

D - ADJUSTMENTS - GASOLINE

Article Text

1991 Volkswagen Passat
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Wednesday, August 25, 1999 07:54PM

ARTICLE BEGINNING

1990-91 ENGINE PERFORMANCE
Volkswagen On-Vehicle Adjustments

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.

ENGINE MECHANICAL

Before performing any on-vehicle adjustments to fuel or ignition systems, ensure engine mechanical condition is okay.

ENGINE COMPRESSION

Check engine compression with engine at normal operating temperature at specified cranking speed, all spark plugs removed and throttle wide open.

COMPRESSION SPECIFICATION TABLE

AA		
Application	Compression Pressure psi (kg/cm ²)	Compression Ratio
Cabriolet	131-174 (9.0-12.0)	8.5:1
Corrado	116-174 (8.0-12.0)	8.0:1
Fox	131-174 (9.0-12.0)	9.0:1
Golf GL & GTI	131-174 (9.0-12.0)	10.0:1
Jetta	131-174 (9.0-12.0)	10.0:1
Jetta GLI	145-190 (10.0-13.0)	10.0:1
Passat	116-174 (8.0-12.0)	10.8:1
Vanagon	145-190 (10.0-13.0)	9.0:1
AA		

VALVE CLEARANCE

NOTE: All models use hydraulic lifters. No adjustments are required.

IGNITION TIMING

NOTE: Basic timing readings are only valid when engine idle speed and idle mixture are within specifications. For best results, manufacturer recommends ignition timing, idle CO

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and idle speed be checked and adjusted in that order.

NOTE: Off idle timing is computer controlled on models with knock sensor(s). Only idle ignition timing can be set.

DIGIFANT II TIMING ADVANCE

1) Check timing advance only after determining that the basic ignition timing is adjusted to specification. With the engine running at normal operating temperature, briefly raise engine speed to above 3000 rpm, repeating this step 4 times. Then let the engine idle for at least 2 minutes.

2) Disconnect the coolant temperature sensor connector. Raise the engine speed to 2300 rpm, and record timing value. Reconnect coolant temperature sensor connector and briefly raise engine speed above 3000 rpm to store knock sensor information in memory. Raise engine speed to 2300 rpm and recheck timing. It should now be 30° +/- 3° more advance than it was with coolant temperature sensor connected.

3) If timing does not advance as specified, first check knock sensor mounting bolt torque, then check knock sensor resistance and wiring. If torque and resistance are within specification and there are no breaks in wiring, then Digifant control unit is probably faulty.

4) If connecting or disconnecting coolant temperature sensor has no effect on timing advance, check continuity of coolant temperature sensor wire. If there are no breaks in wire, then either Digifant control unit or temperature sensor is faulty. See ## FUEL SYSTEM - GASOLINE for information on testing coolant temperature sensor.

EXCEPT VANAGON

1) Warm engine to normal operating temperature (cooling fan should cycle at least once). Remove the 27 mm plastic plug from timing check hole on transaxle bellhousing.

2) With ignition off, connect a tachometer and timing light to vehicle. Start engine, raise speed above 2100 RPM a few times, and allow engine to idle normally. With distributor vacuum hoses connected, timing mark on flywheel should appear at pointer in hole.

NOTE: Before checking engine timing, raise engine speed above 2100 RPM at least 4 times. This must be done each time ignition is turned off and restarted to clear ECU memory and by-pass hot-start, fast-idle function.

3) If an adjustment is needed, turn ignition off and loosen distributor hold-down bolt (2.0L has 2 hold-down bolts) just enough to move distributor by hand. Start engine and allow to idle. Turn distributor until timing mark is aligned with pointer in bellhousing.

4) Stop engine and tighten hold down bolt to 18 ft. lbs. (24 N.m). On 2.0L tighten hold-down bolts to 87 INCH lbs. (10 N.m). Check and readjust if necessary and install plastic plug in inspection hole.

VANAGON

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1) Engine oil temperature must be 176°F (80°C). Connect timing light and tachometer. Start engine and allow to idle. Check ignition timing at 800-1000 RPM

NOTE: Before checking engine timing, raise engine speed above 2100 RPM at least 4 times. This must be done each time ignition is turned off and restarted to clear ECU memory and by-pass hot-start, fast-idle function.

2) If an adjustment is needed, turn ignition off and loosen distributor hold-down bolt just enough to move distributor by hand. Remove connectors from idle stabilizer by squeezing connectors then pulling apart. Plug idle stabilizer connectors together.

3) Start and allow engine to idle. Turn distributor until notch on V-belt pulley matches separation in case. Set timing and RPM. Reconnect electrical connectors to idle stabilizer. Tighten distributor clamp bolt.

IGNITION TIMING TABLE (Degrees BTDC @ RPM)

Application				Checking				Adjusting			
1.8L	.....	4-8 @	870-930	.....	5-7 @	870-930					
2.0L	.....	4-8 @	770-830	.....	5-7 @	770-830					
2.1L	.....	4-8 @	800-900	.....	5-7 @	800-900					

COLD (FAST) IDLE

Fast idle RPM is NOT adjustable.

IDLE SPEED & MIXTURE

NOTE: Mixture adjustment is NOT a part of normal tune-up procedure and should NOT be performed unless mixture control unit is replaced or vehicle fails emissions testing.

NOTE: Ensure fuel system pressure is correct before attempting idle speed or mixture adjustment.

FOX (CIS-E), GTI 2.0L & JETTA GLI (CIS-MOTRONIC)

1) Ignition timing and idle speed must be checked before CO is adjusted. See CHECKING & ADJUSTING under IGNITION TIMING. With ignition timing properly adjusted, check and adjust idle speed, differential pressure regulator current and idle mixture. Repeat adjustments until correct.

2) Warm engine to normal operating temperature. Radiator fan must come on at least once and engine oil temperature must be at least 176°F (80°C). Turn off all electrical equipment, including A/C and

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radiator fan. Disconnect all fuel pressure test equipment (if installed). If injection lines have been removed or replaced, run engine several times to 3000 RPM for about 2 minutes.

3) Ensure idle switch is properly adjusted. Check that auxiliary air regulator valve is fully closed. Pinch shut the hose leading from idle speed boost valve(s). Remove temperature sensor harness connector from temperature sensor. Pull crankcase breather hoses off valve cover and air filter, vent to atmosphere.

4) Remove suction hose from carbon canister. Disconnect "T" fitting from carbon canister at air intake boot. On Fox, remove connector from coolant temperature sensor and install 15,000-Ohm Resistor (VW 1490) on temperature sensor harness. See Fig. 1.

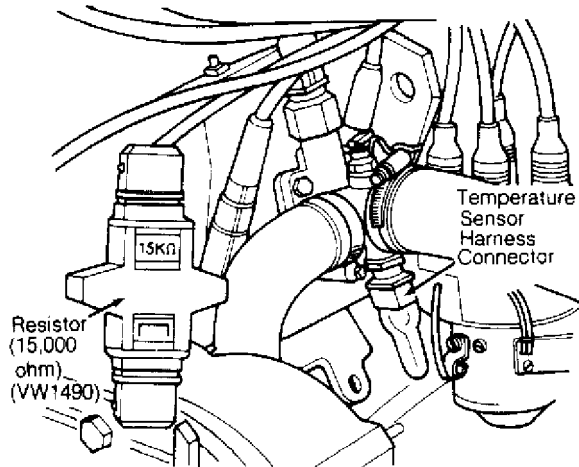


Fig. 1: Locating CTS Sensor & 15,000-Ohm Test Resistor (Fox)
Courtesy of Volkswagen United States, Inc.

5) Turn "T" fitting 90 degrees and insert blank side with .059" (1.5 mm) restrictor into hole in intake air boot. If vehicle is not equipped with this type of connector, use Plug (026 133 382D) with .059" (1.5 mm) orifice. Adjust idle speed if not within specification. See IDLE SPEED & CO LEVEL table.

6) Connect fuel pressure gauge and ensure system fuel pressure is correct. See FUEL SYSTEM in F - BASIC TESTING article in the ENGINE PERFORMANCE Section. Connect an inductive tachometer or Tester (VW 1367) and Test Lead (VW 1473). See Fig. 2.

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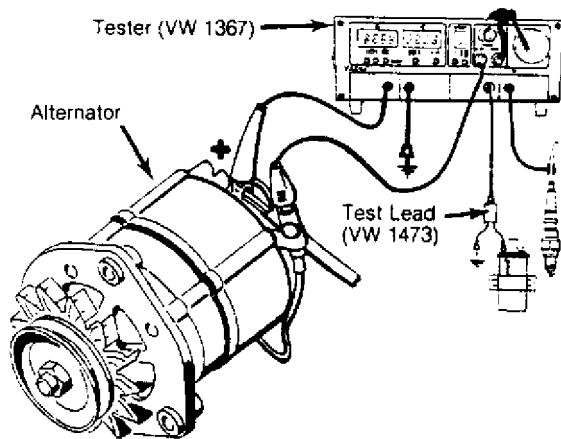


Fig. 2: Tester (VW 1367) & Test Lead (VW 1473)
Courtesy of Volkswagen United States, Inc.

7) Remove C0 probe receptacle cap and connect C0 meter. Ensure fit is snug to prevent exhaust leaks. Connect Digital Multimeter (US 1119) with Adapter (VW 1315 A/1) to differential pressure regulator. See Fig. 3.

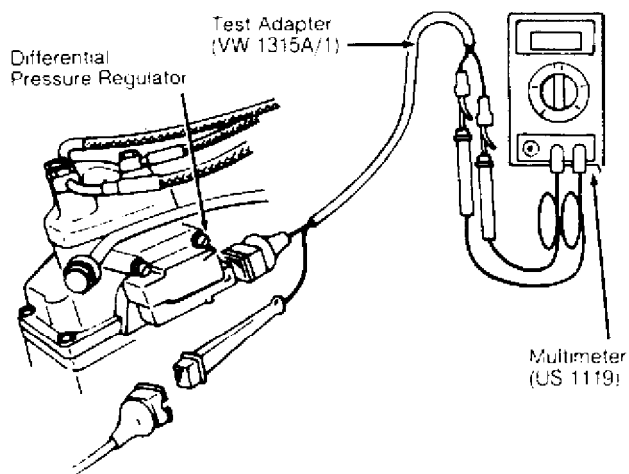


Fig. 3: Making Digital Multimeter Hook-Up
Courtesy of Volkswagen United States

8) Connect adapter between connector and regulator. Connect multimeter to adapter and turn switch to DCA 200-mA range. Read and compare current (4-16 mA) and C0 values to specifications. Turn engine off.

9) If C0 reading is more than 1.2% at current reading of 4-16 mA, check for exhaust system leaks, ignition timing, injector inserts for leaks, and fuel distributor for uneven fuel distribution. If

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required, seal injector inserts with sealing compound and tighten to 15 ft. lbs. (20 N.m).

10) If current reading is less than 4 mA or more than 16 mA, adjustment must be made with C0 adjustment screw.

11) Remove boot from mixture control unit. Center punch plug in C0 adjusting hole and drill a 3/32" hole to a depth of 5/32" (4 mm). DO NOT drill completely through as adjustment screw will be damaged. Install a 1/8" sheet metal screw and remove plug using pliers.

12) Start engine and run at idle. Adjust current reading to 10 mA by turning C0 adjustment screw with Wrench (P 377). Turn screw clockwise to lower reading, counterclockwise to raise reading. See Fig. 4.

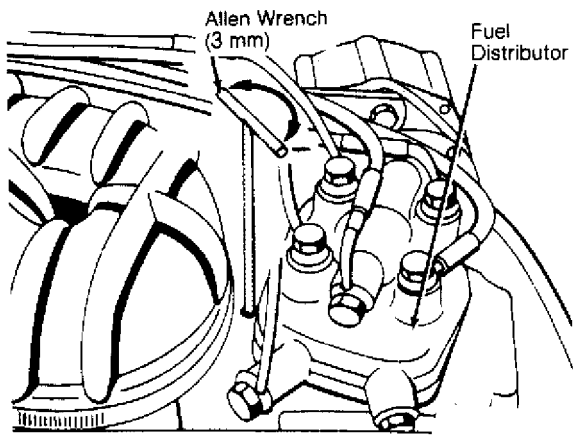


Fig. 4: Adjusting Idle C0 (CIS-E)
Courtesy of Volkswagen United States, Inc.

13) Readjust idle speed if required. Turn engine off. Install new plug in mixture control unit and seat plug flush with unit. Remove all test equipment and reconnect all hoses and wiring.

CABRIOLET, CORRADO, GOLF & GTI 1.8L, JETTA & PASSAT(DIGIFANT)

1) For correct system operation basic adjustments to ignition timing, C0 content and idle speed must be correct. These adjustments are inter-related and must be checked/adjusted together.

2) Warm engine to normal operating temperature (radiator fan should have cycled at least once). Engine oil temperature must be at least 176°F (80°C). All electrical components must be off. Ensure idle speed stabilization system is okay (with ignition ON idle stabilizer valve must hum/buzz). Ensure throttle valve switch is adjusted correctly.

NOTE: Before checking engine timing, raise engine speed above 2100 RPM at least 4 times. This must be done each time engine is turned off and restarted to clear ECU memory and by-pass hot-start, fast-idle function.

3) Connect an inductive tachometer or Tester (VW 1367) to

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alternator, Test Lead (VW 1473) to ignition coil, and timing light lead to No. 1 spark plug wire. See Fig. 2. Start engine and ensure engine speed and timing are correct. If NOT, adjust to specification.

4) Remove Blue cap from CO tap tube rising from exhaust manifold and connect exhaust gas analyzer. Disconnect coolant sensor harness connector. Raise oil dipstick slightly to vent crankcase. Disconnect and plug crankcase ventilation hose. Start engine and raise engine speed to 2100 RPM at least 4 times. Check idle, adjust if incorrect. Ensure CO is correct. See IDLE & CO LEVEL table. If CO adjustment is needed, idle mixture screw anti-tamper plug must be removed from top of air flow sensor.

5) Center punch plug in CO adjusting hole. See Fig. 5. Using a 3/32" drill bit, drill 5/32" (4 mm) deep in center of plug. Remove any metal shavings. Install a sheet metal screw and, using pliers, pry out plug.

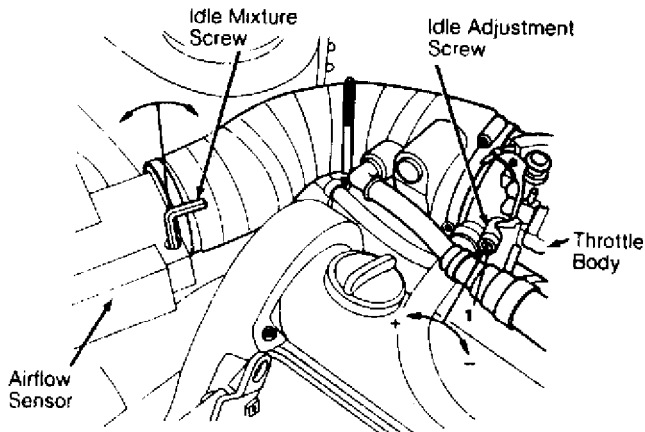


Fig. 5: Locating Idle Mixture Screw & Idle Adjustment Screw (1.8L)
Courtesy of Volkswagen United States, Inc.

6) Adjust idle mixture CO with a 5 mm hex wrench. Turning idle mixture screw clockwise will richen CO. Adjust idle mixture to get correct CO. Check engine idle and CO, repeat procedure if needed.

NOTE: A throttle valve potentiometer is used by the Digifant ECU to sense throttle position. The potentiometer is also used for the activation of the idle stabilizer system, deceleration fuel shutoff and the activation of full throttle enrichment. Corrado models equipped with a 4-speed automatic transmission have 2 separate potentiometers in the same housing. One is for the engine management system and the other for transmission ECU.

VANAGON (DIGIFANT)

1) Warm engine to normal operating temperature. Engine oil temperature must be at least 176°F (80°C). Connect an inductive tachometer or Tester (VW 1367) to alternator, Test Lead (VW 1473) to ignition coil, and timing light lead to No. 1 spark plug wire. Start engine and ensure engine speed and timing are correct. If speed and

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timing are incorrect, adjust to specification.

2) Remove connectors from idle stabilizer by squeezing connectors then pulling apart. Plug idle stabilizer connectors together. Turn idle speed screw until idle speed is correct. To adjust timing, see CHECKING & ADJUSTING under IGNITION TIMING in this article.

3) Ensure all vehicle electrical equipment is off. Place exhaust gas analyzer in exhaust pipe. See IDLE SPEED & CO LEVEL table. If adjustment is needed, go to next step.

4) If adjustment is needed in step 2). Remove intake air sensor from engine. Center punch plug in CO adjusting hole. Using a 3/32" drill bit, drill hole 5/32" (4 mm) deep in center of plug. Remove any metal shavings. Install a sheet metal screw and, using pliers, pry out plug.

5) Disconnect oxygen sensor connector on left side of engine compartment (Green wire). Start engine. Set idle speed and CO reading by alternately turning mixture and idle speed adjustment screws. Reconnect oxygen sensor and idle stabilizer connectors. Let engine idle for 2 minutes.

6) Check CO value. If incorrect, repeat adjusting procedure. If correct turn ignition off. Drive in new adjusting hole plug flush with air intake sensor. Remove all test equipment and reconnect all hoses and wiring.

NOTE: DO NOT push down on adjustment screw and DO NOT accelerate engine with wrench in plate. Remove wrench after each adjustment and accelerate engine briefly before measuring current reading. Always adjust from a high to a low reading.

IDLE SPEED & CO LEVEL TABLE

Application				Idle RPM		CO Level %	
Cabriole	.....	750-850	(1)	.....	.3-1.1		
Corrado	.....	750-850		.....	.3-1.1		
Fox	.....	875-925		.....	(2) 1.2-1.5		
Golf GL, 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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IDLE & FULL THROTTLE SWITCHES

THROTTLE STOP SCREW

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NOTE: Stop screw is set by manufacturer and should NOT be moved.

If basic factory setting has been changed, turn throttle stop screw counterclockwise until there is a gap between stop and screw. Turn screw in until it just touches stop. Turn screw 1/2 turn (180 degrees) further. Check and adjust idle speed and CO.

IDLE & FULL THROTTLE SWITCH ADJUSTMENTS

Idle Switch Adjustment - Digifant (Except Vanagon)

1) Check idle and adjust if needed. Idle air by-pass screw is located in throttle valve. Adjusting screw changes amount of air by-passing throttle plate, raising or lowering idle speed. See Fig. 6.

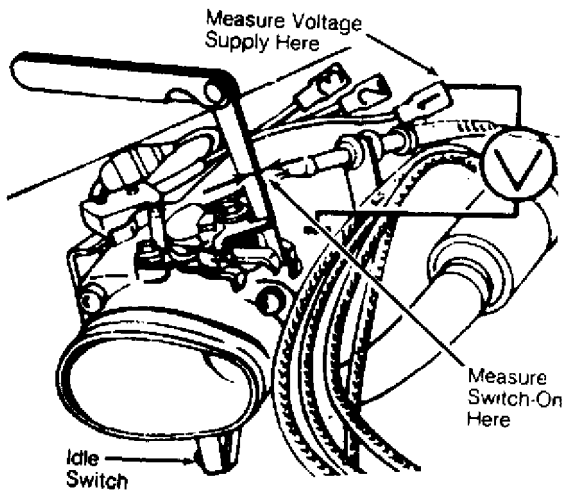


Fig. 6: Checking Idle Switch Adjustment
Courtesy of Volkswagen United States, Inc.

2) To adjust idle speed, disconnect harness connector from coolant temperature sensor. Idle speed should be 925-1025 RPM. If idle speed is not as specified, turn idle air by-pass adjusting screw until 950-1000 RPM is obtained. When coolant temperature sensor harness is reconnected, idle speed should drop to 750-850 RPM.

Idle & Full Throttle Switch - Digifant (Vanagon)

1) Idle and full throttle switches are wired in parallel on throttle valve assembly. Disconnect throttle valve connector from throttle valve switch. Connect voltmeter between terminal in harness connector. Turn ignition on. If 5 volts are not present, check for break in wiring and repair. If no break in wiring, replace Digifant II control unit and recheck.

2) Circuit should be closed when throttle is at rest. Check continuity between test harness terminals No. 1 and 2. If switch-on point is incorrect, loosen and adjust idle switch position. Recheck clearance between throttle valve lever and stop. Ensure clearance is .002-.006 (.15-.05 mm). Throttle switch is located on underside of throttle valve housing, opposite idle stop.

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NOTE: Airflow potentiometer is factory adjusted. No adjustment should be needed, unless component is replaced.

Airflow Sensor Potentiometer Adjustment - CIS-E (Fox)

1) Disconnect airflow sensor potentiometer. Loosen 4 retaining screws and adjust airflow sensor potentiometer until voltage between center terminal and ground is 0.2-0.3 volt.

2) Carefully tighten mounting screws. Raise the sensor plate. Voltage should increase to approximately 7.0 volts. If increase is not as specified, readjust airflow sensor potentiometer. See Fig. 7.

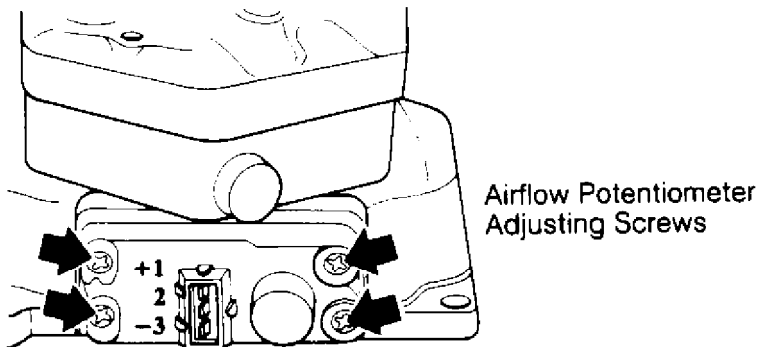


Fig. 7: Adjusting Airflow Sensor Potentiometer (CIS-E)
Courtesy of Volkswagen United States, Inc.

Airflow Sensor Potentiometer Adjustment - CIS-E Motronic (GTI 2.0L & Jetta GLI)

1) Install Test Connector (VW 1501) between airflow sensor potentiometer connector and airflow sensor potentiometer on airflow meter. Check input voltage between terminals No. 1 and 3 with ignition on. See Fig. 8. Voltage should be 4.35-5.35 volts. Turn off ignition.

2) Connect a voltmeter between terminals No. 2 and 3. Output voltage should be within specifications, see AIRFLOW SENSOR (CIS-E MOTRONIC) table. If voltage is not as specified, carefully melt sealer from potentiometer adjusting screw and adjust output voltage.

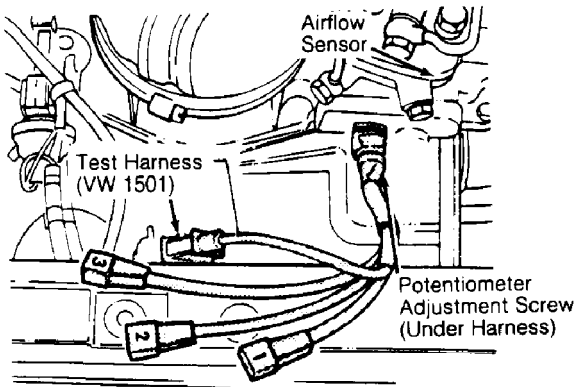


Fig. 8: Adjusting Airflow Potentiometer (CIS-Motronic)
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AIRFLOW SENSOR TABLE (CIS-E MOTRONIC)

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Input Voltage	Output Voltage
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4.35	0.43-0.75
------------	-----------

4.50	0.45-0.77
------------	-----------

4.60	0.47-0.79
------------	-----------

4.70	0.48-0.80
------------	-----------

4.80	0.49-0.81
------------	-----------

4.90	0.50-0.83
------------	-----------

5.00	0.51-0.85
------------	-----------

5.10	0.52-0.87
------------	-----------

5.20	0.53-0.89
------------	-----------

5.30	0.54-0.90
------------	-----------

5.40	0.55-0.91
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AA

END OF ARTICLE