Chapter 5 Part B:
Ignition system

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

General

System type:	
1.0, 1.1 and 1.3 litre HCS engines with carburettor	Distributorless ignition system (DIS) controlled by ignition module
1.1 and 1.3 litre HCS engines with CFi fuel injection	Electronic distributorless ignition system (E-DIS) with ignition module controlled by EEC IV engine management module
1.4 litre CVH engines with carburettor:	
Early models	Distributor, with integral ignition amplifier module
Later models	Distributorless ignition system (DIS) controlled by ignition module
1.6 litre CVH engines with carburettor	Distributor, with integral ignition amplifier module
1.4 litre CVH engines with CFi fuel injection:	
Pre-September 1990 models	Distributor, with ignition module, controlled by EEC IV engine management module
September 1990 models onward	Electronic distributorless ignition system (E-DIS) with ignition module controlled by EEC IV engine management module
1.6 litre CVH engines with EFi fuel injection, and all PTE and Zetec engines	Electronic distributorless ignition system (E-DIS) with ignition module controlled by EEC IV engine management module
Firing order:	
HCS engines	1-2-4-3
All other engines	1-3-4-2
Location of No 1 cylinder	Crankshaft pulley end

Ignition coil

All engines with distributor ignition systems:	
Output	30.0 kilovolts (minimum)
Primary resistance	0.72 to 0.88 ohms
Secondary resistance	4500 to 7000 ohms
All engines with distributorless ignition systems:	
Output	37.0 kilovolts (minimum)
Primary resistance (measured at coil tower)	0.5 to 1.0 ohm

Distributor

Make:	
1.4 and 1.6 litre carburettor models	Lucas
1.4 litre CFi fuel injection models (pre-September 1990)	Bosch
Direction of rotor arm rotation	Anti-clockwise (viewed from cap)
Automatic advance method:	
1.4 and 1.6 litre carburettor models	Mechanical and vacuum
1.4 litre CFi fuel injection models (pre-September 1990)	Totally controlled by EEC IV engine management module
Heat sink compound for ignition amplifier module (Lucas distributor)	Ford part number 81 SF-12103-AA

Ignition timing

1.4 and 1.6 litre carburettor models with distributor:	
For use with 4-star leaded petrol (97 RON)	12° BTDC at idle speed (vacuum pipe disconnected and plugged)
For use with unleaded petrol (95 or 98 RON)	8° BTDC at idle speed (vacuum pipe disconnected and plugged)
1.4 litre CFi fuel injection models with distributor (pre-Sept 1990)	10° BTDC at idle speed (set using STAR test equipment - refer to text)
All other models	Totally controlled by ignition module or EEC IV engine management module

Spark plugs ..... See Chapter 1 Specifications

Torque wrench settings

	Nm	lbf ft
Crankshaft position sensor (all engines except Zetec)	3 to 4	2 to 3
Crankshaft position sensor to bracket (Zetec engines)	7 to 9	5 to 7
Crankshaft position sensor bracket to engine (Zetec engines)	18 to 23	13 to 17
DIS/E-DIS ignition coil to bracket	5 to 7	4 to 5
DIS/E-DIS ignition coil bracket to engine (all engines except Zetec)	9 to 12	7 to 9
DIS/E-DIS ignition coil bracket to engine (Zetec engines)	18 to 23	13 to 17

1 General information and precautions

General information

The ignition system is responsible for igniting the air/fuel mixture in each cylinder, at the correct moment in relation to engine speed and load, as the electrical spark generated jumps the spark plug gap.

The ignition system is based on feeding low tension (LT) voltage from the battery to the ignition coil where it is converted to high tension (HT) voltage. The high tension voltage is powerful enough to jump the spark plug gap in the cylinders many times a second under high compression pressures, providing that the system is in good condition.

A number of different ignition systems have been fitted to Fiesta models depending on the year of manufacture, type of fuel system fitted and the emission level that the vehicle has been designed to meet. Broadly speaking the systems can be sub-divided into two categories - distributor ignition systems and distributorless ignition systems.

One version of the distributor ignition system is fitted to all CVH engines with carburettors. A second (more sophisticated) version is fitted to pre-September 1990 CVH engines with CFi fuel injection.

Distributorless ignition systems are fitted to all HCS, PTE and Zetec engines, and to all CVH engines with fuel injection except pre-September 1990 CFi versions.

Distributor ignition systems (CVH engines with carburettor)

The ignition system is divided into two circuits; low tension (primary) and high tension (secondary). The low tension circuit consists of the battery, ignition switch, coil primary windings, ignition amplifier module and the signal generating system inside the distributor. The signal generating system comprises the trigger coil, trigger wheel, stator, permanent magnet and trigger coil to ignition amplifier module connector. The high tension circuit consists of the coil secondary windings, the HT lead from the coil to the distributor cap, the distributor cap, the rotor arm, the HT leads from the distributor cap to the spark plugs and the spark plugs themselves.

When the system is in operation, low tension voltage is changed in the coil into high tension voltage by the action of the electronic amplifier module in conjunction with the signal generating system. Any change in the magnetic field force (flux), created by the movement of the trigger wheel relative to the magnet, induces a voltage in the trigger coil. This voltage is passed to the ignition amplifier module which switches off the ignition coil primary circuit. This results in the collapse of the magnetic field in the coil which generates the high tension voltage. The high tension voltage is then fed, via the coil HT lead and the carbon brush in the centre of the distributor cap, to the rotor arm. The voltage passes across to the appropriate metal segment in the cap and via the spark plug HT lead to the spark plug where it finally jumps the spark plug gap to earth.

The distributor is driven by an offset drive dog locating to a correspondingly offset slot in the end of the camshaft.

The ignition advance is a function of the distributor and is controlled both mechanically and by a vacuum operated system. The mechanical governor mechanism consists of two weights which move out from the distributor shaft as the engine speed rises due to centrifugal force. As they move outwards, they rotate the trigger wheel relative to the distributor shaft and so advance the spark. The weights are held in position by two light springs and it is the tension of the springs which is largely responsible for correct spark advancement.

The vacuum control consists of a diaphragm, one side of which is connected via a small bore hose to the carburettor or throttle housing, and the other side to the distributor. Depression in the inlet manifold and/or carburettor, which varies with engine speed and throttle position, causes the diaphragm to move, so moving the stator and advancing or retarding the spark. A fine degree of control is achieved by a spring in the diaphragm assembly.

Additionally, one or more vacuum valve may be incorporated in the vacuum line between the inlet manifold or carburettor and the distributor. The function of these is to control the vacuum felt at the distributor and to prevent fuel entering along the vacuum line (as applicable).

Distributor ignition systems (pre-September 1990 CVH engines with CFi fuel injection)

The ignition system is divided into two circuits; low tension (primary) and high tension (secondary). The low tension circuit consists of the battery, ignition switch, ignition module, ballast resistor, coil primary windings and “Hall effect” distributor. The high tension circuit consists of the coil secondary windings, coil-to-distributor cap HT lead, distributor cap, rotor arm, spark plug HT leads and spark plugs. The system is under the overall control of the EEC IV engine management module which also controls the fuel injection and emission control equipment.

When the system is in operation the distributor supplies the EEC IV module with a crankshaft position reference signal to enable an initial ignition timing setting to be established. This signal is generated by means of a trigger vane attached to the distributor shaft and which rotates in the gap between a permanent magnet and a sensor. The trigger vane has four cut-outs, one for each cylinder. When one of the trigger vane cut-outs is in line with the sensor, magnetic

flux can pass between the magnet and the sensor. When a trigger vane segment is in line with the sensor, the magnetic flux is diverted through the trigger vane, away from the sensor. The sensor detects the change in magnetic flux and sends an impulse to the EEC IV module. Additional data is received from the engine coolant temperature sensor, manifold absolute pressure sensor, inlet air temperature sensor, throttle position sensor and vehicle speed sensor. Using this information the EEC IV module calculates the optimum ignition advance setting and switches off the low tension circuit via the ignition module. This results in the collapse of the magnetic field in the coil which generates the high tension voltage. The high tension voltage is then fed, via the coil HT lead and the carbon brush in the centre of the distributor cap, to the rotor arm. The voltage passes across to the appropriate metal segment in the cap and via the spark plug HT lead to the spark plug where it finally jumps the spark plug gap to earth. It can be seen that the ignition module functions basically as a high current switch by controlling the low tension supply to the ignition coil primary windings.

In the event of failure of a sensor, the EEC IV module will substitute a preset value for that input to allow the system to continue to function. In the event of failure of the EEC IV module, a "limited operation strategy" (LOS) function allows the vehicle to be driven, albeit at reduced power and efficiency. The EEC IV module also has a "keep alive memory" (KAM) function which stores idle and drive values and codes which can be used to indicate any system fault which may occur.

Distributorless ignition systems

The main ignition system components include the ignition switch, the battery, the crankshaft speed/position sensor, the ignition module, the coil, the primary (low tension/LT) and secondary (high tension/HT) wiring circuits, and the spark plugs.

The system used on carburettor models is termed DIS (Distributorless Ignition System), and on fuel injection models E-DIS, (Electronic Distributorless Ignition System). The primary difference between the two is that the DIS system is an independent ignition control system while the E-DIS system operates in conjunction with the EEC IV engine management module which also controls the fuel injection and emission control systems.

With both systems, the main functions of the distributor are replaced by a computerised ignition module and a coil unit. The coil unit combines a double-ended pair of coils - each time a coil receives an ignition signal, two sparks are produced, at each end of the secondary windings. One spark goes to a cylinder on compression stroke and the other goes to the corresponding cylinder on its exhaust stroke. The first will give the correct power stroke, but the second spark will have no effect (a "wasted spark"), occurring as it does during exhaust conditions.

The ignition signal is generated by a crankshaft position sensor which scans a series of 36 protrusions on the periphery of the engine flywheel. The inductive head of the crankshaft position sensor runs just above the flywheel periphery and as the crankshaft rotates, the sensor transmits a pulse to the ignition module every time a protrusion passes it. There is one missing protrusion in the flywheel periphery at a point corresponding to 90° BTDC. The ignition module recognises the absence of a pulse from the crankshaft position sensor at this point to establish a reference mark for crankshaft position. Similarly, the time interval between absent pulses is used to determine engine speed.

On carburettor engines, the ignition module receives signals provided by information sensors which monitor various engine functions (such as crankshaft position, coolant temperature, inlet air temperature, inlet manifold vacuum etc). This information allows the ignition module to generate the optimum ignition timing setting under all operating conditions.

On fuel injection engines, the ignition module operates in conjunction with the EEC IV engine management module, and together with the various additional information sensors and emission control components, provides total control of the fuel and ignition systems to form a complete engine management package.

The information contained in this Chapter concentrates on the ignition-related components of the engine management system. Information covering the fuel, exhaust and emission control components can be found in the applicable Parts of Chapter 4.

Precautions

When working on the ignition system, take the following precautions:

a) Do not keep the ignition switch on for more than 10 seconds if the engine will not start.

b) If a separate tachometer is ever required for servicing work, consult a dealer service department before buying a tachometer for use with this vehicle - some tachometers may be incompatible with these types of ignition systems - and always connect it in accordance with the equipment manufacturer's instructions.

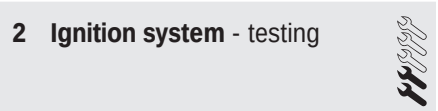
c) Never connect the ignition coil terminals to earth. This could result in damage to the coil and/or the ignition module.

d) Do not disconnect the battery when the engine is running.

e) Make sure that the ignition module is properly earthed.

f) Refer to the warning at the beginning of the next Section concerning HT voltage.

2 **Ignition system** - testing



Warning: Voltages produced by an electronic ignition system are considerably higher than those produced by conventional ignition systems. Extreme care must be taken when working on the system with the ignition switched on. Persons with surgically-implanted cardiac pacemaker devices should keep well clear of the ignition circuits, components and test equipment.

Note: *Refer to the precautions given in Section 1 of Part A of this Chapter before starting work. Always switch off the ignition before disconnecting or connecting any component and when using a multi-meter to check resistances.*

1 If the engine turns over but won't start, disconnect the (HT) lead from any spark plug, and attach it to a calibrated tester (available at most automotive accessory shops). Connect the clip on the tester to a good earth - a bolt or metal bracket on the engine. If you're unable to obtain a calibrated ignition tester, have the check carried out by a Ford dealer service department or similar. Any other form of testing (such as jumping a spark from the end of an HT lead to earth) is not recommended, because of the risk of personal injury, or of damage to the ignition module.

2 Crank the engine, and watch the end of the tester to see if bright blue, well-defined sparks occur.

3 If sparks occur, sufficient voltage is reaching the plug to fire it. Repeat the check at the remaining plugs, to ensure that all leads are sound and that the coil is serviceable. However, the plugs themselves may be fouled or faulty, so remove and check them as described in Chapter 1.

4 If no sparks or intermittent sparks occur, the spark plug lead(s) may be defective. Also, on distributor systems, there may be problems with the rotor arm or distributor cap - check all these components as described in Chapter 1.

5 If there's still no spark, check the coil's electrical connector (where applicable), to make sure it's clean and tight. Check for full battery voltage to the coil at the connector's centre terminal. Check the coil itself (see Section 3). Make any necessary repairs, then repeat the check again.

6 The remainder of the system checks should be left to a dealer service department or other qualified repair facility, as there is a chance that the ignition module may be damaged if tests are not performed properly.

3 Ignition coil - checking, removal and refitting

Distributor ignition systems

Checking

1 Accurate checking of the coil output requires the use of special test equipment and should be left to a dealer or suitably equipped automotive electrician. It is however possible to check the primary and secondary winding resistance using an ohmmeter as follows.
2 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
3 Remove the vehicle jack from its storage position by unscrewing its retainer. The ignition coil is mounted below.
4 To check the primary resistance (with all leads disconnected if the coil is fitted), connect the ohmmeter across the coil positive and negative terminals. The resistance should be as given in the *Specifications* at the beginning of this Chapter.
5 To check the secondary resistance (with all leads disconnected if the coil is fitted), connect one lead from the ohmmeter to the coil negative terminal, and the other lead to the centre HT terminal. Again the resistance should be as given in the *Specifications*.
6 If any of the measured values vary significantly from the figures given in the *Specifications*, the coil should be renewed.
7 If a new coil is to be fitted, ensure that it is of the correct type. The appropriate Ford supplied ignition coil is identified by a red label, and will be one of three different makes, all of which are fully interchangeable. Bosch and Femsa coils are fitted with protective plastic covers, and Polmot coils are fitted with an internal fusible link. Note that contact breaker ignition coils are not interchangeable with the required breakerless type and could cause ignition module failure if used.

Removal

8 If not already done, remove the vehicle jack from its storage position by unscrewing its retainer. The ignition coil is mounted below.
9 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
10 Disconnect the HT lead and the low tension (LT) connections from the ignition coil. Note that the LT connections on the ignition coil are of different sizes. As an aid to refitting the positive (+) terminal is larger than the negative (-) terminal **(see illustration)**.
11 Remove the two screws or bolts securing the coil mounting bracket to the inner wing panel, and withdraw the coil and mounting bracket assembly.

Refitting

12 Refitting is a reversal of the removal procedure, ensuring correct LT lead polarity.

Distributorless ignition systems

Checking

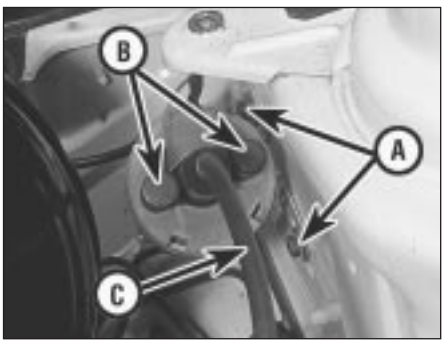
Note: *The ignition coil is located on the rear facing side of the cylinder block on HCS engines; on the left-hand end of the cylinder head on CVH, PTE and Zetec engines.*
13 Having checked that full battery voltage is available at the centre terminal of the coil's electrical connector (see Section 2), disconnect the battery negative (earth) lead (refer to Part A, Section 1).
14 Unplug the coil's electrical connector, if not already disconnected.
15 Using an ohmmeter, measure the resistance of the coil's primary windings, connecting the meter between the coil's terminal pins as follows. Measure first from one outer pin to the centre pin, then from the other outer pin to the centre. Compare the readings with the coil primary resistance listed in the *Specifications*.
16 Disconnect the spark plug (HT) leads - note their connections or label them carefully, as described in Chapter 1. Use the meter to check that there is continuity between each pair of (HT) lead terminals; Nos 1 and 4 terminals are connected by their secondary winding, as are Nos 2 and 3. Now switch to the highest resistance scale, and check that there is no continuity between either pair of terminals and the other - ie, there should be infinite resistance between terminals 1 and 2, or 4 and 3 - and between any terminal and earth.
17 If either of the above tests yield resistance values outside the specified amount, or results other than those described, renew the coil. Any further testing should be left to a dealer service department or other qualified repair facility.

Removal

Note: *The ignition coil is located on the rear facing side of the cylinder block on HCS engines; on the left-hand end of the cylinder head on CVH, PTE and Zetec engines.*
18 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
19 Disconnect the coil main electrical connector and (where fitted) the electrical connector to the suppressor.
20 The coil can be removed with the HT leads left attached, in which case disconnect the leads from their respective spark plugs and from the location clips in the rocker cover or air inlet duct (as applicable). If preferred, the HT leads can be disconnected from the coil. First check that both the ignition HT leads and their fitted positions are clearly marked numerically to ensure correct refitting. Spot mark them accordingly if necessary, using quick-drying paint.
21 If disconnecting the leads from the spark plugs, pull them free by gripping on the connector, not the lead. To detach the leads from the ignition coil, compress the retaining arms of each lead connector at the coil, and detach each lead in turn **(see illustration)**.
22 Unscrew the Torx-type retaining screws, and remove the coil from its mounting on the engine **(see illustration)**.

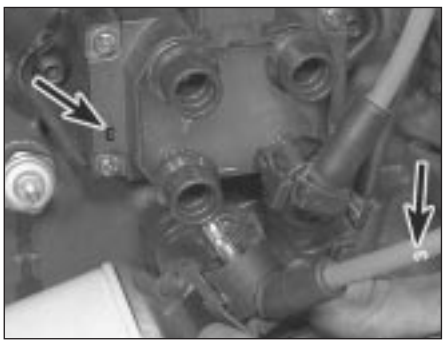
Refitting

23 Refitting is the reverse of the removal procedure. Ensure that the spark plug (HT) leads are correctly reconnected, and tighten the coil screws securely.



3.10 Ignition coil fitted to distributor ignition systems

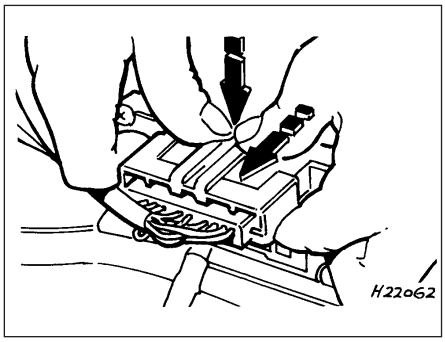
A Retaining bolts
B LT connections
C HT lead to distributor cap



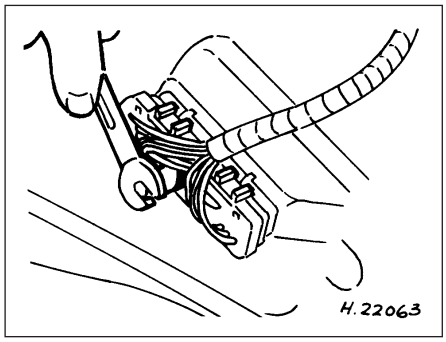
3.21 Removing an HT lead from the distributorless ignition system ignition coil. Note the corresponding markings on the ignition coil and HT lead (arrowed)

3.22 Distributorless ignition system ignition coil and mounting bracket removal (HCS engine shown)

5.3 Disconnecting the vacuum pipe from the ignition module



5.4a Disconnecting the ignition module multi-plug



5.4b Undoing the ignition module multi-plug securing bolt

4 Ignition amplifier module (distributor ignition systems) - removal and refitting

Note: *The ignition amplifier module is only fitted to carburettor engine models.*

Removal

1 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
2 Remove the distributor, as described in Section 8.
3 With the distributor on the workbench, remove both screws securing the module to the distributor body, then slide the module from its trigger coil connector and remove it.
4 Check that the rubber grommet is serviceable. If it is not, it must be renewed but ensure that the correct type is obtained.

Refitting

5 Apply heat sink compound (see *Specifications*) to the module metal face, ensuring a good earth. This is an essential part of the procedure, protecting the module electronic circuitry from excessive heat build-up and subsequent malfunction.
6 Slide the module into its trigger coil connector and secure with both screws.
7 Refit the distributor in accordance with Section 8, then reconnect the battery.

5 Ignition module - removal and refitting

Note: *Various designs of ignition module may be fitted depending on ignition system type. Although the units may differ in appearance from the those shown in the accompanying illustrations, the procedures described below are applicable to all types.*

Removal

1 The ignition module is located on the engine compartment bulkhead.
2 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
3 Where applicable, detach the vacuum hose from the module **(see illustration)**.
4 According to type, either compress the locktab securing the wiring multi-plug in position, or where applicable, undo the retaining bolt, then withdraw the plug from the module **(see illustrations)**.
5 Undo the retaining screws, and remove the module from the bulkhead **(see illustration)**.

Refitting

6 Refitting is the reverse of the removal procedure.

6 Crankshaft position sensor - removal and refitting

Removal

1 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
2 Chock the rear wheels then jack up the front of the car and support it on axle stands (see *"Jacking and vehicle support"*).
3 If working on the Zetec engine, remove the starter motor as described in Part A of this Chapter.
4 Compress the retaining clip and pull free the wiring multi-plug connector from the sensor unit, but take care to pull on the connector, not the lead **(see illustration)**.
5 Undo the Torx-type retaining screw, and withdraw the sensor from its location in the cylinder block bellhousing flange.

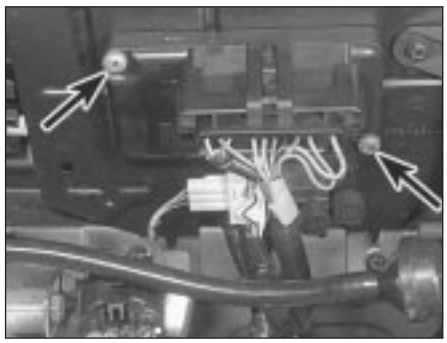
Refitting

6 Refitting is the reversal of removal.

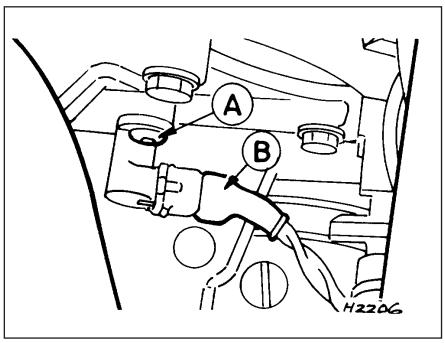
7 Distributor cap and rotor arm - removal and refitting

Removal

1 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).
2 Disconnect the coil HT lead from the centre of the distributor cap and the spark plug HT leads from the spark plugs, having identified them for subsequent refitting. Pull on the connectors, not the leads. Release the leads from any cable clips or ties.
3 On carburettor models, unclip the suppressor shield (where fitted), remove the distributor cap securing screws and detach the cap.
4 On CFi fuel injection models, disconnect the distributor multi-plug for better access to the rear cap securing clip. Release the distributor cap securing clips by levering with a screwdriver, withdraw the cap assembly

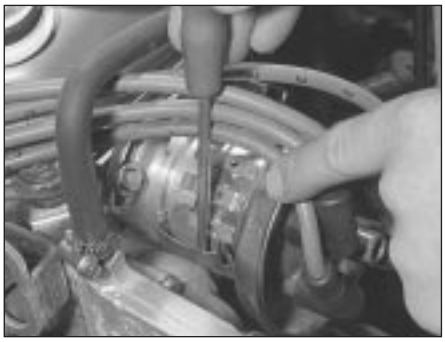


5.5 Ignition module location on bulkhead panel. Note retaining screws (arrowed)



6.4 Crankshaft position sensor removal
A Retaining screw B Multi-plug

7.4a Disconnecting the distributor multi-plug



7.4b Releasing one of the distributor cap securing clips by carefully levering with a screwdriver

7.4c Withdrawing the distributor cap and suppressor shield assembly

and separate the suppressor shield from the cap **(see illustrations)**.

5 Withdraw the rotor arm from the distributor shaft.

6 Before refitting, wipe clean the distributor cap and leads and carry out a careful inspection as described in Chapter 1.

Refitting

7 Refitting is a reversal of the removal procedure, ensuring that the HT leads are securely connected and in the correct order.

8 Distributor - removal and refitting

Note: *On pre-September 1990 CVH engines with CFi fuel injection, unless the original distributor is to be refitted to the original cylinder head, it will be necessary to take the vehicle to a Ford dealer for accurate adjustment of the ignition timing after refitting.*

Removal

1 Disconnect the battery negative (earth) lead (refer to Part A, Section 1).

2 If the original distributor is to be refitted to the original cylinder head, check that the punch marks on the cylinder head and distributor body are aligned before removing the distributor **(see illustration)**. If no marks are present, make your own using a punch or small file to ensure correct alignment upon subsequent refitting.

3 Refer to Section 7 and remove the distributor cap.

4 On carburettor equipped CVH engines, disconnect the vacuum pipe from the distributor vacuum diaphragm unit.

5 Disconnect the wiring multi-plug from the distributor.

6 Remove the clamp bolts securing the distributor in position and slide it out **(see illustration)**.

7 Prior to refitting, check the condition of the distributor oil seal and renew it if necessary.

Refitting

CVH engines with carburettor

8 Position the distributor so that its offset drive is engaged with the slot in the end of the camshaft, then loosely insert the two clamp bolts.

9 Where both original punch marks are present, on the cylinder head and distributor body, rotate the distributor body until the punch marks are aligned before fully tightening the clamp bolts.

10 If one or both of the punch marks are missing (due to component renewal), turn the body of the distributor so that the clamp bolts are centrally located in their slots then fully tighten the bolts.

11 Refit the rotor arm (if removed), distributor cap, suppressor shield (as applicable) and HT leads, making reference to Section 7, then reconnect the wiring multi-plug and vacuum pipe.

12 Reconnect the battery negative lead.

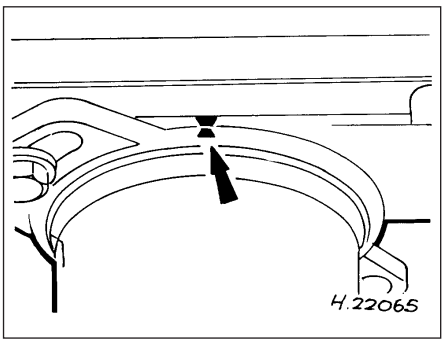
13 If one or both of the punch marks are missing after component renewal, check the ignition timing, as described in Section 10, and adjust as necessary. This will not be required where the original punch marks have been re-aligned.

Pre-September 1990 CVH engines with CFi fuel injection

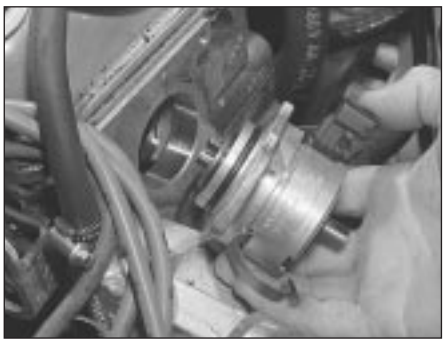
14 Position the distributor so that its offset drive is engaged with the slot in the end of the camshaft, then loosely insert the two clamp bolts.

15 Where both original punch marks are present, on the cylinder head and distributor body, rotate the distributor body until the punch marks are aligned then fully tighten the clamp bolts.

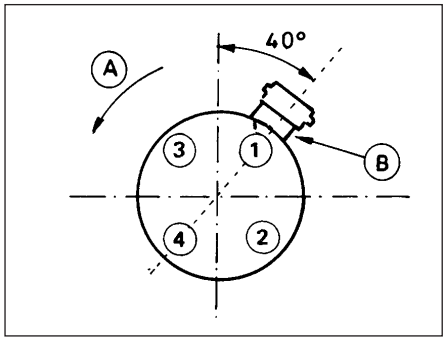
16 If one or both of the punch marks are missing (due to component renewal), rotate the distributor body until the centre line through the distributor multi-plug connector is at 40° to the vertical **(see illustration)**, before fully tightening the distributor clamp bolts. This will give an approximate (static) ignition timing setting to enable starting of the engine



8.2 Distributor alignment punch marks (arrowed)

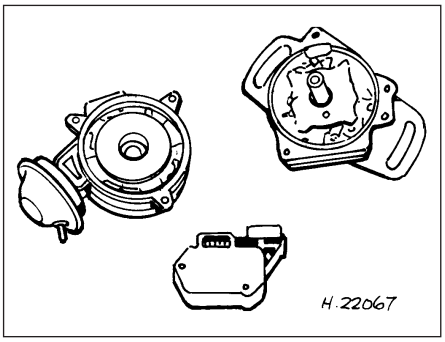


8.6 Removing the distributor from the cylinder head

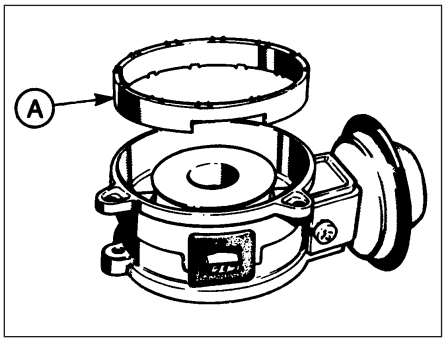


8.16 Distributor orientation when re-fitting if alignment punch marks are missing (Pre-September 1990 CVH engines with CFi fuel injection)

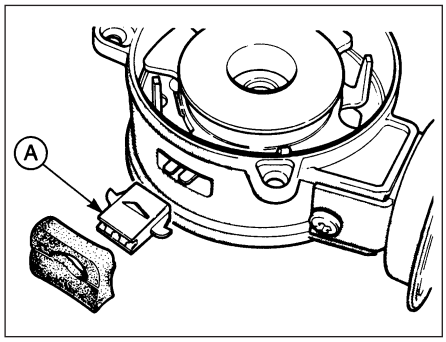
A Direction of rotation
B Centre line through distributor connector (40º to vertical)



9.3 Distributor body halves separated (ignition amplifier module also shown)



9.4 Remove the plastic spacer ring (A)



9.5 Trigger coil to ignition amplifier module connector (A) and seal

after the remaining components have been refitted and the relevant connections made.

17 Refit the rotor arm (if removed), distributor cap, suppressor shield (as applicable) and HT leads, making reference to Section 7, then reconnect the wiring multi-plug.

18 Reconnect the battery negative lead.

19 If one or both of the punch marks are missing after component renewal, the vehicle will need to be taken to a Ford dealer for accurate ignition timing checking and, if necessary, adjustment. This can only be carried out with the EEC IV engine management module in "self-test" mode and connected to the Ford specialised test equipment (see Section 10, paragraph 19).

9 Distributor vacuum diaphragm unit - renewal

Note: *Check parts availability before proceeding with this operation.*

1 Remove the distributor, as described in Section 8.

2 With the distributor on the workbench, remove the ignition amplifier module (see Section 4) and the distributor cap and rotor arm (if not already done).

3 Remove the three screws securing the distributor body halves and separate the assembly **(see illustration)**.

4 Lift out the plastic spacer ring from the upper distributor body half **(see illustration)**.

5 Remove the trigger coil to ignition amplifier module connector and seal, having noted which way the connector fits for subsequent reassembly **(see illustration)**.

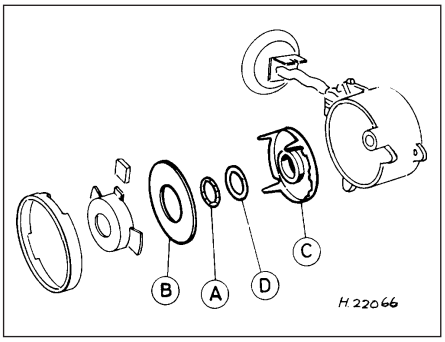
6 Lift out the trigger coil, before careful not to damage it or its connectors as it is withdrawn.

7 Remove the stator securing circlip and the upper shim followed by the stator and the lower shim **(see illustration)**.

8 Undo the vacuum diaphragm unit securing screw and detach the unit.

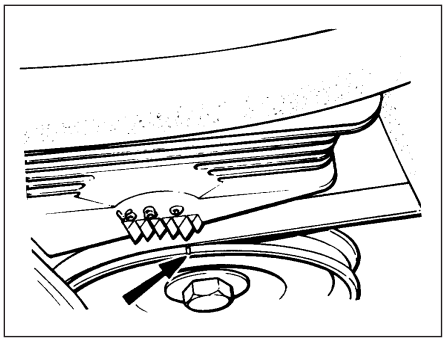
9 This is the limit of dismantling that can be undertaken on these distributors. Should the distributor be worn or unserviceable in any other respect, renewal of the complete unit will be necessary.

10 Reassembling is a reversal of the dismantling procedure. During reassembly, ensure that the pin on the vacuum diaphragm unit arm engaged in the stator as the stator is refitted, and fit the plastic spacer ring so that its cut-out aligns with the trigger coil to ignition amplifier module connector. Additionally, after the distributor body halves' securing screws have been tightened, ensure that the distributor shaft turns easily. Refit the ignition amplifier module in accordance with Section 4.



9.7 Stator and shim details

A Circlip
B Upper shim
C Stator
D Lower shim



10.6 Crankshaft pulley timing notch (arrowed) and timing marks on the timing cover scale

10 Ignition timing - checking and adjustment

Distributorless ignition systems

1 The ignition timing is controlled entirely by the ignition module (acting in conjunction with the EEC IV engine management module on fuel injection engines), and can only be checked and adjusted when the system is connected to Ford diagnostic equipment.

2 If the timing is thought to be incorrect, this can only be due to a fault in the ignition module or engine management system components and the vehicle should be taken to a Ford dealer for full testing and fault diagnosis.

Distributor ignition systems (CVH engines with carburettor)

Note: *When an engine is timed in production, marks are punched into the cylinder head and the distributor body flange to indicate the correct timing position of the distributor* ***(see illustration 8.2)****. Therefore, under normal circumstances, ignition timing adjustment will only be necessary if the initial setting has been disturbed. An ignition timing setting for use with unleaded petrol (95 RON) is given in the Specifications*

3 Where the original punch marks are present on the cylinder head and the distributor body flange, correct ignition timing can be set, as necessary, by turning the body of the distributor to align the marks before re-tightening the distributor clamp bolts.

4 If, due to component renewal, one or both of the original punch marks is missing, the following procedure must be carried out.

5 Turn the distributor body so that the clamp bolts are located centrally in their slots then tighten the clamp bolts.

6 Increase the contrast of the notch in the crankshaft pulley and the appropriate mark on the timing cover scale (refer to *Specifications*) by applying a dab of quick-drying white paint **(see illustration)**.

7 Connect a stroboscopic timing light in

accordance with the manufacturer's instructions.

8 Start the engine, bring it up to normal operating temperature and allow it to idle.

9 Disconnect the vacuum pipe from the distributor and fit blanking plugs.

10 If the timing light is now directed at the engine timing marks, the pulley notch will appear to be stationary and opposite the specified mark on the scale. If the marks are not in alignment, release the distributor clamp bolts slightly and turn the distributor body in whichever direction is necessary to align the pulley notch to the appropriate scale mark. Tighten the clamp bolts fully when the setting is correct.

11 Using a suitable punch, re-mark the cylinder head and/or the distributor flange to indicate the new distributor timing position for any future repair operations.

12 The operation of the centrifugal advance weights in the distributor can be checked by increasing the engine speed with the timing light pointing at the engine timing marks and observing that the pulley notch advances from its initial position.

13 To check the vacuum advance, run the engine at a fast idle speed and reconnect the vacuum pipe. The pulley notch should again advance.

14 Stop the engine, disconnect the tachometer and timing light and reconnect the vacuum pipe. Refit the timing aperture cover.

15 If the timing notch did not appear to move during the centrifugal advance check, a fault in the distributor centrifugal advance mechanism is indicated. No increased movement of the notch during the vacuum advance check indicate a punctured diaphragm in the vacuum unit, or a leak in the vacuum line.

16 On completion of the adjustments and checks, switch the engine off, disconnect the timing light and ensure that the distributor vacuum pipe is securely connected.

Distributor ignition systems (pre-September 1990 CVH engines with CFi fuel injection)

Note: *When an engine is timed in production it is set, using a microwave timing system, to an accuracy of within half a degree. Unless it is essential, do not remove the distributor or alter the ignition timing. If no distributor timing position punch marks are present on the cylinder head and distributor body flange, make your own before disturbing the setting* ***(see illustration 8.2)***.

17 The method of obtaining correct ignition timing, with both original punch marks present, is described in paragraph 3 above.

18 If (due to component renewal) one or both of the punch marks is missing, an approximate ignition timing setting can be obtained to enable starting of the engine by following the instruction given in Section 8, paragraph 16.

19 Accurate ignition timing adjustment can only be carried out using specialised equipment - this is a task for your Ford dealer or other suitably equipped specialist. The reason for this is that the EEC IV engine management module has to "lock" its internal ignition advance compensations and its idle speed control whilst the timing is set. The "locking" of the EEC IV module is performed in "self-test" mode when connected to the Ford STAR test (Self-Test Automatic Readout) equipment, which is also used to access fault codes stored in the module memory and analyse the performance of the system components. New punch marks should be made after accurate timing has been carried out, as necessary.