

F - BASIC TESTING

Article Text

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

ARTICLE BEGINNING

1990 ENGINE PERFORMANCE

Volkswagen Basic Diagnostic Procedures

Cabriolet, Corrado, Fox, Golf GL/GTI, Jetta, Vanagon

INTRODUCTION

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.

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 with a 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.

MECHANICAL INSPECTION

COMPRESSION

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

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.

EXHAUST SYSTEM BACKPRESSURE

The exhaust system can be checked with a vacuum or pressure gauge. Remove O2 sensor or air injection check valve (if equipped). Connect a 1-10 psi pressure gauge and run engine at 2500 RPM. If

F - BASIC TESTING

Article Text (p. 2)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

exhaust system backpressure is greater than 1 3/4-2 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, exhaust system should be checked for a restriction.

FUEL SYSTEM APPLICATION TABLE

FUEL SYSTEM APPLICATION TABLE

Application	Fuel System
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Cabriolet, Corrado, Golf GL/GTI	
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Jetta & Vanagon	AFC-Digifant II
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Fox	CIS-E
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Jetta GLi	CIS-Motronic
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FUEL PRESSURE CHECK

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

FUEL PUMP CIRCUIT CHECK

Remove fuel tank cap. Turn ignition on and listen for fuel pump operating sound for approximately 2 seconds. If there is no sound, check fuse, fuel pump relay, fuel pump and all electrical connections.

VISUAL CHECK (AFC-DIGIFANT II)

Push air door open, slight resistance should be felt and door should not bind. Uniform resistance should be felt throughout travel after slight amount of free travel. No binding should be felt when air door is released.

VISUAL CHECK (CIS-E & CIS-MOTRONIC)

Move sensor plate slowly upward. Sensor plate should have slight resistance from control piston adjusting lever. No binding should be felt. Let sensor plate fall. There should no resistance. Slight fuel seepage past control piston is acceptable.

FUEL PRESSURE TEST

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

F - BASIC TESTING

Article Text (p. 3)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

CABRIOLET, GOLF GL/GTI, JETTA WITH AFC-DIGIFANT II

1) Install Fuel Pressure Gauge at service port on fuel plenum. Fuel pressure gauge must be able to read 0-50 psi. Start engine and allow it to idle. System fuel pressure should be approximately 36 psi (2.5 kg/cm²).

2) Disconnect vacuum hose from top of the fuel pressure regulator. Fuel pressure should increase to approximately 44 psi (3.0 kg/cm²). Turn engine off. After 10 minutes, residual pressure should be 29 psi (2.0 kg/cm²). If system pressure is too high, the fuel pressure regulator should be replaced.

3) If residual pressure is too low, run the engine until system pressure is built up, pinch off Blue fuel return line. If pressure holds, replace the fuel regulator.

CORRADO WITH AFC-DIGIFANT II

1) Install Fuel Pressure Gauge (VW 1318) and Adaptor (VW 3118-1 and 11) between the fuel distributor test port and pressure switch. Bleed excess air from system cycling control valve with gauge upside down.

2) Open fuel pressure gauge control lever, start engine and allow to idle. Fuel pressure should be approximately 36.3 psi (2.5 kg/cm²). Pull hose off intake manifold fuel pressure should increase to approximately 43.5 psi (3.0 kg/cm²).

3) Switch ignition off. After 10 minutes residual pressure should be 29 psi (2.0 kg/cm²). If residual pressure is too low, run the engine until system pressure is built up, pinch off Blue fuel return line. If pressure holds, replace the fuel regulator.

If fuel pressure is low, check the following:

- * Fuel lines for leaks.
- * Fuel injectors leaking.
- * Fuel pump check valve leaking.
- * Pressure gauge stop-cock leaking.

FOX & JETTA GLI WITH CIS-E & CIS-MOTRONIC

1) Connect pressure gauge (VW 1318) between fuel distributor port and the end of the fuel line to cold start valve. Ensure control lever is in the closed position. See Fig. 1. Bleed excess air from system by cycling control valve with gauge upside down.

2) Open fuel pressure gauge control lever. Start engine allow to run. System fuel pressure should 75-82 psi (5.2-5.6 kg/cm²). On Jetta GLi system pressure should be 89-95 psi (6.1-6.6 kg/cm²). If system fuel pressure is low, perform fuel volume check. If fuel volume is okay, replace fuel pressure regulator.

3) If fuel pressure is above specification, remove return hose from pressure regulator and repeat test. If system pressure is okay, check for restricted fuel return line. If pressure is incorrect, replace fuel pressure regulator.

F - BASIC TESTING

Article Text (p. 4)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

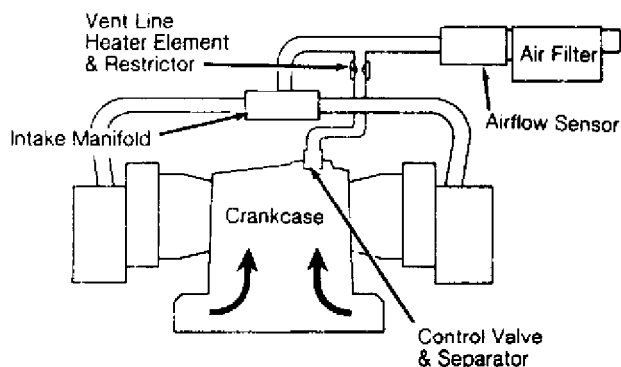


Fig. 1: Testing Fuel Pump Pressure (CIS-E & CIS-Motronic)
Courtesy of Volkswagen United States, Inc.

VANAGON WITH AFC-DIGIFANT II

1) Install Fuel Pressure Gauge (VW 1318) at fuel supply hose 3-way "T" connector. See Fig. 2. Using a jumper wire, connect terminals No. 30 and 87 on fuel pump relay.

2) Turn ignition on. With fuel pump operating, minimum pressure should be 33 psi (2.2 kg/cm²). If fuel pressure is incorrect, inspect for restricted fuel lines, defective fuel pump or weak control pressure regulator. If okay, perform MAIN FUEL PUMP VOLUME CHECK.

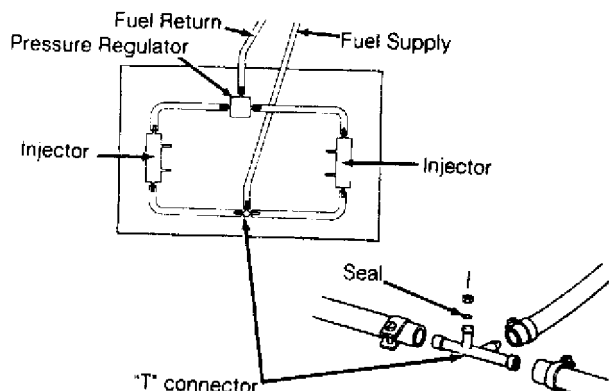


Fig. 2: Testing Fuel Pump Pressure (Vanagon)
Courtesy of Volkswagen United States, Inc.

REGULATED FUEL PRESSURE TABLE

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Application	Engine Off (1)		At Idle	
	psi (kg/cm ²)		psi (kg/cm ²)	
Cabriolet, Corrado,				
Golf GL/GTI & Jetta	29-36	(2.0-2.5)	75-82	(5.2-5.6)
Fox	38.0	(2.6)	75-82	(5.2-5.6)
Jetta GLi	48.0	(3.3)	89-95	(6.1-6.6)
Vanagon	29-36	(2.0-2.5)	(2) 33	(2.2)

(1) - After checking fuel pressure at idle, turn ignition switch

F - BASIC TESTING

Article Text (p. 5)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

to OFF position.

- (2) - With pressure regulator vacuum hose disconnected, pressure should be 36 psi (2.5 kg/cm²).

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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 jumper to ground. With transmission in neutral, crank engine for a 3-4 seconds. While the starter is turning and for a few seconds afterwards, an audible sound should be heard at the pump. If not, proceed to step 2).

2) Activate fuel pumps by removing fuel pump relay and attaching jumper wire between terminals No. 30 battery voltage and No. 87 output to fuel pumps. Terminal identification is molded on fuse/relay panel. If pump does not operate, remove transfer pump wiring harness connector. See Fig. 3.

3) Using test light, check for voltage between Brown (-) and Green (+) wire at connector. If voltage is present, replace transfer pump. If not, repair open or short circuit in wiring.

4) If transfer pump operates correctly, 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.

5) Minimum fuel flow for CIS-E should be 13.5 ounces (.4 liters). Minimum fuel flow for CIS-Motronic and AFC-Digifant II should be 10.0 ounces (.3 liters). If fuel flow is low, check fuel tank filter for restriction. If okay, replace transfer pump.

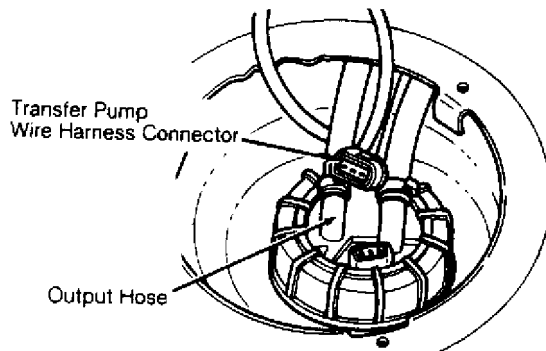


Fig. 3: Checking Transfer Pump Fuel Volume (Fox & Jetta GLi)
(Others Similar)

Courtesy of Volkswagen United States, Inc.

NOTE: Before testing main fuel pump, check transfer pump. See TRANSFER PUMP FUEL VOLUME CHECK in this article.

MAIN FUEL PUMP VOLUME CHECK

F - BASIC TESTING

Article Text (p. 6)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

ALL EXCEPT CORRADO & VANAGON

1) Remove fuel return line located near left strut tower. Remove fuel tank cap. Attach a piece of hose between return line and a 1 qt. (.95 liter) graduated container.

2) Activate fuel pump for 30 seconds by removing fuel pump relay and attaching jumper wire between terminals No. 30 and No. 87. Remove fuel pump relay from fuse/relay block. Compare volume with specifications.

CORRADO

1) Disconnect wire harness connector from fuel pump. See Fig. 4. With voltmeter attached to terminals, activate fuel pump by removing fuel pump relay and applying battery voltage to terminals No. 4 of the fuse box connection for the fuel pump relay. Fuel pump relay located on fuse box housing. Terminal numbers are molded into fuse box plastic housing.

2) Record voltage. Remove fuel line from outlet side of accumulator. See Fig. 4. Attach a piece of hose between return line and a graduated container. Activate fuel pump for 30 seconds. Compare volume with specifications given in MAIN FUEL PUMP VOLUME (AFC-Digifant II) table.

VANAGON

1) Remove the return line from the pressure regulator located in engine compartment left side. Push a piece of hose onto open connection of pressure regulator. Insert hose into a 1 qt. (1 liter) graduated container.

2) Activate fuel pump for 30 seconds by removing fuel pump relay and attaching jumper wire between terminals No. 30 and No. 87. Fuel pump relay located left side of engine compartment in Black plastic box. Compare volume with specifications.

FUEL PUMP PERFORMANCE TABLE (AFC-DIGIFANT II)

		Pressure	Min. Vol. in 30 Sec.
Application		psi (kg/cm ²)	Pts. (L)
Cabriolet, Corrado,			
Golf GL/GTI & Jetta	.... 29-36 (2.0-2.5)		1.0 (.5)
Vanagon	..... 33-39 (2.3-2.7)		1.0 (.5)

FUEL PUMP PERFORMANCE TABLE (CIS-E & CIS-MOTRONIC)

Application @ Voltage	Min. Vol. in 30 Sec. Pts. (L)
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Fox
108 (.375)

F - BASIC TESTING

Article Text (p. 7)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

11	1.1 (.520)
12	1.4 (.675)
Jetta GLi		
10	1.0 (.460)
11	1.3 (.620)
12	1.6 (.750)
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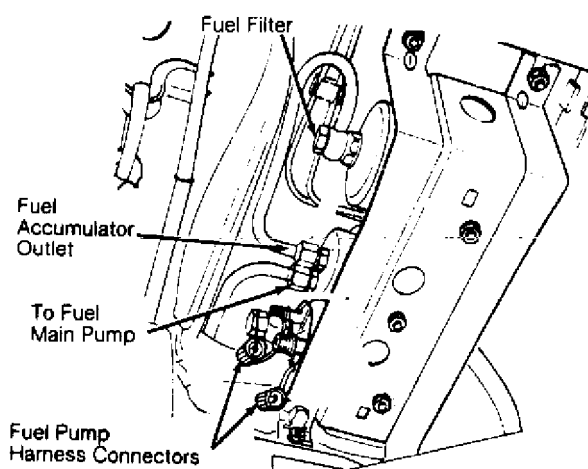


Fig. 4: Identifying Main Fuel Pump (Fox & Jetta GLi)
Courtesy of Volkswagen United States, Inc.

IGNITION CHECKS (CIS-E)

NOTE: Ignition checks are divided according to fuel system.

SPARK TEST

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

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

3) Using ohmmeter, check 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

F - BASIC TESTING

Article Text (p. 8)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

Fox

Coil Wire With Connectors	1600-2400
Spark Plug Wire With Connectors	4800-7200
Spark Plug Connector	4000-6000
Suppressor	800-1200

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IGNITION COIL RESISTANCE TABLE

IGNITION COIL RESISTANCE TABLE - Ohms @ 68°F (20°C)

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Application	Primary	Secondary
Jetta GLi 2.0L60-.70	6500-8500
All Other Models52-.76	2400-3500

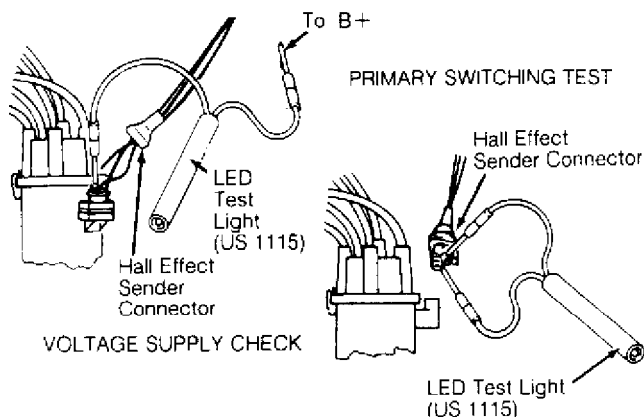
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DISTRIBUTOR

HALL EFFECT SENDER

1) Remove coil secondary and attach to ground. Disconnect Hall Effect sender harness connector at distributor. Using a LED Test Light (US 1115), check for voltage between outer terminals of connector. See Fig. 5. With ignition on, light should be on. If not, check wiring for short or open circuit. If wiring is okay, replace Digifant control unit.

2) If light came on in step 1), reconnect Hall Effect sender harness connector. Pull back Hall Effect sender boot to expose contact terminals. Apply LED Test Light (US 1115) probe to center contact and battery positive terminal. See Fig. 5. Observe test light while cranking engine. If test light blinks, Hall Effect sender is okay. If not, replace Hall Effect sender.



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Fig. 5: Testing Typical Hall Effect Sender
Courtesy of Volkswagen United States, Inc.

ELECTRONIC CONTROL UNIT (ECU)

F - BASIC TESTING

Article Text (p. 9)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

1) Perform SPARK TEST check. If secondary spark is present, ignition control unit is okay. If not, turn ignition off. Disconnect ignition control unit wire harness connector. Turn ignition on. Using a voltmeter, measure voltage between terminal No. 2 (-) and terminal No. 4 (+) of connector. See Fig. 6.

2) Voltage should be present. If not, 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.

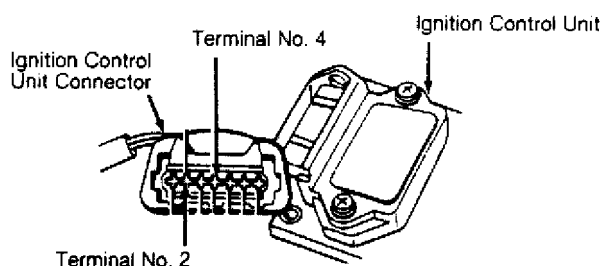


Fig. 6: Checking Typical Ignition Control Unit Voltage
Courtesy of Volkswagen United States, Inc.

NOTE: These tests require a high-impedance volt-ohmmeter.

IGNITION CHECKS (CIS-MOTRONIC)

SPARK

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

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

3) Using ohmmeter, check 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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Jetta GLi

Coil Wire With Connectors	1600-2400
Spark Plug Wire With Connectors	4800-7200
Spark Plug Connector	4000-6000
Suppressor (1)	800-1200

(1) - Suppressor is located between ignition wire and

F - BASIC TESTING

Article Text (p. 10)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

distributor cap.

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HALL EFFECT SENDER & COIL POWER STAGE

The Hall Effect sender and coil power stage should be tested if there is no spark at the spark plugs when tested. These tests also check the CIS-Motronic ECU response to the Hall Effect sender signal. Ensure SPARK and IGNITION COIL tests are performed first.

VOLTAGE SUPPLY & GROUND TO POWER STAGE

1) With ignition off, disconnect the coil power stage harness connector. Connect a voltmeter to terminals No. 1 and No. 3. See Fig. 7.

2) When ignition is turned on, there should be approximately battery voltage. Turn ignition off. If there was no voltage, check for an open wire from fuse box to terminal No. 1 or an open from terminal No. 3 to ground. Repair open wire and recheck.

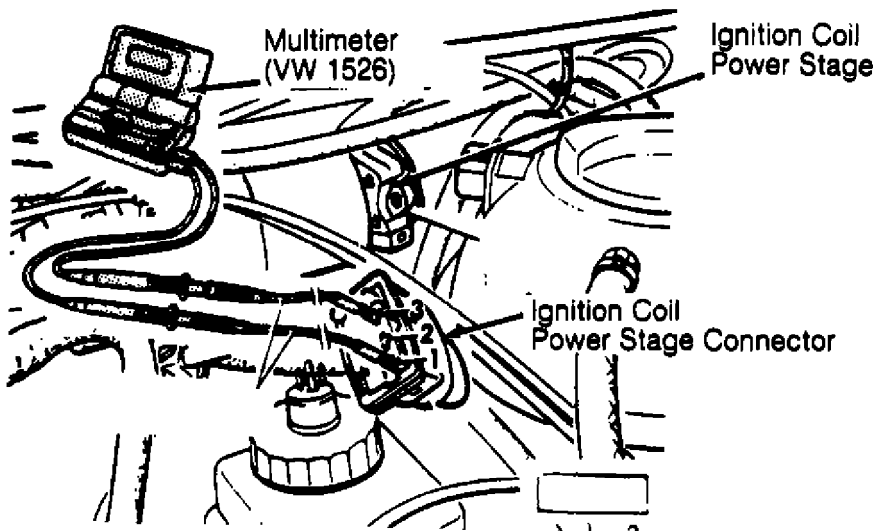


Fig. 7: Testing Typical Ignition Coil Power Stage
Courtesy of Volkswagen United States, Inc.

VOLTAGE SUPPLY & GROUND TO HALL EFFECT SENDER

1) With ignition off, disconnect Hall Effect sender harness connector. Using a voltmeter, check for voltage between outer terminals No. 1 and No. 3. See Fig. 8. When ignition is turned on, there should be a minimum of 9 volts.

2) If there is no voltage, check for open wire between terminal No. 3 of the Hall Effect sender connector and terminal No. 30 of the ECU. Also check for voltage between terminal No. 1 of the Hall Effect sender and ground. Repair open, and recheck.

F - BASIC TESTING

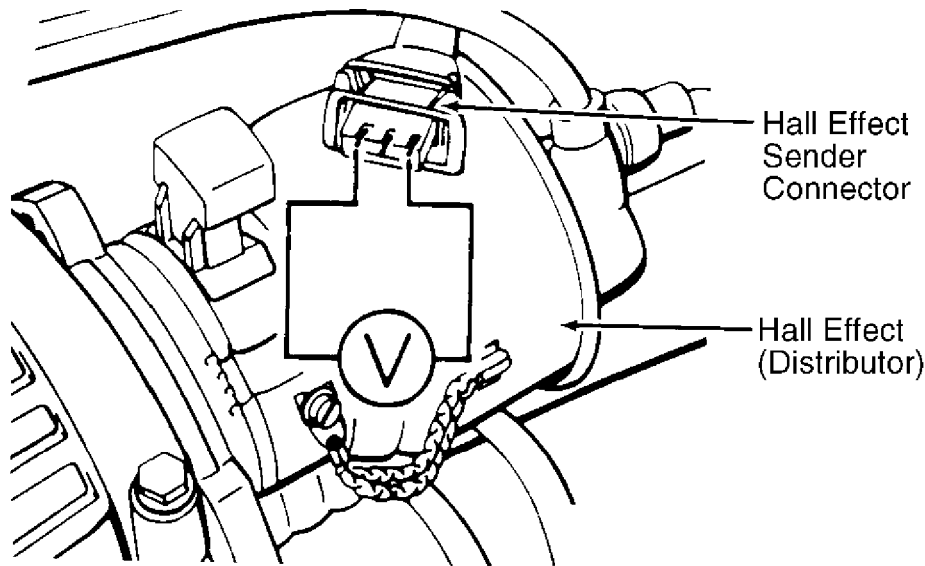
Article Text (p. 11)

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Thursday, March 23, 2000 09:44PM



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Fig. 8: Testing Typical Hall Effect Sender Connector

Courtesy of Volkswagen United States, Inc.

HALL EFFECT SENDER SWITCHING FUNCTION

1) Peel back the protective rubber boot on the Hall Effect sender harness connector. Remove coil secondary and attach to ground. Disconnect Hall Effect sender wire harness connector at distributor. Using a LED Test Light (US 1115), check for voltage between outer terminals of connector. See Fig. 5 or 8. With ignition on, light should be on. If not, check wiring for short or open circuit. If not, replace ignition control unit.

2) If light came on in step 1), reconnect Hall Effect sender harness connector. Pull back Hall Effect sender boot to expose contact terminals. Apply LED Test Light (US 1115) probe to center contact and battery positive terminal. See Fig. 5 or 8. Observe test light while cranking engine. If test light blinks, Hall Effect sender is okay. If not, replace Hall Effect sender.

CIS-MOTRONIC (ECU) RESPONSE TO HALL EFFECT SENDER SIGNAL

1) Ground the ignition coil secondary lead. Remove coil power stage connector and connect a LED test light (US 1115) between terminals No. 2 and No. 3. See Fig. 7.

2) Actuate the starter, the test light should flicker. If not, check for open wire between terminal No. 2 of the power stage connector and terminal No. 11 of the ECU, or ECU is defective. Repair wiring or replace ECU and recheck.

POWER STAGE RESPONSE TO CIS-MOTRONIC (ECU) SIGNAL

1) Reconnect the coil power stage connector, then disconnect the Hall Effect sender connector and attach a voltmeter to terminal

Thursday, March 23, 2000 09:44PM

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F - BASIC TESTING

Article Text (p. 13)

1990 Volkswagen Corrado

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Thursday, March 23, 2000 09:44PM

DISTRIBUTOR

HALL EFFECT SENDER

1) Remove coil secondary and attach to ground. Disconnect Hall Effect sender wire at the distributor. Using a LED Test Light (US 1115), check for voltage between outer terminals of connector. See Fig. 5 or 8. With ignition on, light should be on. If not, check wiring for short or open circuit. If wiring is okay, replace Digifant control unit.

2) If light came on in step 1), reconnect Hall Effect sender harness connector. Pull back Hall Effect sender boot to expose contact terminals. Apply LED Test Light (US 1115) probe to center contact and battery positive terminal. See Fig. 5. Observe test light while cranking engine. If test light blinks, Hall Effect sender is okay. If not, replace Hall Effect-sender.

IDLE SPEED, CO LEVEL & IGNITION TIMING

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

IDLE SPEED & CO LEVEL TABLE

Application			Idle RPM	CO Level %
All Models			800-1000	0.3-1.2%

IGNITION TIMING TABLE (Degrees BTDC @ RPM)

Application			Checking	Adjusting
1.8L	.....	4-8 @ 2250-2350	.	5-7 @ 2250-2350
2.0L	.....	4-8 @ 770-830	.....	5-7 @ 770-830
2.1L (1)	.....	4-8 @ 2250-2350	.	5-7 @ 2250-2350

(1) - With coolant temperature sensor disconnected.

SUMMARY

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

END OF ARTICLE