

## **F - BASIC TESTING**

### **Article Text**

1993 Volkswagen Passat

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Wednesday, March 22, 2000 10:14PM

## **ARTICLE BEGINNING**

1993 ENGINE PERFORMANCE

Volkswagen Basic Diagnostic Procedures

Cabriolet, Corrado SLC, EuroVan, Fox, Golf,  
GTI, Jetta, Passat GL, Passat GLX

## **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 M - VACUUM DIAGRAMS article in this section 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 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 SPECIFICATION TABLE

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Application	Compression Pressure		Compression Ratio
	psi	(kg/cm <sup>2</sup> )	
Cabriolet .....	131-174	(9.2-12.2)	10.0:1
Corrado SLC .....	157-186	(11.0-13.0)	10.0:1
EuroVan .....	128-170	(9.0-12.0)	8.5:1
Fox .....	128-170	(9.0-12.0)	9.0:1
Golf & GTI .....	142-186	(10.0-13.0)	10.0:1
Jetta .....	142-186	(10.0-13.0)	10.0:1
Passat GL (2.0L) .....	142-186	(10.0-13.0)	10.8:1
Passat GLX (2.8L) .....	142-186	(10.0-13.0)	10.0:1

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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 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

#### FUEL SYSTEM APPLICATION TABLE

UAAA;				
3	3	3Engine3		3
3	Model	3 Engine	3 ID	3 Fuel System
AAA-				
3	Cabriolet	3 1.8L	3 2H	3 Digifant II MFI
3		3 8-Valve	3	3 (1)
AAA-				
3	Corrado SLC	3 2.8L VR6	3 AAA	3 Motronic MFI (2)
AAA-				
3	EuroVan	3 2.5L	3 AAF	3 Digifant MFI
3		3 10-Valve	3	3
AAA-				
3	Fox	3 1.8L	3 ABG	3 Digifant II MFI
3		3 8-Valve	3	3 (1)
AAA-				
3	Golf	3 2.0L	3 ABA	3 Motronic MFI (2)
3		3 8-Valve	3	3
AAA-				
3	GTI	3 2.0L	3 ABA	3 Motronic MFI (2)
3		3 8-Valve	3	3
AAA-				

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- 2) Disconnect vacuum hose from top of fuel pressure regulator. Fuel pressure should increase to approximately 44 psi (3

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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 for leaks at fuel lines, fuel injectors and fuel pump check valve

### 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.

2) 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 5).

3) Remove fuel pump relay from relay panel. On Corrado and Passat, activate fuel pumps using Remote Control (VAG 1348/3A). On all other models, activate fuel pumps using Remote Control (US 4480/3). On all models, if pump does not operate, remove transfer pump wire harness connector. See Fig. 1.

4) 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.

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 (.3 liter). If fuel flow is low, check fuel tank filter for restriction. If fuel tank filter is okay, replace transfer pump.

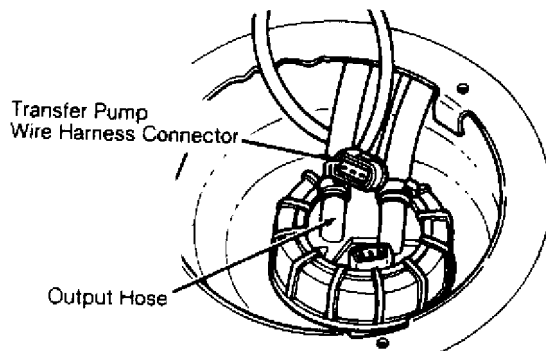


Fig. 1: Checking Transfer Pump Fuel Volume (Typical)  
Courtesy of Volkswagen United States, Inc.

### MAIN FUEL PUMP VOLUME CHECK

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

Cabriolet, Fox, Golf & Jetta

Remove fuel pump relay from relay panel. Activate fuel pumps using Remote Control (US 4480/3). Activate fuel pumps for 30 seconds. Compare fuel volume with values in FUEL PUMP PERFORMANCE table.

Corrado, GTI & Passat

1) Remove fuel pump relay from relay panel. On Corrado and Passat, activate fuel pumps using Remote Control (VAG 1348/3A). On GTI, activate fuel pumps using Remote Control (US 4480/3). On all models, 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

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Application	Pressure psi (kg/cm <sup>2</sup> )	Min. Vol. In 30 Sec. Pts. (L)
Cabriolet .....	43 (3.0)	1.4 (0.7)
Corrado SLC (1) .....	58 (4.0)	1.0-1.4 (0.5-0.7)
Golf, GTI & Jetta (1) ....	43 (3.0)	1.0-1.4 (0.5-0.7)
EuroVan (1) .....	43 (3.0)	1.0-1.4 (0.5-0.7)
Fox (2) .....	36 (2.5)	1.4 (0.7)
Passat GL .....	(3) 87-94 (6.1-6.6)	1.0-1.4 (0.5-0.7)
Passat GLX (1) .....	58 (4.0)	1.0-1.4 (0.5-0.7)

- (1) - Using Adapter Cable (VAG 1348/3-2) between battery positive terminal and terminal No. 4 of fuel pump relay socket. Fuel pump energized, with 10-12 volts at fuel pump and engine off.
- (2) - Using Remove Control Switch (US 4480/3) in place of fuel pump relay.
- (3) - Briefly operate starter and ensure fuel pump runs for at least one second. Alternate method is to disconnect Electronic Control Module (ECM) and ground terminal No. 12 using Remove Control Switch (VAG 1348/3A).

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#### REGULATED FUEL PRESSURE

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Application	At Idle w/Vacuum psi (kg/cm <sup>2</sup> )	At Idle w/o Vacuum (1) psi (kg/cm <sup>2</sup> )
Cabriolet & Fox .....	36 (2.5)	43 (3.0)
Corrado SLC .....	50 (3.5)	58 (4.0)
Golf, GTI & Jetta .....	36 (2.5)	43 (3.0)

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EuroVan	.....	36 (2.5)	.....	43 (3.0)
Passat GL	.....	(2) 87-94 (6.1-6.6)	...	(3) 87-94 (6.1-6.6)
Passat GLX	.....	50 (3.5)	.....	58 (4.0)

- (1) - With vacuum hose disconnected from fuel pressure regulator.
- (2) - Approximately 4.3-7.2 psi (0.3-0.5 kg/cm<sup>2</sup>) below system pressure, with differential pressure regulator disconnected.
- (3) - Approximately 18.5-23.0 psi (1.3-1.6 kg/cm<sup>2</sup>) below system pressure, with differential pressure regulator connected.

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### 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 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
-------------	------

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

- (1) - Check for continuity.
- (2) - Suppressor is located between ignition coil wire and distributor cap.

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### IGNITION COIL

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

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Application	Primary	Secondary
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Cabriolet		
Digifant I	.....	0.5-0.7 ..... 3000-4000

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Digifant II	0.52-0.76	2400-3500
Corrado SLC (1)		
Fox		
Digifant I	0.5-0.7	3000-4000
Digifant II	0.6-0.7	2500-3500
Golf, GTI & Jetta	0.5-0.7	3000-4000
Passat GL	0.6-0.8	6500-8500
Passat GLX (1)		

(1) - Ignition coil pack, new for 1993, is located on left side of cylinder head. When ignition coil is triggered, spark is supplied to 2 spark plugs at one time. One spark plug fires during compression stroke and the other plug fires during exhaust stroke (waste spark). Ignition coil specifications are not available from manufacturer.

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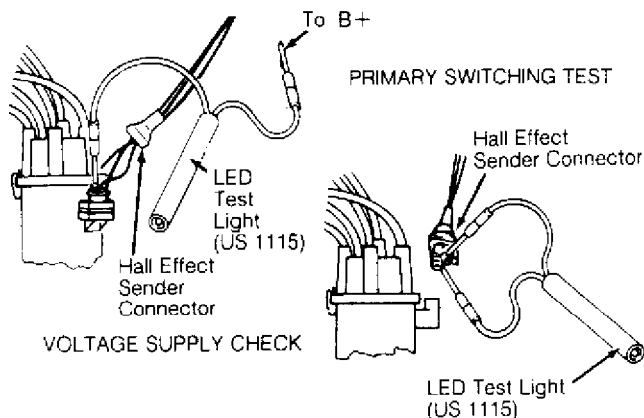
## DISTRIBUTOR

### Hall Effect Sender

1) Remove coil secondary wire and attach to ground.

Disconnect Hall Effect sender 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 Hall Effect sender harness connector. Pull back Hall Effect sender boot to expose contact terminals. Connect LED Test Light (US 1115) probe to center contact and battery positive terminal. See Fig. 2. 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. 2: Testing Hall Effect Sender (Typical)

Courtesy of Volkswagen United States, Inc.

Voltage Supply & Ground To Hall Effect Sender

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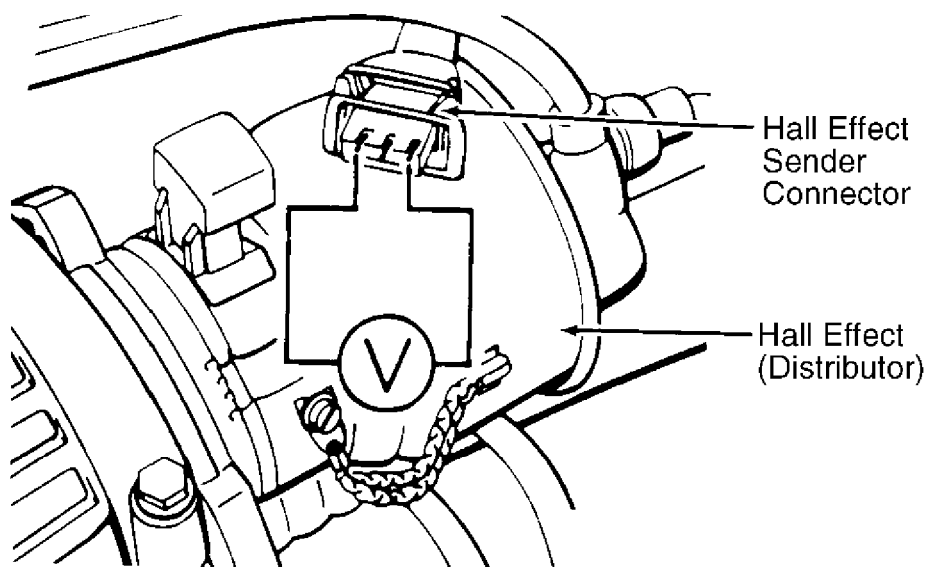
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1) With ignition off, disconnect Hall Effect sender harness connector. Using a voltmeter, check for voltage between outer terminals No. 1 and No. 3. See Fig. 3. Turn ignition on. There should be a minimum of 9 volts on vehicles with CIS-E fuel system, 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. 3: Testing Hall Effect Sender 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 No. 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 open from terminal No. 3 to ground. Repair open wire and recheck.



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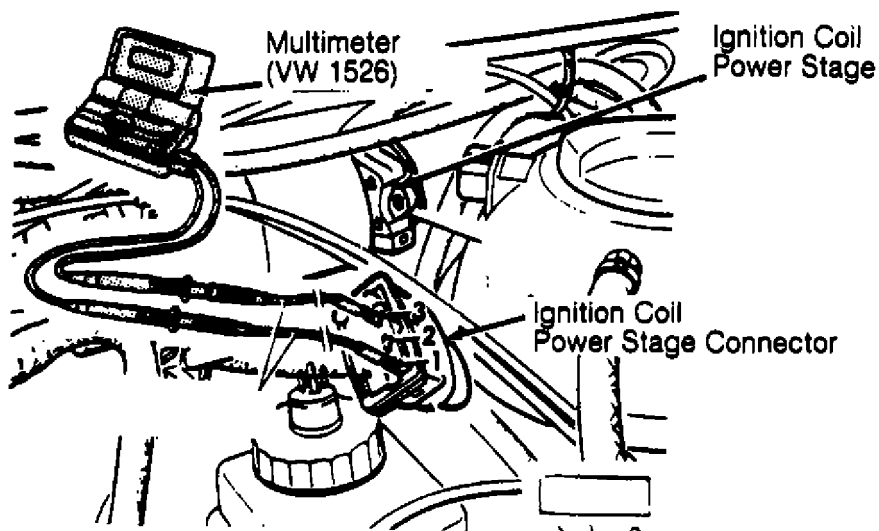


Fig. 4: Testing Ignition Coil Power Stage (Typical)  
Courtesy of Volkswagen United States, Inc.

### 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. 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.

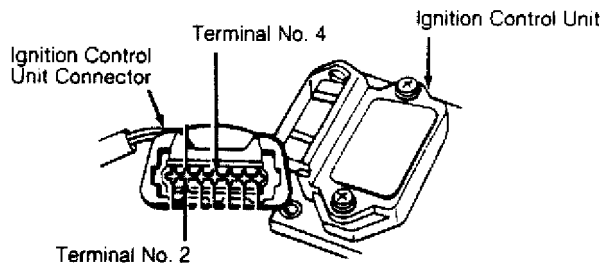


Fig. 5: Checking Hall Control Unit Voltage (Typical)  
Courtesy of Volkswagen United States, Inc.

### 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 the appropriate D - ADJUSTMENTS article in this section. Refer to the following menu:

NOTE: For the appropriate D - ADJUSTMENTS article, go to:

- \* For Cabriolet, see: D - ADJUSTMENTS
- \* For Corrado SLC, see: D - ADJUSTMENTS
- \* For EuroVan, see: D - ADJUSTMENTS
- \* For Fox, see: D - ADJUSTMENTS
- \* For Golf, GTI, Jetta, see: D - ADJUSTMENTS
- \* For Passat GL 2.0L 4-Cylinder, see: D - ADJUSTMENTS - 4-CYL
- \* For Passat GLX 2.8L VR6, see: D - ADJUSTMENTS - VR6

#### IDLE SPEED & CO LEVEL

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Application	Idle RPM	CO Level %
Cabriolet (1)		
Digifant I .....	750-850 .....	0.3-1.2
Digifant II .....	750-850 .....	0.3-1.1
Corrado SLC (2) .....	650-750 .....	0.3-1.5
Fox .....	(3) 875-925 .....	0.3-1.2
Golf, Jetta & GTI (2)	800-880	0.3-1.2
Passat GL .....	(4) 800-1000 .....	0.2-1.2
Passat GLX (2) .....	650-750 .....	0.3-1.5

- (1) - With engine running, after reconnecting Blue coolant temperature sensor. See the D - ADJUSTMENTS article in this section for more information. See menu above.
- (2) - Idle speed and fuel mixture (CO level) are not adjustable.
- (3) - If A/C equipped, disconnect idle speed boost valve harness connector when checking idle speed. Clamp crankcase breather hose near emission control valve when checking CO level.
- (4) - Idle speed is not adjustable.

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

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Application	Checking	Adjusting
Cabriolet (1) .....	4-8 @ 2000-2500 ..	5-7 @ 2000-2500
Corrado SLC .....	(2) .....	(2)
Fox (1) .....	4-8 @ 2000-2500 ..	5-7 @ 2000-2500
Golf, GTI & Jetta ...	(3) 12 @ 800-880 .....	.....
Passat GL .....	4-8 @ 800-1000 ....	5-7 @ 800-1000
Passat GLX .....	(2) .....	(2)

- (1) - On Digifant I systems, ensure engine oil temperature

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is 176°F (80°C) and Blue engine coolant temperature sensor is disconnected.

(2) - Ignition timing is computer controlled. Information is not available from manufacturer.

(3) - Using Scan Tester (VAG 1551) in START BASIC SETTING mode. Ignition timing is not adjustable.

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IGNITION TIMING ADVANCE (Degrees BTDC @ RPM)

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Application	Specification
-------------	---------------

Cabriolet

Digifant I (California) .....	(1) 27-33 @ 4500
-------------------------------	------------------

Digifant II (Other 49 States) ....	(1) 20-30 @ 2300
------------------------------------	------------------

Fox

Digifant I (California) .....	(1) 27-33 @ 4500
-------------------------------	------------------

Digifant II (Other 49 States) ....	(1) 20-30 @ 2300
------------------------------------	------------------

All Other Models .....	(2)
------------------------	-----

(1) - With Blue engine coolant temperature sensor connected. Specification is in addition to the initial setting.

(2) - Ignition timing advance is computer controlled. Information is not available from manufacturer.

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### SUMMARY

If no faults were found while performing the tests in this article, see H - TESTS W/O CODES article in this section for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.

END OF ARTICLE