AMERICA, INC.

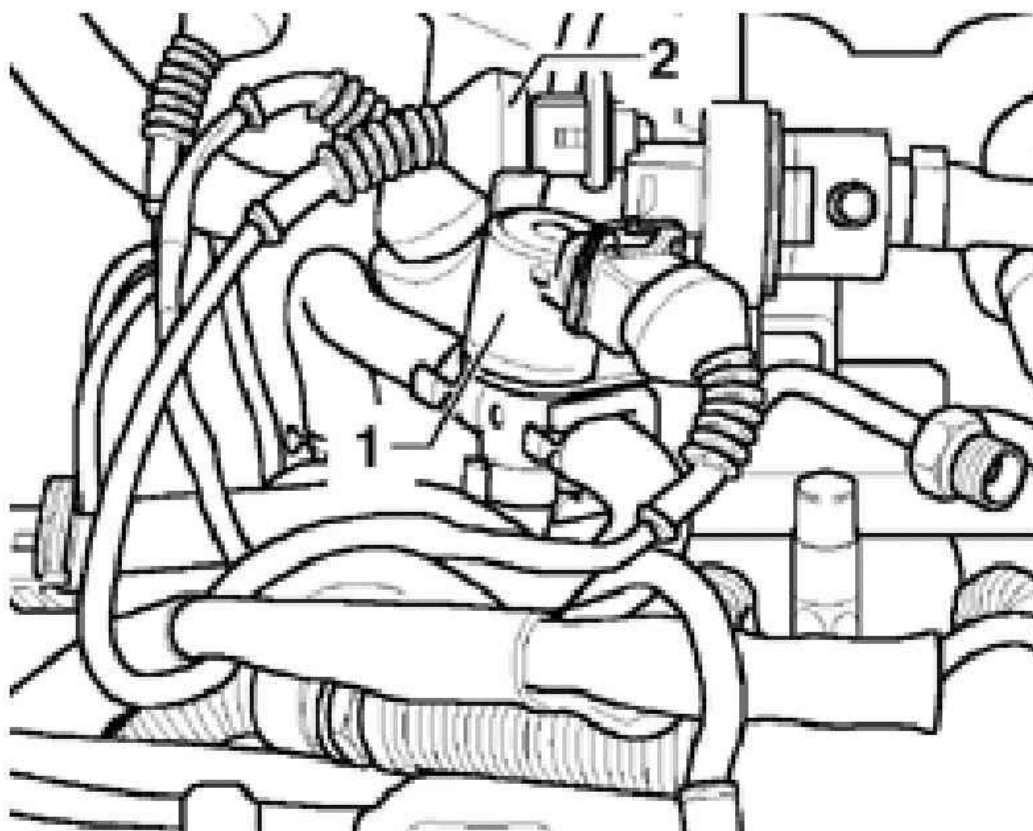
- Disconnect electrical connectors from injectors -2- (cylinder bank 1..3).
- Disconnect hose -5- going to turbocharger intake side.



G02724996

Fig. 141: Disconnecting Electrical Connectors From Fuel Injectors (Cylinder Bank 1, 2, 3)
Courtesy of AUDI OF AMERICA, INC.

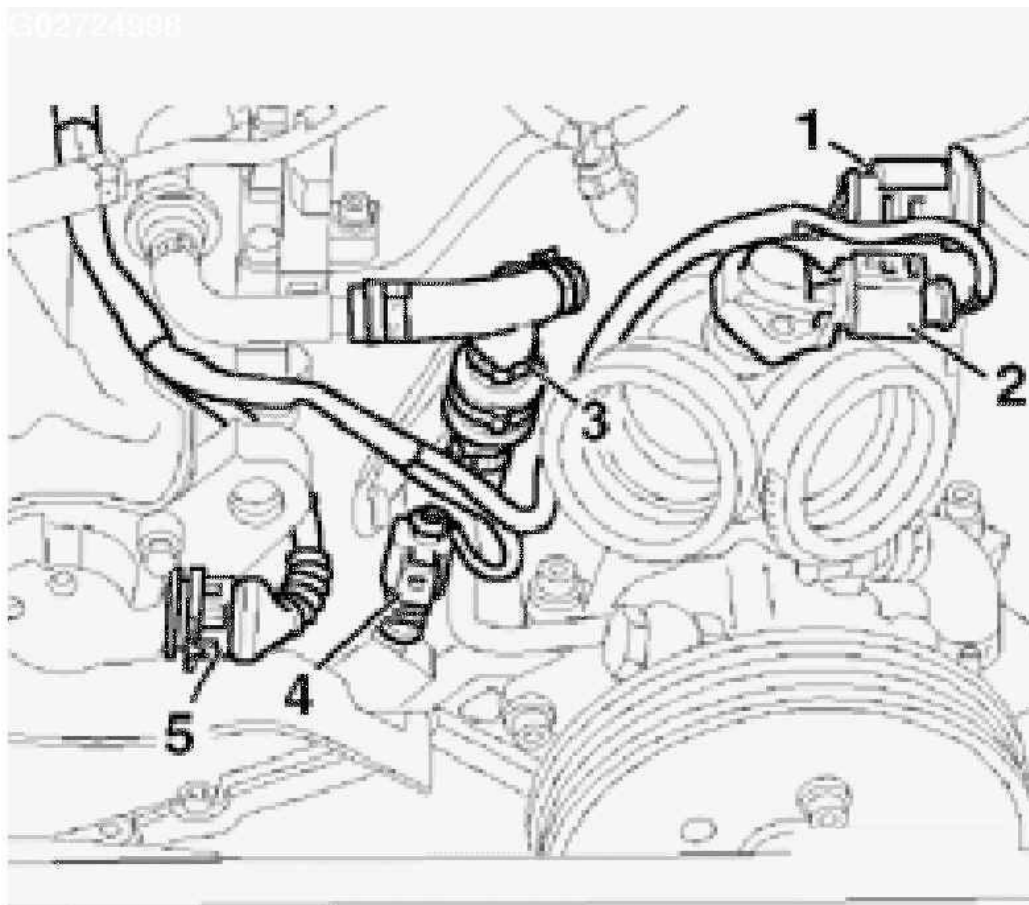
- Unclip solenoid valve for charge air pressure control -1-.
- Disconnect connector from EVAP valve -2-.



G02724997

Fig. 142: Disconnecting Solenoid Valve For Charge Air Pressure Control And EVAP Valve
Courtesy of AUDI OF AMERICA, INC.

- Disconnect connector from throttle unit -1-. See **Fig. 143**.
- Disconnect connector from charge air sensor -2-.
- Disconnect crankcase breather -3-.
- Disconnect connector from intake air temperature sensor -4-.

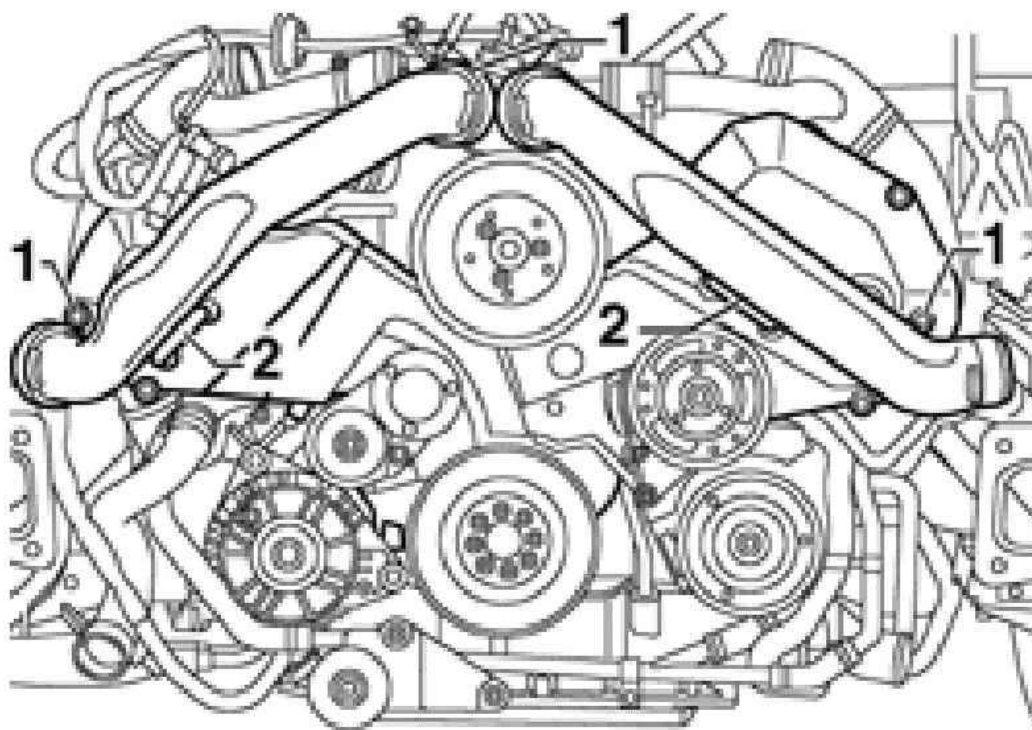


G02724998

Fig. 143: Disconnecting Connector From Throttle Unit
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure lines-1-. See **Fig. 144**.

NOTE: Watch position of retaining strips -2-.

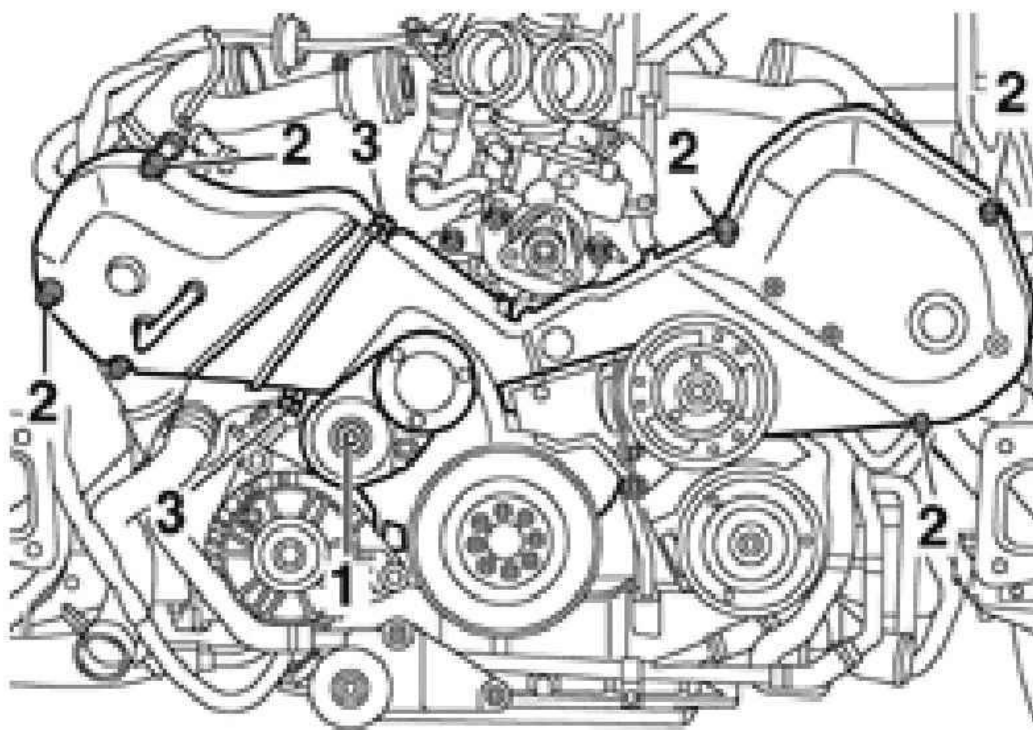


G02724999

Fig. 144: Removing Pressure Lines

Courtesy of AUDI OF AMERICA, INC.

- Remove tensioner -1- for ribbed belt.
- Remove toothed belt guards -2- (left and right).
- Remove toothed belt guard -3- (center).

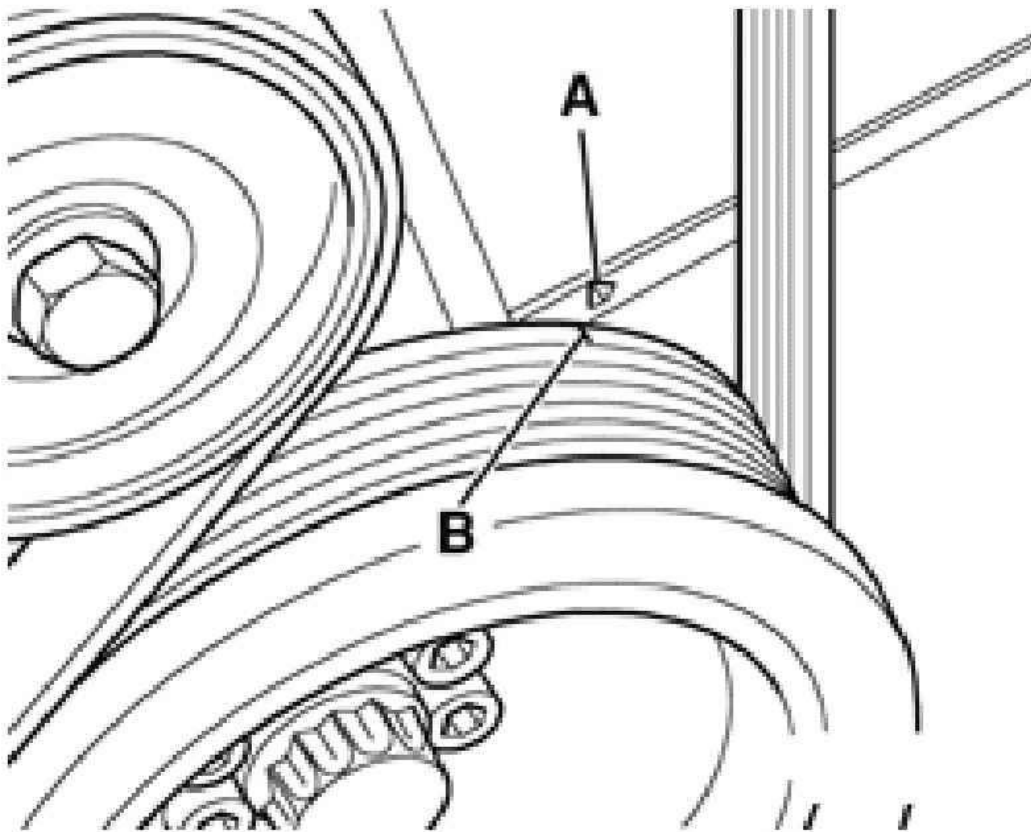


G02725000

Fig. 145: Removing Tensioner

Courtesy of AUDI OF AMERICA, INC.

- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

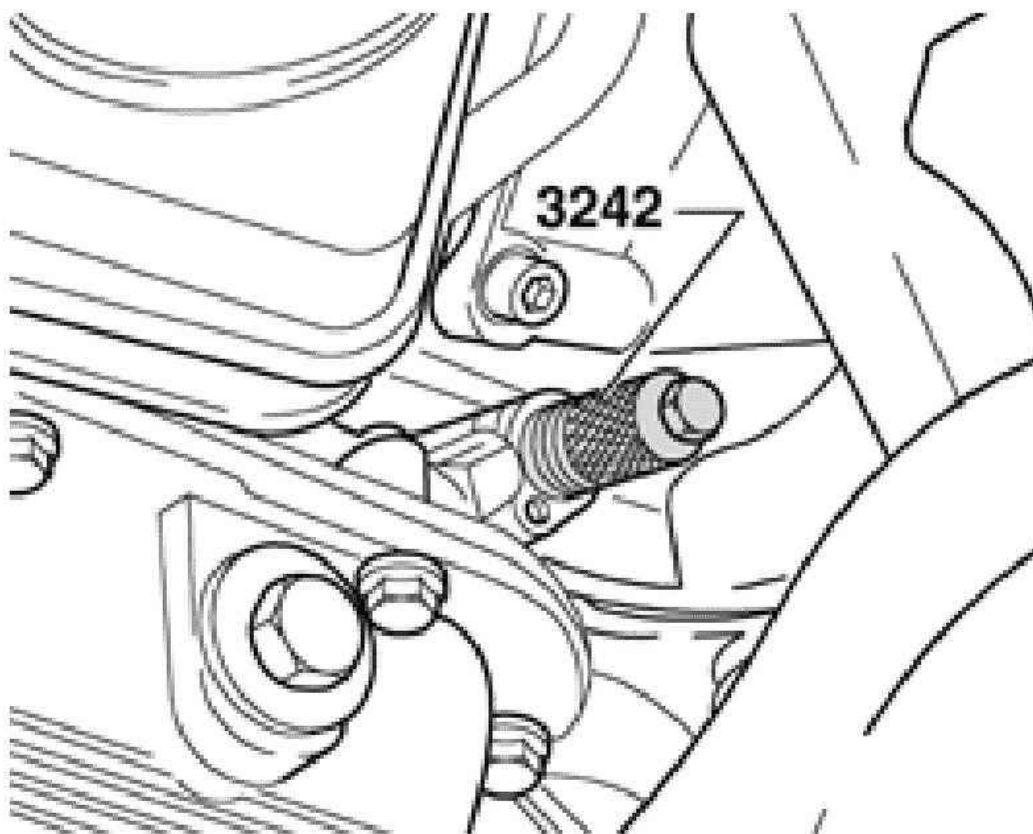


G02725001

Fig. 146: Aligning Match Marks -A- And -B- On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

NOTE: Turn over the engine at the central bolt on the crankshaft.

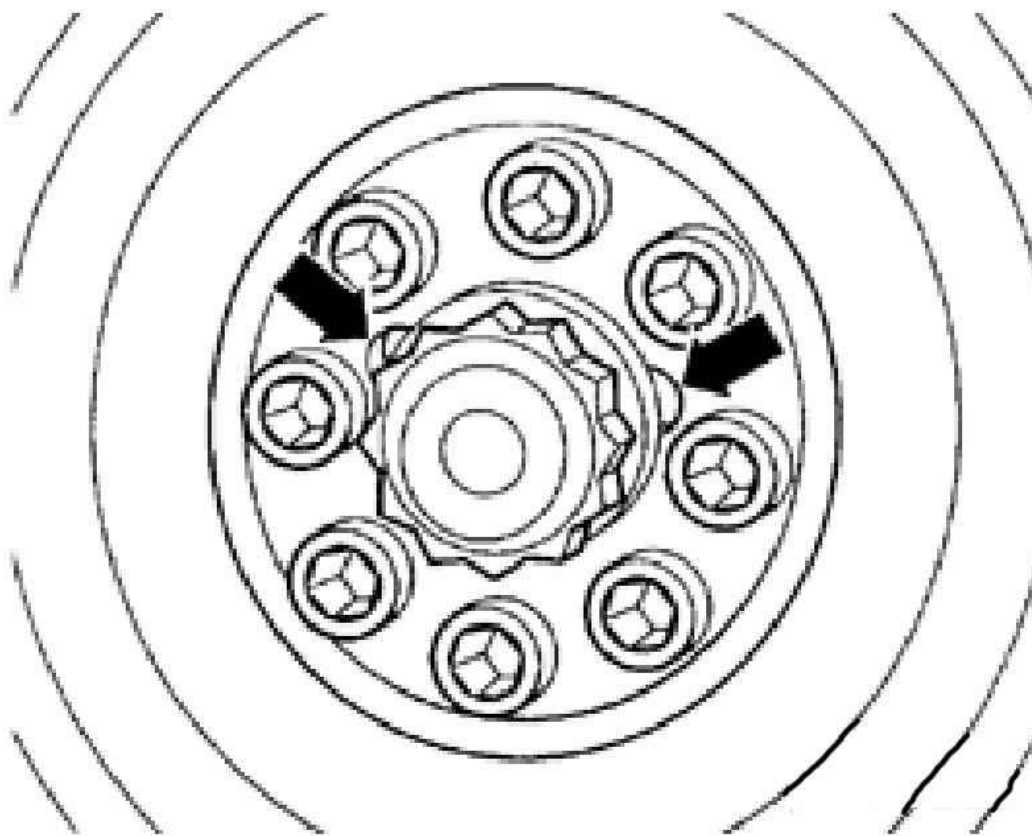
- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If not, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.
- TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.
- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.



G02725002

Fig. 147: Installing Screw Clamping Bolt 3242 For Crankshaft Into Sealing Plug
Courtesy of AUDI OF AMERICA, INC.

- Remove vibration damper on crankshaft

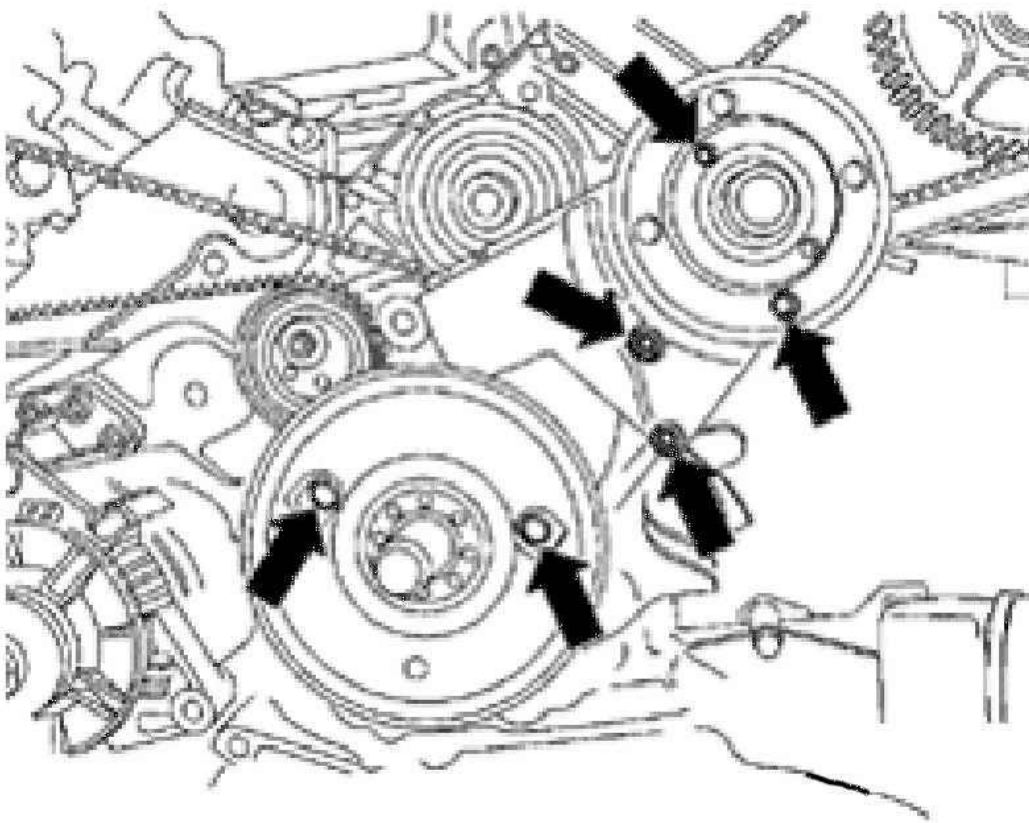


G02725003

Fig. 148: Removing Vibration Damper On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

NOTE: The central bolt does not have to be loosened to remove the vibration damper.

- Remove idler wheel for ribbed belt -arrows-.
- Remove toothed belt guard behind vibration damper -arrows-.



G02725004

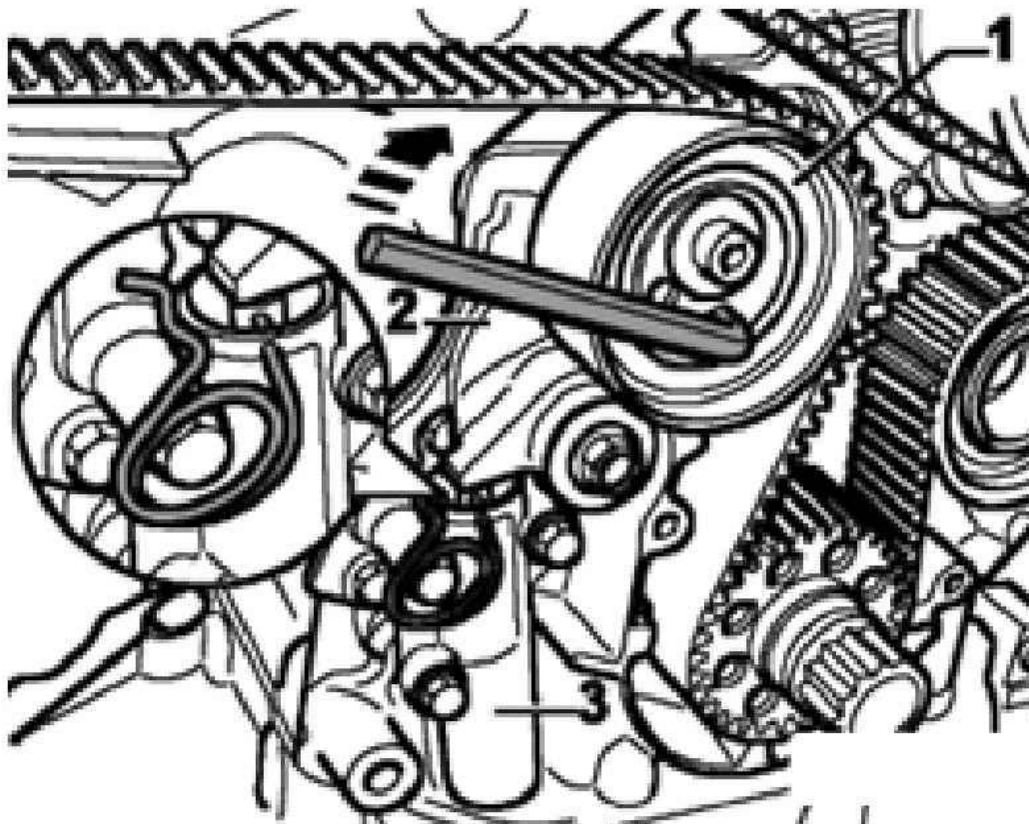
Fig. 149: Removing Idler Wheel For Ribbed Belt And Toothed Belt Guard Behind Vibration Damper

Courtesy of AUDI OF AMERICA, INC.

NOTE:

- Mark the direction of rotation of the toothed belt with or chalk or felt pen before removing. A used belt can break if it rotates in the wrong direction when reinstalled.
 - The toothed belt tensioning element is oil-damped and can therefore only be compressed slowly by applying constant pressure.
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until tensioning lever -2- compresses tensioning element -3- sufficiently to enable a 2 mm dia. spring pin to be installed in drilling and in plunger.
 - Insert spring pin and release toothed belt tensioning roller.
 - Use spring pin from 2024 A.
 - Insert camshaft clamp 3391 in securing plates of two camshafts.

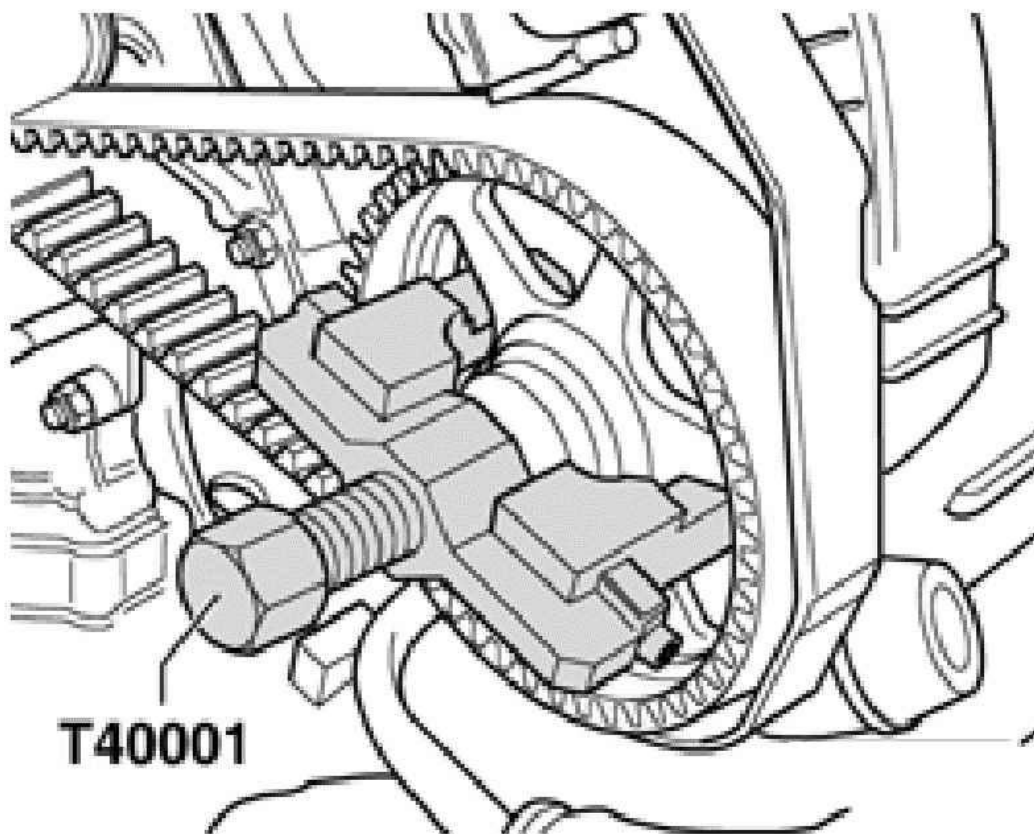
- Loosen both camshaft bolts and remove approx. 5 turns.



G02725005

Fig. 150: Identifying Toothed (Timing) Belt Tensioning Roller
Courtesy of AUDI OF AMERICA, INC.

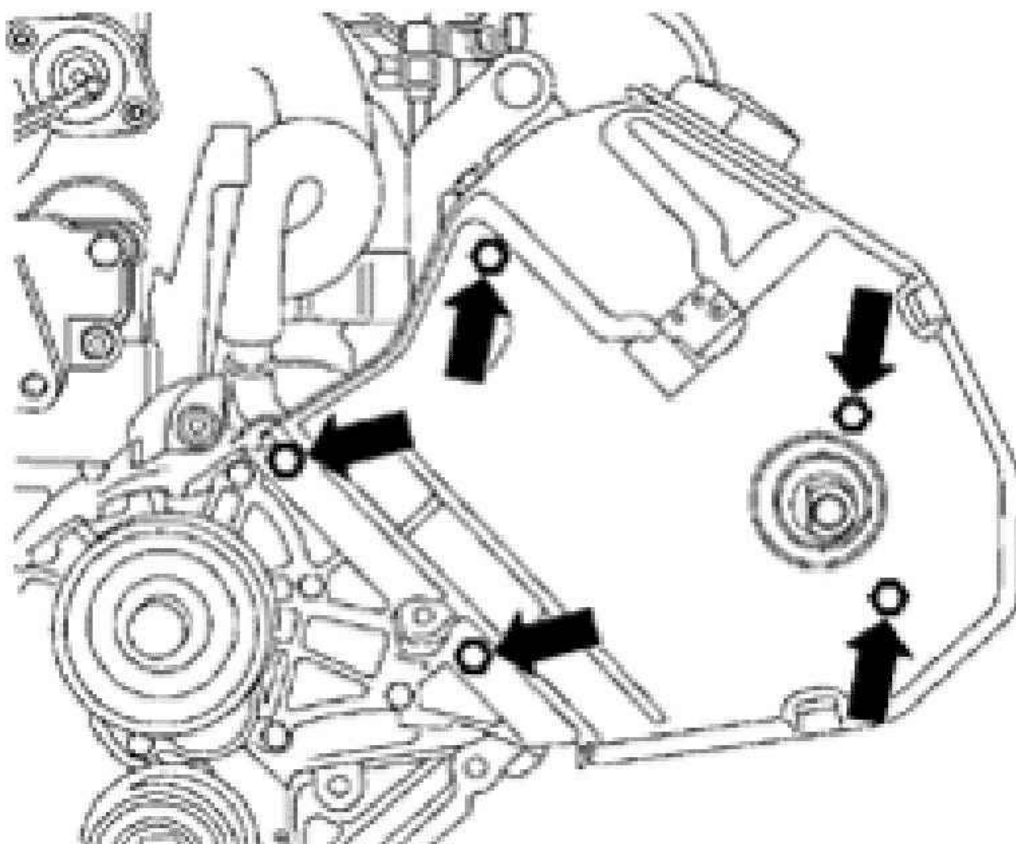
- Take out camshaft clamp 3391.
- Disconnect both camshaft sprockets with special tool T40001.



G02725006

Fig. 151: Disconnecting Camshaft Sprockets
Courtesy of AUDI OF AMERICA, INC.

- Unbolt rear left toothed belt guard -arrows-.
- Detach intake manifold using special tool 3249.

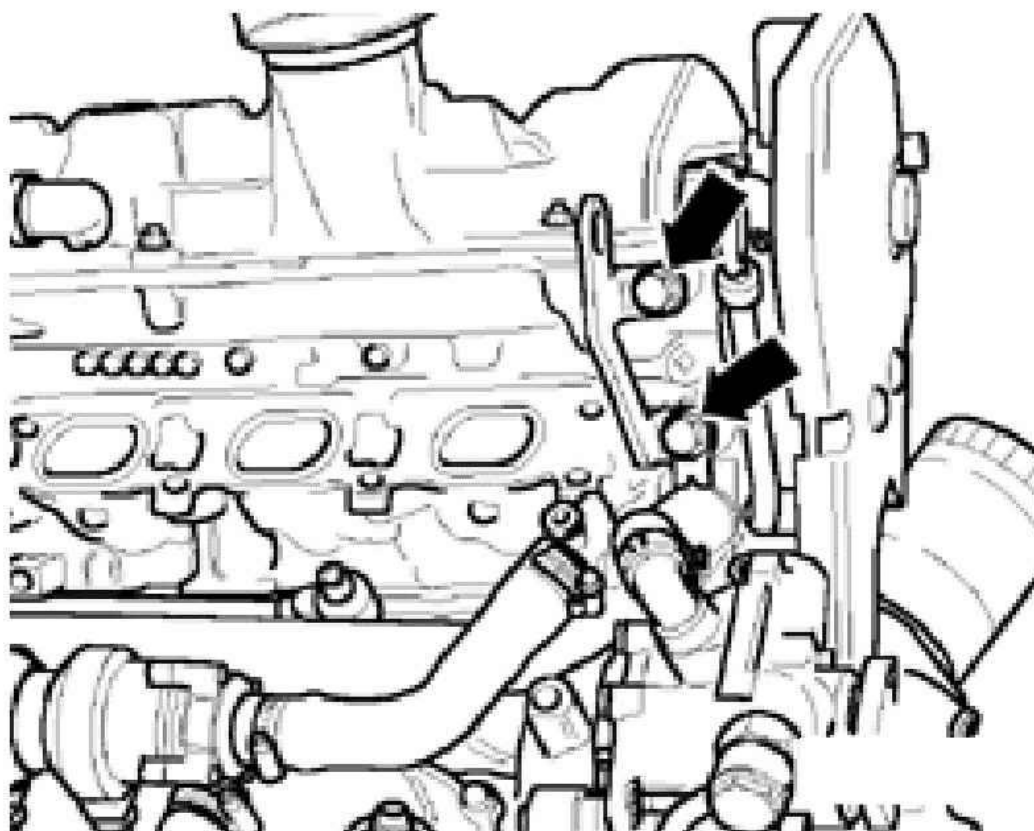


G02725007

Fig. 152: Removing Rear Left Toothed Belt Guard

Courtesy of AUDI OF AMERICA, INC.

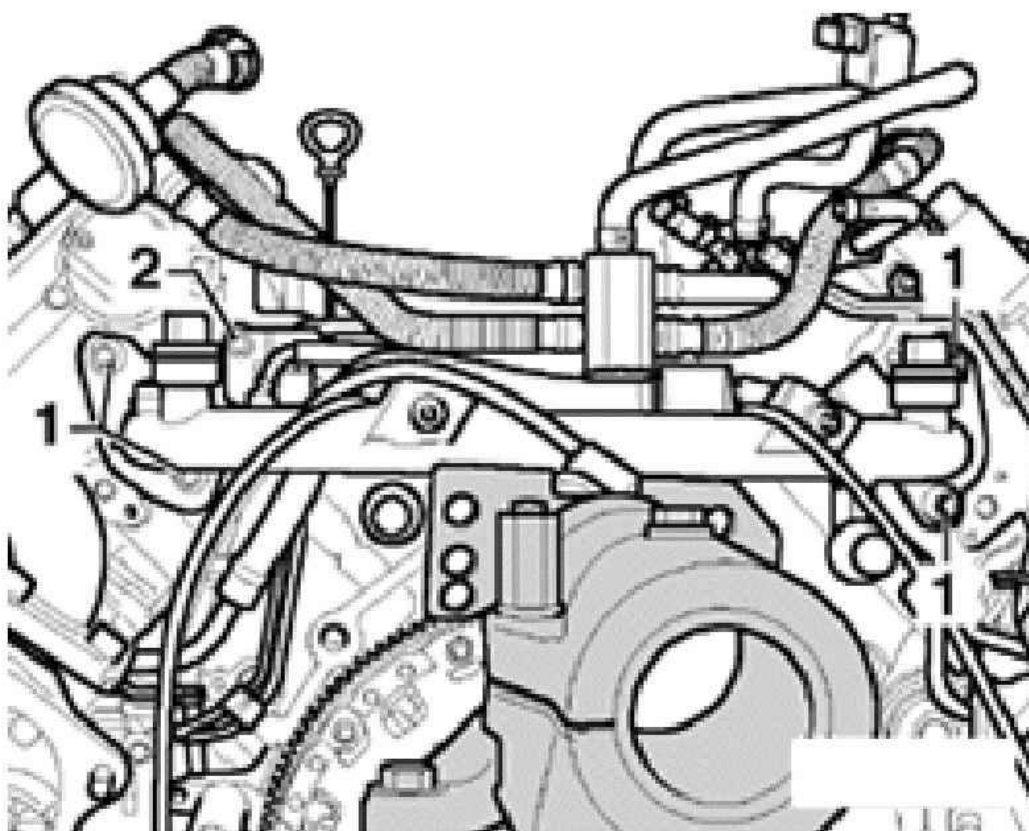
- Unbolt cylinder head lifting bracket with coolant line -arrows- from cylinder head.



G02725008

Fig. 153: Removing Cylinder Head Lifting Bracket
Courtesy of AUDI OF AMERICA, INC.

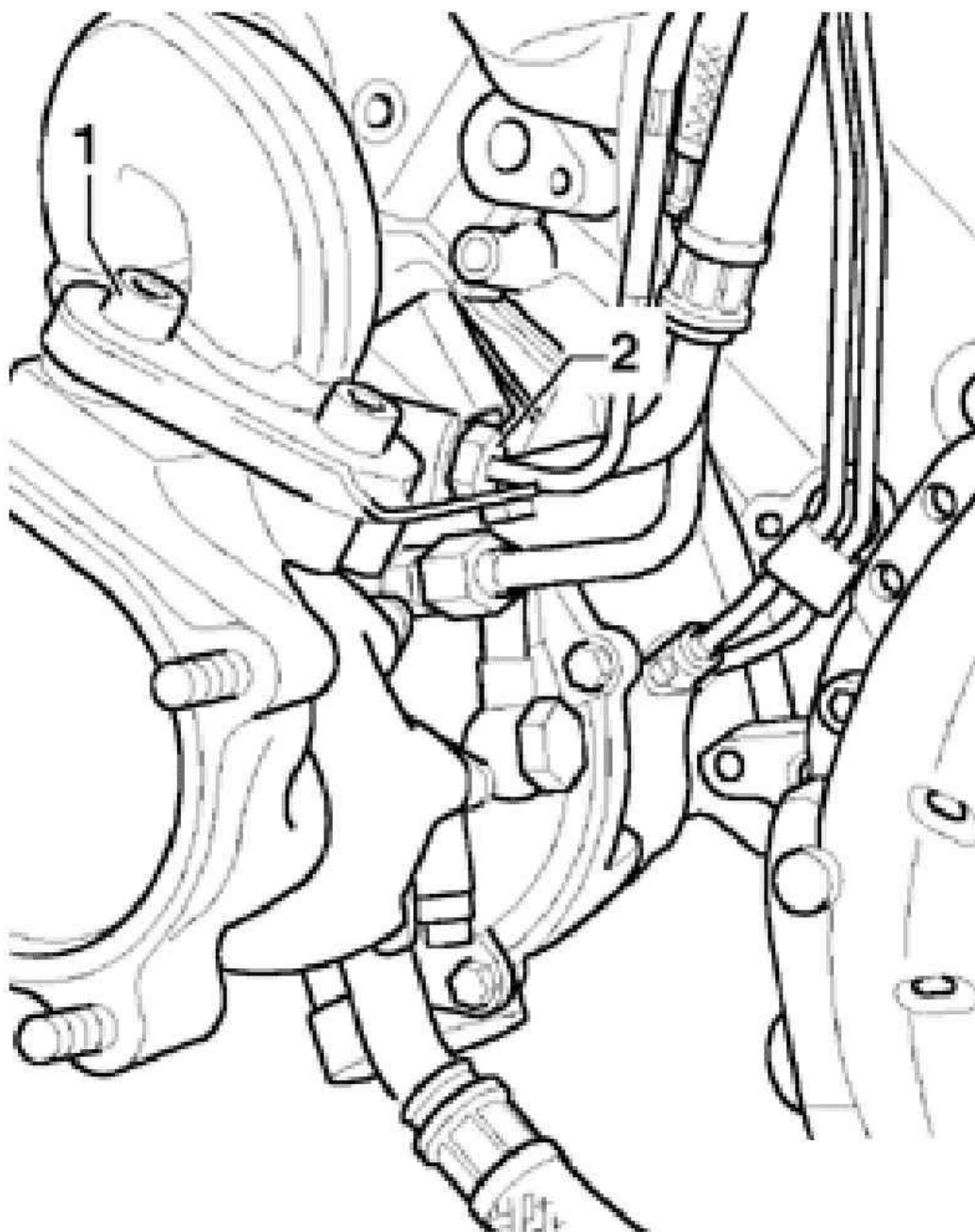
- Unbolt water line -1- and disconnect it towards rear. See **Fig. 154**.
- Unbolt bracket -2- from cylinder head.
- Remove heat sensor -2-.



G02725009

Fig. 154: Removing Water Line And Heat Sensor
Courtesy of AUDI OF AMERICA, INC.

- Unbolt turbocharger -1- from exhaust manifold (3 bolts).

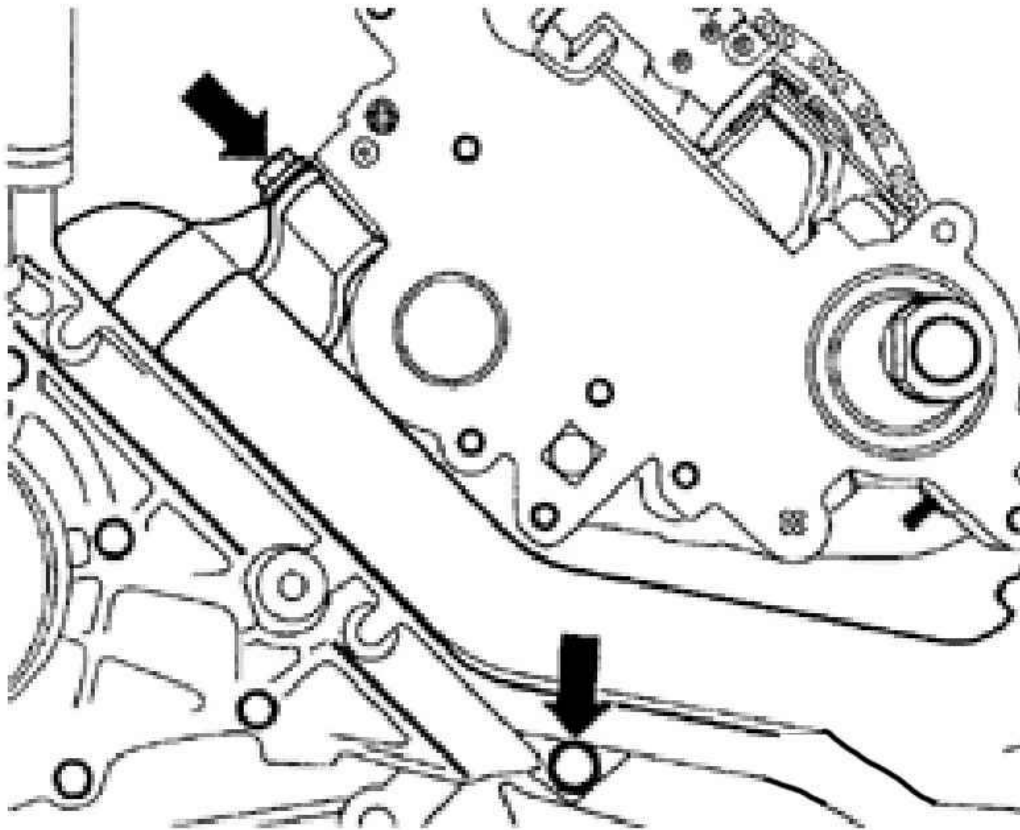


G02725010

Fig. 155: Removing Turbocharger
Courtesy of AUDI OF AMERICA, INC.

- Unbolt coolant line at front of cylinder head -arrows-.

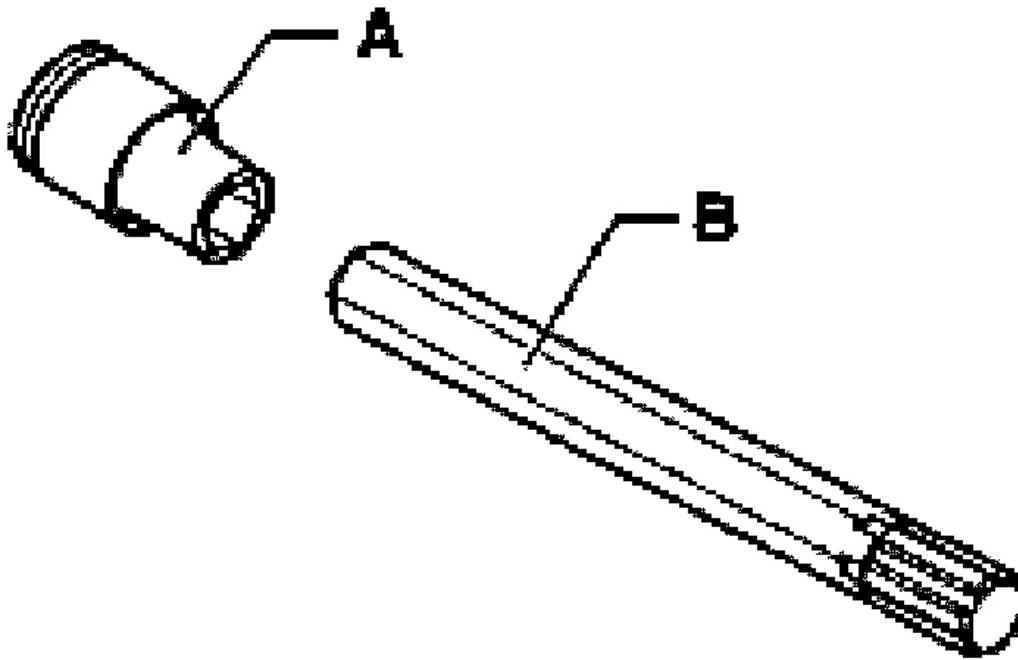
- Unbolt cylinder head cover.
- Loosen and remove cylinder head bolts in opposite sequence to tightening sequence using special tool 3452 (Polidrive).
- Carefully lift off cylinder head.



G02725011

Fig. 156: Removing Coolant Line At Front Of Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

NOTE: Use special tool 3452 together with a normal commercial 10 mm socket when removing and installing.



G02725012

Fig. 157: Identifying Special Tool
Courtesy of AUDI OF AMERICA, INC.

Installing

NOTE:

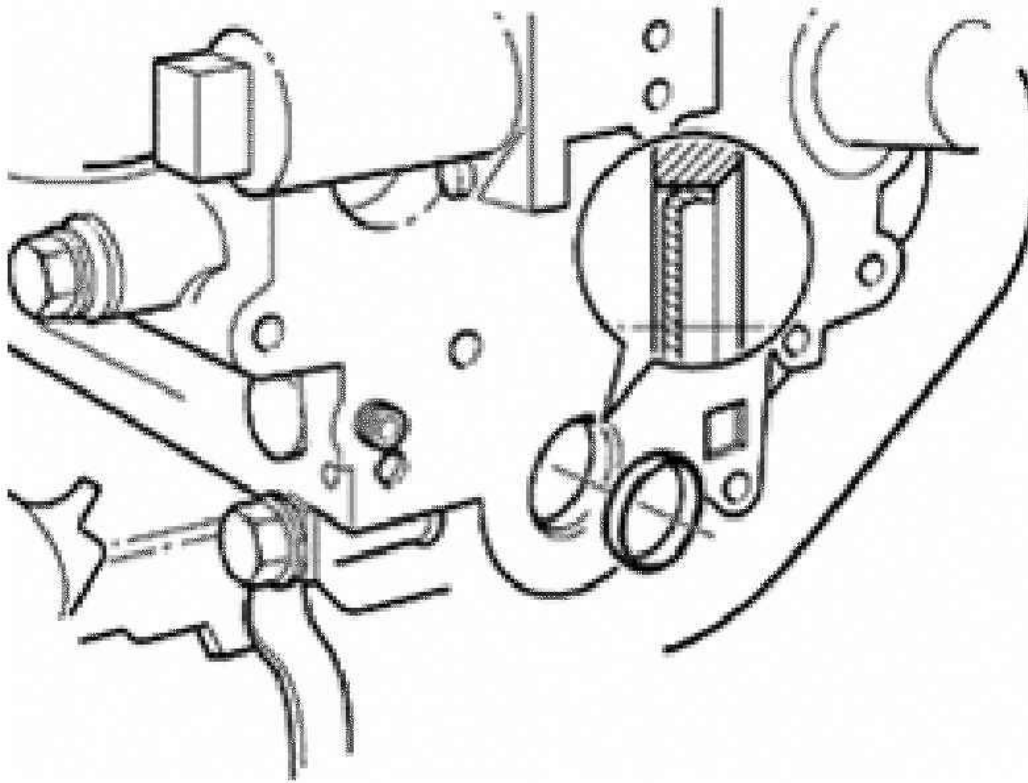
- Do not allow any oil or coolant to remain in the blind holes for the cylinder head bolts in the cylinder block.
- **REPLACE** cylinder head bolts.
- Connecting vacuum hoses. See VACUUM DIAGRAM - COMPLETE.

When installing a new cylinder head:

- Screw in centering pin for intake manifold.

The cylinder head supplied as a replacement part can be used on both sides (left or right). But a sealing cap (core plug) must be installed in the front end of the cylinder head in each case.

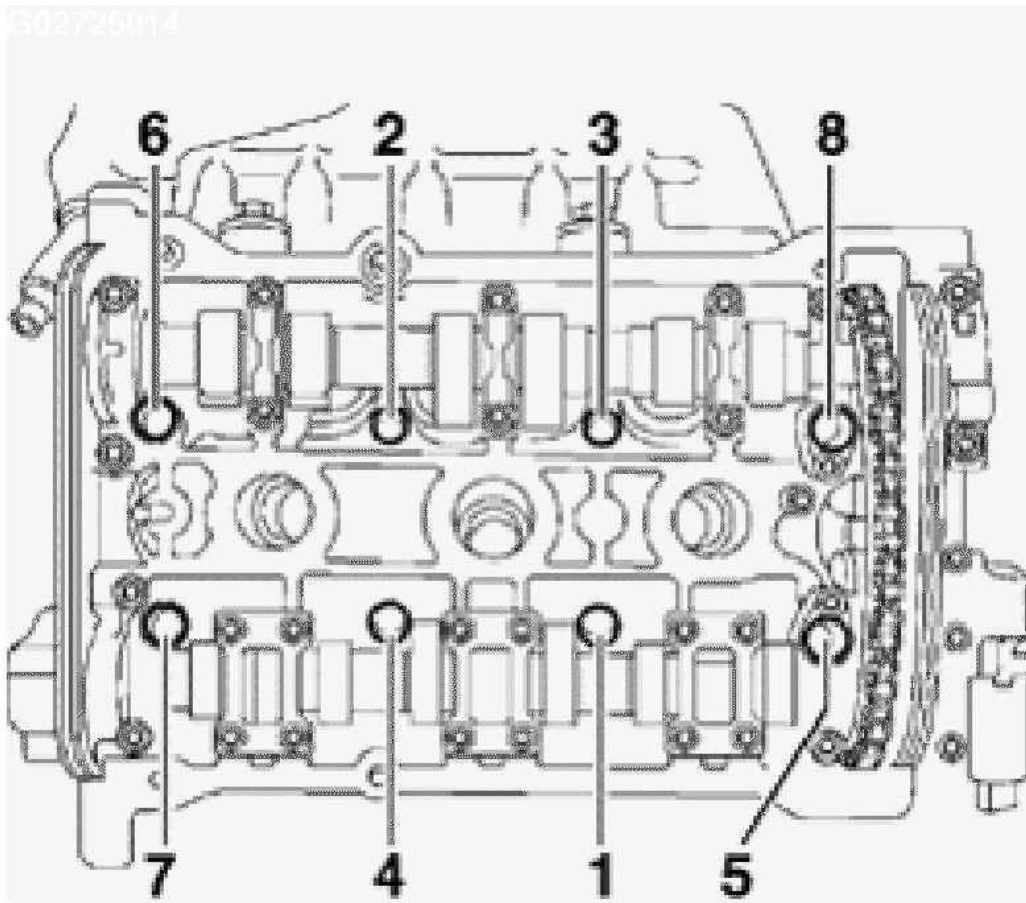
- Coat outside circumference of sealing cap (core plug) with sealant AMV 188 001 02.
- Using drift VW 295, knock in sealing cap (core plug) until outside rim is flush with end of the chamfer in cylinder head.



G02725013

Fig. 158: Locating Core Plug In Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

- Before installing cylinder head in position, turn crankshaft and camshafts to TDC of No. 3 cylinder.
- Install cylinder head gasket on dowel sleeves. Marking "oben" (top) or part number must face towards cylinder head.
- Install cylinder head, insert cylinder head bolts and tighten finger-tight.
- Tighten NEW cylinder head bolts in two stages in sequence (**Fig. 159**), as follows:
 - Stage 1 = 60 Nm.
 - Stage 2 = turn a further 1/2 turn (180°) with a rigid wrench (turning 2 x 90° is also permissible).

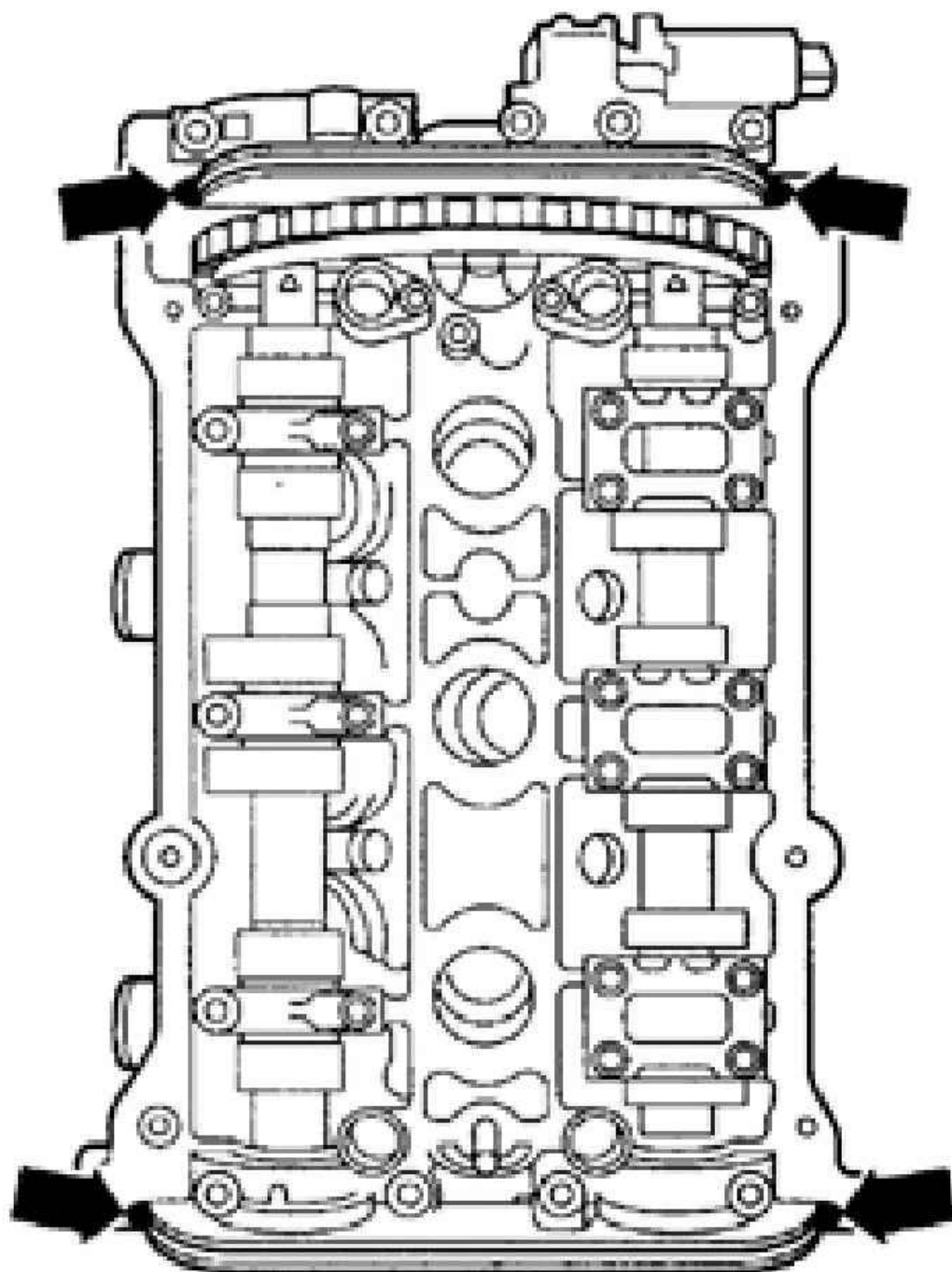


G02725014

Fig. 159: Identifying Cylinder Head Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, INC.

It is not necessary to torque down cylinder head bolts again after repairs have been completed.

- Seal end points of joints between bearing caps and cylinder head.
- Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02725015

Fig. 160: Locating Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

Tightening torques

TIGHTENING TORQUES: LEFT CYLINDER HEAD

Component	Nm
Bolts-M6	10
Bolts-M8	20
Camshaft bearing caps and camshaft adjuster	10
Exhaust manifold to cylinder head	25
Front exhaust line to exhaust manifold	25
Oxygen sensor	50
Spark plugs	25
Toothed belt sprocket to camshaft	55
Intake manifold to cylinder head	10
Cylinder head cover	10

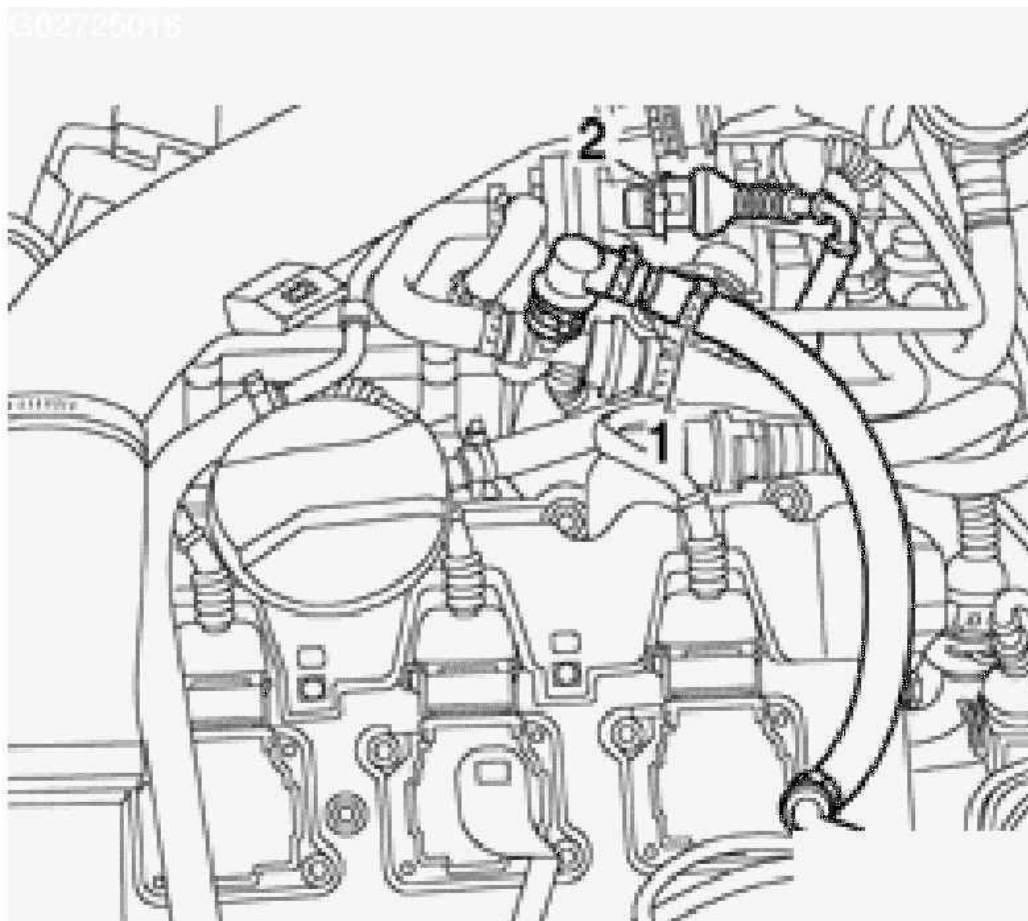
Right cylinder head, removing and installing

NOTE:

- All hose connections are secured with clips.
- Charge air pressure system must be free of leaks.
- Replace all seals and gaskets.

Removing

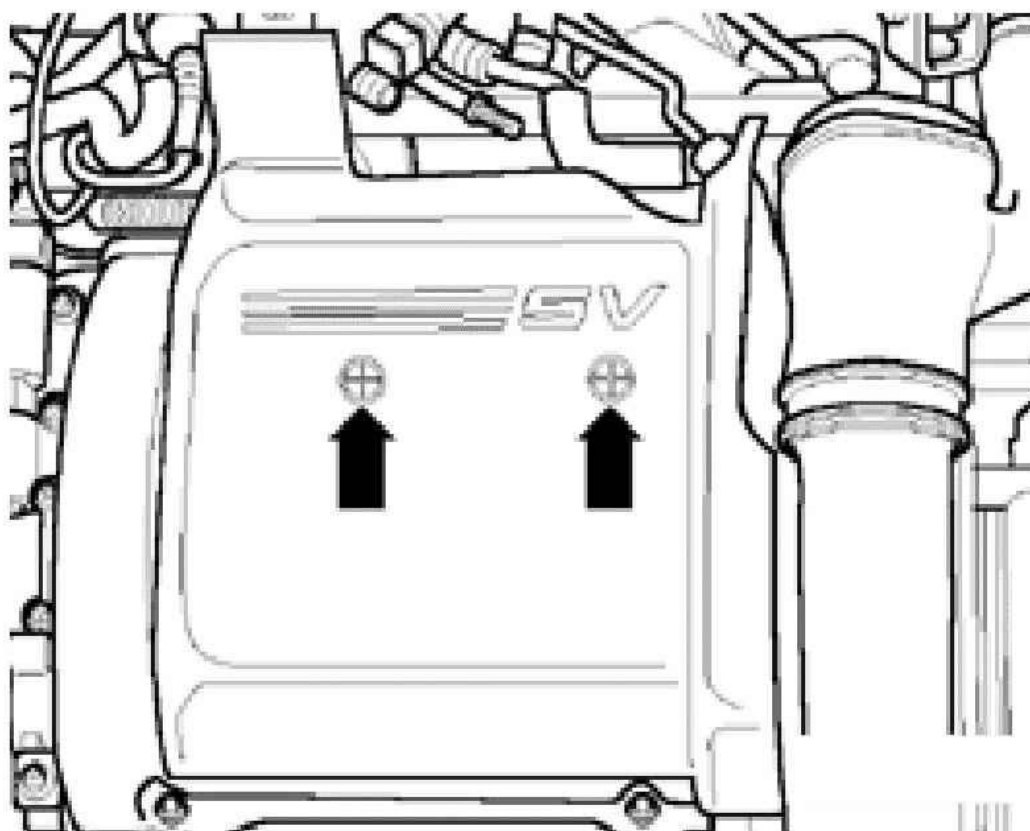
- Remove engine. See **ENGINE, REMOVING AND INSTALLING**.



G02725016

Fig. 161: Disconnecting Electrical Connector From Air Recirculation Valve
Courtesy of AUDI OF AMERICA, INC.

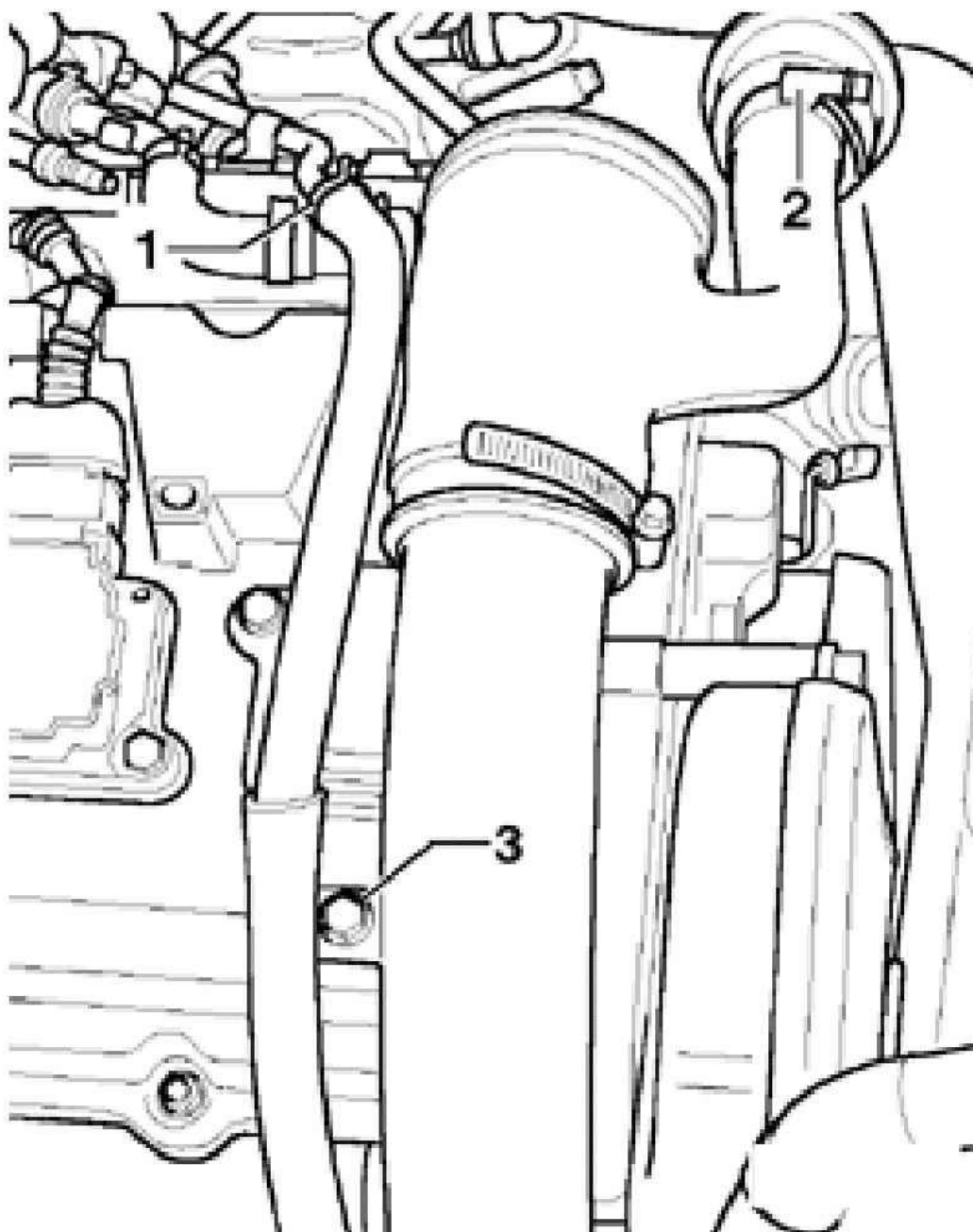
- Disconnect electrical connector from air recirculation valve -2-.
- Remove cover panel from right-hand cylinder head cover -arrows-.



G02725017

Fig. 162: Removing Cover Panel From Right-Hand Cylinder Head Cover
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1-.
- Disconnect hose -2-. See **Fig. 163**.
- Unbolt upper section of intake line -3-.



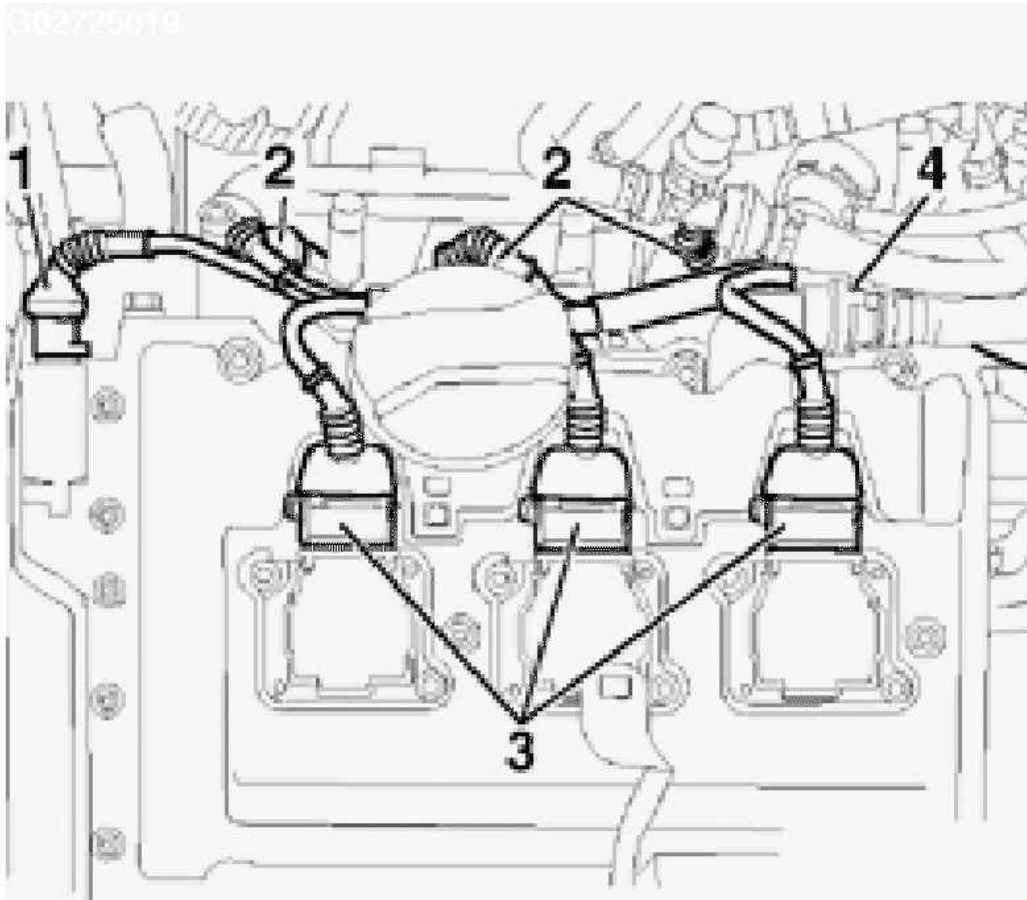
G02725018

Fig. 163: Disconnecting Hose

Courtesy of AUDI OF AMERICA, INC.

NOTE: Plug lower section of intake line.

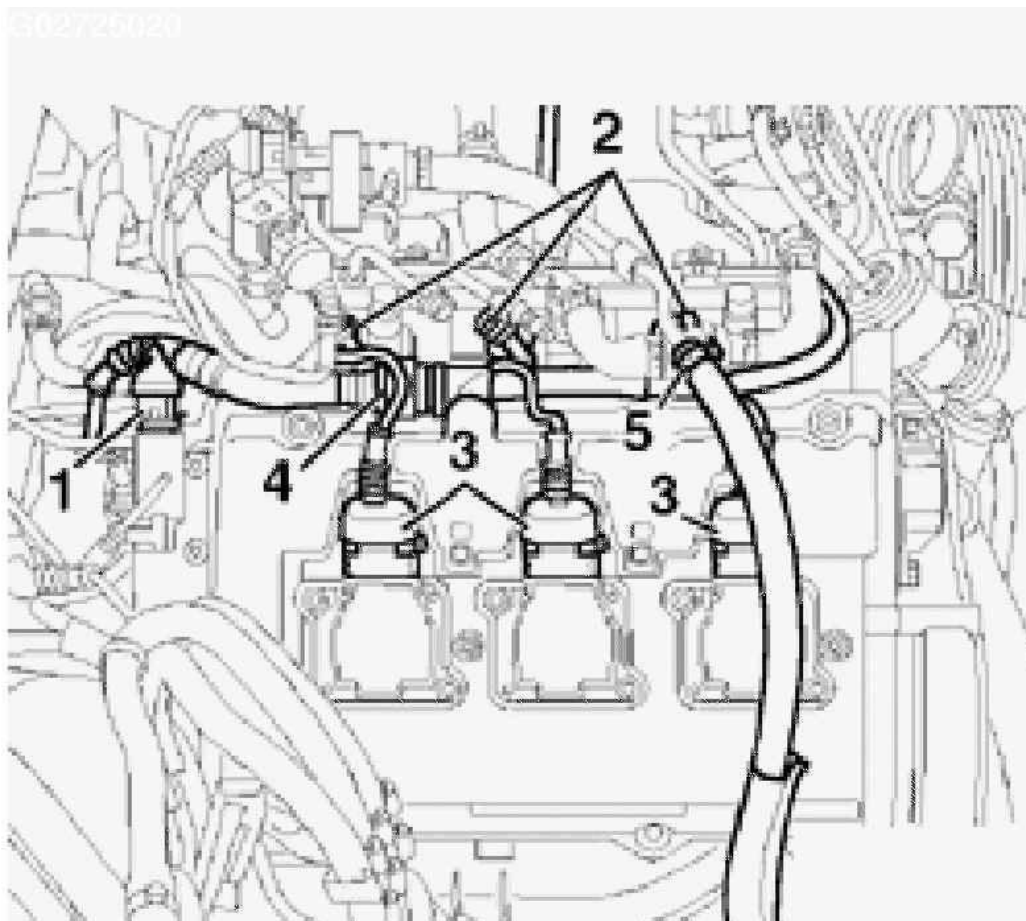
- Disconnect connectors from injectors -2- (cylinder bank 4..6).



G02725019

Fig. 164: Disconnecting Connectors From Fuel Injectors (Cylinder Bank 4, 5, 6)
 Courtesy of AUDI OF AMERICA, INC.

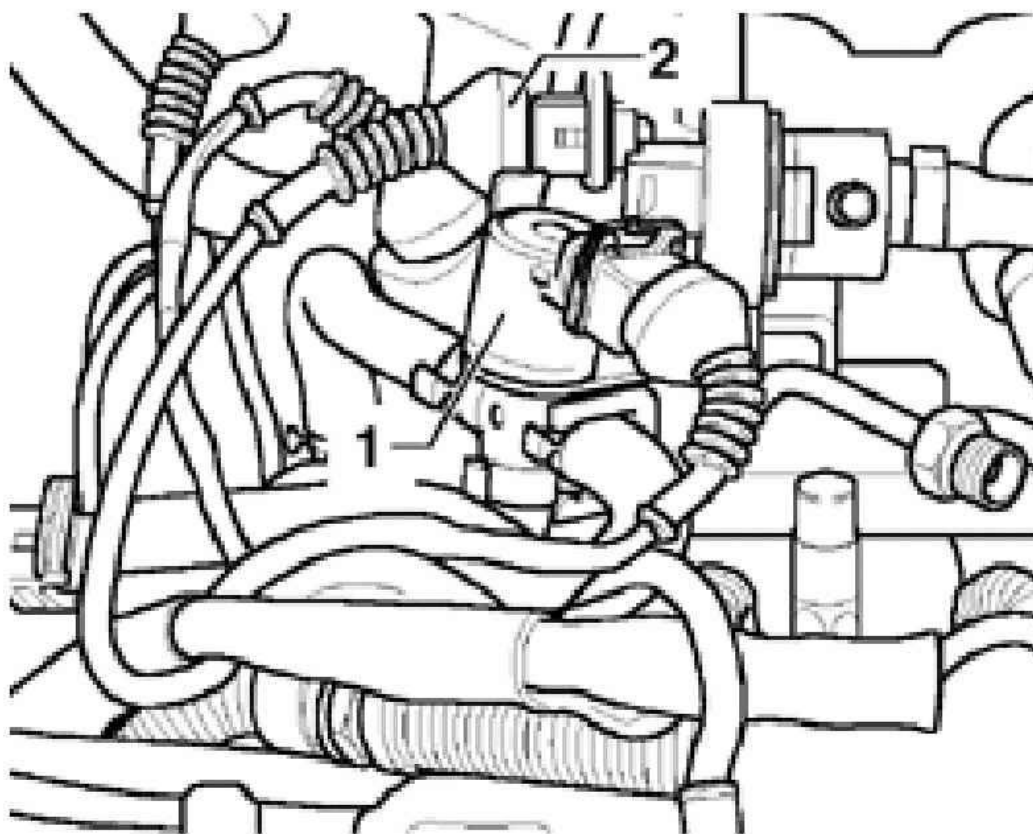
- Disconnect connector for camshaft timing control -1- (cylinder bank 1..3).
- Disconnect connectors from injectors -2-(cylinder bank 1..3).
- Disconnect connectors from ignition coils -3- and move wiring harness clear (cylinder bank 1..3).
- Disconnect crankcase breather -4- from cylinder head cover (cylinder bank 1..3).



G02725020

Fig. 165: Disconnecting Connectors On Cylinder Bank 1-3
 Courtesy of AUDI OF AMERICA, INC.

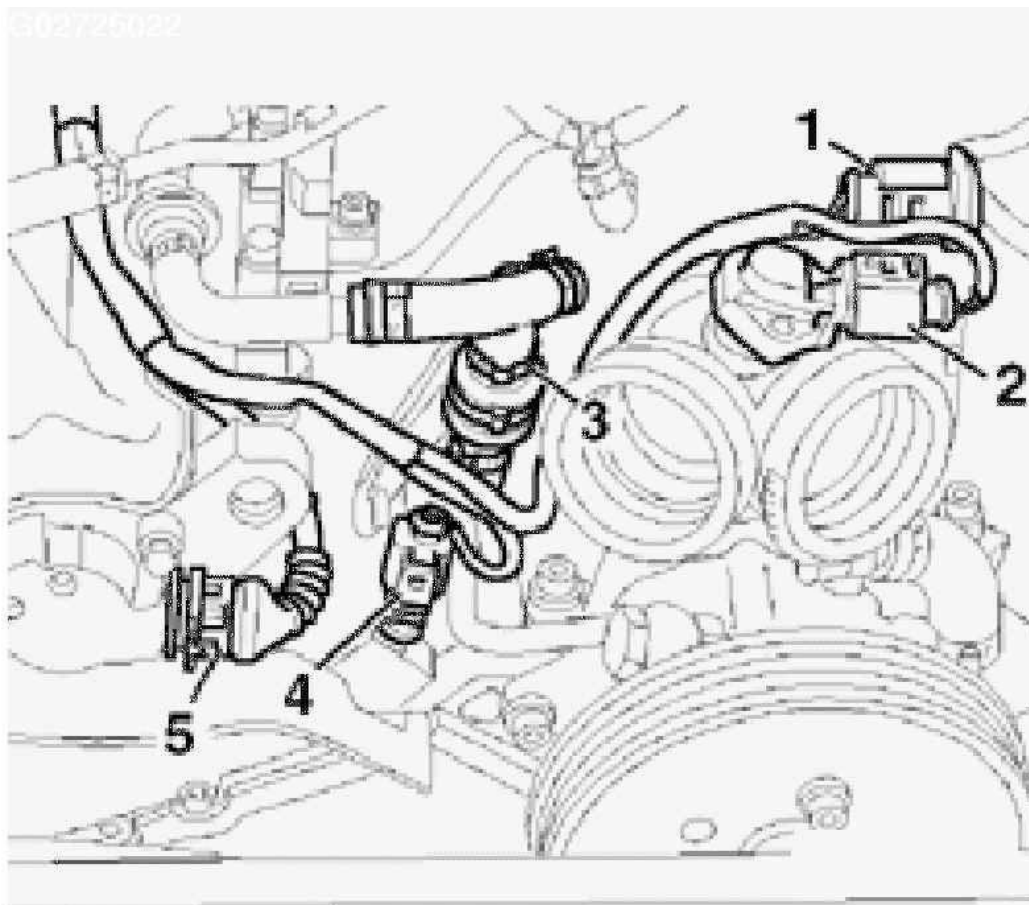
- Disconnect hose -5- going to turbocharger intake side.
- Remove ignition coils.
- Unclip solenoid valve for charge pressure control -1-.
- Disconnect connector from EVAP valve -2-.



G02725021

Fig. 166: Removing Solenoid Valve And Disconnecting Connector From EVAP Valve
Courtesy of AUDI OF AMERICA, INC.

- Disconnect connector from throttle unit -1-. See **Fig. 167**.
- Disconnect connector from charge air sensor -2-.
- Disconnect crankcase breather -3-.
- Disconnect connector from intake air temperature sensor -4-.
- Disconnect connector -5- from Hall sensor.

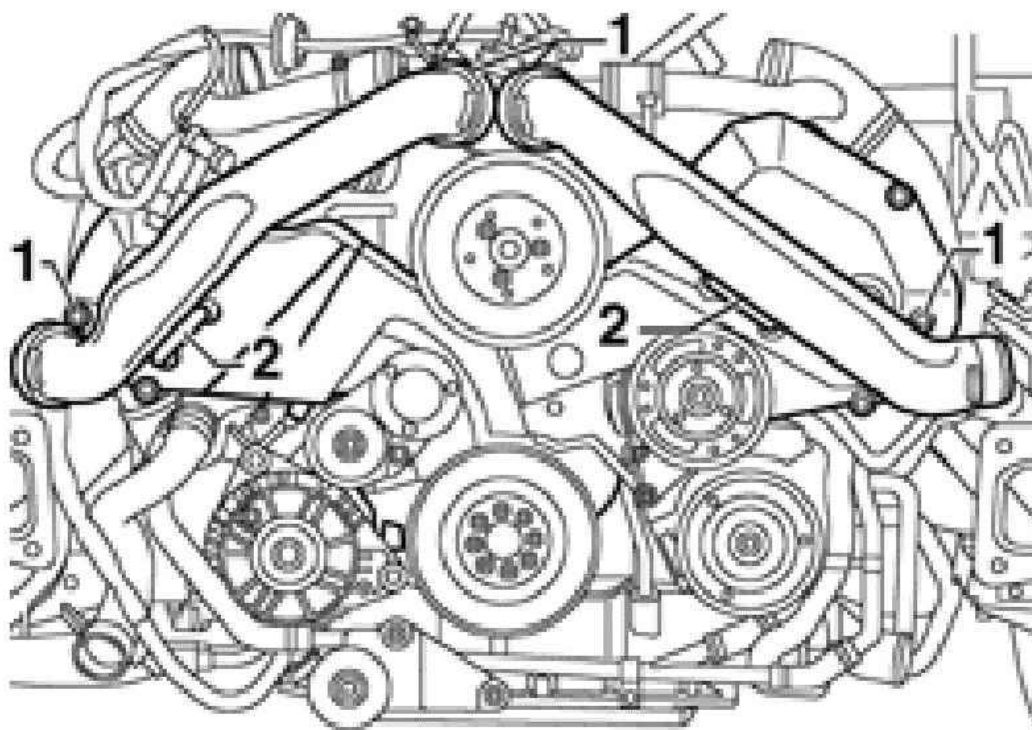


G02725022

Fig. 167: Disconnecting Connector, Crankcase Breather And Temperature Sensor
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure lines -1-.

NOTE: Watch position of retaining strips -2-.

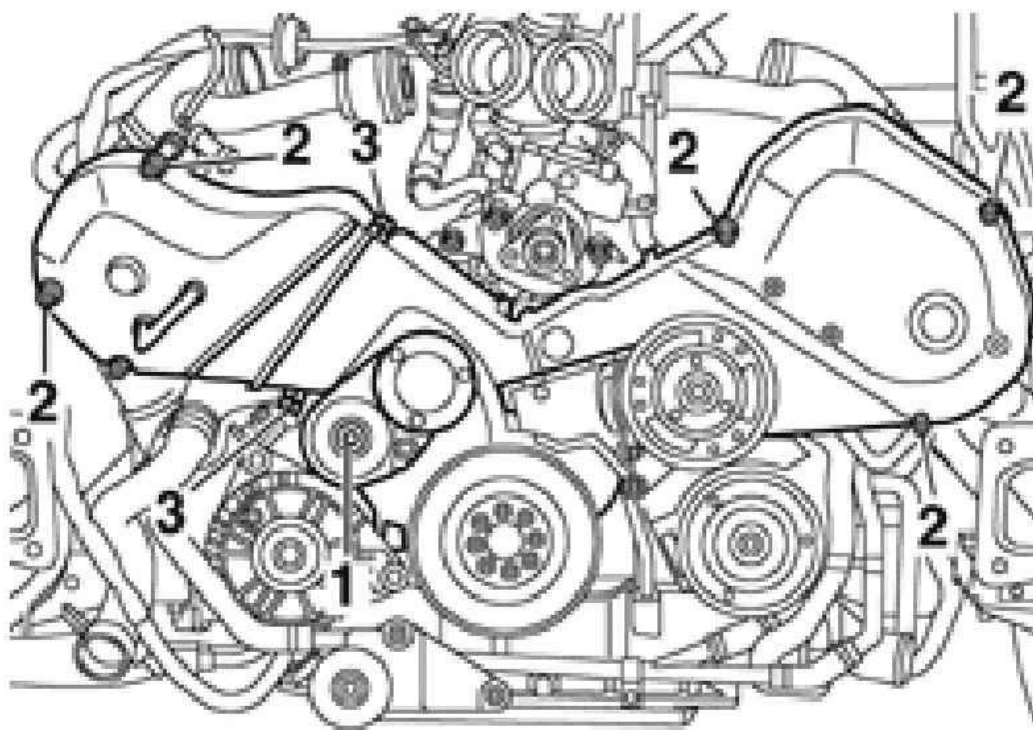


G02725023

Fig. 168: Removing Pressure Lines

Courtesy of AUDI OF AMERICA, INC.

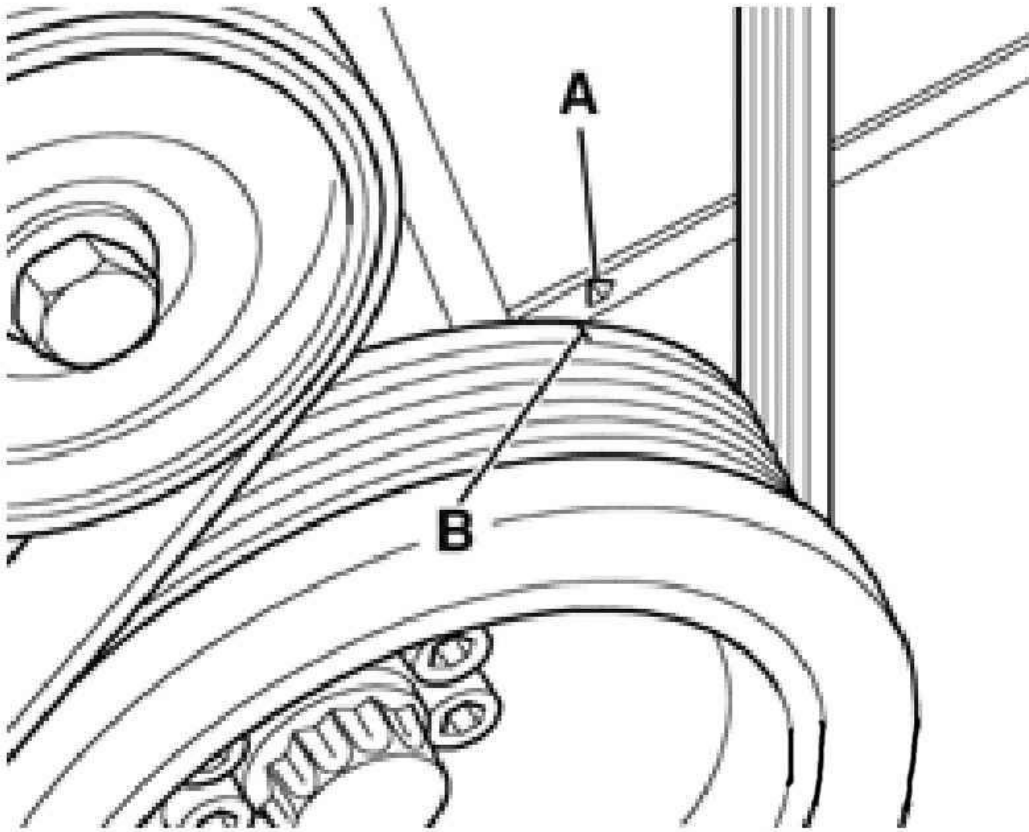
- Remove tensioner -1- for ribbed belt.
- Remove toothed belt guards -2- (left and right).
- Remove toothed belt guard -3- (center).



G02725024

Fig. 169: Removing Ribbed Belt Tensioner And Toothed Belt Guards
Courtesy of AUDI OF AMERICA, INC.

- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

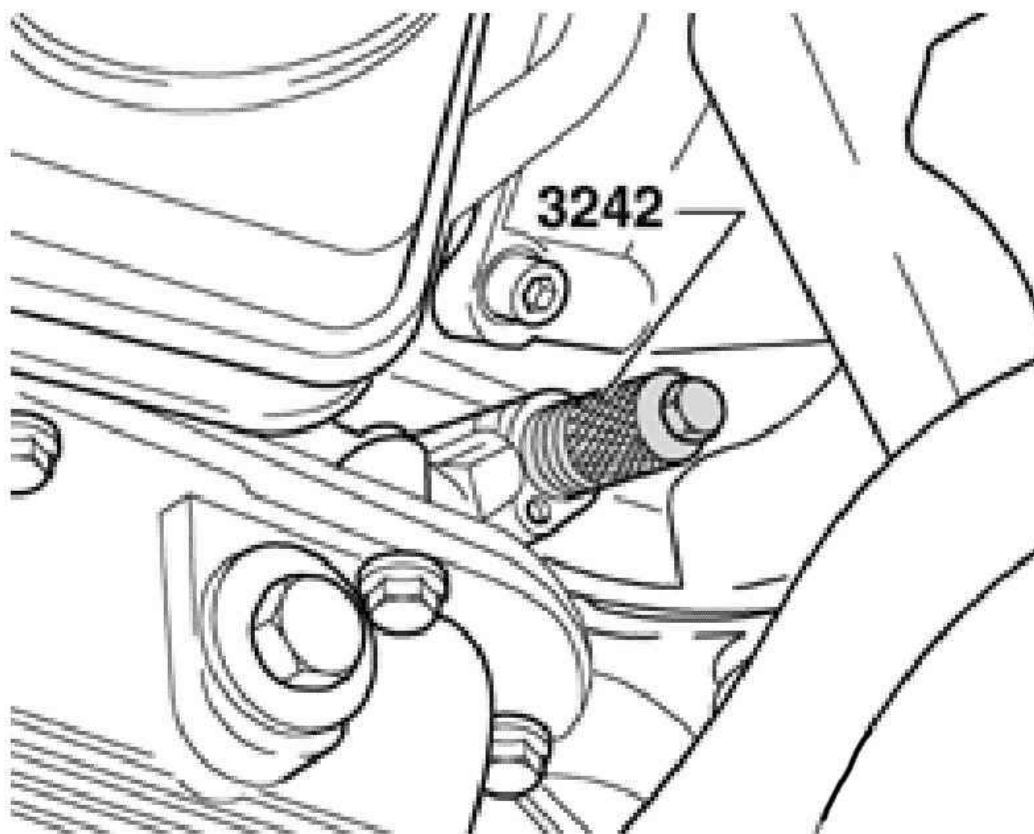


G02725025

Fig. 170: Aligning Match Marks -A- and -B- On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

NOTE: Turn over the engine at the central bolt on the crankshaft.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If not, turn crankshaft one revolution further.
- Remove sealing plug from cylinder block, left.
- TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.
- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.

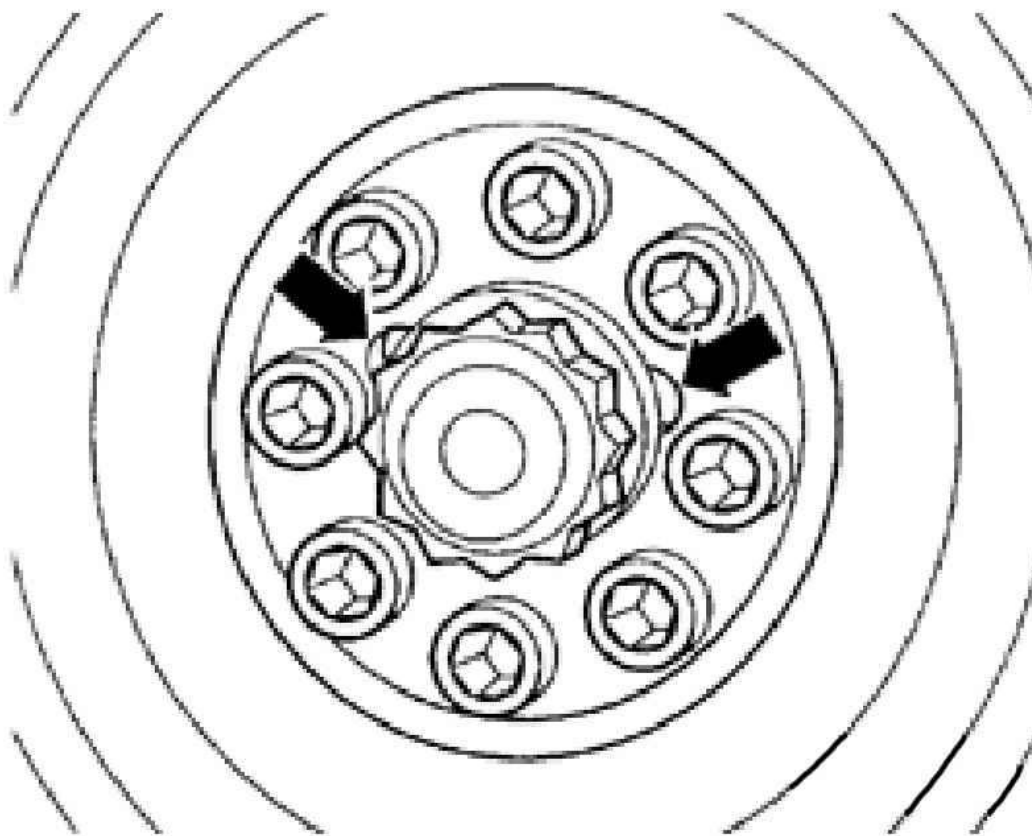


G02725026

Fig. 171: Removing Sealing Plug 3242 From Cylinder Block
Courtesy of AUDI OF AMERICA, INC.

- Remove vibration damper on crankshaft.

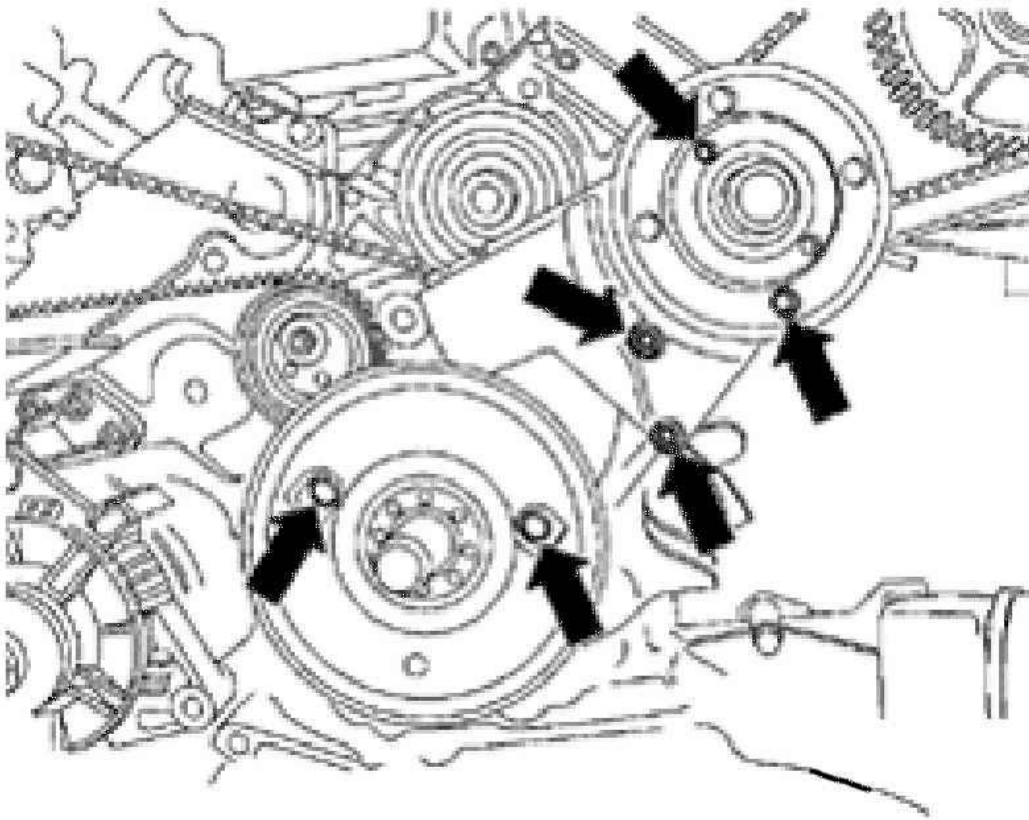
NOTE: **The central bolt does not have to be loosened to remove the vibration damper.**



G02725027

Fig. 172: Removing Vibration Damper On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

- Remove idler wheel for ribbed belt -arrows-.
- Remove toothed belt guard behind vibration damper -arrows-.



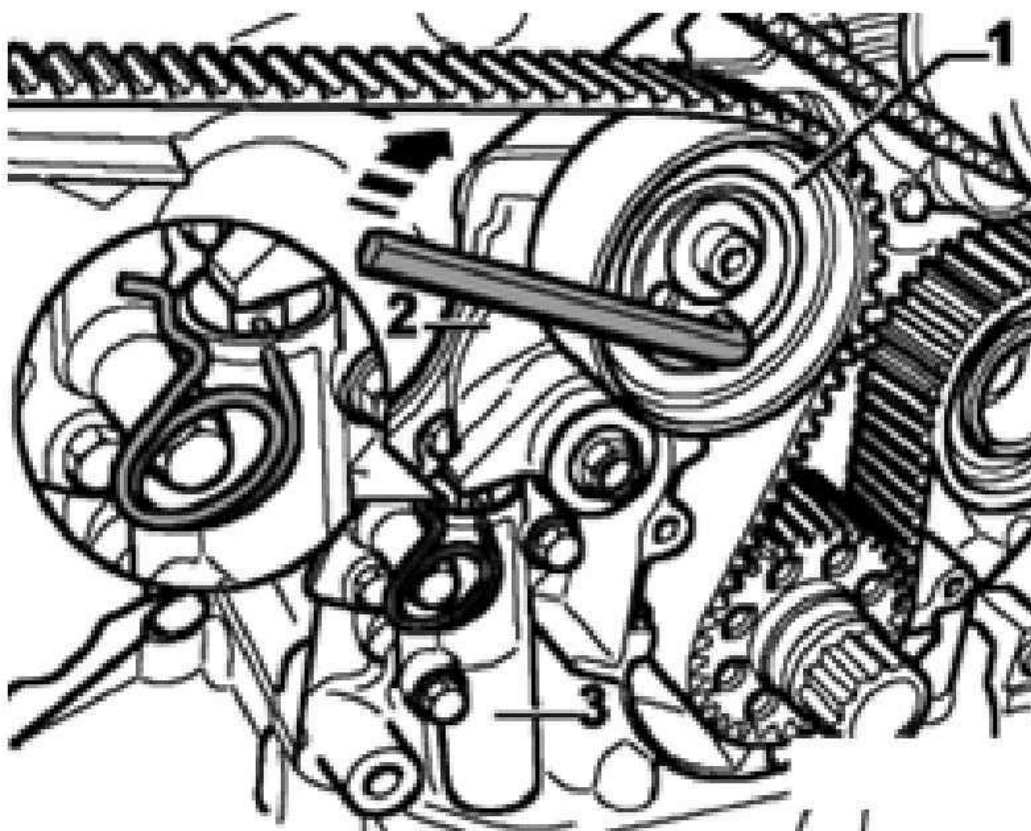
G02725028

Fig. 173: Removing Idler Wheel For Ribbed Belt And Toothed Belt Guard Behind Vibration Damper

Courtesy of AUDI OF AMERICA, INC.

NOTE:

- Mark the direction of rotation of the toothed belt with chalk or felt pen before removing. A used belt can break if it rotates in the wrong direction when reinstalled.
 - The toothed belt tensioning element is oil-damped and can therefore only be compressed slowly by applying constant pressure.
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until tensioning lever -2- compresses tensioning element -3- sufficiently to enable a 2 mm dia. spring pin to be installed in drilling and in plunger.
 - Insert spring pin and release toothed belt tensioning roller.
 - Use spring pin from 2024 A.



G02725029

Fig. 174: Compressing Toothed Belt Tensioning Roller
 Courtesy of AUDI OF AMERICA, INC.

- Insert camshaft clamp 3391 in securing plates of two camshafts.
- Loosen both camshaft bolts and remove approx. 5 turns.
- Take out camshaft clamp 3391.
- Disconnect both camshaft sprockets with special tool T40001.

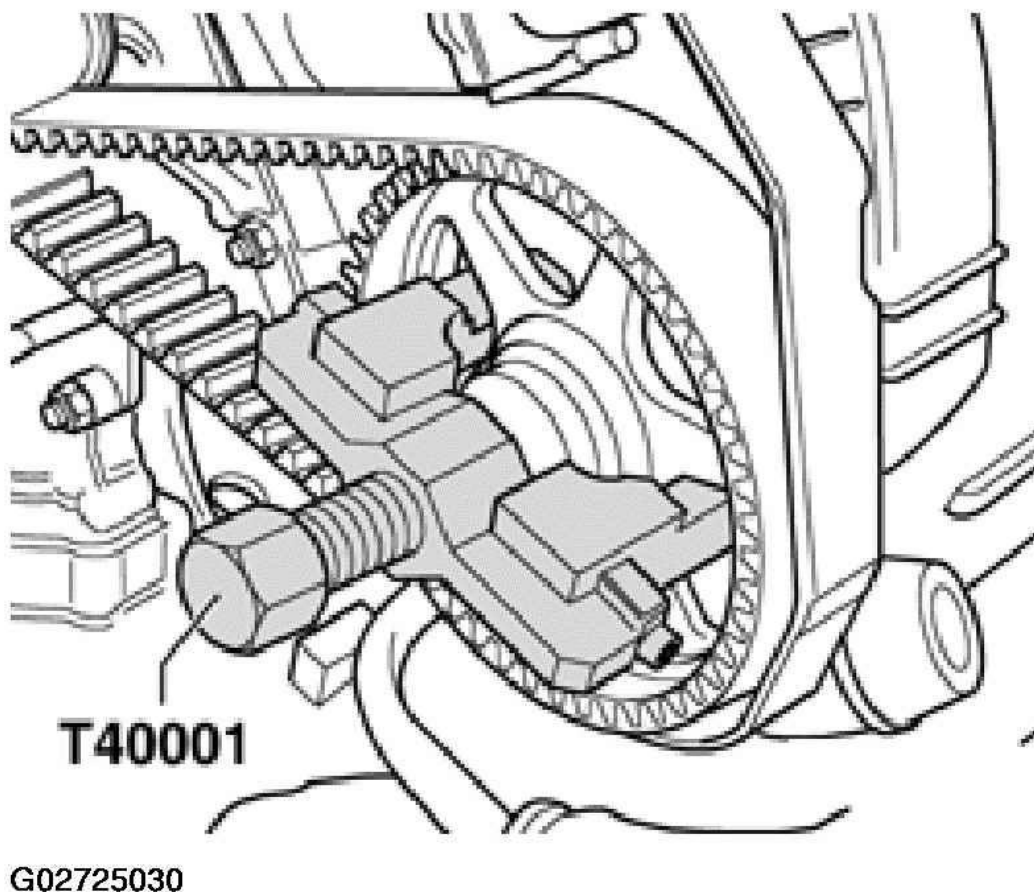
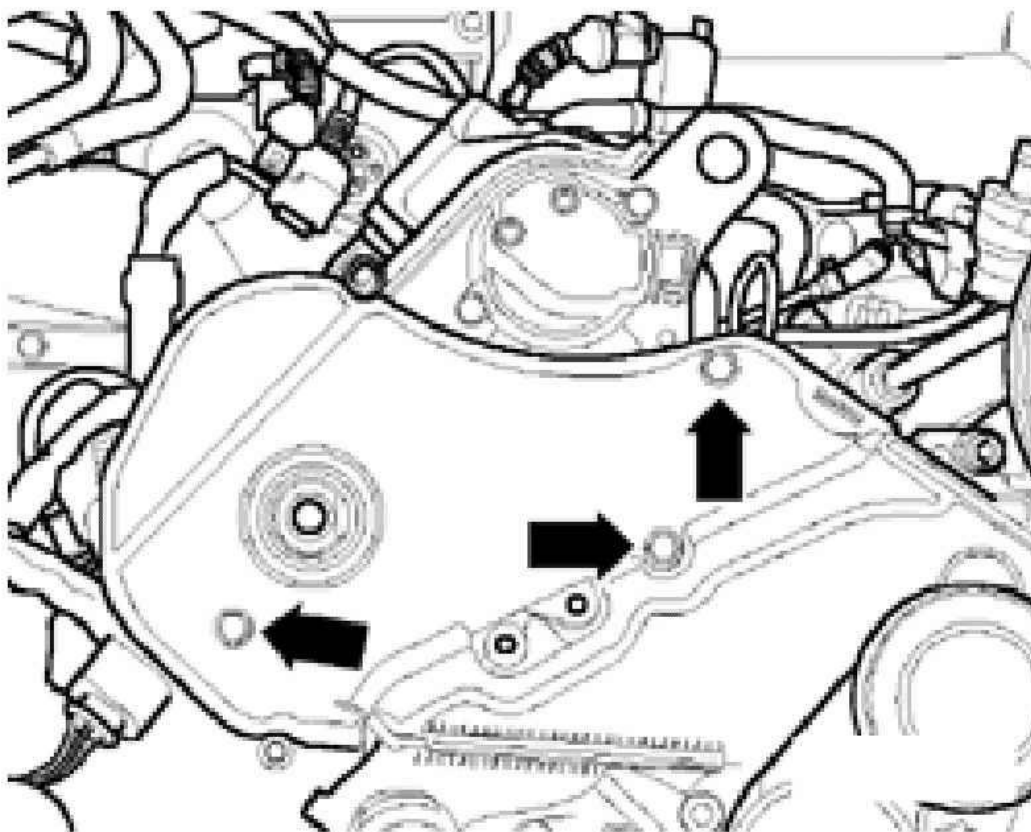


Fig. 175: Disconnecting Camshaft Sprockets
Courtesy of AUDI OF AMERICA, INC.

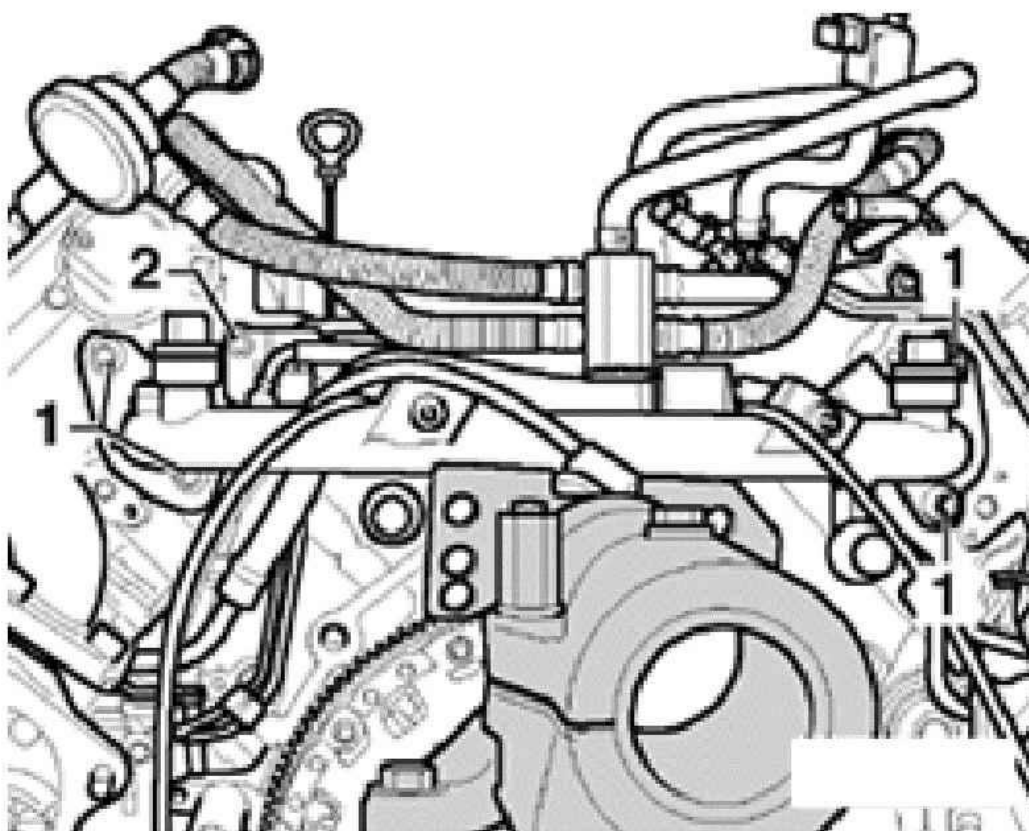
- Unbolt rear right toothed belt guard -arrows-.
- Detach intake manifold using special tool 3249.



G02725031

Fig. 176: Removing Rear Right Toothed Belt Guard
Courtesy of AUDI OF AMERICA, INC.

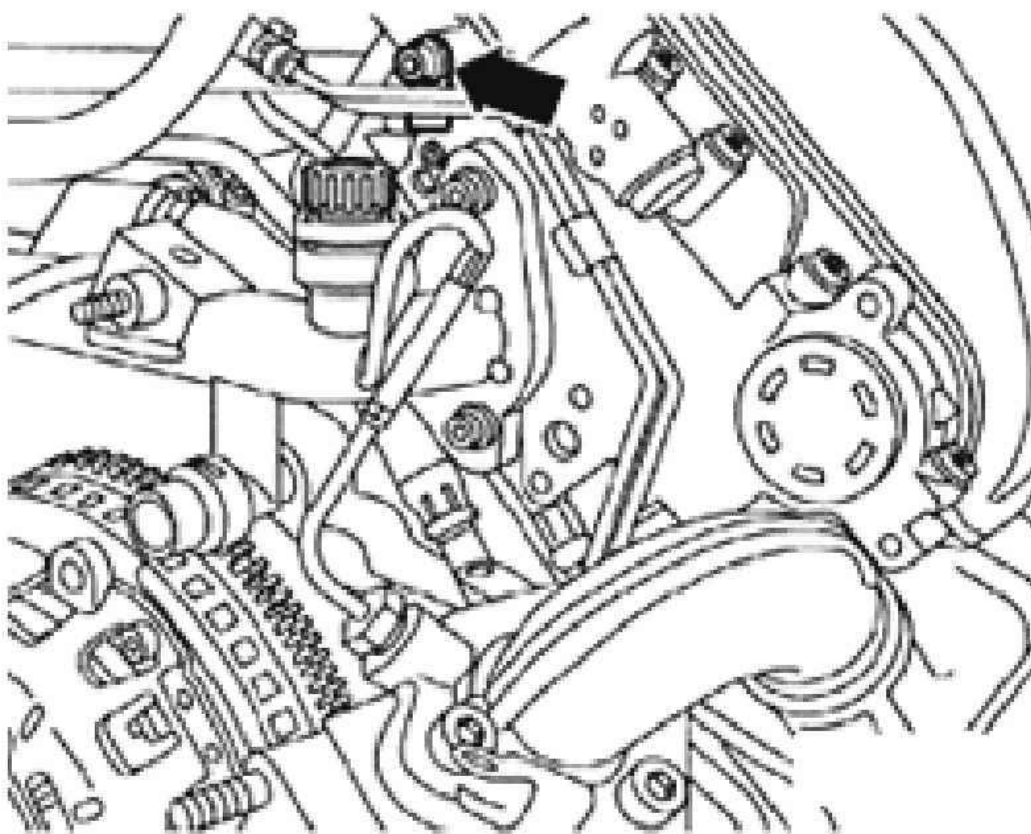
- Unbolt water line -1- and disconnect toward rear.



G02725032

Fig. 177: Unbolting Water Line
Courtesy of AUDI OF AMERICA, INC.

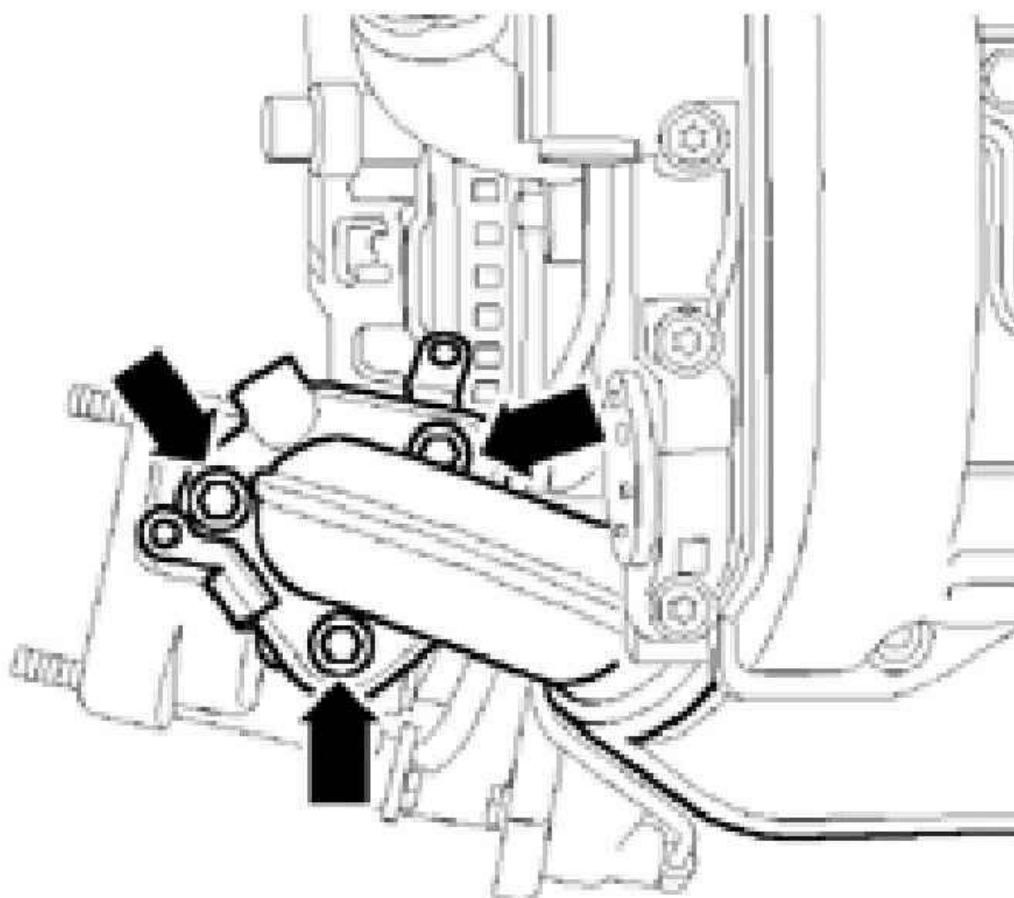
- Detach line -arrow- from cylinder head.



G02725033

Fig. 178: Disconnecting Line From Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

- Remove turbocharger -arrows-.

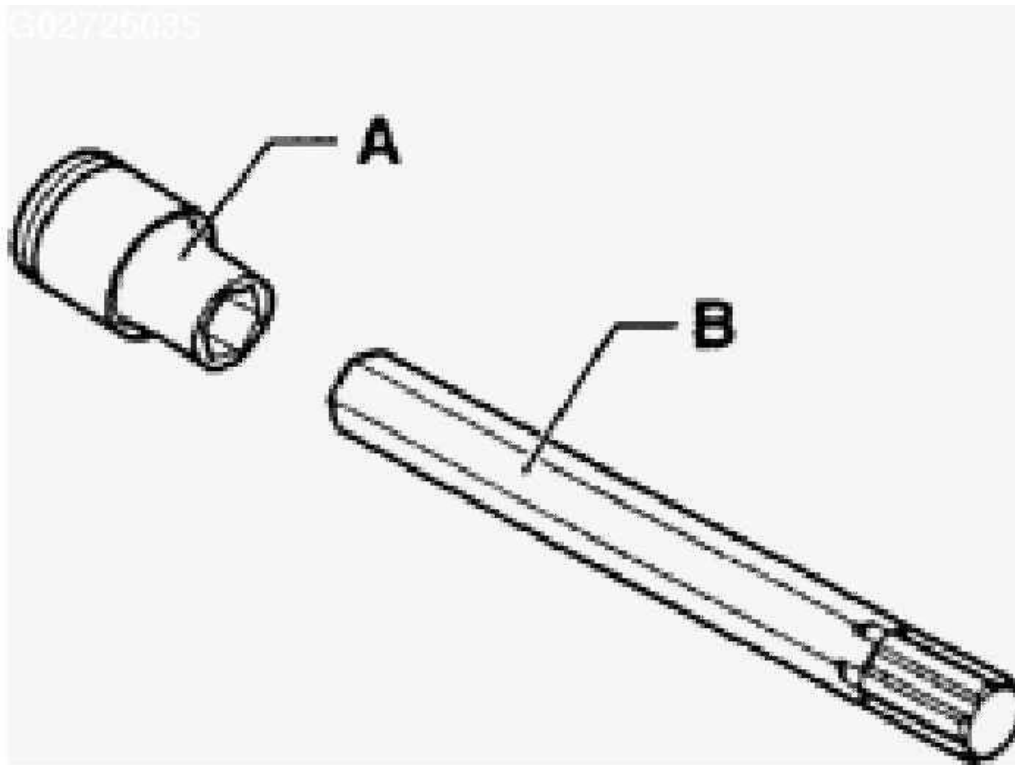


G02725034

Fig. 179: Removing Turbocharger
Courtesy of AUDI OF AMERICA, INC.

- Unbolt cylinder head cover.
- Loosen and remove cylinder head bolts in opposite sequence to tightening sequence using special tool 3452 (Polidrive).
- Carefully lift off cylinder head.

NOTE: Use special tool 3452 together with a normal commercial 10 mm socket when removing and installing.



G02725035

Fig. 180: Identifying Special Tool
Courtesy of AUDI OF AMERICA, INC.

Installing

NOTE:

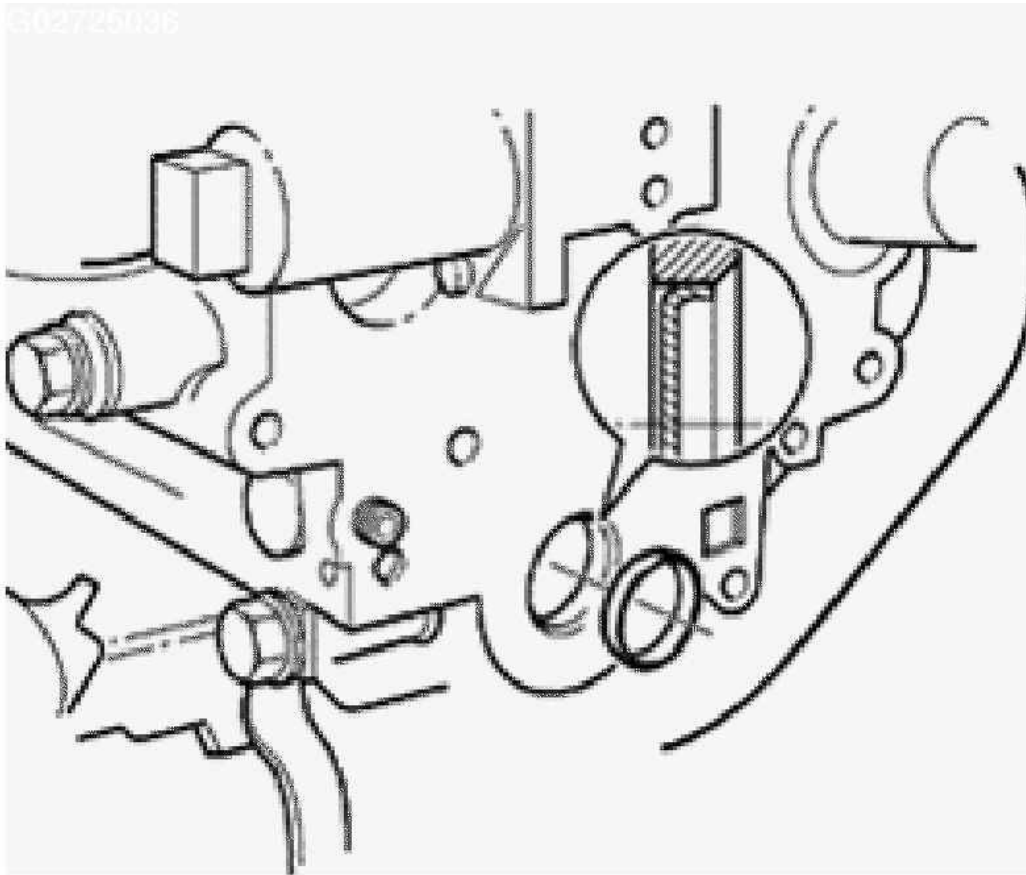
- Do not allow any oil or coolant to remain in the blind holes for the cylinder head bolts in the cylinder block.
- Install **NEW** cylinder head bolts.
- Connecting vacuum hoses. See VACUUM DIAGRAM - COMPLETE.

When installing a new cylinder head:

- Screw in centering pin for intake manifold.

The cylinder head supplied as a replacement part can be used on both sides (left or right). But a sealing cap (core plug) must be installed in the front end of the cylinder head in each case.

- Coat outside circumference of sealing cap (core plug) sealant AMV 188 001 02.
- Using drift VW 295, knock in sealing cap (core plug) until outside rim is flush with end of chamfer in cylinder head.



G02725036

Fig. 181: Locating Core Plug In Cylinder Head

Courtesy of AUDI OF AMERICA, INC.

- Before installing cylinder head in position, turn crankshaft and camshafts to TDC of No. 3 cylinder.
- Install cylinder head gasket on dowel sleeves. Marking "oben" (top) or part number must face towards cylinder head.
- Install cylinder head, insert cylinder head bolts and tighten finger-tight.
- Tighten NEW cylinder head bolts in two stages in sequence (**Fig. 182**), as follows:
 - Stage 1 = 60 Nm.
 - Stage 2 = turn a further 1/2 turn (180°) with a box wrench (turning 2 x 90° is also permissible).

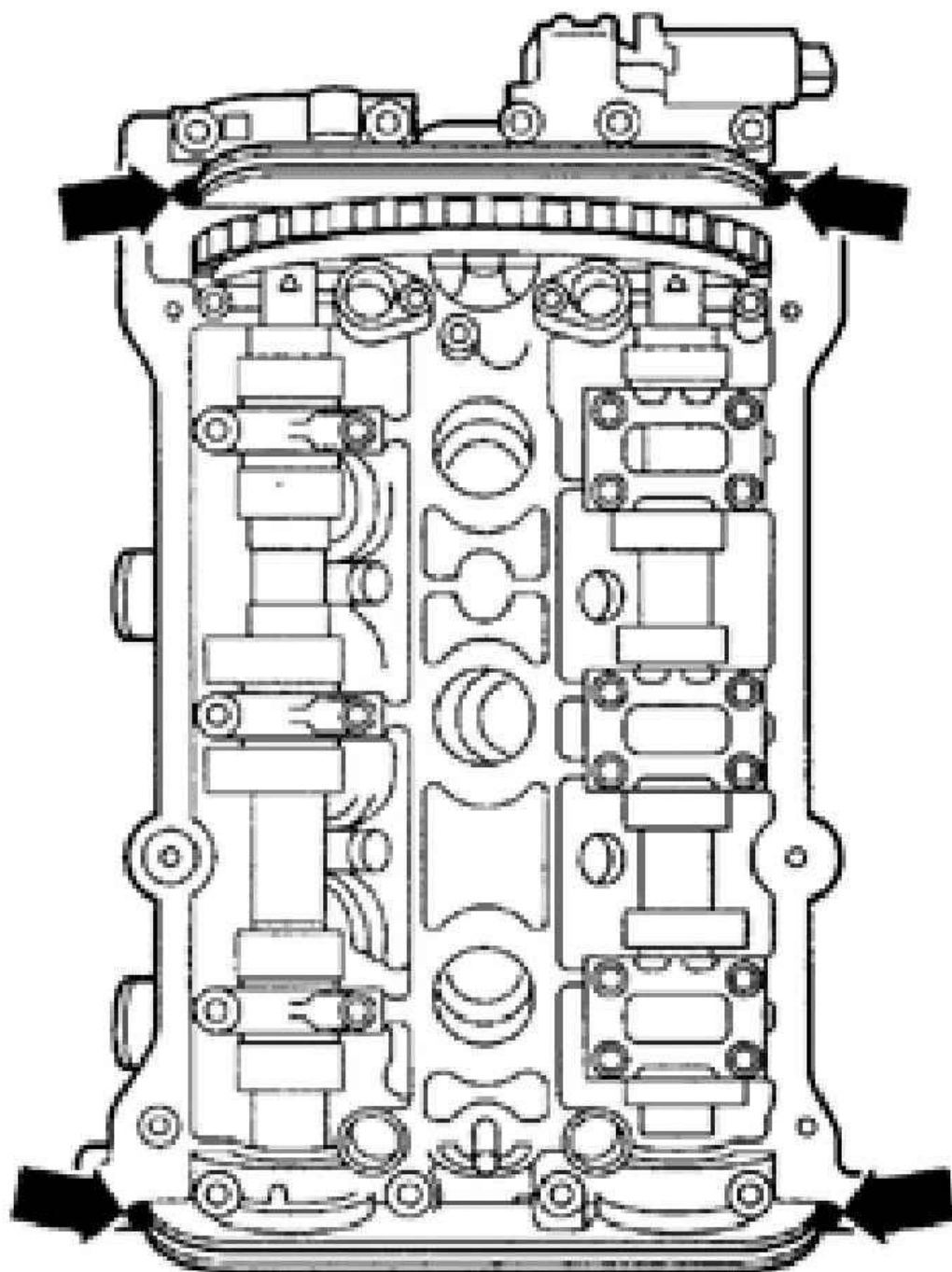


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Fig. 182: Identifying Right Cylinder Head Bolt Tightening Sequence
Courtesy of AUDI OF AMERICA, INC.

It is not necessary to torque down cylinder head bolts again after repairs have been completed.

- Seal end points of joints between bearing caps and cylinder head.
- Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02725038

Fig. 183: Identifying Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

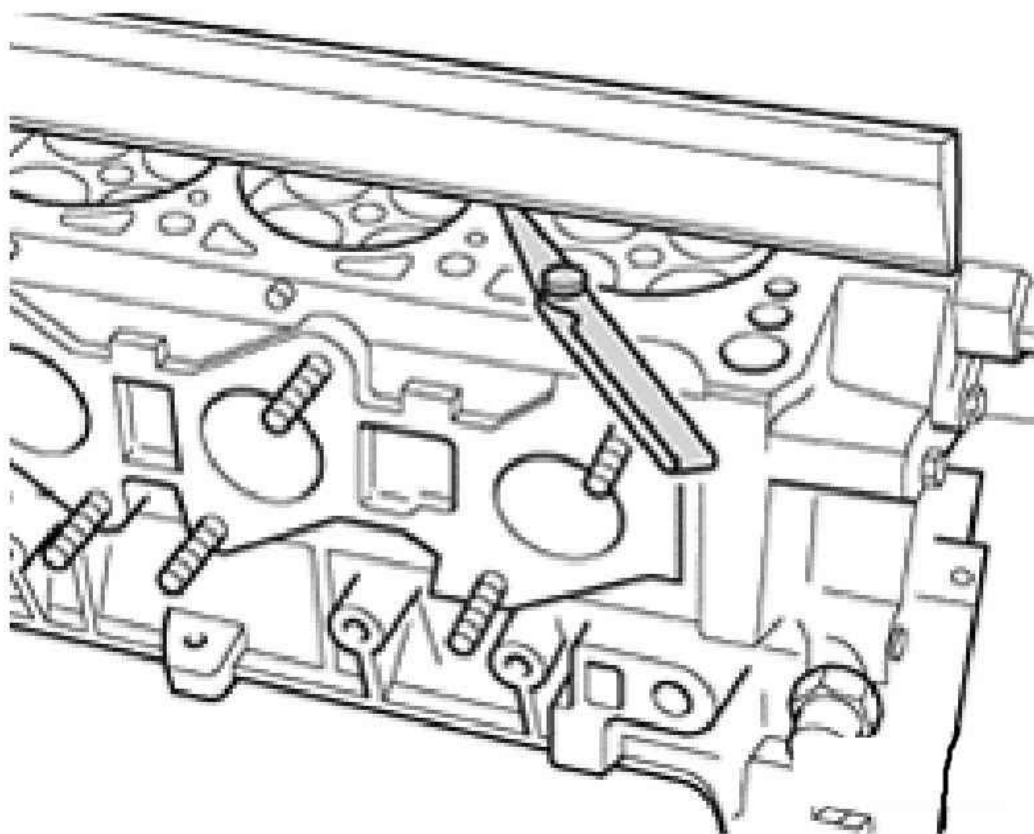
Tightening torques

TIGHTENING TORQUES: RIGHT CYLINDER HEAD

Component	Nm
Bolts - M6	10
Bolts - M8	20
Camshaft bearing caps and camshaft adjuster	10
Exhaust manifold to cylinder head	25
Front exhaust pipe to exhaust manifold	25
Oxygen sensor	50
Spark plugs	25
Toothed belt sprocket to camshaft	55
Intake manifold to cylinder head	10
Cylinder head cover	10

Cylinder head, checking for distortion

- Measure at several points with straightedge.
 - Maximum permissible distortion: 0.1 mm.

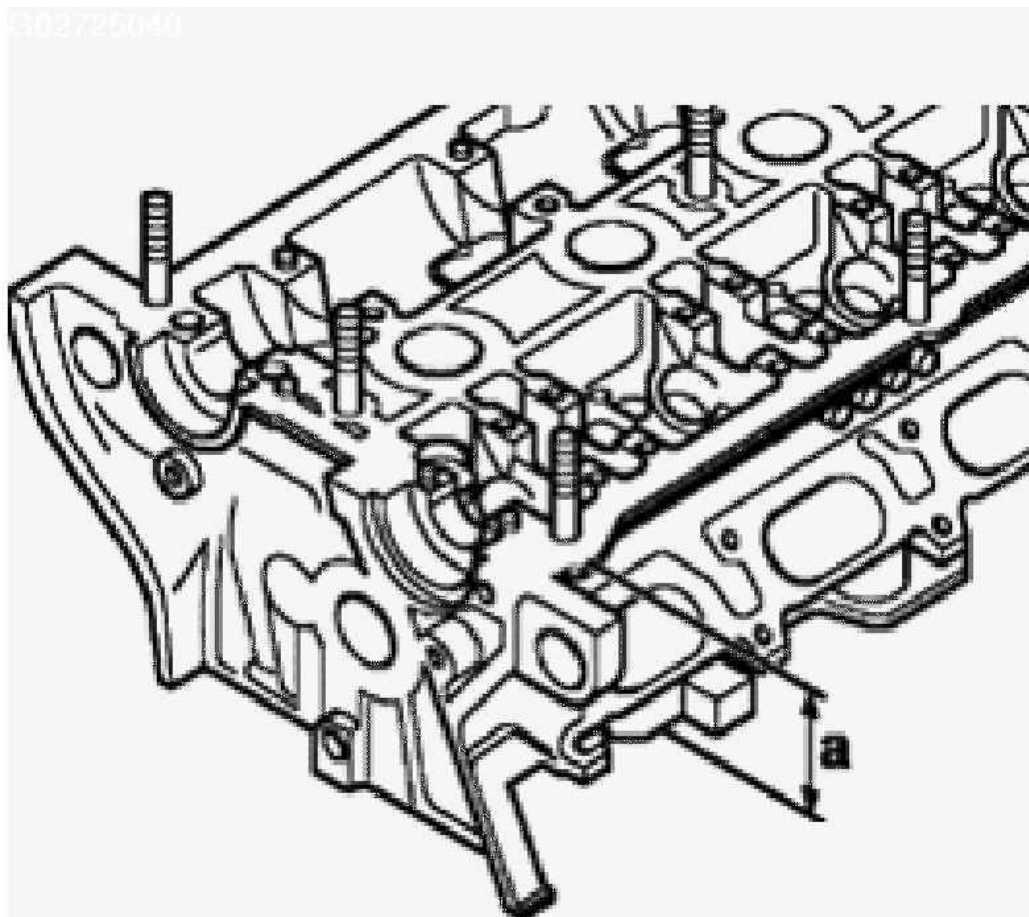


G02725039

Fig. 184: Measuring Cylinder Head Flatness (Distortion)
Courtesy of AUDI OF AMERICA, INC.

Cylinder head, reworking

- Reworking the cylinder head (skimming) is only permissible down to a minimum dimension of $\varnothing 139.25$ mm.



G02725040

Fig. 185: Identifying Cylinder Head (Skimming) Minimum Dimensions
Courtesy of AUDI OF AMERICA, INC.

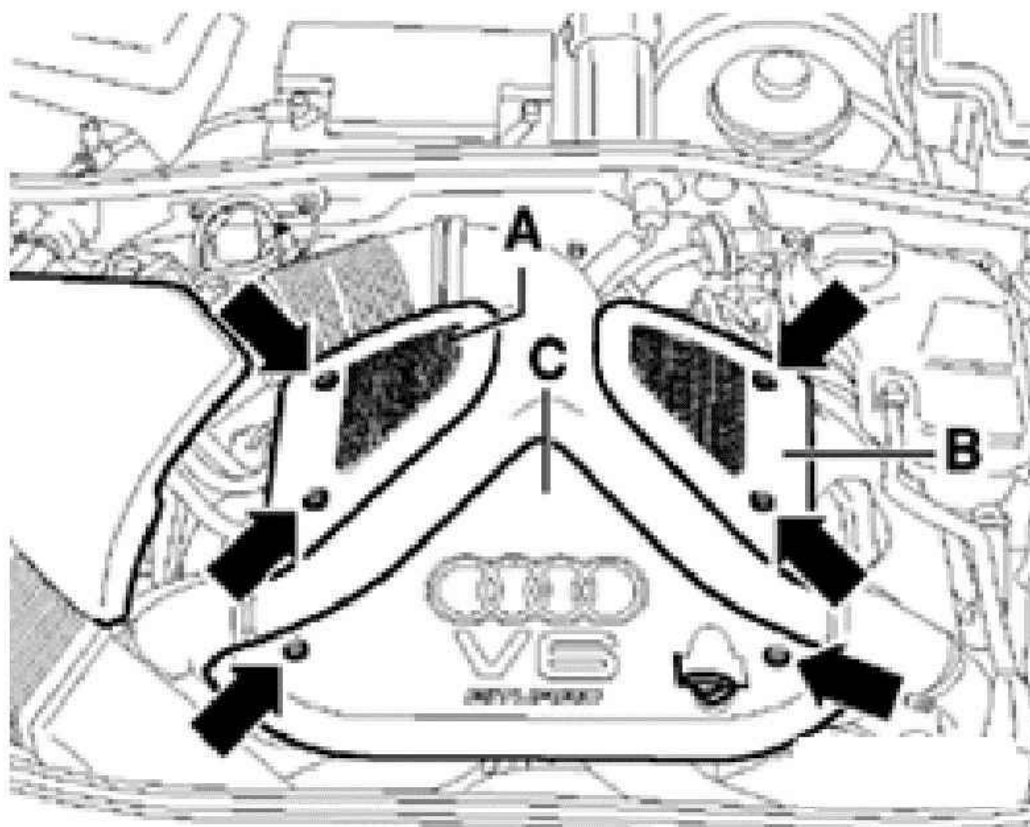
Compression, checking

Test requirements

- Engine oil temperature at least 30°C.
- Battery fully charged.

Procedure

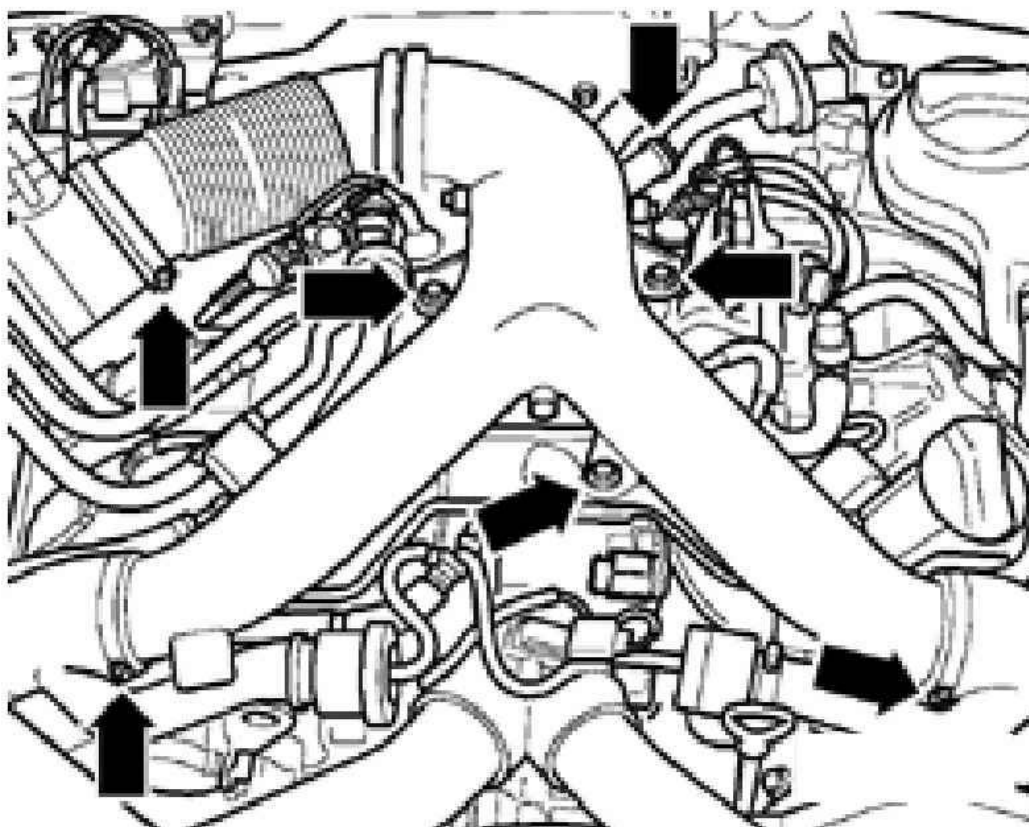
- Remove bolts -arrows- and remove engine cover panels A To C.



G02725041

Fig. 186: Removing Engine Cover Panels
Courtesy of AUDI OF AMERICA, INC.

- Remove air duct -arrows-.



G02725042

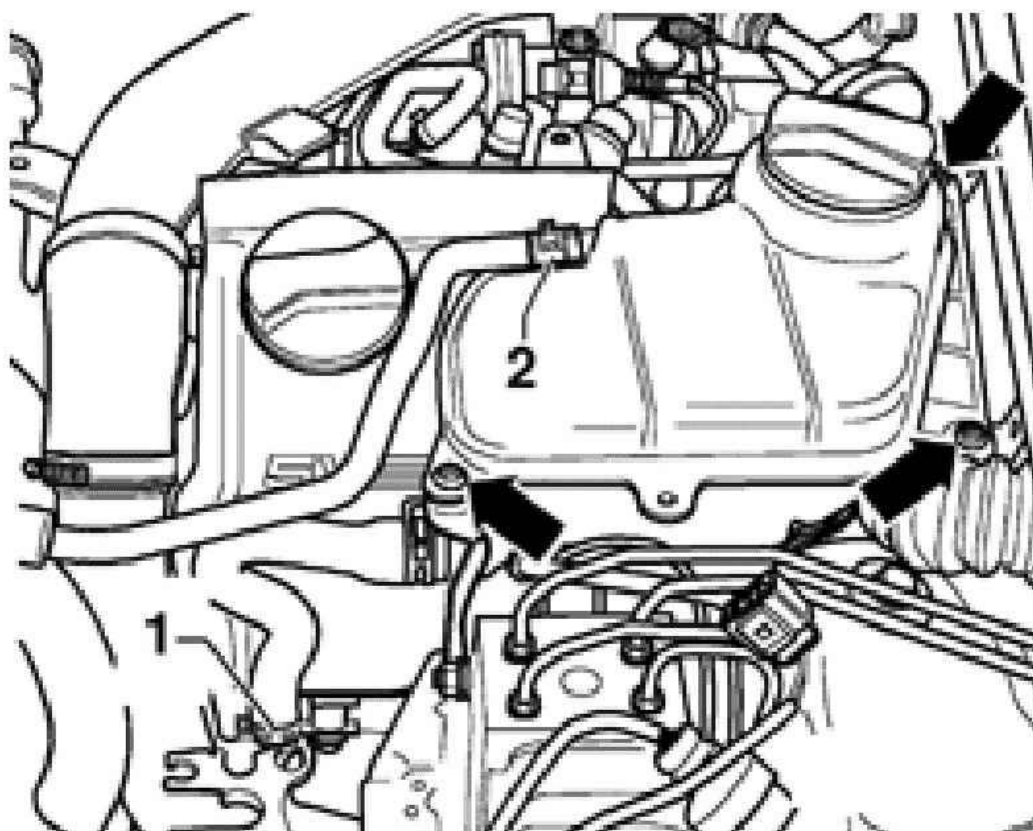
Fig. 187: Removing Air Duct

Courtesy of AUDI OF AMERICA, INC.

- Remove coolant reservoir -arrows- and move it clear to side.

NOTE: Leave coolant hoses connected.

- Disconnect connector from coolant level monitor.
- Remove cover panel from cylinder head cover (cylinder bank 4-6).



G02725043

Fig. 188: Removing Coolant Reservoir
Courtesy of AUDI OF AMERICA, INC.

- Release hose clamp -arrow-. See **Fig. 189**.
- Remove intake line -1-.
- Disconnect hose -2-.
- Detach water line -3-.

NOTE: Plug lower section of intake line.

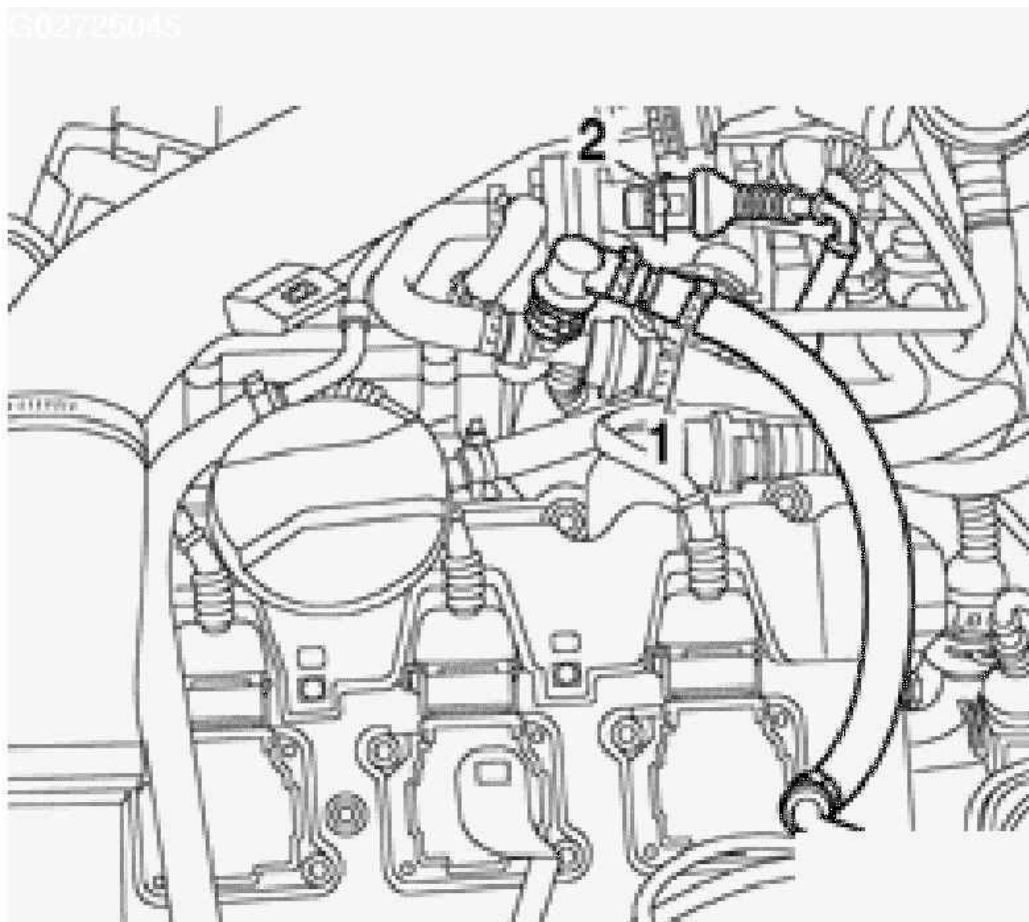


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Fig. 189: Removing Hose Clamp And Intake Line
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1-.

WARNING: Fuel system is under pressure. Before opening the system, place a cloth around the connection. Then release pressure by carefully loosening the connection.



G02725045

Fig. 190: Disconnecting Hose

Courtesy of AUDI OF AMERICA, INC.

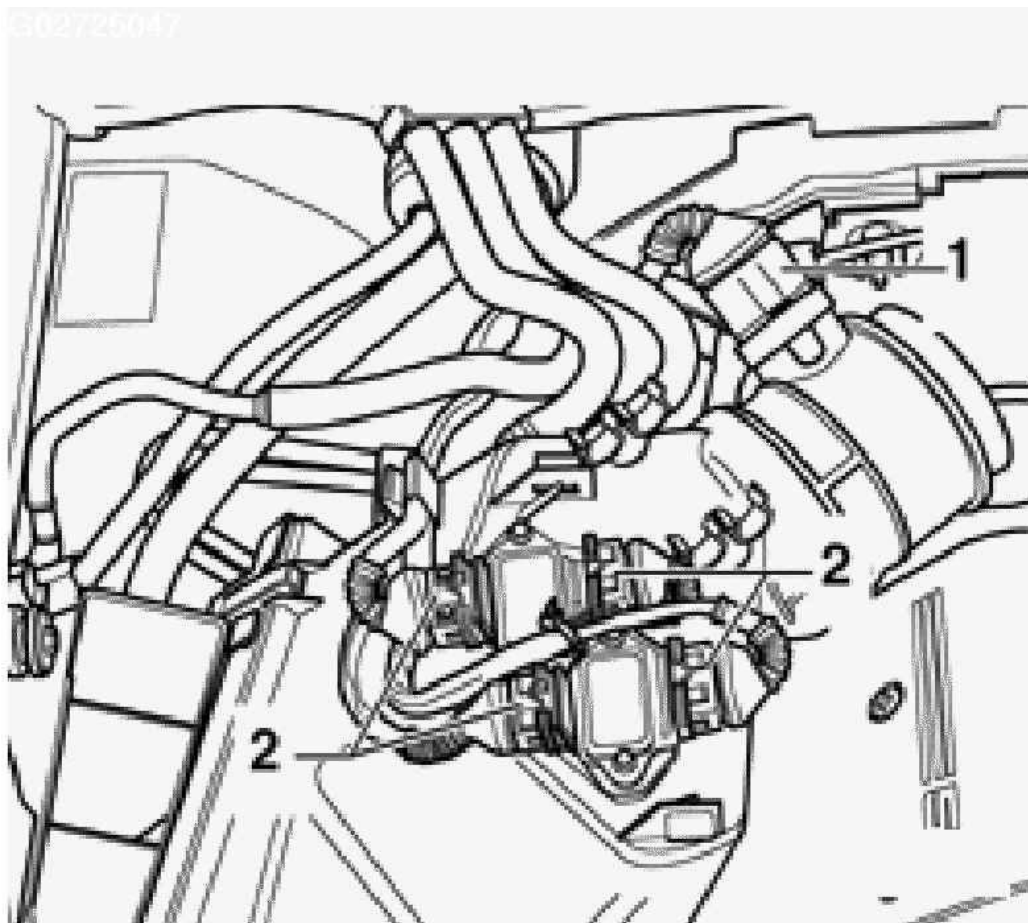
- Disconnect fuel supply line and fuel return line -1- and -2-, and move fuel lines clear.
- Disconnect hose from EVAP valve -3-.



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Fig. 191: Disconnecting Fuel Supply/Return Lines And EVAP Valve
Courtesy of AUDI OF AMERICA, INC.

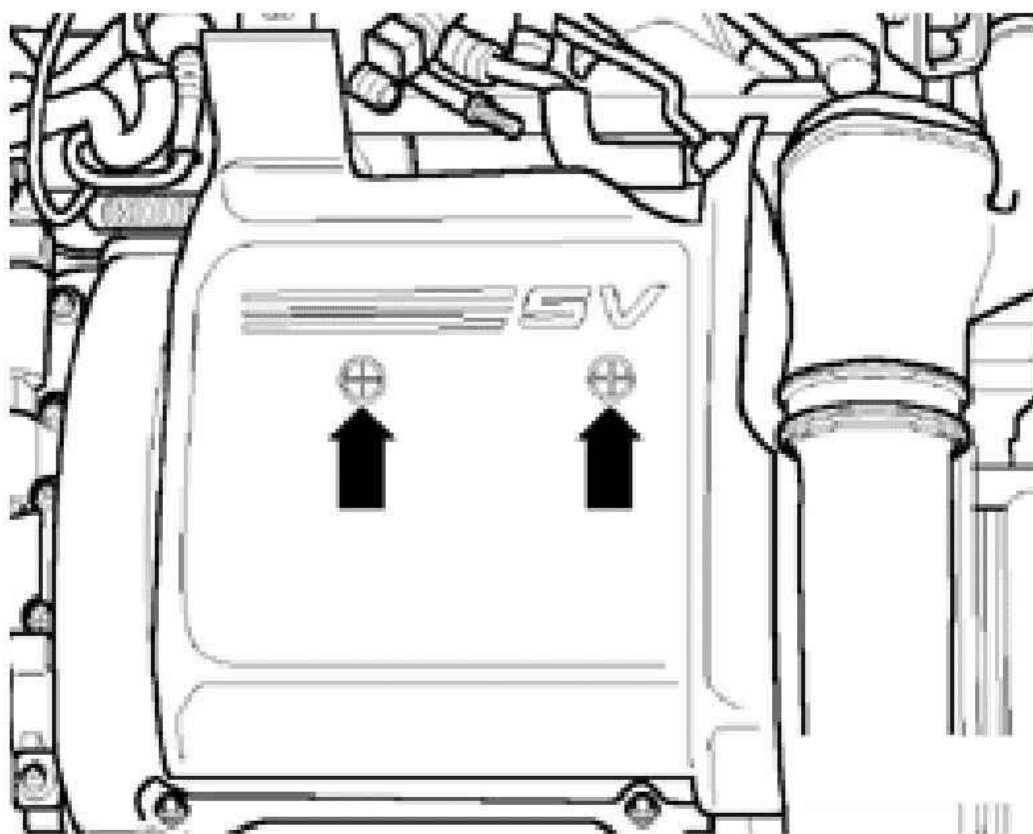
- Disconnect connector -1- from mass air flow (MAF) sensor.
- Disconnect connectors -2- from ignition output stages, and move wiring clear.
- Remove air cleaner.



G02725047

Fig. 192: Disconnecting Connectors From MAF Sensor And Ignition Coil Output Stages
Courtesy of AUDI OF AMERICA, INC.

- Remove cover panel from right-hand cylinder head cover -arrows-.



G02725048

Fig. 193: Removing Cover Panel From Right-Hand Cylinder Head Cover
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1-. See **Fig. 194**.
- Disconnect hose -2-.
- Detach upper section of pressure line -3-.



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Fig. 194: Disconnecting Hose And Detaching Upper Section Of Pressure Line
Courtesy of AUDI OF AMERICA, INC.

NOTE: Plug lower section of pressure line.

- Disconnect crankcase breathers from cylinder head covers.
- Disconnect plug connectors from ignition coils.
- Remove ignition coils.
- Remove spark plugs.
- Disconnect connectors from all 6 injectors.
- Remove fuse No. 28 (for fuel pump).
- Disconnect 5-pin connector at power output stage of ignition coils.
- Use compression tester VAG 1381 or VAG 1763.
- Open throttle fully.
- Operate starter until pressure reading on tester no longer rises.

Compression pressure values

ENGINE COMPRESSION PRESSURE VALUES

New	Wear limit	Max. permissible difference between cylinders
9-13 bar	7 bar	3 bar

Installing

Install in reverse sequence; note the following points.

- Install fuse No. 28 (for fuel pump).
- Erase Diagnostic Trouble Code (DTC) memory.

NOTE: DTCs will have been stored in the memory because the connector to the Hall sensor has been disconnected. Therefore check and erase the DTC memory after the test.

Tightening torques

TIGHTENING TORQUES: IGNITION COILS & SPARK PLUGS

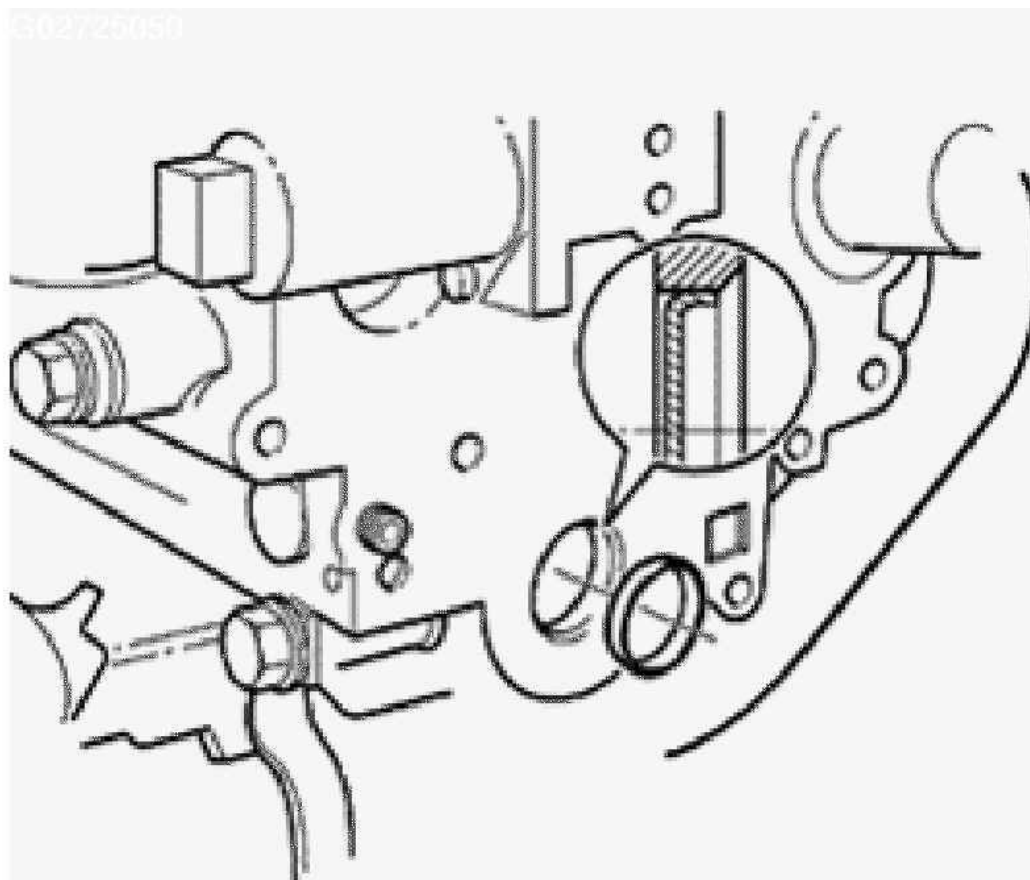
Component	Nm
Ignition coils to cylinder head	10
Spark plugs in cylinder head	30

Sealing cap (core plug) in cylinder head, installing

The cylinder head supplied as a replacement part can be used on both sides (left or right). But a sealing cap (core plug) must be installed in the front end of the cylinder head in each case.

- Coat outside circumference of sealing cap (core plug) with sealant AMV 188 001 02.
- Using drift VW 295, knock in sealing cap (core plug) until outside rim is flush with end of chamfer in

cylinder head.



G02725050

Fig. 195: Locating Core Plug In Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

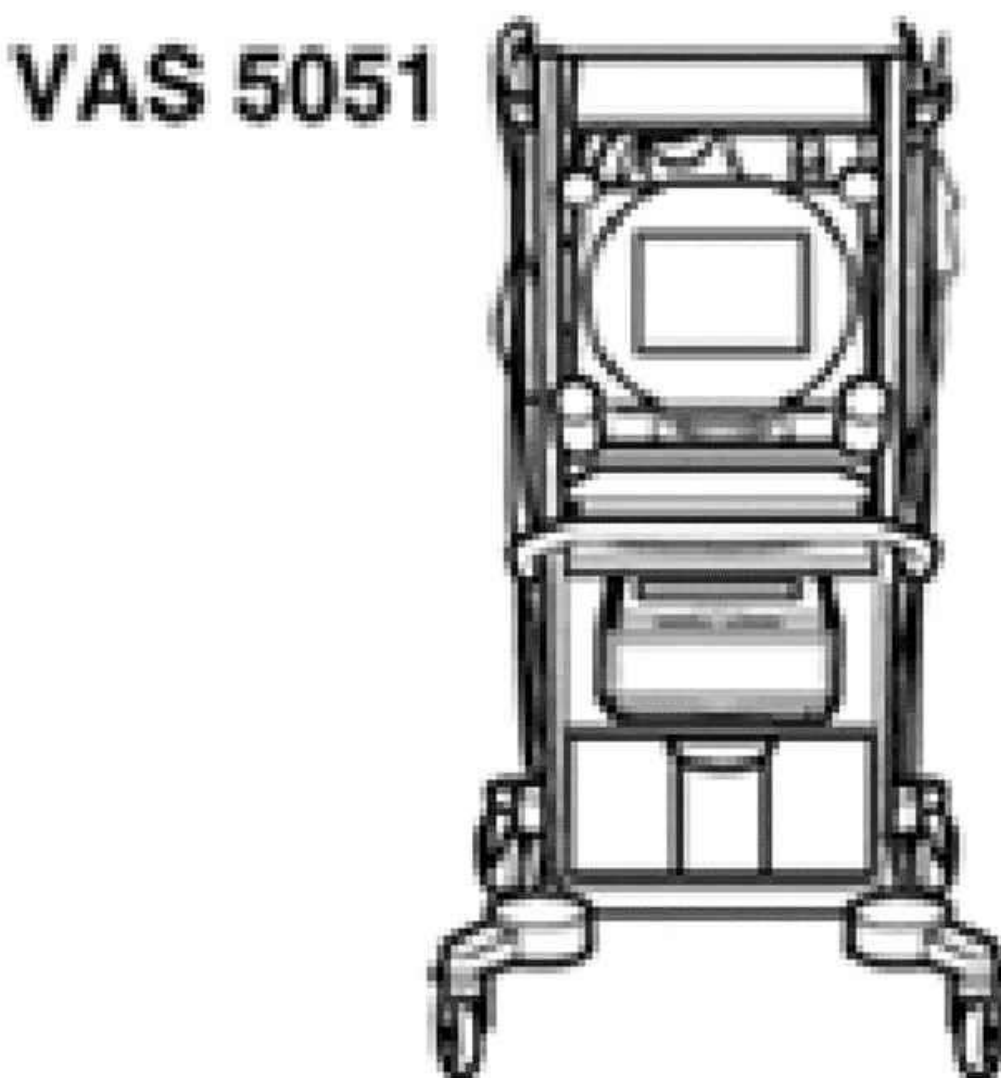
Camshaft adjustment function, checking

Special tools and equipment

- VAS 5051 with VAG 5051/1
- or
- VAG 1551 with VAG 1551/3A

Test requirement

- Coolant Temperature at least 80°C.



G02725051

Fig. 196: Identifying Special Service Tool
Courtesy of AUDI OF AMERICA, INC.

WARNING:

- During a road test in an airbag-equipped vehicle, test equipment must always be fastened to and operated from the rear seat by a second technician.
- When driving or riding in an airbag-equipped vehicle, **NEVER** hold the scan tool or other test equipment in your hands or lap while in

motion. Objects between you and the airbag increase the risk of injury in an accident.

Test sequence

- Connect VAS 5051 tester or VAG 1551 scan tool and select control module for engine electronics using "address word" 01 Engine must run at idle.

See **VEHICLE DIAGNOSTIC, TESTING AND INFORMATION SYSTEM VAS5051 OR VAG1551 SCAN TOOL, CONNECTING AND SELECTING FUNCTIONS** .

When indicated on display

Rapid data transfer

HELP

Select function XX

G02725052

Fig. 197: Identifying Test Sequence Display - Camshaft Adjustment Function, Checking (1 Of 3)
Courtesy of AUDI OF AMERICA, INC.

- Press buttons -0- and -4- to select "Initiate basic setting" and press -Q- button to confirm input.

When indicated on display

Initiate Basic Setting

Q

Input display group number XXX

G02725053

Fig. 198: Identifying Test Sequence Display - Camshaft Adjustment Function, Checking (2 Of 3)
 Courtesy of AUDI OF AMERICA, INC.

- Press buttons -0-, -9- and -4- to select "display group number 094" and press -Q- button to confirm input.

When indicated on display

System in Basic Setting 94



1

2

3

4

G02725054

Fig. 199: Identifying Test Sequence Display - Camshaft Adjustment Function, Checking (3 Of 3)
 Courtesy of AUDI OF AMERICA, INC.

- Camshaft adjustment is checked for function.
- Increase engine speed to above 2000 RPM.

	Display fields			
	1	2	3	4
Display group 94: Function of camshaft adjustment				
Display	RPM	Text	Text	Text
Indicated	Engine speed (RPM)	Camshaft adjustment	Test result, Bank 1	Test result, Bank 2
Specified value	>2000	Cs-CM. ON	Test ON Sys. OK	Test ON Sys. OK
Note:				

G02725055

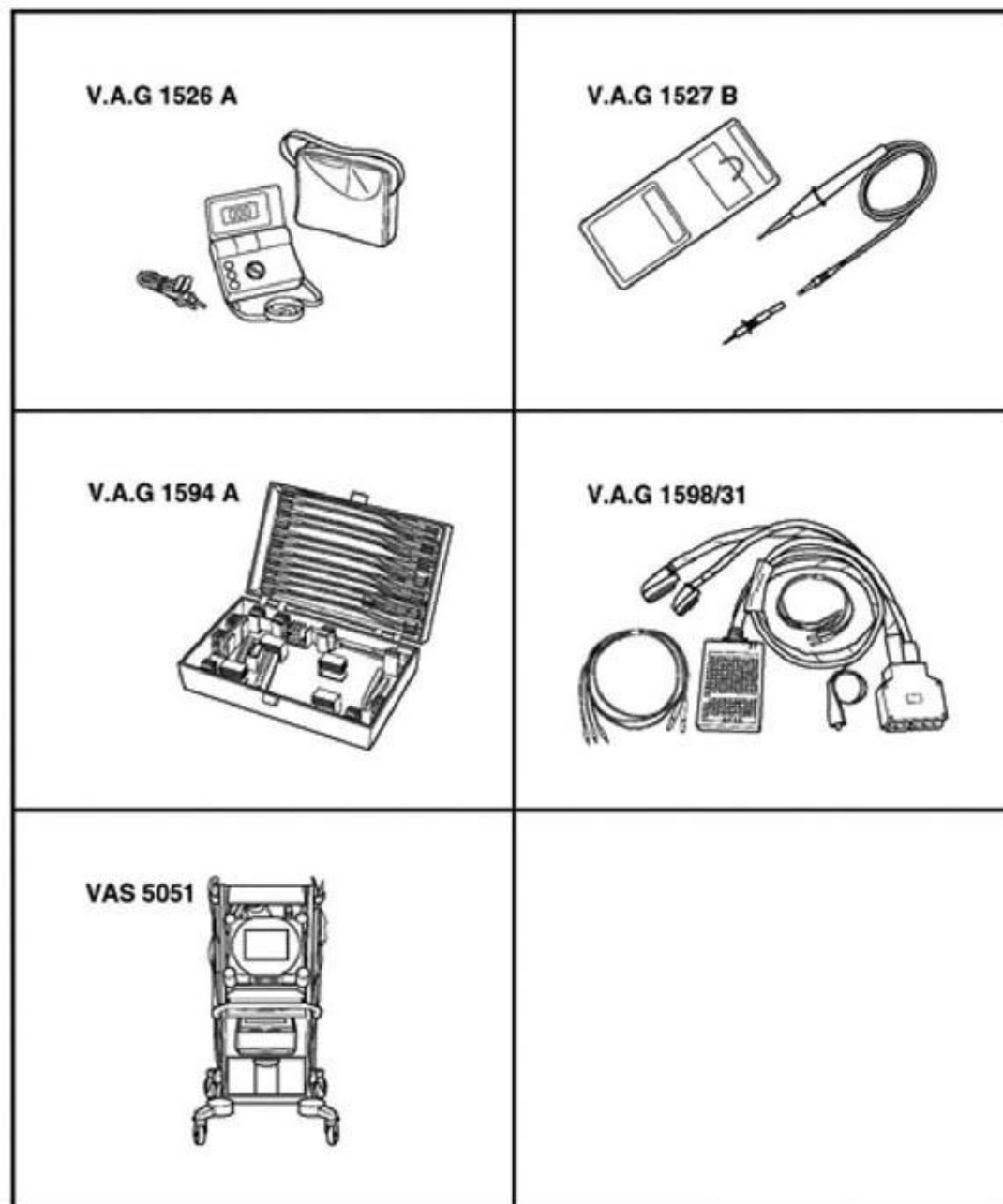
Fig. 200: Display Group 94: Function Of Camshaft Adjustment
 Courtesy of AUDI OF AMERICA, INC.

If "not OK" is indicated in display field 3 and/or 4:

- Check solenoid valve for camshaft adjustment.

Solenoid valve for camshaft adjustment, checking**Special tools and equipment**

- VAG 1526A
- VAG 1527B
- VAG 1594A
- VAG 1598/31
- VAS 5051
- or
- VAG 1551 with VAG 1551/3A



G02725056

Fig. 201: Identifying Special Service Tool
Courtesy of AUDI OF AMERICA, INC.

Checking

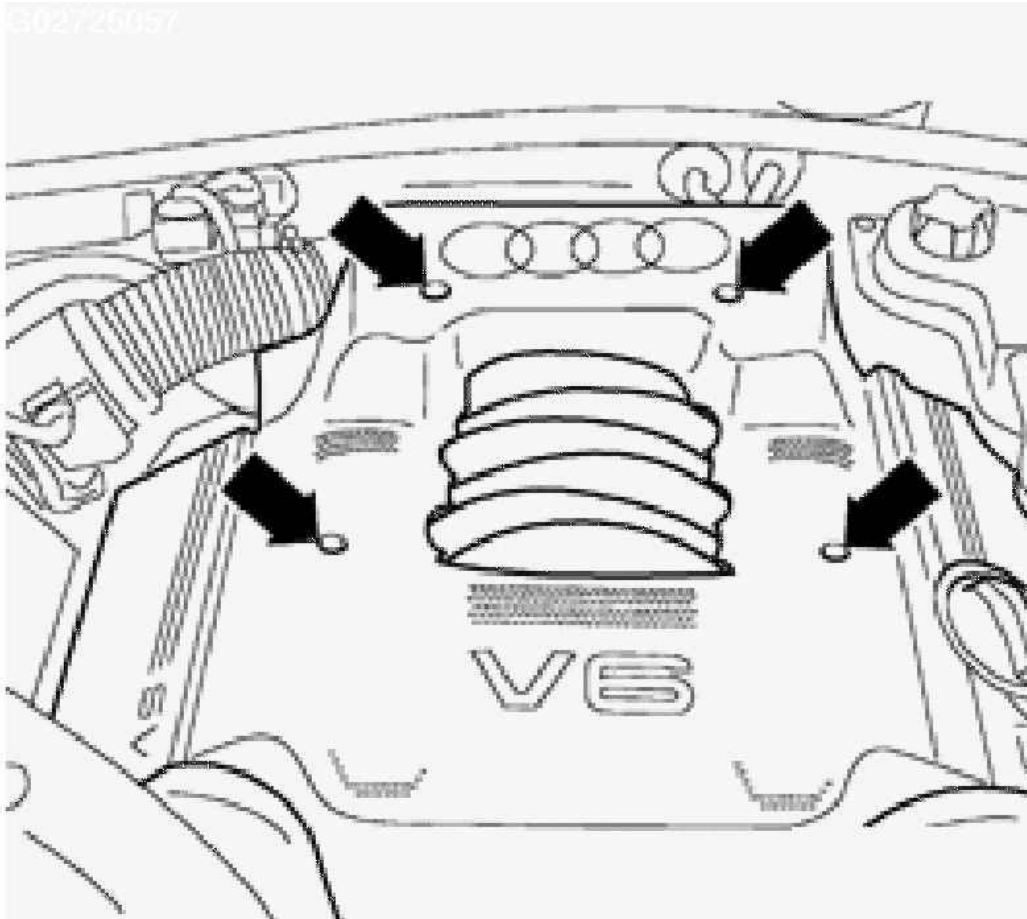
- Initiate output Diagnostic Test Mode (DTM) and activate valve for camshaft adjustment.

See **OUTPUT DIAGNOSTIC TEST MODE (DTM)** .

If valves do not click during output Diagnostic Test Mode (DTM), go to **CHECKING INTERNAL RESISTANCE**.

Checking internal resistance

- Switch ignition off.
- Remove engine cover (arrows).
- Disconnect connector from solenoid valve.



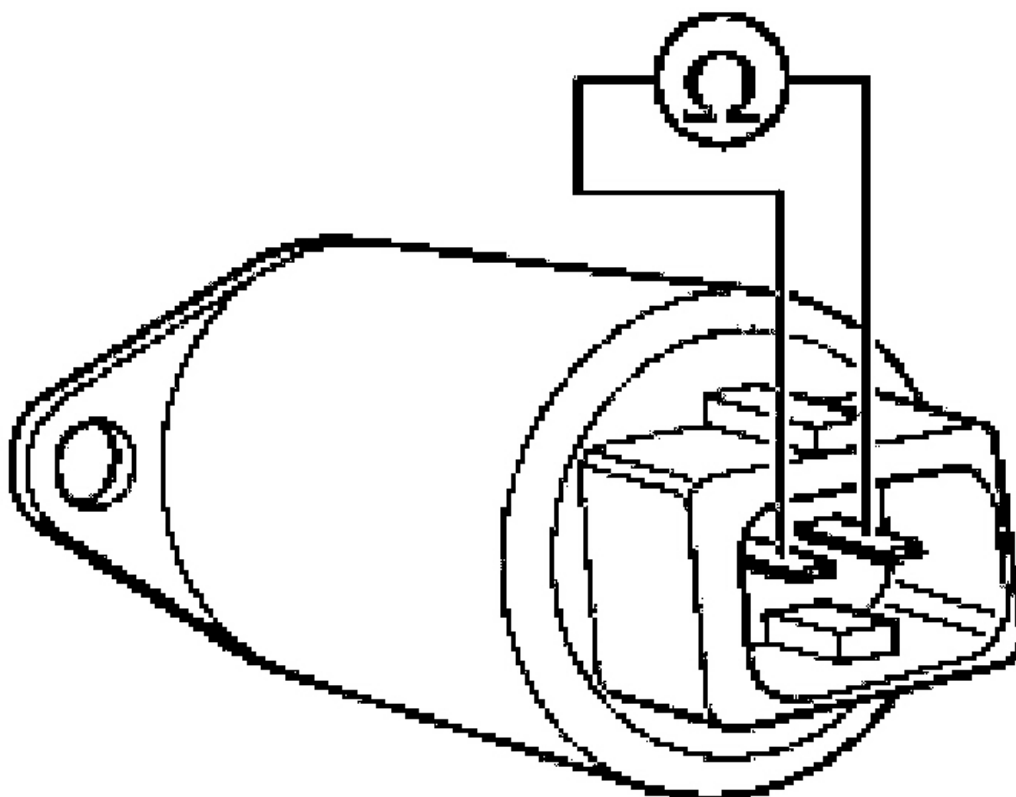
G02725057

Fig. 202: Removing Engine Cover
Courtesy of AUDI OF AMERICA, INC.

- Connect multimeter at valve for resistance measurement.
 - Specified value: 10-18 ohms

If specified value is not obtained:

- Replace valve.



G02725058

Fig. 203: Measuring Resistance Of Solenoid Valve For Camshaft Adjustment
Courtesy of AUDI OF AMERICA, INC.

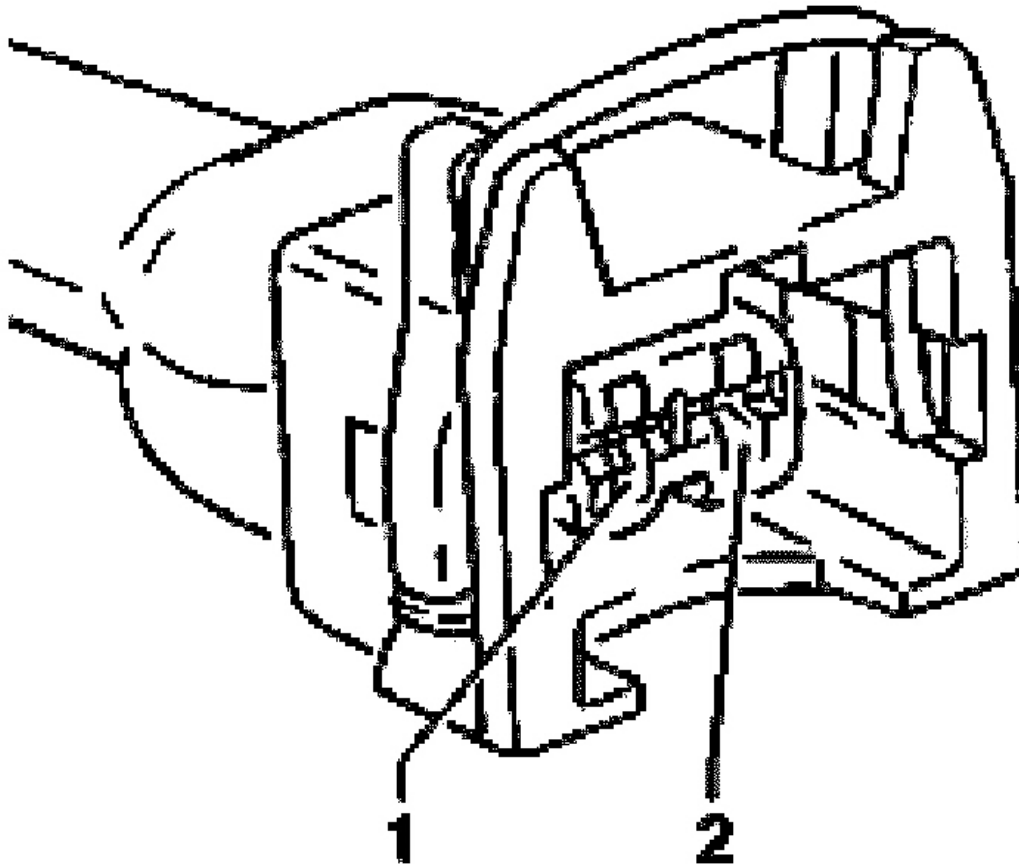
Checking voltage supply

- Disconnect connector from solenoid valve.
- Connect VAG 1527B voltage tester as follows:

SOLENOID VALVE FOR CAMSHAFT ADJUSTMENT - TERMINAL 1 CIRCUIT TEST

Harness connector terminal	Measure to
1	Engine Ground (GND)

- Operate starter briefly.
 - LED must light.



G02725059

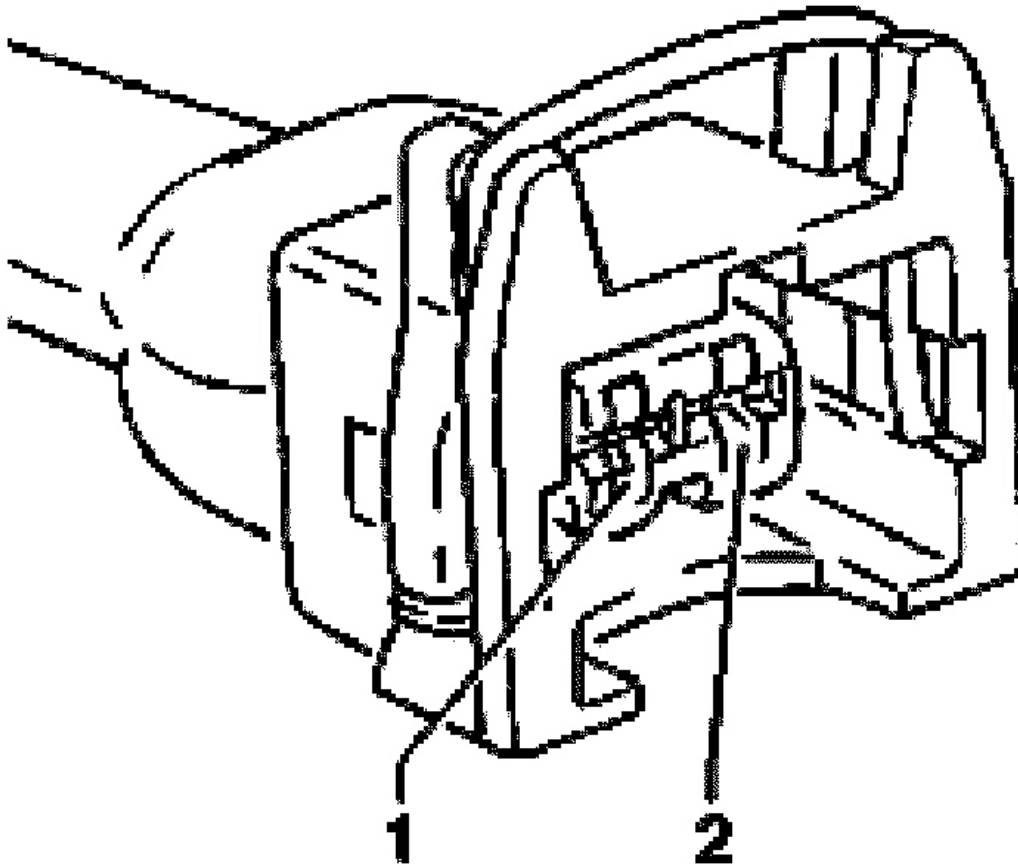
Fig. 204: Identifying Solenoid Valve For Camshaft Adjustment Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

If LED does not light:

- Perform following tests marked with dots:
 - Check fuse of solenoid valves for camshaft adjustment.

See System Wiring Diagrams .

- Check wire connection from terminal 1 of connector via fuse S234 (in fuse holder, socket 34) to Fuel Pump (FP) relay for open circuit:



G02725060

Fig. 205: Identifying Solenoid Valve For Camshaft Adjustment Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

- Repair open circuit if necessary.

If no malfunctions are detected:

- Check Fuel Pump (FP) relay.

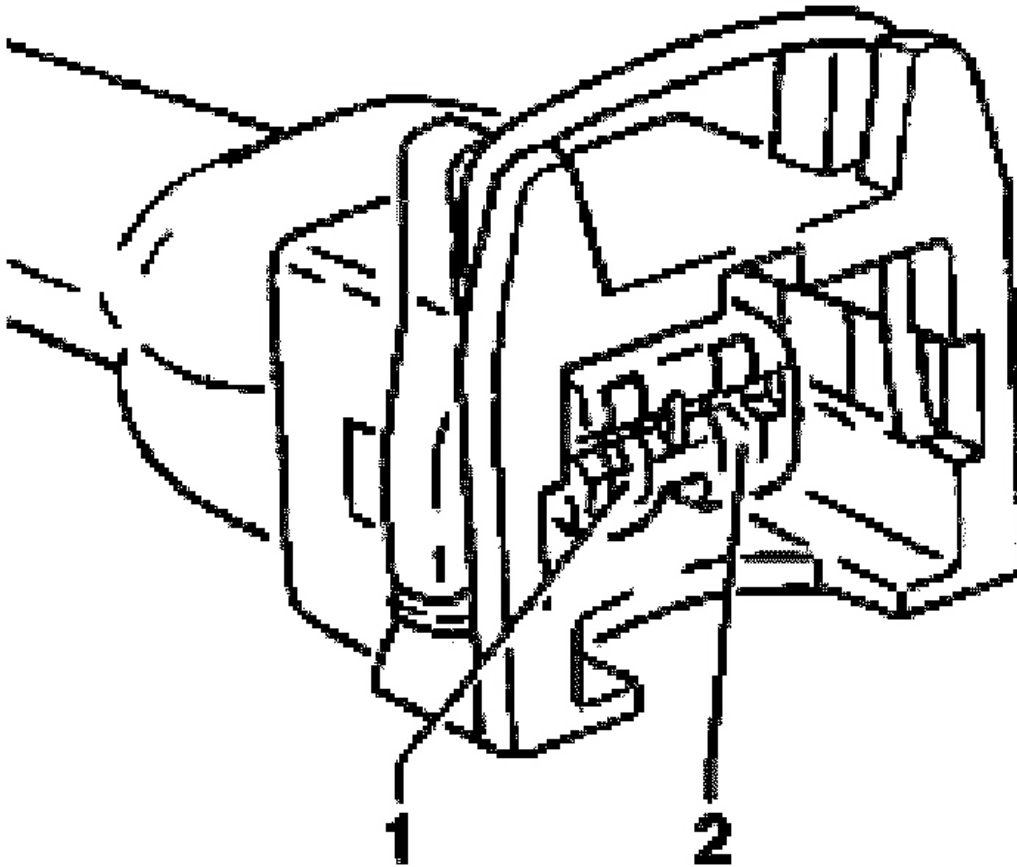
See **FUEL PUMP (FP) RELAY -J17- AND RELAY ACTIVATION AND CHECKING .**

Checking activation

- Connect VAG 1527B voltage tester between terminal 1 (+) and 2.
- Initiate output Diagnostic Test Mode (DTM) and activate valve for camshaft adjustment.

See **OUTPUT DIAGNOSTIC TEST MODE (DTM)** .

- LED must blink



G02725061

Fig. 206: Identifying Solenoid Valve For Camshaft Adjustment Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

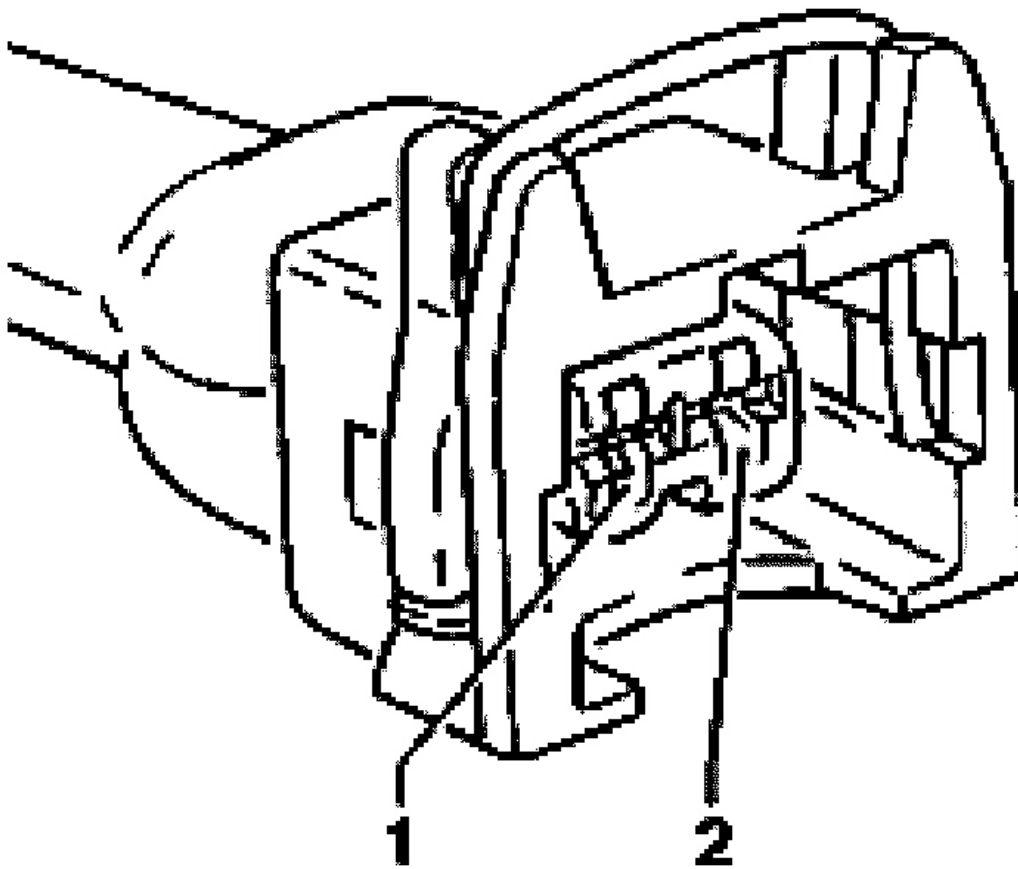
If LED does not blink or if it remains constantly lit:

- Connect VAG 1598/31 test box at wiring harness to ECM do not connect ECM.

See See **VEHICLE DIAGNOSTIC, TESTING AND INFORMATION SYSTEM VAS5051 OR VAG1551 SCAN TOOL, CONNECTING AND SELECTING FUNCTIONS** .

- Check following wire connections for open circuit and short circuit to Ground (GND) and B+:

Valve 1 for camshaft adjustment -N205- and valve 2 for camshaft adjustment -N208-



G02725062

Fig. 207: Identifying Solenoid Valve For Camshaft Adjustment Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

SOLENOID VALVE FOR CAMSHAFT ADJUSTMENT - TERMINAL 2 CIRCUIT TEST

Harness connector terminal	VAG 1598/31 or test box Bushing
2	

- Repair Ground (GND) connection or open circuit if necessary.

If wire connection is OK:

- Replace Engine Control Module (ECM).

See **MOTRONIC MULTIPOINT FUEL INJECTION (MFI) SYSTEM, SERVICING** .

If no malfunctions are detected:

- Replace mechanical camshaft adjuster.

Camshafts and camshaft adjusters, removing and installing

Removing

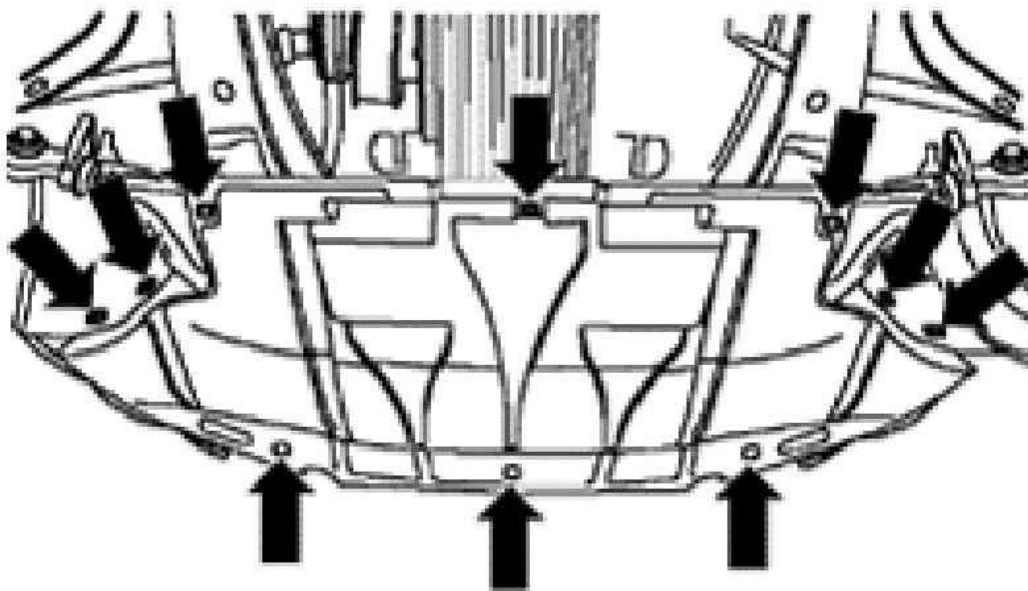
- Cylinder head installed
- Remove noise insulation panel -arrows-.
- Remove front bumper.

See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.
- Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING**.



G02725063

Fig. 208: Removing Noise Insulator Panel**Courtesy of AUDI OF AMERICA, INC.****Left cylinder head**

- Remove left-hand cylinder head cover. See **CYLINDER HEAD COVERS, REMOVING AND INSTALLING.**

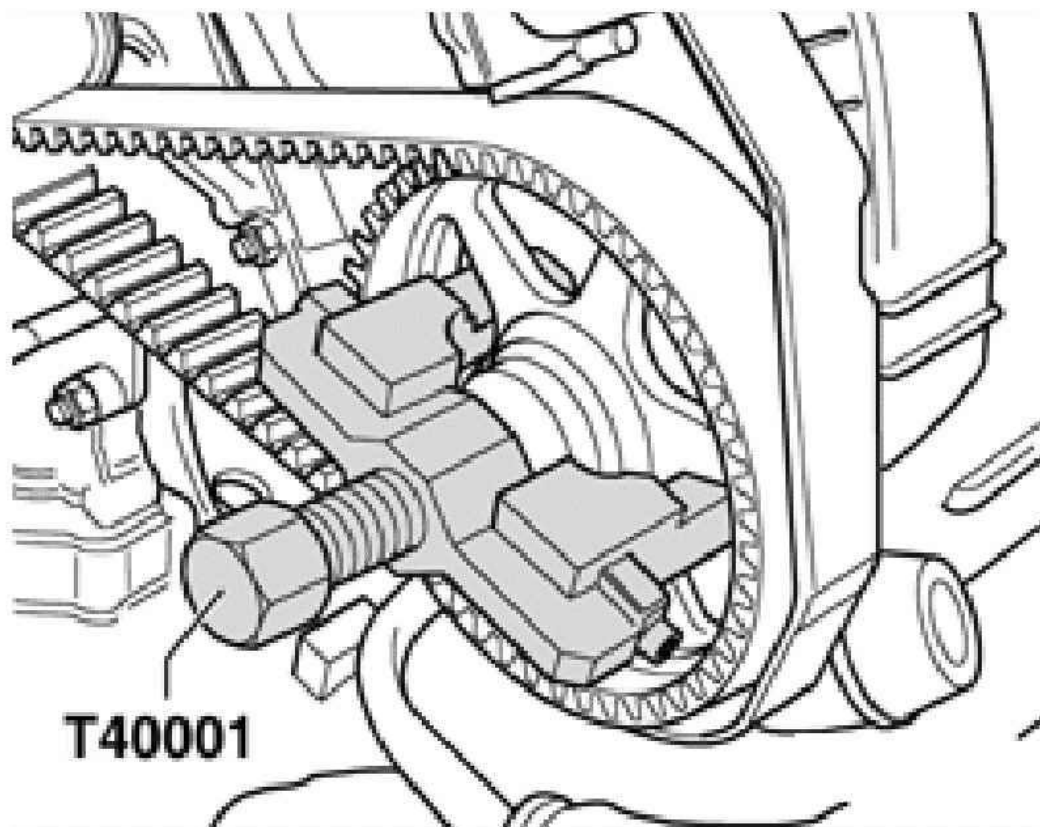
Right cylinder head

- Remove right-hand cylinder head cover. See **RIGHT CYLINDER HEAD COVER, REMOVING AND INSTALLING.**

All:

- Unbolt Hall sensor housing (10 Nm).
- Remove bolt securing Hall sensor rotor (20 Nm) and carefully pry off rotor using a screwdriver.
- Insert camshaft clamp 3391 in the securing plates of two camshafts.
- Loosen both camshaft bolts and remove approx. 5 turns.
- Take out camshaft clamp 3391.
- Disconnect both camshaft sprockets with special tool T40001.
- Using a screwdriver, carefully lever oil feed lines for camshaft bearings out of camshaft bearings.

Make sure that the retaining catches do not break off when prying out the oil lines.



G02725064

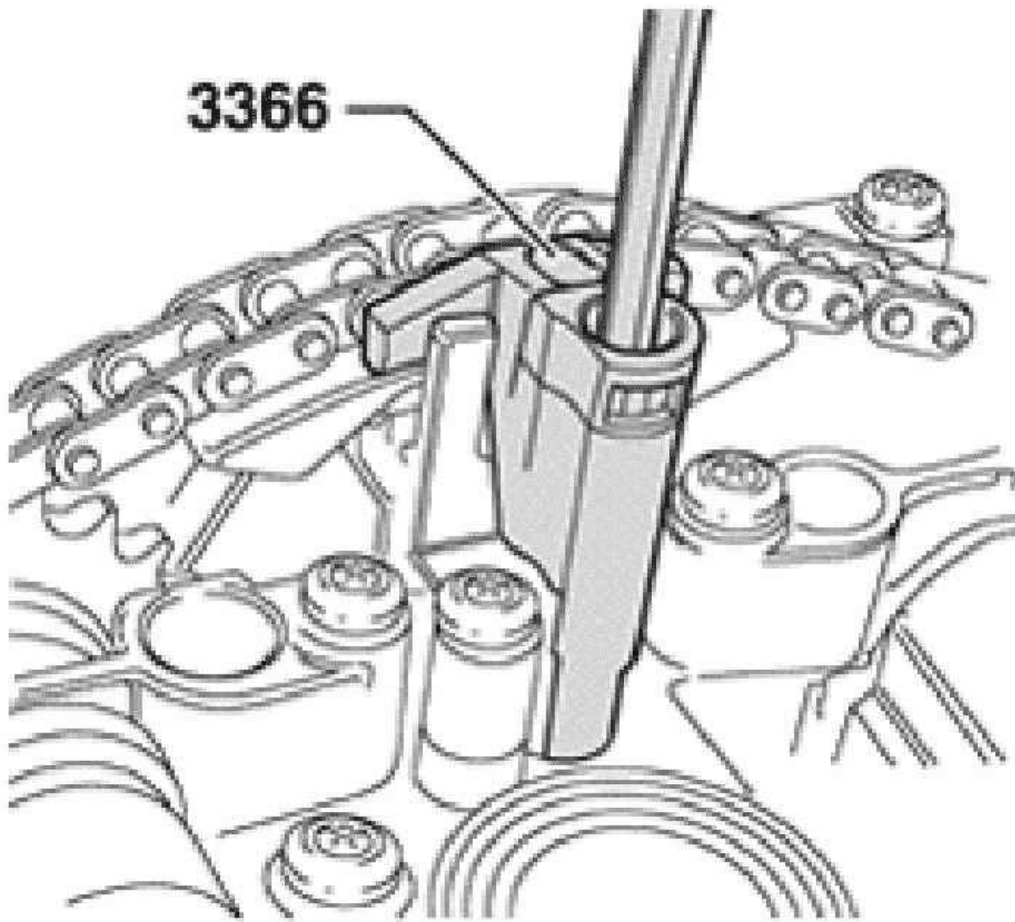
Fig. 209: Disconnecting Camshaft Sprockets

Courtesy of AUDI OF AMERICA, INC.

- Secure camshaft adjuster using retainer for chain tensioner 3366.

NOTE: Do not over-tighten retainer for chain tensioner, otherwise camshaft adjuster can be damaged.

G02725065



G02725065

Fig. 210: Securing Camshaft Adjuster Using Retainer For Chain Tensioner 3366

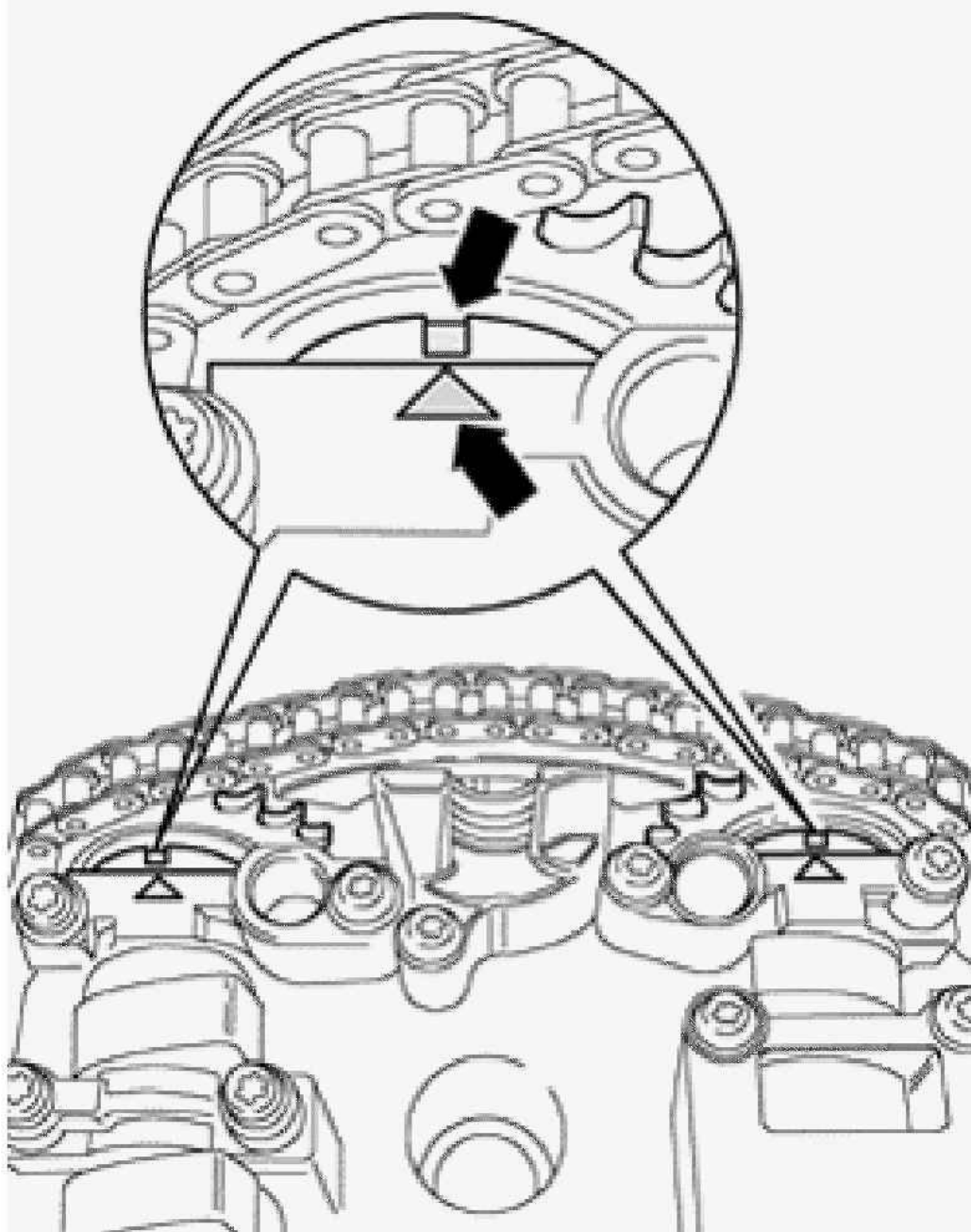
Courtesy of AUDI OF AMERICA, INC.

- Check TDC position of camshafts once again.

NOTE: **The two markings on the camshafts must be in line with the two arrows on the bearing caps.**

- Clean drive chain and camshaft chain sprockets in vicinity of arrows on bearing caps and mark position of chain on sprockets with paint opposite two arrows.

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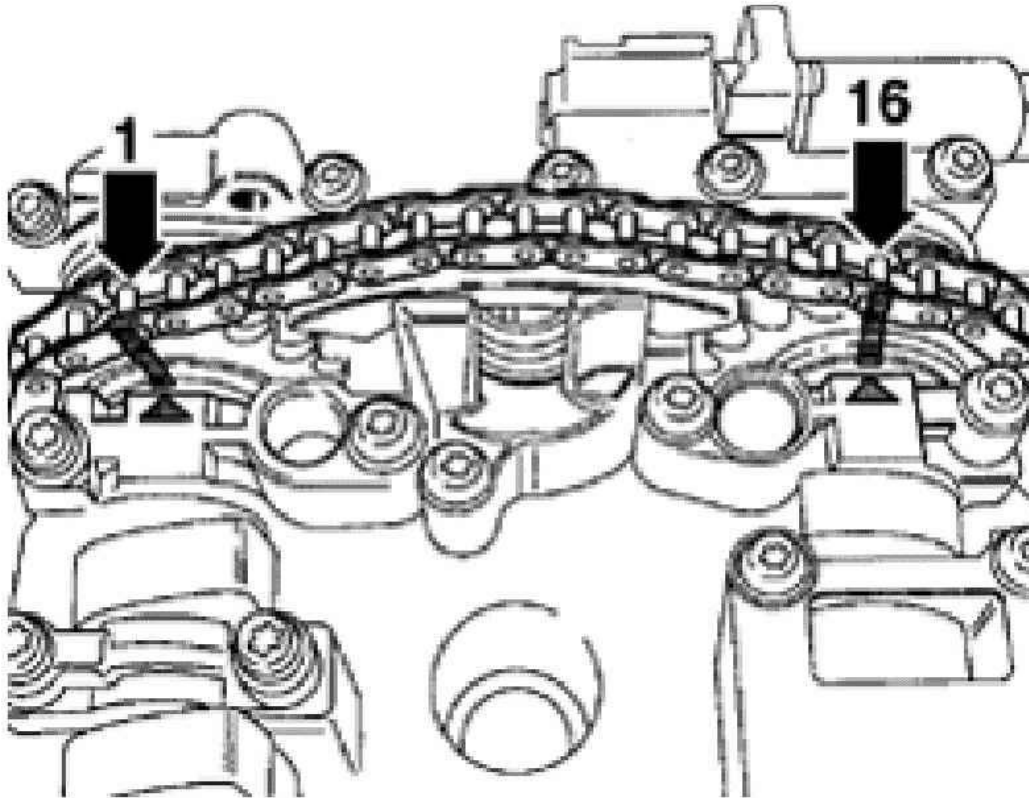
Fig. 211: Identifying TDC Position Of Camshafts
Courtesy of AUDI OF AMERICA, INC.

NOTE:

- The distance between the two arrows (and thus between the paint

markings) is 16 rollers on the chain.

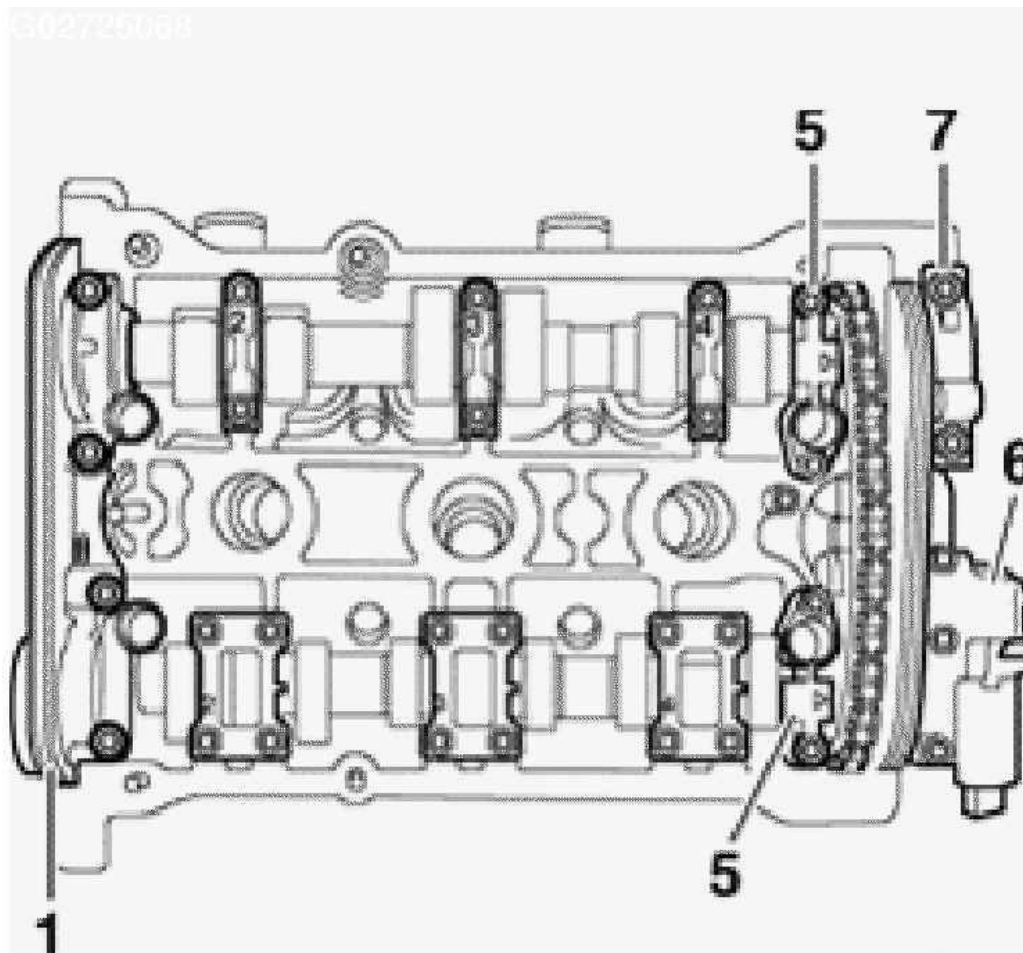
- The notch on the exhaust camshaft is offset slightly towards the inside in relation to chain roller -1-.
- Do not mark the chain with a center punch or by making a notch or similar.



G02725067

Fig. 212: Identifying Distance Between Camshaft Drive Chain Paint Marks
Courtesy of AUDI OF AMERICA, INC.

- Remove bolts securing camshaft adjuster -6-. See **Fig. 213**.
- Remove bearing caps 1, 3, 5 and 7 from inlet and exhaust camshafts and place them in correct order on a clean surface.
- Loosen bearing caps 2 and 4 alternately and in diagonal sequence, and remove from both camshafts.
- Take out both camshafts together with camshaft adjuster.

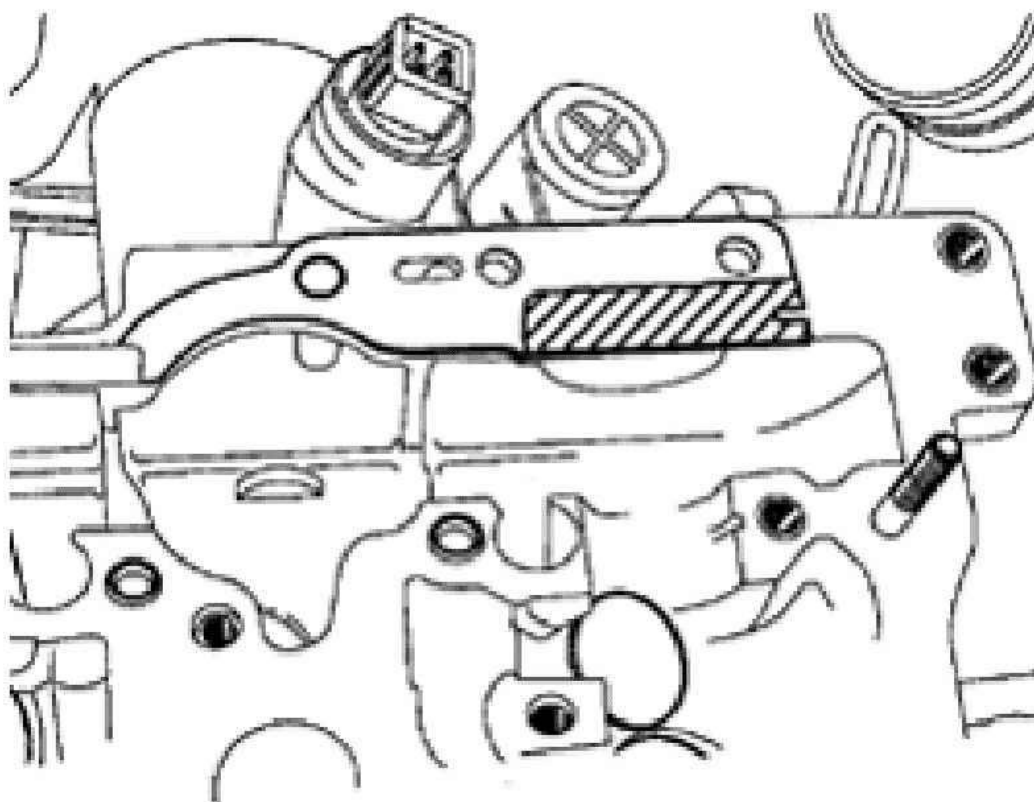


G02725068

Fig. 213: Removing Camshaft Adjuster And Camshafts
Courtesy of AUDI OF AMERICA, INC.

Installing

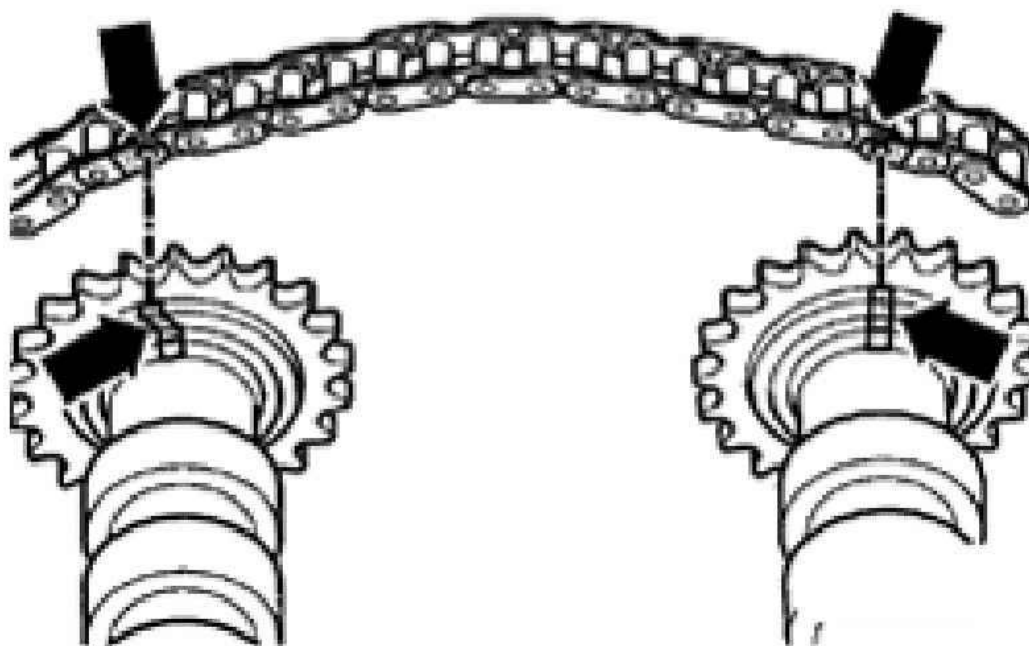
- Replace rubber/metal gasket for camshaft adjuster and apply a thin coat of sealant D 454 300 A2 to shaded area.



G02725069

Fig. 214: Locating Shaded Area For Sealant D 454 300 A2
Courtesy of AUDI OF AMERICA, INC.

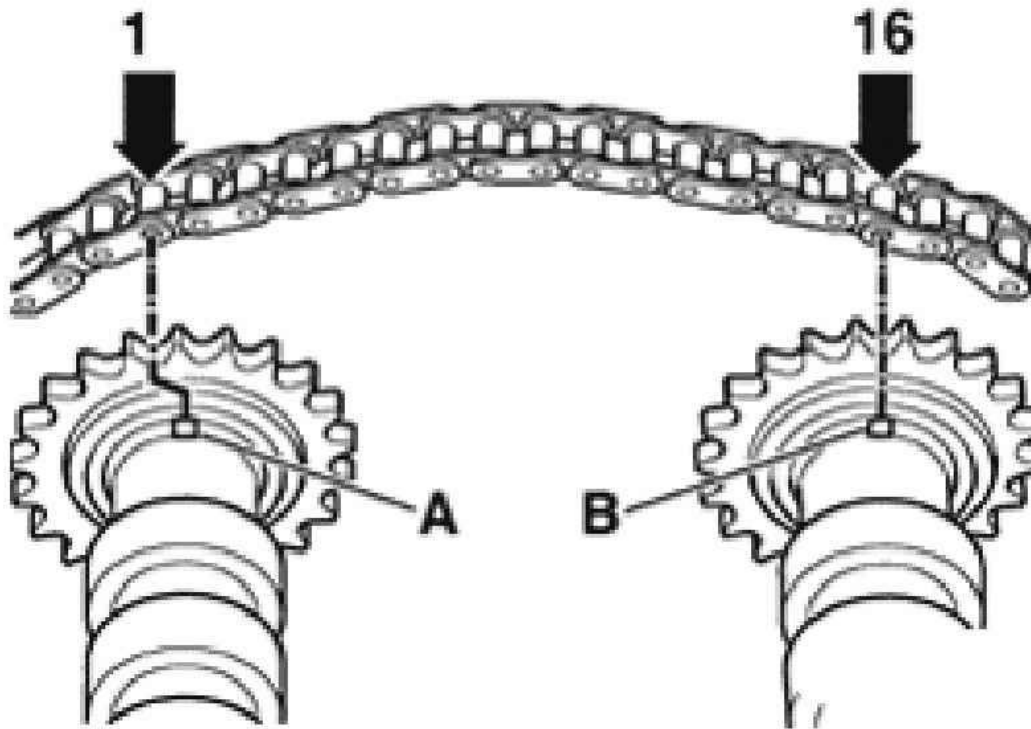
- Install drive chain on camshaft sprockets as follows:
 - When old chain is being used again, install chain so that paint markings (arrow) are in line.



G02725070

Fig. 215: Identifying Paint Markings On Old Camshaft Chain
Courtesy of AUDI OF AMERICA, INC.

- When a new chain is being installed, distance between notches -A- and -B- on camshafts must be 16 rollers on chain. Illustration shows exact positions of 1st and 16th rollers on sprockets. See **Fig. 216**.
- Notch -A- is offset slightly towards inside in relation to chain roller -1-.
- Insert camshaft adjuster inside chain (second mechanic required).



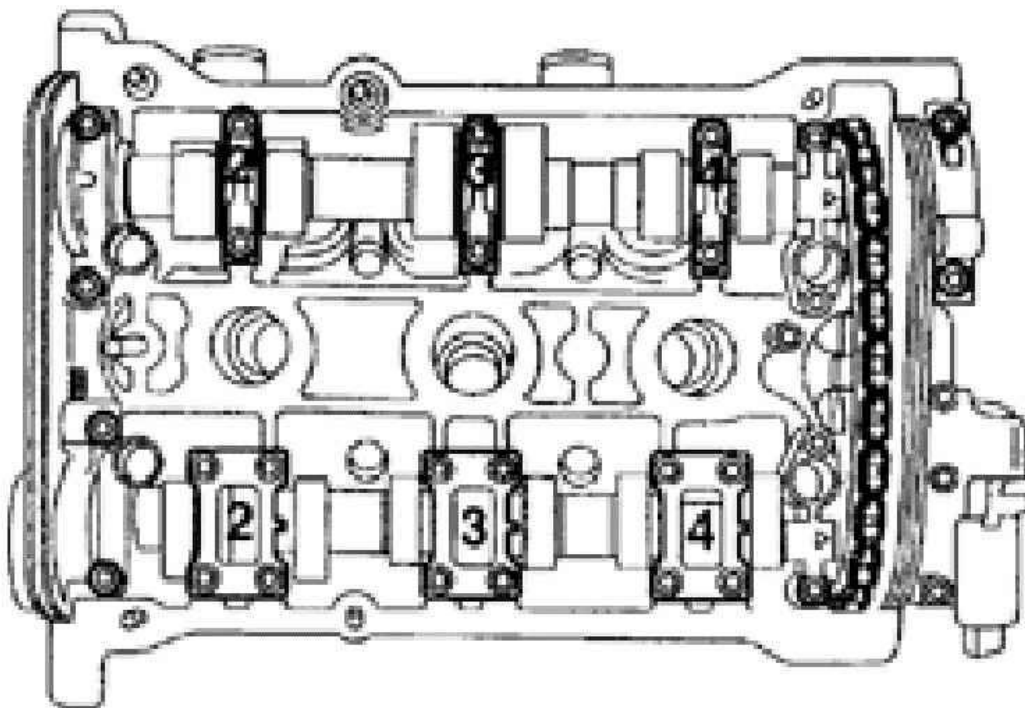
G02725071

Fig. 216: Installing New Camshaft Chain
 Courtesy of AUDI OF AMERICA, INC.

- Locate camshafts with chain and camshaft adjuster in cylinder head.
- Oil camshaft bearing surfaces.

NOTE:

- The dowel sleeves for the bearing caps and camshaft adjuster must be in the cylinder head.
 - Install the bearing caps so that the markings on the bearing caps can be read from the inlet side of the cylinder head.
- Tighten bolts securing chain tensioner (watch position of dowel sleeves).
 - Tighten bearing caps 2 and 4 of inlet and exhaust camshafts alternately and in diagonal sequence (watch position of dowel sleeves). See **Fig. 217**.
 - Install two bearing caps next to chain sprockets on inlet and exhaust camshafts.

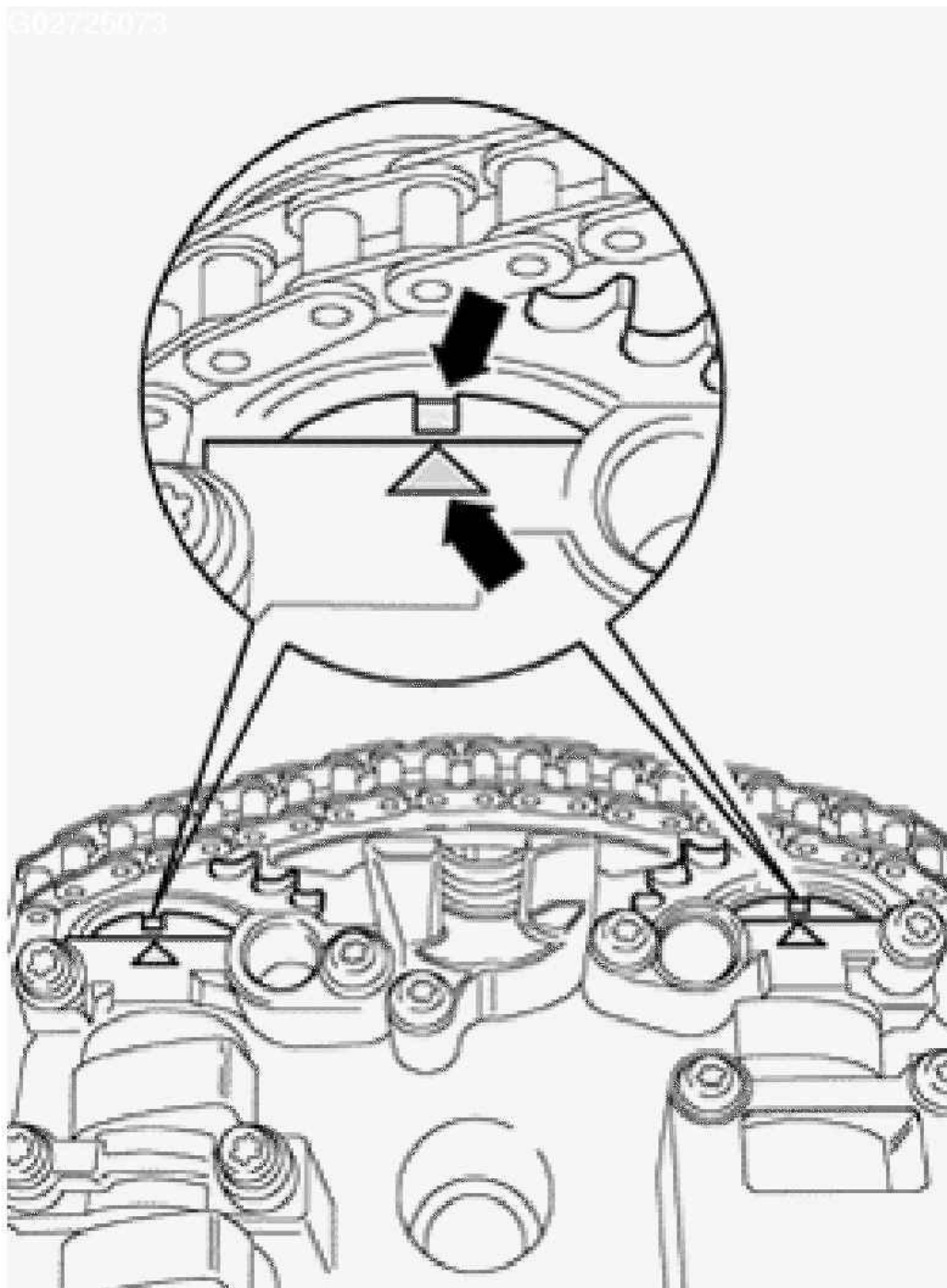


G02725072

Fig. 217: Tightening Camshaft Bearing Caps

Courtesy of AUDI OF AMERICA, INC.

- Check correct setting of camshafts:
 - Two markings on camshafts must be in line with two arrows on bearing caps -arrows-.



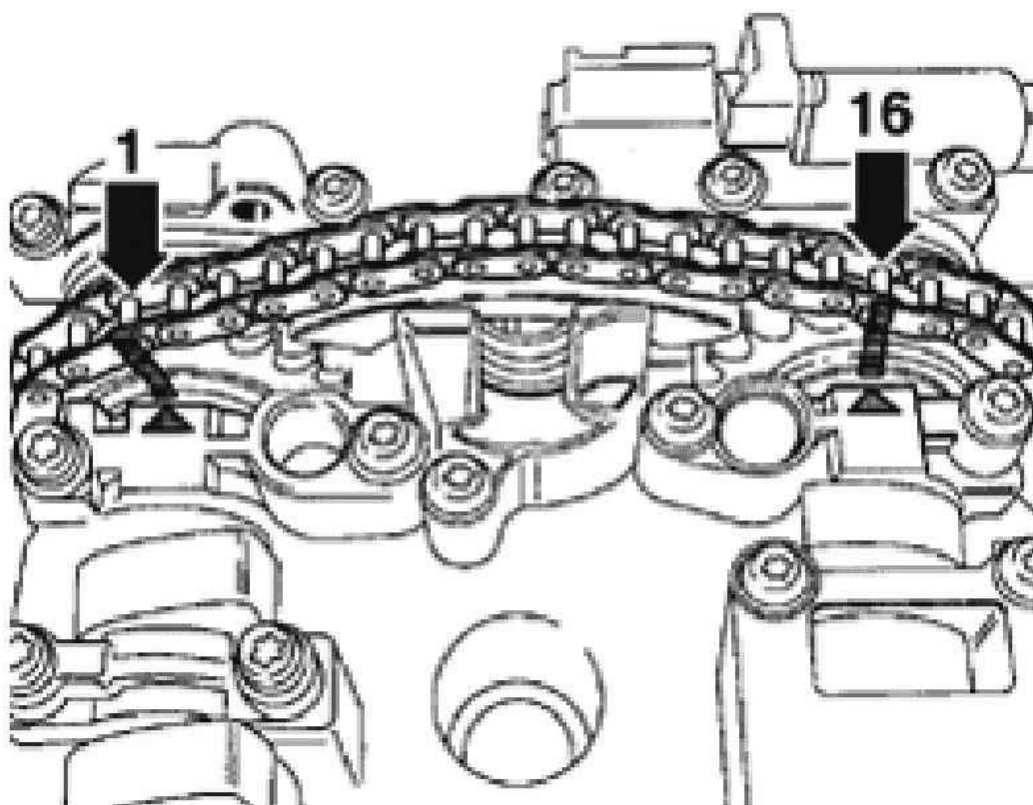
G02725073

Fig. 218: Identifying Markings On Camshafts
Courtesy of AUDI OF AMERICA, INC.

- Distance between two arrows on bearing caps (or between paint markings) is 16 rollers on chain.

See **Fig. 219**.

- Notch on exhaust camshaft is offset slightly towards inside in relation to chain roller -1-.



G02725074

Fig. 219: Identifying Distance Between Camshaft Bearing Caps Or Chain Rollers
Courtesy of AUDI OF AMERICA, INC.

- Prepare shaded areas on double bearing cap -1- and bearing cap -7-.

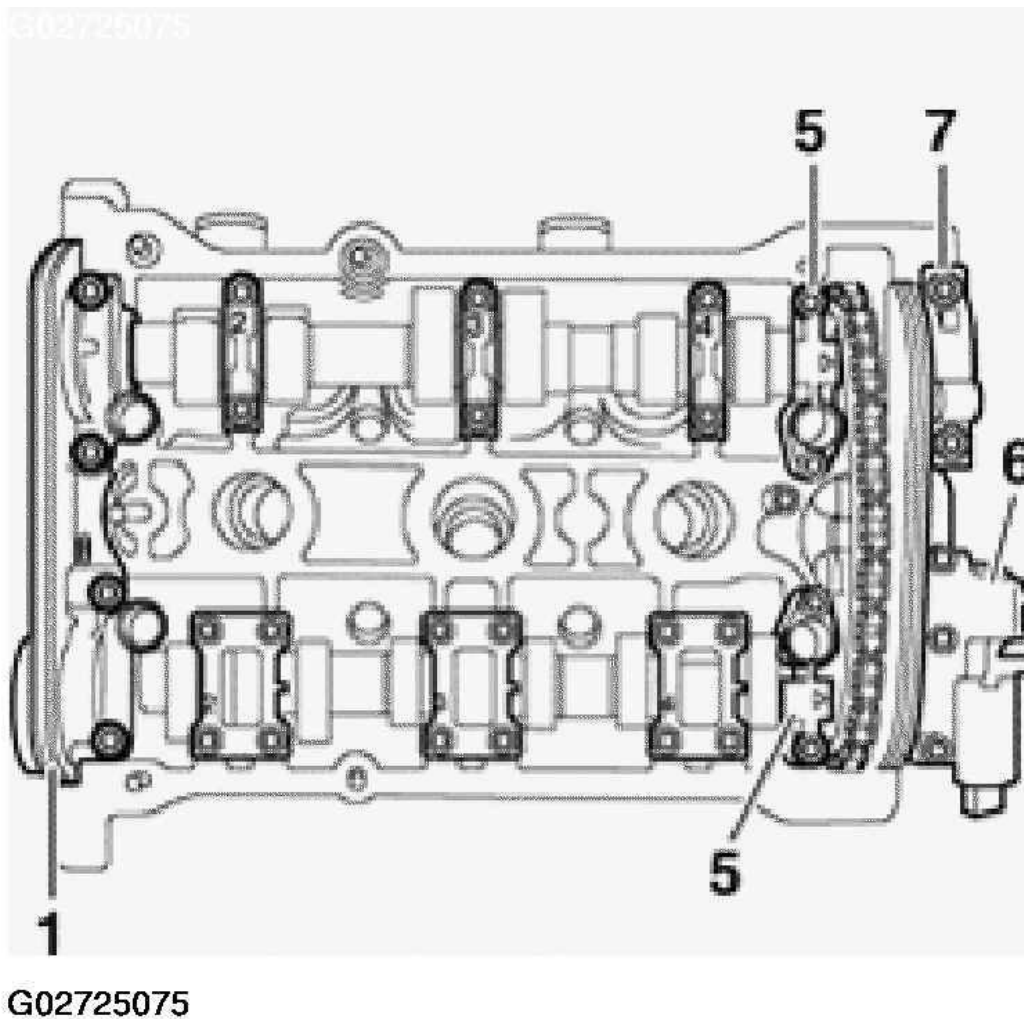
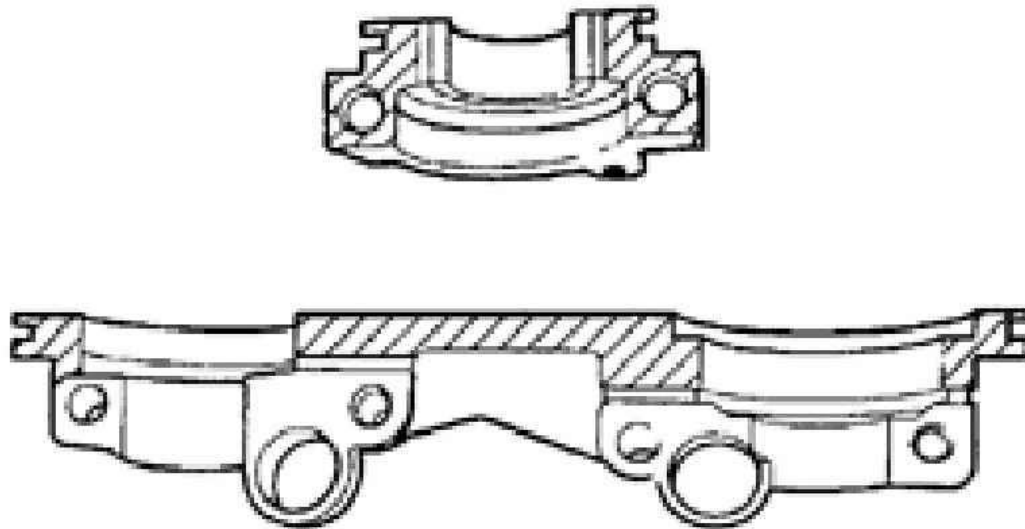


Fig. 220: Identifying Double Bearing Caps

Courtesy of AUDI OF AMERICA, INC.

- ... by applying a thin coat of sealant D 454 300 A2 and install bearing caps (watch position of dowel sleeves).



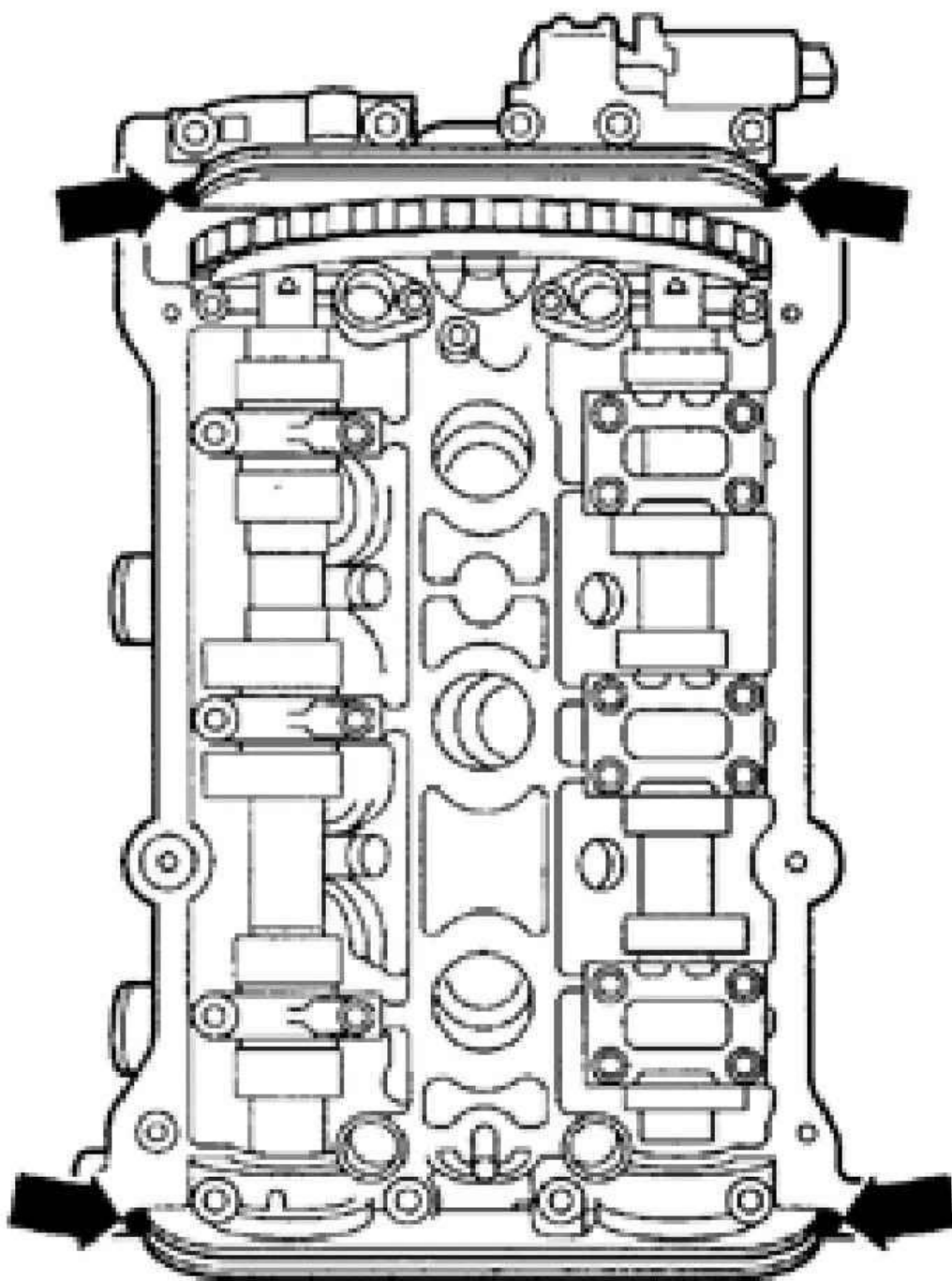
G02725076

Fig. 221: Identifying Areas On Double Camshaft Bearing Caps To Apply Sealant D 454 300 A2
Courtesy of AUDI OF AMERICA, INC.

- Install remaining bearing caps (watch position of dowel sleeves).
- Install new oil feed lines for camshaft bearings.
- Install new oil seals for inlet and exhaust camshafts;
- Installing, see **OIL SEALS IN CYLINDER HEADS, REPLACING**
- Remove retainer for chain tensioner 3366.

NOTE:

- **When new lifters have been installed the engine must not be started for about 30 minutes. The hydraulic compensation elements must settle (otherwise valves will strike pistons). Then turn crankshaft two full revolutions before starting.**
 - **After working on the valve gear, turn over the engine carefully at least two revolutions by hand to ensure that none of the valves make contact when the starter is operated.**
- Seal end points of joints between bearing caps and cylinder head.
 - Before installing cylinder head cover and gasket, carefully apply a small quantity of sealant D 454 300 A2 at the four end points of sealing surfaces on cylinder head -arrows-, using a small screwdriver.



G02725077

Fig. 222: Locating Seal End Points Of Joints Between Bearing Caps And Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

- Install cylinder head covers. See **CYLINDER HEAD COVERS, REMOVING AND INSTALLING.**
- Install toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING.**
- Install ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING.**

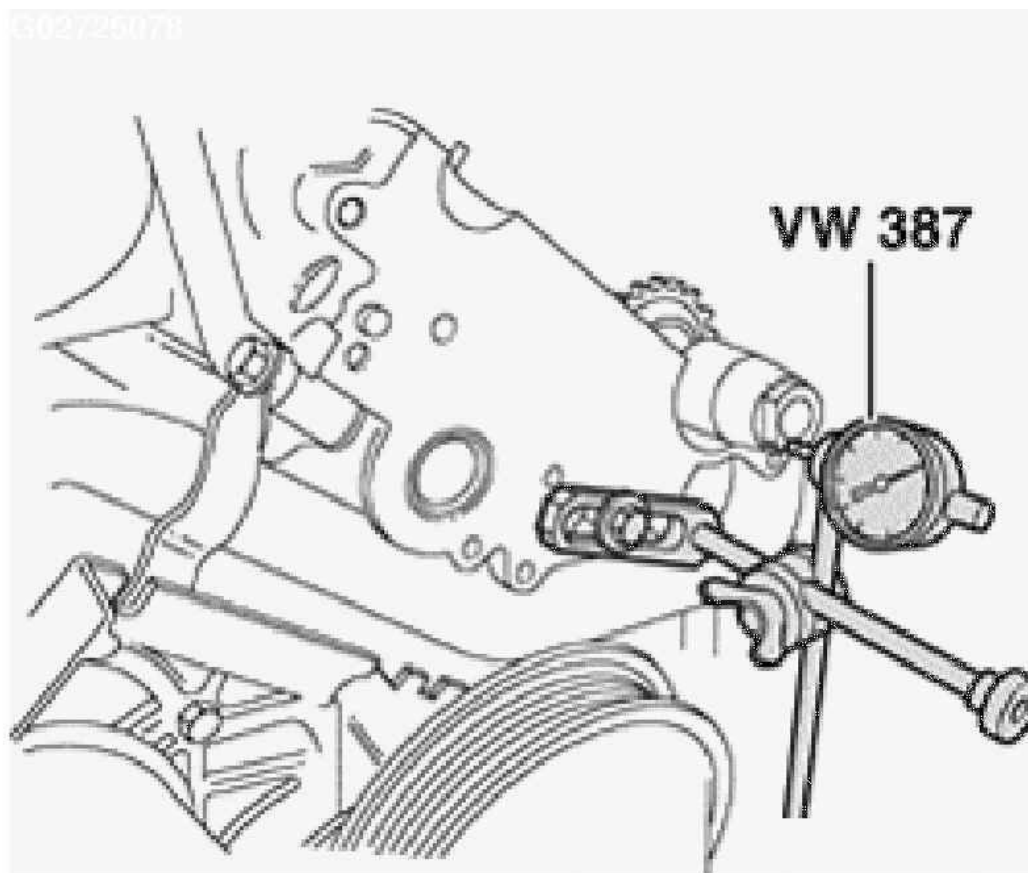
Tightening torques

TIGHTENING TORQUES: CAMSHAFTS & CAMSHAFT ADJUSTERS

Component	Nm
Bolts - M6	10
Bolts - M8	20
Except for the following:	
Bearing caps to cylinder head	10
Camshaft adjuster to cylinder head	10
Hall sensor rotor to camshaft	25
Hall sensor housing to cylinder head	10
Camshaft sprocket to camshaft	55
Cylinder head cover	10

Camshaft axial clearance, checking

- Remove camshafts. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**
- Remove lifters.
- Install camshafts in cylinder head without drive chain and secure by tightening bearings caps 2 and 4.
- Attach dial indicator to cylinder head with universal dial indicator bracket VW 387.
- Press camshaft against dial indicator by hand.
- Set dial indicator to -0-.



G02725078

Fig. 223: Measuring Camshaft Axial Clearance Wear Limit
Courtesy of AUDI OF AMERICA, INC.

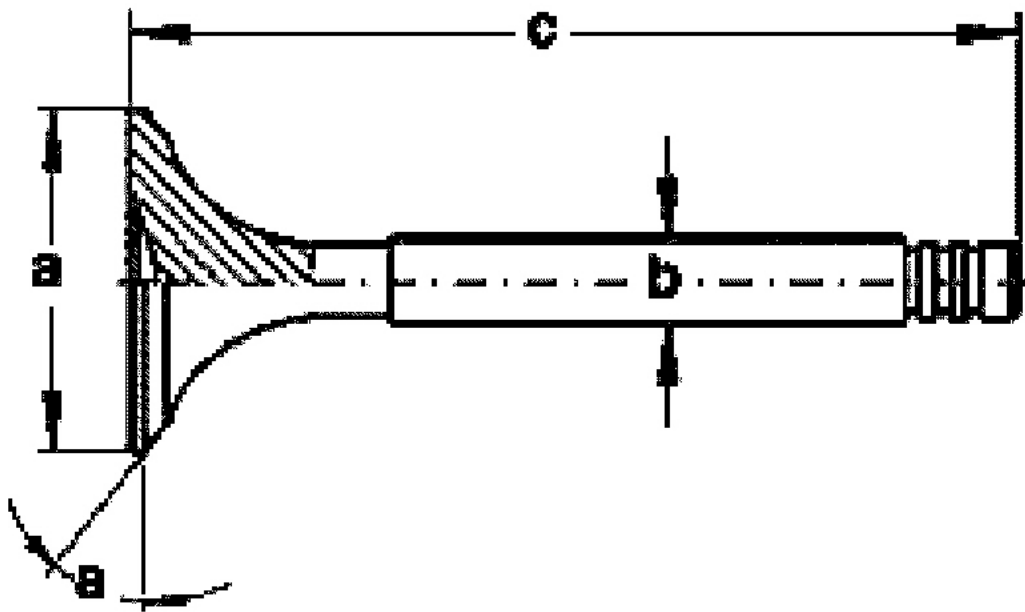
- Press camshaft away from dial indicator.
- Note reading on gauge:

CAMSHAFT AXIAL CLEARANCE SPECIFICATIONS

New	Wear limit
0.05 - 0.15 mm	0.20 mm

Valve dimensions

NOTE: Valves must not be reworked. Only grinding-in (lapping) is permitted.



G02725079

Fig. 224: Identifying Valve Dimensions
 Courtesy of AUDI OF AMERICA, INC.

VALVE DIMENSIONS

Dimension	Inlet valve	Exhaust valve
a = diameter mm	26.8 - 27.0	29.8 - 30.0
b = diameter mm	5.96 - 5.97	5.94 - 5.95
c = mm	104.84 - 105.34	103.64 - 104.14
alpha angle (degree)	45	45

WARNING: Worn sodium-cooled exhaust valves must be treated as follows before disposal: Saw the valves into two sections with a metal saw at a point between the center of the valve stem and the valve head. The valves must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time) and step back, because a chemical reaction occurs when the sodium filling burns. After this treatment the valves can be disposed of in the normal way.

Hydraulic valve lifters, checking

NOTE:

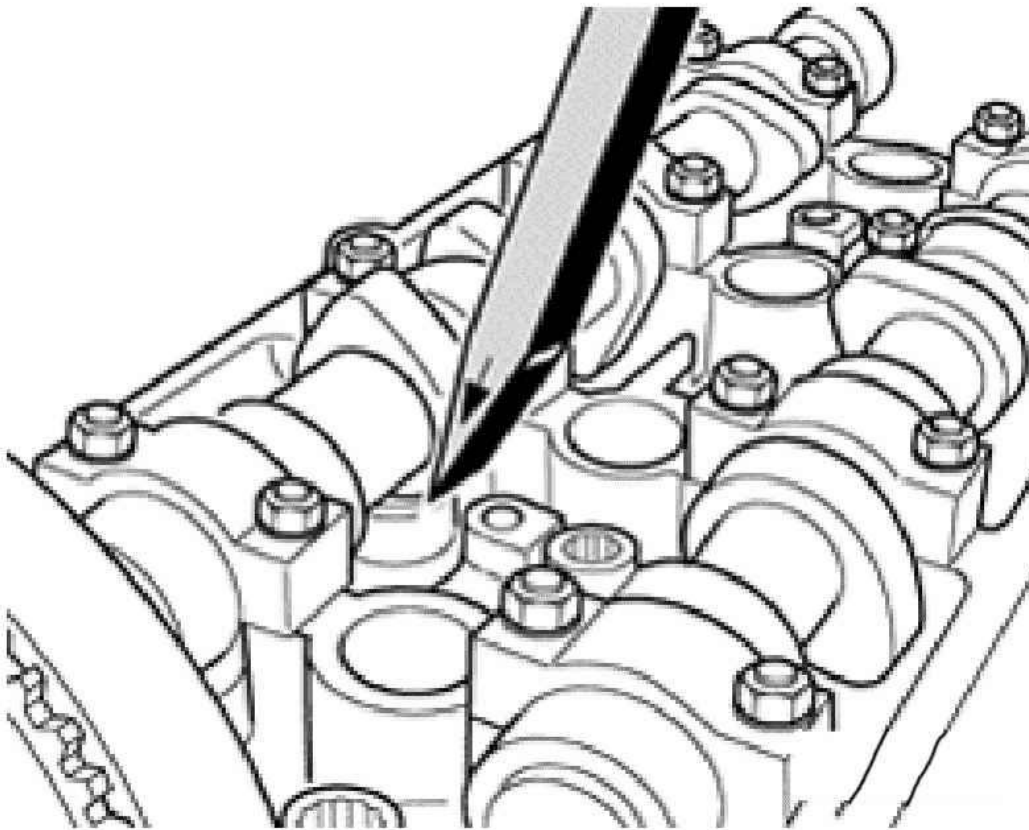
- Replace malfunctioning lifters completely (lifters cannot be adjusted or repaired).

- **When new lifters have been installed the engine must not be started for about 30 minutes (otherwise valves will strike pistons).**
- **Irregular valve noises when starting engine are normal.**

- Start engine and run until coolant temperature reaches approx. 80° C.
- Increase engine speed to about 2500 RPM for approx. 2 minutes: if necessary, perform road test.

If the hydraulic lifters are still noisy, locate malfunctioning lifters as follows:

- Remove cylinder head cover.
- Rotate crankshaft clockwise by turning securing bolt for toothed belt sprocket until cams of lifters to be checked are pointing upward.
- Measure clearance between cam and lifter.
- Push lifter down with a wooden or plastic wedge. If a 0.20 mm feeler gauge can then be inserted between camshaft and lifter, replace lifter if necessary: removing and installing camshafts and camshaft adjuster. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**



G02725080

Fig. 225: Pushing Lifter Down With A Wooden Or Plastic Wedge
Courtesy of AUDI OF AMERICA, INC.

NOTE: If irregular valve noise occurs repeatedly during short journeys and disappears after extended driving, the oil check valves must be replaced. See **OIL CHECK VALVES, REPLACING.**

Valve stem seals, replacing

- Cylinder head installed
 - Remove ribbed belt. See **REMOVING.**
 - Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING.**
 - Remove camshafts. See **CAMSHAFTS AND CAMSHAFT ADJUSTERS, REMOVING AND INSTALLING.**
 - Remove lifters and place them down with contact surface downward. Make sure that lifters are not

interchanged.

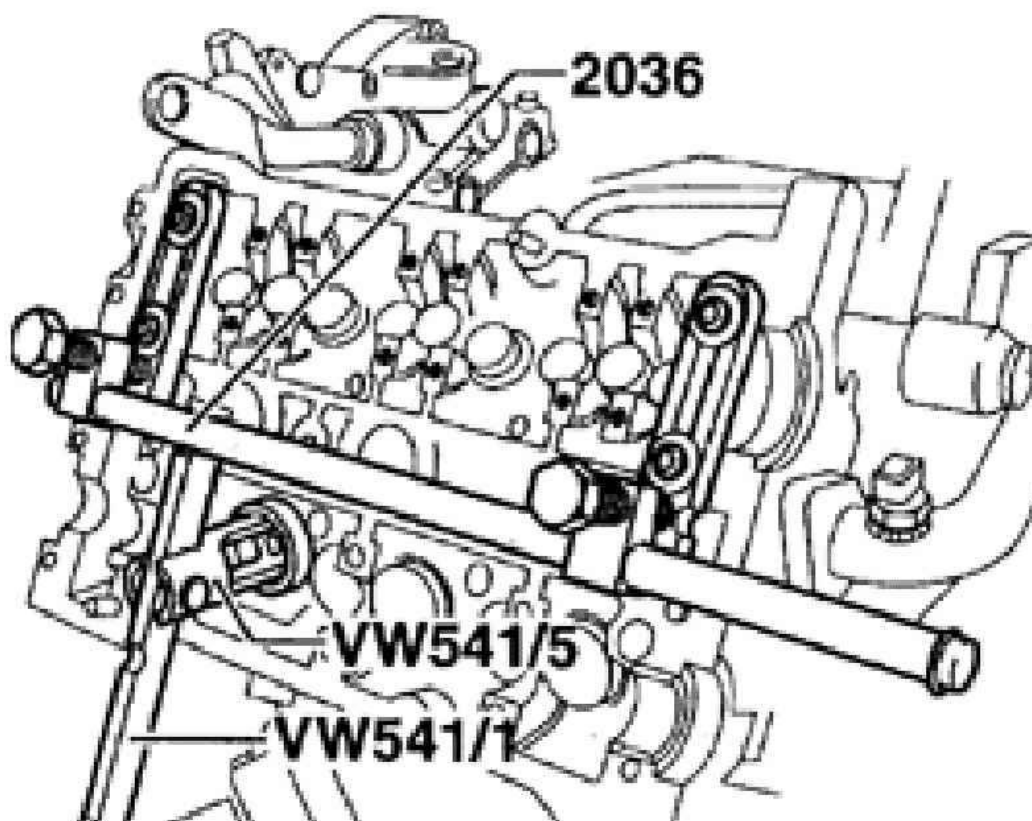
- Remove spark plugs.
- Set piston of relevant cylinder to bottom dead center.

NOTE: **Tight cotters can be released by tapping lightly on the valve lever with a hammer.**

Exhaust side

NOTE: **Before attaching the valve assembly appliance, remove the two studs in the center of the cylinder head and the three upper studs (inlet side) for securing the cylinder head cover.**

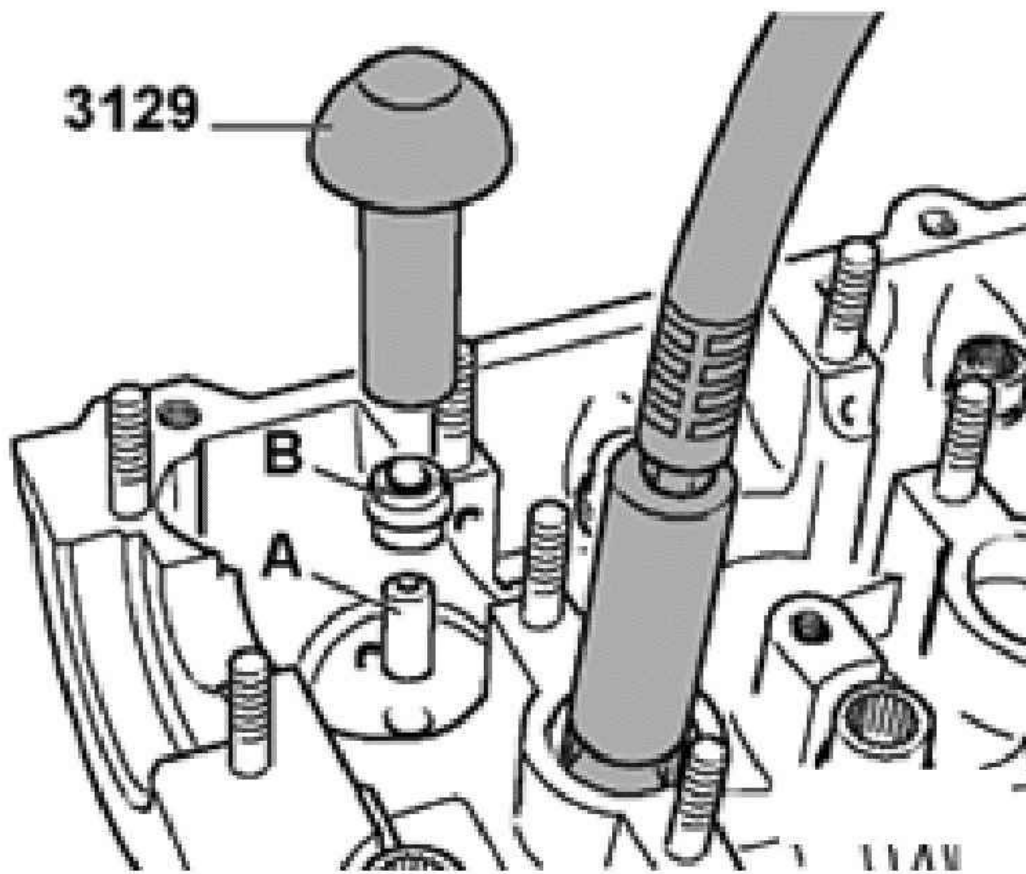
- Screw pressure hose VW 653/3 with sealing ring finger-tight into spark plug thread of relevant cylinder, and maintain a constant pressure of at least 6 bar.
- Attach valve assembly appliance 2036 as illustrated: use M6 x 40 bolts with large washers. See **Fig. 226**.
- Remove valve spring using valve lever VW 541/1 and thrust piece VW 541/5.
- Take out valve spring and valve spring plate.
- Disconnect from valve stem seal with 3047 A.



G02725081

Fig. 226: Compressing Valve Springs Using Valve Assembly Appliance 2036
Courtesy of AUDI OF AMERICA, INC.

- To prevent damage to new valve stem seals, place plastic sleeve -A- on the valve stem.
- Lightly oil sealing lip.
- Insert valve stem seal -B- (without oiling outside of seal) into installing tool 3129 and carefully push it down onto valve guide.



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Fig. 227: Removing Valve Stem Seals - Exhaust Side
 Courtesy of AUDI OF AMERICA, INC.

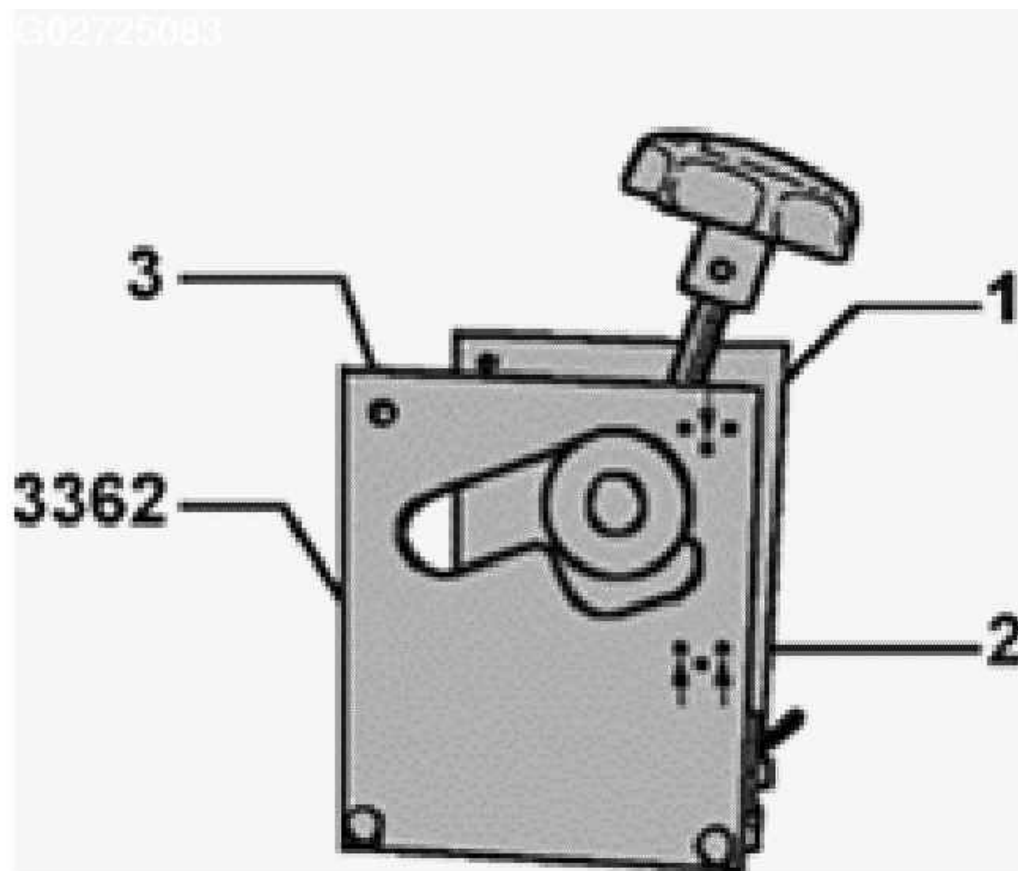
NOTE: When installing new valves, lightly oil valve stems before installing.

Inlet side

NOTE: The inlet valves are installed in the cylinder head at different angles.

Valve spring compressor 3362 can be set accordingly to two different positions:

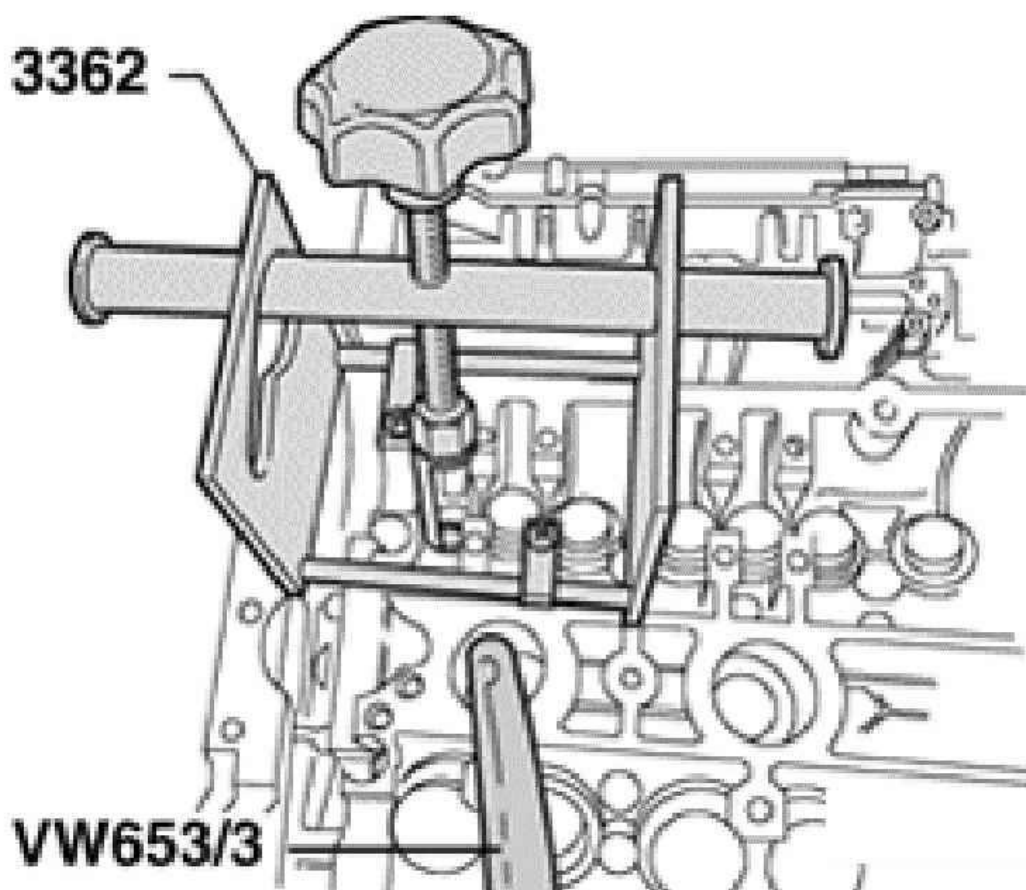
1. Upper position for center valve
2. Lower position for the two outer valves
3. Threads on each side to take M6 x 25 bolts for securing spring compressor to cylinder head



G02725083

Fig. 228: Identifying Valve Spring Compressor
Courtesy of AUDI OF AMERICA, INC.

- Mount spring compressor 3362 on cylinder head with two bolts supplied, as in illustration.
- Screw pressure hose VW 653/3 with sealing ring finger-tight into spark plug thread of relevant cylinder, and maintain a constant pressure of at least 6 bar.
- Set position of spring compressor for relevant valve, and remove valve spring using threaded spindle.



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Fig. 229: Mounting Spring Compressor 3362 On Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

- Disconnect valve stem from seal using 3364.



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Fig. 230: Disconnecting Valve Stem - Inlet Side
Courtesy of AUDI OF AMERICA, INC.

- To prevent damage to new valve stem seals, place plastic sleeve -A- on valve stem.
- Lightly lubricate sealing lip with oil.

- Insert valve stem seal -B- (without oiling outside of seal) into installing tool 3365 and carefully push it down onto the valve guide.

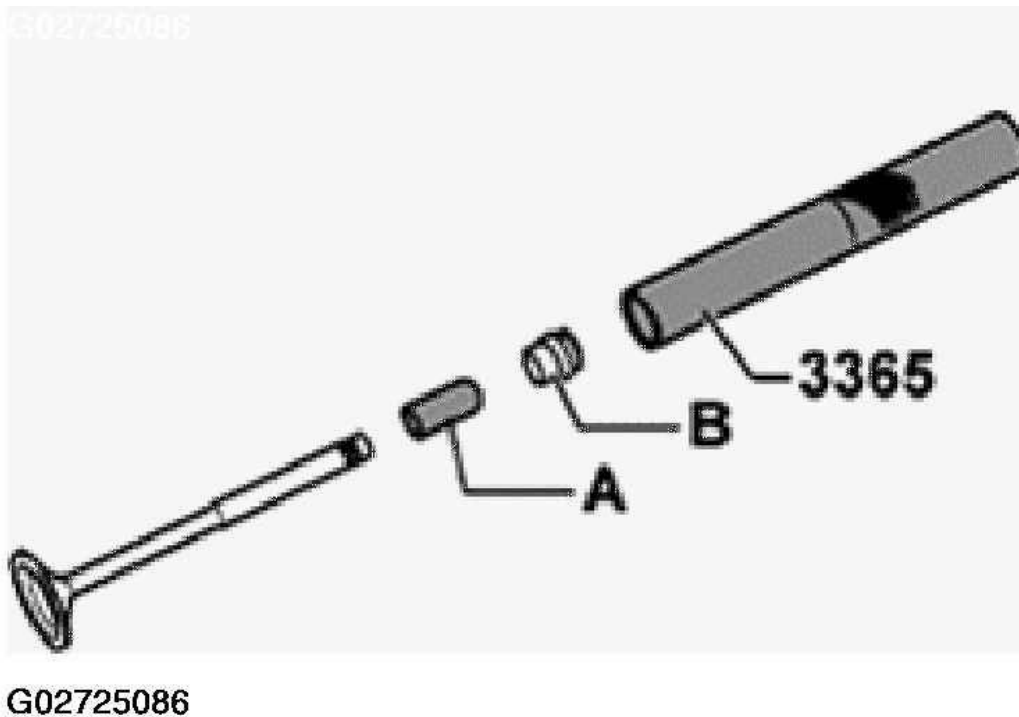


Fig. 231: Identifying Special Service Tool
Courtesy of AUDI OF AMERICA, INC.

NOTE: When installing new valves, lightly oil valve stems before installing.

Reworking valves

Valves must not be reworked. Only grinding-in (lapping) is permitted.

WARNING: Worn sodium-cooled exhaust valves must be treated as follows before disposal: Saw the valves into two sections with a metal saw at a point between the center of the valve stem and the valve head. The valves must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time) and step back, because a chemical reaction occurs when the sodium filling burns. After this treatment the valves can be disposed of in the normal way.

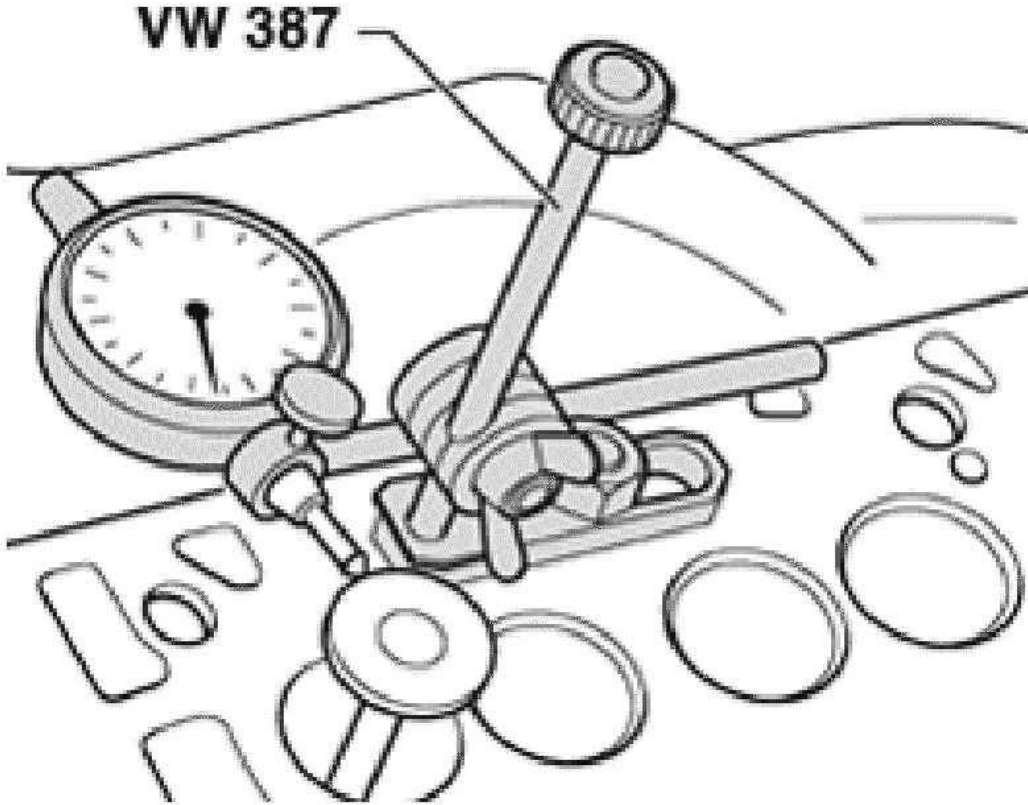
Valve guides, checking

When repairing engines or cylinder heads with leaking valves, it is not sufficient to reface the valve seats and renew the valves. The valve guides must also be checked for wear. This is particularly important on high-

mileage engines.

- Insert valve into valve guide so that end of valve stem is flush with end of guide. Valve stems have different diameters, so only use an inlet valve in an inlet guide and an exhaust valve in an exhaust guide.
- Measure amount of rock.

VW 387



G02725087

Fig. 232: Checking Valve Guide Clearance (Valve Rock)
Courtesy of AUDI OF AMERICA, INC.

Wear limit

VALVE GUIDE CLEARANCE (VALVE ROCK) WEAR LIMIT

Inlet valve guide	Exhaust valve guide
0.8 mm	0.8 mm

If the wear limit is exceeded, replace cylinder head.

Valve seats, reworking (refacing)

NOTE:

- The valve seats should only be reworked just enough to produce a good seating pattern.
- Calculate the maximum permissible reworking dimension before reworking.
- If the reworking dimension is exceeded, the function of the hydraulic lifters can no longer be guaranteed and the cylinder head should be replaced.

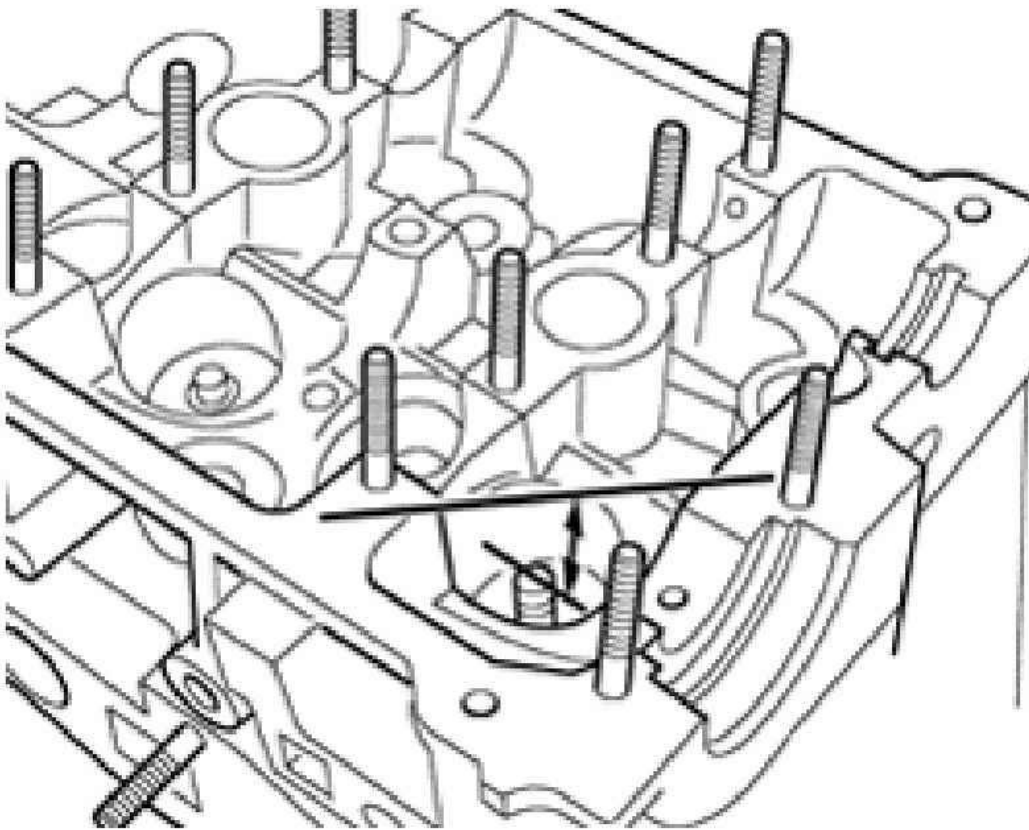
Calculating maximum permissible reworking dimension

- Insert valve and press firmly against valve seat.

NOTE:

If the valve is to be replaced as part of a repair, use a new valve for the calculation.

- Measure distance between end of valve stem and top surface of cylinder head (illustration shows a 4-valve head).
- Calculate maximum permissible reworking dimension from measured distance and minimum dimension.



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Fig. 233: Measuring Distance Between End Of Valve Stem And Top Surface Of Cylinder Head
 Courtesy of AUDI OF AMERICA, INC.

CALCULATE MAXIMUM PERMISSIBLE VALVE SEAT REWORKING DIMENSION

Minimum dimensions		
Outer inlet valve	Center inlet valve	Exhaust valve
32.2 mm	33.2 mm	33.0 mm

Measured distance minus minimum dimension = maximum permissible reworking dimension.

CALCULATE MAXIMUM PERMISSIBLE VALVE SEAT REWORKING DIMENSION (EXAMPLE)

Center inlet valve	Dimension
Measured distance	33.0 mm
Minimum dimension	-32.2 mm
Maximum permissible reworking dimension	= 0.8 mm

NOTE: If the measured distance is less than the minimum dimension, repeat the measurement with new valves, or replace cylinder head.

ENGINE - LUBRICATION

LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING

CAUTION: Before beginning repairs on the electrical system:

- Obtain the anti-theft radio security code.
- Switch the ignition off.
- Disconnect the battery Ground (GND) strap.
- On vehicles equipped with Audi Telematics by OnStar®, switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting vehicle battery. See EMERGENCY (BACK-UP) BATTERY, SWITCH ON/OFF, RESET TIME REGISTER .
- After reconnecting vehicle battery, re-code and check operation of anti-theft radio. Also check operation of clock and power windows according to Repair Manual and/or Owner's Manual.
- After reconnecting vehicle battery on vehicles equipped with Audi Telematics by OnStar®, switch-on the emergency (back-up) battery for the Telematic/Telephone Control Module. See EMERGENCY (BACK-UP) BATTERY, SWITCH ON/OFF, RESET TIME REGISTER .

- NOTE:**
- If large quantities of metal particles or other deposits (caused, for example, by partial seizure of the crankshaft or connecting rod bearings) are found in the engine oil when performing repairs, clean the oil passages thoroughly and replace the oil cooler in order to prevent further damage from occurring later.
 - Always replace O-rings, gaskets and oil seals when performing repairs.
 - The oil level must not be above the max. mark - otherwise this can cause damage to the catalytic converter. For markings, see OIL LEVEL, CHECKING.

Viscosity grades, Oil capacities and oil specifications, see ENGINE OIL, FILLING

Checking oil pressure, see OIL PRESSURE AND OIL PRESSURE SWITCH, CHECKING

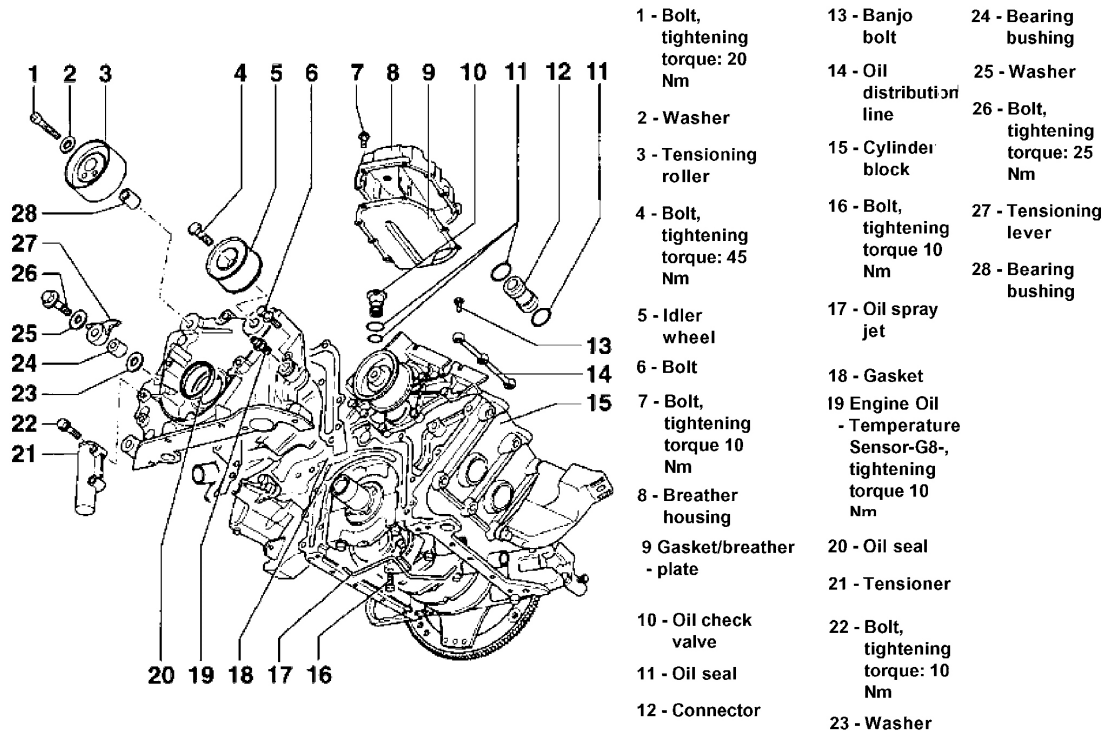
Crankcase breather and oil spray jets

Removing and installing oil pump, oil pan, oil filter and oil cooler: See UPPER AND LOWER SECTIONS OF OIL PAN, REMOVING AND INSTALLING.Fig. 234

NOTE: The following list refers to items in .

1. - **Bolt, tightening torque: 20 Nm**
2. - **Washer**
3. - **Tensioning roller**
4. - **Bolt, tightening torque: 45 Nm**
5. - **Idler wheel**
 - For toothed belt
6. - **Bolt**
 - M6 Tightening torque: 10 Nm
 - M8 Tightening torque: 20 Nm
7. - **Bolt, tightening torque 10 Nm**
8. - **Breather housing**
9. - **Gasket/breather plate**
 - Always replace
10. - **Oil check valve**
 - Tightening torque: 25 Nm
11. - **Oil seal**
12. - **Connector**
13. - **Banjo bolt**
 - Tightening torque: 15 Nm
14. - **Oil distribution line**
 - For oil spray jets for piston cooling
15. - **Cylinder block**
16. - **Bolt, tightening torque 10 Nm**
 - Apply locking fluid "D6" when installing
17. - **Oil spray jet**
 - For piston cooling
18. - **Gasket**
 - Metal gasket
 - Always replace
19. - **Engine Oil Temperature Sensor-G8-, tightening torque 10 Nm**
 - For oil temperature gauge
 - White
 - If seal is leaking, cut open with pliers and replace.
20. - **Oil seal**
 - Replacing, see **OIL SEALS IN CYLINDER HEADS, REPLACING**
21. - **Tensioner**
 - Secure in position before removing. See **SECURING TENSIONER IN POSITION BEFORE REMOVING.**

- 22. - Bolt, tightening torque: 10 Nm
 - Apply locking fluid "D6" when installing
- 23. - Washer
- 24. - Bearing bushing
 - For tensioning lever
- 25. - Washer
- 26. - Bolt, tightening torque: 25 Nm
- 27. - Tensioning lever
- 28. - Bearing bushing
 - For tensioning roller



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Fig. 234: Exploded View Of Engine Lubrication System
Courtesy of AUDI OF AMERICA, INC.

Securing tensioner in position before removing

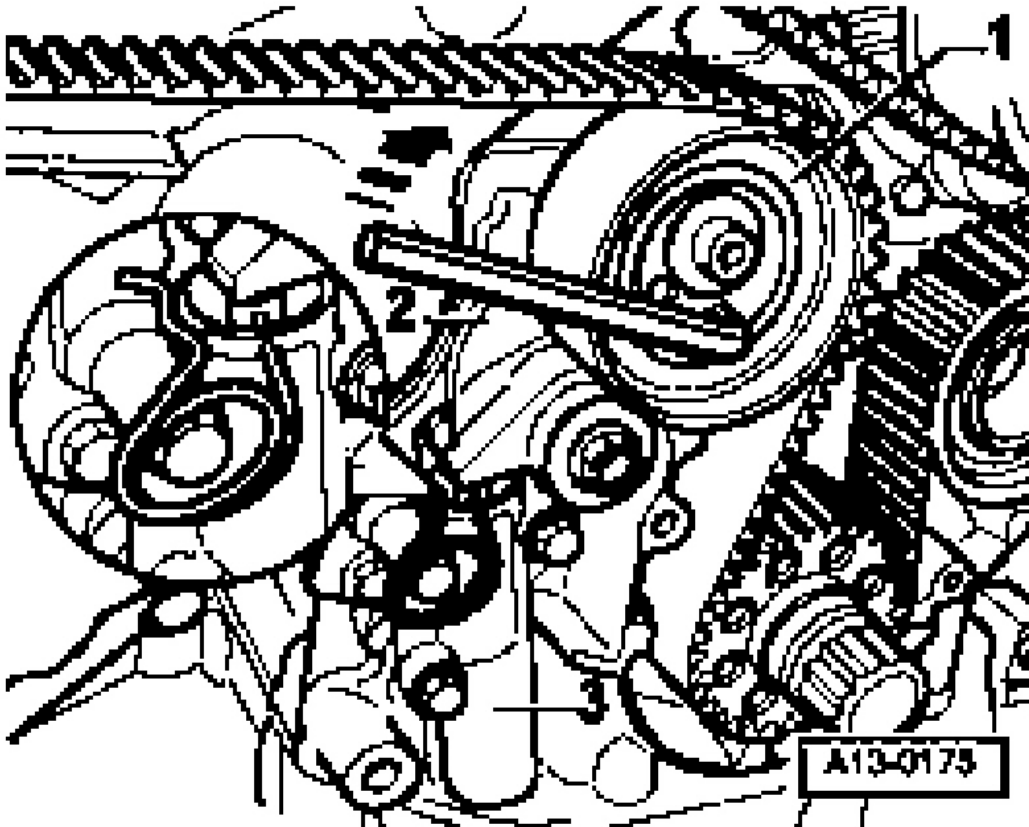
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until tensioning lever -2- compresses tensioner -3- far enough to enable a 2 mm dia. spring pin to be inserted in drilling and in plunger.

NOTE:

- The toothed belt tensioner is oil-damped and can only be

compressed slowly by applying gradual pressure.

- Use spring pin from 2024 A.



G02724339

Fig. 235: Turning Toothed (Timing) Belt Tensioner
Courtesy of AUDI OF AMERICA, INC.

- Insert spring pin and release toothed belt tensioning roller.

Oil pump, oil pan, oil filter and oil cooler, removing and installing

NOTE: The following list refers to items in Fig. 236.

1. - Bolt for dipstick guide tube
 - Tightening torque: 25 Nm
2. - Dipstick guide tube
 - Replace O-ring

3. - Oil pan - upper section

- There is no gasket between engine block and upper section of oil pan. Only use silicone sealant D 454 300 A2.

4. - Hex socket head bolt M8

- Tightening torque: 20 Nm

5. - Hex bolt M6

- Tightening torque: 15 Nm

6. - Hex socket head bolt M8

- Tightening torque: 20 Nm
- The coolant drain screw is next to this bolt

7. - Hex bolt M6

- Tightening torque: 10 Nm

8. - O-ring

- Always replace

9. - Gasket for lower section of oil pan

- Sealing surfaces should be clean and dry

10. - Oil drain plug

- Tightening torque: 30 Nm

11. - Seal for oil drain plug

- Oil pan

12. - Hex bolt M6

- Tightening torque: 10 Nm

13. - Oil pan -lower section**14. - Hex bolt M6**

- Tightening torque: 10 Nm

15. - Retainer for oil lines**16. - Oil supply line**

- From pump to oil filter

17. - Oil supply line

- From oil filter to engine oil system

18. - O-ring

- Always replace

19. - O-ring

- Always replace

20. - Oil filter**21. - Hex nut**

- Tightening torque: 30 Nm
- Threaded line for oil cooler and oil filter is screwed into upper section of oil pan with 20 Nm

tightening torque.

22. - Oil cooler

- Make sure O-ring is installed correctly when installing

23. - Oil pump

- Driven off crankshaft via chain
- Tightening torque of chain sprocket to oil pump: 25 Nm
- Tightening torque of oil pump to engine block: 25 Nm

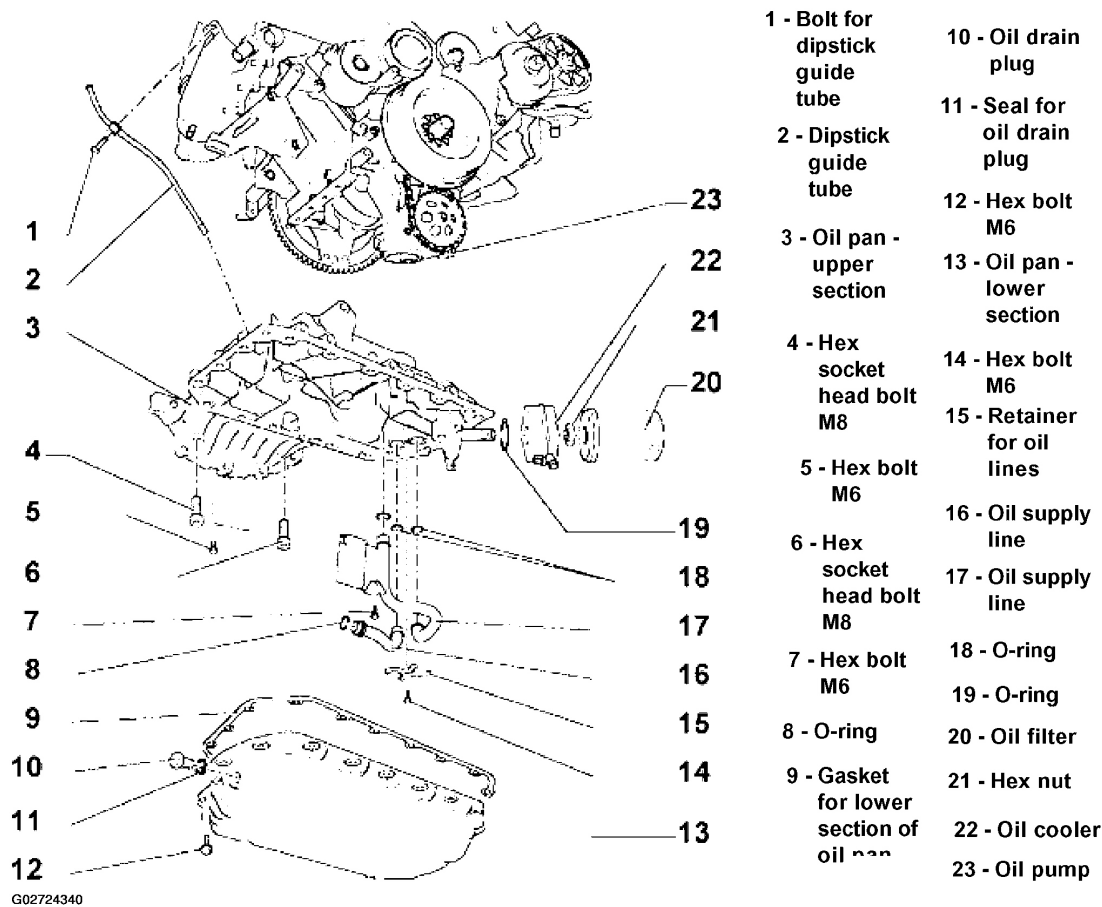


Fig. 236: Exploded View Of Oil Pans And Oil Cooler
Courtesy of AUDI OF AMERICA, INC.

Oil check valves, replacing

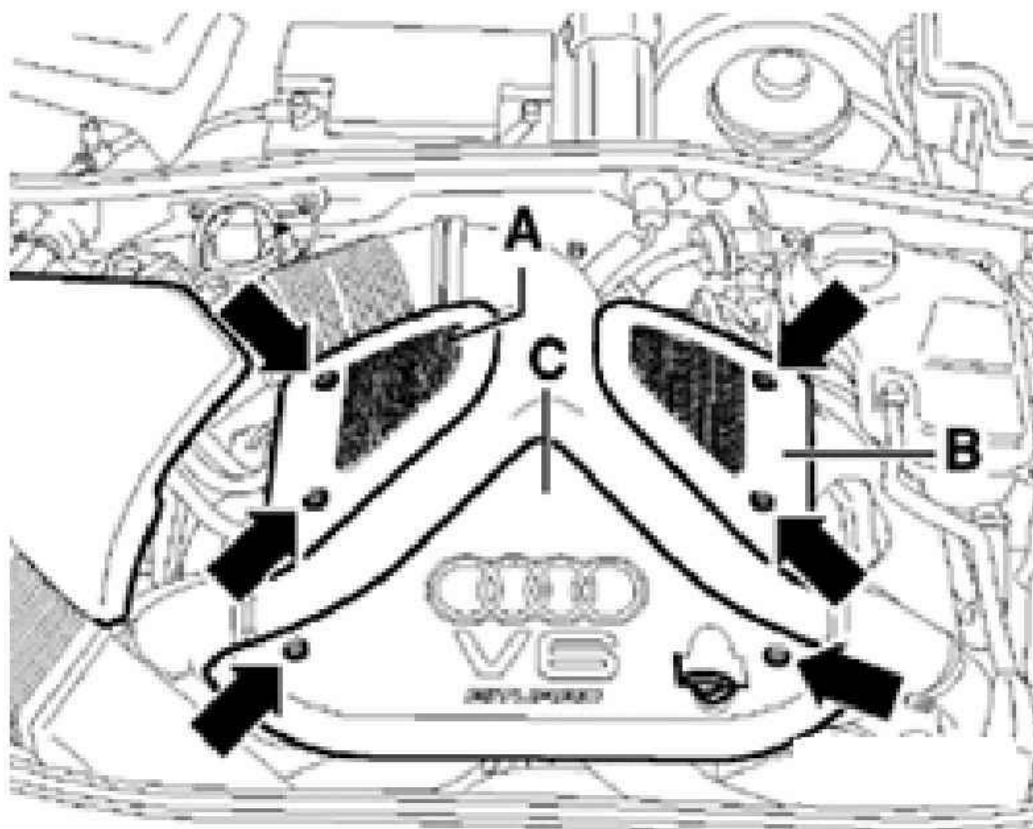
NOTE: If irregular valve noise occurs repeatedly during short journeys and disappears after extended driving, the oil check valves must be replaced.

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

- Catch drained-off coolant in a clean container for re-use or disposal.
- Replace all gaskets and seals.

Removing

- Remove bolts -arrows- and remove engine cover panels C-.
- Remove cover above air cleaner.



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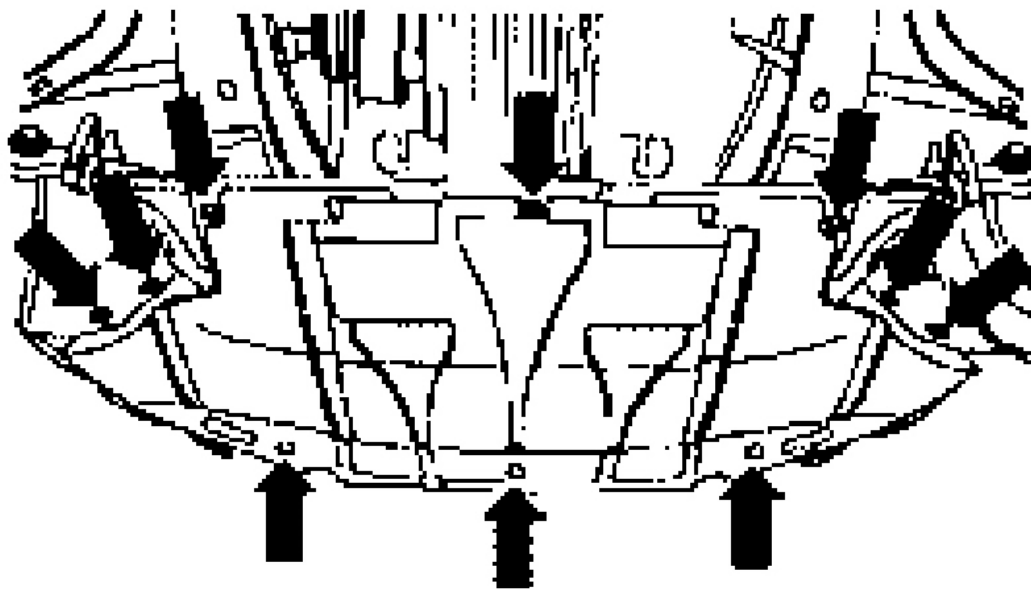
Fig. 237: Removing Engine Cover Panels
Courtesy of AUDI OF AMERICA, INC.

- Remove noise insulation -arrows-.
- Drain coolant. See **COOLING SYSTEM, DRAINING AND FILLING** .
- Remove bumper.

See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

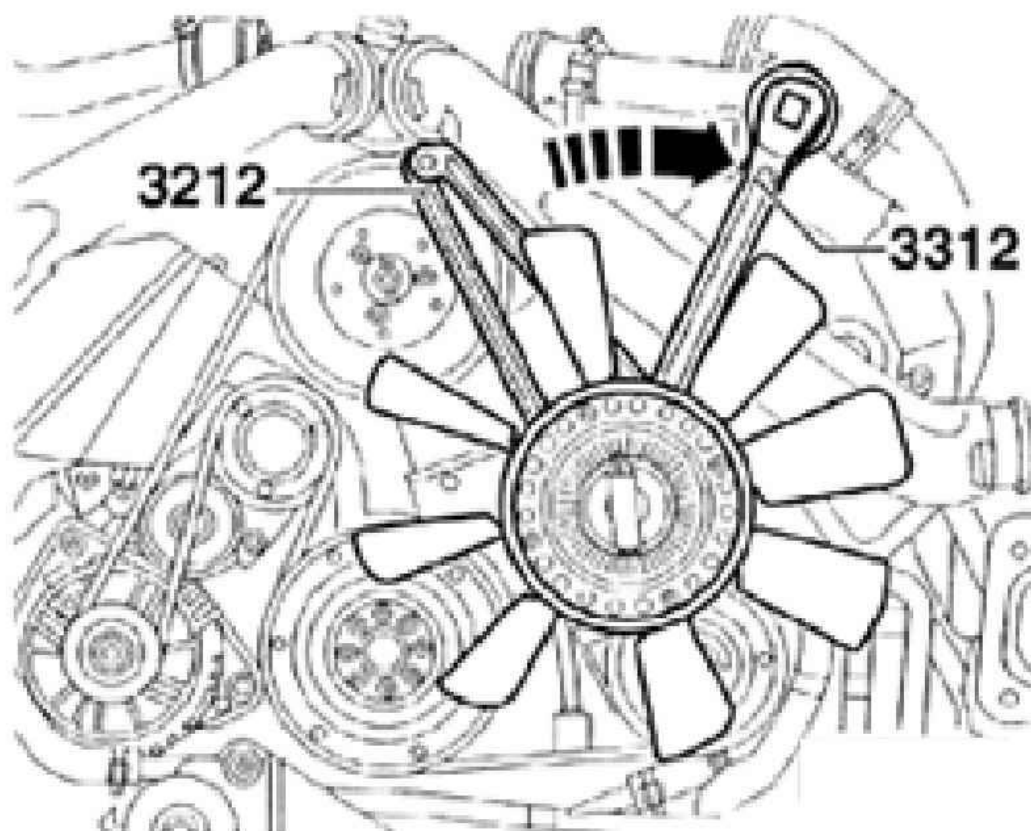


G02724342

Fig. 238: Removing Noise Insulation
Courtesy of AUDI OF AMERICA, INC.

- Remove viscous fan (counter-hold with pin wrench 3212).

NOTE: **Viscous fan has LEFT-HAND thread.**



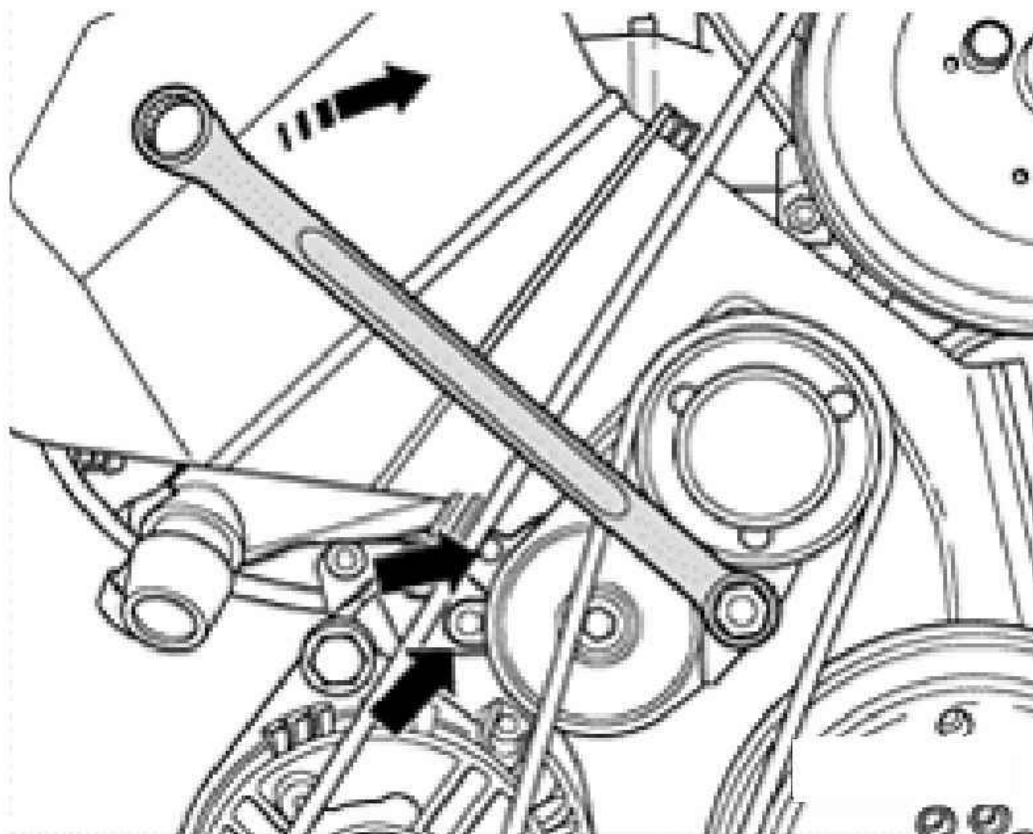
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Fig. 239: Removing Viscous Fan With Pin Wrench 3212
Courtesy of AUDI OF AMERICA, INC.

- Mark direction of rotation of ribbed belt.
- Loosen ribbed belt by turning to right using a 17 mm box wrench until two holes are aligned with each other -arrow- and hold in position with mandrel 3204.

NOTE: Mark direction of rotation of ribbed belt. The belt can break if it runs in the opposite direction when reinstalled.

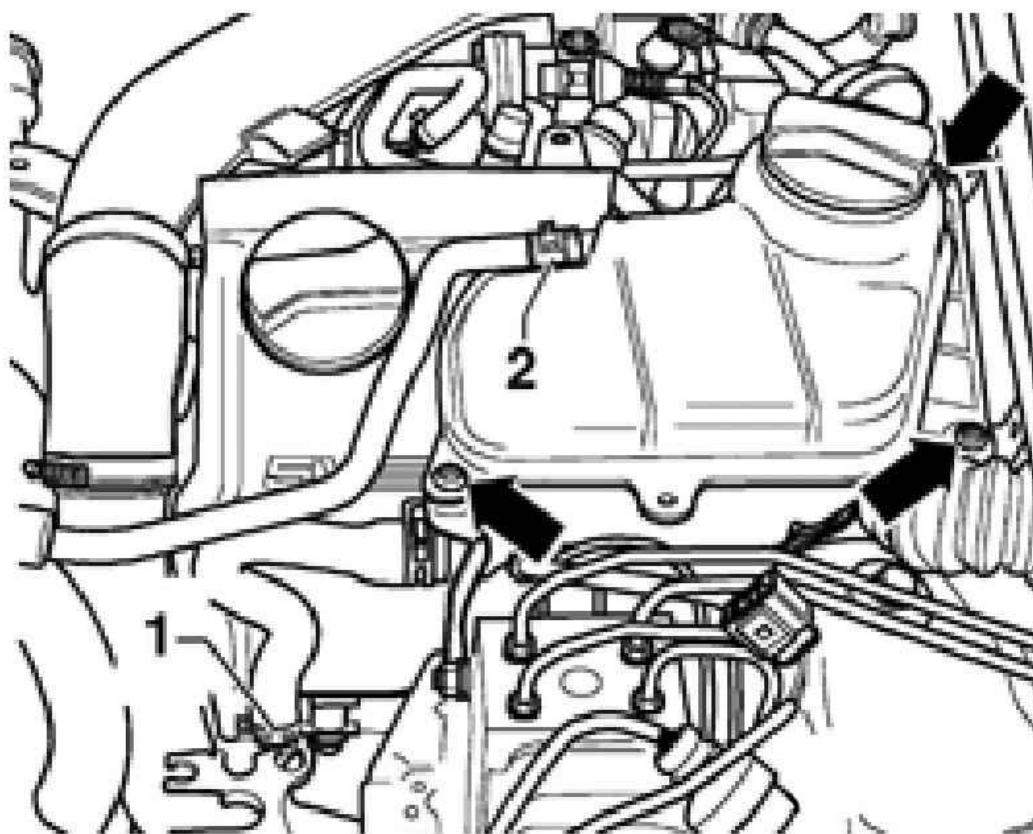
- Remove ribbed belt.



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Fig. 240: Turning Ribbed Belt Tensioner Using A 17 mm Box Wrench
Courtesy of AUDI OF AMERICA, INC.

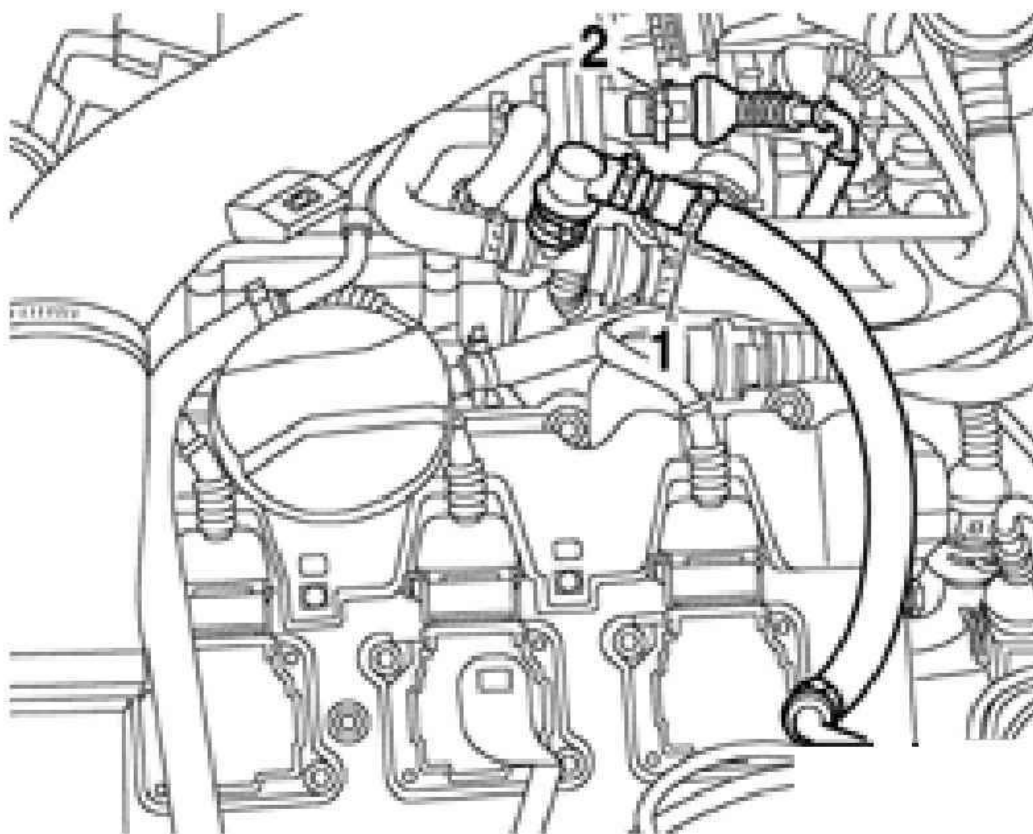
- Disconnect water hoses -1- and -2-.
- Remove coolant reservoir (arrows).
- Disconnect connector for coolant level monitor.
- Remove cover panel from cylinder head cover (cylinder bank 4 through 6).



G02724345

Fig. 241: Disconnecting Water Hoses From Coolant Reservoir
Courtesy of AUDI OF AMERICA, INC.

- Disconnect hose -1- from vacuum reservoir.



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Fig. 242: Disconnecting Vacuum Reservoir
Courtesy of AUDI OF AMERICA, INC.

- Remove air duct -arrows-.



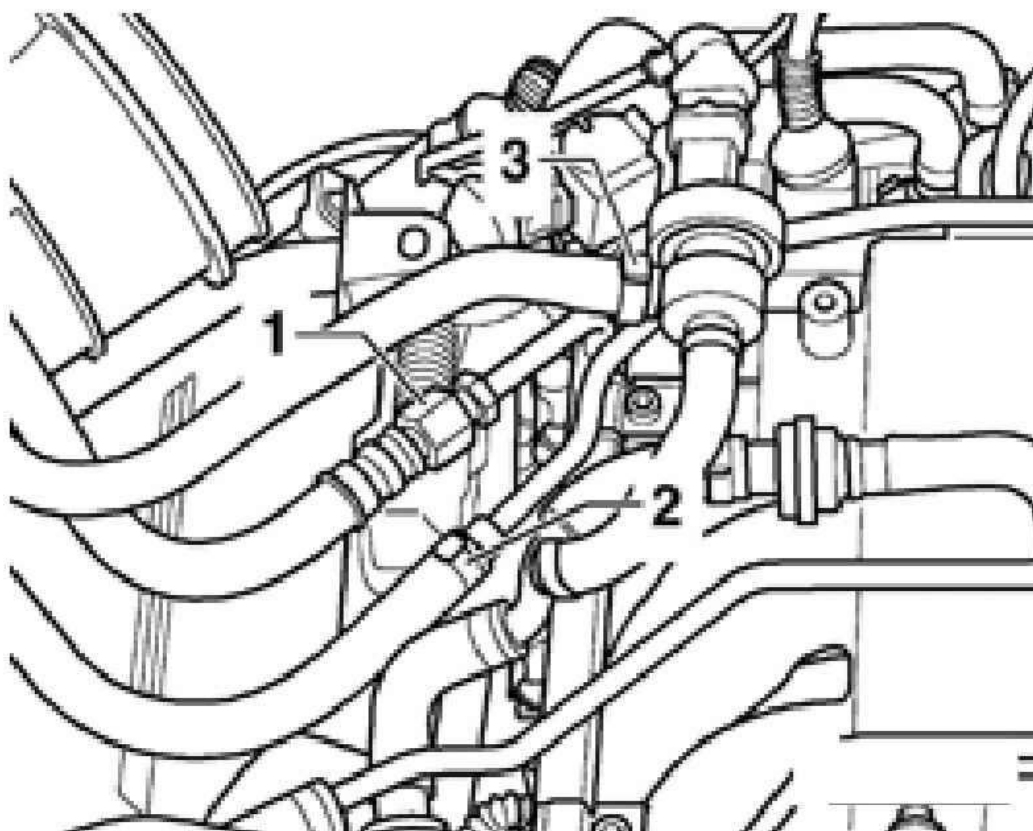
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Fig. 243: Removing Air Duct

Courtesy of AUDI OF AMERICA, INC.

WARNING: Fuel system is under pressure. Before opening the system, place a cloth around the connection. Then release pressure by carefully loosening the connection.

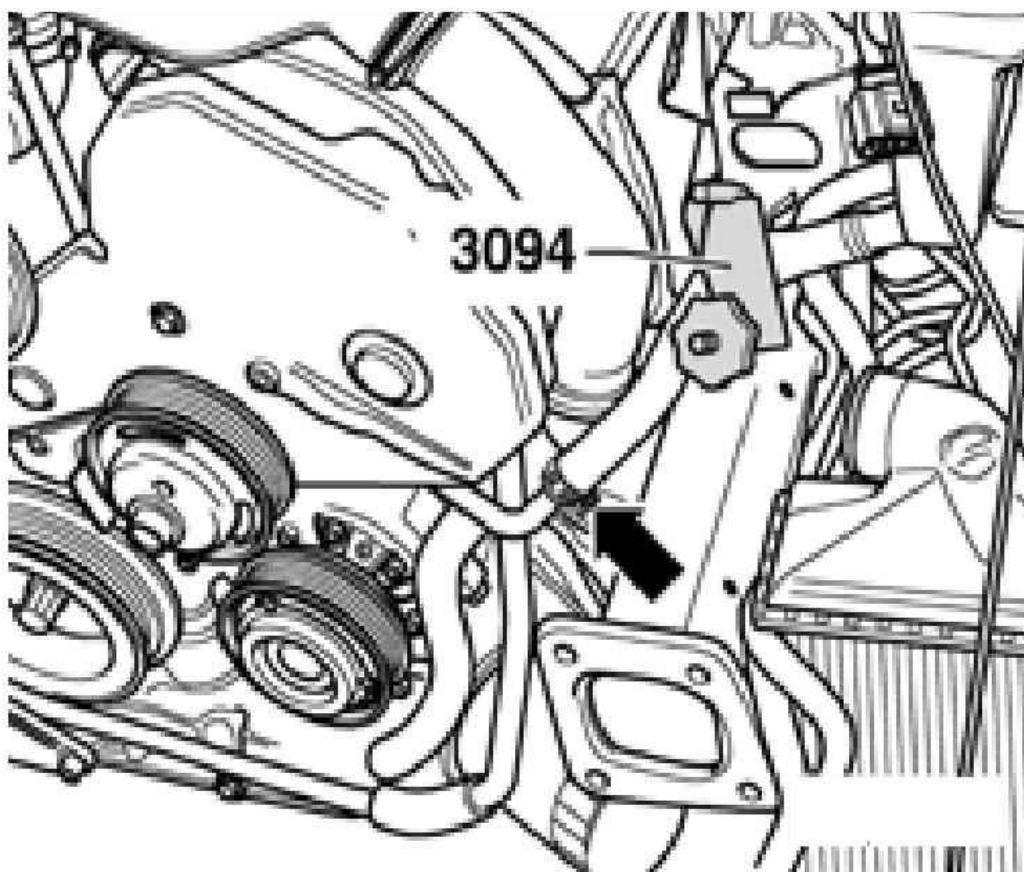
- Disconnect fuel supply line and fuel return line -1- and -2-, and move fuel lines clear. See **Fig. 244**.
- Disconnect hose from EVAP valve -3-.



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Fig. 244: Disconnecting Fuel Lines And Hose From EVAP Valve
Courtesy of AUDI OF AMERICA, INC.

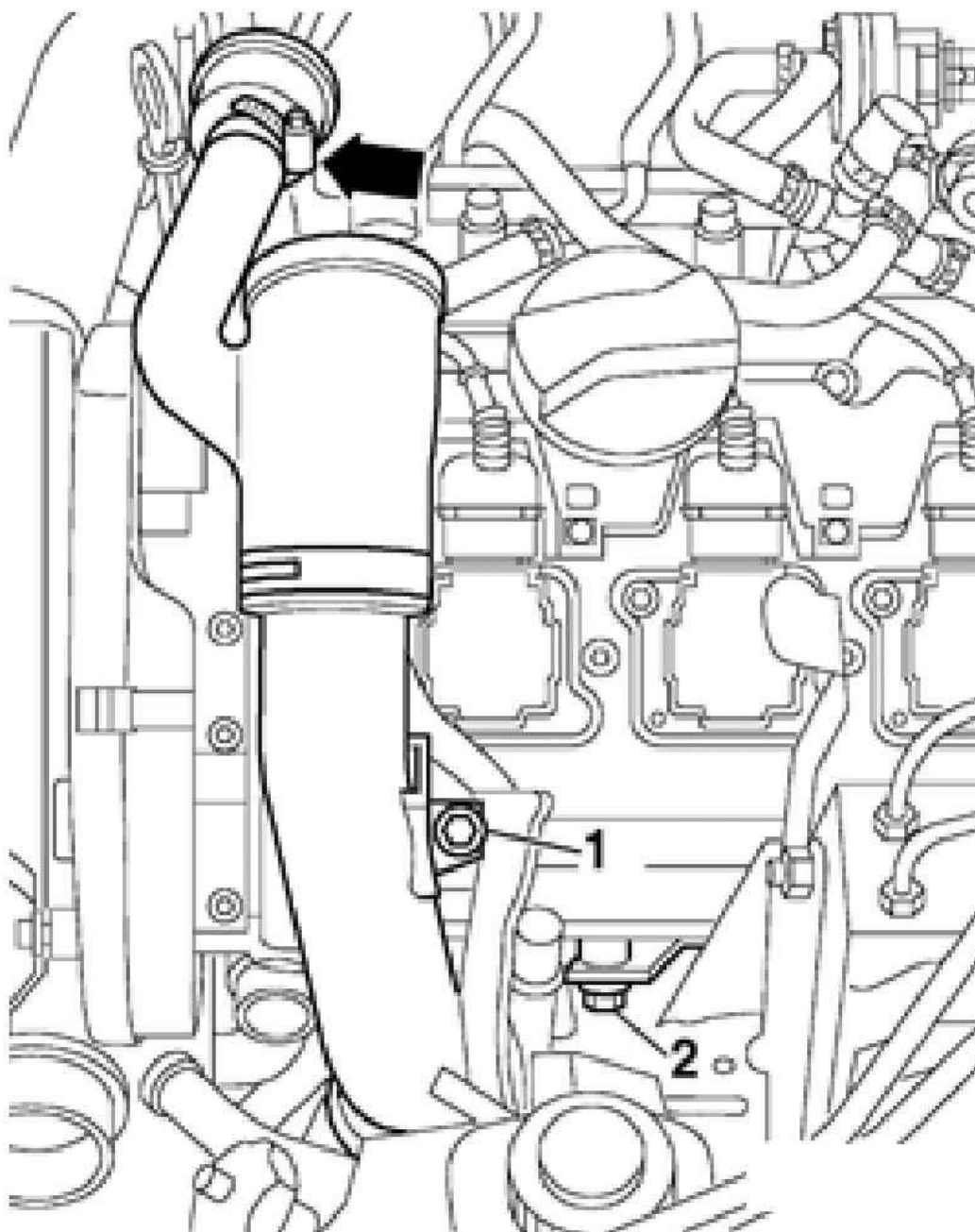
- Install clamp (special tool 3094) on hose from power steering reservoir to power steering pump.
- Disconnect power steering hose -arrow-.



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Fig. 245: Disconnecting Power Steering Hose
Courtesy of AUDI OF AMERICA, INC.

- Release hose clamp -arrow-.
- Remove intake line -1-.



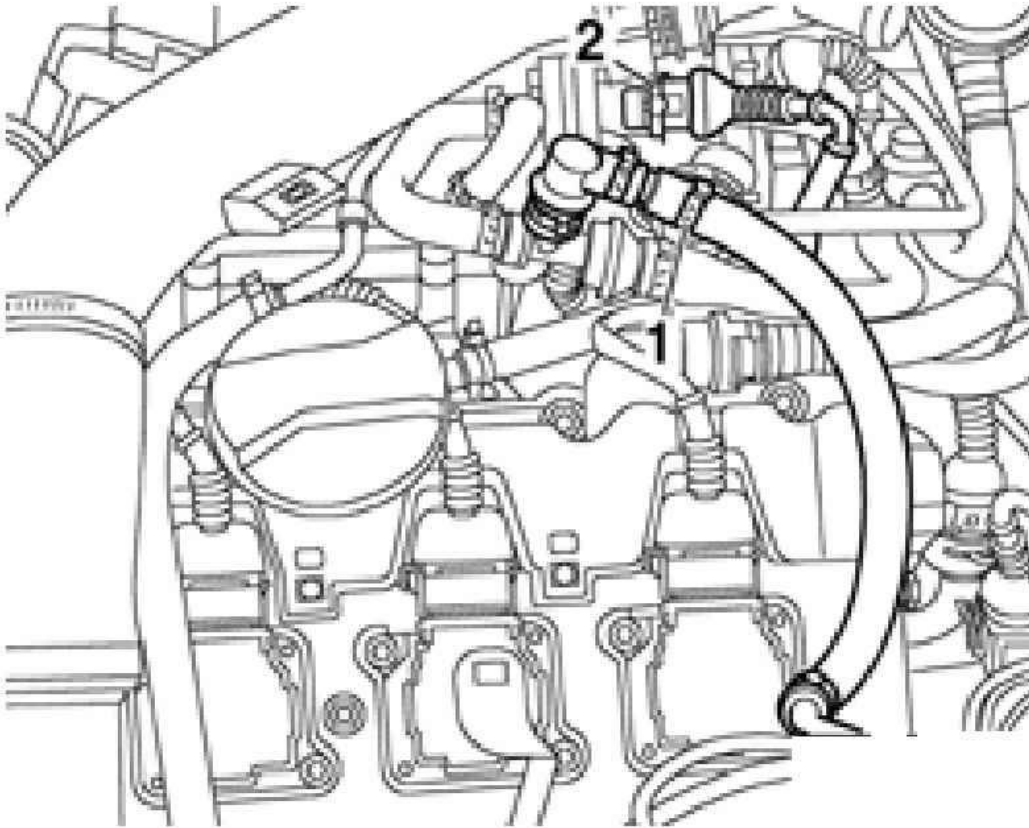
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Fig. 246: Removing Hose Clamp And Intake Line
Courtesy of AUDI OF AMERICA, INC.

NOTE:

- All hose connections are secured with clips.

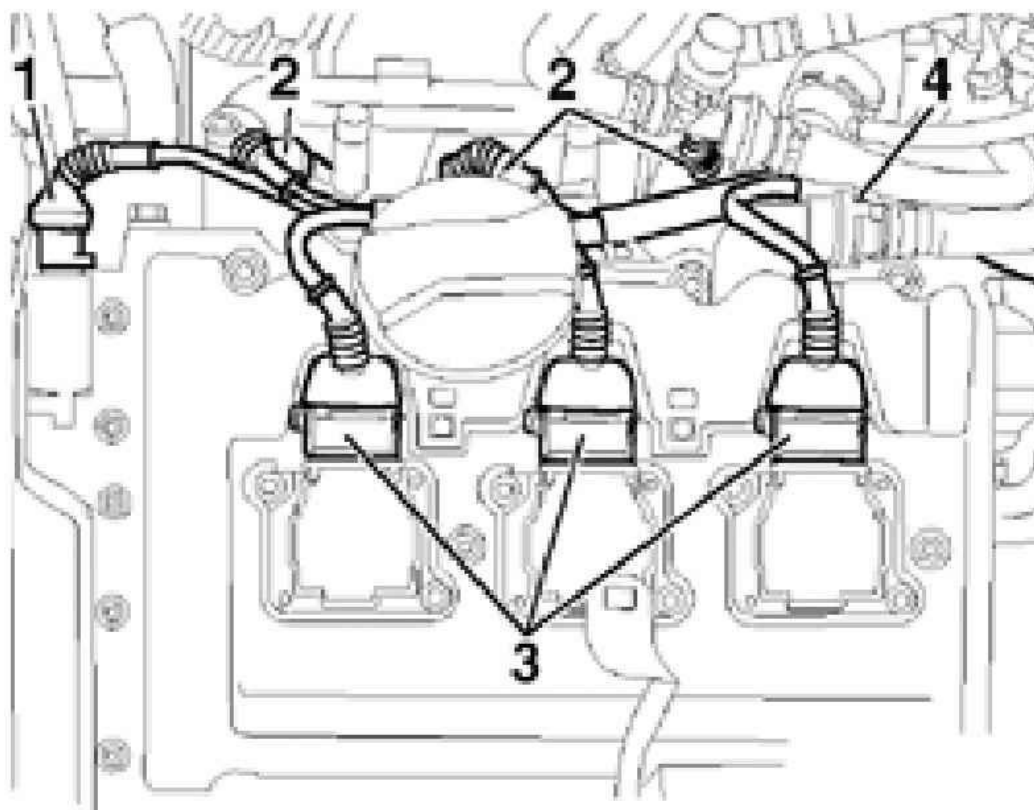
- **Charge air system must be free of leaks.**
 - **Replace all seals and gaskets.**
- Disconnect connector from air recirculation valve -2-.



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Fig. 247: Disconnecting Connector From Air Recirculation Valve
Courtesy of AUDI OF AMERICA, INC.

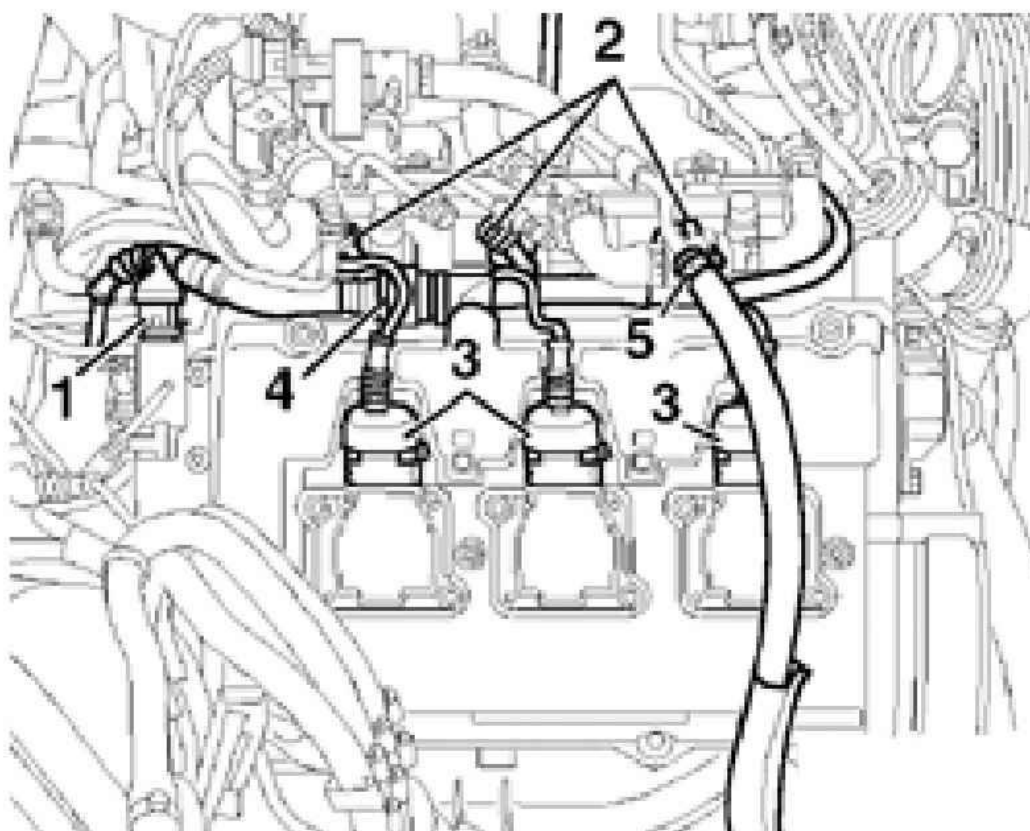
- Disconnect connector from camshaft timing control -1- (cylinder bank 4 through 6).
- Disconnect connectors from injectors -2- (cylinder bank 4 through 6).
- Disconnect crankcase breather -4- from cylinder head cover (cylinder bank 4 through 6).



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Fig. 248: Disconnecting Electrical Connectors On Cylinder Bank 4 Through 6
 Courtesy of AUDI OF AMERICA, INC.

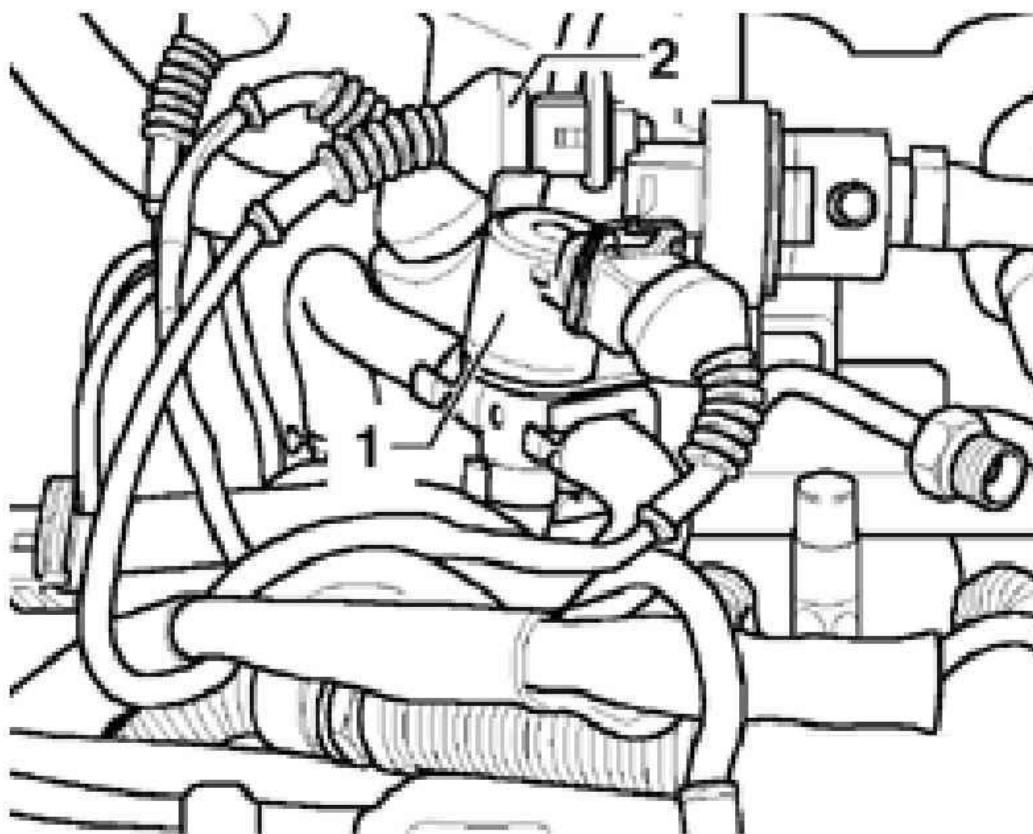
- Disconnect connectors from injectors -2- (cylinder bank 1 through 3).
- Disconnect hose -5- going from turbocharger intake side. See **Fig. 249**.



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Fig. 249: Disconnecting Electrical Connectors On Cylinder Bank 1 Through 3
Courtesy of AUDI OF AMERICA, INC.

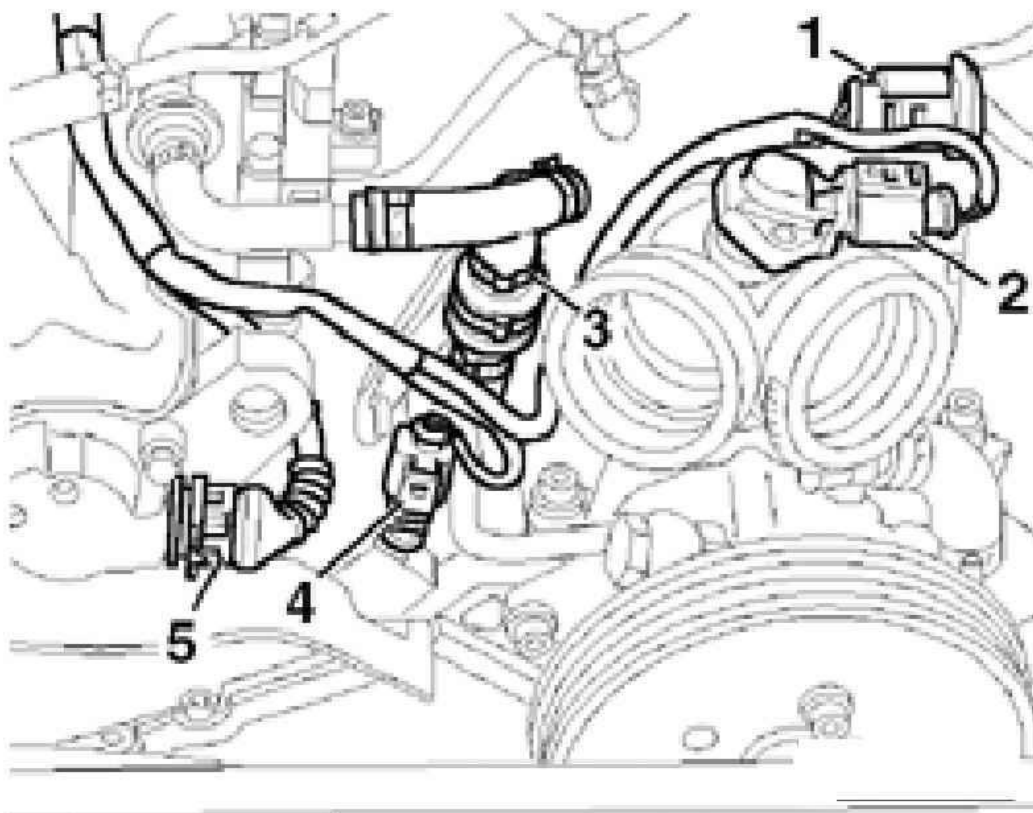
- Unclip solenoid valve for charge air pressure control -1-.
- Disconnect connector from EVAP valve -2-.



G02724354

Fig. 250: Disconnecting Solenoid Valve For Charge Air Pressure Control
Courtesy of AUDI OF AMERICA, INC.

- Disconnect connector from throttle unit -1-. See **Fig. 251**.
- Disconnect connector from charge air pressure sensor -2-.
- Disconnect crankcase breather -3-.
- Disconnect connector from intake air temperature sensor -4-.

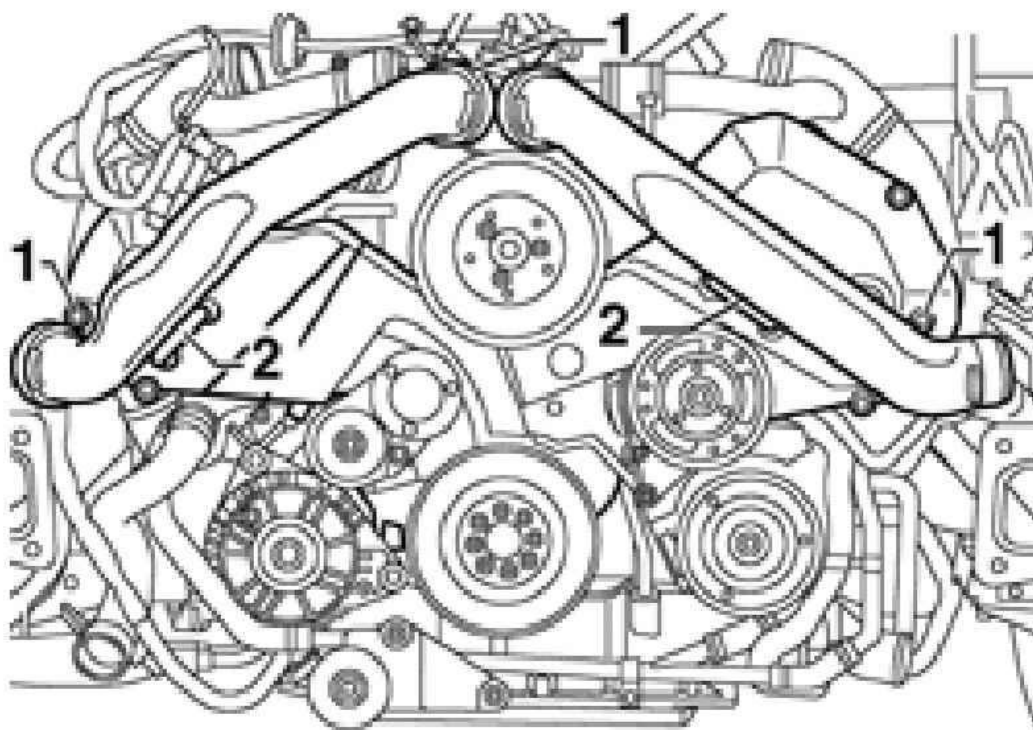


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Fig. 251: Disconnecting Connectors On Engine
Courtesy of AUDI OF AMERICA, INC.

- Remove pressure lines -1-.

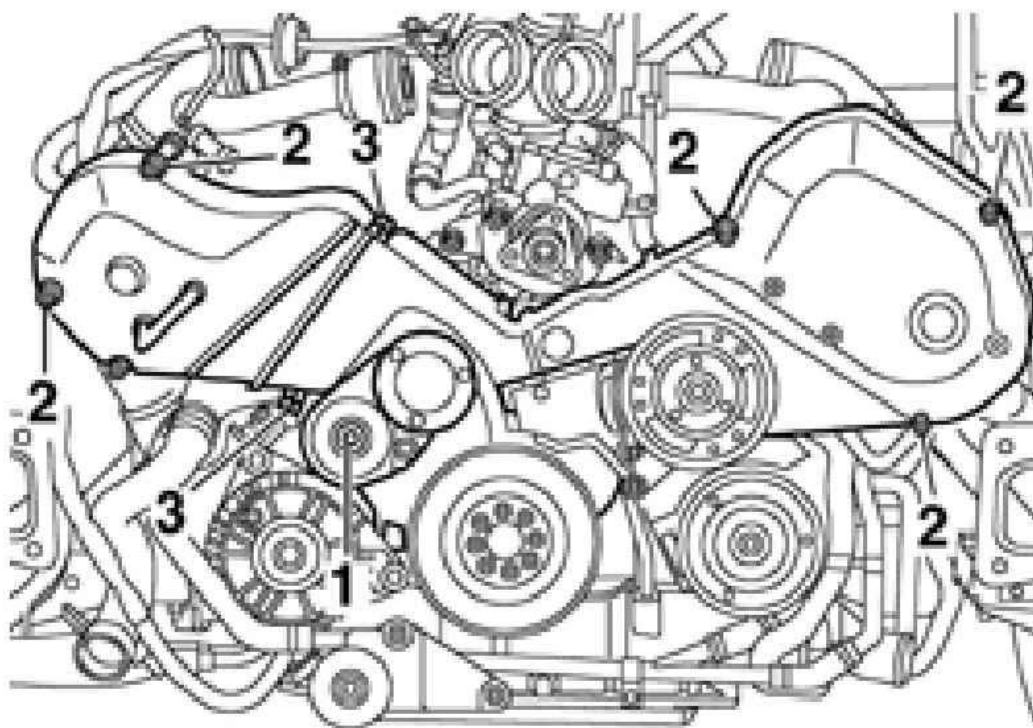
NOTE: **Observe position of retaining strips -2-.**



G02724356

Fig. 252: Removing Pressure Lines
Courtesy of AUDI OF AMERICA, INC.

- Remove tensioner -1- for ribbed belt.
- Remove toothed belt guards -2- (left and right).
- Remove toothed belt guard -3- (center).



G02724357

Fig. 253: Removing Ribbed Belt Tensioner And Toothed Guards
 Courtesy of AUDI OF AMERICA, INC.

- Turn crankshaft to TDC by hand. Marks -A- and -B- must be aligned.

NOTE: Turn over the engine at the central bolt on the crankshaft.

- Check position of camshafts: larger holes in securing plates on camshaft sprockets must align opposite one another on inside. If not, turn crankshaft one revolution further.



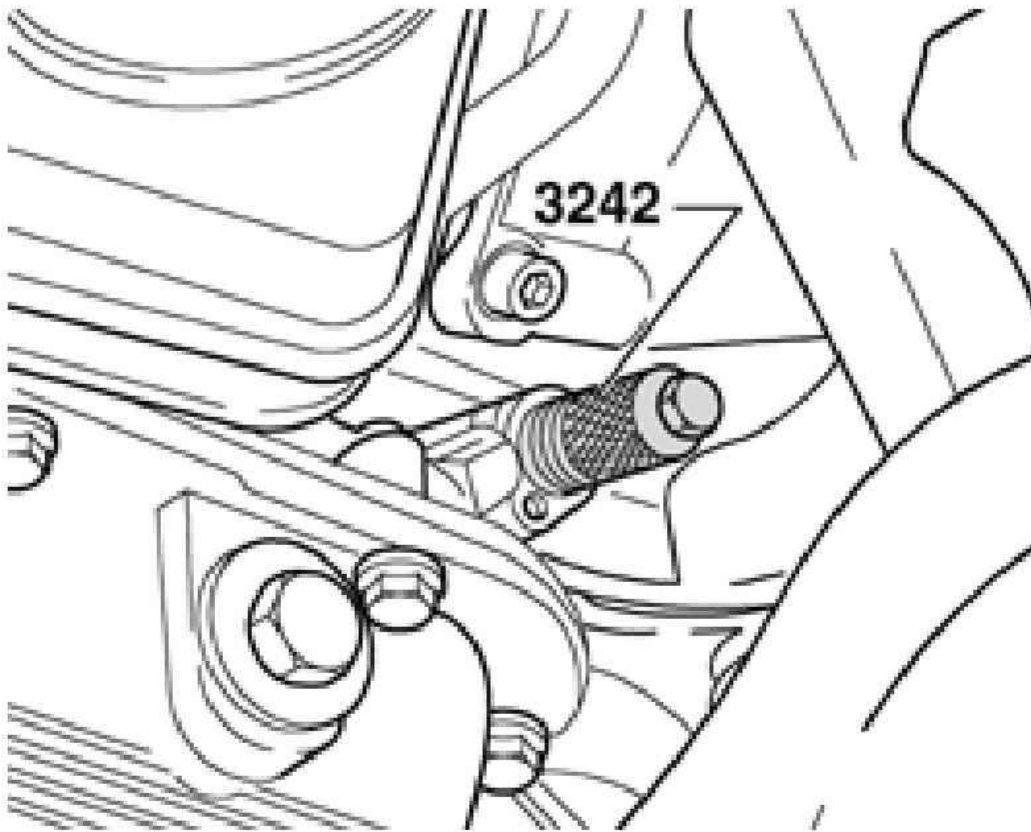
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Fig. 254: Aligning Match Marks -A- And -B- On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

- Remove sealing plug from cylinder block, left.

TDC drilling in crankshaft must be visible (or able to be felt) in line with sealing plug hole.

- Screw clamping bolt 3242 for crankshaft into sealing plug hole and tighten.

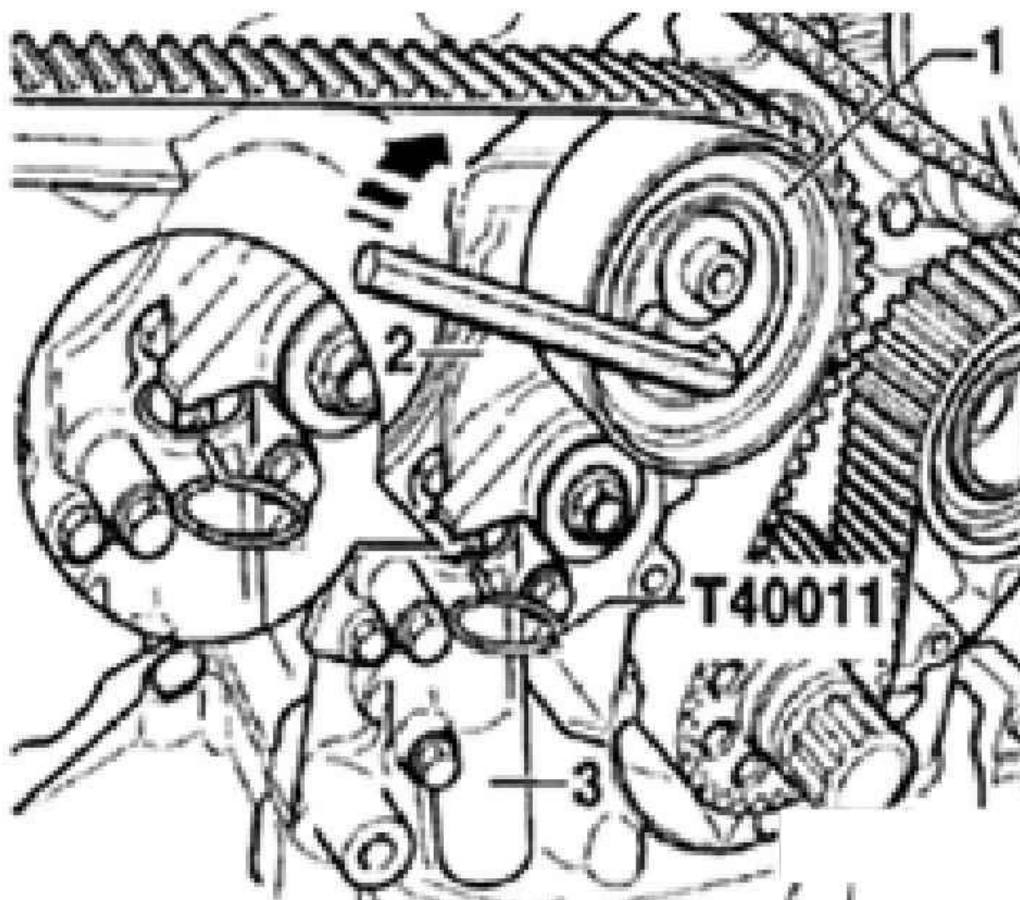


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Fig. 255: Removing Sealing Plug 3242 From Cylinder Block
Courtesy of AUDI OF AMERICA, INC.

NOTE:

- Mark the direction of rotation of the toothed belt with chalk or felt pen before removing. A used belt can break if it rotates in the wrong direction when reinstalled.
 - The toothed belt tensioning element is oil-damped and can therefore only be compressed slowly by applying constant pressure.
- Using a hex key, turn toothed belt tensioning roller -1- clockwise 8 mm in direction of arrow until tensioning lever 2- compresses tensioning element -3- sufficiently to enable special tool T 400 11 to be installed in drilling and in plunger.



G02724360

Fig. 256: Using A Hex Key To Turn Toothed Belt Tensioning Roller
Courtesy of AUDI OF AMERICA, INC.

- Insert special tool T 400 11 and release toothed belt tensioning roller.
- Insert camshaft clamp 3391 in securing plates of two camshafts.
- Loosen both camshaft bolts and remove approx. 5 turns.
- Remove camshaft clamp 3391.
- Disconnect both camshaft sprockets with special tool T40001.

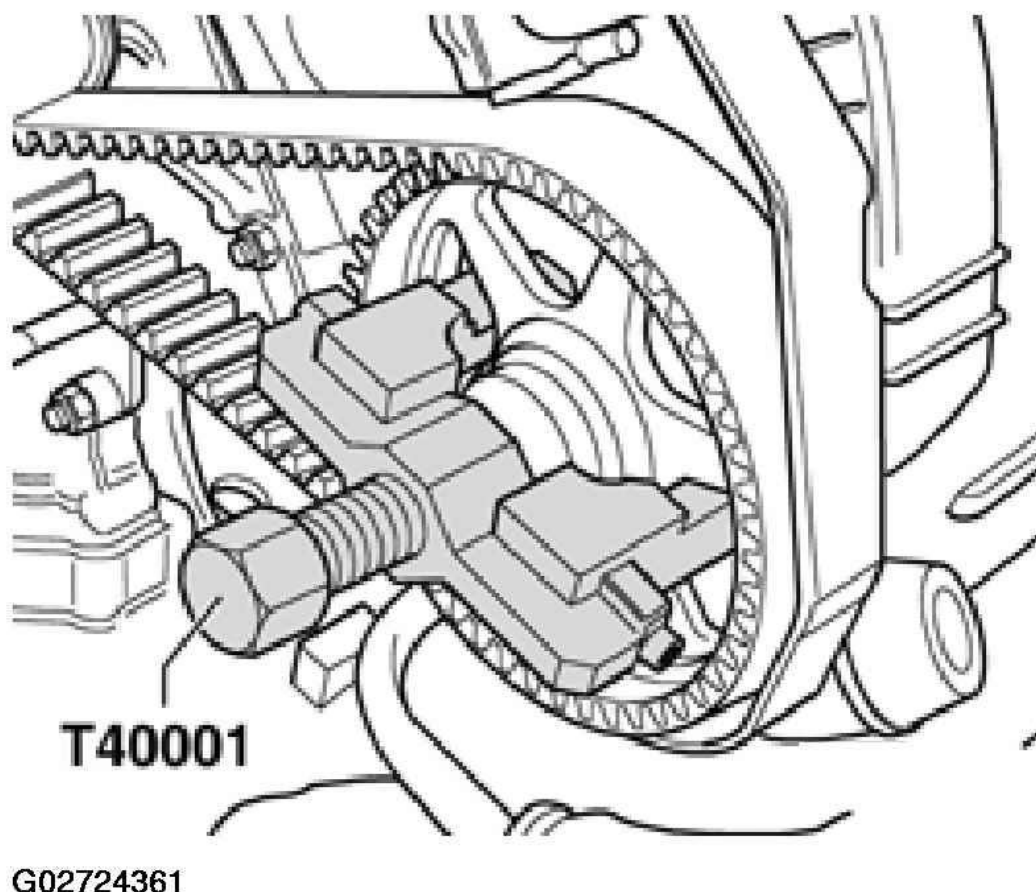
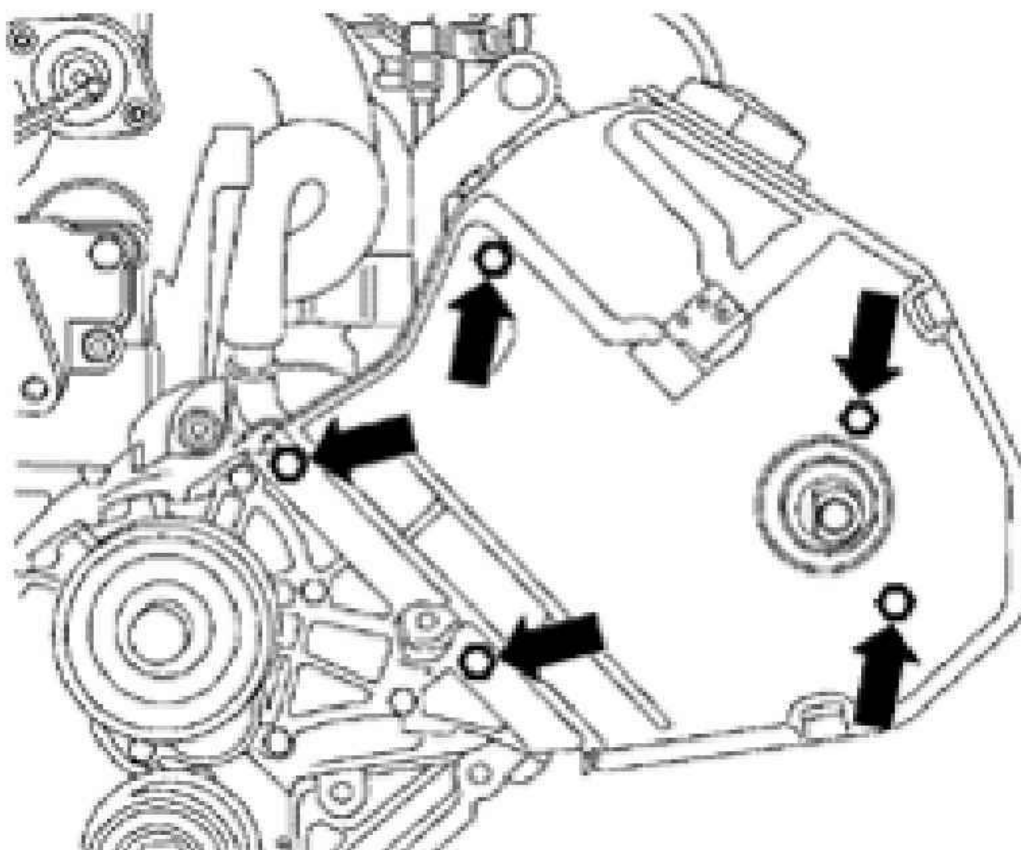


Fig. 257: Disconnecting Camshaft Sprockets
Courtesy of AUDI OF AMERICA, INC.

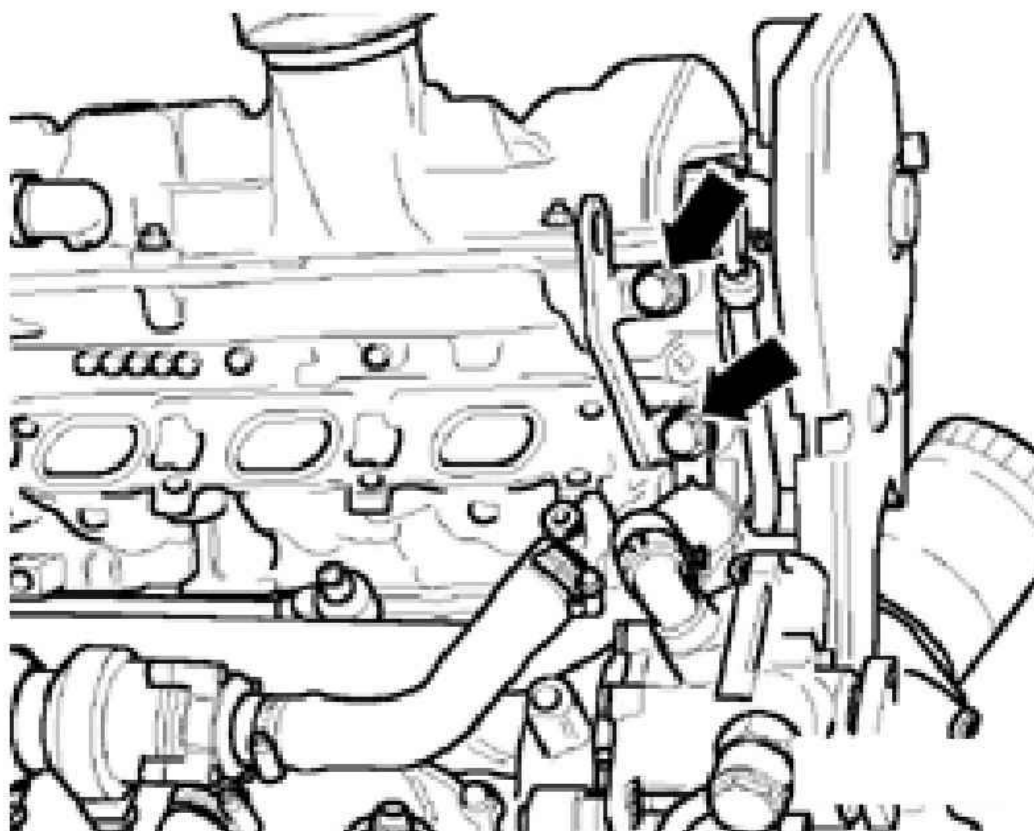
- Unbolt rear left toothed belt guard -arrows-.
- Detach intake manifold using special tool 3249.



G02724362

Fig. 258: Removing Rear Left Toothed Belt Guard
Courtesy of AUDI OF AMERICA, INC.

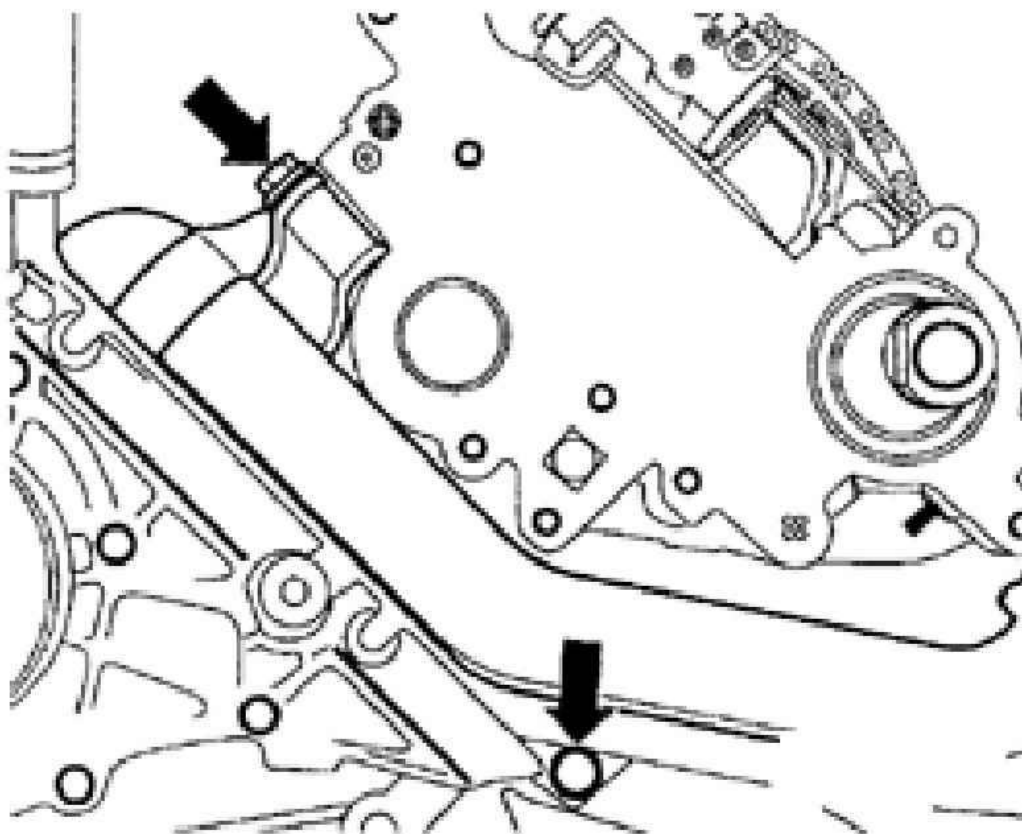
- Unbolt cylinder head lifting bracket with coolant line -arrows- from cylinder head.



G02724363

Fig. 259: Removing Cylinder Head Lifting Bracket With Coolant Line
Courtesy of AUDI OF AMERICA, INC.

- Unbolt coolant line at front of cylinder head -arrows- and remove.
- Remove water line and auxiliary water pump.
- Remove cover on oil check valves.

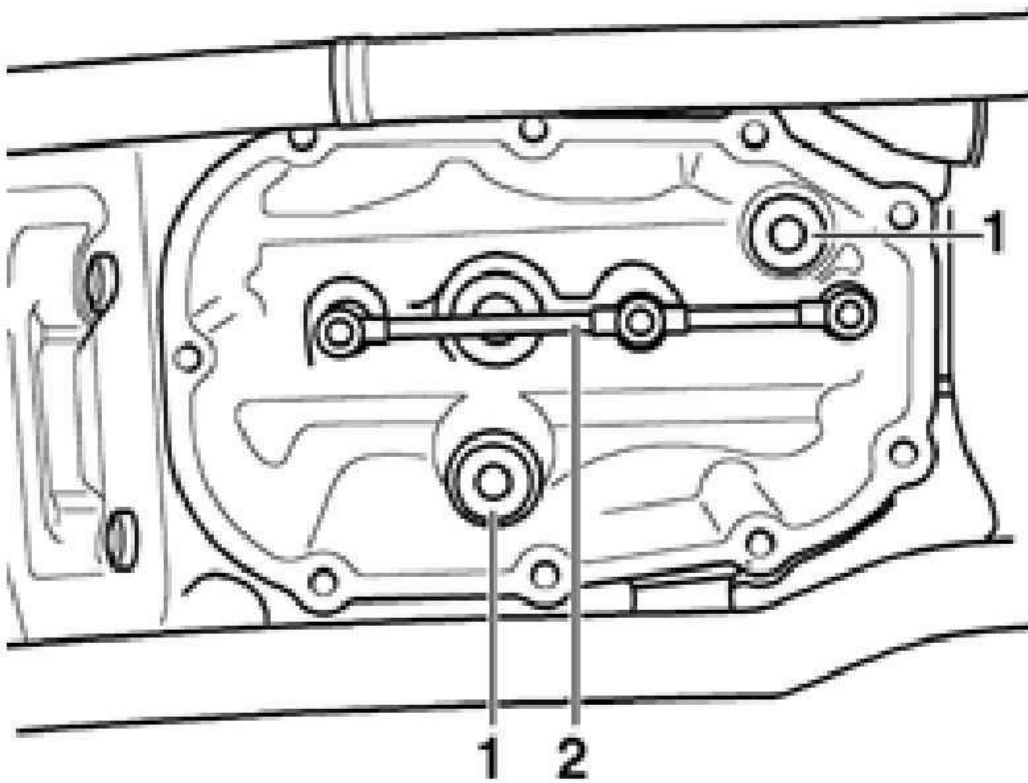


G02724364

Fig. 260: Removing Coolant Line At Front Of Cylinder Head
Courtesy of AUDI OF AMERICA, INC.

- Replace oil check valves -1- (25 Nm).

NOTE: The oil distribution line -2- for the spray jets for piston cooling is also located in the opening.



G02724365

Fig. 261: Locating Oil Check Valves And Oil Distribution Line
Courtesy of AUDI OF AMERICA, INC.

Installing

Install in the opposite order to removing. When installing, note the following points:

- Install lock carrier.

See **LOCK CARRIER, SERVICE POSITION** .

- Install bumper.

See **FRONT BUMPER** .

- Fill with coolant. See **COOLING SYSTEM, DRAINING AND FILLING** .

TIGHTENING TORQUES: OIL CHECK VALVES

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

Component	Nm
Bolts - M6	10
Bolts - M8	20
Toothed belt sprocket to camshaft	55
Intake manifold to cylinder head	10
Oil check valves	25
Cover for oil check valves	10

Lower section of oil pan, removing and installing

Special tools, testers and auxiliary items

- Drip tray VAG 1306

Removing

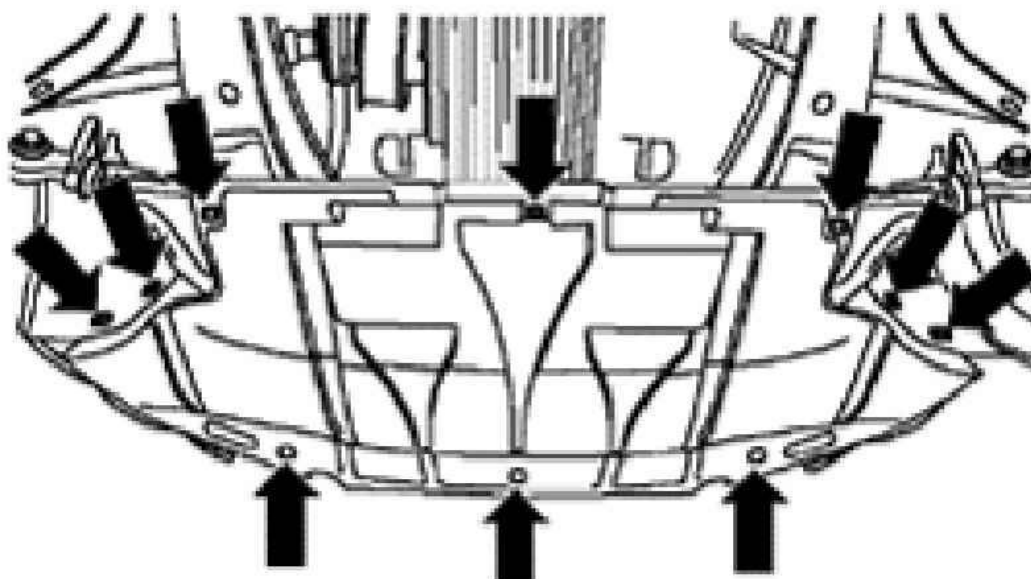
- Remove noise insulation panel -arrows-.
- Remove bumper.

See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

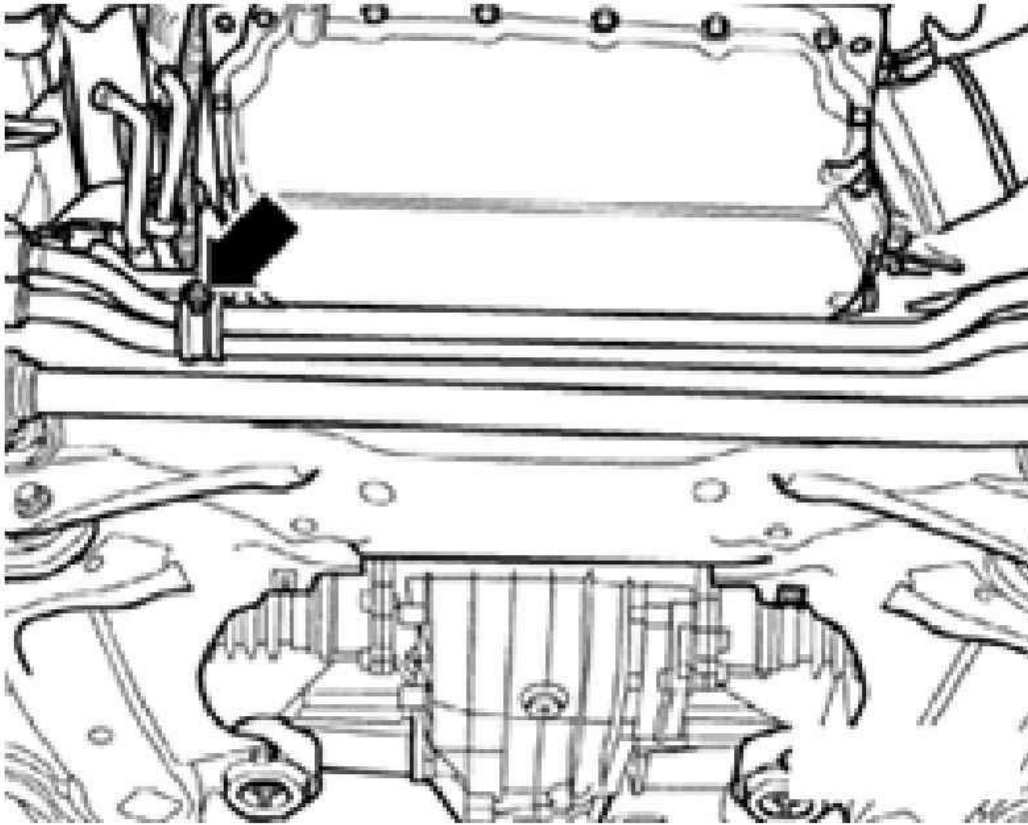
- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.



G02724366

Fig. 262: Removing Noise Insulation Panel
Courtesy of AUDI OF AMERICA, INC.

- Unbolt air conditioner lines from oil pan -arrow-.



G02724367

Fig. 263: Removing Air Conditioner Lines From Oil Pan
Courtesy of AUDI OF AMERICA, INC.

WARNING: Do not open air conditioner refrigerant circuit.

- Detach air conditioner compressor lines -1- and -2-.

NOTE:

- Watch position of guide bushings when installing.
- When installing, insert bolt -1- in the compressor first.
- To prevent damage to the condenser and refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.

- Drain engine oil.



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Fig. 264: Removing Air Conditioner Compressor Lines
Courtesy of AUDI OF AMERICA, INC.

NOTE: Use a separate container to collect the engine oil.

- Remove lower section of oil pan.

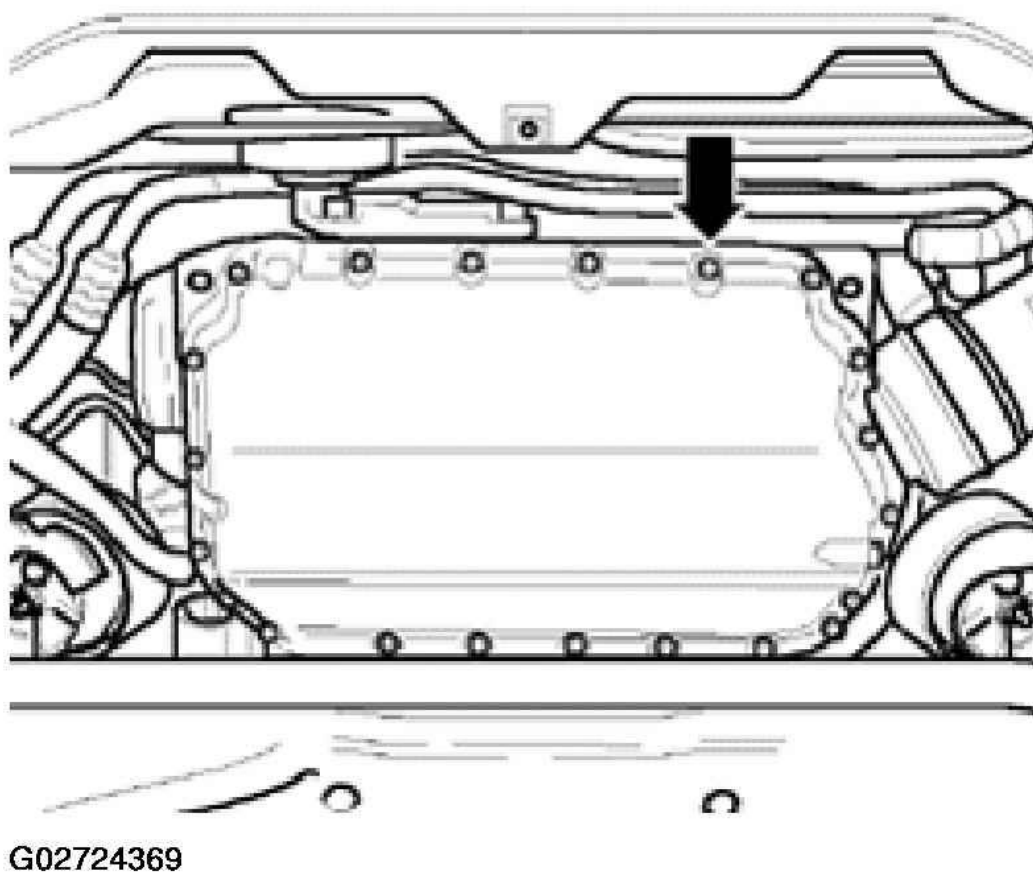


Fig. 265: Removing Lower Section Of Oil Pan
Courtesy of AUDI OF AMERICA, INC.

Installing

Install in the opposite order to removing. When installing, note the following points:

NOTE: **Do not use any adhesive or sealant.**

- Clean sealing surfaces; make sure that they are free of oil and grease.
- Install new gasket on lower section of oil pan and install on upper section of oil pan with two diagonally opposite bolts.
- Tighten all securing bolts hand-tight.
- Tighten bolts to 10 Nm with torque wrench, working from center outward.
- Install new seal on oil drain plug and tighten to 30 Nm.
- Fill engine with oil.

Oil capacities, **ENGINE OIL, FILLING**

- Install lock carrier in normal position.

See **LOCK CARRIER, SERVICE POSITION** .

- Install bumper.

See **FRONT BUMPER** .

Chain tensioner for oil pump, checking

Removing

The chain tensioner incorporates a leaf spring. To check the spring tension, the lower section of the oil pan must be removed.

- Remove bumper.

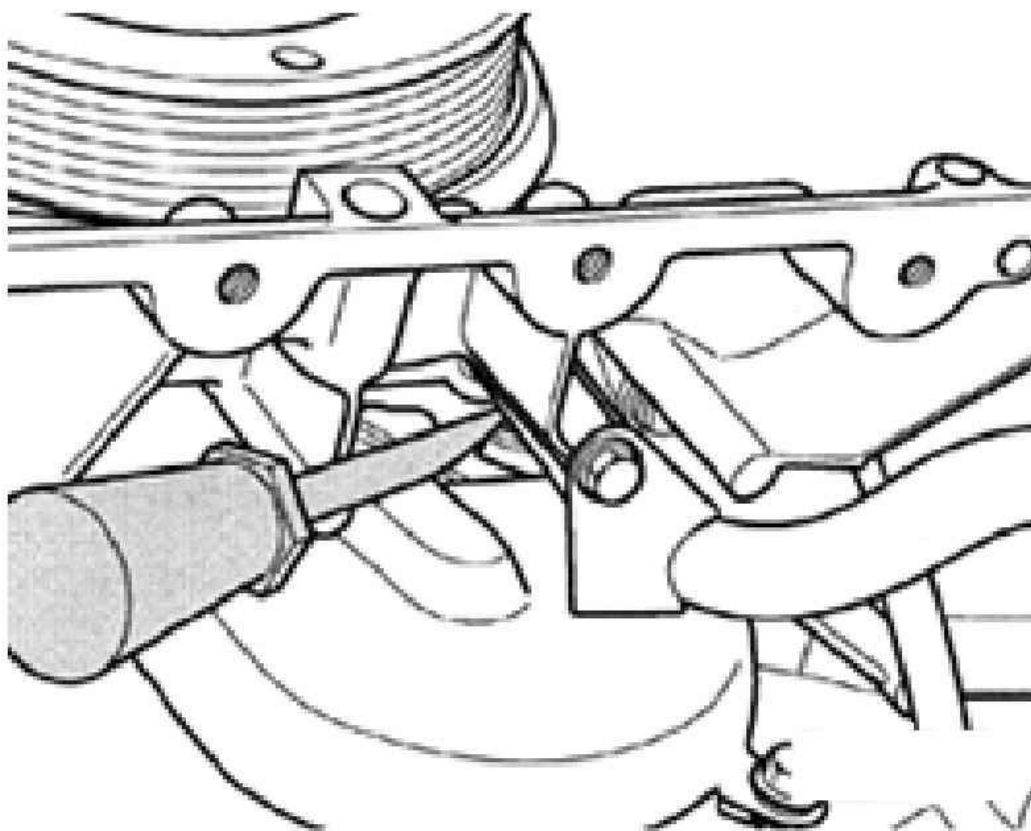
See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.
- Remove lower section of oil pan. See **LOWER SECTION OF OIL PAN, REMOVING AND INSTALLING**.
- Insert a screwdriver between chain and chain tensioner and press screwdriver against chain tensioner.

If no spring tension can be felt and the chain is not being tensioned, this means the chain tensioner is malfunctioning and must be replaced.



G02724370

Fig. 266: Pressing Chain Tensioner

Courtesy of AUDI OF AMERICA, INC.

To replace oil pump chain tensioner, remove front sealing flange. See **FRONT SEALING FLANGE AND OIL PUMP DRIVE CHAIN, REMOVING AND INSTALLING**.

Installing

Install in the opposite order to removing. When installing, note the following points:

- Fill engine with oil.

Oil capacities, see **ENGINE OIL, FILLING**

- Install lock carrier in normal position.

See **LOCK CARRIER, SERVICE POSITION** .

- Install bumper.

See **FRONT BUMPER** .

Upper and lower sections of oil pan, removing and installing

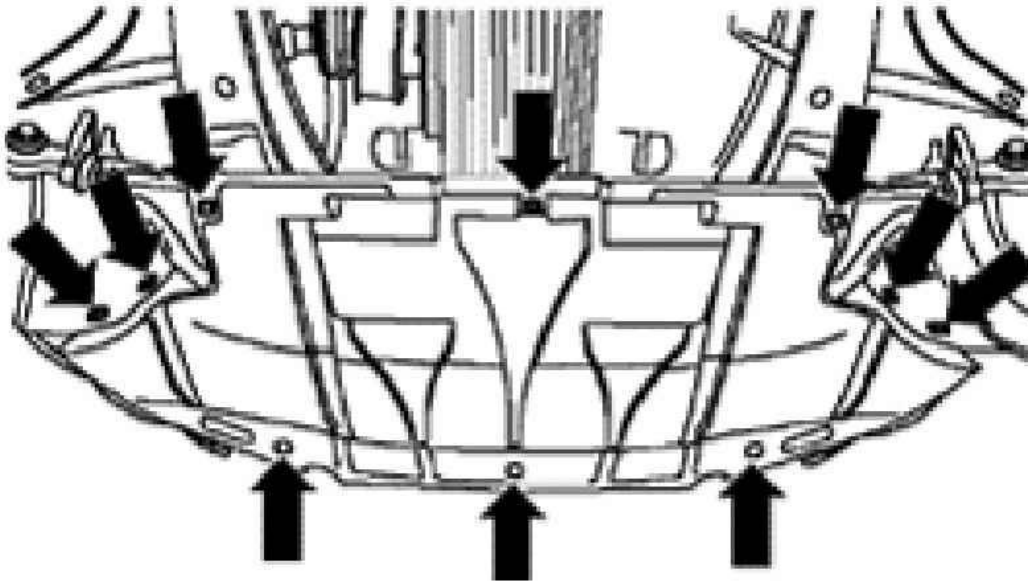
Special tools and equipment

- Engine support bracket 10-222A with adapter 10-222A/3
- Drip tray VAG 1306
- Electric drill with plastic brush attachment
- Silicone sealant D 176 404 A2
- Torque wrench 10 Nm/ 45 Nm

Removing

See Caution before beginning repairs on the electrical system under LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING.

- With ignition switched off, disconnect battery Ground strap.
- Pull out dipstick.
- Unbolt dipstick guide tube at front of cylinder head (right side), and pull out of oil pan from the top.
- Remove noise insulation panel -arrows-.



G02724371

Fig. 267: Removing Noise Insulation Panel
Courtesy of AUDI OF AMERICA, INC.

- Remove bumper.

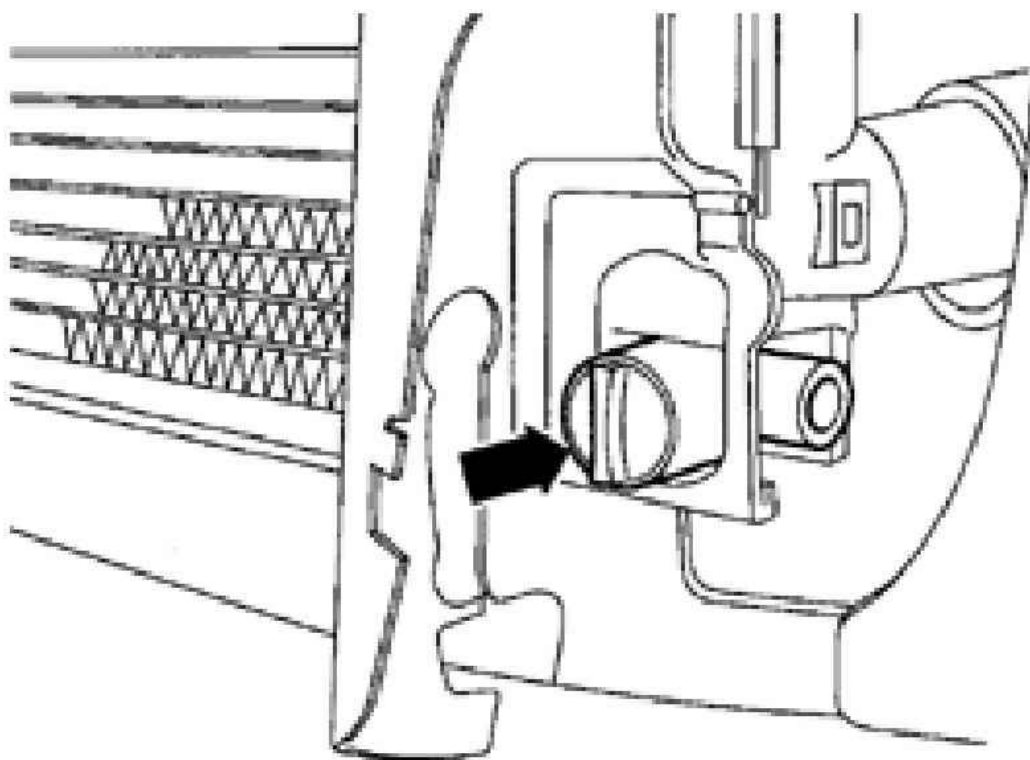
See **FRONT BUMPER** .

- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

WARNING: Hot steam can escape from the expansion tank when the filler cap is opened. Cover the filler cap with a cloth and remove it carefully.

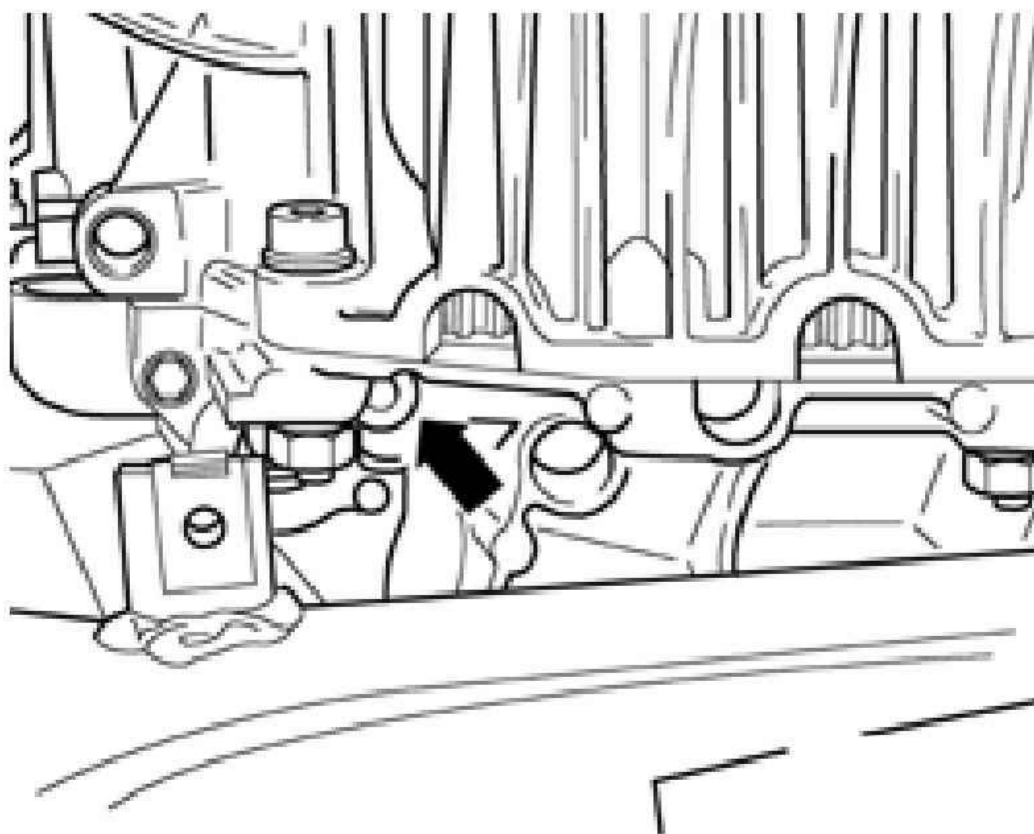
- Remove cap on coolant expansion tank.
- Place drip tray VAG 1306 below engine.
- Turn drain screw -arrow- on radiator counter-clockwise, if necessary install drain hose to connection.



G02724372

Fig. 268: Locating Drain Screw On Radiator
Courtesy of AUDI OF AMERICA, INC.

- Also open coolant drain screw -arrow- at rear right of oil pan. See **COOLING SYSTEM, DRAINING AND FILLING** .



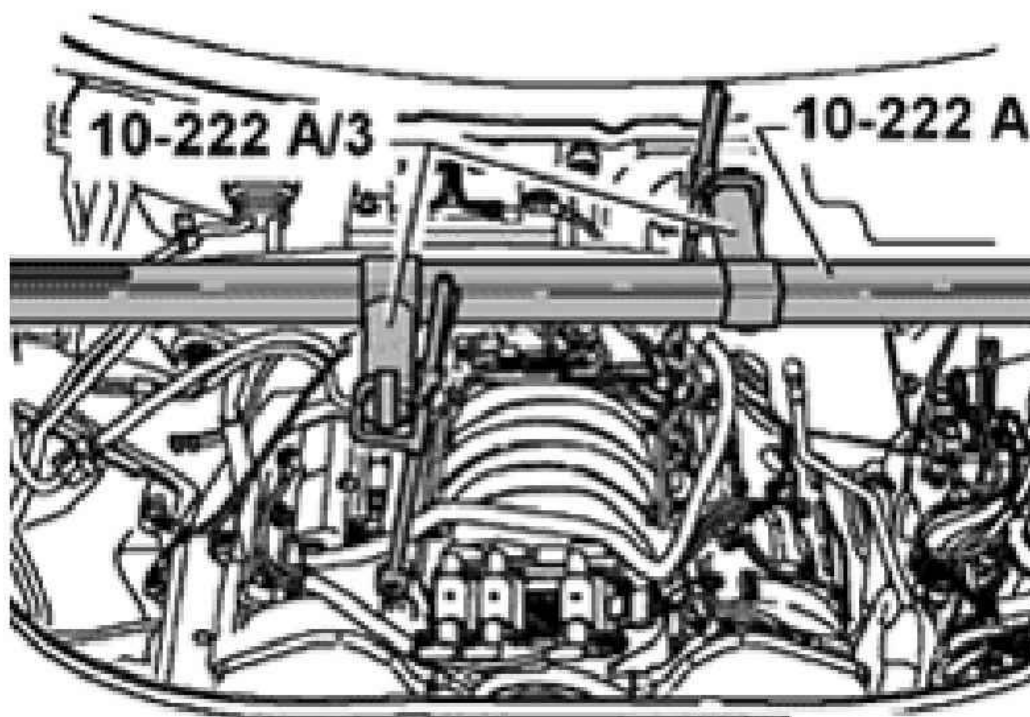
G02724373

Fig. 269: Identifying Coolant Drain Screw At Rear Right Of Oil Pan
 Courtesy of AUDI OF AMERICA, INC.

- Drain engine oil.

Use a separate container to collect the engine oil.

- Set up support bracket 10-222A with adapter 10-222A/3 on bolted flanges for wing panels.
- Attach support bracket to front and rear lifting eyes on engine.
- Raise engine as far as possible with spindles of support bracket.



G02724374

Fig. 270: Setting Up Support Bracket 10-222A With Adapter 10-222A/3 On Bolted Flanges For Wing Panels

Courtesy of AUDI OF AMERICA, INC.

- Cut open cable ties -arrows-, open retainer for starter cable and take out cable.

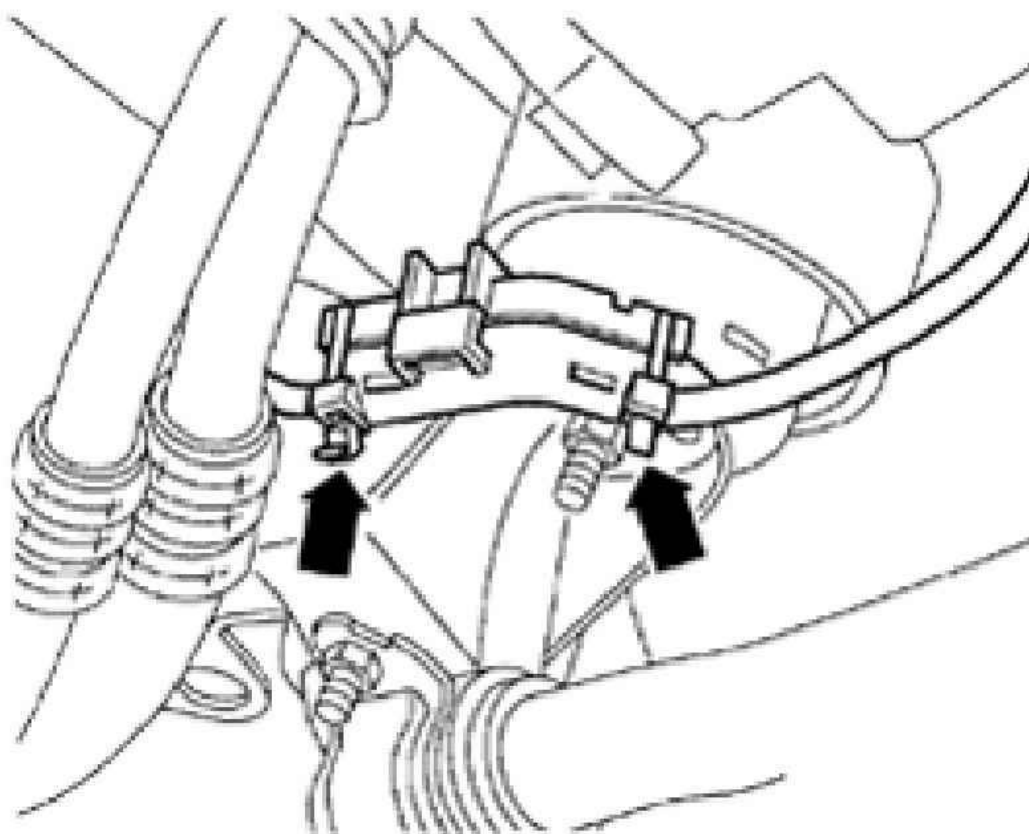
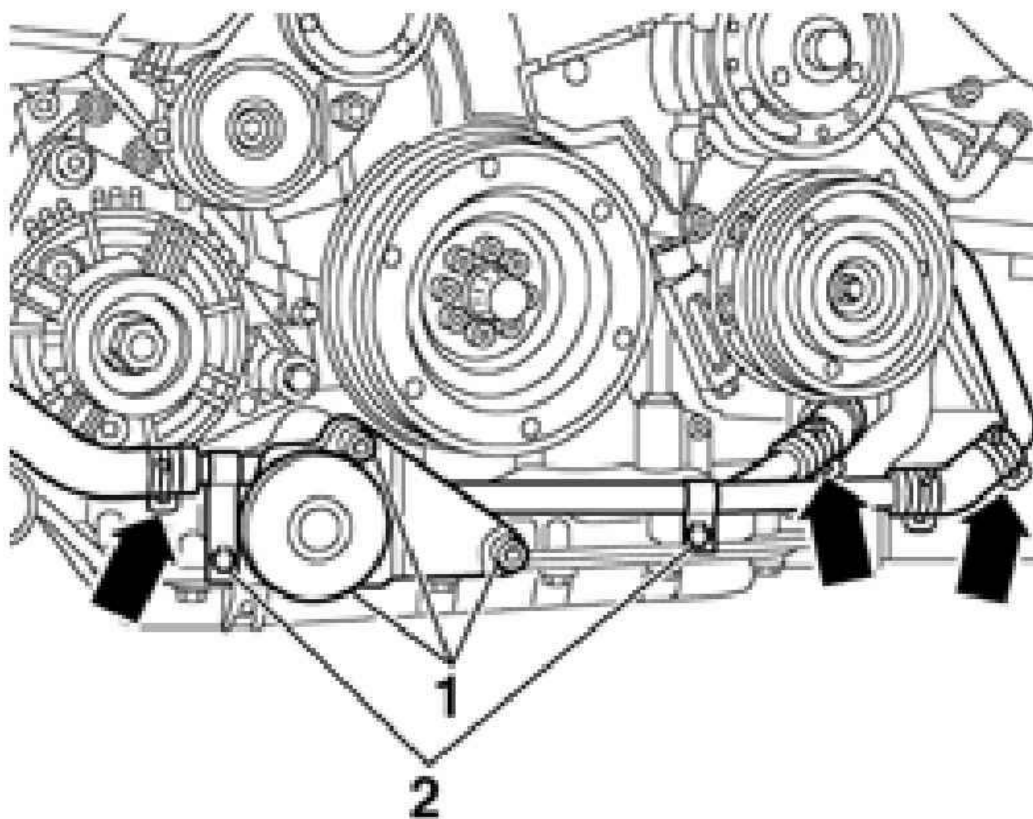
**G02724375**

Fig. 271: Disconnecting Open Cable Ties
Courtesy of AUDI OF AMERICA, INC.

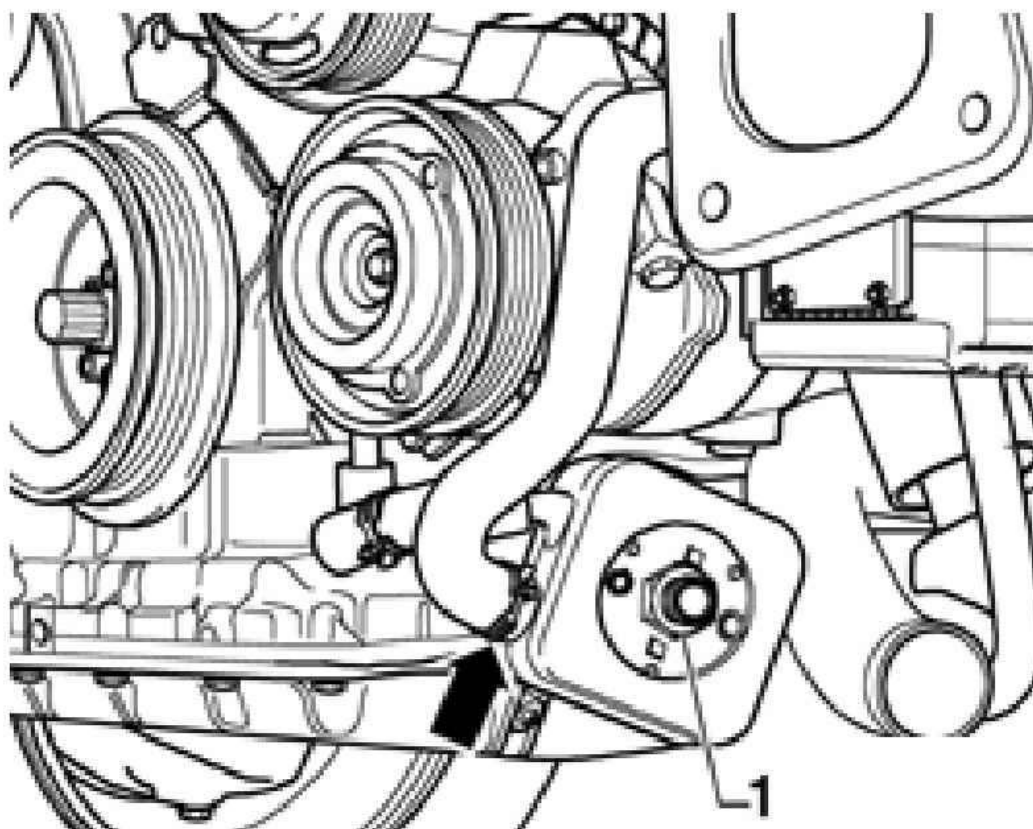
- Unbolt torque reaction support at front of oil pan.
- Unbolt coolant line from oil pan.
- Disconnect connector from oil pressure switch on left of oil pan.
- Remove torque reaction support -1-.
- Release hose clamps -arrows-.
- Remove water line -2-.



G02724376

Fig. 272: Removing Torque Reaction Support And Water Line
 Courtesy of AUDI OF AMERICA, INC.

- Place drip tray VAG 1306 under engine.
- Remove oil filter.
- Release hose clamps -arrows-. See **Fig. 273**.
- Remove oil cooler -1-.

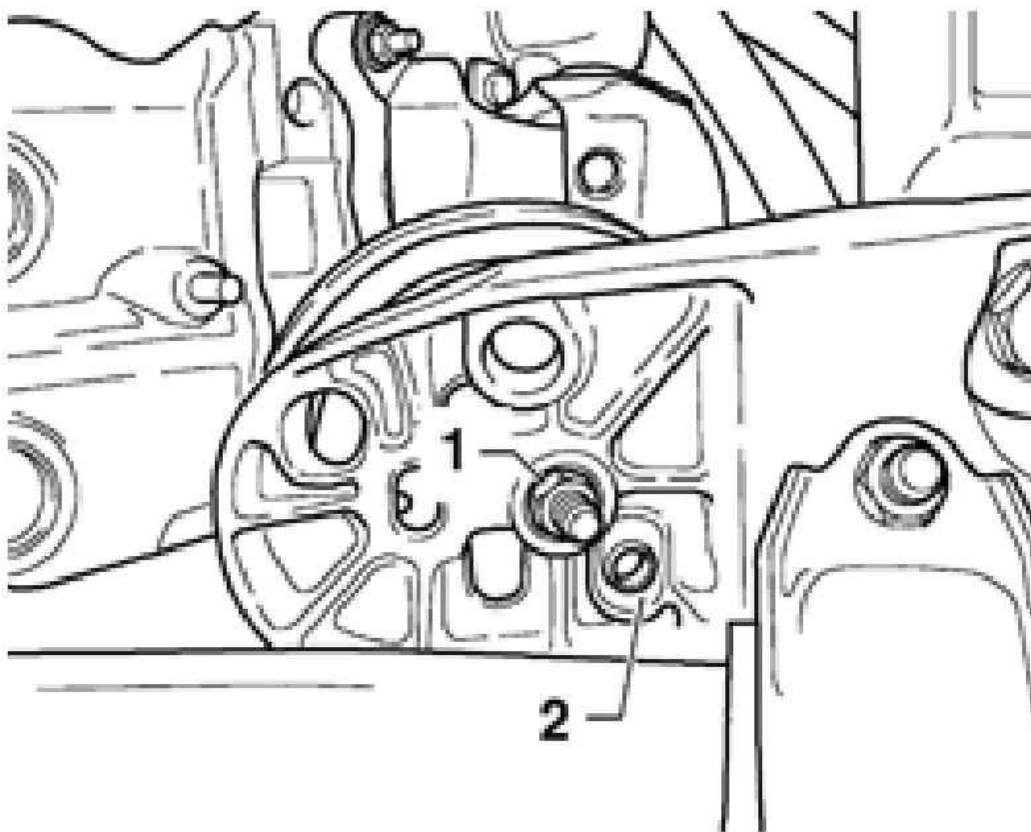


G02724377

Fig. 273: Removing Oil Cooler

Courtesy of AUDI OF AMERICA, INC.

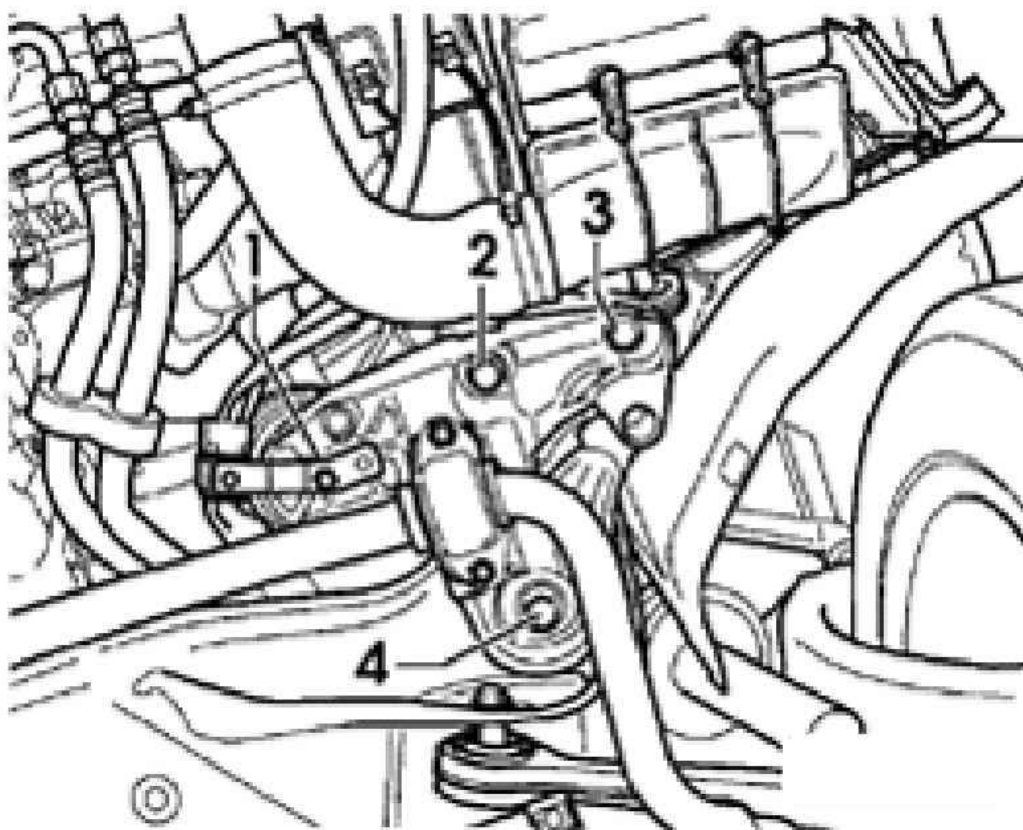
- Remove lower nuts on engine mountings -1- (left and right sides).
- Mark positions of securing points -1- and locating sleeves -2- under engine mountings on left and right sides.



G02724378

Fig. 274: Removing Lower Nuts On Engine Mountings
Courtesy of AUDI OF AMERICA, INC.

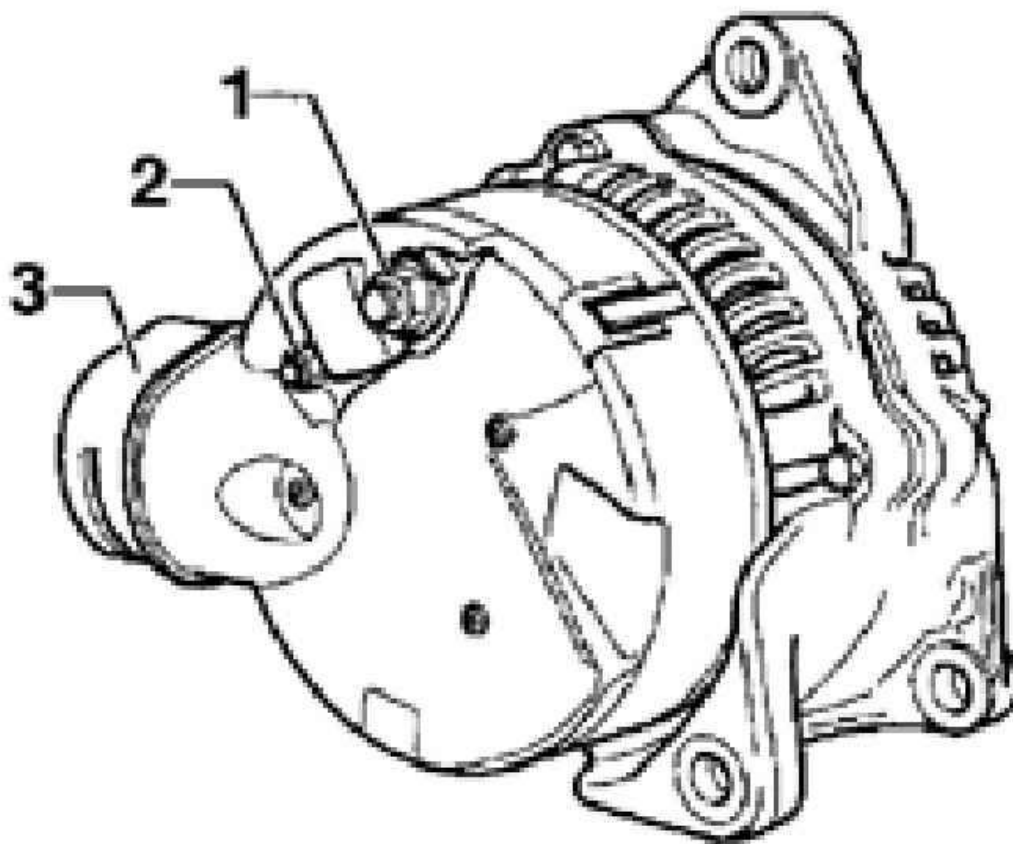
- Remove front subframe bolts -2- and -3-(left and right).
- Remove bolts -4-.
- Move stabilizer bar downward.
- Remove charge air cooler -2- on right side (release hose connection at top, and 3 rubber mountings).



G02724379

Fig. 275: Removing Front Subframe Bolts
Courtesy of AUDI OF AMERICA, INC.

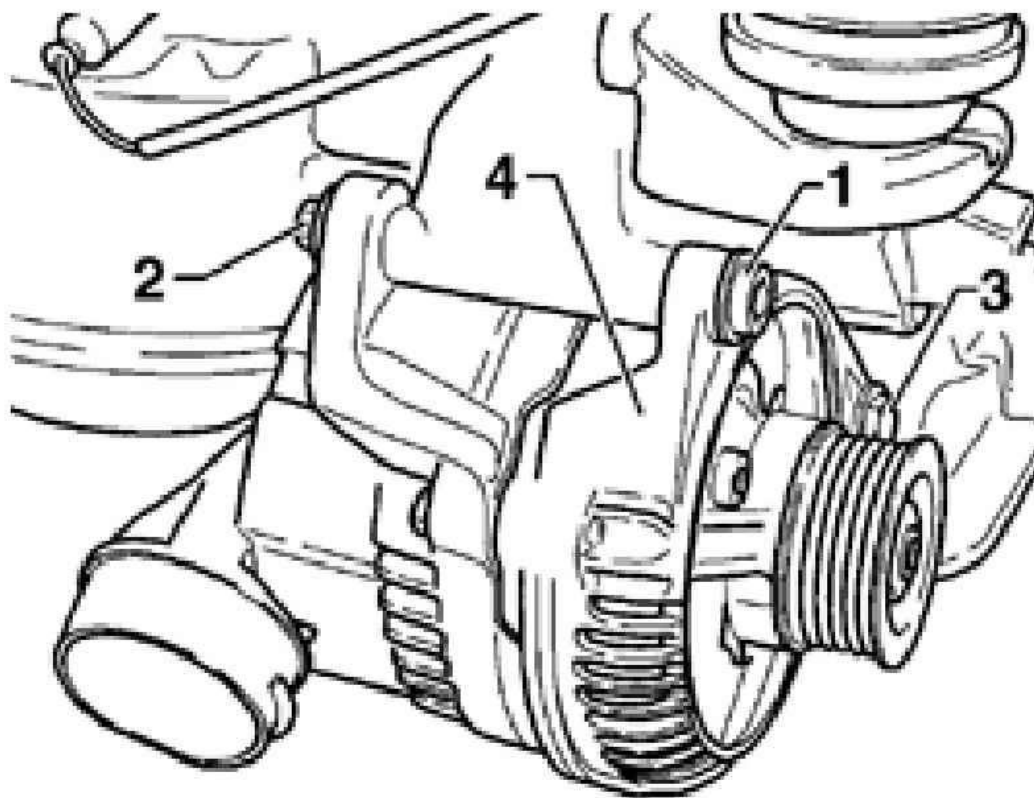
- Remove air duct from connector elbow on alternator -3-.
- Disconnect cable from terminal 30/B+ -1-. Tightening torque: 16 Nm. See **Fig. 276**.
- Disconnect cable from terminal D+ -2-. Tightening torque: 4 Nm



G02724380

Fig. 276: Removing Air Duct From Alternator Connector Elbow
Courtesy of AUDI OF AMERICA, INC.

- Remove hex socket head bolt -1- and securing nut -2-. Tightening torque: 45 Nm
- Loosen bolt -3-. Tightening torque 22 Nm
- Remove alternator -4- from below.



G02724381

Fig. 277: Removing Hex Socket Head From Alternator
Courtesy of AUDI OF AMERICA, INC.

1. Remove air line -1-.

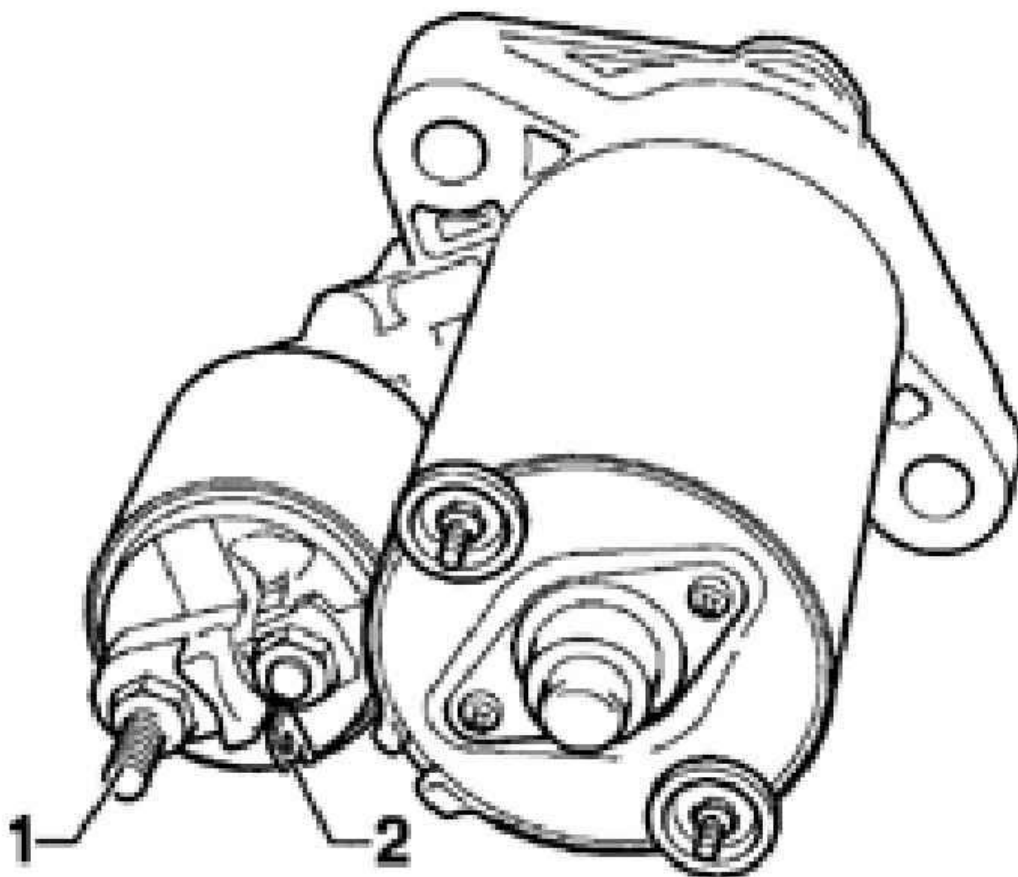


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Fig. 278: Removing Air Line

Courtesy of AUDI OF AMERICA, INC.

2. Mounting for oil line and air conditioner lines
3. Mounting on cylinder block
4. Release hose clamp
 - Disconnect cable from terminal 30/B+ -1-. Tightening torque: 16 Nm
 - Disconnect connector for terminal 50 -2-.
 - Remove right wheel.

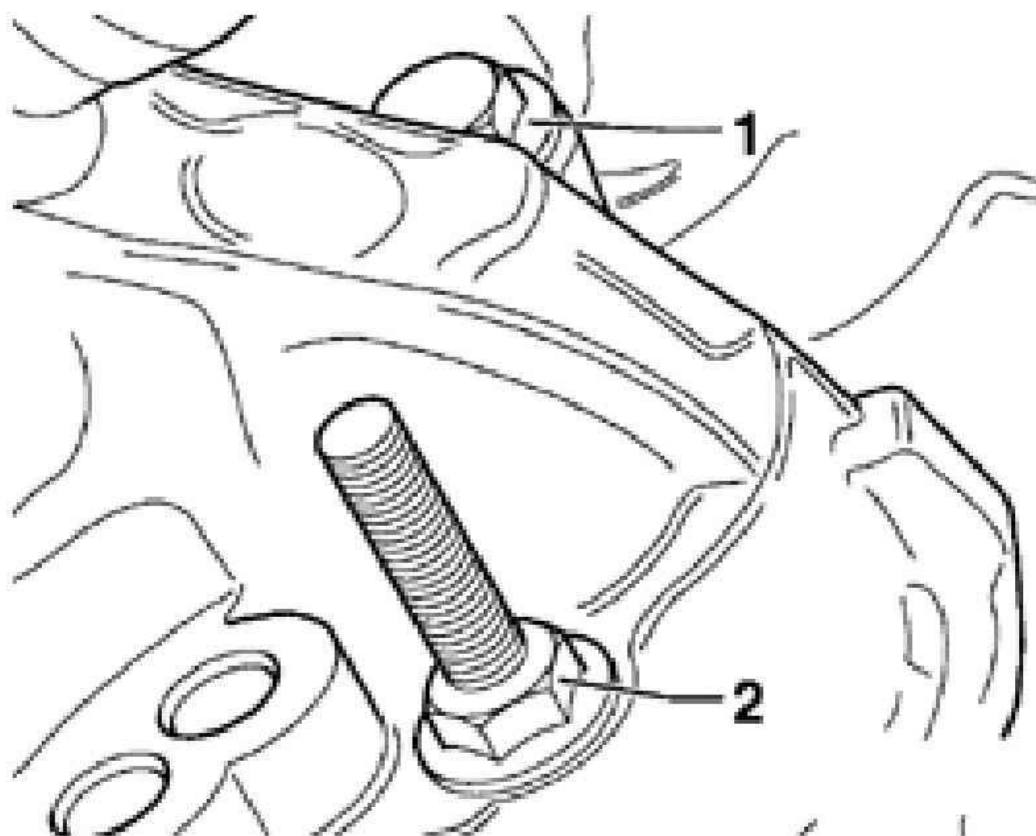


G02724383

Fig. 279: Disconnecting Cables From Starter Terminals

Courtesy of AUDI OF AMERICA, INC.

- Remove top bolt -1- from right wheelhousing. Tightening torque: 65 Nm
- Remove lower bolt (accessible from engine side). Tightening torque: 65 Nm
- Remove starter from front of vehicle.



G02724384

Fig. 280: Removing Top Bolt -1- From Right Wheelhousing
Courtesy of AUDI OF AMERICA, INC.

NOTE: To avoid having to check and adjust wheel alignment, only loosen the front subframe mountings and lower the subframe at the front.

- Remove lower section of oil pan.
- Disconnect return lines for turbocharger from upper section of oil pan.



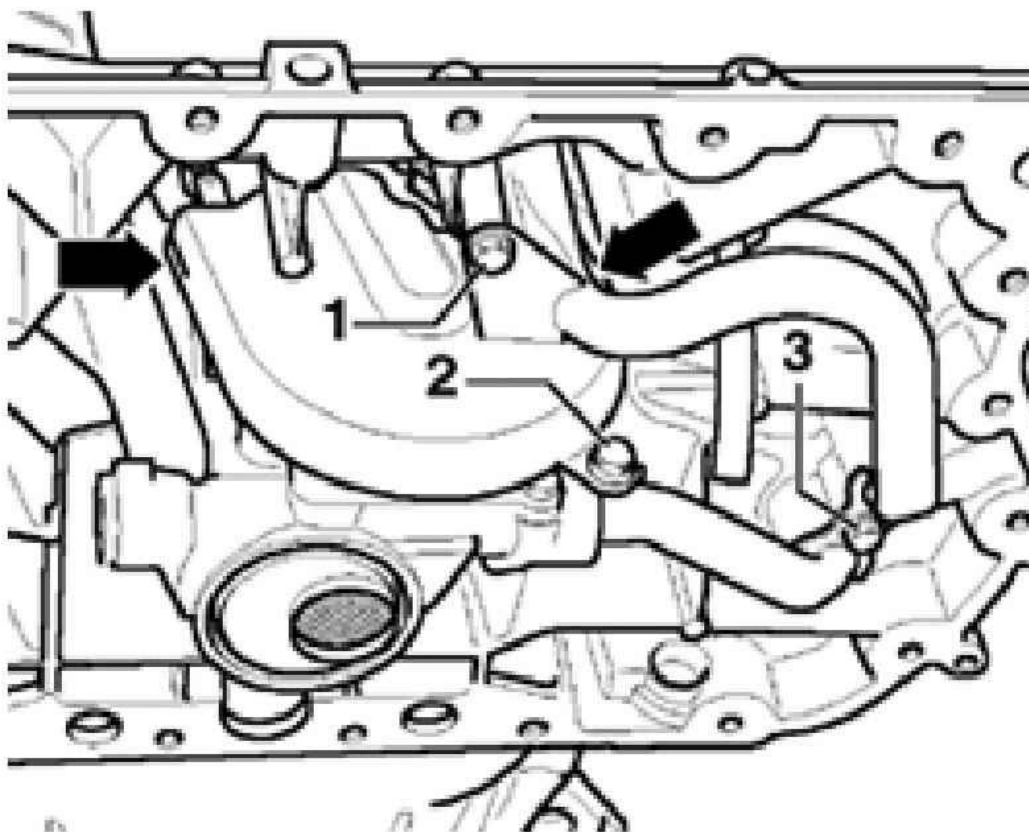
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Fig. 281: Removing Lower Section Of Oil Pan
Courtesy of AUDI OF AMERICA, INC.

- Unbolt cover plate -2- for oil pump sprocket.

NOTE:

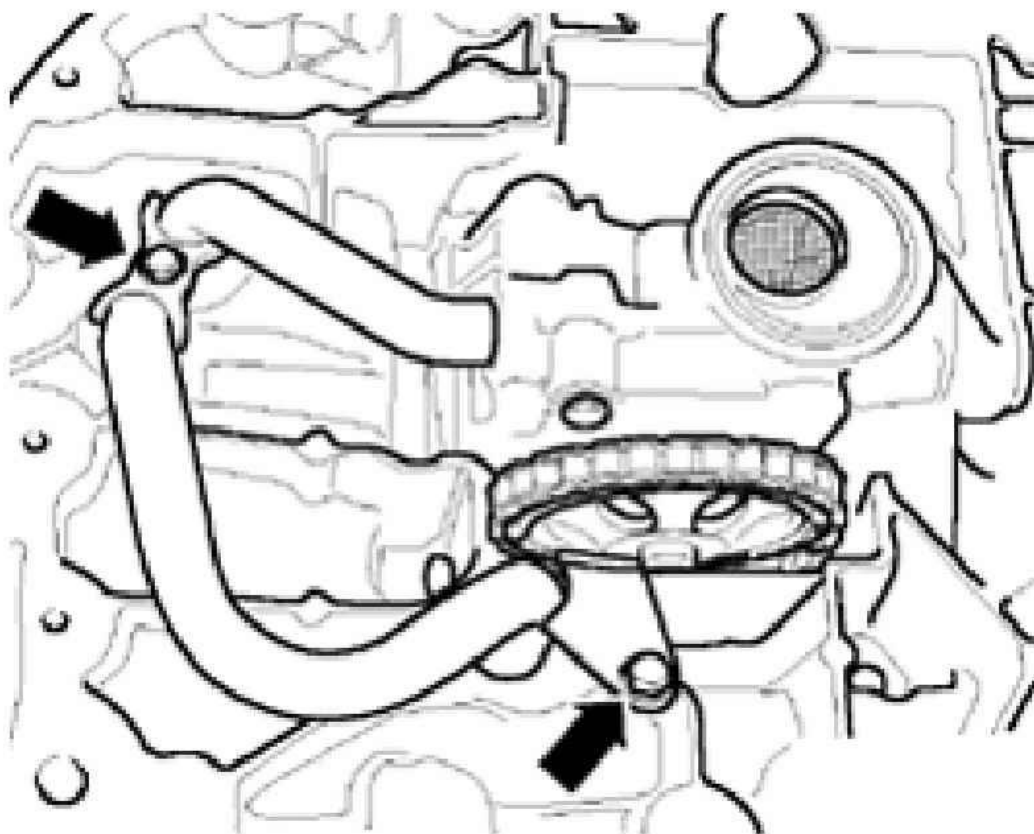
- When loosening bolt -2- securing cover plate, counter-hold at welded nut.
- When installing, make sure that the plate engages in position - arrows-.



G02724386

Fig. 282: Locating Cover Plate For Oil Pump Sprocket
Courtesy of AUDI OF AMERICA, INC.

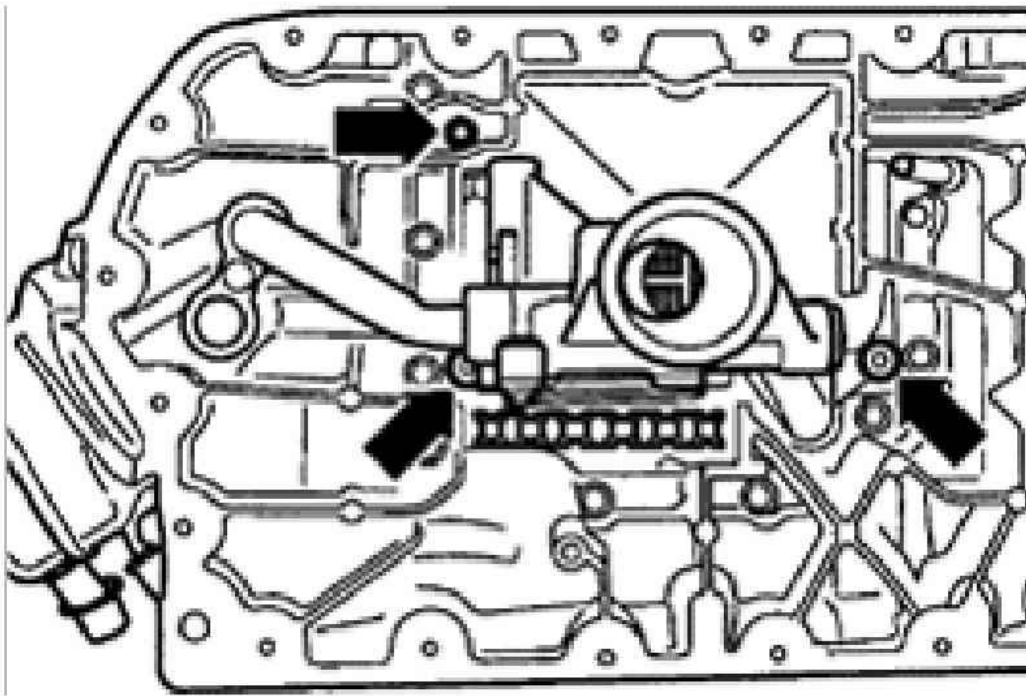
- Unbolt two oil supply lines, and pull longer of two lines downward to disconnect from upper section of oil pan.



G02724387

Fig. 283: Locating Oil Supply Lines
Courtesy of AUDI OF AMERICA, INC.

- Unbolt oil pump from engine so that shorter oil supply line can be disconnected (do not remove oil pump).
- Remove bolts securing upper section of oil pan to transmission.
- Unbolt upper section of oil pan from engine.



G02724388

Fig. 284: Locating Bolts For Upper Section Of Oil Pan

Courtesy of AUDI OF AMERICA, INC.

NOTE: Two M6 bolts and two M8 bolts are located vertically at rear of oil pan upper section (in front of joint between engine and transmission).

Installing:

See Caution for connecting Telematics battery under **LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING.**

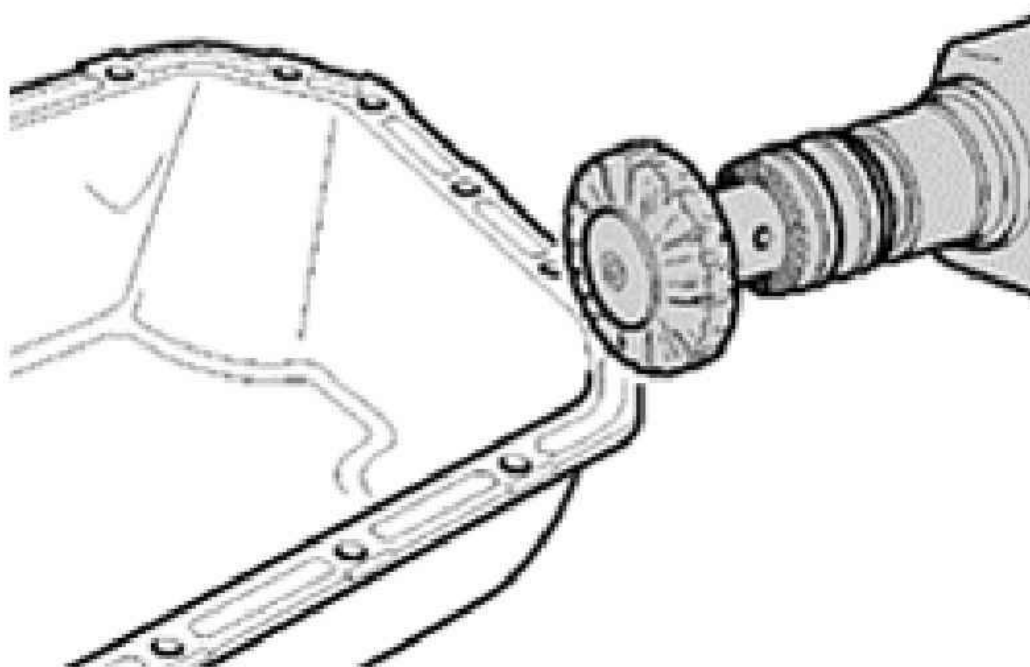
Install in the opposite order to removing. When installing, note the following points:

- Clean sealing surfaces; ensure that they are free of oil grease.

WARNING: Wear protective goggles.

- Remove any residues of sealant on oil pan and engine block using plastic brush attachment, or similar.

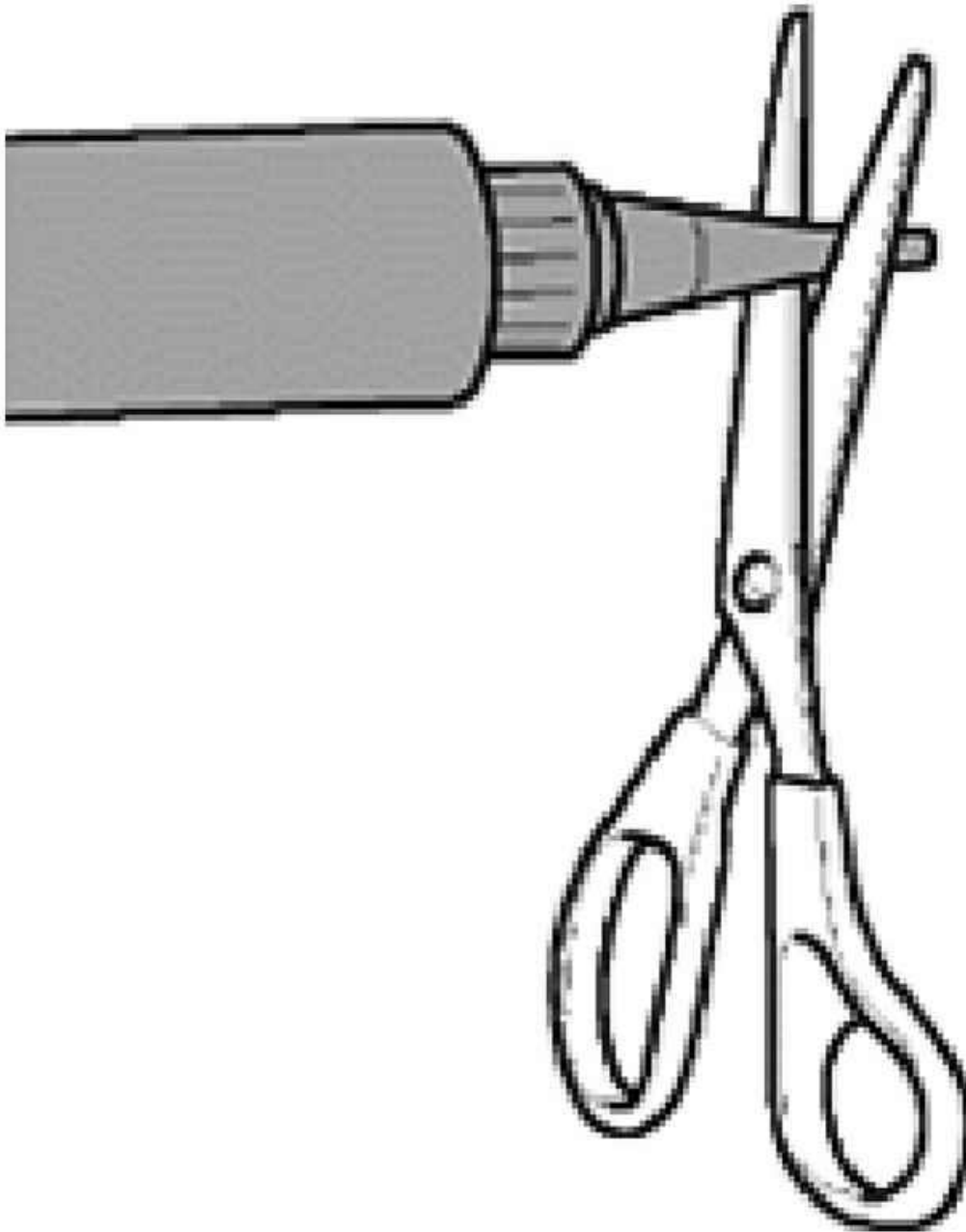
NOTE: The oil pan must be installed within 5 minutes after applying silicone sealant D 454 300 A2.



G02724389

Fig. 285: Removing Sealant On Oil Pan
Courtesy of AUDI OF AMERICA, INC.

- Cut off nozzle of tube at front marking (diameter of nozzle approx. 3 mm).
 - Thickness of sealant bead: 2 - 3 mm



G02724390

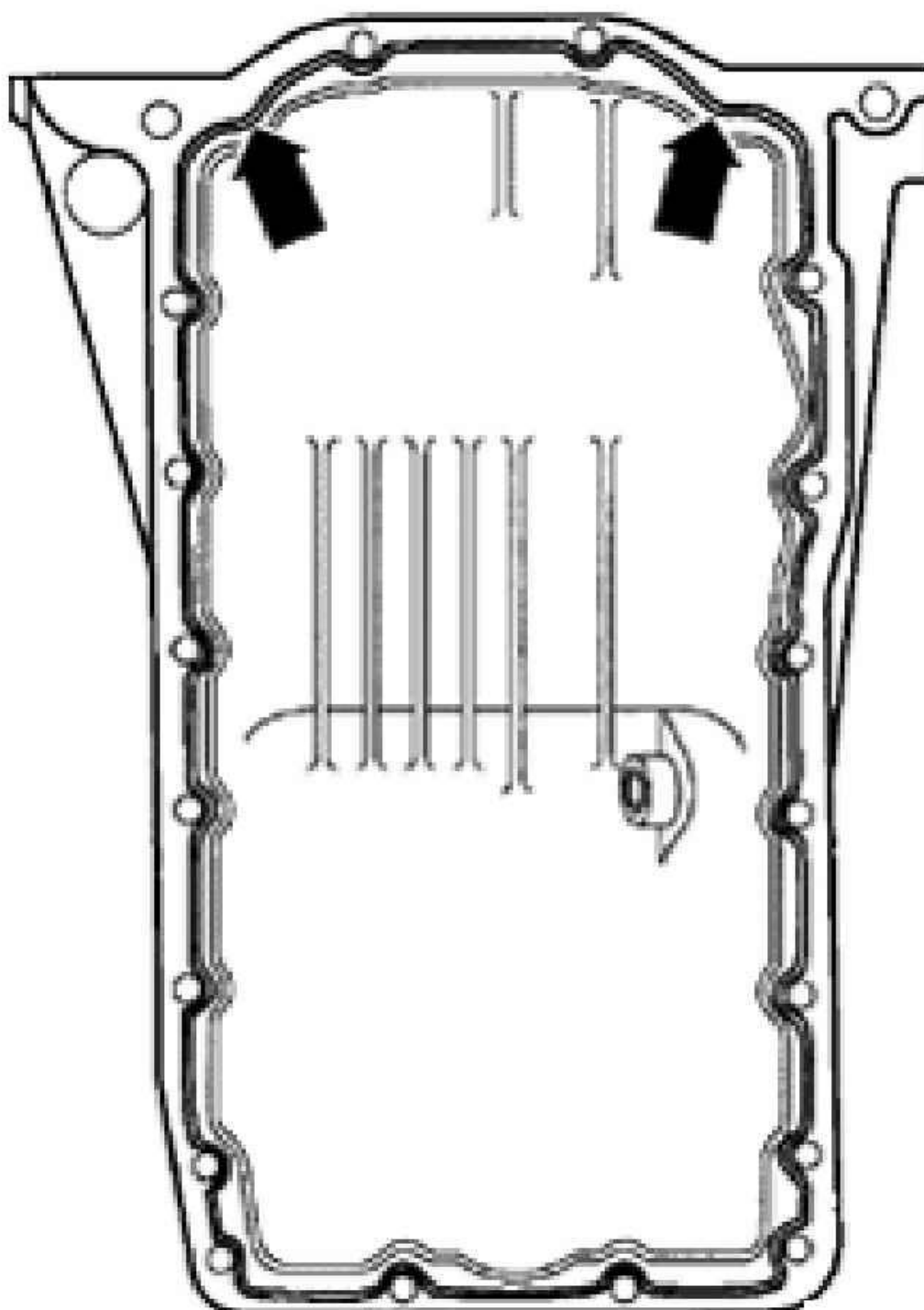
Fig. 286: Cutting Off Nozzle Tube
Courtesy of AUDI OF AMERICA, INC.

NOTE: **The bead of sealant must not be thicker than 3 mm, as otherwise excess sealant may enter the oil pan and block the strainer in the oil intake line.**

- Make sure sealing surface is clean and then apply silicone sealant on sealing surface of oil pan, as shown in illustration. (Illustration shows position of sealant on cylinder block.)

NOTE: **Be particularly careful when applying the sealant around the rear sealing flange -arrows in illustration-.**

- Locate oil pan in position immediately, and tighten all bolts securing pan to cylinder block to 5 Nm initially.
- Tighten bolts securing oil pan to transmission to 45 Nm.
- Tighten bolts securing oil pan to cylinder block in diagonal sequence in 2 stages; tighten to 10 Nm when tightening second time.
- Tighten M10 bolts securing oil pan to cylinder block to 45 Nm.



G02724391

Fig. 287: Applying Silicone Sealant

Courtesy of AUDI OF AMERICA, INC.

- Clean both sealing surfaces for lower section of oil pan; make sure that they are free of oil and grease.

NOTE: **Do not use any adhesive or sealant.**

- Install new gasket on lower section of oil pan and install on upper section of pan with two diagonally opposite bolts.
- Tighten all securing bolts hand-tight.
- Tighten bolts to 10 Nm with torque wrench, working from center outward.
- Install new seal on oil drain plug and tighten to 30 Nm.

- NOTE:**
- When installing the upper section of the oil pan with the engine removed from the vehicle, make sure that the pan is positioned flush with the cylinder block at the flywheel end.
 - The sealant must be left to dry for about 30 minutes after installing the oil pan before the engine can be filled with oil.

- Fill with coolant. See COOLING SYSTEM, DRAINING AND FILLING .
- Fill engine with oil.

Oil capacities, see ENGINE OIL, FILLING

- Install subframe.

See SUBFRAME & SUBFRAME BUSHINGS .

- Install lock carrier in normal position.

See LOCK CARRIER, SERVICE POSITION .

- Install bumper.

See FRONT BUMPER .

- Install noise insulation.

Tightening torques**TIGHTENING TORQUES: UPPER AND LOWER SECTIONS OF OIL PAN**

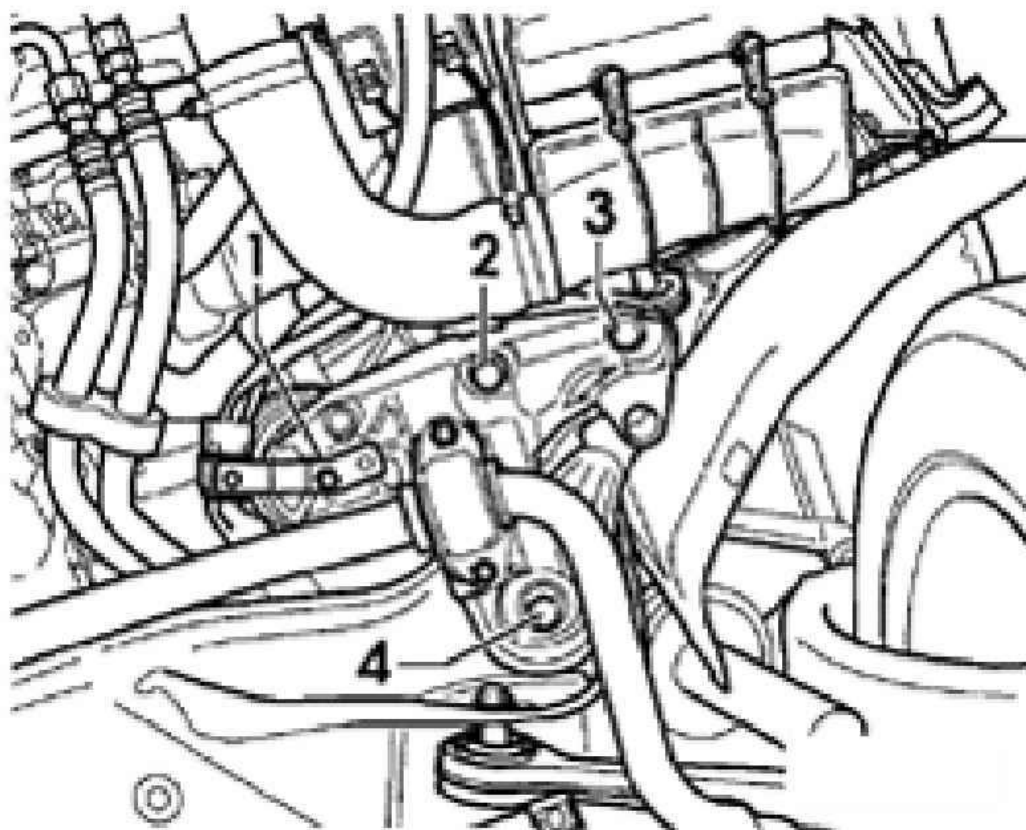
Component	Nm
Upper section of oil pan to cylinder block - M6	10
Upper section of oil pan to cylinder block - M8	20

2005 allroad Quattro

2000-2004 ENGINE 2.7L V6 5V Biturbo (APB, BEL) - A6 & Allroad

Lower section of oil pan to upper section of oil pan	10
Oil pan to transmission - M8	25
Oil pan to transmission-M10	45
Coolant line to oil pan	10
Oil drain plug in lower section of oil pan	30
Dipstick guide tube to cylinder head	25
Oil pump to cylinder block	25
Oil pump supply lines to upper section of oil pan	10
Front sealing flange-M6	10
Collar bolt-M8	30
Bracket for coolant lines to oil pan	10
Coolant drain screw on engine	20
Stop for torque reaction support to bracket on engine	25
Engine mounting to subframe	25
Torque reaction support to front of oil pan	25
Engine mounting to engine support	25
Chain sprocket to oil pump	25

WARNING: Combi bolt -4- MUST BE REPLACED after removing. See Fig. 288.



G02724392

Fig. 288: Identifying Subframe Mounting Bolts
Courtesy of AUDI OF AMERICA, INC.

Oil pump, removing and installing

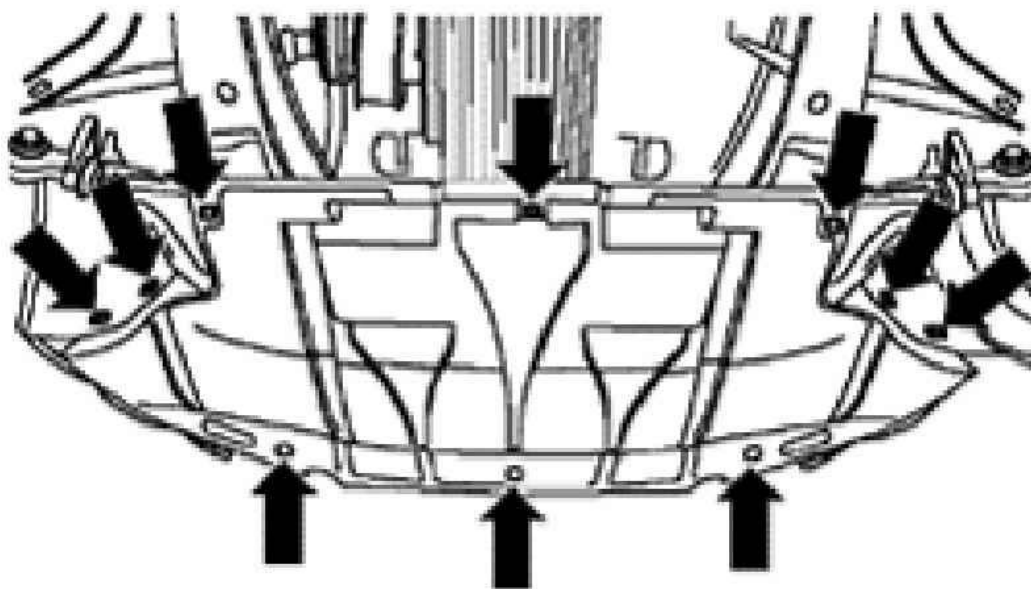
Removing

- Remove noise insulation panel -arrows-.
- Remove bumper.

See **FRONT BUMPER** .

- Move lock carrier to service position.

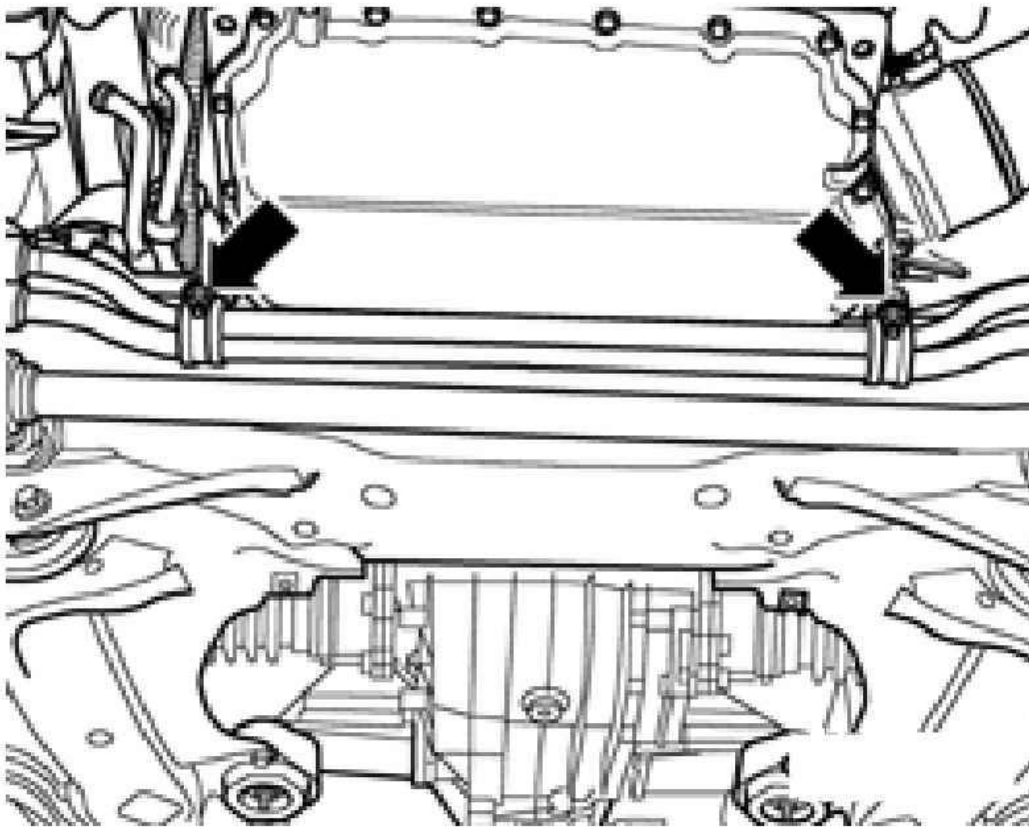
See **LOCK CARRIER, SERVICE POSITION** .



G02724393

Fig. 289: Removing Noise Insulation Panel
Courtesy of AUDI OF AMERICA, INC.

- Unbolt air conditioner lines from oil pan -arrows-.



G02724394

Fig. 290: Removing Air Conditioner Lines From Oil Pan
Courtesy of AUDI OF AMERICA, INC.

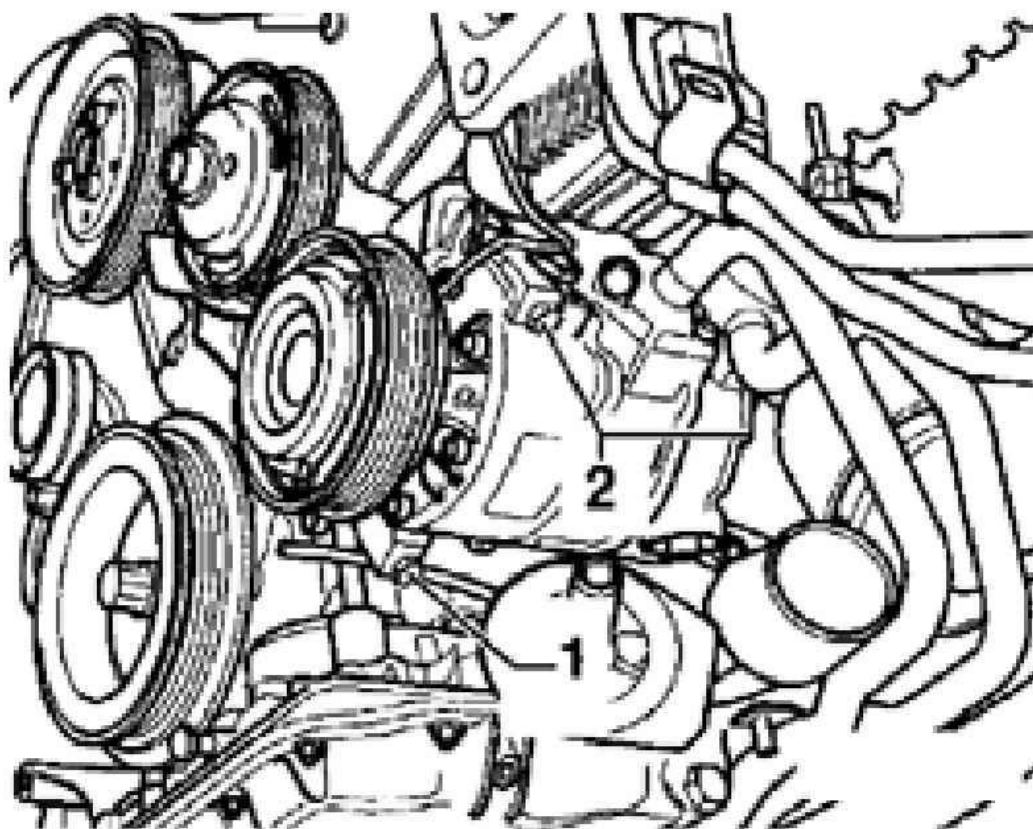
WARNING: Do not open air conditioner refrigerant circuit.

- Detach air conditioner compressor -1- and -3-.

NOTE:

- Watch position of guide bushings when installing.
- When installing, insert bolt -1- in the compressor first.
- To prevent damage to the condenser and refrigerant lines/hoses, make sure that the lines and hoses are not stretched, kinked or bent.

- Drain engine oil.



G02724395

Fig. 291: Removing Air Conditioner Compressor
Courtesy of AUDI OF AMERICA, INC.

NOTE: Use a separate container to collect the engine oil.

- Remove lower section of oil pan.

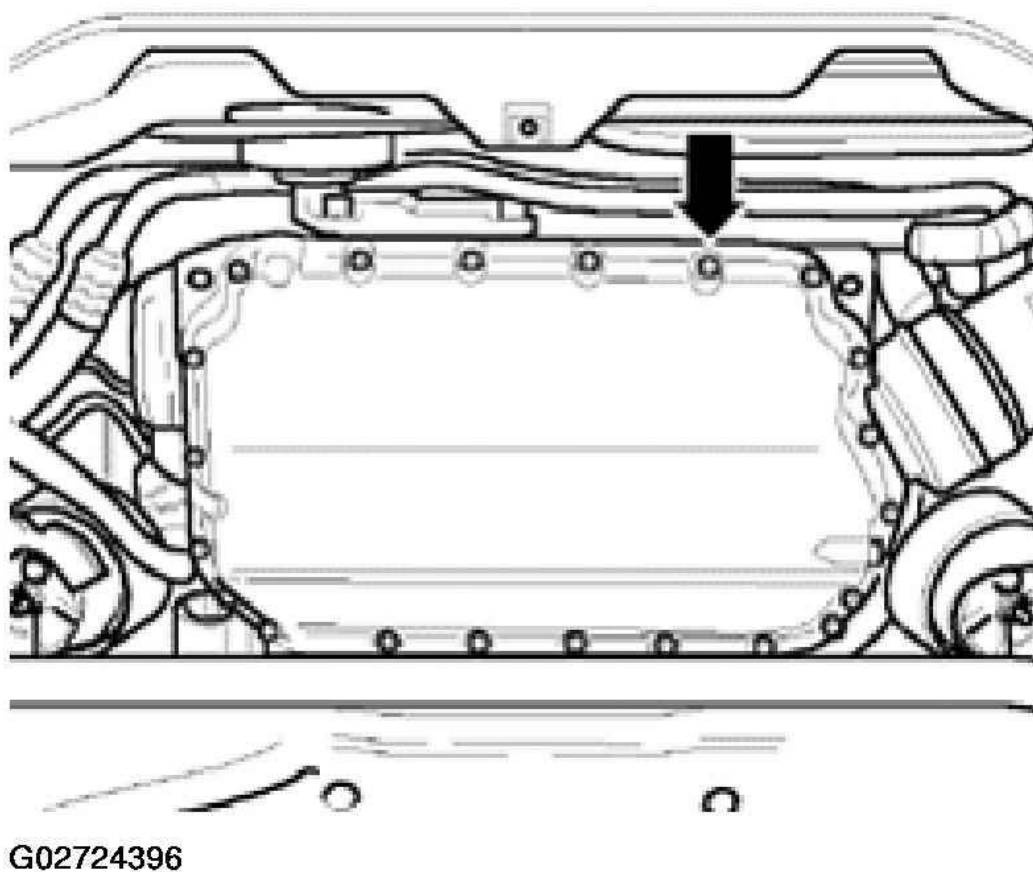
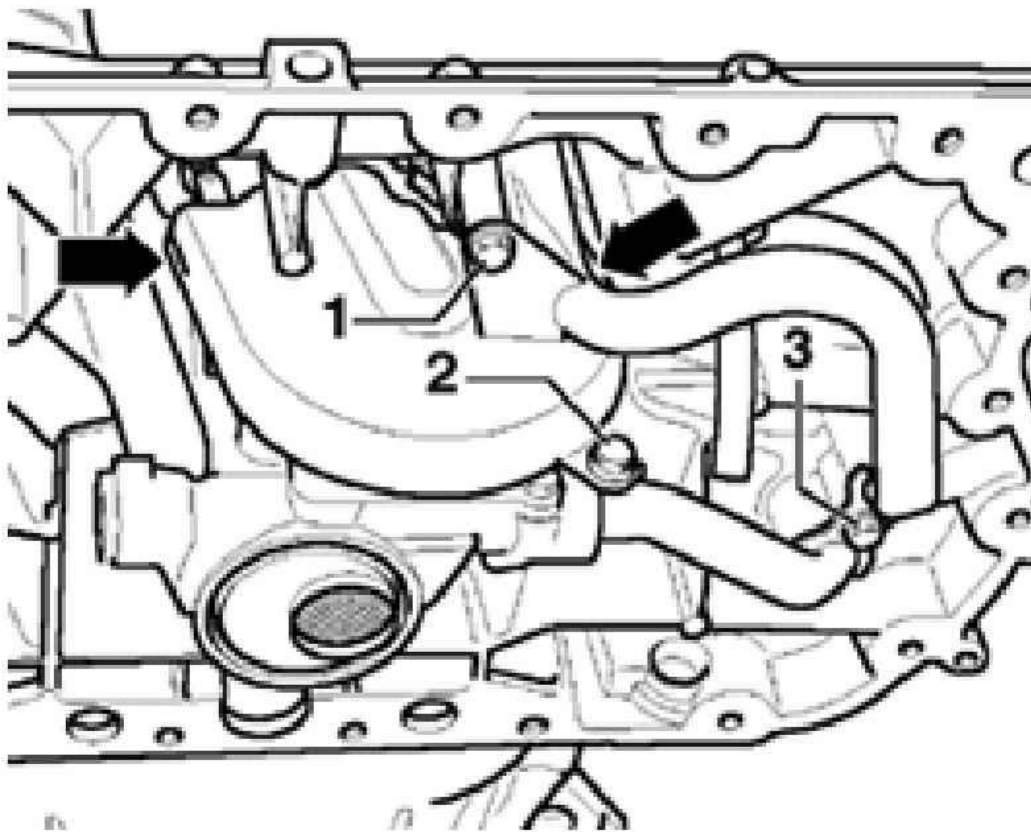


Fig. 292: Removing Lower Section Of Oil Pan
Courtesy of AUDI OF AMERICA, INC.

- Unbolt cover plate -2- for oil pump sprocket.



G02724397

Fig. 293: Removing Cover Plate -2- For Oil Pump Sprocket
 Courtesy of AUDI OF AMERICA, INC.

NOTE:

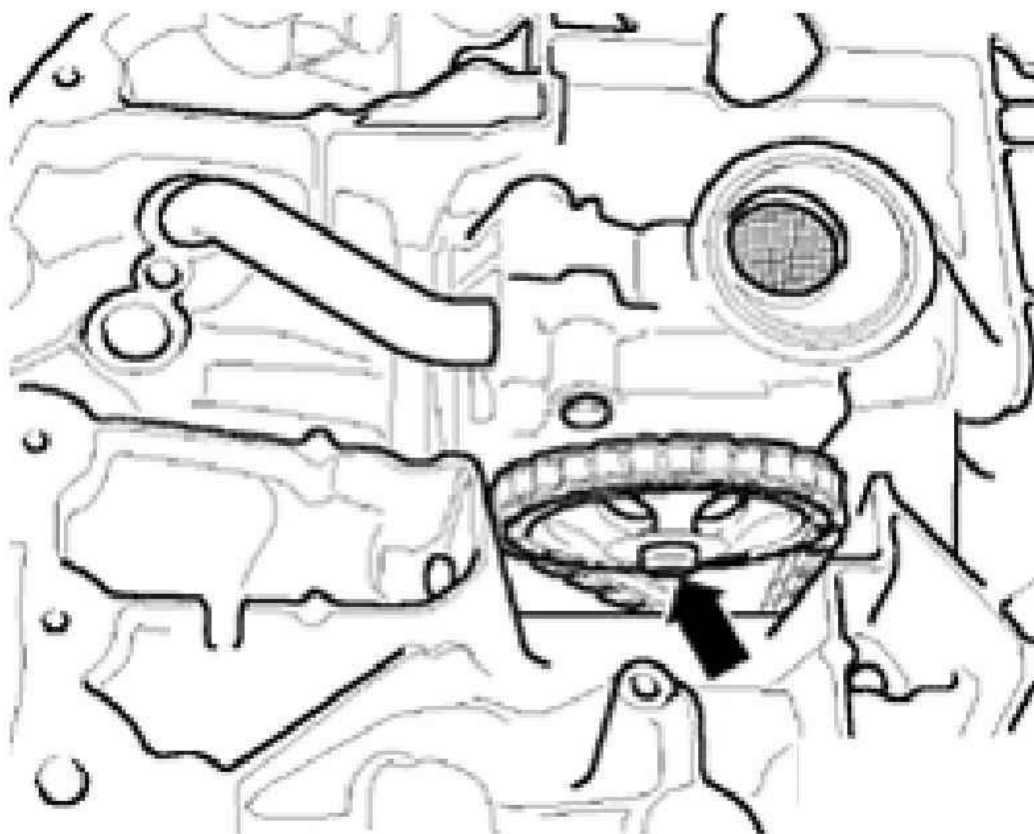
- When loosening bolt -2- securing cover plate, counter-hold at welded nut.
 - When installing, make sure that the plate engages in position - arrows-.
- Unbolt brackets for oil supply lines -arrows- and pull front (longer) oil supply line away downward.



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Fig. 294: Removing Brackets For Oil Supply Lines
Courtesy of AUDI OF AMERICA, INC.

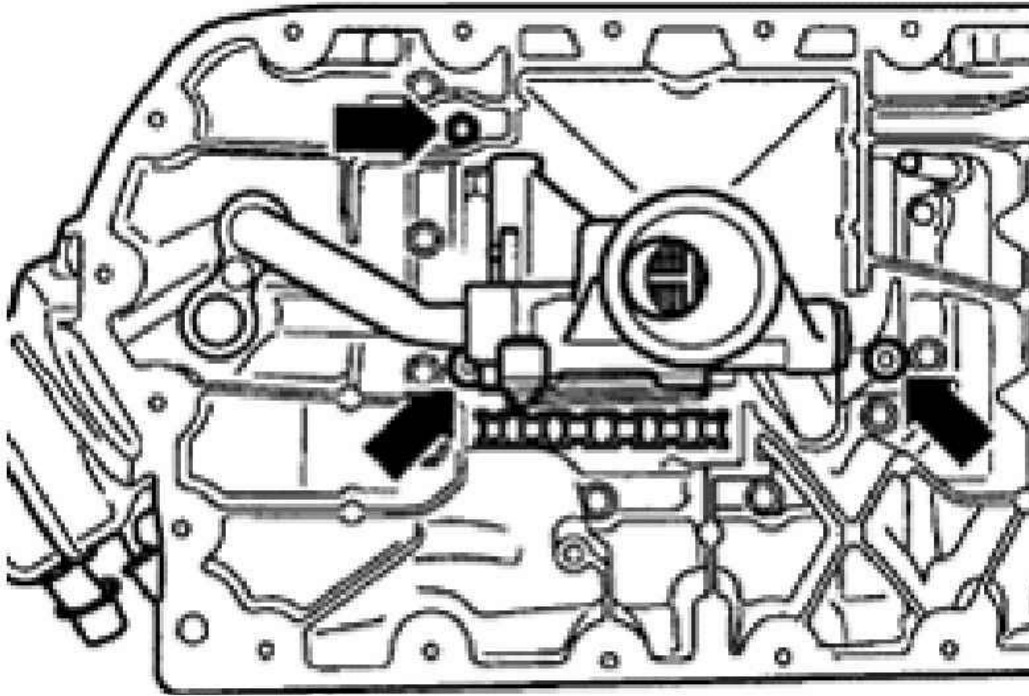
- Remove bolt securing chain sprocket to oil pump using Torx T45, and pull sprocket off oil pump.



G02724399

Fig. 295: Removing Bolt Securing Chain Sprocket To Oil Pump
Courtesy of AUDI OF AMERICA, INC.

- Remove oil pump together with shorter oil supply line.



G02724400

Fig. 296: Removing Oil Pump Together With Shorter Oil Supply Line
Courtesy of AUDI OF AMERICA, INC.

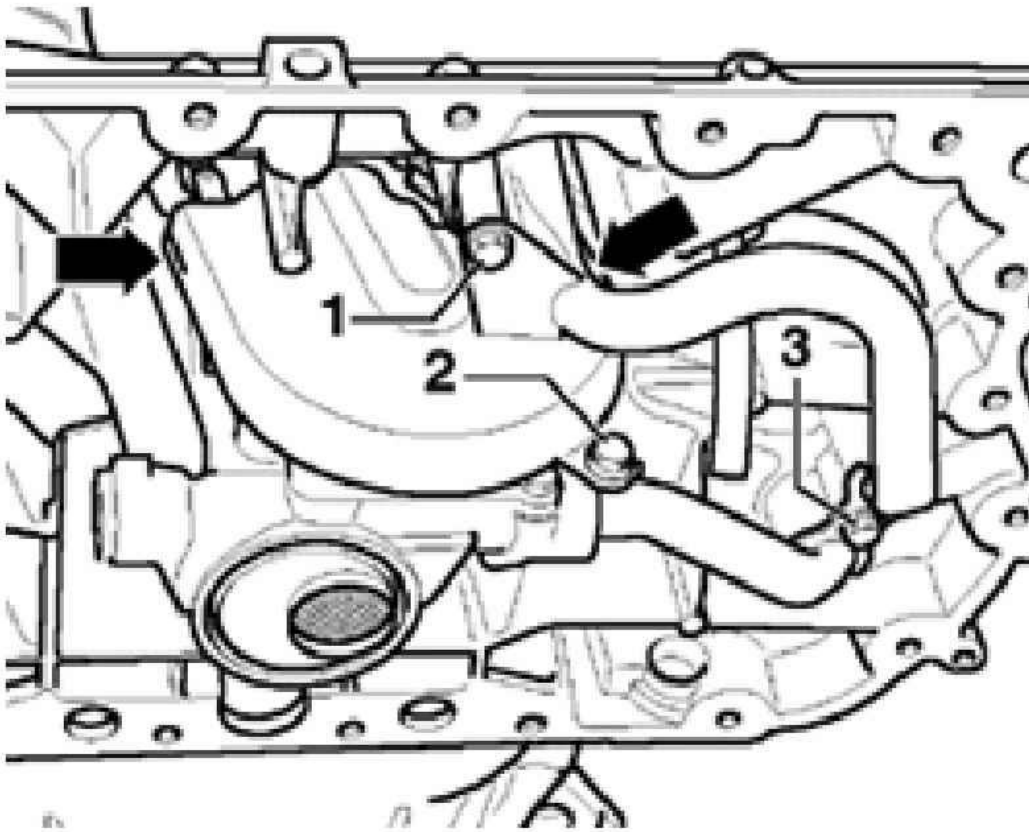
Installing

Install in the opposite order to removing. When installing, note the following points:

- Before bolting on oil pump, install short oil supply line into pump and upper section of oil pan with new O-rings.
- Bolt on cover plate -2- for oil pump sprocket.

NOTE:

- When installing, make sure that the plate engages in position - arrows-.
- When tightening bolt -2- securing cover plate, counter-hold at welded nut.



G02724401

Fig. 297: Tightening Cover Plate Bolts
Courtesy of AUDI OF AMERICA, INC.

- Clean both sealing surfaces for lower section of oil pan; make sure that they are free of oil and grease.

NOTE: **Do not use any adhesive or sealant.**

- Install new gasket on lower section of oil pan and install on upper section of oil pan with two diagonally opposite bolts.
- Tighten all securing bolts hand-tight.
- Tighten bolts to 10 Nm with torque wrench, working from center outward.
- Install new seal on oil drain plug and tighten to 30 Nm.
- Fill engine with oil.

Oil capacities, see **ENGINE OIL, FILLING**

- Install subframe.

See **SUBFRAME & SUBFRAME BUSHINGS** .

- Install lock carrier in normal position.

See **LOCK CARRIER, SERVICE POSITION** .

- Install bumper.

See **FRONT BUMPER** .

Tightening torques

TIGHTENING TORQUES: OIL PUMP

Component	Nm
Chain sprocket to oil pan	25
Lower section of oil pan to upper section of oil pan	10
Oil drain plug in lower section of oil pan	30
Oil pump to cylinder block	25
A/C compressor to bracket	25
Oil pump supply lines to upper section of oil pan	10
Bracket for A/C lines to oil pan	10

Front sealing flange and oil pump drive chain, removing and installing

Removing

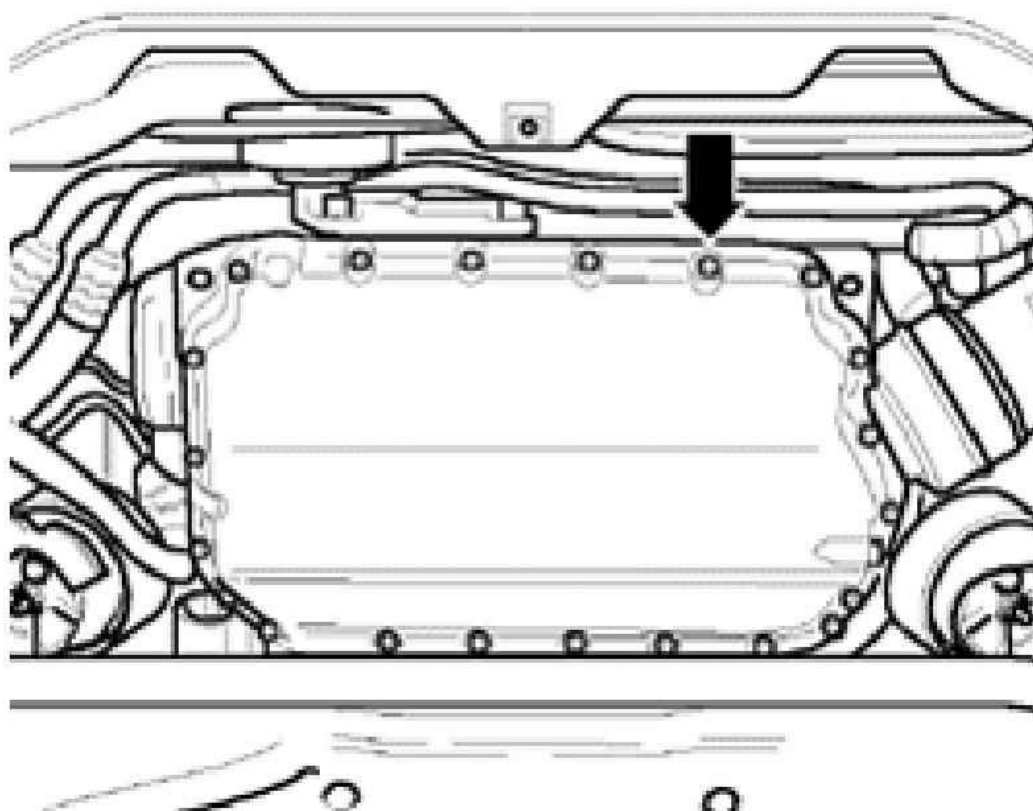
- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**
- Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING**.
- Drain engine oil.

NOTE: Use a separate container to collect the engine oil.

- Remove lower section of oil pan.
- Unbolt cover plate for oil pump sprocket (-2-).

NOTE:

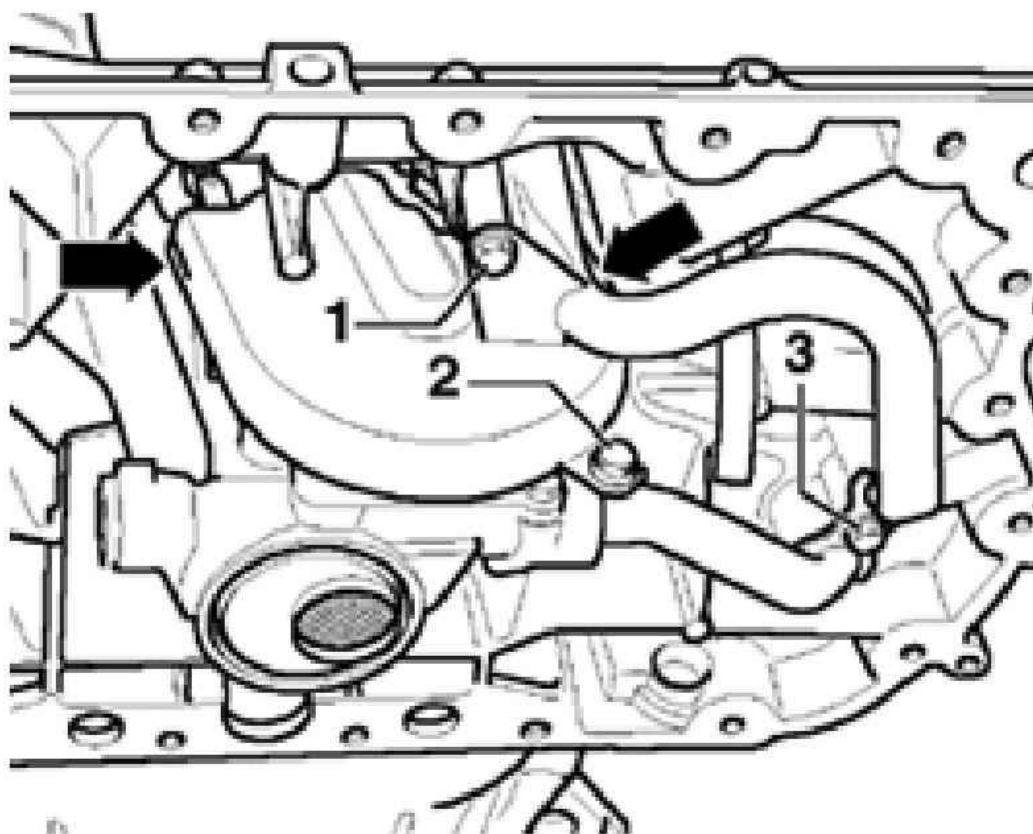
- When loosening bolt -2- securing cover plate, counter-hold at welded nut.
- When installing, make sure that the plate engages in position - arrows-.



G02724402

Fig. 298: Removing Lower Section Of Oil Pan
Courtesy of AUDI OF AMERICA, INC.

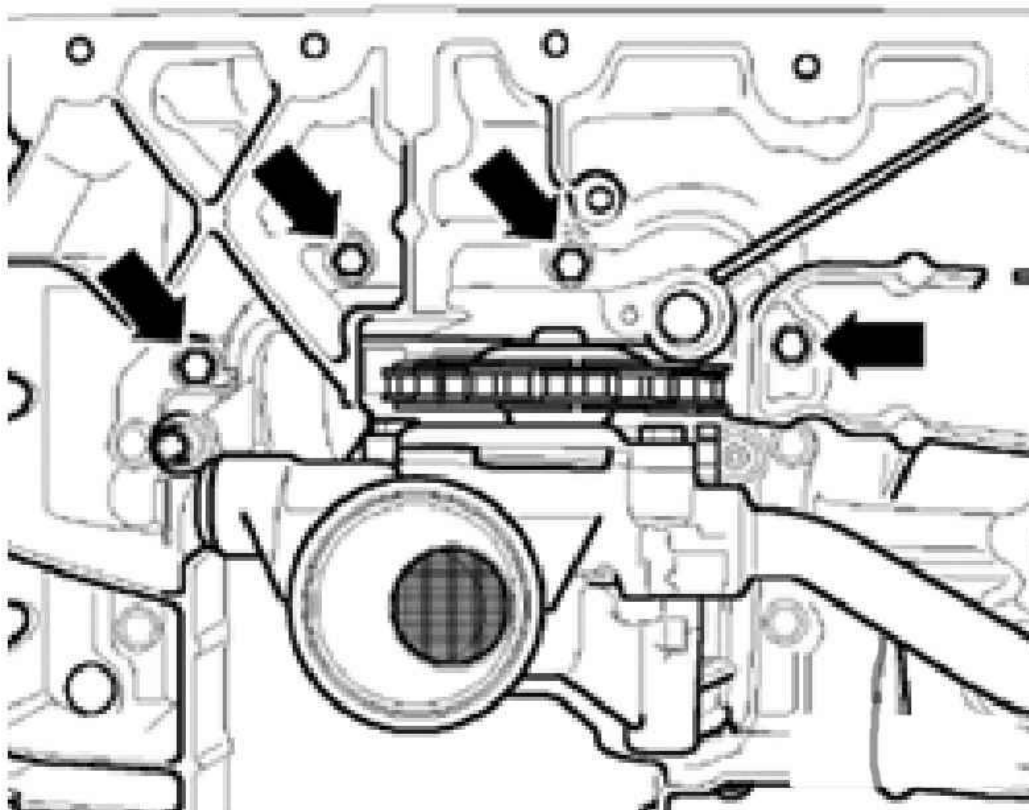
- Unbolt both oil supply lines -1- and -3- from upper section of oil pan and pull longer of two lines away downward.



G02724403

Fig. 299: Removing Oil Supply Lines
Courtesy of AUDI OF AMERICA, INC.

- Remove 4 bolts from upper section of oil pan.



G02724404

Fig. 300: Removing 4 Bolts From Upper Section Of Oil Pan
Courtesy of AUDI OF AMERICA, INC.

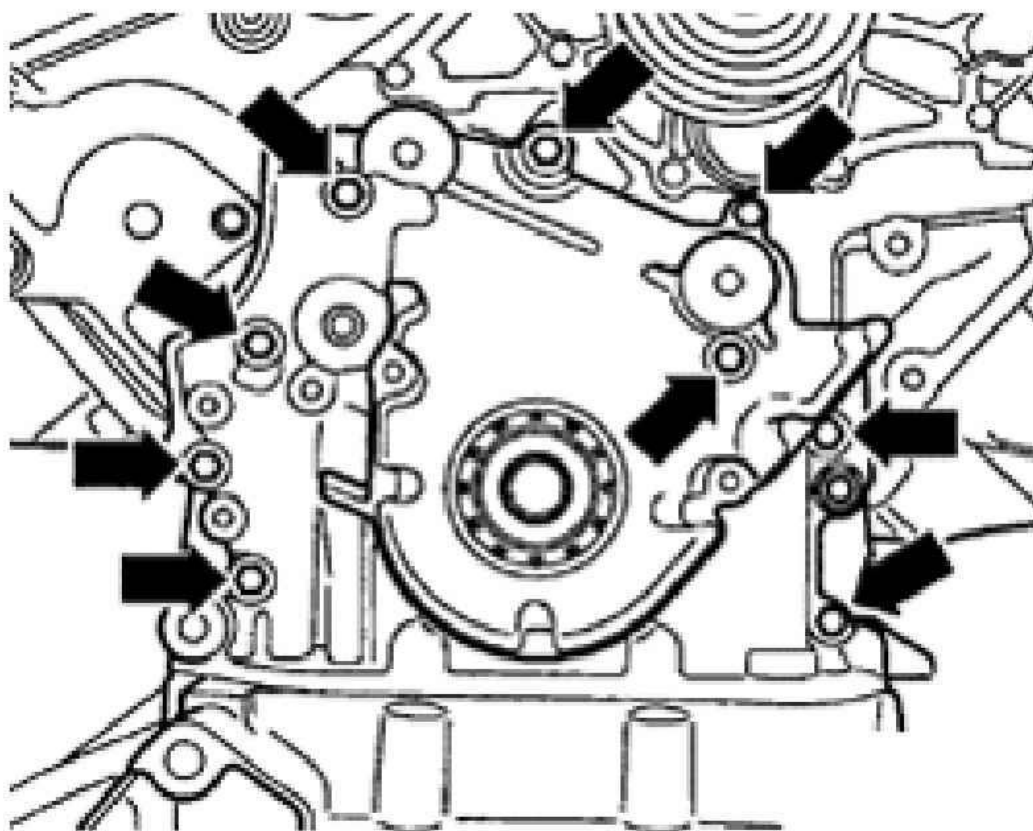
- Remove following components before unbolting front sealing flange:
 1. Tensioning roller for toothed belt: 20 Nm
 2. Idler wheel: 45 Nm
 3. Toothed belt tensioner: 10 Nm
 4. Lever for toothed belt tensioner: 20 Nm



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Fig. 301: Removing Toothed Belt Tensioning Components
Courtesy of AUDI OF AMERICA, INC.

- Unbolt front sealing flange and take off gasket for front sealing flange M6 bolts: 10 Nm M8 collar bolt: 30 Nm.

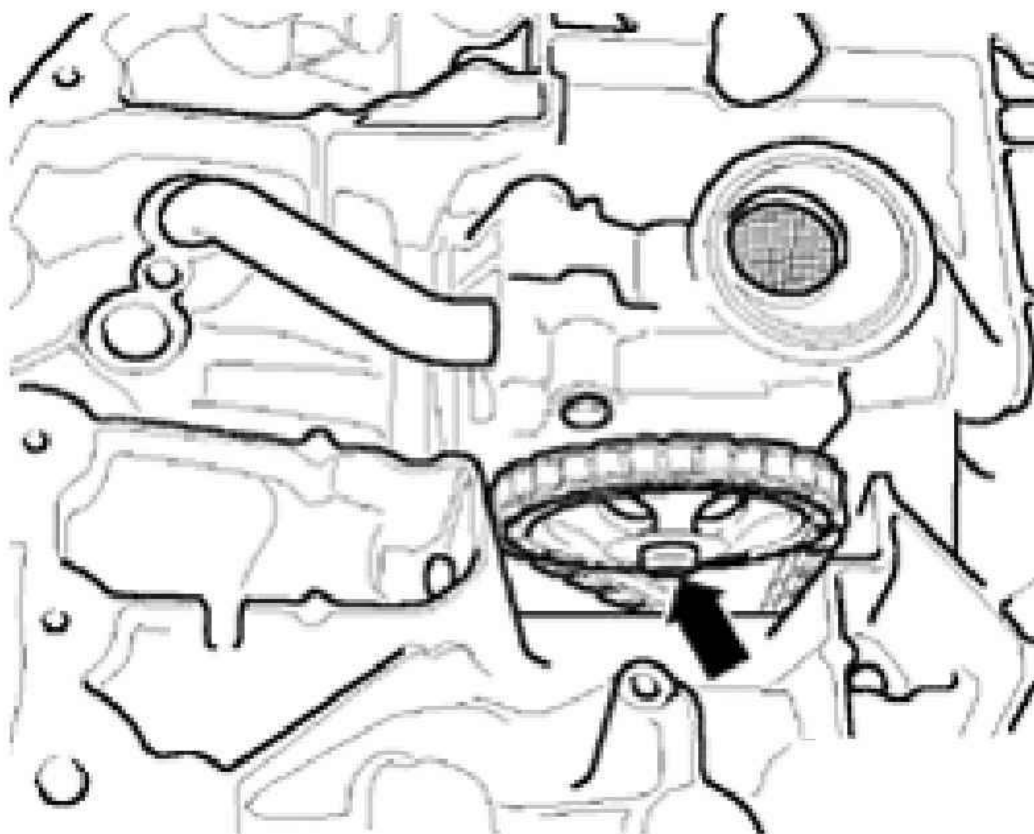


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Fig. 302: Removing Front Sealing Flange
Courtesy of AUDI OF AMERICA, INC.

Replacing oil pump drive chain

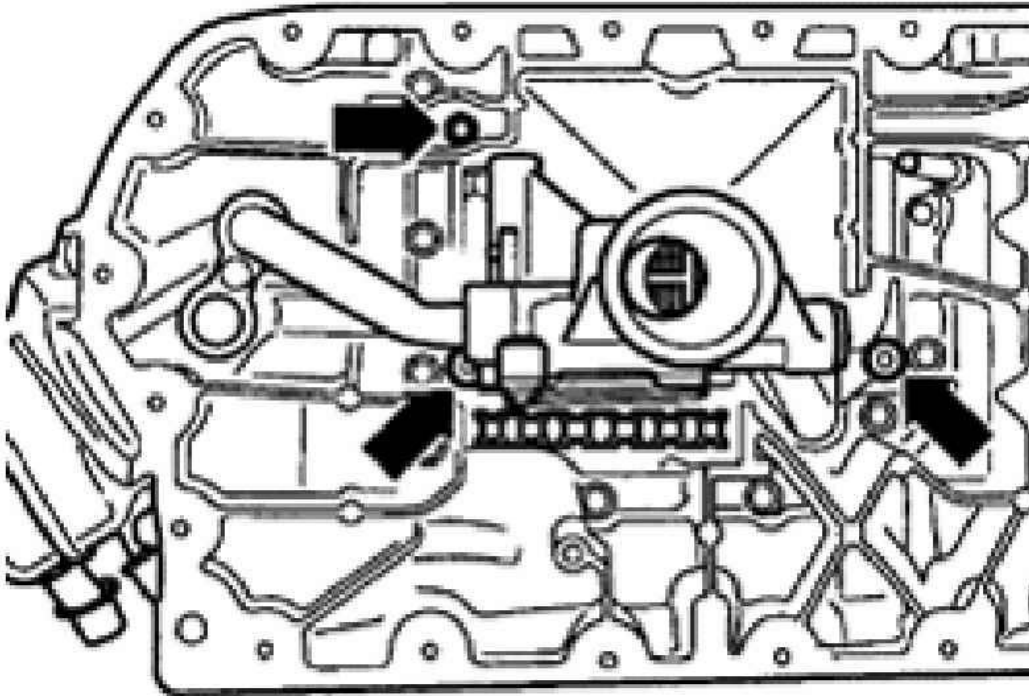
- Remove bolt securing chain sprocket to oil pump using Torx T45, and pull sprocket off oil pump.



G02724407

Fig. 303: Removing Oil Pump Chain Sprocket
Courtesy of AUDI OF AMERICA, INC.

- Remove oil pump together with shorter oil supply line.



G02724408

Fig. 304: Removing Oil Pump And Oil Supply Line
Courtesy of AUDI OF AMERICA, INC.

- Take out oil pump sprocket and remove drive chain from crankshaft.

Removing and installing chain sprocket on crankshaft , see **CHAIN SPROCKET FOR OIL PUMP ON CRANKSHAFT, REMOVING AND INSTALLING**

Installing

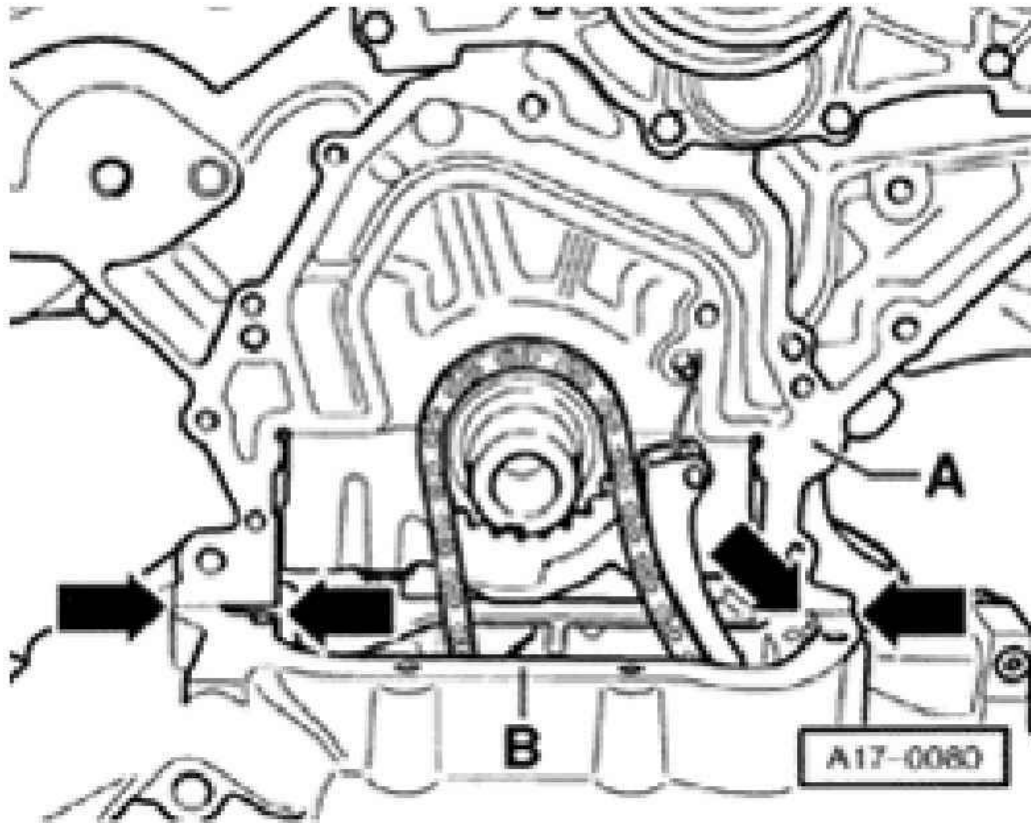
Install in the opposite order to removing. When installing, note the following points:

- Remove any residues of sealant on front of oil pan or engine block, if necessary.
- Clean sealing surfaces; ensure that they are free of oil and grease.

NOTE: The front sealing flange must be installed within 5 minutes of applying silicone sealant D 454 300 A2.

NOTE: Do not apply any sealant on sealing surface -A- of the cylinder block.

- After installing gasket on sealing surface -A-, apply a small quantity of sealant to joints between two arrows -left and right-. See **Fig. 305**.

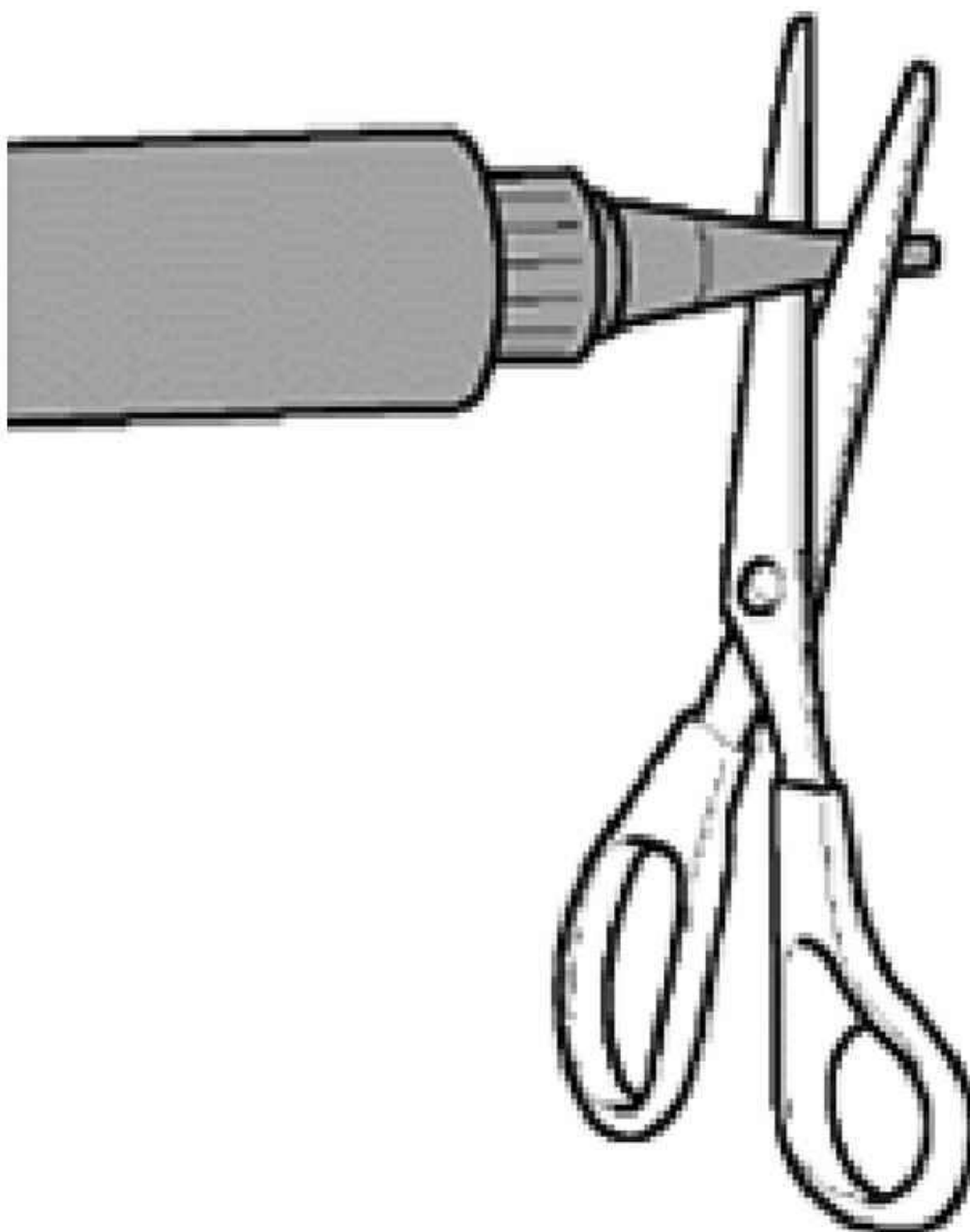


G02724409

Fig. 305: Locating Gasket Sealing Surface -A-
Courtesy of AUDI OF AMERICA, INC.

- Cut off nozzle of tube at front marking (diameter of nozzle approx. 3 mm).
 - Thickness of sealant bead: 2 to 3 mm

NOTE: The bead of sealant must not be thicker than 3 mm, as otherwise excess sealant may enter the oil pan and block the strainer in the oil intake line.



G02724410

Fig. 306: Installing Oil Intake Line
Courtesy of AUDI OF AMERICA, INC.

- Make sure sealing surface is clean and then apply silicone sealant on sealing surface of front sealing flange, as shown in illustration. (The illustration shows where the bead of sealant is applied)

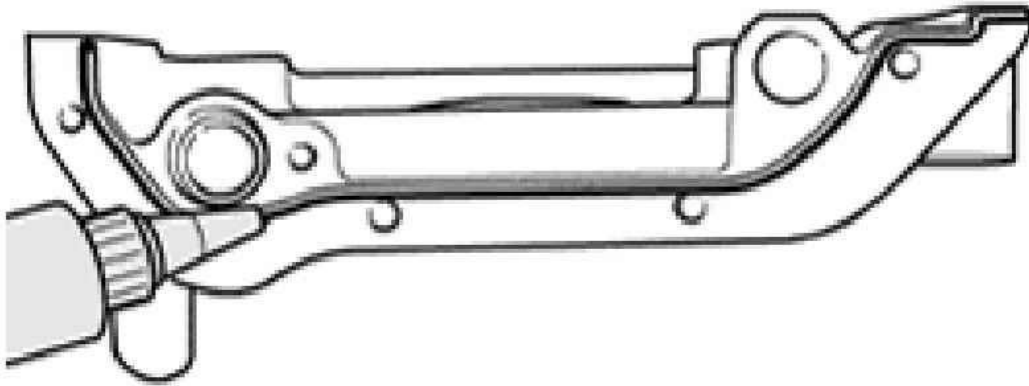
**G02724411**

Fig. 307: Applying Silicone Sealant On Sealing Surface of Front Sealing Flange
Courtesy of AUDI OF AMERICA, INC.

- Use installing sleeve 3202/1 to install sealing flange. Locate sealing flange in position immediately and tighten all 4 bolts in oil pan hand-tight initially.
- Tighten bolts securing sealing flange Tightening torque: Front sealing flange: M6 10 Nm, M8 20 Nm 4 bolts in oil pan: 10 Nm

Chain sprocket for oil pump on crankshaft, removing and installing

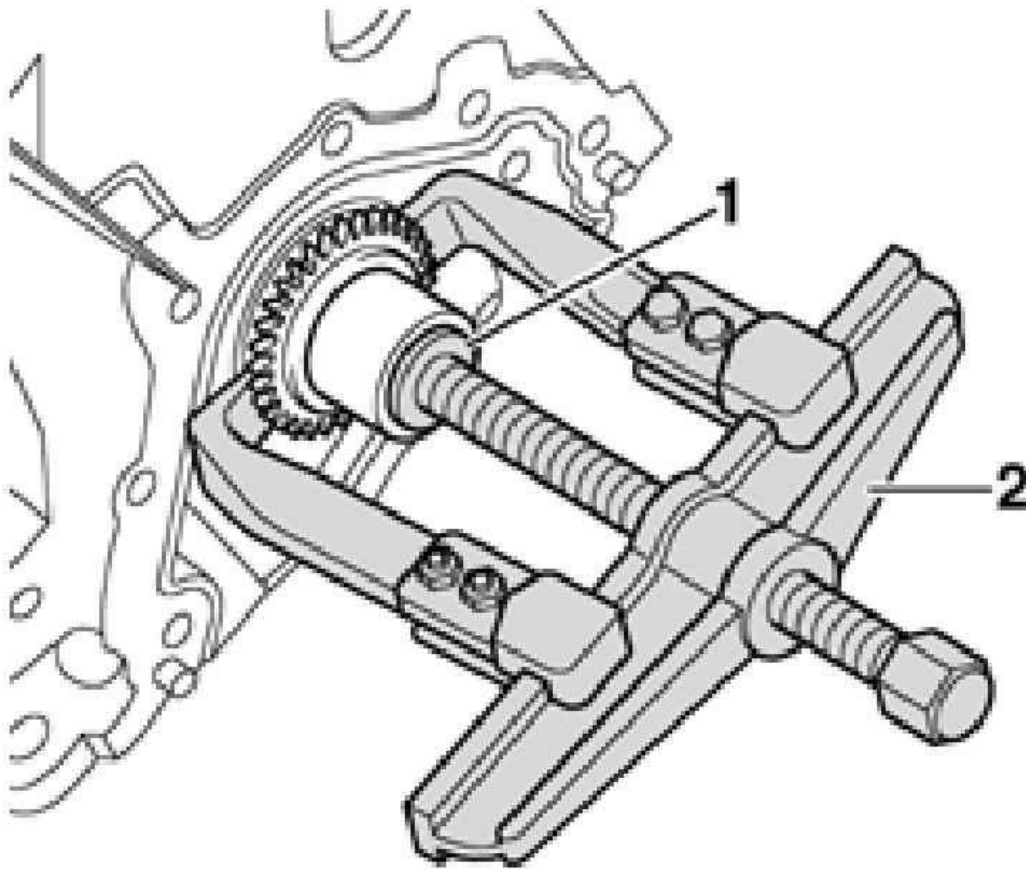
Removing

Removing and installing front sealing flange and oil pump drive chain. See **FRONT SEALING FLANGE AND OIL PUMP DRIVE CHAIN, REMOVING AND INSTALLING.**

- Pull chain sprocket off crankshaft using a normal commercial-type puller -2-: use a suitable washer -1- to protect end of crankshaft.

Installing

- Heat chain sprocket in oven for about 15 minutes at 220;deg;C.



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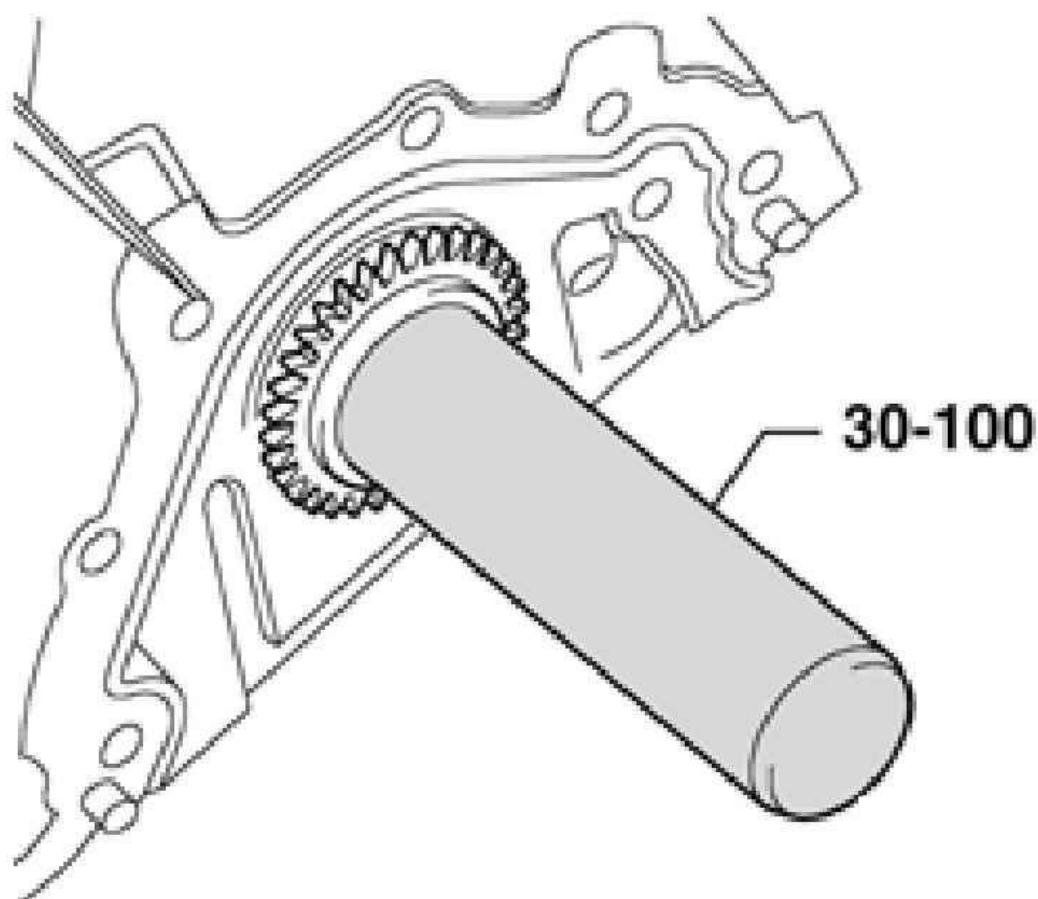
Fig. 308: Removing Chain Sprocket From Crankshaft

Courtesy of AUDI OF AMERICA, INC.

NOTE:

- **Wear protective gloves.**
 - **Installation position: it must be possible to read the lettering on the chain sprocket.**
- Using pliers, install chain sprocket on end of crankshaft and push against stop on crankshaft with drift sleeve 30-100. If necessary knock on carefully using a plastic hammer.

Removing and installing front sealing flange and oil pump drive chain. See **FRONT SEALING FLANGE AND OIL PUMP DRIVE CHAIN, REMOVING AND INSTALLING.**



G02724413

Fig. 309: Installing Chain Sprocket On Crankshaft
Courtesy of AUDI OF AMERICA, INC.

Crankshaft oil seal - pulley end, replacing

Removing

- Remove bumper.

See **FRONT BUMPER** .

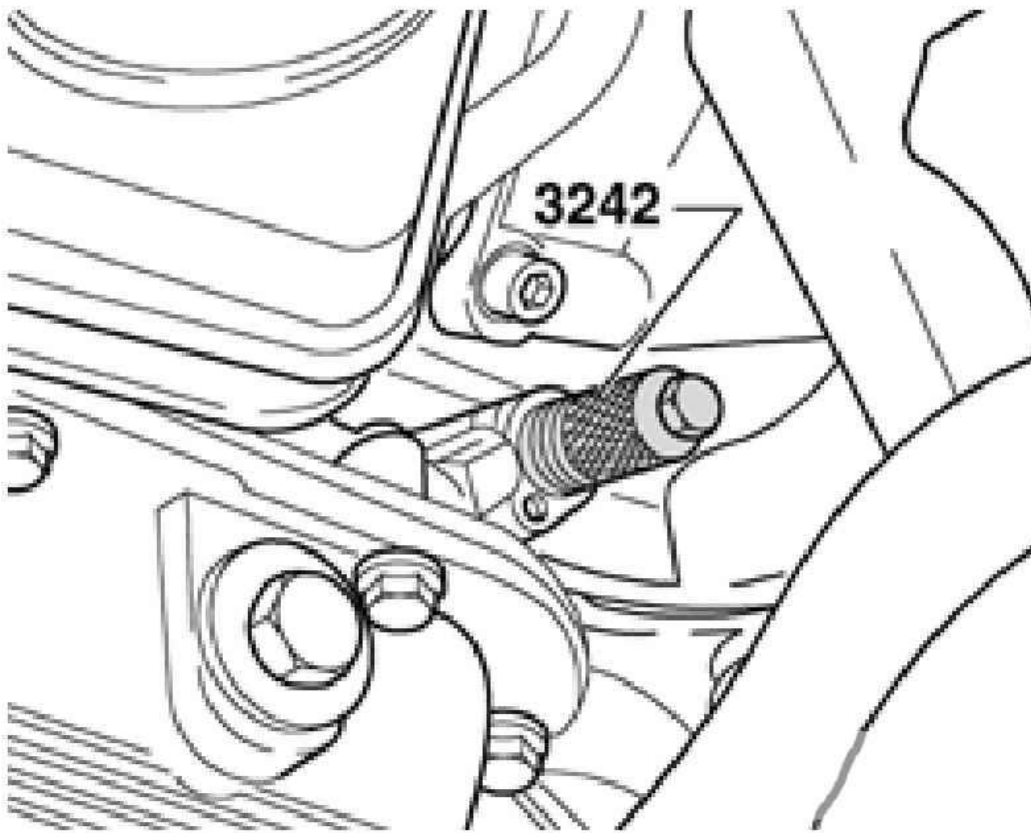
- Move lock carrier to service position.

See **LOCK CARRIER, SERVICE POSITION** .

- Remove ribbed belt. See **RIBBED BELT, REMOVING AND INSTALLING**.
- Remove toothed belt. See **TOOTHED BELT, REMOVING AND INSTALLING**.
- Remove sealing plug from hole in cylinder block (left side).
- Position crankshaft to TDC of No. 3 cylinder.

TDC drilling should be visible (or it should be possible to feel the drilling) in the sealing plug hole.

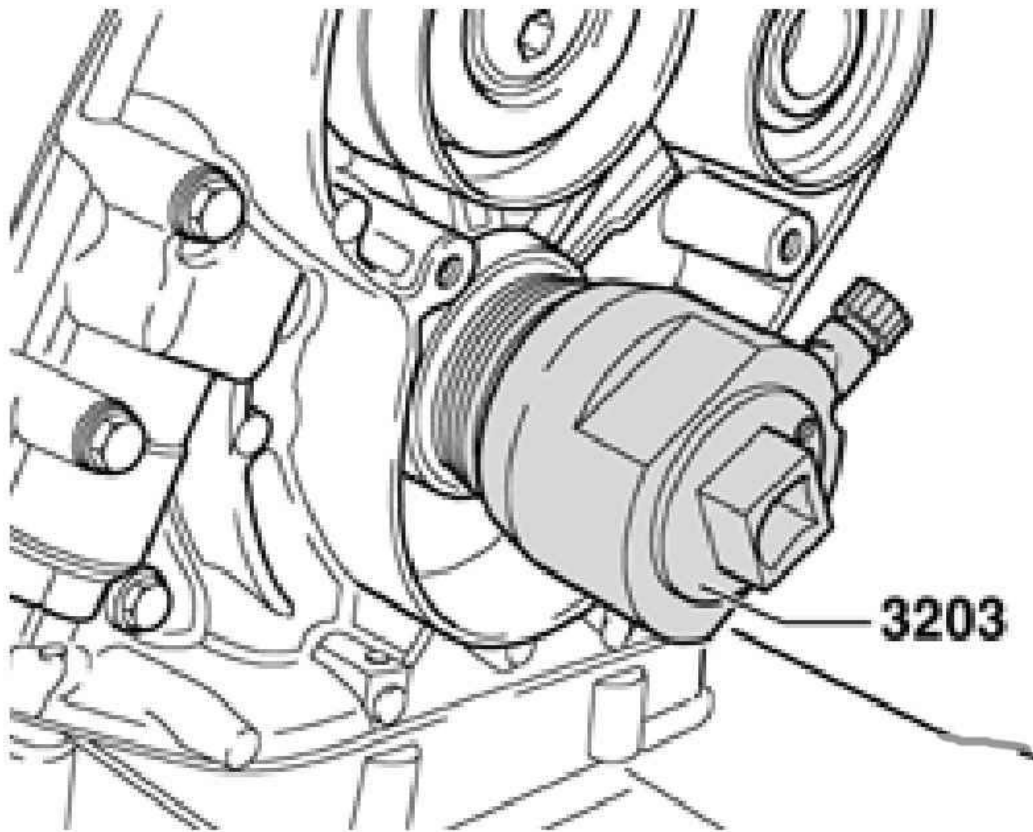
- Screw clamping bolt 3242 into hole so that crankshaft is secured against turning.



G02724414

Fig. 310: Installing Clamping Bolt 3242
Courtesy of AUDI OF AMERICA, INC.

- Remove crankshaft toothed belt sprocket.
- Remove inner part of oil seal extractor 3203 two turns (approx. 3 mm) out of outer part and lock with knurled screw.



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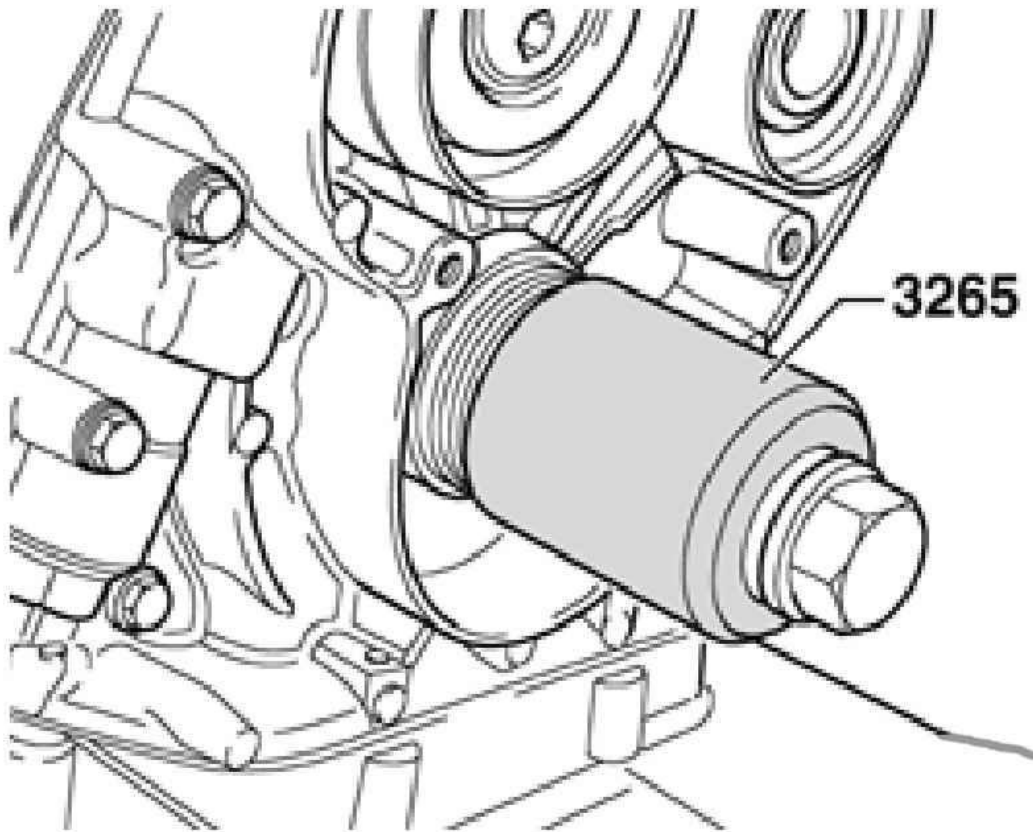
Fig. 311: Removing Crankshaft Front Oil Seal Using Oil Seal Extractor 3203
Courtesy of AUDI OF AMERICA, INC.

- Lubricate threaded head of oil seal extractor, place it in position and, exerting firm pressure, screw it in as far as possible into oil seal.
- Loosen knurled screw and turn inner part against crankshaft until oil seal is pulled out.

Installing

- Place guide sleeve 3202/1 onto crankshaft journal.
- Slide dry seal over guide sleeve.
- Press oil seal in flush with installing sleeve 3265.

Then proceed as for removing, performing steps in reverse order.



G02724416

Fig. 312: Installing Crankshaft Front Oil Seal With Installing Sleeve 3265
Courtesy of AUDI OF AMERICA, INC.

Oil pressure and oil pressure switch, checking

Test procedure

- Remove oil pressure switch-F1- and screw oil pressure switch into tester.
- Screw tester into oil pan in place of oil pressure switch.
- Connect brown wire of tester to Ground (-).
- Using test leads from VAG 1594, connect diode test lamp VAG 1527 between positive battery terminal (+) and oil pressure switch.
- Start engine and gradually increase engine speed. LED should light up at 1.2 -1.6 bar, otherwise replace oil pressure switch.

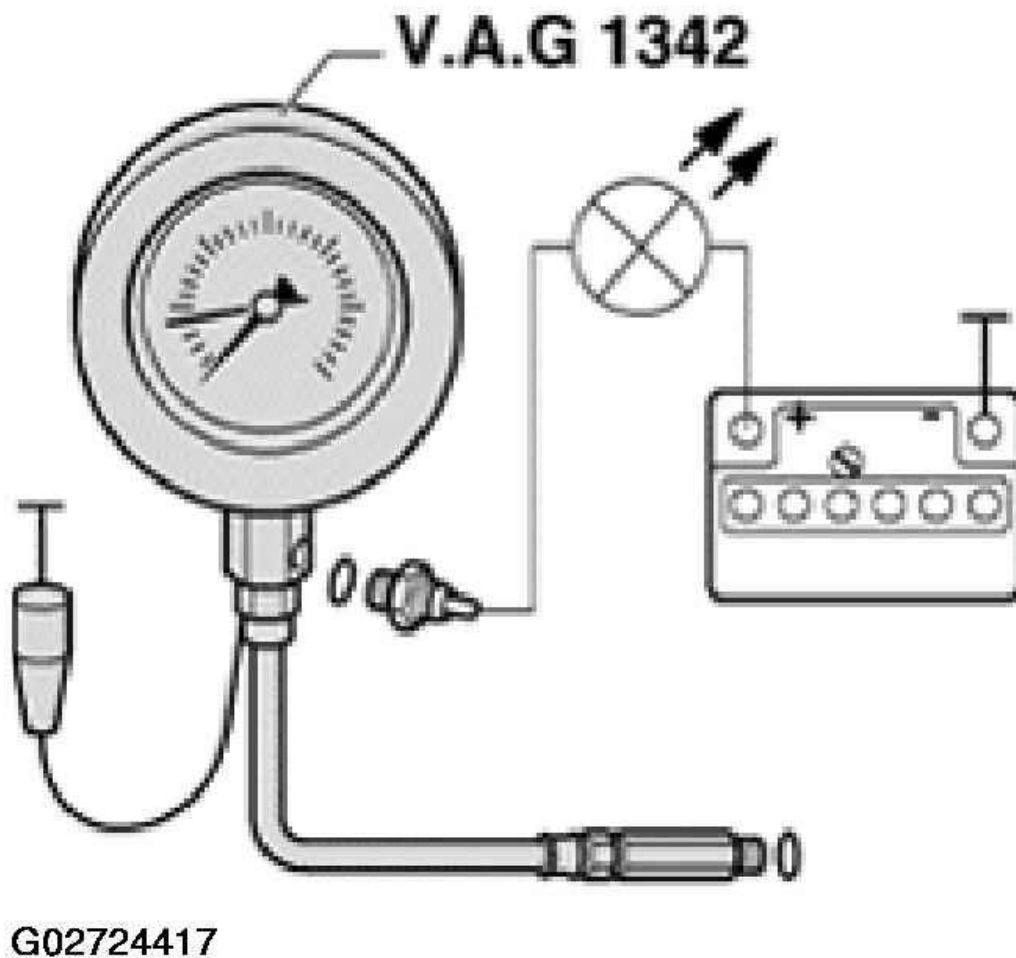


Fig. 313: Checking Oil Pressure And Oil Pressure Switch
Courtesy of AUDI OF AMERICA, INC.

- Increase engine speed further. At 2000 RPM and an oil temperature of 80;deg; C oil pressure should be at least 2.0 bar.

Engine oil

A high-quality multigrade oil is put in at the factory: this can be used all year round, except in extremely cold climates.

Viscosity grades and oil specifications

Viscosity grades and oil specifications, see **ENGINE OIL, FILLING**

Oil level, checking**Test conditions**

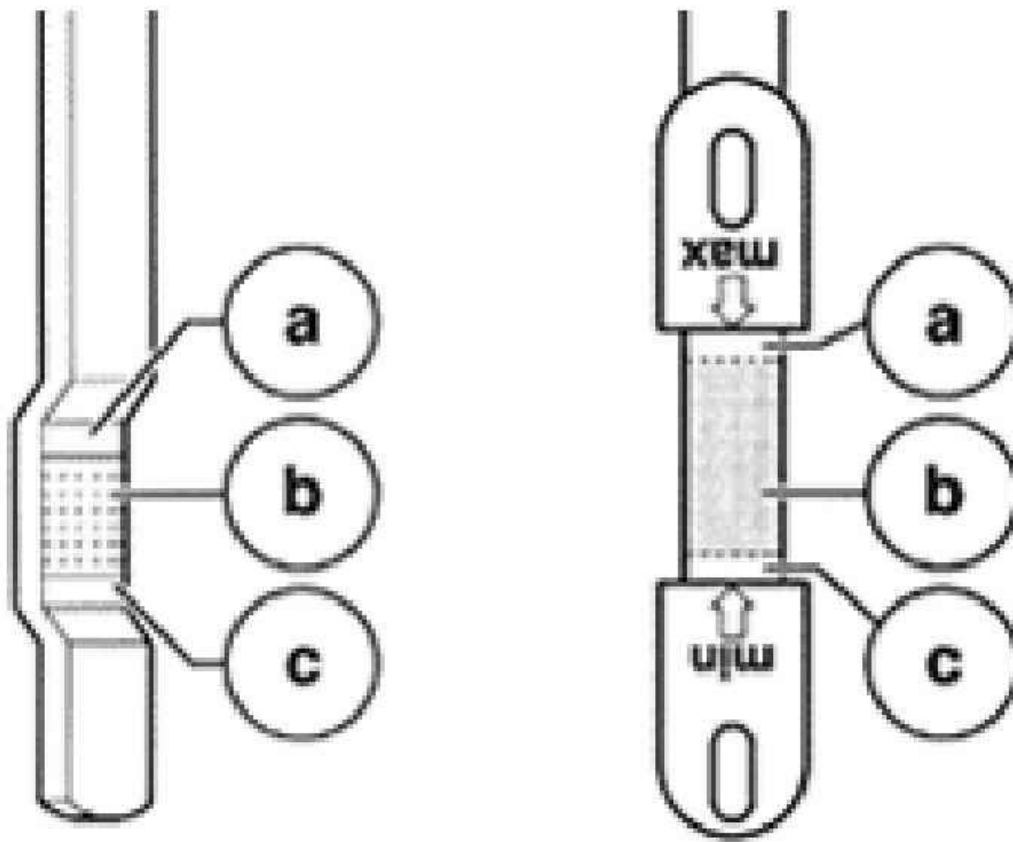
- Oil temperature above 60;deg; C.
- Vehicle level.
- Wait for a few minutes after switching off the engine to allow the oil to flow back into the oil pan.

Test sequence

- Remove dipstick, wipe off with a clean cloth and insert it again as far as it will go.
- Remove dipstick again and read oil level.

Markings on oil dipstick:

- a. Do not top off oil.
- b. Oil can be topped off. The oil level may rise as far as area -a- after topping off.
- c. Oil must be topped off. It is sufficient if the oil level is somewhere in area -b-(grooved area on dipstick) after topping off.



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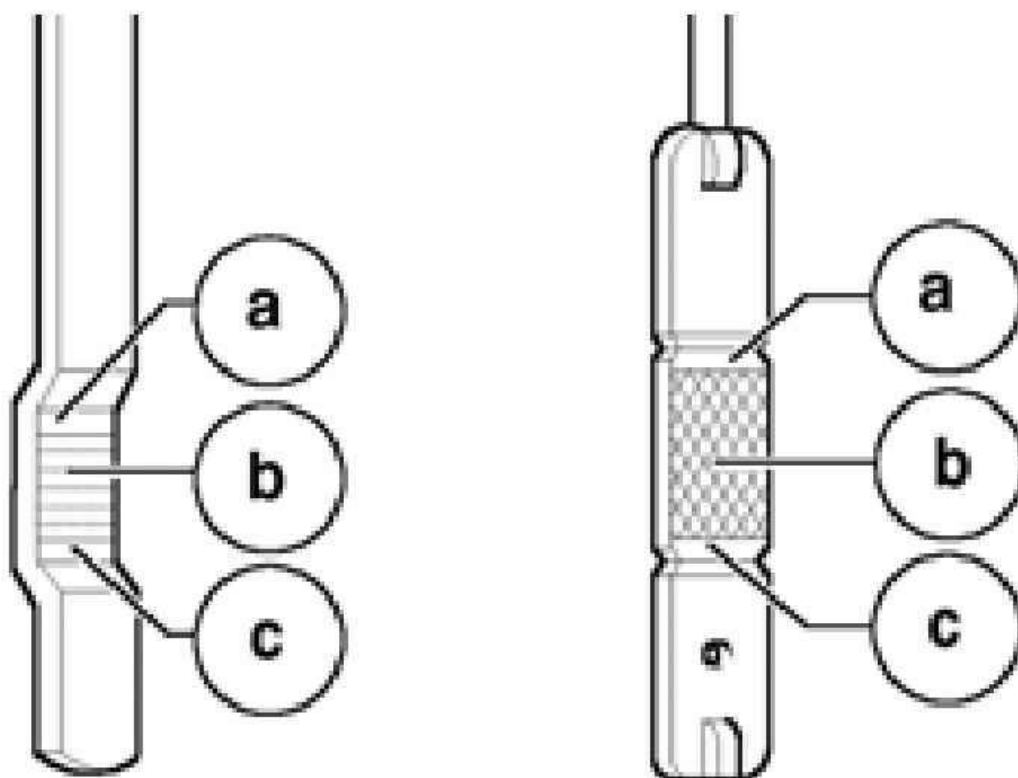
Fig. 314: Identifying Markings On Oil Dipstick (1 Of 2)
Courtesy of AUDI OF AMERICA, INC.

NOTE: The oil level must not be above marking -a-on the dipstick.

Oil capacities, see **ENGINE OIL, FILLING**

Markings on oil dipstick:

- a. Do not top off oil.
- b. Oil can be topped off. The oil level may rise as far as area -a- after topping off.
- c. Oil must be topped off. It is sufficient if the oil level is somewhere in area -b-(grooved area on dipstick) after topping off.



G02724419

Fig. 315: Identifying Markings On Oil Dipstick (2 Of 2)
 Courtesy of AUDI OF AMERICA, INC.

NOTE: The oil level must not be above marking -a-on the dipstick.

Oil capacities, see **ENGINE OIL, FILLING**