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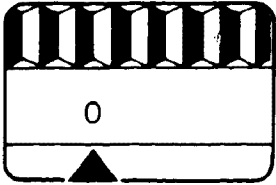
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Technical data

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Ignition System

Ignition data 1989 M.Y.		U.S.A./Calif./Canada
Engine code		MC
Ignition distributor		035 905 206 AF
Ignition timing		TDC
Timing mark location: on flywheel (Not adjustable; marks on distributor body and aperture rotor should line up with cylinder no. 1 at TDC)		
Centrifugal advance (vacuum advance/retard)		Intake air temperature, intake manifold pressure and position of throttle plate are monitored by control unit for electronic ignition after each engine rotation. Checking not necessary.
Firing order		1 - 2 - 4 - 5 - 3
Spark plugs	Bosch	WR7DS or W7DTC
	Beru	RS35 or 14-7DTU
	Champion	N8GY or N9BYC
	electrode gap mm (in.)	0.7 ± 0.1 (0.028 ± 0.004)
	tightening torque Nm (ft lb)	20 (14)
Idle speed RPM		800 ± 50
Engine speed limiter	switching OFF RPM	6700 ± 200
CO-content (oxygen sensor probe disconnected)		checking value
		0.3-3.0 vol. %
		adjusting value
(oxygen sensor probe connected, as control)		0.6-1.0 vol. %
		0.3-1.2 vol. %

Safety guidelines

To prevent injury to persons or damage to the ignition system, observe the following safety guidelines:

CAUTION

Do **NOT** touch or disconnect ignition cables when engine is running or starter is cranked.

Disconnect ignition system wiring only when ignition is switched **OFF**.

Connect and disconnect tester leads to ignition system only when ignition is switched **OFF**.

Do **NOT** connect any capacitors or test lights to terminal 1 of coil.

When high tension cable (terminal 4 from coil) is disconnected from distributor, always connect it directly to ground using jumper cable. Otherwise, engine must **NOT** be cranked with starter (such as with compression test).

Fast charging may only be used for emergency starting for up to 15 seconds maximum with no more than 16.5 volts. Wait at least one minute after each starting attempt.

Do **NOT** replace ignition coil with conventional type coil.

Battery must be completely disconnected when using arc, spot, or electrical welding equipment.

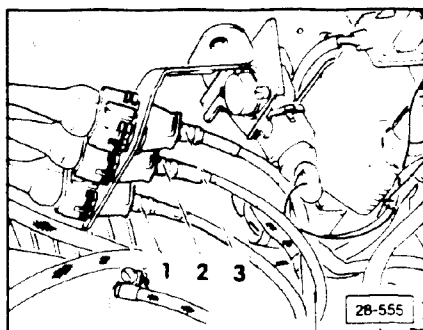
If components are heated above 80°C (176°F) such as from paint drier or steam cleaner, wait for components to cool down before starting engine.

Do **NOT** wash engine while it is running or ignition is switched **ON**.

Do **NOT** disconnect battery with engine running.

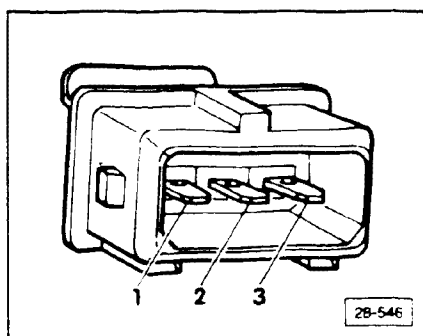
High tension ignition cable must be suppressed with at least 2 K Ω (with 1K ohm at rotor).

Do **NOT** apply voltage to the control unit to simulate output signals.



Ignition timing reference sensor, checking

- unplug (black) harness connector **3** from plenum panel mounting



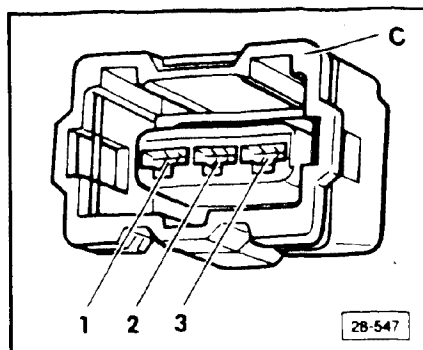
- connect multimeter **US 1119** between terminals **1** and **2** of male connector
 - approximately 1 K Ω

If **NO**

- replace ignition timing reference sensor

If **YES**

- connect multimeter **US 1119** between terminals **1** and **3** then **2** and **3** of male connector
 - $\infty \Omega$ (open)



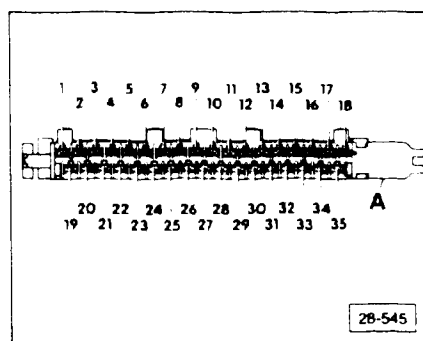
If **NO**

- replace ignition timing reference sensor

If **YES**

- check wiring and connections between sensor harness connector **C** and control unit harness connector **A** as follows

- remove ignition control unit cover panel located on passenger side footwell

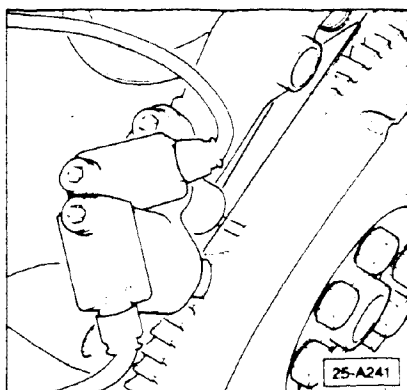


- disconnect control unit harness connector **A**
- using multimeter **US 1119**, check between terminals of reference sensor connector **C** and control unit harness connector **A**

Terminals of connector C	Terminals of connector A
1	13
2	12
3	28

- each measurement approximately 0 Ω (continuity)

Ignition System



If **NO**

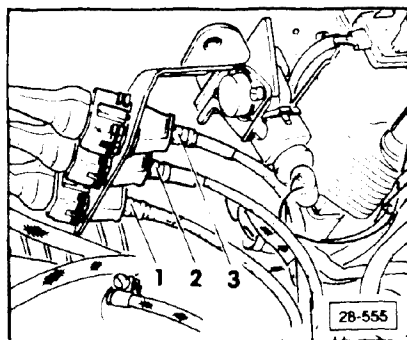
- check for open circuit in wiring between ignition timing reference sensor and control unit using wiring diagram

If **YES**

- check clearance between ignition timing sensor and reference pin in flywheel
 - 1.10 mm (0.043 in.)

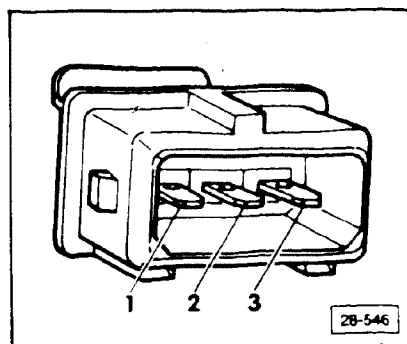
If **YES**

- replace control unit



Engine RPM sensor, checking

- unplug (gray) harness connector 2 from plenum panel mounting



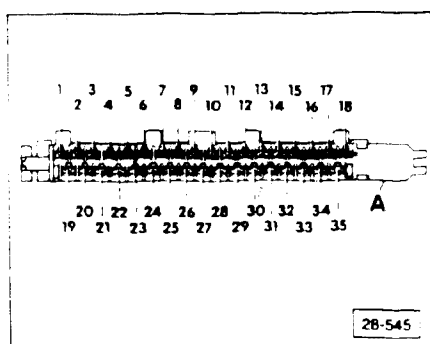
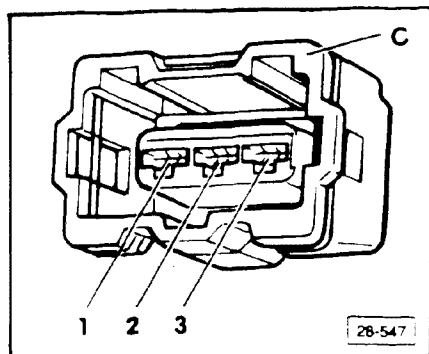
- connect multimeter **US 1119** between terminals 1 and 2 of male connector
 - 1 K Ω

If **NO**

- replace engine RPM sensor

If **OK**

- connect multimeter **US 1119** between terminals 1 and 3 then 2 and 3 of male connector
 - $\infty \Omega$ (open)



If **NO**

- replace engine RPM sensor

If **YES**

- check wiring and connectors between sensor harness connector **C** and control unit harness connector **A** as follows

- remove control unit cover panel located on passenger side footwell
- disconnect control unit harness connector **A**

- using multimeter **US 1119**, check between terminals of sensor harness connector **C** and control unit harness connector **A**

Terminals of connector C	Terminals of connector A
1	29
2	11
3	28

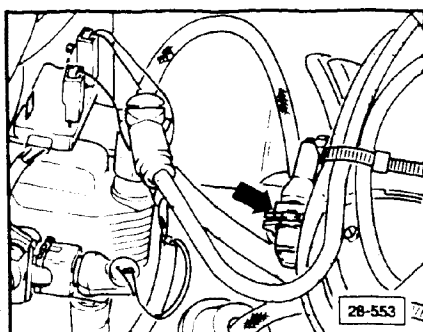
- each measurement approximately 0 Ω (continuity)

If **NO**

- check for open circuit in wiring between engine RPM sensor and control unit using wiring diagram

If **YES**

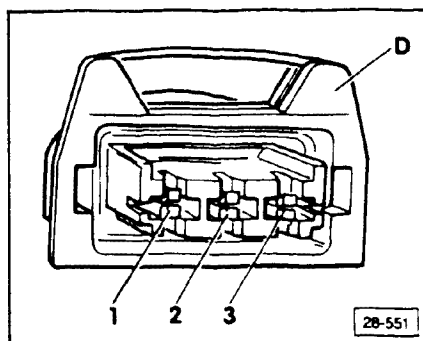
- replace control unit



Hall sending unit, checking

Check this first:

- ignition coil wire from distributor must be disconnected and grounded
- disconnect harness connector from Hall control unit (**arrow**)



- connect multimeter **US 1119** to terminals 1 and 3 of Hall sender harness connector **D**
- switch ignition **ON**
 - 9 volts minimum

If **NO**

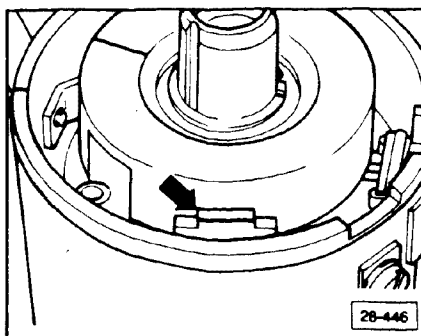
- check for open circuit in wiring to Hall sending unit using wiring diagram

If **YES**

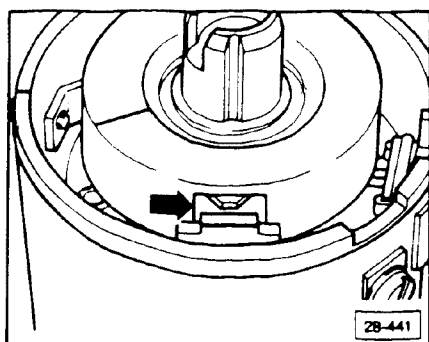
- switch ignition **OFF**
- peel back boot on Hall sending unit harness connector
- connect multimeter **US 1119** across wires for terminals 1 and 2
- plug connector back into Hall sending unit on distributor
- switch ignition **ON**
- remove distributor cap rotor and dust cover

CAUTION

Distributor cap retaining clips must not interfere with Hall sending unit during test.



- turn crankshaft using tool **2079** until rotor window (**arrow**) is clear of Hall sender
- check voltage reading
 - 4.0 volts minimum



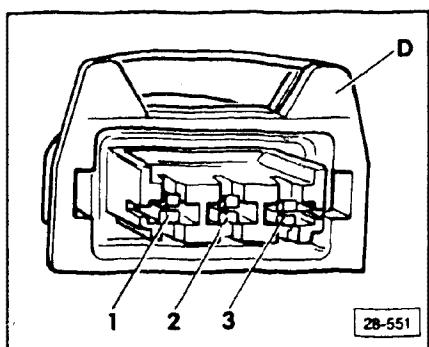
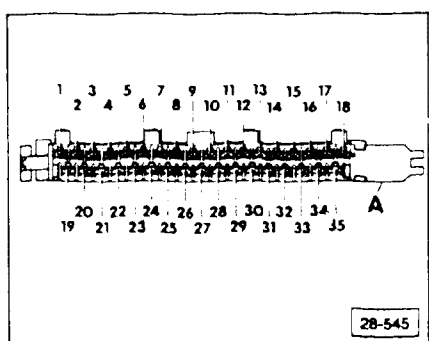
- turn crankshaft using tool **2079** until rotor window (**arrow**) is fully aligned with Hall sender
- check voltage reading
 - 0-0.5 volts
- switch ignition **OFF**

If **NO**

- replace Hall sending unit

If **YES**

- check wiring for open circuit between Hall sending unit and control unit harness connector using wiring diagram
- remove control unit cover located in footwell on passenger side of vehicle
- unplug control unit connector **A**



- use multimeter **US 1119** to check continuity between terminals of Hall sender connector **D** and control unit connector **A**

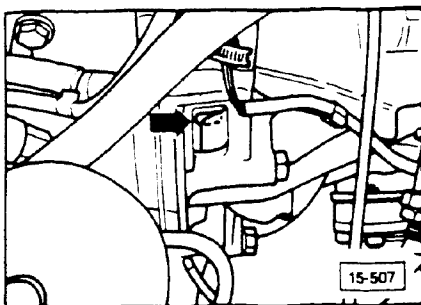
Connector D	Connector A
1	23
2	27
3	25

If **NO**

- check for open circuit in wiring between connectors **A** and **D** using wiring diagram

If **YES**

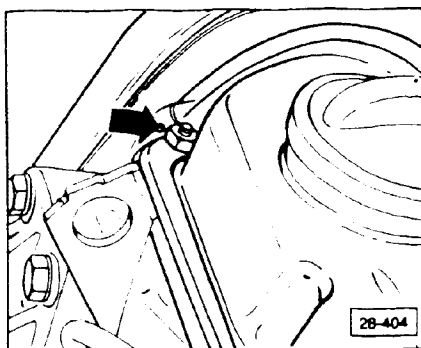
- replace Hall control unit



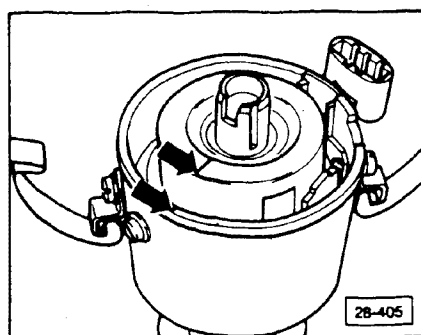
Ignition distributor, basic adjustment

Check this first:

- ignition switched **OFF**
- turn crankshaft using tool **2079**, to TDC position (**arrow**)

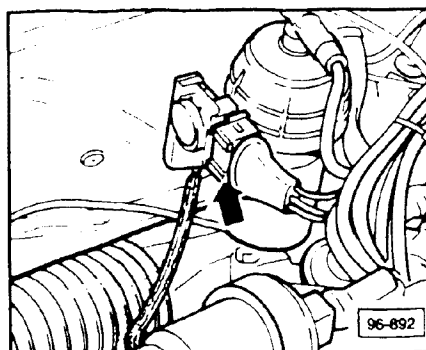


- mark on camshaft sprocket must align with upper edge of valve cover gasket (**arrow**)
- remove ignition distributor cap
- remove rotor and dust cover
- loosen distributor at mounting nut



- turn distributor housing so mark on rotor aligns with mark on distributor housing (**arrows**)
- tighten distributor mounting nut

Ignition coil (with power stage), checking



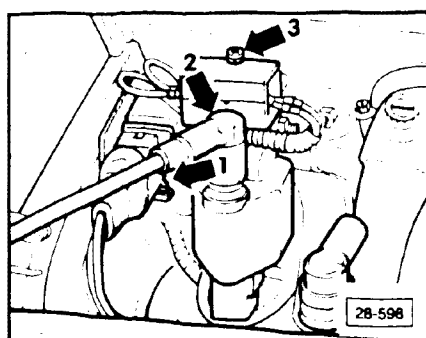
Ignition coil control, checking

Note

Two different ignition coils are being used on this engine. Follow the instructions for the version that is found on the repair vehicle.

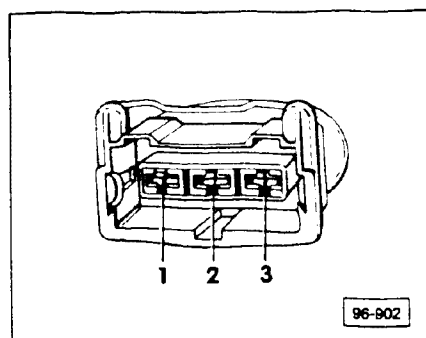
Version I

- disconnect ignition coil power stage (arrow)



Version II

- disconnect ignition coil power stage 1
- remove coil wire from ignition coil 2
- remove screw 3



Both versions

- connect multimeter **US 1119** between terminal 1 and ground then between terminals 1 and 3
- switch ignition **ON**
 - approximately 12 volts

If NO

- repair break in wiring using wiring diagram
- connect multimeter **US 1119** between terminals 2 and 3
- crank engine with starter
 - minimum 0.2 volts

If NO

- check wiring between terminal 2 of connector and terminal 22 of ignition control unit according to wiring diagram

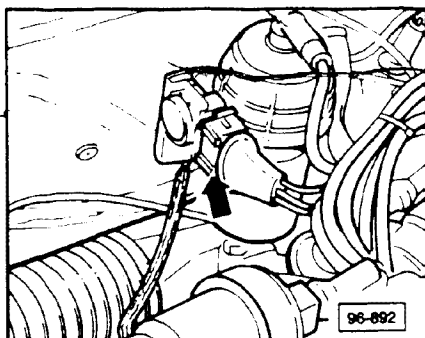
If no break in wiring can be determined

- replace ignition control unit

If YES

- check ignition coil

Ignition coil, checking

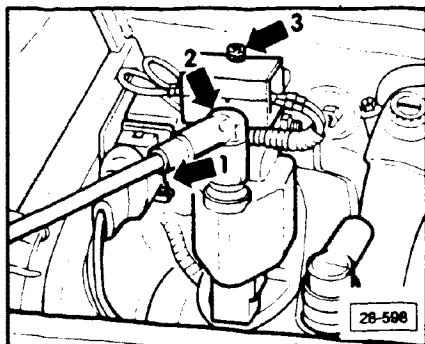


Check wiring between power stage and ignition coil and ground wire between power stage and engine for corrosion or damage.

Two different ignition coils are being used on this engine. Follow the instructions for the version that is found on the repair vehicle.

Version I

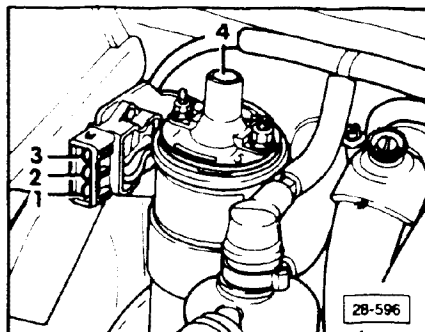
- disconnect ignition coil power stage (arrow)
- remove coil wire from ignition coil



Version II

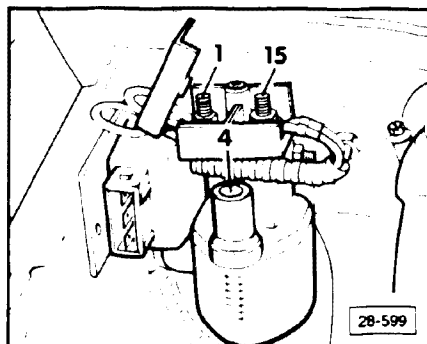
- disconnect ignition coil power stage 1
- remove screw 3

Ignition System



Version I

- use Version II procedure



Version II

Secondary resistance, checking (both versions)

- connect multimeter **US 1119** between terminals 1 and 4 of the appropriate coil
 - 5000-9000 Ω

If **NO**

- replace ignition coil

Primary resistance, checking (both versions)

- connect multimeter **US 1119** between terminal 1 and 15 of ignition coil
 - 0.5-1.5 ohm

If **NO**

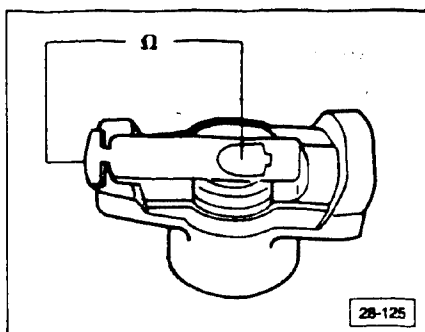
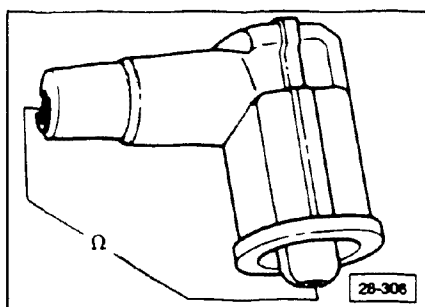
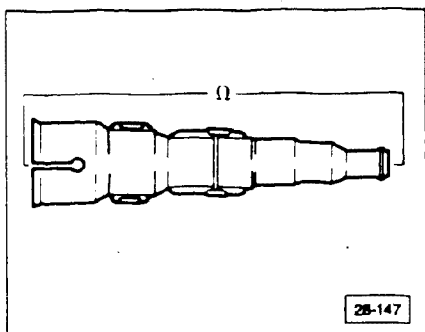
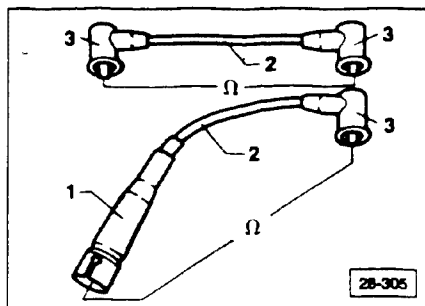
- replace ignition coil

If all specified values are obtained in tests of ignition coil with power stage and the engine still does not run (no ignition impulse)

- replace ignition coil with power stage

Note

The function of the power stage is **NOT** to be tested on either version.



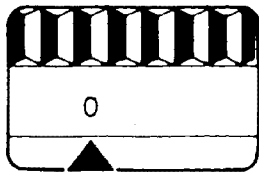
Ignition wires/connectors, rotor arm, checking

- use multimeter **US 1119** for the following resistance measurements
- check ignition wires
 - between coil and distributor
 - with radio: **2000 ± 800 ohms**
 - without radio: **0 ohms**
 - between distributor and spark plug
 - with radio: **6000 ± 1400 ohms**
 - without radio: **1000 ± 400 ohms**
 - if not within tolerance go on
- check spark plug connector 1 resistance
 - with radio (suppressed): **5000 ± 1000 ohms**
 - without radio (not suppressed): **1000 ± 400 ohms**
- check ignition wire 2 for continuity
- check supressor 3 resistance
 - **1000 ± 400 ohms**
- check rotor arm resistance
 - **1000 ± 400 ohms**

Note

Rotor must be marked with **R 1** (for Hall generator equipped cars).

Ignition System

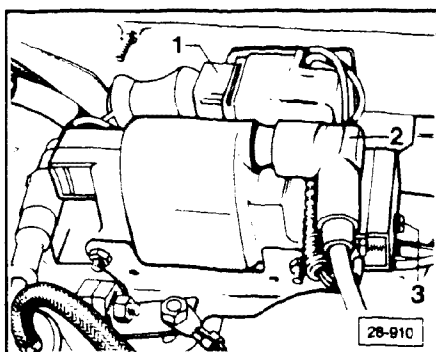
Tuneup specifications		U.S.A./Calif./Canada
Engine code letters		MC
Start of production		November 1988
Ignition distributor		035 905 206 AF
Ignition timing		0° TDC
Timing mark location: on flywheel (Not adjustable; marks on distributor body and aperture rotor should line up with cylinder no. 1 at TDC)		
Centrifugal advance (vacuum advance/retard)		Intake air temperature, intake manifold pressure and position of throttle plate are monitored by control unit for electronic ignition after each engine rotation. Checking not necessary.
Firing order		1 - 2 - 4 - 5 - 3
Spark plugs	Bosch	WR7DS or W7DTC
	Beru	RS35 or 14-7DTU
	Champion	N8GY or N9BYC
	electrode gap	mm (in.) 0.7 ± 0.1 (0.028 ± 0.004)
	tightening torque	Nm (ft lb) 20 (14)
Idle speed RPM		720 ± 20 RPM
Engine speed limiter switching OFF RPM		6700 ± 200
CO-content (oxygen sensor probe disconnected) checking value		0.3-3.0 vol. %
adjusting value (oxygen sensor probe connected, as control)		0.6-1.0 vol. % 0.3-1.2 vol. %
Ignition timing sensor	resistance	approximately 1000 ohms
Engine speed sensor	resistance	approximately 1000 ohms
Intake-air temperature sensor	resistance	450 — 700 ohms
Ignition coil	secondary resistance	6.5 — 8.0 K-ohm
	primary resistance	0.5 — 1.5 ohms
Ignition distributor rotor	resistance	1000 ohms

Ignition control unit, removing and installing

Note

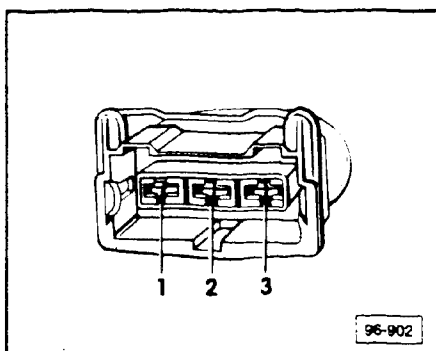
The ignition control unit is located in the A-pillar next to the passenger side foot well.

- remove screws (**arrows**) from glove compartment
- remove glove compartment



Ignition coil control function, checking

- remove power output stage harness connector 1 and coil wire 2 from ignition coil
- remove screw 3
- switch multimeter **US 1119** to 20 volts range



- connect multimeter between terminal 1 of harness connector and ground, then between terminals 1 and 3
- switch **ON** ignition
 - approximately 12 volts

If voltage value is **NOT** obtained

- check for break in wiring using wiring diagram, repair as necessary
- connect multimeter between terminals 2 and 3

- crank engine with starter
 - 0.2 volts minimum

If voltage value **IS** obtained,

- check ignition coil

If voltage value is **NOT** obtained

- check wiring between terminal 2 of harness connector and terminal 22 of engine control unit harness connector using wiring diagram

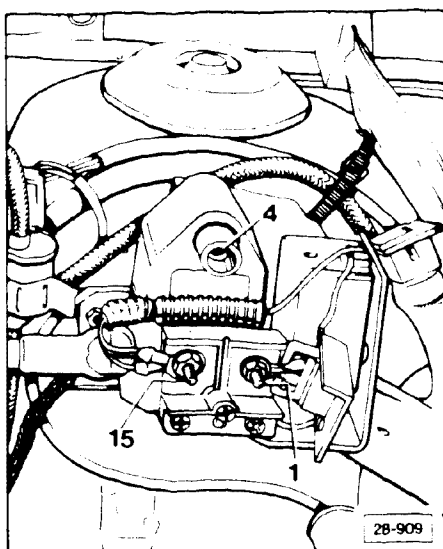
If **NO** break in wiring is found

- replace engine control unit

Ignition coil, checking

Check wiring between power output stage and ignition coil and between power output stage ground strap and engine for corrosion or damage. replace or repair as necessary.

- disconnect harness connector 1 from power output stage of ignition coil
- remove screw 3
- switch multimeter **US 1119** to resistance range



Secondary resistance, checking

- remove all connectors from ignition coil
- connect multimeter between terminals 1 and 4 of ignition coil
 - 5000-9000 ohms

If resistance value is **NOT** obtained

- replace ignition coil

Primary resistance, checking

- remove all connectors from ignition coil
- connect multimeter between terminals 1 and 15 of ignition coil
 - 0.5-1.5 ohms

If resistance value is **NOT** obtained

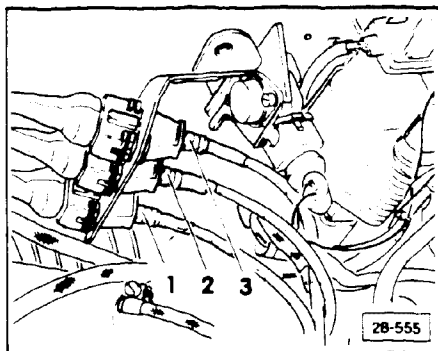
- replace ignition coil

If all specified values are obtained **BUT** the engine will **NOT** start (no ignition signal).

- replace ignition coil (with power output stage)

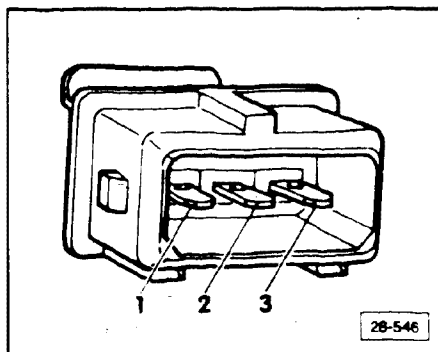
CAUTION

The function of the power output stage of the coil can **NOT** be checked.



Engine speed sensor, checking

- separate (gray) speed sensor harness connector 2 on plenum
- switch multimeter **US 1119** to resistance range



- connect multimeter between terminals 1 and 2 of the speed sensor harness connector
 - approximately 1000 ohms

If resistance value is **NOT** obtained

- replace engine speed sensor

If resistance value **IS** obtained

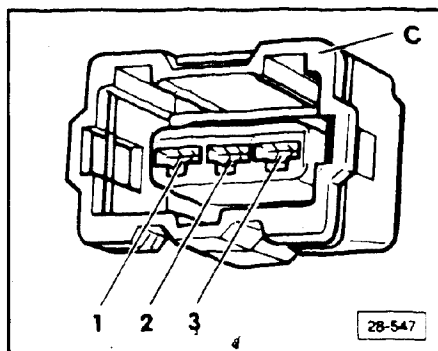
- connect multimeter between terminals 1 and 3, then between terminals 2 and 3
 - infinite ohms (open)

If infinite resistance is **NOT** obtained

- replace engine speed sensor

If infinite resistance **IS** obtained

- check wiring between speed sensor harness connector and engine control unit harness connector as follows:
- remove engine control unit then disconnect control unit harness connector



- check continuity between control unit harness connector **A** and speed sensor harness connector **C** as follows:

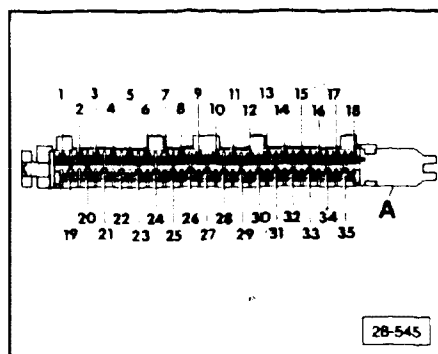
Connector C	Connector A
1	29
2	11
3	28

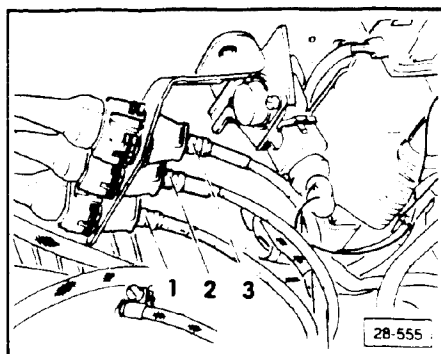
If continuity is **NOT** obtained

- check wiring using wiring diagram, make repairs as necessary

If continuity **IS** obtained

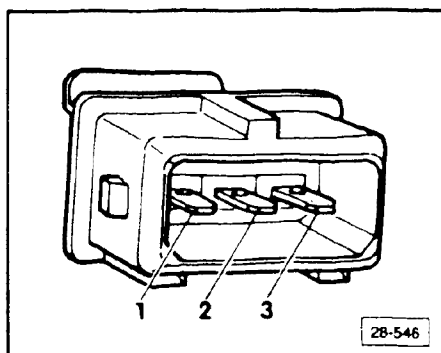
- replace engine control unit





Ignition timing sensor, checking

- separate black harness connector 1 on plenum



- connect multimeter terminals 1 and 2 of harness connector
 - approximately 1000 ohms

If resistance value is **NOT** obtained

- replace ignition timing sensor

If resistance value **IS** obtained

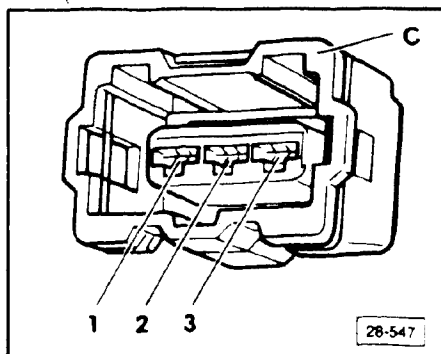
- connect multimeter between terminals 1 and 3, then between terminals 2 and 3
 - infinite ohms (open)

If infinite resistance is **NOT** obtained

- replace ignition timing sensor

If infinite resistance **IS** obtained

- check wiring between sensor harness connector and engine control unit harness connector as follows:
- remove engine control unit then disconnect control unit harness connector



- check continuity between timing sensor harness connector **C** and control unit harness connector **A**

Sensor connector C	Connector A
1	13
2	12
3	28

If continuity is **NOT** obtained

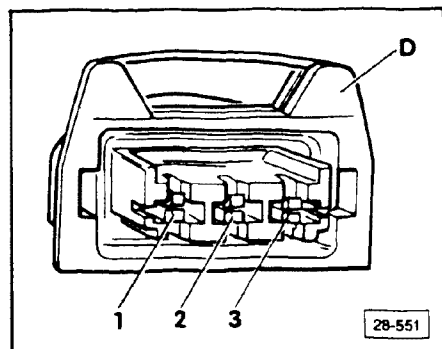
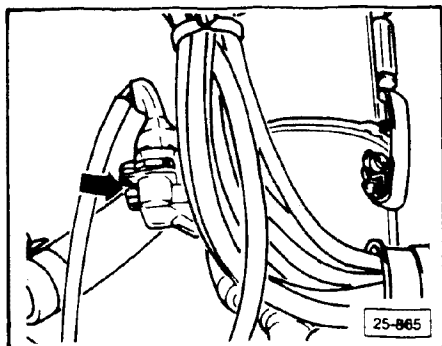
- check wiring using wiring diagram, make repairs as necessary

If continuity **IS** obtained

- check air gap between timing sensor pin and flywheel (see Group 13)

If gap is **OK**

- replace engine control unit



Hall sensor, checking

CAUTION

Disconnect the power output stage of the ignition coil **BEFORE** checking the Hall sensor.

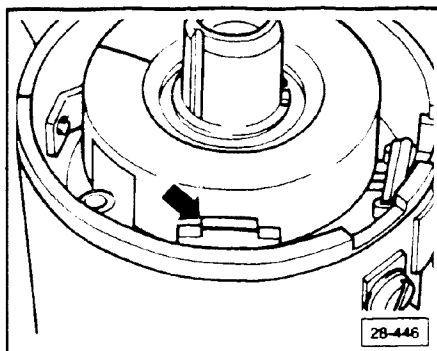
- disconnect Hall sensor harness connector on ignition distributor
- switch multimeter **US 1119** to 20 volt range and connect to terminals 1 and 3 of connector **D**
- switch **ON** ignition
 - 9 volts minimum

If voltage value is **NOT** obtained

- check wiring using wiring diagram, make repairs as necessary

If voltage value **IS** obtained

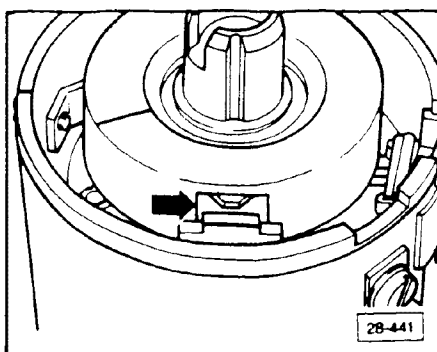
- switch **OFF** ignition
- push back rubber grommet on Hall sensor harness connector
- connect multimeter between terminals 1 and 2
- re-connect Hall sensor (on ignition distributor)
- switch **ON** ignition
- remove ignition distributor cap, rotor, and dust shield



CAUTION

Do **NOT** allow distributor cap clips to tilt into the distributor and thus contact the Hall sensor.

- turn crankshaft using special tool **2079** until trigger wheel shutter completely blocks Hall sensor
 - 4.0 volts minimum



- turn crankshaft using special tool **2079** until Hall sensor is fully visible in trigger wheel window
 - 0-0.5 volts minimum

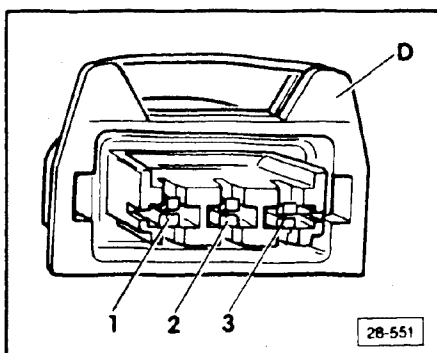
- switch **OFF** ignition

If voltage values are **NOT** obtained

- replace Hall sensor

If voltage values **ARE** obtained

- check wiring between Hall sensor harness connector and engine control unit harness connector as follows:
- remove engine control unit then disconnect harness from control unit
- switch multimeter **US 1119** to resistance range
- check continuity between wires of Hall sensor harness connector **D** and control unit harness connector **A**:



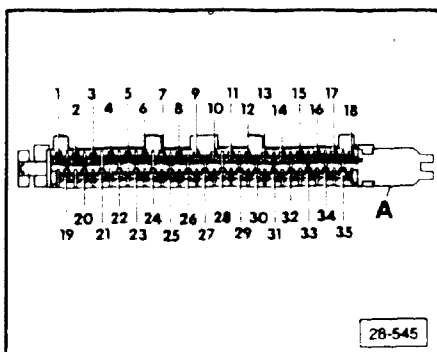
Connector D	Connector A
1	23
2	27
3	25

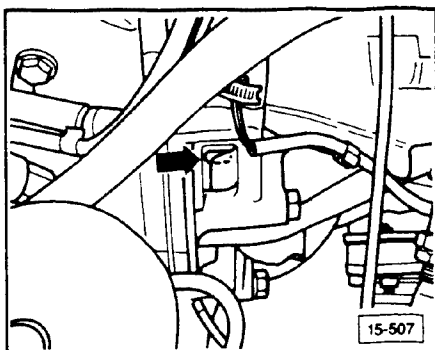
If continuity is **NOT** obtained

- check wiring using wiring diagram, and make repairs as necessary

If continuity **IS** obtained

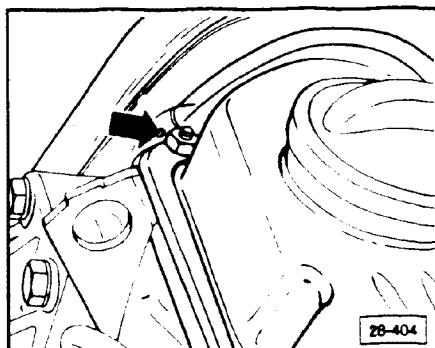
- replace engine control unit



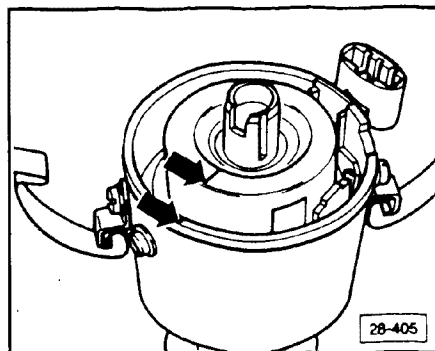


Ignition distributor, basic setting (Static check, engine NOT running)

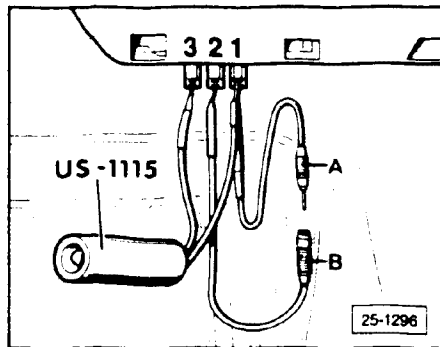
- turn crankshaft to TDC using special tool 2079 (arrow)



- mark on camshaft sprocket must align with upper edge of valve cover gasket (arrow)
- remove ignition distributor cap
- remove distributor rotor and dust shield
- drill out shear bolt and tab (that conceals distributor clamp bolt)
- loosen distributor clamp



- rotate distributor until marking on trigger wheel lines up with marking on distributor (arrow)
- tighten distributor base clamp nut

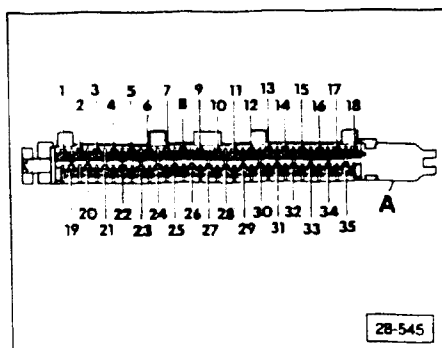


Ignition distributor, basic setting (dynamic check, engine running)

- connect **US 1115** LED tester (using adaptors from **VW 1594** adaptor kit) between rear terminals of black diagnostic connector 1 and blue diagnostic connector 3
- connect adaptor leads from **VW 1594** to front terminals of diagnostic connectors 1 and 2
- join connectors **A** and **B**
- start engine and let run at idle
- separate connectors **A** and **B** after about 4 seconds
 - **US 1115** must **NOT** light up or flash

If **US 1115** lights up or flashes

- switch **OFF** engine
- loosen distributor base clamp
- start engine and let run at idle
- rotate distributor housing until **US 1115** goes out (with the engine running)
- tighten distributor base clamp nut
- install new shear bolt to conceal clamp nut



Ignition control unit, checking

Supply voltage, checking

- remove ignition control unit then disconnect control unit harness connector
- switch multimeter **US 1119** to 20 volt range and connect between terminals **18** and **33** of ignition control unit harness connector **A**
 - approximately battery voltage (with ignition switched **OFF**)
- connect multimeter between terminals **18** and **35** and **9** and **35** of control unit harness connector **A**
- switch **ON** ignition
 - approximately battery voltage
- switch **OFF** ignition

If voltage values are **NOT** obtained

- check wiring using wiring diagram, make repairs as necessary