



## Ignition systems

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**Note** For details of the ignition system fitted to 1989 model year turbocharged cars, refer to Chapter B, Section B4 K - Motronic.



# Issue record sheet

The dates quoted below refer to the issue date of individual pages within this chapter.

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## Precautions

### **Danger – Exhaust gases**

To ensure adequate ventilation, always open garage doors fully before starting the car in a garage, or any confined space.

The exhaust gases contain carbon monoxide (CO), which is odourless and invisible, but very poisonous.

Operating the air conditioning system in a confined space increases the danger of these gases entering the car.

### **Danger – High voltage levels**

Dangerously high voltage levels are present in an electronic ignition system. These levels are not only present in individual components, but also in the wiring looms, plugs, sockets, and test connections.

The primary as well as the secondary circuit are subject to these high voltages.

Therefore, whenever the system is switched on ensure that you do not touch components/circuits contained within the ignition system.

### **General precautions**

Whenever possible ensure that the battery master switch (if fitted) is turned to the OFF position or the battery is disconnected. However, it is essential that when disconnecting or connecting electrical components, either the battery master switch is turned to the OFF position or the battery is disconnected.

When carrying out operations that require the battery master switch to be in the ON position and the battery connected **always** ensure that the following procedures are carried out.

The parking brake is firmly applied.

The gear range selector lever is in the park position.

The gearchange isolating fuse (fuse A6) on the main fuseboard F2 is removed.

In addition, the following points should be noted.

**Never** disconnect the battery or switch off the battery master switch when the engine is running.

**Always** ensure correct polarity when making cable connections.

It is recommended that when carrying out tests on the car wiring, a good quality multi-meter is used. **Never** use generator type meters.

Do not use a test lamp on circuitry that contains electronic components, such as the ignition system.

### **Special precautions**

1. Always wear thick rubber gloves and use insulated tools.
2. Before using test equipment always read the manufacturer's instructions.
3. Do not pierce any electrical leads or looms with test probes, etc.

4. Never remove the high tension lead situated between the ignition coil and distributor when the engine is running.

5. Ensure that no arcing takes place between electrical connections.

6. Never supply more than 16 volts direct current to the ignition system.



## Ignition control system

### Introduction

A constant energy ignition control system is fitted.

The system utilises a variable reluctance electronic distributor incorporating an integral amplifier module together with a high energy coil. The system also incorporates resistive type sparking plugs.

### Component description

#### Ignition distributor (see fig. E3-1)

The ignition distributor assembly is situated at the rear of the engine and is driven from the crankshaft via a skew gear.

Contained within the distributor body is an assembly incorporating a permanent magnet and coil; the assembly being linked to an amplifier module. Also contained within the body is a rotor arm and reluctor wheel; the wheel incorporating eight teeth, one per cylinder. Each time a tooth of the reluctor wheel passes close to the coil pole piece (during rotation of the distributor shaft) a small voltage is induced within the coil. The voltage is then passed to the ignition amplifier module. This in turn controls the primary current in the ignition coil.

The advance characteristics of the ignition distributor are controlled by centrifugal weights together with the vacuum advance capsule.

Except during idle speed or at small throttle openings, a gated orifice vacuum signal is applied to the ignition distributor capsule from the throttle body. This ensures smooth running of the engine under all operating conditions and therefore improves fuel economy.

#### Ignition coil

The ignition coil is situated in the engine compartment, mounted on the right-hand inner wing valance (see fig. E3-2).

When the ignition amplifier, located on the distributor body, interrupts the current to the primary winding of the ignition coil a high voltage is induced in the secondary winding. The high voltage is distributed via the distributor rotor arm and high tension leads to the sparking plugs.

#### Sparking plugs

Prior to fitting the sparking plugs ensure that the gap setting corresponds to the figures quoted in Chapter A.

#### Engine crankshaft sensor

To enable ignition timing to be measured using diagnostic test equipment an engine crankshaft sensor is located at the rear of the engine, mounted on the transmission adapter (see fig. E3-3).

When the crankshaft is at 20° atdc the sensor detects a pin on the starter ring carrier. This causes a

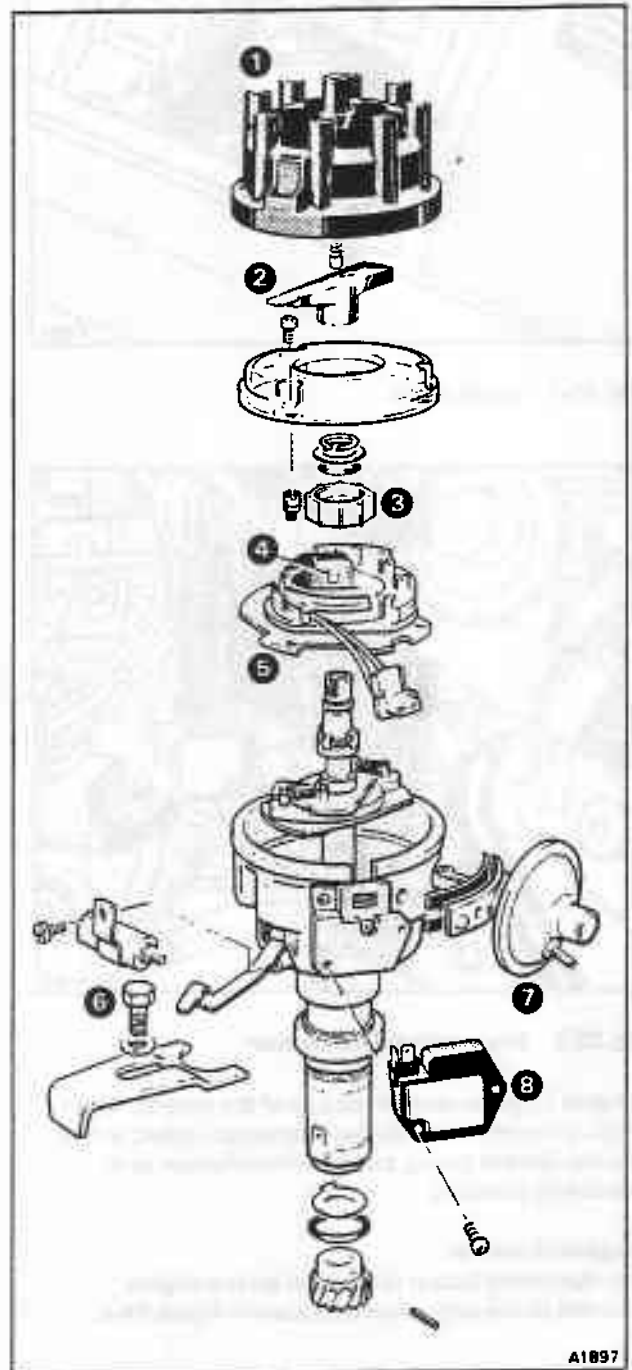
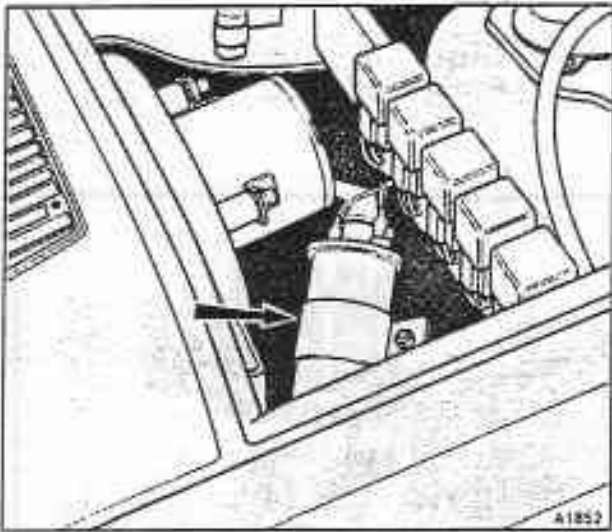
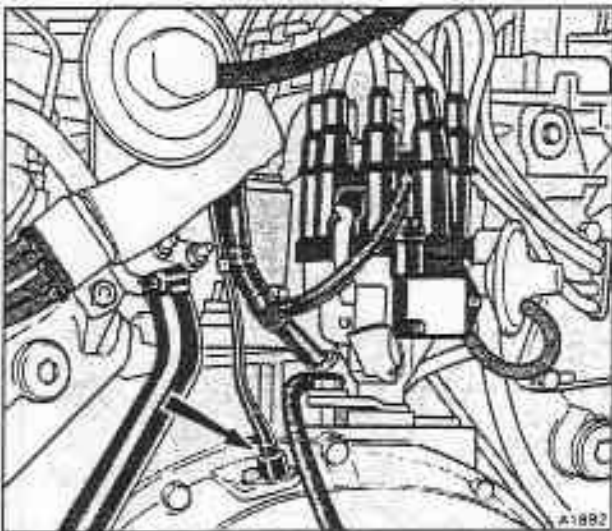


Fig. E3-1 Ignition distributor

- 1 Cover
- 2 Rotor arm
- 3 Reluctor wheel
- 4 Coil pole piece
- 5 Pick-up assembly
- 6 Clamp setscrew
- 7 Vacuum advance capsule
- 8 Amplifier module



**Fig. E3-2 Ignition coil**



**Fig. E3-3 Engine crankshaft sensor**

pulse to be generated in the coil of the sensor. This pulse is transmitted, via the diagnostic socket, to the test equipment giving accurate information as to crankshaft position.

**Diagnostic socket**

The diagnostic socket is situated on the engine adjacent to the alternator as shown in figure E4-4.



## Ignition timing

### Ignition timing

Ignition timing settings vary, dependent upon the country specification of the car. Therefore, prior to commencing work, reference must be made to one of the following ignition timing data charts.

Figure E4-1 Cars conforming to an Australian, Japanese, or North American specification.

Figure E4-2 Cars conforming to a Middle East specification.

Figure E4-3 Cars other than those conforming to an Australian, Japanese, Middle East, or North American specification.

### Ignition – To time

Ignition timing is carried out on A1 cylinder, the front cylinder on the right-hand side of the engine when viewed from the driver's seat.

**Note** It is important that the test equipment used to time the ignition meets the following specification.

Accuracy – Ignition timing within  $\pm 1^\circ$

Rotational speed within  $\pm 10$  rev/min.

1. Ensure that the parking brake is firmly applied, the gear range selector lever is in the park position, and the gearchange isolating fuse (fuse A6) removed from fuseboard F2 at the main fuseboard.

Also ensure that the air conditioning function switch is in the OFF position and any non essential electrical loads are off.

2. Check that the sparking plugs are in good

condition and that the gap settings are correct.

3. Move the battery master switch (if fitted) to the OFF position. Alternatively, disconnect the battery.
4. Connect suitable diagnostic test equipment (e.g. Bosch MOT 201) to the diagnostic socket (see fig. E4-4). Refer to the manufacturer's instructions when connecting this equipment.

If diagnostic test equipment is not available connect a stroboscope and tachometer in accordance with the manufacturer's instructions.

5. Disconnect the vacuum advance hose at the reducer connection (see fig. E4-5). Blank off the exposed hose leading to the throttle body.
6. As necessary move the battery master switch to the ON position or re-connect the battery.
7. Start and run the engine until the coolant thermostat has opened.

Continue to run the engine for a minimum of 15 minutes after the thermostat has opened.

8. As engine speed and ignition timing settings vary, dependent upon the specification of the car, reference must be made to the appropriate ignition timing data chart (see fig. E4-1, E4-2, or E4-3), prior to carrying out Operations 9, 10, 11, 14, and 18.
9. Operate the primary throttles by use of the accelerator pedal until the required engine speed is obtained (see **A** in fig. E4-1, E4-2, or E4-3).

When selecting this speed ensure that it is approached from a higher range.

Engine rev/min	Ignition timing	Remarks
Static	10° btdc	Initial static setting. A1 piston approaching tdc; distributor rotor arm on A1 firing position.
1400 ± 25 <b>A</b>	20° btdc ± 1°	Vacuum advance hose disconnected and exposed hose leading to throttle body blanked off. Approach engine rev/min from a higher speed.
580 (idle speed) <b>B</b>	6° btdc to 14° btdc	Air conditioning function switch in LOW position. Ensure that the compressor clutch is in the engaged position and record ignition timing figure.
580 (idle speed) <b>C</b>	10° to 14° further advanced than the figure recorded in <b>B</b>	Initial Vacuum of 635 mm Hg (25 in Hg) applied using Mityvac pump RH 12495, then reduce to 508 mm Hg (20 in Hg). Ensure that the compressor clutch is in the engaged position when taking ignition timing figure. Ignition timing figure should be between 16° btdc and 28° btdc.

Fig. E4-1 Ignition timing data Cars conforming to an Australian, Japanese, or North American specification



10. Check the ignition timing read out on the diagnostic test equipment. Alternatively, direct the timing light from the stroboscope onto the crankshaft damper timing marks and timing pointer (see fig. E4-6). Check the timing.

11. If the reading is outside the specified limits, slacken the ignition distributor clamp setscrew (see

fig. E3-1) and rotate the distributor body in the appropriate direction until the correct setting is obtained.

Clockwise rotation of the distributor body advances the ignition and conversely anti-clockwise rotation retards the ignition.

After adjustment, tighten the distributor clamp

Engine rev/min	Ignition timing	Remarks
Static	1° btdc	Initial static setting. A1 piston approaching tdc; distributor rotor arm on A1 firing position.
2000 <b>A</b>	Middle East 25° btdc ± 1° Taiwan 30° btdc ± 1°	Vacuum advance hose disconnected and exposed hose leading to throttle body blanked off. Approach engine rev/min from a higher speed.
580 (idle speed) <b>B</b>	Middle East 3° atdc to 5° btdc Taiwan 2° btdc to 10° btdc	Air conditioning function switch in LOW position. Ensure that the compressor clutch is in the engaged position and record ignition timing figure.
580 (idle speed) <b>C</b>	12° to 16° further advanced than the figure recorded in <b>B</b>	Initial Vacuum of 635 mm Hg (25 in Hg) applied using Mityvac pump RH 12495, then reduce to 508 mm Hg (20 in Hg). Ensure that the compressor clutch is in the engaged position when taking ignition timing figure. Ignition timing figure should be between 9° btdc and 21° btdc.

Fig. E4-2 Ignition timing data Cars conforming to a Middle East or Taiwan specification

Engine rev/min	Ignition timing	Remarks
Static	6° btdc	Initial static setting. A1 piston approaching tdc; distributor rotor arm on A1 firing position.
2000 <b>A</b>	30° btdc ± 1°	Vacuum advance hose disconnected and exposed hose leading to throttle body blanked off. Approach engine rev/min from a higher speed.
580 (idle speed) <b>B</b>	2° btdc to 10° btdc	Air conditioning function switch in LOW position. Ensure that the compressor clutch is in the engaged position and record ignition timing figure.
580 (idle speed) <b>C</b>	12° to 16° further advanced than the figure recorded in <b>B</b>	Initial Vacuum of 635 mm Hg (25 in Hg) applied using Mityvac pump RH 12495, then reduce to 508 mm Hg (20 in Hg). Ensure that the compressor clutch is in the engaged position when taking ignition timing figure. Ignition timing figure should be between 14° btdc and 26° btdc.

Fig. E4-3 Ignition timing data Cars other than those conforming to an Australian, Japanese, Middle East, North American, or Taiwan specification

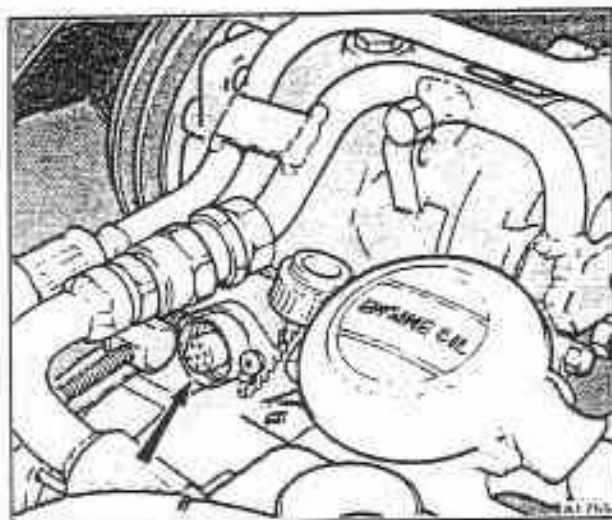


Fig. E4-4 Diagnostic socket

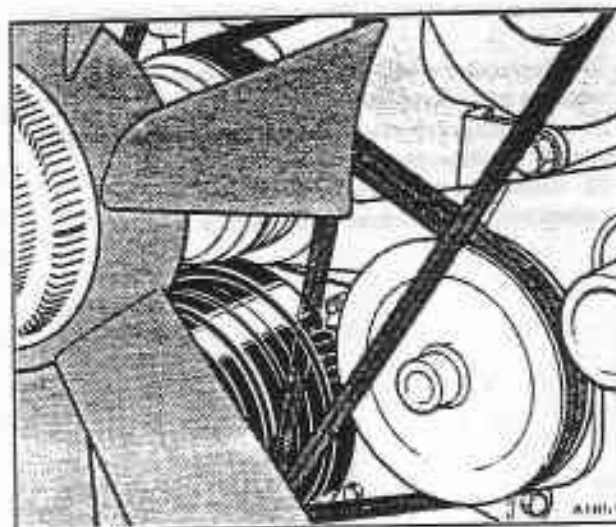


Fig. E4-6 Crankshaft damper timing marks

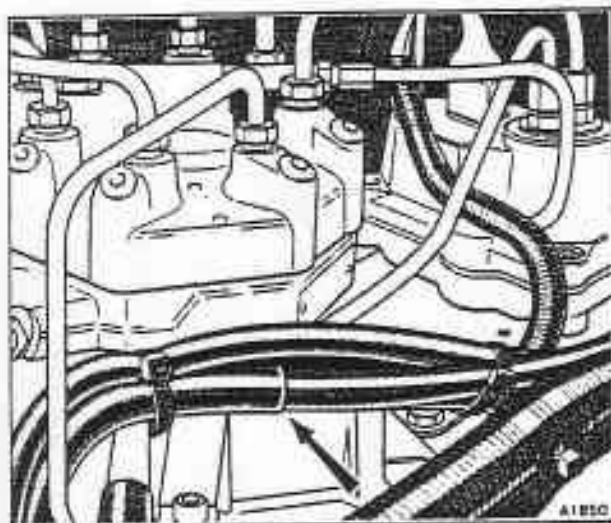


Fig. E4-5 Vacuum advance hose reducer connection

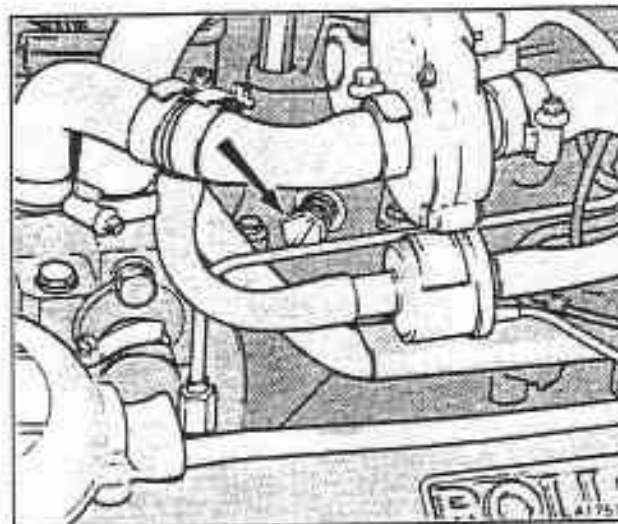


Fig. E4-7 Idle speed adjustment screw

setscrew (finger tight plus half a turn) and check to ensure that the reading is still within the specified limits.

12. Select LOW position on the air conditioning function switch and ensure that the compressor clutch, situated in the engine compartment, has engaged.

With the switch in LOW position the compressor clutch will cycle in and out. Therefore, when carrying out Operations 13, 14, and 18 ensure that the compressor clutch is always in the engaged position.

13. Set the engine idle speed to 580 rev/min by means of the adjustment screw on the throttle body (see fig. E4-7). Clockwise rotation of the screw reduces the rev/min; anti-clockwise rotation increases the rev/min.

14. Check the ignition timing to ensure that it corresponds with the timing figures quoted in the relevant chart (see **B** in fig. E4-1, E4-2, or E4-3). Record the figure obtained.

If the figure is outside the specified range, this indicates that the distributor is faulty and a new unit must be fitted.

15. Stop the engine.

16. Locate the exposed hose from the vacuum advance capsule and connect a Mityvac pump RH 12495 to this hose.

17. Start the engine and apply an initial vacuum of 635 mm Hg (25 in Hg). Then, reduce the vacuum to 508 mm Hg (20 in Hg).

18. Adjust the engine idle speed to 580 rev/min. Note the ignition timing figure obtained in Operation 14 and check that the timing has further advanced by the amount specified in the relevant chart (see **C** in fig. E4-1, E4-2, or E4-3).

If the figure is outside the specified range, this indicates that the distributor is faulty and a new unit must be fitted.

19. Stop the engine. As necessary move the battery



master switch to the OFF position or disconnect the battery.

20. Remove the test equipment and re-connect the vacuum advance hose.

21. As necessary move the battery master switch to the ON position or re-connect the battery.

22. Check the engine idle speed and adjust if necessary, as described in Chapter B.



## Ignition control system

### Introduction

To provide optimum ignition timing a digital electronic ignition control system is fitted.

The system (see fig. E5-3) incorporates engine sensors, an EZ 58F electronic control unit, group 1 ignition amplifier and coil, group 2 ignition amplifier and coil, a two times four-way ignition distributor, and resistive type sparking plugs.

**Ignition timing is pre-programmed and is not adjustable. Under no circumstance must any attempt be made to rotate the ignition distributor housing.**

### Component description

#### Engine sensors

The sensors located at various positions on the engine, monitor operating conditions. The information obtained from the sensors is transferred to the EZ 58F electronic control unit providing a constant indication of engine operating conditions. This enables the EZ 58F to provide optimum ignition timing.

**Crankshaft sensor** (see fig. E5-1) The sensor monitors engine speed and crankshaft position by obtaining a signal from the timing wheel mounted on the end of the crankshaft.

A regular waveform is induced by the sensor from the 124 tooth timing wheel. Each time an odd tooth spacing on the timing wheel passes the sensor tip an indication is produced in the waveform pattern. This provides a reference point for the EZ 58F electronic control unit.

The air gap between the tip of the sensor and the timing wheel should be between 0,5mm and 1,5mm (0.019in and 0.059in).

**Engine coolant temperature sensor** (see fig. E5-2)

Located in the engine thermostat housing, the sensor provides the EZ 58F electronic control unit with information as to engine coolant temperature.

**Ignition system Piezo resistive pressure transducer**

(see fig. E5-4) This sensor is located within the EZ 58F electronic control unit. It obtains information as to the load on the engine by measuring the absolute induction manifold pressure from a tapping on the induction manifold.

**Throttle position switch** (see fig. E5-5) The switch unit is mounted onto the throttle body and is connected to the spindle of the primary throttle plates. It identifies the position of the accelerator pedal and supplies the EZ 58F electronic control unit with information as to the operating mode of the engine (i.e. idle speed/ overrun, part load, or full load).

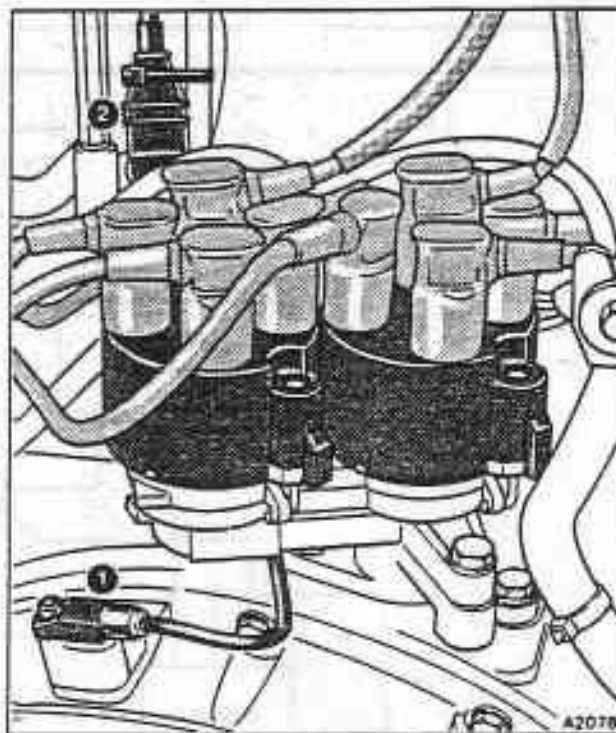


Fig. E5-1 Crankshaft sensor, plug, and socket

- 1 Sensor
- 2 Plug and socket

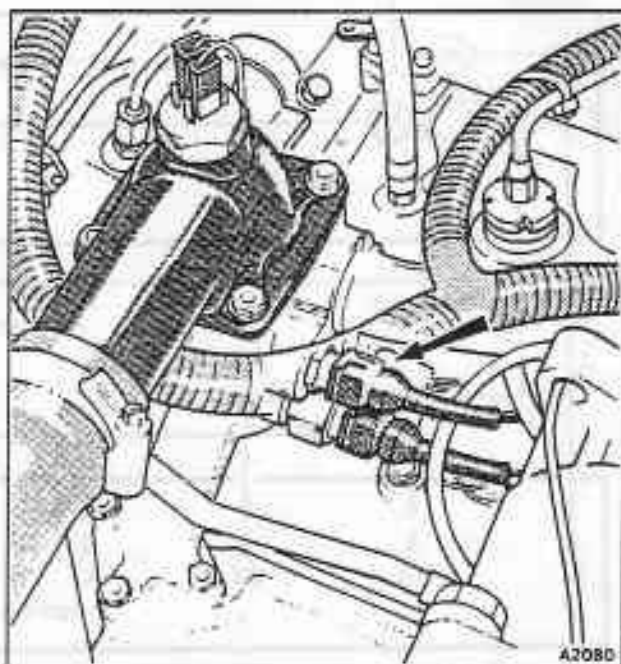
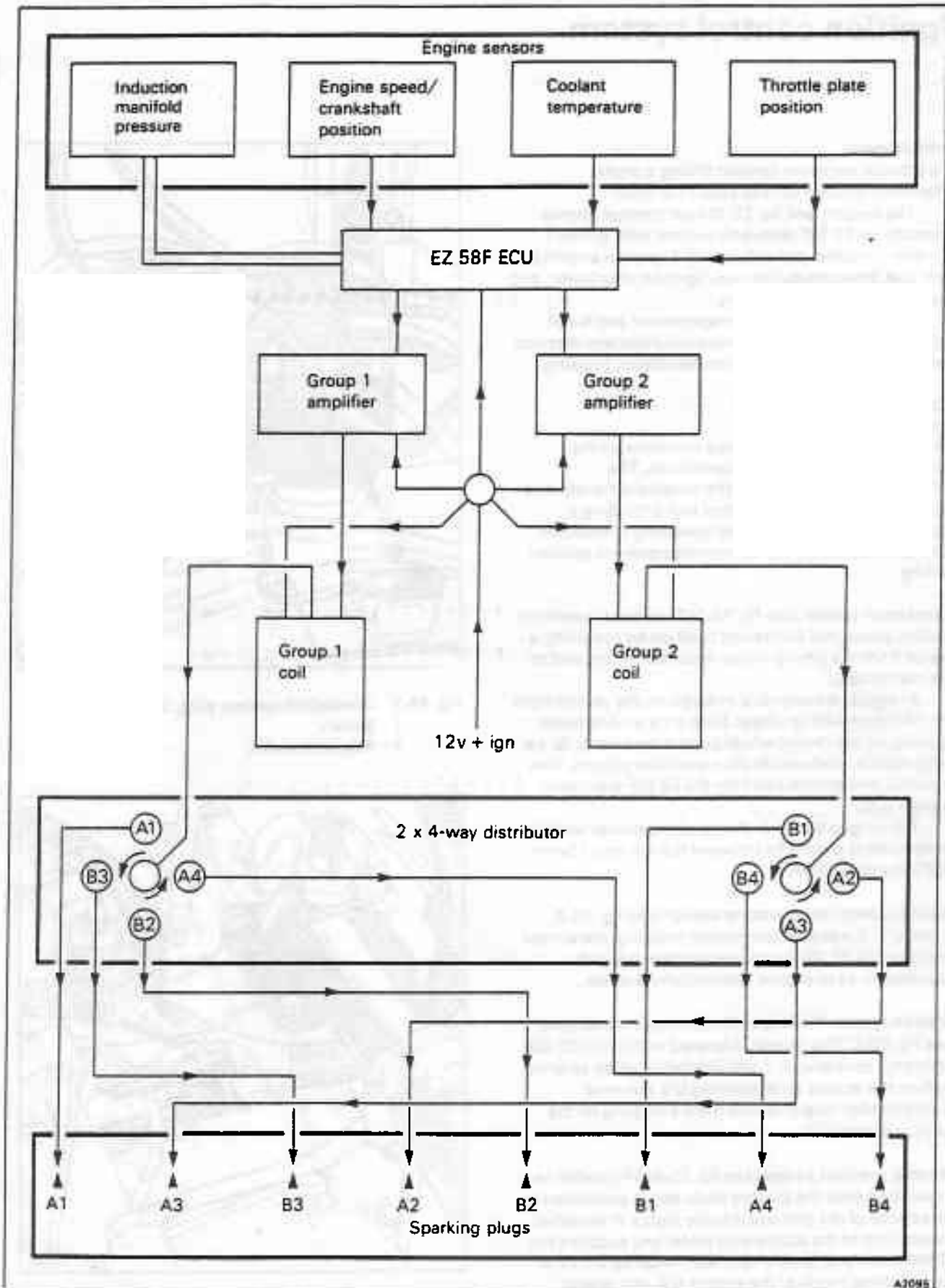
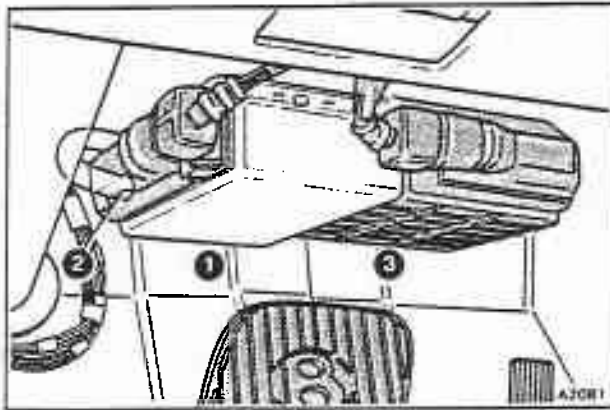


Fig. E5-2 Engine coolant temperature sensor



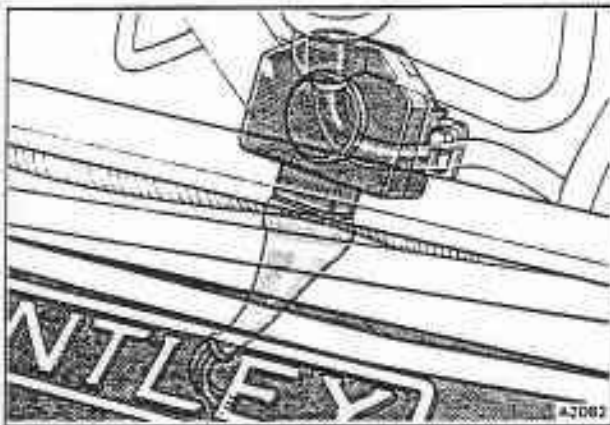
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Fig. E5-3 Digital electronic ignition control system

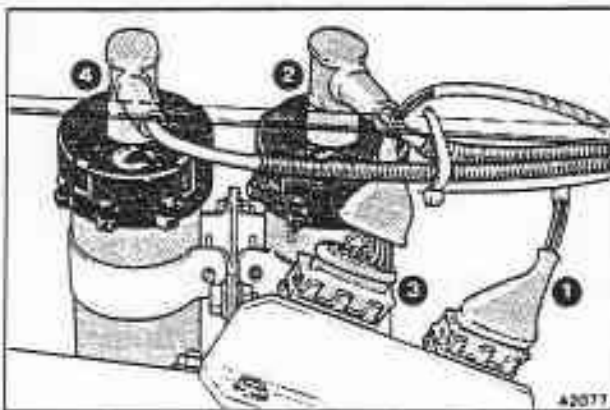


**Fig. E5-4 Ignition system EZ 58F digital electronic control unit**

- 1 Electronic control unit
- 2 Piezo resistive pressure transducer
- 3 KE2-Jetronic fuel injection system electronic control unit



**Fig. E5-5 Throttle position switch**



**Fig. E5-6 Ignition amplifiers and coils**

- 1 Group 1 amplifier
- 2 Group 1 coil
- 3 Group 2 amplifier
- 4 Group 2 coil

#### **EZ 58F digital electronic control unit (see fig. E5-4)**

The electronic control unit incorporates four pre-programmed ignition advance maps. These maps are designated – cranking and low engine rev/min, idle speed/overrun, part load, and full load.

#### **Ignition amplifier modules (see fig. E5-6)**

The amplifier modules (group 1 and group 2) are located adjacent to the bulkhead on the right-hand side of the engine compartment to the rear of the windscreen washer fluid reservoir. They are mounted on a common heat sink.

The amplifiers provide first stage amplification of low tension signals from the EZ 58F electronic control unit to the ignition coils.

#### **Ignition coils (see fig. E5-6)**

The ignition coils (group 1 and group 2) are located adjacent to the bulkhead on the right-hand side of the engine compartment to the rear of the windscreen washer fluid reservoir.

When the low tension to the coil primary winding is interrupted by its amplifier, high tension is induced in the coil secondary winding. This high tension is then passed to the ignition distributor.

#### **Ignition distributor (see fig. E5-1)**

The distributor assembly is mounted at the rear of the engine. It is driven by a gear situated on the end of the camshaft.

The unit incorporates two four-pole ignition distributor caps connected by a toothed drive belt. A rotor arm in each cap distributes the high tension from the ignition coils to the sparking plugs.

#### **Sparking plugs**

The sparking plugs are NGK BPR 5 EV with the gap set to 1,0mm (0.040in).

#### **Cylinder firing order**

A1, A3, B3, A2, B2, B1, A4, B4.



## Ignition system test procedures

Prior to commencing fault diagnosis on the EZ 58F digital electronic ignition control system it must be established that the mechanical functions of the engine are operating correctly, that the KE2-Jetronic fuel injection system is operating correctly, and that the battery is in a good state of charge.

When carrying out the following procedures it is essential that all workshop safety precautions and the precautions described in Section E2 are observed.

### Equipment required

1. A stroboscopic ignition timing lamp
2. A suitable tachometer
3. A vacuum pump with a range of up to 635mm Hg (25in Hg)
4. A digital multi-meter
5. Equipment suitable for testing high tension (HT)

**Note** It is important that the test equipment used to check the ignition timing meets the following specification.

Accuracy – Ignition timing within  $\pm 1^\circ$

Rotational speed within  $\pm 10$  rev/min.

### Basic fault diagnosis

The basic ignition system fault diagnosis chart given in figure E6-2 provides a list of basic symptoms and possible ignition system causes.

**Note** The symptoms described could also be caused by fuel system failure or boost control system failure.

The chart also indicates which ignition system test procedures should be carried out to rectify a specific problem. When carrying out a test procedure reference can also be made to the appropriate wiring diagram in Section E7.

### Test procedures

#### High tension (HT)

1. Using suitable test equipment check for spark (HT) at a sparking plug during engine cranking.  
If HT is present proceed to Operation 3.

2. Ensure that all HT leads, the ignition distributor caps, and the rotor arms are in good condition.

Using the multi-meter check the series suppression resistance of the ignition system components (see fig. E6-1), renew as necessary.

**Note** To remove a distributor cap depress each of the two retaining screws and rotate them a quarter of a turn anti-clockwise, then lift off the cap.

Reverse the procedure to fit the cap.

Repeat Operation 1. If HT is not present proceed to Operation 4.

3. Referring to figure E5-3 ensure that the HT leads of the group 1 and group 2 ignition systems are not crossed. Also ensure the correct firing order A1, A3, B3, A2, B2, B1, A4, B4.

Using the multi-meter check the series

Component	Resistance
Rotor arms _____	1 K $\Omega$ $\pm$ 100 $\Omega$
Ignition distributor towers _____	1 K $\Omega$ $\pm$ 100 $\Omega$
HT leads _____	0.1 $\Omega$ – 0.5 $\Omega$
Sparking plug connector caps _____	5 K $\Omega$ $\pm$ 100 $\Omega$
Sparking plugs _____	5 K $\Omega$ $\pm$ 100 $\Omega$

Take into account the internal resistance of test leads/probes when carrying out the above measurements.

Fig. E6-1 Ignition system components series suppression resistance

suppression resistance of the ignition system components as given in figure E6-1. Renew components as necessary and re-test the system.

#### Primary ignition system

4. To enable Operations 5 to 8 inclusive to be carried out it is recommended that the windscreen washer fluid reservoir is removed.

5. Fold back the sleeving at each ignition amplifier plug. Switch on the ignition. Using the multi-meter measure the voltage between the black cable (earth) at pin 2 and the white cable (positive) at pin 4 on each ignition amplifier.

If a voltage reading cannot be obtained.

- a. Verify that fuse B3 at fuseboard F1 is intact.
- b. Ensure the continuity of the white cable at pin 4 of each ignition amplifier to fuse B3 at fuseboard F1.
- c. Ensure the continuity of the black cable at pin 2 of each ignition amplifier to its earth connection.

If a voltage reading of less than 12 volts is obtained.

- a. Check the condition of the battery. Rectify if necessary.
- b. Referring to the wiring diagram in Section E7 ensure that no high resistance occurs in the routing of the white cables from pin 4 of each ignition amplifier to fuse B3 at fuseboard F1.
- c. Ensure the integrity of the earth connection on the black cable at pin 2 of each ignition amplifier.

6. Using the multi-meter, measure the voltage between the white cable at terminal 15 of each ignition coil and a known earth point. Also measure the voltage between the white cable at pin 25 of the EZ 58F electronic control unit and a known earth point. In each case ensure that a 12 volts positive supply is available on the white cables.

If a voltage reading cannot be obtained ensure the continuity of the white cable to fuse B3 at fuseboard F1.

#### Ignition coils

7. Remove the protective cover from each ignition coil and inspect the blanking plug. If the plug is



displaced or sealing compound has escaped, fit a new coil.

Using the multi-meter and taking into account the resistance of the test leads, ensure the resistance of the primary and secondary windings at each ignition coil as follows.

- Between terminals 1 and 15 0.4  $\Omega$  to 0.7  $\Omega$
  - Between terminals 1 and 4 4.9 K  $\Omega$  to 8.7 K  $\Omega$
- If a reading is outside the limits fit a new coil.

**Ignition amplifiers**

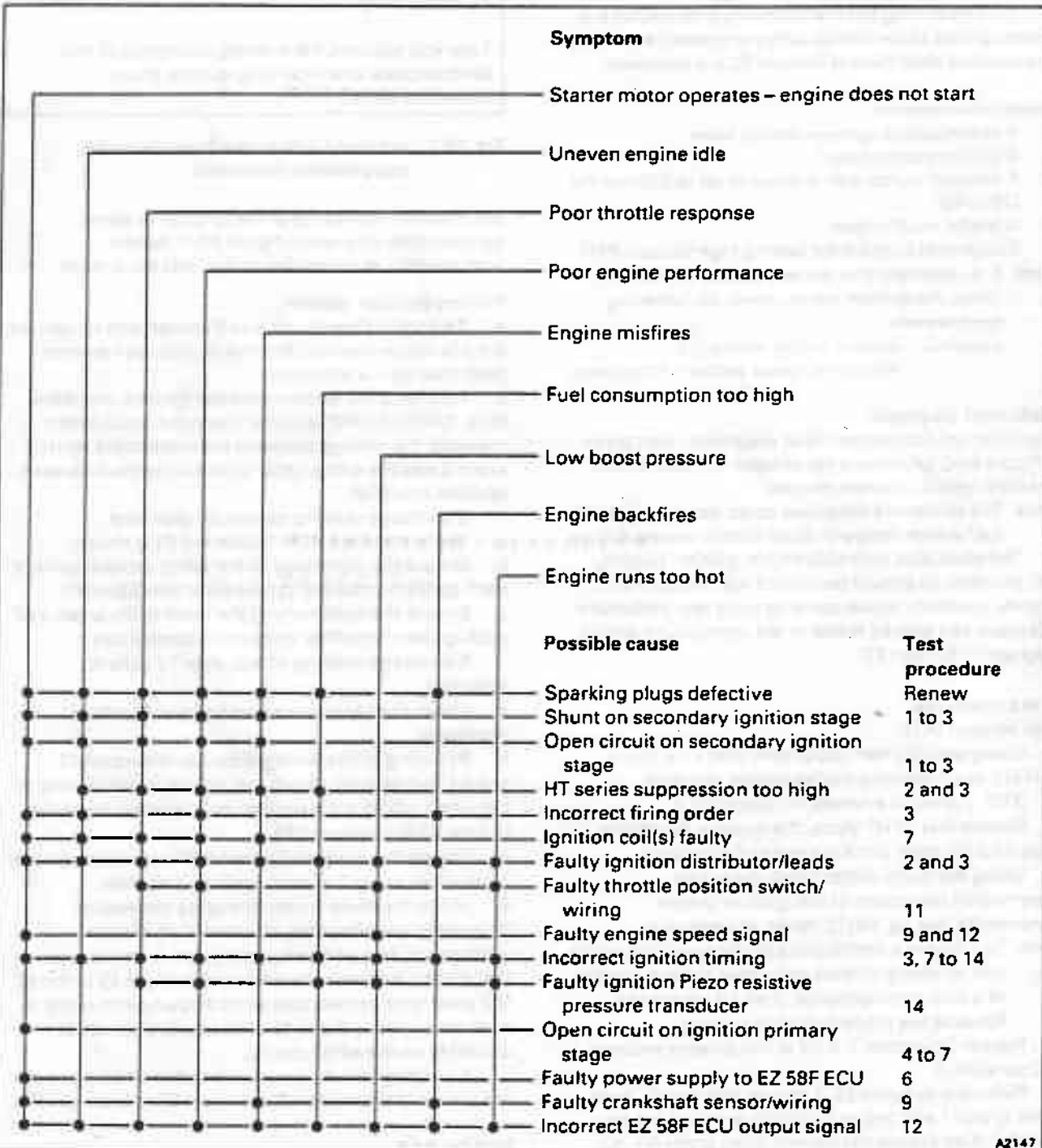
8. Remove the ignition amplifier plugs and at each

plug ensure continuity between the blue/black cable at pin 3 and the red cable at pin 5. Also ensure continuity of the white/black cable at pin 1 to its coil connection.

Re-connect the amplifier plugs. Carry out Operations 1, 2, and 3. If the ignition coils fail to generate HT replace the ignition amplifiers as necessary.

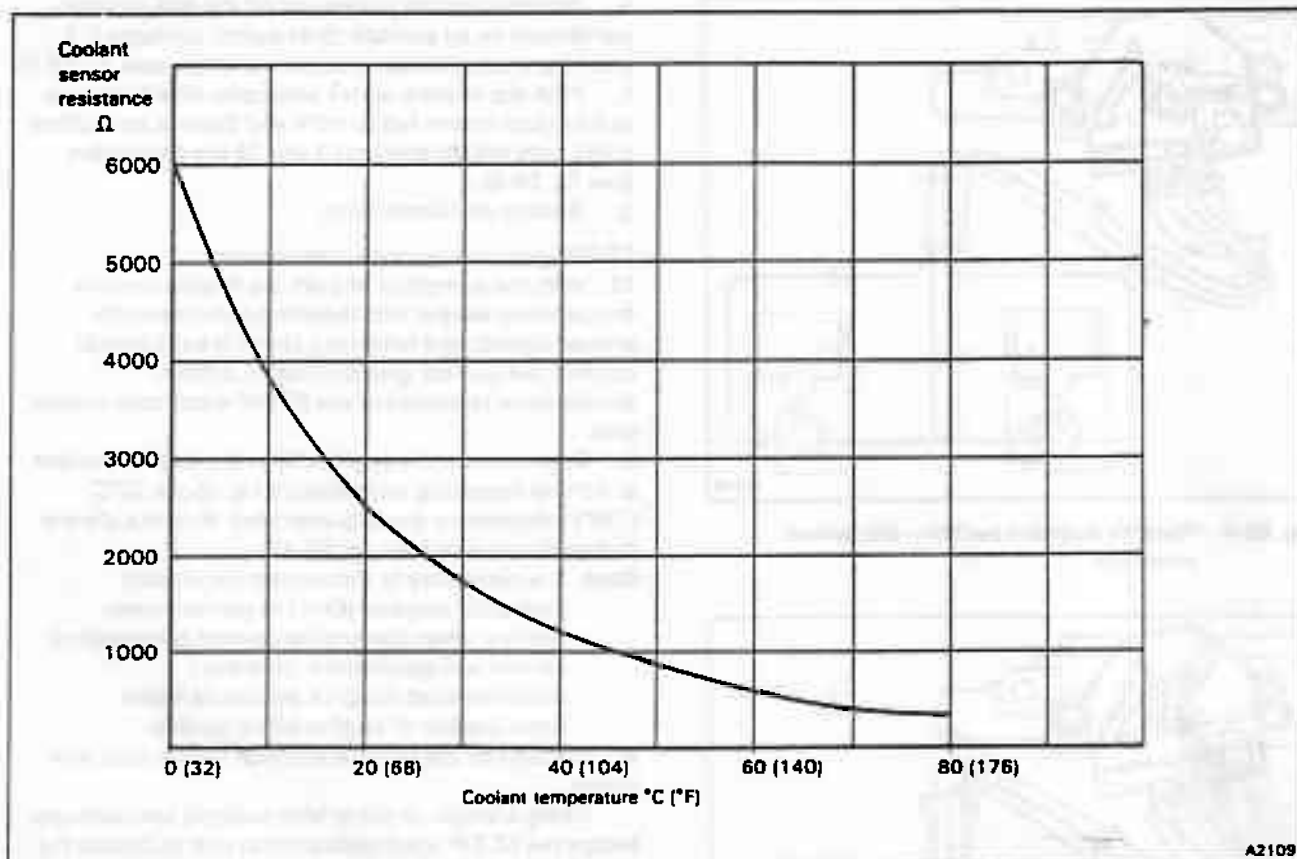
**Crankshaft sensor**

9. Disconnect the three-way plug and socket to the crankshaft sensor. Using the multi-meter ensure the following.



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Fig. E6-2 Ignition system fault diagnosis chart



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**Fig. E6-3 Engine coolant temperature sensor resistance characteristic graph**

- The continuity of the blue cable at pin 1 of the loom connector to pin 7 of the EZ 58F electronic control unit.
- The continuity of the brown cable at pin 2 of the loom connector to pin 19 of the EZ 58F electronic control unit.
- The internal resistance of the crankshaft sensor, measured between pins 1 and 2 of the sensor connection, is between 0.6 KΩ and 1.6 KΩ.

If the measurement is outside these limits fit a new sensor. Re-make all connections.

#### Engine coolant temperature sensor

10. The sensor provides information to both the EZ 58F electronic control unit (via the green/blue cable) and the KE2-Jetronic fuel injection system electronic control unit (via the yellow/blue cable).

Disconnect the plug from both the EZ 58F electronic control unit and from the KE2-Jetronic fuel injection system electronic control unit.

Using the multi-meter ensure the following.

- Continuity of the black cable at pin 10 of the EZ 58F electronic control unit plug to its earth connection.
- Continuity of the green/blue cable at pin 23 of the EZ 58F electronic control unit plug to the engine coolant temperature sensor.
- Resistance measured between pins 10 and 23 of the EZ 58F electronic control unit plug compares with

the sensor resistance characteristic graph given in figure E6-3.

**Note** Under service conditions it may not be practical to gauge precise engine coolant temperature. Therefore carrying out the test with a cold engine (e.g. after the car has stood overnight) would mean that coolant temperature and ambient air temperature would be similar.

#### Throttle position switch

11. The throttle position switch provides information to both the EZ 58F electronic control unit and to the KE2-Jetronic fuel injection system electronic control unit.

Disconnect the plug from the EZ 58F electronic control unit and from the KE2-Jetronic electronic control unit.

Using the multi-meter and referring to the wiring diagram in Section E7 ensure the following.

- Continuity of the blue/purple cable at pin 4 of the EZ 58F electronic control unit plug to its connection at the throttle position switch.
- Continuity of the yellow/purple cable at pin 17 of the EZ 58F electronic control unit plug to its connection at the throttle position switch.
- Continuity of the black cable at the throttle position switch to its earth connection.
- With the throttle plates closed only switch contacts 2 and 18 are connected (see fig. E6-4).

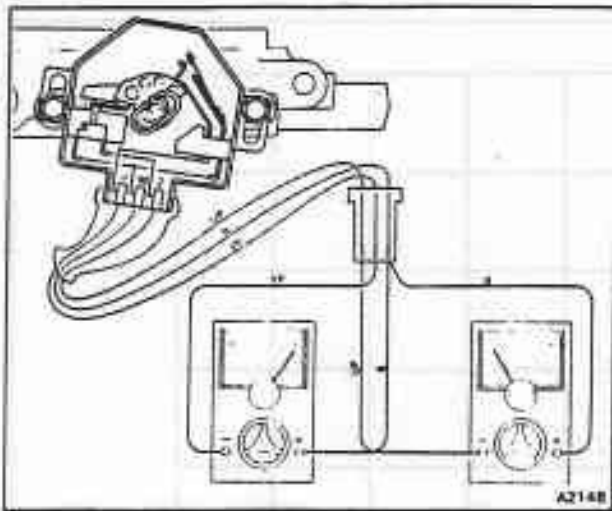


Fig. E6-4 Throttle position switch – idle speed condition

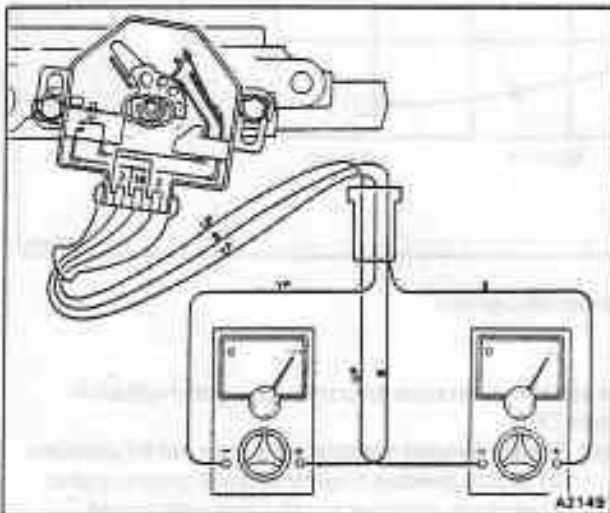


Fig. E6-5 Throttle position switch – part load condition

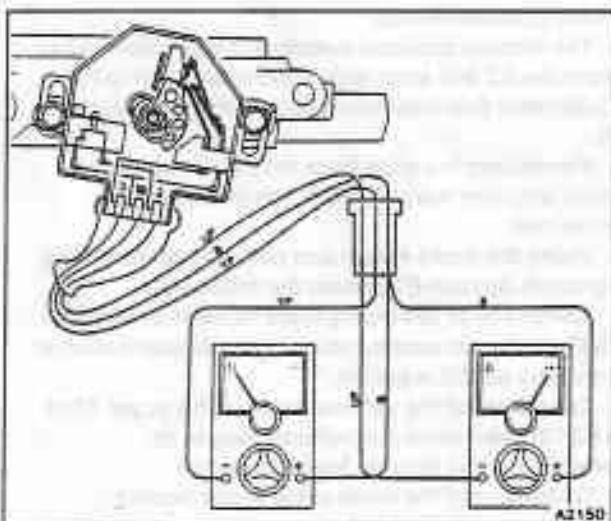


Fig. E6-6 Throttle position switch – full load condition

- e. With the throttle plates just off the idle position (confirmed by an audible click) switch contacts 2, 3, and 18 are open circuit i.e. not connected (see fig. E6-5).
- f. With the throttle plates fully open (the switching point is just before full throttle and there is no audible click), only switch contacts 3 and 18 are connected (see fig. E6-6).
- g. Restore all connections.

#### EZ 58F ignition electronic control unit

12. With the operation of both the engine coolant temperature sensor and throttle position switch proved correct, the following check is sufficient to confirm the correct ignition/engine coolant temperature response of the EZ 58F electronic control unit.

- a. Start and run the engine. With the engine coolant at normal operating temperature i.e. above 80°C (176°F) disconnect the two-way plug from the electro hydraulic actuator (see fig. E6-11).

**Note** It is necessary to disconnect the electro hydraulic actuator (EHA) to prevent over-fuelling when the engine coolant temperature sensor is disconnected. However, disconnecting the EHA will cause some deterioration of engine idling quality.

- b. Disconnect the throttle position switch plug and socket.

Using a length of cable with suitable connections bridge the EZ 58F electronic control unit to initiate the ignition idle speed map.

The bridge should be made at the black and blue/purple connections on the control unit side of the throttle position switch plug and socket.

- c. Partly open the engine throttles to set a stabilized engine speed at approximately 700 rev/min. Using a stroboscopic timing light, connected in accordance with the manufacturer's instructions, measure the degree of ignition advance at the crankshaft damper timing marks (see fig. E6-12).

- d. Disconnect the two-way connector from the engine coolant temperature sensor. Check that the ignition timing has advanced by 2° btdc.

Should this check not prove satisfactory renew the EZ 58F electronic control unit.

Restore all plug and socket connections to return the system to basic engine settings.

#### Ignition timing

13. All ignition timing checks must be carried out with the engine speed stabilized and with the engine coolant at normal operating temperature i.e. above 80°C (176°F).

**Note** Although engine settings are carried out with the air conditioning system switched on and with the compressor clutch engaged, it will prove more convenient to carry out the following checks with the air conditioning system switched off. However, it is essential that when re-setting the engine idle speed at the conclusion of these checks, the air conditioning system is switched on and the compressor clutch is engaged.

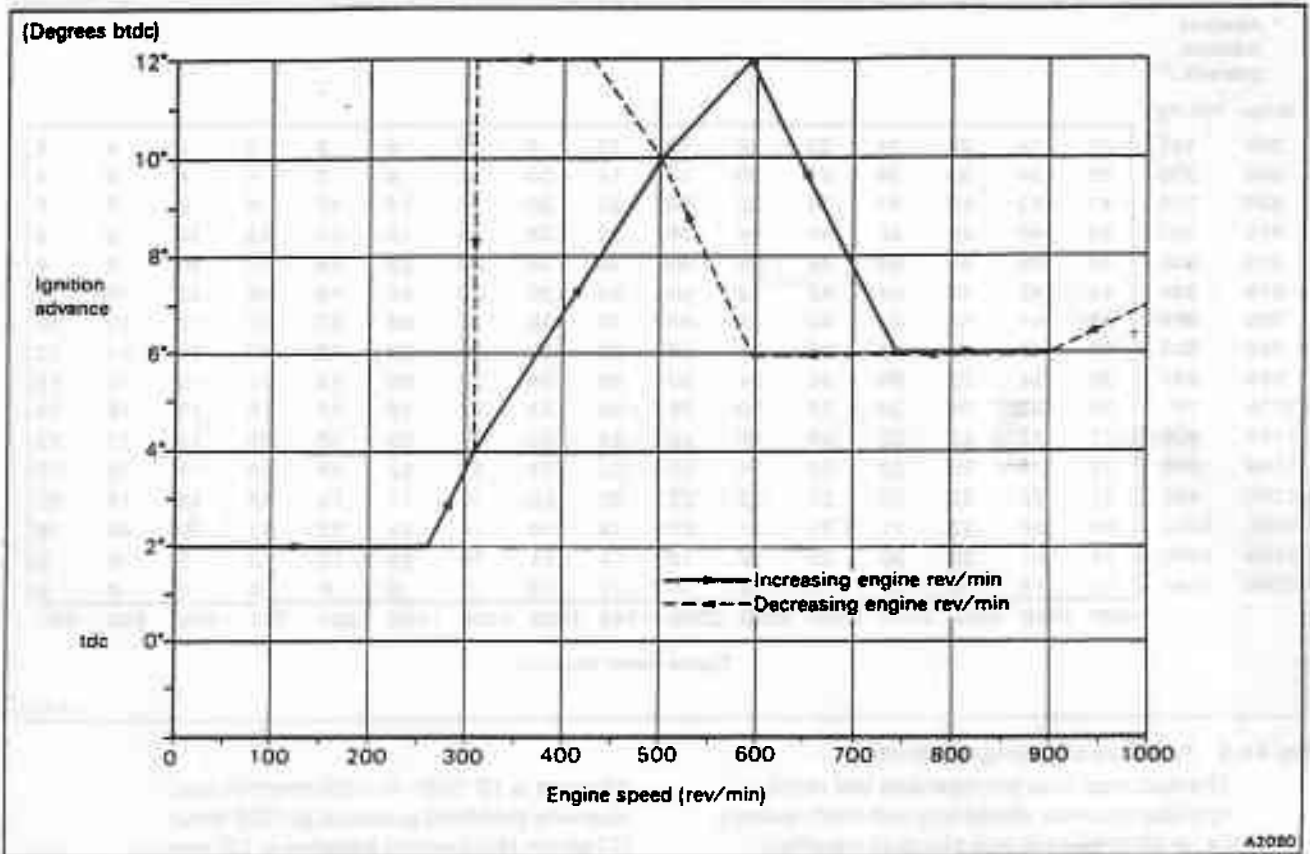


Fig. E6-7 Cranking and low rev/min stabilization map

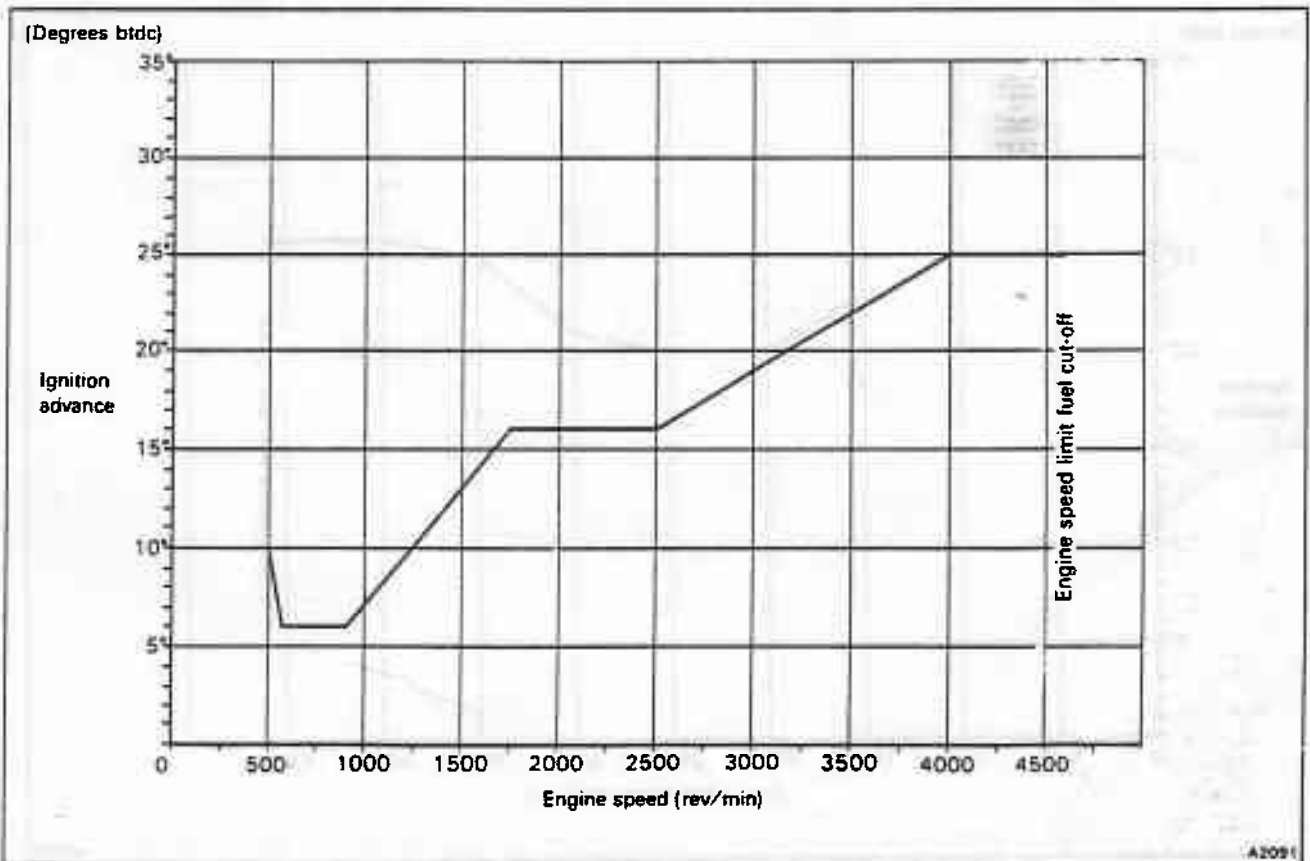


Fig. E6-8 Idle speed/overrun map



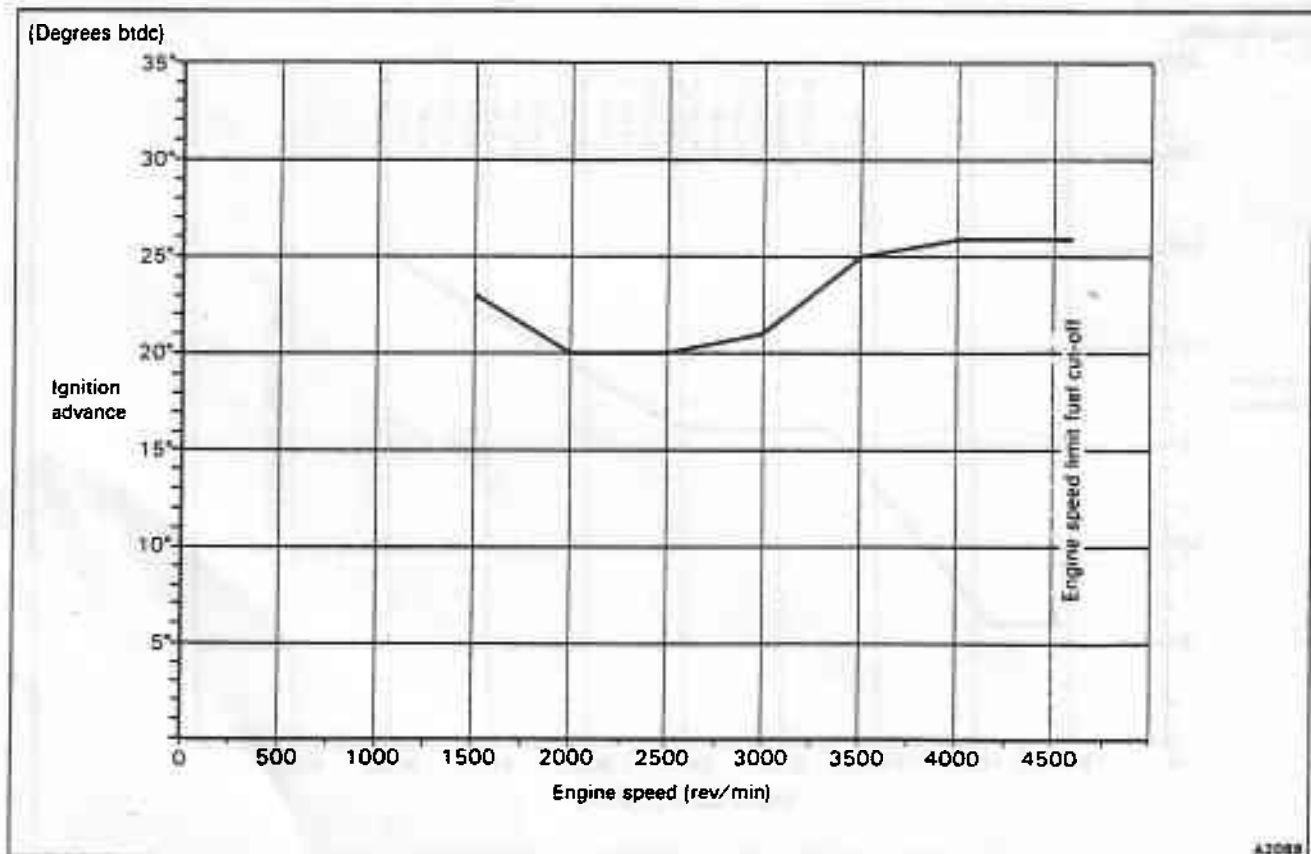
Absolute manifold pressure																	
m bar	mm Hg	4000	3500	3000	2750	2500	2250	2000	1750	1500	1300	1100	900	744	598	500	430
255	191	36	34	26	24	22	16	12	10	8	6	6	6	6	6	6	6
340	255	36	34	30	26	24	20	16	12	10	8	8	6	6	6	6	6
425	320	41	43	40	34	34	30	26	22	20	18	14	10	8	6	6	6
510	382	44	46	46	46	44	44	38	32	28	24	18	16	12	10	8	8
595	446	44	46	46	44	44	44	40	34	30	26	22	16	14	10	8	8
675	506	44	46	46	44	42	42	40	34	30	26	24	18	16	12	10	8
760	570	44	44	44	43	40	41	40	36	28	24	24	20	17	13	12	10
845	633	40	40	42	42	38	38	36	32	26	24	22	18	17	14	14	12
930	697	35	34	36	36	36	34	33	28	24	22	20	18	17	15	15	13
1015	791	32	32	34	34	32	30	28	26	23	22	18	16	16	15	15	13
1100	825	27	27	28	28	28	28	26	24	23	21	18	16	16	15	15	13
1185	889	27	24	23	23	23	24	23	22	22	20	18	15	14	14	15	13
1270	952	27	24	22	22	22	23	22	20	20	18	17	14	13	13	14	12
1355	1016	26	25	22	21	21	21	21	18	16	14	13	12	11	10	10	8
1440	1080	24	22	20	20	20	18	16	14	12	10	10	10	9	8	8	8
1525	1144	12	16	18	18	18	16	14	12	10	8	8	8	8	8	8	8

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Fig. E6-9 Part load map (degrees btdc)

The part load map extrapolates last point ignition advance values beyond 4000 rev/min, i.e. at 4000 rev/min and absolute manifold pressure at 1525 mbar (1144mm Hg) ignition

advance is 12° btdc. At 4600 rev/min and absolute manifold pressure at 1525 mbar (1144mm Hg) ignition advance is 12° btdc.



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Fig. E6-10 Full load map

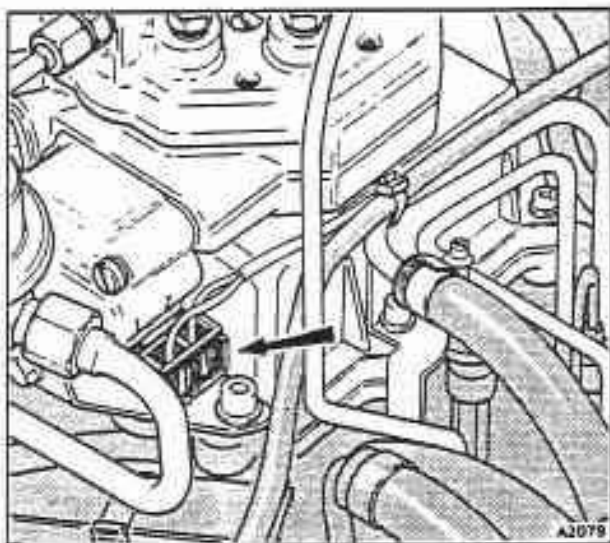


Fig. E6-11 Electro hydraulic actuator

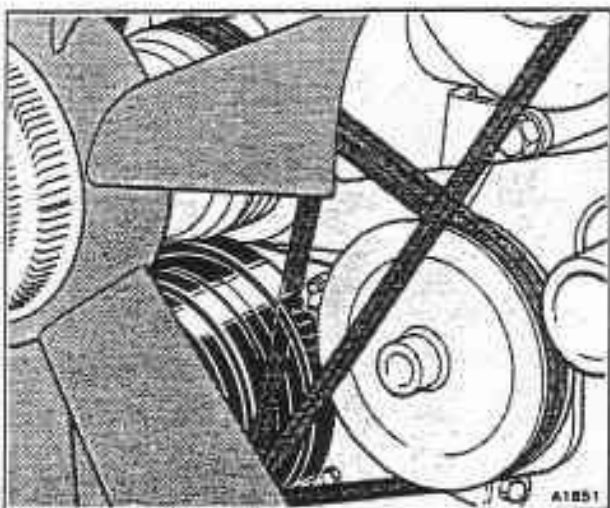


Fig. E6-12 Crankshaft damper timing marks

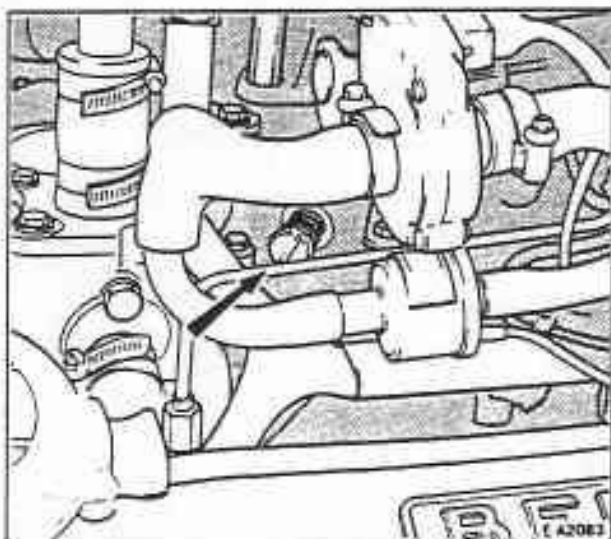


Fig. E6-13 Idle speed adjustment screw

Connect a stroboscopic timing light and a tachometer in accordance with the manufacturer's instructions.

Using the idle speed adjustment screw (see fig. E6-13) set the engine idle speed to  $580 \text{ rev/min} \pm 10 \text{ rev/min}$ . Clockwise rotation of the screw reduces the rev/min, conversely anti-clockwise rotation increases the rev/min.

Check that the ignition timing is  $7^\circ \text{ btdc} \pm 1^\circ \text{ btdc}$ .

Using the idle speed adjustment screw, reduce the engine idle speed to  $500 \text{ rev/min} \pm 10 \text{ rev/min}$ .

Check that the ignition timing is  $10^\circ \text{ btdc} \pm 1^\circ \text{ btdc}$ .

If the ignition timing is outside the specified limits it will be necessary to renew the EZ 58F electronic control unit.

Return the engine idle speed to the basic setting of  $580 \text{ rev/min}$  with the air conditioning system switched on and with the compressor clutch engaged.

Switch off the ignition.

Ignition system Piezo resistive pressure transducer 14. Disconnect the vacuum hose from the EZ 58F electronic control unit at the induction manifold. Blank off the manifold tapping. Connect the Mityvac pump RH 12495 to the hose from the EZ 58F electronic control unit.

Start the engine and allow to idle. Apply a vacuum of  $508 \text{ mm Hg}$  ( $20 \text{ in Hg}$ ) to the ignition hose. This should result in a decrease in engine speed of approximately  $100 \text{ rev/min}$ .

If no decrease occurs, check the induction manifold hose for leaks or blockage between the vacuum pump and the EZ 58F electronic control unit. If no leaks or blockage are present, the Piezo resistive pressure transducer within the EZ 58F electronic control unit is faulty. Renew the unit.

Switch off the ignition. Remove all test equipment and restore all connections.

15. For more detailed information concerning the EZ 58F electronic control unit ignition maps refer to figures E6-7 to E6-10 inclusive.