

Chapter 4 Part C:

Exhaust and emission control 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



Specifications

Turbocharger

Manufacturer/type:

2.0 litre C.T. petrol models	Garret T025
2.1 litre turbo diesel models	Mitsubishi TD 0411B
2.5 litre turbo diesel models	Garret T2

Boost pressure (at 3000 rpm on full load):

2.0 litre C.T. petrol	0.65 bar
2.1 litre turbo diesel	0.9 bar
2.5 litre turbo diesel	0.9 bar

Torque wrench settings

	Nm	lbf ft
Turbo oil return union screws to cylinder block	20	15
Exhaust manifold nuts	30	22
Turbocharger support bracket	20	15
Oil supply union to cylinder block	30	22
Oil supply union to turbo:		
2.1 litre engine	20	15
2.5 litre engine:		
Stage 1	10	7
Stage 2	Angle tighten through 45°	
Turbocharger mounting nuts:		
2.1 litre engine	60	44
2.5 litre engine	25	18

1 General information

Emission control systems

1 All petrol engined models covered in this manual are controlled by fuel injection or engine management systems that are 'tuned' to give the best compromise between driveability, fuel consumption and exhaust emission production. In addition, a number of systems are fitted that help to minimise other harmful emissions: a crankcase emission-control system that reduces the release of pollutants from the engines lubrication system is fitted to all models, catalytic converters that reduce exhaust gas pollutants are fitted to most models and an evaporative loss emission control system that reduces the release of gaseous hydrocarbons from the fuel tank is fitted to some models.

2 All diesel engined models are also equipped with a crankcase emission control system. In addition, all models are fitted with an Exhaust Gas Recirculation (EGR) system to reduce exhaust emissions.

Crankcase emission control

3 To reduce the emission of unburned hydrocarbons from the crankcase into the atmosphere, the engine is sealed and the blow-by gases and oil vapour are drawn from inside the crankcase, through a wire mesh oil separator, into the inlet tract to be burned by the engine during normal combustion.

4 Under conditions of high manifold depression (idling, deceleration) the gases will be sucked positively out of the crankcase. Under conditions of low manifold depression (acceleration, full-throttle running) the gases are forced out of the crankcase by the (relatively) higher crankcase pressure; if the engine is worn, the raised crankcase pressure (due to increased blow-by) will cause some of the flow to return under all manifold conditions. On certain engines, a pressure regulating valve (mounted on the camshaft cover) controls the flow of gases from the crankcase.

Exhaust emission control - petrol models

5 To minimise the amount of pollutants which escape into the atmosphere, most models are fitted with a catalytic converter in the exhaust system. On all models where a catalytic converter is fitted, the fuelling system is of the closed-loop type, in which a lambda sensor in the exhaust system provides the engine management system ECU with constant feedback, enabling the ECU to adjust the air/fuel mixture to optimise combustion.

6 The lambda sensor has a heating element built-in that is controlled by the ECU through the lambda sensor relay to quickly bring the sensor's tip to its optimum operating

temperature. The sensor's tip is sensitive to oxygen and relays a voltage signal to the ECU that varies according to the amount of oxygen in the exhaust gas. If the intake air/fuel mixture is too rich, the exhaust gases are low in oxygen so the sensor sends a low-voltage signal, the voltage rising as the mixture weakens and the amount of oxygen rises in the exhaust gases. Peak conversion efficiency of all major pollutants occurs if the intake air/fuel mixture is maintained at the chemically-correct ratio for the complete combustion of petrol of 14.7 parts (by weight) of air to 1 part of fuel (the 'stoichiometric' ratio). The sensor output voltage alters in a large step at this point, the ECU using the signal change as a reference point and correcting the intake air/fuel mixture accordingly by altering the fuel injector pulse width.

Exhaust emission control - diesel models

7 An Exhaust Gas Recirculation (EGR) system is fitted to all diesel engined models. This reduces the level of nitrogen oxides produced during combustion by introducing a proportion of the exhaust gas back into the inlet manifold, under certain engine operating conditions, via a plunger valve.

Evaporative emission control - petrol models

8 To minimise the escape of unburned hydrocarbons into the atmosphere, an evaporative loss emission control system is fitted to certain petrol models. The fuel tank filler cap is sealed and a charcoal canister is mounted underneath the right-hand wing to collect the petrol vapours released from the fuel contained in the fuel tank. It stores them until they can be drawn from the canister (under the control of the fuel-injection/ignition system ECU) via the purge valve(s) into the inlet tract, where they are then burned by the engine during normal combustion.

9 To ensure that the engine runs correctly when it is cold and/or idling and to protect the catalytic converter from the effects of an over-rich mixture, the purge control valve(s) are not opened by the ECU until the engine has warmed up, and the engine is under load; the valve solenoid is then modulated on and off to allow the stored vapour to pass into the inlet tract.

Exhaust systems

10 The exhaust system comprises the exhaust manifold, a number of silencer units (depending on model and specification), a catalytic converter (where fitted), a number of mounting brackets and a series of connecting pipes.

11 Refer to Section 4 for details of the turbocharger fitted to 2.0 litre turbo petrol, 2.1 and 2.5 litre turbo diesel models.

2 Exhaust manifold (petrol models) - removal and refitting

Removal

1 Chock the rear wheels, then jack up the front of the vehicle and support it on axle stands (see *Jacking and Vehicle Support*).

2 On turbo models, refer to Section 5 and remove the turbocharger from the exhaust manifold.

3 On non-turbo models, undo the nuts securing the front pipe to the manifold. Recover the springs and spring cups, and withdraw the bolts then disconnect the front pipe from the manifold, and recover the gasket.

4 Undo the nuts securing the manifold to the cylinder head. Manoeuvre the manifold out of the engine compartment, complete with gasket. Space is very limited and hence care should be taken.

5 Undo the two retaining bolts and separate the manifold and gasket, noting the spacers which are fitted between the gasket and manifold.

Refitting

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

- Examine all the exhaust manifold studs for signs of damage and corrosion; remove all traces of corrosion, and repair or renew any damaged studs.
- Ensure that the manifold and cylinder head sealing faces are clean and flat, and fit the new manifold gasket(s). Tighten the manifold nuts to the specified torque.
- Reconnect the front pipe to the manifold or refit the turbocharger with reference to Section 5.

3 Exhaust manifold (diesel models) - removal and refitting

Removal

Note: Access to the exhaust manifold with the engine in situ is extremely limited, particularly on 2.1 litre models.

1 Remove the upper and lower sections of the inlet manifold, as described in Chapter 4B, to improve access.

2 Where applicable, remove the clip securing the flexible portion of the EGR pipe to the manifold. If the original crimped clip is still in place, cut it off; new clips are supplied by Citroën parts stockists with a screw clamp fixing. If a screw clamp type clip is fitted, undo the screw and manipulate the clip off the pipe.

3 On turbo models, unscrew the union nut and disconnect the oil feed pipe from the top of the turbocharger.

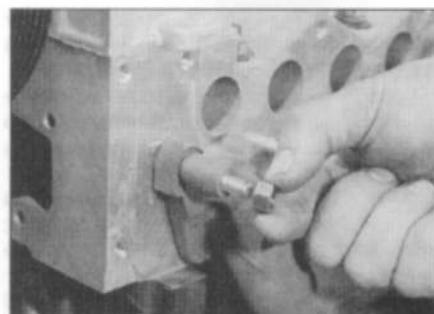
4 Undo the two bolts and separate the oil return pipe flange from the base of the turbocharger (turbo models only). Recover the gasket.



3.5 Removing the turbocharger steady bracket bolts



3.6a Note the position of the various support brackets and heat shields . . .



3.6b . . . then undo the nuts securing the exhaust manifold to the cylinder head studs . . .

5 Undo the turbocharger steady bracket bolt (where applicable) (see illustration).

6 Undo the nuts securing the manifold to the cylinder head studs, noting the position of the various support brackets and heat shields. Recover the spacers (see illustrations).

7 Withdraw the manifold, complete with turbocharger, from the cylinder head and recover the gasket (see illustrations).

Refitting

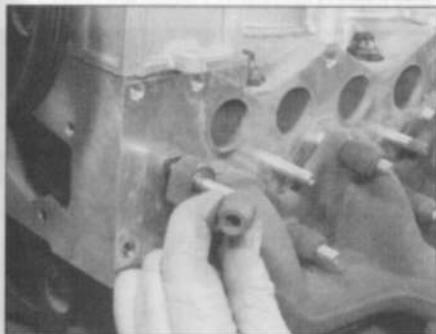
8 Refitting is a reversal of removal, bearing in mind the following points.

- Renew all gaskets and manifold securing nuts when refitting.
- Tighten all fixings to the specified torque, where given.
- On turbo models, secure the EGR pipe with a new screw clamp type clip, if a crimped type was initially fitted.
- Refit the inlet manifold as described in Chapter 4B.

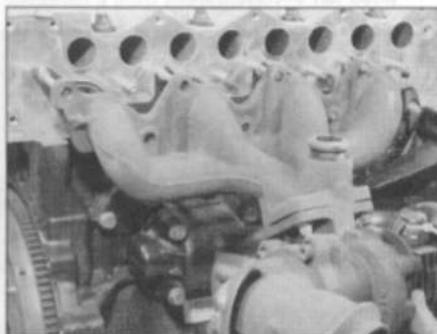
4 Turbocharger - description and precautions

Description

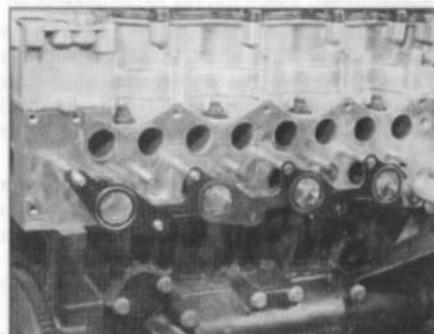
A turbocharger is fitted to certain petrol and diesel engines covered by this manual. It operates by raising the pressure in the inlet manifold above atmospheric pressure.



3.6c . . . and recover the exhaust manifold stud spacers



3.7a Withdraw the manifold, complete with turbocharger, from the cylinder head . . .



3.7b . . . and recover the gasket - 2.5 litre turbo diesel model shown

Instead of the inlet air being sucked into the combustion chambers, it is forced in under pressure. This leads to a greater charge pressure increase during combustion and improved fuel burning, which raises the thermal efficiency of the engine. Under these conditions, additional fuel is supplied by the fuel injection system, in proportion to the increased air flow.

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 vaned wheel known as the compressor wheel. The compressor wheel spins in its own housing, and compresses the inlet air on the way to the inlet manifold.

Between the turbocharger and the inlet manifold, the compressed air passes through an intercooler. This is an air-to-air heat exchanger, mounted in front of the radiator and supplied with cooling air from the front grille and electric cooling fans. The temperature of the inlet air rises due to the compression action of the turbocharger - the purpose of the intercooler is to cool the inlet air again, before it enters the engine. Because cool air is denser than hot air, this allows a greater mass of air (occupying the same volume) to be forced into the combustion chambers, resulting in a further increase the engine's thermal 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. On petrol models, the wastegate valve is controlled by the engine management system ECU, via an electronic vacuum modulator valve. The ECU uses the modulator valve to open the wastegate valve in a series of rapid pulses - the duty ratio of the pulses depends primarily on engine speed and load. In this manner, the ECU keeps the turbocharger boost pressure constant throughout the engine speed range, resulting in an almost flat torque curve.

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. On petrol models the turbo charger is water cooled and has a dedicated system of coolant supply and return pipes.

Precautions

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.

Do not operate the turbo with any of its parts exposed, or with any of its hoses removed. Foreign objects falling onto the rotating vanes could cause excessive damage, and (if ejected) personal injury. Suction can build up very quickly and without warning at the turbocharger air intake when the engine speed is raised.

Do not race the engine immediately after start-up, especially if it is cold. Give the oil a few seconds to circulate.

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.

Allow the engine to idle for several minutes before switching off after a high-speed run; this will allow the oil to reduce the temperature of the turbocharger.

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, leading to subsequent failure.

5 Turbocharger - removal and refitting



Note: On 2.1 and 2.5 litre diesel models, access to the turbocharger is extremely limited.

2.1 litre diesel models

Removal

- 1 Disconnect the battery negative cable and position it away from the terminal.
- 2 Slacken and remove the screws that secure the air cleaner-to-turbocharger ducting to its mountings.
- 3 Apply the parking brake, then jack up the front of the vehicle and support securely on axle stands (see *Jacking and Vehicle Support*).
- 4 Remove the fixings and lower the undertray away from the engine bay.
- 5 Refer to Chapter 7 and disconnect the gear change/selector link rods from their respective ball joints at the transmission.
- 6 Unbolt the exhaust front pipe from the flange at the end of the turbocharger elbow.
- 7 Unbolt and remove the support bracket(s) from the base of the turbocharger and the engine block.
- 8 Slacken and withdraw the turbocharger-to-manifold securing bolts. Access is extremely limited - you will need to use a socket extension bar with a flexible or universal joint.
- 9 At the rear of the engine, below the intermediate driveshaft bearing support bracket, remove the bolt that secures the bracket to the engine torque rod. This will allow the engine to tilt slightly, giving greater clearance when the turbocharger is removed.
- 10 Tilt the engine forward slightly and wedge a piece of wood (approx. 50mm thick) between the transmission casing and the suspension subframe to keep it in this position.
- 11 Slacken the clip and disconnect the air ducting from the turbocharger outlet port. Remove the bolt and disconnect the air ducting from inlet port at the top of the turbocharger. Cover the turbocharger openings with clean rag.



5.23a Disconnect the air ducting from the ports on the turbocharger . . .

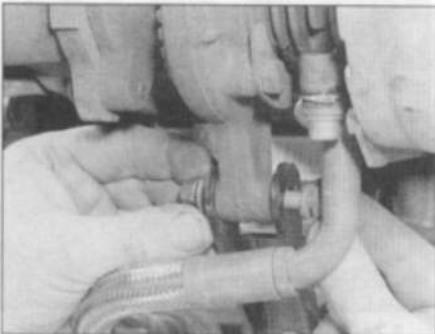


5.23b . . . and recover the O-ring seals - 2.5 litre model shown

- 12 Unscrew the union nut, and disconnect the oil feed pipe from the top of the turbocharger.
- 13 Undo the union and separate the oil return pipe from the base of the turbocharger. Recover the gasket.
- 14 Slacken and withdraw the turbocharger-to-manifold securing bolts.
- 15 Rotate the turbocharger and elbow assembly through half a turn and carefully withdraw it from the engine.
- 16 Lower the turbocharger and remove it from under the car. If it is to be refitted, store the turbocharger carefully, and plug its openings to prevent dirt ingress.

Refitting

- 17 Refitting is a reversal of removal, bearing in mind the following points:
 - a) Renew all gaskets and oil supply and return union seals.
 - b) Tighten all fixings to the correct torque (where specified).
 - c) If a new turbo is being fitted, change the engine oil and filter. Also renew the filter (where fitted) in the oil feed pipe.
 - d) 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.
 - e) 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.

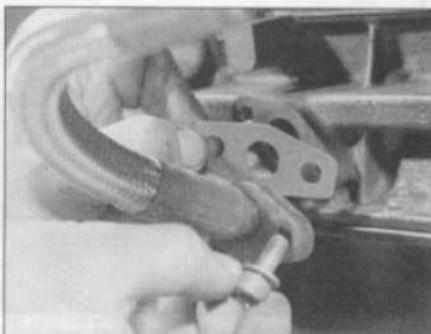


5.24 Unbolting the turbocharger support bracket from the base of the turbocharger

2.5 litre diesel models

Removal

- 18 Disconnect both battery cables from their respective terminals. Lift out the battery then unbolt the battery tray and remove it from the engine bay.
- 19 Raise the front of the car and support it securely on axle stands. Remove the right hand front wheel.
- 20 Unscrew the fixings and remove the engine bay undertray. Similarly, remove the rear section of the right hand wheel arch plastic liner.
- 21 Refer to Chapter 8 and remove the right hand intermediate shaft/driveshaft assembly from the vehicle.
- 22 Slacken the clamps and release the heat shield sleeving from the air ducting, at top and side of the turbocharger (where applicable).
- 23 Remove the securing screws and disconnect the air inlet and outlet ducting from the ports on the turbocharger. Recover the O-ring seals from the ends of the ducting (see illustrations).
- 24 Unbolt the turbocharger support bracket from the base of the turbocharger and the engine block (see illustration).
- 25 Slacken the clamp and disconnect the exhaust front pipe from the turbocharger exhaust outlet elbow. Unbolt the exhaust outlet elbow from the side of the turbocharger.
- 26 Remove the two bolts and disconnect the oil return union at the cylinder block (see illustration)



5.26 Remove the two bolts and disconnect the oil return union at the cylinder block

27 Undo the union and disconnect the oil supply union from the top of the turbocharger (see illustration).

28 Slacken and remove the turbocharger-to-manifold nuts (see illustration), then lower the turbocharger away from the engine and remove it from the vehicle.

Refitting

29 Refitting is a reversal of removal, bearing in mind the following points (see illustrations):

- Renew all gaskets and oil supply and return union seals
- Tighten all fixings to the correct torque (where specified).
- If a new turbo is being fitted, change the engine oil and filter. Also renew the filter (where fitted) 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.
- Renew the air duct O-ring seals.
- Refer to Chapter 8 for details of the driveshaft refitting procedure.
- 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.

2.0 litre petrol models

Removal

30 Disconnect the battery negative cable and position it away from the terminal.

31 Slacken and remove the screws that secure the air cleaner-to-turbocharger ducting to its mountings.

32 Apply the parking brake, then jack up the front of the vehicle and support securely on axle stands (see *Jacking and Vehicle Support*).

33 Remove the fixings and lower the undertray away from the engine bay.

34 Unbolt the exhaust front pipe from the turbocharger exhaust flange.

35 Unbolt and remove the support bracket(s) from the base of the turbocharger and the engine block.

36 Clamp the hoses to minimise coolant loss,



5.27 Undo the union and disconnect the oil supply union from the top of the turbocharger

then slacken the clips and disconnect the coolant hoses from the turbocharger housing.

37 Slacken and withdraw the turbocharger-to-manifold securing bolts. Access is extremely limited - you will need to use a socket extension bar with a flexible or universal joint.

38 At the rear of the engine, below the intermediate driveshaft bearing support bracket, remove the bolt that secures the bracket to the engine torque rod. This will allow the engine to tilt slightly, giving greater clearance when the turbocharger is removed.

39 Tilt the engine forward slightly and wedge a piece of wood (approx. 50 mm thick) between the transmission casing and the suspension subframe to keep it in this position.

40 Slacken the clip and disconnect the air ducting from the turbocharger outlet port.

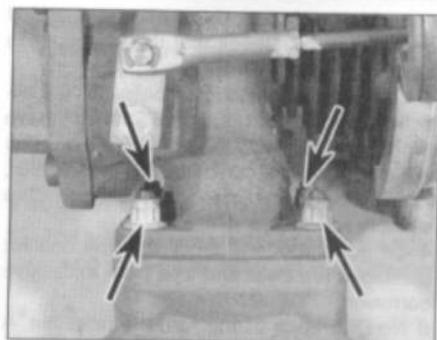
41 Remove the bolt and disconnect the air ducting from inlet port at the top of the turbocharger. Cover the turbocharger openings with clean rag.

42 Unscrew the union nut, and disconnect the oil feed pipe from the top of the turbocharger.

43 Undo the union and separate the oil return pipe from the base of the turbocharger. Recover the gasket.

44 Slacken and withdraw the turbocharger-to-manifold securing bolts.

45 Rotate the turbocharger and elbow assembly through half a turn and carefully withdraw it from the engine.



5.28 Slacken and remove the turbocharger-to-manifold nuts (arrowed) - 2.5 litre model shown

46 Lower the turbocharger and remove it from under the car. If it is to be refitted, store the turbocharger carefully, and plug its openings to prevent dirt ingress.

Refitting

47 Refitting is a reversal of removal, bearing in mind the following points:

- Renew all gaskets and oil supply and return union seals.
- Tighten all fixings to the correct torque (where specified).
- If a new turbo is being fitted, change the engine oil and filter. Also renew the filter (where fitted) 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 removing the fuel pump relay and cranking the engine on the starter for three ten-second bursts.

6 Turbocharger - examination and renovation

1 With the turbocharger removed, inspect the housing 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



5.29a Renew all gaskets and oil supply and return union seals



5.29b Unscrew the oil supply line union at the cylinder block . . .



5.29c . . . and renew the oil filter cartridge

normal, since in use, the shaft is suspended on a film of oil. Check that the wheel vanes are undamaged.

3 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 should if necessary be flushed with a suitable solvent.)

4 On petrol models, check that the coolant passages are clear and free from excessive corrosion.

5 No DIY repair of the turbo is possible. A new unit may be available on an exchange basis.

7 Exhaust system - general information, removal and refitting



General information

1 On all models, the exhaust system is made up of three sections (excluding the exhaust manifolds): the down pipe which incorporates the front silencer (or catalytic converter where fitted), the intermediate silencer, and the tail section which contains the two rear silencers.

2 The exhaust system is suspended along its entire length by rubber mountings, which are secured to the underside of the vehicle by metal brackets. The downpipe is secured to the transmission by means of a bracket and U-bolts.

3 The connection between the exhaust manifold/turbocharger and the downpipe is a gasketed flange joint, secured with bolts. The connection between the downpipe and the intermediate silencer is also a flange joint and is fitted with a sealing olive. A clamping ring, secured with a bolt is used to connect the intermediate silencer to the tail section.

Removal

4 Each exhaust section can be removed individually or, alternatively, the complete system can be removed as a unit.

5 Before removing any part of the system, first jack up the front or rear of the car, as applicable, and support it on axle stands. Alternatively position the car over an inspection pit or on car ramps.

Downpipe

6 Place blocks of wood under the catalytic converter, or the lowest point of the downpipe, to act as a support. Where applicable, unbolt and remove the lambda sensor from the exhaust pipe. This may entail the use of a special slotted socket which can either be fabricated from an old long reach socket or borrowed/hired from a Citroën dealer.

7 Slacken and remove the nuts securing the down pipe to the intermediate silencer (as applicable). Remove the bolts and recover the sealing olive from the joint.

8 Slacken and withdraw the bolts that secure the downpipe bracket to the base of the transmission casing (where applicable).

9 Undo the nuts and separate the downpipe from the exhaust manifold(s)/turbocharger. Recover the gasket then withdraw the downpipe from underneath the vehicle.

Intermediate silencer

10 Slacken and remove the nuts securing the down pipe to the catalytic converter or the intermediate silencer. Remove the bolts and recover the sealing olive from the joint.

11 Slacken the catalytic converter to intermediate pipe clamping ring nut and bolt.

12 Free the catalytic converter from the intermediate pipe then withdraw it from underneath the vehicle.

Tailpipe

13 Slacken the clamping ring bolts and disengage the tailpipe at the joint.

14 Unhook the tailpipe from its mounting rubbers and remove it from the vehicle. Note: *Where applicable, silencers in the tail section can be separated from the exhaust system, to allow individual renewal, by slackening the clamp rings and pulling the silencers apart. Refer to a Citroën dealer or an exhaust specialist for further advice.*

Complete system

15 Disconnect the front pipe from the manifold(s) or turbocharger as described above. Where applicable, unplug the lambda sensor wiring at the connector - refer to the Downpipe sub-section for details.

16 With the aid of an assistant, free the system from all its mounting rubbers and manoeuvre it out from underneath the vehicle.

Refitting

17 Each section is refitted by a reverse of the removal sequence, noting the following points.

- Ensure that all traces of corrosion have been removed from the flanges and renew all necessary gaskets.
- Inspect the rubber mountings for signs of damage or deterioration and renew as necessary.
- Renew the sealing olive in the intermediate silencer-to-downpipe joint.
- On joints which are secured by clamping rings, apply a smear of exhaust system jointing paste to the joint mating surfaces to ensure an air-tight seal. Tighten the clamping ring nuts securely.
- Prior to tightening the exhaust system fasteners, ensure all rubber mountings are correctly located and that there is adequate clearance between the exhaust system and vehicle underbody.

8 Catalytic converters - general information and precautions

1 The catalytic converter is a reliable and simple device, with no moving parts and as such requires no maintenance. There are, however, some facts of which an owner should be aware if the converter is to function properly for its full service life.

Petrol models

- DO NOT use leaded petrol in a car equipped with a catalytic converter - the lead will coat the precious metals reagents, reducing their converting efficiency and will eventually destroy the converter.
- Always keep the ignition and fuel systems well-maintained in accordance with the manufacturer's schedule.
- If the engine develops a misfire, do not drive the car at all (or at least as little as possible) until the fault is cured.
- DO NOT push- or tow-start the car - this will soak the catalytic converter in unburned fuel, causing it to overheat when the engine does start.
- DO NOT switch off the ignition at high engine speeds.
- In some cases a sulphurous smell (like that of rotten eggs) may be noticed from the exhaust. This is common to many catalytic converter-equipped cars. Low quality fuel with a high sulphur content will exacerbate this effect.
- The catalytic converter, used on a well-maintained and well-driven car, should last for between 50 000 and 100 000 miles - if the converter is no longer effective it must be renewed.

Petrol and diesel models

- DO NOT use fuel or engine oil additives - these may contain substances harmful to the catalytic converter.
- DO NOT continue to use the car if the engine burns oil to the extent of leaving a visible trail of blue smoke.
- Remember that the catalytic converter operates at very high temperatures and its external casing can take a while to cool down. DO NOT, therefore, park the car in dry undergrowth, over long grass, or piles of dead leaves after a long run.
- Remember that the catalytic converter is FRAGILE - do not strike it with tools during servicing work.

9 Crankcase emission system - general information

1 The crankcase emission control system consists of a series of hoses that connect the

crankcase vent to the camshaft cover vent and the air intake, a pressure regulating valve (where applicable) and an oil separator unit.

2 The components of this system require no attention, other than to check at regular intervals that the hose(s) are free of blockages and undamaged.

10 Exhaust Gas Recirculation (EGR) system - general information and component renewal



General information

- 1 Several different versions of the EGR control system have been fitted to the XM. The type of system fitted and its mode of operation will depend on the age of the vehicle, the engine type and the market for which the vehicle is specified.
- 2 In depth coverage of each system type is beyond the scope of this manual, therefore the procedures described in this section are limited to the renewal of the major components that are common to each system.

Vacuum supply pump

Removal

- 3 The pump is located inside the right hand wheel arch, behind the plastic liner. Access is improved if the right hand road wheel is removed.
- 4 Ensure that the ignition is switched off, then unplug the wiring from the pump at the connector.
- 5 Make a careful note of their order of

- connection, then pull the vacuum hoses from the ports on the vacuum pump.
- 6 Undo the screws and remove the pump from the wheel arch.

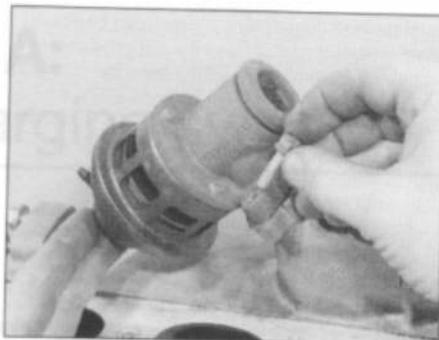
Refitting

- 7 Refitting is a reversal of removal, but ensure that the vacuum hoses are reconnected to the correct ports on the pump.

EGR valve

Removal

- 8 Ensure that the engine has cooled completely before starting work. Jack up the front of the car and rest it securely on axle stands.
- 9 Unplug the vacuum hose from the port on the top of the EGR valve.
- 10 Remove the inlet manifold as described in Chapter 4B.



10.11 Remove the screws and lift the EGR valve from the manifold - 2.5 litre model shown

- 11 Slacken and remove the screws and lift the EGR valve from the manifold (see illustration).

Refitting

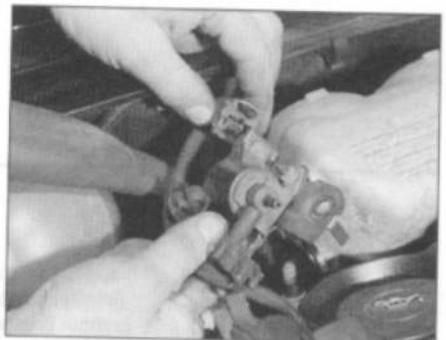
- 12 Refitting is a reversal of removal. Use new gasket and ensure that the securing nuts are tightened to the correct torque.

Vacuum solenoid valve

- 13 The solenoid valve is mounted on the right hand end of the inlet manifold (see Chapter 4B).
- 14 Disconnect the hoses from the valve, noting their order of connection to avoid confusion during refitting.
- 15 Remove the screws, lift the valve from its mountings and remove it from the engine bay (see illustration).

Refitting

- 16 Refitting is a reversal of removal.



10.15 Removing the EGR vacuum solenoid valve

Degrees of difficulty

Easy - suitable for a beginner with some experience	Fairly easy - suitable for a beginner with some experience	Fairly difficult - suitable for an experienced DIY enthusiast	Difficult - requires a good knowledge of the system	Very difficult - suitable for a specialist or professional
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Specifications

System type	12-valve, injection engine
Battery	45Ah
Oil	10W/40
Oil filter	10W/40
Water pump	10W/40
Alternator	10W/40
Flux	10W/40
Water meter	10W/40
Flux	10W/40
Torque wrench settings	10W/40