






# Chapter 4

## Fuel and exhaust systems

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### 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

System type	Rear-mounted fuel tank, injection pump with integral transfer pump, indirect injection
Firing order	1-3-4-2 (No 1 at flywheel end)
Fuel:	
Type	Commercial diesel fuel for road vehicles (DERV)
Tank capacity:	
Visa	43 litres
BX	52 litres

#### Injection pump (Roto-diesel)

Static advance	2.26 ± 0.05 mm BTDC (equivalent to 16° BTDC)
Dynamic advance:	
Visa	14 ± 1° BTDC at 800 rpm
BX17	14 ± 1° BTDC at 800 rpm
BX19 with injection pump code DPCR 844 3161 A	17 ± 1° BTDC at idle speed
BX19 with injection pump code DPCR 844 3261 C	14 ± 1° BTDC at idle speed
Maximum engine speed (no load)	5100 ± 100 rpm
Rotation	Clockwise from sprocket end

#### Injection pump (Bosch) - pre 1987 models

Static advance:	
Visa	0.72 ± 0.03 mm BTDC
BX17	0.80 ± 0.03 mm BTDC
BX19	0.57 ± 0.03 mm BTDC
Dynamic advance:	
Visa	14 ± 1° BTDC at 800 rpm
BX17	14 ± 1° BTDC at 800 rpm
BX19	13 to 14° BTDC at idle speed
Maximum engine speed	5100 ± 100 rpm
Fast idle speed (automatic transmission only)	1150 to 1250 rpm
Rotation	Clockwise from sprocket end

## Injection pump (Bosch) - 1987-on models

Timing values at TDC (refer to text):

Engine code	Pump code	Timing value
XUD 7 (from October 1987)	VER 171-1	0.90 mm
XUD 7 (from early 1993)	VER R171-3	0.89 mm
XUD 9A (from April 1987 to April 1988)	VER 272-1	0.83 mm
XUD 9A (from April 1988)	VER 272-2	0.90 mm
XUD 7TE	-	0.80 mm

## Injection pump (Bosch, in C15 Van from early 1993)

Type	523 (R171-3)
Static timing (pump ABDC)	0.89 mm
Idle speed	800 ± 50 rpm
Maximum engine speed	5150 ± 125 rpm
Fast idle speed	950 ± 50 rpm
Injector opening pressure (colour code)	130 bars (mauve)

## Injection pump (Lucas, in C15 Van from early 1993)

Type	047 (R 8443B 930 A)
Static timing	"X" dimension marked on pump
Idle speed	800 ± 50 rpm
Maximum engine speed	5150 ± 125 rpm
Fast idle speed	950 ± 50 rpm
Injector opening pressure:	
Green collar	138 to 143 bars
Green collar and green spot	142 to 147 bars

## Injection pump (Bosch, in BX models from early 1993)

Type	D9B XUD9A/L BVM XUD201 R425/1	D9B XUD9A/L BVA XUD201 R425/3
Static timing (pump ABDC)	1.07 mm	0.98 mm
Idling speed	750 to 800 rpm	750 to 800 rpm
Fast idle speed	900 to 1000 rpm	900 to 1000 rpm
Maximum engine speed (loaded)	4600 rpm	4600 rpm
Injector opening pressure (colour code)	130 bars (silver)	130 bars (silver)
Type	DJZ* XUD9/Y 518 R162/4 XUD200	AJZ* XUD7TE/Y R403
Static timing (pump ABDC)	0.77 mm	0.74 mm
Idling speed	750 to 800 rpm	750 to 800 rpm
Fast idle speed	900 to 1000 rpm	900 to 1000 rpm
Maximum engine speed (loaded)	4600 rpm	4300 rpm
Injector opening pressure (colour code)	130 bars (mauve)	155 bars (silver)

\* Not fitted to UK models

## Injection pump (Lucas, in BX models from early 1993)

Type	161-A XUD7/L 052 R8444 B030A	A8A XUD7TE/L 056 R8443 B941A
Static timing	"X" dimension marked on pump	"X" dimension marked on pump
Dynamic timing	14° ± 1°	-
Anti-stall speed (with 3.0 mm diameter pin and 3.0 mm shim)	800 to 1000 rpm	800 to 1000 rpm
Maximum engine speed (loaded)	4600 rpm	4300 rpm
Injector opening pressure (colour code)	118 ± 5 bars	143 ± 5 bars

## Injectors

Type	Pintle
Opening pressure:	
Peto-diesel	115 ± 5 bar
Bosch	130 ± 5 bar

## Heater plug

Type	Champion CH 68
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## Turbocharger

Make .....	KKK or Garrett
Type .....	
KKK .....	K14
Garrett .....	T2
Boost pressure .....	0.8 to 0.9 bars at full-load

## Torque wrench settings

	Nm	lbf ft
Cylinder head blanking plug .....	30	22
Heater plug .....	22	16
Injection pump .....	18	13
Injection pump (Bosch) blanking plug .....	20	15
Injection pump sprocket nut .....	50	37
Injector:		
Bosch .....	90	66
Roto-diesel .....	130	96
Injector pipe union nuts .....	20	15
Turbocharger mounting bolts .....	45	33
Turbocharger oil feed pipe unions .....	20	15

## 1 Description - general



**Warning:** It is necessary to take certain precautions when working on the fuel system components, particularly the fuel injectors. Before carrying out any operations on the fuel system, refer to the precautions given in "Safety first" at the beginning of this manual, and to any additional warning notes at the start of the relevant Sections.

The fuel system consists of a rear-mounted fuel tank, a fuel filter, a fuel injection pump, injectors and associated components. The exhaust system is similar to that used on petrol-engined vehicles.

Fuel is drawn from the tank by a vane-type transfer pump incorporated in the delivery head of the injection pump. Before reaching the pump the fuel passes through a fuel filter where foreign matter and water are removed. The injection pump is driven at half crankshaft speed by the timing belt. The high pressure required to inject the fuel into the compressed air in the swirl chambers is achieved by two opposed pistons forced together by rollers running on a cam ring. The fuel passes through a central rotor with a single outlet drilling which aligns with ports leading to the injector pipes and injectors. Fuel metering is controlled by a centrifugal governor that reacts to accelerator pedal position and engine speed. The governor is linked to the metering valve that moves the rotor sleeve to increase or decrease the amount of fuel transferred to the high pressure chamber. Injection timing is varied by turning the cam ring to suit the prevailing engine speed (see illustration).

There are four precision-made injectors that inject a homogeneous spray of fuel into the swirl chambers located in the cylinder head.

The injectors are calibrated to open and close at critical pressures to provide efficient and even combustion. The injector needle is lubricated by fuel that accumulates in the spring chamber and is channelled to the injection pump return hose by leak-off pipes (see illustration).

Preheater or "glow" plugs are fitted to each swirl chamber to facilitate cold starting. Additionally, a thermostatic sensor in the cooling system operates a fast idle lever to increase the idling speed and supply additional fuel when the engine is cold.

A stop solenoid cuts the fuel supply to the injection pump rotor when the ignition is switched off, and there is also a hand-operated stop lever for use in an emergency (see illustration).

Servicing of the injection pump and injectors is very limited for the home mechanic, and any dismantling other than that described in this Chapter must be entrusted to a Citroën dealer or fuel injection specialist.

In 1987 the Bosch injection pump was modified to increase the length of the pump shaft front bearing. At the same time, the pump sprocket, timing belt tensioner roller and timing belt covers were modified. Old and new components are not interchangeable. Maintenance and adjustment procedures are unchanged.

Following the introduction of new EEC emission standards, all engines fitted to BX models from early 1993 are equipped with modified injection pumps. Details of the various components are as shown (see illustration), and refer to the Specifications for data on the new injection pump.

On automatic transmission models, the injection pump incorporates an ALFB system that automatically adjusts the advance of injection according to the load on the engine. The advance is controlled by a solenoid valve located on the injection pump, and the solenoid valve is activated by a thermostatic switch located on the thermostat housing

(see illustration).

A turbocharger is fitted to the XUD 7TE engine. It increases engine efficiency by raising the pressure in the inlet manifold above atmospheric pressure. Instead of the air simply being sucked into the cylinders, it is forced in.

Energy for the operation of the turbocharger comes from the exhaust gas. The gas flows through a specially shaped housing (the turbine housing) and in so doing, spins the turbine wheel. The turbine wheel is attached to a shaft, at the end of which is another vane wheel known as the compressor wheel. The compressor wheel spins in its own housing, and compresses the inducted air on the way to the inlet manifold (see illustration).

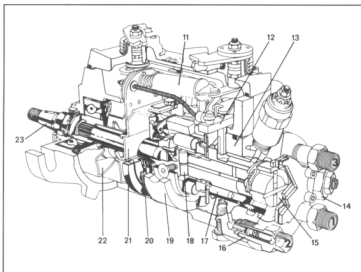
Between the turbocharger and the inlet manifold the compressed air passes through an intercooler. This is an air-to-air heat exchanger, mounted over the engine and supplied with air ducted through the bonnet insulation. The purpose of the intercooler is to remove from the inducted air some of the heat it gained in being compressed. Removal of this heat further increases engine efficiency.

Boost pressure (the pressure in the inlet manifold) is limited by a wastegate, which diverts the exhaust gas away from the turbine wheel in response to a pressure-sensitive actuator. A pressure-operated switch operates a dashboard warning light in the event of excessive boost pressure developing.

The turbo shaft is pressure-lubricated by an oil feed pipe from the main oil gallery. The shaft "floats" on a cushion of oil. A drain pipe returns the oil to the sump.

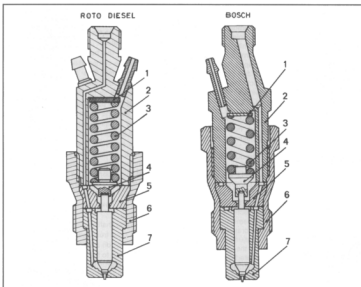
Before starting any work involving the turbo, read the precautions in the following section, first.

## 1.2 Cutaway view of the Roto-diesel injection pump



- 11 MIN-MAX speed regulator
- 12 Fuel metering valve
- 13 Hydraulic head
- 14 Transfer pressure adjustment
- 15 Transfer pump
- 16 High pressure outlet and recirculation valve
- 17 Overload ram
- 18 Piston
- 19 Cam ring
- 20 Overleaf springs
- 21 Control lever
- 22 Centrifugal governor
- 23 Driveshaft

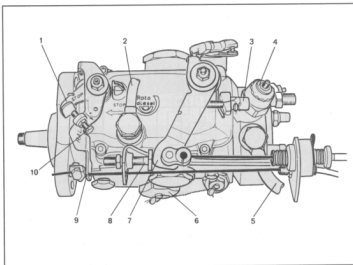
## 1.3 Cross-section of the injectors



- 1 Adjustment shim
- 2 Upper body
- 3 Spring
- 4 Pushrod
- 5 Spacer
- 6 Nut
- 7 Lower body and needle

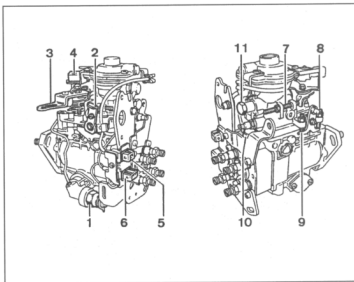
### 1.5 Roto-diesel injection pump

- 1 Manual stop lever
- 2 Fuel return to tank
- 3 Engine maximum speed adjustment screw
- 4 Stop solenoid
- 5 Fuel inlet
- 6 Timing inspection plug
- 7 Accelerator lever
- 8 Anti-stalling adjustment screw
- 9 Fast idle lever
- 10 Idling adjustment screw

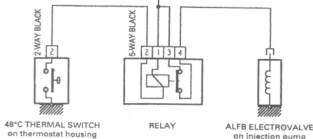


### 1.8 Bosch injection pump - BX models from early 1993

- 1 Cold engine low-load advance suppression device (ALFB) fitted to automatic transmission models
- 2 Stop lever
- 3 Load lever
- 4 Load lever position switch
- 5 Load lever position switch connector (2-way)
- 6 Electrical stop and ALFB connector (3-way)
- 7 Residual flow adjustment screw
- 8 Fast idle adjustment screw
- 9 Idle speed adjustment screw
- 10 Stop solenoid valve
- 11 Calibrated return banjo bolt (marked OUT)



Ignition switched "+"



1.9 ALFB wiring circuit

## 2 Turbocharger - precautions

1 The turbocharger operates at extremely high speeds and temperatures. Certain precautions must be observed, to avoid premature failure of the turbo or injury to the operator.

- 2 Do not operate the turbo with any parts exposed. Foreign objects falling onto the rotating vanes could cause excessive damage and (if ejected) personal injury.
- 3 Do not race the engine immediately after start-up, especially if it is cold. Give the oil a few seconds to circulate.
- 4 Always allow the engine to return to idle speed before switching it off - do not blip the throttle and switch off, as this will leave the

turbo spinning without lubrication.

5 Allow the engine to idle for several minutes before switching off after a high-speed run.

6 Observe the recommended intervals for oil and filter changing, and use a reputable oil of the specified quality.



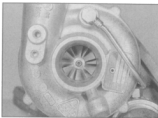
*Neglect of oil changing, or use of inferior oil, can cause carbon formation on the turbo shaft and subsequent failure.*

- 3 Air cleaner and element (non-Turbo models) - removal and refitting

## Visa models

### Removal

- 1 Unscrew and remove the through-bolt from the top of the air cleaner.
- 2 Release the spring clips and lift off the cover (see illustration).
- 3 Remove the element and wipe clean the inside surfaces of the main body and cover.
- 4 Loosen the clips and disconnect the inlet ducting. Leave the bracket for the rear duct attached to the duct, but unbolt the bracket from the inlet manifold. Disconnect the ventilation hose from the oil separator (see illustrations).
- 5 Unscrew the nut from the base of the main body then slide the body rearwards from the



1.11 View of the compressor wheel end of the turbocharger (KKK type)



3.2 Air cleaner element (Visa models)



3.4A Disconnecting the air duct from the inlet manifold



3.4B Air duct support bracket (Visa models)



3.4C Disconnecting the ventilation hose from the oil separator (Visa models)



3.5 Removing the air cleaner from the mounting rubbers (Visa models)



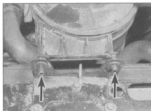
3.7A Unscrew the wing nut ...



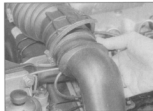
3.7B ... and lift off the air cleaner cover (BX models)



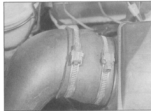
3.11A Air cleaner mounting nut - arrowed (BX models)



3.11B Air cleaner mounting rubbers - arrowed (BX models)



4.1 Unclipping the air intake tube



4.2 Two hose clips securing the stub hose

two mounting rubbers (see illustration).

#### Refitting

6 Refitting is a reversal of removal.

#### BX models

#### Removal

7 Unscrew the wing nut and lift the cover from the air cleaner (see illustrations).

8 Move the inlet duct to one side and remove the element. Wipe clean the inside surfaces of the main body and cover.

9 Check the sealing ring for the cover and renew it if necessary.

10 Loosen the clips and disconnect the inlet ducting.

11 Unscrew the nut securing the base of the main body to the bracket below the battery, then slide the body rearwards from the mounting rubbers in the bracket over the

radiator (see illustrations).

#### Refitting

12 Refitting is a reversal of removal.

4 Air cleaner and element (Turbo models) - removal and refitting

#### Removal

1 Unclip the rigid air inlet tube on the right-hand side of the engine bay (see illustration).

2 At the air cleaner end of the inlet tube, remove the stub hose that joins the tube to the air cleaner (see illustration).

3 Disconnect the crankcase ventilation hose (see illustration).

4 Release the spring clips which secure the

air cleaner body to its mounting.

5 Release the spring clips which secure the air cleaner lid.

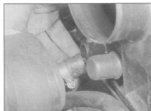
6 Remove the air cleaner lid (see illustration). It is likely to be a tight fit, but by manipulating the lid and the air cleaner body at the same time, the lid can be removed.

7 Remove the element and clean out the housing. The housing can be removed by pulling it off its rubber mountings.

#### Refitting

8 Fit the new element. It can only be fitted one way up (see illustration).

9 Refit and secure the other disturbed components.



4.3 Disconnecting the crankcase ventilation hose



4.6 Removing the air cleaner lid



4.8 Fitting the air cleaner element



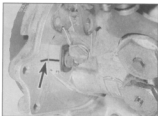
5.9 Main fuel return pipe (1) and injector leak off return pipe (2) (Roto-diesel)



5.10 Disconnecting the stop solenoid wire (Roto-diesel)



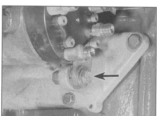
5.11 Injector pipe union nuts on the Roto-diesel injection pump



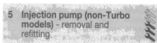
5.15 Mark the injection pump in relation to the mounting bracket (arrowed)



5.16A Injection pump mounting nut and plate (arrowed)



5.16B Injection pump mounting bolt (arrowed)



## Removal

- 1 Disconnect the battery negative lead.
- 2 Cover the alternator with a plastic bag as a precaution against spillage of diesel fuel.
- 3 On Visa models apply the handbrake. On BX models chock the rear wheels and release the handbrake.
- 4 On manual transmission models, jack up the front right-hand corner of the vehicle until the wheel is just clear of the ground. Support the vehicle on an axle stand and engage 4th or 5th gear. This will enable the engine to be turned easily by turning the right-hand wheel. On automatic models the engine must be turned by using a spanner on the crankshaft pulley bolt. It may be advantageous to remove the heater plugs.
- 5 Pull up the special clip, release the spring clips, and withdraw the two timing cover sections.
- 6 Open the accelerator lever on the injection pump and disconnect the cable by passing it through the special slot. Disconnect the cable adjustment ferrule from the bracket.
- 7 Note the position of the end stop on the fast idle cable then loosen the screw and disconnect the inner cable. Unscrew the adjustment locknut and remove the cable and ferrule from the bracket.
- 8 Loosen the clip and disconnect the fuel

supply hose.

9 Disconnect the main fuel return pipe and the injector leak off return pipe from the union tube (see illustration).

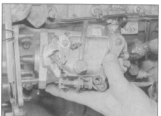
10 Disconnect the wire from the stop solenoid (see illustration).

11 Unscrew the union nuts securing the injector pipes to the injection pump (see illustration).

12 On BX models remove the clip securing the hydraulic pipes to the engine front plate.

13 Turn the engine by means of the front right-hand wheel or crankshaft pulley bolt until the two bolt holes in the injection pump sprocket are aligned with the corresponding holes in the engine front plate.

14 Insert two M8 bolts through the holes and hand tighten them. The bolts must retain the sprocket while the injection pump is removed thereby making it unnecessary to remove the timing belt.

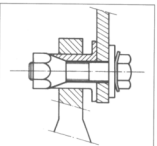


5.18 Removing the injection pump from its mounting bracket

15 Mark the injection pump in relation to the mounting bracket using a scriber or felt tip pen (see illustration). This will ensure the correct timing when refitting. If a new pump is being fitted transfer the mark from the old pump to give an approximate setting.

16 Unscrew the three mounting nuts and remove the plates. Unscrew and remove the rear mounting bolt and support the injection pump on a block of wood (see illustrations).

17 Unscrew the sprocket nut until the taper is released from the sprocket. The nut acts as a puller, together with the plate bolted to the sprocket. From late 1992, the fuel injection pump sprocket bolt no longer incorporates a puller. To free the sprocket from the taper on the injection pump shaft, a flange must be



5.26 Cross-section of injection pump rear mounting



bolted to the sprocket before unscrewing the bolt. Ideally, a flange should be removed from an old sprocket and used to remove the new-type sprocket. Alternatively, a flange can be made up from steel plate.

18 Continue to unscrew the sprocket nut and withdraw the injection pump from the mounting bracket (see illustration). Recover the Woodruff key from the shaft groove if it is loose.

### Refitting

19 Begin refitting the injection pump by fitting the Woodruff key to the shaft groove (if removed).

20 Unbolt the puller plate from the injection pump sprocket.

21 Insert the injection pump from behind the sprocket, making sure that the shaft key enters the groove in the sprocket. Screw on the nut and hand tighten it.

22 Fit the mounting nuts, together with their plates, and hand tighten the nuts.

23 Tighten the sprocket nut to the specified torque then refit the puller plate and tighten the bolts.

24 Unscrew and remove the two bolts from the injection pump sprocket.

25 If the original injection pump is being refitted, align the scribed marks and tighten the mounting nuts. If fitting a new pump, the timing must be set as described in Sections 8 or 9, as applicable.

26 Refit the rear mounting bolt and special nut, tightening the nut slowly to allow the bush to align itself as shown (see illustration).

27 On BX models refit the clip securing the hydraulic pipes.

28 Refit the injector pipes to the injection pump and tighten the union nuts.

29 Reconnect the wire to the stop solenoid.

30 Refit the fuel supply and return pipes.

31 Refit the fast idle cable and accelerator cable, and adjust them, referring to Sections 10 and 18.

32 Refit the two timing cover sections and secure with the spring clips.

33 Lower the vehicle to the ground and apply the handbrake (BX models).

34 Remove the plastic bag from the

alternator and reconnect the battery negative lead.

35 Prime the fuel circuit by first switching on the ignition to energise the stop solenoid, then actuating the pump on the fuel filter until resistance is felt. On early models fitted with a Roto-diesel filter the pump plunger must first be unscrewed then retightened after priming.

36 Turn the ignition key to position M and wait for the preheating warning light to go out. Start the engine and adjust the idling speed, referring to Chapter 1.

## 6 Injection pump (Turbo models) - general, removal and refitting

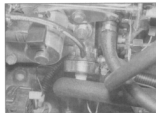
### General

1 The injection pump fitted to Turbo models is similar to that fitted to normally-aspirated models, but incorporates the following additional features.

#### Lucas CAV/Roto-diesel

2 An over-fuelling device varies the quantity of fuel injected in response to turbo boost pressure. Pressure is sensed through a hose connected to the inlet manifold (see illustration).

3 An electromagnetic timing system advances injection timing when the engine is cold. The system is switched off by a contact activated by movement of the fast idle control lever (see illustrations).



6.2 The overfuelling device - Lucas CAV/Roto-diesel pump

4 These additional devices cannot be checked or adjusted by the home mechanic.

### Bosch

5 A richness limiter replaces the over-fuelling device just described, and a cold start accelerator replaces the electromagnetic timing system (see illustrations).

6 The cold start accelerator receives its own coolant feed. Because it is a mechanical device, it must be disconnected when timing the pump.

### Removal

7 Proceed as in Section 5, but additionally disconnect the boost pressure hose from the over-fuelling device or richness limiter.

8 On the Bosch pump, the coolant hoses must be disconnected from the cold start accelerator. If the cooling system is first depressurised by removing the expansion tank cap (system cold), and preparations made to plug the disconnected hoses, coolant loss can be kept to a minimum.

### Refitting

9 Refit by reversing the removal operations. Check the pump timing if necessary as described in Sections 8 or 9, as applicable. Top-up the coolant level if necessary.



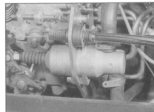
6.3A Electromagnetic timing device (arrowed) - Lucas CAV/Roto-diesel pump



6.3B Electromagnetic timing contact on the fast idle lever



6.5A Richness limiter - Bosch pump



6.5B Cold start accelerator - Bosch pump

## 7 Injection pump dynamic timing (all models) - general

Dynamic timing is given for certain models in the Specifications. However, the specialist equipment necessary to check the timing dynamically is quite expensive, and will not normally be available to the home mechanic. Also, the setting-up procedure varies according to the type of equipment used, so it is important to refer to the equipment maker's instructions when connecting the equipment to the engine. Note that most dynamic checking testers are only accurate to approximately  $\pm 2^\circ$ .

Dynamic timing should only be used within the limitations of the checking equipment. If the timing requires adjustment, then it must only be adjusted using the static timing method.

## 8 Injection pump static timing (Roto-diesel) - checking

**Caution:** The maximum engine speed and transfer pressure settings, together with timing access plugs, are sealed by the manufacturers at the factory using locking wire and lead seals. Do not disturb the wire if the vehicle is still within the warranty period otherwise the warranty will be invalidated. Also do not attempt the timing procedure unless accurate instrumentation is available.

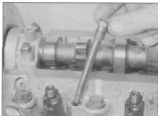
### Pre mid-1987 models

#### Checking

- 1 Disconnect the battery negative lead.
- 2 Cover the alternator with a plastic bag as a precaution against spillage of diesel fuel.
- 3 On Visa models apply the handbrake. On BX models chock the rear wheels and release the handbrake.
- 4 On manual transmission models jack up the front right-hand corner of the vehicle until the wheel is just clear of the ground. Support the vehicle on an axle stand and engage 4th or 5th gear. This will enable the engine to be



8.12 Roto-diesel injection pump with the timing plug removed



8.7 Removing the blanking plug from No 4 cylinder

turned easily by turning the right-hand wheel. On automatic transmission models use an open-ended spanner on the crankshaft pulley bolt.

5 Disconnect the wire and unscrew the heater plug from cylinder No 4 (timing belt end). Note that the engine is timed with No 4 piston at TDC compression (ie No 1 piston at TDC with valves "rocking").

6 Two dial test indicators are now necessary for checking the positions of the No 4 piston and the injection pump. Magnetic type stands will be found helpful or alternatively brackets may be made for fitting to appropriate positions on the engine.

7 Unscrew and remove the blanking plug from the cylinder head next to No 4 injector (see illustration).

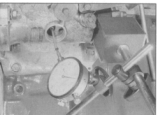
8 Turn the engine forwards until pressure is felt in No 4 cylinder indicating that No 4 piston is beginning its compression stroke.

9 Position the dial test indicator over the blanking hole and fit the probe (see illustration).

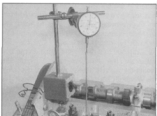
10 Turn the engine forwards until the maximum lift of piston No 4 is registered on the dial test indicator. Turn the engine slightly back and forth to determine the exact point of maximum lift then zero the indicator.

11 On BX models remove the clip securing the hydraulic pipes to the engine front plate and move the pipes to one side.

12 Loosen the lower of the two large side plugs on the side of the injection pump. Position a small container beneath the plug then remove the plug and catch the escaping fuel in the container (see illustration).



8.13A Timing the Roto-diesel injection pump with a dial test indicator



8.9 Setting No 4 piston timing position with a dial test indicator

13 Inside the plug aperture there is a probe guide. Insert the probe and connect it to the dial test indicator directly over the hole (see illustration). Note that the end of the probe must be pointed in order to fully engage the groove in the pump rotor (see illustration).

14 Turn the engine backwards approximately  $\frac{1}{8}$ th of a turn or until the No 4 piston has moved 4.0 mm down the cylinder. Now turn the engine slowly forwards while watching the dial test indicator on the injection pump. After the probe has reached the bottom of the timing groove then risen by 0.01 to 0.02 mm, check that the upper dial test indicator reads  $2.26 \pm 0.05$  mm before TDC. If the timing is incorrect continue as follows.

15 Check the zero setting of the upper dial test indicator by repeating the procedure given in paragraph 10.

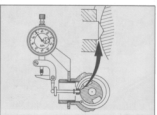
16 Turn the engine backwards approximately  $\frac{1}{8}$ th of a turn or until No 4 piston has moved 4.0 mm down the cylinder. Now turn the engine slowly forwards until No 4 piston is  $2.26 \pm 0.05$  mm before TDC.

17 Unscrew the union nuts and disconnect the injector pipes from the injection pump. Loosen the injection pump mounting nuts and bolt.

18 Turn the pump body until the probe is at the bottom of the timing groove in the rotor. Zero the dial test indicator. Now turn the pump clockwise (from the injector pipe end) until the probe has risen by 0.01 to 0.02 mm.

19 Tighten the mounting nuts and bolts making sure that there is no movement on the dial test indicator.

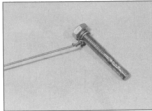
20 Recheck the timing as described in



8.13B Checking the timing on the Roto-diesel fuel injection pump



**8.26** Plastic disc on later Lucas CAV/Rotodiesel pump



**8.27** Home-made TDC setting tool



**8.31** Removing the inspection plug from the pump

paragraph 14.

**21** Remove the dial test indicators and refit the plugs. Reconnect the injector pipes and tighten the union nuts.

**22** Refit the hydraulic pipe clip on BX models.

**23** Refit the heater plug and connect the wire.

**24** Lower the car to the ground and reconnect the battery negative lead. Remove the plastic bag from the alternator.

**25** Prime the fuel system as described in Section 23.

### From mid-1987

#### Checking

From mid-1987, a modified pump is fitted. The pump can be recognised by the presence of a white or blue plastic disc on its front face. A timing value is engraved on the disc (see illustration).

**27** The pump timing is now carried out at TDC. Only one dial test indicator is needed, but it will be necessary to make up a bent rod (8.0 mm diameter) or similar tool to enter the TDC setting hole. The tool made up in the workshop consisted of an M8 bolt with the threads filed away, attached to a piece of welding rod (see illustration). Alternatively, the starter motor can be removed, and a twist drill or straight rod can be used (refer to Chapter 2, Section 23).

**28** Prepare the engine as described in paragraphs 1 to 4.

**29** Turn the engine to bring No 4 cylinder (timing belt end) to TDC on compression. To establish which cylinder is on compression, either remove No 4 cylinder heater plug and feel for pressure, or remove the valve cover and observe when No 1 cylinder valves are "rocking" (inlet opening and exhaust closing).

**30** Insert the TDC setting tool into the hole, and turn the engine back and forth slightly until the tool enters the hole in the flywheel. Leave the tool in position.

**31** Remove the inspection plug from the top of the pump (see illustration). Position a dial test indicator so that it can read the movement of a probe inserted into the hole. If a magnetic stand is to be used, the absence of ferrous metal in the vicinity poses a problem; a piece of steel plate can be bolted to the engine mounting or valve cover to carry the stand.

**32** Insert a probe into the inspection hole so that the tip of the probe rests on the rotor timing piece. Position the dial test indicator so that it reads the movement of the probe.

**33** Remove the TDC setting tool. Turn the engine approximately a quarter-turn backwards. Zero the dial test indicator.

**34** Turn the engine forwards slowly until the TDC setting tool can be re-inserted. Read the dial test indicator; the reading should correspond to the value engraved on the pump disc ( $\pm 0.04$  mm).

**35** If the reading is not as specified, continue as follows.

**36** Disconnect the injector pipes from the pump. Slacken the pump mounting nuts and bolts, and swing the pump away from the engine. Zero the dial test indicator.

**37** With the engine still at TDC, slowly swing the pump back towards the engine until the dial test indicator displays the value engraved on the pump disc. In this position, tighten the pump mountings, then remove the TDC setting tool and recheck the timing as just described.

**38** When the timing is correct, reconnect the injector pipes, remove the dial test indicator and TDC setting tool and refit the inspection plug.

**39** Refit any other disturbed components, remove the plastic bag from the alternator, and lower the vehicle to the ground.

### 9 Injection pump static timing (Bosch) - checking

**Caution:** Some of the injection pump settings and access plugs may be sealed by the manufacturers at the factory using locking wire and lead seals. Do not disturb the wire if the vehicle is still within the warranty period otherwise the warranty will be invalidated. Also do not attempt the timing procedure unless accurate instrumentation is available.

#### Pre October 1987 models

- 1 Disconnect the battery negative lead.
- 2 Cover the alternator with a plastic bag as a precaution against spillage of diesel fuel.

**3** On Visa models apply the handbrake. On BX models chock the rear wheels and release the handbrake.

**4** On manual transmission models jack up the front right-hand corner of the vehicle until the wheel is just clear of the ground. Support the vehicle on an axle stand and engage 4th or 5th gear. This will enable the engine to be turned easily by turning the right-hand wheel. On automatic transmission models use an open ended spanner on the crankshaft pulley bolt.

**5** Disconnect the wire and unscrew the heater plug from cylinder No 4 (timing belt end). Note that the engine is timed with No 4 piston at TDC compression (ie No 1 piston at TDC with valves "rocking").

**6** Two dial test indicators are now necessary for checking the positions of the No 4 piston and the injection pump. Magnetic type stands will be found helpful or alternatively brackets may be made for fitting to appropriate positions on the engine.

**7** Unscrew and remove the blanking plug from the cylinder head next to No 4 injector.

**8** Turn the engine forwards until pressure is felt in No 4 cylinder, indicating that No 4 piston is beginning its compression stroke.

**9** Position the dial test indicator over the blanking hole and fit the probe.

**10** Turn the engine forwards until the maximum lift of piston No 4 is registered on the dial test indicator. Turn the engine slightly to and fro to determine the exact point of maximum lift then zero the indicator.

**11** Unscrew the union nuts and disconnect the injector pipes for cylinders 1 and 2 from the injection pump.

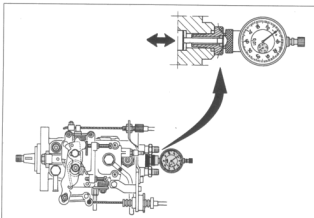
**12** Unscrew the blanking plug from the end of the injection pump between the injector pipe connections. Be prepared for the loss of some fuel.

**13** Insert the probe and connect it to the dial test indicator positioned directly over the hole. The fixture used by Citroën technicians is shown (see illustration).

**14** Turn the engine backwards approximately 1/8th of a turn or until the No 4 piston has moved 4.0 mm down the cylinder.

**15** Zero the dial test indicator on the injection pump.

**16** Turn the engine slowly forwards until the dial test indicator on the injection pump reads



9.13 Checking the timing on the Bosch fuel injection pump

0.30 mm, then check that the upper dial test indicator reads  $0.72 \pm 0.03$  mm before TDC for Visa models, or  $0.80 \pm 0.03$  mm before TDC for BX17 models or  $0.57 \pm 0.03$  mm before TDC for BX19 models. If the timing is incorrect continue as follows.

17 Check the zero setting of the upper dial test indicator by repeating the procedure given in paragraph 10.

18 Turn the engine backwards approximately 1/6th of a turn or until the No 4 piston had moved 4.0 mm down the cylinder. Now turn the engine slowly forwards until the upper dial test indicator reads  $0.72 \pm 0.03$  mm before TDC for Visa models, or  $0.80 \pm 0.03$  mm before TDC for BX17 models, or  $0.57 \pm 0.03$  mm before TDC for BX19 models.

19 Unscrew the union nuts and disconnect the remaining injector pipes from the injection pump. Loosen the injection pump mounting nuts and bolt.

20 Turn the pump body anti-clockwise (from the injector pipe end) and check that the dial test indicator is zeroed. Now turn the pump body slowly clockwise until the dial test indicator reads 0.30 mm.

21 Tighten the mounting nuts and bolts, making sure that there is no movement on the dial test indicator.

22 Recheck the timing as described in paragraphs 14 to 16.

23 Remove the dial test indicators and refit the plugs. Reconnect the injector pipes and tighten the union nuts.

24 Refit the heater plug and connect the wire.

25 Lower the car to the ground and reconnect the battery negative lead. Remove the plastic bag from the alternator.

26 Prime the fuel system as described in Section 23.

### October 1987-on models

27 Later Bosch pumps are timed at TDC. Refer to the Specifications for pump identification and timing values. Only one dial test indicator is needed, but it will be necessary to make up a TDC setting tool as just described for the Lucas CAV/Roto-diesel pump.

28 Prepare the engine as described in paragraphs 1 to 4. On Turbo models, disconnect the cold start accelerator.

29 Bring the engine to TDC, No 4 cylinder on compression, and insert the TDC setting tool (refer to Section 8, paragraphs 29 and 30).

30 Fit a dial test indicator to the rear of the pump as described in paragraphs 11 to 13.

31 Remove the TDC setting tool. Turn the engine approximately a quarter-turn backwards. Zero the dial test indicator.

32 Turn the engine forwards slowly until the TDC setting tool can be re-inserted. Read the dial test indicator; the value should correspond to that given in the Specifications.

33 If the reading is not as specified, continue as follows.



10.1 Fast idle inner cable and end fitting (arrowed) on the Bosch injection pump

34 Disconnect the remaining injector pipes from the pump. Slacken the pump mounting nuts and bolts, and swing the pump away from the engine. Zero the dial test indicator.

35 With the engine still at TDC, slowly swing the pump back towards the engine until the dial test indicator displays the desired value. In this position, tighten the pump mountings, then remove the TDC setting tool and recheck the timing as just described.

36 When the timing is correct, remove the dial test indicator and TDC setting tool. Reconnect the injector pipes.

37 Refit any other disturbed components, remove the plastic bag from the alternator, and lower the vehicle to the ground.

### 10 Fast idle control - removal, refitting and adjustment

#### Removal

1 Loosen the clamp screw or nut and remove the end fitting from the inner cable (see illustration).

2 Unscrew the locknut and remove the adjustment ferrule and outer cable from the bracket on the injection pump (see illustration).

3 Drain the cooling system as described in Chapter 1.

4 Unscrew the thermostatic sensor from the thermostat housing cover and recover the washer.

#### Refitting

5 Fit the new thermostatic sensor and washer.

6 Insert the cable and ferrule in the bracket and screw on the locknut finger tight.

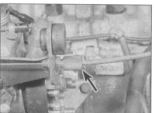
7 Fit the end fitting on the inner cable.

#### Adjustment

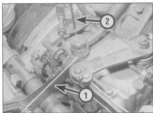
8 With the engine cold, push the fast idle lever fully towards the flywheel end of the engine then tighten the clamp screw or nut with the end fitting touching the lever.

9 Adjust the ferrule to ensure that the fast idle lever is touching its stop then tighten the locknuts.

10 Measure the exposed length of the inner cable between the ferrule and end fitting.



10.2 Fast idle cable adjustment ferrule on the Roto-diesel injection pump



11.3 Anti-stall adjustment on the Roto-diesel injection pump showing feeler blades (1) and twist drill (2)

11 Refill the cooling system as described in Chapter 1, and run the engine to normal operating temperature.

12 With the engine hot, check that the length of the inner cable has increased by at least 6.0 mm indicating that the thermostatic sensor is functioning correctly.

13 Switch off the engine.

#### 11 Injection pump anti-stall (Roto-diesel) - adjustment

**Note:** This adjustment requires the use of a tachometer - refer to Chapter 1, Section 19, for alternative methods.

1 Run the engine to normal operating temperature then switch it off.

2 Insert a 3.0 mm shim or feeler blade between the accelerator lever and the anti-stall adjustment screw.

3 Turn the stop lever clockwise until it is clear of the hole in the fast idle lever then insert a 3.0 mm dowel rod or twist drill (see illustration).

4 Start the engine and allow it to idle. The engine speed should be 900 ± 100 rpm.

5 If adjustment is necessary loosen the locknut, turn the anti-stall adjustment screw as required, then tighten the locknut.

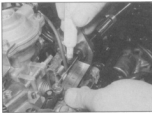
6 Remove the feeler blade and twist drill and adjust the idling speed as described in Chapter 1.

7 Turn the accelerator lever to increase the engine speed to 3000 rpm then quickly release the lever. If the deceleration is too fast and the engine stalls turn the anti-stall adjustment screw ¼ turn anti-clockwise (viewed from flywheel end of engine). If the deceleration is too slow, resulting in poor engine braking, turn the screw ¼ turn clockwise.

8 Retighten the locknut after making an adjustment then recheck the idling speed as described in Chapter 1.

9 With the engine idling check the operation of the manual stop control by turning the stop lever clockwise. The engine must stop instantly.

10 Switch off the ignition switch.



13.1 Marking the accelerator inner cable 11.0 mm from the end of the outer cable

#### 12 Injection pump anti-stall (Bosch) - adjustment

**Note:** This adjustment requires the use of a tachometer - refer to Chapter 1, Section 19, for alternative methods.

1 Run the engine to normal operating temperature. Note the exact idling speed then switch off the engine.

2 Insert a 1.0 mm shim or feeler blade between the accelerator lever and the anti-stall adjustment screw.

3 Start the engine and allow it to idle. The engine speed should exceed the normal idling speed by 50 rpm.

4 If adjustment is necessary loosen the locknut and turn the anti-stall adjustment screw as required. Retighten the locknut.

5 Remove the feeler blade and allow the engine to idle.

6 Move the fast idle lever fully towards the flywheel end of the engine and check that the engine speed increases to 950 ± 50 rpm. If necessary loosen the locknut and turn the stop adjusting screw as required, then retighten the locknut.

7 With the engine idling, check the operation of the manual stop control by turning the stop lever. The engine must stop instantly.

8 Switch off the ignition switch.

#### 13 Injection pump load lever position switch (later Bosch models) - adjustment

1 Mark the accelerator inner cable 11.0 mm from the end of the outer cable (see illustration).

2 Move the load lever until the mark on the inner cable coincides with the end of the outer cable, and hold the lever in this position.

3 Loosen the switch mounting screws, then turn the switch until the internal contacts click open (see illustration).

4 Tighten the mounting screws with the switch in this position, then release the lever.

5 Move the lever again, and check that the switch contacts operate when the mark on the



13.3 Load lever position switch

inner cable reaches the end of the outer cable.

#### 14 Maximum engine speed - checking and adjustment

**Caution:** On Roto-diesel injection pumps the maximum speed setting is sealed by the manufacturers at the factory using locking wire and a lead seal. Do not disturb the wire if the vehicle is still within the warranty period otherwise the warranty will be invalidated. This adjustment requires the use of a tachometer - refer to Chapter 1, Section 19, for alternative methods.

##### Checking

1 Run the engine to normal operating temperature.

2 Have an assistant fully depress the accelerator pedal and check that the maximum engine speed is as given in the Specifications. Do not keep the engine at maximum speed for more than two or three seconds.

##### Adjustment

3 If adjustment is necessary stop the engine then loosen the locknut, turn the maximum engine speed adjustment screw as necessary, and retighten the locknut (see illustration).

4 Repeat the procedure in paragraph 2 to check the adjustment.

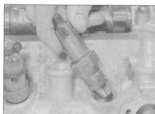
5 Switch off the ignition switch.



14.3 Maximum engine speed adjustment screw on the Roto-diesel injection pump



15.5 Disconnecting the injector pipes



15.6A Removing an injector



15.6B An injector

## 15 Fuel injectors - removal and refitting



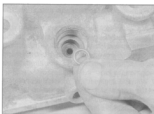
**Warning:** Exercise extreme caution when working on the fuel injectors. Never expose the hands or any part of the body to injector spray, as the high working pressure can cause the fuel to penetrate the skin, with possibly fatal results. You are strongly advised to have any work that involves testing the injectors under pressure, carried out by a dealer or fuel injection specialist.

### Removal

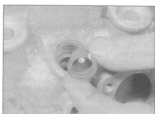
1 On BX models remove the air duct between the air cleaner and inlet manifold.



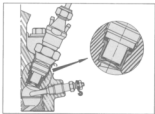
15.7A Removing an injector copper washer ...



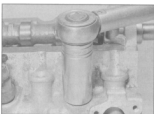
15.7B ... fire-seal washer ...



15.7C ... and sleeve



15.15A Cross-section of cylinder head showing location of injector and heater plug  
Note fire-seal washer position in inset



15.15B Tightening an injector



15.17 A leak off pipe connected between two injectors

2 Clean around the injectors and injector pipe union nuts.

3 Pull the leak off pipes from the injectors (see illustration).

4 Loosen the injector pipe union nuts at the injection pump.

5 Unscrew the union nuts and disconnect the pipes from the injectors (see illustration). If required the injector pipes may be completely removed.

6 Unscrew the injectors and remove them from the cylinder head (see illustrations).

7 Recover the copper washers, fire-seal washers, and sleeves from the cylinder head (see illustrations).

8 If an injector sleeve is tight in the cylinder head, it can be removed using the following procedure. First block the injector sleeve hole with grease, to prevent debris entering the combustion chamber.

9 Cut a thread in the sleeve using a tap, then screw in a stud or bolt, which should have a thread on its entire length.

10 Using a thick washer in contact with the cylinder head, tighten a nut onto the washer, and pull out the sleeve.

### Refitting

11 The new injector sleeve may be inserted in the cylinder head by using an old injector as a drift. Do not fit the sealing washer or fire ring while using this method.

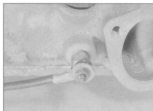
12 Obtain new copper washers and fire-seal washers.

13 Take care not to drop the injectors or allow the needles at their tips to become damaged. The injectors are precision-made to fine limits and must not be handled roughly, in particular do not mount them in a bench vice.

14 Begin refitting by inserting the sleeves



17.3 Plastic clips (arrowed) on heater plug terminals



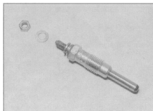
17.4A Heater plug terminal and inter-connecting wire



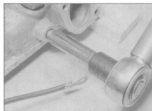
17.4B Removing the heater plug main supply cable (arrowed)



17.5A Removing a heater plug



17.5B Heater plug and terminal nut



17.5 Tightening a heater plug

followed by the fire-seal washers (convex face uppermost), and copper washers.

15 Insert the injectors and tighten them to the specified torque (see illustrations).

16 Refit the injector pipes and tighten the union nuts to the specified torque.

17 Reconnect the leak off pipes (see illustration).

18 On BX models refit the air duct.

#### 16 Preheater system - description and testing

### Description

1 Each swirl chamber has a preheater plug (commonly called a glow plug) screwed into it. The plugs are electrically operated before, during and immediately after starting a cold engine. Preheating is not required on a hot engine.

2 On XUD 9 models, the glow plugs are operated for approximately 7 seconds before starting the engine. A post-heating system keeps the glow plugs operating for 3 minutes after the engine has been started, under the following conditions. The injection pump load lever must be less than 11.0 mm open - a lever position switch switches off the glow plugs when the lever is opened more than this amount. The engine temperature must be lower than 60°C - a thermo-switch located behind the fuel filter housing monitors the temperature. The thermo-switch is identified

by having a mauve plastic ring.

### Testing

3 If the system malfunctions, testing is ultimately by substitution of known good units, but some preliminary checks may be made as follows.

4 Disconnect the main supply cable from the No 1 heater plug (counting from the flywheel) on Visa models, or No 2 plug on BX models.

5 Connect a voltmeter between the supply cable and earth making sure that the cable is kept clear of the engine and bodywork. Have an assistant switch on the preheater and check that there is a 12 volt supply for several seconds before the system cuts out. Typically there should be a 7 second supply at an ambient temperature of 20°C (68°F), but this will increase with colder temperatures and decrease with higher temperatures. If there is no supply, the relay or associated wiring is at fault. Switch off the ignition.

6 Connect an ammeter between the battery positive terminal and the heater plug inter-connecting wire. Check that the current draw after 20 seconds is 12 amps per working plug, i.e. 48 amps if all four plugs are working.

7 If one or more heater plugs appear to be not drawing the expected current disconnect the inter-connecting wire and check them individually or use an ohmmeter to check them for continuity and equal resistance.

8 Re-connect the main supply cable after completing the tests.

#### 17 Heater plugs and relay - removal and refitting

### Heater plugs

#### Removal

1 Check that the ignition switch is off.

2 On BX models remove the air duct between the air cleaner and inlet manifold.

3 Prise the plastic clips from the heater plugs (see illustration).

4 Unscrew the nuts from the heater plug terminals. Remove the main supply cable from No 1 plug (counting from the flywheel) on Visa models, or No 2 plug on BX models, then remove the inter-connecting wire from all the plugs (see illustrations).

5 Unscrew the heater plugs and remove them from the cylinder head (see illustrations).

#### Refitting

6 Refitting is a reversal of removal but tighten the heater plugs to the specified torque (see illustration).

### Relay

#### Removal

7 The relay is located on the left-hand side of the engine compartment near the battery (see illustrations).

8 First disconnect the battery negative lead. Unbolt the relay from the side panel and disconnect the wiring.



17.7A Heater plug control relay on Visa models ...



17.7B ... and BX models



18.1A Accelerator cable on the Roto-diesel injection pump



18.1B Accelerator cable attachment on the Bosch injection pump



18.2 Accelerator cable adjustment ferrule on the Bosch injection pump



19.3 Disconnecting the wiring from the stop solenoid

## Refitting

9 Refitting is a reversal of removal.

## 18 Accelerator cable - removal, refitting and adjustment

## Removal

- 1 Open the accelerator lever on the injection pump and disconnect the inner cable by passing it through the special slot (see illustrations).
- 2 Disconnect the cable adjustment ferrule and outer cable from the bracket (see illustration).
- 3 Working inside the vehicle, remove the lower facia panel where necessary then release the inner cable and fitting from the top of the accelerator pedal.
- 4 Pull the spring shock absorber from the bulkhead and withdraw the accelerator cable from inside the engine compartment.

## Refitting

5 Refitting is a reversal of removal, but adjust the cable as follows.

## Adjustment

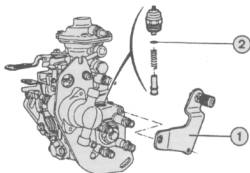
6 Have an assistant fully depress the accelerator pedal then check that the accelerator lever on the injection pump is touching the maximum speed adjustment screw. If not, pull the spring clip from the adjustment ferrule, reposition the ferrule and fit the spring clip in the groove next to the

metal washer. With the accelerator pedal fully released check that the accelerator lever is touching the anti-stall (deceleration) adjustment screw.

## 19 Stop solenoid - description, removal and refitting

## Description

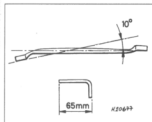
1 The stop solenoid is located on the end of



19.7 Stop solenoid removal

- 1 Fast idle cable support plate
- 2 O-ring





20.1 Tool modifications for turbocharger removal

the injection pump by the injector pipes. Its purpose is to cut the fuel supply when the ignition is switched off. If an open circuit occurs in the supply wiring it will be impossible to start the engine as the fuel will not reach the injectors.

### Removal

- Before removing the stop solenoid, clean the surrounding area, to prevent dust and dirt entering the fuel system.
- With the ignition switched off unscrew the nut and disconnect the wire (see illustration).
- Unscrew and remove the stop solenoid and recover the washer.
- After removing the solenoid, recover the plunger piston and spring from the injection pump.

### Refitting

- With the solenoid removed, operate the priming pump several times, to discharge any debris from the threads in the pump casing.
- Refitting is a reversal of the removal procedure, but renew the O-ring before refitting the solenoid and tightening it (see illustration).

## 20 Turbocharger - removal and refitting

### Removal

- Because the manifolds and turbocharger are on the back of the engine, access to the fastenings is difficult. The work will be made easier if two standard tools, a 6 mm Allen key and a 16 mm ring spanner, are modified as shown (see illustration).
- Disconnect the battery earth lead.
- Raise and support the vehicle. Remove the exhaust system; recover the two dowels that locate the exhaust downpipe on the turbo outlet flange.
- Prepare for some oil spillage. Disconnect the turbo oil feed and return pipes from the block. Undo the return pipe union and remove the return pipe completely. Also remove the feed pipe bracket.
- Unbolt and remove the engine bottom mounting torque link. The engine will move forwards slightly when this is done.
- Using the modified 16 mm spanner, remove the turbo mounting bolts that are accessible from below.
- Lower the vehicle. Remove the intercooler and its hoses as described in Section 22.
- Remove the radiator hose support bracket on the right-hand side of the radiator.
- Support the engine, either with a hoist from above, or with a jack and wooden blocks from below. Whichever method is used must allow for movement of the engine in subsequent operations.
- Protect the radiator with a piece of hardboard, or for greater security, remove it altogether.
- Remove the engine right-hand mounting bracket. Move the engine forwards as far as possible, making sure that it is still securely

supported and that the radiator is not damaged.

- Remove the air hoses from the turbocharger.

13 Using the modified Allen key, remove the inlet manifold bolts. These may be very tight. The middle bolt hole is in fact slotted, so if wished, the middle bolt may just be slackened.

14 Remove the inlet manifold. The gasket is shared with the exhaust manifold, so it will stay in place for the time being.

15 Disconnect the oil feed pipe from the top of the turbo. Remove the pipe. Note the strainer in the pipe (see illustrations).

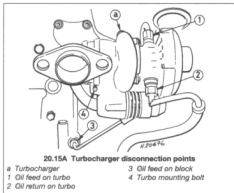
16 Slacken the remaining turbo mounting bolt. This fixing bolt is also slotted.

17 Manipulate the turbocharger and lift it out.

### Refitting

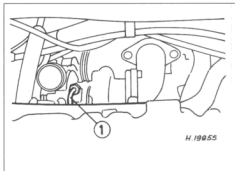
18 Refit by reversing the removal operations, noting the following points:

- If a new turbocharger is being fitted, change the engine oil and filter. Also renew the strainer in the oil feed pipe.
  - Do not fully tighten the oil feed pipe unions until both ends of the pipe are in place. When tightening the oil return pipe union, position it so that the return hose is not strained.
  - Before starting the engine, prime the turbo lubrication circuit by disconnecting the stop solenoid lead at the fuel pump and cranking the engine on the starter for three ten-second bursts.
- 19 After initial start-up, do not race the engine. Inspect the turbo and its lubrication pipes for oil leaks. Stop the engine and check the oil level.
- 20 A new turbo should be run-in like any other major mechanical component.



20.15A Turbocharger disconnection points

- Turbocharger
- Oil feed on turbo
- Oil return on turbo
- Turbo mounting bolt



20.15B Turbo oil feed (1) seen from above

## 21 Turbocharger - examination

- 1 With the turbocharger removed, inspect the housings for cracks or other visible damage.
- 2 Spin the turbine or the compressor wheel to verify that the shaft is intact, and to feel for excessive shake or roughness. Some play is normal; in use, the shaft is "floating" on a film of oil. Check that the wheel vanes are undamaged.
- 3 On the KKK turbo, the wastegate and actuator are integral, and cannot be checked or renewed separately. On the Garrett turbo, the wastegate actuator is a separate unit. Consult a Citroën dealer or other specialist if it is thought that testing or renewal is necessary.
- 4 If the exhaust or induction passages are oil-contaminated, the turbo shaft oil seals have probably failed (on the induction side, this will also have contaminated the intercooler, which if necessary should be flushed with solvent).
- 5 No DIY repair of the turbo is possible. A new unit may be available on an exchange basis.



22.1 Slackening the intercooler inlet trunking clip

## Refitting

- 7 Before refitting, clean the intercooler matrix with a soft brush, or by blowing air through it. Flush the intercooler internally with solvent if contaminated with oil. Make sure that the inlet manifold seal is in good condition, and renew it if necessary.
- 8 Refit by reversing the removal operations.

## 23 Fuel injection system - priming

## Early models

- 1 After disconnecting part of the fuel injection system or running out of fuel it is necessary to carry out the priming procedure before starting the engine.
- 2 Loosen the bleed screw on the fuel filter head two or three turns. On the Roto-diesel filter a plastic drain tube may be fitted to the bleed screw and a small container positioned to catch the fuel.
- 3 Actuate the plunger until fuel free from air bubbles flows from the bleed screw. On some Roto-diesel filter heads the plunger must first be unscrewed, and with this type the plunger may become detached from the internal piston. If this happens, unscrew the housing and press the piston back onto the plunger. Refit the housing and operate the plunger slowly.
- 4 Tighten the bleed screw.
- 5 Turn on the ignition so that the stop



22.2 One of the three screws securing the front of the intercooler. This one secures a hose guide as well

- solenoid is energised then activate the plunger until resistance is felt.
- 6 Where applicable on Roto-diesel filters reighten the plunger.
  - 7 Turn the ignition switch to position "M" and wait for the preheater warning light to go out.
  - 8 Fully depress the accelerator pedal and start the engine. Additional cranking may be necessary to finally bleed the fuel system before the engine starts.

## Later models

- 9 Later models are provided with a rubber hand-operated priming bulb, located on the right-hand side of the engine compartment. When the bulb is squeezed, fuel is forced into the fuel filter housing and then through a double valve. The valve forces fuel initially in the direction of the fuel injection pump, then any excess, along with fuel returned from the injectors, is returned to the fuel tank.
- 10 To prime the fuel lines, for instance after removing and refitting the injection pump, depress the priming bulb several times to force any trapped air back to the fuel tank.
- 11 Purging of air from the injection pump itself and the injectors is carried out when the engine is turned by the starter motor. However this process may be accelerated by temporarily slightly loosening each pipe in turn at the injector and until fuel emerges as the engine is being turned. Note that the fuel may spurt out under considerable pressure when doing this - precautions should be taken to prevent personal injury.

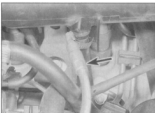
## 22 Intercooler - removal and refitting

## Removal

- 1 Slacken the intercooler inlet trunking clip (see illustration).
- 2 Remove the three screws that secure the front edge of the intercooler (see illustration).
- 3 Remove the three Allen screws that secure the rear edge of the intercooler. These screws are concealed by the intercooler rubber seal (see illustration).
- 4 Disconnect the intercooler-to-injection pump hose (see illustration).
- 5 Uncouple the crankcase ventilation system oil trap (see illustration).
- 6 Lift off the intercooler. Note the seal between the intercooler outlet and the inlet manifold.



22.3 Pulling back the rubber seal to reveal the rear securing screws



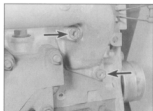
22.4 Disconnecting the hose (arrowed) which runs to the injection pump



22.5 Unclipping the oil trap



24.1 Auxiliary fuel tank - BX Turbo model



25.3A Inlet manifold bolts (arrowed)



25.3B Removing the inlet manifold (engine removed from car)



25.6 Exhaust manifold resonator and downpipe bolts (arrowed) on a 1.7 engine



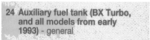
25.7A Removing the exhaust manifold on a 1.9 engine



25.7B Exhaust manifold gasket



25.8 Tightening the exhaust manifold nuts



## General

An auxiliary fuel tank is fitted to BX Turbo models, and to all models from early 1993. It is located in the rear right-hand corner of the vehicle, immediately below the fuel filler (see illustration).

## 25 Manifolds - removal and refitting

### Inlet

#### Removal

- 1 Disconnect the battery negative lead.
- 2 Disconnect and remove the air duct from the inlet manifold and air cleaner. On Visa models unbolt the support bracket.
- 3 Using a hexagon key, unscrew the bolts and remove the inlet manifold from the cylinder head (see illustrations). There are no gaskets.

#### Refitting

- 4 Refitting is a reversal of removal, but tighten the bolts evenly.

### Exhaust

#### Removal

- 5 Jack up the front of the car and support on axle stands (see "Jacking and vehicle support"). Apply the handbrake on Visa models, or chock the rear wheels on BX models.

- 6 Unscrew and remove the exhaust manifold-to-downpipe bolts, together with the springs and collars (see illustration). Tie the downpipe to one side.

- 7 Unscrew the nuts and withdraw the exhaust manifold from the studs in the cylinder head. Recover the gaskets (see illustrations).

#### Refitting

- 8 Refitting is a reversal of removal, but clean the mating faces and fit new gaskets. Tighten the nuts evenly (see illustration).