28 Ignition System

GENERAL

The ignition systems of the 1.8L and 3.2L gasoline engines are controlled by the Motronic engine management system. The engine control module computes ignition timing based on inputs from various sensors. Crankshaft speed from the crankshaft position sensor and engine load from the mass air flow (MAF) sensor are the two main inputs used to calculate the basic ignition timing point. The other sensors, including two knock sensors, are used by the ECM to modify and correct the ignition timing point based on changing operating conditions.

Ignition firing order	
1.8L turbo gasoline	1-3-4-2
3.2L gasoline	1-5-3-6-2-4

NOTE—

- *The Motronic fuel systems are all OBD II compliant. It is recommended that fault diagnosis and troubleshooting be carried out using Audi scan tools VAG 1551/1552, diagnostic computer VAS 5051/5052, or equivalent scan tool or computer program. See* **OBD On Board Diagnostics** *for a list of diagnostic trouble codes (DTCs) and scan tool suppliers.*
- *For spark plug and ignition coil removal and installation, see* **03 Maintenance.**

Service precautions

Ignition system service and repair work must be carried out carefully. The ignition system contains sensitive electronic components. To guard against system damage, and for personal and general safety, the following warnings and cautions apply to any ignition system troubleshooting, maintenance or repair work.

WARNING —

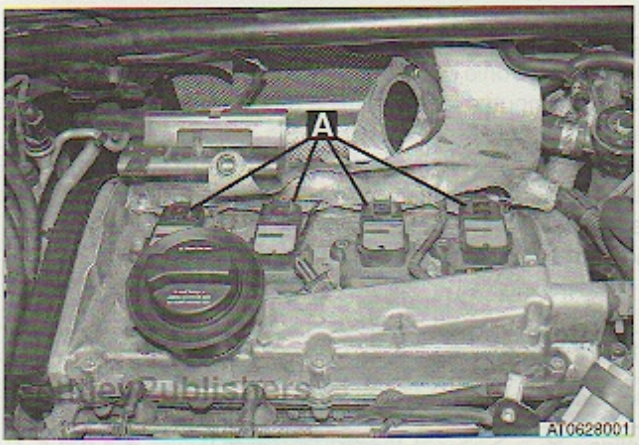
- *Ignition systems operate in a dangerous voltage range that could prove to be fatal if exposed terminals or live parts are contacted. Use extreme caution when working on a vehicle with the ignition on or the engine running.*
- *Connect and disconnect ignition coil connectors, terminal connectors and test equipment leads only while the ignition is off unless specifically instructed otherwise.*

Disabling ignition system

If the engine must be turned at starter speed without starting, the ignition system should be disabled to prevent the discharge of dangerously high voltage. This should be done any time repairs or maintenance are performed on the engine with the ignition key on or if the starter needs to be operated without running the engine.

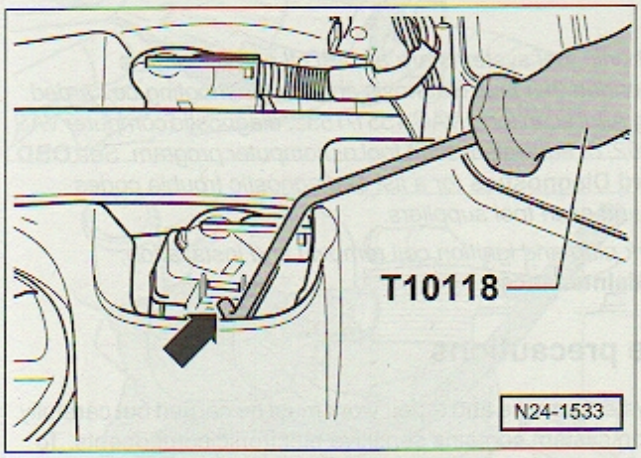
– Remove upper sound absorber panel from top of engine, see **03 Maintenance**.

1.8L engine

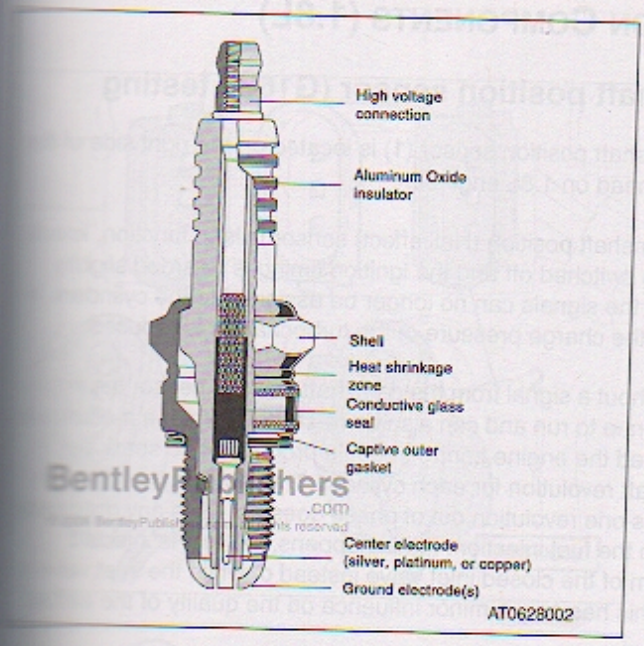


➤ Disconnect harness connectors (**A**) from each individual ignition coil to disable ignition system. See **03 Maintenance, Spark Plugs**, for detailed ignition coil removal instructions.

3.2L engine



➤ Disconnect harness connectors from ignition coils by releasing tabs (**arrow**) with **T10118** or equivalent.



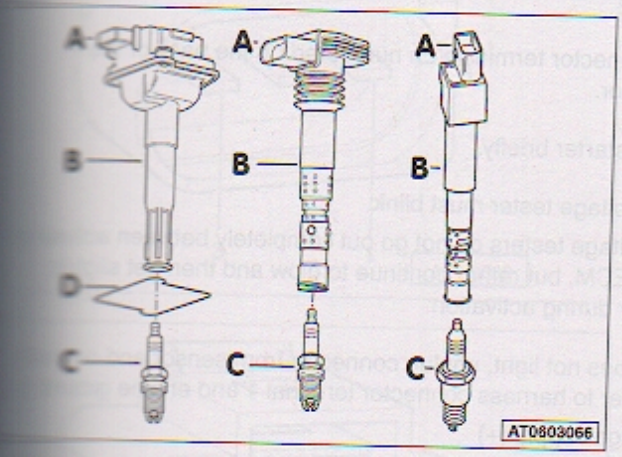
Ignition Coils and Spark Plugs

Audi specifies spark plugs made by several different manufacturers. Because specifications and part numbers can change, always check with an authorized Audi Dealer's parts department or aftermarket parts specialist for the latest application information.

Engine	Spark plug specifications
1.8L 4-cyl. 180-hp 225-hp	AoA number.....101 000 063 AA NGK number.....PFR6Q Gap.....0.8 mm (0.032 in.) maximum Torque.....30 Nm (22 ft-lb) Firing order.....1-3-4-2
3.2L 6-cyl. 250-hp	AoA number.....101 905 606 A NGK number.....IZKR7B Gap.....1.1 mm (0.043 in.) maximum Torque.....30 Nm (22 ft-lb) Firing order.....1-5-3-6-2-4

NOTE—

- *Part number information is current at time of publication, but can change due to supersessions, etc.*
- *Audi part numbers are given for reference only! Always consult with your Audi of America Parts Department or aftermarket parts specialist for the latest parts information.*
- *Spark plugs are generally pre-gapped by the original manufacturer during production but should be checked before installation.*

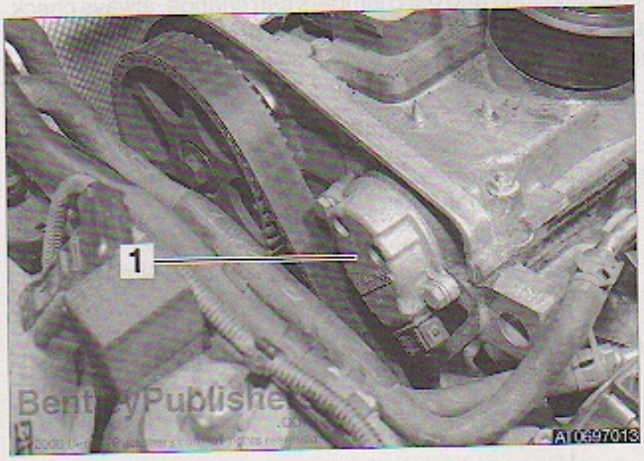


Spark plug access requires disconnecting harness connector from ignition coil and removal of ignition coil. Early 4-cylinder coils (**left**), are bolted in place and use a separate gasket. Later 4-cylinder (**center**) and 6-cylinder versions (**right**) are push-in.

A. Wiring harness connection
B. Ignition coil
C. Spark plug
D. Gasket

IGNITION COMPONENTS (1.8L)

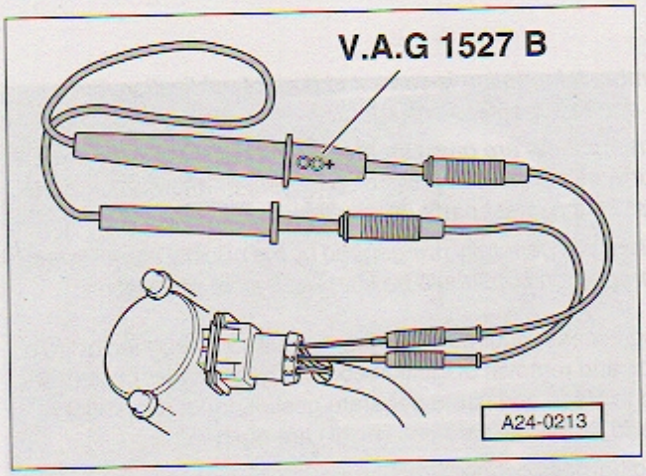
Camshaft position sensor (G163), testing



The camshaft position sensor (1) is located on the right side of the cylinder head on 1.8L engines.

If the camshaft position (Hall effect) sensor fails to function, knock control is switched off and the ignition timing is retarded slightly because the signals can no longer be assigned to the cylinders. In addition the charge pressure of the turbocharger is reduced.

Even without a signal from the camshaft position sensor the engine will continue to run and can also be re-started. When a malfunction is detected the engine control module produces one spark per crankshaft revolution for each cylinder. The fact that the injection system is one revolution out of phase does not have any noticeable effect on the fuel injection. If this happens, the fuel is injected upstream of the closed inlet valve instead of while the inlet valve is open. This has only a minor influence on the quality of the air/fuel mixture.



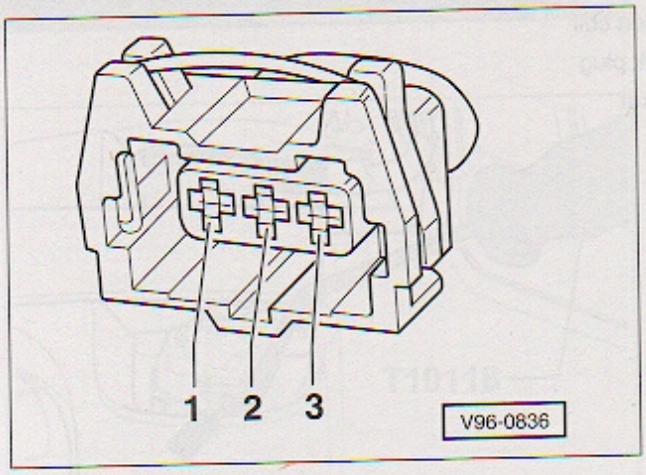
Slide back rubber sleeve (if applicable) from camshaft position sensor harness connector. Connect test leads of LED voltage tester (V.A.G. 1527B shown) to terminals 1 (positive) and terminal 2 (signal).

- The connector terminals on numbered on the back of the connector.

– Operate starter briefly.

– LED of voltage tester must blink.

- LED voltage testers do not go out completely between activations by the ECM, but rather continue to glow and then get slightly brighter during activation.



If LED does not light, unplug connector from sensor and connect multimeter to harness connector terminal **1** and engine ground.

1. Voltage supply (+)
2. Signal
3. Ground (–)

– Switch on ignition.

- Specification: approximately 5 volts.

– If specification is not obtained, check signal wire by connecting multimeter to harness connector terminal **2** and engine ground.

– Switch on ignition.

- Specification: approximately battery voltage (12 volts).

– If specification is not obtained, check ground wire by connecting multimeter to harness connector terminal **3** and engine ground.

- Check for continuity to ground.

– If specification is not obtained, check wiring for open or short using wiring diagrams. See **EWD Electrical Wiring Diagrams**.

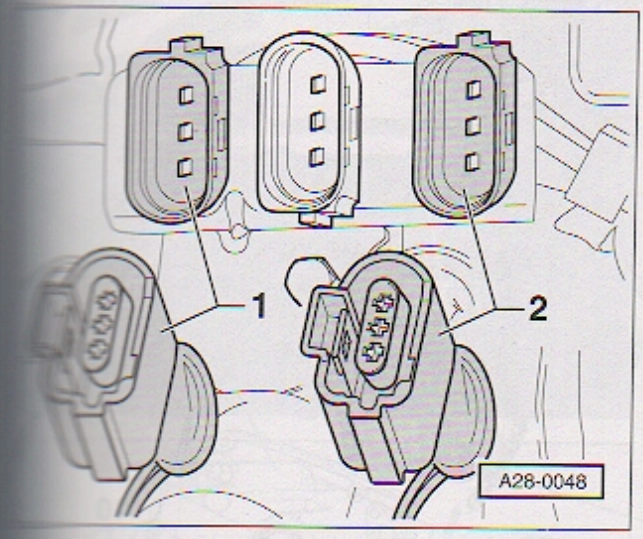
– If above specifications are not obtained and no wiring faults are found, replace camshaft position sensor.

Knock sensors (G61 / G66), testing

Knock sensor control must be tested using a diagnostic scan tool (VAG 1551/1552 or VAS 5051/5052). The wiring for the knock sensors can be checked for electrical short circuits as described below.

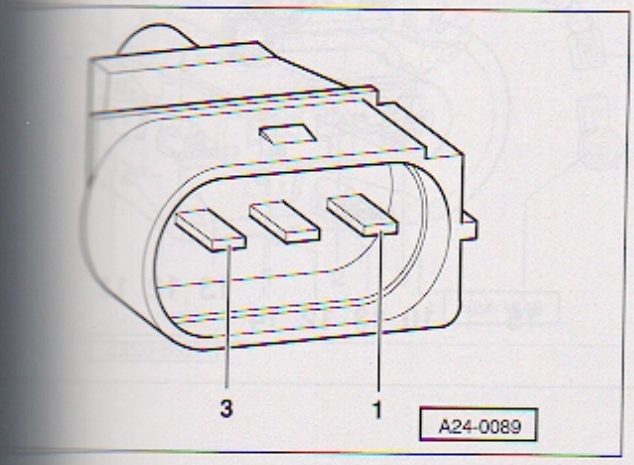
NOTE—

- *Audi identifies electrical components by a letter and/or a number in the electrical schematics. See* **EWD Electrical Wiring Diagrams**. *These electrical identifiers are listed in parentheses as an aid to electrical troubleshooting.*



➤ Unplug harness connector for knock sensor **1** (G61) or knock sensor **2** (G66).

- Knock sensor harness connectors are located in front of intake manifold.



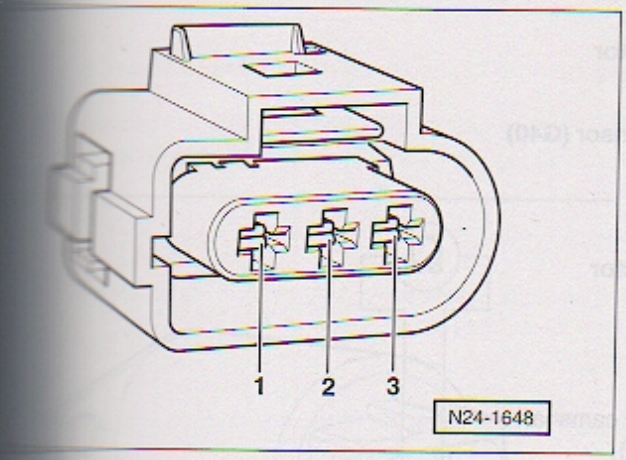
➤ Test for short circuits between all three terminals of knock sensor harness connector (male side).

- Specification: ∞ Ω (no continuity)

– If there is continuity between any of the terminals, replace knock sensor.

– Knock sensors must be tightened to exact specification for proper operation. Use of an accurate torque wrench is necessary when installing.

Tightening torque	
Knock sensor to cylinder block	20 Nm (15 ft-lb)



➤ Test for short circuits between all three terminals of knock sensor harness connector (female side).

- Specification: ∞ Ω (no continuity)

1. Signal
2. Ground (–)
3. Screening

– If there is continuity between any of the terminals, repair wiring using wiring diagrams. See **EWD Electrical Wiring Diagrams**.

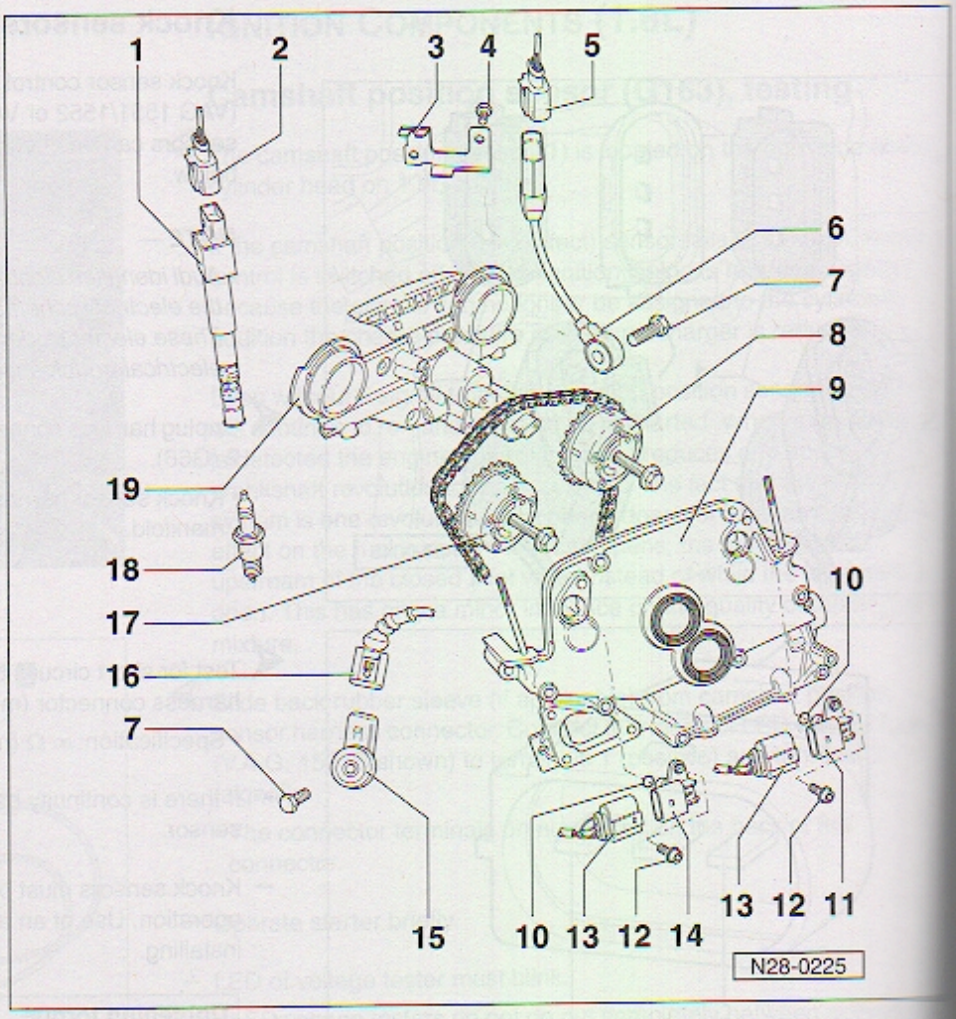
Ignition Components (3.2L)

IGNITION COMPONENTS (3.2L)

Ignition system components

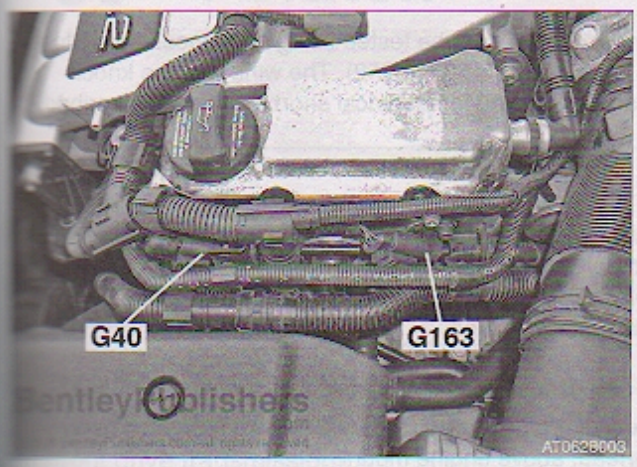
NOTE—

- *Audi identifies electrical components by a letter and/or a number in the electrical schematics. See* **EWD Electrical Wiring Diagrams**. *These electrical identifiers are listed in parentheses as an aid to electrical troubleshooting.*



1. **Ignition coils with power output stage**
   - Cylinder #1 (N70)
   - Cylinder #2 (N127)
   - Cylinder #3 (N291)
   - Cylinder #4 (N292)
   - Cylinder #5 (N323)
   - Cylinder #6 (N324)
   - Removing and installing, see **03 Maintenance**
2. **4-pin harness connector**
   - For ignition coil
3. **Bracket**
   - For knock sensor connector
4. **Bolt**
   - 10 Nm (7 ft-lb)
5. **3-pin harness connector**
   - Black
6. **Knock sensor 1 (G61)**
7. **Bolt**
   - 20 Nm (15 ft-lb)
8. **Camshaft adjuster**
   - For exhaust camshaft
   - With sender wheel for camshaft position sensor 2 (G163)
   - After re-installing, adjust valve timing
9. **Cover (upper) for camshaft timing chain**
10. **Seal**
    - Always replace
11. **Camshaft position sensor 2 (G163)**
    - For exhaust camshaft
12. **Bolt**
    - 10 Nm (7 ft-lb)
13. **3-pin harness connector**
    - Black
14. **Camshaft position sensor (G40)**
    - For intake camshaft
15. **Knock sensor 2 (G66)**
16. **2-pin harness connector**
    - Black
17. **Camshaft adjuster**
    - For intake camshaft
    - With sender wheel for camshaft position sensor (G40)
    - After re-installing, adjust valve timing
18. **Spark plug**
    - 30 Nm (22 ft-lb)
    - Remove/install with spark plug socket 3122 B or 16 mm (5/8 inch) spark plug socket and extension
19. **Valve timing housing**
    - For variable valve timing

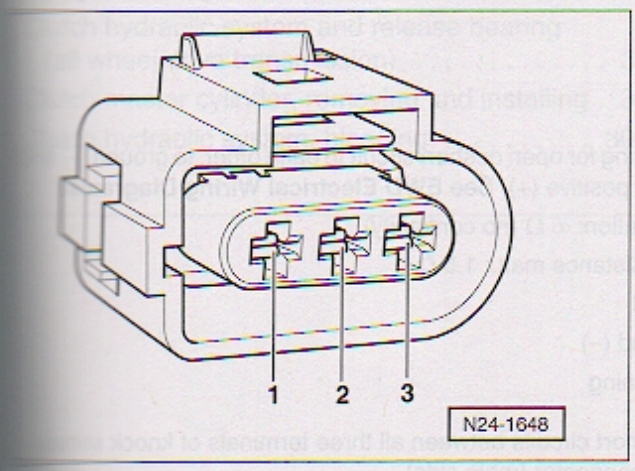
Camshaft position sensors (G40 / G163), testing



➢ The camshaft position sensors are located on the left side of the 3.2L cylinder head.

- **G40** - camshaft position sensor for intake camshaft
- **G163** - camshaft position sensor for exhaust camshaft

– Disconnect harness connector for camshaft position sensor.



➢ Connect test leads of multimeter between terminal 1 (B+) and terminal 3 (ground).

1. Voltage supply (+)
2. Signal
3. Ground (–)

– Switch ignition on.

- Specified value: minimum 4.5 V

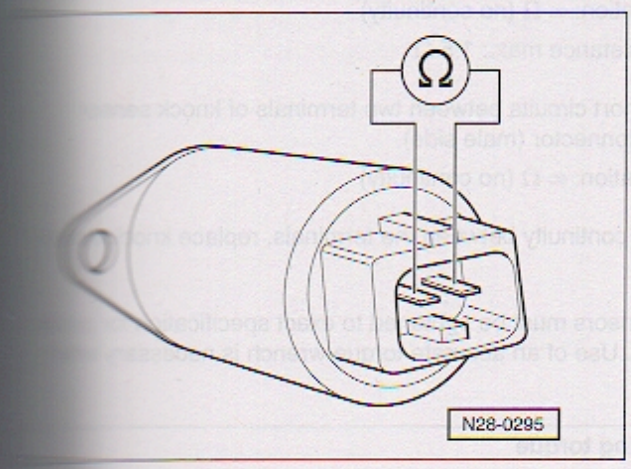
– If specification is not obtained, check wiring for open or short circuit using wiring diagrams. See **EWD Electrical Wiring Diagrams**.

– If above specifications are not obtained and no wiring faults can be found, replace camshaft position sensor.

Camshaft adjustment valves (N205 / N318), testing

– Disconnect 2-pin harness connector from camshaft adjustment valve.

- N205 - valve 1 for camshaft adjuster (intake camshaft)
- N318 - camshaft adjustment valve 1 (exhast camshaft)

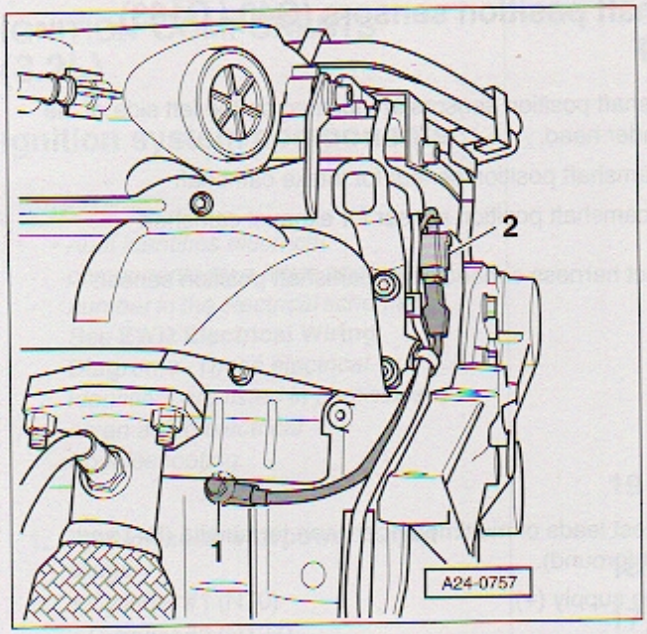


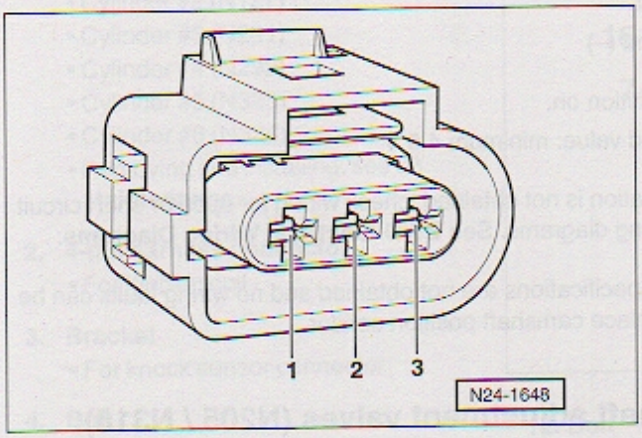
➢ Use a multimeter to measure resistance between two terminals of camshaft adjustment valve.

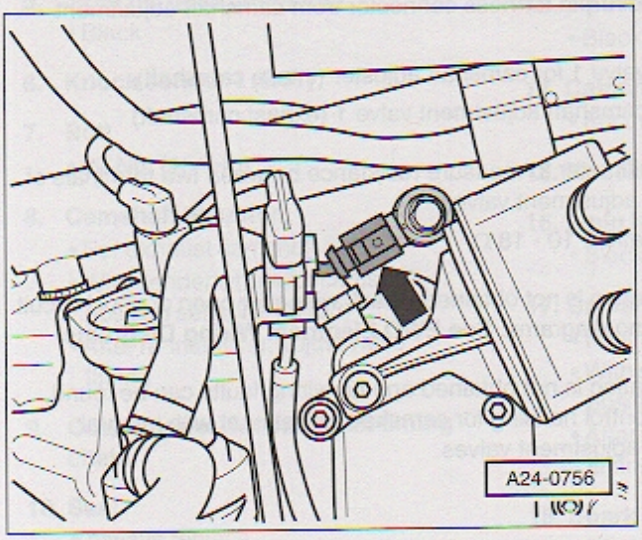
- Specification: 10 - 18 Ω

– If specification is not obtained, check wiring for open or short circuit using wiring diagrams. See **EWD Electrical Wiring Diagrams**.

– If specification is not obtained and no wiring faults can be found, replace control housing for camshaft adjustment with integral camshaft adjustment valves.







Knock sensors (G61 / G66), testing

Knock sensor control must be tested using a diagnostic scan tool (VAG 1551/1552 or VAS 5051/5052). The wiring for the knock sensors can be checked for electrical short circuits as described below.

NOTE—

- *Audi identifies electrical components by a letter and/or a number in the electrical schematics. See* **EWD Electrical Wiring Diagrams**. *These electrical identifiers are listed in parentheses as an aid to electrical troubleshooting.*

➤ Unplug 3-pin harness connector (**2**) for knock sensor **1** (G61).

- Knock sensor 1 harness connector is located at right side of cylinder head, above engine mount.

➤ Check wiring for open or short circuit to each other, to ground (–) and to battery positive (+). See **EWD Electrical Wiring Diagrams**.

- Specification: ∞ Ω (no continuity)
- Wire resistance max.: 1.5 Ω

1. Signal
2. Ground (–)
3. Screening

– Test for short circuits between all three terminals of knock sensor harness connector (male side).

- Specification: ∞ Ω (no continuity)

– If there is continuity between any of the terminals, replace knock sensor.

➤ Unplug 2-pin harness connector (**arrow**) for knock sensor 2.

– Check wiring for open or short circuit to each other, to ground (–) and to battery positive (+). See **EWD Electrical Wiring Diagrams**.

- Specification: ∞ Ω (no continuity)
- Wire resistance max.: 1.5 Ω

– Test for short circuits between two terminals of knock sensor harness connector (male side).

- Specification: ∞ Ω (no continuity)

– If there is continuity between the terminals, replace knock sensor.

– Knock sensors must be tightened to exact specification for proper operation. Use of an accurate torque wrench is necessary when installing.

Tightening torque	
Knock sensor to cylinder block	20 Nm (15 ft-lb)