






# Chapter 4 Part C:

## Central (single-point) Fuel Injection (CFI) system

### Contents

Accelerator pedal - removal and refitting . . . . .	5	Fuel system - depressurising . . . . .	6
Air charger temperature (ACT) sensor - removal and refitting . . . . .	13	Fuel tank - removal and refitting . . . . .	3
Air cleaner - removal and refitting . . . . .	2	General information and precautions . . . . .	1
Air cleaner element renewal . . . . .	See Chapter 1	Heated Exhaust Oxygen (HEGO) sensor - removal and refitting . . . . .	17
Central Fuel Injection (CFI) unit - removal and refitting . . . . .	8	Idle speed and mixture adjustment . . . . .	See Chapter 1
EEC IV module - removal and refitting . . . . .	20	Knock sensor - removal and refitting . . . . .	15
Engine Coolant Temperature (ECT) sensor - removal and refitting . . . . .	14	Manifold Absolute Pressure (MAP) sensor - removal and refitting . . . . .	16
Fuel cut-off (inertia) switch - removal and refitting . . . . .	18	Speed sender unit - removal and refitting . . . . .	19
Fuel filter renewal . . . . .	See Chapter 1	Throttle cable - adjustment, removal and refitting . . . . .	4
Fuel injector - removal and refitting . . . . .	10	Throttle position sensor (TPS) - removal and refitting . . . . .	11
Fuel pressure regulator - removal and refitting . . . . .	9	Throttle valve control motor - removal and refitting . . . . .	12
Fuel pump - removal and refitting . . . . .	7		

### Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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### Specifications

#### General

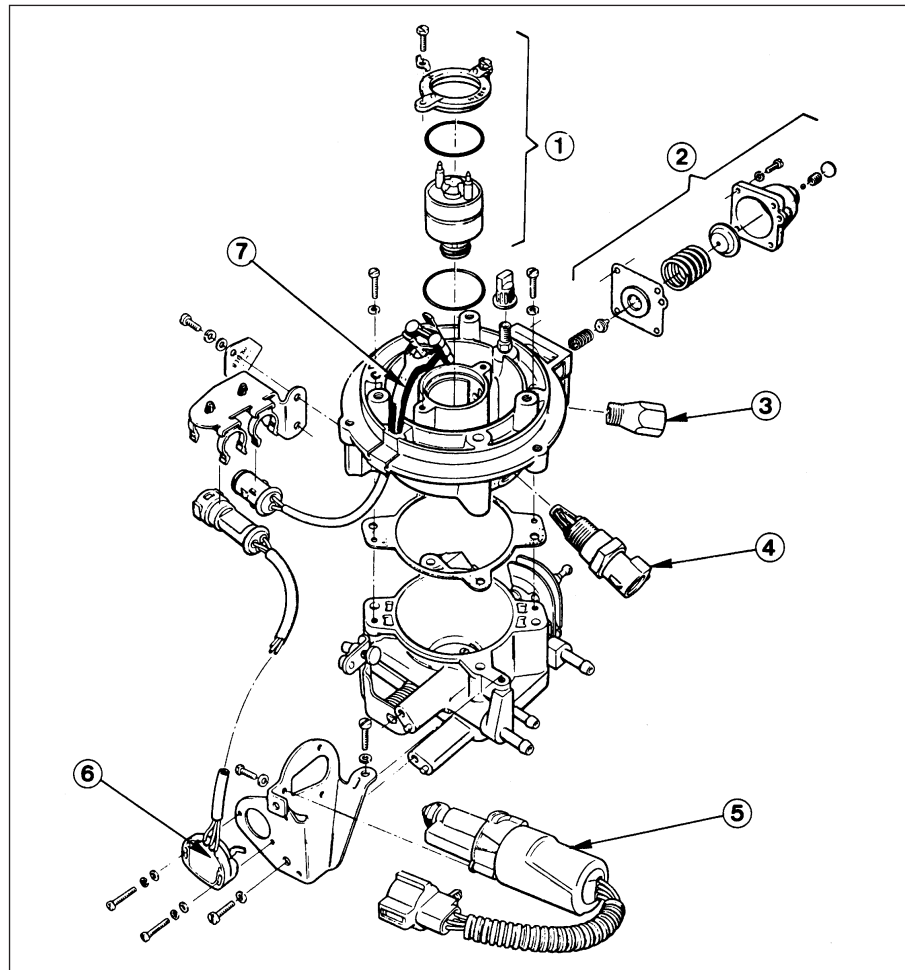
System type . . . . .	Single-point electronic fuel injection
Application . . . . .	1.4 litre engines from 1990

#### Fuel requirement

Fuel octane rating . . . . .	95 RON (unleaded)
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#### Torque wrench settings

	Nm	lbf ft
HEGO sensor . . . . .	50 to 70	37 to 52
Fuel filter unions . . . . .	14 to 20	11 to 15



### 1.2 Exploded view of the Central Fuel Injection (CFI) unit - 1.4 CFI engine

- 1 Fuel injector assembly
- 2 Fuel pressure regulator components
- 3 Fuel inlet connector
- 4 Air charge temperature (ACT) sensor
- 5 Throttle valve control motor
- 6 Throttle position sensor (TPS)
- 7 Fuel injector wiring

The CFI unit, resembling a carburettor, houses the throttle valve, throttle valve control motor, TPS (Throttle Position Sensor), ACT sensor, electronic injector unit, and pressure regulator.

### Engine management and emission system

The EEC IV (Electronic Engine Control IV) module is a microprocessor-based system containing within its memory the necessary strategy and calibration data. It provides control signals to the output actuators according to the input signals received from the various engine condition sensors. In addition to the sensors mentioned previously, the module also receives data from an engine coolant temperature sensor (ECT), and a speed sender unit (mounted on the speedometer take-off point on the gearbox). The EEC IV module will calculate the necessary requirements against data stored or programmed into its memory. Accurate control of the engine is thus maintained.

### Ignition system

The ignition system consists of a distributor, TFI IV module, ignition coil and HT wiring. These components are more fully described in Chapter 5, Part B.

A knock sensor detects engine detonation, which may occur when using low octane fuel. Screwed into the cylinder block in such a position as to detect detonation in any of the four cylinders, it passes a signal based on vibration to the EEC IV module. The module analyses the signal and adjusts the ignition timing accordingly.

### Catalytic converter

The function of the catalytic converter is to control and reduce exhaust gas emissions, keeping oxides of nitrogen (NOx), hydrocarbons (HC) and carbon monoxide (CO) to an acceptable level.

The catalyst consists of a ceramic honeycomb coated with platinum and rhodium, housed in a metal exhaust box. The honeycomb design presents a large surface area to the exhaust gas promoting maximum conversion. A HEGO (Heated Exhaust Gas Oxygen) sensor screwed into the exhaust downpipe allows the engine management system to control the air/fuel ratio at the ideal ratio of 14.7:1, which is required for the catalyst to function most effectively.

### 1 General information and precautions

#### General information

The system is best described by dividing it into four separate sub-systems: air, fuel, engine management (EEC IV system), and ignition.

#### Air system

The air system consists of an air cleaner, connecting air inlet duct, CFI unit, MAP (Manifold Absolute Pressure) sensor, and inlet manifold.

Air is drawn through the air cleaner and inlet duct to the CFI unit. The CFI unit contains an ACT (Air Charge Temperature) sensor and a throttle valve (see illustration). The ACT sensor passes information to the EEC IV module, which uses the information to determine the engine's fuel requirement. The inlet air then passes the throttle valve into the inlet manifold. Below the throttle valve is a take-off point for the MAP sensor which measures pressure in the manifold, passing this information to the EEC IV module. The EEC IV module uses this information as

another factor in determining fuel requirements and ignition timing at full throttle or during ignition key "on" engine "off" conditions. Using the information from the ACT and MAP sensors, the EEC IV module can calculate the mass of air entering the engine and adjust the fuelling and ignition timing accordingly.

#### Fuel system

The fuel system consists of a fuel pump, fuel filter, and the CFI unit. Power to the system is supplied by the power relay, which has a built-in timer which allows the throttle valve motor to continue to operate after the engine is switched off, preventing the engine from "running on".

The fuel pump is electric, of roller cell design, and delivers fuel under pressure to the engine. Electric power to the pump is supplied via a relay which is controlled directly by the EEC IV module. The pump contains a non-return valve which maintains pressure in the system after the ignition is switched off, to assist starting.

From the fuel pump, the fuel passes through an in-line filter to the CFI unit. A fuel pressure regulator, mounted on the CFI unit maintains fuel pressure to the injector at 1 bar. Excess fuel is returned to the fuel tank.

## Precautions

**Note:** Following disconnection of the battery, all Keep Alive Memory (KAM) values will be erased from the EEC IV system module memory, which may result in erratic idle, engine surge, hesitation and a general deterioration of driving characteristics.



**Warning:** Many of the procedures in this Chapter entail the removal of fuel pipes and connections which may result in some fuel spillage. Before carrying out any operation on the fuel system refer to the precautions given in *Safety First!* at the beginning of this manual and follow them implicitly. Petrol is a highly dangerous and volatile liquid and the precautions necessary when handling it cannot be overstressed.

Refer to the precautions given in Part B of this Chapter for models with mechanical fuel injection.

### 2 Air cleaner - removal and refitting

The procedure is similar to that described in Part A of this Chapter for carburettor engines.

### 3 Fuel tank - removal and refitting

The procedure is as described in Part A of this Chapter for carburettor engines.

### 4 Throttle cable - adjustment, removal and refitting

The procedure is similar to that described in Part A of this Chapter for carburettor engines.

### 5 Accelerator pedal - removal and refitting

The procedure is the same as described in Part A of this Chapter for carburettor models.

### 6 Fuel system - depressurising



**Warning:** The fuel system will remain pressurised after the engine is switched off. Comply with all relevant safety precautions during this operation and refer to the "Safety first!" Section at the beginning of this manual before proceeding.

- 1 Disconnect the battery negative lead.
- 2 Remove the air cleaner assembly.
- 3 Position a suitable container or a sufficient quantity of absorbent cloth beneath the fuel inlet connection on the CFI unit.
- 4 Use an open-ended spanner on the flats of the inlet union screwed into the CFI unit to

prevent it from turning while the inlet pipe union is loosened. Allow all pressure/fuel seepage to dissipate before fully unscrewing the union if it is to be disconnected, or tightened if another part of the system is to be worked on.

- 5 The system will remain depressurised until the fuel pump is primed prior to starting the engine. Remove the container or cloth, as applicable, on completion.

### 7 Fuel pump - removal and refitting

#### Removal

- 1 The fuel pump is integral with the fuel level sender unit in the fuel tank (see illustration).
- 2 Chock the front wheels, then jack up the rear of the vehicle and support it securely on axle stands (see "Jacking and Vehicle Support").
- 3 Disconnect the battery negative lead.
- 4 Depressurise the fuel system (Section 6).
- 5 Remove the fuel tank, then proceed as described for fuel level sender unit removal and refitting. This is described as part of the fuel tank removal and refitting procedure in Part A of this Chapter.

#### Refitting

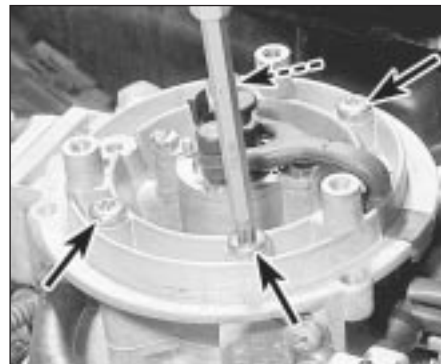
- 6 Refitting is a reversal of removal.

### 8 Central Fuel Injection (CFI) unit - removal and refitting

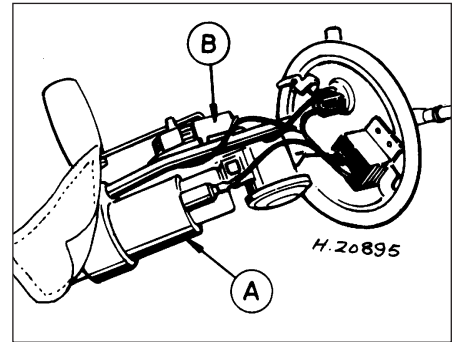
**Note:** Refer to the precautions at the end of Section 1 before proceeding.

#### Removal

- 1 Disconnect the battery negative lead.
- 2 Remove the air cleaner assembly.
- 3 Depressurise the fuel system as described in Section 6, and disconnect the fuel inlet pipe from the CFI unit.
- 4 Disconnect the fuel return pipe from the CFI unit.
- 5 Disconnect the throttle cable from the linkage on the CFI unit.



8.9 Unscrewing the CFI unit securing bolts (arrowed)



7.1 Integral fuel level sender unit/fuel pump - 1.4 CFI engine

A Fuel pump

B Sender unit

- 6 Either drain the cooling system as described in Chapter 1, or clamp the coolant hoses as close as possible to the CFI unit to minimise coolant loss, then disconnect the hoses from the unit.

- 7 Disconnect the air charge temperature sensor, throttle position sensor, and throttle valve control motor wiring plugs.

- 8 Disconnect the vacuum pipe from the CFI unit.

- 9 Unscrew the four securing bolts, and lift the CFI unit from the inlet manifold (see illustration).

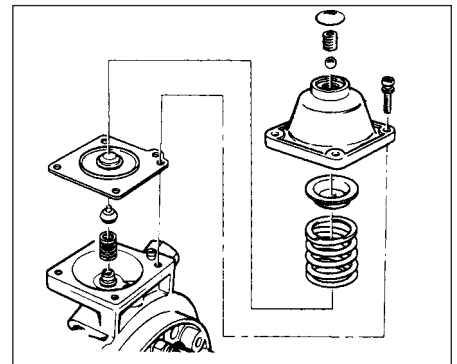
#### Refitting

- 10 Refitting is a reversal of removal, but on completion, refill or top-up the cooling system (as applicable) as described in Chapter 1, and check for fuel leaks with the engine running.

### 9 Fuel pressure regulator - removal and refitting

#### Removal

- 1 Remove the CFI unit as described in Section 8.
- 2 Remove the four screws securing the regulator housing to the CFI unit, then carefully lift off the housing and recover the ball, cup, large spring, diaphragm, valve, and small spring, noting the position and orientation of all components (see illustration). Do not



9.2 Exploded view of fuel pressure regulator - 1.4 CFI engine



**10.4 Disconnecting the fuel injector wiring plug - 1.4 CFI engine**

attempt to prise the plug from the regulator housing, or adjust the Allen screw (if no plug is fitted); this will alter the fuel system pressure.

**3** Examine all components and renew any defective items as necessary

### Refitting

**4** Commence reassembly by supporting the CFI unit on its side so that the regulator components can be fitted from above.

**5** Fit the small spring, valve, diaphragm (ensuring that it locates correctly), large spring, and the spring cup.

**6** Carefully place the ball into position on the spring cup, and ensure that it locates correctly.

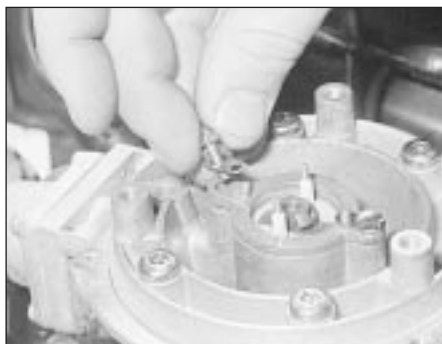
**7** Refit the regulator housing, taking great care to avoid disturbing the ball, and once



**10.6 Withdrawing the injector from the CFI unit**



**10.7 Removing the seal from the injector retaining collar - 1.4 CFI engine**



**10.5a Removing an injector retaining collar securing bolt and locktab - 1.4 CFI engine**

correctly in position, tighten the screws evenly to avoid distorting the diaphragm.

**8** Refit the CFI unit as described in Section 8.

**9** On completion, the fuel system pressure should be checked by a Ford dealer at the earliest opportunity.

### 10 Fuel injector - removal and refitting

**Note:** Refer to the precautions at the end of Section 1 before proceeding. New injector seals will be required on refitting.

#### Removal

**1** Disconnect the battery negative lead.

**2** Remove the air cleaner assembly.

**3** Depressurise the fuel system as described in Section 6.

**4** Disconnect the fuel injector wiring plug (see illustration).

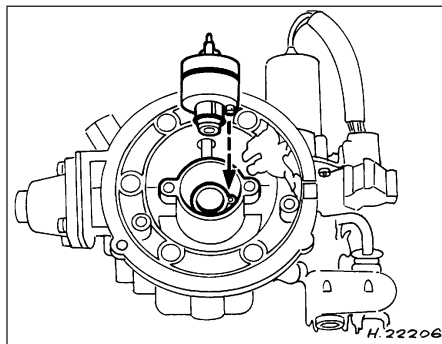
**5** Bend back the injector retaining collar securing bolt locktabs, then unscrew the bolts. Remove the injector retaining collar (see illustrations).

**6** Withdraw the injector from the CFI unit, noting its orientation, then withdraw the injector seals (see illustration).

**7** Remove the seal from the injector retaining collar (see illustration).

#### Refitting

**8** Refitting is a reversal of removal, bearing in mind the following points.



**10.10 Align locating peg on injector with slot in CFI unit when refitting**



**10.5b Removing the injector retaining collar - 1.4 CFI engine**

**9** Use new injector seals, and coat them with silicon grease (to Ford specification ESEM-1C171A or equivalent).

**10** Ensure that the locating peg on the injector is correctly positioned (see illustration).

### 11 Throttle Position Sensor (TPS) - removal and refitting

#### Removal

**1** Disconnect the battery negative lead.

**2** Unclip and disconnect the sensor wiring plug.

**3** Remove the two securing screws, and withdraw the sensor from the throttle valve shaft (see illustration).

#### Refitting

**4** Refitting is a reversal of removal, but ensure that the sensor actuating arm is correctly located.

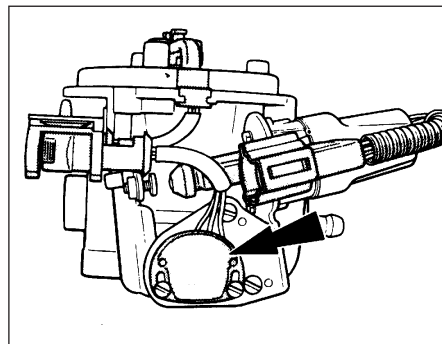
### 12 Throttle valve control motor - removal and refitting

#### Removal

**1** Disconnect the battery negative lead.

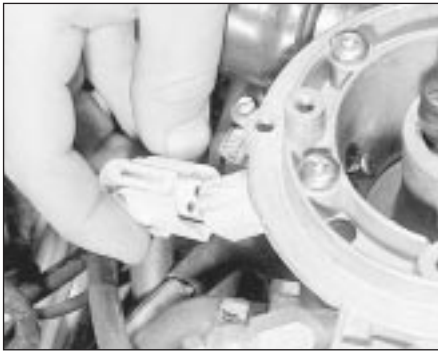
**2** Remove the air cleaner assembly.

**3** Disconnect the wiring plugs from the motor and the throttle position sensor.



**11.3 Throttle position sensor (TPS) location (arrowed) on side of CFI unit**





**13.4 Disconnecting the ACT sensor wiring plug - 1.4 CFI engine**

4 Remove the screws securing the motor and throttle position sensor assembly mounting bracket to the CFI unit, and withdraw the assembly.

5 Remove the motor securing screws and withdraw the motor from the bracket.

### Refitting

6 Refitting is a reversal of removal, bearing in mind the following points.

7 Ensure that the throttle position sensor locates correctly on the throttle valve spindle, and that the mounting bracket aligns with its locating pegs.

8 On completion, the idle speed should be checked by a Ford dealer at the earliest opportunity.

## 13 Air Charge Temperature (ACT) sensor - removal and refitting

### Removal

1 The ACT sensor is screwed into the CFI unit.

2 Disconnect the battery negative lead.

3 Remove the air cleaner assembly.

4 Disconnect the ACT sensor wiring plug (see illustration).

5 Unscrew the sensor from the CFI unit.

### Refitting

6 Refitting is a reversal of removal.

## 14 Engine Coolant Temperature (ECT) sensor - removal and refitting

### Removal

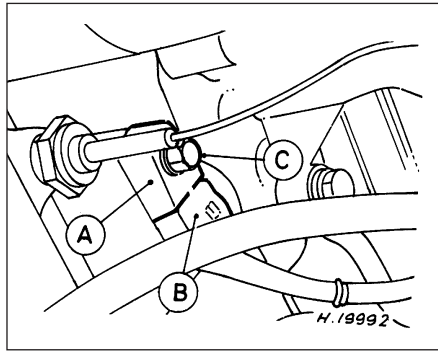
1 The ECT sensor is screwed into the inlet manifold.

2 Disconnect the battery negative lead.

3 Partially drain the cooling system as described in Chapter 1.

4 Disconnect the sensor wiring plug.

5 Unscrew the sensor from the inlet manifold.



**15.1 Knock sensor location - 1.4 CFI engine**

A Knock sensor

B Wiring plug

C Securing bolt

### Refitting

6 Refitting is a reversal of removal, but on completion top-up the cooling system as described in "Weekly checks".

## 15 Knock sensor - removal and refitting

### Removal

1 The knock sensor is screwed into the cylinder block, near the oil filter (see illustration).

2 Disconnect the battery negative lead.

3 Disconnect the sensor wiring plug by depressing the plug locking lugs and pulling the plug from the sensor. Do not pull on the wiring.

4 Unscrew the securing bolt and withdraw the sensor from the cylinder block.

### Refitting

5 Refitting is a reversal of removal, but ensure that the mating faces of the sensor and cylinder block are clean.

## 16 Manifold Absolute Pressure (MAP) sensor - removal and refitting

### Removal

1 Disconnect the battery negative lead.

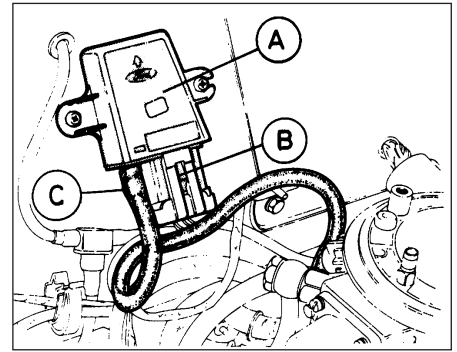
2 Disconnect the sensor wiring plug (see illustration). Do not pull on the wiring.

3 Disconnect the vacuum pipe from the sensor.

4 Remove the two securing screws, and withdraw the sensor from the engine compartment bulkhead.

### Refitting

5 Refitting is a reversal of removal.



**16.2 Manifold absolute pressure (MAP) sensor - 1.4 CFI engine**

A MAP sensor

B Wiring plug

C Vacuum hose

## 17 Heated Exhaust Gas Oxygen (HEGO) sensor - removal and refitting

**Note:** A new sealing ring will be required on refitting.

### Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see "Jacking and Vehicle Support").

2 Disconnect the battery negative lead.

3 Unclip the wiring and disconnect the sensor wiring plug (see illustration).

4 Remove the sensor heat shield, then unscrew the sensor from the exhaust downpipe, and carefully remove it complete with sealing ring.

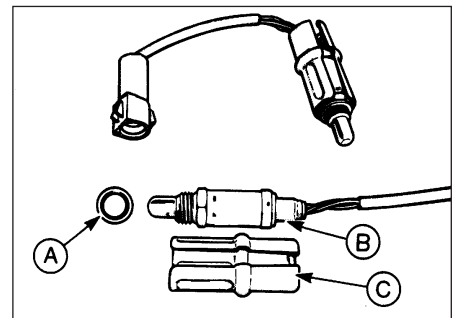


**Warning:** Do not touch the tip of the HEGO sensor.

### Refitting

5 Refitting is a reversal of removal, bearing in mind the following points.

6 Clean the sensor threads, and take care not to touch the tip of the sensor during the refitting procedure.



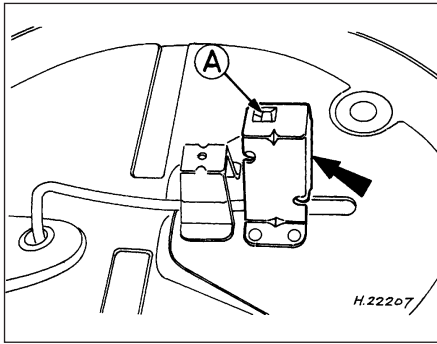
**17.3 Heated exhaust gas oxygen (HEGO) sensor - 1.4 CFI engine**

A Sealing ring

B HEGO sensor

C Sensor shield

## 4C•6 Central (single-point) fuel injection system



**18.1 Fuel cut-off (inertia) switch location (arrowed) - 1.4 CFI engine**  
A Reset button

- 7 Use a new sensor sealing ring.
- 8 Tighten the sensor to the specified torque.
- 9 On completion, start the engine and check for leaks between the sensor and the exhaust downpipe.

### 18 Fuel cut-off (inertia) switch - removal and refitting

#### Removal

- 1 The fuel cut-off switch is located in the luggage compartment, under the spare wheel (see illustration).
- 2 Disconnect the battery negative lead.
- 3 Remove the spare wheel and its cover to gain access to the switch.
- 4 Disconnect the switch wiring plug.
- 5 Remove the two screws securing the switch to its bracket, then withdraw the switch.

#### Refitting

- 6 Refitting is a reversal of removal, but before refitting the spare wheel, ensure that the switch is reset by pushing down the button on the top of the switch, and on completion start the engine and check that the switch operates correctly.

### 19 Speed sender unit - removal and refitting

The speed sender unit is similar to that used with the fuel computer described in Chapter 12.

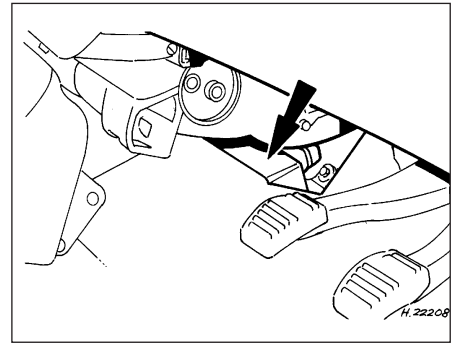
### 20 EEC IV module - removal and refitting

#### Removal

- 1 The EEC IV module is located behind the centre console, beneath the trim panel (see illustration).
- 2 Disconnect the battery negative lead.
- 3 Remove the trim panel to expose the module, then pull the module from its bracket behind the centre console.
- 4 Loosen the screw securing the wiring plug, then disconnect the plug and withdraw the module.

#### Refitting

- 5 Refitting is a reversal of removal.



**20.1 EEC IV module location (arrowed) - 1.4 CFI engine**