

## **F - BASIC TESTING - GASOLINE**

### **Article Text**

1991 Volkswagen Vanagon  
For Volkswagen Technical Site  
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Saturday, March 18, 2000 09:11PM

#### **ARTICLE BEGINNING**

1990-91 ENGINE PERFORMANCE  
Volkswagen Basic Diagnostic Procedures

1990-91 Passat  
1991 Cabriolet, Corrado, Fox, Golf GL, GTI, Jetta,  
Jetta GLi, Vanagon

#### **MODEL APPLICATION**

NOTE: Information in this article applies to gasoline engine models only.

#### **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.

Before entering self-diagnostics (if equipped), 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.

#### **PRELIMINARY INSPECTION & ADJUSTMENTS**

##### **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 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.

WARNING: DO NOT use ignition switch during compression tests on fuel

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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.

#### ENGINE COMPRESSION TABLE

AA

Application	psi (kg/cm <sup>2</sup> )
-------------	---------------------------

#### Normal Compression Pressure

1.8L

Except Corrado .....	131-174 (9-12)
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Corrado .....	116-174 (8-12)
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2.0L & 2.1L .....	145-189 (10-13)
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#### Minimum Compression Pressure

1.8L

Except Corrado & Fox .....	109 (8)
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Corrado .....	87 (6)
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Fox .....	102 (7)
-----------	---------

2.0L .....	109 (8)
------------	---------

2.1L .....	116 (8)
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#### Maximum Variation Between Cylinders

All Models .....	44 (3)
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#### 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 0-5 psi pressure gauge and operate engine at 2500 RPM. If 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, check exhaust system for restriction.

## FUEL SYSTEM

#### FUEL SYSTEM APPLICATION TABLE

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Application	Fuel System
-------------	-------------

1.8L

Except Corrado .....	AFC-Digifant
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Corrado .....	Digifant
---------------	----------

2.0L .....	CIS-E Motronic
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2.1L .....	AFC-Digifant
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## FUEL PRESSURE

Basic diagnosis of fuel system should begin with determining

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fuel system pressure.

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

#### CIS-E Motronic

1) Ensure ignition is off. Wrap a shop rag around fuel distributor port near cold start valve. Slowly loosen distributor port near cold start valve to release fuel pressure. 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 system fuel pressure is lower than specification, perform fuel volume check. If fuel volume is okay, replace fuel pressure regulator.

3) If fuel pressure is greater than specification, remove return hose from pressure regulator and place in a container. Repeat test. If system pressure is okay, check for restricted fuel return line. If pressure is incorrect, replace fuel pressure regulator.

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. Replace if necessary. If these components are okay, replace fuel pressure regulator.

#### Digifant (Except Vanagon)

1) Ensure ignition is off. Wrap a shop rag around service port on fuel plenum. Slowly loosen service port on fuel plenum to release fuel pressure. Install fuel pressure gauge at service port on fuel plenum. Fuel pressure gauge must have reading range of 0-50 psi. Start engine and allow it to idle. System fuel pressure should be approximately 36 psi (2.5 kg/cm<sup>2</sup>).

2) Disconnect vacuum hose from top of fuel pressure regulator. Fuel pressure should increase to approximately 44 psi (3 kg/cm<sup>2</sup>). Turn engine off. After 10 minutes, residual pressure should be 29 psi (2 kg/cm<sup>2</sup>). If system pressure is too high, replace fuel pressure regulator.

3) If residual pressure is too low, operate engine until system pressure builds up, then pinch off Blue fuel return line. If pressure holds, replace the fuel regulator. If fuel pressure is low, check the following for leaks.

- \* Fuel Lines
- \* Fuel Injectors
- \* Fuel Pump Check Valve

#### Digifant (Vanagon)

1) Remove fuel pump relay. Start engine. Operate engine until it stalls. Crank engine to ensure all fuel pressure is relieved. Install Fuel Pressure Gauge (VW 1318) at fuel supply hose 3-way "T"

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connector. See Fig. 1. Turn ignition on. Ensure there are no fuel leaks.

2) Start engine. With engine idling, minimum pressure should be 29 psi (2 kg/cm<sup>2</sup>). Remove vacuum hose from fuel pressure regulator. Fuel pressure should increase to 36 psi (2.5 kg/cm<sup>2</sup>).

3) Turn engine off. After 10 minutes, residual pressure should be 29-36 psi (2-2.5 kg/cm<sup>2</sup>). If fuel pressure is incorrect, check for restricted fuel lines, defective fuel pump, or weak control pressure regulator. If these items are okay, go to MAIN FUEL PUMP VOLUME CHECK.

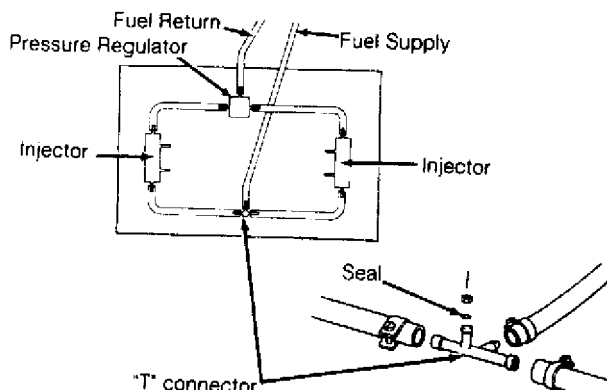


Fig. 1: Testing Fuel Pump Pressure (Vanagon)  
Courtesy of Volkswagen United States, Inc.

### 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 3-4 seconds. While starter is turning and for a few seconds afterwards, 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 4).

2) Remove fuel pump relay from relay panel. On Corrado and Passat, activate fuel pumps using Remote Control (VAG1348/3A). On all other models, activate fuel pumps using Remote Control (US4480/3). On all models, if pump does not operate, remove transfer pump wire harness connector. See Fig. 2.

3) Using test light, check voltage between middle wire and outer Brown wire of fuel pump connector for Digifant fuel system, or between Brown wire and Red/Yellow wire for CIS-E fuel system. If voltage is present, replace transfer pump. If voltage is not present, repair open or short circuit in wiring.

4) 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 should be 10 ounces (.3 liter). If fuel flow is low, check fuel tank filter for restriction. If fuel tank

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filter is okay, replace transfer pump.

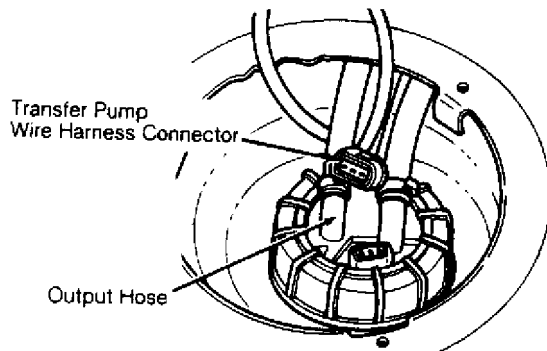


Fig. 2: Checking Transfer Pump Fuel Volume (Typical)  
Courtesy of Volkswagen United States, Inc.

### MAIN FUEL PUMP VOLUME CHECK

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

Cabriolet, Fox, Golf & Jetta

Remove fuel pump relay from relay panel. Activate fuel pumps using Remote Control (US4480/3). Activate fuel pumps for 30 seconds. Compare fuel volume with values in FUEL PUMP PERFORMANCE table.

Corrado, GTI, Jetta GLI & Passat

Remove fuel pump relay from relay panel. On Corrado and Passat, activate fuel pumps using Remote Control (VAG1348/3A). On GTI and Jetta GLI, activate fuel pumps using Remote Control (US4480/3). On all models, measure voltage being applied to fuel pump when activating with remote control. Record voltage. Fuel volume is relational to voltage applied to fuel pumps. Activate fuel pumps for 30 seconds. Compare volume with values in FUEL PUMP PERFORMANCE table.

Vanagon

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

2) Remove fuel pump relay from relay panel. Activate fuel pumps using Remote Control (US4480/3). Activate fuel pumps for 30 seconds. Compare volume with values in FUEL PUMP PERFORMANCE table.

### FUEL PUMP PERFORMANCE TABLE

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Application	Pressure psi (kg/cm <sup>2</sup> )	Min. Vol. in 30 Sec. Pts. (L)
-------------	---------------------------------------	----------------------------------

Cabriolet, Fox,

Golf & Jetta .....	29-36 (2.0-2.5)	1.0 (.5)
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Vanagon .....	33-39 (2.3-2.7)	1.0 (.5)
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#### Corrado & Passat

10 Volts	.....	N/A	.....	1.0 (.460)
11 Volts	.....	N/A	.....	1.3 (.620)
12 Volts	.....	N/A	.....	1.6 (.750)

#### GTI & Jetta GLI

10 Volts	.....	N/A	.....	.8 (.375)
11 Volts	.....	N/A	.....	1.1 (.520)
12 Volts	.....	N/A	.....	.4 (.675)

AA

### IGNITION CHECKS

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" 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

AA

Application	Ohms
-------------	------

##### 1.8L

###### Except Fox

Coil Wire Only	.....	(2)
Coil Wire With Connector	.....	1600-2400
Spark Plug Wire/ Connector	.....	4000-6000
Suppressor (1)	.....	600-1400

###### Fox

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

##### 2.0L

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

##### 2.1L

Coil Wire With Connectors	.....	1200-2800
Spark Plug Wire/Connector	.....	4600-7400

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Spark Plug Connector ..... 4000-6000  
Suppressor (1) ..... 600-1400

(1) - Suppressor is located between ignition wire  
and distributor cap.

(2) - Check for continuity.

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### IGNITION COIL

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

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Application	Primary	Secondary
-------------	---------	-----------

All Models	.5-.7	3000-4000
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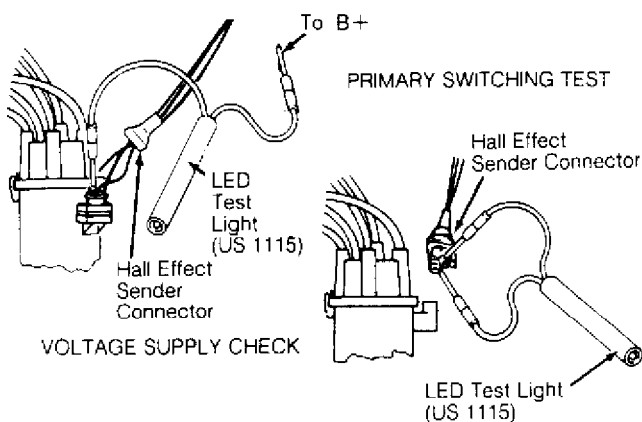
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### DISTRIBUTOR

#### 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 Figs. 3 and 4. With ignition on, light should be on. If light is on, go to step 2). If light is not on, check wiring for short or open circuit. If wiring is okay, replace ignition control unit.

2) 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. 3. Observe test light while cranking engine. If test light blinks, Hall Effect sender is okay. If light does not blink, replace Hall Effect sender.



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Fig. 3: Testing Hall Effect Sender (Typical)

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

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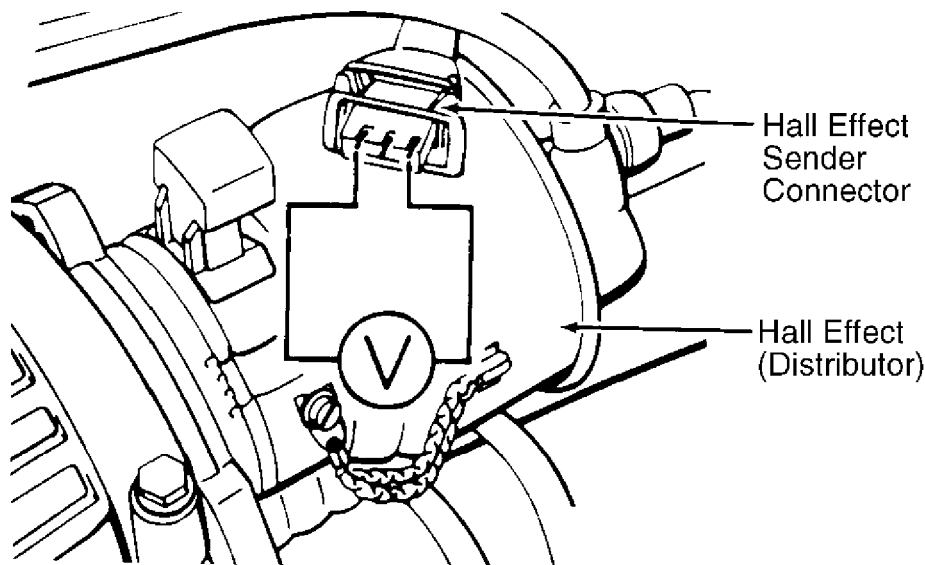
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terminals No. 1 and No. 3. See Fig. 4. Turn ignition on. There should be a minimum of 9 volts on vehicles with CIS-E fuel system, or 10 volts on vehicles with Digifant fuel system.

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



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Fig. 4: Testing Hall Effect Sender Connector (Typical)  
Courtesy of Volkswagen United States, Inc.

## POWER STAGE

### POWER STAGE APPLICATION TABLE

AA

Application	Fuel System
-------------	-------------

1.8L

Corrado .....	Digifant
---------------	----------

Fox .....	Digifant
-----------	----------

Golf, Jetta & GTI .....	Digifant I
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2.0L .....	CIS-E
------------	-------

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### Voltage Supply & Ground To Power Stage

1) With ignition off, disconnect coil power stage harness connector. Connect a voltmeter to terminals No. 1 and No. 3. See Fig. 5.

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 open from terminal No. 3 to ground. Repair open wire and recheck.

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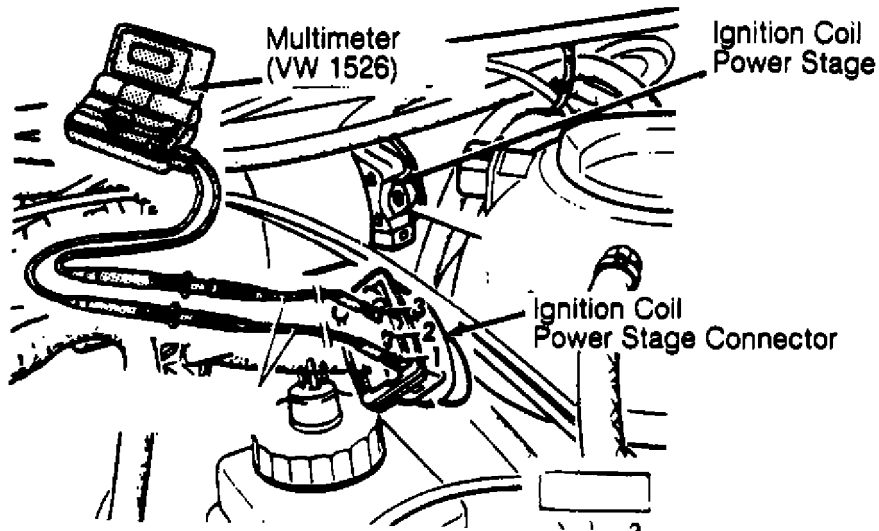


Fig. 5: Testing Ignition Coil Power Stage (Typical)  
Courtesy of Volkswagen United States, Inc.

### HALL CONTROL UNIT

Cabriolet, Fox, Golf, Jetta, & GTI With Digifant II

1) Perform spark test. See SPARK TEST under IGNITION CHECKS. 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 terminal No. 2 ( ) and terminal No. 4 (+) of connector. See Fig. 6.

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.

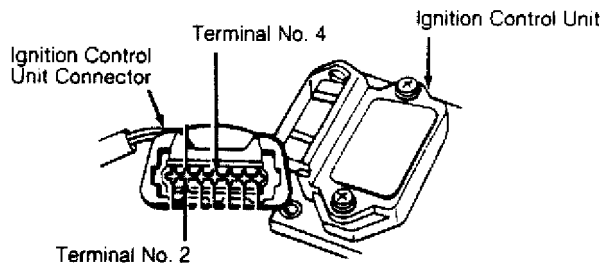


Fig. 6: Checking Hall Control Unit Voltage (Typical)  
Courtesy of Volkswagen United States, Inc.

### IDLE SPEED, CO LEVEL & IGNITION TIMING

Ensure idle speed, CO level and base ignition timing are set

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to specification. If necessary, see D - ADJUSTMENTS article in the ENGINE PERFORMANCE Section.

#### IDLE SPEED & CO LEVEL TABLE

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Application	Idle RPM	CO Level %
Cabriolet .....	750-850 (1) .....	.3-1.1
Corrado .....	750-850 .....	.3-1.1
Fox .....	875-925 .....	(2) 1.2-1.5
Golf, Jetta & GTI		
1.8L (Digifant) .....	750-850 .....	.3-1.1
2.0L (CIS-E) .....	N/A (3) .....	.2-1.2
Passat .....	700-900 (3) .....	.2-1.2
Vanagon .....	830-930 .....	.3-1.1

(1) - Disconnect Blue coolant temperature sensor connector.

(2) - Clamp crankcase breather hose near emission control valve.

(3) - Not adjustable.

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

AA

Application	Checking	Adjusting
Except Vanagon (1) .....	4-8 @ 2000-2500 .....	5-7 @ 2000-2500
Vanagon (1) .....	3-7 @ 2000-2500 .....	4-6 @ 2000-2500

(1) - Disconnect coolant temperature sensor.

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### SUMMARY

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

END OF ARTICLE