

Chapter 4 Fuel and exhaust systems

Contents

Accelerator cable (models with traction control) - removal, refitting and adjustment	6	Fuel lines and fittings - general information	3
Accelerator cable (models without traction control) - removal, refitting and adjustment	5	Fuel pump/fuel gauge sender unit - removal and refitting	9
Accelerator pedal - removal and refitting	7	Fuel pump/fuel pressure - check	8
Air cleaner assembly/air intake components - removal and refitting	4	Fuel system - depressurisation	2
Air filter element renewal	See Chapter 1	Fuel system components - check and renewal	16
Catalytic converter	See Chapter 6	Fuel tank - removal and refitting	10
Exhaust manifold - removal and refitting	See Chapter 2A	Fuel tank cleaning and repair - general information	11
Exhaust system - general information and component renewal	17	General information and precautions	1
Exhaust system check	See Chapter 1	Idle speed and mixture check and adjustment	See Section 14
Fuel cut-off switch - removal and refitting	13	Inlet manifold - removal and refitting	See Chapter 2A
Fuel filter renewal	See Chapter 1	Oxygen sensor	See Chapter 6
Fuel injection system/engine management system - check	15	Roll-over valves - removal and refitting	12
Fuel injection system/engine management system - general	14	Underbody fuel/brake line check	See Chapter 1
		Underbonnet hose check	See Chapter 1

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 
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Specifications

General

Idle speed:

Regulated - nominal (± 50 rpm)	830 to 880 rpm*
Unregulated - base	1500 rpm*
Idle mixture (CO level)	Not available

* Given for reference only - not adjustable.

Rev limiter operation

Fuel injectors shut off at:

Automatic transmission, position "N" selected	4100 rpm
Automatic transmission, any other position selected	6800 rpm (approximately)
Manual transmission	6800 to 7100 rpm

Fuel pressure

Regulated fuel pressure - engine running at idle speed:

Pressure regulator vacuum hose connected	2.1 ± 0.2 bars
Pressure regulator vacuum hose disconnected	2.7 ± 0.2 bars

Note: When the ignition is switched off, the system should hold 1.8 bars for 5 minutes. If the engine is hot, the pressure may rise to maximum of 2.7 bars during this check. Pressure regulator (when reconnected) should prevent any higher pressure being reached.

Fuel injectors

Resistance	13.7 to 15.2 ohms
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Idle speed control valve

Resistance	6 to 14 ohms
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Idle-increase solenoid valve

Resistance	50 to 120 ohms
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Torque wrench settings

	Nm	lbf ft
Plenum chamber-to-inlet manifold fasteners	4	3
Throttle housing-to-inlet manifold screws	10	7
Idle speed control valve bolts	6	4
Fuel pressure regulator bolts	6	4
Fuel injector bolts	6	4
Fuel rail-to-inlet manifold bolts	10	7
Fuel feed and return line threaded couplings at fuel rail	24 to 30	17 to 22
All exhaust system nuts and bolts	40 to 45	30 to 33

1 General information and precautions


This Chapter is concerned with those features of the engine management system that supply clean fuel and air to the engine, meter it in the required proportions, and dispose of the results. Since the emission control sub-systems modify the functions of both the fuel and exhaust sub-systems, all of which are integral parts of the whole engine management system, there are many cross-references to Chapters 5 and 6. Information on the electronic control system, its fault diagnosis, sensors and actuators, is given in Chapter 6.

The air intake system consists of several plastics components designed to eliminate induction roar as much as possible. The air intake tube (opening behind the direction indicator/headlight assembly) is connected, via small and large resonators located under the front left-hand wing, to the air cleaner assembly in the engine compartment. Once it has passed through the filter element and the air mass meter, the air enters the plenum chamber mounted above the throttle housing and inlet manifold; the resonator mounted in the engine compartment further reduces noise levels.

The fuel system consists of a plastic tank (mounted under the body, beneath the rear seats), combined metal and plastic fuel hoses, an electric fuel pump mounted in the fuel tank, and an electronic fuel injection system.


The exhaust system consists of an exhaust manifold, the front downpipe and catalytic converter and, on production-fit systems, a rear section incorporating two or three silencers and the tailpipe assembly. The service replacement exhaust system consists of three or four sections: the front downpipe/catalytic converter, the intermediate pipe and front silencer, and the tailpipe and rear silencer. On some versions, the tailpipe is in two pieces, with two rear silencers. The system is suspended throughout its entire length by rubber mountings.

Extreme caution should be exercised when dealing with either the fuel or exhaust systems. Fuel is a primary element for combustion. Be very careful! The exhaust system is an area for exercising caution, as it operates at very high temperatures. Serious burns can result from even momentary contact with any part of the exhaust system, and the fire risk is ever-present. The catalytic converter in particular runs at very high temperatures - refer to the information in Chapter 6.

 **Warning: Many of the procedures in this Chapter require the removal of fuel lines and connections, which may result in some fuel spillage. Petrol is extremely flammable, so take extra precautions**

when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand. Before carrying out any operation on the fuel system, refer also 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.

2 Fuel system - depressurisation

 **Warning: The fuel system will remain pressurised for long periods of time after the engine is switched off - this pressure must be released before any part of the system is disturbed. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.**


1 The fuel system referred to in this Chapter is defined as the fuel tank and tank-mounted fuel pump/fuel gauge sender unit, the fuel filter, the fuel injectors and the pressure regulator in the injector rail, and the metal pipes and flexible hoses of the fuel lines between these components. All these contain fuel, which will be under pressure while the engine is running and/or while the ignition is switched on.

2 The pressure will remain for some time after the ignition has been switched off, and must be relieved before any of these components is disturbed for servicing work.

3 The simplest method is simply to disconnect the fuel pump's electrical supply while the engine is running - either by removing the fuel pump fuse (number 14), or by lifting the red button on the fuel cut-off switch (see Section 13) - and to allow the engine to idle until it dies through lack of fuel pressure. Turn the engine over once or twice on the starter to ensure that all pressure is released, then switch off the ignition; do not forget to refit the fuse (or depress the red


button, as appropriate) when work is complete.

4 The Ford method of depressurisation is to use service tool 29-033 fitted to the fuel rail pressure test/release fitting - a Schrader-type valve with a blue plastic cap, located on the union of the fuel feed line and the fuel rail - to release the pressure, using a suitable container and wads of rag to catch the spilled fuel. Do not simply depress the valve core to release fuel pressure - droplets of fuel will spray out, with a consequent risk of fire, and of personal injury through fuel getting into your eyes.

 **Warning: Either procedure will merely relieve the increased pressure necessary for the engine to run. Remember that fuel will still be present in the system components, and take precautions accordingly before disconnecting any of them.**

5 Note that, once the fuel system has been depressurised and drained (even partially), it will take significantly longer to restart the engine - perhaps several seconds of cranking - before the system is refilled and pressure restored.


3 Fuel lines and fittings - general information

 **Warning: The fuel system pressure must be released before any part of the system is disturbed - see Section 2. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.**

Disconnecting and connecting quick-release couplings

1 Quick-release couplings are employed at all unions in the fuel feed and return lines.

2 Before disconnecting any fuel system component, relieve the residual pressure in the system (see Section 2), and equalise tank pressure by removing the fuel filler cap.

 **Warning: This procedure will merely relieve the increased pressure necessary for the engine to run - remember that fuel will still be present in the system components, and take precautions accordingly before disconnecting any of them.**



3.3 Disconnect fuel line quick-release couplings by squeezing together protruding locking lugs and pulling coupling apart

3 Release the protruding locking lugs on each union, by squeezing them together and carefully pulling the coupling apart. Use rag to soak up any spilt fuel. Where the unions are colour-coded, the pipes cannot be confused. Where both unions are the same colour, note carefully which pipe is connected to which, and ensure that they are correctly reconnected on refitting (see illustration).

4 To reconnect one of these couplings, press them together until the locking lugs snap into their groove. Switch the ignition on and off five times to pressurise the system, and check for any sign of fuel leakage around the disturbed coupling before attempting to start the engine.

Checking

5 Checking procedures for the fuel lines are included in Chapter 1.

Component renewal

6 If you must renew any damaged sections, use original-equipment replacement hoses or pipes, constructed from exactly the same material as the section you are replacing. Do not install substitutes constructed from inferior or inappropriate material, or you could cause a fuel leak or a fire.

7 Before detaching or disconnecting any part of the fuel system, note the routing of all hoses and pipes, and the orientation of all clamps and clips. Replacement sections must be installed in exactly the same manner.



4.5 Ensure air filter housing intake mouth is fully engaged inside connector sleeve



4.3 Disconnecting the crankcase breather hose from the cylinder head union

8 Before disconnecting any part of the fuel system, be sure to relieve the fuel system pressure (see Section 2), and equalise tank pressure by removing the fuel filler cap. Also disconnect the battery negative (earth) lead - see Chapter 5, Section 1. Cover the fitting being disconnected with a rag, to absorb any fuel that may spray out.

4 Air cleaner assembly and air intake components - removal and refitting

Air cleaner assembly

1 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

2 Unclip the air mass meter from the air cleaner cover (see Chapter 6).

3 Disconnect the crankcase breather hose, either from the air cleaner housing or from the cylinder head cover union (see illustration).

4 Remove the rubber retaining band (see illustration). Withdraw the air cleaner assembly, lifting it upwards out of its grommets, and releasing it from the rubber connector sleeve in the inner wing panel.

5 Refitting is the reverse of the removal procedure. Ensure that the housing pegs seat correctly in their grommets, and that the intake mouth is fully engaged inside the connector sleeve (see illustration).



4.7 Unplugging intake air temperature sensor's electrical connector



4.4 Remove rubber retaining band to withdraw air cleaner assembly

Air intake components

Note: Depending on the reason for removal, these components can be removed either individually, or as one assembly. For example, unplugging the two electrical connectors and disconnecting the vacuum hose (where fitted), will allow the air cleaner assembly cover to be removed with the air mass meter, the resonator and the plenum chamber.

Air mass meter

6 Refer to Section 4 of Chapter 6.

Resonator (engine compartment)

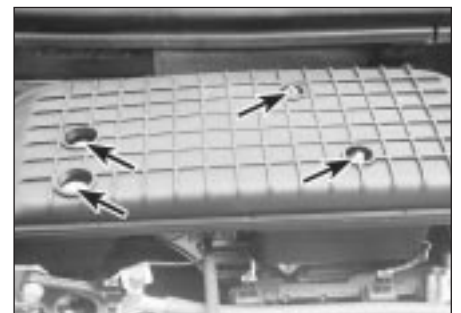
7 Unbolt the resonator support bracket from the engine compartment front crossmember. Slacken the two clamp screws securing the resonator to the air mass meter and plenum chamber hoses. Swing the resonator clear of the thermostat housing, and unplug the intake air temperature sensor's electrical connector (see illustration). Withdraw the resonator.

8 Refitting is the reverse of the removal procedure.

Plenum chamber

9 Prising out the rubber plugs covering them, undo the chamber's fasteners (see illustration). Slacken the clamp screw securing the chamber to the resonator hose.

10 Lift the chamber and (where fitted) disconnect the vacuum hose from its underside. Withdraw the chamber - note the two rubber spacers (one on each throttle



4.9 Plenum chamber fasteners (arrowed) - four shown here, some vehicles may only have three

4•4 Fuel and exhaust systems



4.10A Lift plenum chamber and (where fitted) disconnect the vacuum hose - note the two rubber spacers (arrowed) . . .

housing stud) and the sealing O-ring in the chamber's mouth (see illustrations).

11 Refitting is the reverse of the removal procedure. Ensure that the O-ring and spacers are correctly seated.

Underwing components

12 Remove the left-hand wheel arch liner (see Chapter 11).

13 Unbolt and withdraw the air intake tube and both resonators as required.

14 Refitting is the reverse of the removal procedure.

5 Accelerator cable (models without traction control) - removal, refitting and adjustment



Removal

1 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

2 Remove the plenum chamber (see Section 4).

3 Remove the clip securing the cable to the throttle housing bracket (see illustration). Disconnect the cable end nipple from the throttle linkage, and release the cable from any securing clips or ties.

4 Working in the passenger compartment, reach up to the top of the accelerator pedal. Pull the end fitting and collar out of the pedal,



5.4 Pull the accelerator cable end fitting (arrowed) out of the pedal



4.10B . . . and the sealing O-ring (arrowed) in the chamber's mouth

then release the cable inner wire through the slot in the pedal (see illustration). Tie a length of string to the end of the cable.

5 Returning to the engine compartment, pull the cable through the bulkhead until the string can be untied and the cable removed.

Refitting

6 Refitting is the reverse of the removal procedure; use the string to draw the cable through the bulkhead.

7 Adjust the cable as described below.

Adjustment

8 Remove the plenum chamber (see Section 4).

9 Find the cable adjuster - this is either at the throttle housing bracket, or two-thirds along the length of the cable, clipped to the front suspension right-hand mounting (see illustration). Remove the metal clip and lubricate the adjuster's grommet with soapy water.

10 Remove any slack by pulling the cable outer as far as possible out of the adjuster. Have an assistant depress the accelerator pedal fully - the cable outer will move back into the adjuster - and hold it there while the clip is refitted.

11 Check that the throttle valve moves smoothly and easily from the fully-closed to the fully-open position and back again, as the assistant depresses and releases the



5.9 Location of accelerator cable adjuster - remove metal clip (arrowed) to enable adjustment to be made



5.3 Removing clip securing accelerator cable to throttle housing bracket

accelerator pedal. Re-adjust the cable if required.

12 When the setting is correct, refit the plenum chamber (see Section 4).

6 Accelerator cable (models with traction control) - removal, refitting and adjustment



Removal

Note: While the following procedure deals with the complete cable, the pedal-to-actuator and actuator-to-throttle housing sections of the cable are available separately, and can be removed and refitted individually. If doing this, modify the procedure as required.

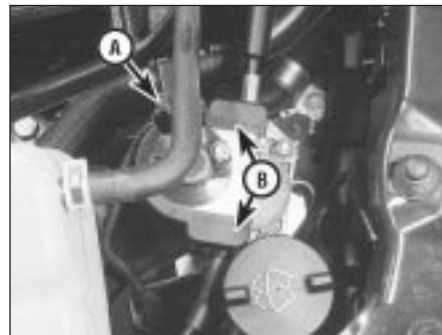
1 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

2 Remove the plenum chamber (see Section 4).

3 Remove the clip securing the cable to the throttle housing bracket, then pull the cable's grommet out of the bracket. Disconnect the cable end nipple from the throttle linkage, and release the cable from any securing clips or ties.

4 Unplug the TCS throttle actuator's electrical connector, and prise off its cover (see illustration).

5 Noting which cable section is connected to



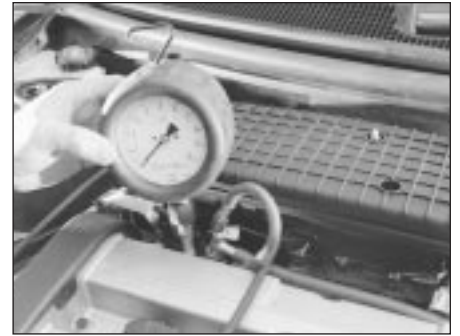
6.4 Unplug TCS throttle actuator's electrical connector (A), and prise off its cover at two points (B)



6.11 Location of TCS throttle actuator-to-throttle housing cable adjuster (arrowed)



7.2 Removing the accelerator pedal assembly



8.4 A fuel pressure gauge, equipped with an adaptor to suit the Schrader-type valve on the fuel rail pressure test/release fitting, is needed to check fuel pressure

which pulley, disconnect the first cable end nipple from the throttle actuator's upper pulley, then slide the cable outer upwards out of the actuator housing. Disconnect the second cable in the same way from the actuator's lower pulley.

6 Working in the passenger compartment, reach up to the top of the accelerator pedal. Pull the end fitting and collar out of the pedal, then release the cable inner wire through the slot in the pedal. Tie a length of string to the end of the cable.

7 Returning to the engine compartment, pull the cable through the bulkhead until the string can be untied and the pedal-to-actuator cable removed.

Refitting

8 Refitting is the reverse of the removal procedure. Use the string to draw the pedal-to-actuator cable through the bulkhead. Ensure that each cable end is connected to the correct actuator pulley.

9 Adjust both cables as described below.

Adjustment

Note: Both sections of the cable must be adjusted together, even if only one has been disturbed.

10 Remove the plenum chamber (see Section 4).

11 Remove the metal clip from the adjuster of each cable section (see illustration), and lubricate the adjusters' grommets with soapy water.

12 Remove any slack by pulling both cable outers as far as possible out of their respective adjusters.

13 Unplug the TCS throttle actuator's electrical connector, and prise off its cover. Lock both pulleys together by pushing a locking pin (a pin punch or a similar tool of suitable size) into their alignment holes. Disconnect the actuator-to-throttle housing cable's end nipple from the throttle linkage.

14 Have an assistant depress the accelerator pedal fully. The pedal-to-actuator cable outer will move back into the adjuster; hold it there, and refit the clip.

15 Connect the actuator-to-throttle housing cable end nipple to the throttle linkage, and

check that the cable outer's grommet is correctly secured in the housing bracket.

16 Again have the assistant depress the accelerator pedal fully. The actuator-to-throttle housing cable outer will move back into the adjuster; hold it there, and refit the clip.

17 Remove the locking pin from the pulleys. Check that the throttle valve moves smoothly and easily from the fully-closed to the fully-open position and back again, as the assistant depresses and releases the accelerator pedal. Re-adjust the cable(s) if required.

18 When the setting is correct, refit the TCS throttle actuator's cover and electrical connector, then refit the plenum chamber (see Section 4).

7 Accelerator pedal - removal and refitting

1 Disconnect the cable inner wire from the pedal - see Section 5 or 6, as appropriate.

2 Undo the retaining nuts and bolt, then withdraw the pedal assembly (see illustration).

3 Refitting is the reverse of the removal procedure. Adjust the cable(s) as described in the relevant Section of this Chapter.

8 Fuel pump/fuel pressure - check



Warning: Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

Fuel pump operation check

1 Switch on the ignition and listen for the fuel pump (the sound of an electric motor running, audible from beneath the rear seats). Assuming there is sufficient fuel in the tank, the pump should start and run for approximately one or two seconds, then stop, each time the ignition is switched on. **Note:** If the pump runs continuously all the time the ignition is switched on, the electronic control system is running in the backup (or "limp-home") mode referred to by Ford as "Limited Operation Strategy" (LOS). This almost certainly indicates a fault in the ECU itself, and the vehicle should therefore be taken to a Ford dealer for a full test of the complete system, using the correct diagnostic equipment; do not waste time trying to test the system without such facilities.

2 Listen for fuel return noises from the fuel pressure regulator. It should be possible to feel the fuel pulsing in the regulator and in the feed hose from the fuel filter.

3 If the pump does not run at all, check the fuse, relay and wiring (see Chapter 6).

Fuel pressure check

3 A fuel pressure gauge, equipped with an adaptor to suit the Schrader-type valve on the fuel rail pressure test/release fitting (identifiable by its blue plastic cap, and located on the union of the fuel feed line and the fuel rail) is required for the following procedure. If the Ford special tool 29-033 is available (see Section 2), the tool can be attached to the valve, and a conventional-type pressure gauge attached to the tool.

4 If using the service tool, ensure that its tap is turned fully anti-clockwise, then attach it to the valve. Connect the pressure gauge to the service tool. If using a fuel pressure gauge with its own adaptor, connect it in accordance with its maker's instructions (see illustration).

5 Start the engine and allow it to idle. Note the gauge reading as soon as the pressure stabilises, and compare it with the pressure listed in this Chapter's Specifications.

(a) If the pressure is high, check for a restricted fuel return line. If the line is clear, renew the pressure regulator.



9.4 Unplugging the fuel pump/fuel gauge sender unit electrical connector (arrowed)

(b) If the pressure is low, pinch the fuel return line. If the pressure now goes up, renew the fuel pressure regulator. If the pressure does not increase, check the fuel feed line, the fuel pump and the fuel filter.

6 Detach the vacuum hose from the fuel pressure regulator; the pressure shown on the gauge should increase. Note the increase in pressure, and compare it with that listed in this Chapter's Specifications. If the pressure increase is not as specified, check the vacuum hose and pressure regulator.

7 Reconnect the regulator vacuum hose, and switch off the engine. Verify that the fuel pressure stays at the specified level for five minutes after the engine is turned off.

8 Carefully disconnect the fuel pressure gauge. Be sure to cover the fitting with a rag before slackening it. Mop up any spilt petrol.

9 Run the engine, and check that there are no fuel leaks.

9 Fuel pump/fuel gauge sender unit - removal and refitting



Warning: Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

Note: Ford specify the use of their service tool 23-038 (a large box spanner with projecting teeth to engage the fuel pump/sender unit retaining ring's slots) for this task. While alternatives are possible, as shown below, in view of the difficulty experienced in removing and refitting the pump/sender unit, owners are strongly advised to obtain this tool before starting work. The help of an assistant will be required.

1 Relieve the residual pressure in the fuel system (see Section 2), and equalise tank pressure by removing the fuel filler cap.



9.5 If fuel couplings are difficult to release, use pliers and a block of wood as shown to prise pipe end out of union - be careful not to damage pipes or unions



Warning: This procedure will merely relieve the increased pressure necessary for the engine to run - remember that fuel will still be present in the system components, and take precautions accordingly before disconnecting any of them.

2 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

3 Unbolt or fold forwards (as appropriate) the rear seat base cushion (see Chapter 11). Withdraw from the vehicle's floor the grommet covering the fuel pump/sender unit. Wash off any dirt from the tank's top surface, and dry it; use a vacuum cleaner to clean the immediate surroundings of the vehicle's interior, to reduce the risk of introducing water, dirt and dust into the tank while it is open.

4 Unplug the fuel pump/sender unit's electrical connector (see illustration).

5 To disconnect the fuel feed and return pipes from the unit, release each pipe's coupling, by squeezing together the protruding locking lugs on each union and carefully pulling the coupling apart. Use rag to soak up any spilt fuel. Where the couplings are difficult to separate, use a pair of pliers and a block of wood as shown, to lever the pipe out of the union. Considerable force may



9.7A Removing fuel pump/fuel gauge sender unit - take care not to bend float arm, and note how it is fitted on spring-loaded extension



9.6 Fuel pump/fuel gauge sender unit's retaining ring can be released using ordinary tools as shown. Correct service tool will probably be required on refitting

be required, but be as careful as possible to avoid damaging any of the components (see illustration).

6 Release the fuel pump/sender unit's retaining ring by turning it anti-clockwise. As noted above, Ford recommend the use of service tool 23-038. For those without access to such equipment, a hammer and drift, or a pair of slip-jointed pliers, will serve as an adequate substitute - at least for removal (see illustration).

7 Withdraw the fuel pump/fuel gauge sender unit, taking care not to bend the float arm. The float arm is mounted on a spring-loaded extension, to hold it closely against the bottom of the tank. Note the sealing ring; this must be renewed whenever it is disturbed (see illustrations).

8 On refitting, use a new sealing ring, and ensure that the gauze filter over the base of the pump pick-up is clean.

9 Align the pump/sender unit with the tank opening, and refit it, ensuring that the float arm is not bent. Insert the unit so that the float arm slides correctly up the extension, until the unit's top mounting plate can be aligned with the tank opening and pressed onto the sealing ring. This may require a considerable amount of pressure; if so, be careful to avoid damaging any of the components. The Ford service tool provides the best way of holding



9.7B Fuel pump/fuel gauge sender unit's sealing ring must be renewed whenever it is disturbed

the ring square to the tank and turning it at the same time.

10 Maintain the pressure while an assistant refits and engages the retaining ring. When the ring is engaged in the tank lugs, turn it clockwise to tighten it until it is secured.

11 The remainder of the refitting procedure is the reverse of removal. Observe the colour-coding to ensure that the fuel pipes are reconnected to the correct unions.

10 Fuel tank - removal and refitting

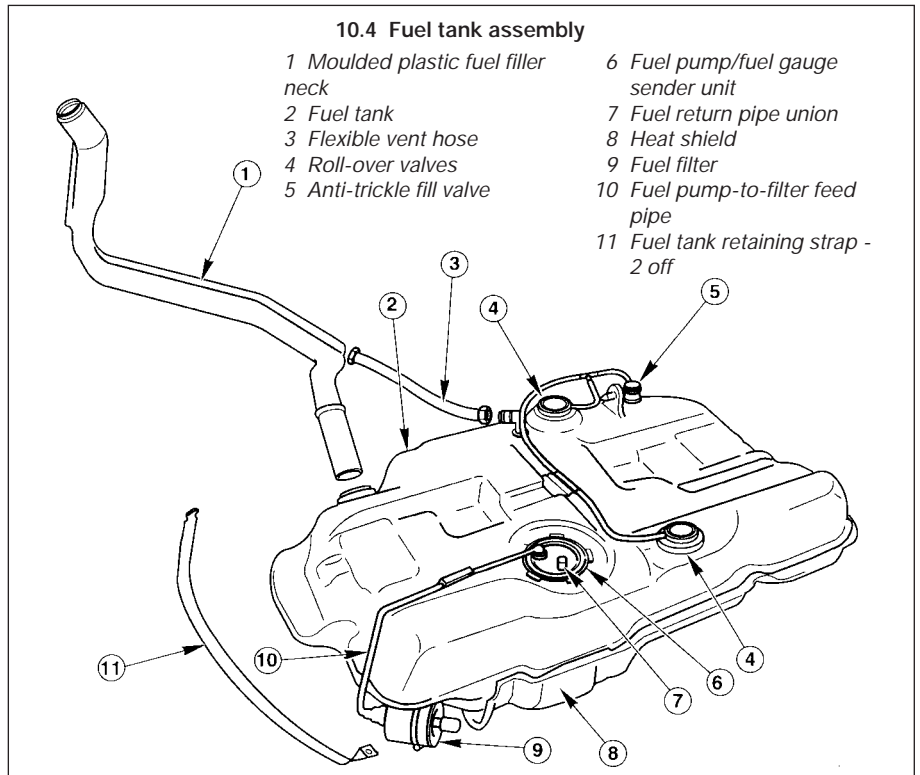


Warning: The fuel system pressure must be released before any part of the system is disturbed - see Section 2. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

1 A fuel tank drain plug is not provided; it is therefore preferable to carry out the removal operation when the tank is nearly empty. Before proceeding, disconnect the battery negative (earth) lead, and syphon or hand-pump the remaining fuel from the tank. Alternatively, disconnect the feed pipe from the fuel filter (see Chapter 1), and connect a spare length of hose to this so that when the ignition is switched on, the fuel pump will empty the tank into a clean container. If this approach is adopted, ensure that the container is large enough to take all the fuel in the tank, and be careful to take all suitable precautions to prevent the risk of fire. Note: Before disconnecting or opening any part of the fuel system, relieve the residual pressure (see Section 2), and equalise tank pressure by removing the fuel filler cap. Also disconnect the battery negative (earth) lead - see Chapter 5, Section 1.



10.6 Unbolt rear anti-roll bar mounting clamps (one arrowed) when preparing to remove the fuel tank



2 Unbolt or fold forwards (as appropriate) the rear seat base cushion (see Chapter 11). Withdraw from the vehicle's floor the grommet covering the fuel pump/sender unit. Unplug the fuel pump/sender unit's electrical connector, and disconnect the fuel return pipe (coded red) from the unit (see Section 9).

3 Raise the rear of the vehicle, and support it securely on axle stands. Get underneath and familiarise yourself with the layout of the fuel tank assembly before proceeding (see illustration).



Warning: Do not place any part of your body under a vehicle when it's supported only by a jack!

4 Either remove the fuel filter, or disconnect its outlet pipe (see Chapter 1).

5 Unhook the exhaust system rubber mountings. Lower the system onto a suitable support, so that the front downpipe-to-exhaust manifold joint is not strained, or remove it completely (see Section 17).

6 Unbolt the rear suspension anti-roll bar mounting clamps (see illustration). Swing the bar down as far as possible - if clearance is very restricted, it is advisable to remove the bar completely (see Chapter 10).

7 Disconnect the flexible vent hose from the moulded plastic fuel tank filler neck as follows:

(a) On Saloon and Hatchback models, reach up into the right-hand side aperture in the rear suspension crossmember, slacken the clamp, and work the hose off the filler neck stub. This is a job for someone with small hands, good tools and a lot of patience! (see illustration).



10.7A Fuel filler vent hose clamp (arrowed) is accessible through right-hand side aperture in rear suspension crossmember on Saloon and Hatchback models . . .



10.7B . . . on Estate models, it is immediately above rear suspension anti-roll bar



10.8 Exhaust system must be lowered and heat shield removed to enable fuel tank removal - arrows show location of retaining strap front bolts

(b) On Estate models, slacken the clamp immediately above the rear anti-roll bar, and work the hose off the filler neck stub (see illustration).

8 Unscrew the six retaining nuts, and withdraw the exhaust system's rear heat shield from the underbody (see illustration).

9 Support the tank with a trolley jack or similar. Place a sturdy plank between the support and the tank, to protect the tank.

10 Unscrew the bolt at the front of each retaining strap, and pivot them down until they are hanging out of the way. Note the earth lead under the left-hand strap's bolt - clean the mating surfaces before the tank is refitted, so that clean, metal-to-metal contact is ensured.

11 Lower the tank enough to unclip the fuel return pipe (coded red) from its top surface, then disconnect the charcoal canister's vapour hose from the union at the top rear of the tank (see illustration). If you have any doubts, clearly label the fuel lines and hoses, and their respective unions. Plug the hoses, to prevent leakage and contamination of the fuel system.

12 Remove the tank from the vehicle, releasing it from the filler neck stub. While the tank is removed, unhook the retaining straps (twist them through 90° to do so), and check that they and their locations in the underbody are in good condition.

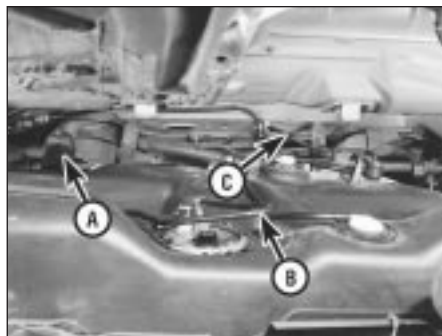
13 With the fuel tank removed, the filler neck can be withdrawn. It is secured by a single screw in the filler opening, and by two bolts to the underbody.

14 Refitting is the reverse of the removal procedure.

11 Fuel tank cleaning and repair - general information



Warning: Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance



10.11 Lower fuel tank - do not distort filler neck stub (A) - and unclip (red-coded) fuel return pipe (B), then disconnect charcoal canister's vapour hose (C)

(such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

1 Any repairs to the fuel tank or filler neck should be carried out by a professional who has experience in this critical and potentially-dangerous work. Even after cleaning and flushing of the fuel system, explosive fumes can remain and ignite during repair of the tank.

2 If the fuel tank is removed from the vehicle, it should not be placed in an area where sparks or open flames could ignite the fumes coming out of the tank. Be especially careful inside garages where a natural gas-type appliance is located, because the pilot light could cause an explosion.

12 Roll-over valves - removal and refitting



Warning: The fuel system pressure must be released before any part of the system is disturbed - see Section 2. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

Note: Refer to illustrations 10.4 and 10.11 for details.

1 Remove the fuel tank (see Section 10).

2 Prise the two valves out of the tank, and remove the anti-trickle fill valve from its mounting. Take care not to damage the valves or the tank. Prise out the rubber seals from



13.3 Fuel cut-off switch retaining screws (arrowed)

the tank openings, and renew them if they are worn, distorted, or if either has been leaking.

3 If either valve is thought to be faulty, seek the advice of a Ford dealer as to whether they can be renewed individually. If not, the complete valve and pipe assembly must be renewed.

4 Refitting is the reverse of the removal procedure. Ensure that both roll-over valves are pressed securely into their seals, so that there can be no fuel leaks.

13 Fuel cut-off switch - removal and refitting



1 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

2 Remove the trim panel from the left-hand footwell.

3 Peel back the sound-insulating material from the switch, and undo its two retaining screws (see illustration).

4 Unplug the switch electrical connector, and withdraw the switch.

5 Refitting is the reverse of the removal procedure. Ensure that the switch is reset by depressing its red button.

14 Fuel injection system/engine management system - general information

These models are equipped with a Sequential Electronically-controlled Fuel Injection (SEFI) system. The system is composed of three basic sub-systems: fuel system, air induction system and electronic control system. **Note:** Refer to illustrations 2.1A and 2.1B of Chapter 6 for further information on the components of the system.

Fuel system

An electric fuel pump located inside the fuel tank supplies fuel under pressure to the fuel rail, which distributes fuel evenly to all injectors. A filter between the fuel pump and the fuel rail protects the components of the system. A pressure regulator controls the system pressure in relation to inlet tract depression. From the fuel rail, fuel is injected

into the inlet ports, just above the inlet valves, by four fuel injectors. The system also includes features such as the flushing of fresh (ie, cold) fuel around each injector on start-up, thus improving hot starts.

The amount of fuel supplied by the injectors is precisely controlled by an Electronic Control Unit (ECU). The ECU uses the signals derived from the engine speed/crankshaft position sensor and the camshaft position sensor, to trigger each injector separately in cylinder firing order (sequential injection), with benefits in terms of better fuel economy and lower exhaust emissions.

Air induction system

The air system consists of an air filter housing, an air mass meter, an intake resonator and plenum chamber, and a throttle housing. The air mass meter is an information-gathering device for the ECU; it uses a "hot-wire" system to send the ECU a constantly-varying (analogue) voltage signal corresponding to the volume of air passing into the engine. Another sensor in the air mass meter measures intake air temperature. The ECU uses these signals to calculate the mass of air entering the engine.

The throttle valve inside the throttle housing is controlled by the driver, through the accelerator pedal. As the valve opens, the amount of air that can pass through the system increases. The throttle potentiometer opens further, the air mass meter's signal alters, and the ECU opens each injector for a longer duration, to increase the amount of fuel delivered to the inlet ports.

Electronic control system

The ECU controls the fuel injection system, as well as the other sub-systems which make up the entire engine management system. It receives signals from a number of information sensors, which monitor such variables as intake air mass and temperature, coolant temperature, engine speed and position, acceleration/deceleration, and exhaust gas oxygen content. These signals help the ECU determine the injection duration necessary for the optimum air/fuel ratio. These sensors and associated ECU-controlled relays are located throughout the engine compartment. For further information regarding the ECU and its control of the engine management system, see Chapter 6.

Idle speed and mixture adjustment - general

Both the idle speed and mixture are under the control of the ECU, and cannot be adjusted. Not only can they not be adjusted, they cannot even be checked, except with the use of special diagnostic equipment (see Chapter 6) - this makes it a task for a Ford dealer service department. *Do not* attempt to "adjust" these settings in any way without such equipment.

If the idle speed and mixture are thought to

be incorrect, take the vehicle to a Ford dealer for the complete system to be tested.

On models equipped with a heated windscreen, an idle-increase solenoid valve is fitted, which raises the idle speed to compensate for the increased load on the engine when the heated windscreen is switched on. When the valve is open, air from the plenum chamber bypasses the throttle housing and idle speed control valve, passing directly into the inlet manifold through the union on its left-hand end. The system is active only for the four minutes that the heated windscreen circuit is live, and is supplementary to the main (ECU-controlled) idle speed regulation.

15 Fuel injection system/engine management system - check



Warning: Petrol is extremely flammable, so extra precautions must be taken when working on any part of the fuel system. Do not smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage if a natural gas-type appliance with a pilot light is present. While performing any work on the fuel system, wear safety glasses, and have a dry chemical (Class B) fire extinguisher on hand. If you spill any fuel on your skin, rinse it off immediately with soap and water.

Note: *This is an initial check of the fuel delivery and air induction sub-systems of the engine management system, to be carried out in conjunction with the operational check of the fuel pump (see Section 8), and as part of the preliminary checks of the complete engine management system (see Section 3 of Chapter 6).*

1 Check the earth wire connections for tightness. Check all wiring and electrical connectors that are related to the system. Loose electrical connectors and poor earths can cause many problems that resemble more serious malfunctions.

2 Check to see that the battery is fully-charged. The ECU and sensors depend on an accurate supply voltage to properly meter the fuel.

3 Check the air filter element - a dirty or partially-blocked filter will severely impede performance and economy (see Chapter 1).

4 If a blown fuse is found, renew it and see if it blows again. If it does, search for a short-circuited wire in the harness related to the system (see Chapter 6).

5 Check the air intake duct from the intake to the inlet manifold for leaks, which will result in an excessively-lean mixture. Also check the condition of the vacuum hoses connected to the inlet manifold.

6 Remove the plenum chamber from the throttle housing. Check the throttle valve for dirt, carbon or other residue build-up. If it's

dirty, seek the advice of a Ford dealer - since the electronic control system is designed to compensate for factors such as the build-up of dirt in the throttle housing, it may well be best to leave it dirty, unless the deposits are extensive. Note: *A warning label on the housing states specifically that the housing bore and the throttle valve have a special coating, and must not be cleaned using carburettor cleaner, as this may damage it.*

7 With the engine running, place a screwdriver or a stethoscope against each injector, one at a time. Listen through the screwdriver handle or stethoscope for a clicking sound, indicating operation.

8 If an injector isn't operating (or sounds different from the others), turn off the engine, and unplug the electrical connector from the injector. Check the resistance across the terminals of the injector, and compare your reading with the resistance value listed in this Chapter's Specifications. If the resistance isn't as specified, renew the injector.

9 A rough idle, diminished performance and/or increased fuel consumption could also be caused by clogged or fouled fuel injectors. Fuel additives that can sometimes clean fouled injectors are available at car accessory shops.

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

16 Fuel system components - check and renewal



Warning: The fuel system pressure must be released before any part of the system is disturbed - see Section 2. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand.

Throttle housing

Check

1 Remove the plenum chamber (see Section 4), and verify that the throttle linkage operates smoothly.

2 If the housing bore and valve are dirty enough for you to think that this might be the cause of a fault, seek the advice of a Ford dealer. *Do not* clean the housing (see the notes in the checking procedure given in Section 15).



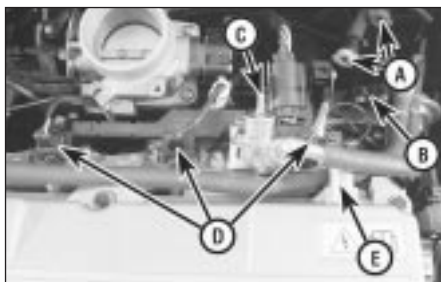
16.8 Undo screws (arrowed) to remove throttle housing

Renewal

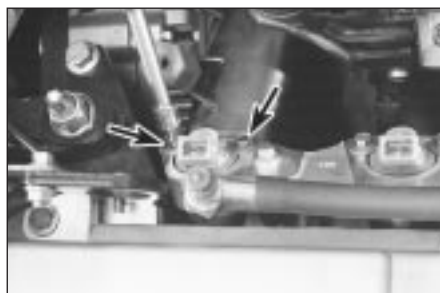
- 3 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.
- 4 Remove the plenum chamber (see Section 4).
- 5 Disconnect the accelerator cable from the throttle linkage (see Section 5 or 6, as appropriate). Where fitted, also disconnect the cruise control actuator cable (see Chapter 12).
- 6 Releasing its wire clip, unplug the large electrical connector (next to the fuel pressure regulator). Similarly release and unplug the throttle potentiometer's electrical connector.
- 7 Clearly label, then detach, all vacuum hoses from the throttle housing.
- 8 Remove the throttle housing mounting screws (see illustration), then detach the throttle housing and gasket from the inlet manifold. Discard the gasket - this must be renewed whenever it is disturbed.
- 9 Using a soft brush and carburettor cleaner, thoroughly clean the exterior of the throttle housing, then blow out all passages with compressed air.

Caution: Do not clean the throttle housing's bore, the throttle valve, or the potentiometer, either by scraping or with a solvent. Just wipe them over carefully with a clean soft cloth.

10 Refitting is the reverse of the removal procedure. Fit a new gasket, and tighten the housing screws to the specified torque.



16.18 Injector removal - disconnect fuel lines at quick-release couplings (A), unclip hoses (B), disconnect vacuum hose from regulator (C), unplug electrical connectors (D) - three of four shown - and disconnect breather hose from union (E)



16.12A Fuel injectors can be unbolted (arrowed) . . .

Fuel rail and injectors

Check

11 Refer to the procedure in the fuel system check (see Section 15).

Renewal

Note: For simplicity, and to ensure the necessary absolute cleanliness on reassembly, the following procedure describes the removal of the fuel rail assembly, complete with the injectors and pressure regulator, so that the injectors can be serviced individually on a clean work surface.

It is also possible to remove and refit an individual injector once the fuel system has been depressurised and the battery has been disconnected. If this approach is followed, read through the complete procedure, and work as described in the relevant paragraphs, depending on the amount of preliminary dismantling required. Be careful not to allow any dirt to enter the system (see illustrations).

12 Relieve the residual pressure in the fuel system (see Section 2), and equalise tank pressure by removing the fuel filler cap.

Warning: This procedure will merely relieve the increased pressure necessary for the engine to run - remember that fuel will still be present in the system components, and take precautions accordingly before disconnecting any of them.

13 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

14 Remove the plenum chamber (see Section 4).

15 If the additional clearance is required, disconnect the accelerator cable from the throttle linkage (see Section 5 or 6, as appropriate). Where fitted, also disconnect the cruise control actuator cable (see Chapter 12).

16 Releasing the wire clips, unplug the four fuel injector electrical connectors.

17 Disconnect the fuel feed and return lines at the quick-release couplings next to the braking system vacuum servo unit, then unclip the fuel hoses from the inlet manifold; use rag to soak up any spilled fuel. **Note:** Do not disturb the threaded couplings at the fuel rail unions unless absolutely necessary; these are



16.12B . . . and removed individually if required, but it is better to remove them with the fuel rail, if servicing is necessary. O-ring seals (arrowed) must be renewed whenever injector is removed

sealed at the factory. The quick-release couplings will suffice for all normal service operations.

18 Disconnect the crankcase breather hose from the cylinder head cover union, and the vacuum hose from the fuel pressure regulator (see illustration).

19 Unscrew the three bolts securing the fuel rail, and withdraw the rail, carefully prising it out of the inlet manifold, and draining any remaining fuel into a suitable clean container (see illustrations). Note the seals between the rail noses and the manifold; these must be renewed whenever the rail is removed.

20 Clamping the rail carefully in a vice fitted with soft jaws, unscrew the two bolts securing each injector, and withdraw the injectors. Place each in a clean, clearly-labelled storage container.

21 If you are renewing the injector(s), discard the old injector, the nose seal and the O-rings. If you are simply renewing leaking injector O-



16.19A Unscrew bolts (arrowed) . . .



16.19B . . . and withdraw fuel rail with injectors and pressure regulator - renew nose seals (arrowed) whenever rail is disturbed



16.29 Disconnect vacuum hose, and unscrew bolts (arrowed) to withdraw fuel pressure regulator

rings, and intend to re-use the same injectors, remove the old nose seal and O-rings, and discard them.

22 Further testing of the injector(s) is beyond the scope of the home mechanic. If you are in doubt as to the status of any injector(s), it can be tested at a dealer service department.

23 Refitting is the reverse of the removal procedure, noting the following points:

- (a) Lubricate each nose seal and O-ring with clean engine oil on installation.
- (b) Locate each injector carefully in the fuel rail recess, ensuring that the locating tab on the injector head fits into the slot provided in the rail. Tighten the bolts to the specified torque.
- (c) Fit a new seal to each fuel rail nose, and ensure the seals are not displaced as the rail is refitted. Ensure that the fuel rail is settled fully in the manifold before tightening the three bolts evenly and to the torque wrench setting specified.
- (d) Fasten the fuel feed and return quick-release couplings as described in Section 3.
- (e) Ensure that the breather hose, vacuum hose and wiring are routed correctly, and secured on reconnection by any clips or ties provided.
- (f) On completion, switch the ignition on and off five times, to activate the fuel pump and pressurise the system, without cranking the engine. Check for signs of fuel leaks around all disturbed unions and joints before attempting to start the engine.


Fuel pressure regulator

Check

24 Refer to the fuel pump/fuel pressure check procedure (see Section 8).

Renewal

25 Relieve the residual pressure in the fuel system (see Section 2), and equalise tank pressure by removing the fuel filler cap.

 **Warning:** This procedure will merely relieve the increased pressure necessary for the engine to run - remember that fuel will still be present in the system components, and take precautions accordingly before disconnecting any of them.



16.33 Access to idle speed control valve is from underneath vehicle - unplug electrical connector (arrowed) to check valve

26 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

27 Remove the plenum chamber (see Section 4).

28 Disconnect the vacuum hose from the regulator.

29 Unscrew the two regulator retaining bolts, place a wad of clean rag to soak up any spill fuel, and withdraw the regulator (see illustration).

30 Refitting is the reverse of the removal procedure, noting the following points:


- (a) Renew the regulator sealing O-ring whenever the regulator is disturbed. Lubricate the new O-ring with clean engine oil on installation.
- (b) Locate the regulator carefully in the fuel rail recess, and tighten the bolts to the specified torque wrench setting.
- (c) On completion, switch the ignition on and off five times, to activate the fuel pump and pressurise the system, without cranking the engine. Check for signs of fuel leaks around all disturbed unions and joints before attempting to start the engine.

Idle speed control valve

Check


31 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

32 Raise the front of the vehicle, and support it securely on axle stands.

 **Warning:** Do not place any part of your body under a vehicle when it's supported only by a jack!

33 Unplug the valve's electrical connector (see illustration).

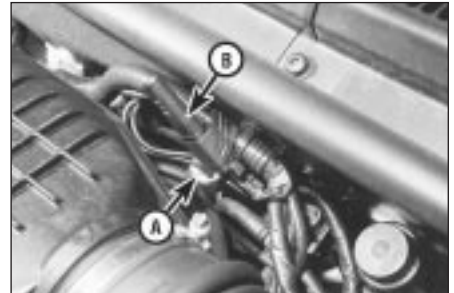
34 Connect a 12-volt battery across the valve's terminals - positive (+) to terminal 37 (the green/yellow wire) and negative (-) to terminal 21 (the black/yellow).

 **Caution:** It is essential that the correct polarity is observed, or the diode incorporated in the valve may be damaged.

35 A distinct click should be heard each time contact is made and broken. If not, measure the resistance between the terminals. If the resistance is as specified, the valve is okay (but there may be a problem with the wiring or the ECU). If the resistance is not as specified, renew the valve (see below).



16.40 Unscrew bolts (arrowed) to remove idle speed control valve




16.43 Location of idle-increase solenoid valve (A) and diode (B)

36 Plug in the valve's electrical connector.

Renewal

37 Disconnect the battery negative (earth) lead - see Chapter 5, Section 1.

38 Raise the front of the vehicle, and support it securely on axle stands.

 **Warning:** Do not place any part of your body under a vehicle when it's supported only by a jack!

39 Unplug the valve's electrical connector.

40 Unscrew the two retaining bolts, and withdraw the valve from the inlet manifold (see illustration).

41 Since the valve's individual components are not available separately, and the complete assembly must be renewed if it is thought to be faulty, there is nothing to be lost by attempting to flush out the passages, using carburettor cleaner or similar solvent. This won't take much time or effort, and may well cure the fault.

42 Refitting is the reverse of the removal procedure, noting the following points:

- (a) Clean the mating surfaces carefully, and always fit a new gasket whenever the valve is disturbed.
- (b) Tighten the bolts evenly and to the specified torque wrench setting.
- (c) Once the wiring and battery are reconnected, start the engine and allow it to idle. When it has reached normal operating temperature, check that the idle speed is stable, and that no induction (air) leaks are evident. Switch on all electrical loads (headlights, heated rear window, etc), and check that the idle speed is still correct.

Idle-increase solenoid valve

Check

43 If this valve is thought to be faulty, unplug its electrical connector and disconnect its vacuum hoses, then connect a battery directly across the valve's terminals. Check that air can flow through the valve's passages when the solenoid is energised, and that nothing can pass when the solenoid is not energised. Alternatively, connect an ohmmeter to measure the resistance between the valve's terminals, and compare this reading to that listed in the Specifications Section at the beginning of this Chapter. Renew the valve if it is faulty (see illustration).

44 The solenoid's diode is fitted to control any voltage "spikes" which might occur as the solenoid is switched off. A faulty diode would not, therefore, necessarily interfere with the operation of the valve. If the diode is thought to be faulty, however, it can be checked by unplugging it and connecting an ohmmeter across its terminals, to check that continuity exists in one direction only. If continuity is found in both directions, or in neither, the diode is faulty, and must be renewed.

Renewal

45 If better access is required, remove the plenum chamber (see Section 4).

46 Disconnect the battery negative (earth) lead - see Section 1 of Chapter 5.

46 Unplug the valve's electrical connector. Unclip the valve from the bulkhead, then disconnect its vacuum hoses and withdraw it.

47 Refitting is the reverse of the removal procedure.

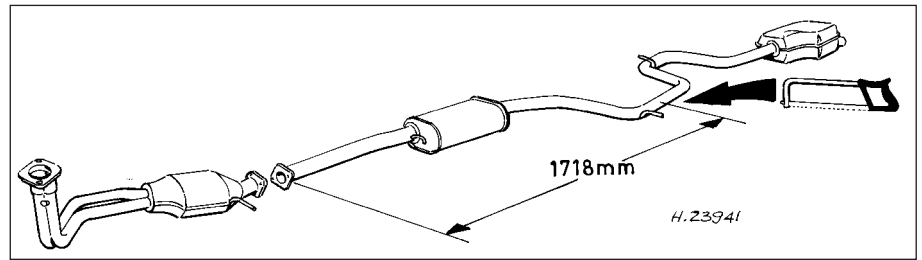
17 Exhaust system - general information and component renewal



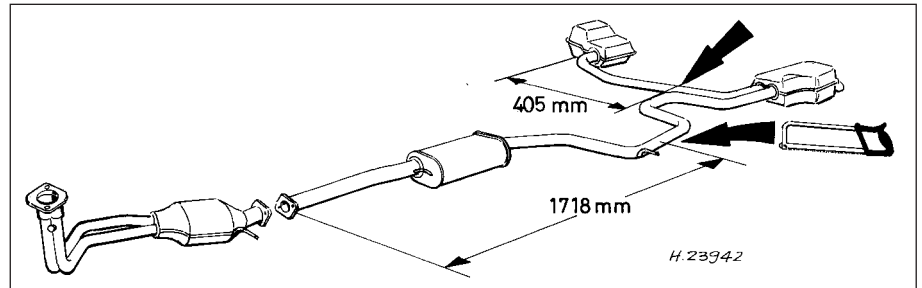
Warning: Inspection and repair of exhaust system components should be done only after enough time has elapsed after driving the vehicle to allow the system components to cool completely. This applies particularly to the catalytic converter, which runs at very high temperatures. Also, when working under the vehicle, make sure it is securely supported on axle stands.

1 The exhaust system is composed of an exhaust manifold, the front downpipe and catalytic converter, and a rear section incorporating two silencers (three on some versions) and the tailpipe assembly. The service replacement exhaust system consists of three or four sections: the front downpipe/catalytic converter, the intermediate pipe and front silencer, and the tailpipe and rear silencer. On some versions, the tailpipe is in two pieces, with two rear silencers. The system is suspended throughout its entire length by rubber mountings.

2 If any of these parts are damaged or



17.4A Cutting point for renewal of production-fit exhaust system - 1.6 and 1.8 models



17.4B Cutting points for renewal of production-fit exhaust system - 2.0 models

deteriorated, excessive noise and vibration will occur.

3 Conduct regular inspections of the exhaust system, to keep it safe and quiet. Look for any damaged or bent parts, open seams, holes, loose connections, excessive corrosion, or other defects which could allow exhaust fumes to enter the vehicle. Deteriorated exhaust system components should not be repaired - they should be replaced with new parts.

4 If the exhaust system components are extremely corroded or rusted together, they will probably have to be cut from the exhaust system. The most convenient way of accomplishing this is to have a quick-fit exhaust repair specialist remove the corroded sections. If, however, you want to save money by doing it yourself (and you don't have an oxy/acetylene welding outfit with a cutting torch), simply cut off the old components with a hacksaw. If you have compressed air, special pneumatic cutting chisels can also be used. If you do decide to tackle the job at home, be sure to wear eye protection, to protect your eyes from metal chips, and work gloves, to protect your hands. If the production-fit system is still fitted, it must be cut at the points shown (see illustrations) for the service-replacement system sections to fit.

5 Here are some simple guidelines to apply when repairing the exhaust system:



Warning: The catalytic converter operates at very high temperatures, and takes a long time to cool. Wait until it's completely cool before attempting to remove the converter. Failure to do so could result in serious burns.

- (a) Work from the back to the front when removing exhaust system components.
- (b) Apply penetrating fluid to the exhaust



17.5 Tighten exhaust system front downpipe-to-manifold nuts as described - do not overtighten them

system component fasteners, to make them easier to remove.

- (c) Use new gaskets, rubber mountings and clamps when installing exhaust system components.
- (d) Apply anti-seize compound to the threads of all exhaust system fasteners during reassembly.
- (e) Note that the downpipe is secured to the manifold by two bolts, with a coil spring, spring seat and self-locking nut on each. On refitting, tighten the nuts until they stop on the bolt shoulders; the pressure of the springs will then suffice to make a leakproof joint (see illustration). Do not overtighten the nuts to cure a leak - the bolts will shear. Renew the gasket and the springs if a leak is found (also see Chapter 2, Part A).
- (f) Be sure to allow sufficient clearance between newly-installed parts and all points on the underbody, to avoid overheating the floorpan, and possibly damaging the interior carpet and insulation. Pay particularly close attention to the catalytic converter and its heat shield.