

I - SYSTEM/COMPONENT TESTS - 4-CYL

Article Text

1993 Volkswagen Passat

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Wednesday, March 22, 2000 10:18PM

ARTICLE BEGINNING

1993 ENGINE PERFORMANCE

Volkswagen System & Component Testing - CIS-E Motronic

Passat GL (2.0L 4-Cylinder)

INTRODUCTION

Since many computer-controlled and monitored components set a trouble code if they malfunction, also perform procedures in the G - TESTS W/CODES article. In most instances, Scan Tester (VAG 1551) must be used to test systems and/or components. See ENTERING SELF-DIAGNOSTICS in THE G - TESTS W/CODES article for additional scan tester operating instructions.

AIR INDUCTION SYSTEMS

INTAKE AIR PREHEATING

1) Ensure control flap vacuum motor has no leaks. Separate upper and lower air filter housings. Remove air filter. Position upper housing so control flap can be seen.

2) Disconnect vacuum hose from temperature regulator (located on air intake boot). Connect hand-held vacuum pump to control flap vacuum motor. Control flap must close cold air intake.

3) Reconnect vacuum hose to temperature regulator. Start engine and allow it to idle. Check position of control flap after 20 seconds. Replace temperature regulator if position of control flap is not as specified in TEMPERATURE REGULATOR table.

TEMPERATURE REGULATOR

Regulator Temperature °F (°C)	Control Flap Position
-------------------------------	-----------------------

Less Than 68 (20)	Cold Air Intake Closed
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Between 68-86 (20-30)	Open To Both Hot & Cold Air Intake
-----------------------	------------------------------------

More Than 86 (30)	Hot Air Intake Closed
-------------------	-----------------------

COMPUTERIZED ENGINE CONTROLS

ELECTRONIC CONTROL MODULE (ECM)

Ground & Power Circuits

Check ECM ground and power circuits using PIN VOLTAGE CHARTS article.

ENGINE SENSORS & SWITCHES

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AIRFLOW SENSOR

See D - ADJUSTMENTS - 4-CYL article.

ENGINE COOLANT TEMPERATURE SENSOR

1) Ensure engine is cold. Connect Scan Tester (VAG 1551) to Data Link Connectors (DLC) located in center console. Start engine and allow it to idle. With scan tester in READ MEASUREMENT BLOCK function, read coolant temperature value in channel No. 1 of scan tester.

2) If temperature value increases uniformly without interruption, sensor and its circuit are okay. Select END OUTPUT function on scan tester. If display value is incorrect, check for an open engine coolant temperature circuit or for a short circuit to ground.

3) If necessary, use test leads from Adapter Kit (VAG 1594) to measure ECT sensor resistance. See Fig. 1. See COOLANT TEMPERATURE SENSOR RESISTANCE table below.

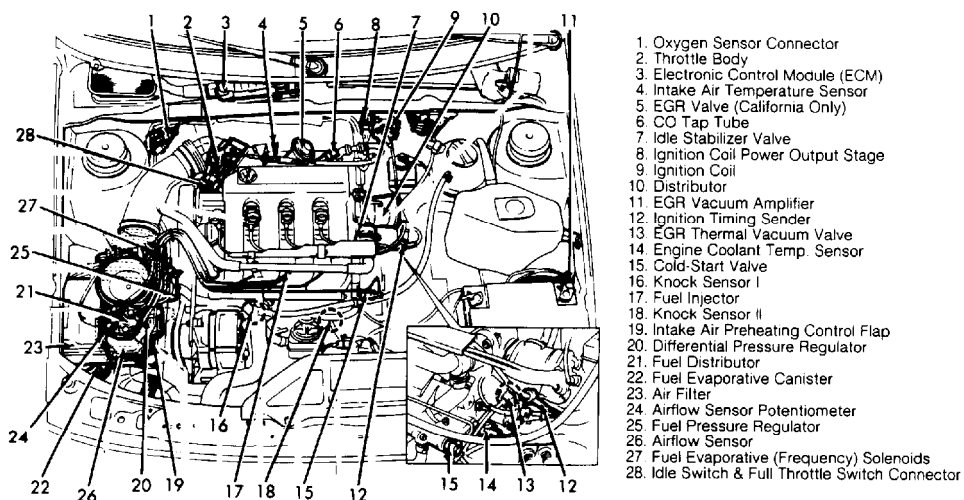
COOLANT TEMPERATURE SENSOR RESISTANCE

AA

Temperature °F (°C) Ohms

68 (20)	3000-2000
86 (30)	2000-1500
104 (40)	1500-1000
122 (50)	1000-800
140 (60)	700-500
158 (70)	500-375
176 (80)	375-275
194 (90)	275-225

AA



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Fig. 1: Component Locations (Passat GL 2.0L - CIS-E Motronic)

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HALL EFFECT SENSOR

1) Remove fuse No. 18 from fuse/relay panel to prevent fuel pump from running. Disconnect power output stage wiring harness connector from ignition coil.

2) Connect LED Tester (US 1115) to wiring harness connector terminals No. 2 and 3 using test leads from Adapter Kit (VW 1594). Crank engine and observe LED tester. If LED tester flickers, Hall Effect sensor and its circuit is okay.

3) If LED tester does not flicker, turn ignition off. Disconnect Hall Effect sensor wiring harness connector at distributor. Connect Digital Volt-Ohmmeter (DVOM) to outer terminals of wiring harness connector.

4) Turn ignition on. Voltage supply to Hall Effect sensor must be 9 volts minimum. If voltage is not present, check Hall Effect sensor voltage supply circuit back to Electronic Control Module (ECM).

5) If voltage is present, reconnect Hall Effect sensor wiring harness connector. Use LED tester to backprobe center wire at sensor connector. Connect other end of LED tester to battery positive terminal. Crank engine and observe LED tester.

6) If LED tester flickers, Hall Effect sensor is okay. If LED tester does not flicker, check sensor wiring harness. If wiring harness is okay, replace Hall Effect sensor or ECM as necessary.

VEHICLE SPEED SENSOR

1) Connect Scan Tester (VAG 1551) to Data Link Connectors (DLC) located in center console, in front of shift lever. Place transmission in Neutral (including automatic transmission). Raise left front wheel.

2) With scan tester in READ MEASUREMENT BLOCK function, read speed signal value in channel No. 8 of scan tester. Value must fluctuate between 0 and 1 while manually rotating left front wheel.

3) If value fluctuates as specified, select END OUTPUT function on scan tester. If value does not fluctuate as specified, check vehicle speed sensor wiring harness back to instrument cluster speedometer.

FUEL SYSTEM

ACCELERATION ENRICHMENT & DECELERATION FUEL CUT-OFF

1) Ensure engine is cold and A/C system is turned off. Connect Scan Tester (VAG 1551) to Data Link Connectors (DLC) located in center console, in front of shift lever. Start engine and allow it to idle.

2) With scan tester in READ MEASUREMENT BLOCK function, read coolant temperature value in channel No. 1 of scan tester. Value must be greater than 96, which corresponds to a coolant temperature less than 140°F (60°C).

3) With scan tester in READ MEASUREMENT BLOCK function, quickly open throttle to wide open position and read acceleration

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enrichment value in channel No. 9 of scan tester. A display value of 70 must appear briefly.

4) If this value is not obtained, check idle and full throttle switches. See D - ADJUSTMENTS - 4-CYL article. If a value of 70 is obtained, allow engine coolant temperature to reach at least 140°F (60°C). Value in channel No. 1 of scan tester must be less than 95.

5) With scan tester in READ MEASUREMENT BLOCK function, accelerate engine to more than 3000 RPM then allow throttle to close suddenly. Deceleration fuel cut-off value of 133 must appear briefly in channel No. 9 of scan tester.

6) If a value of 133 is obtained, select END OUTPUT function on scan tester. If a value of 133 is not obtained, check idle and full throttle switches, wiring harness, or replace Electronic Control Module (ECM) as necessary.

OXYGEN (O2) SENSOR CONTROL

1) Ensure engine coolant temperature is at least 176°F (80°C). Ensure idle speed is correct. Ensure there are no leaks between cylinder head and catalytic converter. Ensure voltage to oxygen (O2) sensor heater is okay. Turn ignition off.

2) Connect Scan Tester (VAG 1551) to Data Link Connectors (DLC) located in center console, in front of shift lever. Start engine and let it idle. Press "1" to select RAPID DATA TRANSFER function.

3) Press "0" and "1" buttons to select ENGINE ELECTRONICS function. Press "Q" button to enter input. Press right arrow button, then "0" and "8" buttons to select READ MEASUREMENT BLOCK function. Press "Q" button to enter input.

4) Press "0" button twice to select INPUT DISPLAY GROUP NUMBER 00. Press "Q" button to enter input. Scan tester displays READ MEASUREMENT BLOCK 1 through 10.

5) If channel No. 1 value is less than "63", read oxygen (O2) sensor signal in channel No. 6. Oxygen (O2) sensor signal must fluctuate. If signal fluctuates, press right arrow button. Press "0" and "6" button to select END OUTPUT function. Press "Q" button to enter output.

6) If signal does not fluctuate, disconnect oxygen (O2) sensor 4-pin wiring harness connector located on right engine mount. See Fig. 2. Momentarily ground (20 seconds) Violet wire from wiring harness connector. Value displayed on channel 6 must increase.

7) If value increased, replace oxygen (O2) sensor. Erase fault code(s). If value does not increase, check oxygen (O2) sensor circuit back to Electronic Control Module (ECM). Replace ECM if necessary. Erase fault code(s).

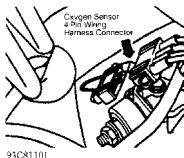


Fig. 2: Checking Oxygen (O2) Sensor Control
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COLD-START VALVE

1) Disconnect ignition coil power output stage from ignition coil. Disconnect air intake boot from throttle body. Disconnect engine coolant temperature sensor wiring harness connector.

2) Set Digital Potentiometer (VAG 1360) to 15,000 ohms and connect to coolant temperature sensor wiring harness connector. Remove cold-start valve (injector). Place cold-start injector in container and crank engine.

3) Cold-start injector must spray uniformly for 6-8 seconds. Wipe off cold-start valve nozzle and observe tip. No drips or dampness may occur within one minute. Replace cold-start injector if it does not operate as specified.

FUEL INJECTORS

1) Ensure fuse No. 18 in fuse/relay panel is okay. Remove fuel pump relay from fuse/relay panel. Connect Test Harness (VAG 1348/3-2) to terminal No. 4 of fuel pump relay socket. Connect Remote Control (VAG 1348/3A) to test harness and battery positive terminal.

2) Carefully pull injectors out of their inserts and place complete assembly into Fuel Analyzer (VAG 1348/2B). Ensure fuel lines are not twisted or kinked. Turn and lift adjustment screw, slide, and knurled nut of Sensor Plate Positioner (VAG 1348/1A) to upper position. See Fig. 3.

3) Center positioner on edge of airflow sensor, with pointer of positioner facing fuel distributor. Hold airflow sensor plate in rest position and push slide in to stop.

4) Turn adjustment screw in until magnetic tip contacts sensor plate mounting bolt. Operate remote control and turn positioner adjustment screw out far enough so that start of spray becomes visible at one injector.

5) Turn off remote control and empty analyzer (fuel injectors remain inserted in analyzer). Push in slide to first stop position (idle simulation) and observe injector spray patterns. If spray pattern for one injector is different, lift sensor plate briefly and repeat test.

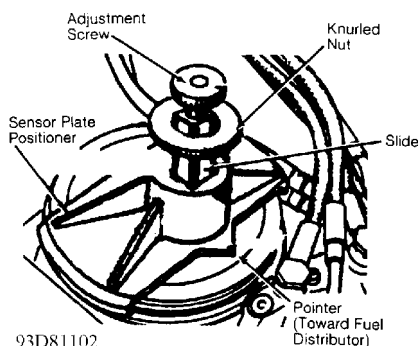


Fig. 3: Testing Fuel Injectors

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6) Operate remote control until 20 ml (milliliters) of fuel accumulates in one of the tubes. Compare fuel quantities for each injector while holding analyzer level. Maximum variation between injectors is 2.0 ml.

7) If fuel quantity varies more than 2.0 ml, interchange those injectors and repeat test. If fuel quantity changes between interchanged injectors, replace injectors.

8) If fuel quantity remains the same between interchanged injectors, check for a pinched fuel line or defective fuel distributor. Repair or replace as necessary.

9) If fuel quantity variation between injectors is within 2.0 ml, empty fuel analyzer. Pull slide on positioner to second stop (full throttle simulation) and observe injector spray patterns. If spray pattern for one injector is different, lift sensor plate briefly and repeat test.

10) Operate remote control until 80 ml of fuel accumulates in one of the tubes. Compare fuel quantities for each injector while holding analyzer level. Maximum variation between injectors is 8.0 ml.

11) If fuel quantity varies more than 8.0 ml, interchange those injectors and repeat test. If fuel quantity changes between interchanged injectors, replace injectors.

12) If fuel quantity remains the same between interchanged injectors, check for a pinched fuel line or defective fuel distributor. Repair or replace as necessary.

13) Place airflow sensor plate at rest (leak test) position. Operate remote control for 2 minutes, to pressurize fuel injectors. Fuel injectors must not leak.

IGNITION SYSTEM

IGNITION COIL

Connect Digital Volt-Ohmmeter (DVOM) between coil terminals. Primary coil resistance should be .60-.80 ohm. Connect DVOM between coil tower and coil positive terminal. Secondary coil resistance should be 6500-8500 ohms. If resistance values are incorrect, replace ignition coil.

IGNITION COIL POWER OUTPUT STAGE (IGNITION CONTROL UNIT)

1) Ensure ignition coil is okay. Remove fuse No. 18 from fuse/relay panel to prevent fuel pump from running. Disconnect power output stage wiring harness connector from ignition coil. See Fig. 4.

2) Connect DVOM to wiring harness connector terminals No. 1 and 3 using test leads from Adapter Kit (VW 1594). Turn ignition on and check for battery voltage. If battery voltage is not present, check wiring harness for an open circuit between Brown wire and ground or between Black wire and ignition fuse.

3) If battery voltage is present, connect LED Tester (US 1115) to wiring harness connector terminals No. 2 and 3 using test leads from adapter kit. Crank engine and observe LED tester. If LED tester does not flicker, go to HALL EFFECT SENSOR under ENGINE SENSORS

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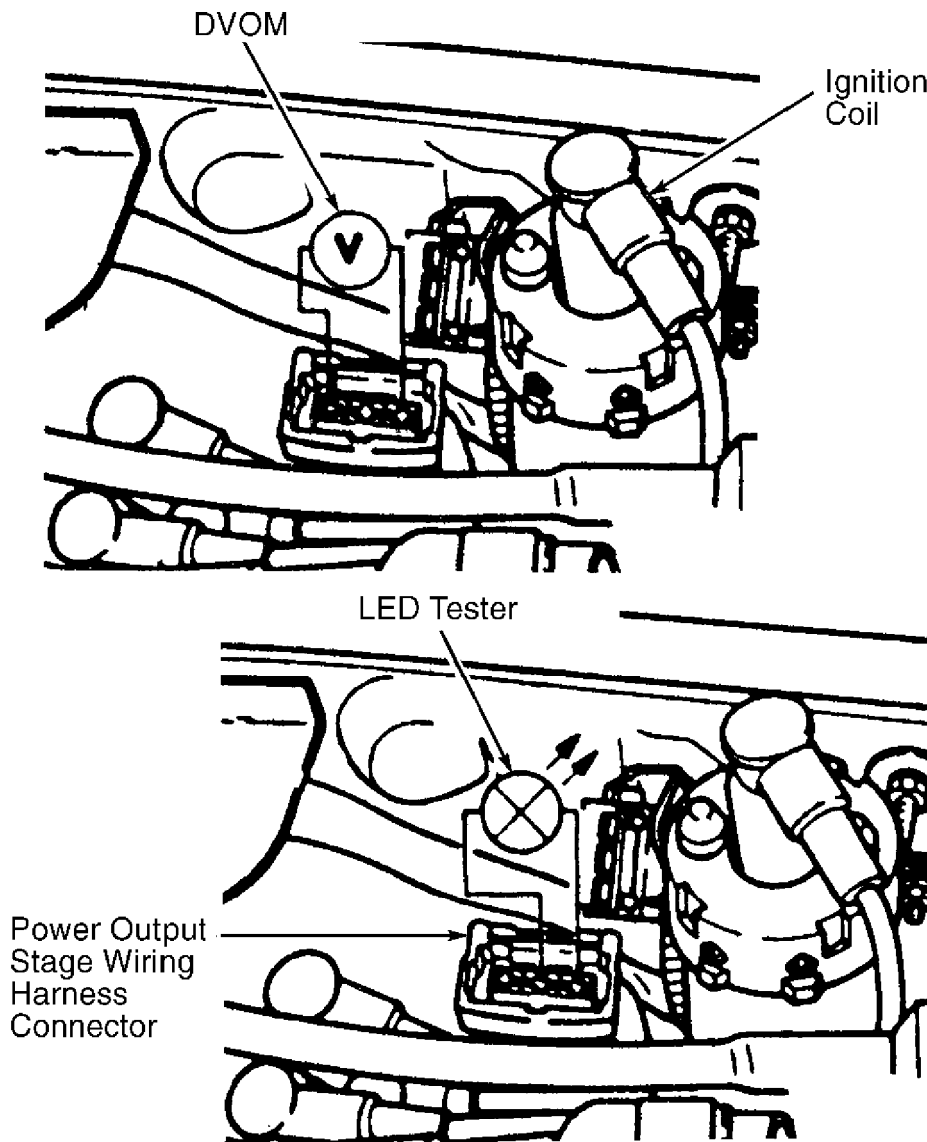
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& SWITCHES.

4) If LED tester flickers, turn ignition off. Reconnect power output stage wiring harness connector to ignition coil. Disconnect Hall Effect sensor wiring harness connector at distributor.

5) Connect DVOM to ignition coil terminals. Turn ignition on. Briefly ground center terminal of Hall Effect sensor wiring harness. Voltage must increase to 2 volts minimum and then drop to zero volts.

6) If voltage changes, ignition coil power output stage is okay. If voltage does not change, install a known good ignition coil output stage. Replace Electronic Control Module (ECM) if necessary.



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Fig. 4: Testing Ignition Coil Power Output Stage
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NOTE: Other than EGR system, additional emission systems and sub-system component testing information is not available from manufacturer.

EXHAUST GAS RECIRCULATION (EGR)

California Models Only

1) Disconnect Yellow vacuum hose to EGR valve from straight connection on Thermal Vacuum Valve (TVV). See Fig. 5. Connect hand-held vacuum pump to disconnected hose.

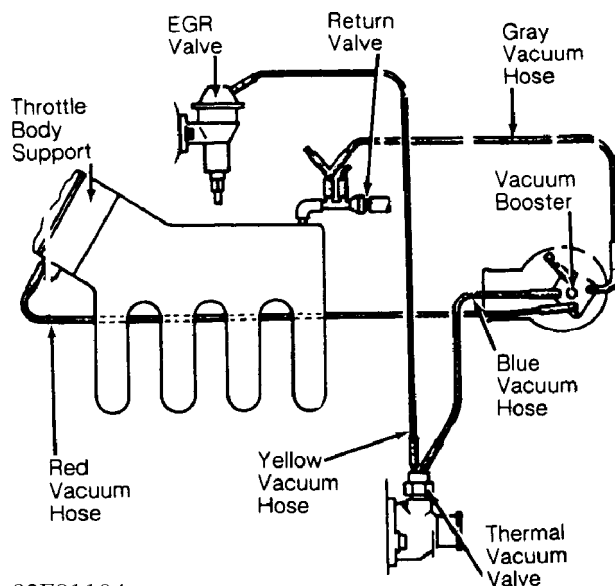
2) Start engine and allow it to idle. Apply vacuum to hose (EGR valve). Idle quality must noticeably deteriorate. If idle quality does not change, check EGR valve and manifold for plugging.

3) If idle quality changes, connect Vacuum Tester (VAG 1368) between vacuum booster and Red hose to throttle support. Start engine and allow it to idle. Vacuum must be at least 13 mBar (9.8 in. Hg).

4) Remove Red vacuum hose from throttle support at vacuum tester and plug. Turn on vacuum pump on vacuum tester until 23-27 mBar (17.3-20.3 in. Hg) is indicated on tester. Idle quality must noticeably deteriorate.

5) Connect vacuum tester between vacuum booster and Blue hose to TVV. Vacuum must be 71-101 mBar (53.3-75.8 in. Hg). Increase engine speed to 3100 RPM. Vacuum must be at least 120 mBar (90.0 in. Hg). If necessary, replace vacuum booster.

6) Remove Thermal Vacuum Valve (TVV) and attach a hose to valve. Immerse valve in a temperature controllable water bath. With water temperature less than 113°F (45°C), no air should flow through valve. With water temperature greater than 142°F (61°C), air should flow through valve. Replace valve if necessary.



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Fig. 5: Testing Exhaust Gas Recirculation System
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