

## Article Text

## ARTICLE BEGINNING

## Volkswagen Basic Diagnostic Procedures - Gasoline

**Cabrio, Golf III, GTI, Jetta III, Passat**

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions the problem reportedly occurred.

Before entering self-diagnostics, perform a careful and complete visual inspection. Most engine control problems result from mechanical breakdowns, poor electrical connections, or damaged/misrouted vacuum hoses. Before condemning the computerized system, perform each test listed in this article.

**NOTE:** Perform all voltage tests using Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

## VISUAL INSPECTION

Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Ensure vacuum hoses are properly routed and are not pinched or cut. See M - VACUUM DIAGRAMS article to verify routing and connections (if necessary). Inspect air induction system for possible vacuum leaks.

## Compression

Check engine mechanical condition with a compression gauge, vacuum gauge, or an engine analyzer. See engine analyzer manual for specific instructions.

**WARNING:** DO NOT use ignition switch during compression tests on fuel injected vehicles. Use a remote starter to crank engine. Fuel injectors on many models are triggered by ignition switch during cranking mode, which can create a fire hazard or contaminate the engine's oiling system.

## COMPRESSION SPECIFICATIONS TABLE

[illegible]

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#### Application

#### Specification

##### Compression Ratio

All Models ..... 10.0:1

##### Compression Pressure

2.0L ..... 142-186 psi (10.0-13.0 kg/cm<sup>2</sup>)

2.8L ..... 157-186 psi (11.0-13.0 kg/cm<sup>2</sup>)

Minimum Compression Pressure ..... 106 psi (7.5 kg/cm<sup>2</sup>)

Maximum Variation Between Cylinders ..... 43 psi (3.0 kg/cm<sup>2</sup>)

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##### Exhaust System Backpressure

A restricted exhaust system can be checked with a vacuum or pressure gauge. Remove heated oxygen sensor or air injection check valve (if equipped). Connect a 0-5 psi pressure gauge and operate engine at 2500 RPM. If exhaust system backpressure is greater than 2 psi, exhaust system or catalytic converter is plugged.

If a vacuum gauge is used, connect vacuum gauge hose to intake manifold vacuum port and start engine. Observe vacuum gauge. Open throttle part way and hold steady. If vacuum gauge reading slowly drops after stabilizing, check exhaust system for restriction.

## FUEL SYSTEM

All models use a Motronic Multiport Fuel Injection (MFI) system.

### FUEL PRESSURE

Basic diagnosis of fuel system should begin with determining fuel system pressure.

**WARNING:** ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. See FUEL SYSTEM PRESSURE RELEASE. DO NOT allow fuel to contact engine or electrical components.

##### Fuel System Pressure Release

Disconnect ignition coil output stage wiring harness to deactivate ignition. To relieve fuel system pressure, remove fuel pump fuse No. 18, or fuel pump relay, to deactivate fuel pump. Place a clean shop rag around fuel line fitting and slowly loosen fitting. Reconnect ignition coil output stage wiring harness and fuel pump fuse No. 18.

##### Fuel Pressure Test

1) Release fuel pressure. Ensure ignition is off. Connect fuel pressure gauge between fuel distributor port and end of fuel line to cold start valve. Disconnect differential pressure regulator harness connector.

2) Start engine and let it run. System fuel pressure should be 89-96 psi (6.3-6.7 kg/cm<sup>2</sup>). If fuel pressure is greater than

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specification, go to next step. If system fuel pressure is less than specification, perform fuel volume check. If fuel volume is okay, release fuel pressure and replace fuel pressure regulator.

3) Release fuel pressure. Remove return hose from pressure regulator and place in a container. Repeat test. If pressure is incorrect, release fuel pressure and replace fuel pressure regulator. If system pressure is okay, check for restricted fuel return line. Repair as necessary. Go to next step.

4) Turn ignition off. After 10 minutes, residual pressure should be 48 psi (3.4 kg/cm<sup>2</sup>). After 20 minutes, residual pressure should be 46 psi (3.2 kg/cm<sup>2</sup>). If system fuel pressure is low, check fuel pump check valve, sensor plate free play, fuel distributor "O" rings and seats. Release fuel pressure and replace if necessary. If these components are okay, release fuel pressure and replace fuel pressure regulator.

### TRANSFER PUMP CHECK

#### Transfer Pump Fuel Volume Check

1) Turn ignition off. To check transfer pump (in tank), remove rear seat. Remove fuel sending unit access cover. Disconnect ignition coil secondary wire and connect to ground.

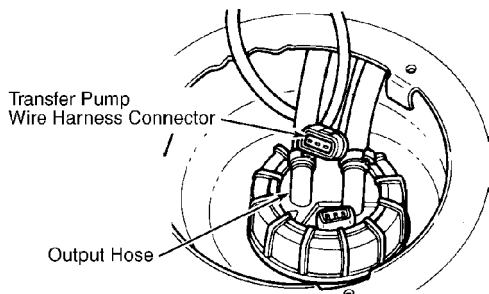
2) With transmission in Neutral, crank engine for 3-4 seconds. While starter is turning and for a few seconds afterward, an audible sound should be heard at the pump. If sound is not heard, go to next step. If sound is heard, go to step 5).

3) Remove fuel pump relay from relay panel. Using a remote control, activate fuel pump. If pump does not operate, remove transfer pump wire harness connector. See Fig. 1.

4) Using test light, check voltage between Brown wire and Red/Yellow wire. If voltage is present, replace transfer pump. If voltage is not present, repair open or short circuit in wiring.

5) Remove fuel pump relay jumper wire. Disconnect and plug transfer pump output hose. Attach a hose to pump outlet connector, and place other end of hose in a graduated container. Activate fuel pump for 10 seconds.

6) Minimum fuel flow should be 10 ounces (0.3 liter). If fuel flow is low, check fuel tank filter for restriction. If fuel tank filter is okay, replace transfer pump.



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Fig. 1: Checking Transfer Pump Fuel Volume (Typical)  
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#### MAIN FUEL PUMP VOLUME CHECK

**NOTE:** Before testing main fuel pump, check transfer pump. See TRANSFER PUMP CHECK.

##### 2.0L

Remove fuel pump relay from relay panel. Using a remote control, activate fuel pumps for 30 seconds. Compare fuel volume with values in FUEL PUMP PERFORMANCE table.

##### 2.8L

1) Remove fuel pump relay from relay panel. Using a remote control, activate fuel pumps. Measure voltage being applied to fuel pump when activating with remote control. Record voltage.

2) Fuel volume is relative to voltage applied to fuel pumps. Activate fuel pumps for 30 seconds. Compare volume with values in FUEL PUMP PERFORMANCE table.

#### FUEL PUMP PERFORMANCE TABLE (1)

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Application	Pressure psi (kg/cm <sup>2</sup> )	Min. Vol. In 30 Sec. Pts. (L)
2.0L .....	43 (3.0) .....	1.0-1.4 (0.5-0.7)
2.8L .....	58 (4.0) .....	1.0-1.4 (0.5-0.7)

(1) - Fuel pump energized, with 10-12 volts at fuel pump, and engine off.

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#### IGNITION CHECKS

##### SPARK TEST

1) Using an ohmmeter, check resistance of each spark plug wire. See HIGH TENSION WIRE RESISTANCE table. Check for strong Blue spark at coil wire and at each spark plug wire by holding wire terminal 5/16" from ground while cranking engine.

2) Disconnect and inspect all related ignition system connectors and harness. Clean or repair if necessary. If related connectors and harness are okay, remove negative battery cable. Disconnect secondary and primary leads from ignition coil.

3) Using ohmmeter, check primary resistance between primary terminals of coil. Check secondary resistance between coil secondary terminal and primary positive terminal. Replace coil if readings are not within specifications. See IGNITION COIL RESISTANCE table.

#### HIGH TENSION WIRE RESISTANCE TABLE

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Application	Ohms
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2.0L

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Cap & Coil Suppressors .....	600- 1400
Spark Plug Connector Suppressors .....	4000- 6000
2.8L .....	(1)

(1) - Information is not available from manufacturer.

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#### IGNITION COIL

##### IGNITION COIL RESISTANCE TABLE - 0hms @ 68øF (20øC)

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Application	Primary	Secondary
2.0L .....	0.5- 0.7 .....	3000- 4000
2.8L .....	(1) .....	(1)

(1) - Information is not available from manufacturer.

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#### DISTRIBUTOR

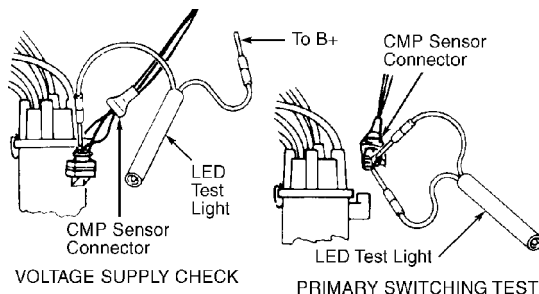
**NOTE:** The Camshaf Position (CMP) portion of this article has been updated by TSB Group No. 28 - Ignition System, Bulletin No. 95-03, dated June 7, 1995. For TSB see 2.0L CAMSHAFT POSITION SENSOR (G40) CHECKING

##### Camshaft Position (CMP) Sensor/Hall Sensor

1) Remove coil secondary wire and attach to ground.

Disconnect CMP sensor harness connector at distributor. Using an LED Test Light (US 1115), check for voltage between outer terminals of connector. See Figs. 2 and 3. With ignition on, light should be on. If light is on, go to next step. If light is not on, check wiring for short or open circuit. If wiring is okay, replace ignition control unit.

2) Reconnect CMP sensor harness connector. Pull back CMP sensor boot to expose contact terminals. Connect LED test light probe to center contact and battery positive terminal. See Fig. 2. Observe test light while cranking engine. If test light blinks, CMP sensor is okay. If light does not blink, replace CMP sensor.



**Fig. 2: Testing CMP Sensor (Typical)**  
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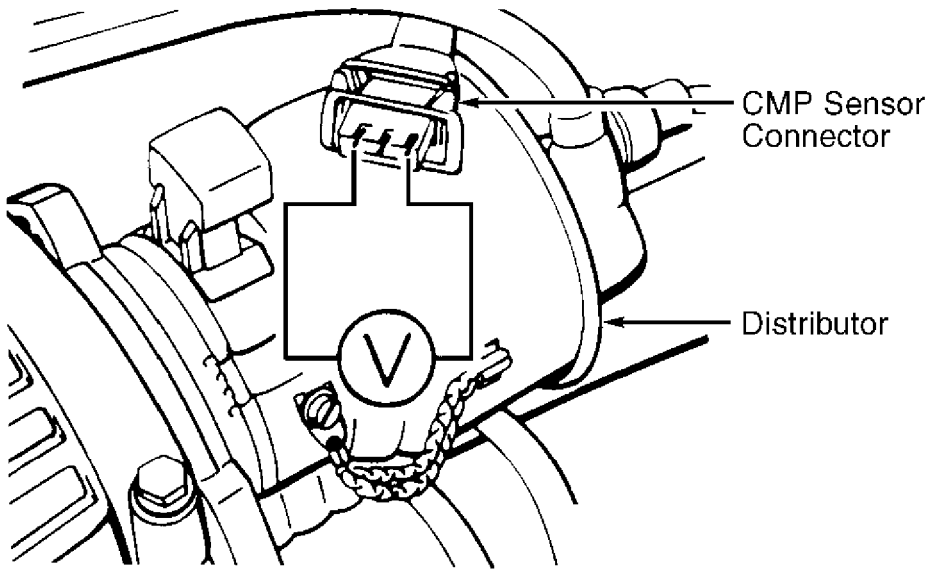
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#### Voltage Supply & Ground To CMP/Hall Sensor

1) With ignition off, disconnect CMP sensor harness connector. Using a voltmeter, check for voltage between outer terminals No. 1 and 3. See Fig. 3. Turn ignition on. There should be a minimum of 10.0 volts (4-cylinder) or 4.5 volts (VR6).

2) If there is no voltage, check for open wire between CMP sensor connector terminal No. 3 of and ECM. Also check for voltage between CMP sensor terminal No. 1 and ground. Repair open and recheck.



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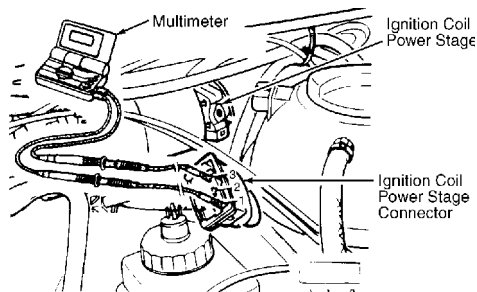
Fig. 3: Testing CMP Sensor Connector (Typical)  
Courtesy of Volkswagen United States, Inc.

#### POWER STAGE

##### Voltage Supply & Ground To Power Stage

1) Turn ignition off. Disconnect coil power stage harness connector. Connect a voltmeter to terminals No. 1 and 3. See Fig. 4.

2) Turn ignition on. Ensure battery voltage is present. Turn ignition off. If voltage is not present, check for open wire from fuse box to terminal No. 1, or from terminal No. 3 to ground. Repair open wire and recheck.



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Fig. 4: Testing Ignition Coil Power Stage (Typical)  
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#### IGNITION CONTROL UNIT

##### 2.0L

1) Perform spark test. See SPARK TEST. If secondary spark is present, ignition control unit is okay. If secondary spark is not present, turn ignition off. Disconnect ignition control unit wire harness connector. Turn ignition on. Using a voltmeter, measure voltage between terminals No. 2 (-) and No. 4 (+) of connector. See Fig. 5.

2) Battery voltage should be present. If battery voltage is not present, ensure continuity exists between terminal No. 2 and ground. Continuity must also exist between terminal No. 4 and ignition coil positive terminal. Repair wiring if necessary. If wiring is okay, replace ignition control unit.

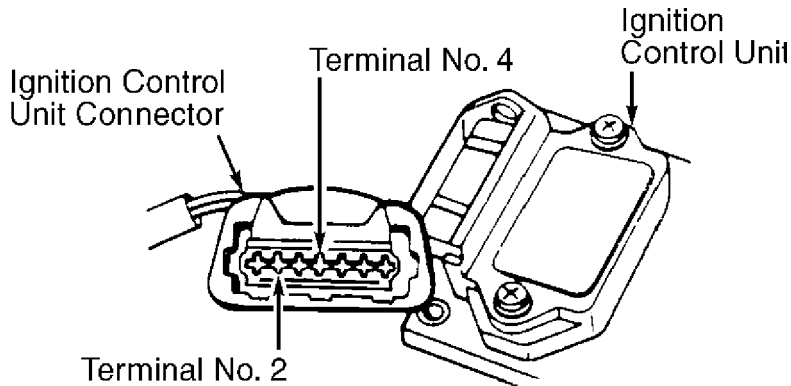


Fig. 5: Checking Ignition Control Unit Voltage (Typical)  
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#### IDLE SPEED, CO LEVEL & IGNITION TIMING

Ensure idle speed, CO level and base ignition timing are set to specification. If necessary, see D - ADJUSTMENTS article.

#### IDLE SPEED & MIXTURE

##### IDLE SPEED & CO LEVEL TABLE

Application			
Idle RPM		CO Level %	
2.0L	800-880	0.3-1.2	
2.8L (1)	650-750	0.3-1.5	

(1) - Idle speed and fuel mixture (CO level) are not adjustable.

##### IGNITION TIMING TABLE (Degrees BTDC @ RPM)

Application		
Checking		Adjusting

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2.0L ..... (1) 12 @ 800-880  
2.8L ..... 4-8 @ 2000-2500 ..... 5-7 @ 2000-2500

(1) - Scan Tool (VAG 1551) in START BASIC SETTING mode. Ignition timing is not adjustable.

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#### IGNITION TIMING ADVANCE TABLE (Degrees BTDC @ RPM)

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Application	Specification
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VR6 ..... (1) 27-33 @ 4500

(1) - Vehicle not in BASIC ADJUSTMENT mode, engine oil temperature at 176°F (80°C), and engine coolant temperature sensor connected.

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### SUMMARY

If no faults were found while performing BASIC DIAGNOSTIC PROCEDURES, go to H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.

END OF ARTICLE