PEUGEOT 406

Haynes 3982

Mar 1999 to 2002 (**T** registration onwards) Petrol & Diesel

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Peugeot 406

Service and Repair Manual

Peter T Gill and A K Legg LAE MIMI

Models covered

(3982 - 384)

Peugeot 406 Saloon and Estate models with normally-aspirated four-cylinder petrol engines and turbo-Diesel engines, including special/limited editions;

1761cc, 1749cc & 1997cc petrol engines
1997cc & 2179cc turbo-Diesel engines

Does not cover 1998cc (petrol) Turbo, 1997cc direct injection (HPi) petrol, 2230cc (4 cyl) or 2946cc (V6) engines
Does not cover Coupe

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Advanced driving

Many people see the words 'advanced driving' and believe that it won't interest them or that it is a style of driving beyond their own abilities. Nothing could be further from the truth. Advanced driving is straightforward safe, sensible driving - the sort of driving we should all do every time we get behind the wheel.

An average of 10 people are killed every day on UK roads and 870 more are injured, some seriously. Lives are ruined daily, usually because somebody did something stupid. Something like 95% of all accidents are due to human error, mostly driver failure. Sometimes we make genuine mistakes - everyone does. Sometimes we have lapses of concentration. Sometimes we deliberately take risks.

For many people, the process of 'learning to drive' doesn't go much further than learning how to pass the driving test because of a common belief that good drivers are made by 'experience'.

Learning to drive by 'experience' teaches three driving skills:

- ☐ Quick reactions. (Whoops, that was close!)
- ☐ Good handling skills. (Horn, swerve, brake, horn).
- ☐ Reliance on vehicle technology. (Great stuff this ABS, stop in no distance even in the wet...)

Drivers whose skills are 'experience based' generally have a lot of near misses and the odd accident. The results can be seen every day in our courts and our hospital casualty departments.

Advanced drivers have learnt to control the risks by controlling the position and speed of their vehicle. They avoid accidents and near misses, even if the drivers around them make mistakes.

The key skills of advanced driving are **concentration,** effective all-round **observation, anticipation** and **planning.** When **good vehicle handling** is added to these skills, all driving situations can be approached and negotiated in a safe, methodical way, leaving nothing to chance.

Concentration means applying your mind to safe driving, completely excluding anything that's not relevant. Driving is usually the most dangerous activity that most of us undertake in our daily routines. It deserves our full attention.

Observation means not just looking, but seeing and seeking out the information found in the driving environment.

Anticipation means asking yourself what is happening, what you can reasonably expect to happen and what could happen unexpectedly. (One of the commonest words used in compiling accident reports is 'suddenly'.)

Planning is the link between seeing something and taking the appropriate action. For many drivers, planning is the missing link.

If you want to become a safer and more skilful driver and you want to enjoy your driving more, contact the Institute of Advanced Motorists on 0208 994 4403 or write to IAM House, Chiswick High Road, London W4 4HS for an information pack.

Working on your car can be dangerous. This page shows just some of the potential risks and hazards, with the aim of creating a safety-conscious attitude.

General hazards

Scalding

• Don't remove the radiator or expansion tank cap while the engine is hot.
• Engine oil, automatic transmission fluid or power steering fluid may also be dangerously hot if the engine has recently been running.

Burning

• Beware of burns from the exhaust system and from any part of the engine. Brake discs and drums can also be extremely hot immediately after use.

Crushing

• When working under or near a raised vehicle, always supplement the jack with axle stands, or use drive-on ramps. ***Never venture under a car which is only supported by a jack.***

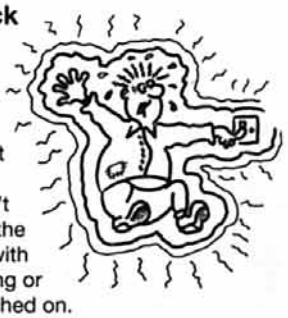
• Take care if loosening or tightening high-torque nuts when the vehicle is on stands. Initial loosening and final tightening should be done with the wheels on the ground.

Fire

• Fuel is highly flammable; fuel vapour is explosive.
• Don't let fuel spill onto a hot engine.
• Do not smoke or allow naked lights (including pilot lights) anywhere near a vehicle being worked on. Also beware of creating sparks (electrically or by use of tools).
• Fuel vapour is heavier than air, so don't work on the fuel system with the vehicle over an inspection pit.
• Another cause of fire is an electrical overload or short-circuit. Take care when repairing or modifying the vehicle wiring.
• Keep a fire extinguisher handy, of a type suitable for use on fuel and electrical fires.

Electric shock

• Ignition HT voltage can be dangerous, especially to people with heart problems or a pacemaker. Don't work on or near the ignition system with the engine running or the ignition switched on.



• Mains voltage is also dangerous. Make sure that any mains-operated equipment is correctly earthed. Mains power points should be protected by a residual current device (RCD) circuit breaker.

Fume or gas intoxication

• Exhaust fumes are poisonous; they often contain carbon monoxide, which is rapidly fatal if inhaled. Never run the engine in a confined space such as a garage with the doors shut.

• Fuel vapour is also poisonous, as are the vapours from some cleaning solvents and paint thinners.

Poisonous or irritant substances

• Avoid skin contact with battery acid and with any fuel, fluid or lubricant, especially antifreeze, brake hydraulic fluid and Diesel fuel. Don't syphon them by mouth. If such a substance is swallowed or gets into the eyes, seek medical advice.
• Prolonged contact with used engine oil can cause skin cancer. Wear gloves or use a barrier cream if necessary. Change out of oil-soaked clothes and do not keep oily rags in your pocket.
• Air conditioning refrigerant forms a poisonous gas if exposed to a naked flame (including a cigarette). It can also cause skin burns on contact.

Asbestos

• Asbestos dust can cause cancer if inhaled or swallowed. Asbestos may be found in gaskets and in brake and clutch linings. When dealing with such components it is safest to assume that they contain asbestos.

Special hazards

Hydrofluoric acid

• This extremely corrosive acid is formed when certain types of synthetic rubber, found in some O-rings, oil seals, fuel hoses etc, are exposed to temperatures above 400°C. The rubber changes into a charred or sticky substance containing the acid. *Once formed, the acid remains dangerous for years. If it gets onto the skin, it may be necessary to amputate the limb concerned.*
• When dealing with a vehicle which has suffered a fire, or with components salvaged from such a vehicle, wear protective gloves and discard them after use.

The battery

• Batteries contain sulphuric acid, which attacks clothing, eyes and skin. Take care when topping-up or carrying the battery.
• The hydrogen gas given off by the battery is highly explosive. Never cause a spark or allow a naked light nearby. Be careful when connecting and disconnecting battery chargers or jump leads.

Air bags

• Air bags can cause injury if they go off accidentally. Take care when removing the steering wheel and/or facia. Special storage instructions may apply.

Diesel injection equipment

• Diesel injection pumps supply fuel at very high pressure. Take care when working on the fuel injectors and fuel pipes.

Warning: Never expose the hands, face or any other part of the body to injector spray; the fuel can penetrate the skin with potentially fatal results.

Remember...

DO

• Do use eye protection when using power tools, and when working under the vehicle.
• Do wear gloves or use barrier cream to protect your hands when necessary.
• Do get someone to check periodically that all is well when working alone on the vehicle.
• Do keep loose clothing and long hair well out of the way of moving mechanical parts.
• Do remove rings, wristwatch etc, before working on the vehicle – especially the electrical system.
• Do ensure that any lifting or jacking equipment has a safe working load rating adequate for the job.

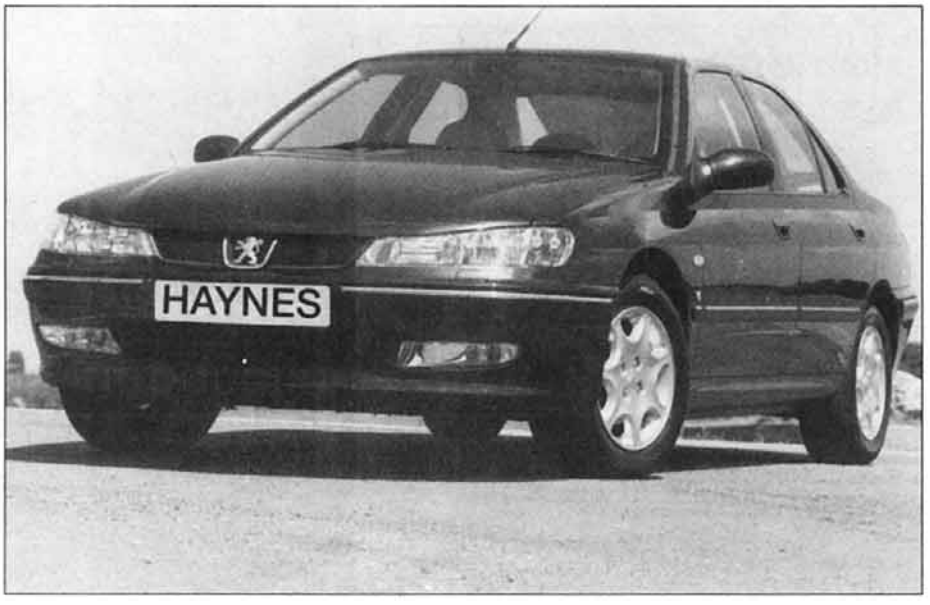
DON'T

• Don't attempt to lift a heavy component which may be beyond your capability – get assistance.
• Don't rush to finish a job, or take unverified short cuts.
• Don't use ill-fitting tools which may slip and cause injury.
• Don't leave tools or parts lying around where someone can trip over them. Mop up oil and fuel spills at once.
• Don't allow children or pets to play in or near a vehicle being worked on.

The Peugeot 406 Saloon was introduced into the UK in early 1996. At its launch, the 406 was offered with a choice of 1.6 (1580cc – not available in the UK), 1.8 (1761cc) and 2.0 litre (1998cc) petrol engines or a 1.9 litre (1905cc) turbo diesel engine. In the summer of 1996, a 2.0 litre petrol turbo model was introduced, also a new 2.1 litre (2088cc) turbo diesel engine was introduced into the range with the new diesel engine being a 12-valve version of the XUD engine which has also been used in other Peugeot/Citroën vehicles. In early 1997, Peugeot introduced an Estate model, and also introduced the V6 petrol engine into the range.

This manual covers the facelifted models introduced in March 1999 which were available with the 1.8 litre (1761cc) petrol engine used in the earlier models. New engines include 1.8 litre (1749cc) and the 2.0 litre (1997cc) petrol engines. The new diesel engines are 2.0 litre (1997cc) and 2.2 litre (2179cc).

The engines fitted to the facelift 406 range are all versions of the well-proven units which have appeared in many Peugeot/Citroën vehicles over the years. The engines are based from the XU engine series, the petrol engines are of four-cylinder double overhead camshaft design. The 2.0 litre diesel engine is a single overhead camshaft 8-valve unit and the 2.2 litre diesel is a double overhead camshaft 16-valve unit.



The engine is mounted transversely at the front of vehicle, with the transmission mounted on its left-hand end. All engines are fitted with a manual transmission as standard (an automatic transmission is available on certain engines).

All models have fully-independent front and rear suspension arrangements incorporating shock absorbers and coil springs.

A wide range of standard and optional equipment is available within the range to suit most tastes, including central locking, electric windows and front and side airbags. An air conditioning system is available on all models.

Provided that regular servicing is carried out in accordance with the manufacturer's recommendations, the vehicle should prove reliable and very economical. The engine compartment is well-designed, and most of the items requiring frequent attention are easily accessible.

Your Peugeot 406 manual

The aim of this manual is to help you get the best value from your vehicle. It can do so in several ways. It can help you decide what work must be done (even should you choose to get it done by a garage). It will also provide information on routine maintenance and servicing, and give a logical course of action and diagnosis when random faults occur. However, it is hoped that you will use the manual by tackling the work yourself. On simpler jobs it may even be quicker than booking the car into a garage and going there twice, to leave and collect it. Perhaps most important, a lot of money can be saved by avoiding the costs a garage must charge to cover its labour and overheads.

The manual has drawings and descriptions to show the function of the various components so that their layout can be understood. Tasks are described and photographed in a clear step-by-step sequence.

References to the 'left' and 'right' of the vehicle are in the sense of a person in the driver's seat facing forward.

Acknowledgements

Thanks are due to Draper tools Limited, who provided some of the workshop tools, and to all those people at Sparkford who helped in the production of this manual.

We take great pride in the accuracy of information given in this manual, but vehicle manufacturers make alterations and design changes during the production run of a particular vehicle of which they do not inform us. No liability can be accepted by the authors or publishers for loss, damage or injury caused by any errors in, or omissions from, the information given.

The following pages are intended to help in dealing with common roadside emergencies and breakdowns. You will find more detailed fault finding information at the back of the manual, and repair information in the main chapters.

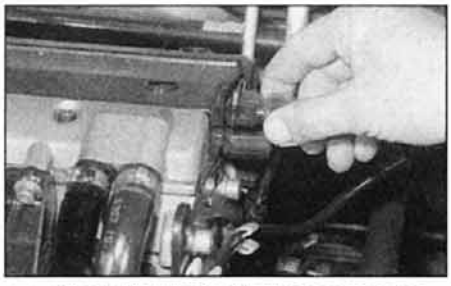
If your car won't start and the starter motor doesn't turn

- ☐ If it's a model with automatic transmission, make sure the selector is in P or N.
- ☐ Open the bonnet and make sure that the battery terminals are clean and tight.
- ☐ Switch on the headlights and try to start the engine. If the headlights go very dim when you're trying to start, the battery is probably flat. Get out of trouble by jump starting (see next page) using a friend's car.

If your car won't start even though the starter motor turns as normal

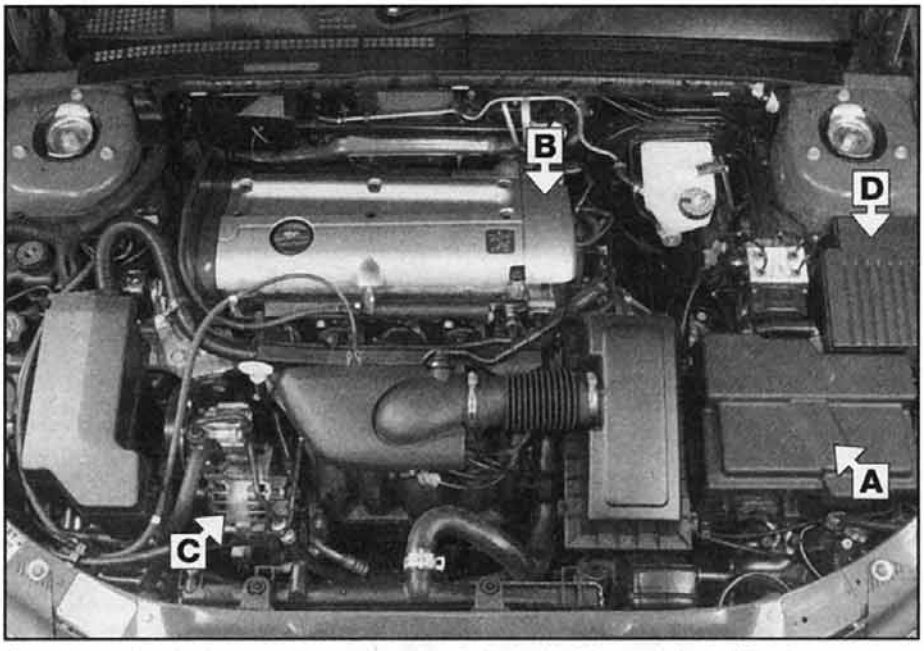
- ☐ Is there fuel in the tank?
- ☐ Is there moisture on electrical components under the bonnet? Switch off the ignition, then wipe off any obvious dampness with a dry cloth. Spray a water-repellent aerosol product (WD-40 or equivalent) on ignition and fuel system electrical connectors like those shown in the photos. Pay special attention to the ignition coil wiring connector and HT leads. (Note that Diesel engines don't normally suffer from damp.)

A Remove the plastic cover and check the condition and security of the battery connections.



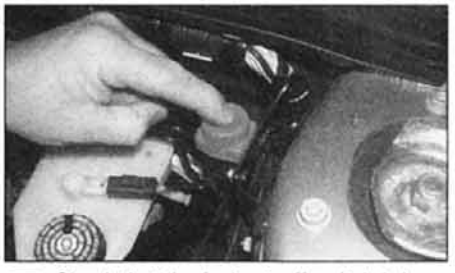
B Check that the fuel/ignition system (as applicable) wiring connectors are securely connected (2.0 litre petrol model shown).

C Check that the alternator wiring connectors are securely connected.



Check that electrical connections are secure (with the ignition switched off) and spray them with a water dispersant spray like WD40 if you suspect a problem due to damp

D Check that all fuses are still in good condition and none have blown.



E Check that the fuel cut-off switch (where fitted) has not been activated.

Jump starting

When jump-starting a car using a booster battery, observe the following precautions:

- ✔ Before connecting the booster battery, make sure that the ignition is switched off.
- ✔ Ensure that all electrical equipment (lights, heater, wipers, etc) is switched off.
- ✔ Take note of any special precautions printed on the battery case.
- ✔ Make sure that the booster battery is the same voltage as the discharged one in the vehicle.
- ✔ If the battery is being jump-started from the battery in another vehicle, the two vehicles MUST NOT TOUCH each other.
- ✔ Make sure that the transmission is in neutral (or PARK, in the case of automatic transmission).

HAYNES HiNT ***Jump starting will get you out of trouble, but you must correct whatever made the battery go flat in the first place. There are three possibilities:***

1 The battery has been drained by repeated attempts to start, or by leaving the lights on.

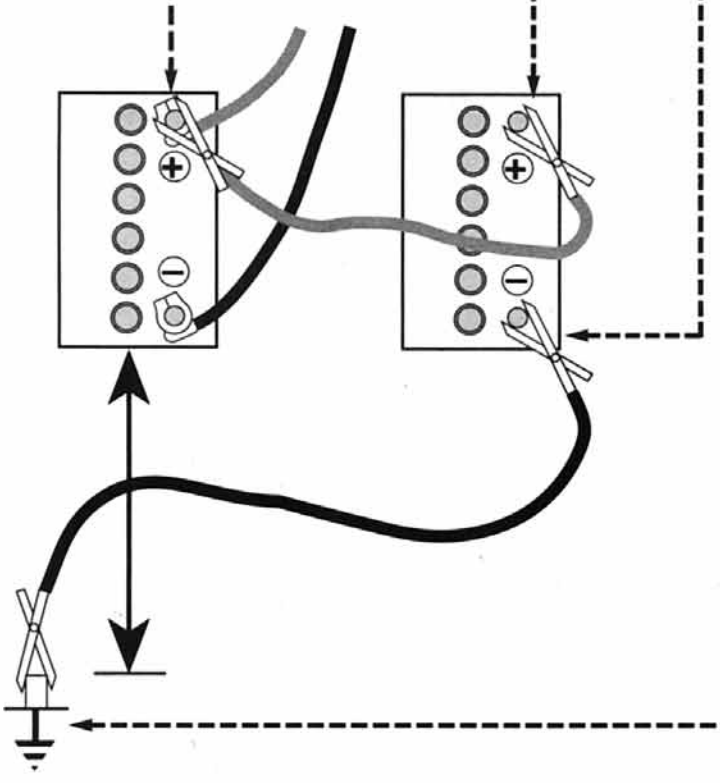
2 The charging system is not working properly (alternator drivebelt slack or broken, alternator wiring fault or alternator itself faulty).

3 The battery itself is at fault (electrolyte low, or battery worn out).

1 Connect one end of the red jump lead to the positive (+) terminal of the flat battery

2 Connect the other end of the red lead to the positive (+) terminal of the booster battery.

3 Connect one end of the black jump lead to the negative (-) terminal of the booster battery



4 Connect the other end of the black jump lead to a bolt or bracket on the engine block, well away from the battery, on the vehicle to be started.

5 Make sure that the jump leads will not come into contact with the fan, drive-belts or other moving parts of the engine.

6 Start the engine using the booster battery and run it at idle speed. Switch on the lights, rear window demister and heater blower motor, then disconnect the jump leads in the reverse order of connection. Turn off the lights etc.

Wheel changing

Warning: Do not change a wheel in a situation where you risk being hit by another vehicle. On busy roads, try to stop in a lay-by or a gateway. Be wary of passing traffic while changing the wheel - it is easy to become distracted by the job in hand.

Preparation

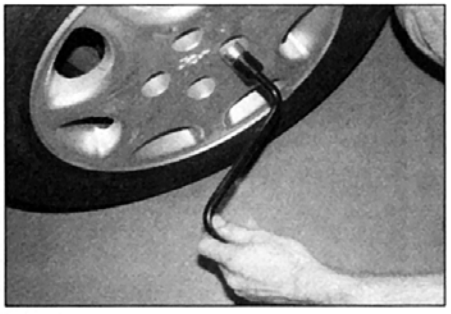
- ☐ When a puncture occurs, stop as soon as it is safe to do so.
- ☐ Park on firm level ground, if possible, and well out of the way of other traffic.
- ☐ Use hazard warning lights if necessary.
- ☐ If you have one, use a warning triangle to alert other drivers of your presence.
- ☐ Apply the handbrake and engage first or reverse gear (or Park on models with automatic transmission).
- ☐ Chock the wheel diagonally opposite the one being removed – a couple of large stones will do for this.
- ☐ If the ground is soft, use a flat piece of wood to spread the load under the jack.

Changing the wheel

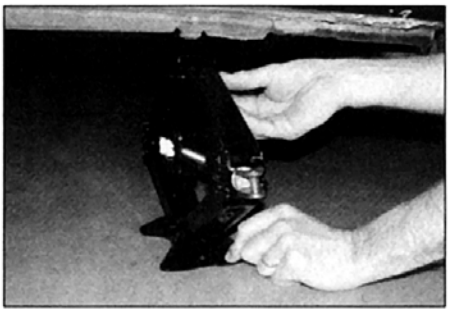
1 The spare wheel and tools are stored in the luggage compartment. Lift up the carpet/rear family seat (as applicable) and remove the tool kit and jack from the centre of the spare wheel. Unscrew the retainer and remove the spare wheel.

2 Remove the wheel trim/hub cap (as applicable).

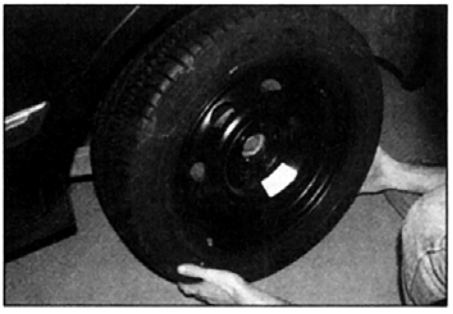
3 On models where anti-theft wheel bolts are fitted, pull off the plastic cover then unscrew the anti-theft bolt using the special socket provided.



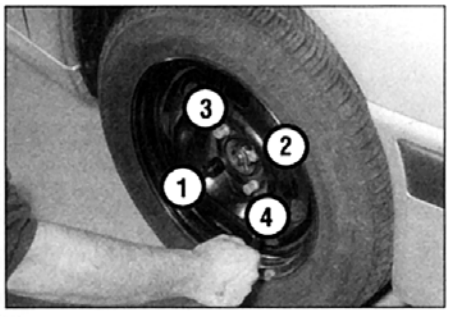
4 With the vehicle on the ground, slacken each wheel bolt by half a turn. On models with alloy wheels, use the special tool to undo the locking wheel nuts.



5 Make sure the jack is located on firm ground, and engage the jack head correctly with the sill. Then raise the jack until the wheel is raised clear of the ground.



6 Unscrew the wheel bolts and remove the wheel. Fit the spare wheel and screw in the bolts. Lightly tighten the bolts with the wheelbrace then lower the car to the ground.



7 Securely tighten the wheel bolts in a diagonal sequence then refit the wheel trim/hub cap/wheel bolt covers (as applicable). Stow the punctured wheel and tools back in the boot, and secure them in position.

Finally...

- ☐ Remove the wheel chocks.
- ☐ Check the tyre pressure on the wheel just fitted. If it is low, or if you don't have a pressure gauge with you, drive slowly to the nearest garage and inflate the tyre to the right pressure.
- ☐ The wheel bolts should be slackened and retightened to the specified torque at the earliest possible opportunity (see Chapter 1A or 1B).
- ☐ Have the damaged tyre or wheel repaired as soon as possible.

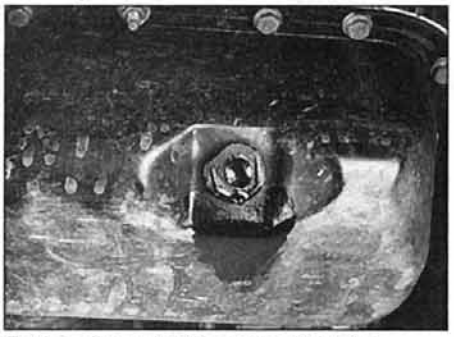
Identifying leaks

Puddles on the garage floor or drive, or obvious wetness under the bonnet or underneath the car, suggest a leak that needs investigating. It can sometimes be difficult to decide where the leak is coming from, especially if the engine bay is very dirty already. Leaking oil or fluid can also be blown rearwards by the passage of air under the car, giving a false impression of where the problem lies.

Warning: Most automotive oils and fluids are poisonous. Wash them off skin, and change out of contaminated clothing, without delay.

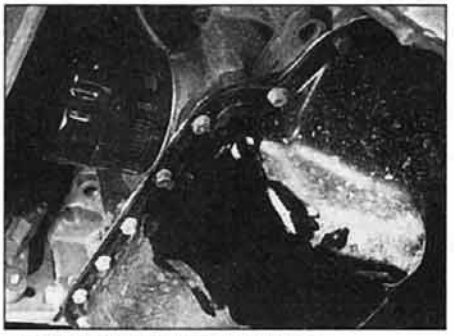
HAYNES HiNT ***The smell of a fluid leaking from the car may provide a clue to what's leaking. Some fluids are distinctively coloured. It may help to clean the car carefully and to park it over some clean paper overnight as an aid to locating the source of the leak.***
Remember that some leaks may only occur while the engine is running.

Sump oil



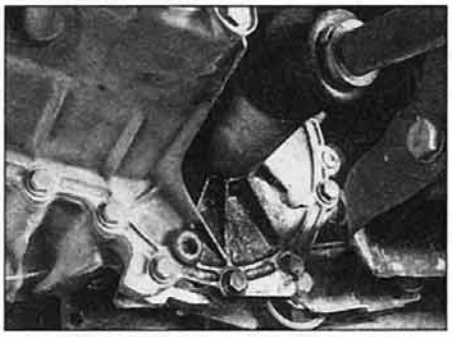
Engine oil may leak from the drain plug...

Oil from filter



...or from the base of the oil filter.

Gearbox oil



Gearbox oil can leak from the seals at the inboard ends of the driveshafts.

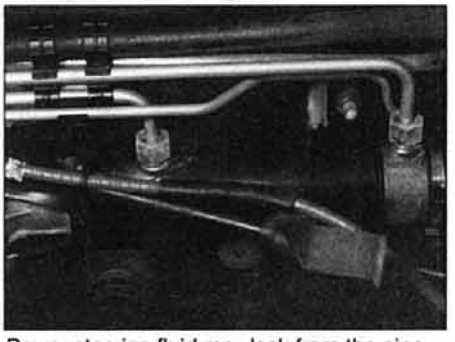
Antifreeze

Leaking antifreeze often leaves a crystalline deposit like this.

Brake fluid

A leak occurring at a wheel is almost certainly brake fluid.

Power steering fluid



Power steering fluid may leak from the pipe connectors on the steering rack.

Towing

When all else fails, you may find yourself having to get a tow home – or of course you may be helping somebody else. Long-distance recovery should only be done by a garage or breakdown service. For shorter distances, DIY towing using another car is easy enough, but observe the following points:

☐ Use a proper tow-rope – they are not expensive. The vehicle being towed must display an ON TOW sign in its rear window.

☐ Always turn the ignition key to the 'on' position when the vehicle is being towed, so that the steering lock is released, and that the direction indicator and brake lights will work.

☐ The towing eye is supplied in the vehicle toolkit which is stored in the luggage compartment with the spare wheel (see *Wheel changing*). To fit the eye, unclip the access cover from the relevant bumper and screw the eye firmly into position.

☐ Before being towed, release the handbrake and select neutral on the transmission.

Caution: On models with automatic transmission, do not tow the car at speeds in excess of 45 mph (75 kmh) or for a distance of greater than 60 miles (100 km). If towing speed/distance are to exceed these limits, then the car must be towed with its front wheels off the ground.

☐ Note that greater-than-usual pedal pressure will be required to operate the brakes, since the vacuum servo unit is only operational with the engine running.

☐ On models with power steering, greater-than-usual steering effort will also be required.

☐ The driver of the car being towed must keep the tow-rope taut at all times to avoid snatching.

☐ Make sure that both drivers know the route before setting off.

☐ Only drive at moderate speeds and keep the distance towed to a minimum. Drive smoothly and allow plenty of time for slowing down at junctions.

Introduction

There are some very simple checks which need only take a few minutes to carry out, but which could save you a lot of inconvenience and expense.

These *Weekly checks* require no great skill or special tools, and the small amount of time they take to perform could prove to be very well spent, for example;

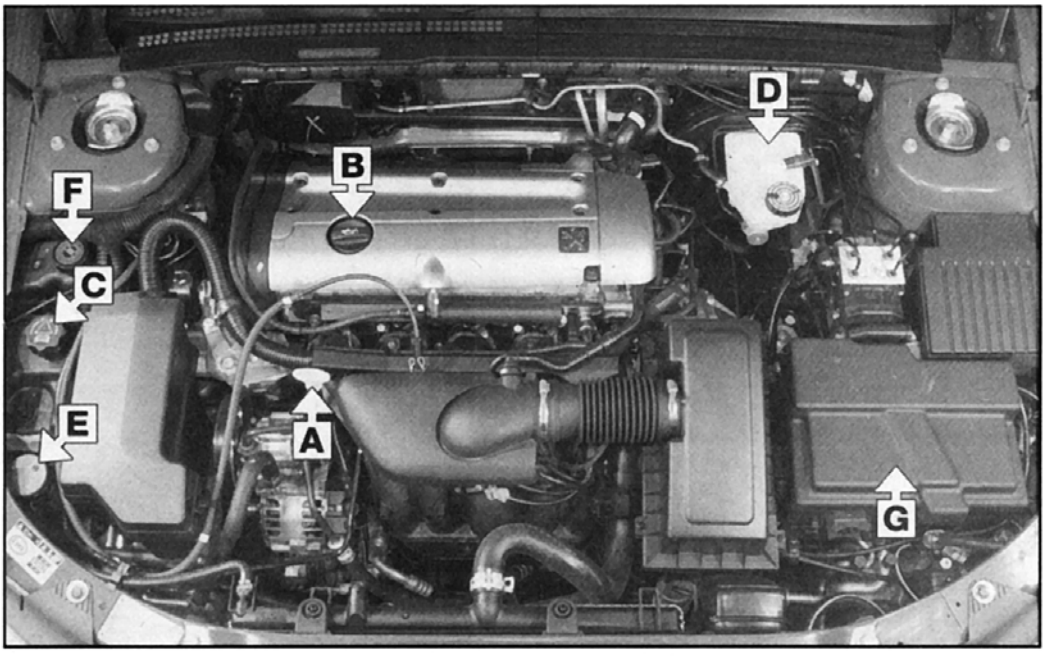
☐ Keeping an eye on tyre condition and pressures, will not only help to stop them wearing out prematurely, but could also save your life.

☐ Many breakdowns are caused by electrical problems. Battery-related faults are particularly common, and a quick check on a regular basis will often prevent the majority of these.

☐ If your car develops a brake fluid leak, the first time you might know about it is when your brakes don't work properly. Checking the level regularly will give advance warning of this kind of problem.

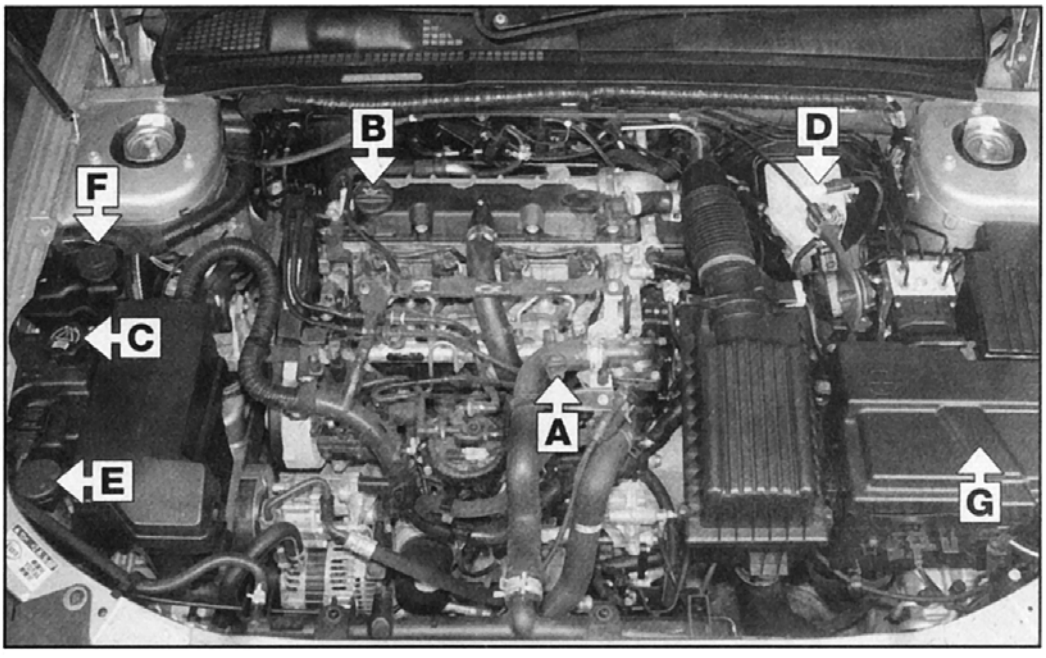
☐ If the oil or coolant levels run low, the cost of repairing any engine damage will be far greater than fixing the leak, for example.

Underbonnet check points



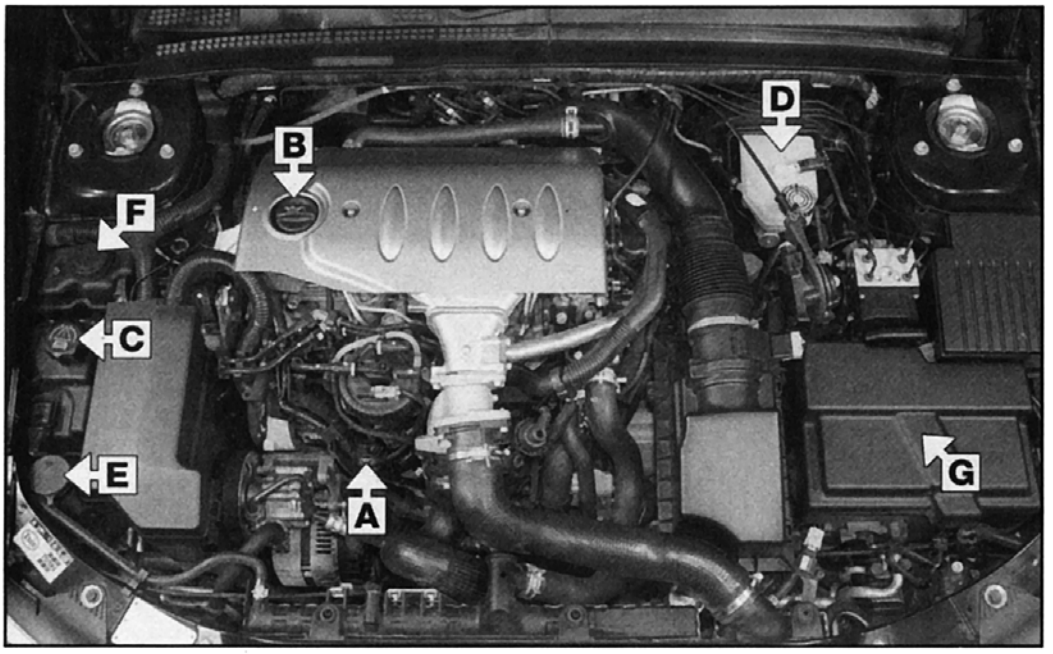
◀ 2.0 litre petrol (1.8 litre similar)

A *Engine oil level dipstick*
B *Engine oil filler cap*
C *Coolant expansion tank*
D *Brake fluid reservoir*
E *Screen washer fluid reservoir*
F *Power steering fluid reservoir*
G *Battery*



◀ 2.0 litre Diesel

A *Engine oil level dipstick*
B *Engine oil filler cap*
C *Coolant expansion tank*
D *Brake fluid reservoir*
E *Screen washer fluid reservoir*
F *Power steering fluid reservoir*
G *Battery*



◀ 2.2 litre Diesel

A *Engine oil level dipstick*
B *Engine oil filler cap*
C *Coolant expansion tank*
D *Brake fluid reservoir*
E *Screen washer fluid reservoir*
F *Power steering fluid reservoir*
G *Battery*

Engine oil level

Before you start

✔ Make sure that your car is on level ground.

✔ Check the oil level before the car is driven, or at least 5 minutes after the engine has been switched off.

> **HAYNES HiNT** ***If the oil is checked immediately after driving the vehicle, some of the oil will remain in the upper engine components, resulting in an inaccurate reading on the dipstick.***

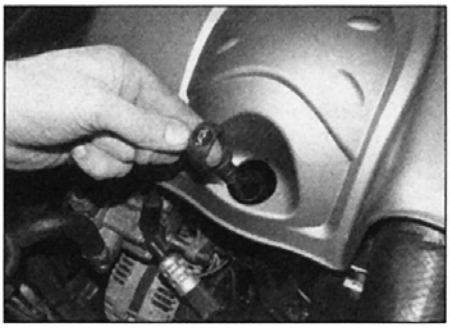
The correct oil

Modern engines place great demands on their oil. It is very important that the correct oil for your car is used (See 'Lubricants and fluids').

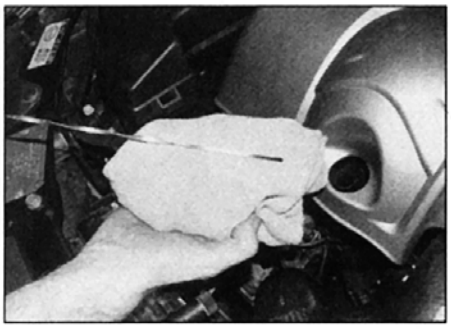
Car Care

● If you have to add oil frequently, you should check whether you have any oil leaks. Place some clean paper under the car overnight, and check for stains in the morning. If there are no leaks, the engine may be burning oil.

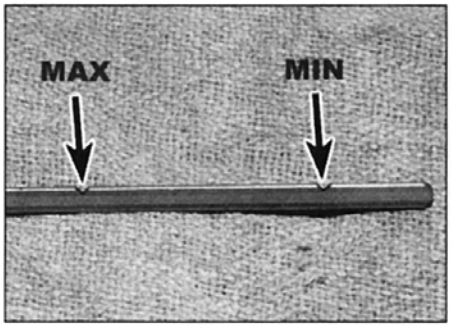
● Always maintain the level between the upper and lower dipstick marks (see photo 3). If the level is too low severe engine damage may occur. Oil seal failure may result if the engine is overfilled by adding too much oil.



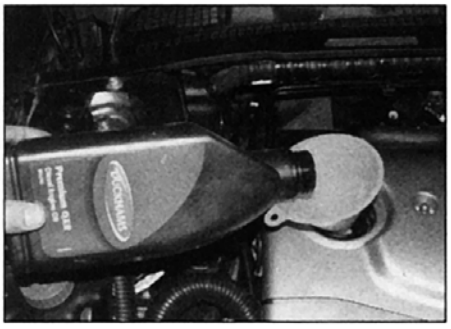
1 The dipstick is located at the front of the engine (see *Underbonnet check points* for exact location); The dipstick is often brightly-coloured or has a picture of an oil can on the top for easy identification. Withdraw the dipstick.



2 Using a clean rag or paper towel remove all oil from the dipstick. Insert the clean dipstick into the tube as far as it will go, then withdraw it again.



3 Note the oil level on the end of the dipstick, which should be between the upper (MAX) mark and lower (MIN) mark. Approximately 1.0 litre of oil will raise the level from the lower mark to the upper mark.



4 Oil is added through the filler cap. Unscrew the cap and top-up the level; a funnel may help to reduce spillage. Add the oil slowly, checking the level on the dipstick often. Don't overfill (see *Car care*).

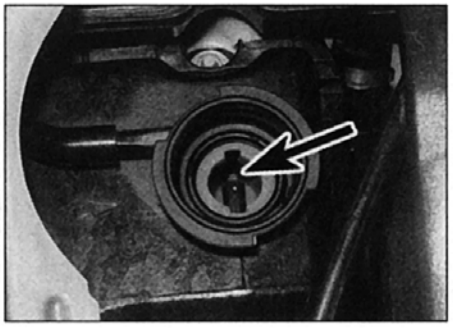
Coolant level

Warning: DO NOT attempt to remove the expansion tank pressure cap when the engine is hot, as there is a very great risk of scalding. Do not leave open containers of coolant about, as it is poisonous.

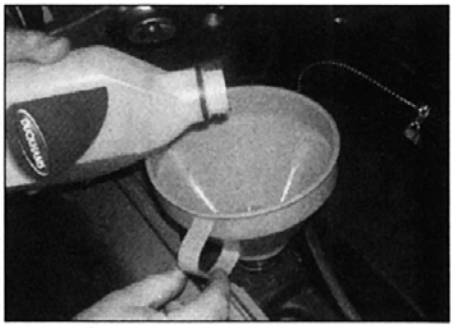
Car Care

- Adding coolant should not be necessary on a regular basis. If frequent topping-up is required, it is likely there is a leak. Check the radiator, all hoses and joint faces for signs of staining or wetness, and rectify as necessary.
- It is important that antifreeze is used in the cooling system all year round, not just during the winter months. Don't top-up with water alone, as the antifreeze will become too diluted.

1 The coolant level must be checked with the engine cold. Remove the pressure cap (see *Warning*) from the expansion tank which is located on the right-hand side of the engine compartment.



2 The coolant level should be between the MAX and MIN marks on the expansion tank neck insert. The MIN mark is the thin bar at the base of the neck and the MAX mark is the slot approximately halfway up the neck.



3 If topping-up is necessary, add a mixture of water and antifreeze to the expansion tank until the coolant level is between the level marks. Once the level is correct, securely refit the cap.

Brake and clutch fluid level

Warning:

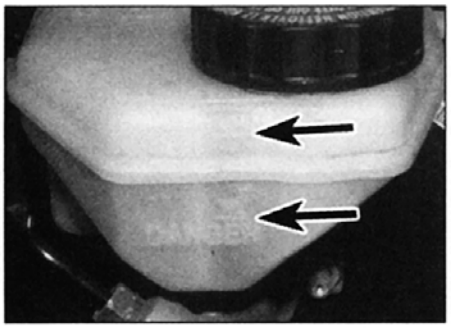
- ***Brake fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it.***
- ***Do not use fluid that has been standing open for some time, as it absorbs moisture from the air, which can cause a dangerous loss of braking effectiveness.***

HAYNES HiNT

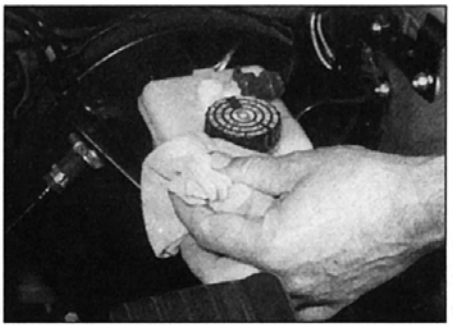
- ***Make sure that your car is on level ground.***
- ***The fluid level in the reservoir will drop slightly as the brake pads wear down, but the fluid level must never be allowed to drop below the DANGER mark.***

Safety First!

- If the reservoir requires repeated topping-up this is an indication of a fluid leak somewhere in the system, which should be investigated immediately.
- If a leak is suspected, the car should not be driven until the braking system has been checked. Never take any risks where brakes are concerned.



1 The upper (MAX) and lower (DANGER) fluid level markings are on the side of the reservoir, which is located in the left-hand rear corner of the engine compartment. The fluid level must always be kept between these two marks.



2 If topping-up is necessary, first wipe clean the area around the filler cap with a clean cloth, then unscrew the cap and remove it along with the rubber diaphragm.

3 Carefully add fluid, avoiding spilling it on the surrounding paintwork. Use only the specified hydraulic fluid. After filling the correct level, refit the cap and diaphragm and tighten it securely. Wipe off any spilt fluid.

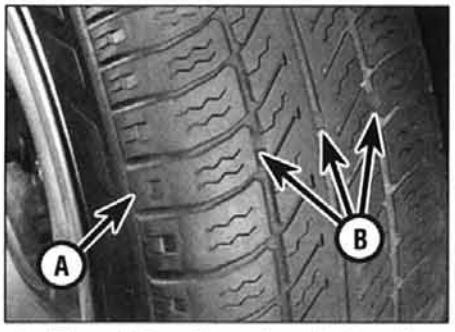
Tyre condition and pressure

It is very important that tyres are in good condition, and at the correct pressure - having a tyre failure at any speed is highly dangerous. Tyre wear is influenced by driving style - harsh braking and acceleration, or fast cornering, will all produce more rapid tyre wear. As a general rule, the front tyres wear out faster than the rears. Interchanging the tyres from front to rear ("rotating" the tyres) may result in more even wear. However, if this is completely effective, you may have the expense of replacing all four tyres at once!

Remove any nails or stones embedded in the tread before they penetrate the tyre to cause deflation. If removal of a nail does reveal that the tyre has been punctured, refit the nail so that its point of penetration is marked. Then immediately change the wheel, and have the tyre repaired by a tyre dealer.

Regularly check the tyres for damage in the form of cuts or bulges, especially in the sidewalls. Periodically remove the wheels, and clean any dirt or mud from the inside and outside surfaces. Examine the wheel rims for signs of rusting, corrosion or other damage. Light alloy wheels are easily damaged by "kerbing" whilst parking; steel wheels may also become dented or buckled. A new wheel is very often the only way to overcome severe damage.

New tyres should be balanced when they are fitted, but it may become necessary to re-balance them as they wear, or if the balance weights fitted to the wheel rim should fall off. Unbalanced tyres will wear more quickly, as will the steering and suspension components. Wheel imbalance is normally signified by vibration, particularly at a certain speed (typically around 50 mph). If this vibration is felt only through the steering, then it is likely that just the front wheels need balancing. If, however, the vibration is felt through the whole car, the rear wheels could be out of balance. Wheel balancing should be carried out by a tyre dealer or garage.



1 *Tread Depth - visual check*

The original tyres have tread wear safety bands (B), which will appear when the tread depth reaches approximately 1.6 mm. The band positions are indicated by a triangular mark on the tyre sidewall (A).

2 *Tread Depth - manual check*

Alternatively, tread wear can be monitored with a simple, inexpensive device known as a tread depth indicator gauge.

3 *Tyre Pressure Check*

Check the tyre pressures regularly with the tyres cold. Do not adjust the tyre pressures immediately after the vehicle has been used, or an inaccurate setting will result.

Tyre tread wear patterns

Shoulder Wear

Underinflation (wear on both sides)
Under-inflation will cause overheating of the tyre, because the tyre will flex too much, and the tread will not sit correctly on the road surface. This will cause a loss of grip and excessive wear, not to mention the danger of sudden tyre failure due to heat build-up.
Check and adjust pressures
Incorrect wheel camber (wear on one side)
Repair or renew suspension parts
Hard cornering
Reduce speed!

Centre Wear

Overinflation
Over-inflation will cause rapid wear of the centre part of the tyre tread, coupled with reduced grip, harsher ride, and the danger of shock damage occurring in the tyre casing.
Check and adjust pressures

If you sometimes have to inflate your car's tyres to the higher pressures specified for maximum load or sustained high speed, don't forget to reduce the pressures to normal afterwards.

Uneven Wear

Front tyres may wear unevenly as a result of wheel misalignment. Most tyre dealers and garages can check and adjust the wheel alignment (or "tracking") for a modest charge.
Incorrect camber or castor
Repair or renew suspension parts
Malfunctioning suspension
Repair or renew suspension parts
Unbalanced wheel
Balance tyres
Incorrect toe setting
Adjust front wheel alignment
Note: *The feathered edge of the tread which typifies toe wear is best checked by feel.*

Power steering fluid level

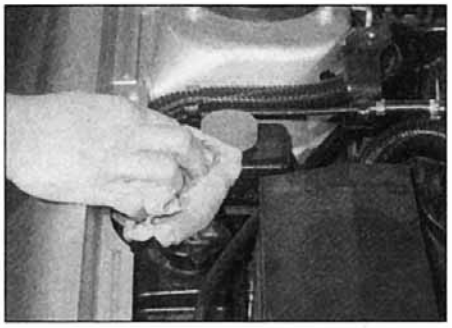
Before you start:

✔ Park the vehicle on level ground.
✔ Set the steering wheel straight-ahead.
✔ The engine should be turned off.

HAYNES HINT ***For the check to be accurate, the steering must not be turned once the engine has been stopped.***

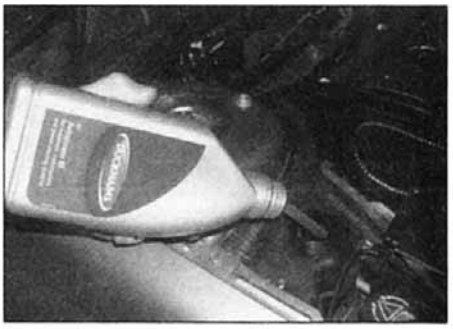
Safety First!

● The need for frequent topping-up indicates a leak, which should be investigated immediately.



1 The power steering fluid level is checked in the fluid reservoir on the right-hand side of the engine compartment. With the engine cold, wipe clean the area around the reservoir cap.

2 Unscrew the reservoir cap, and check the fluid level is up to the upper (MAXI) level indicators which is visible inside the reservoir.

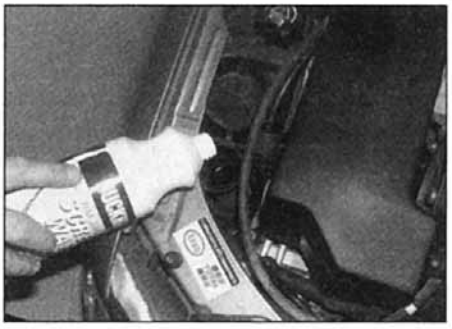


3 Top-up the reservoir with the specified type of the fluid. Once the level is between the level marks, securely refit the reservoir cap. Do not overfill the reservoir.

Screen washer fluid level

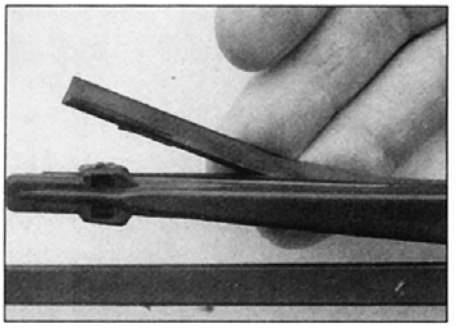
Screenwash additives not only keep the winscreen clean during foul weather, they also prevent the washer system freezing in cold weather - which is when you are likely to need it most. Don't top up using plain water as the screenwash will become too diluted, and will freeze during cold weather. ***On no account use coolant antifreeze in the washer system - this could discolour or damage paintwork.***

1 The washer fluid reservoir is located in the right-hand front corner of the engine compartment. To check the fluid level, open the cap and look down the filler neck.

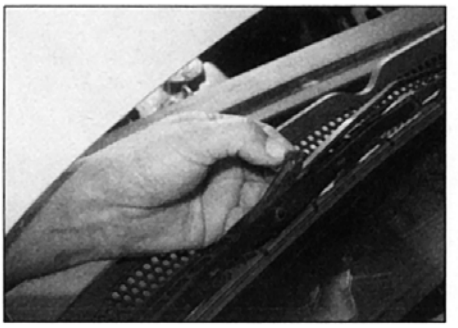


2 If topping-up is necessary, add water and a screenwash additive in the quantities recommended on the bottle.

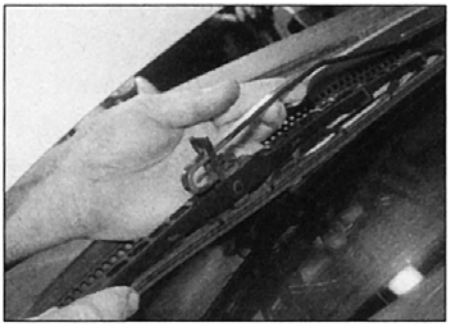
Wiper blades



1 Check the condition of the wiper blades: if they are cracked or show signs of deterioration, or if the glass swept area is smeared, renew them. For maximum clarity of vision, wiper blades should be renewed annually.



2 To remove a windscreen wiper blade, lift the arm locking clip then raise the wiper arm slightly away from the screen.



3 Disengage the blade from the wiper arm and remove it from the vehicle, taking care not to allow the arm to damage the windscreen.

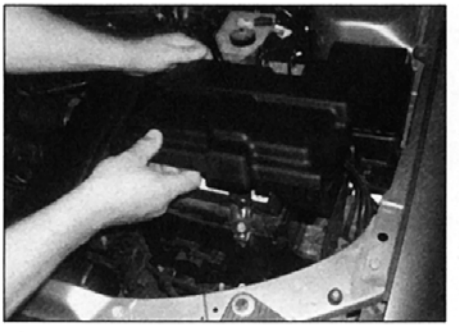
Battery

Caution: Before carrying out any work on the vehicle battery, read the precautions given in 'Safety first' at the start of this manual.

✔ Make sure that the battery tray is in good condition, and that the clamp is tight. Corrosion on the tray, retaining clamp and the battery itself can be removed with a solution of water and baking soda. Thoroughly rinse all cleaned areas with water. Any metal parts damaged by corrosion should be covered with a zinc-based primer, then painted.

✔ Periodically (approximately every three months), check the charge condition of the battery as described in Chapter 5A.

✔ If the battery is flat, and you need to jump start your vehicle, see *Roadside Repairs*.



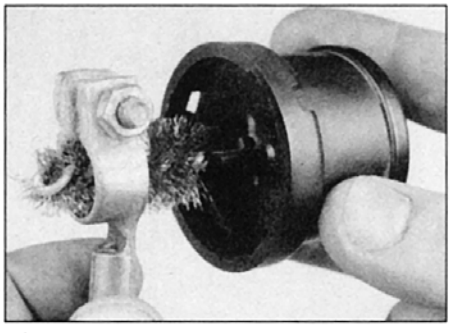
1 Remove the plastic cover to gain access to the battery, which is located at the front left-hand corner of the engine compartment. The exterior of the battery should be inspected periodically for damage such as a cracked case or cover.

2 Check the battery lead clamps for tightness to ensure good electrical connections, and check the leads for signs of damage.

HAYNES HiNT

Battery corrosion can be kept to a minimum by applying a layer of petroleum jelly to the clamps and terminals after they are reconnected.

3 If corrosion (white, fluffy deposits) is evident, remove the cables from the battery terminals, clean them with a small wire brush, then refit them. Automotive stores sell a tool for cleaning the battery post . . .



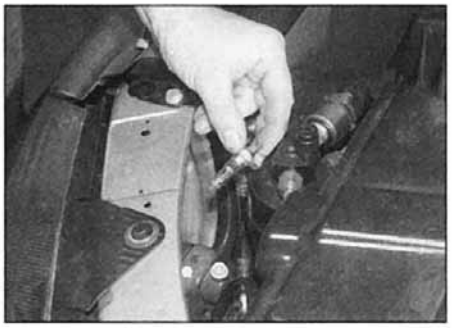
4 . . . as well as the battery cable clamps

Bulbs and fuses

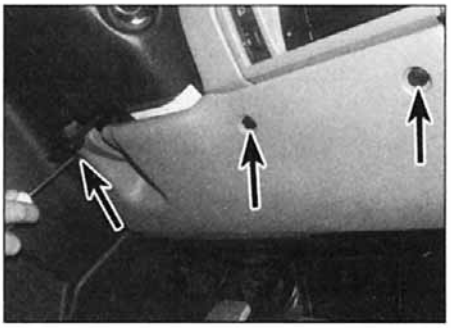
✔ Check all external lights and the horn. Refer to the appropriate Sections of Chapter 12 for details if any of the circuits are found to be inoperative.

✔ Visually check all accessible wiring connectors, harnesses and retaining clips for security, and for signs of chafing or damage.

HAYNES HiNT ***If you need to check your brake lights and indicators unaided, back up to a wall or garage door and operate the lights. The reflected light should show if they are working properly.***



1 If a single indicator light, stop-light, sidelight or headlight has failed, it is likely that a bulb has blown, and will need to be renewed. Refer to Chapter 12 for details. If both stop-lights have failed, it is possible that the switch has failed (see Chapter 9).



2 If more than one indicator light or tail light has failed, it is likely that either a fuse has blown or that there is a fault in the circuit (see Chapter 12). The fuses are located behind the cover on the driver's side lower facia panel, release the three retaining clips and lower the cover. Additional fuses and relays are located in the left-hand side of the engine compartment fusebox.

3 To renew a blown fuse, simply pull it out and fit a new fuse of the correct rating (see Chapter 12). If the fuse blows again, it is important that you find out why – a complete checking procedure is given in Chapter 12.

Lubricants and fluids

Engine (petrol)	Multigrade engine oil to specification ACEA A3 or API SH/SJ *(Duckhams QXR Premium Petrol Engine Oil)*
Engine (diesel)	Multigrade engine oil to specification ACEA B3 or API CD/CF *(Duckhams QXR Premium Diesel Engine Oil)*
Cooling system	Procor TM108/Glysantin G33 or Revkogel 2000 antifreeze
Manual transmission	ESSO gear oil BV – SAE 75W-80W to API GL5 specification *(Duckhams Hypoid PT 75w-80w)*
Automatic transmission	ESSO LT71141 Automatic Transmission Fluid
Braking and clutch system	Hydraulic fluid to DOT 4 *(Duckhams Universal Brake & Clutch Fluid)*
Power steering	ESSO ATF D or Automatic Transmission Fluid Dexron IID *(Duckhams ATF Autotrans III)*

Choosing your engine oil

Engines need oil, not only to lubricate moving parts and minimise wear, but also to maximise power output and to improve fuel economy. By introducing a simplified and improved range of engine oils, Duckhams has taken away the confusion and made it easier for you to choose the right oil for your engine.

HOW ENGINE OIL WORKS

• *Beating friction*

Without oil, the moving surfaces inside your engine will rub together, heat up and melt, quickly causing the engine to seize. Engine oil creates a film which separates these moving parts, preventing wear and heat build-up.

• *Cooling hot-spots*

Temperatures inside the engine can exceed 1000° C. The engine oil circulates and acts as a coolant, transferring heat from the hot-spots to the sump.

• *Cleaning the engine internally*

Good quality engine oils clean the inside of your engine, collecting and dispersing combustion deposits and controlling them until they are trapped by the oil filter or flushed out at oil change.

OIL CARE - FOLLOW THE CODE

To handle and dispose of used engine oil safely, always:

OIL CARE

OIL BANK LINE 0800 66 33 66 www.oilbankline.org.uk

- ***Avoid skin contact with used engine oil. Repeated or prolonged contact can be harmful.***
- ***Dispose of used oil and empty packs in a responsible manner in an authorised disposal site. Call 0800 663366 to find the one nearest to you. Never tip oil down drains or onto the ground.***

DUCKHAMS ENGINE OILS

For the driver who demands a premium quality oil for complete reassurance, we recommend synthetic formula **Duckhams QXR Premium Engine Oils.**

For the driver who requires a straight-forward quality engine oil, we recommend **Duckhams Hypergrade Engine Oils.**

For further information and advice, call the Duckhams UK Helpline on 0800 212988.

DUCKHAMS

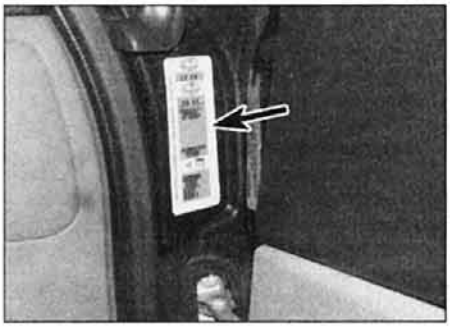
Tyre pressures (cold)

Note 1: *The make of tyres, the sizes and the pressures for each specific vehicle are given on a label attached to the driver's door A-pillar* ***(see illustration)****. On models with a space-saver spare wheel (family estates), a separate pressure is given for the spare tyre, and care must be taken not to misread the sticker; the space-saver wheel is inflated to a lot higher pressure than the standard tyres (typically 60 psi). On models with a space-saver spare wheel, note that the spare is for temporary use only; whilst the spare is fitted, the vehicle should not be driven at speeds in excess of 50 mph (80 kmh).*

Note 2: *Pressures on the label apply to original-equipment tyres listed, and may vary if any other make or type of tyre is fitted; check with the tyre manufacturer or supplier for correct pressures if necessary.*

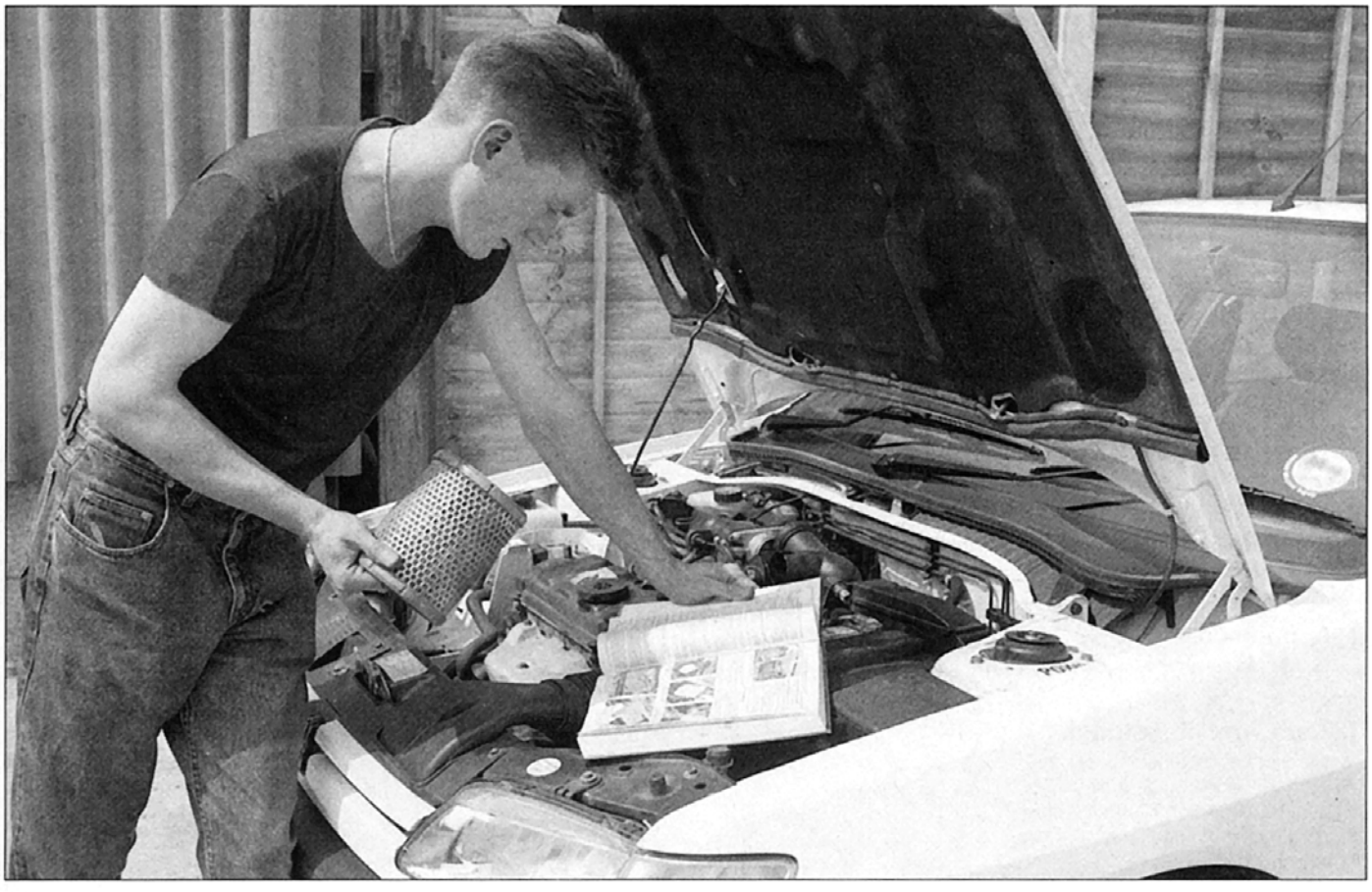
Note 3: *Tyre pressures must always be checked with the tyres cold to ensure accuracy.*

Saloon models (typical)	**Front (psi)**	**Rear (psi)**
195/65 R15 tyres	33	33
205/60 R15 tyres	35	35
Estate models (typical)		
195/65 R15 tyres	33	35
205/60 R15 tyres	35	35



Chapter 1 Part A:
Routine maintenance & servicing – petrol models

Contents



Degrees of difficulty

Easy, suitable for novice with little experience

Fairly easy, suitable for beginner with some experience

Fairly difficult, suitable for competent DIY mechanic

Difficult, suitable for experienced DIY mechanic

Very difficult, suitable for expert DIY or professional

Servicing specifications - petrol engines

Lubricants and fluids

Refer to *Weekly checks* on page 0•18

Capacities

Engine oil (including oil filter)

1.8 litre engine:		
1749cc	4.25 litres	
1761cc:	**Yellow dipstick**	**Orange dipstick**
Models with air conditioning	4.50 litres	4.25 litres
Models without air conditioning	5.00 litres	4.75 litres
2.0 litre engine	4.25 litres	

Cooling system

All engines (approximate)	8.8 litres

Transmission

Manual transmission (approximate)	1.9 litres
Automatic transmissions:	
4HP20:	
Drain and refill	3.0 litres
Total capacity (including torque converter)	8.0 litres
AL4:	
Drain and refill	4.5 litres
Total capacity (including torque converter)	6.0 litres
Fuel tank	70 litres

Cooling system

Antifreeze mixture:	
50% antifreeze	Protection down to –37°C
55% antifreeze	Protection down to –45°C

Note: *Refer to antifreeze manufacturer for latest recommendations.*

Ignition system

Spark plugs:	
XU engines	Bosch FR8 LDC or Eyquem RFC 42 LZ2E
EW engines	Bosch FR8ME, Sagem RFN52HZ or Eyquem RFC 52 LZDP
Electrode gap*	0.9 mm

**The spark plug gap quoted is that recommended by Bosch/Sagem/Eyquem for their specified plug listed above. If spark plugs of any other type are to be fitted, refer to their manufacturer's recommendations.*

Brakes

Brake pad friction material minimum thickness	2.0 mm
Brake shoe friction material minimum thickness	1.5 mm

Tyre pressures

See end of *Weekly checks* on page 0•18

Torque wrench settings

	Nm	**lbf ft**
Auxiliary drivebelt tensioner pulley	20	15
Auxiliary drivebelt guide pulley	35	26
Manual transmission filler/level plug	20	15
Spark plugs	25	18
Roadwheel bolts	90	66

The maintenance intervals in this manual are provided with the assumption that you, not the dealer, will be carrying out the work. These are the minimum maintenance intervals recommended by us for vehicles driven daily. If you wish to keep your vehicle in peak condition at all times, you may wish to perform some of these procedures more often. We encourage frequent maintenance, because it enhances the efficiency, performance and resale value of your vehicle.

When the vehicle is new, it should be serviced by a factory-authorised dealer service department, in order to preserve the factory warranty.

Weekly, or every 250 miles (400 km)

☐ Refer to *Weekly checks*

Every 6000 miles (10 000 km) or 6 months – whichever comes first

☐ Renew the engine oil and filter (Section 3)

Note: *Frequent oil and filter changes are good for the engine. We recommend changing the oil at the mileage specified here, or at least twice a year if the mileage covered is a less.*

Every 12000 miles (20 000 km) or 12 months – whichever comes first

☐ Check the automatic transmission (4HP20 type) fluid level, and top up if necessary (Section 4)
☐ Check all underbonnet components and hoses for fluid leaks (Section 5)
☐ Check the pollen filter (where fitted) (Section 6)
☐ Check the operation of the clutch (Section 7)
☐ Check the condition of the driveshaft rubber gaiters (Section 8)
☐ Check the steering and suspension components for condition and security (Section 9)
☐ Lubricate all hinges and locks (Section 10)

Every 18 000 miles (30 000 km)

In addition to all the items listed above, carry out the following:

☐ Check the condition of the front brake pads, and renew if necessary (Section 11)
☐ Check the condition of the rear brake pads and renew if necessary – rear disc brake models (Section 12)
☐ Check the operation of the handbrake (Section 13)
☐ Carry out a road test (Section 14)
☐ Check the condition of the auxiliary drivebelt, and renew if necessary (Section 15)

Every 18 000 miles (30 000 km) or 2 years, whichever comes first

☐ Renew the 4HP20 automatic transmission fluid (Chapter 7B)

Every 36 000 miles (60 000 km)

In addition to all the items listed above, carry out the following:

☐ Renew the spark plugs (Section 16)
☐ Renew the air filter (Section 17)
☐ Renew the fuel filter (Section 18)
☐ Check the manual transmission oil level, and top-up if necessary (Section 19)
☐ Check the automatic transmission (AL4 type) fluid level, and top up if necessary (Section 4)
☐ Check the condition of the rear brake shoes and renew if necessary – rear drum brake models (Section 20)

Every 36 000 miles (60 000 km) or 2 years, whichever comes first

☐ Renew the brake fluid (Section 21)

Note: *A hydraulic clutch shares its fluid reservoir with the braking system, and may also need to be bled.*

Every 72 000 miles (120 000 km)

In addition to all the items listed above, carry out the following:

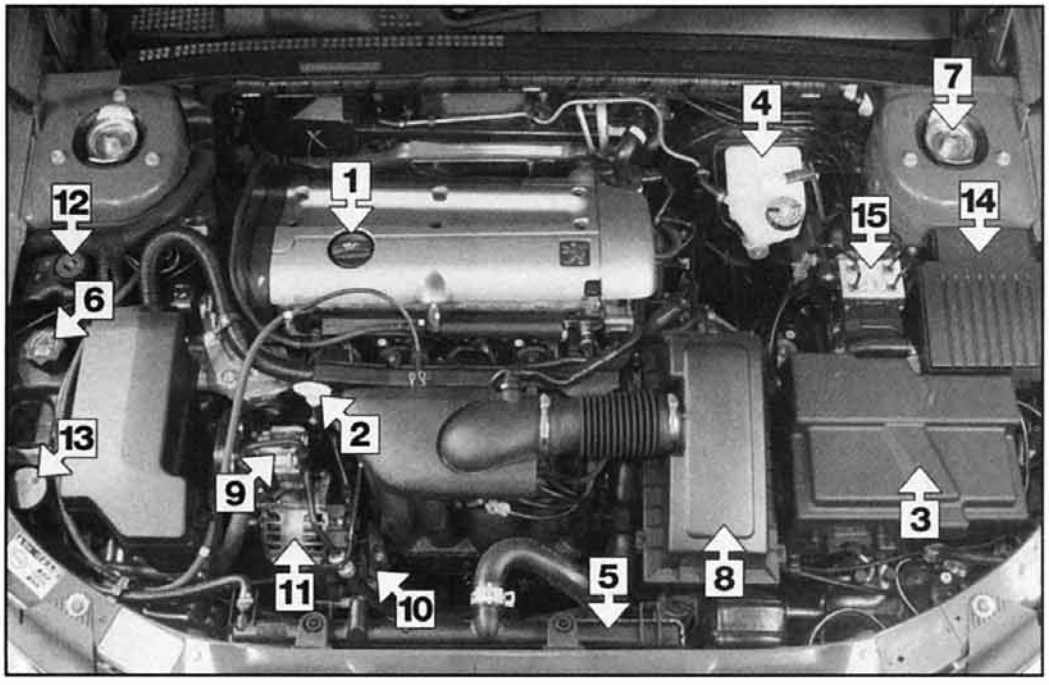
☐ Renew the timing belt (Section 22)

Note: *It is strongly recommended that the timing belt renewal interval is halved to 36 000 miles (60 000 km) on vehicles which are subjected to intensive use, ie. mainly short journeys or a lot of stop-start driving. The actual belt renewal interval is therefore very much up to the individual owner, but bear in mind that severe engine damage will result if the belt breaks.*

Every 72 000 miles (120 000 km) or 5 years, whichever comes first

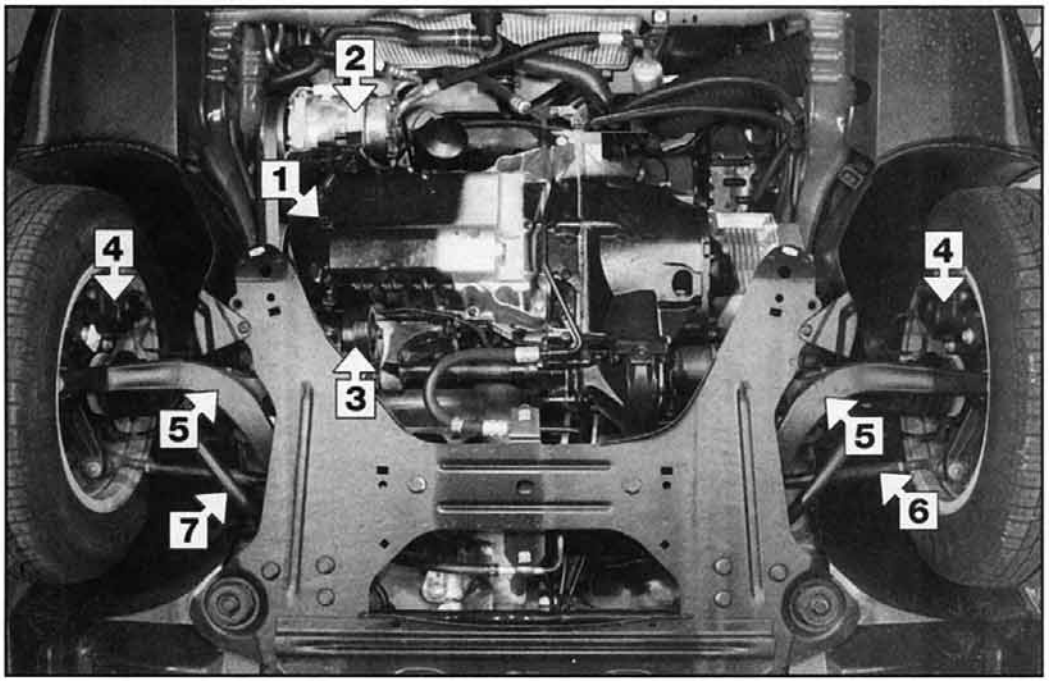
☐ Renew the coolant (Section 23)

Underbonnet view of a 2.0 litre model



1 *Engine oil filler cap*
2 *Engine oil level dipstick*
3 *Battery*
4 *Brake fluid reservoir*
5 *Radiator*
6 *Coolant expansion tank*
7 *Suspension strut upper mounting*
8 *Air filter housing*
9 *Power steering pump*
10 *Air conditioning compressor*
11 *Alternator*
12 *Power steering fluid reservoir*
13 *Washer fluid reservoir*
14 *Fuse/relay box*
15 *Anti-lock braking system (ABS) hydraulic unit*

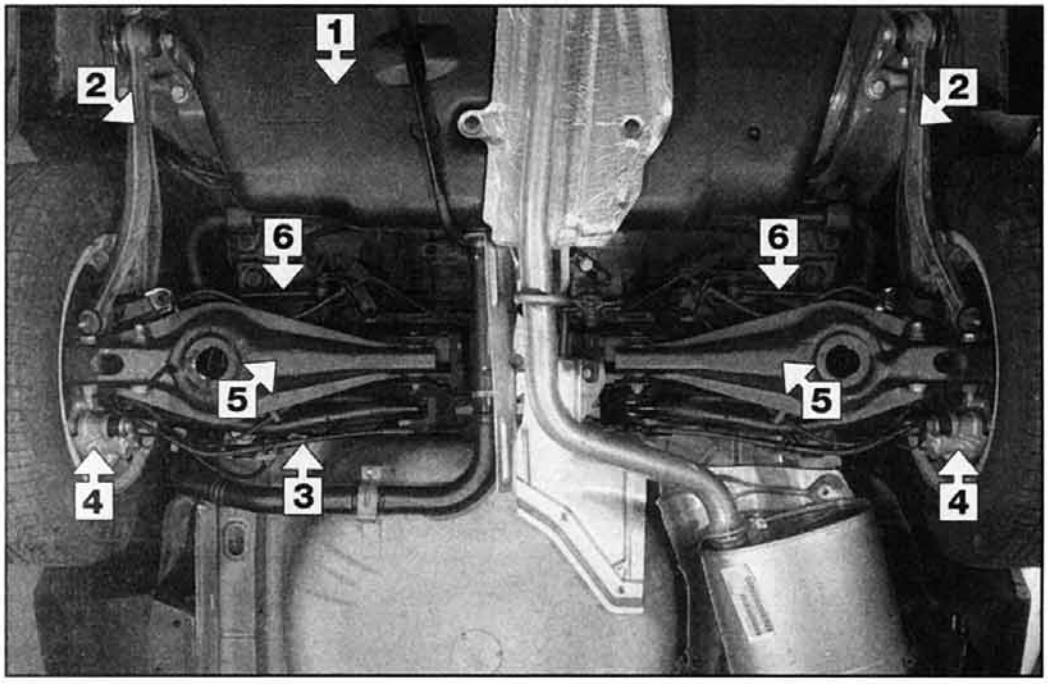
Front underbody view



1 *Engine oil drain plug*
2 *Air conditioning compressor*
3 *Driveshaft intermediate bearing*
4 *Brake caliper*
5 *Front suspension lower arm*
6 *Track rod*
7 *Front suspension anti-roll bar*

Rear underbody view

1 *Fuel tank*
2 *Rear suspension trailing arm*
3 *Handbrake cable*
4 *Brake caliper*
5 *Rear suspension lower arm*
6 *Rear suspension track arm*



Maintenance procedures

1 General information

1 This Chapter is designed to help the home mechanic maintain his/her vehicle for safety, economy, long life and peak performance.

2 The Chapter contains a master maintenance schedule, followed by Sections dealing specifically with each task in the schedule. Visual checks, adjustments, component renewal and other helpful items are included. Refer to the accompanying illustrations of the engine compartment and the underside of the vehicle for the locations of the various components.

3 Servicing your vehicle in accordance with the mileage/time maintenance schedule and the following Sections will provide a planned maintenance programme, which should result in a long and reliable service life. This is a comprehensive plan, so maintaining some items but not others at the specified service intervals, will not produce the same results.

4 As you service your vehicle, you will discover that many of the procedures can – and should – be grouped together, because of the particular procedure being performed, or because of the proximity of two otherwise-unrelated components to one another. For example, if the vehicle is raised for any reason, the exhaust can be inspected at the same time as the suspension and steering components.

5 The first step in this maintenance programme is to prepare yourself before the actual work begins. Read through all the Sections relevant to the work to be carried out, then make a list and gather all the parts and tools required. If a problem is encountered, seek advice from a parts specialist, or a dealer service department.

2 Regular maintenance

1 If, from the time the vehicle is new, the routine maintenance schedule is followed closely, and frequent checks are made of fluid levels and high-wear items, as suggested throughout this manual, the engine will be kept in relatively good running condition, and the need for additional work will be minimised.

2 It is possible that there will be times when the engine is running poorly due to the lack of regular maintenance. This is even more likely if a used vehicle, which has not received regular and frequent maintenance checks, is purchased. In such cases, additional work may need to be carried out, outside of the regular maintenance intervals.

3 If engine wear is suspected, a compression test (refer to Chapter 2A or 2B) will provide

valuable information regarding the overall performance of the main internal components. Such a test can be used as a basis to decide on the extent of the work to be carried out. If, for example, a compression test indicates serious internal engine wear, conventional maintenance as described in this Chapter will not greatly improve the performance of the engine, and may prove a waste of time and money, unless extensive overhaul work is carried out first.

4 The following series of operations are those often required to improve the performance of a generally poor-running engine:

Primary operations

a) Clean, inspect and test the battery (refer to 'Weekly checks').
b) Check all the engine-related fluids (refer to 'Weekly checks').
c) Check the condition and tension of the auxiliary drivebelt (Section 15).
d) Renew the spark plugs (Section 16).
e) Check the condition of the air filter, and renew if necessary (Section 17).
f) Renew the fuel filter (Section 18).
g) Check the condition of all hoses, and check for fluid leaks (Section 5).

5 If these operations do not prove effective, carry out the following secondary operations:

Secondary operations

All items listed under *Primary operations*, plus the following:

a) Check the charging system (refer to Chapter 5A).
b) Check the ignition system (refer to Chapter 5B).
c) Check the fuel system (refer to Chapter 4A).
d) Renew the ignition HT leads – where fitted (Section 16).

Every 6000 miles (10 000 km) or 6 months

3 Engine oil and filter renewal

Note: *A suitable square-section wrench may be required to undo the sump drain plug on some models. These wrenches can be obtained from most motor factors or your Peugeot dealer.*

1 Frequent oil and filter changes are the most important preventative maintenance procedures which can be undertaken by the DIY owner. As engine oil ages, it becomes diluted and contaminated, which leads to premature engine wear.

2 Before starting this procedure, gather together all the necessary tools and materials. Also make sure that you have plenty of clean rags and newspapers handy, to mop up any spills. Ideally, the engine oil should be warm, as it will drain better, and more built-up sludge will be removed with it. Take care, however, not to touch the exhaust or any other hot parts of the engine when working under the vehicle. To avoid any possibility of scalding, and to protect yourself from possible skin irritants and other harmful contaminants in used engine oils, it is advisable to wear gloves when carrying out this work. Access to the underside of the vehicle will be greatly improved if it can be raised on a lift, driven onto ramps, or jacked up and supported on axle stands. Whichever method is chosen, make sure that the vehicle remains level, or if it is at an angle, that the drain plug is at the lowest point. Where fitted, remove the splash guard from under the engine.

3 Slacken the drain plug about half a turn. Position the draining container under the drain plug, then remove the plug completely. If possible, try to keep the plug pressed into the sump while unscrewing it by hand the last couple of turns **(see Haynes Hint)**. Recover the sealing ring from the drain plug.

4 Allow some time for the old oil to drain, noting that it may be necessary to reposition the container as the oil flow slows to a trickle.

5 After all the oil has drained, wipe off the drain plug with a clean rag, and fit a new sealing washer. Clean the area around the drain plug opening, and refit the plug. Tighten the plug securely.

6 If the filter is also to be renewed, move the container into position under the oil filter, which is located on the front side of the cylinder block.

7 Using an oil filter removal tool if necessary, slacken the filter initially, then unscrew it by hand the rest of the way **(see illustration)**. Empty the oil in the old filter into the container.

8 Use a clean rag to remove all oil, dirt and sludge from the filter sealing area on the engine. Check the old filter to make sure that the rubber sealing ring hasn't stuck to the engine. If it has, carefully remove it.

9 Apply a light coating of clean engine oil to the sealing ring on the new filter, then screw it into position on the engine. Tighten the filter firmly by hand only – **do not** use any tools. Where necessary, refit the splash guard under the engine.

10 Remove the old oil and all tools from under the car, then lower the car to the ground (if applicable).

11 Remove the dipstick, then unscrew the oil filler cap from the cylinder head cover, or from the top of the filler tube on the front side of the cylinder block, as applicable. Fill the engine, using the correct grade and type of oil (*see Weekly checks*). An oil can spout or funnel may help to reduce spillage. Pour in half the specified quantity of oil first, then wait a few minutes for the oil to fall to the sump. Continue adding oil a small quantity at a time until the level is up to the lower mark on the dipstick. Adding approximately 1.0 litre will bring the level up to the upper mark on the dipstick. Refit the filler cap.

12 Start the engine and run it for a few minutes; check for leaks around the oil filter seal and the sump drain plug. Note that there may be a delay of a few seconds before the oil pressure warning light goes out when the engine is first started, as the oil circulates through the engine oil galleries and the new oil filter (where fitted) before the pressure builds-up.

13 Switch off the engine, and wait a few minutes for the oil to settle in the sump once more. With the new oil circulated and the filter completely full, recheck the level on the dipstick, and add more oil as necessary.

14 Dispose of the used engine oil safely, with reference to *General Repair Procedures*.

HAYNES HINT

As the drain plug releases from the threads, move it away sharply so the stream of oil issuing from the sump runs into the container, not up your sleeve.

3.7 Using an oil filter removal tool to slacken the oil filter

Every 12 000 miles (20 000 km) or 12 months

4 Automatic transmission fluid level check

Note: *The AL4 transmission is identified by having the Park Lock facility.*

4HP20 transmission

1 Take the vehicle on a moderate journey (at least 30 minutes), to warm the transmission up to normal operating temperature, then park the vehicle on level ground. Leave the engine idling, apply the handbrake fully, and move the selector lever to the P (Park) position. The fluid level is checked using the dipstick located at the front of the engine compartment, directly in front of the engine unit **(see illustration)**. The dipstick top is brightly-coloured for easy identification.

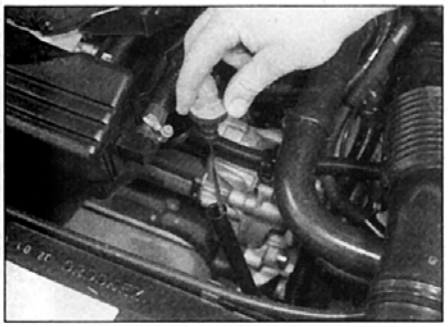
2 With the engine idling and the footbrake applied, move the selector lever through all gear positions, stopping briefly in each position, then return the selector lever to the P position. Withdraw the dipstick from the tube, and wipe all the fluid from its end with a clean rag or paper towel. Insert the clean dipstick back into the tube as far as it will go, then withdraw it once more. Note the fluid level on the end of the dipstick. The fluid level should be between the two upper marks on the dipstick (the marks located on either side of the number 80) **(see illustration)**.

3 If topping-up is necessary, add the required quantity of the specified fluid to the transmission via the dipstick tube. Use a funnel with a fine-mesh gauze, to avoid spillage, and to ensure that no foreign matter enters the transmission. **Note:** *Never overfill the transmission so that the fluid level is above the upper mark.*

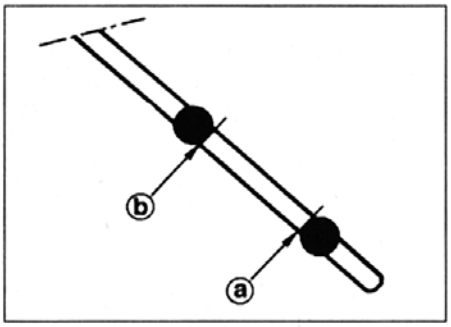
4 After topping-up, take the vehicle on a short run to distribute the fresh fluid, then recheck the level, topping-up if necessary.

5 Always maintain the level between the two upper dipstick marks. If the level is allowed to fall below the lower mark, fluid starvation may result, which could lead to severe transmission damage.

6 Frequent need for topping-up indicates that there is a leak, which should be found and corrected before it becomes serious.



4.1 Withdrawing the automatic transmission dipstick – 4HP20 transmission



4.2 Automatic transmission fluid dipstick lower (a) and upper (b) fluid level markings

AL4 transmission

7 Take the vehicle on a moderate journey (at least 30 minutes), to warm the transmission up to normal operating temperature, then park the vehicle on level ground.

8 With the engine switched off, the oil level is checked by removing the oil filler and oil level plugs from the transmission housing.

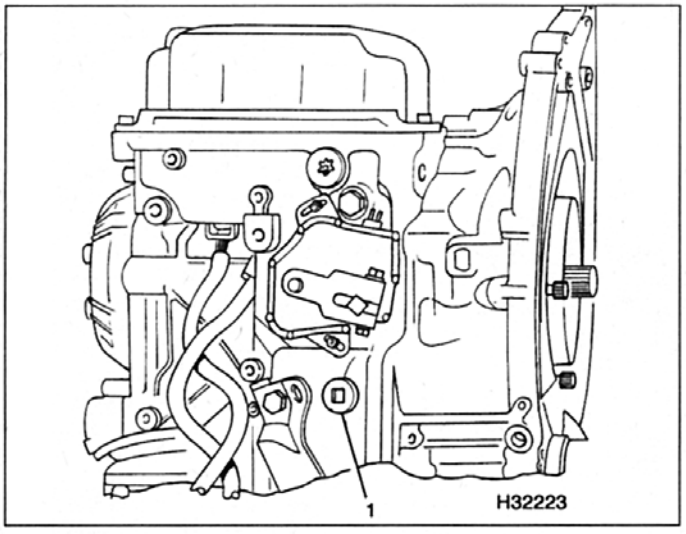
9 Remove the air cleaner air inlet duct as described in Chapter 4A.

10 To improve access to the oil level plug, which is on the base of the transmission housing, it may be preferable to jack up the front and rear of the car, and support it on axle stands (see *Jacking and vehicle support*); it is essential that the car is kept level for the check to be accurate. Remove the engine undertray for access to the plug.

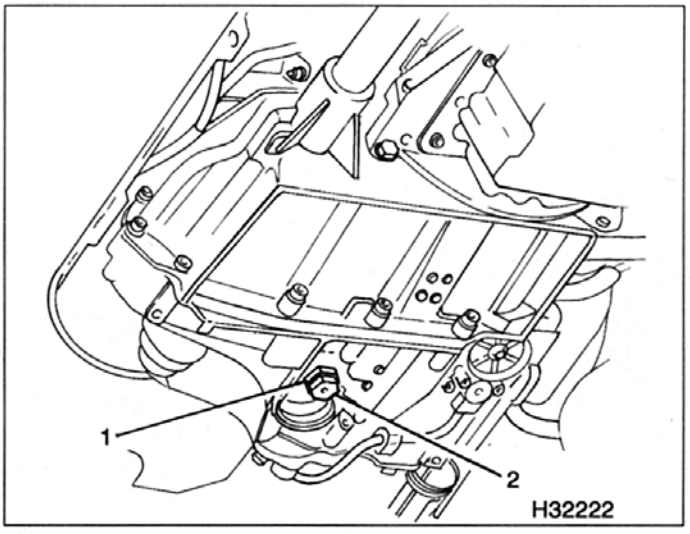
11 Using a square-section wrench, remove the oil filler plug from the top of the transmission housing **(see illustration)**, and add 0.5 litres of the specified oil. As access to the filler plug is limited, Peugeot mechanics use a filling bottle with a length of small-bore hose attached. The end of the hose is inserted into the filler orifice and the bottle (filled with the specified oil) is then suspended from the bonnet. A suitable alternative could easily be made up from, for example, a clean plastic drinks bottle with the base cut off and with a hose attached to the cap.

12 With the handbrake and footbrake firmly applied, start the engine and move the selector through all available positions several times. Finally, select P, and leave the engine running.

13 Working under the car, place a suitable container underneath the transmission, then remove the oil level plug **(see illustration)**. This is the smaller hex-head bolt inside the larger hex-headed transmission drain plug – do not loosen the larger, outer plug with the



4.11 Automatic transmission oil filler plug (1), viewed from above – AL4 transmission



4.13 Automatic transmission oil level plug (2) is located inside the drain plug (1) – AL4 transmission

engine running, or the transmission oil will run out, resulting in transmission damage.

14 If the level is correct, oil will run from the level plug in a steady stream, quickly reducing to a sequence of drips. In theory, the amount of oil lost when the plug is removed should be the same as, or less than, the 0.5 litres just added. When the dripping stops, refit the level plug.

15 If little or no oil emerges, refit the level plug, then switch off the engine. Repeat paragraphs 11 to 14 until the level is correct.

16 On completion, tighten the filler and level plugs to the specified torque (Chapter 7B), then refit the engine undertray and air inlet duct.

17 Frequent need for topping-up indicates that there is a leak, which should be found and corrected before it becomes serious.

5 Hose and fluid leak check

Cooling system

Warning: Refer to the safety information given in 'Safety First!' and Chapter 3 before disturbing any of the cooling system components.

1 Carefully check the radiator and heater coolant hoses along their entire length. Renew any hose which is cracked, swollen or which shows signs of deterioration. Cracks will show up better if the hose is squeezed. Pay close attention to the clips that secure the hoses to the cooling system components. Hose clips that have been over-tightened can pinch and puncture hoses, resulting in cooling system leaks.

2 Inspect all the cooling system components (hoses, joint faces, etc) for leaks. Where any problems of this nature are found on system components, renew the component or gasket with reference to Chapter 3 **(see Haynes Hint)**.

Fuel

Warning: Refer to the safety information given in 'Safety First!' and Chapter 4A before disturbing any of the fuel system components.

3 Petrol leaks are difficult to pinpoint, unless the leakage is significant and hence easily visible. Fuel tends to evaporate quickly once it comes into contact with air, especially in a hot engine bay. Small drips can disappear before you get a chance to identify the point of leakage. If you suspect that there is a fuel leak from the area of the engine bay, leave the vehicle overnight then start the engine from cold, with the bonnet open. Metal components tend to shrink when they are cold, and rubber seals and hoses tend to harden, so any leaks will be more apparent whilst the engine is warming-up from a cold start.

4 Check all fuel lines at their connections to the fuel rail, fuel pressure regulator and fuel filter. Examine each rubber fuel hose along its length for splits or cracks. Check for leakage from the crimped joints between rubber and metal fuel lines. Examine the unions between the metal fuel lines and the fuel filter housing. Also check the area around the fuel injectors for signs of O-ring leakage.

5 To identify fuel leaks between the fuel tank and the engine bay, the vehicle should raised and securely supported on axle stands. Inspect the petrol tank and filler neck for punctures, cracks and other damage. The connection between the filler neck and tank is especially critical. Sometimes a rubber filler neck or connecting hose will leak due to loose retaining clamps or deteriorated rubber.

6 Carefully check all rubber hoses and metal fuel lines leading away from the petrol tank. Check for loose connections, deteriorated hoses, kinked lines, and other damage. Pay particular attention to the vent pipes and hoses, which often loop up around the filler neck and can become blocked or kinked, making tank filling difficult. Follow the fuel supply and return lines to the front of the vehicle, carefully inspecting them all the way for signs of damage or corrosion. Renew damaged sections as necessary.

Engine oil

7 Inspect the area around the camshaft cover, cylinder head, oil filter and sump joint faces. Bear in mind that, over a period of time, some very slight seepage from these areas is to be expected – what you are really looking for is any indication of a serious leak caused by gasket failure. Engine oil seeping from the base of the timing belt cover or the transmission bellhousing may be an indication of crankshaft or transmission input shaft oil seal failure. Should a leak be found, renew the failed gasket or oil seal by referring to the appropriate Chapters in this manual.

Automatic transmission fluid

8 Where applicable, check the hoses leading to the transmission fluid cooler at the front of the engine bay for leakage. Look for deterioration caused by corrosion and damage from grounding, or debris thrown up from the road surface. Automatic transmission fluid is a thin oil and is usually red in colour.

A leak in the cooling system will usually show-up as white- or rust-coloured deposits on the area adjoining the leak.

Power assisted steering fluid

9 Examine the hose running between the fluid reservoir and the power steering pump, and the return hose running from the steering rack to the fluid reservoir. Also examine the high pressure supply hose between the pump and the steering rack.

10 Where applicable, check the hoses leading to the PAS fluid cooler at the front of the engine bay. Look for deterioration caused by corrosion and damage from grounding, or debris thrown up from the road surface.

11 Pay particular attention to crimped unions, and the area surrounding the hoses that are secured with adjustable worm drive clips. Like automatic transmission fluid, PAS fluid is a thin oil, and is usually red in colour.

Air conditioning refrigerant

Warning: Refer to the safety information given in 'Safety First!' and Chapter 3, regarding the dangers of disturbing any of the air conditioning system components.

12 The air conditioning system is filled with a liquid refrigerant, which is retained under high pressure. If the air conditioning system is opened and depressurised without the aid of specialised equipment, the refrigerant will immediately turn into gas and escape into the atmosphere. If the liquid comes into contact with your skin, it can cause severe frostbite. In addition, the refrigerant contains substances which are environmentally damaging; for this reason, it should not be allowed to escape into the atmosphere.

13 Any suspected air conditioning system leaks should be immediately referred to a Peugeot dealer or air conditioning specialist. Leakage will be shown up as a steady drop in the level of refrigerant in the system.

14 Note that water may drip from the condenser drain pipe, underneath the car, immediately after the air conditioning system has been in use. This is normal, and should not be cause for concern.

Brake (and clutch) fluid

Warning: Refer to the safety information given in 'Safety First!' and Chapter 9, regarding the dangers of handling brake fluid.

15 With reference to Chapter 9, examine the area surrounding the brake pipe unions at the master cylinder for signs of leakage. Check the area around the base of fluid reservoir, for signs of leakage caused by seal failure. Also examine the brake pipe unions at the ABS hydraulic unit.

16 If fluid loss is evident, but the leak cannot be pinpointed in the engine bay, the brake calipers and under body brake lines and should be carefully checked with the vehicle raised and supported on axle stands. Leakage of fluid from the braking system is serious fault that must be rectified immediately.

17 On models with a hydraulically-operated clutch, refer to Chapter 6 and check for leakage around the hydraulic fluid line connections to the clutch master cylinder at the bulkhead, and to the clutch slave cylinder, bolted to the side of the transmission bell housing.

18 Brake/clutch hydraulic fluid is a toxic substance with a watery consistency. New fluid is almost colourless, but it becomes darker with age and use.

Unidentified fluid leaks

19 If there are signs that a fluid of some description is leaking from the vehicle, but you cannot identify the type of fluid or its exact origin, park the vehicle overnight and slide a large piece of card underneath it. Providing that the card is positioned in roughly the right location, even the smallest leak will show up on the card. Not only will this help you to pinpoint the exact location of the leak, it should be easier to identify the fluid from its colour. Bear in mind, though, that the leak may only be occurring when the engine is running!

Vacuum hoses

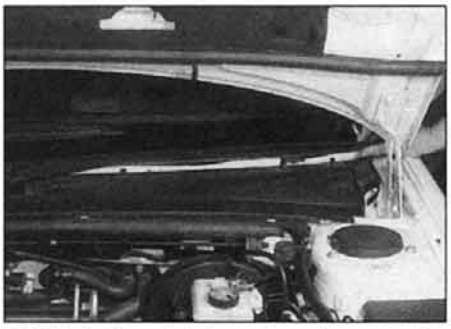
20 Although the braking system is hydraulically-operated, the brake servo unit amplifies the effort you apply at the brake pedal, by making use of the vacuum in the inlet manifold, generated by the engine. Vacuum is ported to the servo by means of a large-bore hose. Any leaks that develop in this hose will reduce the effectiveness of the braking system.

21 In addition, many of the underbonnet components, particularly the emission control components, are driven by vacuum supplied from the inlet manifold via narrow-bore hoses. A leak in a vacuum hose means that air is being drawn into the hose (rather than escaping from it) and this makes leakage very difficult to detect. One method is to use an old length of vacuum hose as a kind of stethoscope – hold one end close to (but not in) your ear and use the other end to probe the area around the suspected leak. When the end of the hose is directly over a vacuum leak, a hissing sound will be heard clearly through the hose. Care must be taken to avoid contacting hot or moving components, as the engine must be running, when testing in this manner. Renew any vacuum hoses that are found to be defective.

6 Pollen filter renewal

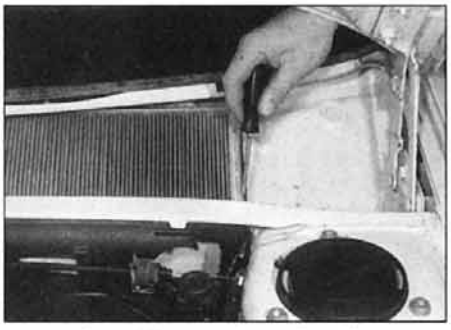
1 Operate the windscreen wipers and switch off the ignition so the wiper arms stop at the top of their travel.

2 Unscrew the retaining nut then unclip and remove the passenger side plastic inlet vent cover from the base of the windscreen **(see illustration)**.

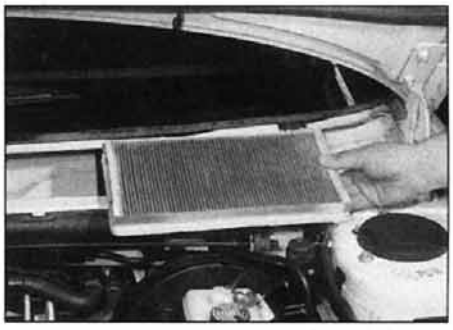


6.2 Undo the retaining nut and remove the passenger side plastic inlet vent cover . . .

6.3 . . . then unclip the inlet vent panel from the vehicle



6.4a Carefully ease the pollen filter out from its housing . . .



6.4b . . . and remove it from the vehicle

3 Unclip the passenger side inlet vent panel and remove the panel from beneath the windscreen to gain access to the pollen filter **(see illustration)**.

4 Ease the pollen filter out of its housing and remove it from the vehicle **(see illustrations)**.

5 Check the condition of the filter, if it is dirty, renew the filter.

6 Wipe clean the housing then install the filter, making sure it is clipped securely in position.

7 Clip the vent panel into position, making sure it is correctly engaged with the driver's side panel, then refit the vent cover and retaining nut.

8 Switch the ignition back on and return the wiper arm to the at rest position.

7 Clutch operation check

1 Petrol engine models covered by this manual are equipped with either a cable-operated, or hydraulically operated self-adjusting clutch mechanism which is virtually maintenance-free.

2 The only maintenance necessary is to check that the clutch pedal moves smoothly and easily through its full travel, and that the clutch itself functions correctly, with no trace of slip or drag.

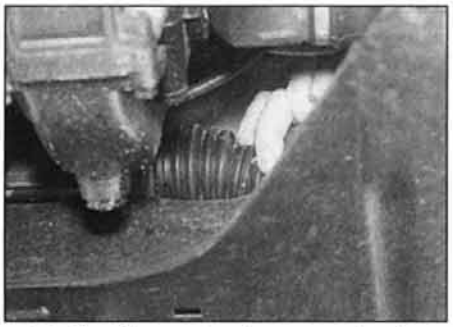
3 The hydraulic fluid uses the same reservoir as the brakes, check the fluid level as described in the relevant Chapter. (Note that some early models had a hydraulically-operated clutch mechanism which was a completely sealed assembly. Checking or topping-up of the hydraulic fluid level on this system is not possible.)

4 If any problems are experienced, refer to Chapter 6 for further details.

8 Driveshaft gaiter check

1 With the vehicle raised and securely supported on axle stands, turn the steering to full left or right lock, then slowly rotate the roadwheel. Inspect the outer constant velocity (CV) joint rubber gaiters, squeezing the gaiters to open out the folds **(see illustration)**. Check for signs of cracking, splits or deterioration of the rubber, which may allow the grease to

8.1 Checking a driveshaft gaiter for damage



9.2 Checking a steering gear gaiter for damage

9.4 Check for wear in the hub bearings by grasping the wheel and trying to rock it

escape, or water and grit to enter. Also check the security and condition of the retaining clips. Repeat these checks on the inner CV joints. If any damage or deterioration is found, the gaiters should be renewed (Chapter 8).

2 At the same time, check the general condition of the CV joints themselves by first holding the driveshaft and attempting to rotate the wheel. Repeat this check whilst holding the inner joint and attempting to rotate the driveshaft. Any appreciable movement indicates wear in the CV joints, wear in the driveshaft splines, or a loose driveshaft retaining nut.

9 Steering and suspension component check

Front suspension/steering

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

2 Visually inspect the balljoint dust covers and the steering rack-and-pinion gaiters for splits, chafing or deterioration **(see illustration)**. Any wear of these components will cause loss of lubricant, together with dirt and water entry, resulting in rapid deterioration of the balljoints or steering gear.

3 Check the power steering fluid hoses for chafing or deterioration, and the pipe and hose unions for fluid leaks. Also check for signs of fluid leakage under pressure from the steering gear rubber gaiters, which would indicate failed fluid seals within the steering gear.

4 Grasp the roadwheel at the 12 o'clock and 6 o'clock positions, and try to rock it **(see illustration)**. Very slight free play may be felt, but if the movement is appreciable, further investigation is necessary to determine the source. Continue rocking the wheel while an assistant depresses the footbrake. If the movement is now eliminated or significantly reduced, it is likely that the hub bearings are at fault. If the free play is still evident with the footbrake depressed, then there is wear in the suspension joints or mountings.

5 Now grasp the wheel at the 9 o'clock and 3 o'clock positions, and try to rock it as before. Any movement felt now may again be caused by wear in the hub bearings or the steering track rod balljoints. If the inner or outer balljoint is worn, the visual movement will be obvious.

6 Using a large screwdriver or flat bar, check for wear in the suspension mounting bushes by levering between the relevant suspension component and its attachment point. Some movement is to be expected as the mountings are made of rubber, but excessive wear should be obvious. Also check the condition of any visible rubber bushes, looking for splits, cracks or contamination of the rubber.

7 With the car standing on its wheels, have an assistant turn the steering wheel back-and-forth about an eighth of a turn each way. There should be very little, if any, lost movement between the steering wheel and roadwheels. If this is not the case, closely observe the joints and mountings previously described, but in addition, check the steering column universal joints for wear, and the rack-and-pinion steering gear itself.

Strut/shock absorber check

8 Check for any signs of fluid leakage around the suspension strut/shock absorber body, or from the rubber gaiter around the piston rod. Should any fluid be noticed, the suspension strut/shock absorber is defective internally, and should be renewed. **Note:** *Suspension struts/shock absorbers should always be renewed in pairs on the same axle, or the handling of the vehicle will be impaired.*

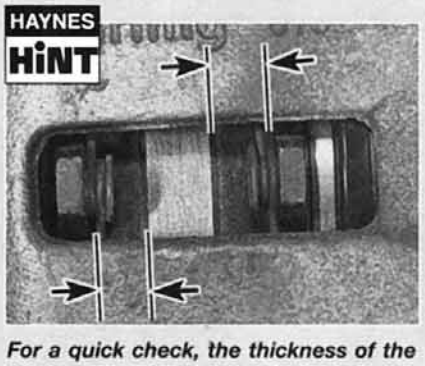
9 The efficiency of the suspension strut/shock absorber may be checked by bouncing the vehicle at each corner. Generally speaking, the body will return to its normal position and stop after being depressed. If it rises and returns on a rebound, the suspension strut/shock absorber is probably suspect. Examine also the suspension strut/shock absorber upper and lower mountings for any signs of wear.

10 Hinge and lock lubrication

1 Lubricate the hinges of the bonnet, doors and tailgate with a light general-purpose oil. Similarly, lubricate all latches, locks and lock strikers. At the same time, check the security and operation of all the locks, adjusting them if necessary (see Chapter 11).

2 Lightly lubricate the bonnet release mechanism and cable with a suitable grease.

Every 18 000 miles (30 000 km)



For a quick check, the thickness of the friction material on each brake pad can be measured through the aperture in the caliper body.

11 Front brake pad check

1 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands. Remove the front roadwheels.

2 For a comprehensive check, the brake pads should be removed and cleaned. The operation of the caliper can then also be checked, and the condition of the brake disc itself can be fully examined on both sides. Refer to Chapter 9 for further information **(see Haynes Hint)**.

3 If any pad's friction material is worn to the specified thickness or less, *all four pads must be renewed as a set.* **Note:** *If any pad is approaching the minimum thickness, consider renewal as a precautionary measure in case the pads wear out before the next service.*

12 Rear brake pad check

1 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands. Remove the rear roadwheels.

2 For a quick check, the thickness of friction material remaining on each brake pad can be measured through the top of the caliper body. If any pad's friction material is worn to the specified thickness or less, all four pads must be renewed as a set.

3 For a comprehensive check, the brake pads should be removed and cleaned. This will

permit the operation of the caliper to be checked, and the condition of the brake disc itself to be fully examined on both sides. Refer to Chapter 9 for further information.

4 If any pad's friction material is worn to the specified thickness or less, *all four pads must be renewed as a set.* **Note:** *If any pad is approaching the minimum thickness, consider renewal as a precautionary measure in case the pads wear out before the next service.*

13 Handbrake check

1 Check and, if necessary, adjust the handbrake (see Chapter 9). Check that the handbrake cables are free to move easily and lubricate all exposed linkages/cable pivots.

14 Road test

Instruments and electrical equipment

1 Check the operation of all instruments and electrical equipment.

2 Make sure all instruments read correctly, and switch on all electrical equipment in turn, to check that it functions properly.

Steering and suspension

3 Check for any abnormalities in the steering, suspension, handling or road 'feel'.

4 Drive the vehicle, and check that there are no unusual vibrations or noises.

5 Check that the steering feels positive, with no excessive 'sloppiness', or roughness, and check for any suspension noises when cornering and driving over bumps.

Drivetrain

6 Check the performance of the engine, clutch (where applicable), gearbox/transmission and driveshafts.

7 Listen for any unusual noises from the engine, clutch and gearbox/transmission.

8 Make sure that the engine runs smoothly when idling, and that there is no hesitation when accelerating.

9 Check that, where applicable, the clutch action is smooth and progressive, that the drive is taken up smoothly, and that the pedal travel is not excessive. Also listen for any noises when the clutch pedal is depressed.

10 On manual gearbox models, check that all gears can be engaged smoothly without noise, and that the gear lever action is smooth and not abnormally vague or 'notchy'.

11 On automatic transmission models, make sure that all gearchanges occur smoothly, without snatching, and without an increase in engine speed between changes. Check that all the gear positions can be selected with the vehicle at rest. If any problems are found, they should be referred to a Peugeot dealer.

Braking system

12 Make sure that the vehicle does not pull to one side when braking, and that the wheels do not lock when braking hard.

13 Check that there is no vibration through the steering when braking.

14 Check that the handbrake operates correctly without excessive movement of the lever, and that it holds the vehicle stationary on a slope.

15 Test the operation of the brake servo unit as follows. With the engine off, depress the footbrake four or five times to exhaust the vacuum. Hold the brake pedal depressed, then start the engine. As the engine starts, there should be a noticeable 'give' in the brake pedal as vacuum builds-up. Allow the engine to run for at least two minutes, and then switch it off. If the brake pedal is depressed now, it should be possible to detect a hiss from the servo as the pedal is depressed. After about four or five applications, no further hissing should be heard, and the pedal should feel much harder.

15 Auxiliary drivebelt check and renewal

Note: *Depending on model and equipment fitted, access to the auxiliary drivebelt can be extremely limited. Where necessary, greater working clearance can be gained by removing the fuel injection/ignition electronic control unit (ECU) and its mounting box (Chapter 4A).*

Note: *On models with a manually-adjusted drivebelt, Peugeot specify the use of a special electronic tool (SEEM C105.5) to correctly set the drivebelt tension. If access to this equipment cannot be obtained, an approximate setting can be achieved using the method described below. If this method is used, the tension should be checked using the special electronic tool at the earliest opportunity.*

1 All models are equipped with a single poly-V type, multi-ribbed auxiliary drivebelt. The belt tension is adjusted manually on models without air conditioning, and automatically, by means of a spring-loaded tensioner, on models with air conditioning.

Drivebelt condition

2 Apply the handbrake, then jack up the front of the car and support it on axle stands. Remove the right-hand front roadwheel.

3 Release the screws and clips and remove the wheelarch liner from under the right-hand front wing for access to the crankshaft pulley bolt. Where fitted, also remove the splash guard from under the front of the engine.

4 Using a suitable socket and bar fitted to the crankshaft pulley bolt, rotate the crankshaft so that the entire length of the drivebelt can be examined. Examine the drivebelt for cracks, splitting, fraying or damage. Check also for signs of glazing (shiny patches) and for separation of the belt plies. Renew the belt if worn or damaged.

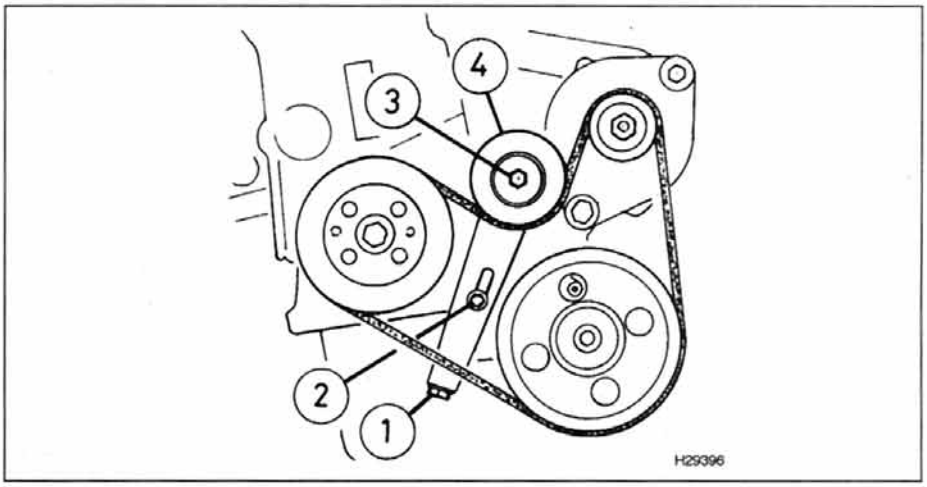
5 If the condition of the belt is satisfactory, on models without air conditioning, check the drivebelt tension as described below. On models with air conditioning, there is no need to check the drivebelt tension.

Removal

6 If not already done, proceed as described in paragraphs 2 and 3.

7 Disconnect the battery negative lead.

8 On models with a manually-adjusted drivebelt, slacken the two bolts securing the tensioning pulley assembly to the engine **(see illustration).** Rotate the adjuster bolt to move the tensioner pulley away from the drivebelt until there is sufficient slack for the drivebelt to be removed from the pulleys.



15.8 Auxiliary drivebelt manual adjustment (1.8 litre XU engine, without air conditioning)

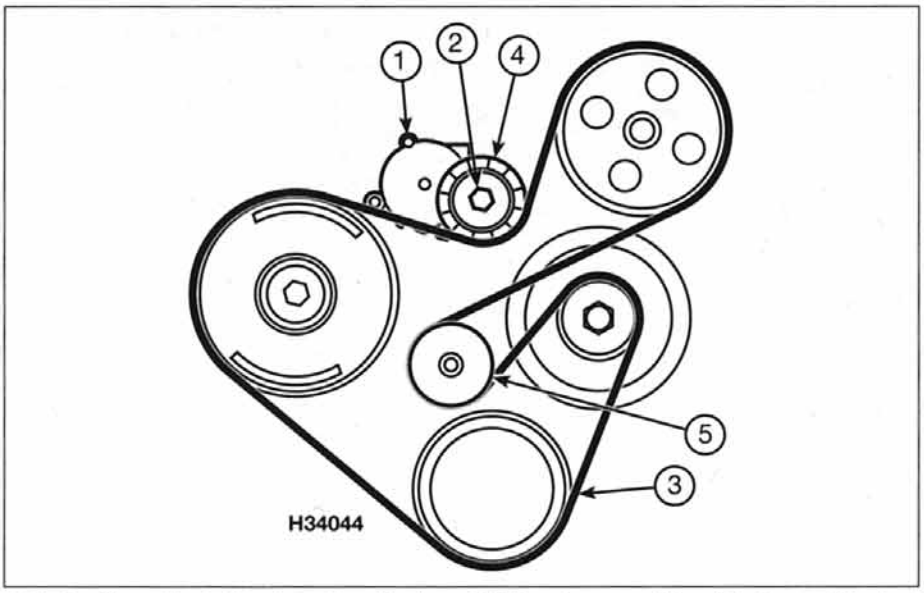
1 Adjuster bolt
2 Tensioning pulley assembly lower securing bolt
3 Tensioning pulley assembly upper retaining bolt
4 Tensioning pulley

9 On models with automatic (spring-loaded) adjusted drivebelt, move the tensioner pulley away from the drivebelt, using a spanner on the tensioner roller retaining nut. Rotate the tensioner roller anti-clockwise away from the belt **Note:** *The tensioner roller retaining nut has a left-hand thread, so it will not loosen when releasing the tension on the belt.* Once the tensioner is released, disengage the drivebelt from all the pulleys, noting its correct routing. Remove the drivebelt from the engine **(see illustration)**.

Refitting

10 Fit the drivebelt around the pulleys:
a) Tensioner pulley.
b) Crankshaft.
c) Power steering pump.
d) Alternator.
e) Idler pulley (where applicable).
f) Air conditioning compressor (where applicable).

11 Ensure that the ribs on the belt are correctly engaged with the grooves in the pulleys, and that the drivebelt is correctly routed.



15.9 Auxiliary drivebelt automatic adjustment (EW engines, models with air conditioning)

1 Tensioning pulley assembly
*2 Tensioner roller retaining nut **(left-hand thread)***
3 Auxiliary drivebelt
4 Tensioner roller
5 Idler roller

Tensioning

Manual adjuster

12 If not already done, proceed as described in paragraphs 2 and 3.

13 After refitting, take all the slack out of the belt by turning the tensioner pulley adjuster bolt, then tension the belt as follows.

14 Correct tensioning of the drivebelt will ensure that it has a long life. A belt which is too slack will slip and perhaps squeal. Beware, however, of overtightening, as this can cause wear in the alternator bearings.

15 The belt should be tensioned so that, under firm thumb pressure, there is about 5.0 mm of free movement at the mid-point between the pulleys on the longest belt run.

16 To adjust the tension, with the two tensioner pulley assembly retaining bolts slackened, rotate the adjuster bolt until the correct tension is achieved. Once the belt is correctly tensioned, rotate the crankshaft four complete revolutions in the normal direction of rotation and recheck the tension.

17 When the belt is correctly tensioned, tighten the tensioner pulley assembly retaining bolts to the specified torque, then reconnect the battery negative lead.

18 Refit the wheelarch liner and, where fitted, the engine splash guard. Refit the roadwheel, and lower the car to the ground.

Automatic adjuster

19 Where necessary, securely tighten the automatic tensioner mounting bolts to the specified torque.

20 The tensioner is spring-loaded, when the tensioner is released it will automatically tension the belt.

21 Reconnect the battery negative lead.

22 Refit the wheelarch liner and, where fitted, the engine splash guard. Refit the roadwheel, and lower the vehicle to the ground.

Every 36 000 miles (60 000 km)

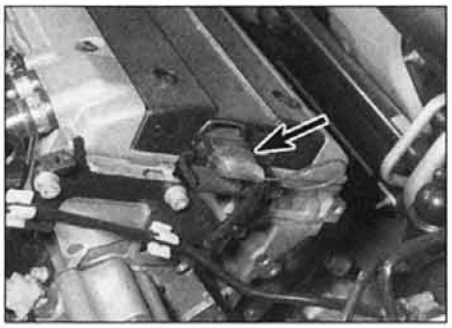
16 Spark plug renewal and ignition system check

Spark plug renewal

1 The correct functioning of the spark plugs is vital for the correct running and efficiency of the engine. It is essential that the plugs fitted are appropriate for the engine (a suitable type is specified at the beginning of this Chapter). If this type is used, and the engine is in good condition, the spark plugs should not need attention between scheduled renewal intervals.

2 Spark plug cleaning is rarely necessary, and should not be attempted unless specialised equipment is available, as damage can easily be caused to the firing ends.

3 To gain access to the spark plugs, the ignition coil unit fitted in the centre of the cylinder head cover must first be removed. Disconnect the wiring connector at the left-hand end of the coil unit, then undo the six retaining bolts and lift the coil unit upwards, off the spark plugs and from its location in the cylinder head cover **(see illustration)**.



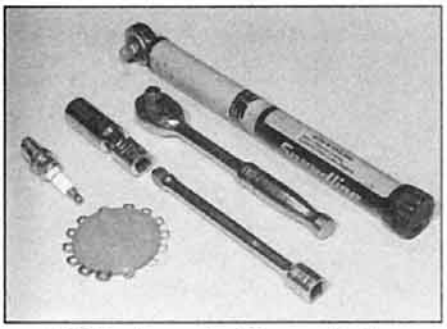
16.3 Ignition coil unit wiring connector (arrowed)

4 On certain models, to improve access to some of the plugs, it may be necessary to remove the air inlet ducting (refer to Chapter 4A for further information).

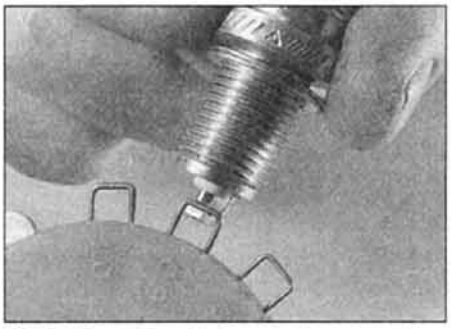
5 It is advisable to remove the dirt from the spark plug recesses, using a clean brush, vacuum cleaner or compressed air before removing the plugs, to prevent dirt dropping into the cylinders.

6 Unscrew the plugs using a spark plug spanner, suitable box spanner, or a deep socket and extension bar **(see illustration)**. Keep the socket aligned with the spark plug – if it is forcibly moved to one side, the ceramic insulator may be broken off. As each plug is removed, examine it as follows.

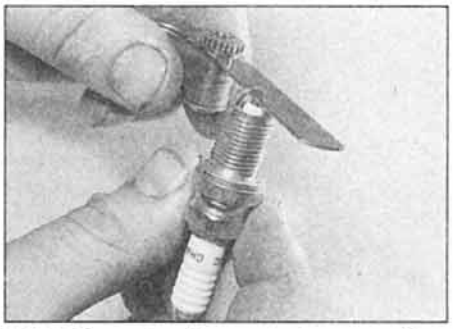
7 Examination of the spark plugs will give a good indication of the condition of the engine. If the insulator nose of the spark plug is clean and white, with no deposits, this is indicative



16.6 Tools required for spark plug removal, gap adjustment and refitting



16.10 Measuring the spark plug gap with a wire gauge



16.11 Measuring the spark plug gap with a feeler blade

of a weak mixture. It could also indicate that the plug is too 'hot' for the engine (a hot plug transfers heat away from the electrode slowly, a cold plug transfers heat away quickly). If this condition is apparent, either correct the mixture setting (where possible), or ensure that the correct grade of plug is fitted.

8 If the tip and insulator nose are covered with hard black-looking deposits, then this is indicative that the mixture is too rich. Should the plug be black and oily, then it is likely that the engine is fairly worn, as well as the mixture being too rich.

9 If the insulator nose is covered with light tan to greyish-brown deposits, then the mixture is correct, and it is likely that the engine is in good condition.

10 The spark plug electrode gap is of considerable importance as, if it is too large or too small, the size of the spark and its efficiency will be seriously impaired. The gap should be set to the value given in the Specifications at the beginning of this Chapter **(see illustration)**.

11 To set it, measure the gap with a feeler blade. If necessary, bend the outer plug electrode open or closed until the correct gap is achieved **(see illustration)**. The centre electrode should never be bent, as this may crack the insulator and cause plug failure, if nothing worse.

12 Special spark plug electrode gap adjusting tools are available from most motor accessory shops.

13 Before fitting the spark plugs, check that the threaded connector sleeves (on top of the plug) are tight, and that the plug exterior surfaces and threads are clean. Apply a smear of copper-based anti-seize compound to the plug threads **(see Haynes Hint)**.

14 Once the plug begins to screw in correctly, remove the rubber hose (if used), and tighten the plug to the specified torque using the spark plug socket and a torque wrench. Refit the remaining spark plugs in the same manner.

15 Refit the ignition coil unit to the head cover. Refit the retaining bolts, tightening them securely, then reconnect the coil unit wiring connectors.

Ignition system check

16 Check that all the primary (LT) circuit wiring connectors are clean and free of corrosion.

17 Ensure that the any wiring is marked accordingly, before removing them, to avoid confusion when refitting.

18 Check inside the end fitting for signs of corrosion, which will look like a white crusty powder. Push the end fitting back onto the spark plug, ensuring that it is a tight fit on the plug.

19 Using a clean rag, wipe the entire length of wiring or leads to remove any built-up dirt and grease. Once clean, check for burns, cracks and other damage.

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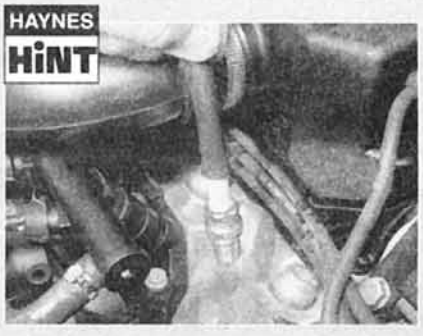


It's often difficult to insert spark plugs into their holes without cross-threading them. To avoid this possibility, fit a short piece of rubber hose over the end of the spark plug. The flexible hose acts as a universal joint, to help align the plug with the plug hole. Should the plug begin to cross-thread, the hose will slip on the spark plug, preventing thread damage.

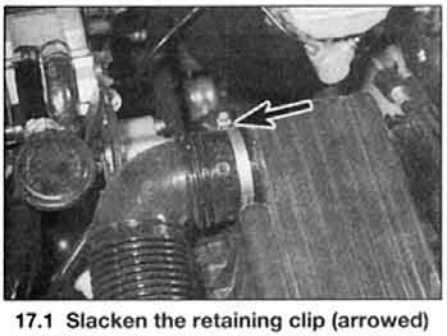
17 Air filter element renewal

1 Slacken the retaining clip and disconnect the inlet duct from the air filter housing top **(see illustration)**.

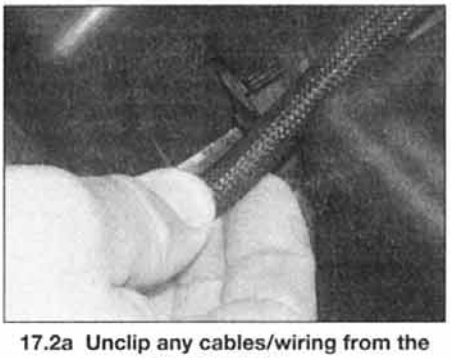
2 Where applicable, unclip any wiring or cables from the air filter housing, then undo the screws in the air filter housing and lift off the top **(see illustrations)**.

3 Lift out the filter element and wipe clean the lower housing body and top **(see illustration)**.

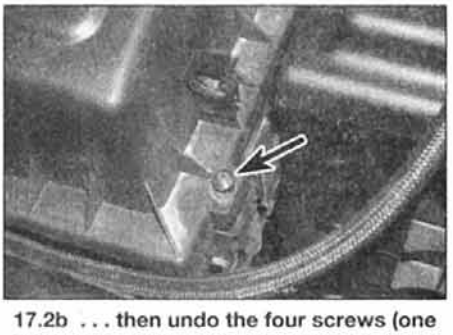
4 Place the new element in position in the lower housing body. Refit the filter housing top, securing it in position with its retaining screws.



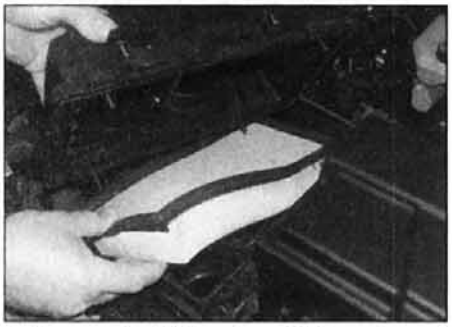
17.1 Slacken the retaining clip (arrowed) and disconnect the inlet duct from the air filter housing top



17.2a Unclip any cables/wiring from the air filter housing . . .



17.2b . . . then undo the four screws (one arrowed) securing the top to the housing body . . .



17.3 . . . and withdraw the air filter element

5 Reconnect the inlet duct to the lid, and securely tighten its retaining clip. Secure any cables and wiring that has been unclipped from the air filter housing on removal.

18 Fuel filter renewal

Warning: Before carrying out the following operation, refer to the precautions given in 'Safety first!' at the beginning of this manual, and follow them implicitly. Petrol is a highly-dangerous and volatile liquid, and the precautions necessary when handling it cannot be overstressed.

1 The fuel filter is located beneath the right-hand side of the vehicle, adjacent to the fuel tank **(see illustration)**. To gain access to the filter, chock the front wheels, then jack up the rear of the car and support it on axle stands.

2 Clamp the fuel inlet hose on the tank side of the filter. Bearing in mind the information given in the relevant Part of Chapter 4A on depressurising the fuel system, disconnect the quick-release fuel hose connections and remove the fuel hoses from the filter. Be prepared for fuel spillage.

3 Pull the upper end of the filter retaining strap upward to disengage it from the slot in the retaining bracket, move the strap aside and remove the filter.

4 Dispose of the old filter safely; it will be highly-inflammable, and may explode if thrown on a fire.

5 Locate the new filter in position and secure it with the retaining strap. Make sure that the lug on the strap fully engages with the slot in the retaining bracket.

6 Connect the fuel hoses to the filter and remove the hose clamp.

7 Start the engine, and check the filter hose connections for leaks. Lower the vehicle to the ground on completion.

19 Manual transmission oil level check

Note: *A new sealing washer will be required for the transmission filler/level plug, when refitting.*

1 Jack up the front and rear of the car and securely support it on axle stands so that it remains level. If the car has been recently driven, wait at least 5 minutes after the engine has been switched off. If the oil level is checked immediately after driving the car, some of the oil will remain distributed around the transmission components, resulting in an inaccurate level reading.

2 Remove the left-hand front roadwheel then release the screws and clips and remove the wheelarch liner from under the wing for access to the filler/level plug.

3 Wipe clean the area around the filler/level plug, which is the largest bolt among those securing the end cover to the transmission. Unscrew the plug and clean it; discard the sealing washer **(see illustrations)**.

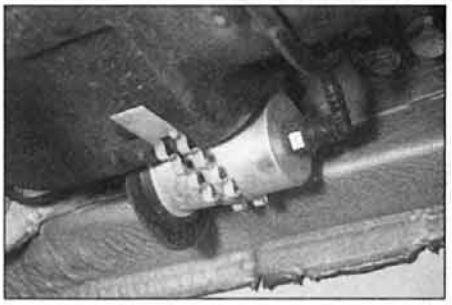
4 The oil level should reach the lower edge of the filler/level hole. A certain amount of oil will have gathered behind the filler/level plug, and will trickle out when it is removed; this does *not* necessarily indicate that the level is correct. To ensure that a true level is established, wait until the initial trickle has stopped, then add oil as necessary until a trickle of new oil can be seen emerging **(see illustration)**. The level will be correct when the flow ceases; use only good-quality oil of the specified type.

5 Refilling the transmission is an awkward operation; above all, allow plenty of time for the oil level to settle properly before checking it. If a large amount had to be added to the transmission, or if a large amount flowed out on checking the level, refit the filler/level plug and take the vehicle on a short journey. With the new oil distributed fully around the transmission components, recheck the level after allowing time for it to settle again.

6 If the transmission has been overfilled so that oil flows out as soon as the filler/level plug is removed, first check that the car is completely level (front-to-rear and side-to-side). Allow any surplus oil to drain off into a suitable container.

7 When the level is correct, fit a new sealing washer to the filler/level plug. Tighten the plug to the specified torque wrench setting. Wash off any spilt oil. Refit the wheelarch liner, and secure it in position with its retaining screws and clips. Refit the roadwheel.

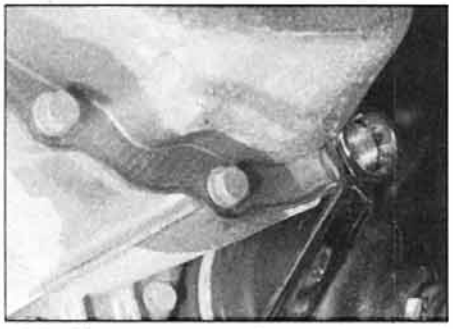
8 Frequent need for topping-up indicates a leak, which should be found and corrected before it becomes serious.



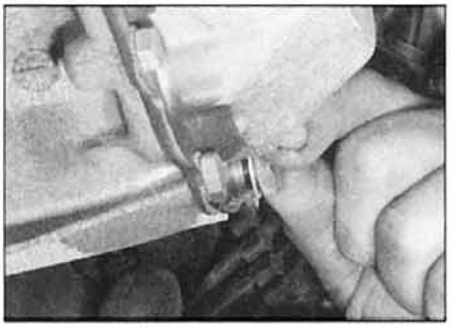
18.1 The fuel filter is situated underneath the right-hand side of the vehicle, adjacent to the fuel tank

20 Rear brake shoe check

1 Remove the rear brake drums and check the brake shoes for signs of wear or contamination. At the same time, also check the wheel cylinders for signs of leakage and the brake drums for signs of wear. Refer to the relevant Sections of Chapter 9 for further information.



19.3a Use a spanner to loosen the manual transmission filler/level plug . . .



19.3b . . . then unscrew and remove it

19.4 Topping-up the transmission oil level

Every 36 000 miles (60 000 km) or 2 years

21 Brake fluid renewal

Warning: Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it. Do not use fluid that has been standing open for some time, as it absorbs moisture from the air. Excess moisture can cause a dangerous loss of braking effectiveness.

Note: *A hydraulic clutch shares its fluid reservoir with the braking system, and may also need to be bled (see Chapter 6).*

1 The procedure is similar to that for the bleeding of the hydraulic system as described in Chapter 9, except that the brake fluid reservoir should be emptied by syphoning, using a clean poultry baster or similar before starting, and allowance should be made for the old fluid to be expelled when bleeding a section of the circuit.

2 Working as described in Chapter 9, open the first bleed screw in the sequence, and pump the brake pedal gently until nearly all the old fluid has been emptied from the master cylinder reservoir.

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Old brake fluid is invariably much darker in colour than the new, making it easy to distinguish the two.

3 Top-up to the MAX level with new fluid, and continue pumping until only the new fluid remains in the reservoir, and new fluid can be seen emerging from the bleed screw. Tighten the screw, and top the reservoir level up to the MAX level line.

4 Work through all the remaining bleed screws in the sequence until new fluid can be seen at all of them. Be careful to keep the master cylinder reservoir topped-up to above the MIN/DANGER level at all times, or air may enter the system and greatly increase the length of the task.

5 When the operation is complete, check that all bleed screws are securely tightened, and that their dust caps are refitted. Wash off all traces of spilt fluid, and recheck the master cylinder reservoir fluid level.

6 Check the operation of the brakes before taking the car on the road.

Every 72 000 miles (120 000 km)

22 Timing belt renewal

Refer to the relevant Part of Chapter 2.

Every 72 000 miles (120 000 km) or 5 years

23 Coolant renewal

Cooling system draining

Warning: Wait until the engine is cold before starting this procedure. Do not allow antifreeze to come in contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.

1 With the engine completely cold, remove the expansion tank filler cap. Turn the cap anti-clockwise until it reaches the first stop. Wait until any pressure remaining in the system is released, then push the cap down, turn it anti-clockwise to the second stop, and lift it off.

2 Remove the splash guard under the engine, where fitted, then position a suitable container beneath the coolant drain outlet at the lower left-hand side of the radiator.

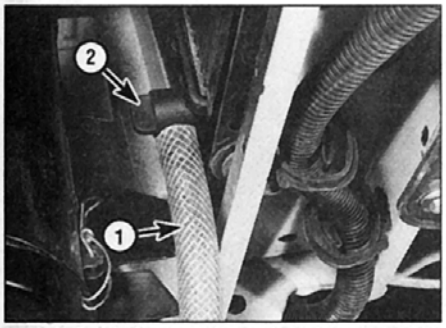
3 Where fitted, loosen the drain plug (there is no need to remove it completely) and allow the coolant to drain into the container. If desired, a length of tubing can be fitted to the drain outlet to direct the flow of coolant during draining **(see illustration)**.

4 To assist draining, open the cooling system bleed screws. These are located in the heater matrix outlet hose union (to improve access, it may be located in an extension hose) on the engine compartment bulkhead, and on the top of the thermostat housing **(see illustrations)**. On some models, there may also be a bleed screw in the top left-hand end of the radiator.

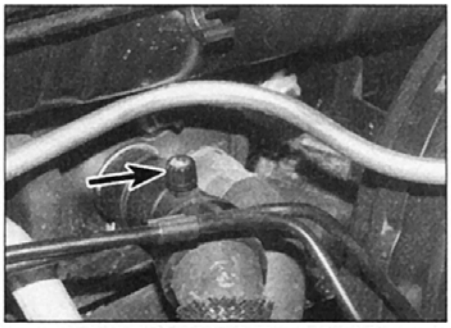
5 When the flow of coolant stops, reposition the container below the cylinder block drain plug.

6 Remove the drain plug, and allow the coolant to drain into the container.

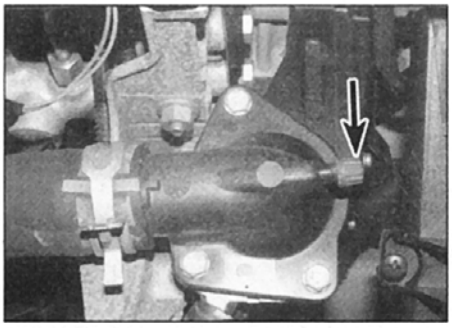
7 If the coolant has been drained for a reason



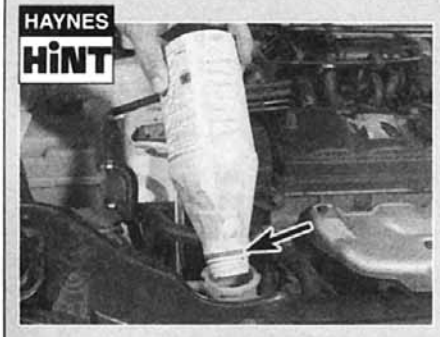
23.3 Tubing (1) attached to the radiator drain outlet and coolant drain plug (2)



23.4a Heater hose bleed screw (arrowed) . . .



23.4b . . . and thermostat housing bleed screw (arrowed)



Cut the bottom off an old antifreeze container to make a 'header tank' for use when refilling the cooling system. The seal at the point arrowed should be as tight as possible – use an O-ring if available, or seal the joint by some other means.

other than renewal, then provided it is clean and less than two years old, it can be re-used, though this is not recommended.

8 Refit the radiator and cylinder block drain plugs on completion of draining.

Cooling system flushing

9 If coolant renewal has been neglected, or if the antifreeze mixture has become diluted, then in time, the cooling system may gradually lose efficiency, as the coolant passages become restricted due to rust, scale deposits, and other sediment. The cooling system efficiency can be restored by flushing the system clean.

10 The radiator should be flushed independently of the engine, to avoid contamination.

Radiator flushing

11 To flush the radiator, first tighten the radiator drain plug, and the radiator bleed screw, where applicable.

12 Disconnect the top and bottom hoses and any other relevant hoses from the radiator, with reference to Chapter 3.

13 Insert a garden hose into the radiator top inlet. Direct a flow of clean water through the radiator, and continue flushing until clean water emerges from the radiator bottom outlet.

14 If after a reasonable period, the water still does not run clear, the radiator can be flushed with a good proprietary cleaning agent. It is important that their manufacturer's instructions are followed carefully. If the contamination is particularly bad, insert the hose in the radiator bottom outlet, and reverse-flush the radiator.

Engine flushing

15 To flush the engine, first refit the cylinder block drain plug, and tighten the cooling system bleed screws.

16 Remove the thermostat (see Chapter 3), then temporarily refit the thermostat cover.

17 With the top and bottom hoses disconnected from the radiator, insert a garden hose into the radiator top hose. Direct a clean flow of water through the engine, and continue flushing until clean water emerges from the radiator bottom hose.

18 On completion of flushing, refit the thermostat and reconnect the hoses with reference to Chapter 3.

Cooling system filling

19 Before attempting to fill the cooling system, make sure that all hoses and clips are in good condition, and that the clips are tight. Note that an antifreeze mixture must be used all year round, to prevent corrosion of the engine components (see following sub-Section). Also check that the radiator and cylinder block drain plugs are in place and tight.

20 Remove the expansion tank filler cap.

21 Open all the cooling system bleed screws (see paragraph 4).

22 Some of the cooling system hoses are positioned at a higher level than the top of the radiator expansion tank. It is therefore necessary to use a 'header tank' when refilling the cooling system, to reduce the possibility of air being trapped in the system. Although Peugeot dealers use a special header tank, the same effect can be achieved by using a suitable bottle, with a seal between the bottle and the expansion tank **(see Haynes Hint)**.

23 Fit the 'header tank' to the expansion tank and slowly fill the system. Coolant will emerge from each of the bleed screws in turn, starting with the lowest screw. As soon as coolant free from air bubbles emerges from the lowest screw, tighten that screw, and watch the next bleed screw in the system. Repeat the procedure until the coolant is emerging from the highest bleed screw in the cooling system and all bleed screws are securely tightened.

24 Ensure that the header tank is full (at least 0.5 litres of coolant). Start the engine, and run it at a fast idle speed (do not exceed 2000 rpm) until the cooling fan cuts in, and then cuts out. Stop the engine. **Note:** *Take great care not to scald yourself with the hot coolant during this operation.*

25 Allow the engine to cool, then remove the header tank.

26 When the engine has cooled, check the coolant level as described in *Weekly checks*. Top-up the level if necessary, and refit the expansion tank cap. Where applicable, refit the splash guard under the engine.

Antifreeze mixture

27 The antifreeze should always be renewed at the specified intervals. This is necessary not only to maintain the antifreeze properties, but also to prevent corrosion which would otherwise occur as the corrosion inhibitors become progressively less effective.

28 Always use an ethylene-glycol based antifreeze which is suitable for use in mixed-metal cooling systems. The quantity of antifreeze and levels of protection are indicated in the Specifications.

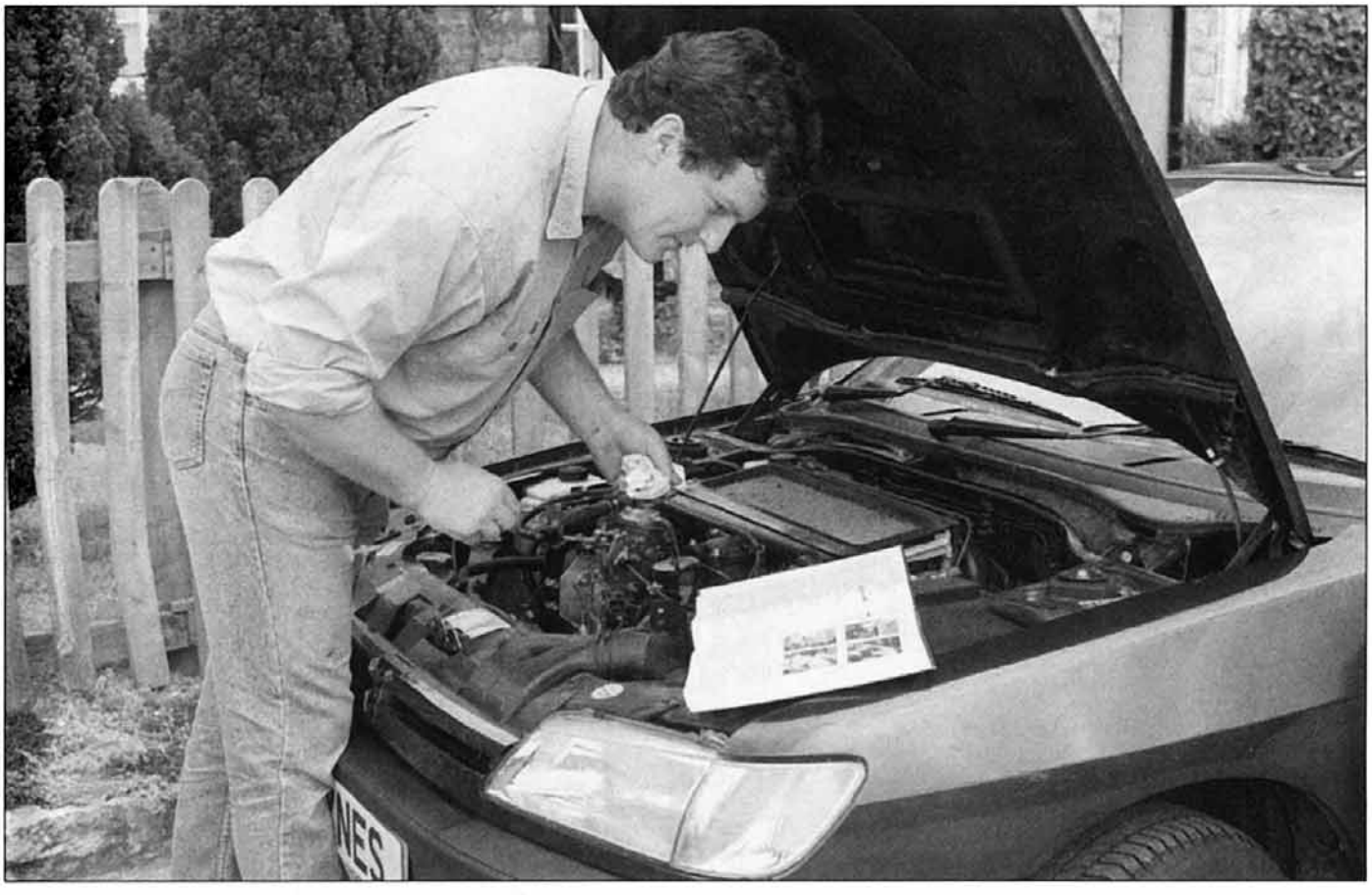
29 Before adding antifreeze, the cooling system should be completely drained, preferably flushed, and all hoses checked for condition and security.

30 After filling with antifreeze, a label should be attached to the expansion tank, stating the type and concentration of antifreeze used, and the date installed. Any subsequent topping-up should be made with the same type and concentration of antifreeze.

31 Do not use engine antifreeze in the washer system, as it will cause damage to the vehicle paintwork. A screenwash additive should be added to the washer system in the quantities stated on the bottle.

Chapter 1 Part B:
Routine maintenance & servicing – diesel models

Contents



Degrees of difficulty

Easy, suitable for novice with little experience	**Fairly easy,** suitable for beginner with some experience	**Fairly difficult,** suitable for competent DIY mechanic	**Difficult,** suitable for experienced DIY mechanic	**Very difficult,** suitable for expert DIY or professional

1B•2 Servicing specifications - Diesel models

Lubricants and fluids

Refer to *Weekly checks* on page 0•18

Capacities

Engine oil (including oil filter)

2.0 litre engines	4.5 litres
2.2 litre engine	4.75 litres

Cooling system

All engines (approximate)	8.8 litres

Transmission

Manual transmission (approximate)	1.9 litres
Automatic transmissions:	
4HP20:	
Drain and refill	3.0 litres
Total capacity (including torque converter)	8.0 litres
AL4:	
Drain and refill	4.5 litres
Total capacity (including torque converter)	6.0 litres
Fuel tank	70 litres

Cooling system

Antifreeze mixture:	
50% antifreeze	Protection down to –37°C
55% antifreeze	Protection down to –45°C

Note: *Refer to antifreeze manufacturer for latest recommendations.*

Brakes

Brake pad friction material minimum thickness	2.0 mm
Brake shoe friction material minimum thickness	1.5 mm

Tyre pressures

See end of *Weekly checks* on page 0•18

Torque wrench settings

	Nm	lbf ft
Auxiliary drivebelt eccentric tensioner roller bolt	44	32
Manual transmission filler/level plug	20	15
Roadwheel bolts	90	66

The maintenance intervals in this manual are provided with the assumption that you, not the dealer, will be carrying out the work. These are the minimum maintenance intervals recommended by us for vehicles driven daily. If you wish to keep your vehicle in peak condition at all times, you may wish to perform some of these procedures more often. We encourage frequent maintenance, because it enhances the efficiency, performance and resale value of your vehicle.

When the vehicle is new, it should be serviced by a factory-authorised dealer service department, in order to preserve the factory warranty.

Weekly, or every 250 miles (400 km)

- ☐ Refer to *Weekly checks*

Every 6000 miles (10 000 km) or 12 months – whichever comes first

In addition to all the items listed above, carry out the following:

- ☐ Renew the engine oil and filter (Section 3)

Note: *Peugeot recommend that the engine oil and filter are changed every 10 000 miles (16 000 km) or 2 years. However, oil and filter changes are good for the engine and we recommend that the oil and filter are renewed more frequently, especially if the vehicle is used on a lot of short journeys.*

- ☐ Drain any water from the fuel filter (Section 4)
- ☐ Check all underbonnet components and hoses for fluid leaks (Section 5)
- ☐ Check the operation of the clutch (Section 6)
- ☐ Check the automatic transmission (4HP20 type) fluid level, and top up if necessary (Section 7)
- ☐ Check the steering, suspension and driveshaft rubber gaiters for condition and security (Section 8)
- ☐ Lubricate all hinges and locks (Section 9)
- ☐ Check the pollen filter (where fitted) (Section 10)

Every 12 000 miles (20 000 km)

In addition to all the items listed above, carry out the following:

- ☐ Check the condition of the front brake pads, and renew if necessary (Section 11)
- ☐ Check the condition of the rear brake pads, and renew if necessary – rear bisc brake models (Section 12)
- ☐ Check the operation of the handbrake (Section 13)
- ☐ Carry out a road test (Section 14)
- ☐ Check the condition of the auxiliary drivebelt, and renew if necessary (Section 15)

Every 24 000 miles (40 000 km)

In addition to all the items listed above, carry out the following:

- ☐ Renew the air filter (Section 16)
- ☐ Renew the fuel filter (Section 17)

Every 36 000 miles (60 000 km)

In addition to all the items listed above, carry out the following:

- ☐ Check the manual transmission oil level, and top-up if necessary (Section 18)
- ☐ Check the automatic transmission (AL4 type) fluid level, and top up if necessary (Section 7)
- ☐ Check the condition of the rear brake shoes and renew if necessary – rear drum brake models (Section 19)

Every 36 000 miles (60 000 km) or 2 years, whichever comes sooner

- ☐ Renew the brake fluid (Section 20)

Note: *A hydraulic clutch shares its fluid reservoir with the braking system, and may also need to be bled.*

Every 48 000 miles (80 000 km)

- ☐ Check the particulate emission system (where fitted) (Section 21)

Every 72 000 miles (120 000 km)

In addition to all the items listed above, carry out the following:

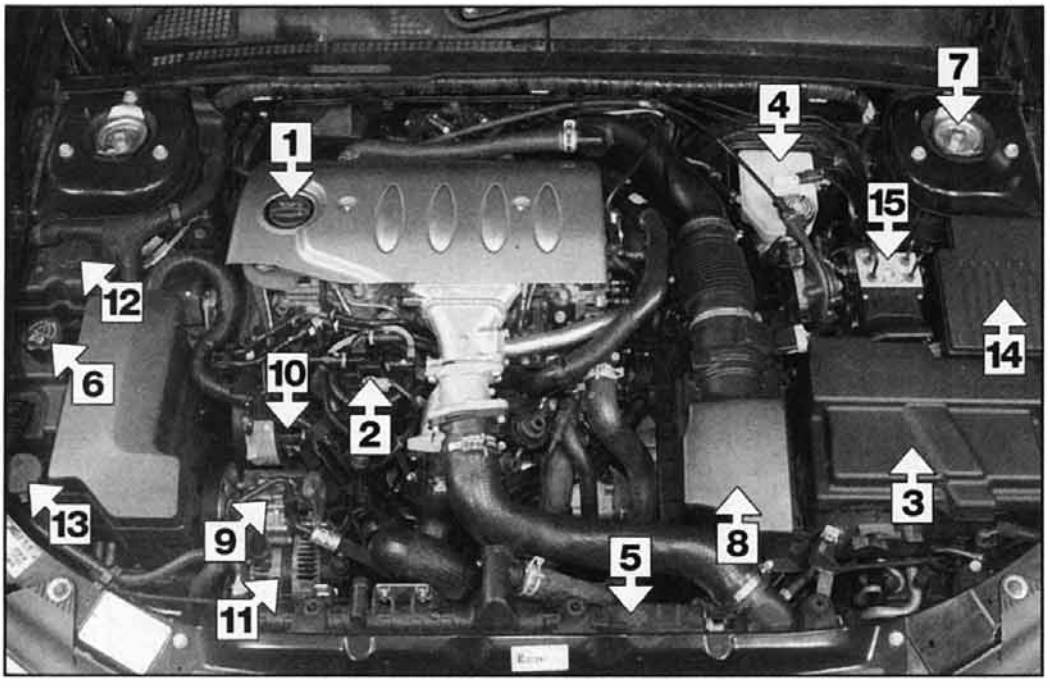
- ☐ Renew the timing belt (Section 22)

Note: *It is strongly recommended that the timing belt renewal interval is halved to 36 000 miles (60 000 km) on vehicles which are subjected to intensive use, ie, mainly short journeys or a lot of stop-start driving. The actual belt renewal interval is therefore very much up to the individual owner, but bear in mind that severe engine damage will result if the belt breaks.*

Every 72 000 miles (120 000 km) or 5 years, whichever comes sooner

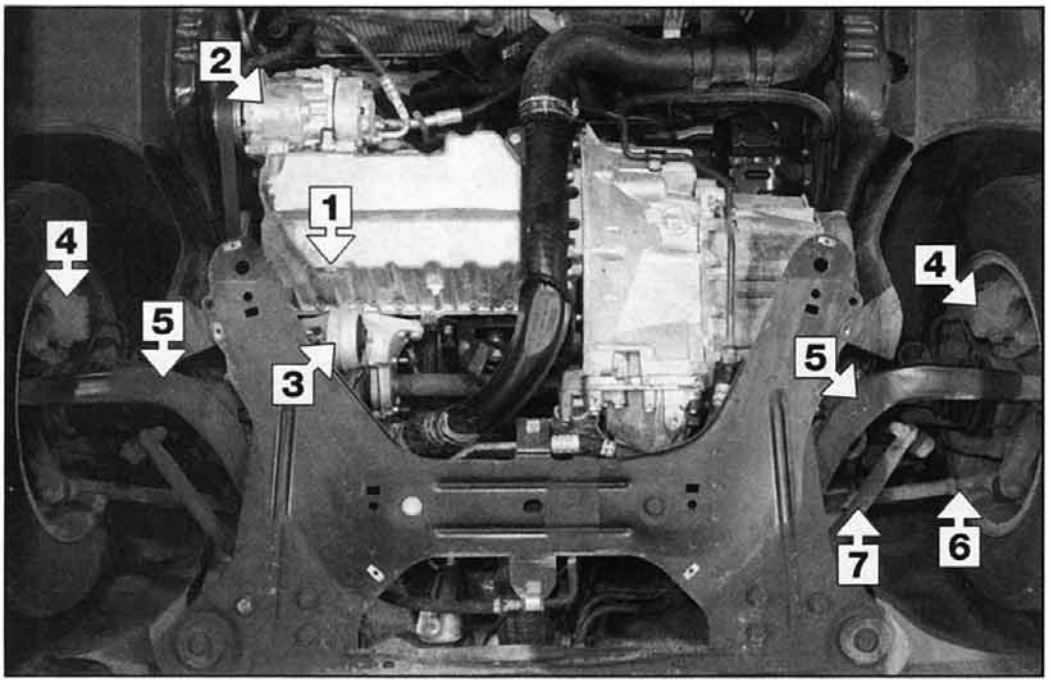
- ☐ Renew the coolant (Section 23)

Underbonnet view of a 2.2 litre model



1 *Engine oil filler cap/dipstick*
2 *Fuel filter housing*
3 *Battery*
4 *Brake fluid reservoir*
5 *Radiator*
6 *Coolant expansion tank*
7 *Suspension strut upper mounting*
8 *Air filter housing*
9 *Power steering pump*
10 *Injection pump*
11 *Alternator*
12 *Power steering fluid reservoir*
13 *Washer fluid reservoir*
14 *Fuse/relay box*
15 *Anti-lock braking system (ABS) hydraulic unit*

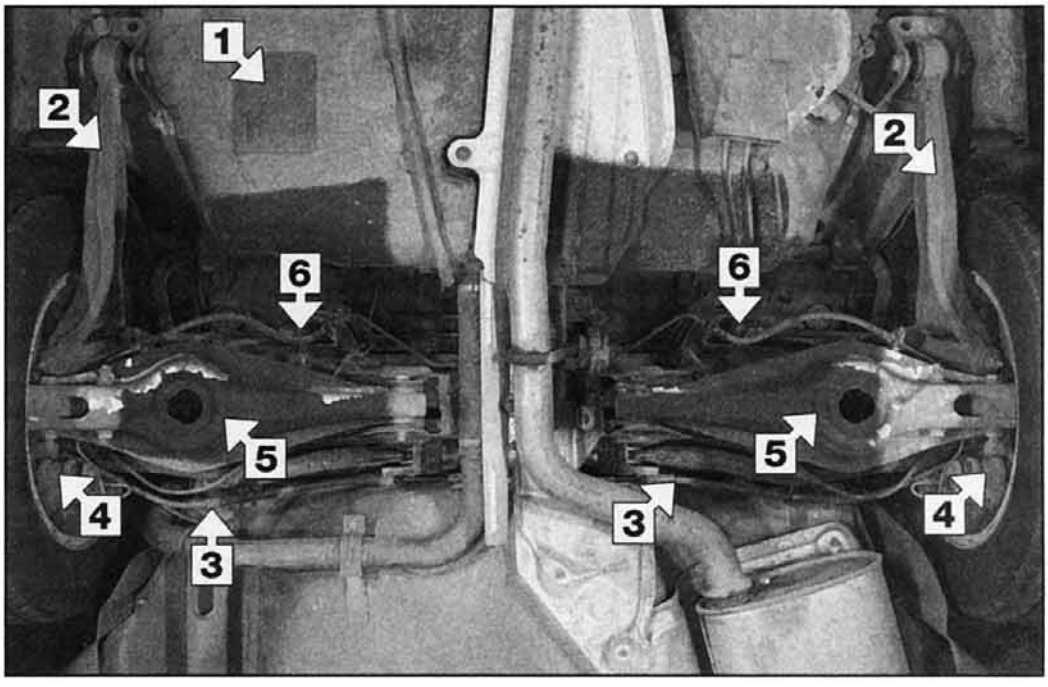
Front underbody view



1 *Engine oil drain plug*
2 *Air conditioning compressor*
3 *Driveshaft intermediate bearing*
4 *Brake caliper*
5 *Front suspension lower arm*
6 *Track rod*
7 *Front suspension anti-roll bar*

Rear underbody view

1 *Fuel tank*
2 *Rear suspension trailing arm*
3 *Handbrake cable*
4 *Brake caliper*
5 *Rear suspension lower arm*
6 *Rear suspension track arm*



Maintenance procedures

1 General information

This Chapter is designed to help the home mechanic maintain his/her vehicle for safety, economy, long life and peak performance.

The Chapter contains a master maintenance schedule, followed by Sections dealing specifically with each task in the schedule. Visual checks, adjustments, component renewal and other helpful items are included. Refer to the accompanying illustrations of the engine compartment and the underside of the vehicle for the locations of the various components.

Servicing your vehicle in accordance with the mileage/time maintenance schedule and the following Sections will provide a planned maintenance programme, which should result in a long and reliable service life. This is a comprehensive plan, so maintaining some items but not others at the specified service intervals, will not produce the same results.

As you service your vehicle, you will discover that many of the procedures can – and should – be grouped together, because of the particular procedure being performed, or because of the proximity of two otherwise-unrelated components to one another. For example, if the vehicle is raised for any reason, the exhaust can be inspected at the same time as the suspension and steering components.

The first step in this maintenance programme is to prepare yourself before the actual work begins. Read through all the Sections relevant to the work to be carried out, then make a list and gather all the parts and tools required. If a problem is encountered, seek advice from a parts specialist, or a dealer service department.

2 Regular maintenance

1 If, from the time the vehicle is new, the routine maintenance schedule is followed closely, and frequent checks are made of fluid levels and high-wear items, as suggested throughout this manual, the engine will be kept in relatively good running condition, and the need for additional work will be minimised.

2 It is possible that there will be times when the engine is running poorly due to the lack of regular maintenance. This is even more likely if a used vehicle, which has not received regular and frequent maintenance checks, is purchased. In such cases, additional work may need to be carried out, outside of the regular maintenance intervals.

3 If engine wear is suspected, a compression test (refer to Chapter 2C) will provide valuable information regarding the overall performance of the main internal components. Such a test can be used as a basis to decide on the extent of the work to be carried out. If, for example, a compression test indicates serious internal engine wear, conventional maintenance as described in this Chapter will not greatly improve the performance of the engine, and may prove a waste of time and money, unless extensive overhaul work is carried out first.

4 The following series of operations are those most often required to improve the performance of a generally poor-running engine:

Primary operations

a) Clean, inspect and test the battery (refer to 'Weekly checks').
b) Check all the engine-related fluids (refer to 'Weekly checks').
c) Check the condition and tension of the auxiliary drivebelt (Section 15).
d) Check the condition of the air filter, and renew if necessary (Section 16).
e) Check the condition of all hoses, and check for fluid leaks (Section 5).
f) Renew the fuel filter (Section 17).

5 If the above operations do not prove fully effective, carry out the following secondary operations:

Secondary operations

All items listed under Primary operations, plus the following:

a) Check the charging system (refer to Chapter 5A).
b) Check the preheating system (refer to Chapter 5C).
c) Check the fuel system (refer to Chapter 4B).

Every 6 000 miles (10 000 km) or 12 months

3 Engine oil and filter renewal

1 Frequent oil and filter changes are the most important preventative maintenance procedures which can be undertaken by the DIY owner. As engine oil ages, it becomes diluted and contaminated, which leads to premature engine wear.

2 Before starting this procedure, gather together all the necessary tools and materials. Also make sure that you have plenty of clean rags and newspapers handy, to mop up any spills. Ideally, the engine oil should be warm, as it will drain better, and more built-up sludge will be removed with it. Take care, however, not to touch the exhaust or any other hot parts of the engine when working under the vehicle. To avoid any possibility of scalding, and to protect yourself from possible skin irritants and other harmful contaminants in used engine oils, it is advisable to wear gloves when carrying out this work. Access to the underside of the vehicle will be greatly improved if it can be raised on a lift, driven onto ramps, or jacked up and supported on axle stands. Whichever method is chosen, make sure that the vehicle remains level, or if it is at an angle, that the drain plug is at the lowest point. Where fitted, remove the splash guard from under the engine.

3 Slacken the drain plug about half a turn, position the draining container under the drain plug, then remove the plug completely **(see illustration)**. If possible, try to keep the plug pressed into the sump while unscrewing it by hand the last couple of turns **(see Haynes Hint)**. Recover the sealing ring from the drain plug.

4 Allow some time for the old oil to drain, noting that it may be necessary to reposition the container as the oil flow slows to a trickle.

5 After all the oil has drained, wipe off the drain plug with a clean rag, and fit a new sealing washer. Clean the area around the drain plug opening, and refit the plug. Tighten the plug securely.

6 If the filter is also to be renewed, move the container into position under the oil filter, which is located on the front side of the cylinder block.

7 Using an oil filter removal tool if necessary, slacken the filter initially, then unscrew it by hand the rest of the way **(see illustration)**. Empty the oil in the old filter into the container.

8 Use a clean rag to remove all oil, dirt and sludge from the filter sealing area on the engine. Check the old filter to make sure that the rubber sealing ring hasn't stuck to the engine. If it has, carefully remove it.

9 Apply a light coating of clean engine oil to the sealing ring on the new filter, then screw it into position on the engine. Tighten the filter firmly by hand only – **do not** use any tools. Where necessary, refit the splash guard under the engine.

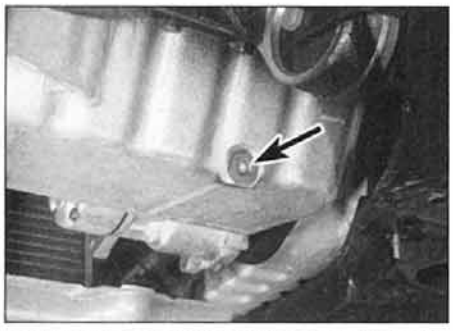
10 Remove the old oil and all tools from under the car, then lower the car to the ground (if applicable).

11 Remove the dipstick, then unscrew the oil filler cap from the top of the filler tube on the front side of the cylinder block. Fill the engine, using the correct grade and type of oil (*see Weekly checks*). An oil can spout or funnel may help to reduce spillage. Pour in half the specified quantity of oil first, then wait a few minutes for the oil to fall to the sump. Continue adding oil a small quantity at a time until the level is up to the lower mark on the dipstick. Adding approximately 1.0 litre will bring the level up to the upper mark on the dipstick. Refit the filler cap.

12 Start the engine and run it for a few minutes; check for leaks around the oil filter seal and the sump drain plug. Note that there may be a delay of a few seconds before the oil pressure warning light goes out when the engine is first started, as the oil circulates through the engine oil galleries and the new oil filter (where fitted) before the pressure builds-up.

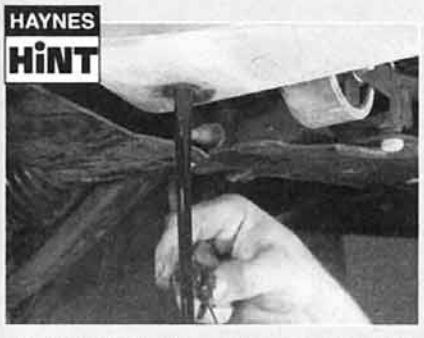
13 Switch off the engine, and wait a few minutes for the oil to settle in the sump once more. With the new oil circulated and the filter completely full, recheck the level on the dipstick, and add more oil as necessary.

14 Dispose of the used engine oil safely, with reference to *General Repair Procedures*.

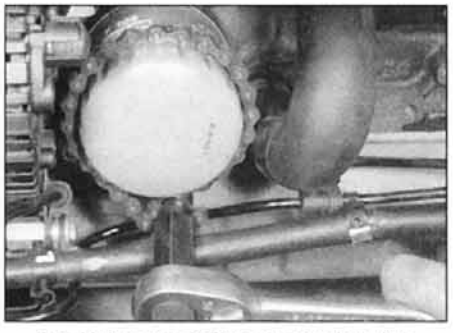


3.3 Engine oil sump drain plug (arrowed)

HAYNES HINT



As the drain plug releases from the threads, move it away sharply so the stream of oil issuing from the sump runs into the container, not up your sleeve.



3.7 Using an oil filter removal tool to slacken the oil filter

4 Fuel filter water draining

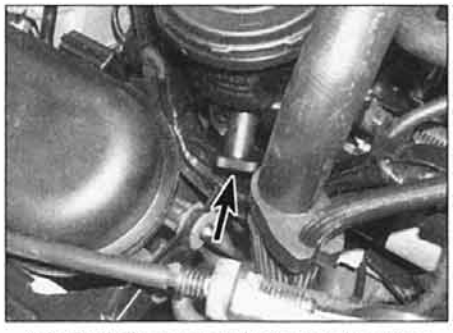
1 A water drain plug and tube are provided at the base of the fuel filter housing.

2 Place a suitable container beneath the drain tube, and cover the surrounding area with rags. Take care not to allow fuel to enter the transmission bellhousing which is just below.

3 Open the drain plug by turning it anti-clockwise. Allow fuel and water to drain until fuel which is free from water, emerges from the end of the tube **(see illustration)**. Close the drain plug.

4 Dispose of the drained fuel safely.

5 Start the engine. If difficulty is experienced, bleed the fuel system (Chapter 4B).



4.3 Fuel filter water drain plug location (arrowed) – 2.0 litre

5 Hose and fluid leak check

Cooling system

Warning: Refer to the safety information given in 'Safety first!' and Chapter 3 before disturbing any of the cooling system components.

1 Carefully check the radiator and heater coolant hoses along their entire length. Renew any hose which is cracked, swollen or which shows signs of deterioration. Cracks will show up better if the hose is squeezed. Pay close attention to the clips that secure the hoses to the cooling system components. Hose clips that have been over-tightened can pinch and puncture hoses, resulting in cooling system leaks.

2 Inspect all the cooling system components (hoses, joint faces, etc) for leaks. Where any problems of this nature are found on system components, renew the component or gasket with reference to Chapter 3.

3 A leak from the cooling system will usually show up as white or rust-coloured deposits, on the area surrounding the leak **(see Haynes Hint)**.

Fuel

Warning: Refer to the safety information given in 'Safety first!' and Chapter 4B before disturbing any of the fuel system components.

4 Check all fuel lines at their connections to the injection pump, injectors and fuel filter housing.

5 Examine each fuel hose/pipe along its length for splits or cracks. Check for leakage from the union nuts and examine the unions between the metal fuel lines and the fuel filter housing. Also check the area around the fuel injectors for signs of leakage.

6 To identify fuel leaks between the fuel tank and the engine bay, the vehicle should raised and securely supported on axle stands. Inspect the fuel tank and filler neck for punctures, cracks and other damage. The connection between the filler neck and tank is especially critical. Sometimes a rubber filler neck or connecting hose will leak due to loose retaining clamps or deteriorated rubber.

7 Carefully check all rubber hoses and metal fuel lines leading away from the fuel tank. Check for loose connections, deteriorated hoses, kinked lines, and other damage. Pay particular attention to the vent pipes and hoses, which often loop up around the filler neck and can become blocked or kinked, making tank filling difficult. Follow the fuel supply and return lines to the front of the vehicle, carefully inspecting them all the way for signs of damage or corrosion. Renew damaged sections as necessary.

Engine oil

8 Inspect the area around the camshaft cover, cylinder head, oil filter and sump joint faces. Bear in mind that, over a period of time, some very slight seepage from these areas is to be expected – what you are really looking for is any indication of a serious leak caused by gasket failure. Engine oil seeping from the base of the timing belt cover or the transmission bellhousing may be an indication of crankshaft or input shaft oil seal failure. Should a leak be found, renew the failed gasket or oil seal by referring to the appropriate Chapters in this manual.

Power assisted steering fluid

9 Examine the hose running between the fluid reservoir and the power steering pump, and the return hose running from the steering rack to the fluid reservoir. Also examine the high pressure supply hose between the pump and the steering rack.

10 Where applicable, check the hoses leading to the PAS fluid cooler at the front of the engine bay. Look for deterioration caused by corrosion and damage from grounding, or debris thrown up from the road surface.

11 Pay particular attention to crimped unions, and the area surrounding the hoses that are secured with adjustable worm drive clips. PAS fluid is a thin oil, and is usually red in colour.

Air conditioning refrigerant

Warning: Refer to the safety information given in 'Safety first!' and Chapter 3, regarding the dangers of disturbing any of the air conditioning system components.

12 The air conditioning system is filled with a liquid refrigerant, which is retained under high pressure. If the air conditioning system is opened and depressurised without the aid of specialised equipment, the refrigerant will immediately turn into gas and escape into the atmosphere. If the liquid comes into contact with your skin, it can cause severe frostbite. In addition, the refrigerant contains substances which are environmentally damaging; for this reason, it should not be allowed to escape into the atmosphere.

13 Any suspected air conditioning system leaks should be immediately referred to a Peugeot dealer or air conditioning specialist. Leakage will be shown up as a steady drop in the level of refrigerant in the system.

14 Note that water may drip from the condenser drain pipe, underneath the car, immediately after the air conditioning system has been in use. This is normal, and should not be cause for concern.

Brake (and clutch) fluid

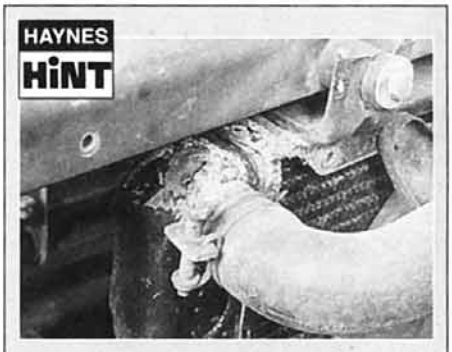
Warning: Refer to the safety information given in 'Safety first!' and Chapter 9, regarding the dangers of handling brake fluid.

15 With reference to Chapter 9, examine the area surrounding the brake pipe unions at the master cylinder for signs of leakage. Check the area around the base of fluid reservoir, for signs of leakage caused by seal failure. Also examine the brake pipe unions at the ABS hydraulic unit.

16 If fluid loss is evident, but the leak cannot be pinpointed in the engine bay, the brake calipers and underbody brake lines and should be carefully checked with the vehicle raised and supported on axle stands. Leakage of fluid from the braking system is serious fault that must be rectified immediately.

17 Refer to Chapter 6 and check for leakage around the hydraulic fluid line connections to the clutch master cylinder at the bulkhead, and to the clutch slave cylinder, bolted to the side of the transmission bellhousing.

18 Brake/clutch hydraulic fluid is a toxic substance with a watery consistency. New fluid is almost colourless, but it becomes darker with age and use.



A leak in the cooling system will usually show-up as white- or rust-coloured deposits on the area adjoining the leak.

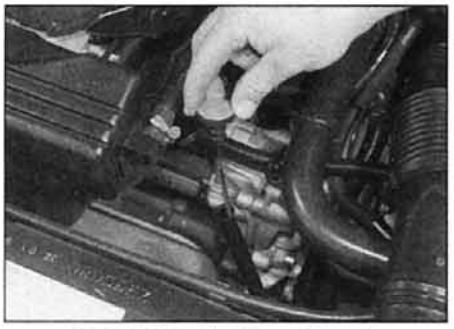
Unidentified fluid leaks

19 If there are signs that a fluid of some description is leaking from the vehicle, but you cannot identify the type of fluid or its exact origin, park the vehicle overnight and slide a large piece of card underneath it. Providing that the card is positioned in roughly in the right location, even the smallest leak will show up on the card. Not only will this help you to pinpoint the exact location of the leak, it should be easier to identify the fluid from its colour. Bear in mind, though, that the leak may only be occurring when the engine is running!

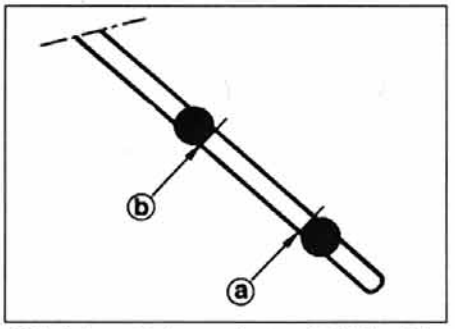
Vacuum hoses

20 Although the braking system is hydraulically-operated, the brake servo unit amplifies the effort you apply at the brake pedal, by making use of the vacuum created by the pump (see Chapter 9). Vacuum is ported to the servo by means of a large-bore hose. Any leaks that develop in this hose will reduce the effectiveness of the braking system.

21 In addition, many of the underbonnet components, particularly the emission control components, are driven by vacuum supplied



7.1 Withdrawing the automatic transmission dipstick – 4HP20 transmission



7.2 Automatic transmission fluid dipstick lower (a) and upper (b) fluid level markings

from the vacuum pump via narrow-bore hoses. A leak in a vacuum hose means that air is being drawn into the hose (rather than escaping from it) and this makes leakage very difficult to detect. One method is to use an old length of vacuum hose as a kind of stethoscope – hold one end close to (but not in) your ear and use the other end to probe the area around the suspected leak. When the end of the hose is directly over a vacuum leak, a hissing sound will be heard clearly through the hose. Care must be taken to avoid contacting hot or moving components, as the engine must be running, when testing in this manner. Renew any vacuum hoses that are found to be defective.

6 Clutch operation check

1 Diesel engine models covered by this manual are equipped with a hydraulically operated self-adjusting clutch mechanism which is virtually maintenance-free.

2 The only maintenance necessary is to check that the clutch pedal moves smoothly and easily through its full travel, and that the clutch itself functions correctly, with no trace of slip or drag.

3 If any problems are experienced, refer to Chapter 6 for further details.

7 Automatic transmission fluid level check

Note: *The AL4 transmission is identified by having the Park Lock facility.*

4HP20 transmission

1 Take the vehicle on a moderate journey (at least 30 minutes), to warm the transmission up to normal operating temperature, then park the vehicle on level ground. Leave the engine idling, apply the handbrake fully, and move the selector lever to the P (Park) position. The fluid level is checked using the dipstick located at the front of the engine compartment, directly in front of the engine unit **(see illustration)**. The dipstick top is brightly-coloured for easy identification.

2 With the engine idling and the footbrake applied, move the selector lever through all gear positions, stopping briefly in each position, then return the selector lever to the P position. Withdraw the dipstick from the tube, and wipe all the fluid from its end with a clean rag or paper towel. Insert the clean dipstick back into the tube as far as it will go, then withdraw it once more. Note the fluid level on the end of the dipstick. The fluid level should be between the two upper marks on the dipstick (the marks located on either side of the number 80) **(see illustration)**.

3 If topping-up is necessary, add the required quantity of the specified fluid to the transmission via the dipstick tube. Use a funnel with a fine-mesh gauze, to avoid spillage, and to ensure that no foreign matter enters the transmission. **Note:** *Never overfill the transmission so that the fluid level is above the upper mark.*

4 After topping-up, take the vehicle on a short run to distribute the fresh fluid, then recheck the level, topping-up if necessary.

5 Always maintain the level between the two upper dipstick marks. If the level is allowed to fall below the lower mark, fluid starvation may result, which could lead to severe transmission damage.

6 Frequent need for topping-up indicates that there is a leak, which should be found and corrected before it becomes serious.

AL4 transmission

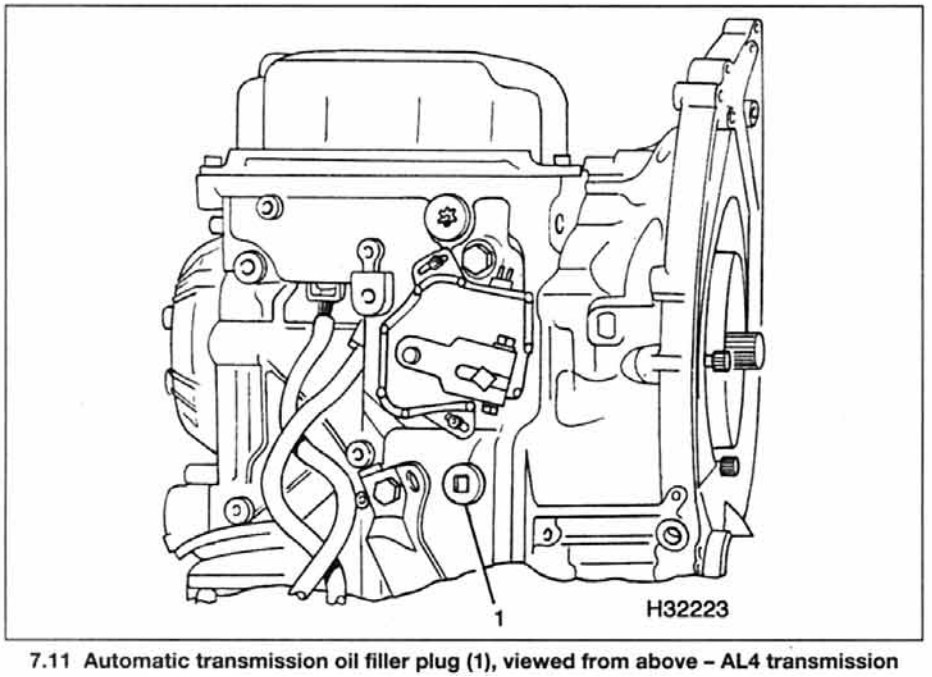
7 Take the vehicle on a moderate journey (at least 30 minutes), to warm the transmission up to normal operating temperature, then park the vehicle on level ground.

8 With the engine switched off, the oil level is checked by removing the oil filler and oil level plugs from the transmission housing.

9 Remove the air cleaner air inlet duct as described in Chapter 4B.

10 To improve access to the oil level plug, which is on the base of the transmission housing, it may be preferable to jack up the front and rear of the car, and support it on axle stands (see *Jacking and vehicle support*); it is essential that the car is kept level for the check to be accurate. Remove the engine undertray for access to the plug.

11 Using a square-section wrench, remove the oil filler plug from the top of the transmission housing **(see illustration)**, and add 0.5 litres of the specified oil. As access to the filler plug is limited, Peugeot mechanics use a filling bottle with a length of small-bore hose attached. The end of the hose is inserted into the filler orifice and the bottle (filled with the specified oil) is then suspended from the bonnet. A suitable alternative could easily be made up from, for example, a clean plastic drinks bottle with the base cut off and with a hose attached to the cap.



7.11 Automatic transmission oil filler plug (1), viewed from above – AL4 transmission

12 With the handbrake and footbrake firmly applied, start the engine and move the selector through all available positions several times. Finally, select P, and leave the engine running.

13 Working under the car, place a suitable container underneath the transmission, then remove the oil level plug **(see illustration)**. This is the smaller hex-head bolt inside the larger hex-headed transmission drain plug – do not loosen the larger, outer plug with the engine running, or the transmission oil will run out, resulting in transmission damage.

14 If the level is correct, oil will run from the level plug in a steady stream, quickly reducing to a sequence of drips. In theory, the amount of oil lost when the plug is removed should be the same as, or less than, the 0.5 litres just added. When the dripping stops, refit the level plug.

15 If little or no oil emerges, refit the level plug, then switch off the engine. Repeat paragraphs 11 to 14 until the level is correct.

16 On completion, tighten the filler and level plugs to the specified torque (Chapter 7B), then refit the engine undertray and air inlet duct.

17 Frequent need for topping-up indicates that there is a leak, which should be found and corrected before it becomes serious.

8 Steering, suspension and driveshaft gaiter check

Front suspension/steering

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

2 Visually inspect the balljoint dust covers and the steering rack-and-pinion gaiters for splits, chafing or deterioration **(see illustration)**. Any wear of these components will cause loss of lubricant, together with dirt and water entry, resulting in rapid deterioration of the balljoints or steering gear.

3 Check the power steering fluid hoses for chafing or deterioration, and the pipe and hose unions for fluid leaks. Also check for signs of fluid leakage under pressure from the steering gear rubber gaiters, which would indicate failed fluid seals within the steering gear.

4 Grasp the roadwheel at the 12 o'clock and 6 o'clock positions, and try to rock it **(see illustration)**. Very slight free play may be felt, but if the movement is appreciable, further investigation is necessary to determine the source. Continue rocking the wheel while an assistant depresses the footbrake. If the movement is now eliminated or significantly reduced, it is likely that the hub bearings are at fault. If the free play is still evident with the footbrake depressed, then there is wear in the suspension joints or mountings.

5 Now grasp the wheel at the 9 o'clock and 3 o'clock positions, and try to rock it as before. Any movement felt now may again be caused by wear in the hub bearings or the steering track rod balljoints. If the inner or outer balljoint is worn, the visual movement will be obvious.

6 Using a large screwdriver or flat bar, check for wear in the suspension mounting bushes by levering between the relevant suspension component and its attachment point. Some movement is to be expected as the mountings are made of rubber, but excessive wear should be obvious. Also check the condition of any visible rubber bushes, looking for splits, cracks or contamination of the rubber.

7 With the car standing on its wheels, have an assistant turn the steering wheel back-and-forth about an eighth of a turn each way. There should be very little, if any, lost movement between the steering wheel and roadwheels. If this is not the case, closely observe the joints and mountings previously described, but in addition, check the steering column universal joints for wear, and the rack-and-pinion steering gear itself.

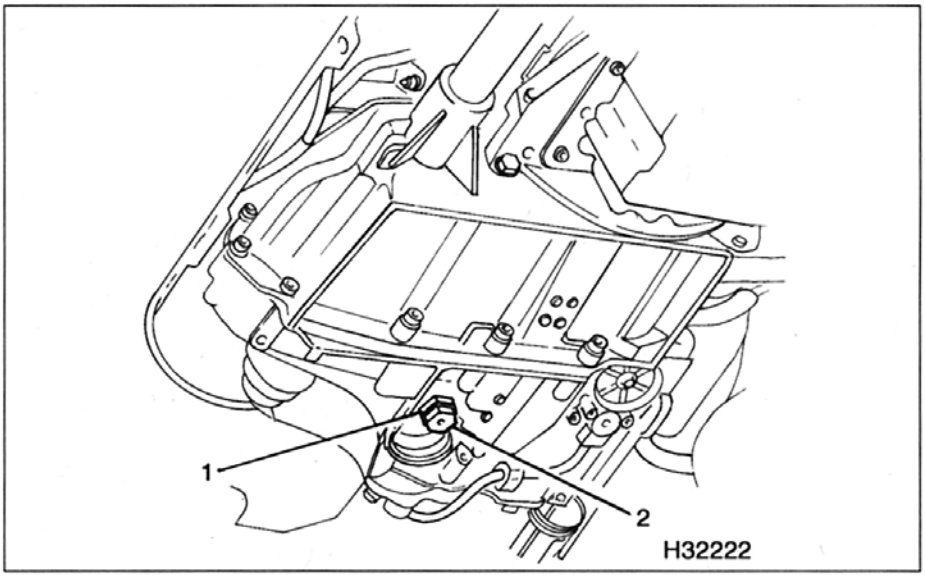
Strut/shock absorber

8 Check for any signs of fluid leakage around the suspension strut/shock absorber body, or from the rubber gaiter around the piston rod. Should any fluid be noticed, the suspension strut/shock absorber is defective internally, and should be renewed. **Note:** *Suspension struts/shock absorbers should always be renewed in pairs on the same axle.*

9 The efficiency of the suspension strut/shock absorber may be checked by bouncing the vehicle at each corner. Generally speaking, the body will return to its normal position and stop after being depressed: If it rises and returns on a rebound, the suspension strut/shock absorber is probably suspect. Examine also the suspension strut/shock absorber upper and lower mountings for any signs of wear.

Driveshaft gaiter check

10 With the vehicle raised and securely supported on axle stands, turn the steering to full left or right lock, then slowly rotate the roadwheel. Inspect the outer constant velocity (CV) joint rubber gaiters, squeezing the gaiters to open out the folds **(see illustration)**. Check for signs of cracking, splits or deterioration of the rubber, which may allow the grease to

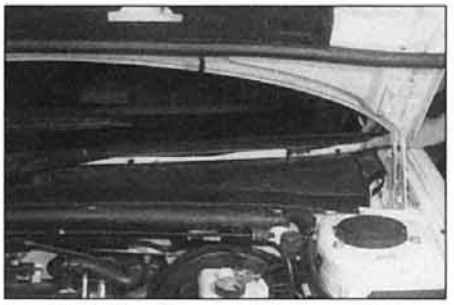


7.13 Automatic transmission oil level plug (2) is located inside the drain plug (1) – AL4 transmission

8.2 Checking a steering gear gaiter for damage

8.4 Check for wear in the hub bearings by grasping the wheel and trying to rock it

8.10 Checking a driveshaft gaiter for damage

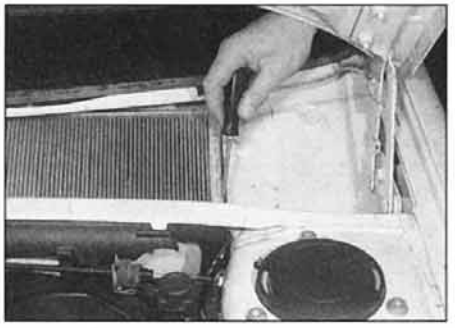


10.2 Undo the nut and remove the passenger side half of the intake vent cover . . .

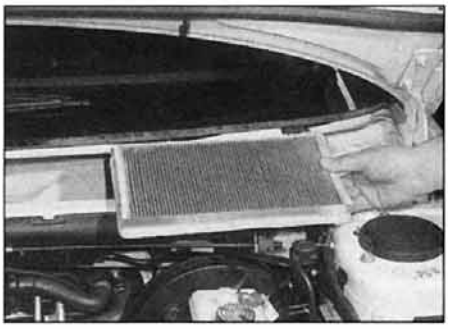
10.3 . . . then unclip the intake vent panel from the vehicle

escape, or water and grit to enter. Also check the security and condition of the retaining clips. Repeat these checks on the inner CV joints. If any damage or deterioration is found, the gaiters should be renewed (see Chapter 8).

11 At the same time, check the general condition of the CV joints themselves by first holding the driveshaft and attempting to rotate the wheel. Repeat this check whilst holding the inner joint and attempting to rotate the driveshaft. Any appreciable movement indicates wear in the CV joints, wear in the driveshaft splines, or a loose driveshaft retaining nut.



10.4a Carefully ease the pollen filter out from its housing . . .



10.4b . . . and remove it from the vehicle

9 Hinge and lock lubrication

1 Lubricate the hinges of the bonnet, doors and tailgate with a light general-purpose oil. Similarly, lubricate all latches, locks and lock strikers – don't overdo it, or it will get on your clothes as you get in! At the same time, check the security and operation of all the locks, adjusting them if necessary (see Chapter 11).

2 Lightly lubricate the bonnet release mechanism and cable with a suitable grease.

10 Pollen filter check

1 Operate the windscreen wipers and switch off the ignition so the wiper arms stop at the top of their travel.

2 Unscrew the retaining nut then unclip and remove the passenger side plastic intake vent cover from the base of the windscreen **(see illustration)**.

3 Unclip the passenger side intake vent panel and remove the panel from beneath the windscreen to gain access to the pollen filter **(see illustration)**.

4 Ease the pollen filter out of its housing and remove it from the vehicle **(see illustrations)**.

5 Check the condition of the filter, if it is dirty, renew the filter.

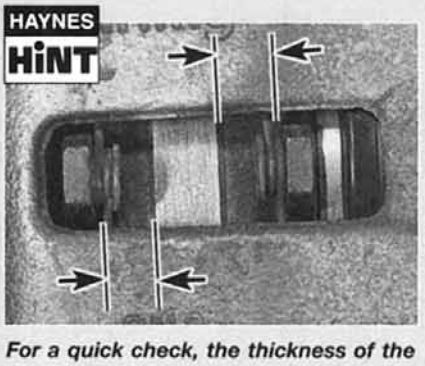
6 Wipe clean the housing then install the new filter (if required), making sure it is clipped securely in position.

7 Clip the vent panel into position, making sure it is correctly engaged with the driver's side panel, then refit the vent cover and retaining nut.

8 Switch the ignition back on and return the wiper arm to the 'at rest' position.

Every 12 000 miles (20 000 km)

HAYNES HiNT



For a quick check, the thickness of the friction material on each brake pad can be measured through the aperture in the caliper body.

11 Front brake pad check

1 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands. Remove the front roadwheels.

2 For a comprehensive check, the brake pads should be removed and cleaned. The operation of the caliper can then also be checked, and the condition of the brake disc itself can be fully examined on both sides. Refer to Chapter 9 for further information **(see Haynes Hint)**.

3 If any pad's friction material is worn to the specified thickness or less, *all four pads must be renewed as a set.* **Note**: *If any pad is approaching the minimum thickness, consider renewal as a precautionary measure in case the pads wear out before the next service.*

12 Rear brake pad check

1 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands. Remove the rear road wheels.

2 For a quick check, the thickness of friction material remaining on each brake pad can be measured through the top of the caliper body.

3 For a comprehensive check, the brake pads should be removed and cleaned. This will permit the operation of the caliper to be checked, and the condition of the brake disc

itself to be fully examined on both sides. Refer to Chapter 9 for further information.

4 If any pad's friction material is worn to the specified thickness or less, *all four pads must be renewed as a set.* **Note:** *If any pad is approaching the minimum thickness, consider renewal as a precautionary measure in case the pads wear out before the next service.*

13 Handbrake check

1 Check and, if necessary, adjust the handbrake (see Chapter 9). Check that the handbrake cables are free to move easily and lubricate all exposed linkages/cable pivots.

14 Road test

Instruments and electrical equipment

1 Check the operation of all instruments and electrical equipment.

2 Make sure that all instruments read correctly, and switch on all electrical equipment in turn, to check that it functions properly.

Steering and suspension

3 Check for any abnormalities in the steering, suspension, handling or road 'feel'.

4 Drive the vehicle, and check that there are no unusual vibrations or noises.

5 Check that the steering feels positive, with no excessive 'sloppiness', or roughness, and check for any suspension noises when cornering and driving over bumps.

Drivetrain

6 Check the performance of the engine, clutch, transmission and driveshafts.

7 Listen for any unusual noises from the engine, clutch and transmission.

8 Make sure that the engine runs smoothly when idling, and that there is no hesitation when accelerating.

9 Check that the clutch action is smooth and progressive, that the drive is taken up smoothly, and that the pedal travel is not excessive. Also listen for any noises when the clutch pedal is depressed.

10 Check that all gears can be engaged smoothly without noise, and that the gear lever action is smooth and not abnormally vague or 'notchy'.

Braking system

11 Make sure that the vehicle does not pull to one side when braking, and that the wheels do not lock when braking hard.

12 Check that there is no vibration through the steering when braking.

13 Check that the handbrake operates correctly without excessive movement of the lever, and that it holds the vehicle stationary on a slope.

14 Test the operation of the brake servo unit as follows. With the engine off, depress the footbrake four or five times to exhaust the vacuum. Hold the brake pedal depressed, then start the engine. As the engine starts, there should be a noticeable 'give' in the brake pedal as vacuum builds-up. Allow the engine to run for at least two minutes, and then switch it off. If the brake pedal is depressed now, it should be possible to detect a hiss from the servo as the pedal is depressed. After about four or five applications, no further hissing should be heard, and the pedal should feel considerably harder.

15 Auxiliary drivebelt check and renewal

Note: *Depending on model and equipment fitted, access to the auxiliary drivebelt can be extremely limited. Where necessary, greater working clearance can be gained by removing the diesel injection electronic control unit (ECU) and its mounting box as described in Chapter 4B, Section 13.*

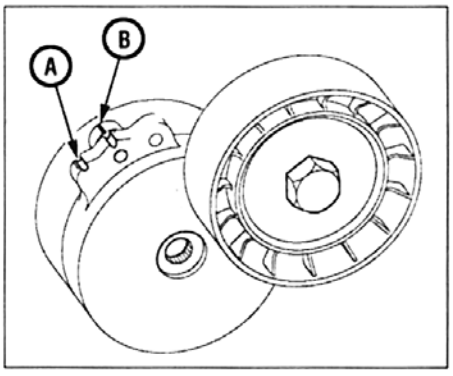
Note: *Refer to Chapter 2C for information on engine identification.*

1 All models are equipped with a single poly-V type, multi-ribbed auxiliary drivebelt. The belt tension is adjusted automatically by means of a spring-loaded tensioner. On 2.0 litre engines with a new drivebelt being fitted, an initial setting procedure has to be carried out as described below.

Checking condition

2 Apply the handbrake, then jack up the front of the car and support it on axle stands. Remove the right-hand front roadwheel.

3 Release the screws and clips and remove the wheelarch liner from under the right-hand front wing for access to the crankshaft pulley bolt. Where fitted, also remove the splash guard from under the front of the engine.



15.5 When groove (A) on the automatic tensioner lines up with the mark (B) on the mounting bracket the belt requires renewing

4 Using a suitable socket and bar fitted to the crankshaft pulley bolt, rotate the crankshaft so that the entire length of the drivebelt can be examined. Examine the drivebelt for cracks, splitting, fraying or damage. Check also for signs of glazing (shiny patches) and for separation of the belt plies. Renew the belt if worn or damaged.

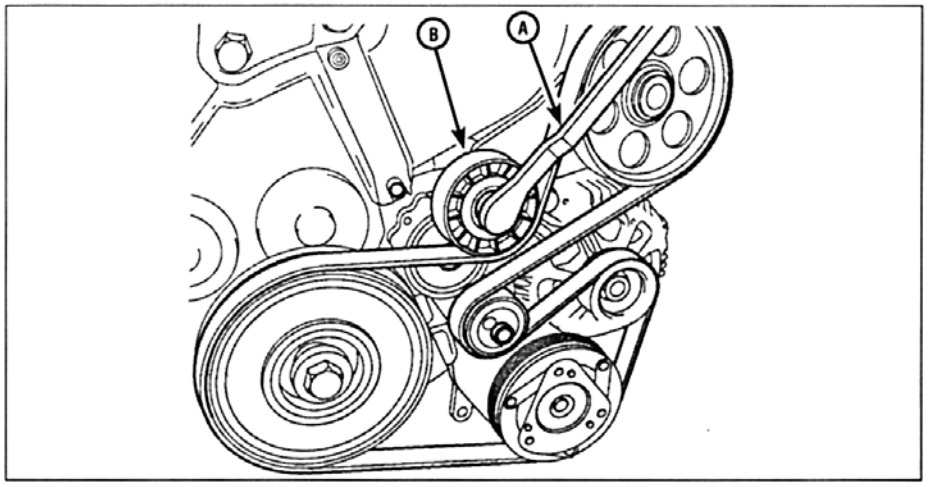
5 The automatic tensioner has markings on the casing to show when the belt is need of renewal **(see illustration)**.

Removal (all models)

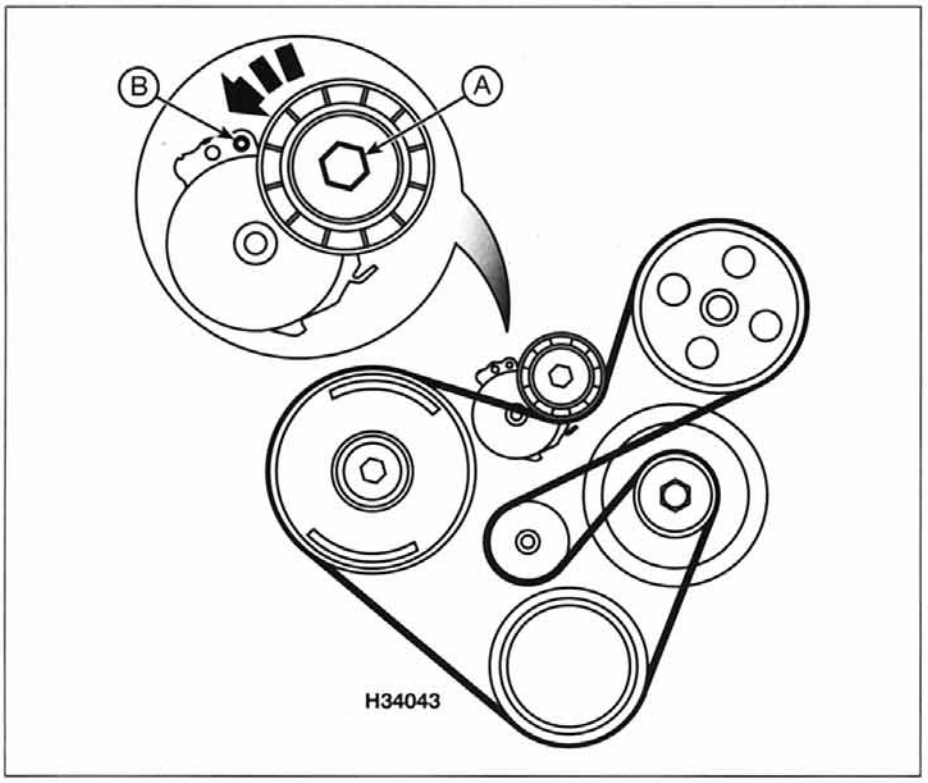
6 If not already done, proceed as described in paragraphs 2 and 3.

7 Disconnect the battery negative lead *(*refer to *Disconnecting the battery* in the Reference Section of this manual).

8 Using a suitable spanner engaged with the hexagonal stud in the centre of the automatic tensioner pulley, move the pulley towards the rear of the car to release the tension on the drivebelt, then slip the belt off the pulleys **(see illustration)**. Note that considerable effort will be needed to move the pulley against spring tension.



15.8 Move the spanner (A) anti-clockwise to release the tension roller (B) from the drivebelt – 2.0 litre



15.9 On 2.2 litre engines, turn tension roller stud (A) anti-clockwise until hole (B) is aligned, then insert the locking tool . . .

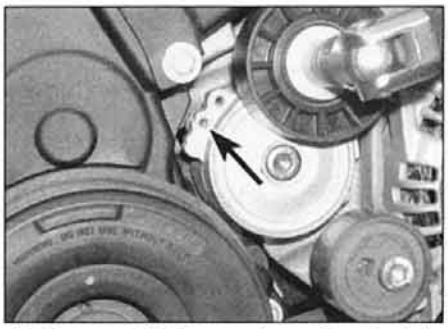
Refitting and tensioning

2.2 litre

9 Using the spanner on the hexagonal stud of the automatic tensioner pulley, move the pulley to the rear of the car until the hole in the pulley arm is aligned with the hole in the mounting bracket. When the holes are aligned, slide a suitable locking tool (a bolt or length of bar of approximately 4.0 mm diameter) through the hole in the arm and into the mounting bracket **(see illustration)**. It is useful to have a small mirror available to enable the alignment of the locking holes to be more easily seen in the limited space available.

10 Fit the belt around the pulleys, ensuring that the ribs on the belt are correctly engaged with the grooves in the pulleys, and the drivebelt is correctly routed.

11 Using the spanner on the hexagonal stud of the automatic tensioner pulley, take the tension up in the pulley and remove the locking tool from the tensioner housing.



15.13 . . . on 2.0 litre engines align the hole (arrowed) to insert the locking tool

Release the pressure on the spanner so that the automatic tensioner takes up the slack in the drivebelt.

12 On completion, reconnect the battery negative lead, refit the wheelarch liner and, where fitted, the engine splash guard. Refit the roadwheel, and lower the vehicle to the ground.

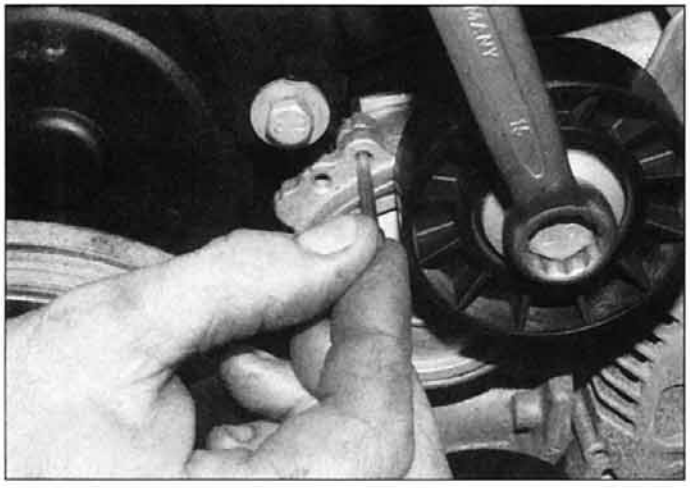
2.0 litre – used drivebelt

13 Proceed as described in paragraphs 9 to 12, except the locking tool fits into a different alignment hole in the automatic tensioner pulley mounting bracket **(see illustration)**.

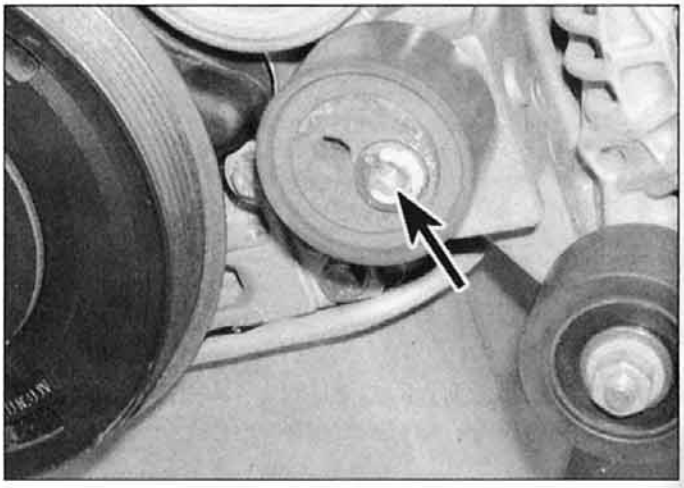
2.0 litre – new drivebelt

14 Using the spanner on the hexagonal stud of the automatic tensioner pulley, move the pulley to the rear of the car until the hole in the pulley arm is aligned with the hole in the mounting bracket. When the holes are aligned, slide a suitable locking tool (a bolt or length of bar of approximately 4.0 mm diameter) through the hole in the arm and into the mounting bracket **(see illustration)**. It is useful to have a small mirror available to enable the alignment of the locking holes to be more easily seen in the limited space available.

15 Working under the wheelarch, slacken the retaining bolt located in the eccentric roller **(see illustration)**.



15.14 Turn the tension roller and insert the 4.0mm locking tool – 2.2 litre



15.15 Slacken the retaining bolt (arrowed) located in the eccentric tensioner pulley – 2.0 litre

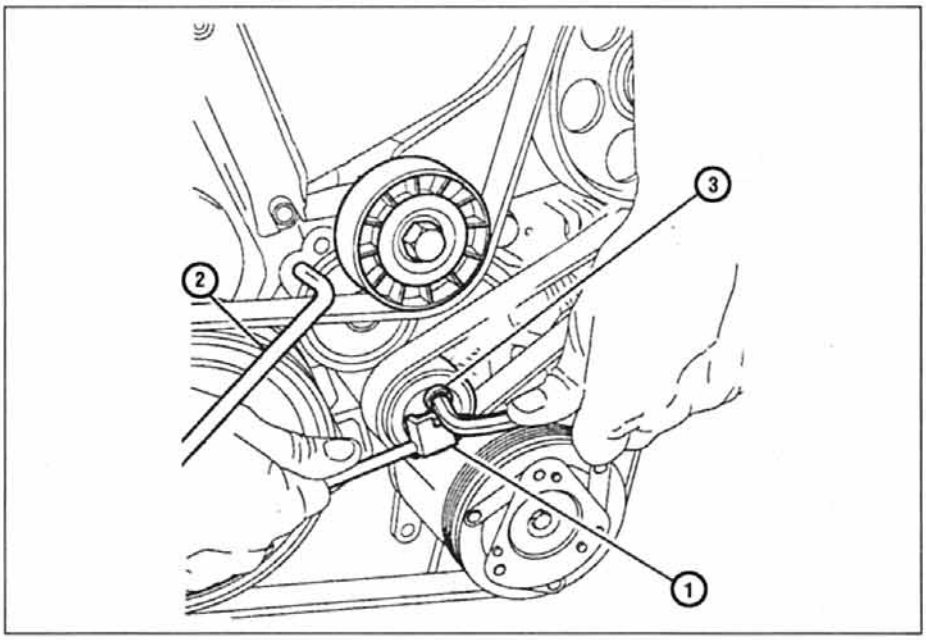
16 Ensure that the new belt supplied is correct. Fit the belt around the pulleys, ensuring that the ribs on the belt are correctly engaged with the grooves in the pulleys, and the drivebelt is correctly routed.

17 Turn the eccentric roller to apply tension to the drivebelt, until the load is released from the locking tool in the automatic tensioner **(see illustration)**. Without altering the position of the eccentric roller, tighten its retaining bolt to the specified torque.

18 Remove the locking tool from the automatic tensioner, then rotate the crankshaft through four complete revolutions in the normal direction of rotation.

19 Check that the holes in the automatic adjuster and the mounting bracket are still aligned, and that it is now possible to insert a setting tool of 2.0 mm diameter through both holes. If the setting tool will not slide in easily, slacken the eccentric roller retaining bolt and repeat the entire tensioning procedure.

20 On completion, reconnect the battery negative lead, refit the wheelarch liner and, where fitted, the engine splash guard. Refit the roadwheel, and lower the vehicle to the ground.



15.17 Turn the eccentric roller (1) to apply tension to the drivebelt, until the load is released from the locking tool (2) in the automatic tensioner, then tighten bolt (3) – 2.0 litre

Every 24 000 miles (40 000 km)

16 Air filter element renewal

1 Undo the screws securing the top to the air filter housing body, lift the top up and withdraw the filter element **(see illustrations)**.

2 If required, slacken the clip and disconnect the intake duct from the filter housing top to give better access to the filter housing body **(see illustration)**.

3 Where applicable, release any wiring or coolant hoses from their retaining clips on the air filter housing top.

4 Wipe clean the housing body and top.

5 Place the new element in position in the housing body. Refit the filter housing top, securing it in position with its retaining screws.

6 Refit any wiring or coolant hoses (where applicable) to their locating clips in the air filter housing, then reconnect the intake duct and securely tighten its retaining clip.

17 Fuel filter renewal

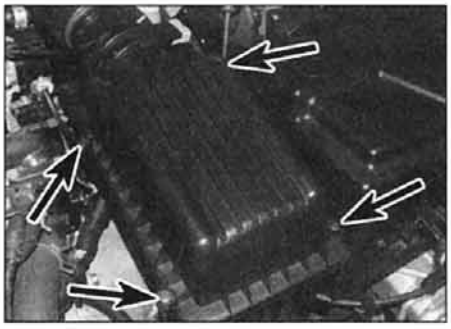
Removal

Note: *Check with your dealer for the availability of fuel filter/housing before removal. On some models the fuel filter/housing may come as a complete assembly.*

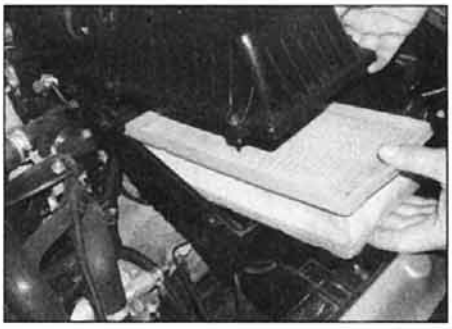
1 Remove the engine top cover, then the fuel filter is located in a plastic housing at the front of the engine.

2 Position a suitable container under the end of the fuel filter drain hose. Open the drain screw on the front of the filter housing and allow the fuel to drain completely (see Section 4 in this Chapter).

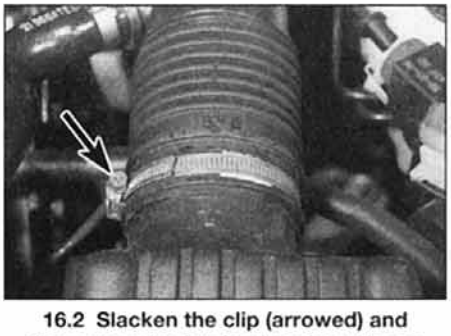
3 Where applicable, disconnect the wiring connector from the top of the fuel filter **(see illustration)**.



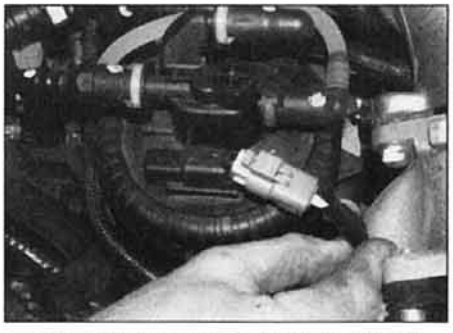
16.1a Undo the screws (arrowed) securing the top of the air filter housing body . . .



16.1b . . . then lift the top and withdraw the filter element

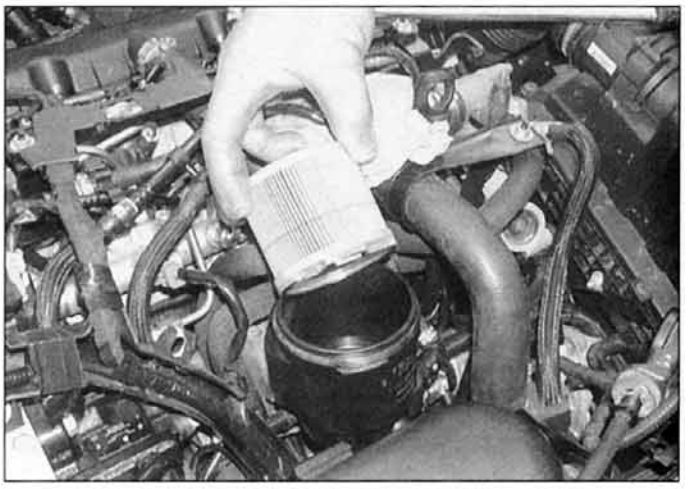


16.2 Slacken the clip (arrowed) and disconnect the intake duct from the air filter housing top



17.3 Disconnect the wiring connector from the fuel filter housing – 2.2 litre

17.5a Remove the fuel filter housing cover, then remove the metal sealing ring and O-ring . . .



17.5b . . . and lift out the filter from the housing

4 Disconnect the fuel lines from the top of the fuel filter housing by releasing the quick-release fittings using a small screwdriver. Move them to one side, covering the ends of the fuel lines to prevent dirt entry.

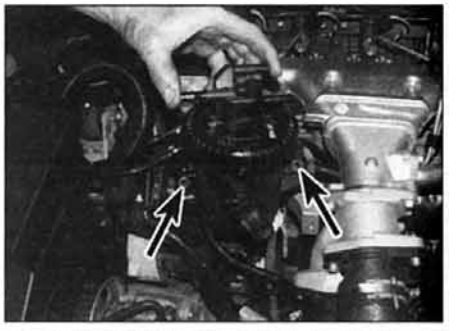
5 Where applicable, unscrew the top of the fuel filter and lift the filter from the housing **(see illustrations)**.

6 To remove the complete fuel filter housing, undo the two retaining bolts and remove the assembly from the vehicle **(see illustration)**.

Refitting

7 Refitting is a reversal of removal. Where applicable, place the new filter in the housing, making sure that a new seal is used before refitting the top to the filter housing.

8 Refit the filter housing assembly, close the fuel filter drain screw and prime the fuel system (see Chapter 4B).



17.6 Undo the two retaining bolts (arrowed) and lift the assembly from the engine

Every 36 000 miles (60 000 km)

18 Manual transmission oil level check

Note: *A new sealing washer will be required for the transmission filler/level plug, when refitting.*

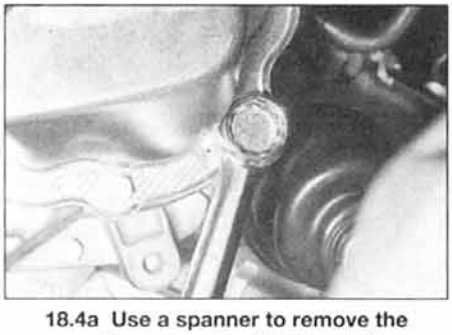
1 Jack up the front and rear of the car and securely support it on axle stands so that it remains level. If the car has been recently driven, wait at least 5 minutes after the engine has been switched off. If the oil level is checked immediately after driving the car, some of the oil will remain distributed around the transmission components, resulting in an inaccurate level reading.

2 On 2.0 litre models, remove the left-hand front roadwheel then release the screws and clips and remove the wheelarch liner from under the wing for access to the filler/level plug.

3 On 2.2 litre models, remove the splash guard from under the engine.

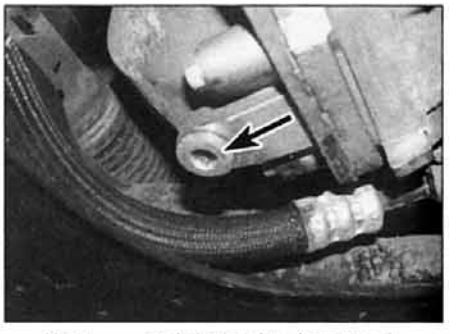
4 Wipe clean the area around the filler/level plug. On 2.0 litre models the filler/level plug is the largest bolt among those securing the end cover to the transmission; on 2.2 litre models the filler/level plug is located on the rear face of the differential housing. Unscrew the plug and clean it; discard the sealing washer **(see illustrations)**.

5 The oil level should reach the lower edge of



18.4a Use a spanner to remove the manual transmission filler/level plug – 2.0 litre

18.4b Manual transmission filler/level plug . . .

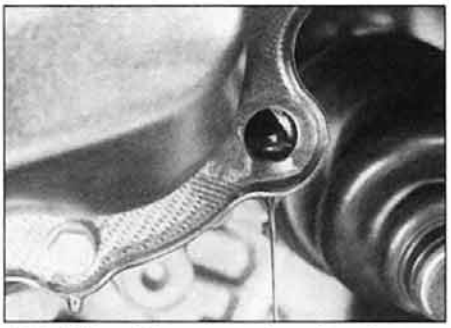


18.4c . . . and drain plug (arrowed) – 2.2 litre

the filler/level hole. A certain amount of oil will have gathered behind the filler/level plug, and will trickle out when it is removed; this does *not* necessarily indicate that the level is correct. To ensure that a true level is established, wait until the initial trickle has stopped, then add oil as necessary until a trickle of new oil can be seen emerging **(see illustration)**. The level will be correct when the flow ceases; use only good-quality oil of the specified type.

6 Refilling the transmission is an awkward operation; above all, allow plenty of time for the oil level to settle properly before checking it. If a large amount had to be added to the transmission, or if a large amount flowed out on checking the level, refit the filler/level plug and take the vehicle on a short journey. With the new oil distributed fully around the transmission components, recheck the level after allowing time for it to settle again.

7 If the transmission has been overfilled so that oil flows out as soon as the filler/level plug is removed, first check that the car is completely level (front-to-rear and side-to-side). Allow any surplus oil to drain off into a suitable container.



18.5 Oil level is correct when the oil stops flowing out of the filler/level hole

8 When the level is correct, fit a new sealing washer to the filler/level plug. Tighten the plug to the specified torque wrench setting. Wash off any spilt oil. Refit the wheelarch liner or splash guard, and secure it in position with its retaining screws and clips. Refit the roadwheel (if removed) then lower the car to the ground.

9 Frequent need for topping-up indicates a leak, which should be found and corrected before it becomes serious.

19 Rear brake shoe check

1 Remove the rear brake drums and check the brake shoes for signs of wear or contamination. At the same time, also check the wheel cylinders for signs of leakage and the brake drums for signs of wear. Refer to the relevant Sections of Chapter 9 for further information.

Every 36 000 miles (60 000 km) or 2 years

20 Brake fluid renewal

Warning: Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it. Do not use fluid that has been standing open for some time, as it absorbs moisture from the air. Excess moisture can cause a dangerous loss of braking effectiveness.

Note: *A hydraulic clutch shares its fluid reservoir with the braking system, and may also need to be bled (see Chapter 6).*

1 The procedure is similar to that for the bleeding of the hydraulic system as described in Chapter 9, except that the brake fluid reservoir should be emptied by syphoning, using a clean poultry baster or similar before starting, and allowance should be made for the old fluid to be expelled when bleeding a section of the circuit.

2 Working as described in Chapter 9, open the first bleed screw in the sequence, and pump the brake pedal gently until nearly all the old fluid has been emptied from the master cylinder reservoir.

HAYNES HiNT ***Old brake fluid is invariably much darker in colour than the new, making it easy to distinguish the two.***

3 Top-up to the MAX level with new fluid, and continue pumping until only the new fluid remains in the reservoir, and new fluid can be seen emerging from the bleed screw. Tighten the screw, and top the reservoir level up to the MAX level line.

4 Work through all the remaining bleed screws in the sequence until new fluid can be seen at all of them. Be careful to keep the master cylinder reservoir topped-up to above the MIN/DANGER level at all times, or air may enter the system and greatly increase the length of the task.

5 When the operation is complete, check that all bleed screws are securely tightened, and that their dust caps are refitted. Wash off all traces of spilt fluid, and recheck the master cylinder reservoir fluid level.

6 Check the operation of the brakes before taking the car on the road.

Every 48 000 miles (80 000 km)

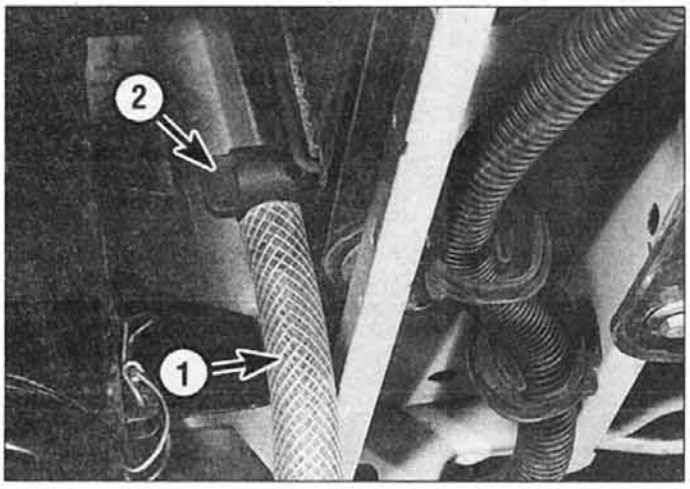
21 Particulate emission system check

1 Cleaning the filter and topping-up the fuel additive is a dealer-only task, as special tools are required (see Chapter 4C, Section 1).

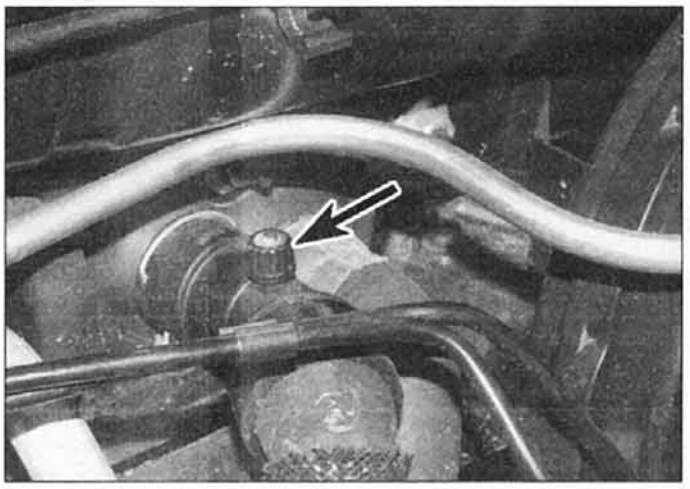
Every 72 000 miles (120 000 km)

22 Timing belt renewal

Refer to Chapter 2C.



23.3 Tubing (1) attached to the radiator drain outlet and coolant drain plug (2)



23.4a Heater hose bleed screw (arrowed) in the heater matrix outlet hose . . .

Every 72 000 miles (120 000km) or 5 years

23 Coolant renewal

Cooling system draining

Warning: Wait until the engine is cold before starting this procedure. Do not allow antifreeze to come in contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.

1 With the engine completely cold, remove the expansion tank filler cap. Turn the cap anti-clockwise until it reaches the first stop. Wait until any pressure remaining in the system is released, then push the cap down, turn it anti-clockwise to the second stop, and lift it off.

2 Position a suitable container beneath the coolant drain outlet at the lower left-hand side of the radiator.

3 Where fitted, loosen the drain plug (there is no need to remove it completely) and allow the coolant to drain into the container. If desired, a length of tubing can be fitted to the drain outlet to direct the flow of coolant during draining **(see illustration)**.

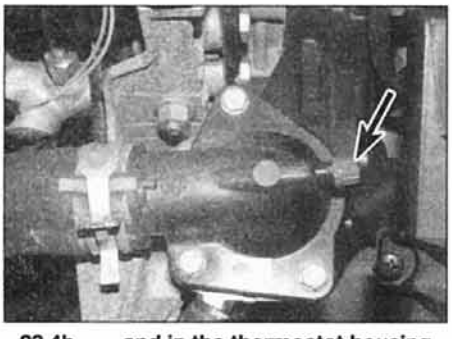
4 To assist draining, open the cooling system bleed screws. These are located in the heater matrix outlet hose on the engine compartment bulkhead, in the extension hose (clipped to the rear of the cylinder head) from the thermostat housing and in the coolant bypass hose, depending on model **(see illustrations)**. There may also be a bleed screw in the top left-hand end of the radiator.

5 When the flow of coolant stops, reposition the container below the cylinder block drain plug, located at the rear of the cylinder block.

6 Remove the drain plug, and allow the coolant to drain into the container.

7 If the coolant has been drained for a reason other than renewal, then provided it is clean and less than five years old, it can be re-used, though this is not recommended.

8 Refit the radiator and cylinder block drain plugs on completion of draining.



23.4b . . . and in the thermostat housing (arrowed)

Cooling system flushing

9 If coolant renewal has been neglected, or if the antifreeze mixture has become diluted, then in time, the cooling system may gradually lose efficiency, as the coolant passages become restricted due to rust, scale deposits, and other sediment. The cooling system efficiency can be restored by flushing the system clean.

10 The radiator should be flushed independently of the engine, to avoid unnecessary contamination.

Radiator flushing

11 To flush the radiator, first tighten the radiator drain plug, and the radiator bleed screw, where applicable.

12 Disconnect the top and bottom hoses and any other relevant hoses from the radiator, with reference to Chapter 3.

13 Insert a garden hose into the radiator top inlet. Direct a flow of clean water through the radiator, and continue flushing until clean water emerges from the radiator bottom outlet.

14 If after a reasonable period, the water still does not run clear, the radiator can be flushed with a good proprietary cleaning agent. It is important that their manufacturer's instructions are followed carefully. If the contamination is particularly bad, insert the hose in the radiator bottom outlet, and reverse-flush the radiator.

Engine flushing

15 To flush the engine, first refit the cylinder block drain plug, and tighten the cooling system bleed screws.

16 Remove the thermostat as described in Chapter 3, then temporarily refit the thermostat cover.

17 With the top and bottom hoses disconnected from the radiator, insert a garden hose into the radiator top hose. Direct a clean flow of water through the engine, and continue flushing until clean water emerges from the radiator bottom hose.

18 On completion of flushing, refit the thermostat and reconnect the hoses with reference to Chapter 3.

Cooling system filling

19 Before attempting to fill the cooling system, make sure that all hoses and clips are in good condition, and that the clips are tight. Note that an antifreeze mixture must be used all year round, to prevent corrosion of the engine components (see following sub-Section). Also check that the radiator and

cylinder block drain plugs are in place and tight.

20 Remove the expansion tank filler cap.

21 Open all the cooling system bleed screws (see paragraph 4).

22 Some of the cooling system hoses are positioned at a higher level than the top of the radiator expansion tank. It is therefore necessary to use a 'header tank' when refilling the cooling system, to reduce the possibility of air being trapped in the system. Although Peugeot dealers use a special header tank, the same effect can be achieved by using a suitable bottle, with a seal between the bottle and the expansion tank **(see Haynes Hint)**.

23 Fit the 'header tank' to the expansion tank and slowly fill the system. Coolant will emerge from each of the bleed screws in turn, starting with the lowest screw. As soon as coolant free from air bubbles emerges from the lowest screw, tighten that screw, and watch the next bleed screw in the system. Repeat the procedure until the coolant is emerging from the highest bleed screw in the cooling system and all bleed screws are securely tightened.

24 Ensure that the 'header tank' is full (at least 0.5 litres of coolant). Start the engine, and run it at a fast idle speed (do not exceed 2000 rpm) until the cooling fan cuts in, and then cuts out. Stop the engine. **Note:** *Take great care not to scald yourself with the hot coolant during this operation.*

25 Allow the engine to cool, then remove the 'header tank'.

26 When the engine has cooled, check the coolant level as described in *Weekly checks*. Top-up the level if necessary, and refit the expansion tank cap.

Antifreeze mixture

27 The antifreeze should always be renewed at the specified intervals. This is necessary not only to maintain the antifreeze properties, but also to prevent corrosion which would otherwise occur as the corrosion inhibitors become progressively less effective.

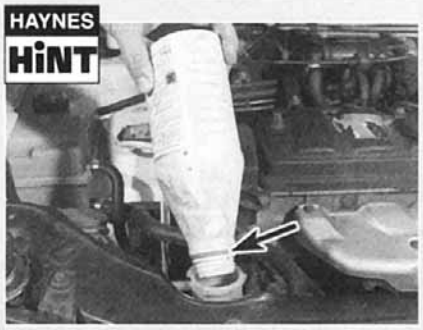
28 Always use an ethylene-glycol based antifreeze which is suitable for use in mixed-metal cooling systems. The quantity of antifreeze and levels of protection are indicated in the Specifications.

29 Before adding antifreeze, the cooling system should be completely drained, preferably flushed, and all hoses checked for condition and security.

30 After filling with antifreeze, a label should be attached to the expansion tank, stating the type and concentration of antifreeze used, and the date installed. Any subsequent topping-up should be made with the same type and concentration of antifreeze.

31 Do not use engine antifreeze in the washer system, as it will cause damage to the vehicle paintwork. A screen wash additive should be added to the washer system in the quantities stated on the bottle.

HAYNES HiNT



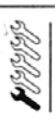
Cut the bottom off an old antifreeze container to make a 'header tank' for use when refilling the cooling system. The seal at the point arrowed should be as tight as possible – use an O-ring if available, or seal the joint by some other means.

Notes

Chapter 2 Part A:
XU petrol engine in-car repair procedures

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

Engine (general)

Capacity	1.8 litre (1761 cc)
Designation	XU7
Engine code *	LFY (XU7 JP4/Z/L/L3)
Bore	83.00 mm
Stroke	81.40 mm
Direction of crankshaft rotation	Clockwise (viewed from the right-hand side of vehicle)
No 1 cylinder location	At the transmission end of block
Compression ratio	10.4 : 1

** The engine code is stamped on a plate attached to the front left-hand end of the cylinder block. This is the code most often used by Peugeot. The code given in brackets is the factory identification number, and is not often referred to by Peugeot or this manual.*

Camshaft

Drive	Toothed belt
No of bearings	5

Lubrication system

Oil pump type	Gear-type, chain-driven off the crankshaft right-hand end
Minimum oil pressure at 80°C	5.3 bars (approximate) at 4000 rpm
Oil pressure warning switch operating pressure	0.5 bars

Torque wrench settings	Nm	lbf ft
Big-end bearing cap nuts:		
Stage 1	20	15
Stage 2	Angle-tighten a further 70°	
Camshaft bearing housings:		
Stage 1	5	4
Stage 2	10	7
Camshaft sprocket hub-to-camshaft retaining bolts	75	55
Camshaft sprocket-to-hub retaining bolts	10	7
Crankshaft pulley retaining bolt	130	96
Cylinder head bolts (up to VIN No 80800000):		
Stage 1	60	44
Stage 2 – a to c on bolt 1, then bolt 2, etc:		
a	Slacken fully	
b	20	15
c	Angle-tighten a further 107°	
Stage 3	Angle-tighten a further 100°	
Stage 4	Angle-tighten a further 100°	
Cylinder head bolts (from VIN No 80800001):		
Stage 1	20	15
Stage 2	45	33
Stage 3	Angle-tighten a further 270°	
Cylinder head cover bolts (see illustration 4.10):		
All bolts except Nos 4', 5', 12 and 13	13	10
Bolts 4' and 5'	2	1
Bolts 12 and 13	15	11
Engine-to-transmission fixing bolts	45	33
Flywheel/driveplate retaining bolts	50	37
Left-hand engine/transmission mounting:		
Centre nut	65	48
Mounting bracket to body	30	22
Mounting stud bracket to transmission	60	44
Mounting stud to transmission	60	44
Rubber mounting-to-bracket bolts	30	22
Lower engine movement limiter to driveshaft bearing housing	50	37
Lower engine movement limiter to subframe	85	62
Main bearing cap bolts:		
Bearing bolts	54	40
Side securing bolts	23	17
Oil pump retaining bolts	16	12
Oil seal carrier bolts	16	12
Piston oil jet spray tube bolt	10	7
Right-hand engine/transmission mounting:		
Mounting bracket-to-engine bolts	60	44
Mounting bracket-to-engine nuts	45	33
Mounting bracket-to-rubber mounting nut	45	33
Rubber mounting-to-body nut	40	29
Upper engine movement limiter bolts	50	37
Sump retaining bolts	16	12
Timing belt cover bolts	8	6
Timing belt idler bolt	37	27
Timing belt tensioner bolt	21	16

1 General information

How to use this Chapter

This Part of Chapter 2 describes those repair procedures that can reasonably be carried out on the engine, while it remains in the car. If the engine has been removed from the car and is being dismantled as described in Part D, any preliminary dismantling procedures can be ignored.

Note that, while it may be possible physically to overhaul items such as the piston/connecting rod assemblies while the engine is in the car, such tasks are not usually carried out as separate operations. Usually, several additional procedures (not to mention the cleaning of components and oil ways) have to be carried out. For this reason, all such tasks are classed as major overhaul procedures, and are described in Part D of this Chapter.

Part D describes the removal of the engine/transmission unit from the vehicle, and the full overhaul procedures that can then be carried out.

XU series engine

The engine is of the in-line four-cylinder type, mounted transversely at the front of the car. The clutch and transmission are attached to its left-hand end.

The crankshaft runs in five main bearings. Thrust washers are fitted to No 2 main bearing cap, to control crankshaft endfloat.

The connecting rods rotate on horizontally-split bearing shells at their big-ends. The pistons are attached to the connecting rods by gudgeon pins. The gudgeon pins are an interference fit in the connecting rod small-end eyes. The aluminium alloy pistons are

fitted with three piston rings – two compression rings and an oil control ring.

The cast aluminium alloy cylinder block incorporates 'wet' liners, and the bores have renewable cast-iron liners that are located from the top of the cylinder block. Sealing O-rings are fitted at the base of each liner, to prevent the escape of coolant into the sump.

The camshafts, driven by a toothed timing belt, operate sixteen valves via followers located beneath each cam lobe. The valve clearances are self-adjusting by means of hydraulic tappets fitted to the cam followers. The camshaft runs in bearing caps which are bolted to the top of the cylinder head. The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head. Both the valve seats and guides can be renewed separately if worn.

The coolant pump is also driven by the timing belt, and is located in the right-hand end of the cylinder block.

Lubrication is by means of an oil pump which is driven by a chain and sprocket off the crankshaft right-hand end. It draws oil through a strainer located in the sump, and then forces it through an externally-mounted filter into galleries in the cylinder block/crankcase. From there, the oil is distributed to the crankshaft main bearings and camshaft. The big-end bearings are supplied with oil by internal drillings in the crankshaft; the camshaft bearings also receive a pressurised supply. The camshaft lobes and valves are lubricated by splash, as are all other engine components. An oil cooler is fitted to certain models to keep the oil temperature constant under severe operating conditions – it is mounted behind the oil filter. The oil cooler is supplied with coolant from the engine cooling system.

Throughout the manual, it is often necessary to identify the engines not only by their cubic capacity, but also by their engine code. The engine code consists of three letters (eg. LFY). The code is stamped directly onto the front face of the cylinder block, on the machined surface located just to the left of the oil filter (next to the crankcase vent hose union).

Repair operations possible with the engine in the car

The following work can be carried out with the engine in the car:

a) Compression pressure – testing.
b) Cylinder head cover – removal and refitting.
c) Crankshaft pulley – removal and refitting.
d) Timing belt covers – removal and refitting.
e) Timing belt – removal, refitting and adjustment.
f) Timing belt tensioner and sprockets – removal and refitting.
g) Camshaft oil seals – renewal.
h) Camshafts and followers – removal, inspection and refitting.
i) Cylinder head – removal and refitting.
j) Cylinder head and pistons – decarbonising.
k) Sump – removal and refitting.
l) Oil pump – removal, overhaul and refitting.
m) Crankshaft oil seals – renewal.
n) Engine/transmission mountings – inspection and renewal.
o) Flywheel/driveplate – removal, inspection and refitting.
p) Oil cooler – removal and refitting

2 Compression test – description and interpretation

1 When engine performance is down, or if misfiring occurs which cannot be attributed to the ignition or fuel systems, a compression test can provide diagnostic clues as to the engine's condition. If the test is performed regularly, it can give warning of trouble before any other symptoms become apparent.

2 The engine must be fully warmed-up to normal operating temperature, the battery must be fully charged, and all the spark plugs must be removed (Chapter 1A). The aid of an assistant will also be required.

3 Disable the fuel system by disconnecting the wiring connectors from the fuel injectors, referring to Chapter 4A, Section 13, for further information.

4 Fit a compression tester to the No 1 cylinder spark plug hole – the type of tester which screws into the plug thread is to be preferred.

5 Have the assistant hold the throttle wide open, and crank the engine on the starter motor; after one or two revolutions, the compression pressure should build up to a maximum figure, and then stabilise. Record the highest reading obtained.

6 Repeat the test on the remaining cylinders, recording the pressure in each.

7 All cylinders should produce very similar pressures; a difference of more than 2 bars between any two cylinders indicates a fault. Note that the compression should build-up quickly in a healthy engine; low compression on the first stroke, followed by gradually-increasing pressure on successive strokes, indicates worn piston rings. A low compression reading on the first stroke, which does not build-up during successive strokes, indicates leaking valves or a blown head gasket (a cracked head could also be the cause). Deposits on the undersides of the valve heads can also cause low compression.

8 Although Peugeot do not specify exact compression pressures, as a guide, any cylinder pressure of below 10 bars can be considered as less than healthy. Refer to a Peugeot dealer or other specialist if in doubt as to whether a particular pressure reading is acceptable.

9 If the pressure in any cylinder is low, carry out the following test to isolate the cause. Introduce a teaspoonful of clean oil into that cylinder through its spark plug hole, and repeat the test.

10 If the addition of oil temporarily improves the compression pressure, this indicates that bore or piston wear is responsible for the pressure loss. No improvement suggests that leaking or burnt valves, or a blown head gasket, may be to blame.

11 A low reading from two adjacent cylinders is almost certainly due to the head gasket having blown between them; the presence of coolant in the engine oil will confirm this.

12 If one cylinder is about 20 percent lower than the others and the engine has a slightly rough idle, a worn camshaft lobe could be the cause.

13 If the compression reading is unusually high, the combustion chambers are probably coated with carbon deposits. If this is the case, the cylinder head should be removed and decarbonised.

14 On completion of the test, refit the spark plugs and reconnect the wiring.

3 Engine assembly/ valve timing holes – general information and usage

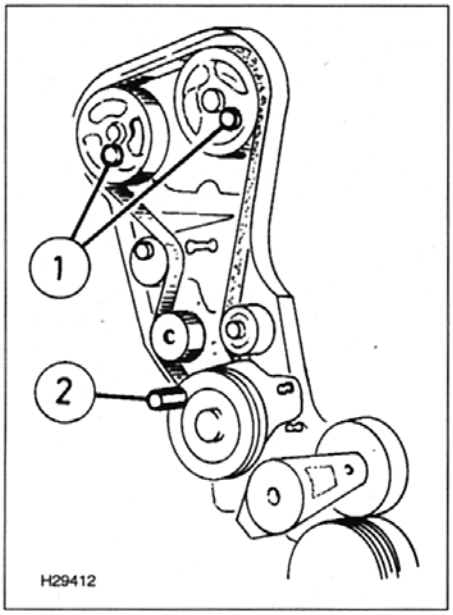
Note: *Do not attempt to rotate the engine whilst the crankshaft/camshaft are locked in position. If the engine is to be left in this state for a long period of time, it is a good idea to place suitable warning notices inside the vehicle, and in the engine compartment. This will reduce the possibility of the engine being accidentally cranked on the starter motor, which is likely to cause damage with the locking pins in place.*

1 Timing holes are drilled in the camshaft sprockets and crankshaft pulley. The holes are used to align the crankshaft and camshaft, to prevent the possibility of the valves contacting the pistons when refitting the cylinder head, or when refitting the timing belt. When the holes are aligned with their corresponding holes in the cylinder head and cylinder block (as appropriate), suitable diameter pins can be inserted to lock both the camshaft and crankshaft in position. Proceed as follows:

2 Remove the timing belt upper cover with reference to Section 6.

3 Jack up the front of the car and support it on axle stands. Remove the right-hand front roadwheel.

4 From underneath the front of the car, unscrew the bolts and prise out the clips securing the plastic cover to the inner wing valance. Remove the cover to gain access to the crankshaft pulley bolt. The crankshaft can then be turned using a suitable socket and extension bar fitted to the pulley bolt. Note that the crankshaft must always be turned in a clockwise direction (viewed from the right-hand side of the vehicle).



3.7 Camshaft sprocket timing holes (1) and crankshaft pulley timing hole (2) locked with suitable timing pins

5 Rotate the crankshaft pulley until the timing holes in both camshafts are aligned with their corresponding holes in the cylinder head. The holes are aligned when the inlet camshaft sprocket hole is in approximately the 5 o'clock position and the exhaust camshaft sprocket hole is in approximately the 7 o'clock position, when viewed from the right-hand end of the engine.

6 With the camshaft sprocket holes correctly positioned, insert a 6 mm diameter bolt or drill through the timing hole in the crankshaft pulley, and locate it in the corresponding hole in the end of the engine. Note that the hole size may vary according to the type of pulley fitted and auxiliary drivebelt arrangement. If the bolt or drill is not a snug fit, try a larger size until a good fit is achieved in both the pulley and cylinder block.

7 With the crankshaft locked in position, insert a suitable bolt or drill through the timing hole in each camshaft sprocket and locate it in the cylinder head **(see illustration)**.

8 The crankshaft and camshafts are now locked in position, preventing rotation.

4 Cylinder head covers – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Remove the fuel rail and fuel injectors as described in Chapter 4A, Section 13.

3 Disconnect the wiring connector at the left-hand end of the ignition coil unit, located in the centre of the cylinder head covers. Undo the six retaining bolts and lift the coil unit upwards, off the spark plugs and from its location between the cylinder head covers.

4 Slacken the retaining clips, and disconnect the breather hoses from the front left-hand side of the front cover. Where the original crimped-type Peugeot hose clips are still fitted, cut them off and discard them; use standard worm-drive hose clips on refitting.

5 Working in a spiral sequence starting from the outside and working inwards, progressively slacken, then remove the retaining bolts of each cylinder head cover, noting the correct fitted position of any brackets or clips.

6 Lift off each cover in turn and remove it along with its rubber seal.

Refitting

7 Clean the cylinder head and cover mating surfaces, and remove all traces of oil.

8 Lubricate the new rubber seals with grease, then locate them in the grooves of each cover, ensuring they are correctly located.

9 Carefully refit the cylinder head covers to the engine, taking great care not to displace the rubber seals.

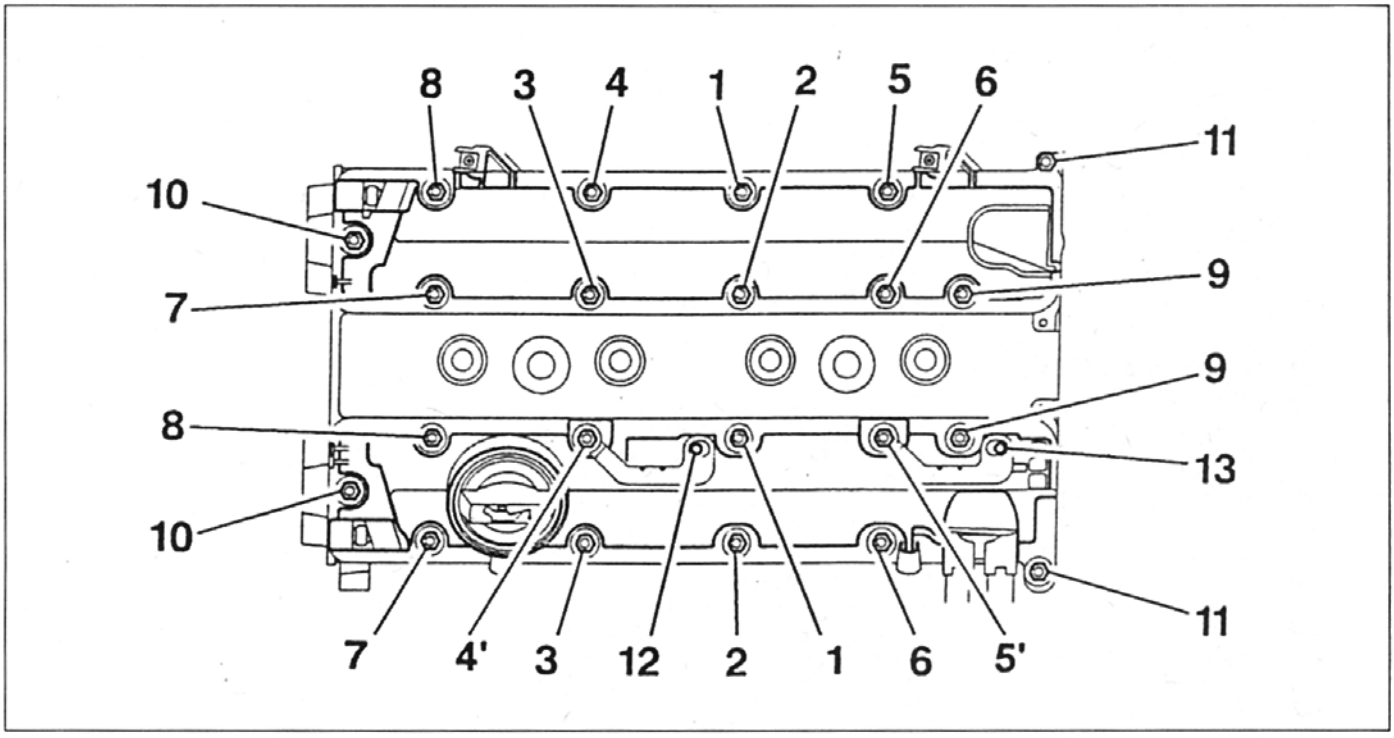
10 Check that the seal is correctly located, then refit the cover retaining nuts and, working in the sequence shown, tighten them evenly and progressively to the specified torque **(see illustration)**.

11 Reconnect the breather hoses to the front cover and securely tighten the retaining clips.

12 Refit the ignition coil unit between the cylinder head covers. Refit the retaining bolts, tightening them securely, then reconnect the coil unit wiring connectors.

13 Refer to Chapter 4A and refit the fuel rail and fuel injectors.

14 Reconnect the battery negative terminal. On completion, start the engine and check the fuel hose unions for signs of leakage.



4.10 Cylinder head cover nut tightening sequence

5 Crankshaft pulley – removal and refitting

Removal

1 Remove the auxiliary drivebelt (Chapter 1A).
2 To prevent the crankshaft turning whilst the pulley retaining bolt is being slackened on manual transmission models, select 4th gear and have an assistant apply the brakes firmly. On automatic transmission models it will be necessary to remove the starter motor (Chapter 5A) and lock the driveplate with a suitable tool. If the engine has been removed from the vehicle, lock the flywheel ring gear using the arrangement shown **(see illustration)**. *Do not* attempt to lock the pulley by inserting a bolt/drill through the timing hole. If the locking pin is in position, temporarily remove it prior to slackening the pulley bolt, then refit it once the bolt has been slackened.
3 Unscrew the retaining bolt and washer, then slide the pulley off the end of the crankshaft **(see illustration)**. If the pulley locating roll pin or Woodruff key (as applicable) is a loose fit, remove it and store it with the pulley for safe-keeping. If the pulley is a tight fit, it can be drawn off the crankshaft using a suitable puller.

Refitting

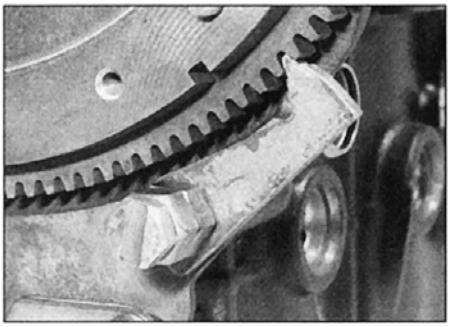
4 Ensure that the Woodruff key is correctly located in its crankshaft groove, or that the roll pin is in position (as applicable). Refit the pulley to the end of the crankshaft, aligning its locating groove or hole with the Woodruff key or pin.
5 Thoroughly clean the threads of the pulley retaining bolt, then apply a coat of locking compound to the bolt threads. Peugeot recommend the use of Loctite Frenetanche (available from your Peugeot dealer); in the absence of this, any good-quality locking compound may be used.
6 Refit the crankshaft pulley retaining bolt and washer. Tighten the bolt to the specified torque, preventing the crankshaft from turning using the method employed on removal.
7 Refit and tension the auxiliary drivebelt as described in Chapter 1A.

6 Timing belt covers – removal and refitting

Removal

Upper (outer) cover

1 Undo the upper and lower retaining bolts securing the outer cover to the inner cover. Slide the cover retaining clip upwards to release it from its fasteners.



5.2 Use a fabricated tool like this one to lock the flywheel ring gear and prevent the crankshaft rotation

2 Ease the outer cover upwards and away from the engine, freeing it from its lower locations.

Lower cover

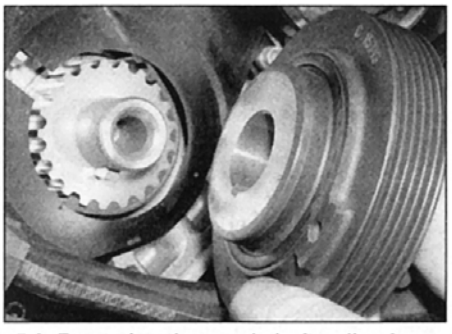
3 Remove the crankshaft pulley as described in Section 5.
4 Remove the upper (outer) cover as described above.
5 Slacken and remove the three retaining bolts, then remove the lower timing belt cover from the engine. Note that on some models it may be necessary to unbolt the auxiliary drivebelt tensioner assembly and remove it from the engine in order to allow the cover to be removed.

Upper (inner) cover

6 Remove the timing belt as described in Section 7.
7 Remove both camshaft sprockets as described in Section 8.
8 Remove the six bolts securing the cover to the side of the cylinder head, and remove the cover from the engine.

Refitting

9 Refitting is a reversal of the relevant removal procedure, ensuring that each cover section is correctly located, and that the cover retaining nuts and/or bolts are securely tightened to the specified torque, where given.



5.3 Removing the crankshaft pulley from the end of the crankshaft

7 Timing belt – general information, removal and refitting

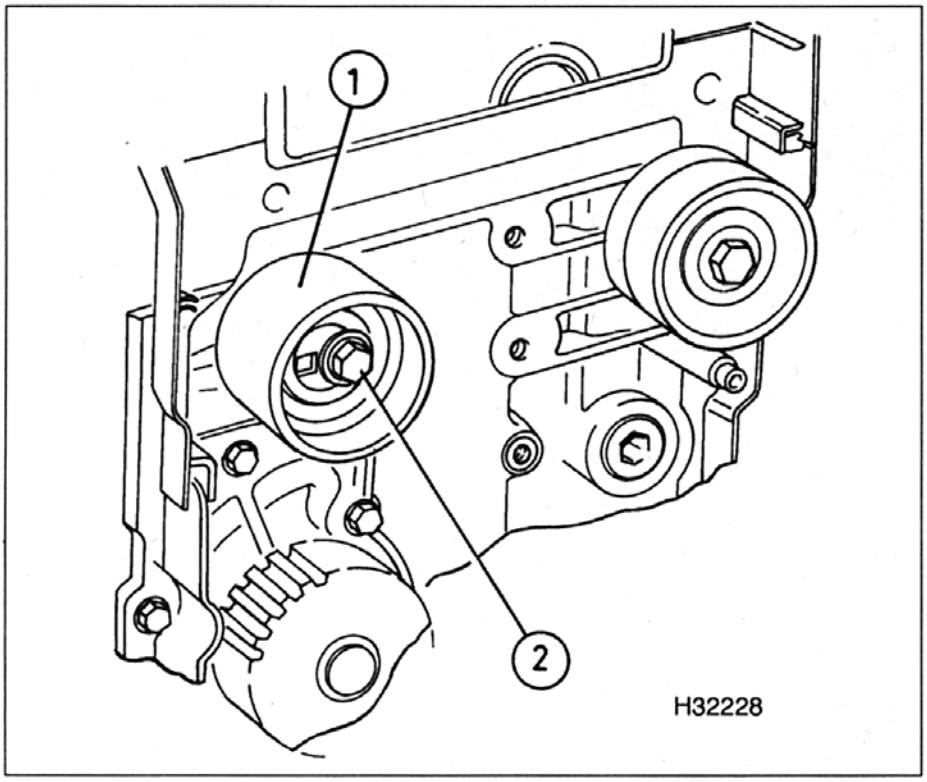
Note: *Peugeot specify the use of a special electronic tool (SEEM C105.5) to correctly set the timing belt tension.*

General information

1 The timing belt drives the camshafts and coolant pump from a toothed sprocket on the end of the crankshaft. If the belt breaks or slips in service, the pistons are likely to hit the valve heads, resulting in extensive (and expensive) damage.
2 The timing belt should be renewed at the specified intervals (see Chapter 1A), or earlier if it is contaminated with oil, or if it is at all noisy in operation (a 'scraping' noise due to uneven wear).
3 If the timing belt is being removed, it is a wise precaution to check the condition of the coolant pump at the same time (check for signs of coolant leakage). This may avoid the need to remove the timing belt again at a later stage, should the coolant pump fail.
4 Two types of timing belt tensioner pulley may be encountered. On early engines a manual tensioner pulley is used, and the belt tension must be set using an electronic tension checking tool. On later engines (from approximately mid-1999) a dynamic tensioner pulley is used which automatically adjusts the belt tension.
5 On engines with a manual tensioner pulley, Peugeot specify the use of an electronic belt tension checking tool to correctly set the timing belt tension. The following procedure assumes that this equipment (or suitable alternative equipment calibrated to display belt tension in SEEM units) is available. Accurate tensioning of the timing belt is essential, and if the electronic equipment is not available, it is recommended that the work is entrusted to a Peugeot dealer or suitably-equipped garage.

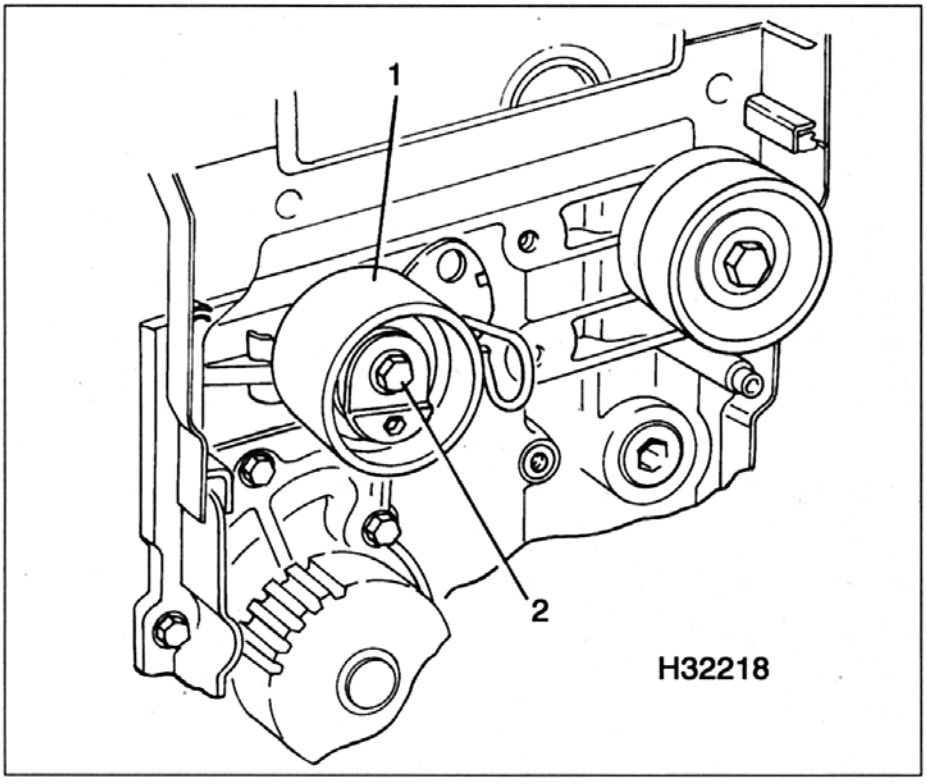
Removal

6 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).
7 Remove the auxiliary drivebelt as described in Chapter 1A. Where applicable, unbolt and remove the auxiliary drivebelt tensioner.
8 Move the engine wiring harness and relevant hoses clear of the working area as necessary. This will entail the disconnection of certain connectors, and the removal of the harness from various cable clips and supports. Label any disconnected wiring and components as an aid to refitting.
9 Remove the timing belt upper (outer) cover as described in Section 6.
10 Determine the type of timing belt tensioner pulley fitted then proceed as described in the appropriate following sub-sections **(see illustrations overleaf)**.



7.10a Early type manual timing belt tensioner pulley

1 Manual tensioner pulley *2 Retaining bolt*



7.10b Later type dynamic timing belt tensioner pulley

1 Dynamic tensioner pulley *2 Retaining bolt*

Manual tensioner pulley

11 To improve access, refer to Section 17 and remove the engine right-hand mounting. This is not essential, but it does make several of the timing belt components much easier to remove with the engine in the car.

12 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hubs in position. *Do not* attempt to rotate the engine whilst the locking tools are in place.

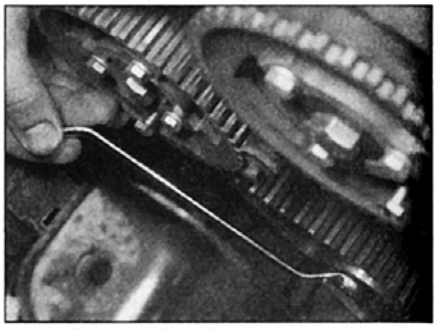
13 Remove the crankshaft pulley as described in Section 5.

14 Unbolt and remove the timing belt lower cover (refer to Section 6 if necessary).

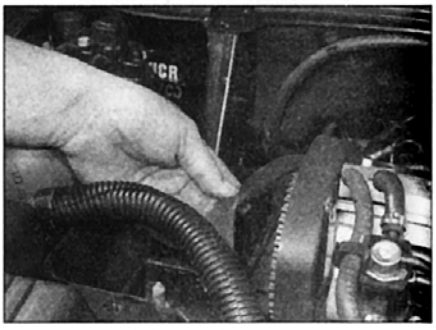
15 Loosen the timing belt tensioner pulley retaining bolt **(see illustration)**. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.

16 If the timing belt is to be re-used, use white paint or chalk to mark the direction of rotation on the belt (if markings do not already exist), then slip the belt off the sprockets **(see illustration)**. Note that the crankshaft must not be rotated whilst the belt is removed.

17 Check the timing belt carefully for any signs of uneven wear, splitting, or oil contamination. Pay particular attention to the roots of the teeth. Renew it if there is the slightest doubt about its condition. If the engine is undergoing an overhaul, and has covered more than 36 000 miles (60 000 km) with the existing belt fitted, renew the belt as a matter of course, regardless of its apparent



7.15 Loosen the manual timing belt tensioner retaining bolt . . .



7.16 . . . and slip the timing belt off the sprockets

condition. The cost of a new belt is nothing compared with the cost of repairs, should the belt break in service. If signs of oil contamination are found, trace the source of the oil leak and rectify it. Wash down the engine timing belt area and all related components, to remove all traces of oil.

Dynamic tensioner pulley

18 To improve access, refer to Section 17 and remove the engine right-hand mounting. This is not essential, but it does make several of the timing belt components much easier to remove with the engine in the car.

19 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hubs in position. *Do not* attempt to rotate the engine whilst the locking tools are in position.

20 Remove the crankshaft pulley as described in Section 5.

21 Unbolt and remove the timing belt lower cover (refer to Section 6 if necessary).

22 Slacken the camshaft sprocket centre retaining bolt on each camshaft. To prevent the sprockets rotating as the bolts are slackened, a sprocket holding tool will be required. In the absence of the special Peugeot tool, an acceptable substitute can be fabricated at home **(see Tool Tip in Section 8)**. *Do not* attempt to use only the sprocket hub locking tools inserted in the engine assembly/valve timing holes to prevent the sprockets from rotating whilst the bolts are slackened.

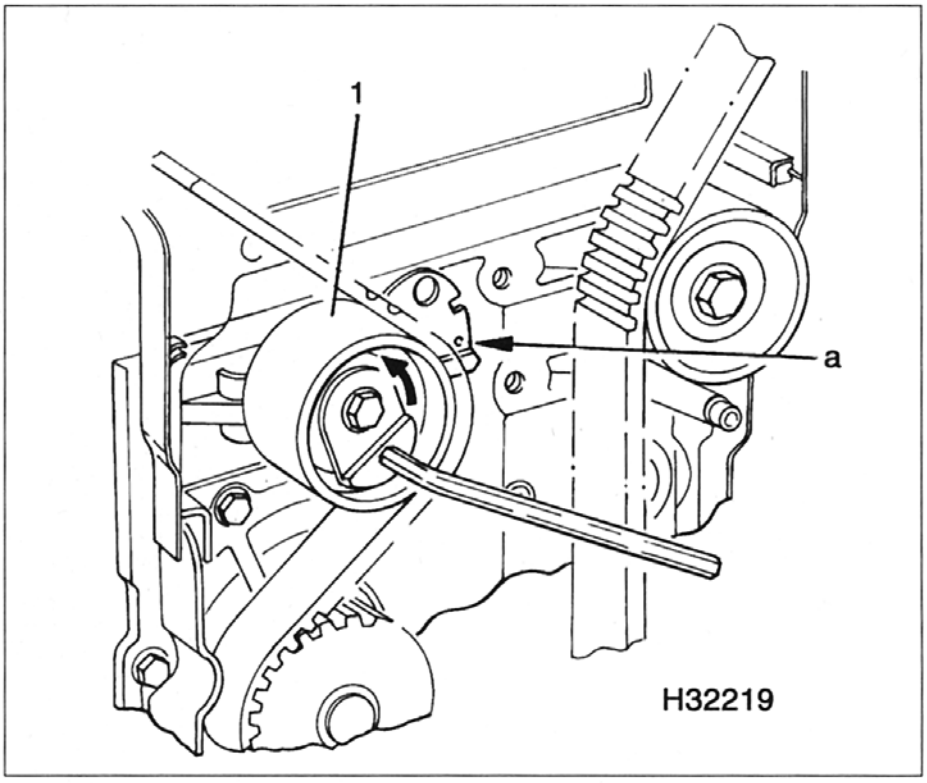
23 Slacken the timing belt tensioner pulley retaining bolt and insert a suitable Allen key into the hexagonal hole on the front face of the tensioner pulley.

24 Using the Allen key, turn the tensioner pulley anti-clockwise (as viewed from the right-hand side of the car) until the index pointer is below the reference hole **(see illustration)**. Insert a small drill bit or short length of welding rod into the reference hole to retain the index pointer in this position.

25 Now turn the tensioner pulley clockwise until the hexagonal Allen key hole is positioned approximately adjacent to the upper edge of the coolant pump flange. Tighten the tensioner pulley retaining bolt to retain the pulley in this position.

26 If the timing belt is to be re-used, use white paint or chalk to mark the direction of rotation on the belt (if markings do not already exist), then slip the belt off the sprockets. Note that the crankshaft must not be rotated whilst the belt is removed.

27 Check the timing belt carefully for any signs of uneven wear, splitting, or oil contamination. Pay particular attention to the roots of the teeth. Renew it if there is the slightest doubt about its condition. If the engine is undergoing an overhaul, and has covered more than 36 000 miles (60 000 km) with the existing belt fitted, renew the belt as a matter of course, regardless of its apparent condition. The cost of a new belt is nothing compared with the cost of repairs, should the belt break in service. If signs of oil contamination are found, trace the source of the oil leak and rectify it. Wash down the engine timing belt area and all related components, to remove all traces of oil.



7.24 Rotate the dynamic tensioner pulley (1) anti-clockwise until the index pointer is below the reference hole (a)

Refitting and tensioning

Manual tensioner pulley

28 Before refitting, thoroughly clean the timing belt sprockets. Check that the tensioner and idler pulleys rotate freely, without any sign of roughness. If necessary, renew the pulleys as described in Section 8.

29 Ensure that the camshaft sprocket hub locking tools are still in position. Temporarily refit the crankshaft pulley, insert the locking tool through the pulley timing hole to ensure that the crankshaft is still correctly positioned, then remove the pulley.

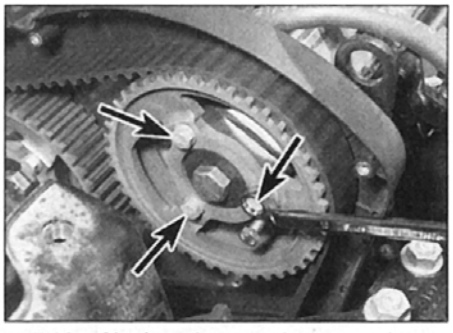
30 Without removing the locking tools, on early engines, slacken the six camshaft sprocket retaining bolts (three on each sprocket). On later engines, only the single bolt securing each camshaft sprocket need be slackened. Check that both sprockets are free to turn within the limits of their elongated bolt holes, or that the protruding lug on single-bolt sprockets can move within its limits **(see illustrations)**. To prevent the single-bolt sprockets rotating as the bolts are slackened, a sprocket holding tool will be required. In the absence of the special Peugeot tool, an acceptable substitute can be fabricated at home **(see Tool Tip in Section 8)**. *Do not* attempt to use only the sprocket hub locking tools to prevent the sprockets from rotating whilst the bolts are slackened.

31 Tighten the camshaft sprocket retaining bolts finger-tight, then slacken them all by one sixth of a turn.

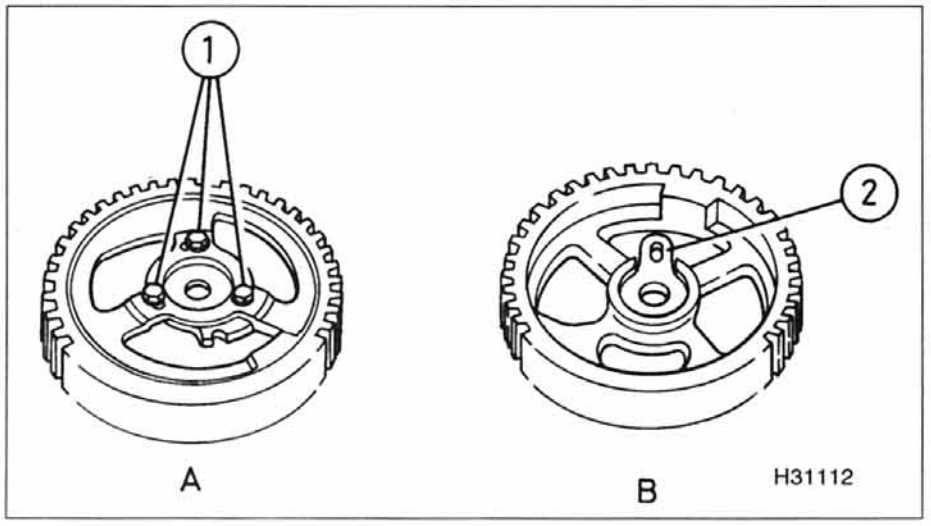
32 Again without removing the locking tools, turn each camshaft sprocket clockwise until the protruding lug reaches the end of its travel.

33 Ensuring that any arrows on the belt are pointing in the direction of rotation (clockwise when viewed from the right-hand end of the engine), manoeuvre the timing belt into position on the exhaust camshaft sprocket. Retain the belt on the sprocket using a cable tie.

34 With the sprockets still positioned fully clockwise as far as they will go, feed the belt over the inlet camshaft sprocket, keeping it tight on its top run.



7.30a Slacken the camshaft sprocket retaining bolts (arrowed)



7.30b Camshaft sprocket details – early models (A) have three retaining bolts (1) in elongated slots, while later models (B) have a single bolt and a protruding lug (2)

35 Engage the belt around the idler pulley, crankshaft sprocket, coolant pump sprocket and finally around the tensioner pulley.

36 Fit the sensor head of the electronic belt tension measuring equipment to the 'front run' of the timing belt, approximately midway between the idler pulley and crankshaft sprocket.

37 Slacken the tensioner pulley retaining bolt and insert a short length of 8.0 mm square bar into the square hole on the front face of the tensioner pulley **(see Tool Tip)**.

38 Using the square bar and a spanner, pivot the tensioner pulley anti-clockwise until an initial setting of 55 SEEM units is displayed on the tension measuring equipment. Hold the tensioner pulley in that position and retighten the retaining bolt.

39 Check that the sprockets have not been turned so far that the retaining bolts are at the end of their slots, or that the protruding lug on single-bolt sprockets is at the end of its travel. If either condition is evident, repeat the refitting operation. If all is satisfactory, tighten the sprocket retaining bolts to the specified torque.

40 Remove the belt tension measuring equipment, the crankshaft and camshaft locking tools, and the cable tie used to retain the belt on the exhaust camshaft sprocket.

41 Refit the timing belt lower cover and the crankshaft pulley.

42 Rotate the crankshaft through six complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the engine assembly/valve timing holes and refit the crankshaft pulley and camshaft sprocket hub locking tools.

43 Slacken the camshaft sprocket retaining bolts, retighten them finger-tight, then slacken them all by one sixth of a turn.

44 Slacken the tensioner pulley retaining bolt once more. Refit the belt tension measuring equipment to the front run of the belt, and turn the tensioner pulley to give a final setting of 35 SEEM units on the tensioning gauge. Hold the tensioner pulley in this position and tighten the retaining bolt to the specified torque. Remove the tension measuring equipment.

45 Retighten all sprocket retaining bolts to the specified torque.

46 The belt tension must now be checked as follows. Remove the locking tools, then rotate the crankshaft once again through two complete rotations in a clockwise direction. Realign the engine assembly/valve timing holes and refit the crankshaft pulley and camshaft sprocket hub locking tools.

47 Slacken the camshaft sprocket retaining bolts, then retighten them to the specified torque.

48 Remove the camshaft and crankshaft locking tools. Turn the crankshaft approximately one quarter of a turn in the normal direction of rotation, until the locking tool hole in the crankshaft pulley is aligned with the timing belt lower cover front retaining bolt. It is important that this position is achieved ONLY by turning the engine forwards (ie, clockwise) – if the engine is turned back at all to achieve alignment, the belt tension check will not be valid.

49 In this position, refit the tension measuring equipment to the front run of the belt, and check that the reading is between 32 and 40 SEEM units. If not, the entire belt tensioning procedure must be repeated from the start.

50 Once the belt tension has been correctly set, refit the engine right-hand mounting components (if removed) as described in Section 17.

51 Refit the timing belt upper (outer) cover.

52 Reconnect any hoses and wiring disturbed for access.

53 Refit the auxiliary drivebelt tensioner then refit and tension the drivebelt with reference to Chapter 1A.

54 Reconnect the battery negative terminal.

Dynamic tensioner pulley

55 Before refitting, thoroughly clean the timing belt sprockets. Check that the tensioner and idler pulleys rotate freely, without any sign of roughness. If necessary, renew the pulleys as described in Section 8.

56 Ensure that the camshaft sprocket hub locking tools are still in position. Temporarily refit the crankshaft pulley, insert the locking tool through the pulley timing hole to ensure that the crankshaft is still correctly positioned, then remove the pulley.

57 With the camshaft sprocket retaining bolts still slackened, turn each camshaft sprocket clockwise to the end of its travel. Tighten the sprocket retaining bolts slightly to hold the sprockets in this position.

58 Ensuring that any arrows on the belt are pointing in the direction of rotation (clockwise when viewed from the right-hand end of the engine), manoeuvre the timing belt into position on the exhaust camshaft sprocket. Retain the belt on the sprocket using a cable tie.

59 With the sprockets still positioned fully clockwise as far as they will go, feed the belt over the inlet camshaft sprocket, keeping it tight on its top run.

60 Engage the belt around the idler pulley, crankshaft sprocket, coolant pump sprocket and finally around the tensioner pulley.

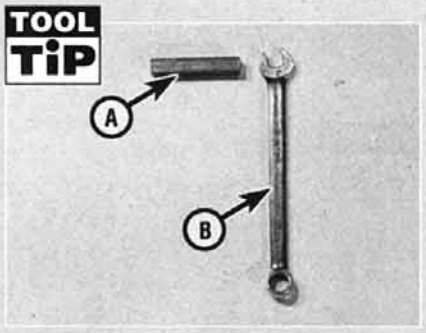
61 With the timing belt in position, slacken the camshaft sprocket retaining bolts once more.

62 Remove the drill bit or welding rod from the reference hole in the tensioner pulley.

63 Slacken the tensioner pulley retaining bolt and turn the tensioner pulley, by means of the Allen key, so that the index pointer is positioned in its maximum position (ie, below the reference hole). Hold the tensioner in this position and tighten the retaining bolt.

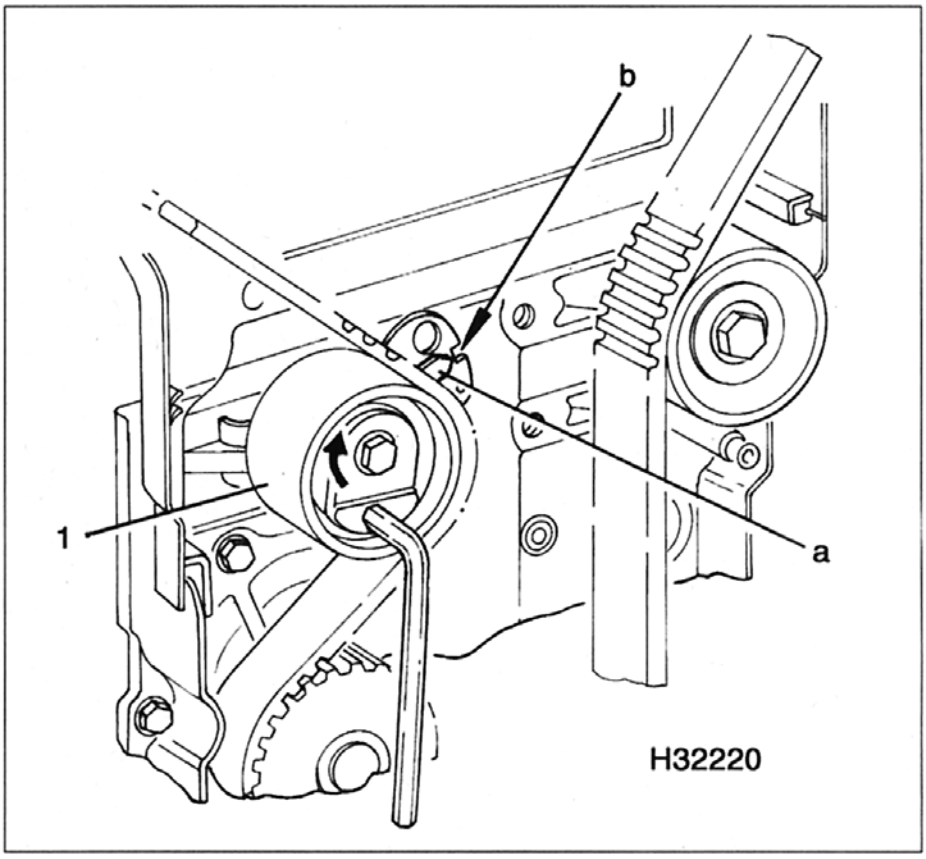
64 Hold the camshaft sprockets with the tool used during removal, and tighten the sprocket centre retaining bolts to the specified torque.

TOOL TiP



A square section tool to fit the timing belt tensioner pulley can be made from a length of standard 8 mm door handle rod (A), obtained from a DIY shop, and then cut to size. Once the rod has been fitted to the tensioner, the timing belt can be tensioned by turning the rod with an 8 mm spanner (B).

65 Refit the timing belt lower cover and the crankshaft pulley. Remove the cable tie used to retain the belt on the exhaust sprocket.
66 Remove the locking tools and rotate the crankshaft through four complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the engine assembly/valve timing holes and refit the crankshaft pulley and camshaft sprocket hub locking tools.
67 Hold the camshaft sprockets with the tool used during removal, and once again slacken the sprocket centre retaining bolts.
68 Hold the tensioner pulley in position by means of the Allen key and slacken the tensioner pulley retaining bolt. Turn the tensioner clockwise until the index pointer is aligned with the slot in the centre of the index plate, then tighten the retaining bolt to the specified torque **(see illustration)**.
69 Hold the camshaft sprockets and tighten the sprocket centre retaining bolts to the specified torque.
70 Remove the locking tools and rotate the crankshaft through two complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the engine assembly/valve timing holes and refit the crankshaft pulley and camshaft sprocket hub locking tools.
71 Check that the index pointer on the tensioner pulley is still aligned with the slot in the centre of the index plate. If not, repeat the procedure from paragraph 66 to 70.
72 Once the belt tension has been correctly set, refit the engine right-hand mounting components (if removed) as described in Section 17.
73 Refit the timing belt upper (outer) cover.
74 Reconnect any hoses and wiring disturbed for access.
75 Refit the auxiliary drivebelt tensioner then refit and tension the drivebelt with reference to Chapter 1A.
76 Reconnect the battery negative terminal.



7.68 Turn the dynamic tensioner pulley (1) clockwise until the index pointer (a) is aligned with the slot (b) in the index plate

8 Timing belt tensioner and sprockets – removal, inspection and refitting

Note: *This Section describes the removal and refitting of the components concerned as individual operations – if more than one is to be removed at the same time, start by removing the timing belt as described in Section 7; remove the actual component as described below, ignoring the preliminary dismantling steps.*

Removal

Camshaft sprocket

1 Remove the timing belt from around the sprocket as described in Section 7.
2 Remove the relevant sprocket hub locking tool, then slacken the sprocket centre retaining bolt. To prevent the sprocket rotating as the bolt is slackened, a sprocket holding tool will be required. In the absence of the special Peugeot tool an acceptable substitute can be fabricated at home **(see Tool Tip)**. Do not attempt to use the engine assembly/valve timing hole locking tool to prevent the sprocket from rotating whilst the bolt is slackened.
3 Remove the previously-slackened hub retaining bolt, and withdraw the relevant sprocket and hub from the end of the camshaft. Suitably mark the sprockets and hubs 'inlet' and/or 'exhaust' as they are removed (although in fact they are identical).

Crankshaft sprocket

4 Remove the timing belt from around the sprocket as described in Section 7.
5 Slide the crankshaft sprocket off the end of the crankshaft. Remove the Woodruff key from the crankshaft, and store it with the sprocket for safe-keeping. Where necessary, also slide the spacer (where fitted) off the end of the crankshaft.
6 Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 15.

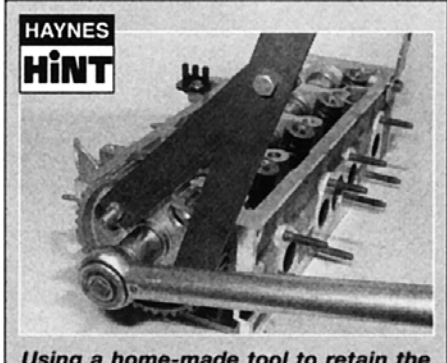
Tensioner and idler pulleys

7 Remove the timing belt from around the sprocket as described in Section 7.
8 Undo the tensioner and idler pulley retaining bolts and remove the relevant pulley from the engine. On engines with a dynamic tensioner pulley, recover the small drill bit or welding rod inserted in the reference hole as the assembly is removed.

Inspection

9 Clean the camshaft/crankshaft sprockets thoroughly, and renew any that show signs of wear, damage or cracks.
10 Clean the tensioner/idler pulleys but do not use any strong solvent which may enter the pulley bearings. Check that the pulleys rotate freely, with no sign of stiffness or free play. Renew them if there is any doubt about

HAYNES HINT



Using a home-made tool to retain the camshaft sprocket whilst the sprocket retaining bolt is tightened.

their condition, or if there are any obvious signs of wear or damage.

Refitting

Camshaft sprockets

11 Engage the sprocket hub with the camshaft. Ensure that the correct hub is fitted to the relevant camshaft according to the identification made on removal.

12 Position the relevant sprocket on the hub and refit the sprocket retaining bolt and washer. Tighten the retaining bolt just tight enough to hold the sprocket/hub in place at this stage.

13 Turn the hub so that the locking tool can be engaged.

14 Refit and tension the timing belt as described in Section 7.

Crankshaft sprocket

15 Slide the spacer (where fitted) into position, taking great care not to damage the crankshaft oil seal, and refit the Woodruff key to its slot in the crankshaft end.

16 Slide on the crankshaft sprocket, aligning its slot with the Woodruff key.

17 Temporarily refit the crankshaft pulley, and insert the locking tool through the pulley timing hole, to ensure that the crankshaft is still correctly positioned.

18 Remove the crankshaft pulley, then refit and tension the timing belt as described in Section 7.

Tensioner and idler pulleys

19 Refit the tensioner and idler pulleys and secure with the retaining bolts. On engines with a dynamic tensioner pulley, ensure that the pulley body correctly engages with the projection on the cylinder block, and position the index pointer as described in Section 7.

20 Relocate and tension the timing belt as described in Section 7.

9 Camshaft oil seals – renewal

Note: *If the camshaft oil seal is to be renewed with the timing belt still in place, check first that the belt is free from oil contamination. (Renew the belt as a matter of course if signs of oil contamination are found; see Section 7.) Cover the belt, to protect it from contamination by oil, while work is in progress. If the timing belt is removed, ensure that all traces of oil are removed from the area before the belt is refitted.*

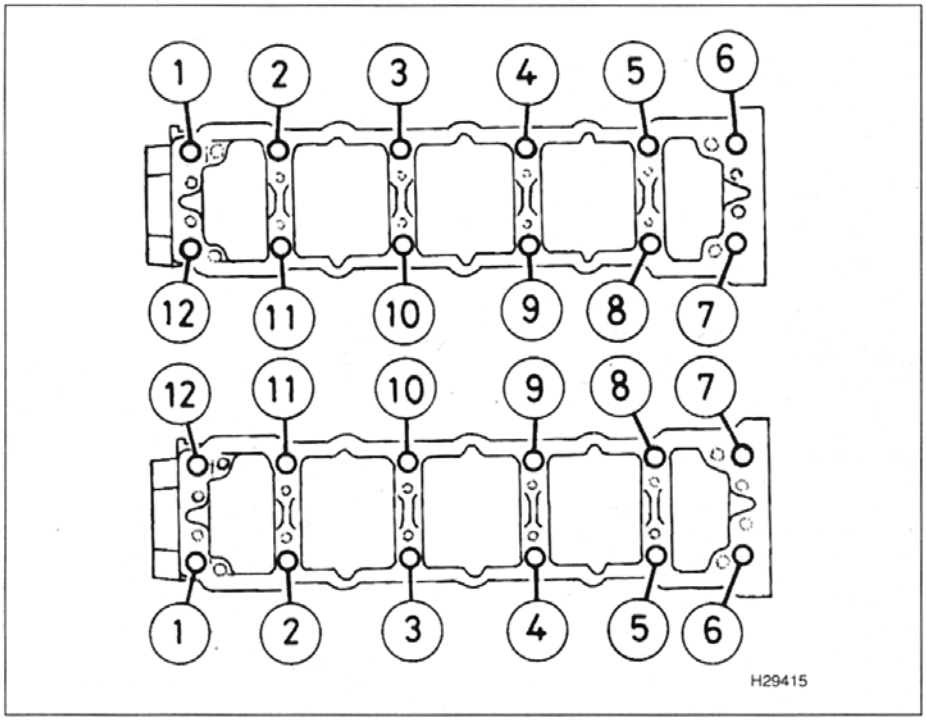
1 Remove the camshaft sprockets and hubs as described in Section 8.

2 Punch or drill two small holes opposite each other in the oil seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

3 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

4 Lubricate the lips of the new seal with clean engine oil, and drive it into position until it seats on its locating shoulder. Use a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Take care not to damage the seal lips during fitting. Note that the seal lips should face inwards.

5 Refit the camshaft sprockets and hubs as described in Section 8.



10.17 Camshaft bearing housing retaining bolt tightening sequence

10 Camshafts and followers – removal, inspection and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Remove both cylinder head covers as described in Section 4.

3 Refer to Section 8 and remove both camshaft sprockets together with their hubs, and also remove the timing belt tensioner pulley.

4 Remove the timing belt upper (inner) cover as described in Section 6.

5 Progressively slacken, by a few turn at a time, the twelve bolts securing each camshaft bearing housing to the cylinder head. Release the bearing housings from their dowels and cylinder head locations. When each housing is free, remove the bolts and washers completely, and lift off the bearing housings.

6 As both camshafts are identical, suitably mark them inlet and exhaust, or front and rear before removal.

7 Tilt the camshafts by pressing them down at their transmission end to release the centralising bearing at the timing belt end. Carefully lift the camshafts up and out of their locations and slide the oil seal off each camshaft end.

8 Obtain sixteen small, clean plastic containers, and number them inlet 1 to 8 and exhaust 1 to 8; alternatively, divide a larger container into sixteen compartments and number each compartment accordingly. Using a rubber sucker, withdraw each hydraulic tappet in turn, and place it in its respective container. Do not interchange the tappets, or the rate of wear will be much-increased.

Inspection

9 Examine the camshaft bearing surfaces and cam lobes for signs of wear ridges and scoring. Renew the camshaft if any of these conditions are apparent. Examine the condition of the bearing surfaces, both on the camshaft journals and in the cylinder head/bearing caps. If the head bearing surfaces are worn excessively, the cylinder head will need to be renewed. If suitable measuring equipment is available, camshaft bearing journal wear can be checked by direct measurement (where the necessary specifications have been quoted by Peugeot), noting that No 1 journal is at the transmission end of the head.

10 Examine the cam follower/hydraulic tappet bearing surfaces which contact the camshaft lobes for wear ridges and scoring. Renew any follower/tappet on which these conditions are apparent. If a follower/tappet bearing surface is badly scored, also examine the corresponding lobe on the camshaft for wear, as it is likely that both will be worn. Renew worn components as necessary.

Refitting

11 Before refitting, remove all traces of oil from the bearing housing retaining bolt holes in the cylinder head, using a clean rag. Also ensure that both the cylinder head and bearing housing mating faces are clean and free from oil.

12 Liberally oil the cylinder head hydraulic tappet bores and the tappets. Carefully refit the tappets to the cylinder head, ensuring that each tappet is refitted to its original bore. Some care will be required to enter the tappets squarely into their bores. Check that each tappet rotates freely in its bore.

13 Liberally oil the camshaft bearings in the cylinder head and the camshaft lobes, then refit the camshafts to the cylinder head. Turn the camshafts so that the groove at the timing belt end of the exhaust camshaft is positioned at 12 o'clock, and the groove at the timing belt end of the inlet camshaft groove is positioned at 11 o'clock.

14 Ensure that the four locating dowels are in position, one at each corner of the cylinder head.

15 Apply a bead of silicone-based jointing compound around the perimeter of the mating faces and around the retaining bolt hole locations.

16 Liberally oil the camshaft bearings and carefully locate the bearing housings over the camshafts. Refit the retaining bolts ensuring that each has a washer under its head.

17 Working in the order shown, progressively tighten the bearing housing retaining bolts to the Stage 1 torque setting then to the Stage 2 setting **(see illustration opposite)**.

18 Refit the timing belt upper (inner) cover as described in Section 6.

19 Refit the timing belt tensioner pulley as described in Section 8.

20 Refit the cylinder head covers as described in Section 4.

21 Fit new camshaft oil seals using the information given in Section 9, then refit the camshaft sprockets and hubs as described in Section 8.

11 Cylinder head – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Drain the cooling system as described in Chapter 1A. For improved access, remove the bonnet as described in Chapter 11.

3 Align the engine assembly/valve timing holes as described in Section 3, locking both the camshaft sprockets and crankshaft pulley in position. *Do not* attempt to rotate the engine whilst the pins are in position.

4 Remove the air cleaner assembly and intake ducting as described in Chapter 4A.

5 Remove the cylinder head covers as described in Section 4.

6 Remove the inlet manifold as described in Chapter 4A.

7 Working as described in Chapter 4A, disconnect the exhaust system front pipe from the manifold. Where necessary, disconnect or release the lambda sensor wiring, so that it is not strained by the weight of the exhaust.

8 Disconnect the radiator hose from the coolant outlet elbow.

9 Disconnect all remaining vacuum/breather hoses, and all electrical connector plugs from the cylinder head.

10 Release the timing belt tensioner and disengage the timing belt from the camshaft sprocket as described in Section 7.

11 Working in the *reverse* of the sequence shown in paragraph 28, progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand. Remove the bolts along with their washers. **Note:** *Washers are not fitted to later engines.*

12 With all the cylinder head bolts removed, the joint between the cylinder head and gasket and the cylinder block/crankcase must now be broken. On wet-liner engines, there is a risk of coolant and foreign matter leaking into the sump if the cylinder head is lifted carelessly. If care is not taken and the liners are moved, there is also a possibility of the bottom seals being disturbed, causing leakage after refitting the head.

13 To break the joint, obtain two L-shaped metal bars which fit into the cylinder head bolt holes, and gently 'rock' the cylinder head free towards the front of the car. *Do not* try to swivel the head on the cylinder block/crankcase; it is located by dowels.

14 When the joint is broken, lift the cylinder head away. Seek assistance if possible, as it is a heavy assembly. Remove the gasket from the top of the block, noting the two locating dowels. If the locating dowels are a loose fit, remove them and store them with the head for safe-keeping. Do not discard the gasket; it will be needed for identification purposes.

15 The XU7 engine described in this Chapter is fitted with wet-liners, therefore *do not* attempt to turn the crankshaft with the cylinder head removed, otherwise the liners may be displaced. Operations that require the crankshaft to be turned (eg, cleaning the piston crowns), should only be carried out once the cylinder liners are firmly clamped in position. In the absence of the special Peugeot liner clamps, the liners can be clamped in position as follows. Use large flat washers positioned underneath suitable-length bolts, or temporarily refit the original head bolts, with suitable spacers fitted to their shanks **(see illustration)**.

16 If the cylinder head is to be dismantled for overhaul, remove the camshafts as described in Section 10, then refer to Part D of this Chapter.

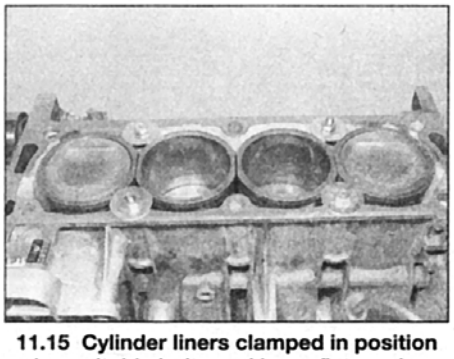
Preparation for refitting

17 The mating faces of the cylinder head and cylinder block/crankcase must be perfectly clean before refitting the head. Use a hard plastic or wooden scraper to remove all traces of gasket and carbon; also clean the piston crowns (refer to paragraph 15 before turning the engine). Take particular care as the soft aluminium alloy is easily damaged. Make sure that the carbon is not allowed to enter the oil and water passages – this is particularly important for the lubrication system, as carbon could block the oil supply to the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block/crankcase. To prevent carbon entering the gap between the pistons and bores, smear a little grease in the gap. After cleaning each piston, use a small brush to remove all traces of grease and carbon from the gap, then wipe away the remainder with a clean rag. Clean all the pistons in the same way.

18 Check the mating surfaces of the cylinder block/crankcase and the cylinder head for nicks, deep scratches and other damage. If slight, they may be removed carefully with a file, but if excessive, machining may be the only alternative to renewal. If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part D of this Chapter if necessary.

19 Check the cylinder liner protrusion as described in Part D of this Chapter.

20 When purchasing a new cylinder head gasket, it is essential that a gasket of the correct thickness is obtained. On some models only one thickness of gasket is available, so this is not a problem. However on other models, there are two different thicknesses available – the standard gasket which is fitted at the factory, and a slightly thicker 'repair' gasket (+ 0.2 mm), for use once the head gasket face has been machined. If the cylinder head has been machined, it should have the letter R stamped adjacent to the No 3 exhaust port, and the gasket should also have the letter R stamped adjacent to No 3 cylinder on its front upper face. The gaskets can also be identified as described in the following paragraph, using the cut-outs on the left-hand end of the gasket.



11.15 Cylinder liners clamped in position using suitable bolts and large flat washers

21 With the gasket fitted the correct way up on the cylinder block, there will be either a single hole, or a series of holes, punched in the tab on the left-hand end of the gasket. The standard (1.2 mm) gasket has only one hole punched in it; the slightly thicker (1.4 mm) gasket has either two or three holes punched in it, depending on its manufacturer. Identify the gasket type, and ensure that the new gasket obtained is of the correct thickness. Note that modifications to the cylinder head gasket material, type, and manufacturer are constantly taking place; seek the advice of a Peugeot dealer as to the latest recommendations.

22 Check the condition of the cylinder head bolts, and particularly their threads, whenever they are removed. Wash the bolts in a suitable solvent, and wipe them dry. Check each bolt for any sign of visible wear or damage, renewing them if necessary. Measure the length of each bolt (without the washer fitted) from the underside of its head to the end of the bolt. If all bolts are less than 160 mm, they may be re-used. However, if any one bolt is longer than the specified length, *all* of the bolts should be renewed as a complete set. Considering the stress which the cylinder head bolts are under, it is highly recommended that they are renewed, regardless of their apparent condition.

Refitting

23 Wipe clean the mating surfaces of the cylinder head and cylinder block/crankcase. Check that the two locating dowels are in position at each end of the cylinder block/crankcase surface. Where applicable, remove the cylinder liner clamps.

24 Position a new gasket on the cylinder block/crankcase surface, ensuring that its identification holes or the projecting tongue are at the left-hand end of the gasket.

25 Check that the crankshaft pulley and camshaft sprocket are still locked in position with their respective pins. With the aid of an assistant, carefully refit the cylinder head assembly to the block, aligning it with the locating dowels.

26 Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Peugeot recommend the use of Molykote G Rapid Plus (available from your Peugeot dealer); in the absence of the specified grease, any good-quality high-melting-point grease may be used.

27 Carefully enter each bolt (and washer where applicable) into its relevant hole (*do not drop it in*) and screw it in finger-tight.

28 Working progressively and in the sequence shown **(see illustration)**, tighten the cylinder head bolts, to their Stage 1 torque setting.

29 Stage 2 torque setting on early models is in three steps on each bolt in turn (see Specifications). On later models the Stage 2 torque wrench setting is more straightforward.

30 With all the bolts tightened to their Stage 2 setting, working again in the specified sequence, angle-tighten the bolts through the specified Stage 3 angle, using a socket and extension bar. It is recommended that an angle-measuring gauge is used during this stage of tightening, to ensure accuracy. If a gauge is not available, use white paint to make alignment marks between the bolt head and cylinder head prior to tightening; the marks can then be used to check that the bolt has rotated sufficiently. Early models also have a Stage 4 angle.

31 Refit the timing belt to the camshaft sprocket as described in Section 8, and tension the belt as described in Section 7.

32 The remainder of the refitting procedure is a reversal of removal, noting the following points:

a) Ensure that all wiring is correctly routed, and that all connectors are securely reconnected to the correct components.
b) Ensure that the coolant hoses are correctly reconnected, and that their retaining clips are securely tightened.
c) Ensure that all vacuum/breather hoses are correctly reconnected.
d) Refit the cylinder head covers as described in Section 4.
e) Reconnect the exhaust system to the manifold, refit the air cleaner housing and ducts, and adjust the accelerator cable, as described in Chapter 4A. If the manifolds were removed, refit these as described in Chapter 4A.
f) On completion, refill the cooling system as described in Chapter 1A, and reconnect the battery.

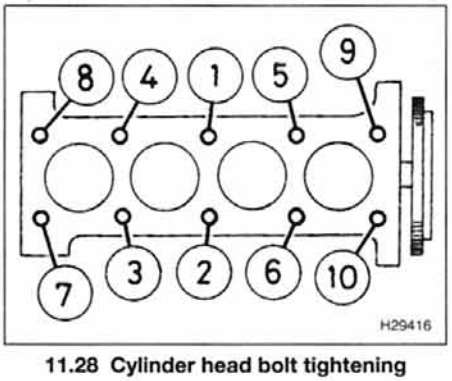
12 Sump – removal and refitting

Removal

1 Disconnect the battery negative terminal.

2 Chock the rear wheels, jack up the front of the vehicle and support it on axle stands.

3 Drain the engine oil as described in Chapter 1A, then clean and refit the engine oil drain plug, tightening it securely. If the engine is nearing its service interval when the oil and filter are due for renewal, it is recommended that the filter is also removed, and a new one fitted. After reassembly, the engine can then be refilled with fresh oil. Refer to Chapter 1A for further information.



11.28 Cylinder head bolt tightening sequence

4 Where necessary, disconnect the wiring connector from the oil temperature sender unit, which is screwed into the sump.

5 Remove the auxiliary drivebelt as described in Chapter 1A.

6 On models with air conditioning, where the compressor is located on the side of the sump, unbolt the compressor and position it clear of the sump. Support the weight of the compressor by tying it to the vehicle, to prevent any excess strain being placed on the compressor lines. *Do not* disconnect the refrigerant lines from the compressor (refer to the warnings given in Chapter 3).

7 Progressively slacken and remove all the sump retaining bolts. Since the sump bolts vary in length, remove each bolt in turn, and store it in its correct fitted order by pushing it through a clearly-marked cardboard template. This will avoid the possibility of installing the bolts in the wrong locations on refitting.

8 Break the joint by striking the sump with the palm of your hand. Lower the sump, and withdraw it from underneath the vehicle. Remove the gasket (where fitted), and discard it; a new one must be used on refitting. While the sump is removed, take the opportunity to check the oil pump pick-up/strainer for signs of clogging or splitting. If necessary, remove the pump as described in Section 13, and clean or renew the strainer.

9 On some models, a large spacer plate is fitted between the sump and the base of the cylinder block/crankcase. If this plate is fitted, undo the two retaining screws from diagonally-opposite corners of the plate. Remove the plate from the base of the engine, noting which way round it is fitted.

Refitting

10 Clean all traces of sealant/gasket from the mating surfaces of the cylinder block/crankcase and sump, then use a clean rag to wipe out the sump and the engine's interior.

11 Where a spacer plate is fitted, remove all traces of sealant/gasket from the spacer plate, then apply a thin coating of suitable sealant to the plate upper mating surface. Offer up the plate to the base of the cylinder block/crankcase, and securely tighten its retaining screws.

12 On models where the sump was fitted without a gasket, ensure that the sump mating surfaces are clean and dry, then apply a thin coating of suitable sealant to the sump mating surface.

13 On models where the sump was fitted with a gasket, ensure that all traces of the old gasket have been removed, and that the sump mating surfaces are clean and dry. Position the new gasket on the top of the sump, using a dab of grease to hold it in position.

14 Offer up the sump to the cylinder block/

crankcase. Refit its retaining bolts, ensuring that each is screwed into its original location. Tighten the bolts evenly and progressively to the specified torque setting.

15 On models with air conditioning, refit the compressor to the side of the sump and tighten the bolts.

16 Refit the auxiliary drivebelt (see Chapter 1A) and the pressure regulator accumulator.

17 Reconnect the wiring connector to the oil temperature sensor (where fitted).

18 Lower the vehicle to the ground, then refill the engine with oil as described in Chapter 1A and reconnect the battery negative terminal.

13 Oil pump – removal, inspection and refitting

Removal

1 Remove the sump (see Section 12).

2 Undo the two retaining screws, and slide the sprocket cover off the front of the oil pump.

3 Slacken and remove the three bolts securing the oil pump to the base of the cylinder block/crankcase. Disengage the pump sprocket from the chain, and remove the oil pump **(see illustration)**. Where necessary, also remove the spacer plate which is fitted behind the oil pump.

Inspection

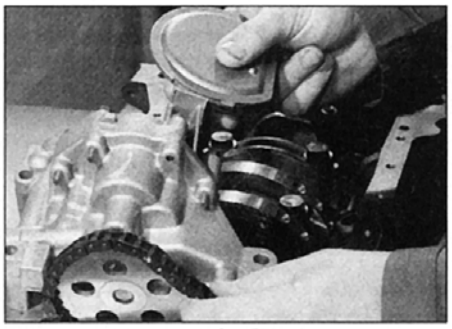
4 Examine the oil pump sprocket for signs of damage and wear, such as chipped or missing teeth. If the sprocket is worn, the pump assembly must be renewed, since the sprocket is not available separately. It is also recommended that the chain and drive sprocket, fitted to the crankshaft, be renewed at the same time. To renew the chain and drive sprocket, first remove the crankshaft timing belt sprocket as described in Section 8. Unbolt the oil seal carrier from the cylinder block. The sprocket, spacer (where fitted) and chain can then be slid off the end of the crankshaft.

5 Slacken and remove the bolts (along with the baffle plate, where fitted) securing the strainer cover to the pump body. Lift off the strainer cover, and take off the relief valve piston and spring, noting which way round they are fitted **(see illustrations)**.

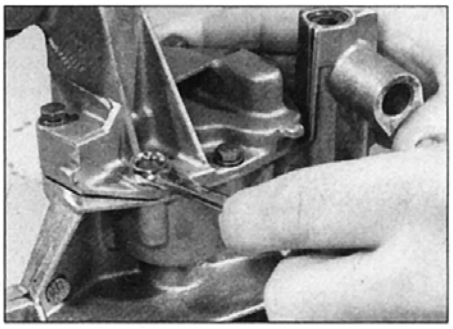
6 Examine the pump rotors and body for signs of wear ridges or scoring. If worn, the complete pump assembly must be renewed.

7 Examine the relief valve piston for signs of wear or damage, and renew if necessary. The condition of the relief valve spring can only be measured by comparing it with a new one; if there is any doubt about its condition, it should also be renewed. Both the piston and spring are available individually.

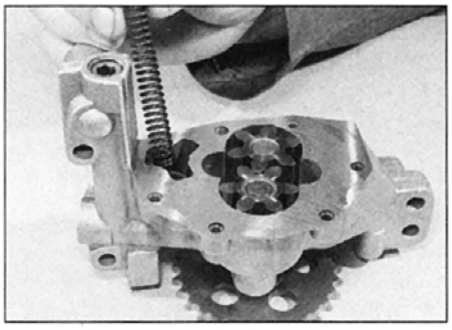
8 Thoroughly clean the oil pump strainer with a suitable solvent, and check it for signs of clogging or splitting. If the strainer is damaged, the strainer and cover assembly must be renewed.



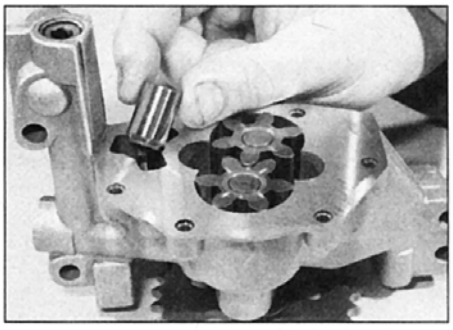
13.3 Removing the oil pump



13.5a Remove the oil pump cover retaining bolts . . .



13.5b . . . then lift off the cover and remove the spring . . .



13.5c . . . and the relief valve piston, noting which way round it is fitted

9 Locate the relief valve spring and piston in the strainer cover. Refit the cover to the pump body, aligning the relief valve piston with its bore in the pump. Refit the baffle plate (where fitted) and the cover retaining bolts, and tighten them securely.

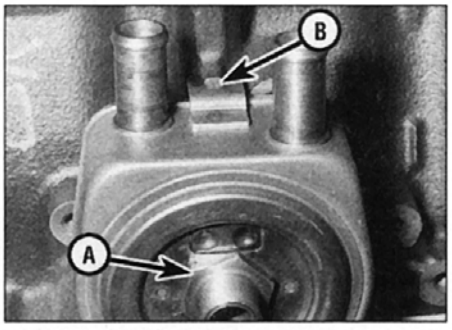
Refitting

10 Offer up the spacer plate (where fitted), then locate the pump sprocket with its drive chain. Seat the pump on the base of the cylinder block/crankcase. Refit the pump retaining bolts, and tighten them to the specified torque setting.

11 Where necessary, slide the sprocket cover into position on the pump. Refit its retaining bolts, tightening them securely.

12 Refit the sump as described in Section 12.

13 Before starting the engine, prime the oil pump as follows. Disconnect the fuel injector wiring connectors, then spin the engine on the starter until the oil pressure light goes out. Reconnect the injector wiring on completion.



14.5 Oil cooler/oil filter mounting bolt (A) and locating notch (B)

14 Oil cooler – removal and refitting

Removal

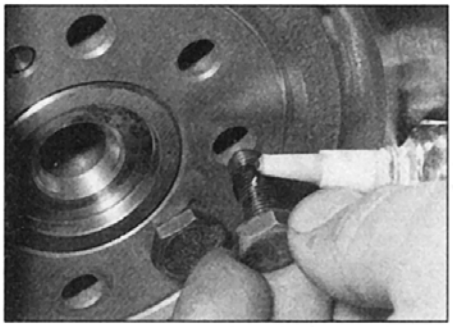
1 Firmly apply the handbrake, then jack up the front of the vehicle and support it on axle stands.

2 Drain the cooling system as described in Chapter 1A. Alternatively, clamp the oil cooler coolant hoses directly above the cooler, and be prepared for some coolant loss as the hoses are disconnected.

3 Position a suitable container beneath the oil filter. Unscrew the filter using an oil filter removal tool if necessary, and drain the oil into the container. If the oil filter is damaged or distorted during removal, it must be renewed. Given the low cost of a new oil filter relative to the cost of repairing the damage which could result if a re-used filter springs a leak, it is probably a good idea to renew the filter in any case.

4 Release the hose clips, and disconnect the coolant hoses from the oil cooler.

5 Unscrew the oil cooler/oil filter mounting bolt from the cylinder block, and withdraw the cooler. Note the locating notch in the cooler flange, which fits over the lug on the cylinder block **(see illustration)**. Discard the oil cooler sealing ring; a new one must be used on refitting.



16.10 If the new flywheel bolt threads are not supplied with their threads precoated, apply a locking compound to them . . .

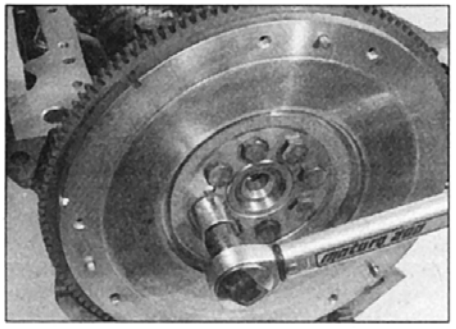
Refitting

6 Fit a new sealing ring to the recess in the rear of the cooler, then offer the cooler to the cylinder block.
7 Ensure that the locating notch in the cooler flange is correctly engaged with the lug on the cylinder block, then refit the mounting bolt and tighten it securely.
8 Fit the oil filter, then lower the vehicle to the ground. Top-up the engine oil level as described in *Weekly Checks*.
9 Refill or top-up the cooling system as described in Chapter 1A or *Weekly Checks* (as applicable). Start the engine, and check the oil cooler for signs of leakage.

15 Crankshaft oil seals – renewal

Right-hand oil seal

1 Remove the crankshaft sprocket and (where fitted) spacer, referring to Section 8. Secure the timing belt clear of the working area, so that it cannot be contaminated with oil. Make a note of the correct fitted depth of the seal in its housing.
2 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal. Alternatively, the seal can be levered out of position. Use a flat-bladed screwdriver, and take great care not to damage the crankshaft shoulder or seal housing.
3 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.
4 Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of the crankshaft. Note that its sealing lip must be facing inwards. Take care not to damage the seal lips during fitting.
5 Fit the new seal using a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Tap the seal into position, to the same depth in the housing as the original was prior to removal.
6 Wash off any traces of oil, then refit the crankshaft sprocket as described in Section 8.



16.12 . . . then refit the flywheel, and tighten the bolts to the specified torque

Left-hand oil seal

7 Remove the flywheel/driveplate as described in Section 16. Make a note of the correct fitted depth of the seal in its housing.
8 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.
9 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.
10 Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of the crankshaft.
11 Fit the new seal using a suitable tubular drift, which bears only on the hard outer edge of the seal. Drive the seal into position, to the same depth in the housing as the original was prior to removal.
12 Wash off any traces of oil, then refit the flywheel/driveplate as described in Section 16.

16 Flywheel/driveplate – removal, inspection and refitting

Removal

Flywheel

1 Remove the transmission as described in Chapter 7A, then remove the clutch assembly as described in Chapter 6.
2 Prevent the flywheel from turning by locking the ring gear teeth with a similar arrangement to that described in Section 5. Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase. *Do not* attempt to lock the flywheel in position using the crankshaft pulley locking pin described in Section 3.
3 Slacken and remove the flywheel retaining bolts, and remove the flywheel from the end of the crankshaft. Be careful not to drop it; it is heavy. If the flywheel locating dowel is a loose fit in the crankshaft end, remove it and store it with the flywheel for safe-keeping. Discard the flywheel bolts; new ones must be used on refitting.

Driveplate

4 Remove the transmission as described in Chapter 7B. Lock the driveplate as described in paragraph 2. Mark the relationship between the torque converter plate and the driveplate, and slacken all the driveplate retaining bolts.
5 Remove the retaining bolts, along with the torque converter plate and (where fitted) the two shims (one fitted on each side of the torque converter plate). Note that the shims are of different thickness, the thicker one being on the outside of the torque converter plate. Discard the driveplate retaining bolts; new ones must be used on refitting.
6 Remove the driveplate from the end of the crankshaft. If the locating dowel is a loose fit in the crankshaft end, remove it and store it with the driveplate for safe-keeping.

Inspection

7 On models with manual transmission, examine the flywheel for scoring of the clutch face, and for wear or chipping of the ring gear teeth. If the clutch face is scored, the flywheel may be surface-ground, but renewal is preferable. Seek the advice of a Peugeot dealer or engine reconditioning specialist to see if machining is possible. If the ring gear is worn or damaged, the flywheel must be renewed, as it is not possible to renew the ring gear separately.
8 On models with automatic transmission, check the torque converter driveplate carefully for signs of distortion. Look for any hairline cracks around the bolt holes or radiating outwards from the centre, and inspect the ring gear teeth for signs of wear or chipping. If any sign of wear or damage is found, the driveplate must be renewed.

Refitting

Flywheel

9 Clean the mating surfaces of the flywheel and crankshaft. Remove any remaining locking compound from the threads of the crankshaft holes, using the correct-size tap, if available.

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If a suitable tap is not available, cut two slots into the threads of one of the old flywheel bolts and use the bolt to remove the locking compound from the threads.

10 If the new flywheel retaining bolts are not supplied with their threads already precoated, apply a suitable thread-locking compound to the threads of each bolt **(see illustration)**.
11 Ensure the locating dowel is in position. Offer up the flywheel, locating it on the dowel, and fit the new retaining bolts.
12 Lock the flywheel using the method employed on dismantling, and tighten the retaining bolts to the specified torque **(see illustration)**.

13 Refit the clutch as described in Chapter 6. Remove the flywheel locking tool, and refit the transmission as described in Chapter 7A.

Driveplate

14 Carry out the operations described above in paragraphs 9 and 10, substituting 'driveplate' for all references to the flywheel.
15 Locate the driveplate on its locating dowel.
16 Offer up the torque converter plate, with the thinner shim positioned behind the plate and the thicker shim on the outside, and align the marks made prior to removal.
17 Fit the new retaining bolts, then lock the driveplate using the method employed on dismantling. Tighten the retaining bolts to the specified torque wrench setting.
18 Remove the driveplate locking tool, and refit the transmission as described in Chapter 7B.

17 Engine/transmission mountings – inspection and renewal

Inspection

1 If improved access is required, raise the front of the car and support it securely on axle stands.
2 Check the mounting rubber to see if it is cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.
3 Check that all the mounting's fasteners are securely tightened; use a torque wrench to check if possible.
4 Using a large screwdriver or a crowbar, check for wear in the mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission unit back-and-forth, or from side-to-side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

Renewal

Right-hand mounting

5 Disconnect the battery negative terminal. Release all the relevant hoses and wiring from their retaining clips. Place the hoses/wiring clear of the mounting so that the removal procedure is not hindered.
6 Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.
7 Slacken and remove the two nuts and two bolts securing the right-hand engine/transmission mounting bracket to the engine. Remove the single nut securing the bracket to the mounting rubber.
8 Undo the bolt securing the upper engine movement limiter to the right-hand mounting bracket, and the four bolts securing the movement limiter mounting bracket to the body. Lift away the right-hand mounting bracket and the movement limiter assembly.
9 Lift the rubber buffer plate off the mounting rubber stud, then unscrew the mounting rubber from the body and remove it from the vehicle. If necessary, the mounting bracket can be unbolted and removed from the front of the cylinder block.
10 Check all components carefully for signs of wear or damage, and renew as necessary.
11 On reassembly, screw the mounting rubber into the vehicle body, and tighten it securely. Refit the mounting bracket to the front of the cylinder head, and securely tighten its retaining bolts.
12 Refit the engine movement limiter assembly to the engine mounting bracket and to the body and tighten the bolts to the specified torque.
13 Refit the rubber buffer plate to the mounting rubber stud, and install the mounting bracket.
14 Tighten the mounting bracket retaining nuts to the specified torque setting. Remove the jack from underneath the engine and reconnect the battery.

Left-hand mounting

15 Remove the air cleaner assembly, as described in Chapter 4A.
16 Place a jack beneath the transmission, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the transmission.
17 Slacken and remove the centre nut and washer from the left-hand mounting, then undo the nuts securing the mounting in position and remove it from the engine compartment.
18 If necessary, slide the spacer (where fitted) off the mounting stud, then unscrew the stud from the top of the transmission housing, and remove it along with its washer. If the mounting stud is tight, a universal stud extractor can be used to unscrew it.
19 Check all components carefully for signs of wear or damage, and renew as necessary.
20 Clean the threads of the mounting stud, and apply a coat of thread-locking compound to its threads. Refit the stud and washer to the top of the transmission, and tighten it to the specified torque setting.
21 Slide the spacer (where fitted) onto the mounting stud, then refit the rubber mounting. Tighten both the mounting-to-body bolts and the mounting centre nut to their specified torque settings, and remove the jack from underneath the transmission.
22 Refit the air cleaner assembly, then refit the battery as described in Chapter 5A.

Lower engine movement limiter

23 If not already done, chock the rear wheels, then jack up the front of the vehicle and support it securely on axle stands.
24 Unscrew and remove the bolt securing the movement limiter link to the driveshaft intermediate bearing housing.
25 Remove the bolt securing the link to the subframe. Withdraw the link.
26 To remove the intermediate bearing housing assembly it will first be necessary to remove the right-hand driveshaft as described in Chapter 8.
27 With the driveshaft removed, undo the retaining bolts and remove the bearing housing from the rear of the cylinder block.
28 Check carefully for signs of wear or damage on all components, and renew them where necessary.
29 On reassembly, fit the bearing housing assembly to the rear of the cylinder block, and tighten its retaining bolts securely. Refit the driveshaft as described in Chapter 8.
30 Refit the movement limiter link, and tighten both its bolts to their specified torque settings.
31 Lower the vehicle to the ground.

Chapter 2 Part B:
EW series petrol engine in-car repair procedures

Contents

Degrees of difficulty

Easy, suitable for novice with little experience	**Fairly easy,** suitable for beginner with some experience	**Fairly difficult,** suitable for competent DIY mechanic	**Difficult,** suitable for experienced DIY mechanic	**Very difficult,** suitable for expert DIY or professional

Specifications

Engine (general)

Designation:	
1.8 litre (1749 cc engine)	EW7J4 L4
2.0 litre (1997 cc engine)	EW10J4 KL3
2.0 litre (1997 cc engine)	EW10J4 IFL5
Engine codes*:	
1.8 litre engine (EW7J4 L4)	6FZ
2.0 litre engine (EW10J4 KL3)	RFR
2.0 litre engine (EW10J4 IFL5)	RFN
Bore:	
1.8 litre engine	82.70 mm
2.0 litre engine	85.00 mm
Stroke:	
1.8 litre engine	81.40 mm
2.0 litre engine	88.00 mm
Direction of crankshaft rotation	Clockwise (viewed from the right-hand side of vehicle)
No 1 cylinder location	At the transmission end of block
Compression ratio	10.8 : 1

** The engine code is stamped on a plate attached to the front right-hand end of the cylinder block, below the right-hand branch of the exhaust manifold. The code is the first 3-digits on the first line, and this is the code most often used by Peugeot.*

Camshaft

Drive	Toothed belt
No of bearings	5
Camshaft bearing journal diameter:	
Journal A:	
Nominal	28.00 –0.020, –0.041 mm
Oversize	28.50 –0.020, –0.041 mm
Journal B:	
Nominal	28.50 –0.020, –0.041 mm
Oversize	29.00 –0.020, –0.041 mm
Journal C:	
Nominal	29.00 –0.020, –0.041 mm
Oversize	29.50 –0.020, –0.041 mm
Journal D:	
Nominal	29.50 –0.020, –0.041 mm
Oversize	30.00 –0.020, –0.041 mm
Journal E:	
Nominal	30.00 –0.020, –0.041 mm
Oversize	30.50 –0.020, –0.041 mm
Cylinder head bearing journal diameter:	
Journal A:	
Nominal	30.00 +0.033, +0 mm
Oversize	30.50 +0.033, +0 mm
Journal B:	
Nominal	29.50 +0.033, +0 mm
Oversize	30.00 +0.033, +0 mm
Journal C:	
Nominal	29.00 +0.033, +0 mm
Oversize	29.50 +0.033, +0 mm
Journal D:	
Nominal	28.50 +0.033, +0 mm
Oversize	29.00 +0.033, +0 mm
Journal E:	
Nominal	28.00 +0.033, +0 mm
Oversize	28.50 +0.033, +0 mm

Lubrication system

Oil pump type	Crescent-type driven directly from crankshaft
Minimum oil pressure at 80°C:	
1000 rpm	1.5 bars
3000 rpm	5.0 bars
Oil pressure warning switch operating pressure	0.5 bars

Torque wrench settings

	Nm	lbf ft
Big-end bearing bolts:		
Stage 1	10	7
Stage 2	Slacken each bolt 180°	
Stage 3	23	17
Stage 4	Angle-tighten a further 46° ± 5°	
Camshaft bearing housings	9	7
Camshaft sprocket/hub-to-camshaft retaining bolts	75	55
Camshaft sprocket-to-hub retaining bolts	9	7
Crankshaft pulley retaining bolt (with gold washer):		
Stage 1	40	30
Stage 2	Angle-tighten a further 53°	
Crankshaft pulley retaining bolt (with metallic washer):		
Stage 1	40	30
Stage 2	Angle-tighten a further 40°	
Crankshaft sprocket centre bolt:		
Stage 1	40	30
Stage 2	Angle tighten a further 53°	
Cylinder head bolts:		
Stage 1	15	11
Stage 2	50	37
Stage 3	Slacken each bolt 360°	
Stage 4	20	15
Stage 5	Angle-tighten through a further 285° (using max 2 steps per bolt)	

Torque wrench settings (continued)	Nm	lbf ft
Cylinder head cover bolts:		
Stage 1	5	4
Stage 2	11	8
Engine-to-transmission fixing bolts	45	33
Flywheel/driveplate retaining bolts (new):		
Stage 1	25	18
Stage 2	Slacken fully	
Stage 3	8	6
Stage 4	20	15
Stage 5	Angle-tighten a further 21° ± 3°	
Left-hand engine/transmission mounting:		
Mounting bracket-to-body bolts	22	16
Mounting bracket-to-transmission bolts	60	44
Rubber mounting centre nut	65	48
Rubber mounting-to-bracket nuts	22	16
Main bearing cap housing:		
Stage 1 – 11.0 mm diameter bolts	10	7
Stage 2 – 6.0 mm diameter bolts	2	1
Stage 3 – 11.0 mm diameter bolts	Slacken fully	
Stage 4 – 11.0 mm diameter bolts	10	7
Stage 5 – 11.0 mm diameter bolts	Angle-tighten a further 70° ± 5°	
Stage 6 – 6.0 mm diameter bolts	10	7
Oil pump-to-engine bolts:		
Stage 1	7	5
Stage 2	9	7
Rear engine/transmission mounting:		
Connecting link-to-mounting bracket bolt	55	41
Connecting link-to-subframe bolt	55	41
Mounting bracket-to-cylinder block bolts	45	33
Right-hand engine/transmission mounting:		
Rubber mounting centre nut	45	33
Rubber mounting to body	22	16
Upper mounting bracket-to-lower (engine) bracket nuts	61	45
Sump retaining bolts	8	6
Timing belt tensioner pulley bolt	21	16
Timing belt idler pulley bolt:		
Stage 1	15	11
Stage 2	37	27

1 General information

How to use this Chapter

This Part of Chapter 2 describes those repair procedures that can reasonably be carried out on the engine, while it remains in the car. If the engine has been removed from the car and is being dismantled as described in Part D, any preliminary dismantling procedures can be ignored.

Note that, while it may be possible physically to overhaul items such as the piston/connecting rod assemblies while the engine is in the car, such tasks are not usually carried out as separate operations. Usually, several additional procedures (not to mention the cleaning of components and oil ways) have to be carried out. For this reason, all such tasks are classed as major overhaul procedures, and are described in Part D of this Chapter.

Part D describes the removal of the engine/transmission unit from the vehicle, and the full overhaul procedures that can then be carried out.

EW series engine

The engine is of in-line four-cylinder, double-overhead camshaft, 16-valve type, mounted transversely at the front of the car. The engine is inclined rearwards by 17°, and the clutch and transmission are attached to its left-hand end.

The engine is of conventional 'dry-liner' type, and the cylinder block is cast in aluminium.

The crankshaft runs in five main bearings. Thrust washers are fitted to No 2 main bearing cap, to control crankshaft endfloat.

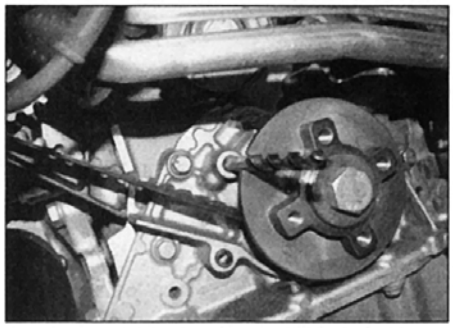
The connecting rods rotate on horizontally-split bearing shells at their big-ends. The pistons are attached to the connecting rods by gudgeon pins. The gudgeon pins are an interference fit in the connecting rod small-end eyes. The aluminium alloy pistons are fitted with three piston rings – two compression rings and an oil control ring.

The camshafts are driven by a toothed timing belt, and operate sixteen valves by followers located beneath each cam lobe. The valve clearances are self-adjusting by means of hydraulic tappets fitted to the cam followers. The camshaft runs in bearing cap housings which are bolted to the top of the cylinder head. The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head. Both the valve seats and guides can be renewed separately if worn.

The coolant pump is driven by the timing belt and located in the right-hand end of the cylinder block.

Lubrication is by means of an oil pump driven off the crankshaft right-hand end. It draws oil through a strainer located in the sump, and then forces it through an externally-mounted filter into galleries in the cylinder block/crankcase. From there, the oil is distributed to the crankshaft (main bearings) and camshaft. The big-end bearings are supplied with oil via internal drillings in the crankshaft; the camshaft bearings also receive a pressurised supply. The camshaft lobes and valves are lubricated by splash, as are all other engine components.

Throughout the manual, it is often necessary to identify the engines not only by their cubic capacity, but also by their engine code. The engine code consists of three digits (eg, 6FZ). The code is stamped on a plate attached to the front, left-hand end of the cylinder block, or stamped directly onto the front face of the



3.5 8.0 mm diameter drill bit inserted through the crankshaft sprocket end plate timing hole, and engaged in the corresponding hole in the oil pump housing

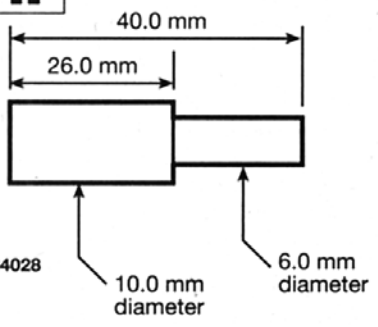
cylinder block, on the machined surface located just to the left of the oil filter (next to the crankcase vent hose union).

Repair operations possible with the engine in the car

The following work can be carried out with the engine in the car:

- *a) Compression pressure – testing.*
- *b) Cylinder head covers – removal and refitting.*
- *c) Crankshaft pulley – removal and refitting.*
- *d) Timing belt covers – removal and refitting.*
- *e) Timing belt – removal, refitting and adjustment.*
- *f) Timing belt tensioner and sprockets – removal and refitting.*
- *g) Camshaft oil seals – renewal.*
- *h) Camshafts and followers – removal, inspection and refitting.*
- *i) Cylinder head – removal and refitting.*
- *j) Cylinder head and pistons – decarbonising.*
- *k) Sump – removal and refitting.*
- *l) Oil pump – removal, overhaul and refitting.*
- *m) Crankshaft oil seals – renewal.*
- *n) Engine/transmission mountings – inspection and renewal.*
- *o) Flywheel/driveplate – removal, inspection and refitting.*

TOOL TiP



Camshaft sprocket locking tools can be made from 10.0 mm diameter steel bar, fabricated to the dimensions shown.

2 Compression test – description and interpretation

1 When engine performance is down, or if misfiring occurs which cannot be attributed to the ignition or fuel systems, a compression test can provide diagnostic clues as to the engine's condition. If the test is performed regularly, it can give warning of trouble before any other symptoms become apparent.

2 The engine must be fully warmed-up to normal operating temperature, the battery must be fully charged, and all the spark plugs must be removed (Chapter 1A). The aid of an assistant will also be required.

3 Disable the fuel system by disconnecting the wiring connectors from the fuel injectors, referring to Chapter 4A, Section 13, for further information.

4 Fit a compression tester to the No 1 cylinder spark plug hole – the type of tester which screws into the plug thread is to be preferred.

5 Have the assistant hold the throttle wide open, and crank the engine on the starter motor; after one or two revolutions, the compression pressure should build up to a maximum figure, and then stabilise. Record the highest reading obtained.

6 Repeat the test on the remaining cylinders, recording the pressure in each.

7 All cylinders should produce very similar pressures; a difference of more than 2 bars between any two cylinders indicates a fault. Note that the compression should build-up quickly in a healthy engine; low compression on the first stroke, followed by gradually-increasing pressure on successive strokes, indicates worn piston rings. A low compression reading on the first stroke, which does not build-up during successive strokes, indicates leaking valves or a blown head gasket (a cracked head could also be the cause). Deposits on the undersides of the valve heads can also cause low compression.

8 Although Peugeot do not specify exact compression pressures, as a guide, any cylinder pressure of below 10 bars can be considered as less than healthy. Refer to a Peugeot dealer or other specialist if in doubt as to whether a particular pressure reading is acceptable.

9 If the pressure in any cylinder is low, carry out the following test to isolate the cause. Introduce a teaspoonful of clean oil into that cylinder through its spark plug hole, and repeat the test.

10 If the addition of oil temporarily improves the compression pressure, this indicates that bore or piston wear is responsible for the pressure loss. No improvement suggests that leaking or burnt valves, or a blown head gasket, may be to blame.

11 A low reading from two adjacent cylinders is almost certainly due to the head gasket having blown between them; the presence of coolant in the engine oil will confirm this.

12 If one cylinder is about 20 percent lower than the others and the engine has a slightly rough idle, a worn camshaft lobe could be the cause.

13 On completion of the test, refit the spark plugs and reconnect the wiring.

3 Engine assembly/ valve timing holes – general information and usage

Note: *Do not attempt to rotate the engine whilst the crankshaft/camshaft are locked in position. If the engine is to be left in this state for a long period of time, it is a good idea to place suitable warning notices inside the vehicle, and in the engine compartment. This will reduce the possibility of the engine being accidentally cranked on the starter motor, which is likely to cause damage with the locking pins in place.*

1 Timing holes are drilled in the crankshaft sprocket end plate and in the two camshaft sprockets. The holes are used to ensure that the crankshaft and camshafts are correctly positioned when assembling the engine (to prevent the possibility of the valves contacting the pistons when refitting the cylinder head), or refitting the timing belt. When the timing holes are aligned with corresponding holes in the cylinder head and oil pump housing, suitable diameter pins or bolts can be inserted to lock both the camshafts and crankshaft in position, preventing them from rotating. To set the engine in the timing position, proceed as follows.

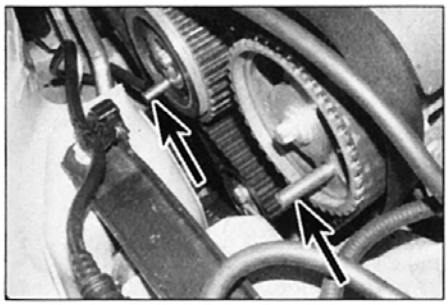
2 Remove the crankshaft pulley as described in Section 5.

3 Remove the timing belt upper (outer) and lower covers as described in Section 6.

4 Using a socket and extension bar fitted to the crankshaft sprocket centre bolt, turn the crankshaft in the normal direction of rotation until the timing holes in both camshaft sprockets are aligned with their corresponding holes in the cylinder head. The holes are aligned when the inlet camshaft sprocket hole is in approximately the 5 o'clock position and the exhaust camshaft sprocket hole is in approximately the 7 o'clock position, when viewed from the right-hand end of the engine. Use a small mirror to accurately observe the position of the holes.

5 With the camshaft sprocket holes correctly positioned, insert an 8.0 mm diameter drill bit or bolt through the timing hole in the crankshaft sprocket end plate, and locate it in the corresponding hole in the oil pump housing **(see illustration)**. **Note:** *It may be found that an 8.0 mm drill is too large, in which case a 5/16 in drill may be required.*

6 The camshaft sprockets can now be locked in position using the Peugeot camshaft setting rods, or suitable home-made alternatives **(see Tool Tip)**. With the crankshaft locked in position, insert the Peugeot special tools, or alternatives, through the timing hole in each camshaft sprocket and locate it in the corresponding hole in the cylinder head **(see illustration)**.



3.6 Camshaft sprocket locking tools inserted through the timing hole in each sprocket

7 The crankshaft and camshafts are now locked in position, preventing rotation. In this position the crankshaft is at 90° BTDC and all the pistons are positioned half-way down their cylinder bores.

4 Cylinder head covers – removal and refitting

Removal

1 If the covers are being removed for major dismantling, disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual) and remove the engine cover. Remove the crankcase ventilation hose and camshaft position sensor from the rear cylinder head cover **(see illustrations)**.

2 Progressively unscrew the bolts securing the cylinder head covers to the cylinder head. The bolts must be unscrewed in a spiral sequence starting from the outside.

3 Remove the cylinder head covers and gaskets **(see illustrations)**. Unless they are obviously damaged, do not attempt to remove the rubber gaskets from the covers.

Refitting

4 Thoroughly clean the surfaces of the covers and cylinder head.

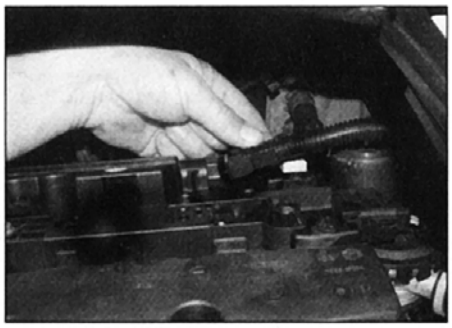
5 If necessary, fit new gaskets and locate the covers on the head **(see illustration)**. Insert the retaining bolts and finger-tighten them.

6 Progressively tighten the bolts to the Stage 1 torque, in sequence **(see illustration)**, then tighten them to the Stage 2 torque.

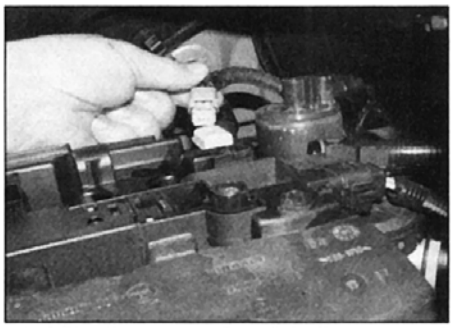
7 Check the condition of the O-ring seal on the camshaft position sensor and renew the seal if it is in any way suspect.

8 Refit the camshaft position sensor and secure with the retaining bolt. Reconnect the sensor wiring connector.

9 Reconnect the breather hose to the rear cover.

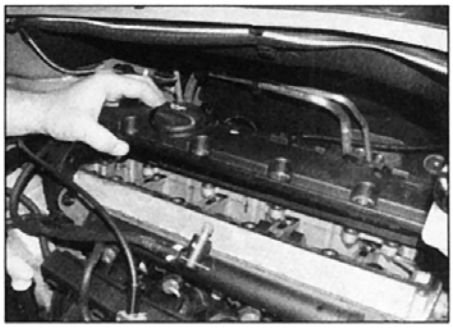


4.1a Disconnect the crankcase breather hose from the rear cylinder head cover

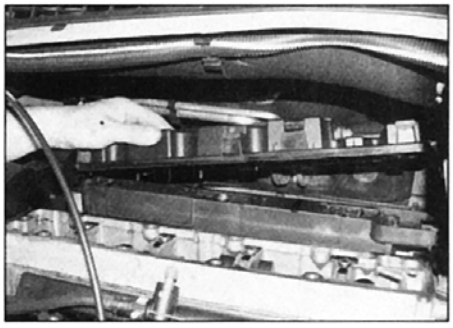


4.1b Disconnect the camshaft position sensor wiring connector . . .

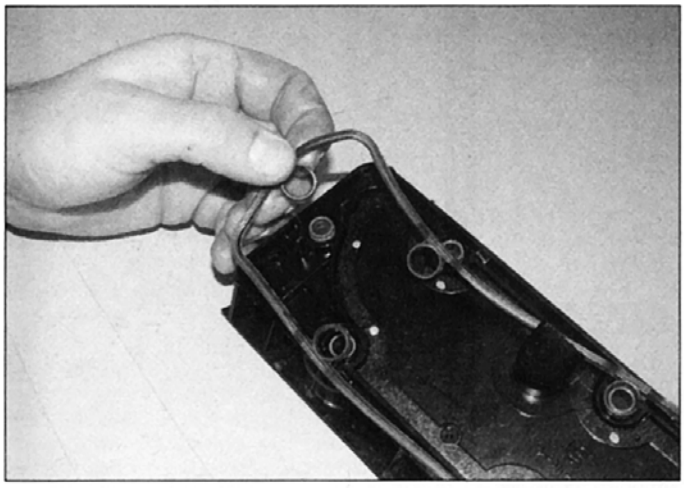
4.1c . . . then undo the bolt and remove the sensor from the rear cylinder head cover



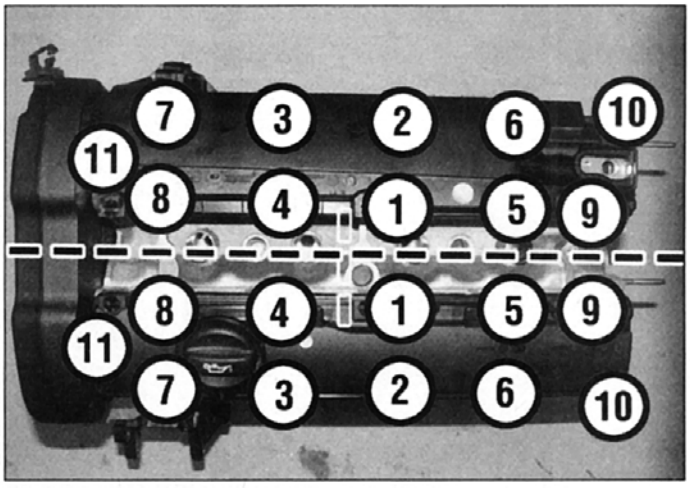
4.3a Undo the retaining bolts and lift off the front . . .



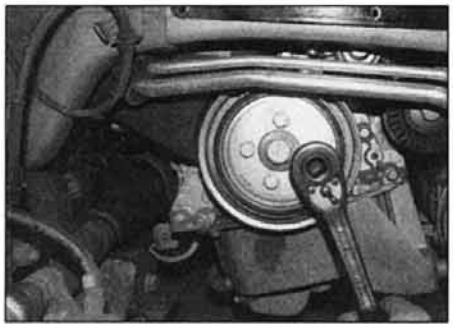
4.3b . . . and rear cylinder head covers



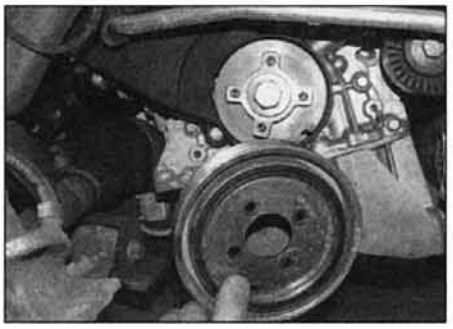
4.5 Locate the cylinder head cover seal in the groove, ensuring that it is fully seated along its entire length



4.6 Cylinder head cover bolt tightening sequence



5.3a Undo the four crankshaft pulley retaining bolts . . .



5.3b . . . and remove the pulley from the crankshaft sprocket end plate

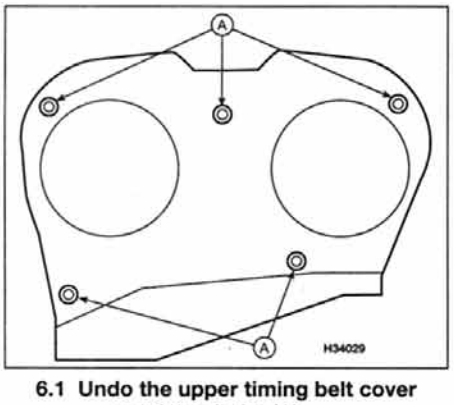
5 Crankshaft pulley – removal and refitting

Removal

1 Remove the auxiliary drivebelt (Chapter 1A).
2 To prevent the crankshaft turning whilst the pulley retaining bolt is being slackened on manual transmission models, select 4th gear and have an assistant apply the brakes firmly. On automatic transmission models it will be necessary to remove the starter motor (Chapter 5A) and lock the driveplate with a suitable tool. If the engine has been removed from the vehicle, lock the flywheel ring gear as described in Section 8. *Do not* attempt to lock the pulley by inserting a bolt/drill through the timing hole. If the locking pin is in position, temporarily remove it prior to slackening the pulley bolt, then refit it once the bolt has been slackened.
3 Undo the four crankshaft pulley retaining bolts and remove the pulley from the crankshaft sprocket end plate **(see illustrations)**.

Refitting

4 Locate the pulley on the crankshaft sprocket end plate, refit the four retaining bolts and tighten them to the specified torque and angle.
5 Refit and tension the auxiliary drivebelt as described in Chapter 1A.



6.1 Undo the upper timing belt cover retaining bolts (A) . . .

6.2 . . . and withdraw the cover from the cylinder head

6 Timing belt covers – removal and refitting

Removal

Upper (outer) cover

1 Undo the upper and lower retaining bolts securing the outer cover to the inner cover **(see illustration)**. Slide the cover retaining clip upwards to release it from its fasteners.
2 Ease the outer cover upwards and away from the engine, freeing it from its lower locations **(see illustration)**.

Lower cover

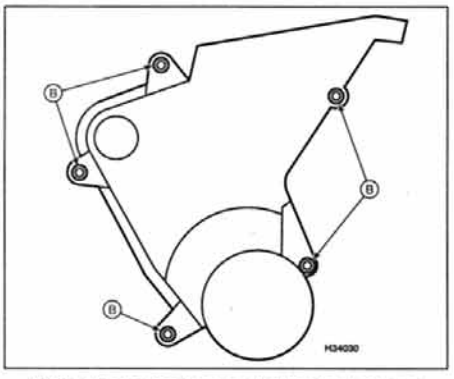
3 Remove the crankshaft pulley as described in Section 5.
4 Remove the upper (outer) cover as described above.
5 Slacken and remove the three retaining bolts, then remove the lower timing belt cover from the engine **(see illustrations)**. Note that on some models it may be necessary to unbolt the auxiliary drivebelt tensioner assembly and remove it from the engine in order to allow the cover to be removed.

Upper (inner) cover

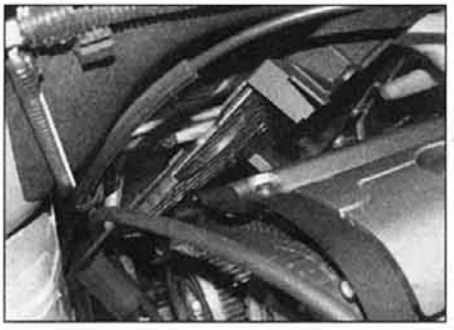
6 Remove the timing belt as described in Section 7.
7 Remove both camshaft sprockets as described in Section 8.
8 Remove the bolts securing the cover to the side of the cylinder head, and remove the cover from the engine **(see illustration)**.

Refitting

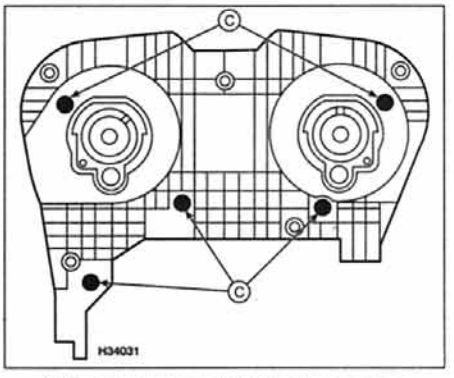
9 Refitting is a reversal of the relevant removal procedure, ensuring that each cover section is correctly located, and that the cover retaining nuts and/or bolts are securely tightened to the specified torque. When refitting the upper (inner) cover, apply thread locking compound to the retaining bolts.



6.5a Undo the lower timing belt cover retaining bolts (B) . . .



6.5b . . . and manipulate the cover up and out from between the engine and bulkhead



6.8 Upper (inner) timing belt cover retaining bolts (C)

7 Timing belt – general information, removal and refitting

Note: *From September 2000, modified camshaft sprockets were fitted. In particular, the exhaust camshaft pinion was fitted with a damper, and sprocket hubs were discontinued.*

General information

1 The timing belt drives the camshafts and coolant pump from a toothed sprocket on the end of the crankshaft. If the belt breaks or slips in service, the pistons are likely to hit the valve heads, resulting in extensive (and expensive) damage.

2 The timing belt should be renewed at the specified intervals (see Chapter 1A), or earlier if it is contaminated with oil, or if it is at all noisy in operation (a 'scraping' noise due to uneven wear).

3 If the timing belt is being removed, it is a wise precaution to check the condition of the coolant pump at the same time (check for signs of coolant leakage). This may avoid the need to remove the timing belt again at a later stage, should the coolant pump fail.

4 The crankshaft sprocket is a two-piece assembly consisting of the toothed sprocket itself and an outer end plate. The end plate is locked to the crankshaft by means of a conventional Woodruff key. When the sprocket retaining bolt is slackened, the sprocket is free to turn on the crankshaft within the limits afforded by an additional keyway within the end plate. When the sprocket retaining bolt is tightened the complete assembly is locked to the crankshaft. This arrangement allows accurate tensioning of the timing belt when refitting, provided that the procedures contained in this Section are strictly adhered to.

Removal

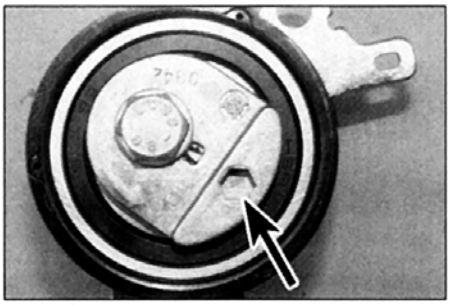
5 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Chapter).

6 Remove the upper (outer) and lower timing belt covers as described in Section 6.

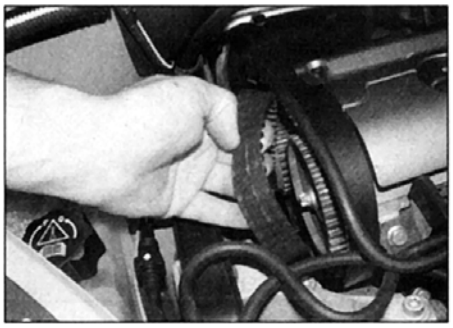
7 Align the engine assembly/valve timing holes as described in Section 3, and lock the crankshaft sprocket and camshaft sprockets in position. *Do not* attempt to rotate the engine whilst the locking tools are in position.

8 Loosen the timing belt tensioner pulley retaining bolt. Using an Allen key in the hole provided on the front of the pulley, rotate the pulley in a clockwise direction, to relieve the tension from the timing belt **(see illustration)**. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.

9 If the timing belt is to be re-used, use white paint or chalk to mark the direction of rotation on the belt (if markings do not already exist), then slip the belt off the sprockets and pulleys **(see illustration)**. Note that the crankshaft must not be rotated whilst the belt is removed.



7.8 Using an Allen key in the hole (arrowed) on the tensioner pulley, rotate the pulley clockwise to relieve the tension from the timing belt



7.9 With the tensioner released, slip the timing belt off the sprockets and pulleys

10 Check the timing belt carefully for any signs of uneven wear, splitting, or oil contamination. Pay particular attention to the roots of the teeth. Renew it if there is the slightest doubt about its condition. If the engine is undergoing an overhaul, it is advisable to renew the belt as a matter of course, regardless of its apparent condition. The cost of a new belt is nothing compared with the cost of repairs, should the belt break in service. If signs of oil contamination are found, trace the source of the oil leak and rectify it. Wash down the engine timing belt area and all related components, to remove all traces of oil.

Refitting

11 Before refitting, thoroughly clean the timing belt sprockets. Check that the tensioner and idler pulleys rotate freely, without any sign of roughness. If necessary, renew the relevant pulley as described in Section 8.

Sprocket with hubs

12 Without removing the locking pins, slacken the six camshaft sprocket retaining bolts (three on each sprocket). Check that both sprockets are free to turn within the limits of their elongated bolt holes.

13 Tighten the six camshaft sprocket retaining bolts finger tight, then slacken them all by one sixth of a turn.

14 Turn each sprocket clockwise to the ends of their retaining bolt slots.

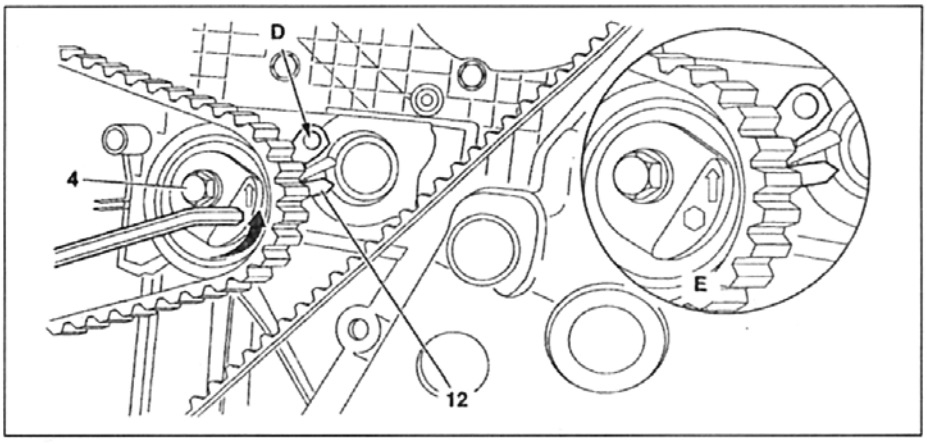
15 With the timing belt engaged with the crankshaft sprocket, keep it tight on its front run and engage it with the front idler pulley then up and into engagement with the inlet camshaft sprocket. If the belt teeth are not aligned with the sprocket teeth, carefully turn the inlet camshaft sprocket anti-clockwise until the belt engages. **Note:** *It is important that the pulley is not turned anti-clockwise more than 1 tooth.*

16 Keeping the belt tight, feed the belt over the exhaust camshaft sprocket and again if necessary, turn the exhaust camshaft sprocket anti-clockwise until the belt engages. **Note:** *It is important that the pulley is not turned anti-clockwise more than 1 tooth.*

17 While still keeping the belt tight, feed it over the rear tensioner pulley and finally around the coolant pump.

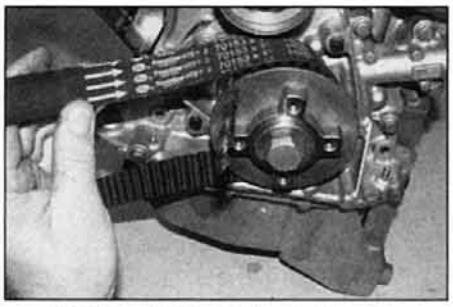
18 Refit the tensioner roller and engage the roller bracket with the rib on the block. Turn the tensioner lightly anti-clockwise to tension the belt, then finger-tighten the tensioner retaining bolt to retain the tensioner.

19 The tensioner pulley must now be turned anti-clockwise until the pointer is positioned as shown **(see illustration).** Use a suitable Allen key in the tensioner hub to do this. Hold

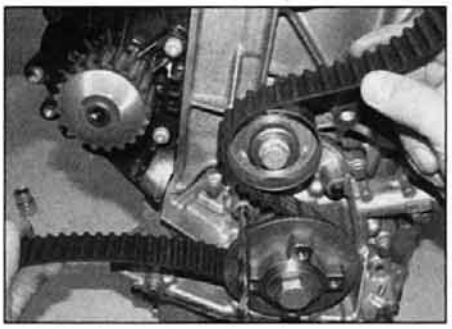


7.19 Turn the tensioner pulley anti-clockwise until the pointer (12) is in the position E

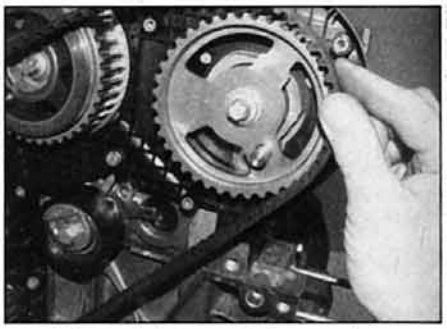
4 Retaining bolt *D Tensioner roller bracket setting hole*



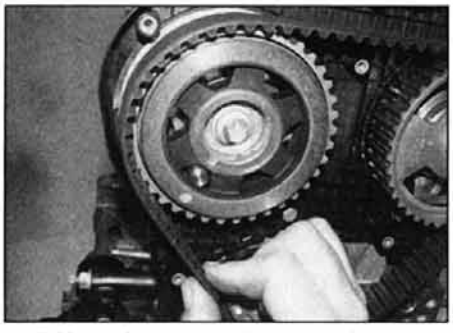
7.27 Locate the timing belt on the crankshaft sprocket, with the arrows on the belt pointing in the direction of rotation



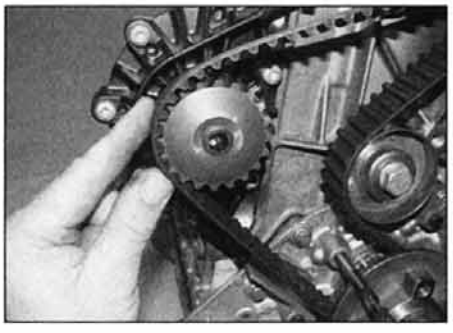
7.28a Retain the belt on the crankshaft sprocket and feed it over the idler pulley . . .



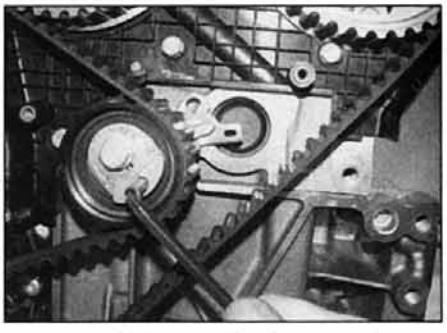
7.28b . . . inlet camshaft sprocket . . .



7.28c exhaust camshaft sprocket . . .



7.28d . . . coolant pump and tensioner pulley



7.30a Using an Allen key, turn the tensioner pulley anti-clockwise . . .

the tensioner in this position and tighten the retaining bolt to the specified torque.

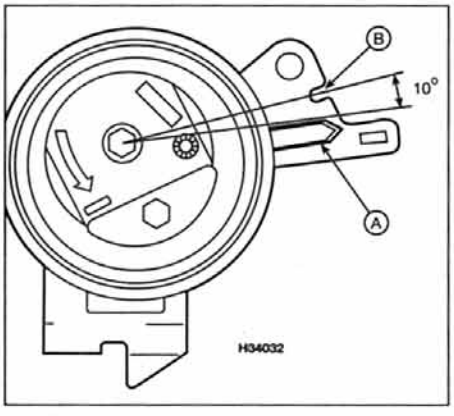
20 Remove one retaining bolt from each camshaft sprocket and check that the sprockets are not at the end of their retaining bolt slots. If they are, repeat the refitting operation. If all is satisfactory, refit the two removed bolts, and tighten all six sprocket retaining bolts to the specified torque.

21 Remove the locking pins, then rotate the crankshaft through six complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Do not turn the crankshaft anti-clockwise.

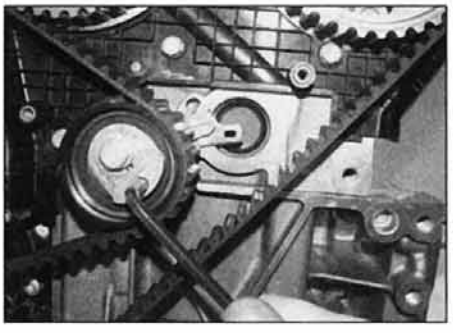
22 Insert Peugeot setting tool 0189-K or a suitable rod through the hole in the tensioner roller bracket, then loosen the tensioner bolt and use the Allen key to turn the tensioner hub clockwise until the control lever just touches the rod. This allows the pointer to move to its nominal position next to the setting tool. Hold the tensioner in this position and tighten the retaining bolt to the specified torque.

23 Re-align the timing holes and insert the camshaft sprocket and crankshaft locking pins. If the camshaft sprocket holes do not align exactly, temporarily loosen the 6 bolts securing the sprockets to the hubs, insert the pins, then tighten the bolts to the specified torque.

24 Remove one retaining bolt from each camshaft sprocket and check that the sprockets are not at the end of their retaining bolt slots. If they are, repeat the refitting operation. If all is satisfactory, refit the two removed bolts, and tighten all six sprocket retaining bolts to the specified torque.



7.30b . . . until the upper edge of the index pointer (A) is positioned approximately 10° past the slot (B) in the backing plate



7.31 Now rotate the pulley clockwise until the index pointer is exactly aligned with the slot in the backing plate

25 Remove the camshaft and crankshaft locking tools.

Fixed sprockets (without hubs)

26 Ensure that the crankshaft and camshaft sprocket locking tools are still in position.

27 Locate the timing belt on the crankshaft sprocket, ensuring that any arrows on the belt are pointing in the direction of rotation (clockwise when viewed from the right-hand end of the engine) **(see illustration)**.

28 Retain the timing belt on the crankshaft sprocket then, keeping it taut, feed the belt over the remaining sprockets and pulleys in the following order **(see illustrations)**:

a) Idler pulley.
b) Inlet camshaft.
c) Exhaust camshaft.
d) Coolant pump.
e) Tensioner pulley.

29 Remove the locking tool from the exhaust camshaft sprocket.

30 Slacken the tensioner pulley retaining bolt and turn the tensioner pulley hub anti-clockwise, by means of the Allen key, so that the upper edge of the index pointer is positioned approximately 10° clockwise past the slot in the backing plate **(see illustrations)**. Note that if the index pointer will not attain a position of at least 10° past the backing plate slot, then the tensioner pulley, or both the tensioner pulley and the timing belt must be renewed.

31 Now rotate the tensioner pulley hub clockwise until the index pointer is exactly aligned with the slot in the backing plate **(see illustration)**. Hold the pulley in this position and

tighten the retaining bolt to the specified torque. With the timing belt tensioned and the tensioner pulley retaining bolt tightened, the Allen key slot in the pulley should be below the cylinder head gasket level. If this is not the case, then the tensioner pulley, or both the tensioner pulley and the timing belt must be renewed.

32 Remove the remaining camshaft and crankshaft locking tools and rotate the crankshaft through ten complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the engine assembly/valve timing holes and refit the inlet camshaft sprocket locking tool.

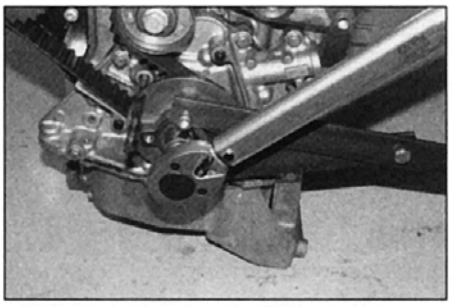
33 Check that the tensioner pulley index pointer is still aligned with the slot in the backing plate. If not repeat the tensioning operation.

34 With the inlet camshaft sprocket locking tool in place, it should now also be possible to fit the crankshaft sprocket locking tool. If so, continue with the refitting procedure. If the crankshaft sprocket locking tool will not engage, then the crankshaft sprocket end plate must be repositioned as follows.

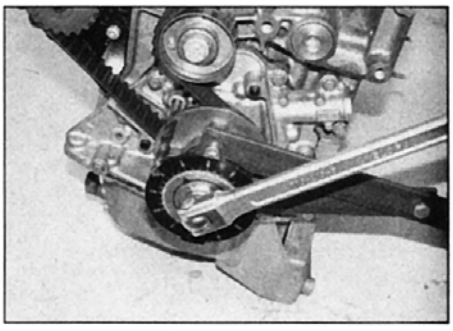
35 Slacken the crankshaft sprocket retaining bolt while holding the sprocket end plate stationary using Peugeot special tool 6310-T or a suitable home-made alternative **(see Tool Tip in Section 8)**. *Do not* attempt to use only the sprocket locking tools inserted in the engine assembly/valve timing holes to prevent rotation whilst the bolt is slackened.

36 With the sprocket retaining bolt slackened, turn the end plate until the sprocket locking tool can be fully inserted through the end plate and into the hole in the oil pump housing.

37 Hold the end plate with the holding tool and tighten the sprocket retaining bolt to the specified torque, then through the specified angle **(see illustrations)**.



7.37a Hold the crankshaft sprocket end plate with the holding tool and tighten the retaining bolt to the specified torque . . .



7.37b . . . then through the specified angle

All engines

38 Refit the lower and upper (outer) timing belt covers as described in Section 6.

39 Refit the crankshaft pulley as described in Section 5.

40 Refit the upper timing belt cover and tighten the bolts.

41 Refit the auxiliary drivebelt with reference to Chapter 1A.

42 Refit the right-hand front wheelarch liner.

43 Refit the roadwheel and lower the vehicle to the ground.

44 Reconnect the battery negative terminal.

8 Timing belt tensioners, sprockets and pulleys – removal, inspection and refitting

Note: *From September 2000, modified camshaft sprockets were fitted. In particular, the exhaust camshaft pinion was fitted with a damper, and sprocket hubs were discontinued.*

Removal

1 Remove the timing belt as described in Section 7.

Camshaft sprockets with hubs

2 To remove a camshaft sprocket (and where applicable, the hub), first remove the timing locking pin, then use a suitable retaining tool in the sprocket holes to hold it stationary. In the absence of the special Peugeot tool, an acceptable substitute can be fabricated at home **(see Tool Tip)**. *Do not* attempt to use the sprocket locking pin to prevent the sprocket from rotating whilst the bolt is slackened. With the sprocket held stationary, unscrew the bolt securing the sprocket hub to the camshaft.

3 Remove the sprocket/hub from the camshaft, noting that the tag engages with the cut-out in the end of the camshaft. If necessary, unbolt the sprocket from the hub.

Fixed camshaft sprockets (no hubs)

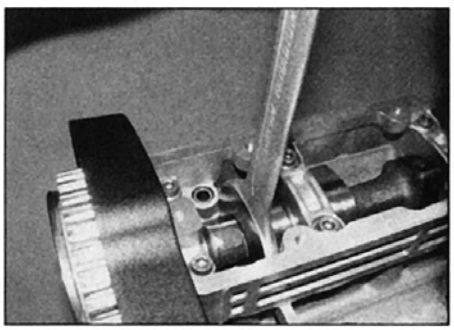
4 The camshafts must now be prevented from rotating to allow the sprocket retaining bolts to be slackened. If working on the exhaust camshaft sprocket, it will be necessary to remove the rear cylinder head cover (see Section 4) to allow a spanner to be engaged with a square section of the camshaft, provided for this purpose. This is because the sprocket contains a rubber vibration damper incorporated into the sprocket hub. If the sprocket itself is held as the bolt is slackened, the rubber hub will be damaged. The inlet camshaft sprocket is conventional and can be held using Peugeot tool 6016-T, or an acceptable substitute can be fabricated at home **(see Tool Tip above)**. Alternatively, remove the front cylinder head cover and hold the camshaft with a spanner as described for the exhaust camshaft. *Do not* attempt to use the engine assembly/valve timing hole locking tools to prevent the sprockets from rotating whilst the bolts are slackened.

5 Remove the engine assembly/valve timing hole locking tool from the relevant sprocket, then slacken the centre retaining bolt. If a spanner is being used to prevent camshaft rotation, the spanner should be engaged with the square section of the camshaft adjacent to No 8 cam lobe **(see illustration)**.

6 Remove the previously slackened sprocket retaining bolt and washer, and withdraw the relevant sprocket from the end of the camshaft **(see illustrations)**.

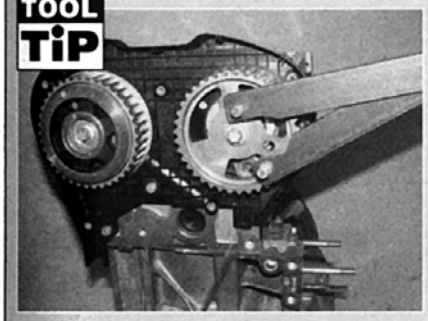
Crankshaft sprocket

7 With the crankshaft pulley removed from the flange on the front of the crankshaft, remove the timing locking pin. **Note:** *Do not use the pin to lock the crankshaft when loosening the crankshaft pulley bolt.*

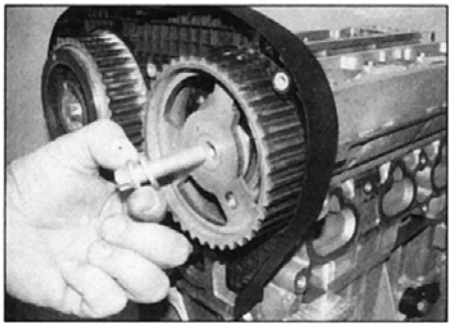


8.5 The camshafts can be held with a spanner engaged with the square section adjacent to No 8 cam lobe

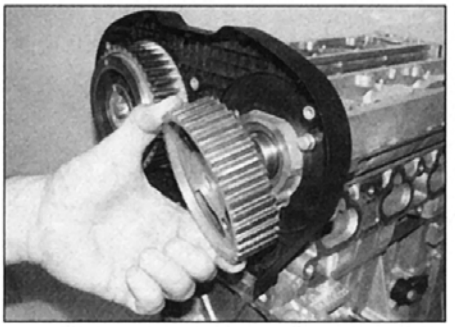
TOOL TiP



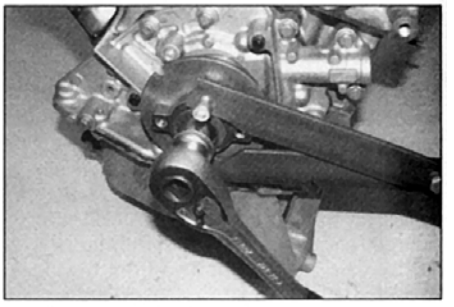
To make a sprocket holding tool, obtain two lengths of steel strip about 6 mm thick by about 30 mm wide or similar, one 600 mm long, the other 200 mm long (all dimensions approximate). Bolt the two strips together to form a forked end, leaving the bolt slack so that the shorter strip can pivot freely. At the other end of each 'prong' of the fork, drill a suitable hole and fit a nut and bolt to engage with the spokes or holes in the sprocket. The same tool can be used to hold both the camshaft sprocket and crankshaft sprocket.



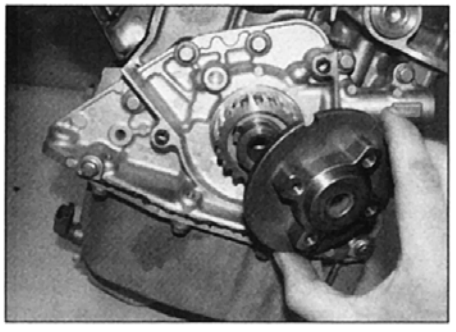
8.6a Remove the previously slackened sprocket retaining bolt and washer . . .



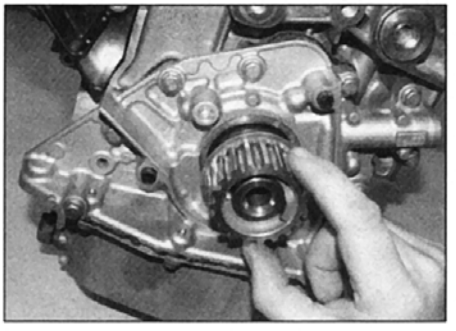
8.6b . . . and withdraw the relevant sprocket from the end of the camshaft



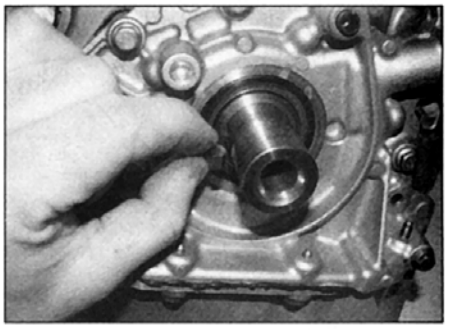
8.8a Hold the crankshaft sprocket end plate with the home-made tool while the retaining bolt is slackened



8.8b Withdraw the crankshaft sprocket end plate . . .



8.8c . . . and the sprocket itself



8.9 Remove the Woodruff key from the end of the crankshaft

8 The flywheel must now be locked. To do this, remove the starter motor and have an assistant insert a wide-bladed screwdriver between the teeth of the ring gear and the transmission casing. Unscrew and remove the bolt and washer, and remove the crankshaft sprocket and flange from the end of the crankshaft. Alternatively a home-made tool may be used as shown **(see illustrations)**.

9 Remove the Woodruff key from the crankshaft, and store it with the sprocket for safe-keeping **(see illustration)**. Where necessary, also slide the spacer (where fitted) off the end of the crankshaft.

10 Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 14.

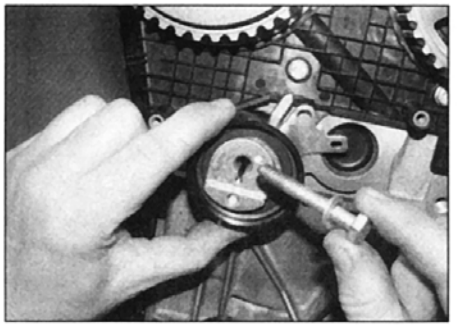
Tensioner and idler pulleys

11 Unscrew the retaining bolts from the tensioner and idler pulleys, then remove the pulleys from the engine **(see illustrations)**. Note that the tensioner roller bracket locates over the rib on the cylinder block.

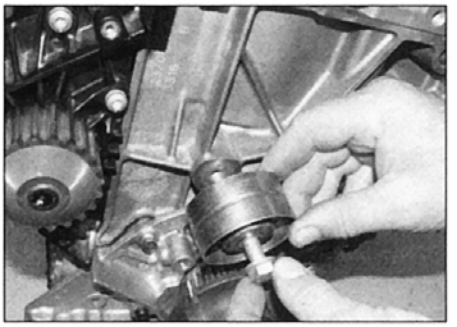
Inspection

12 Clean the camshaft/crankshaft sprockets thoroughly, and renew any that show signs of wear, damage or cracks. Where applicable, check the condition of the rubber vibration damper in the exhaust camshaft sprocket and renew the sprocket if there is any sign of deterioration of the rubber.

13 Clean the tensioner/idler pulleys but do not use any strong solvent which may enter the pulley bearings. Check that the pulleys rotate freely, with no sign of stiffness or free play. Renew them if there is any doubt about their condition, or if there are any obvious signs of wear or damage.



8.11a Removing the timing belt tensioner pulley . . .



8.11b . . . and idler pulley

Refitting

Camshaft sprockets with hubs

15 Refit the sprocket/hub to the camshaft and engage the tag with the cut-out in the end of the camshaft.

16 Insert the retaining bolt and tighten it to the specified torque while holding the sprocket/hub stationary with the tool used for removal.

17 Refit the timing belt and adjust its tension as described in Section 7.

Fixed camshaft sprockets (no hubs)

17 Locate the relevant sprocket on the end of the camshaft, engaging the lug in the sprocket hub with the slot in the end of the camshaft.

18 Refit the sprocket retaining bolt and washer, and tighten it to the specified torque. Prevent the sprocket from turning as the bolt is tightened using the method employed for removal.

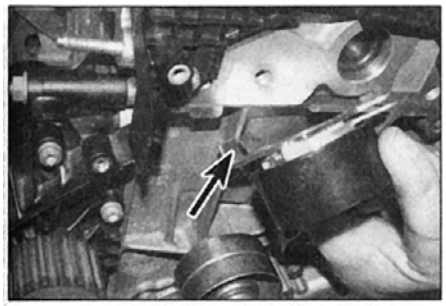
19 Realign the hole in the camshaft sprocket with the corresponding hole in the cylinder head, and refit the locking tool. Check that the crankshaft pulley locking tool is still in position.

20 Where removed, refit the cylinder head cover(s) as described in Section 4.

21 Refit and tension the timing belt as described in Section 7.

Crankshaft sprocket

22 Where fitted, refit the spacer, then locate the Woodruff key in the crankshaft groove, making sure that it is parallel with the surface of the crankshaft.



8.27 Ensure that the slot (arrowed) on the tensioner pulley body engages with the web on the cylinder block when refitting

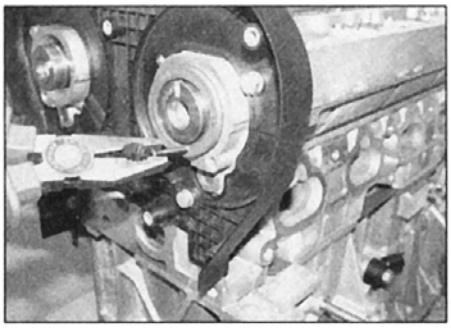
23 Locate the sprocket and flange onto the end of the crankshaft and engage the groove with the Woodruff key.
24 Apply locking fluid to the threads of the crankshaft pulley bolt then insert it together with the washer and screw it in finger-tight.
25 Hold the crankshaft stationary with the method used for removal, then tighten the bolt to the specified torque.
26 Refit and tension the timing belt as described in Section 7.

Tensioner and idler pulleys

27 Locate the tensioner pulley on the engine, making sure that the roller bracket engages over the rib on the cylinder block **(see illustration)**. Insert the bolt and finger-tighten it at this stage.
28 Locate the idler pulley on the engine, insert the bolt, and tighten it to the specified torque and angle.
29 Refit and tension the timing belt as described in Section 7.

9 Camshaft oil seals – renewal

1 Remove the camshaft sprockets and hubs (where applicable) as described in Section 8.
2 Note the fitted depth of the oil seals as a guide to fitting the new ones.
3 Punch or drill two small holes opposite each other in the oil seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal **(see illustration)**.



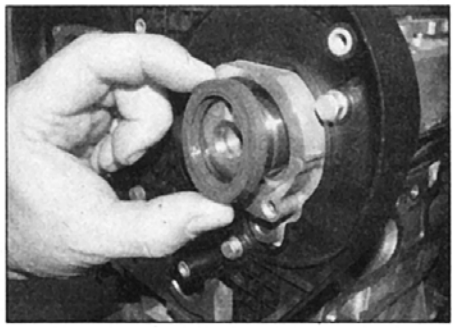
9.3 Using pliers and a self-tapping screw to extract the inlet camshaft oil seal

4 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.
5 Lubricate the lips of the new seal with clean engine oil, and drive it into position until it seats on its locating shoulder **(see illustration)**. Use a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Take care not to damage the seal lips during fitting. Note that the seal lips should face inwards. If available, use the Peugeot tool No 0189-D1/D2.
6 Refit the camshaft sprockets as described in Section 8.

10 Camshafts and followers – removal, inspection and refitting

Removal

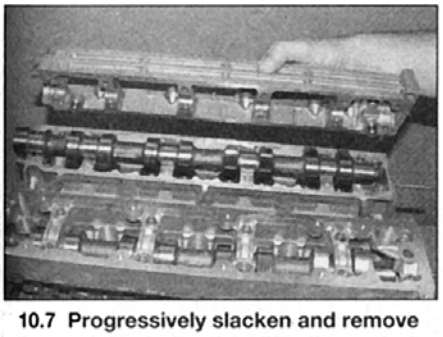
1 Remove the timing belt as described in Section 7.
2 Progressively unscrew the bolts securing the cylinder head covers to the cylinder head. The bolts must be unscrewed in a spiral sequence starting from the outside.
3 Remove the cylinder head covers and gaskets.
4 Refer to Section 8 and remove both camshaft sprockets.
5 Unbolt and remove the inner timing cover from the cylinder head. At this stage, note the fitted depth of the oil seals as a guide to fitting new seals during reassembly.
6 Evenly and progressively slacken the camshaft bearing housing retaining bolts by one turn at a time, in a spiral sequence, starting from the outside. This will relieve the valve spring pressure on the bearing housing gradually and evenly. Once the pressure has been relieved, the bolts can be fully unscrewed together with their washers.
7 Lift the camshaft bearing housings from the cylinder head, noting that the housings are located on dowels **(see illustration)**.
8 Identify each camshaft for position – the exhaust camshaft is at the rear and the inlet camshaft is at the front of the cylinder head. Also note the TDC position of each camshaft for correct refitting.
9 Remove the camshafts by pressing on their transmission ends to release the opposite ends from the bearings. Withdraw the camshafts from the cylinder head and slide the oil seals from their timing ends **(see illustration)**.
10 Obtain sixteen small, clean plastic containers, and number them inlet 1 to 8 and exhaust 1 to 8; alternatively, divide a larger container into sixteen compartments and number each compartment accordingly. Using a rubber sucker, withdraw each hydraulic tappet in turn, and place it in its respective container **(see illustration)**. Do not interchange the tappets, or the rate of wear will be much-increased.



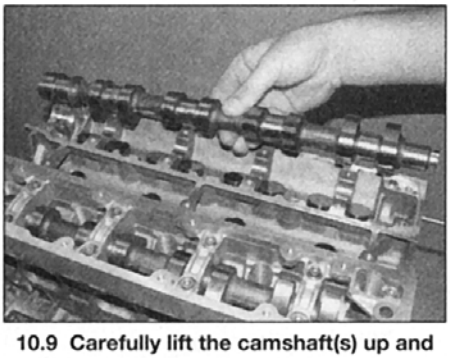
9.5 Locate the new seal in position with the seal lips facing inwards

Inspection

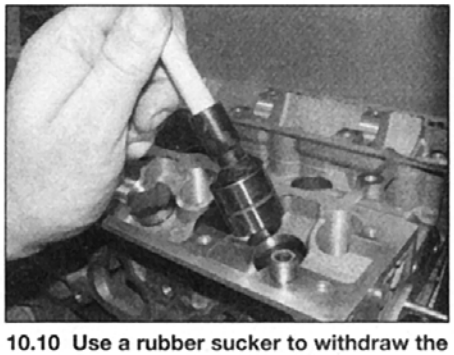
11 Examine the camshaft bearing surfaces and cam lobes for signs of wear ridges and scoring. Renew the camshaft if any of these conditions are apparent. Examine the condition of the bearing surfaces, both on the



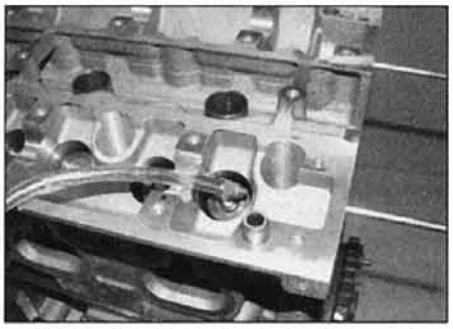
10.7 Progressively slacken and remove the retaining bolts, then lift off camshaft bearing cap housing(s)



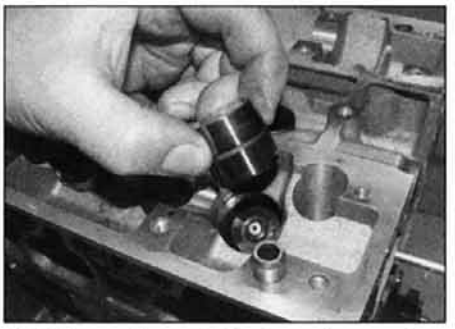
10.9 Carefully lift the camshaft(s) up and out of their locations



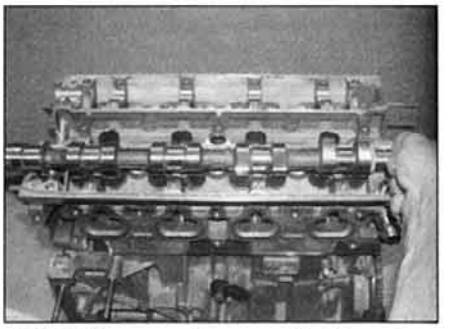
10.10 Use a rubber sucker to withdraw the hydraulic tappets



10.14a Lubricate the hydraulic tappet bores and the tappets . . .



10.14b . . . then refit the tappets ensuring that each is refitted to its original bore



10.15 Liberally oil the camshaft bearings and lobes, then lay the camshafts in the cylinder head

camshaft journals and in the cylinder head and bearing housing. If the head bearing surfaces are worn excessively, the cylinder head will need to be renewed. If suitable measuring equipment is available, camshaft bearing journal wear can be checked by direct measurement, noting that No 1 journal is at the transmission end of the head.

12 Examine the hydraulic tappet bearing surfaces which contact the camshaft lobes for wear ridges and scoring. Renew any tappet where these conditions are apparent. If a tappet bearing surface is badly scored, also examine the corresponding lobe on the camshaft for wear, as it is likely that both will be worn. Renew worn components as necessary.

Refitting

13 Before commencing refitting, remove all traces of oil from the bearing housing retaining bolt holes in the cylinder head, using a clean rag. Also ensure that both the cylinder head and bearing housing mating faces are clean and free from oil.

14 Liberally oil the cylinder head hydraulic tappet bores and the tappets. Carefully refit the tappets to the cylinder head, ensuring that each tappet is refitted to its original bore **(see illustrations)**. Some care will be required to enter the tappets squarely into their bores. Check that each tappet rotates freely in its bore.

15 Liberally oil the camshaft bearings in the cylinder head and the camshaft lobes, then refit the camshafts to the cylinder head in their previously noted positions **(see illustration)**. Note that the exhaust camshaft has a sensor ring on its left-hand end and must be fitted at the rear of the cylinder head.

16 Ensure that the four locating dowels are in position, one at each corner of the cylinder head.

17 Apply a bead of silicone-based jointing compound (Peugeot Silicone Categorie 2) around the perimeter of the mating faces and around the retaining bolt hole locations **(see illustration)**.

18 Liberally oil the camshaft bearings and carefully locate the bearing housings over the camshafts. Refit the retaining bolts ensuring that each has a washer under its head **(see illustration)**. Note that the bearing housing with the sensor hole is located over the exhaust camshaft. Initially finger-tighten the bolts.

19 Progressively tighten the bearing housing retaining bolts to the specified torque, in the order given in Section 4. It is suggested that the bolts are initially tightened to 5 Nm (4 lbf ft), then tightened to their final torque.

20 Refit the inner timing cover to the cylinder head and tighten the retaining bolts securely.

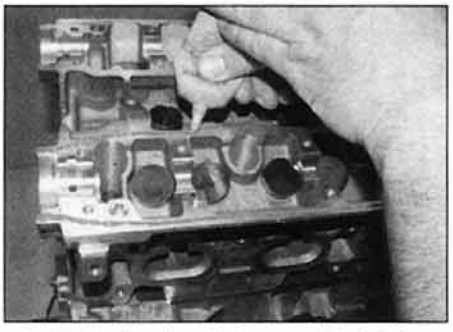
21 Clean the jointing compound from the oil seal seatings in the cylinder head and camshaft housing.

22 Fit new oil seals with reference to Section 9.

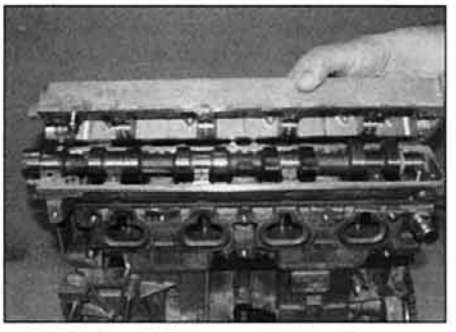
23 Refit the sprockets to the camshafts with reference to Section 8.

24 Refit the cylinder head covers together with new gaskets, with reference to Section 4.

25 Refit the timing belt with reference to Section 7.



10.17 Apply a bead of anaerobic jointing compound around the perimeter of the cylinder head mating faces



10.18 Carefully locate the bearing cap housings over the camshafts

11 Cylinder head – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the engine compartment undertray where fitted. For improved access, remove the bonnet as described in Chapter 11.

3 Drain the cooling system as described in Chapter 1A.

4 Unbolt the exhaust downpipe from the exhaust manifold on the rear of the engine with reference to Chapter 4A.

5 Unbolt the top cover from the engine.

6 Release the fuel pressure from the fuel system by placing cloth rags around and over the Shrader valve on the fuel rail, and depressing the valve core.

7 Disconnect the fuel supply pipe from the fuel rail.

8 Remove the timing belt as described in Section 7.

9 Remove the timing belt tensioner roller as described in Section 8.

10 Remove the air cleaner and intake pipe with reference to Chapter 4A.

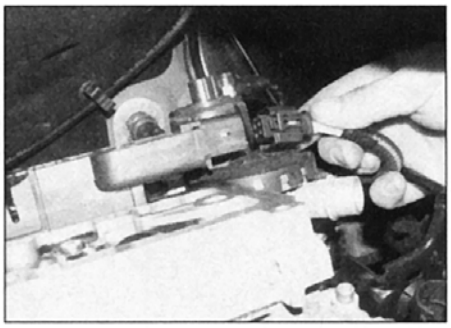
11 Remove the engine oil dipstick from its tube, then remove the tube itself from the block.

12 Disconnect the crankcase breather hose from the camshaft cover. Also disconnect the air inlet hose from the secondary air injection valve at the left-hand end of the cylinder head **(see illustration)**.

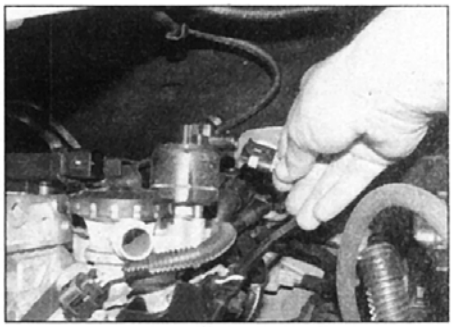
13 Remove the coolant hose from the thermostat housing on the left-hand end of the cylinder head.

14 Disconnect the wiring from the left-hand end of the ignition coil module **(see illustration)**.

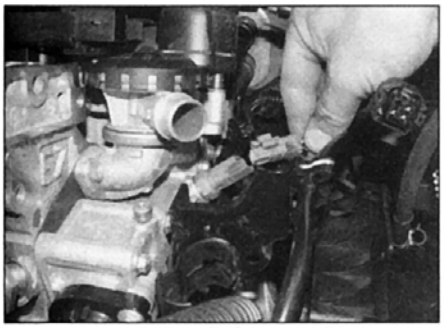
11.12 Disconnect the air inlet hose from the secondary air injection valve



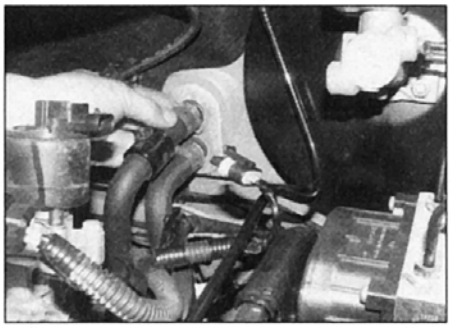
11.14 Disconnect the wiring connector from the ignition coil unit



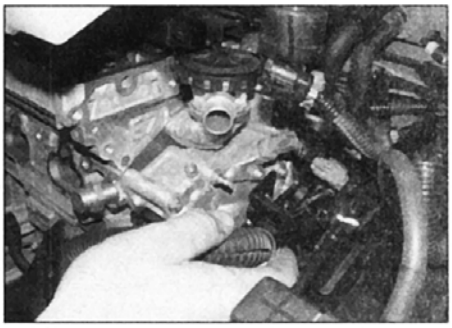
11.16a Disconnect the wiring connectors from the EGR valve . . .



11.16b . . . and coolant temperature sensor



11.20 Disconnect the two heater hose from the heater matrix pipes



11.22 Undo the wiring harness support bracket nuts, release the cable ties and clips then move the bracket, wiring harness and hoses clear of the cylinder head

15 Disconnect the wiring from the fuel injectors, charcoal canister electrovalve and air pressure sensor.

16 Disconnect the wiring from the EGR valve and temperature sensor at the left-hand front of the cylinder head **(see illustrations)**.

17 Remove the camshaft position sensor from the left-hand end of the exhaust camshaft cover.

18 Remove the ignition coil module from the top of the cylinder head with reference to Chapter 5B.

19 Unscrew the bolts/nuts securing the inlet manifold to the front of the cylinder head, then support the manifold away from the cylinder head.

20 Loosen the clips and disconnect the heater matrix hoses **(see illustration)**.

21 Remove both cylinder head covers and gaskets with reference to Section 4.

22 Unbolt the wiring harness bracket from the cylinder head outlet housing, and position it to one side **(see illustration)**.

23 Release the clips and disconnect the hoses from the cylinder head outlet housing. Where the original spring-type hose clips are fitted, use a pair of grips to release them.

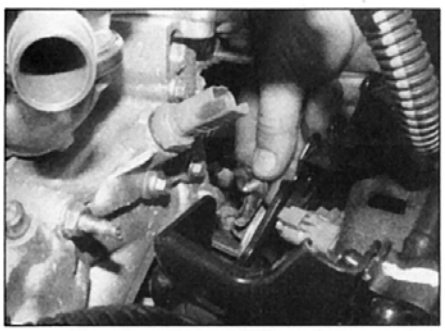
24 At the rear of the outlet housing, unscrew the bolt and remove the retaining fork **(see illustration)**, then disconnect the hoses.

25 Unscrew the bolt securing the right-hand engine mounting to the cylinder head **(see illustration)**. Do not unscrew the lower bolts securing the mounting to the cylinder block.

26 Undo the bolt securing the lower (engine) mounting bracket to the cylinder head. Ensure that the bolt is fully unscrewed but note that there is insufficient clearance to completely remove the bolt from its location.

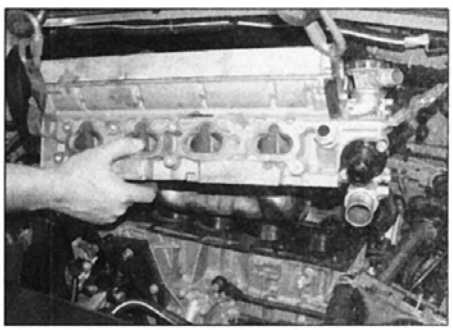
27 Using a Torx key socket and working in the *reverse* of the tightening sequence (see paragraph 41), progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand. Recover the washers where fitted.

28 With all the cylinder head bolts removed, the joint between the cylinder head and gasket and the cylinder block/crankcase must now be broken. To break the joint, obtain two L-shaped metal bars which fit into the cylinder head bolt holes, and gently 'rock' the cylinder head free towards the front of the car. *Do not* try to swivel the head on the cylinder block/crankcase; it is located by dowels. When the joint is broken, lift the cylinder head away. Use a hoist or seek assistance if possible, as it is a heavy assembly **(see illustration)**. Remove the gasket from the top

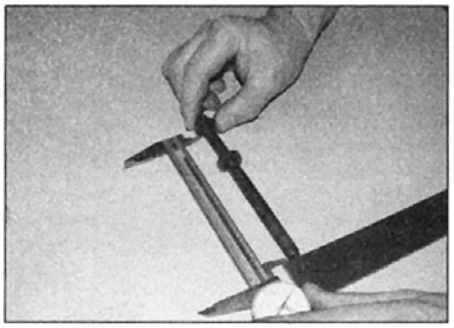


11.24 Remove the bolt and horseshoe-shaped clamp plate securing the coolant pipe to the coolant outlet housing

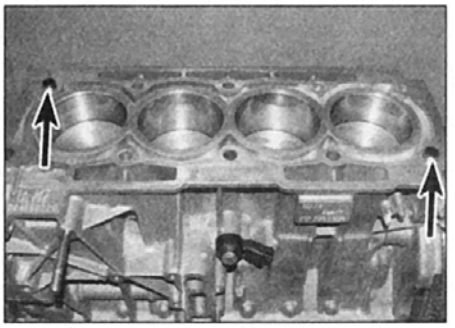
11.25 Undo the bolt securing the lower (engine) mounting bracket to the cylinder head



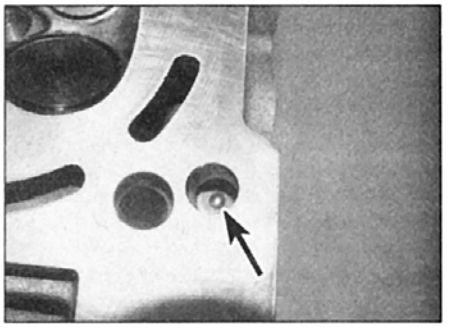
11.28 Removing the cylinder head from the block



11.33 Measure the length of the cylinder head bolts from the underside of the head to the end of the bolt



11.35a Check that the cylinder head locating dowels (arrowed) are in position in the block . . .



11.35b . . . and that the camshaft oil supply non-return valve (arrowed) is in place in the cylinder head

of the block, noting the two locating dowels. If the locating dowels are a loose fit, remove them and store them with the head for safe-keeping. Do not discard the gasket; it will be needed for identification purposes. During removal, check that the camshaft oil supply non-return valve (located in the underside of the cylinder head at the timing belt end) does not drop out; it is easily lost if it does.

29 If the cylinder head is to be dismantled for overhaul, remove the camshafts as described in Section 10, then refer to Part D of this Chapter. Also remove the rigid pipe from the outlet housing.

Preparation for refitting

30 The mating faces of the cylinder head and cylinder block/crankcase must be perfectly clean before refitting the head. Use a hard plastic or wooden scraper to remove all traces of gasket and carbon and also clean the piston crowns. Make sure that the carbon is not allowed to enter the oil and water passages – this is particularly important for the lubrication system, as carbon could block the oil supply to the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block/crankcase. To prevent carbon entering the gap between the pistons and bores, smear a little grease in the gap. After cleaning each piston, use a small brush to remove all traces of grease and carbon from the gap, then wipe away the remainder with a clean rag. Clean all the pistons in the same way.

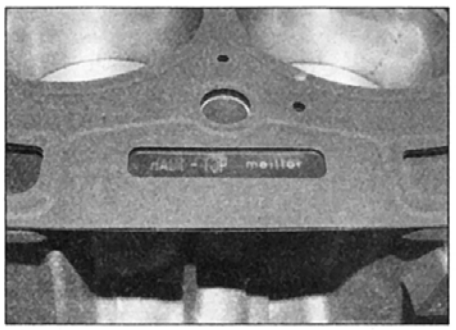
31 Check the mating surfaces of the cylinder block/crankcase and the cylinder head for nicks, deep scratches and other damage. If slight, they may be removed carefully with a file, but if excessive, machining may be the only alternative to renewal. If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part D of this Chapter if necessary.

32 Obtain a new cylinder head gasket before starting the refitting procedure. At the time of writing, there are two different thicknesses available – the standard gasket which is fitted at the factory, and a slightly thicker 'repair' gasket (+0.3 mm), for use once the head gasket face has been machined. If the cylinder head has been machined, it should be marked '–0.3' on the upper corner, on the inlet manifold side, at the timing belt end. Note that modifications to the cylinder head gasket material, type, and manufacturer are constantly taking place; seek the advice of a Peugeot dealer as to the latest recommendations.

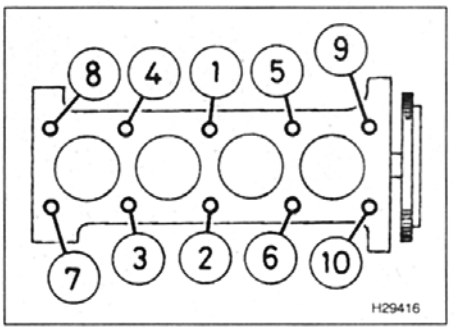
33 Check the condition of the cylinder head bolts, and particularly their threads, whenever they are removed. Wash the bolts in a suitable solvent, and wipe them dry. Check each bolt for any sign of visible wear or damage, renewing them if necessary. Measure the length of each bolt from the underside of its head to the end of the bolt **(see illustration)**. Two different lengths of cylinder head bolts may be encountered according to the date of manufacture of the engine. Early engines were fitted with bolts 127.5 mm in length, whereas on later engines the length was increased to 144.5 mm. The bolts may be re-used if their length does not exceed the following dimensions.

Early engines	*129.0 mm*
Later engines	*147.0 mm*

If any one bolt is longer than the specified length, *all* of the bolts should be renewed as a complete set. Considering the stress which the cylinder head bolts are under, it is highly recommended that they are renewed, regardless of their apparent condition. Also check that the thickness of the head bolt washers is 4.00 ± 0.2 mm.



11.36 Position the cylinder head gasket with the word TOP uppermost and toward the oil filter side of the block



11.41 Cylinder head bolt tightening sequence

Refitting

34 Where removed, refit the camshafts, and the rigid pipe to the outlet housing on the cylinder head.

35 Wipe clean the mating surfaces of the cylinder head and cylinder block/crankcase. Check that the two locating dowels are in position at each end of the cylinder block/crankcase surface. Check also that the camshaft oil supply non-return valve is in place in the oil feed bore at the timing belt end of the cylinder head **(see illustrations)**.

36 Position a new gasket on the cylinder block/crankcase surface, ensuring that the TOP mark is uppermost and at the front of the block **(see illustration)**.

37 Check that the crankshaft pulley and camshaft sprockets are still at their TDC positions.

38 With the aid of an assistant, carefully lower the cylinder head assembly onto the block, aligning it with the locating dowels.

39 Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Peugeot recommend the use of Molykote G Rapid Plus (available from your Peugeot dealer); in the absence of the specified grease, any good-quality high-melting-point grease may be used.

40 Carefully enter each bolt and washer into its relevant hole (*do not drop it in*) then screw them in finger-tight.

41 Working progressively and in the sequence shown **(see illustration)**, tighten the cylinder head bolts to their Stage 1 torque setting.

42 Once all the bolts have been tightened to their Stage 1 torque setting, proceed to tighten them through the remaining stages as given in the Specifications. When carrying out Stage 3, slacken each bolt 1 turn working in the reverse of the tightening sequence. It is recommended that an angle-measuring gauge is used for the angle-tightening stages, however, if a gauge is not available, use white paint to make alignment marks between the bolt head and cylinder head prior to tightening; the marks can then by used to check that the bolt has rotated sufficiently. Where a maximum of 2 steps is given for angle-tightening, each step must be completed in one movement without stopping.

43 The remainder of the refitting procedure is a reversal of removal, referring to the relevant Chapters or Sections as required. On completion, refill the cooling system as described in Chapter 1A. Initialise the engine management ECU as follows. Start the engine and run to normal temperature. Carry out a road test during which the following procedure should be made. Engage third gear and stabilise the engine at 1000 rpm. Now accelerate fully to 3500 rpm.

12 Sump – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Where applicable, remove the engine undertray.

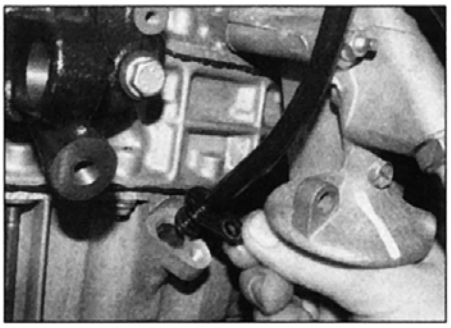
3 Drain the engine oil then clean and refit the engine oil drain plug, tightening it securely. If the engine is nearing its service interval when the oil and filter are due for renewal, it is recommended that the filter is also removed, and a new one fitted. After reassembly, the engine can then be refilled with fresh oil. Refer to Chapter 1A for further information.

4 Withdraw the engine oil dipstick from the guide tube.

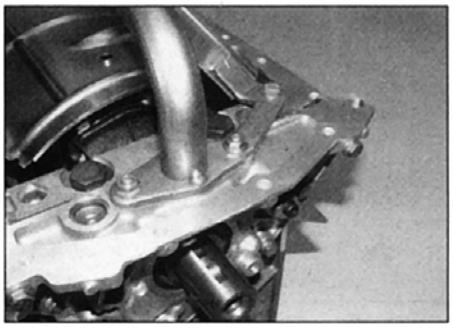
5 Undo the bolt securing the upper end of the dipstick guide tube to the ancillary components mounting bracket. Undo the bolt securing the base of the guide tube to the sump and remove the guide tube **(see illustration)**. Collect the two O-rings from the base of the guide tube, noting that new O-rings will be required for refitting.

6 Where applicable, move the power steering pipe supports from the sump. Also disconnect the wiring from the oil temperature sender unit.

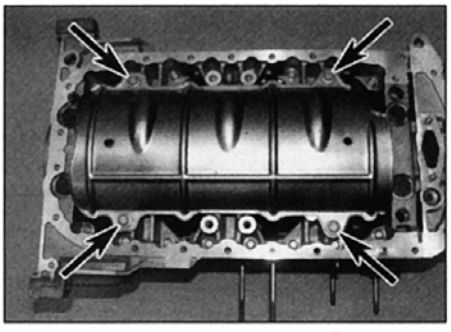
7 Progressively slacken and remove all the sump retaining bolts. Since there are nineteen 25.0 mm bolts and seven 110.0 mm bolts, remove each bolt in turn, and store it in its correct fitted order by pushing it through a clearly-marked cardboard template. This will avoid the possibility of installing the bolts in the wrong locations on refitting.



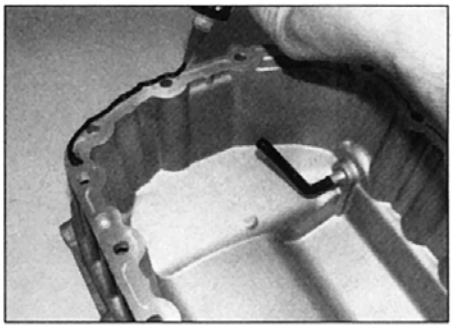
12.5 Undo the upper and lower retaining bolts and remove the dipstick guide tube



12.8a Oil pump pick-up tube retaining nuts and retaining bolt locations (arrowed)



12.8b Crankcase splash plate retaining bolt locations (arrowed)



12.12 Apply a thin bead of RTV sealant to the sump mating surface

8 Break the joint by striking the sump with the palm of your hand. Lower the sump, and withdraw it from underneath the vehicle. While the sump is removed, take the opportunity to check the oil pump pick-up/strainer for signs of clogging or splitting. If necessary, remove the pump as described in Section 13, and clean or renew the strainer. Also unbolt the oil baffle plate from the bottom of the main bearing ladder, noting which way round it is fitted **(see illustrations)**. Note that the sump is located on a dowel.

Refitting

9 Where removed, refit the baffle plate to the main bearing ladder and tighten the bolts securely.

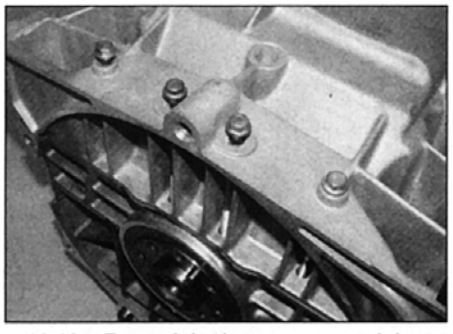
10 Where removed, refit the oil pump and pick-up/strainer with reference to Section 13.

11 Clean all traces of sealant/gasket from the mating surfaces of the main bearing ladder and sump, then use a clean rag to wipe out the sump and the engine's interior.

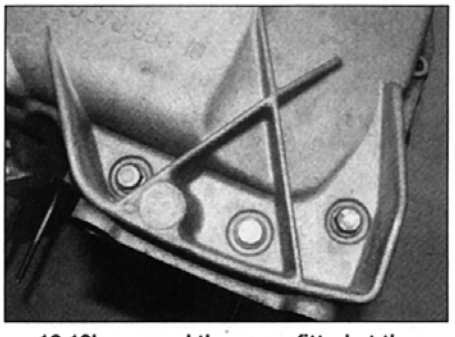
12 Ensure that the sump mating surfaces are clean and dry, then apply a thin coating of suitable sealant to the sump mating surface **(see illustration)**.

13 Check that the location dowel is in place, then refit the sump onto the main bearing ladder and insert the bolts and finger-tighten them at this stage, so that it is still possible to move the sump. Make sure the bolts are refitted in their correct locations **(see illustrations)**.

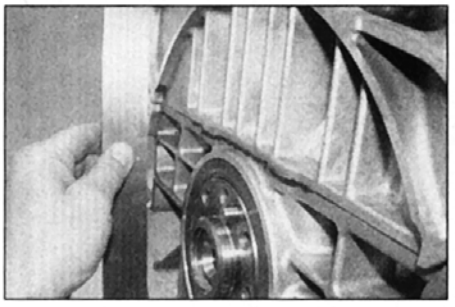
14 Using a straight-edge, align the flywheel end of the sump with the main bearing ladder



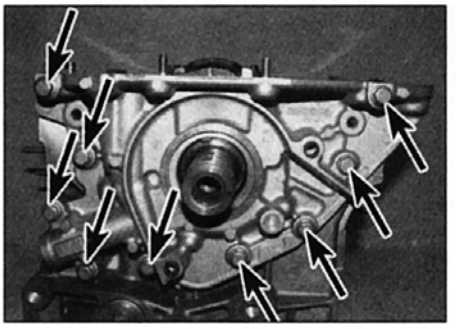
12.13a Four of the long sump retaining bolts are fitted at the transmission end . . .



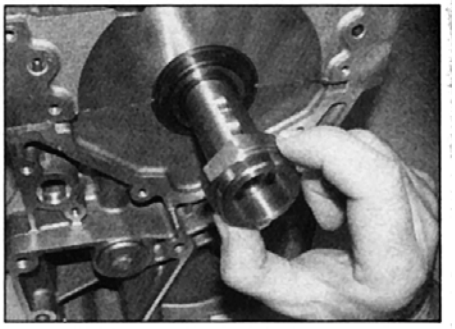
12.13b . . . and three are fitted at the timing belt end on the oil filter side



12.14 Use a straight-edge to ensure that the rear faces of the cylinder block and sump are flush



13.3 Oil pump housing retaining bolt locations (arrowed)



13.4a Slide the oil pump drive collar off the crankshaft . . .

and cylinder block, then progressively tighten the sump bolts to the specified torque **(see illustration)**.

15 Check that the oil drain plug is tightened securely, then refit the engine undertray and lower the vehicle to the ground.

16 Reconnect the battery negative lead.

17 Refill the engine with oil as described in Chapter 1A.

13 Oil pump – removal, inspection and refitting

Removal

1 Remove the timing belt and crankshaft sprocket as described in Sections 7 and 8.

2 Remove the sump and oil pump pick-up/strainer as described in Section 12.

3 Unscrew the nine bolts securing the oil pump to the main bearing ladder and cylinder block, then withdraw the oil pump over the nose of the crankshaft **(see illustration)**. Note it is located on dowels, and therefore it may be necessary to carefully prise it away to release it.

4 Slide the oil pump drive collar off the end of the crankshaft and collect the O-ring located behind the collar **(see illustrations)**.

5 With the oil pump removed, note the fitted depth of the crankshaft oil seal, then drive it from the oil pump housing. A new oil seal must be obtained for refitting.

Inspection

6 At the time of writing, checking specifications for the oil pump were not available, however, if the oil pump is to be re-used, the internal gears should be cleaned. To do this, unbolt the cover, then mark the gears for location and remove them **(see illustrations)**. Clean the gears and inspect them for damage and excessive wear.

7 Lubricate the gears with oil, then refit them in their locations noted during removal. Refit the cover and tighten the bolts securely.

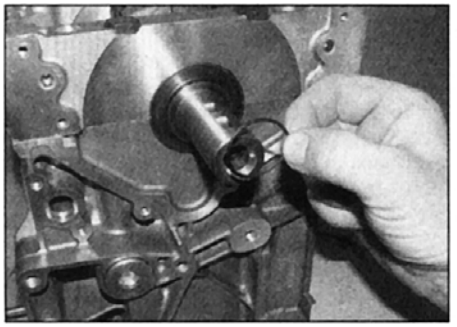
8 Thoroughly clean the oil pump strainer with a suitable solvent, and check it for signs of clogging or splitting. If the strainer is damaged, the strainer and cover assembly must be renewed.

Refitting

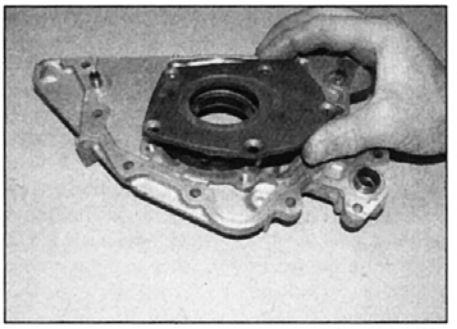
9 Clean the mating surfaces of the oil pump and main bearing ladder/cylinder block. heck that the locating dowels are in position on the pump flange then locate a new O-ring over the oil pump outlet stub **(see illustration)**.

10 Apply a thin coating of suitable sealant to the mating face of the oil pump housing **(see illustration)**.

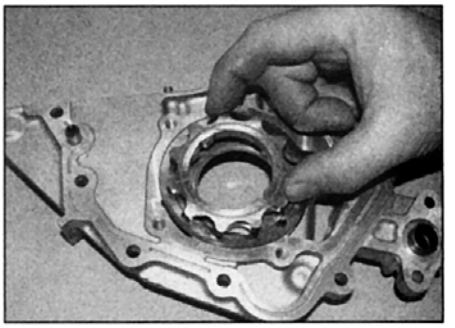
11 Prime the oil pump by injecting clean



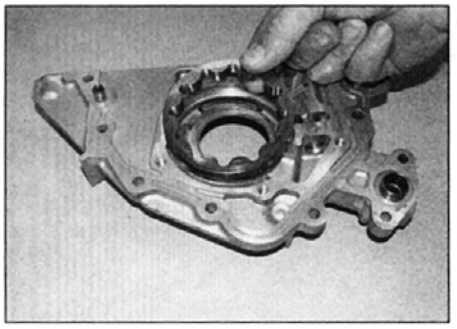
13.4b . . . and collect the O-ring located behind the collar



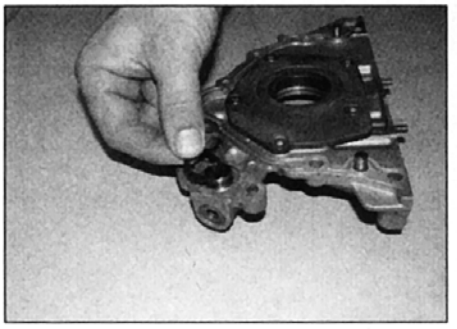
13.6a Undo the five screws and lift off the oil pump rear cover



13.6b Remove the inner rotor . . .



13.6c . . . and outer rotor from the pump housing



13.9 Locate a new O-ring over the oil pump outlet stub

13.10 Apply a thin bead of RTV sealant to the oil pump mating surface

engine oil into the outlet stub, then place the pump in position on the cylinder block, engaging the locating dowels.

12 Apply thread locking compound to the threads of the nine oil pump retaining bolts, then refit the bolts and tighten them to the specified torque.

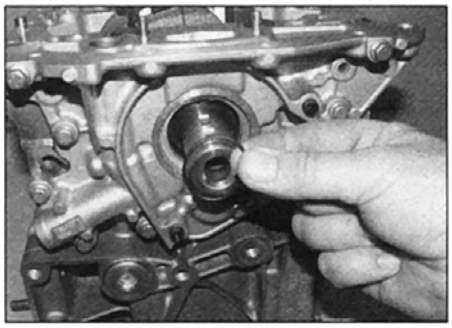
13 Position a new oil pump drive collar O-ring on the end of the crankshaft **(see illustration)**.

14 Lubricate the sealing lips of the new crankshaft right-hand oil seal and carefully fit the seal over the oil pump drive collar **(see illustrations)**. Note that the open part of the seal must be towards the shoulder of the drive collar.

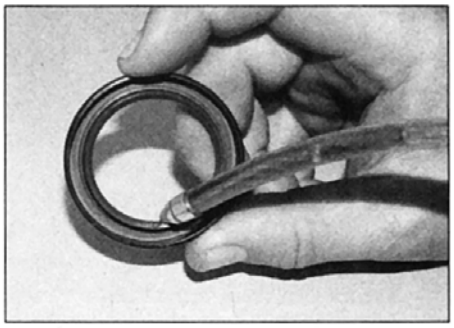
15 Slide the drive collar over the end of the crankshaft and engage it with the oil pump inner rotor **(see illustration)**. As the collar engages with the pump inner rotor, push the oil seal initially into place in the oil pump housing. Tap the seal fully into position using a suitable drift.

16 Refit the pick-up/strainer, sump and crankshaft sprocket as described in Section 12, and the timing belt as described in Sections 7 and 8.

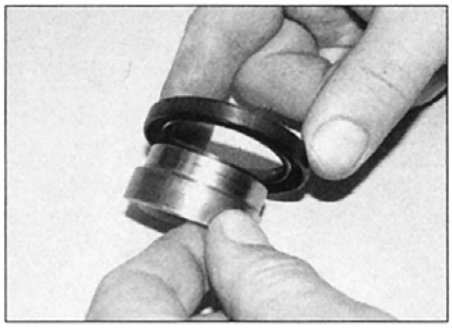
17 Before starting the engine, prime the oil pump as follows. Disconnect the fuel injector wiring connectors, then spin the engine on the starter until the oil pressure light goes out. Reconnect the injector wiring on completion.



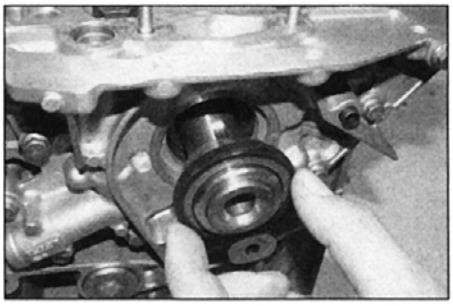
13.13 Position a new oil pump drive collar O-ring on the end of the crankshaft



13.14a Lubricate the sealing lips of the new crankshaft right-hand oil seal . . .



13.14b . . . and carefully fit the seal over the oil pump drive collar



13.15 Slide the drive collar onto the crankshaft and engage it with the oil pump inner rotor

14 Crankshaft oil seals – renewal

Right-hand oil seal

1 Remove the crankshaft sprocket and (where fitted) spacer, referring to Section 8. Secure the timing belt clear of the working area, so that it cannot be contaminated with oil. Make a note of the correct fitted depth of the seal in its housing.

2 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal. Alternatively, the seal can be levered out of position. Use a flat-bladed screwdriver, and take great care not to damage the crankshaft shoulder or seal housing.

3 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

4 Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of the crankshaft. Note that its sealing lip must be facing inwards. Take care not to damage the seal lips during fitting.

5 Fit the new seal using a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Tap the seal into position, to the same depth in the housing as the original was prior to removal **(see illustration)**.

6 Wash off any traces of oil, then refit the crankshaft sprocket as described in Section 8.

Left-hand oil seal

7 Remove the flywheel/driveplate as described in Section 15. Make a note of the correct fitted depth of the seal in its housing.

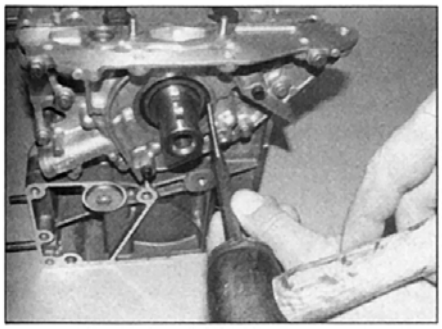
8 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

9 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

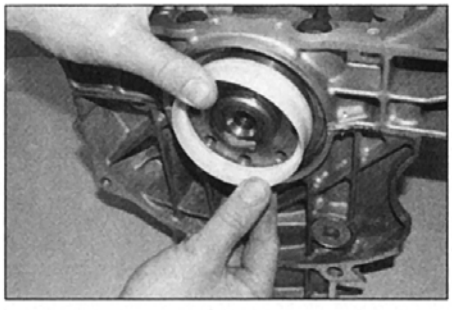
10 Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of the crankshaft. The new seal will normally be supplied with a plastic fitting sleeve to protect the seal lips as the seal is fitted. If so, lubricate the fitting sleeve and locate it over the end of the crankshaft **(see illustration)**.

11 Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal over the fitting sleeve and onto the end of the crankshaft **(see illustration)**. Drive the seal into position, to the same depth in the housing as the original was prior to removal.

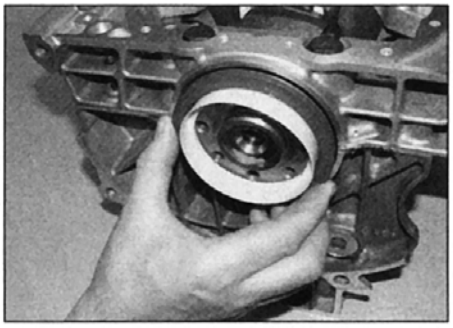
12 Wash off any traces of oil, then refit the flywheel/driveplate as described in Section 15.



14.5 Tap the crankshaft right-hand oil seal into position using a suitable drift



14.10 Lubricate the crankshaft left-hand oil seal fitting sleeve and locate it over the end of the crankshaft



14.11 Locate the oil seal over the fitting sleeve and onto the end of the crankshaft

15 Flywheel/driveplate – removal, inspection and refitting

Removal

Flywheel

1 Remove the transmission as described in Chapter 7A, then remove the clutch assembly as described in Chapter 6.

2 Prevent the flywheel from turning by locking the ring gear teeth with a similar arrangement to that shown in illustration 8.8a. Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase. *Do not* attempt to lock the flywheel in position using the crankshaft pulley locking pin described in Section 3.

3 Slacken and remove the flywheel retaining bolts, and remove the flywheel from the end of the crankshaft. Be careful not to drop it; it is heavy. If the flywheel locating dowel is a loose fit in the crankshaft end, remove it and store it with the flywheel for safe-keeping. Discard the flywheel bolts; new ones must be used on refitting.

Driveplate

4 Remove the transmission as described in Chapter 7B. Lock the driveplate as described in paragraph 2. Mark the relationship between the torque converter plate and the driveplate, and slacken all the driveplate retaining bolts.

5 Remove the retaining bolts, along with the torque converter plate and (where fitted) the two shims (one fitted on each side of the torque converter plate). Note that the shims are of different thickness, the thicker one being on the outside of the torque converter plate. Discard the driveplate retaining bolts; new ones must be used on refitting.

6 Remove the driveplate from the end of the crankshaft. If the locating dowel is a loose fit in the crankshaft end, remove it and store it with the driveplate for safe-keeping.

Inspection

7 On models with manual transmission, examine the flywheel for scoring of the clutch face, and for wear or chipping of the ring gear teeth. If the clutch face is scored, the flywheel may be surface-ground, but renewal is preferable. Seek the advice of a Peugeot dealer or engine reconditioning specialist to see if machining is possible. If the ring gear is worn or damaged, the flywheel must be renewed, as it is not possible to renew the ring gear separately.

8 On models with automatic transmission, check the torque converter driveplate carefully for signs of distortion. Look for any hairline cracks around the bolt holes or radiating outwards from the centre, and inspect the ring gear teeth for signs of wear or chipping. If any sign of wear or damage is found, the driveplate must be renewed.

Refitting

Flywheel

9 Clean the mating surfaces of the flywheel and crankshaft. Remove any remaining locking compound from the threads of the crankshaft holes, using the correct-size tap, if available.

> **TOOL TiP** ***If a suitable tap is not available, cut two slots into the threads of one of the old flywheel bolts and use the bolt to remove the locking compound from the threads.***

10 If the new flywheel retaining bolts are not supplied with their threads already precoated, apply a suitable thread-locking compound to the threads of each bolt.

11 Ensure the locating dowel is in position. Offer up the flywheel, locating it on the dowel, and fit the new retaining bolts.

12 Lock the flywheel using the method employed on dismantling, and tighten the retaining bolts to the specified torque and angle.

13 Refit the clutch as described in Chapter 6. Remove the flywheel locking tool, and refit the transmission as described in Chapter 7A.

Driveplate

14 Carry out the operations described above in paragraphs 9 and 10, substituting 'driveplate' for all references to the flywheel.

15 Locate the driveplate on its locating dowel.

16 Offer up the torque converter plate, with the thinner shim positioned behind the plate and the thicker shim on the outside, and align the marks made prior to removal.

17 Fit the new retaining bolts, then lock the driveplate using the method employed on dismantling. Tighten the retaining bolts to the specified torque wrench setting and angle.

18 Remove the driveplate locking tool, and refit the transmission as described in Chapter 7B.

16 Engine/transmission mountings – inspection and renewal

Inspection

1 If improved access is required, raise the front of the car and support it securely on axle stands.

2 Check the mounting rubber to see if it is cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.

3 Check that all the mounting's fasteners are securely tightened; use a torque wrench to check if possible.

4 Using a large screwdriver or a crowbar, check for wear in the mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission unit back-and-forth, or from side-to-side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

Renewal

Right-hand mounting

5 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual). Release all the relevant hoses and wiring from their retaining clips. Place the hoses/wiring clear of the mounting so that the removal procedure is not hindered.

6 Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

7 Slacken and remove the two nuts and two bolts securing the right-hand engine/transmission mounting bracket to the engine. Remove the single nut securing the bracket to the mounting rubber.

8 Undo the bolt securing the upper engine movement limiter to the right-hand mounting bracket, and the four bolts securing the movement limiter mounting bracket to the body. Lift away the right-hand mounting bracket and the movement limiter assembly.

9 Lift the rubber buffer plate off the mounting rubber stud, then unscrew the mounting rubber from the body and remove it from the vehicle. If necessary, the mounting bracket can be unbolted and removed from the front of the cylinder block.

10 Check all components carefully for signs of wear or damage, and renew as necessary.

11 On reassembly, screw the mounting rubber into the vehicle body, and tighten it securely. Refit the mounting bracket to the front of the cylinder head, and securely tighten its retaining bolts.

12 Refit the engine movement limiter assembly to the engine mounting bracket and to the body and tighten the bolts securely.

13 Refit the rubber buffer plate to the mounting rubber stud, and install the mounting bracket.

14 Tighten the mounting bracket retaining nuts to the specified torque setting. Remove the jack from underneath the engine and reconnect the battery.

Left-hand mounting

15 Remove the air cleaner assembly, as described in Chapter 4A.

16 Place a jack beneath the transmission, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the transmission.

17 Slacken and remove the centre nut and washer from the left-hand mounting, then undo the nuts securing the mounting in

position and remove it from the engine compartment **(see illustration)**.

18 If necessary, slide the spacer (where fitted) off the mounting stud, then unscrew the stud from the top of the transmission housing, and remove it along with its washer. If the mounting stud is tight, a universal stud extractor can be used to unscrew it.

19 Check all components carefully for signs of wear or damage, and renew as necessary.

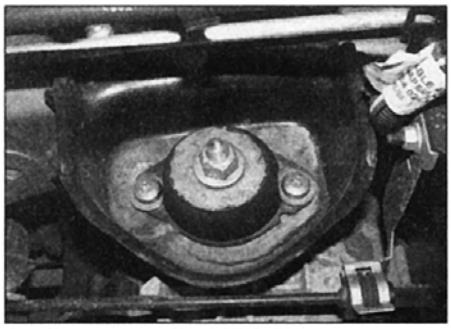
20 Clean the threads of the mounting stud, and apply a coat of thread-locking compound to its threads. Refit the stud and washer to the top of the transmission, and tighten it securely.

21 Slide the spacer (where fitted) onto the mounting stud, then refit the rubber mounting. Tighten both the mounting-to-body bolts and the mounting centre nut to their specified torque settings, and remove the jack from underneath the transmission.

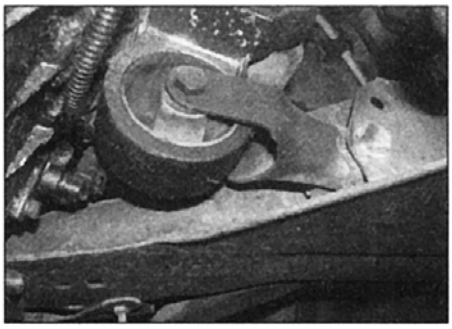
22 Refit the air cleaner assembly as described in Chapter 4A.

Lower engine movement limiter

23 If not already done, chock the rear wheels, then jack up the front of the vehicle and support it securely on axle stands.



16.17 Left-hand engine mounting



16.24 Lower engine movement limiter

24 Unscrew and remove the bolt securing the movement limiter link to the driveshaft intermediate bearing housing **(see illustration)**.

25 Remove the bolt securing the link to the subframe. Withdraw the link.

26 To remove the intermediate bearing housing assembly it will first be necessary to remove the right-hand driveshaft as described in Chapter 8.

27 With the driveshaft removed, undo the retaining bolts and remove the bearing housing from the rear of the cylinder block.

28 Check carefully for signs of wear or damage on all components, and renew them where necessary.

29 On reassembly, fit the bearing housing assembly to the rear of the cylinder block, and tighten its retaining bolts securely. Refit the driveshaft as described in Chapter 8.

30 Refit the movement limiter link, and tighten both its bolts to their specified torque settings.

31 Lower the vehicle to the ground.

Chapter 2 Part C:
Diesel engine in-car repair procedures

Contents

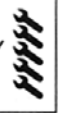
Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

General

Designation:	
2.0 litre (1997 cc engine)	DW10TD
2.0 litre (1997 cc engine)	DW10ATED
2.2 litre (2179 cc engine)	DW12TED4
Engine codes*:	
2.0 litre engine	RHY (DW10TD/L3)
2.0 litre engine	RHZ (DW10ATED/L3)
2.2 litre engine	4HX (DW12TED4/L4)
Bore:	
2.0 litre engine	85.00 mm
2.2 litre engine	85.00 mm
Stroke:	
2.0 litre engine	88.00 mm
2.2 litre engine	96.00 mm
Direction of crankshaft rotation	Clockwise (viewed from the right-hand side of vehicle)
No 1 cylinder location	At the transmission end of block
Compression ratio:	
2.0 litre engine	17.6 : 1
2.2 litre engine	18.0 : 1

** The engine code is stamped on a plate attached to the front of the cylinder block, next to the oil filter*

Compression pressures (engine hot, at cranking speed)

Normal	25 to 30 bars (363 to 435 psi)
Minimum	18 bars (261 psi)
Maximum difference between any two cylinders	5 bars (73 psi)

Timing belt

	2.0 litre engine	2.2 litre engine
Tension setting (see text – Section 7):		
Initial setting	98 ± 2 SEEM units	106 ± 2 SEEM units
Final setting	54 ± 3 SEEM units	51 ± 3 SEEM units

Camshaft(s)

Drive	Toothed belt
No of bearings per camshaft	6
Endfloat (bearing No 3)	0.07 to 0.168 mm

Lubrication system

Oil pump type	Gear-type, chain-driven off the crankshaft right-hand end
Minimum oil pressure at 80°C	4.0 bars at 4000 rpm, 2.0 bars at 2000 rpm
Oil pressure warning switch operating pressure	0.8 bars

Torque wrench settings

	Nm	lbf ft
2.0 litre engine		
Big-end bearing cap nuts*:		
Stage 1	20	15
Stage 2	Angle-tighten a further 70°	
Camshaft bearing housing bolts	10	7
Camshaft sprocket hub-to-camshaft bolts	43	32
Camshaft sprocket-to-hub bolts	20	15
Clutch bellhousing closure plate	18	13
Coolant outlet manifold:		
Stage 1 – studs	25	18
Stage 2 – stud nuts	20	15
Stage 3 – 3 bolts	20	15
Crankshaft pulley bolt:		
Stage 1	50	37
Stage 2	Angle-tighten a further 62°	
Crankshaft right-hand oil seal housing bolts	14	10
Cylinder head bolts:		
Stage 1	22	16
Stage 2	60	44
Stage 3	Slacken 180° in reverse sequence	
Stage 4	60	44
Stage 5	Angle-tighten a further 220° ± 5°	
Cylinder head cover bolts	10	7
Engine-to-transmission fixing bolts	45	33
Flywheel/driveplate bolts*	50	37
High-pressure fuel pump sprocket nut	50	37
Left-hand engine/transmission mounting:		
Rubber mounting-to-body bolts	21	15
Mounting bracket-to-transmission bolts	50	37
Rubber mounting centre nut	65	48
Main bearing cap bolts:		
Stage 1	25	18
Stage 2	Angle-tighten a further 60°	
Oil pump mounting bolts	18	13
Piston oil jet spray tube bolt	10	7
Rear engine torque reaction link bolts:		
Link to engine	50	37
Link to body	60	44
Mounting assembly-to-block bolts	45	33
Rear engine/transmission mounting:		
Connecting link-to-mounting assembly nut/bolt	45	33
Connecting link-to-subframe nut/bolt	45	33
Right-hand engine mounting:		
Mounting to body and engine lower mounting bracket	45	33
Lower mounting bracket to cylinder head:		
Uppermost	45	
Lower	20	
Right-hand engine torque reaction link bolts	45	33
Sump bolts	16	12
Timing belt idler roller bolt	25	18
Timing belt tensioner	23	17

* *New nuts/bolts must be used.*

Torque wrench settings (continued)	Nm	lbf ft
2.2 litre engines (where different to 2.0 litre engine)		
Big-end bearing cap nuts:		
Stage 1	10	7
Stage 2	Slacken by 180°	
Stage 3	23	17
Stage 4	Angle-tighten a further 45° ± 5°	
Camshaft bearing housing:		
Stage 1 – studs	10	7
Stage 2 – bolts	5	4
Stage 3 – bolts	10	7
Crankshaft pulley bolt:		
Stage 1	70	52
Stage 2	Angle-tighten a further 82°	
Cylinder head cover:		
Stage 1	5	
Stage 2	10	7
Exhaust manifold:		
Stage 1	15	11
Stage 2	30	22
Flywheel:		
Stage 1	15	11
Stage 2	47	35
Hub-mounted pulley	20	15
Lower cylinder block:		
Stage 1	10	7
Stage 2	16	12
Main bearing cap:		
Stage 1	25	18
Stage 2	Angle-tighten a further 60° ± 5°	
Oil cooler	58	43
Oil pump:		
Stage 1	7	5
Stage 2	9	7
Piston skirt spray jets	10	7
Right-hand engine mounting:		
Stage 1	10	7
Stage 2 – 8.0 mm diameter bolts	20	15
Stage 3 – 10.0 mm diameter bolts	45	33
Timing belt guide roller:		
Stage 1	15	11
Stage 2	43	32
Timing belt tensioner roller	25	18
Turbocharger lubrication pipe:		
Engine side	30	22
Turbocharger side	20	15

1 General information

How to use this Chapter

This Part of Chapter 2 describes the repair procedures that can reasonably be carried out on the engine while it remains in the vehicle. If the engine has been removed from the vehicle and is being dismantled as described in Part D, any preliminary dismantling procedures can be ignored.

Note that, while it may be possible physically to overhaul items such as the piston/connecting rod assemblies while the engine is in the car, such tasks are not usually carried out as separate operations. Usually, several additional procedures are required (not to mention the cleaning of components and oil ways); for this reason, all such tasks are classed as major overhaul procedures, and are described in Part D of this Chapter.

Part D describes the removal of the engine/transmission from the car, and the full overhaul procedures that can then be carried out.

DW series engine

The DW series engine is a relatively new power unit based on the well-proven XUD series engine which has appeared in many Peugeot and Citroën vehicles. In particular, the cylinder block components are very similar to the XUD, however, the remainder of the engine has been completely redesigned. The DW10 engine is of single overhead camshaft design, but the DW12 engine is of double overhead camshaft, 16-valve design. The turbocharged, four-cylinder engine is mounted transversely, with the transmission mounted on the left-hand side.

On the 2.0 litre DW10 engine, a toothed timing belt drives the camshaft, high-pressure fuel pump and coolant pump. The camshaft operates the inlet and exhaust valves via rocker arms which are supported at their pivot ends by hydraulic self-adjusting tappets. The camshaft is supported by six bearings machined directly in the cylinder head and camshaft bearing housing.

On the 2.2 litre DW12 engine, a toothed timing belt drives the exhaust camshaft, high-pressure fuel pump and coolant pump, and the inlet camshaft is driven by chain from the right-hand end of the exhaust camshaft. A hydraulic tensioner controls the tension of the camshaft chain; it incorporates an internal valve which retains pressure when the engine is stopped.

On both engines, the high-pressure fuel pump supplies fuel to the fuel rail, and subsequently to the electronically-controlled injectors which inject the fuel direct into the combustion chambers. This design differs from the previous type where an injection pump supplies the fuel at high-pressure to each injector. The earlier, conventional type injection pump required fine calibration and timing, and these functions are now completed by the high-pressure pump, electronic injectors and engine management ECU.

On the 2.2 litre DW12 engine, the cylinder head incorporates inlet ducts which are designed to apply 'swirl' to the inlet air as it enters the combustion chambers; in addition 'swirl' control butterflies are fitted in the head to provide variable a 'swirl' action according to operating conditions. One inlet valve in each cylinder is supplied with air through a short inlet duct, and the second inlet valve is supplied with air through a long inlet duct, controlled by the 'swirl' butterflies.

The crankshaft runs in five main bearings of the usual shell type. Endfloat is controlled by thrust washers either side of No 2 main bearing.

The 2.2 litre DW12 engine is equipped with two balance shafts which are located beneath the crankshaft, and are rotated by a large gear on the crankshaft engaged with the rearmost balance shaft. The front balance shaft is geared to the rear shaft and therefore rotates in the opposite direction.

The pistons are selected to be of matching weight, and incorporate fully-floating gudgeon pins retained by circlips.

The oil pump is chain-driven from the right-hand end of the crankshaft and an oil cooler is fitted to all engines.

Throughout the manual, it is often necessary to identify the engines not only by their cubic capacity, but also by their engine code. The engine code, consists of three letters (eg, DW10). The code is stamped on a plate attached to the front of the cylinder block.

Repair operations precaution

The engine is a complex unit with numerous accessories and ancillary components. The design of the engine compartment is such that every conceivable space has been utilised, and access to virtually all of the engine components is extremely limited. In many cases, ancillary components will have to be removed, or moved to one side, and wiring, pipes and hoses will have to be disconnected or removed from various cable clips and support brackets.

When working on this engine, read through the entire procedure first, look at the car and engine at the same time, and establish whether you have the necessary tools, equipment, skill and patience to proceed. Allow considerable time for any operation, and be prepared for the unexpected. Any major work on these engines is not for the faint-hearted!

Because of the limited access, many of the engine photographs appearing in this Chapter were, by necessity, taken with the engine removed from the vehicle.

Warning: It is essential to observe strict precautions when working on the fuel system components of the engine, particularly the high-pressure side of the system. Before carrying out any engine operations that entail working on, or near, any part of the fuel system, refer to the special information given in Chapter 4B, Section 2.

Repair operations possible with the engine in the vehicle

a) Compression pressure – testing.
b) Cylinder head cover(s) – removal and refitting.
c) Crankshaft pulley – removal and refitting.
d) Timing belt covers – removal and refitting.
e) Timing belt – removal, refitting and adjustment.
f) Timing belt tensioner and sprockets – removal and refitting.
g) Camshaft oil seal – renewal.
h) Camshaft, rocker arms and hydraulic tappets – removal, inspection and refitting.
i) Sump – removal and refitting.
j) Oil pump – removal and refitting.
k) Crankshaft oil seals – renewal.
l) Engine/transmission mountings – inspection and renewal.
m) Flywheel/driveplate – removal, inspection and refitting.

2 Compression and leakdown tests – description and interpretation

Compression test

Note: *A compression tester specifically designed for diesel engines must be used for this test.*

1 When engine performance is down, or if misfiring occurs which cannot be attributed to the fuel system, a compression test can provide diagnostic clues as to the engine's condition. If the test is performed regularly, it can give warning of trouble before any other symptoms become apparent.

2 A compression tester specifically intended for diesel engines must be used, because of the higher pressures involved. The tester is connected to an adapter which screws into the glow plug or injector hole. On these engines, an adapter suitable for use in the glow plug holes will be required, so as not to disturb the fuel system components. It is unlikely to be worthwhile buying such a tester for occasional use, but it may be possible to borrow or hire one – if not, have the test performed by a garage.

3 Unless specific instructions to the contrary are supplied with the tester, observe the following points:

a) The battery must be in a good state of charge, the air filter must be clean, and the engine should be at normal operating temperature.
b) All the glow plugs should be removed as described in Chapter 5C before starting the test.
c) The wiring connector on the engine management system ECU (located in the plastic box behind the battery) must be disconnected.

4 The compression pressures measured are not so important as the balance between cylinders. Values are given in the Specifications.

5 The cause of poor compression is less easy to establish on a diesel engine than on a petrol one. The effect of introducing oil into the cylinders ('wet' testing) is not conclusive, because there is a risk that the oil will sit in the swirl chamber or in the recess on the piston crown instead of passing to the rings. However, the following can be used as a rough guide to diagnosis.

6 All cylinders should produce very similar pressures; any difference greater than that specified indicates the existence of a fault. Note that the compression should build-up quickly in a healthy engine; low compression on the first stroke, followed by gradually-increasing pressure on successive strokes, indicates worn piston rings. A low compression reading on the first stroke, which does not build-up during successive strokes, indicates leaking valves or a blown head gasket (a cracked head could also be the cause). Deposits on the undersides of the valve heads can also cause low compression.

7 A low reading from two adjacent cylinders is almost certainly due to the head gasket having blown between them; the presence of coolant in the engine oil will confirm this.

8 If the compression reading is unusually high, the cylinder head surfaces, valves and pistons are probably coated with carbon deposits. If this is the case, the cylinder head should be removed and decarbonised (see Part D).

Leakdown test

9 A leakdown test measures the rate at which compressed air fed into the cylinder is lost. It is an alternative to a compression test, and in many ways it is better, since the escaping air provides easy identification of where pressure loss is occurring (piston rings, valves or head gasket).

10 The equipment needed for leakdown testing is unlikely to be available to the home mechanic. If poor compression is suspected, have the test performed by a suitably-equipped garage.

3 Engine assembly/ valve timing holes – general information and usage

General

Note: *Do not attempt to rotate the engine whilst the crankshaft and camshaft are locked in position. If the engine is to be left in this state for a long period of time, it is a good idea to place suitable warning notices inside the vehicle, and in the engine compartment. This will reduce the possibility of the engine being accidentally cranked on the starter motor, which is likely to cause damage with the locking pins in place.*

1 Timing holes or slots are located only in the flywheel/driveplate and camshaft sprocket hub. The holes/slots are used to align the crank-shaft and camshaft at the TDC position for Nos 1 and 4 pistons. This will ensure that the valve timing is maintained during operations that require removal and refitting of the timing belt. When the holes/slots are aligned with their corresponding holes in the cylinder block and cylinder head, suitable diameter bolts/pins can be inserted to lock the crankshaft and camshaft in position, preventing rotation. Note: With the timing holes aligned, No 4 piston is at TDC on its compression stroke.

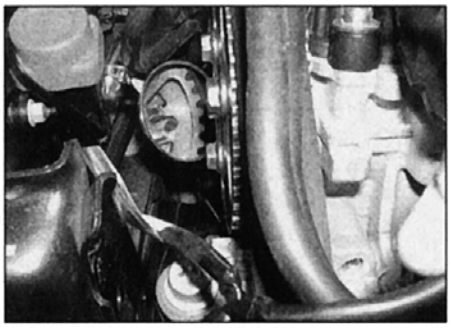
2 Note that the HDi type fuel system used on these engines does not have a conventional diesel injection pump, but instead uses a high-pressure fuel pump that does not have to be timed. The alignment of the fuel pump sprocket (and hence the fuel pump itself) with respect to crankshaft and camshaft position, is therefore irrelevant.

3 To align the engine assembly/valve timing holes, proceed as follows.

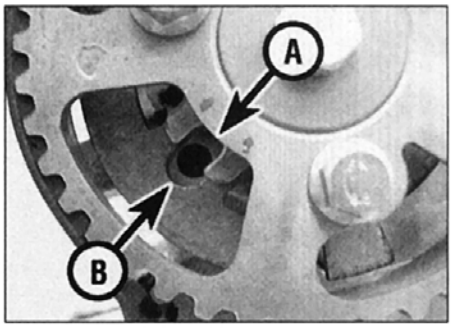
4 Remove the upper and intermediate timing belt covers.

5 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see Jacking and vehicle support). Remove the right-hand front roadwheel.

6 To gain access to the crankshaft pulley, to enable the engine to be turned, the wheelarch plastic liner must be removed. The liner is secured by various screws and clips under the wheelarch. Release all the fasteners, and remove liner from under the front wing. Where necessary, unclip the coolant hoses from under the wing to improve access further. The crank-shaft can then be turned using a suitable socket and extension bar fitted to the pulley bolt.



3.7a Use a mirror to observe the camshaft sprocket hub timing slot (DW10 engine)



3.7b Camshaft sprocket hub timing slot (A) aligned with the cylinder head timing hole (B) (DW10 engine)

7 Turn the crankshaft until the timing slot in the camshaft sprocket hub is aligned with the corresponding hole in the cylinder head. Note that the crankshaft must always be turned in a clockwise direction (viewed from the right-hand side of vehicle). Use a small mirror so that the position of the sprocket hub timing slot can be observed **(see illustrations)**. When the slot is aligned with the corresponding hole in the cylinder head, the engine is positioned at TDC for Nos 1 and 4 pistons. Note: Make sure that the centre part of the slot is aligned with the hole in the cylinder head, as it is possible to incorrectly align the area to each side of the slot.

8 Insert an 8 mm diameter bolt, rod or drill through the hole in the left-hand flange of the cylinder block by the starter motor; if necessary, carefully turn the crankshaft either way until the rod enters the timing hole in the flywheel/driveplate **(see illustrations)**.

9 Insert an 8 mm bolt, rod or drill through the hole in the camshaft sprocket hub and into engagement with the cylinder head **(see illustration)**. Note that the TDC hole is located at the 8 o'clock position on the DW10 engine, whereas on the DW12 engine it is located at the 4 o'clock position.

10 The crankshaft and camshaft are now locked in position, preventing unnecessary rotation.

4 Cylinder head cover – removal and refitting

Removal

1 Remove the engine top cover(s).

2 On the DW10 engine, remove the timing belt upper cover. On the DW12 engine, remove the bolt securing the upper timing cover to the top cover.

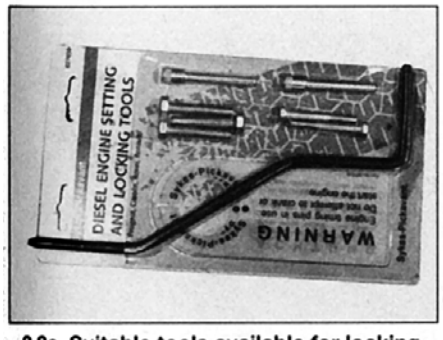
3 As applicable, slacken or release the clips securing the crankcase ventilation hoses to the cylinder cover and disconnect the hoses.

4 On the DW10 engine, undo the bolts and move the engine cover and cable guide support bracket clear of the right-hand end of the cylinder head cover.

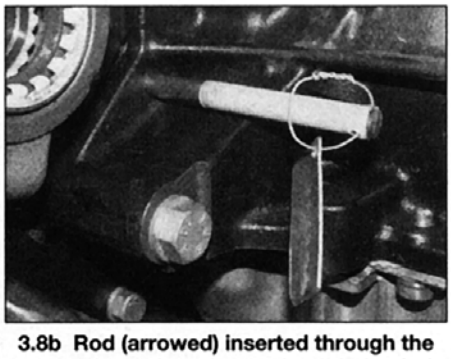
5 Disconnect the camshaft position sensor wiring connector.

6 Release the wiring harness from the clip on the cylinder head cover and move the harness to one side.

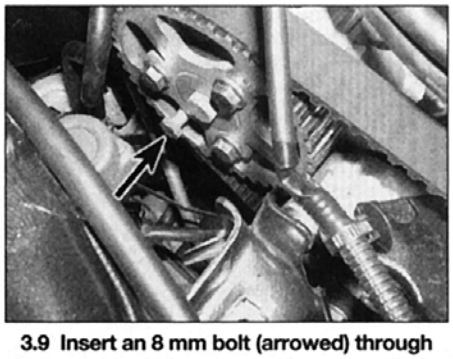
7 Progressively unscrew the bolts securing the cylinder head cover to the camshaft carrier or inlet manifold (as applicable) and collect the washers. Carefully lift off the cover taking care not to damage the camshaft position sensor as the cover is removed. Recover the seal from the cover.



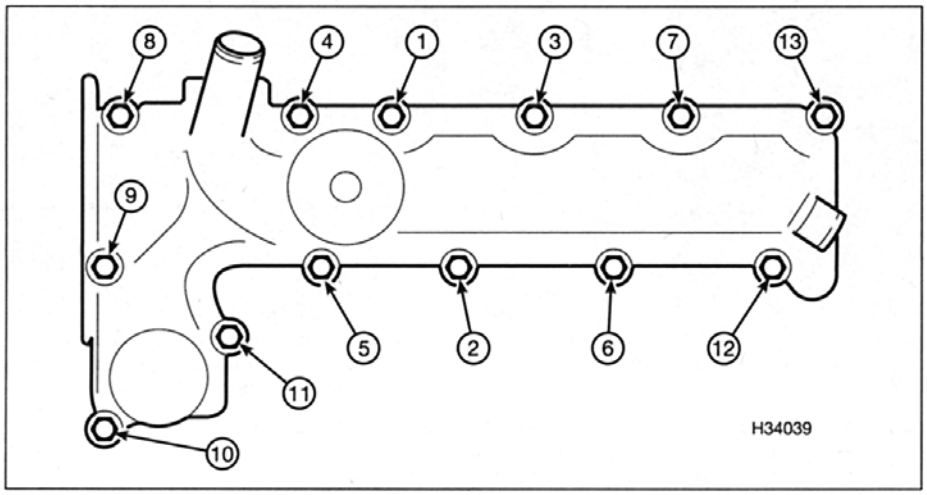
3.8a Suitable tools available for locking the engine in the TDC position



3.8b Rod (arrowed) inserted through the cylinder block into the flywheel timing hole (DW12 engine)



3.9 Insert an 8 mm bolt (arrowed) through the sprocket timing slot and into the cylinder head to lock the camshaft (DW10 engine)



4.8 Cylinder head cover bolt tightening sequence (DW12 engine)

Refitting

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

a) Examine the cover seal for signs of damage and deterioration, and renew if necessary.

*b) Tighten the cylinder head cover bolts to the specified torque in the order shown **(see illustration)**.*

c) Before refitting the timing belt upper cover, adjust the camshaft position sensor air gap as described in Chapter 4B, Section 13.

5 Crankshaft pulley – removal and refitting

Removal

1 Remove the auxiliary drivebelt as described in Chapter 1B. Turn the tensioner anti-clockwise and insert a pin or drill to hold it away from the drivebelt **(see illustration)**.

2 To prevent crankshaft turning whilst the pulley retaining bolt is being slackened on manual transmission models, select top gear and have an assistant apply the brakes firmly. Alternatively, the flywheel/driveplate ring gear can be locked using a suitable tool made from steel angle **(see illustration)**. Remove the cover plate from the base of the transmission bellhousing and bolt the tool to the bellhousing flange so it engages with the ring gear teeth. *Do not* attempt to lock the pulley by inserting a bolt/drill through the timing hole. If the timing hole bolt/drill is in position from a previous operation, temporarily remove it prior to slackening the pulley bolt, then refit it once the bolt has been slackened.

3 Using a suitable socket and extension bar, unscrew the retaining bolt, remove the washer, then slide the pulley off the end of the crankshaft **(see illustration)**. If the pulley is tight fit, it can be drawn off the crankshaft using a suitable puller. If a puller is being used, refit the pulley retaining bolt without the washer, to avoid damaging the crankshaft as the puller is tightened.

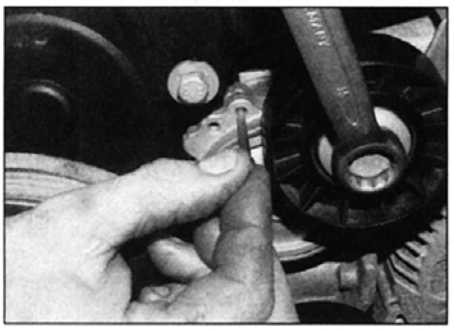
4 If the pulley locating Woodruff key is a loose fit, remove it and store it with the pulley for safe-keeping.

Refitting

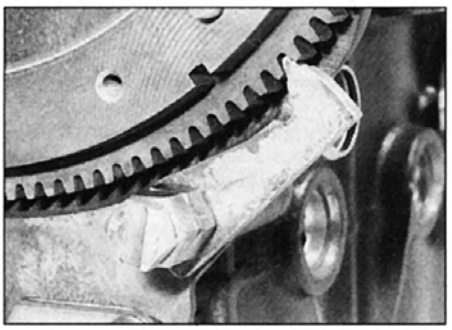
5 Ensure that the Woodruff key is correctly located in its crankshaft groove, then refit the pulley to the end of the crankshaft.

6 Thoroughly clean the threads of the pulley retaining bolt, then apply a coat of locking compound to the bolt threads. Peugeot recommend the use of Loctite (available from your Peugeot dealer); in the absence of this, any good-quality locking compound may be used.

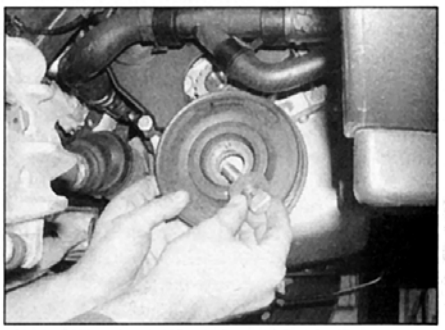
7 Refit the crankshaft pulley retaining bolt and



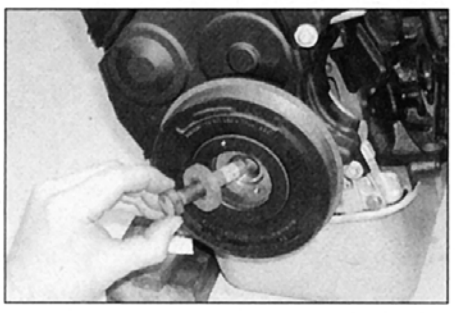
5.1 Turn the tensioner anti-clockwise and insert a pin or drill to hold it away from the drivebelt



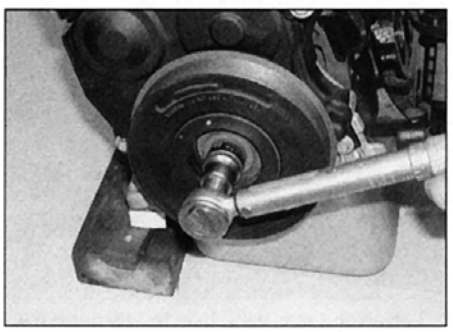
5.2 Use a fabricated tool similar to this to lock the flywheel ring gear and prevent crankshaft rotation



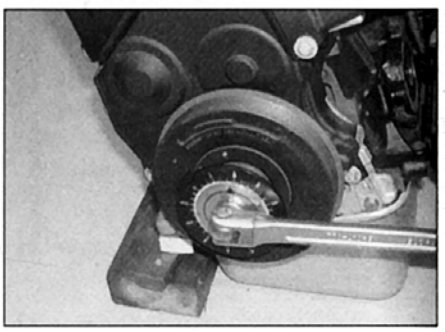
5.3 Removing the crankshaft pulley (DW10 engine)



5.7a Refit the crankshaft pulley retaining bolt after applying locking compound to the threads (DW10 engine)

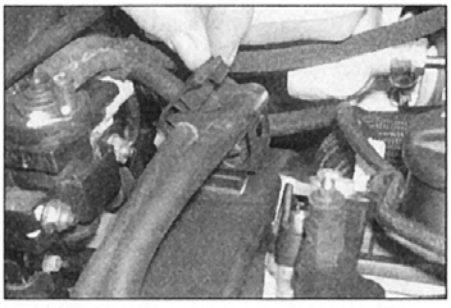


5.7b Tighten the pulley bolt to the specified Stage 1 torque . . .

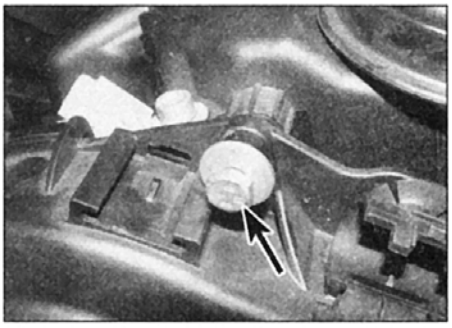


5.7c . . . then through the specified Stage 2 angle (DW10 engine)

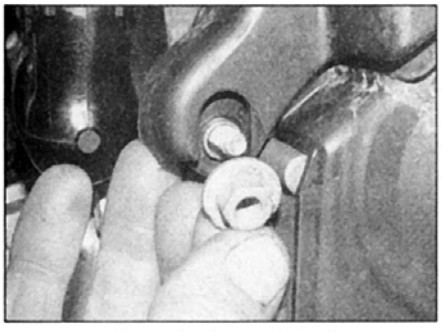
6.2 Disconnect the fuel supply and return hose quick-release fittings (DW10 engine)



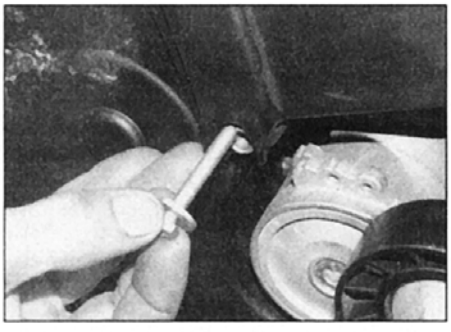
6.3 Release the two fuel hoses from the retaining clips on the timing belt upper cover (DW10 engine)



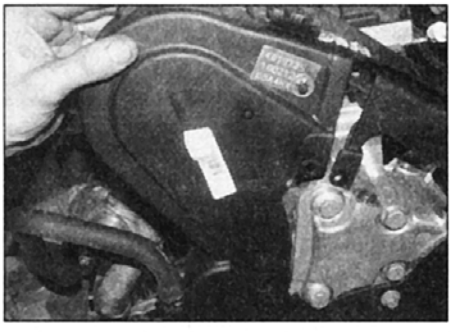
6.5 Bolt securing the upper cover to the cylinder head cover (DW12 engine)



6.7 Removing the lower nut from the stud (DW12 engine)



6.8 Removing the central bolt (DW12 engine)



6.9 Removing the timing belt upper cover . . .

washer. Tighten the bolt to the specified torque, then through the specified angle, preventing the crankshaft from turning using the method employed on removal **(see illustrations)**.

8 Refit and tension the auxiliary drivebelt as described in Chapter 1B.

6 Timing belt covers – removal and refitting

Warning: Refer to the precautionary information contained in Section 1 before proceeding.

Note: *Access to the timing belt covers may be improved by first removing the right-hand engine mounting (see Section 17).*

Removal

Upper cover

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 At the connections above the fuel pump, disconnect the fuel supply and return hose quick-release fittings using a small screwdriver to release the locking clip **(see illustration)**. Cover the open unions to prevent dirt entry, using small plastic bags, or fingers cut from clean rubber gloves.

3 Release the two hoses from the retaining clips on the upper timing belt cover and move them to one side **(see illustration)**.

4 Release the EGR solenoid valve vacuum hose from the clip on the upper cover.

5 Undo the bolt securing the upper cover to the cylinder head cover **(see illustration)**.

6 Undo the upper bolt on the edge of the cover nearest to the engine compartment bulkhead.

7 Undo the lower bolt/nut on the bulkhead side of the cover, at the join between the upper and lower covers **(see illustration)**. Note that this bolt/stud also retains the coolant pump. Where a bolt is fitted, to avoid coolant leakage after the upper cover is removed, refit the bolt fitted with a 17.0 mm spacer, and tighten it securely.

8 Undo the remaining bolt in the centre of the cover **(see illustration)**.

9 Disengage the upper cover from the intermediate cover and manipulate the upper cover from its location **(see illustration)**.

Intermediate cover

10 Remove the upper cover as described previously.

11 Undo the upper bolt on the top edge of the intermediate cover.

12 Undo the two remaining bolts at the join between the intermediate cover and lower cover, then manipulate the intermediate cover from its location **(see illustration)**.

Lower cover

13 Remove the upper and intermediate covers as described previously.

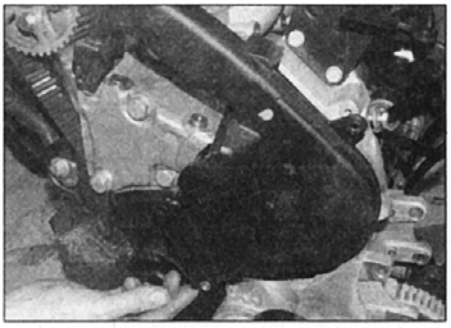
14 Remove the crankshaft pulley as described in Section 5.

15 Undo the two remaining bolts on the edge of the cover, one on either side of the crankshaft pulley location.

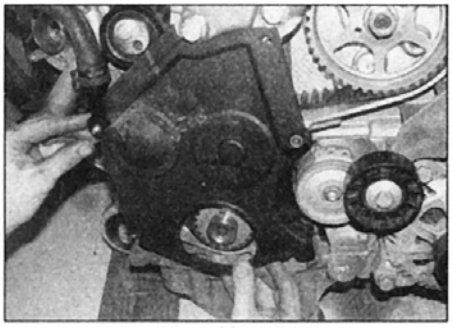
16 Lift the cover off the front of the engine **(see illustration)**.

Refitting

17 Refitting of all the covers is a reversal of the relevant removal procedure, ensuring that



6.12 . . . intermediate cover . . .



6.16 . . . and lower cover (DW12 engine)

7.7 Removing the front wheelarch liner

7.8 Removing the auxiliary drivebelt

7.9 Removing the turbocharger air inlet pipe

each cover section is correctly located, and that the cover retaining bolts are securely tightened. Ensure that all disturbed hoses are reconnected and retained by their relevant clips.

7 Timing belt – removal, inspection, refitting and tensioning

Note: *Peugeot specify the use of an electronic belt tension checking tool (SEEM CTG 105.M) to correctly set the timing belt tension. The following procedure assumes that this equipment (or suitable alternative equipment calibrated to display belt tension in SEEM units) is available. Accurate tensioning of the timing belt is essential, and if the electronic equipment is not available, it is recommended that the work is entrusted to a Peugeot dealer or suitably-equipped garage.*

General

1 The timing belt drives the camshaft(s), high-pressure fuel pump, and coolant pump from a toothed sprocket on the end of the crankshaft. If the belt breaks or slips in service, the pistons are likely to hit the valve heads, resulting in expensive damage.

2 The timing belt should be renewed at the specified intervals, or earlier if it is contaminated with oil, or at all noisy in operation (a 'scraping' noise due to uneven wear).

3 If the timing belt is being removed, it is a wise precaution to check the condition of the coolant pump at the same time (check for signs of coolant leakage). This may avoid the need to remove the timing belt again at a later stage, should the coolant pump fail.

Removal

4 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the front right-hand roadwheel.

5 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

6 Refer to Chapter 4B and remove the complete exhaust system.

Caution: If the exhaust system is not removed, the front pipe flexible section will be damaged when the right-hand engine mounting is detached.

7 Remove the front right-hand wheelarch liner **(see illustration)**.

8 Remove the auxiliary drivebelt as described in Chapter 1B **(see illustration)**.

9 Remove the turbocharger air inlet pipe **(see illustration)**.

10 Unbolt the closure plate from the bottom of the clutch housing

11 Using a suitable tool, lock the flywheel/driveplate, then loosen the crankshaft pulley bolt. Peugeot technicians use a tool which engages the teeth of the starter ring gear and is bolted to the clutch bellhousing. A similar tool may be made out of a length of angle-iron, bent to engage the teeth, or alternatively an assistant may restrain the starter ring gear with a wide-blade screwdriver.

12 Unscrew and remove the crankshaft pulley bolt, then remove the pulley from the crankshaft **(see illustrations)**. If it is tight, refit the bolt without its washer, leaving sufficient room to release the pulley. Using a puller, remove the pulley from the front of the crankshaft.

13 Unbolt and remove the engine rear torque reaction link.

14 An 8.0 mm diameter flywheel/driveplate locking pin is now required, and may be obtained from a Peugeot dealer or car accessory shop. Note that the locking pin for the DW10TD is different to the pin for DW10ATED and DW12TED4 engines. The pin for the DW10ATED and DW12TED4 engines incorporates a retaining coil spring.

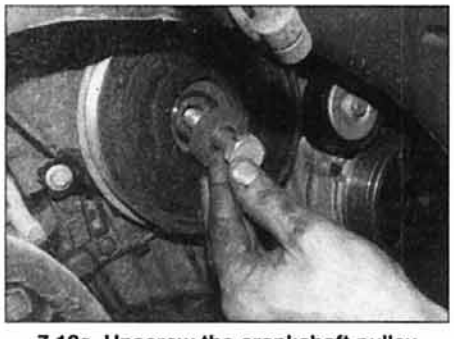
15 Temporarily refit the crankshaft pulley bolt, then turn the engine until the TDC hole in the flywheel/driveplate is aligned with the hole in the front (DW10) or rear (DW12) engine flange (next to the transmission bellhousing). Insert the locking pin to lock the engine.

16 Remove the engine top cover(s).

17 Remove the engine management ECU (see Chapter 4B, Section 13) and the housing from the front right-hand corner of the engine compartment.

18 Unbolt and remove the right-hand engine mounting torque reaction link. The engine will still be supported by the bracket on the rubber mounting. Note that the mounting bracket is slotted so the front bolt need only be loosened **(see illustrations)**.

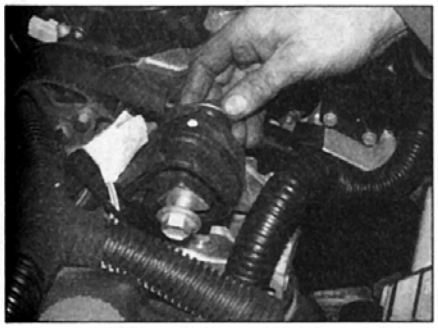
19 Disconnect the fuel supply and return hoses from the fuel rail, then tape over or plug the hoses and rail to prevent entry of dust and dirt.



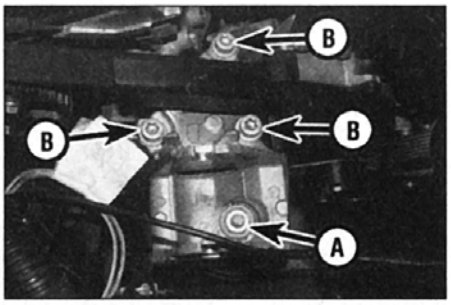
7.12a Unscrew the crankshaft pulley bolt . . .

7.12b . . . then remove the pulley

7.18a Unscrew the bolts . . .

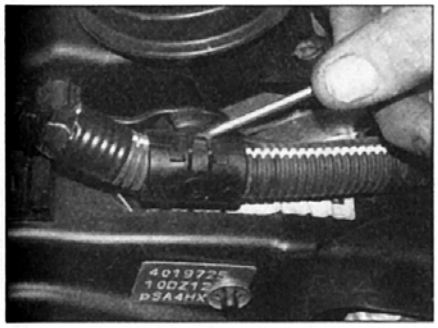


7.18b . . . and remove the right-hand engine mounting torque reaction link

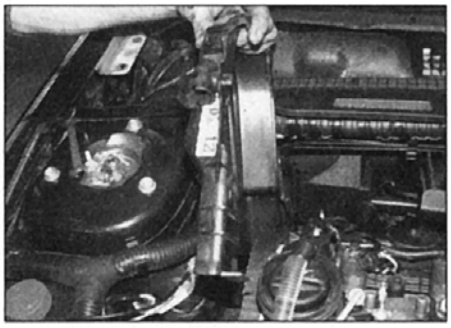


7.22a Undo the shouldered nut (A), then unscrew the Torx bolts (B) from the engine . . .

7.22b . . . and remove the right-hand mounting bracket



7.23a Release the wiring loom . . .



7.23b . . . then unbolt the upper . . .

7.23c . . . intermediate . . .

20 The engine must now be supported while the right-hand engine mounting bracket is removed. To do this, either use a trolley jack and block of wood beneath the sump, or an engine lifting hoist. Whichever method is used, make sure the engine is adequately supported.

21 As a precaution against damage to the radiator, place a card or piece of hardboard over it on the engine side.

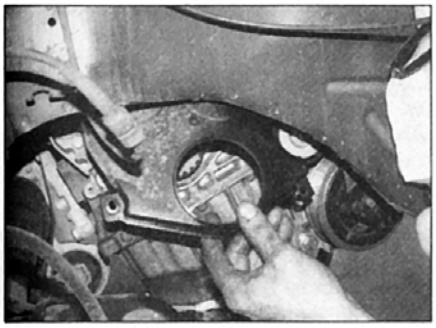
22 Unscrew the shouldered nut securing the right-hand engine mounting bracket to the flexible rubber mounting, then unbolt the bracket from the engine **(see illustrations)**. Note that the bracket is located on the engine with two dowels.

23 Release the wiring loom support from the upper timing cover, then unbolt and remove the upper, intermediate and lower timing covers **(see illustrations)**.

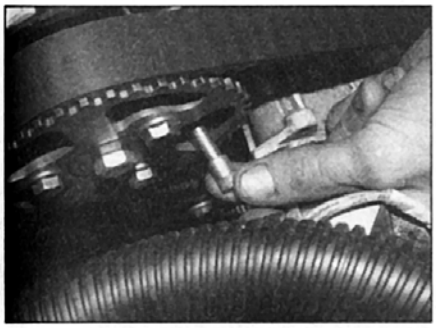
24 Insert a suitable drill or metal dowel through the TDC hole in the camshaft sprocket flange, and into the cylinder head **(see illustration)**. Note on the DW10 engine the hole is positioned at 8 o'clock but on the DW12 engine it is at the 4 o'clock position.

25 Loosen the bolt on the tensioner roller, and turn the tensioner clockwise to release the tension on the timing belt. If available, use a 10 mm square drive extension in the hole provided, to turn the tensioner bracket against the spring tension **(see Tool Tip)**. Retighten the bolt sufficiently to hold the tensioner in its released position; do not fully tighten the bolt in this position.

26 Mark the timing belt with an arrow to indicate its running direction, if it is to be re-used. Remove the belt from the sprockets **(see illustrations)**.

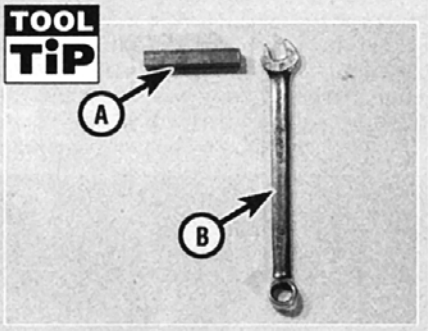


7.23d . . . and lower timing covers

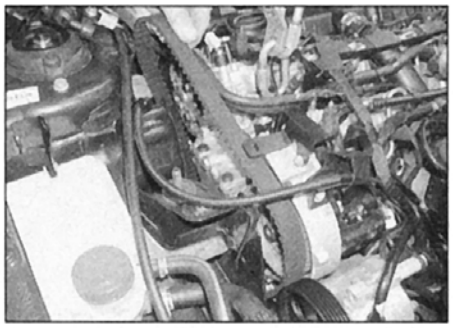


7.24 Inserting the TDC pin through the camshaft sprocket hole (DW12 engine)

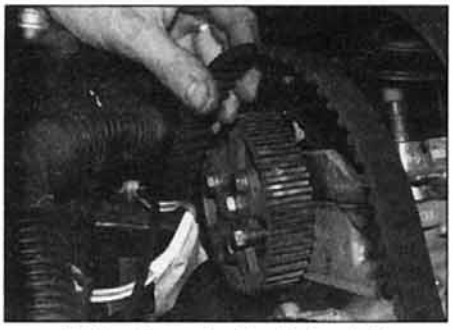
TOOL TiP



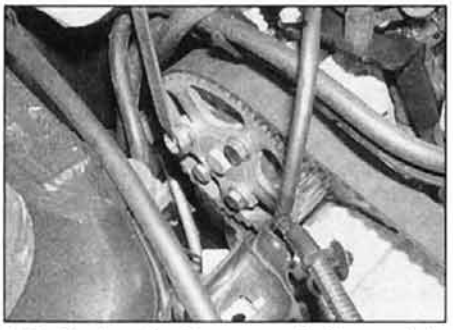
A square section tool to fit the timing belt tensioner pulley can be made from a length of standard 10 mm door handle rod (A), obtained from a DIY shop, and then cut to size. Once the rod has been fitted to the tensioner, the timing belt can be tensioned by turning the rod with an 10 mm spanner (B).



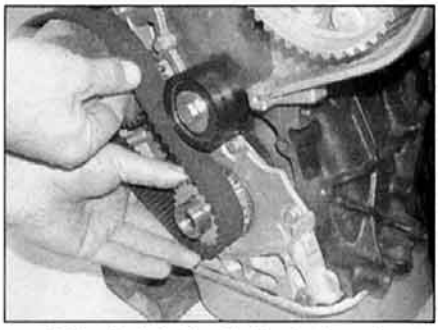
7.26a Removing the timing belt (DW10 engine)



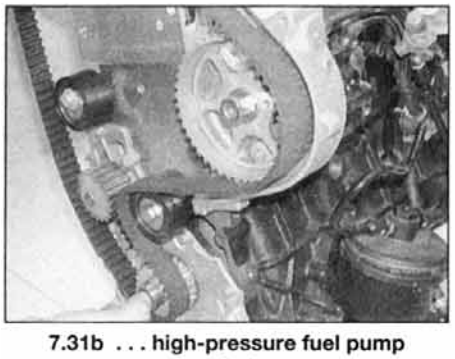
7.26b Removing the timing belt (DW12 engine)



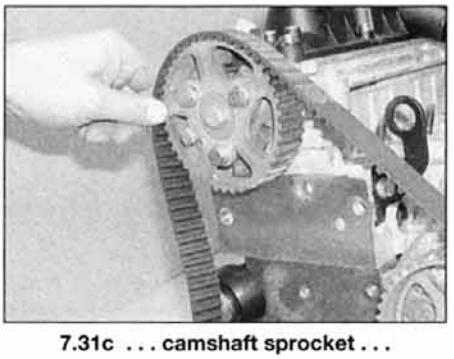
7.29 Slacken the three camshaft sprocket-to-sprocket hub retaining bolts (DW10 engine)



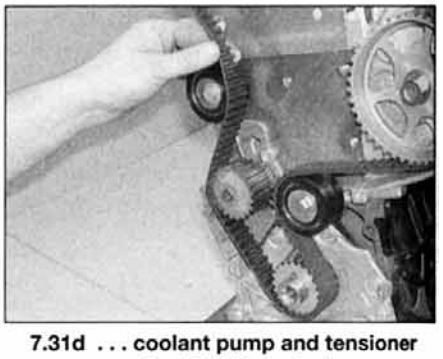
7.31a Retain the timing belt on the crankshaft sprocket and feed it around the idler roller . . .



7.31b . . . high-pressure fuel pump sprocket . . .



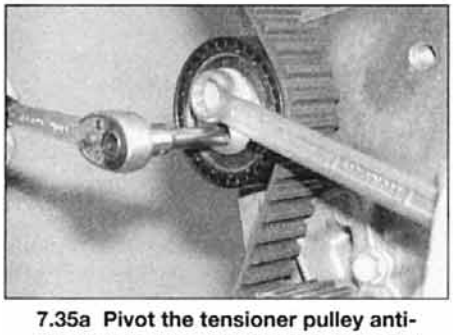
7.31c . . . camshaft sprocket . . .



7.31d . . . coolant pump and tensioner pulley (DW10 engine)

Inspection

27 Check the timing belt carefully for any signs of uneven wear, splits or oil contamination. Pay particular attention to the roots of the teeth. Renew it if there is the slightest doubt about its condition. If the engine is undergoing an overhaul, and has covered more than 36 000 miles (60 000 km) with the existing belt fitted, renew the belt as a matter of course, regardless of its apparent condition. The cost of a new belt is nothing compared with the cost of repairs, should the belt break in service. If signs of oil contamination are found, trace the source of the oil leak and rectify it. Wash down the engine timing belt area and all related components, to remove all traces of oil. Check that the tensioner and idler pulleys rotate freely without any sign of roughness, and also check that the coolant pump pulley rotates freely. If necessary, renew these items.



7.35a Pivot the tensioner pulley anti-clockwise, then tighten the retaining bolt . . .

7.35b . . . when the specified tension value is shown on the tensioning measuring equipment

Refitting and tensioning

28 Commence refitting by ensuring that the TDC timing pins are still in position correctly.

29 Loosen the three bolts securing the camshaft sprocket to the camshaft, so that the sprocket can be turned on its hub **(see illustration)**. To do this, either use a tool engaged with the holes in the sprocket, or alternatively, hold the sprocket with an old timing belt.

30 Finger-tighten the sprocket bolts, then slacken each bolt by one sixth of a turn. Turn the sprocket clockwise to the end of the slots.

31 Locate the timing belt on the crankshaft pulley splines, then, keeping it taut, locate it around the idler pulley and onto the high-pressure pump pulley **(see illustrations)**. If refitting the old belt, make sure that the direction arrow is pointing in the normal rotation of the engine. Peugeot technicians use a plastic clip to retain the belt on the crankshaft pulley; if necessary, use a plastic cable tie to hold it.

32 Locate the belt onto the camshaft pulley splines. If the teeth do not align correctly, turn the camshaft sprocket slightly anti-clockwise until the belt engages. **Note:** *Do not turn the pulley anti-clockwise more than one tooth space.*

33 Continue to locate the belt onto the tensioner pulley and coolant pump splines, then loosen the bolt and turn the tensioner *anti-clockwise* to tension the belt moderately. Pretighten the bolt to 1.0 Nm, then remove the holding clip or cable tie.

34 A timing belt tension setting tool is now required to apply the correct tension. A tool which checks SEEM units is necessary, and should be fitted to the belt run between the camshaft sprocket and high-pressure pump sprocket.

35 Loosen the bolt, then turn the tensioner *anti-clockwise* until 98.0 ± 2.0 SEEM units (DW10 engine) or 106 ± 2.0 SEEM units (DW12 engine) is read on the tool **(see illustrations)**. At this point, tighten the tensioner bolt to the specified torque. **Note:** *In our workshops, it was found impossible to achieve the specified SEEM units on the DW12 engine, as there was insufficient movement of the tensioner. We therefore set it to the maximum possible, before the tensioner reached the apex of its movement.*

36 Temporarily remove one of the three bolts securing the sprocket to the camshaft, and check that the bolts are not at the anti-

clockwise limit of their slots. If they are, repeat the refitting procedure.
37 Tighten the camshaft sprocket bolts to the specified torque.
38 Remove the crankshaft and camshaft TDC setting pins. Also remove the tensioning tool.
39 Turn the engine clockwise 8 times. Do not turn the engine anti-clockwise during this operation.
40 Refit the crankshaft and camshaft TDC setting pins.
41 Loosen the camshaft sprocket bolts again, then finger-tighten them, and loosen each by one sixth of a turn.
42 Refit the tensioning tool midway between the camshaft and high-pressure pump sprocket.
43 Loosen the tensioner bolt, then turn the tensioner anti-clockwise until the tool reads 54.0 ± 2.0 SEEM units (DW10 engine) or 51.0 ± 3.0 SEEM units (DW12 engine). With the tensioner held in this position, tighten the bolt to the specified torque. It is important to apply the correct tension to the timing belt, otherwise the belt may be noisy in operation, or worse still, may break.
44 Tighten the camshaft sprocket bolts to the specified torque.
45 Remove the tensioning tool to release its internal forces, then refit it and check the tension of the belt is between 51.0 and 57.0 SEEM units (DW10 engine) or between 48.0 and 54.0 SEEM units (DW12 engine). If necessary, repeat the tensioning procedure.
46 Remove the tensioning tool and TDC setting pins.
47 Turn the engine clockwise 2 times. Do not turn the engine anti-clockwise during this operation.
48 Refit the crankshaft and camshaft TDC setting/locking pins.
49 Visually check that the offset between the camshaft hub hole and the corresponding setting hole does not exceed 1.0 mm.
50 Remove the TDC setting/locking pins.
51 Refit the lower, intermediate and upper timing covers.
52 Refit the right-hand engine mounting and torque reaction link, tightening the bolts to the specified torque.
53 Remove the protective card from the radiator and also remove the trolley jack from beneath the engine.
54 Reconnect the fuel supply and return hoses to the fuel rail.
55 Refit the ECU control unit housing.
56 Refit the engine management ECU and the engine top cover.
57 Refit the engine rear torque reaction link and tighten the bolts to the specified torque.
58 Locate the crankshaft pulley on the front of the crankshaft.
59 Before refitting the crankshaft pulley bolt, it is recommended that both the threads of the bolt and crankshaft and cleaned of any remaining locking fluid. With the threads clean, apply fresh locking fluid to the bolt threads.
60 Lock the flywheel/driveplate using the method used for removal, then insert the crankshaft pulley bolt and tighten it to its Stage 1 torque. Using an angle-tightening tool, tighten the bolt to the Stage 2 setting. Using the torque wrench, check that the bolt is tightened to at least 195 Nm (144 lbf ft).
61 Refit the closure plate to the bottom of the clutch housing and tighten the bolts securely.
62 Refit the turbocharger pipe.
63 Refit the auxiliary drivebelt with reference to Chapter 1B.
64 Refit the front right-hand wheelarch liner.
65 Refit the exhaust system. Check the mountings and if necessary renew them.
66 Reconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).
67 Refit the roadwheel and lower the vehicle to the ground.

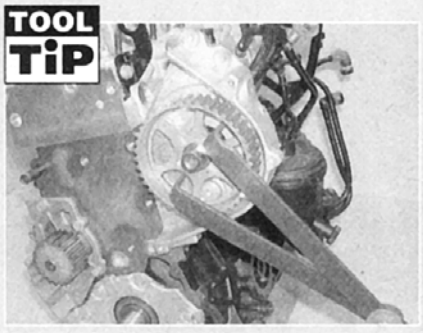
8 Timing belt sprockets and tensioner – removal and refitting

Camshaft sprocket

Removal

1 Remove the crankshaft pulley as described in Section 5. Refit the pulley retaining bolt to allow the engine to be turned in subsequent operations.
2 Remove the upper, intermediate and lower timing belt covers as described in Section 6.
3 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hub and flywheel/driveplate in position.
4 Loosen the timing belt tensioner pulley retaining bolt. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.
5 Disengage the timing belt from the camshaft sprocket and position it clear, taking care not to bend or twist the belt sharply.
6 Remove the locking tool from the camshaft sprocket hub. Slacken the sprocket hub retaining bolt, and the three sprocket-to-hub retaining bolts. To prevent the camshaft rotating as the bolts are slackened, a sprocket holding tool will be required. In the absence of the special Peugeot tool, an acceptable substitute can be fabricated at home **(see Tool Tip 1)**. *Do not* attempt to use the engine assembly/valve timing locking tool to prevent the sprocket from rotating whilst the bolt is slackened.
7 Remove the sprocket hub retaining bolt and washer, and slide the sprocket and hub off the end of the camshaft **(see illustration)**. If the Woodruff key is a loose fit in the camshaft, remove it for safe-keeping. Examine the camshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 14.

TOOL TiP



Tool Tip 1: A sprocket holding tool can be made from two lengths of steel strip bolted together to form a forked end. Bend the ends of the strip through 90° to form the fork 'prongs'.

8 If necessary, the sprocket can be separated from the hub after removing the three retaining bolts.
9 Clean the camshaft sprocket thoroughly, and renew it if there are any signs of wear, damage or cracks.

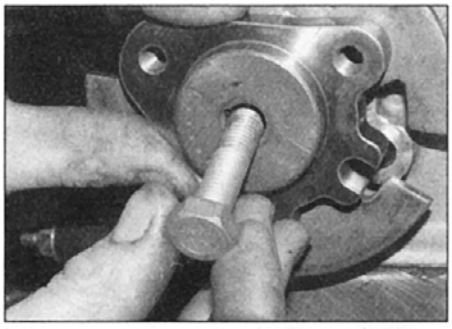
Refitting

10 If removed, refit the sprocket to the hub and secure with the three retaining bolts, tightened finger tight only at this stage.
11 Where applicable, refit the Woodruff key to the end of the camshaft, then refit the camshaft sprocket and hub.
12 Refit the sprocket hub retaining bolt and washer. Tighten the bolt to the specified torque, preventing the camshaft from turning as during removal.
13 Align the engine assembly/valve timing slot in the camshaft sprocket hub with the hole in the cylinder head and refit the 8 mm bolt to lock the camshaft in position.
14 Fit the timing belt around the pump sprocket and camshaft sprocket, and tension the timing belt as described in Section 7.

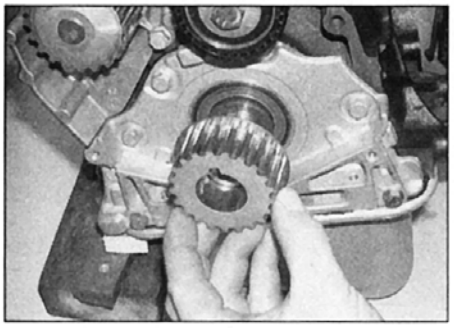
Crankshaft sprocket

Removal

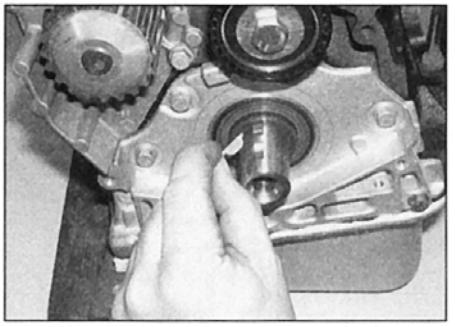
15 Align the engine assembly/valve timing holes as described in Section 3, but do not lock the camshaft sprocket hub or flywheel/driveplate in position at this stage.



8.7 Removing the camshaft sprocket hub (DW12 engine)

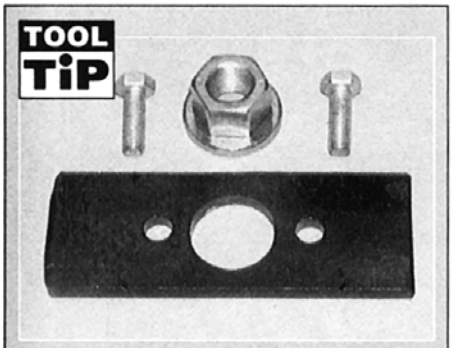


8.21a Slide the crankshaft sprocket off the end of the crankshaft . . .



8.21b . . . and collect the Woodruff key (DW10 engine)

16 Remove the crankshaft pulley as described in Section 5. Refit the pulley retaining bolt to allow the engine to be turned in subsequent operations.
17 Remove the timing belt upper, intermediate and lower covers as described in Section 6.
18 Check that the engine assembly/valve timing holes are still aligned as described in Section 3, and lock the camshaft sprocket hub and flywheel/driveplate in position.
19 Loosen the timing belt tensioner pulley retaining bolt. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.
20 Disengage the timing belt from the crankshaft sprocket and position it clear, taking care not to bend or twist the belt sharply.
21 Slide the sprocket off the end of the crankshaft and collect the Woodruff key **(see illustrations)**.
22 Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 14.
23 Clean the crankshaft sprocket thoroughly, and renew it if there are any signs of wear, damage or cracks.



Tool Tip 2: Make a sprocket releasing tool from a short strip of steel. Drill two holes in the strip to correspond with the two holes in the sprocket. Drill a third hole just large enough to accept the flats of the sprocket retaining nut.

Refitting

24 Refit the Woodruff key to the end of the crankshaft, then refit the crankshaft sprocket (with the flange nearest the cylinder block).
25 Fit the timing belt around the crankshaft sprocket, and tension the timing belt as described in Section 7.

Fuel pump sprocket

Removal

26 Remove the crankshaft pulley as described in Section 5. Refit the pulley retaining bolt to allow the engine to be turned in subsequent operations.
27 Remove the upper, intermediate and lower timing belt covers as described in Section 6.
28 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hub and flywheel/driveplate in position.
29 Loosen the timing belt tensioner pulley retaining bolt. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.
30 Disengage the timing belt from the high-pressure fuel pump sprocket and position it clear, taking care not to bend or twist the belt sharply.
31 Using a suitable socket, undo the pump sprocket retaining nut. The sprocket can be held stationary as the nut is slackened using a suitable forked tool engaged with the holes in the sprocket **(see Tool Tip 1)**.

8.33 Using the home-made tools to remove the fuel pump sprocket (DW10 engine)

32 The pump sprocket is a taper fit on the pump shaft and it will be necessary to make up another tool to release it from the taper **(see Tool Tip 2)**.
33 Partially unscrew the sprocket retaining nut, fit the home-made tool, and secure it to the sprocket with two suitable bolts. Prevent the sprocket from rotating as before, and unscrew the sprocket retaining nut **(see illustration)**. The nut will bear against the tool as it is undone, forcing the sprocket off the shaft taper. Once the taper is released, remove the tool, unscrew the nut fully, and remove the sprocket from the pump shaft.
34 Clean the sprocket thoroughly, and renew it if there are any signs of wear, damage or cracks.

Refitting

35 Refit the pump sprocket and retaining nut, and tighten the nut to the specified torque. Prevent the sprocket rotating as the nut is tightened using the sprocket holding tool.
36 Fit the timing belt around the pump sprocket, and tension the timing belt as described in Section 7.

Coolant pump sprocket

37 The coolant pump sprocket is integral with the pump, and cannot be removed.

Tensioner pulley

Removal

38 Remove the upper and intermediate timing belt covers as described in Section 6.
39 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hub and flywheel/driveplate in position.
40 Loosen the timing belt tensioner pulley retaining bolt. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt.
41 Remove the tensioner pulley retaining bolt, and slide the pulley off its mounting stud.
42 Clean the tensioner pulley, but do not use any strong solvent which may enter the pulley bearings. Check that the pulley rotates freely, with no sign of stiffness or free play. Renew the pulley if there is any doubt about its condition, or if there are any obvious signs of wear or damage.
43 Examine the pulley mounting stud for signs of damage and if necessary, renew it.

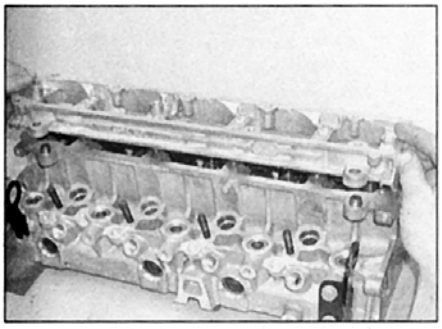
Refitting

44 Refit the tensioner pulley to its mounting stud, and fit the retaining bolt.
45 Fit the timing belt around the pulley, and tension the timing belt as described in Section 7.

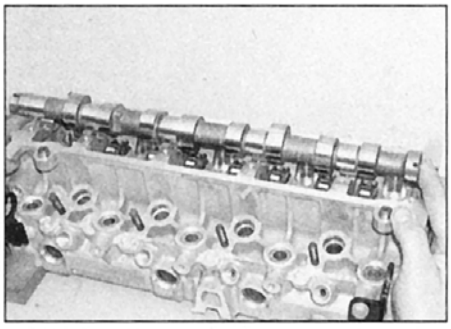
Idler roller

Removal

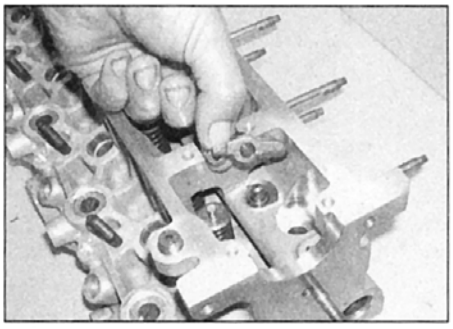
46 Remove the crankshaft pulley as described in Section 5. Refit the pulley retaining bolt to allow the engine to be turned in subsequent operations.



9.14 Remove the camshaft bearing housing from the cylinder head . . .



9.15 . . . then lift out the camshaft (DW10 engine)



9.17 Lift out the rocker arms . . .

47 Remove the upper, intermediate and lower timing belt covers as described in Section 6.

48 Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket hub and flywheel/driveplate in position.

49 Loosen the timing belt tensioner pulley retaining bolt. Allow the pulley to pivot in a clockwise direction, to relieve the tension from the timing belt. Retighten the tensioner pulley retaining bolt to secure it in the slackened position.

50 Undo the retaining bolt and withdraw the idler roller from the engine.

51 Clean the idler roller, but do not use any strong solvent which may enter the bearings. Check that the roller rotates freely, with no sign of stiffness or free play. Renew the idler roller if there is any doubt about its condition, or if there are any obvious signs of wear or damage.

Refitting

52 Locate the idler roller on the engine, and fit the retaining bolt. Tighten the bolt to the specified torque.

53 Fit the timing belt around the idler roller, and tension the timing belt as described in Section 7.

9 Camshaft(s), rocker arms and hydraulic tappets – removal, inspection and refitting

Removal

1 Remove the engine top cover.

2 Remove the air cleaner assembly and air inlet duct as described in Chapter 4B.

3 On the DW10ATED engine, remove the intercooler air duct from the left-hand end of the cylinder head.

4 Remove the timing belt as described in Section 7.

5 Refit the right-hand engine mounting, but only tighten the bolts moderately; this will keep the engine supported during the camshaft removal.

6 Disconnect the crankcase ventilation hose from the cylinder head cover.

7 Disconnect the wiring from the camshaft position sensor on the timing end of the cover.

8 Unbolt and remove the timing cover bracket.

9 Hold the camshaft sprocket stationary, then unscrew and remove the sprocket centre bolt and withdraw the sprocket.

2.0 litre (DW10) engine

10 Working in a spiral fashion starting at the left-hand end and finishing in the middle, progressively unscrew the bolts securing the cover to the camshaft bearing housing (refer to Section 4). Withdraw the cover.

11 Disconnect the vacuum pipe from the brake vacuum pump on the left-hand end of the cylinder head.

12 Remove the vacuum pump from the cylinder head with reference to Chapter 9.

13 Progressively loosen the camshaft bearing cap housing bolts until they can be removed.

14 Withdraw the bearing cap housing from the cylinder head. The housing is likely to be initially tight to release as it is located by two dowels on the forward facing side of the cylinder head. If necessary, very carefully prise up the housing using a screwdriver inserted in the slotted lug adjacent to each dowel location. Once the bearing housing is free, lift it squarely from the cylinder head **(see illustration)**. The camshaft will rise up slightly under the pressure of the valve springs – be careful it doesn't tilt and jam in the cylinder head or bearing housing section.

15 Carefully lift the camshaft from its location and remove the oil seal **(see illustration)**. Discard the seal, a new one should be used on refitting.

16 Obtain eight small, clean plastic containers, and number them 1 to 8; alternatively, divide a larger container into eight compartments.

17 Lift out each rocker arm and release it from the spring clip on the tappet. Place the rocker arms in their respective positions in the box or containers **(see illustration)**.

18 A compartmentalised container filled with engine oil is now required to retain the hydraulic tappets while they are removed from the cylinder head. Using a rubber sucker, withdraw each hydraulic follower and place it in the container, keeping them each identified for correct refitting **(see illustrations)**. The tappets must be totally submerged in the oil to prevent air entering them.

2.2 litre (DW12) engine

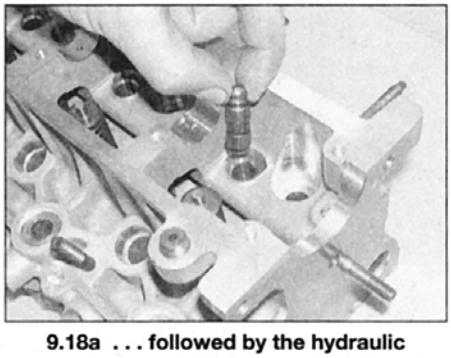
19 Remove the injectors as described in Chapter 4B. This work includes removing the pipes from the high-pressure fuel common rail. Plug the injector holes to prevent dropping any item into the combustion chambers.

20 Progressively loosen the bolts securing the cylinder head cover to the camshaft bearing housing. Withdraw the cover.

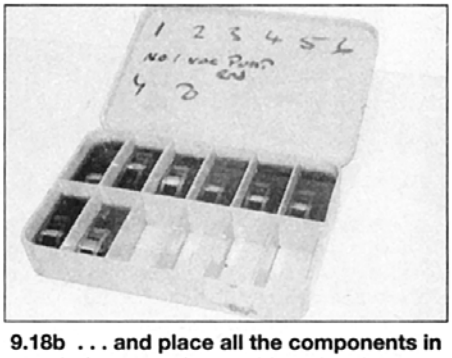
21 Disconnect the vacuum pipe from the brake vacuum pump on the left-hand end of the cylinder head.

22 Remove the vacuum pump from the cylinder head with reference to Chapter 9.

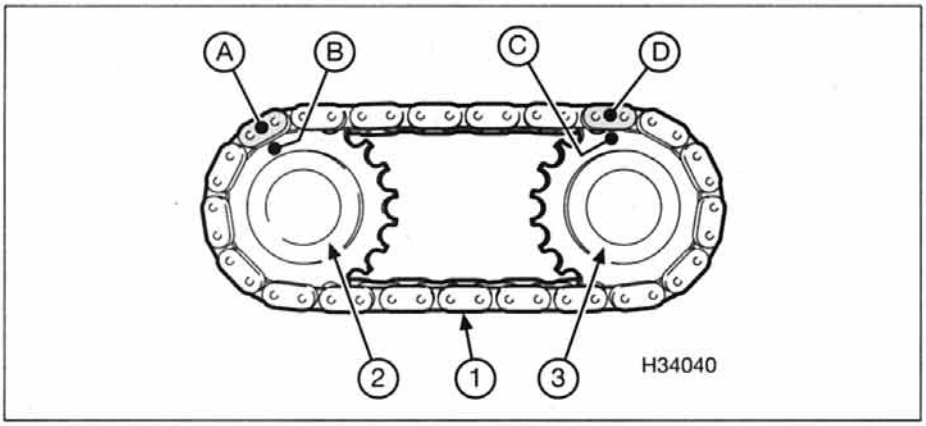
23 Progressively loosen the camshaft bearing cap housing bolts and studs until they can be removed. Note the location of the studs.



9.18a . . . followed by the hydraulic tappets . . .



9.18b . . . and place all the components in their respective positions in a box



9.26a Camshaft chain timing marks (DW12 engine)

1 Chain
2 Exhaust camshaft
3 Inlet camshaft
A Exhaust camshaft mark on chain
B Exhaust camshaft mark on tooth
C Inlet camshaft mark on tooth
D Inlet camshaft mark on chain

24 Unbolt and remove the camshaft hydraulic chain tensioner. **Note:** *Do not separate the pad from the tensioner, as the sealing lip will be damaged – use a cable tie to hold the spring-tensioned pad in the body. On later models, it is possible to insert a 1.5 mm diameter pin through the body and pad of the tensioner to hold all of the components together.*

25 Withdraw the bearing cap housing from the cylinder head. The housing is likely to be initially tight to release as it is located by dowels. If necessary, very carefully prise up the housing using a screwdriver inserted in the slotted lug adjacent to each dowel location. Once the bearing housing is free, lift it squarely from the cylinder head. The camshaft will rise up slightly under the pressure of the valve springs – be careful it doesn't tilt and jam in the cylinder head or bearing housing section.

26 Check that the camshafts and chain are marked in relation to each other – the chain should have two black or copper links which align with marks on the teeth. If necessary, mark the chain and teeth with dabs of paint. The marks on the teeth are the most important as they determine the valve timing, however the chain links can be marked as they are 7 links (inclusive) apart **(see illustrations).**

27 Simultaneously, lift the camshafts and chain from the cylinder head. Release the camshafts from the chain.

28 Obtain sixteen small, clean plastic containers, and number them 1 to 16; alternatively, divide a larger container into sixteen compartments.

29 Lift out each rocker arm and release it from the spring clip on the tappet. Place the rocker arms in their respective positions in the box or containers.

30 A compartmentalised container filled with engine oil is now required to retain the hydraulic tappets while they are removed from the cylinder head. Using a rubber sucker, withdraw each hydraulic follower and place it in the container, keeping them each identified for correct refitting. The tappets must be totally submerged in the oil to prevent air entering them.

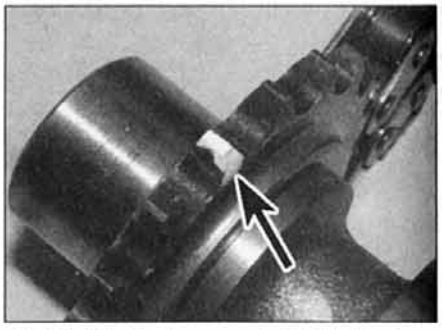
9.43 Apply a bead of silicone sealant to the mating face of the camshaft bearing housing (DW10 engine)

Inspection

31 Inspect the cam lobes and the camshaft bearing journals for scoring or other visible evidence of wear. Once the surface hardening of the cam lobes has been eroded, wear will occur at an accelerated rate. **Note:** *If these symptoms are visible on the tips of the camshaft lobes, check the corresponding rocker arm, as it will probably be worn as well.*

32 Examine the condition of the bearing surfaces in the cylinder head and camshaft bearing housing. If wear is evident, the cylinder head and bearing housing will both have to be renewed, as they are a matched assembly.

33 Inspect the rocker arms and tappets for scuffing, cracking or other damage and renew any components as necessary. Also check the condition of the tappet bores in the cylinder head. As with the camshafts, any wear in this area will necessitate cylinder head renewal.



9.26b The timing mark is highlighted on the camshaft tooth

Refitting

34 Thoroughly clean the sealant from the mating surfaces of the cylinder head and camshaft bearing housing. Use a suitable liquid gasket dissolving agent (available from Peugeot dealers) together with a soft putty knife; do not use a metal scraper or the faces will be damaged. As there is no conventional gasket used, the cleanliness of the mating faces is of the utmost importance.

35 Clean off any oil, dirt or grease from both components and dry with a clean lint-free cloth. Ensure that all the oil ways are completely clean.

36 To prevent any possibility of the valves contacting the pistons as the camshaft is refitted, remove the locking pin/drill from the flywheel/driveplate and turn the crankshaft a quarter turn in the *opposite* direction to normal rotation (ie, anti-clockwise), to position all the pistons at mid-stroke.

37 Liberally lubricate the hydraulic tappet bores in the cylinder head with clean engine oil.

38 Insert the hydraulic tappets into their original bores in the cylinder head unless they have been renewed.

39 Lubricate the rocker arms and place them over their respective tappets and valve stems. Ensure that the ends of the rocker arms engage with the spring clips on the tappets.

40 Lubricate the camshaft bearing journals in the cylinder head sparingly with oil, taking care not to allow the oil to spill over onto the camshaft bearing housing contact areas.

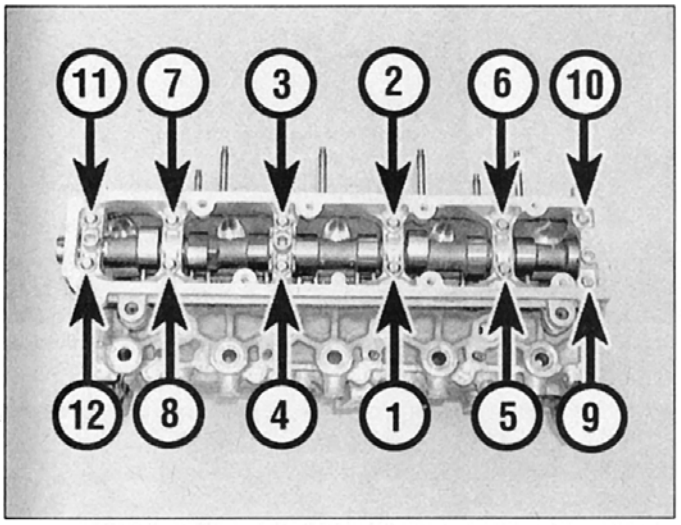
2.0 litre (DW10) engine

41 Lay the camshaft in the cylinder head and position it so that the engine assembly/valve timing slot in the sprocket hub is approximately aligned with the timing hole in the cylinder head.

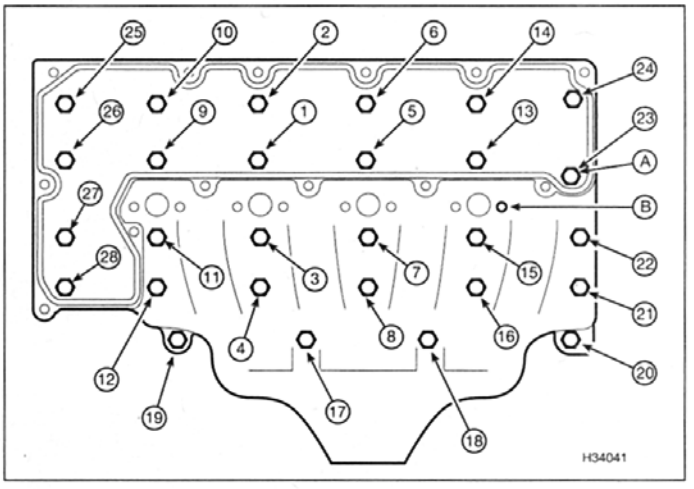
42 Ensure that the mating faces of the cylinder head and camshaft bearing housing are clean and free of any oil or grease.

43 Sparingly apply a bead of silicone sealant to the mating face of the camshaft bearing housing, taking care not to allow the product to contaminate the camshaft bearing journal areas **(see illustration).**

44 Locate the bearing housing over the camshaft and into position on the cylinder head.



9.45 Camshaft bearing housing bolt tightening sequence (DW10 engine)



9.51 Camshaft bearing housing bolt tightening sequence (DW12 engine)

A Bolt *B Stud*

45 Insert all the bearing housing retaining bolts and *progressively* tighten them to the specified torque, in the sequence shown **(see illustration)**.

46 Refit the cylinder head cover as described in Section 4.

2.2 litre (DW12) engine

47 Engage the camshafts with the chain, making sure that the coloured links are aligned with the marked teeth, then lower them in position. The longer exhaust camshaft must go at the rear of the cylinder head.

48 Ensure that the mating faces of the cylinder head and camshaft bearing housing are clean and free of any oil or grease.

49 Sparingly apply a bead of silicone sealant to the mating face of the camshaft bearing housing, taking care not to allow the product to contaminate the camshaft bearing journal areas.

50 Locate the bearing housing over the camshafts and into position on the cylinder head.

51 Insert the bolts and studs in their correct positions, then *progressively* tighten them to the specified torque, in the sequence shown **(see illustration)**. The studs (for the injectors) must be tightened first, then the remaining bolts tightened in two stages.

52 Refit the camshaft chain tensioner and tighten the bolts securely. On later models, remove the pin to release the pad onto the chain.

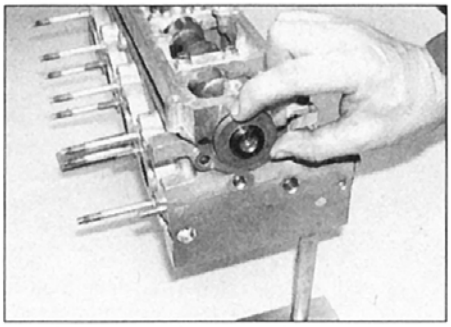
53 Refit the cylinder head cover as described in Section 4.

54 Refit the injectors with reference to Chapter 4B.

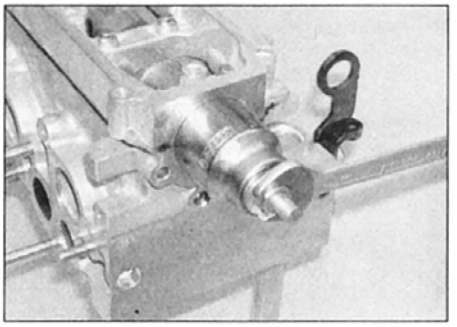
All engines

55 Refit the brake vacuum pump and reconnect the vacuum pipe with reference to Chapter 9.

56 Smear the lips of the new oil seal with clean engine oil and fit it over the camshaft,



9.56a Locate a new oil seal over the camshaft, with its sealing lip facing inwards . . .



9.56b . . . then use a bolt and socket or similar arrangement to press the seal into place (DW10 engine)

making sure its sealing lip is facing inwards. Press the seal into position until it is flush with the end face of the cylinder head. Use a suitable bolt (screwed into the end of the camshaft), washers and a tube or socket to press the seal into position **(see illustrations)**.

57 Make sure that the sprocket hub timing slot is aligned with the corresponding cut-out in the cylinder head.

58 Turn the crankshaft a quarter turn in the normal direction of rotation so that pistons 1 and 4 are again at TDC.

10.1a Depress the centre pin to remove the liner fixings

59 Refit the camshaft sprocket as described in Section 8.

60 Refit the flywheel/driveplate and camshaft TDC locking pins.

61 Refit the timing belt as described in Section 7.

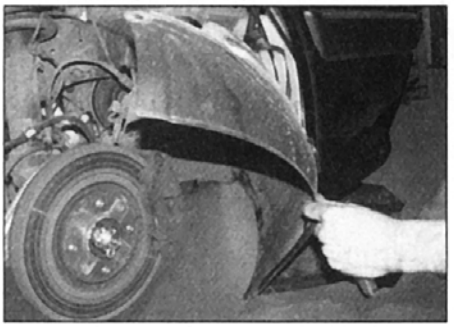
10 Cylinder head – removal and refitting

Note: *This is an involved procedure, and it is suggested that the Section is read thoroughly before starting work. To aid refitting, make notes on the locations of all relevant brackets and the routing of hoses and cables before removal.*

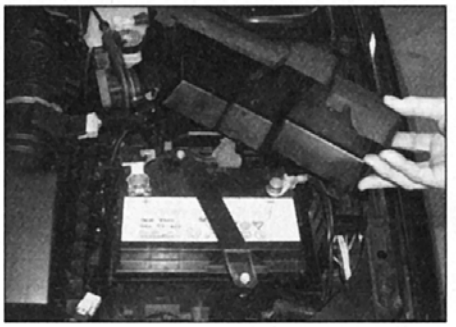
Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the front right-hand roadwheel, the front wheelarch liner **(see illustrations)**, and where applicable the engine undertray.

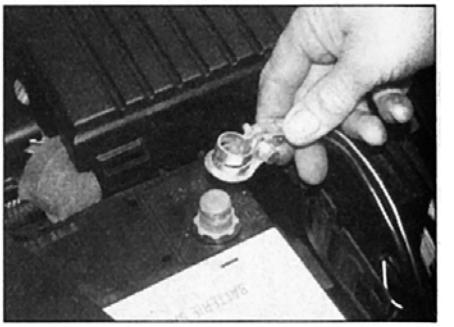
2 Disconnect the battery negative lead (refer



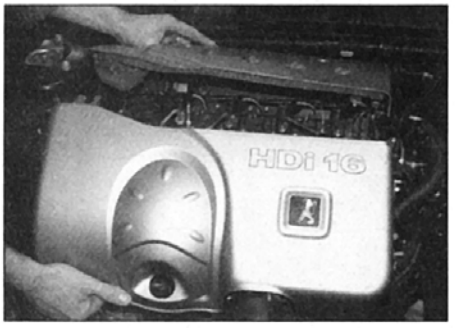
10.1b Removing the front wheelarch liner



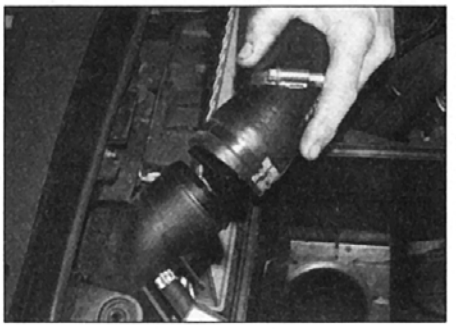
10.2a Remove the battery cover . . .



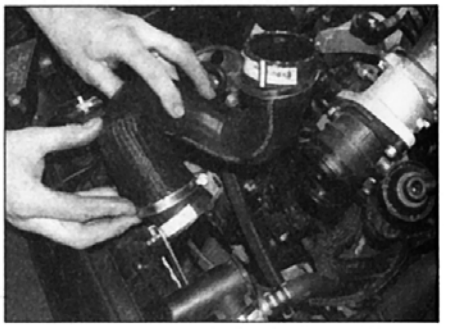
10.2b . . . and disconnect the negative lead



10.3 Removing the engine top covers



10.4a Removing the inlet ducts from the front inlet elbow . . .



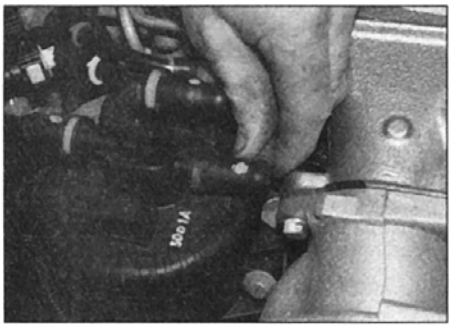
10.4b . . . and throttle housing

to *Disconnecting the battery* at the end of this manual) **(see illustrations)**.

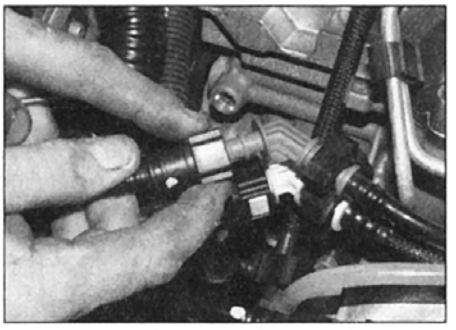
3 Remove the engine top cover(s) **(see illustration)**, then drain the cooling system as described in Chapter 1B. For improved access, remove the bonnet as described in Chapter 11.

4 Remove the air cleaner assembly, airflow meter and inlet air ducts as described in Chapter 4B. On the DW12 engine, unclip and remove the inlet ducts from the throttle body, then remove the throttle body from the inlet manifold/camshaft cap housing with reference to Chapter 4B **(see illustrations)**.

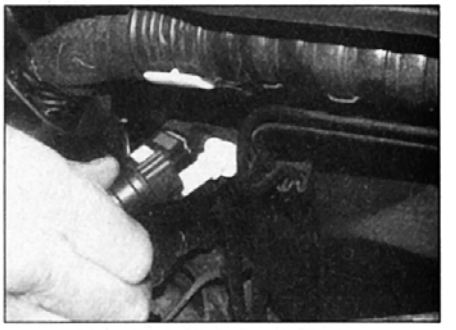
5 Disconnect the quick-release fittings and



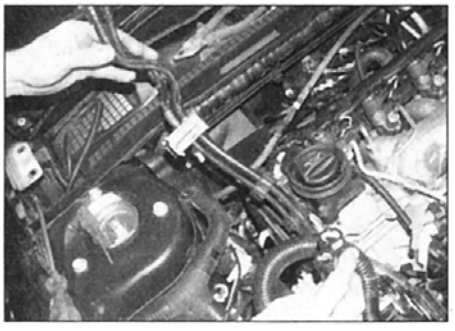
10.5a Disconnect the fuel hoses at the fuel filter . . .



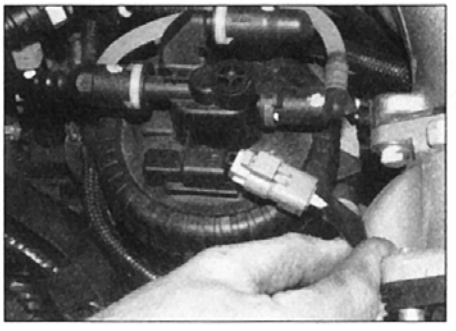
10.5b . . . front of the engine . . .



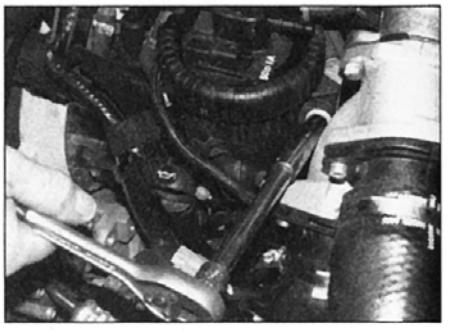
10.5c . . . and bulkhead . . .



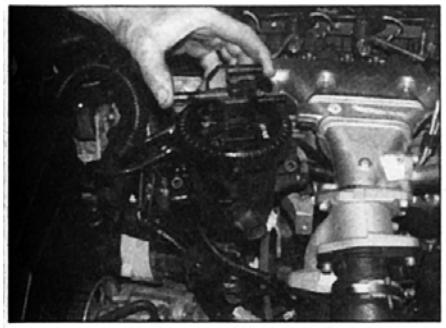
10.5d . . . then unclip and remove the fuel hoses



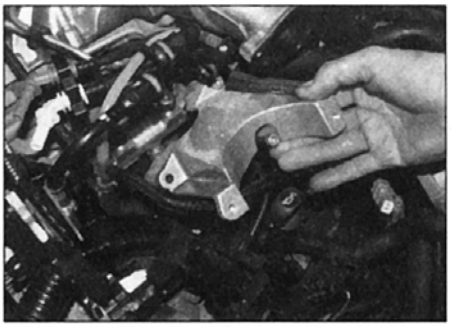
10.6a Disconnect the wiring . . .



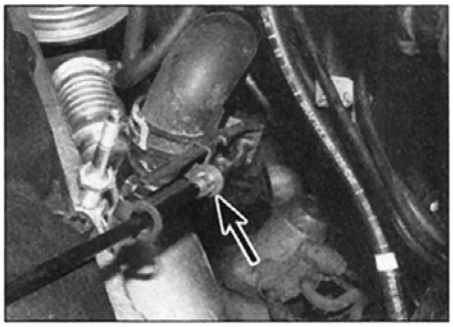
10.6b . . . then unscrew the bolts . . .



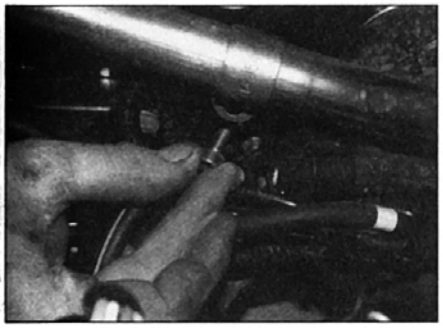
10.6c . . . and remove the fuel filter . . .



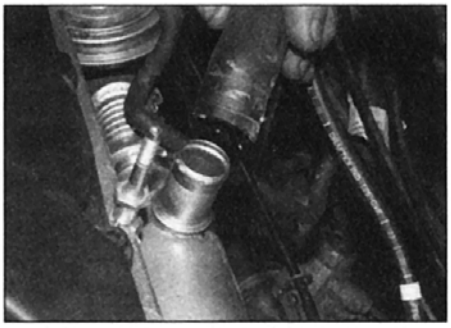
10.6d . . . and mounting bracket



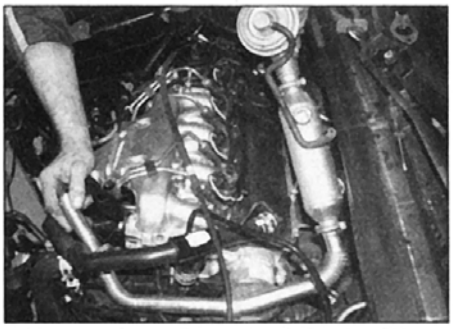
10.7a Using the special tool to remove the spring-type hose clips



10.7b Unscrew the mounting bolt . . .



10.7c . . . disconnect the hoses . . .



10.7d . . . then unbolt and remove the EGR valve assembly . . .

remove the fuel supply and return hoses from the fuel filter. If necessary, disconnect the hoses from the pipes at the bulkhead, then unclip and remove them **(see illustrations)**. Tape over or plug the hose ends and filter ports.

6 Disconnect the wiring then unbolt and remove the fuel filter together with its mounting bracket **(see illustrations)**.

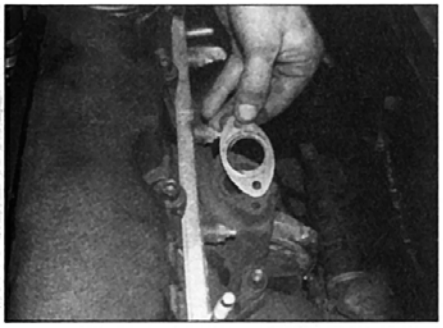
7 On the DW12 engine, release the clips and disconnect the hoses from the EGR valve and heat exchanger, then unbolt and remove the EGR valve from the inlet and exhaust manifolds and remove it together with the exchanger as an assembly. Recover the gaskets from the manifolds. The original hose clips are of the single spring type and are best removed using a hand-operated tool, however, grips can be used instead **(see illustrations)**.

8 Disconnect the wiring from the injectors and move the harness to one side.

9 Disconnect the wiring/shunt from the glow plugs and position away from the cylinder head **(see illustration)**, then remove the glow plugs with reference to Chapter 5C.

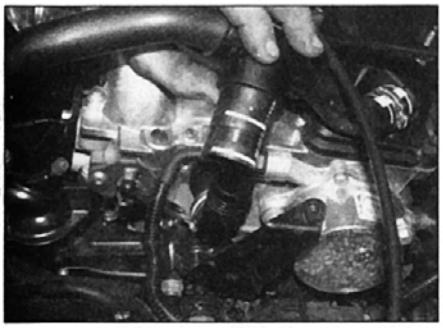
10 Disconnect and remove the crankcase ventilation hose(s) from the cylinder head **(see illustrations)**.

11 Remove the brake vacuum pump from the left-hand side of the cylinder head as described in Chapter 9 **(see illustrations)**.

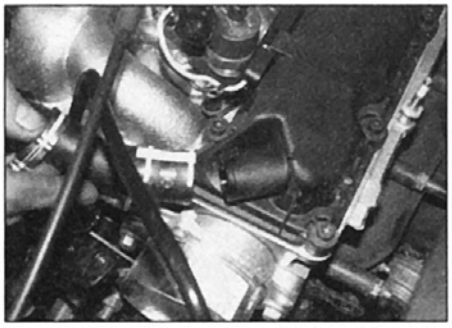


10.7e . . . and recover the gaskets

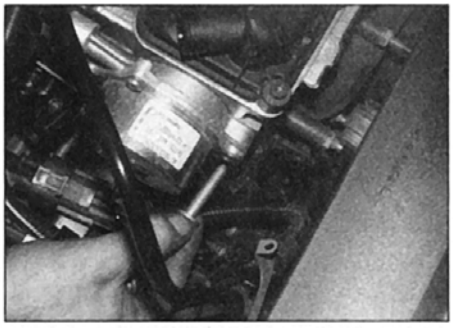
10.9 Disconnecting the shunt/wiring from the glow plugs



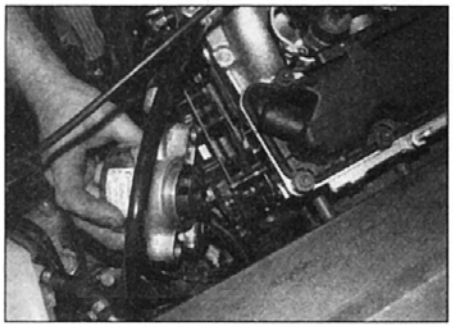
10.10a Disconnecting the crankcase ventilation hose from the separator . . .



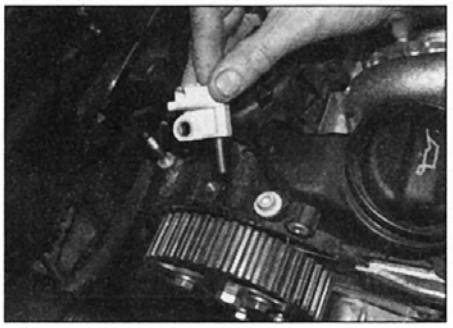
10.10b . . . and valve cover



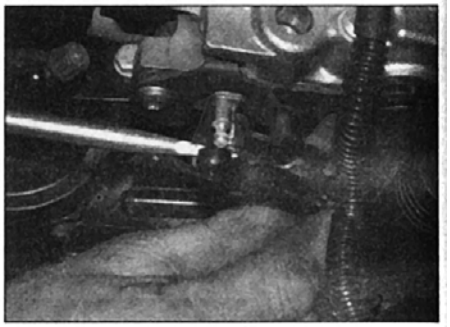
10.11a Undo the bolts . . .



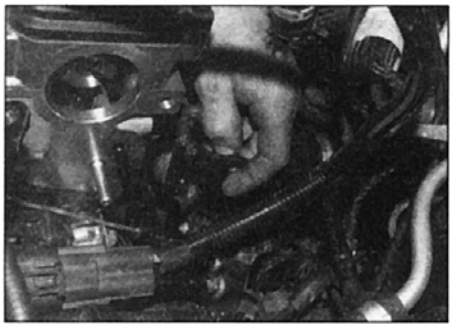
10.11b . . . and remove the brake vacuum pump from the cylinder head



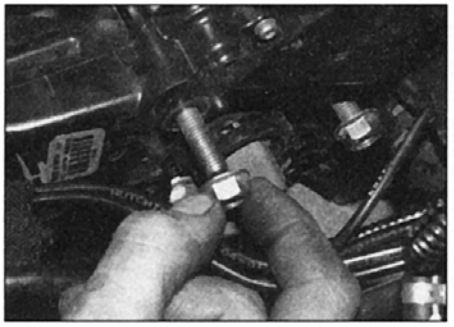
10.12 Removing the camshaft position sensor



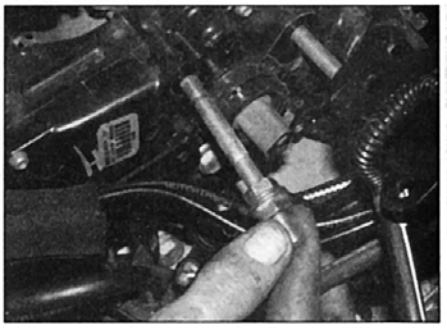
10.15a Use a screwdriver to prise the fitting from the butterfly control rod . . .



10.15b . . . then remove the 'swirl control' diaphragm and electrovalve



10.16a Unscrew the nuts . . .



10.16b . . . then remove the studs from the coolant outlet manifold

12 Disconnect the wiring from the camshaft position sensor then undo the screw and remove the sensor **(see illustration)**. Check that all relevant wiring is disconnected from the sensors on the cylinder head, then move the wiring harness to one side.

13 On the DW10 engine, unbolt and remove the bracket located over the high-pressure fuel pump.

14 On the DW10 engine, unscrew the bolts securing the oil level dipstick tube to the cylinder head.

15 On the DW12 engine, remove the 'swirl control' diaphragm and electrovalve **(see illustrations)**.

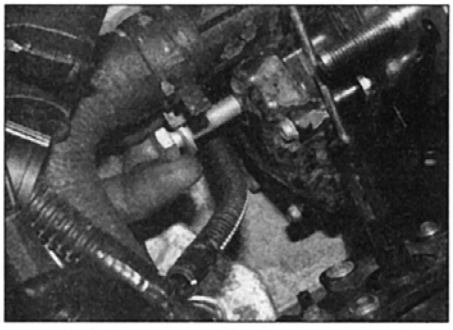
16 Unscrew the nuts on the two studs securing the coolant outlet manifold to the left-hand end of the cylinder head, then unscrew and remove the studs. Use a stud extractor or alternatively tighten two nuts together on the stud before unscrewing it. Note the location of brackets on the studs for correct refitting **(see illustrations)**.

17 Without disconnecting the hoses, unscrew the mounting bolts and move the coolant outlet manifold away from the left-hand end of the cylinder head **(see illustrations)**. If necessary, tie it to one side. Recover the seal.

18 Remove the timing belt as described in Section 7. Note that this work includes removing the auxiliary drivebelt, the crankshaft pulley, supporting the engine then removing the right-hand engine mounting.

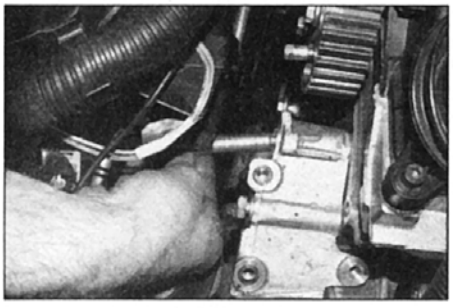
19 Unscrew and remove the two bolts securing the right-hand engine mounting to the cylinder head **(see illustrations)**. Now temporarily refit the right-hand mounting onto the engine bracket and slightly tighten the bolts to hold the engine while the cylinder head is being removed. The engine support can now be removed.

20 Clean the area around the fuel supply and return line union connections to the high-pressure fuel pump, common rail and injectors. Unscrew the union nuts and remove the fuel lines. Tape over or plug the apertures in the pump, rail, lines and injectors to prevent entry of dust and dirt.

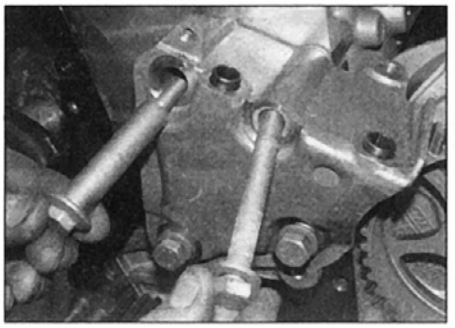


10.17a Unscrew the bolts . . .

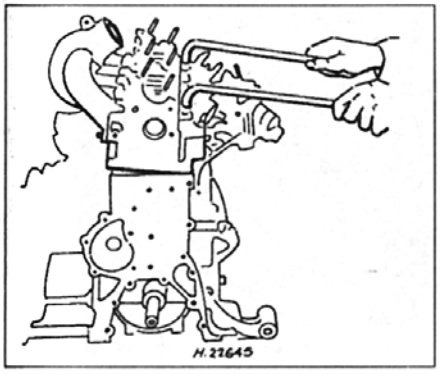
10.17b . . . and move the coolant outlet manifold away from the left-hand end of the cylinder head



10.19a Unscrew and remove the two bolts securing the right-hand engine mounting to the cylinder head



10.19b View of the two bolts with the engine removed



10.28 Freeing the cylinder head using angled rods

Caution: Do not attempt to unscrew the union adapters from the common rail or high-pressure fuel pump.

21 Remove the injectors from the cylinder head with reference to Chapter 4B.

22 At this stage, the manufacturers state that the turbocharger should be removed, however, this includes the removal of the front suspension subframe. On the DW12 diesel engine project car, we found that it was possible to unbolt the turbocharger from the exhaust manifold flange (2 nuts from underneath, 1 nut from above, and 1 horizontal mounting bolt) and leave the turbocharger attached to the exhaust system. The exhaust manifold can then be removed after the cylinder head is removed from the block. If necessary, the turbocharger can be disconnected from the exhaust downpipe, then tied to the rear of the engine compartment.

DW10 engine

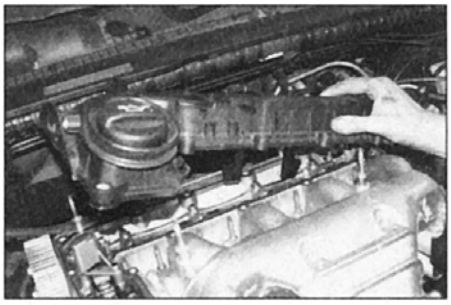
23 Remove the camshaft sprocket with reference to Section 8.

24 Working in a spiral fashion starting at the left-hand end and finishing in the middle, progressively unscrew the bolts securing the cover to the cylinder head. Withdraw the cover.

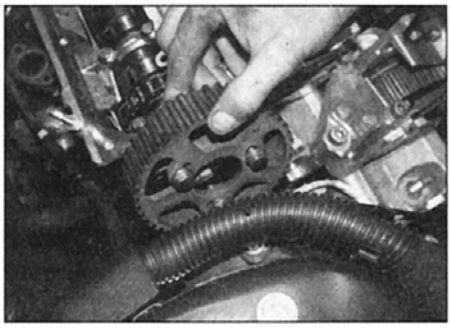
25 Unbolt the bracket from the left-hand end of the head, near the lifting eye.

26 Progressively slacken the cylinder head bolts, in the reverse order to that shown for tightening **(see illustration 10.62)**. A Torx socket will be required for this.

27 When all the bolts are loose, unscrew them fully and remove them from the cylinder head.



10.31 Removing the cover from the camshaft bearing cap housing (DW12 engine)



10.32b . . . then unbolt and remove the sprocket . . .

28 Release the cylinder head from the cylinder block and location dowels by rocking it. The Peugeot tool for doing this consists simply of two metal rods with 90-degree angled ends **(see illustration)**. Do not prise between the mating faces of the cylinder head and block, as this may damage the gasket faces.

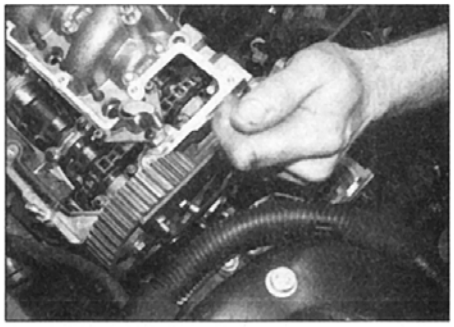
29 Lift the cylinder head from the block, and recover the gasket.

30 If necessary, remove the inlet and exhaust manifolds with reference to Chapter 4B.

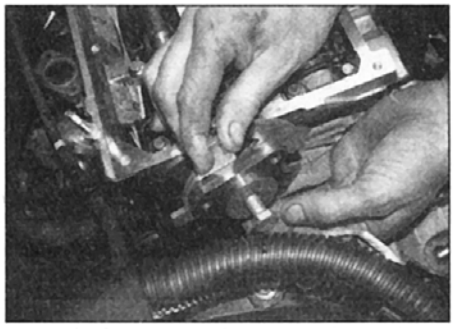
DW12 engine

31 Progressively unscrew the screws securing the cover to the camshaft bearing cap housing. Remove the cover and recover the gasket from the retaining groove **(see illustration)**.

32 Hold the camshaft sprocket stationary using a suitable tool, then loosen the centre bolt from the exhaust camshaft sprocket hub. Unscrew the three screws and remove the sprocket from the hub, then unscrew the centre bolt and remove the hub from the camshaft **(see illustrations)**. **Note:** *Take care not to damage the camshaft position sensor pick-up with the tool.*



10.32a Loosen the exhaust camshaft sprocket centre bolt . . .

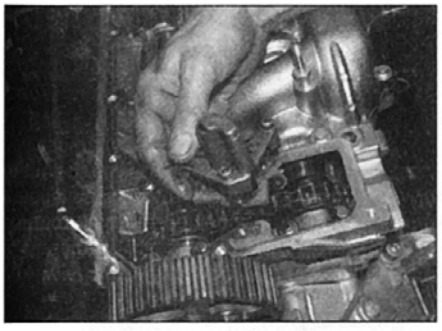


10.32c . . . followed by the hub (DW12 engine)

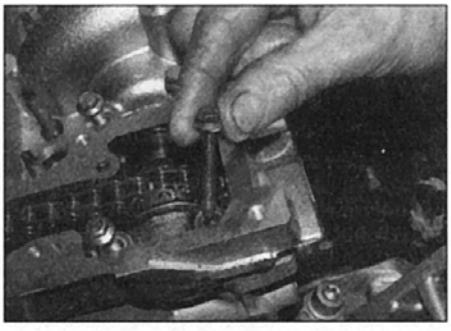
33 Unbolt the chain tensioner from the camshaft bearing cap housing and recover the spring **(see illustration)**.

34 Note the fitted position of the exhaust camshaft oil seal in the camshaft bearing cap housing, then progressively unscrew the 28 screws securing the camshaft bearing cap housing to the cylinder head in the reverse order to that given for fitting in Section 9 **(see illustration)**.

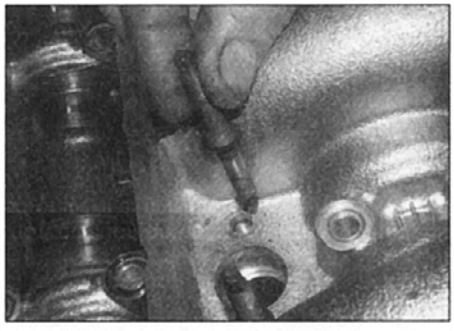
35 Using two injector mounting nuts tightened against each other, unscrew and remove the injector retaining studs **(see illustration)**.



10.33 Removing the chain tensioner (DW12 engine)

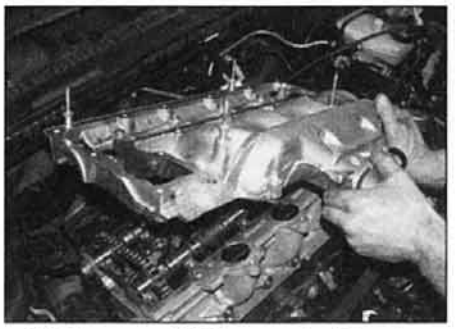


10.34 Remove the camshaft bearing cap housing retaining screws . . .



10.35 . . . then remove the injector retaining studs . . .

10.36a . . . carefully lever with a screwdriver . . .



10.36b . . . and lift the camshaft bearing cap housing from the cylinder head (DW12 engine)

10.38 Removing the inlet and exhaust camshafts together with the chain (DW12 engine)

36 Carefully lift the camshaft bearing cap housing from the cylinder head, making sure that the camshafts remain in the head. If necessary, use a screwdriver on the special lug to carefully lever up the housing **(see illustrations)**. Tap the camshafts down with the handle of a hammer if they remain in the camshaft bearing cap housing.

37 Check that the TDC marks are on the inlet and exhaust camshaft sprockets. The tops of two of the sprockets are marked with white paint, however the bright-links on the chain will not necessarily be aligned with the marks. Note that the timing can be set-up when the camshafts are refitted, because the TDC marks are positioned at a 7 link distance (inclusive) from each other. The sprocket hub is splined to the exhaust camshaft, therefore the timing can be set on refitting.

38 Carefully lift the inlet and exhaust camshafts from the cylinder head together with the chain **(see illustration)**, then remove the oil seal from the end of the exhaust camshaft. Separate the chain from the camshafts.

39 Have ready a suitable container to put the hydraulic tappets and rockers in, so that they are identified for position for correct refitting. The tappets must be kept submersed in engine oil until they are refitted. Carefully remove the rockers and tappets and position them in the container **(see illustration)**.

40 Progressively slacken the cylinder head bolts, in the reverse order to that shown for tightening **(see illustration 10.62)**. A Torx socket will be required for this.

41 When all the bolts are loose, unscrew them fully and remove them from the cylinder head **(see illustration)**.

42 Release the cylinder head from the cylinder block and location dowels by rocking it. The Peugeot tool for doing this consists simply of two metal rods with 90-degree angled ends **(see illustration 10.28)**. Do not prise between the mating faces of the cylinder head and block, as this may damage the gasket faces.

43 Lift the cylinder head from the block, and recover the gasket **(see illustration)**. It is quite heavy, and the help of an assistant is recommended.

44 If necessary, remove the exhaust manifold from the cylinder head with reference to Chapter 4B.

Preparation for refitting

45 The mating faces of the cylinder head and cylinder block must be perfectly clean before refitting the head. Peugeot recommend the use of a scouring agent for this purpose, but acceptable results can be achieved by using a hard plastic or wood scraper to remove all traces of gasket and carbon. The same method can be used to clean the piston crowns. Take particular care to avoid scoring or gouging the cylinder head/cylinder block mating surfaces during the cleaning operations, as aluminium alloy is easily damaged. Make sure that the carbon is not allowed to enter the oil and water passages – this is particularly important for the lubrication system, as carbon could block the oil supply to the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block. To prevent carbon entering the gap between the pistons and bores, smear a little grease in the gap. After cleaning each piston, use a small brush to remove all traces of grease and carbon from the gap, then wipe away the remainder with a clean rag.

46 Check the mating surfaces of the cylinder block and the cylinder head for nicks, deep scratches and other damage. If slight, they may be removed carefully with a file, but if excessive, machining may be the only alternative to renewal. If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part D of this Chapter if necessary.

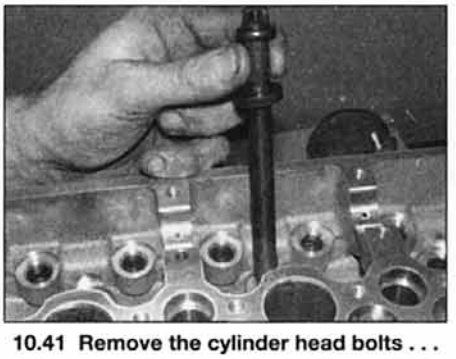
47 Thoroughly clean the threads of the cylinder head bolt holes in the cylinder block. Ensure that the bolts run freely in their threads, and that all traces of oil and water are removed from each bolt hole.

Gasket selection

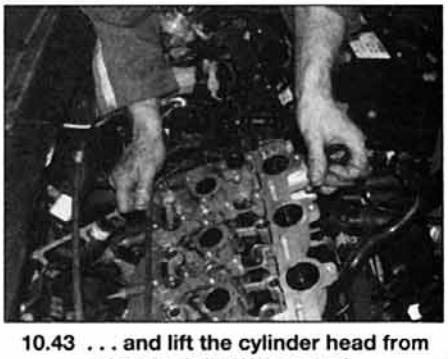
48 Remove the crankshaft TDC timing pin, then turn the crankshaft until pistons 1 and 4 are at TDC. Position a dial test indicator (dial gauge) on the cylinder block adjacent to the rear of No 1 piston, and zero it on the block face. Transfer the probe to the crown of No 1 piston (10.0 mm in from the rear edge), then slowly turn the crankshaft back-and-forth past TDC, noting the highest reading on the indicator. Record this reading as protrusion A.

49 Repeat the check described in para-

10.39 Removing the rockers and hydraulic tappets (DW12 engine)



10.41 Remove the cylinder head bolts . . .



10.43 . . . and lift the cylinder head from the block (DW12 engine)

graph 48, this time 10.0 mm in from the front edge of the No 1 piston crown. Record this reading as protrusion B.

50 Add protrusion A to protrusion B, then divide the result by 2 to obtain an average reading for piston No 1.

51 Repeat the procedure described in paragraphs 48 to 50 on piston 4, then turn the crankshaft through 180° and carry out the procedure on the piston Nos 2 and 3 **(see illustration)**. Check that there is a maximum difference of 0.07 mm protrusion between any two pistons.

52 If a dial test indicator is not available, piston protrusion may be measured using a straight-edge and feeler blades or Vernier calipers. However, this is much less accurate, and cannot therefore be recommended.

53 Note the greatest piston protrusion measurement, and use this to determine the correct cylinder head gasket from the following table. The series of up to five (DW10) or four (DW12) notches/holes on the side of the gasket are used for thickness identification. Note on the DW12 engine, the identification holes are on the edge furthest from the cylinders; the single hole nearest the cylinders is for engine identification **(see illustrations)**.

DW10 engine

Piston protrusion	Gasket identification
0.470 to 0.604 mm	*1 notch*
0.605 to 0.654 mm	*2 notches*
0.655 to 0.704 mm	*3 notches*
0.705 to 0.754 mm	*4 notches*
0.755 to 0.830 mm	*5 notches*

DW12 engine

Piston protrusion	Gasket identification
0.550 to 0.600 mm	*1 hole*
0.610 to 0.650 mm	*2 holes*
0.660 to 0.700 mm	*3 holes*
0.710 to 0.750 mm	*4 holes*

Head bolt examination

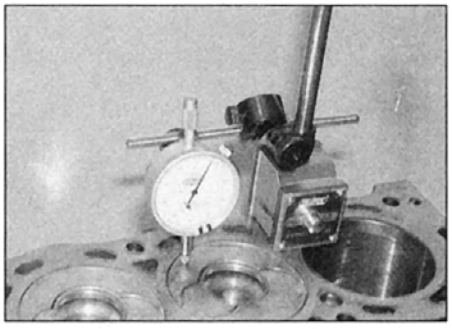
54 Carefully examine the cylinder head bolts for signs of damage to the threads or head, and for any sign of corrosion. If the bolts are in a satisfactory condition, measure the length of each bolt from the underside of the head, to the end of the shank. The bolts may be re-used providing that the measured length does not exceed 133.3 mm on the DW10 engine, or 134.5 mm on the DW12 engine **(see illustration)**. **Note:** *Considering the stress to which the cylinder head bolts are subjected, it is highly recommended that they are all renewed, regardless of their apparent condition.*

Refitting

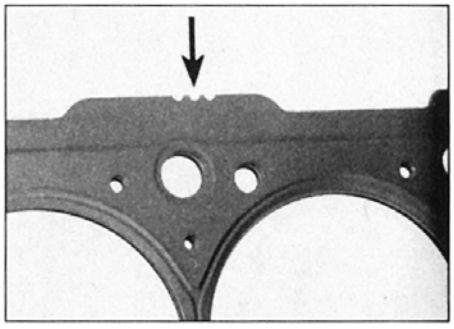
55 Turn the crankshaft and position Nos 1 and 4 pistons at TDC, then turn the crankshaft a quarter turn (90°) anti-clockwise.

56 Thoroughly clean the surfaces of the cylinder head and block.

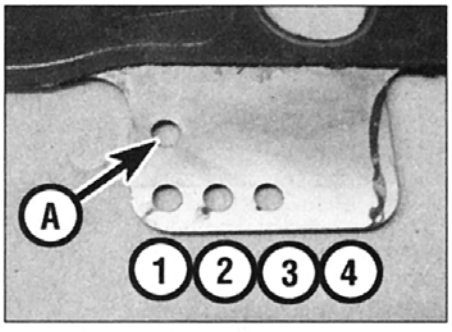
57 Make sure that the locating dowels are in place, then fit the correct gasket the right way round on the cylinder block, with the identification notches toward the fuel pump side of the engine **(see illustration)**.



10.51 Measuring piston protrusion

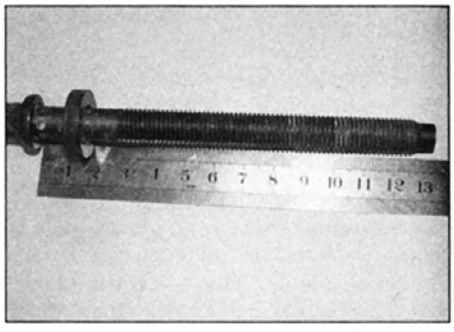


10.53a Cylinder head gasket thickness identification notches (DW10 engine)



10.53b Cylinder head gasket markings

A Engine identification
1 to 4 Thickness identification holes



10.54 Measuring the length of the cylinder head bolts

DW10 engine

58 If necessary, refit the inlet and exhaust manifolds with reference to Chapter 4B.

59 Check that the camshaft TDC timing pin is in position, then carefully lower the cylinder head onto the gasket and block, making sure that it locates correctly onto the dowels.

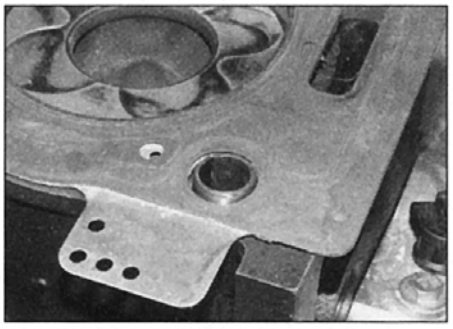
60 Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Peugeot recommend the use of Molykote G Rapid Plus (available from your Peugeot dealer); in the absence of the specified grease, any good-quality high-melting-point grease may be used.

61 Carefully insert the cylinder head bolts into their holes (*do not drop them in*) and initially finger-tighten them.

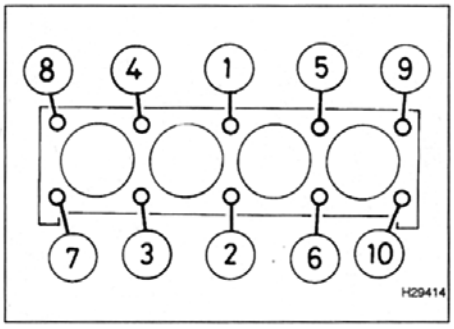
62 Working progressively and in the sequence shown, tighten the cylinder head bolts to their Stage 1 torque setting, using a torque wrench and suitable socket **(see illustration)**.

63 Once all the bolts have been tightened to their Stage 1 torque setting, working again in the specified sequence, tighten each bolt to the specified Stage 2 setting. Working in the reverse order to tightening, loosen all of the bolts by 1 turn. Now tighten them to the Stage 4 setting in their correct order. Finally, angle-tighten the bolts through the specified Stage 5 angle. It is recommended that an angle-measuring gauge is used during this stage of tightening, to ensure accuracy. **Note:** *Retightening of the cylinder head bolts after running the engine is not required.*

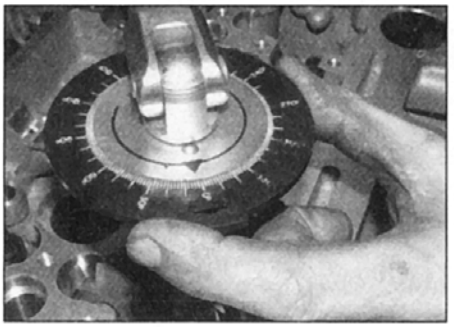
64 Refit the cylinder head cover with reference to Section 4, and the camshaft sprocket with reference to Section 8.



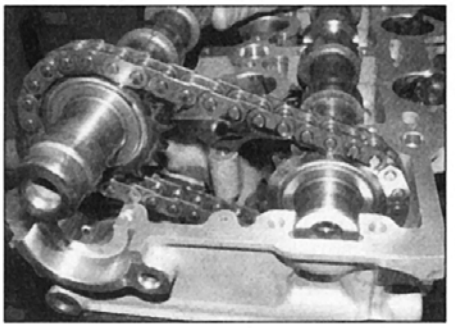
10.57 Locating the head gasket on the dowels



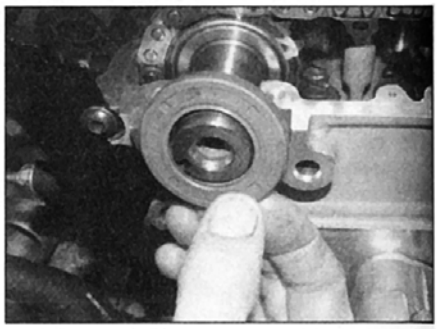
10.62 Cylinder head bolt tightening sequence



10.70 Angle-tightening the cylinder head bolts



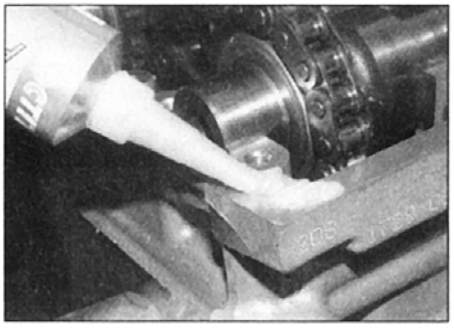
10.73 Lower the camshafts onto the cylinder head . . .



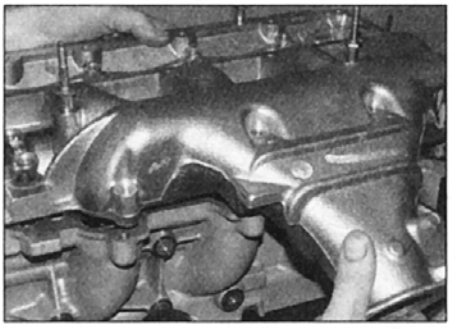
10.74 . . . then locate a new oil seal on the exhaust camshaft

DW12 engine

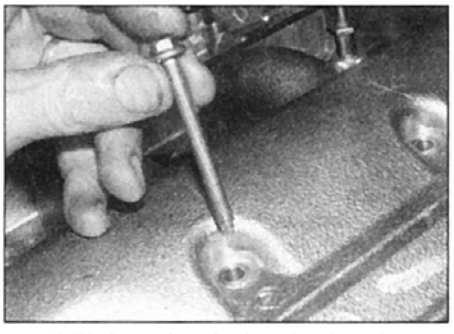
65 If removed, refit the exhaust manifold to the cylinder head with reference to Chapter 4B.
66 Carefully lower the cylinder head onto the gasket and block, making sure that it locates correctly onto the dowels.
67 Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Peugeot recommend the use of Molykote G Rapid Plus (available from your Peugeot dealer); in the absence of the specified grease, any good-quality high-melting-point grease may be used.
68 Carefully insert the cylinder head bolts into their holes (*do not drop them in*) and initially finger-tighten them.
69 Working progressively and in the sequence shown **(see illustration 10.62)**, tighten the cylinder head bolts to their Stage 1 torque setting, using a torque wrench and suitable socket.
70 Once all the bolts have been tightened to their Stage 1 torque setting, working again in the specified sequence, tighten each bolt to the specified Stage 2 setting. Working in the reverse order to tightening, loosen all of the bolts by 1 turn. Now tighten the bolts to the Stage 4 setting in the correct order. Finally, angle-tighten the bolts through the specified Stage 5 angle. It is recommended that an angle-measuring gauge is used during this stage of tightening, to ensure accuracy **(see illustration)**. **Note:** *Retightening of the cylinder head bolts after running the engine is not required.*
71 Refit the hydraulic tappets and rockers in their correct positions in the cylinder head
72 Locate the exhaust and inlet camshafts in the chain so that the TDC marks on the sprockets are 7 links apart **(see illustration 9.26)**.
73 Carefully lower the camshafts onto the cylinder head and onto the rockers **(see illustration)**. Check that the timing marks are still aligned.
74 Locate a new oil seal on the exhaust camshaft in the position noted on removal of the old seal **(see illustration)**.
75 Locate the hub on the exhaust camshaft and refit the centre bolt, then locate the sprocket on the hub and insert the three retaining bolts.
76 Using the TDC timing pin, peg the camshaft hub to the cylinder head.
77 Clean the surfaces of the camshaft bearing cap housing and cylinder head, then apply Locktite 518 or a suitable sealant to the mating surface of the bearing cap housing. Locate the bearing cap housing in position onto the camshafts **(see illustrations)**.
78 Insert the injector retaining studs and the 28 screws in the housing and initially hand-tighten them.
79 Progressively tighten the studs and screws to the specified torque in the sequence shown **(see illustration)**.
80 Assemble the chain tensioner plunger and spring into its body, then refit the assembly and tighten the bolts to the specified torque **(see illustrations)**.
81 Hold the camshaft sprocket stationary and tighten the centre bolt to the specified torque. Leave the 3 sprocket bolts loose at this stage.
82 Fit a new gasket to the groove in the



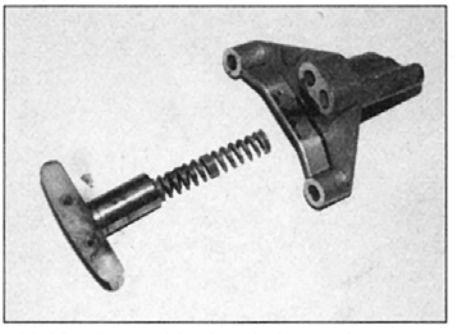
10.77a Apply the sealant . . .



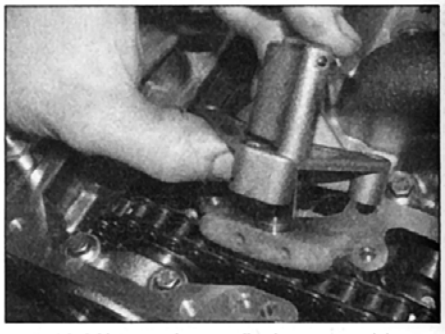
10.77b . . . and locate the bearing housing in position



10.79 Inserting the bearing housing retaining bolts



10.80a Assemble the chain tensioner . . .



10.80b . . . then refit the assembly

camshaft cover, then refit the cover to the bearing cap housing. Progressively tighten the bolts to the specified torque in the sequence given **(see illustrations)**.

83 Check that the oil seal is correctly fitted to the exhaust camshaft with reference to Section 14.

All models

84 Turn the crankshaft clockwise to its TDC position, with Nos 1 and 4 pistons at TDC, and insert the timing pin (see Section 3).

85 Refit the turbocharger with reference to Chapter 4B.

86 Refit the injectors with reference to Chapter 4B.

87 Refit the fuel supply and return lines. **Note:** *Peugeot recommend that the lines are renewed each time they are removed.*

88 Take the weight of the engine (using the method used during timing belt removal), then unbolt the right-hand engine mounting from the engine bracket. Apply locking fluid to the threads of the uppermost bolt securing the mounting to the cylinder head, then insert it and tighten to the specified torque. Insert the remaining bolt and tighten to the specified torque.

89 Refit the timing belt, crankshaft pulley and auxiliary drivebelt with reference to Section 7, then refit the upper section of the right-hand engine mounting and tighten the bolts to the specified torque. Remove the engine support.

90 Clean the mating surfaces, then refit the coolant outlet manifold together with a new seal and tighten the bolts. Apply thread locking fluid to the threads of the studs, then insert them and tighten to the specified torque.

91 On the DW10 engine, refit the oil level dipstick tube and the bracket over the high-pressure pump.

92 On the DW12 engine, refit the 'swirl control' diaphragm and electrovalve.

93 Refit the camshaft position sensor, then reconnect the wiring. Check and if necessary adjust the air gap with reference to Chapter 4B.

94 Refit the brake vacuum pump with reference to Chapter 9.

95 Reconnect the crankcase ventilation hose(s).

96 Refit the glow plugs and wiring with reference to Chapter 5C.

97 Reconnect the wiring to the injectors.

98 Refit the EGR valve and heat exchanger together with new gaskets, and tighten the bolts securely.

99 Refit the fuel filter and mounting bracket.

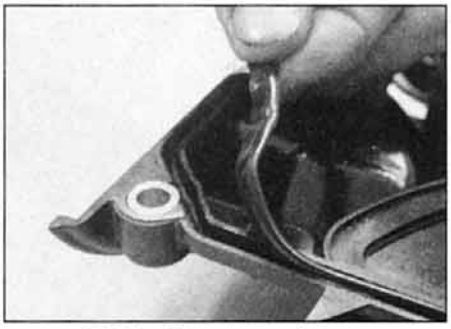
100 Refit the fuel supply and return lines.

101 On the DW12 engine, refit the throttle body with reference to Chapter 4B.

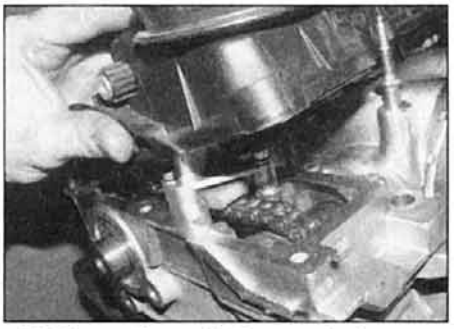
102 Refit the air cleaner assembly, airflow meter and inlet air ducts with reference to Chapter 4B.

103 Refit the right-hand front wheelarch liner and roadwheel and lower the car to the ground.

104 Reconnect the battery negative lead, then fill and bleed the cooling system with reference to Chapter 1B.



10.82a Fit a new gasket . . .



10.82b . . . then refit the camshaft cover

105 Refit the engine top covers, and the bonnet if removed.

106 Start the engine and run to normal temperature. Carry out a road test during which the following procedure should be made. Engage third gear and stabilise the engine at 1000 rpm. Now accelerate fully to 3500 rpm.

107 Check the engine for leaks.

11 Sump – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Drain the engine oil, then clean and refit the engine oil drain plug, tightening it securely. If the engine is nearing its service interval when the oil and filter are due for renewal, it is recommended that the filter is also removed, and a new one fitted. After reassembly, the engine can then be refilled with fresh oil. Refer to Chapter 1B for further information.

3 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

4 On models with air conditioning, where the compressor is mounted onto the side of the sump, remove the drivebelt as described in Chapter 1B. Unbolt the compressor, and position it clear of the sump. Support the weight of the compressor by tying it to the vehicle, to prevent any excess strain being placed on the compressor lines. *Do not* disconnect the refrigerant lines from the compressor (refer to the warnings given in Chapter 3).

5 Where necessary, disconnect the wiring connector from the oil temperature sender unit, which is screwed into the sump.

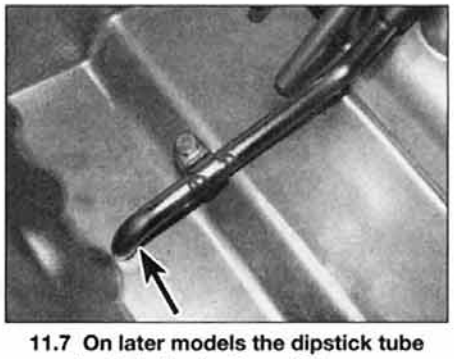
6 Progressively slacken and remove all the sump retaining bolts. Since the sump bolts vary in length, remove each bolt in turn, and store it in its correct fitted order by pushing it through a clearly-marked cardboard template. This will avoid the possibility of installing the bolts in the wrong locations on refitting.

7 Try to break the joint by striking the sump with the palm of your hand, then lower and withdraw the sump from under the car. If the sump is stuck (which is quite likely) use a putty knife or similar, carefully inserted between the sump and block. Ease the knife along the joint until the sump is released. While the sump is removed, take the opportunity to check the oil pump pick-up/strainer for signs of clogging or splitting. If necessary, remove the pump as described in Section 12, and clean or renew the strainer. Note that on later models, the oil dipstick tube extends to the bottom of the sump in order to allow the oil to sucked out of the tube using special equipment **(see illustration)**.

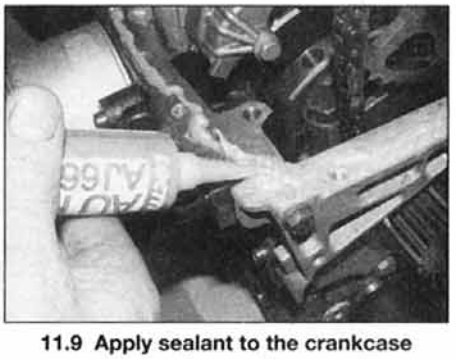
Refitting

8 Clean all traces of sealant/gasket from the mating surfaces of the cylinder block/crankcase and sump, then use a clean rag to wipe out the sump and the engine's interior.

9 On engines where the sump was fitted without a gasket, ensure that the sump mating surfaces are clean and dry, then apply a thin coating of suitable sealant to the sump or crankcase mating surface **(see illustration)**.



11.7 On later models the dipstick tube extends to the bottom of the sump



11.9 Apply sealant to the crankcase mating surface

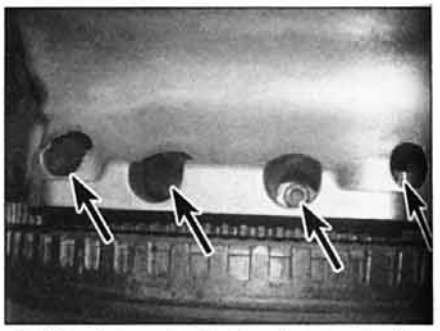
10 Offer up the sump to the cylinder block/crankcase. Refit its retaining bolts, ensuring that each is screwed into its original location. Tighten the bolts evenly and progressively to the specified torque setting. Note the concealed bolts at one end of the sump **(see illustrations)**.

11 Where necessary, align the air conditioning compressor with its mountings on the sump, and insert the retaining bolts. Securely tighten the compressor retaining bolts, then refit the drivebelt as described in Chapter 1B.

12 Reconnect the wiring connector to the oil temperature sensor (where fitted).

13 Lower the vehicle to the ground, then refill the engine with oil as described in Chapter 1B.

11.10a Fitting the sump



11.10b Concealed bolts at one end of the sump

12 Oil pump – removal, inspection and refitting

Removal

1 Remove the sump as described in Section 11.

2 Unscrew and remove the bolts securing the oil pump to the base of the cylinder block/crankcase/balance shaft housing.

3 Disengage the pump sprocket from the chain, and remove the oil pump **(see illustrations)**. Where necessary, also remove the spacer plate which is fitted behind the oil pump.

Inspection

4 Examine the oil pump sprocket for signs of damage and wear, such as chipped or missing teeth. If the sprocket is worn, the pump assembly must be renewed, since the sprocket is not available separately. It is also recommended that the chain and drive sprocket, fitted to the crankshaft, be renewed at the same time. To renew the chain and drive sprocket, first remove the crankshaft timing belt sprocket, then unbolt the oil seal carrier from the cylinder block. The sprocket, spacer (where fitted) and chain can then be slid off the end of the crankshaft.

5 Unscrew and remove the bolts (along with the baffle plate, where fitted) securing the strainer cover to the pump body. Lift off the strainer cover, and take off the relief valve piston and spring, noting which way round they are fitted **(see illustrations)**.

6 Examine the pump rotors and body for signs of wear ridges or scoring. If worn, the complete pump assembly must be renewed.

7 Examine the relief valve piston for signs of wear or damage, and renew if necessary. The condition of the relief valve spring can only be measured by comparing it with a new one; if there is any doubt about its condition, it should also be renewed. Both the piston and spring are available individually.

8 Thoroughly clean the oil pump strainer with a suitable solvent, and check it for signs of clogging or splitting. If the strainer is damaged, the strainer and cover assembly must be renewed.

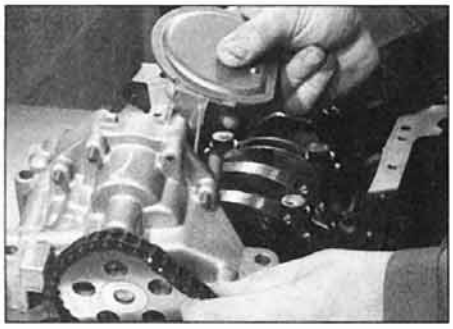
9 Locate the relief valve spring and piston in the strainer cover. Refit the cover to the pump body, aligning the relief valve piston with its bore in the pump. Refit the baffle plate (where fitted) and the cover retaining bolts, and tighten them securely.

10 Prime the pump by filling it with clean engine oil before refitting.

Refitting

11 Offer up the spacer plate (where fitted), then engage the pump sprocket with its drive chain, and seat the pump on the base of the cylinder block/crankcase. Refit the pump retaining bolts, and tighten them to the specified torque setting and angle, where necessary.

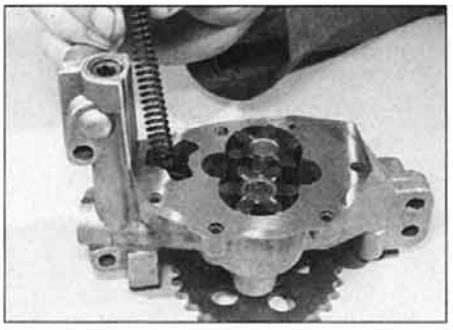
12 Refit the sump as described in Section 11.



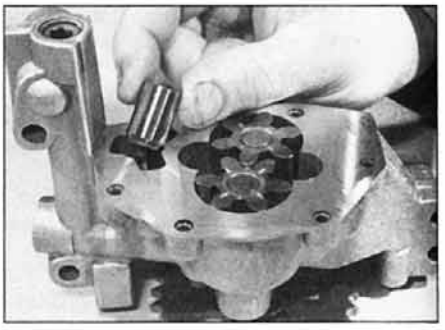
12.3a Removing the oil pump on the DW10 engine . . .

12.3b . . . and on the DW12 engine

12.5a Remove the oil pump cover bolts . . .



12.5b . . . then lift off the cover and remove the spring . . .



12.5c . . . and relief valve piston, noting which way round it is fitted

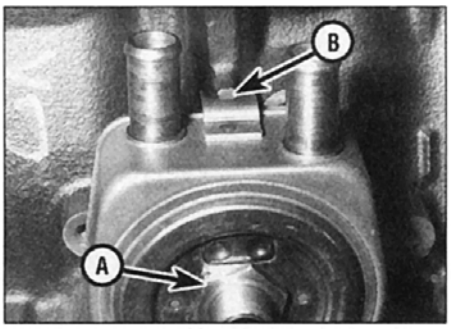
13 Oil cooler – removal and refitting

Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).
2 Drain the cooling system as described in Chapter 1B. Alternatively, clamp the oil cooler coolant hoses directly above the cooler, and be prepared for some coolant loss as the hoses are disconnected.
3 Position a suitable container beneath the oil filter on the front of the engine. Unscrew the filter using an oil filter removal tool if necessary, and drain the oil into the container. If the oil filter is damaged or distorted during removal, it must be renewed. Given the low cost of a new oil filter relative to the cost of repairing the damage which could result if a re-used filter leaks, it is probably a good idea to renew the filter in any case.
4 Release the hose clips, and disconnect the coolant hoses from the oil cooler.
5 Unscrew the oil cooler/oil filter mounting bolt/stud from the cylinder block, and withdraw the cooler. Note the locating notch in the cooler flange, which fits over the lug on the cylinder block **(see illustration)**. Discard the oil cooler sealing ring; a new one must be used on refitting.

Refitting

6 Fit a new sealing ring to the recess in the rear of the cooler, then offer the cooler to the cylinder block.
7 Ensure that the locating notch in the cooler flange is correctly engaged with the lug on the cylinder block. Apply locking fluid to the threads of the mounting bolt/stud, then insert it through the oil cooler and tighten to the specified torque (where given).
8 Fit the oil filter, then lower the vehicle to the ground. Top-up the engine oil level as described in *Weekly Checks*.
9 Refill or top-up the cooling system as described in Chapter 1B or *Weekly Checks* (as applicable). Start the engine, and check the oil cooler for signs of leakage.



13.5 Oil cooler/oil filter mounting bolt A) and locating notch (B)

14 Oil seals – renewal

Crankshaft

Right-hand oil seal

1 Remove the crankshaft sprocket as described in Section 8.
2 Measure and note the fitted depth of the oil seal.
3 Pull the oil seal from the housing using a hooked instrument. Alternatively, drill a small hole in the oil seal, and use a self-tapping screw and a pair of pliers to remove it **(see illustration)**.
4 Clean the oil seal housing and the crankshaft sealing surface.
5 Dip the new oil seal in clean engine oil, and press it into the housing (open end first) to the previously-noted depth, using a suitable tube or socket. A piece of thin plastic or tape wound around the front of the crankshaft is useful to prevent damage to the oil seal as it is fitted.
6 Where applicable, remove the plastic or tape from the end of the crankshaft.
7 Refit the timing belt crankshaft sprocket as described in Section 8.

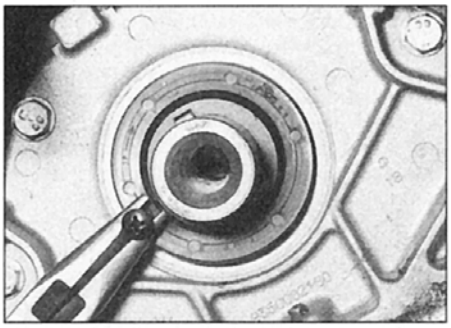
Left-hand oil seal

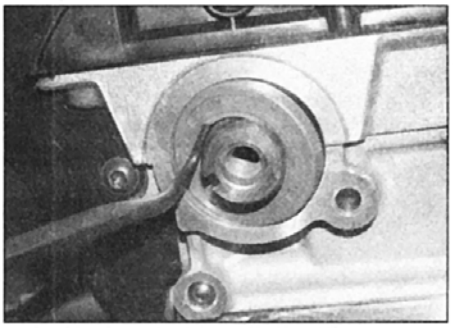
8 Remove the flywheel/driveplate, as described in Section 16.
9 Proceed as described in paragraphs 2 to 6, noting that when fitted, the outer lip of the oil seal must point outwards; if it is pointing inwards, use a piece of bent wire to pull it out. Take care not to damage the oil seal.
10 Refit the flywheel/driveplate, as described in Section 15.

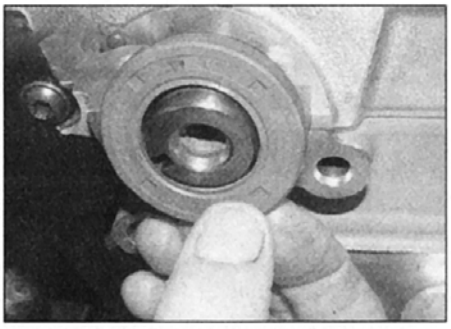
Camshaft

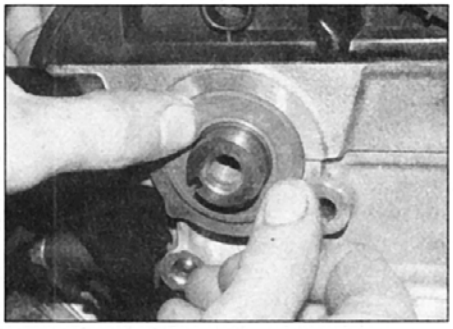
Right-hand oil seal

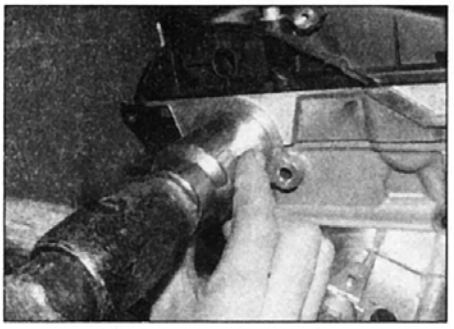
11 Remove the camshaft sprocket (and hub where applicable) as described in Section 8. In principle there is no need to remove the timing belt completely, but remember that if the belt has been contaminated with oil, it must be renewed.
12 Pull the oil seal from the housing using a hooked instrument. Alternatively, drill a small hole in the oil seal and use a self-tapping screw and a pair of pliers to remove it **(see illustrations)**.
13 Clean the oil seal housing and the camshaft sealing surface.
14 Smear the new oil seal with clean engine oil, then fit it over the end of the camshaft, open end first **(see illustration)**. A piece of thin plastic or tape wound around the front of the camshaft is useful to prevent damage to the oil seal as it is fitted.
15 Press the seal into the housing until it is flush with the end face of the cylinder head. Use an M10 bolt (screwed into the end of the camshaft), washers and a suitable tube or socket to press the seal into position **(see illustration)**.
16 Refit the camshaft sprocket (and hub where applicable) as described in Section 8.


14.3 Self-tapping screw and pliers used to remove the crankshaft right-hand oil seal


14.12a Use a hooked tool (or self-tapping screw and pliers) to prise out . . .


14.12b . . . and remove the camshaft oil seal


14.14 Locate the new oil seal in the cylinder head



14.15 Using a socket to drive the new oil seal into position

17 Where necessary, fit a new timing belt with reference to Section 7.

Left-hand oil seal

18 No oil seal is fitted to the left-hand end of the camshaft. The sealing is provided by an O-ring fitted to the end plate flange. The O-ring can be renewed after unbolting the plate from the cylinder head.

15 Oil level, temperature and pressure sensors – general

Refer to Chapter 5A for details.

16 Flywheel/driveplate – removal, inspection and refitting

Removal

Flywheel

1 Remove the transmission as described in Chapter 7A, then remove the clutch assembly as described in Chapter 6.

2 Prevent the flywheel from turning by locking the ring gear teeth **(see illustration 5.2)**. Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase. *Do not* attempt to lock the flywheel in position using the crankshaft pulley locking tool described in Section 3.

3 Slacken and remove the flywheel retaining bolts, and remove the flywheel from the end of the crankshaft. Be careful not to drop it; it is heavy. If the flywheel locating dowel is a loose fit in the crankshaft end, remove it and store it with the flywheel for safe-keeping. Discard the flywheel bolts; new ones must be used on refitting.

Driveplate

4 Remove the transmission as described in Chapter 7B. Lock the driveplate as described in paragraph 2 of this Section. Mark the relationship between the torque converter plate and the driveplate, and slacken all the driveplate retaining bolts.

5 Remove the retaining bolts, along with the torque converter plate and the two shims (one fitted on each side of the torque converter plate). Note that the shims are of different thickness, the thicker one being on the outside of the torque converter plate. Discard the driveplate retaining bolts; new ones must be used on refitting.

6 Remove the driveplate from the end of the crankshaft. If the locating dowel is a loose fit in the crankshaft end, remove it and store it with the driveplate for safe-keeping.

Inspection

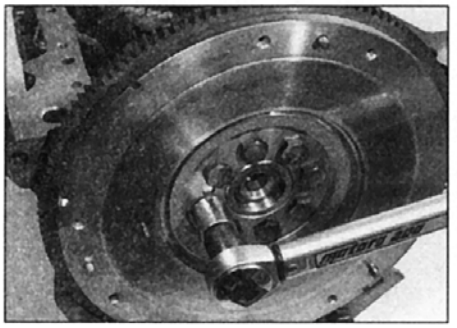
7 On models with manual transmission, examine the flywheel for scoring of the clutch face, and for wear or chipping of the ring gear teeth. If the clutch face is scored, the flywheel may be surface-ground, but renewal is preferable. Seek the advice of a Peugeot dealer or engine reconditioning specialist to see if machining is possible. If the ring gear is worn or damaged, the flywheel must be renewed, as it is not possible to renew the ring gear separately.

8 On models with automatic transmission, check the torque converter driveplate carefully for signs of distortion. Look for any hairline cracks around the bolt holes or radiating outwards from the centre, and inspect the ring gear teeth for signs of wear or chipping. If any sign of wear or damage is found, the driveplate must be renewed.

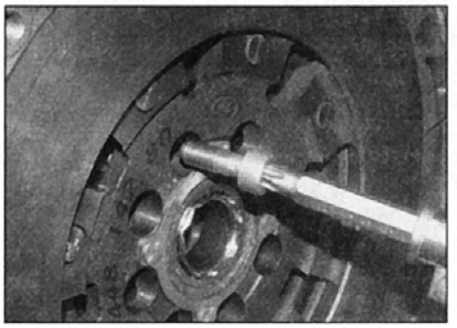
Refitting

Flywheel

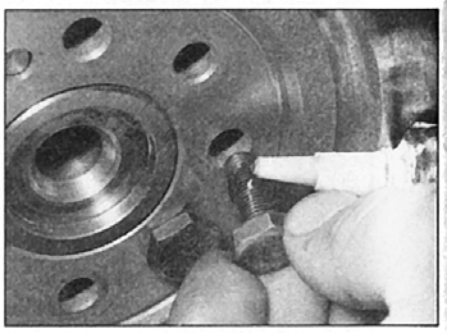
9 Clean the mating surfaces of the flywheel and crankshaft. Remove any remaining locking compound from the threads of the crankshaft holes, using the correct size of tap, if available.



16.12a . . . then refit the flywheel, and tighten the bolts to the specified torque



16.12b Torx bolts are fitted to the flywheel (DW12 engine with two section flywheel)



16.10 If the new flywheel bolt threads are not supplied with their threads precoated, apply a suitable thread-locking compound to them . . .

> **HAYNES HINT** ***If a suitable tap is not available, cut two slots along the threads of one of the old flywheel bolts, and use the bolt to remove the locking compound from the threads.***

10 If the new flywheel retaining bolts are not supplied with their threads already precoated, apply a suitable thread-locking compound to the threads of each bolt **(see illustration)**.

11 Ensure that the locating dowel is in position. Offer up the flywheel, locating it on the dowel, and fit the new retaining bolts.

12 Lock the flywheel using the method employed on dismantling, and tighten the retaining bolts to the specified torque **(see illustrations)**.

13 Refit the clutch as described in Chapter 6. Remove the flywheel locking tool, and refit the transmission as described in Chapter 7A.

Driveplate

14 Carry out the operations described above in paragraphs 9 and 10, substituting 'driveplate' for all references to the flywheel.

15 Locate the driveplate on its locating dowel.

16 Offer up the torque converter plate, with the thinner shim positioned behind the plate and the thicker shim on the outside, and align the marks made prior to removal.

17 Fit the new retaining bolts, then lock the driveplate using the method employed on dismantling. Tighten the retaining bolts to the specified torque wrench setting.

18 Remove the driveplate locking tool, and refit the transmission (see Chapter 7B).

17 Engine/transmission mountings – inspection and renewal

Inspection

1 If improved access is required, firmly apply the handbrake, then jack up the front of the

car and support it on axle stands (see *Jacking and vehicle support*).

2 Check the mounting rubbers to see if they are cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.

3 Check that all the mountings' fasteners are securely tightened; use a torque wrench to check if possible.

4 Using a large screwdriver or a crowbar, check for wear in each mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission back-and-forth, or from side-to-side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

Renewal

Right-hand mounting

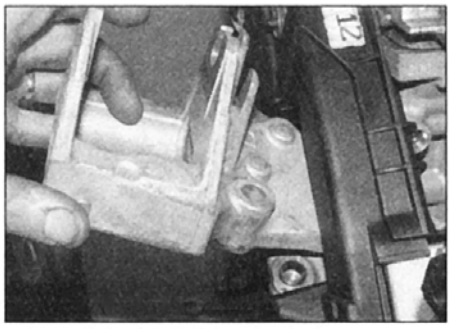
5 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

6 Remove the engine management ECU and housing box from the right-hand side of the engine compartment with reference to Chapter 4B, Section 13, and position it to one side. There is no need to disconnect the wiring.

7 Release all the relevant hoses and wiring from their retaining clips near the mounting. Place the hoses/wiring clear of the mounting so that the removal procedure is not hindered.

8 Unscrew the mounting bolts and remove the torque reaction link from the right-hand mounting and body.

9 Place a jack beneath the right-hand end of the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.



17.11 Removing the right-hand upper engine mounting bracket

10 Slacken and remove the three bolts securing the upper mounting bracket to the lower (engine) bracket.

11 Unscrew the nut securing the upper mounting bracket to the flexible engine mounting, and withdraw the bracket **(see illustration)**.

12 Unscrew the mounting rubber from the body, and remove it from the vehicle **(see illustration)**. A strap wrench or similar may be used to unscrew the mounting, or alternatively fabricate a tool from suitable metal tube with projections to engage in the cut-outs in the mounting.

13 If necessary, the lower mounting bracket can be unbolted and removed from the engine after removing the timing covers.

14 Check all components carefully for signs of wear or damage, and renew them where necessary.

15 On reassembly, screw the mounting rubber into the vehicle body, and tighten it securely. Where removed, refit the lower mounting bracket to the engine, apply a drop of locking compound to the retaining bolts and tighten them to the specified torque.

16 Refit the upper mounting bracket to the flexible mounting, then tighten the retaining nuts/bolts to the specified torque setting.

17 Refit and tighten the domed buffer nut, then refit the torque reaction link and hoses removed.

18 Refit the ECU and housing box, then reconnect the battery.

Left-hand mounting

19 Remove the battery, battery tray, and mounting plate as described in Chapter 5A.

20 Place a jack beneath the transmission, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the transmission.

21 Unscrew and remove the centre nut and washer from the left-hand mounting, then undo the nuts securing the mounting in position and remove it from the engine compartment **(see illustration)**.

22 If necessary, slide the spacer and small washer off the mounting stud, then unscrew the stud from the top of the transmission housing, and remove it along with its large washer. To improve access to the mounting stud, undo the retaining bolts and remove the mounting bracket from the body.

23 Check all components carefully for signs of wear or damage, and renew as necessary.

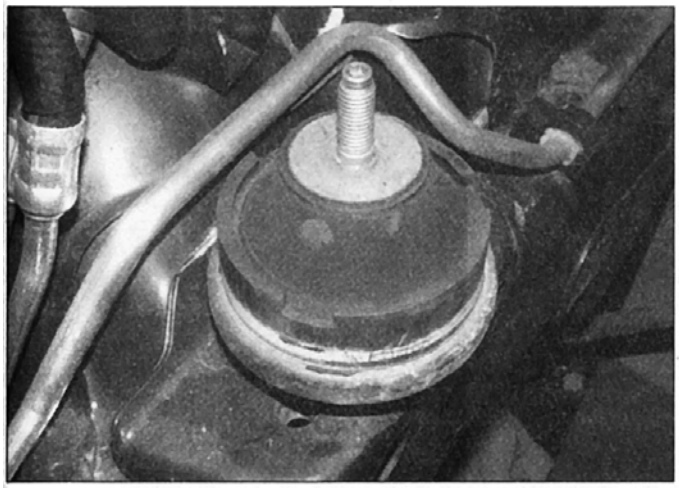
24 Clean the threads of the mounting stud, and apply a coat of thread-locking compound to its threads. Refit the stud and washer to the top of the transmission, and tighten it to the specified torque setting.

25 Slide the spacer (where fitted) onto the mounting stud, then refit the rubber mounting. Tighten both the mounting-to-body bolts and the mounting centre nut to their specified torque settings, and remove the jack from underneath the transmission.

26 Refit the battery mounting plate, battery tray and battery as described in Chapter 5A.

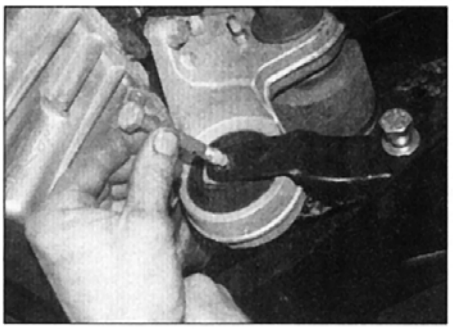
Rear mounting

27 If not already done, firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*). Remove the engine undertray.



17.12 Right-hand engine mounting rubber

17.21 Removing the left-hand engine mounting



17.28 Removing the rear engine mounting connecting link

28 Unscrew and remove the bolt securing the rear mounting connecting link to the mounting on the rear of the cylinder block **(see illustration)**.

29 Remove the bolt securing the rear mounting connecting link to the bracket on the subframe/underbody. Withdraw the link.

30 To remove the mounting assembly it will first be necessary to remove the right-hand driveshaft as described in Chapter 8.

31 With the driveshaft removed, undo the retaining bolts and remove the mounting from the rear of the cylinder block.

32 Check carefully for signs of wear or damage on all components, and renew them where necessary.

33 On reassembly, fit the rear mounting assembly to the rear of the cylinder block, and tighten its retaining bolts to the specified torque. Refit the driveshaft as described in Chapter 8.

34 Refit the connecting link, and tighten both its bolts to their specified torque settings.

35 Refit the engine undertray and lower the vehicle to the ground.

Chapter 2 Part D:
Engine removal and overhaul procedures

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

Note: *At the time of writing, some specifications for certain engines were not available. Where the relevant specifications are not given here, refer to your Peugeot dealer for further information.*

Cylinder head

Maximum gasket face distortion:	
XU engine (LFY)	0.05 mm
EW engines (6FZ, RFR and RFN)	0.05 mm
DW engines (RHY, RHZ and 4HX)	0.03 mm
Cylinder head height:	
XU engine (LFY):	
Nominal	137.00 ± 0.05 mm
Minimum (after grinding)	136.80 mm
EW engines (6FZ, RFR and RFN):	
Nominal	137.00 ± 0.05 mm
Minimum (after grinding)	136.70 ± 0.05 mm
DW engines (RHY, RHZ and 4HX):	
Nominal	133.0 ± 0.05 mm
Minimum (after grinding)	132.8 mm

Valves

	Inlet	Exhaust
Valve head diameter:		
XU engine	34.7 +0.0, –0.2 mm	29.7 +0.0, –0.2 mm
EW7 engine	29.8 ± 0.1 mm	27.2 ± 0.1 mm
EW10 engine	33.3 ± 0.1 mm	29.0 ± 0.1 mm
Diesel engines:		
2.0 litre engine	Not available	Not available
2.2 litre engine	29.9 ± 0.1 mm	25.0 ± 0.1 mm
Valve stem diameter:		
XU engine	6.98 +0.0, –0.015 mm	6.96 +0.0, –0.015 mm
EW engines	5.985 +0.0, –0.015 mm	5.975 +0.0, –0.015 mm
Diesel engines:		
2.0 litre engine	Not available	Not available
2.2 litre engine	5.968 ± 0.05 mm	5.968 ± 0.05 mm
Overall length:		
XU engine	104.38 +0.4, + 0.0	102.9 +0.4, +0.0
EW7 engine	104.17 ± 0.1 mm	104.10 ± 0.1 mm
EW10 engine	106.18 ± 0.3 mm	103.66 ± 0.1 mm
Diesel engines:		
2.0 litre engine	Not available	Not available
2.2 litre engine	102.55 ± 0.15 mm	102.48 ± 0.15 mm
Valve head recess below cylinder head surface (maximum):		
DW12 diesel engine	0.5 to 1.0 mm	0.9 to 1.4 mm

Balance shafts (DW12 diesel engine)

Endfloat	0.03 to 0.20 mm
Backlash clearance between shafts	0.01 to 0.7 mm
Backlash clearance between driver shaft and crankshaft gear	0.01 to 0.26 mm

Cylinder block

Cylinder bore diameter:	
XU engine:	
Category A	83.00 +0.010, +0.0
Category B	83.01 +0.010, +0.0
Category C	83.02 +0.010, +0.0
EW7 engine:	
Nominal	82.7 +0.018, +0.0 mm
Oversize	83.3 +0.018, +0.0 mm
EW10 engine:	
Nominal	85.0 +0.018, +0.0 mm
Oversize	85.6 +0.018, +0.0 mm
Diesel engines:	
2.0 litre engine:	
Standard	85.000 to 85.018 mm
Oversize A1	85.030 to 85.048 mm
Oversize R1	85.250 to 85.268 mm
Oversize R2	85.600 to 85.618 mm
2.2 litre engine:	
Standard	85.000 to 85.018 mm
Oversize R1	85.600 to 85.618 mm
Liner protrusion above block mating surface – XU7 aluminium-block engine only:	
Standard	0.03 to 0.10 mm
Maximum difference between any two liners	0.05 mm

Piston rings

End gaps:	
Petrol engines:	
Top compression ring:	
XU engine	Not available
EW engines	0.2 +0.25, +0.0 mm
Second compression ring:	
XU engine	Not available
EW engines	0.2 +0.25, +0.0 mm
Diesel engines:	
Top compression ring	0.20 to 0.35 mm
Second compression ring	0.80 to 1.00 mm
Oil control ring	0.25 to 0.50 mm

Pistons

Piston diameter:	
XU7 (LFY) engine:	
Category A:	
PDC type	82.970 ± 0.007 mm
SMM type	82.912 ± 0.005 mm
FM type	82.962 ± 0.005 mm
Category B:	
PDC type	82.980 ± 0.007 mm
SMM type	82.922 ± 0.005 mm
FM type	82.972 ± 0.005 mm
Category C:	
PDC type	–
SMM type	82.932 ± 0.005 mm
FM type	–
EW7 engine:	
Nominal	82.657 mm
Oversize	83.257 mm
EW10 engine:	
Nominal	84.948 mm
Oversize	85.548 mm
DW10 engine:	
Standard	84.210 to 84.228 mm
Maximum difference in weight between any two pistons	4.0 g
DW12 engine:	
Standard	84.931 ± 0.009 mm
1st oversize	85.531 ± 0.009 mm
Piston weight class:	
DW12 engine:	
P1	From 605 to 609
P2	From 610 to 614
P3	From 615 to 619
P4	From 620 to 625

Note: *All 4 pistons must be of the same weight class*

Crankshaft

Endfloat	0.07 to 0.32 mm
Main bearing journal diameter:	
XU engine	60.0 +0, –0.019 mm
EW engines:	
Nominal	60.0 +0, –0.025 mm
Undersize	59.7 +0, –0.019 mm
Diesel engines:	
Standard	60.0 +0, –0.025 mm
Undersize	59.7 +0, –0.025 mm
Big-end bearing journal diameter:	
XU engine:	
Nominal	45.0 –0.025, –0.009 mm
Undersize	44.7 –0.025, –0.009 mm
EW engines:	
Nominal	60.0 +0, –0.025 mm
Undersize	59.7 +0, –0.019 mm
Diesel engines:	
Standard	50.0 +0, –0.016 mm
Undersize	49.7 +0, –0.016 mm
Maximum bearing journal out-of-round (all models)	0.007 mm
Main bearing running clearance:	
XU engine	0.025 to 0.062 mm
EW engines	0.030 to 0.054 mm
Diesel engines*	0.025 to 0.050 mm
Big-end bearing running clearance – all models*	0.025 to 0.050 mm

**These are suggested figures, typical for this type of engine – no exact values are stated by Peugeot*

Torque wrench settings

XU series (petrol) engine	Refer to Chapter 2A Specifications
EW series (petrol) engine	Refer to Chapter 2B Specifications
DW series (diesel) engine	Refer to Chapter 2C Specifications

1 General information

Included in this Part of Chapter 2 are details of removing the engine/transmission from the car and general overhaul procedures for the cylinder head, cylinder block/crankcase and all other engine internal components.

The information given ranges from advice concerning preparation for an overhaul and the purchase of parts, to detailed step-by-step procedures covering removal, inspection, renovation and refitting of engine internal components.

After Section 6, all instructions are based on the assumption that the engine has been removed from the car. For information concerning in-car engine repair, as well as the removal and refitting of those external components necessary for full overhaul, refer to Part A, B or C of this Chapter (as applicable) and to Section 6. Ignore any preliminary dismantling operations described in Part A, B or C that are no longer relevant once the engine has been removed from the car.

Apart from torque wrench settings, which are given at the beginning of Part A, B or C (as applicable), all specifications relating to engine overhaul are at the beginning of this Part of Chapter 2.

2 Engine overhaul – general information

It is not always easy to determine when, or if, an engine should be completely overhauled, as a number of factors must be considered.

High mileage is not necessarily an indication that an overhaul is needed, while low mileage does not preclude the need for an overhaul. Frequency of servicing is probably the most important consideration. An engine which has had regular and frequent oil and filter changes, as well as other required maintenance, should give many thousands of miles of reliable service. Conversely, a neglected engine may require an overhaul very early in its life.

Excessive oil consumption is an indication that piston rings, valve seals and/or valve guides are in need of attention. Make sure that oil leaks are not responsible before deciding that the rings and/or guides are worn. Perform a compression test, as described in Part A or B (petrol engines) or C (diesel engine) of this Chapter, to determine the likely cause of the problem.

Check the oil pressure with a gauge fitted in place of the oil pressure switch, and compare it with that specified. If it is extremely low, the main and big-end bearings, and/or the oil pump, are probably worn out.

Loss of power, rough running, knocking or metallic engine noises, excessive valve gear noise, and high fuel consumption may also point to the need for an overhaul, especially if they are all present at the same time. If a complete service does not cure the situation, major mechanical work is the only solution.

An engine overhaul involves restoring all internal parts to the specification of a new engine. During an overhaul, the cylinder liners (XU7 engine), the pistons and the piston rings are renewed. New main and big-end bearings are generally fitted; if necessary, the crankshaft may be renewed to restore the journals. The valves are also serviced as well, since they are usually in less-than-perfect condition at this point. While the engine is being overhauled, other components, such as the distributor, starter and alternator, can be overhauled as well. The end result should be an as-new engine that will give many trouble-free miles.

Note: Critical cooling system components such as the hoses, thermostat and coolant pump should be renewed when an engine is overhauled. The radiator should be checked carefully, to ensure that it is not clogged or leaking. Also, it is a good idea to renew the oil pump whenever the engine is overhauled.

Before beginning the engine overhaul, read through the entire procedure, to familiarise yourself with the scope and requirements of the job. Overhauling an engine is not difficult if you follow carefully all of the instructions, have the necessary tools and equipment, and pay close attention to all specifications. It can, however, be time-consuming. Plan on the car being off the road for a minimum of two weeks, especially if parts must be taken to an engineering works for repair or reconditioning. Check on the availability of parts and make sure that any necessary special tools and equipment are obtained in advance. Most work can be done with typical hand tools, although a number of precision measuring tools are required for inspecting parts to determine if they must be renewed. Often the engineering works will handle the inspection of parts and offer advice concerning reconditioning and renewal.

Always wait until the engine has been completely dismantled, and until all components (especially the cylinder block/crankcase and the crankshaft) have been inspected, before deciding what service and repair operations must be performed by an engineering works. The condition of these components will be the major factor to consider when determining whether to overhaul the original engine, or to buy a reconditioned unit. Do not, therefore, purchase parts or have overhaul work done on other components until they have been thoroughly inspected. As a general rule, time is the primary cost of an overhaul, so it does not pay to fit worn or sub-standard parts.

As a final note, to ensure maximum life and minimum trouble from a reconditioned engine, everything must be assembled with care, in a spotlessly-clean environment.

3 Engine/transmission removal – methods and precautions

If you have decided that the engine must be removed for overhaul or major repair work, several preliminary steps should be taken.

Locating a suitable place to work is extremely important. Adequate work space, along with storage space for the car, will be needed. If a workshop or garage is not available, at the very least, a flat, level, clean work surface is required.

Cleaning the engine compartment and engine/transmission before beginning the removal procedure will help keep tools clean and organised.

An engine hoist or A-frame will also be necessary. Make sure the equipment is rated in excess of the combined weight of the engine and transmission. Safety is of primary importance, considering the potential hazards involved in lifting the engine/transmission out of the car.

If this is the first time you have removed an engine, an assistant should ideally be available. Advice and aid from someone more experienced would also be helpful. There are many instances when one person cannot simultaneously perform all of the operations required when removing the engine from the vehicle.

Plan the operation ahead of time. Before starting work, arrange for the hire of or obtain all of the tools and equipment you will need. Some of the equipment necessary to perform engine/transmission removal and installation safely and with relative ease (in addition to an engine hoist) is as follows: a heavy duty trolley jack, complete sets of spanners and sockets, wooden blocks, and plenty of rags and cleaning solvent for mopping-up spilled oil, coolant and fuel. If the hoist must be hired, make sure that you arrange for it in advance, and perform all of the operations possible without it beforehand. This will save you money and time.

Plan for the car to be out of use for quite a while. An engineering works will be required to perform some of the work which the do-it-yourselfer cannot accomplish without special equipment. These places often have a busy schedule, so it would be a good idea to consult them before removing the engine, in order to accurately estimate the amount of time required to rebuild or repair components that may need work.

During the engine removal procedure, it is advisable to make notes of the locations of all brackets, cable ties, earthing points, etc, as well as how the wiring harnesses, hoses and electrical connections are attached and routed around the engine and engine compartment. An effective way of doing this is to take a series of photographs of the various components before they are disconnected or removed. A simple inexpensive disposable

camera is ideal for this and the resulting photographs will prove invaluable when the engine is refitted.

Always be extremely careful when removing and refitting the engine/transmission. Serious injury can result from careless actions. Plan ahead and take your time, and a job of this nature, although major, can be accomplished successfully.

Note 1: *All manual transmission petrol engines and the DW10 diesel engine are removed upwards from the car as a complete unit together with the transmission, then the transmission is separated from the engine on the bench. The DW12 diesel engine and all engines with automatic transmission are best removed by lowering them from the engine compartment after removing the subframe.*

Note 2: *Such is the complexity of the power unit arrangement on these vehicles, and the variations that may be encountered according to model and optional equipment fitted, that the following should be regarded as a guide to the work involved, rather than a step-by-step procedure. Where differences are encountered, or additional component disconnection or removal is necessary, make notes of the work involved as an aid to refitting.*

4 Engine and manual transmission – removal, separation and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove both front roadwheels. Also remove the undertray from beneath the engine and transmission where fitted.

3 Remove the engine top cover. If necessary for use of the lifting hoist, disconnect the bonnet support struts as described in Chapter 11, Section 8, and tie or support the bonnet in the vertical position. Alternatively, remove the bonnet completely.

4 Drain the cooling system with reference to Chapter 1A or 1B.

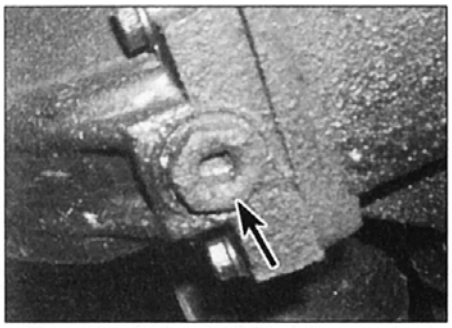
5 Drain the transmission oil as described in Chapter 7A **(see illustration)**. Refit the drain and filler plugs, and tighten them to their specified torque settings.

6 If the engine is to be dismantled, drain the engine oil and remove the oil filter as described in Chapter 1A or 1B **(see illustrations)**. Clean and refit the drain plug, tightening it securely.

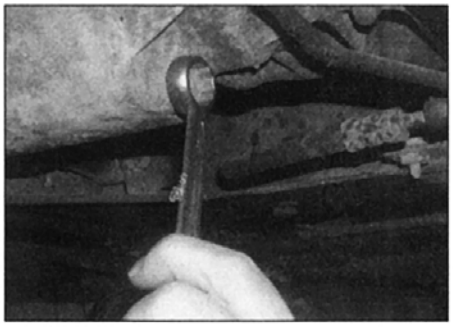
7 Refer to Chapter 11, Section 24, and remove the front wheelarch liners from both sides.

8 Refer to Chapter 8 and remove both front driveshafts **(see illustration)**.

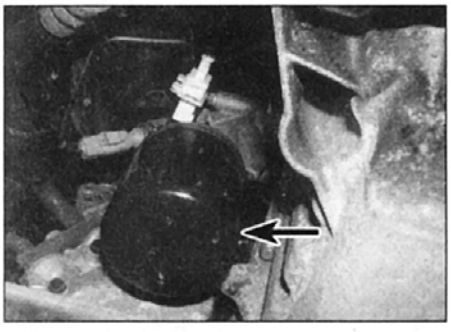
9 Refer to Chapter 1A or 1B and remove the auxiliary drivebelt.



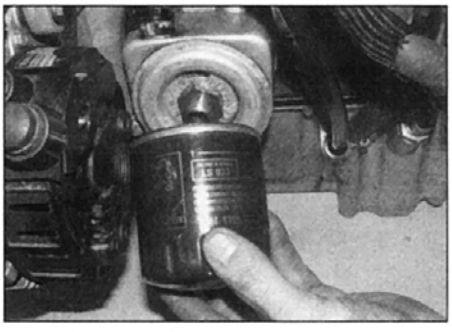
4.5 Manual transmission oil drain plug



4.6a Unscrewing the sump drain plug (EW10 engine)



4.6b Engine oil filter on the EW10 engine . . .



4.6c . . . and on the DW12 engine (same on the DW10 engine)

10 On diesel engines with an intercooler, remove the air duct leading from the turbocharger to the intercooler.

11 Remove the exhaust system with reference to Chapter 4A or 4B.

12 From underneath the vehicle, slacken and remove the nuts and bolts securing the rear engine mounting connecting link to the mounting assembly and subframe, and remove the connecting link. Refer to Chapter 2A, 2B or 2C.

13 On models with air conditioning, refer to Chapter 3 and unbolt the compressor from the engine. On the DW12 diesel engine, it will be necessary to unbolt the auxiliary drivebelt idler for access to the upper compressor mounting bolt **(see illustration)**. **Do not** disconnect the refrigerant lines. Support or tie the compressor to one side.

14 Unclip the power steering fluid pipe from beneath the transmission. On models where the engine/transmission assembly is lowered from the engine compartment, carefully tie the pipe to the right-hand side of the engine compartment.

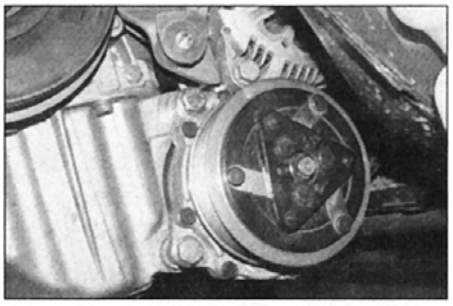
15 On diesel engines with an intercooler, remove the air duct leading from the intercooler to the air cleaner.

16 Refer to Chapter 4A or 4B and remove the air cleaner and its bracket, and all air inlet ducts.

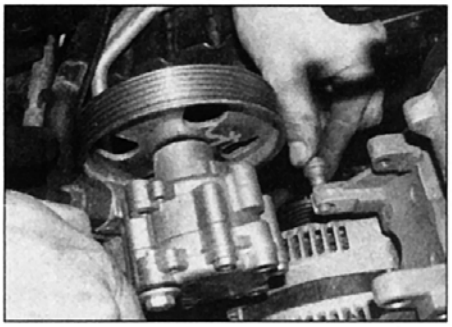
17 Refer to Chapter 5A and remove the battery and battery tray.

18 Refer to Chapter 3 and remove the radiator. Although not essential, this will ensure the radiator is not damaged as the engine/transmission assembly is being removed. Alternatively, a piece of wood or card may be placed over the radiator as protection. If the radiator is left in position, remove the bottom hose from the thermostat housing and radiator.

4.8 Removing the driveshaft/hub nuts



4.13 Air conditioning compressor on the DW12 engine – auxiliary drivebelt idler has been removed for access to the upper bolt



4.29 Unbolting the power steering pump from its bracket

19 On diesel engines, remove the preheating control unit cover, then remove the preheating control unit housing.

20 Refer to Chapter 4A or 4B and remove the engine management ECU and housing.

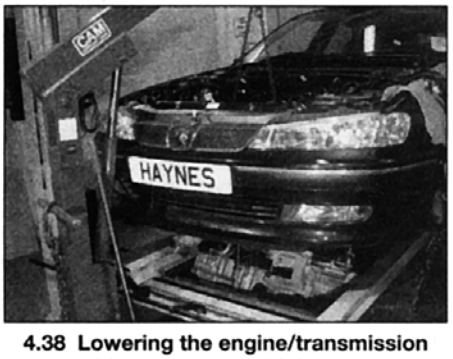
21 Where applicable, disconnect the two engine/transmission wiring connectors at the left-hand front of the engine/transmission. If necessary, trace the wiring harness back from the engine to the main harness connectors at the fuse/relay box, and/or at the bulkhead connection behind the battery tray location. Release the locking rings by twisting them anti-clockwise and disconnect the connectors. Also trace the wiring connectors back to the transmission and disconnect all engine related wiring and earth leads in this area. Check that all the relevant connectors have been disconnected, and that the harness is released from all the clips or ties, so that it is free to be removed with the engine/transmission. On some models it may be necessary to disconnect all the relevant wiring from the engine, then unbolt the harness conduit and move it to one side.

22 Remove the battery support bracket.

23 Unbolt the accelerator control and bracket from the left-hand side of the engine compartment.

24 Disconnect the gear linkage cable end fittings from the levers on the top of the transmission then unclip the outer cables from their supports and tie them to one side.

25 On models with a clutch release cable, disconnect the cable from the transmission release lever and support it to one side. On models with a hydraulic clutch, remove the slave cylinder from the transmission with reference to Chapter 6, Section 4; this will necessitate disconnecting the hydraulic pipe first, as there is insufficient movement with the pipe in position.



4.38 Lowering the engine/transmission assembly to the ground (DW12 engine)

26 On diesel models disconnect the brake vacuum pipe from the vacuum pump on the left-hand end of the cylinder head. Also disconnect the vacuum pipes from throttle bodies and swirl-control unit.

27 On diesel models, disconnect the wiring from the EGR valve.

28 At the bulkhead, disconnect the coolant hoses from the heater matrix.

29 Refer to Chapter 10 and unbolt the power steering pump from the engine, without disconnecting the hydraulic hoses – access to the front bolts is through the pulley **(see illustration)**. Tie it to one side. Note on models where the engine is lowered from the engine compartment, it will be necessary to pull the power steering fluid pipe from under the transmission to the right-hand side before lowering the engine. Take care not to damage the pipe at its connection to the steering gear. Alternatively, disconnect the fluid pipe either from the steering gear or pump.

30 Disconnect the fuel supply and return hoses with reference to the appropriate part of Chapter 4. Tape over or plug the holes in the fuel rail and the ends of the hoses, to prevent entry of dust and dirt.

31 On the DW12 diesel engine and all automatic transmission models, remove the front suspension subframe with reference to Chapter 10.

32 Using a hoist attached to the lifting eyes on the cylinder head, take the weight of the engine and transmission.

33 Refer to Chapter 2A, 2B or 2C and unbolt the right-hand engine mounting torque reaction link and the mounting itself.

34 Unscrew and remove the left-hand engine mounting centre nut and washer, then unbolt the rubber mounting from the body support bracket.

35 Remove the spacer, then unscrew the left-hand engine mounting centre stud from the transmission and remove its washer. On the ML5T transmission, unbolt the bracket together with the stud.

36 Make a final check that any components which would prevent the removal of the engine/transmission from the car have been removed or disconnected. Ensure that components such as the gearchange selector cables are secured so that they cannot be damaged on removal.

37 On models where the engine is lifted upwards from the engine compartment (see note in Section 3), raise the engine hoist and carefully lift the engine/transmission upwards, clear of the mountings, ensuring that nothing is trapped or damaged. Enlist the help of an assistant during this procedure, as it will be necessary to tilt and twist the assembly slightly to clear the body panels and adjacent components. Once the engine/transmission assembly is high enough to clear the front crossmember, withdraw the unit forward and out of the engine compartment. Move the unit clear of the car and lower it to the ground.

38 On models where the engine is lowered from the engine compartment, carefully lower the assembly to the ground, making sure it clears the surrounding engine compartment components **(see illustration)**. On the DW12 engine, make sure that the power steering fluid pipe is tied to the right-hand side of the engine compartment, so that it will clear the engine.

Separation

39 With the engine/transmission assembly removed, support the assembly on suitable blocks of wood on a workbench (or failing that, on a clean area of the workshop floor).

40 Undo the retaining bolts, and remove the flywheel lower cover plate(s) from the transmission.

41 Slacken and remove the retaining bolts, and remove the starter motor from the transmission.

42 Undo the bolts and release the coolant heating housing from the transmission, noting the location of the earth leads and cable clips also secured by the housing retaining bolts.

43 Disconnect any remaining wiring connectors at the transmission, then move the main engine wiring harness to one side.

44 Ensure that both engine and transmission are adequately supported, then slacken and remove the remaining bolts securing the transmission housing to the engine. Note the correct fitted positions of each bolt (and the relevant brackets) as they are removed, to use as a reference on refitting.

45 Carefully withdraw the transmission from the engine, ensuring that the weight of the transmission is not allowed to hang on the input shaft while it is engaged with the clutch friction disc. On models with the 'pull-type' clutch, make sure that the release fork disengages fully from the release bearing.

46 If they are loose, remove the locating dowels from the engine or transmission, and keep them in a safe place.

Refitting

47 If the engine and transmission have not been separated, perform the operations described below from paragraph 58 onwards.

48 Apply a smear of high-melting-point grease (Peugeot recommend the use of Molykote BR2 plus – available from your Peugeot dealer) to the splines of the transmission input shaft. Do not apply too much, otherwise there is a possibility of the grease contaminating the clutch friction disc.

49 On models with the 'pull-type' clutch, fit the release bearing to the release fork with reference to Chapter 6, ensuring that the snap-ring is correctly in position in its groove.

50 Ensure that the locating dowels are correctly positioned in the engine or transmission.

51 Carefully offer the transmission to the engine, until the locating dowels are engaged. Ensure that the weight of the transmission is not allowed to hang on the input shaft as it is engaged with the clutch friction disc.

52 Refit the transmission housing-to-engine bolts, ensuring that all the necessary brackets are correctly positioned, and tighten them securely.

53 On models with the 'pull-type' clutch, use the special tool described in Chapter 6 to pull the release fork in order to force the release bearing through the friction disc.

54 Locate the main engine wiring harness on the transmission and reconnect the relevant wiring connectors. On the DW12 engine in the project car, the wiring connectors are coloured as follows:

Fuel filter	*Green*
High-pressure fuel pump	*White*
Oil pressure switch	*Grey*
Oil level sensor	*Green*
Fuel rail	*Red*
Coolant temperature sensor	*Green*
Glow plugs	*Grey*
Air conditioning compressor	*Grey*

55 Refit the coolant heating housing to the transmission, ensuring that the earth leads and cable clips are correctly attached.

56 Refit the starter motor, and securely tighten its retaining bolts.

57 Refit the lower flywheel cover plate(s) to the transmission, and securely tighten the bolts.

58 Reconnect the hoist and lifting tackle to the engine lifting brackets. With the aid of an assistant, lift the assembly into the engine compartment, taking care not to damage surrounding components.

59 Refit the right-hand engine mounting and torque reaction link, but leave the link bolts finger-tight at this stage.

60 Working on the left-hand mounting, refit the left-hand engine mounting stud to the transmission together with its washer, then refit the spacer and coat it with grease. Refit the rubber mounting to the body and tighten the bolts, then refit the centre nut and washer and finger-tighten. On models with the ML5T transmission, refit the bracket to the transmission and tighten the bolts.

61 Position the engine and transmission on the mountings, and refit the mounting nuts/bolts hand-tight at this stage. Remove the hoist.

62 From underneath the vehicle, refit the rear mounting connecting link and finger-tighten the bolts.

63 Rock the engine to settle it on its mountings, then go around and tighten all the mounting nuts and bolts to their specified torque settings.

64 The remainder of the refitting procedure is a direct reversal of the removal sequence, with reference to the relevant chapters and noting the following points:

a) Ensure that the wiring loom is correctly routed and retained by all the relevant retaining clips; all connectors should be correctly and securely reconnected.

b) Prior to refitting the driveshafts to the transmission, renew the driveshaft oil seals as described in Chapter 7A.

c) Refer to Chapter 10 when refitting the power steering pump; the rear mounting bolt must be tightened last ***(see illustration)****.*

d) Ensure that all coolant hoses are correctly reconnected, and securely retained by their retaining clips.

e) Refill the engine and transmission with the correct quantity and type of lubricant, as described in Chapters 1A or 1B, and 7A.

f) Refill the cooling system as described in Chapter 1A or 1B.

g) Bleed the power steering system as described in Chapter 10.

h) Initialise the engine management ECU as follows. Start the engine and run to normal temperature. Carry out a road test during which the following procedure should be made. Engage third gear and stabilise the engine at 1000 rpm. Now accelerate fully to 3500 rpm.

5 Engine and automatic transmission – removal, separation and refitting

Removal

1 The procedure is essentially the same as described in Section 4, but carry out the following operations with reference to Chapter 7B.

a) Carefully prise the selector cable balljoint from the selector lever on the transmission multi-function switch. Extract the horseshoe-shaped clip securing the cable to the mounting bracket on the transmission.

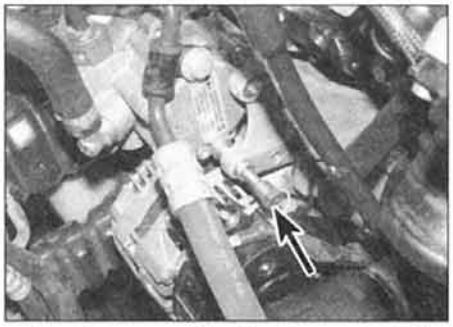
b) Trace the wiring back from the multi-function switch to the wiring connector. Release the connector from the support bracket and disconnect it. Release the switch wiring from the support clip on the transmission.

c) Disconnect the wiring harness at the large connector adjacent to the transmission fluid cooler. Cover the wiring connector socket on the transmission to prevent water ingress when the fluid cooler hoses are disconnected.

d) Using hose clamps or similar, clamp both the fluid cooler coolant hoses to minimise coolant loss during subsequent operations.

e) Disconnect both coolant hoses from the fluid cooler being prepared for some coolant spillage. Wash off any spilt coolant immediately with cold water, and dry the surrounding area before proceeding further.

f) Unclip the wiring connector from the support bracket located just above the fluid cooler, then remove the support bracket.



4.64 The power steering pump rear bolt must be tightened last

g) Disconnect the earth cable from the stud on the transmission.

h) Remove the wiring harness bracket and the hose support bracket from the transmission.

i) Disconnect the wiring from the speedometer transducer (speedometer drive) and crankshaft (RPM) sensor, then remove the sensor from the bellhousing.

j) Remove the starter motor.

k) Label and disconnect any remaining wiring connectors and support brackets connected to the transmission.

Separation

2 With the engine/transmission assembly removed, support the assembly on suitable blocks of wood, on a workbench (or failing that, on a clean area of the workshop floor).

3 Locate the access hole at the lower rear of the cylinder block, then turn the crankshaft, by means of a socket on the crankshaft pulley bolt, until one of the torque converter retaining bolts is accessible through the access hole.

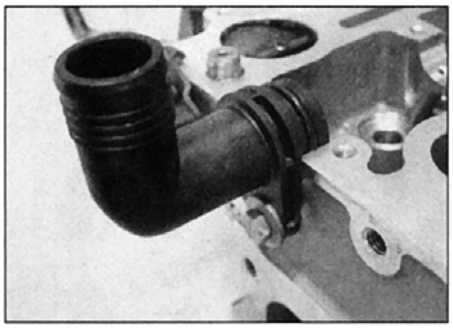
4 Undo the accessible torque converter bolt then turn the crankshaft as necessary and undo the remaining two bolts.

5 Slacken and remove the bolts securing the transmission housing to the engine. Note the correct fitted positions of each bolt and brackets, as they are removed, to use as a reference on refitting. Make a final check that all components have been disconnected, and are positioned clear of the transmission so that they will not hinder the removal procedure.

6 With the bolts removed, pull the transmission off the engine, to free it from its locating dowels. Once the transmission is free, and sufficient clearance exists, insert a bolt with a suitable washer through the crankshaft (RPM) sensor hole in the transmission bellhousing, to retain the torque converter on the transmission.

Preparation for reconnection

7 Prior to reconnection it is necessary to make a simple tool to align the torque converter with the driveplate as the transmission is refitted. To make the tool, obtain a bolt of the same size as the torque converter retaining bolts, but long enough to extend through the access hole in the cylinder block when the transmission is refitted.



7.2 Crankcase ventilation elbow on the DW12 diesel engine

8 Cut the head off the bolt and cut a slot (to enable it to be unscrewed) in the plain end. Check that the tool will slide easily through the torque converter retaining bolt hole in the driveplate.

9 Turn the engine crankshaft so that one of the torque converter retaining bolt holes in the driveplate, is aligned with the access hole in the cylinder block. Screw the alignment tool (finger-tight only) into one of the retaining bolt holes in the torque converter. Turn the torque converter so that the alignment tool is in approximately the correct position, relative to the cylinder block access hole. As the transmission is refitted, the alignment tool will pass through the retaining bolt hole in the driveplate and through the access hole. It can then be unscrewed with a screwdriver and the first torque converter retaining bolt fitted in its place.

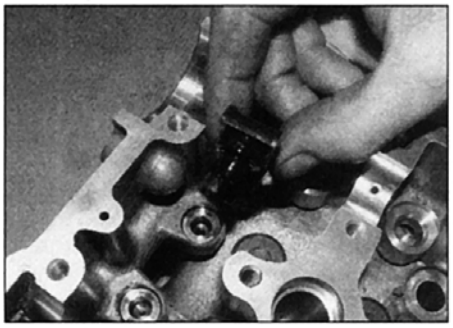
10 Check that the torque converter support bush fitted to the centre of the crankshaft is in good condition, and in place.

11 Ensure that the engine/transmission locating dowels are correctly positioned prior to installation.

Reconnection

12 The transmission is reconnected by a reversal of the removal procedure, bearing in mind the following points:

a) Guide the transmission into position ensuring that the alignment tool passes through the driveplate and access hole.
b) Remove the bolt used to retain the torque converter in place, just before the transmission engages with the engine.
c) Once the transmission is bolted to the engine, remove the alignment tool and fit the first torque converter retaining bolt. Turn the crankshaft as necessary and fit the other two bolts.



7.3 Removing the camshaft chain guide

Refitting

13 Refit the starter motor, and securely tighten its retaining bolts.

14 Refit the engine unit to the vehicle as described in the relevant refitting paragraphs of Section 4.

15 The remainder of the refitting procedure is a reversal of the removal sequence, noting the following points:

a) Ensure that the wiring loom is correctly routed, and retained by all the relevant retaining clips; all connectors should be correctly and securely reconnected.
b) Prior to refitting the driveshafts to the transmission, renew the driveshaft oil seals as described in Chapter 7B.
c) Ensure that all coolant hoses are correctly reconnected, and securely retained by their retaining clips.
d) Adjust the accelerator cable as described in the appropriate part of Chapter 4.
e) Refill the engine and transmission with correct quantity and type of lubricant, as described in Chapter 1A or 1B, and 7B.
f) Refill the cooling system (se Chapter 1A or 1B).
g) Initialise the engine management ECU as follows. Start the engine and run to normal temperature. Carry out a road test during which the following procedure should be made. Engage third gear and stabilise the engine at 1000 rpm. Now accelerate fully to 3500 rpm.

6 Engine overhaul – dismantling sequence

1 It is much easier to dismantle and work on the engine if it is mounted on a portable engine stand. These stands can often be hired from a tool hire shop. Before the engine is mounted on a stand, the flywheel/driveplate should be removed, so that the stand bolts can be tightened into the end of the cylinder block/crankcase.

2 If a stand is not available, it is possible to dismantle the engine with it blocked up on a sturdy workbench, or on the floor. Be extra-careful not to tip or drop the engine when working without a stand.

3 If you are going to obtain a reconditioned engine, all the external components must be removed first, to be transferred to the new engine (just as they will if you are doing a complete engine overhaul yourself). These components include the following:

a) Engine wiring harness and support brackets.
b) Alternator, power steering pump and air conditioning compressor mounting brackets (as applicable).
c) Coolant inlet and outlet housings.
d) Dipstick tube.
e) Fuel system components.
f) All electrical switches and sensors.
g) Inlet and exhaust manifolds and, where fitted, the turbocharger.
h) Oil filter and oil cooler.
i) Flywheel/driveplate.

Note: *When removing the external components from the engine, pay close attention to details that may be helpful or important during refitting. Note the fitted position of gaskets, seals, spacers, pins, washers, bolts, and other small items.*

4 If you are obtaining a 'short' engine (which consists of the engine cylinder block/crankcase, crankshaft, pistons and connecting rods all assembled), then the cylinder head, sump, oil pump, and timing belt will have to be removed also.

5 If you are planning a complete overhaul, the engine can be dismantled, and the internal components removed, in the order given below, referring to Part A, B or C of this Chapter unless otherwise stated.

a) Inlet and exhaust manifolds (Chapter 4A or 4B).
b) Timing belt, sprockets and tensioner.
c) Coolant pump (Chapter 3).
d) Cylinder head.
e) Flywheel/driveplate.
f) Sump.
g) Oil pump.
h) Balance shaft housing – DW12 diesel engine (Section 10 of this Chapter).
i) Pistons/connecting rods (Section 11 of this Chapter).
j) Crankshaft (Section 12 of this Chapter).

6 Before beginning the dismantling and overhaul procedures, make sure that you have all of the correct tools necessary. See *Tools and working facilities* for further information.

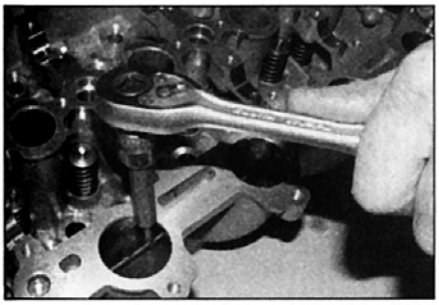
7 Cylinder head – dismantling

Note: *New and reconditioned cylinder heads are available from the manufacturer, and from engine overhaul specialists. Be aware that some specialist tools are required for the dismantling and inspection procedures, and new components may not be readily available. It may therefore be more practical and economical for the home mechanic to purchase a reconditioned head, rather than dismantle, inspect and recondition the original head.*

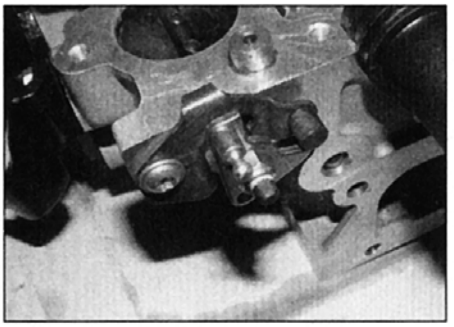
1 Remove the cylinder head as described in Part A, B or C of this Chapter (as applicable).

2 If not already done, remove the inlet and exhaust manifolds with reference to Chapter 4A or 4B. Remove any remaining brackets or housings as required **(see illustration)**.

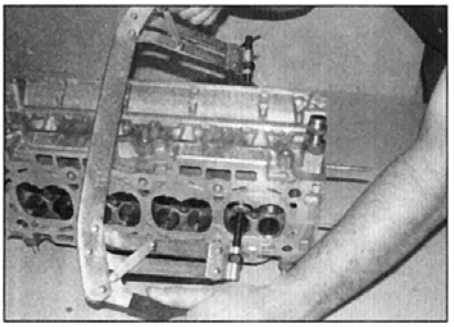
3 Remove the camshaft(s), hydraulic tappets and rockers (as applicable) as described in Part A, B or C of this Chapter. On the 2.2 litre DW12 diesel engine, remove the camshaft drive chain guide from the cylinder head **(see illustration)**.



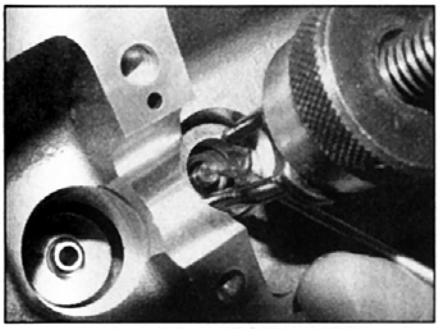
7.6a Use an Allen key to unscrew the grub screws securing the swirl-control butterflies on the shaft (DW12 engine)



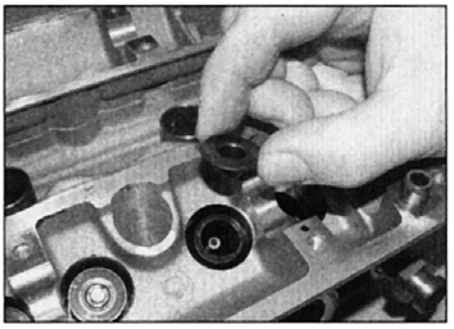
7.6b Butterfly shaft retainer and stop (DW12 engine)



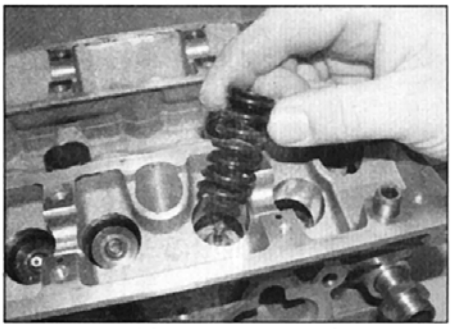
7.7a Compress the valve spring using a spring compressor . . .



7.7b . . . then extract the collets and release the spring compressor



7.7c Remove the spring retainer . . .



7.7d . . . followed by the valve spring . . .

4 If not already done on petrol models, remove the spark plugs as described in Chapter 1A.

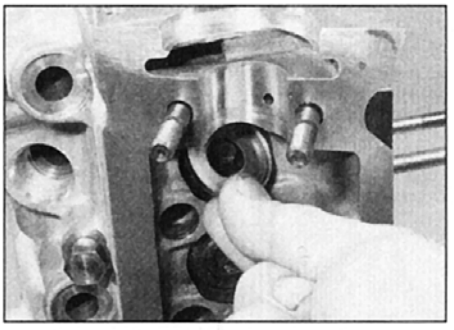
5 If not already done on diesel models, remove the glow plugs as described in Chapter 5C.

6 On the 2.2 litre DW12 diesel engine, remove the swirl-control butterflies as follows. First, identify each butterfly for location and fitted position, to ensure correct refitting. Working on each butterfly in turn, unscrew the grub screws and slide the butterfly from the shaft. Mark the position of the stop, then remove it together with the retainer, and withdraw the shaft from the cylinder head **(see illustrations)**.

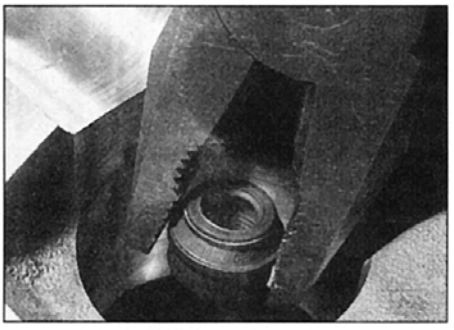
7 On all models, using a valve spring compressor, compress each valve spring in turn until the split collets can be removed. Release the compressor, and lift off the spring retainer, spring and, where fitted, the spring seat. Using a pair of pliers, carefully extract the valve stem oil seal from the top of the guide. On 16-valve engines, the valve stem oil seal also forms the spring seat and is deeply recessed in the cylinder head. It is also a tight fit on the valve guide making it difficult to remove with pliers or a conventional valve stem oil seal removal tool. It can be easily removed, however, using a self-locking nut of suitable diameter screwed onto the end of a bolt and locked with a second nut. Push the nut down onto the top of the seal; the locking portion of the nut will grip the seal allowing it to be withdrawn from the top of the valve guide. Access to the valves is limited, and it may be necessary to make up an adaptor out of metal tube – cut out a 'window' so that the valve collets can be removed **(see illustrations)**.

8 If, when the valve spring compressor is screwed down, the spring retainer refuses to free and expose the split collets, gently tap the top of the tool, directly over the retainer, with a light hammer. This will free the retainer.

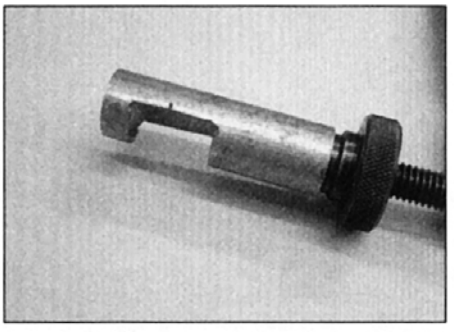
9 Withdraw the valve from the combustion



7.7e . . . and the spring seat (not all models)



7.7f Remove the valve stem oil seal using a pair of pliers



7.7g A metal tube adaptor for access to the valve collets

7.7h Secure a self-locking nut of suitable diameter to a long bolt, then use this tool to remove the valve stem oil seal

chamber. Remove the valve stem oil seal from the top of the guide, then lift out the spring seat where fitted.

10 It is essential that each valve is stored together with its collets, retainer, spring, and spring seat. The valves should also be kept in their correct sequence, unless they are so badly worn that they are to be renewed. If they are going to be kept and used again, place each valve assembly in a labelled polythene bag or similar small container **(see illustration)**. Note that No 1 valve is nearest to the transmission (flywheel/driveplate) end of the engine.

7.10 Place each valve and its associated components in a labelled polythene bag

8 Cylinder head and valves – cleaning and inspection

1 Thorough cleaning of the cylinder head and valve components, followed by a detailed inspection, will enable you to decide how much valve service work must be carried out during the engine overhaul. **Note:** *If the engine has been severely overheated, it is best to assume that the cylinder head is warped – check carefully for signs of this.*

Cleaning

2 Scrape away all traces of old gasket material from the cylinder head.

3 Scrape away the carbon from the combustion chambers and ports, then wash the cylinder head thoroughly with paraffin or a suitable solvent.

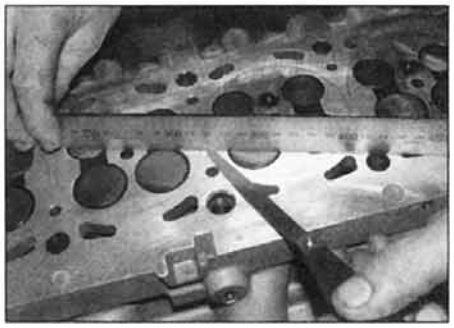
4 Scrape off any heavy carbon deposits that may have formed on the valves, then use a power-operated wire brush to remove deposits from the valve heads and stems.

Inspection

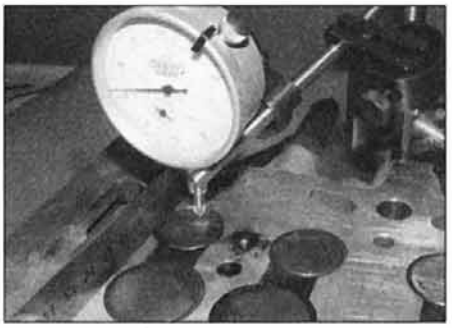
Note: *Be sure to perform all the following inspection procedures before concluding that the services of a machine shop or engine overhaul specialist are required. Make a list of all items that require attention.*

Cylinder head

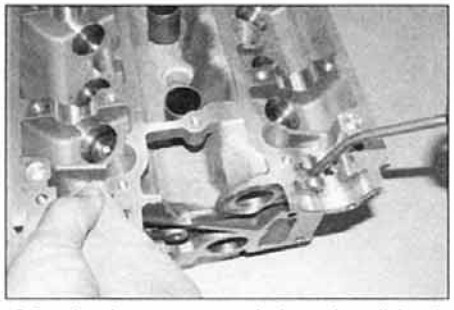
5 Inspect the head very carefully for cracks, evidence of coolant leakage, and other damage. If cracks are found, a new cylinder head should be obtained. Use a straight-edge and feeler blade to check that the cylinder head gasket surface is not distorted **(see illustration)**. If it is, it may be possible to have it machined, provided that the cylinder head height is not significantly reduced.



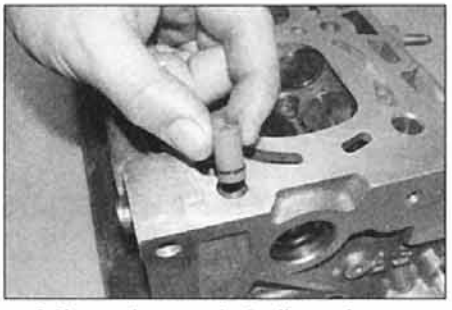
8.5 Checking the cylinder head gasket surface for distortion



8.6 Checking the distance from the valve head to the cylinder head gasket surface



8.9a Apply compressed air to the oil feed bore of the inlet camshaft and seal the bore in the exhaust camshaft with a rag . . .



8.9b . . . the camshaft oil supply non-return valve will be ejected from the underside of the head

6 Examine the valve seats in each of the combustion chambers. If they are severely pitted, cracked, or burned, they will need to be renewed or recut by an engine overhaul specialist. If they are only slightly pitted, this can be removed by grinding-in the valve heads and seats with fine valve-grinding compound, as described below. Note on the DW12 diesel engine, however, that the valve heads must not be recessed below the surface of the cylinder head by more than the maximum amount given in the Specifications. After grinding-in the valves (described later), use a dial gauge to check the distance of recession for each valve in relation to the gasket surface and compare to that given in the Specifications. To do this, zero the dial gauge on the gasket surface, then move the probe onto each valve in turn. Alternatively, a straight-edge can be positioned on the gasket surface and the valve lifted until it contacts the straight-edge **(see illustration)**.

7 Check the valve guides for wear by inserting the relevant valve, and checking for side-to-side motion of the valve. A very small amount of movement is acceptable. If the movement seems excessive, remove the valve. Measure the valve stem diameter (see below), and renew the valve if it is worn. If the valve stem is not worn, the wear must be in the valve guide, and the guide must be renewed. The renewal of valve guides is best carried out by a Peugeot dealer or engine overhaul specialist, who will have the necessary tools available. Where no valve stem diameter is specified, seek the advice of a Peugeot dealer on the best course of action.

8 If renewing the valve guides, the valve seats should be recut or reground only *after* the guides have been fitted.

9 On the EW petrol engines, examine the camshaft oil supply non-return valve in the oil feed bore at the timing belt end of the cylinder head. Check that the valve is not loose in the cylinder head and that the ball is free to move within the valve body. If the valve is a loose fit in its bore, or if there is any doubt about its condition, it should be renewed. The non-return valve can be removed (assuming it is not loose), using compressed air, such as that generated by a tyre foot pump. Place the pump nozzle over the oil feed bore of the inlet camshaft No 4 bearing journal and seal the corresponding oil feed bore in the exhaust camshaft with a rag. Apply the compressed air and the valve will be forced out of its location in the underside of the cylinder head **(see illustrations)**. Fit the new non-return valve to its bore on the underside of the head ensuring it is fitted the correct way. Oil should be able to pass upwards through the valve to the camshafts, but the ball in the valve should prevent the oil from returning back to the cylinder block. Use a thin socket or similar to push the valve fully into position.

Valves

10 Examine the head of each valve for pitting, burning, cracks, and general wear.

Check the valve stem for scoring and wear ridges. Rotate the valve, and check for any obvious indication that it is bent. Look for pits or excessive wear on the tip of each valve stem. Renew any valve that shows any such signs of wear or damage.

11 If the valve appears satisfactory at this stage, measure the valve stem diameter at several points using a micrometer **(see illustration)**. Any significant difference in the readings obtained indicates wear of the valve stem. Should any of these conditions be apparent, the valve must be renewed.

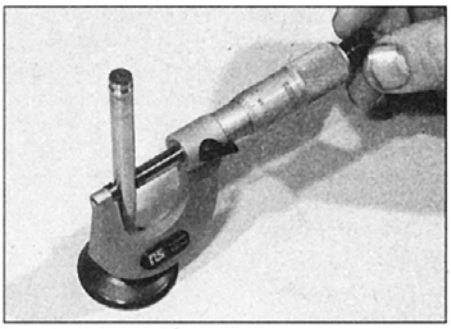
12 If the valves are in satisfactory condition, they should be ground (lapped) into their respective seats, to ensure a smooth, gas-tight seal. If the seat is only lightly pitted, or if it has been recut, fine grinding compound *only* should be used to produce the required finish. Coarse valve-grinding compound should *not* be used, unless a seat is badly burned or deeply pitted. If this is the case, the cylinder head and valves should be inspected by an expert, to decide whether seat recutting, or even the renewal of the valve or seat insert (where possible) is required.

13 Valve grinding is carried out as follows. Place the cylinder head upside-down on a bench.

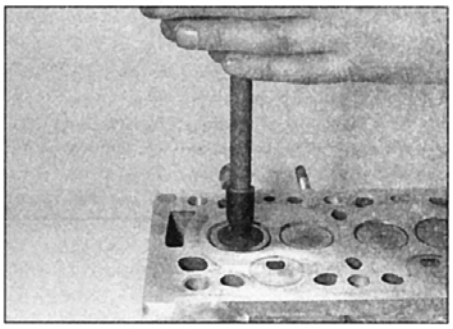
14 Smear a trace of (the appropriate grade of) valve-grinding compound on the seat face, and press a suction grinding tool onto the valve head **(see illustration)**. With a semi-rotary action, grind the valve head to its seat, lifting the valve occasionally to redistribute the grinding compound. A light spring placed under the valve head will greatly ease this operation.

15 If coarse grinding compound is being used, work only until a dull, matt even surface is produced on both the valve seat and the valve, then wipe off the used compound, and repeat the process with fine compound. When a smooth unbroken ring of light grey matt finish is produced on both the valve and seat, the grinding operation is complete. *Do not* grind-in the valves any further than absolutely necessary, or the seat will be prematurely sunk into the cylinder head.

16 When all the valves have been ground-in, carefully wash off *all* traces of grinding compound using paraffin or a suitable solvent, before reassembling the cylinder head.



8.11 Measuring a valve stem diameter



8.14 Grinding-in a valve

Valve components

17 Examine the valve springs for signs of damage and discoloration. No minimum free length is specified by Peugeot, so the only way of judging valve spring wear is by comparison with a new component.

18 Stand each spring on a flat surface, and check it for squareness. If any of the springs are damaged, distorted or have lost their tension, obtain a complete new set of springs. It is normal to renew the valve springs as a matter of course if a major overhaul is being carried out.

19 Renew the valve stem oil seals regardless of their apparent condition.

9 Cylinder head – reassembly

1 Working on the first valve assembly, refit the spring seat then dip the new valve stem oil seal in fresh engine oil. Locate the seal on the valve guide and press the seal firmly onto the guide using a suitable socket **(see illustrations)**.

2 Lubricate the stem of the first valve, and insert it in the guide **(see illustration)**.

3 Locate the valve spring on top of its seat, then refit the spring retainer. Note that on the EW7 engine, the larger diameter of the spring must face the cylinder head.

4 Compress the valve spring, and locate the split collets in the recess in the valve stem. Release the compressor, then repeat the procedure on the remaining valves. Ensure that each valve is inserted into its original location. If new valves are being fitted, insert them into the locations to which they have been ground.

HAYNES HINT ***Use a little dab of grease to hold the collets in position on the valve stem while the spring compressor is released.***

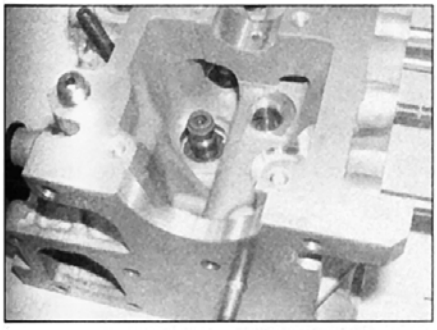
5 With all the valves installed, support the cylinder head and, using a hammer and interposed block of wood, tap the end of each valve stem to settle the components.

6 On the 2.2 litre DW12 diesel engine, refit the swirl-control butterflies as follows. Lubricate the shaft with engine oil, then insert it into the cylinder head and refit the retainer and stop. Fit each butterfly in its correct location and tighten the grub screws securely. The stop must now be adjusted. First, loosen the locknut and position the stop eccentric so that the butterflies can be completely closed in their bores. At this stage, the butterflies will slightly 'bind' in their bores when pressure is applied. Now adjust the stop so that the butterflies do not 'bind' in their bores. Tighten the locknut with the stop in this position.

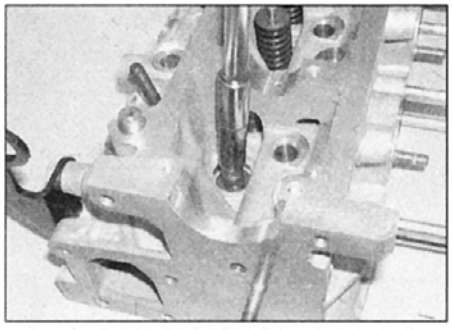
7 Refit the camshafts, hydraulic tappets and rocker arms (as applicable) as described in Part A, B or C of this Chapter.

8 Refit any remaining components using the reverse of the removal sequence and with new seals or gaskets as necessary.

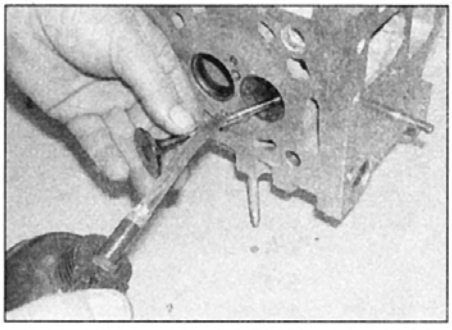
9 The cylinder head can then be refitted as described in Part A, B or C of this Chapter.



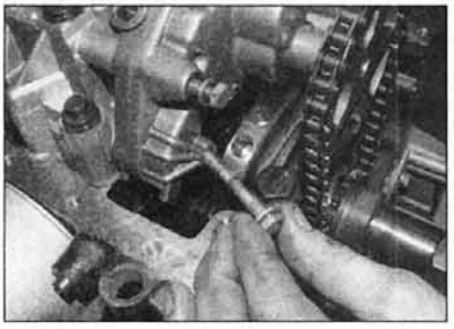
9.1a Locate the valve stem oil seal on the valve guide . . .



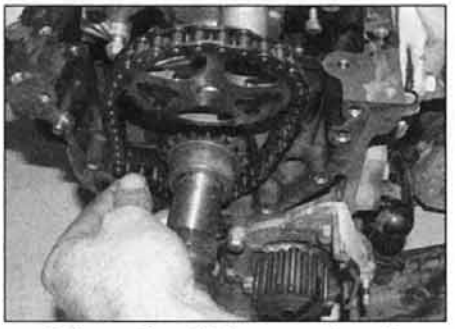
9.1b . . . and press the seal firmly onto the guide using a suitable socket



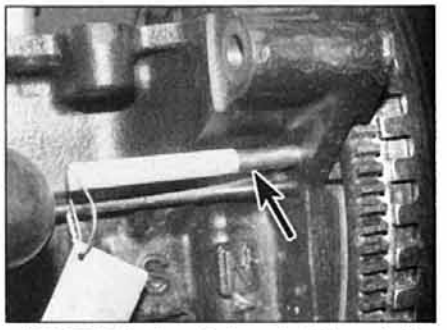
9.2 Lubricate the stem of the valve and insert it in the guide



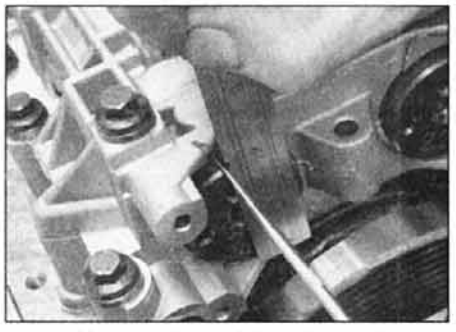
10.1a Unscrew the oil pump mounting bolts ...



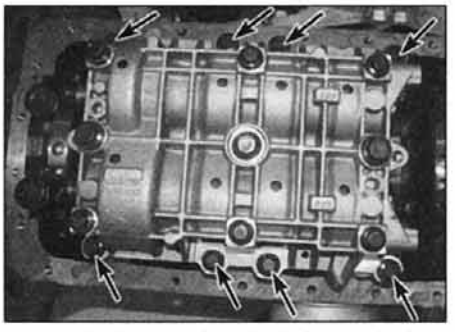
10.1b ... then tilt the pump from the crankcase and unhook the drive chain



10.2 TDC timing pin inserted through the crankcase hole into the flywheel



10.3 Marking the position of the balance shafts with a scriber prior to removing them



10.4 Bolts securing the balance shaft housing to the crankcase

10 Balance shaft housing (DW12 diesel engine) – removal, inspection and refitting

Note: *If a new housing is to be fitted, a Peugeot setting tool and adjustment shims will be required. Note that the balance shafts are timed accurately in relation to the crankshaft to ensure correct functioning, and therefore it is important to mark them accurately during the dismantling procedure.*

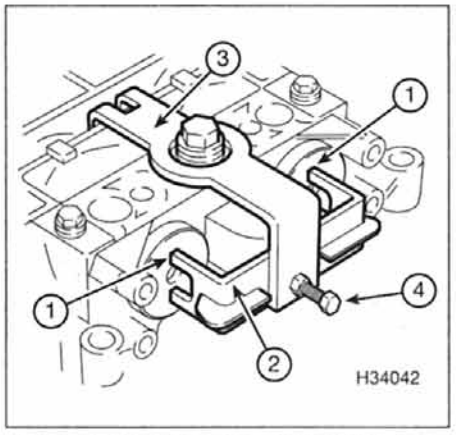
Removal

1 With the engine supported upside down on the workbench, remove the sump and oil pump as described in Chapter 2C **(see illustration)**.

2 Set the engine to TDC and lock the flywheel/driveplate with the timing pin **(see illustration)**.

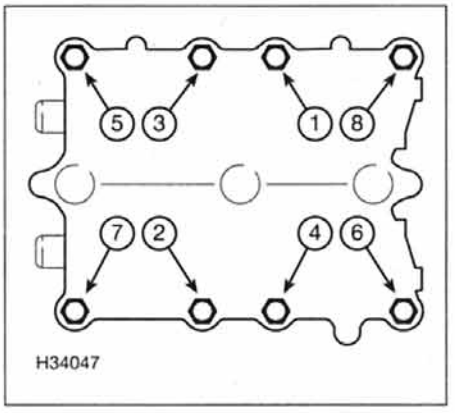
3 Mark each balance shaft in relation to the housing to ensure correct refitting. Use a pin punch to mark the ends of each shaft in line with the cap housing joint face, or alternatively use a scriber and rule to mark the cap housing in line with the centres of the two vertical holes on the shafts **(see illustration)**.

4 Progressively unscrew the bolts securing the balance shaft housing to the crankcase. There are 8 bolts – do not unscrew the bolts securing the cap housing to the main housing at this stage **(see illustration)**.



10.7 Peugeot balance shaft setting tool

1 Blind holes
2 Positioning gauge
3 Tool flange
4 Locking bolt



10.10 Balance shaft housing bolt tightening sequence

5 Carefully lift the balance shaft housing from the crankcase, noting the location of adjustment shims for gear engagement. Remove the shims.

Inspection

6 Place the balance shaft housing on the bench with its lower side facing upwards (ie, the cap housing uppermost).

7 Position the balance shafts with the previously-made marks aligned with the marks on the housing. If a new balance shaft housing is being fitted, transfer the marks from the old balance shafts to the new ones, or, preferably, obtain the special Peugeot setting tool. If the Peugeot tool is obtained, position the balance shafts so that the blind holes at their timing ends are facing upwards (ie, towards the lower side of the housing) **(see illustration)**. The tool must now be used to lock the balance shafts in their TDC position. Engage the 5.0 mm pins of the tool in the blind holes, then fit the flange onto the housing and lightly tighten the tool bolt to lock it.

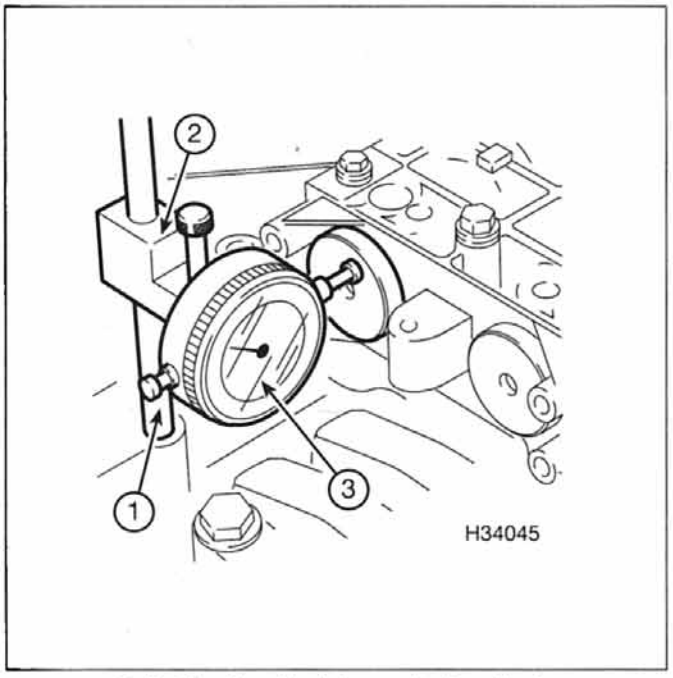
8 Position the special Peugeot gear engagement adjustment shims on the crankcase.

9 Lower the balance shafts and housing onto the shims and crankcase location dowels, and engage the crankshaft gear with the gears on the shafts. Check that the balance shafts are still aligned correctly, then remove the setting tool and timing pin.

10 Insert the bolts and finger-tighten them, then progressively tighten them in the order shown **(see illustration)**.

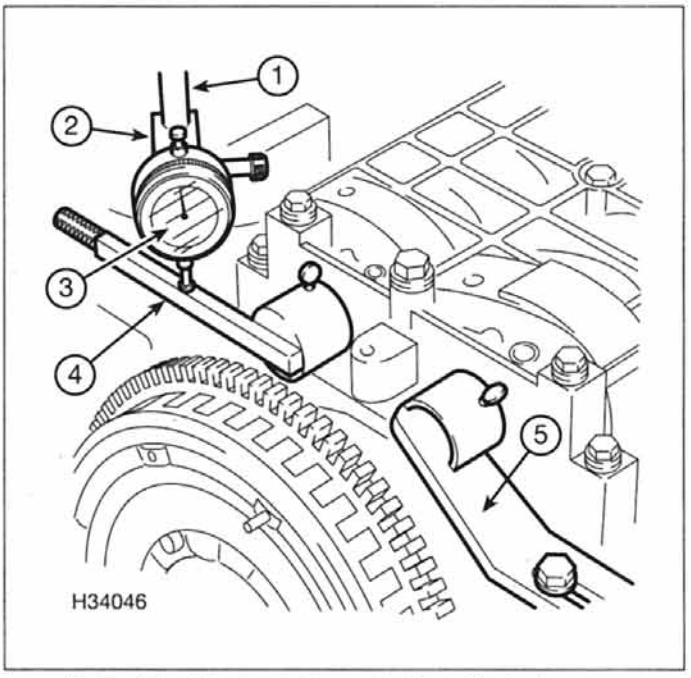
11 The endfloat of the balance shafts must now be checked. Attach a dial test gauge indicator (DTI) to the timing end of the engine, with the probe touching the end face of one of the balance shafts **(see illustration)**. Push the shaft fully in the direction of the flywheel/driveplate, then zero the DTI. Now move the shaft fully in the direction of the timing end of the engine, and record the endfloat. Carry out the procedure on the remaining balance shaft and record the endfloat. Check that the endfloat is as given in the Specifications.

12 The backlash clearance between the two balance shafts must now be checked. To do



10.11 Checking the balance shaft endfloat

1 Gauge stand 2 Holder 3 Dial gauge



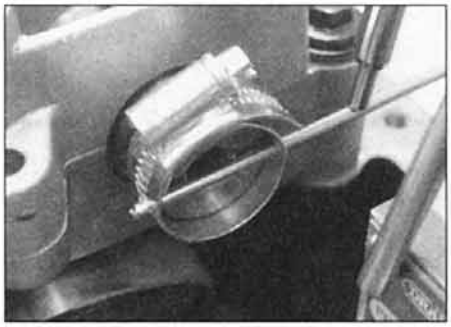
10.12a Checking the balance shaft backlash clearance

1 Gauge stand 2 Holder 3 Dial gauge 4 Driven shaft holder 5 Driver shaft holder

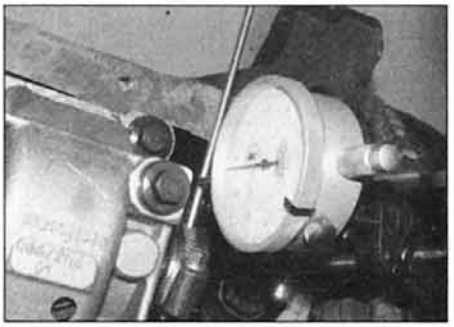
this, lock the driver shaft (front of the engine) using a suitable tool clamped to the flywheel/driveplate end of the shaft. The Peugeot tool consists of a sleeve which locates over the shaft, with a thumb screw to lock it onto the shaft, and an extension of the sleeve bolted to the crankcase. A further tool is clamped to the driven shaft, and the probe of a DTI positioned on the tool, 35.0 mm from the centre of the shaft. Move the driven shaft fully in one direction and zero the DTI, then move the shaft in the other direction and record the clearance. Check that the clearance is as given in the Specifications. A home-made version of the Peugeot tool can be made out of a Jubilee clip and a length of welding rod. Drill the clip to accept the rod, then tighten the clip onto the balance shaft **(see illustrations)**.

13 The backlash clearance between the driver balance shaft and the crankshaft gear must now be checked, and if necessary, a different shim selected for fitting between the housing and crankcase. First, clamp the special tool to the flywheel/driveplate end of the shaft, and arrange the DTI with its probe on the tool. Turn the shaft fully in one direction and zero the DTI, then turn it in the other direction and record the clearance. Turn the shaft by hand so that the crankshaft remains stationary. If the special tool is not available, a dial test gauge may be used through the window on the front of the balance shaft housing **(see illustrations)**.

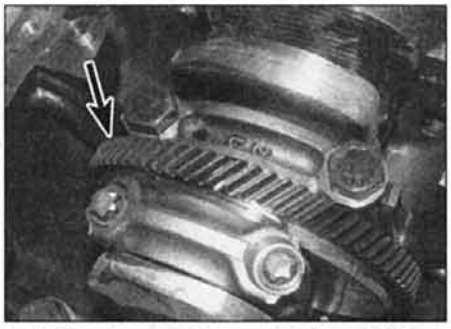
14 Remove the tool from the balance shaft, and rotate the engine an eighth of a turn in its normal direction in order to obtain a quarter rotation of the balance shafts. Repeat the backlash clearance check as described in paragraph 13 and record the result. Carry out 7 more checks and record each result; the engine will now have turned one complete turn.



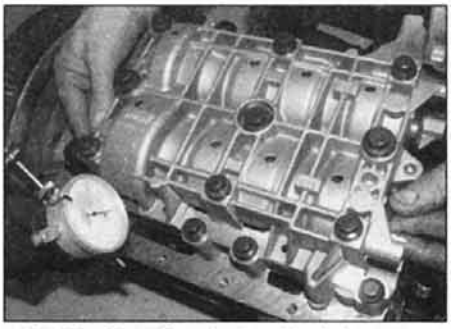
10.12b Home-made tool for checking the backlash clearance between the two balance shafts



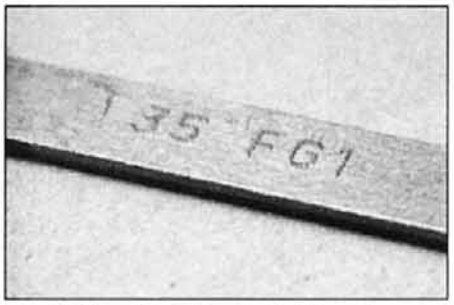
10.12c Using the dial test gauge to check the backlash



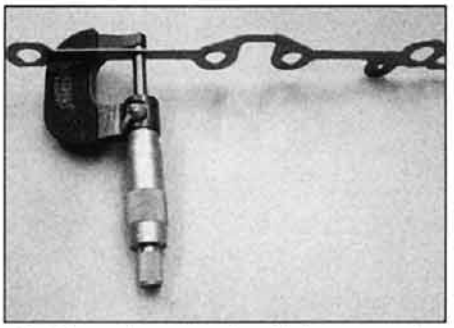
10.13a Gear on the crankshaft which is engaged with the rearmost balance shaft



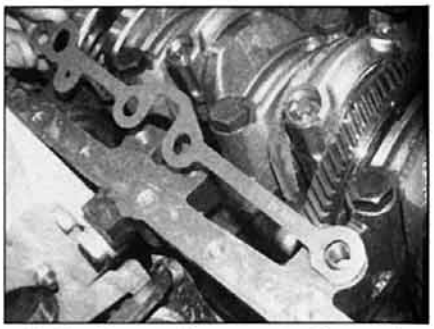
10.13b Checking the backlash between the driver balance shaft and the crankshaft gear



10.16a The balance shaft housing adjustment shims are marked to identify their thickness ...



10.16b ... however, the thickness can be checked with a micrometer



10.16c Locate the correct shims on the cylinder block

15 Calculate the average backlash clearance, then refer to the following list to select the correct shims to fit instead of the Peugeot adjustment shims.

Minimum clearance	Shim thickness	Shim marking
0.01≤ but <0.05	1.57	57
0.05	1.51	51
0.06	1.49	49
0.07	1.47	47
0.08	1.47	47
0.09	1.45	45
0.10	1.43	43
0.11	1.41	41
0.12	1.41	41
0.13	1.39	39
0.14	1.37	37
0.15	1.35	35
0.16	1.35	35
0.17	1.33	33
0.18	1.31	31
0.19	1.29	29
0.20	1.29	29
0.21	1.27	27
0.22	1.25	25
0.23	1.23	23
0.24	1.23	23
0.25	1.21	21
0.26	1.19	19
0.26<	1.19	19

16 Remove the tools, then unbolt the balance shaft housing from the crankcase and replace the adjustment shims with the shims chosen from the chart **(see illustrations)**.

Refitting

17 Refit the balance shaft housing as previously described and progressively tighten the bolts in the order shown.

18 Repeat the clearance checking procedure again. The clearance should be between 0.01 and 0.07 mm.

19 Refit the sump as described in Chapter 2C.

11 Piston/connecting rod assembly – removal

1 Remove the cylinder head, sump and oil pump as described in Part A, B or C of this Chapter. On the DW12 diesel engine, also remove the balance shaft housing as described in Section 10.

2 If there is a pronounced wear ridge at the top of any bore, it may be necessary to remove it with a scraper or ridge reamer, to avoid piston damage during removal. Such a ridge indicates excessive wear of the cylinder bore.

3 Using quick-drying paint, mark each connecting rod and big-end bearing cap with its respective cylinder number on the flat machined surface provided; if the engine has been dismantled before, note carefully any identifying marks made previously **(see illustration)**. Note that No 1 cylinder is at the transmission (flywheel) end of the engine.

4 Turn the crankshaft to bring pistons 1 and 4 to BDC (bottom dead centre).

5 Unscrew the nuts or bolts, as applicable from No 1 piston big-end bearing cap. Take off the cap, and recover the bottom half bearing shell **(see illustration)**. If the bearing shells are to be re-used, tape the cap and the shell together.

6 To prevent the possibility of damage to the crankshaft bearing journals on the XU engine, tape over the connecting rod stud threads **(see illustration)**.

7 Using a hammer handle, push the piston up through the bore, and remove it from the top of the cylinder block. Recover the bearing shell, and tape it to the connecting rod for safe-keeping.

8 Loosely refit the big-end cap to the connecting rod, and secure with the nuts/bolts – this will help to keep the components in their correct order.

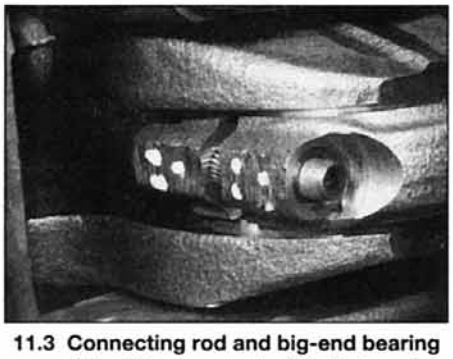
9 Remove No 4 piston assembly in the same way.

10 Turn the crankshaft through 180° to bring pistons 2 and 3 to BDC (bottom dead centre), and remove them in the same way.

12 Crankshaft – removal

1 Remove the crankshaft sprocket and the oil pump as described in Part A, B or C of this Chapter (as applicable). On the DW12 diesel engine, also remove the balance shaft housing as described in Section 10 of this Chapter.

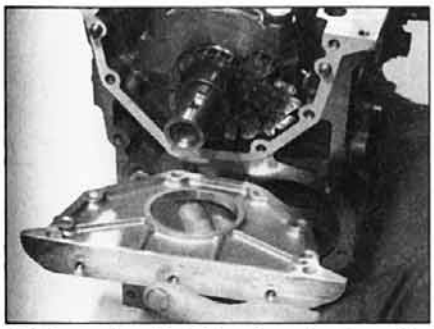
2 Remove the pistons and connecting rods, as described in Section 11. If no work is to be done on the pistons and connecting rods, there is no need to remove the cylinder head, or to push the pistons out of the cylinder bores. The pistons should just be pushed far



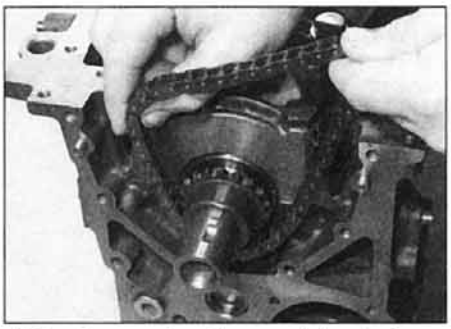
11.3 Connecting rod and big-end bearing cap identification marks (No 3 shown)

11.5 Removing a big-end bearing cap and shell

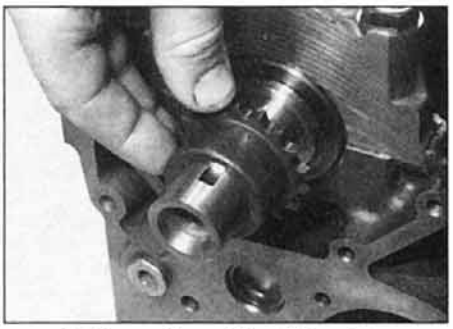
11.6 To protect the crankshaft journals, tape over the connecting rod stud threads



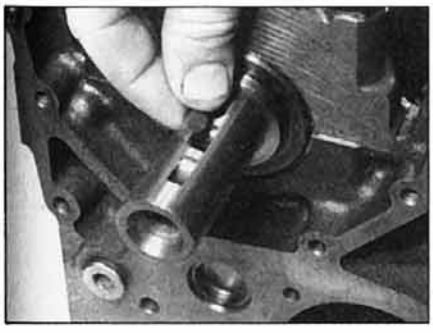
12.4 Removing the oil seal carrier from the right-hand end of the block



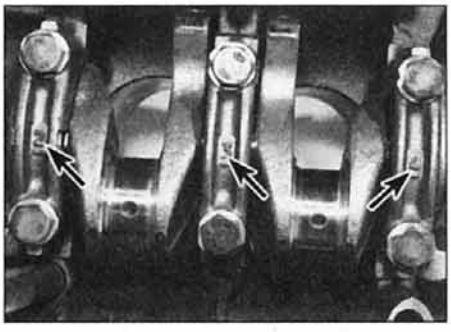
12.5a Remove the oil pump drive chain . . .



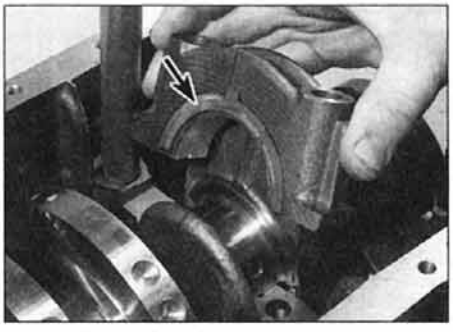
12.5b . . . then slide off the drive sprocket . . .



12.5c . . . and remove the Woodruff key from the crankshaft



12.6 Main bearing cap identification markings (arrowed)



12.8 Removing No 2 main bearing cap. Note the thrustwasher (arrowed)

enough up the bores so that they are positioned clear of the crankshaft journals.

3 Check the crankshaft endfloat as described in Section 15, then proceed as follows.

XU and DW engines

4 Slacken and remove the retaining bolts, and remove the oil seal carrier from the timing belt end of the cylinder block, along with its gasket (where fitted) **(see illustration)**.

5 Remove the oil pump drive chain, and slide the drive sprocket and spacer (where fitted) off the end of the crankshaft. Remove the Woodruff key, and store it with the sprocket for safe-keeping **(see illustrations)**.

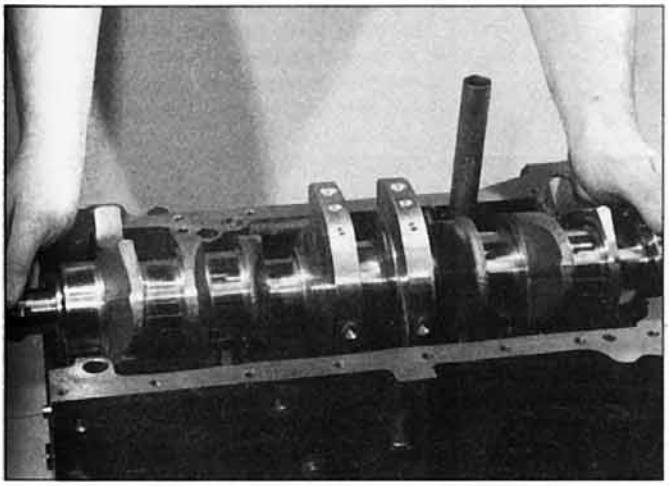
6 The main bearing caps should be numbered 1 to 5, starting from the transmission (flywheel/driveplate) end of the engine **(see illustration)**. If not, mark them accordingly using quick-drying paint. Also note the correct fitted depth of the crankshaft oil seal in the bearing cap.

7 On the XU petrol engine, undo the two bolts (one at the front of the block, and one at the rear) securing the centre main bearing cap to the block. Remove the bolts, along with their sealing washers.

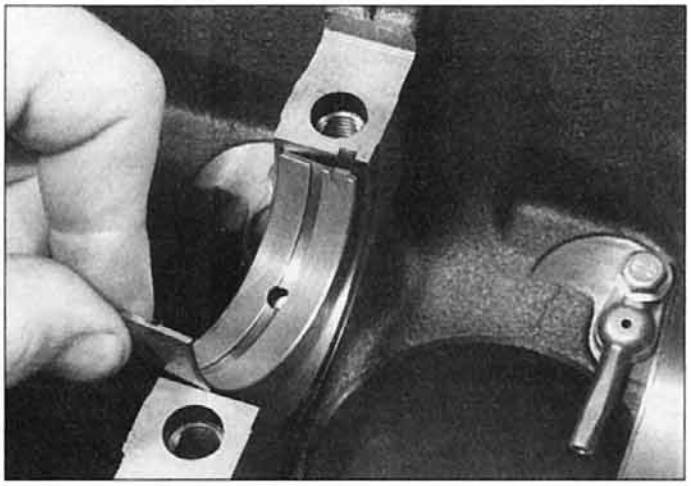
8 On all engines, slacken and remove the main bearing cap retaining bolts/nuts, and lift off each bearing cap. Recover the lower bearing shells, and tape them to their respective caps for safe-keeping. Also recover the lower thrustwasher halves from the side of No 2 main bearing cap **(see illustration)**. Remove the rubber sealing strips from the sides of No 1 main bearing cap, and discard them.

9 Lift out the crankshaft, and discard the oil seal **(see illustration)**.

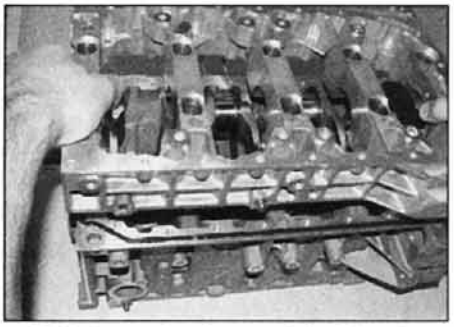
10 Recover the upper bearing shells from the cylinder block, and tape them to their respective caps for safe-keeping **(see illustration)**. Remove the upper thrustwasher halves from the side of No 2 main bearing, and store them with the lower halves.



12.9 Lifting out the crankshaft



12.10 Remove the upper main bearing shells from the cylinder block/crankcase, and store them with their lower shells



12.13 Removing the crankshaft bearing cap housing

EW engines

11 Working around the inner periphery of the crankcase, unscrew the 16 small (M6) bolts securing the crankshaft bearing cap housing to the base of the cylinder block. Note the correct fitted depth of the left-hand crankshaft oil seal in the cylinder block/bearing cap housing.

12 Working in the reverse of the tightening sequence, evenly and progressively slacken the ten large (M11) bearing cap housing retaining bolts by a turn at a time. Once all the bolts are loose, remove them from the housing.

13 With all the retaining bolts removed, tap around the outer periphery of the bearing cap housing using a soft-faced mallet to break the seal between the housing and cylinder block. Once the seal is released and the housing is clear of the locating dowels, lift it up and off the crankshaft and cylinder block **(see illustration)**. Recover the lower main bearing shells, and tape them to their respective locations in the housing. If the two locating dowels are a loose fit, remove them and store them with the housing for safe-keeping.

14 Lift out the crankshaft, and collect the left-hand oil seal.

15 Recover the upper main bearing shells, and store them along with the relevant lower bearing shell. Also recover the two thrustwashers (one fitted either side of No 2 main bearing) from the cylinder block.

13 Cylinder block/crankcase – cleaning and inspection

Cleaning

1 Remove all external components and electrical switches/sensors from the block. For complete cleaning, the core plugs should ideally be removed **(see illustrations)**. Drill a small hole in the plugs, then insert a self-tapping screw into the hole. Pull out the plugs by pulling on the screw with a pair of grips, or by using a slide hammer.

2 On aluminium block engines with wet liners, remove the liners, referring to paragraph 18.

3 Where applicable, undo the retaining bolts and remove the piston oil jet spray tubes from inside the cylinder block **(see illustration)**.

4 Scrape all traces of gasket from the cylinder block/crankcase, and from the main bearing ladder (where fitted), taking care not to damage the gasket/sealing surfaces.

5 Remove all oil gallery plugs (where fitted). The plugs are usually very tight – they may have to be drilled out, and the holes retapped. Use new plugs when reassembling.

6 If any of the castings are extremely dirty, all should be steam-cleaned.

7 After the castings are returned, clean all oil holes and oil galleries one more time. Flush all internal passages with warm water until the water runs clear. Dry thoroughly, and apply a light film of oil to all mating surfaces, to prevent rusting. On cast-iron block engines, also oil the cylinder bores. If you have access to compressed air, use it to speed up the drying process, and to blow out all the oil holes and galleries.

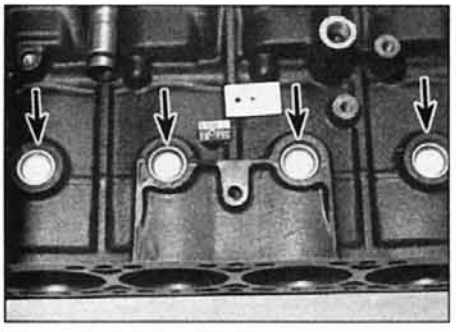
Warning: Wear eye protection when using compressed air.

8 If the castings are not very dirty, you can do an adequate cleaning job with hot (as hot as you can stand), soapy water and a stiff brush. Take plenty of time, and do a thorough job. Regardless of the cleaning method used, be sure to clean all oil holes and galleries very thoroughly, and to dry all components well. On cast-iron block engines, protect the cylinder bores as described above, to prevent rusting.

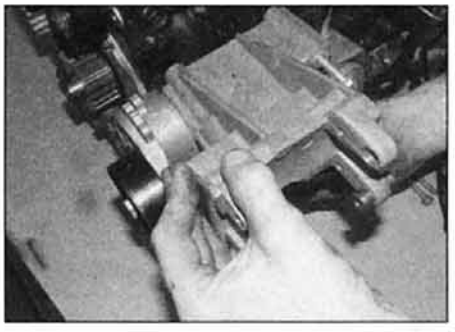
9 All threaded holes must be clean, to ensure accurate torque readings during reassembly. To clean the threads, run the correct-size tap into each of the holes to remove rust, corrosion, thread sealant or sludge, and to restore damaged threads **(see illustration)**. If possible, use compressed air to clear the holes of debris produced by this operation.

10 Apply suitable sealant to the new oil gallery plugs, and insert them into the holes in the block. Tighten them securely. Apply suitable sealant to the new core plugs, and insert them into the holes in the block. Tap them into place with a close-fitting tube or socket.

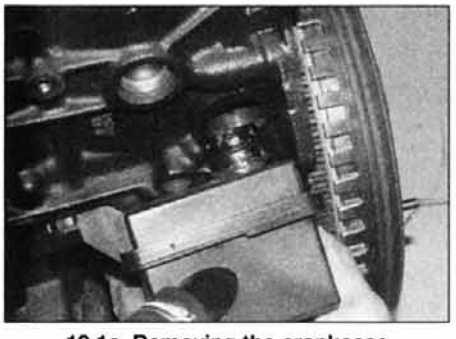
11 Where applicable, clean the threads of the piston oil jet retaining bolt, and apply a drop of thread-locking compound to the bolt threads. Refit the piston oil jet spray tube to the cylinder block, and tighten its retaining bolt to the specified torque setting.



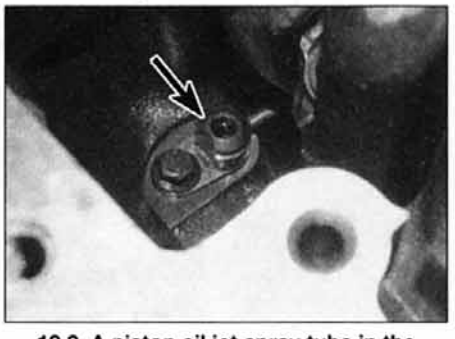
13.1a Cylinder block core plugs (arrowed)



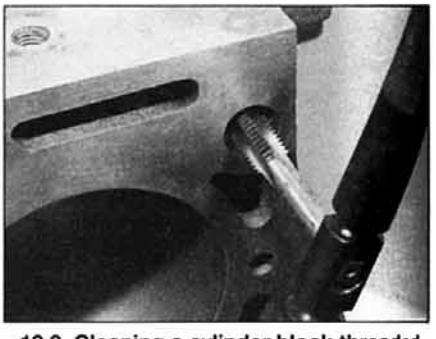
13.1b Removing the air conditioning compressor mounting bracket



13.1c Removing the crankcase ventilation/oil separation box



13.3 A piston oil jet spray tube in the cylinder block (DW12 engine)



13.9 Cleaning a cylinder block threaded hole using a suitable tap

12 If the engine is not going to be reassembled right away, cover it with a large plastic bag to keep it clean; protect all mating surfaces and the cylinder bores as described above, to prevent rusting.

Inspection

Cast-iron cylinder block

13 Visually check the castings for cracks and corrosion. Look for stripped threads in the threaded holes. If there has been any history of internal water leakage, it may be worthwhile having an engine overhaul specialist check the cylinder block/crankcase with special equipment. If defects are found, have them repaired if possible, or renew the assembly.

14 Check each cylinder bore for scuffing and scoring. Check for signs of a wear ridge at the top of the cylinder, indicating that the bore is excessively worn.

15 If the necessary measuring equipment is available, measure the bore diameter of each cylinder liner at the top (just under the wear ridge), centre, and bottom of the cylinder bore, parallel to the crankshaft axis.

16 Next, measure the bore diameter at the same three locations, at right-angles to the crankshaft axis. Compare the results with the figures given in the Specifications. If there is any doubt about the condition of the cylinder bores seek the advice of a Peugeot dealer or suitable engine reconditioning specialist.

17 At the time of writing, it was not clear whether oversize pistons were available for all models. Consult your Peugeot dealer for the latest information on piston availability. If oversize pistons are available, then it may be possible to have the cylinder bores rebored and oversize pistons fitted. If oversize pistons are not available, and the bores are worn, renewal of the block is the only option.

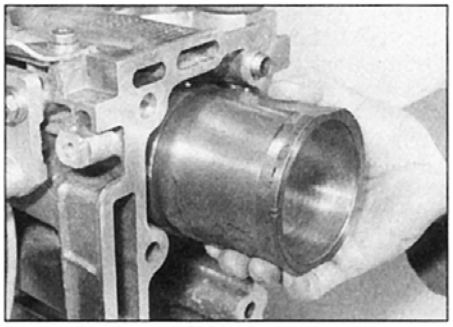
Aluminium cylinder block

18 Remove the liner clamps, then use a hard wood drift to tap out each liner from the inside of the cylinder block. When all the liners are released, tip the cylinder block/crankcase on its side and remove each liner from the top of the block. As each liner is removed, stick masking tape on its left-hand (transmission side) face, and write the cylinder number on the tape. No 1 cylinder is at the transmission (flywheel/driveplate) end of the engine. Remove the O-ring from the base of each liner, and discard it **(see illustrations)**.

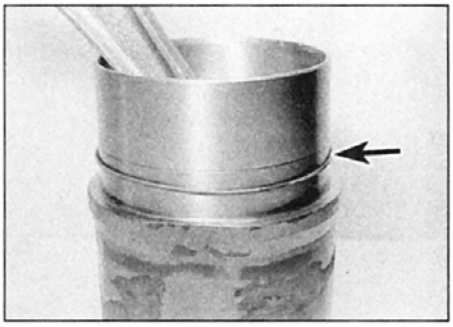
19 Check each cylinder liner for scuffing and scoring. Check for a wear ridge at the top of the liner, indicating that the bore is badly worn.

20 If the necessary measuring equipment is available, measure the bore diameter of each cylinder liner at the top (just under the wear ridge), centre, and bottom of the cylinder bore, parallel to the crankshaft axis.

21 Next, measure the bore diameter at the same three locations, at right-angles to the crankshaft axis. Compare the results with the figures given in the Specifications.



13.18a On aluminium block engines, remove each liner . . .



13.18b . . . and recover the bottom O-ring seal

22 Repeat the procedure for the remaining cylinder liners.

23 If the liner wear exceeds the permitted tolerances at any point, or if the cylinder liner walls are badly scored or scuffed, then renewal of the relevant liner assembly will be necessary. If there is any doubt about the condition of the cylinder bores, seek the advice of a Peugeot dealer or engine reconditioning specialist.

24 If renewal is necessary, new liners, complete with pistons and piston rings, can be purchased from a Peugeot dealer. Note that it is not possible to buy liners individually – they are supplied only as a matched assembly complete with piston and rings.

25 To allow for manufacturing tolerances, pistons and liners are separated into three size groups. The size group of each piston is indicated by a letter (A, B or C) stamped onto its crown, and the size group of each liner is indicated by a series of 1 to 3 notches on the upper lip of the liner; a single notch for group A, two notches for group B, and three notches for group C. Ensure that each piston and its respective liner are both of the same size group. It is permissible to have different size group piston and liner assemblies fitted to the same engine, but never fit a piston of one size group to a liner in a different group.

26 Prior to installing the liners, thoroughly clean the liner mating surfaces in the cylinder block, and use fine abrasive paper to polish away any burrs or sharp edges which might damage the liner O-rings. Clean the liners and wipe dry, then fit a new O-ring to the base of each liner. To aid installation, apply a smear of oil to each O-ring and to the base of the liner.

27 If the original liners are being refitted, use the marks made on removal to ensure that each is refitted the correct way round, and is inserted into its original bore. Insert each liner into the cylinder block, taking care not to damage the O-ring, and press it home as far as possible by hand. Using a hammer and a block of wood, tap each liner lightly but fully onto its locating shoulder. Wipe clean, then lightly oil, all exposed liner surfaces, to prevent rusting.

28 With all four liners correctly installed, use a dial gauge (or a straight-edge and feeler blade) to check that the protrusion of each liner above the upper surface of the cylinder block is within the limits given in the Specifications. The maximum difference between any two liners must not be exceeded.

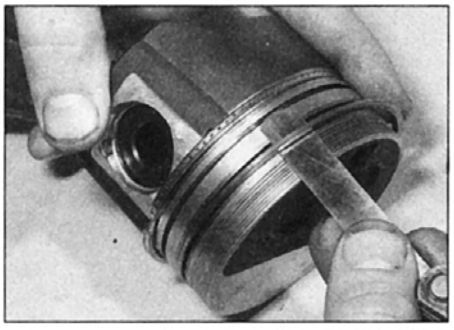
29 If new liners are being fitted, it is permissible to interchange them to bring the difference in protrusion within limits. Remember to keep each piston with its respective liner.

30 If liner protrusion cannot be brought within limits, seek the advice of a Peugeot dealer or engine reconditioning specialist before proceeding with the engine rebuild.

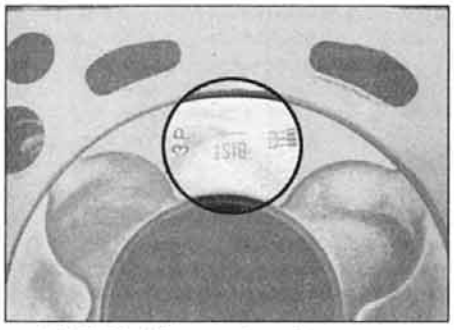
14 Piston/connecting rod assembly – inspection

1 Before the inspection process can begin, the piston/connecting rod assemblies must be cleaned, and the original piston rings removed from the pistons.

2 Carefully expand the old rings over the top of the pistons. The use of two or three old feeler blades will be helpful in preventing the rings dropping into empty grooves **(see illustration)**. Be careful not to scratch the piston with the ends of the ring. The rings are brittle, and will snap if they are spread too far. They are also very sharp – protect your hands and fingers. Note that the third ring incorporates an expander. Always remove the rings from the top of the piston.



14.2 Removing a piston ring with the aid of a feeler blade



14.15 Markings on the piston crown (DW12 engine)

3 Scrape away all traces of carbon from the top of the piston. A hand-held wire brush (or a piece of fine emery cloth) can be used, once the majority of the deposits have been scraped away.

4 Remove the carbon from the ring grooves in the piston, using an old ring. Break the ring in half to do this. Be careful to remove only the carbon deposits – do not remove any metal, and do not nick or scratch the sides of the ring grooves.

5 Once the deposits have been removed, clean the piston/connecting rod assembly with paraffin or a suitable solvent, and dry thoroughly. Make sure that the oil return holes in the ring grooves are clear.

6 If the pistons and cylinder bores are not damaged or worn excessively, and if the cylinder block does not need to be rebored, the original pistons can be refitted. Normal piston wear shows up as even vertical wear on the piston thrust surfaces, and slight looseness of the top ring in its groove. New piston rings should always be used when the engine is reassembled.

7 Carefully inspect each piston for cracks around the skirt, around the gudgeon pin holes, and at the piston ring 'lands' (between the ring grooves).

8 Look for scoring and scuffing on the piston skirt, holes in the piston crown, and burned areas at the edge of the crown. If the skirt is scored or scuffed, the engine may have been suffering from overheating, and/or abnormal combustion which caused excessively high operating temperatures. The cooling and lubrication systems should be checked thoroughly. Scorch marks on the sides of the pistons show that blow-by has occurred. A hole in the piston crown, or burned areas at the edge of the piston crown, indicates that abnormal combustion (pre-ignition, knocking, or detonation) has been occurring. If any of the above problems exist, the causes must be investigated and corrected, or the damage will occur again.

9 Corrosion of the piston, in the form of pitting, indicates that coolant has been leaking into the combustion chamber and/or the crankcase. Again, the cause must be corrected, or the problem may persist in the rebuilt engine.

10 On aluminium-block engines with wet liners, it is not possible to renew the pistons separately; pistons are only supplied with piston rings and a liner, as a part of a matched assembly. On iron-block engines, pistons can be purchased from a Peugeot dealer.

11 Examine each connecting rod carefully for signs of damage, such as cracks around the big-end and small-end bearings. Check that the rod is not bent or distorted. Damage is highly unlikely, unless the engine has been seized or badly overheated. Detailed checking of the connecting rod assembly can only be carried out by a Peugeot dealer or engine repair specialist with the necessary equipment.

12 The big-end cap bolts/nuts must be renewed as a complete set prior to refitting. This should be done after the big-end bearing running clearance check has been carried out. On the XU engine, the bolts can be simply tapped out of the connecting rods and new bolts fitted in the same way.

13 On petrol engines, the gudgeon pins are an interference fit in the connecting rod small-end bearing, therefore piston and/or connecting rod renewal should be entrusted to a Peugeot dealer or engine repair specialist, who will have the necessary tooling to remove and install the gudgeon pins.

14 On diesel engines, the gudgeon pins are of the floating type, secured in position by two circlips. On these engines, the pistons and connecting rods can be separated as described in the following paragraphs 15 to 21.

15 Before separating the piston and connecting rod, check the position of the valve recesses or markings on the piston crown in relation to the connecting rod big-end bearing shell cut-outs and make a note of the orientation. On the DW12 diesel engine, the arrow on the piston crown points towards the timing end of the engine, and the big-end bearing location cut-outs are on the rear side of the engine **(see illustration)**.

16 Using a small flat-bladed screwdriver, prise out the circlips, and push out the gudgeon pin **(see illustrations)**. Hand pressure should be sufficient to remove the pin. Identify the piston and rod to ensure correct reassembly. Discard the circlips – new ones *must* be used on refitting.

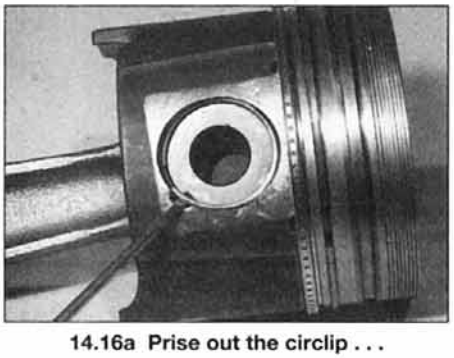
17 Examine the gudgeon pin and connecting rod small-end bearing for signs of wear or damage. Wear can be cured by renewing both the pin and bush. Bush renewal, however, is a specialist job – press facilities are required, and the new bush must be reamed accurately.

18 The connecting rods themselves should not be in need of renewal, unless seizure or some other major mechanical failure has occurred. Check the alignment of the connecting rods visually, and if the rods are not straight, take them to an engine overhaul specialist for a more detailed check.

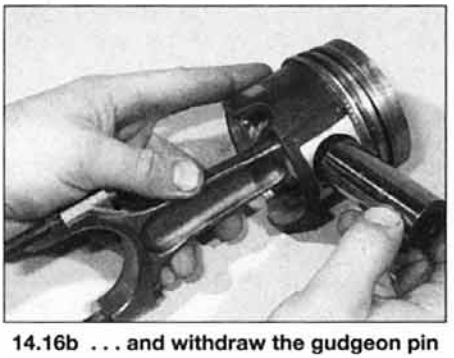
19 Examine all components, and obtain any new parts from your Peugeot dealer. If new pistons are purchased, they will be supplied complete with gudgeon pins and circlips. Circlips can also be purchased individually.

20 Position the piston in relation to the connecting rod big-end bearing shell cut-outs as noted during separation.

21 Apply a smear of clean engine oil to the gudgeon pin and slide it into the piston and through the connecting rod small-end. Check that the piston pivots freely on the rod, then secure the gudgeon pin in position with two new circlips. Ensure that each circlip is correctly located in its groove in the piston.



14.16a Prise out the circlip . . .



14.16b . . . and withdraw the gudgeon pin

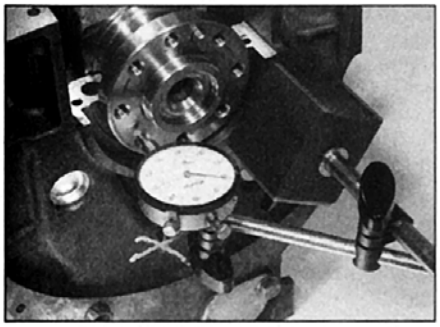
15 Crankshaft – inspection

Checking endfloat

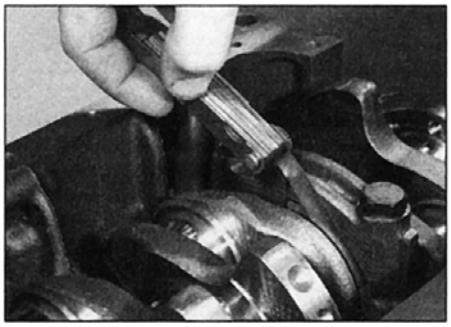
1 If the crankshaft endfloat is to be checked, this must be done when the crankshaft is installed in the cylinder block/crankcase, but is free to move.

2 Check the endfloat using a dial gauge in contact with the end of the crankshaft. Push the crankshaft fully one way, and then zero the gauge. Push the crankshaft fully the other way, and check the endfloat. The result can be compared with the specified amount, and will give an indication as to whether new thrustwashers are required **(see illustration)**.

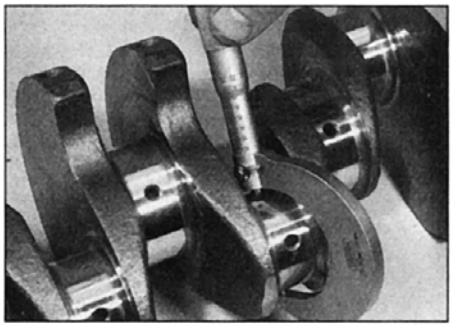
3 If a dial gauge is not available, feeler gauges can be used. First push the crankshaft fully towards the flywheel end of the engine,



15.2 Checking crankshaft endfloat using a dial gauge



15.3 Checking crankshaft endfloat using feeler blades



15.10 Measuring a crankshaft big-end journal diameter

then use feeler gauges to measure the gap between the web of No 2 crankpin and the thrustwasher **(see illustration)**.

Inspection

4 Clean the crankshaft using paraffin or a suitable solvent, and dry it, preferably with compressed air if available. Be sure to clean the oil holes with a pipe cleaner or similar probe, to ensure that they are not obstructed.

Warning: Wear eye protection when using compressed air.

5 Check the main and big-end bearing journals for uneven wear, scoring, pitting and cracking.

6 Big-end bearing wear is accompanied by distinct metallic knocking when the engine is running (particularly noticeable when the engine is pulling from low speed) and by some loss of oil pressure.

7 Main bearing wear is accompanied by severe engine vibration and rumble – getting progressively worse as engine speed increases – and again by loss of oil pressure.

8 Check the bearing journal for roughness by running a finger lightly over the bearing surface. Any roughness (which will be accompanied by obvious bearing wear) indicates that the crankshaft requires regrinding (where possible) or renewal.

9 If the crankshaft has been reground, check for burrs around the crankshaft oil holes (the holes are usually chamfered, so burrs should not be a problem unless regrinding has been carried out carelessly). Remove any burrs with a fine file or scraper, and thoroughly clean the oil holes as described previously.

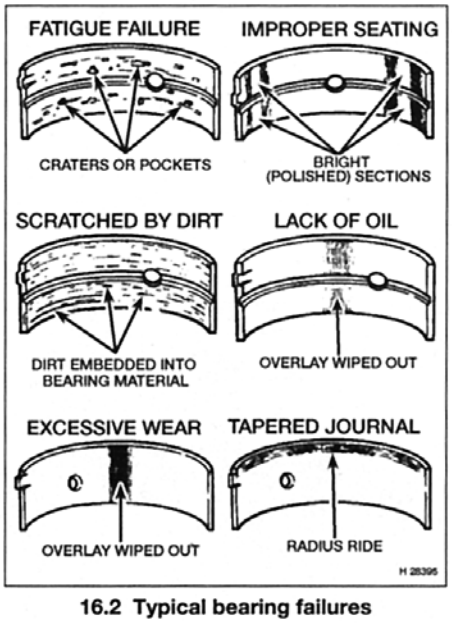
10 Using a micrometer, measure the diameter of the main and big-end bearing journals, and compare the results with the Specifications **(see illustration)**. By measuring the diameter at a number of points around each journal's circumference, you will be able to determine whether or not the journal is out-of-round. Take the measurement at each end of the journal, near the webs, to determine if the journal is tapered. Compare the results obtained with those given in the Specifications.

11 Check the oil seal contact surfaces at each end of the crankshaft for wear and damage. If the seal has worn a deep groove in the surface of the crankshaft, consult an engine overhaul specialist; repair may be possible, but otherwise a new crankshaft will be required.

12 Peugeot produce a set of undersize bearing shells for both the main and big-end bearings on most engines. Where the crankshaft journals have not already been reground, it may be possible to have the crankshaft reconditioned, and to fit undersize shells. If no undersize shells are available and the crankshaft has worn beyond the specified limits, the crankshaft will have to be renewed. Consult your Peugeot dealer or engine specialist for further information on parts availability.

16 Main and big-end bearings – inspection

1 Even though the main and big-end bearings should be renewed during the engine overhaul, the old bearings should be retained for close examination, as they may reveal valuable information about the condition of the engine. The bearing shells are graded by thickness, the grade of each shell being indicated by the colour code marked on it.



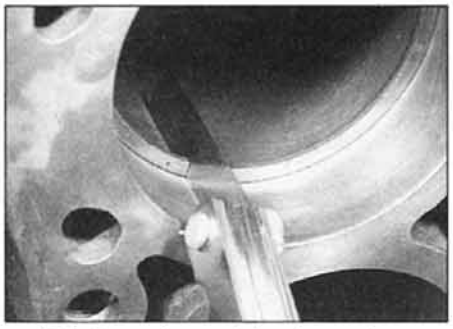
16.2 Typical bearing failures

2 Bearing failure can occur due to lack of lubrication, the presence of dirt or other foreign particles, overloading the engine, or corrosion **(see illustration)**. Regardless of the cause of bearing failure, the cause must be corrected (where applicable) before the engine is reassembled, to prevent it from happening again.

3 When examining the bearing shells, remove them from the cylinder block/crankcase, the main bearing ladder/caps (as appropriate), the connecting rods and the connecting rod big-end bearing caps. Lay them out on a clean surface in the same general position as their location in the engine. This will enable you to match any bearing problems with the corresponding crankshaft journal. *Do not* touch any shell's bearing surface with your fingers while checking it, or the delicate surface may be scratched.

4 Dirt and other foreign matter gets into the engine in a variety of ways. It may be left in the engine during assembly, or it may pass through filters or the crankcase ventilation system. It may get into the oil, and from there into the bearings. Metal chips from machining operations and normal engine wear are often present. Abrasives are sometimes left in engine components after reconditioning, especially when parts are not thoroughly cleaned using the proper cleaning methods. Whatever the source, these foreign objects often end up embedded in the soft bearing material, and are easily recognised. Large particles will not embed in the bearing, and will score or gouge the bearing and journal. The best prevention for this cause of bearing failure is to clean all parts thoroughly, and keep everything spotlessly-clean during engine assembly. Frequent and regular engine oil and filter changes are also recommended.

5 Lack of lubrication (or lubrication breakdown) has a number of interrelated causes. Excessive heat (which thins the oil), overloading (which squeezes the oil from the bearing face) and oil leakage (from excessive bearing clearances, worn oil pump or high



18.5 Measuring a piston ring end gap

engine speeds) all contribute to lubrication breakdown. Blocked oil passages, which usually are the result of misaligned oil holes in a bearing shell, will also oil-starve a bearing, and destroy it. When lack of lubrication is the cause of bearing failure, the bearing material is wiped or extruded from the steel backing of the bearing. Temperatures may increase to the point where the steel backing turns blue from overheating.

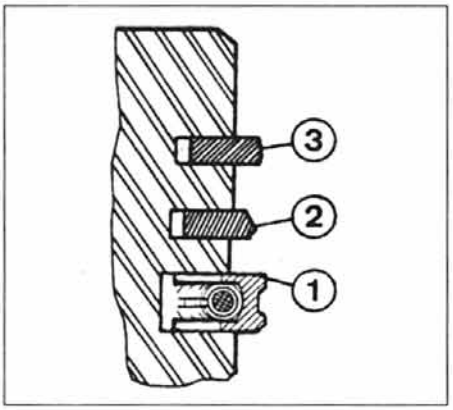
6 Driving habits can have a definite effect on bearing life. Full-throttle, low-speed operation (labouring the engine) puts very high loads on bearings, tending to squeeze out the oil film. These loads cause the bearings to flex, which produces fine cracks in the bearing face (fatigue failure). Eventually, the bearing material will loosen in pieces, and tear away from the steel backing.

7 Short-distance driving leads to corrosion of bearings, because insufficient engine heat is produced to drive off the condensed water and corrosive gases. These products collect in the engine oil, forming acid and sludge. As the oil is carried to the engine bearings, the acid attacks and corrodes the bearing material.

8 Incorrect bearing installation during engine assembly will lead to bearing failure as well. Tight-fitting bearings leave insufficient bearing running clearance, and will result in oil starvation. Dirt or foreign particles trapped behind a bearing shell result in high spots on the bearing, which lead to failure.

9 *Do not* touch any shell's bearing surface with your fingers during reassembly; there is a risk of scratching the delicate surface, or of depositing particles of dirt on it.

10 As mentioned at the beginning of this Section, the bearing shells should be renewed as a matter of course during engine overhaul; to do otherwise is false economy. Refer to Sections 19 and 20 for details of bearing shell selection.



18.10 Piston ring fitting diagram (typical)

1 Oil control ring
2 Second compression ring
3 Top compression ring

17 Engine overhaul – reassembly sequence

1 Before reassembly begins, ensure that all new parts have been obtained, and that all necessary tools are available. Read through the entire procedure to familiarise yourself with the work involved, and to ensure that all items necessary for reassembly of the engine are at hand. In addition to all normal tools and materials, thread-locking compound will be needed. A suitable tube of liquid sealant will also be required for the joint faces that are fitted without gaskets. It is recommended that Peugeot's own products are used, which are specially formulated for this purpose; the relevant product names are quoted in the text of each Section where they are required.

2 In order to save time and avoid problems, engine reassembly can be carried out in the following order:

a) Crankshaft (Section 19).
b) Piston/connecting rod assemblies (Section 20).
c) Balance shaft housing – DW12 diesel engine (Section 10).
d) Oil pump (See Part A, B or C – as applicable).
e) Sump (See Part A, B or C – as applicable).
f) Flywheel (See Part A, B or C – as applicable).
g) Cylinder head (See Part A, B or C – as applicable).
h) Timing belt tensioner and sprockets, and timing belt (See Part A, B or C – as applicable).
i) Engine external components.

3 At this stage, all engine components should be absolutely clean and dry, with all faults repaired. The components should be laid out (or in individual containers) on a completely clean work surface.

18 Piston rings – refitting

1 Before fitting new piston rings, the ring end gaps must be checked as follows.

2 Lay out the piston/connecting rod assemblies and the new piston ring sets, so that the ring sets will be matched with the same piston and cylinder during the end gap measurement and subsequent engine reassembly.

3 Insert the top ring into the first cylinder, and push it down the bore using the top of the piston. This will ensure that the ring remains square with the cylinder walls. Position the ring near the bottom of the cylinder bore, at the lower limit of ring travel. Note that the top and second compression rings are different. The second ring is easily identified by the step on its lower surface, and by the fact that its outer face is tapered.

4 Measure the end gap using feeler gauges.

5 Repeat the procedure with the ring at the top of the cylinder bore, at the upper limit of its travel, and compare the measurements with the figures given in the Specifications **(see illustration)**. Where no figures are given, seek the advice of a Peugeot dealer or engine reconditioning specialist.

6 If the gap is too small (unlikely if genuine Peugeot parts are used), it must be enlarged, or the ring ends may contact each other during engine operation, causing serious damage. Ideally, new piston rings providing the correct end gap should be fitted. As a last resort, the end gap can be increased by filing the ring ends very carefully with a fine file. Mount the file in a vice equipped with soft jaws, slip the ring over the file with the ends contacting the file face, and slowly move the ring to remove material from the ends. Take care, as piston rings are sharp, and are easily broken.

7 With new piston rings, it is unlikely that the end gap will be too large. If the gaps are too large, check that you have the correct rings for your engine and for the particular cylinder bore size.

8 Repeat the checking procedure for each ring in the first cylinder, and then for the rings in the remaining cylinders. Remember to keep rings, pistons and cylinders matched up.

9 Once the ring end gaps have been checked and if necessary corrected, the rings can be fitted to the pistons.

10 Fit the piston rings using the same technique as for removal. Fit the bottom (oil control) ring first, and work up. When fitting the oil control ring, first insert the expander (where fitted), then fit the ring with its gap positioned 180° from the expander gap. Ensure that the second compression ring is fitted the correct way up, with its identification mark (either a dot of paint or the word TOP stamped on the ring surface) at the top, and the stepped surface at the bottom **(see illustration)**. Arrange the gaps of the top and second compression rings 120° either side of the oil control ring gap. Note: *Always follow any instructions supplied with the new piston ring sets – different manufacturers may specify different procedures. Do not mix up the top and second compression rings, as they have different cross-sections.*

19 Crankshaft – refitting and main bearing running clearance check

New main bearing shells

1 To ensure that the main bearing running clearance is correct, the bearing shells are supplied in various thicknesses or grades. The grades are indicated by a colour-coding marked on the edge of each shell. The grade of the new bearing shells required (either standard size or undersize) is selected using the reference marks on the cylinder block and on the crankshaft. The cylinder block marks identify the diameter of the bearing bores in the block, and the crankshaft marks identify the diameter of the crankshaft journals.

2 Note that on the engines described in this Manual, the upper shells are all of the same size, and the running clearance is controlled by fitting a lower bearing shell of the required thickness.

3 Numerous grades of standard and oversize bearing shells are available, depending on the engine type, year of manufacture, and country of export. Using the cylinder block and crankshaft reference marks together with the crankshaft journal diameter, a Peugeot dealer or engine overhaul specialist will be able to supply the correct bearing shells to give the required bearing running clearance for each journal **(see illustration)**.

4 Whether the original shells or new shells are being fitted, it is recommended that the running clearance is checked as follows prior to crankshaft installation.

Running clearance check

5 The running clearance check can be carried out using the original bearing shells. However, it is preferable to use a new set, since the results obtained will be more conclusive.

6 Clean the backs of the bearing shells, and the bearing locations in both the cylinder block/crankcase and the main bearing caps.

7 Press the bearing shells into their locations, ensuring that the tab on each shell engages in the notch in the cylinder block/crankcase or bearing cap **(see illustrations)**. Take care not to touch any shell's bearing surface with your fingers. Note that the upper bearing shells all have a grooved bearing surface, whereas the lower shells have a plain bearing surface. If the original bearing shells are being used for the check, ensure that they are refitted in their original locations.

8 The clearance can be checked in either of two ways.

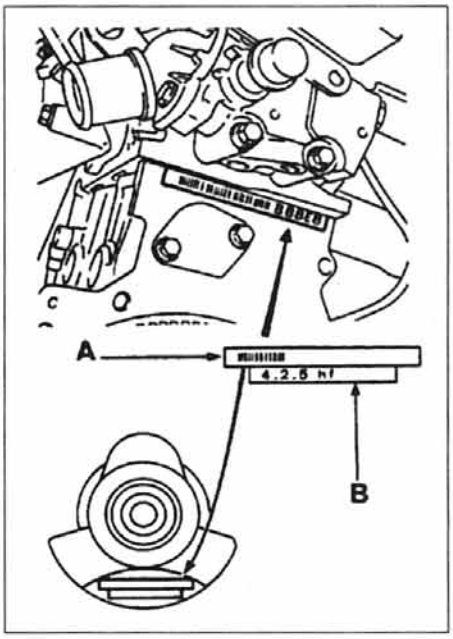
9 One method (which will be difficult to achieve without a range of internal micrometers or internal/external expanding calipers) is to refit the main bearing caps to the cylinder block/crankcase, with bearing shells in place. With the cap retaining bolts tightened to the specified torque, measure the internal diameter of each assembled pair of bearing shells. If the diameter of each corresponding crankshaft journal is measured and then subtracted from the bearing internal diameter, the result will be the main bearing running clearance.

10 The second (and more accurate) method is to use a product known as Plastigauge. This consists of a fine thread of perfectly-round plastic, which is compressed between the bearing shell and the journal. When the shell is removed, the plastic is deformed, and can be measured with a special card gauge supplied with the kit. The running clearance is determined from this gauge. Plastigauge should be available from your Peugeot dealer; otherwise, enquiries at one of the larger specialist motor factors should produce the name of a stockist in your area. The procedure for using Plastigauge is as follows.

11 With the main bearing upper shells in place, carefully lay the crankshaft in position **(see illustration)**. Do not use any lubricant; the crankshaft journals and bearing shells must be perfectly clean and dry.

12 Cut several lengths of the appropriate-size Plastigauge (they should be slightly shorter than the width of the main bearings), and place one length on each crankshaft journal axis **(see illustration)**.

13 With the main bearing lower shells in position, refit the main bearing caps or bearing cap housing (as applicable) and tighten the bolts as described later in this Section. Take care not to disturb the Plastigauge, and *do not* rotate the crankshaft at any time during this operation.

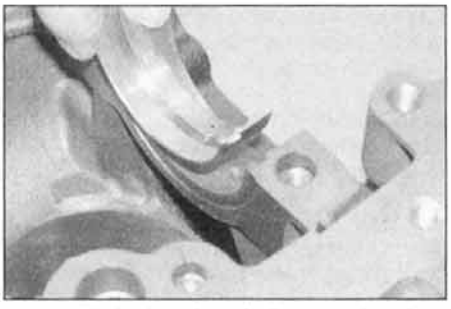


19.3 Cylinder block and crankshaft main bearing reference markings – XU series engine

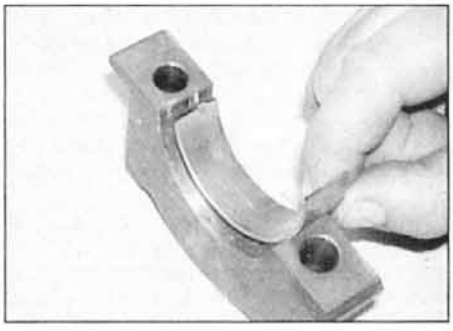
A Bar code (for production use only)
B Reference marks

14 Remove the main bearing caps/housing, again taking great care not to disturb the Plastigauge or rotate the crankshaft.

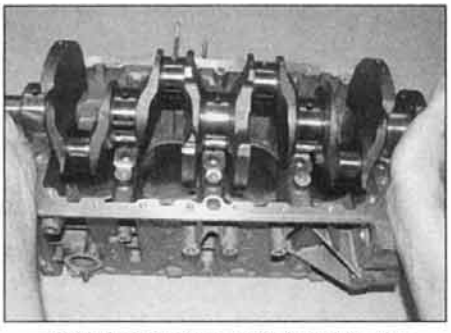
15 Compare the width of the crushed Plastigauge on each journal to the scale



19.7a Fit the bearing shells, ensuring that the tab engages in the notch in the cylinder block/crankcase . . .

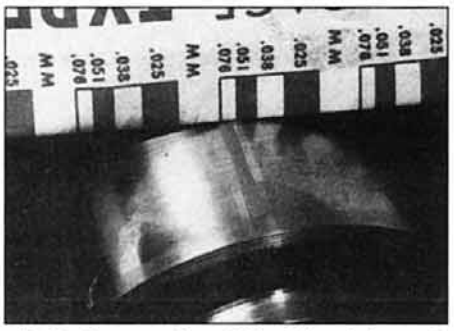


19.7b . . . and in the bearing cap

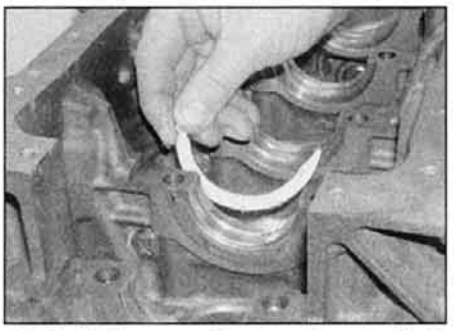


19.11 Lower the crankshaft into the cylinder block

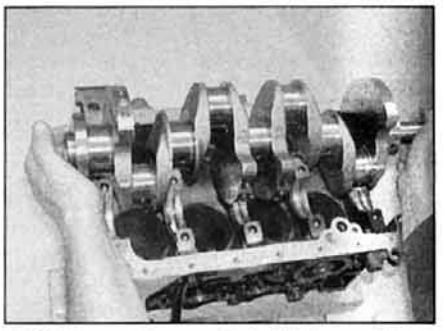
19.12 Plastigauge in place on a crankshaft main bearing journal



19.15 Measure the width of the deformed Plastigauge using the scale on the card



19.21 Fit the upper thrustwashers to No 2 main bearing location with the oil way grooves facing outwards



19.23 Lower the crankshaft into position in the cylinder block/crankcase

printed on the Plastigauge envelope, to obtain the main bearing running clearance **(see illustration)**. Compare the clearance measured with that in the Specifications at the start of this Chapter.

16 If the clearance is significantly different from that expected, the bearing shells may be the wrong size (or excessively worn, if the original shells are being re-used). Before deciding that different-size shells are required, make sure that no dirt or oil was trapped between the bearing shells and the caps or block when the clearance was measured. If the Plastigauge was wider at one end than at the other, the crankshaft journal may be tapered.

17 If the clearance is not as specified, use the reading obtained, along with the shell thicknesses quoted above, to calculate the necessary grade of bearing shells required. When calculating the bearing clearance required, bear in mind that it is always better to have the running clearance towards the lower end of the specified range, to allow for wear in use.

18 Where necessary, obtain the required grades of bearing shell, and repeat the running clearance checking process described above.

19 On completion, carefully scrape away all traces of the Plastigauge material from the crankshaft and bearing shells. Use your fingernail, or a wooden or plastic scraper which is unlikely to score the bearing surfaces.

Final crankshaft refitting

XU and DW engines

20 Carefully lift the crankshaft out of the cylinder block once more.

21 Using a little grease, stick the upper thrustwashers to each side of the No 2 main bearing upper location. Ensure that the oil way grooves on each thrustwasher face outwards (away from the cylinder block) **(see illustration)**.

22 Place the bearing shells in their locations as described earlier. If new shells are being fitted, ensure that all traces of protective grease are cleaned off using paraffin. Wipe dry the shells and connecting rods with a lint-free cloth. Liberally lubricate each bearing shell in the cylinder block/crankcase and cap with clean engine oil.

23 Lower the crankshaft into position so that Nos 2 and 3 cylinder crankpins are at TDC; Nos 1 and 4 cylinder crankpins will be at BDC, ready for fitting No 1 piston **(see illustration)**. Check the crankshaft endfloat, referring to Section 15.

24 Lubricate the lower bearing shells in the main bearing caps with clean engine oil. Make sure that the locating lugs on the shells engage with the corresponding recesses in the caps.

25 Fit main bearing caps Nos 2 to 5 to their correct locations, ensuring that they are fitted the correct way round (the bearing shell tab recesses in the block and caps must be on the same side). Insert the bolts/nuts, tightening them only loosely at this stage.

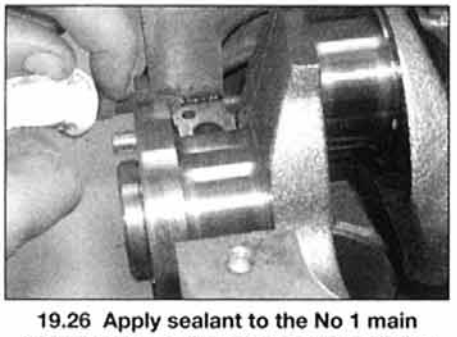
26 Apply a small amount of sealant to the No 1 main bearing cap mating face on the cylinder block, around the sealing strip holes **(see illustration)**.

27 Locate the tab of each sealing strip over the pins on the base of No 1 bearing cap, and press the strips into the bearing cap grooves. It is now necessary to obtain two thin metal strips, of 0.25 mm thickness or less, in order to prevent the strips moving when the cap is being fitted. Peugeot garages use the tool shown, which acts as a clamp. Metal strips (such as old feeler blades) can be used, provided all burrs which may damage the sealing strips are first removed **(see illustration)**.

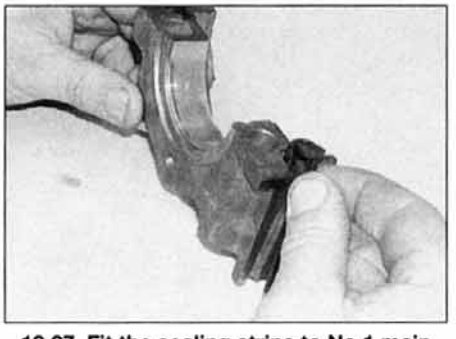
28 Where applicable, oil both sides of the metal strips, and hold them on the sealing strips. Fit the No 1 main bearing cap, insert the bolts loosely, then carefully pull out the metal strips in a horizontal direction, using a pair of pliers **(see illustration)**.

29 Tighten all the main bearing cap bolts/nuts evenly to the specified torque. Using a sharp knife, trim off the ends of the No 1 bearing cap sealing strips, so that they protrude above the cylinder block/crankcase mating surface by approximately 1 mm **(see illustrations)**.

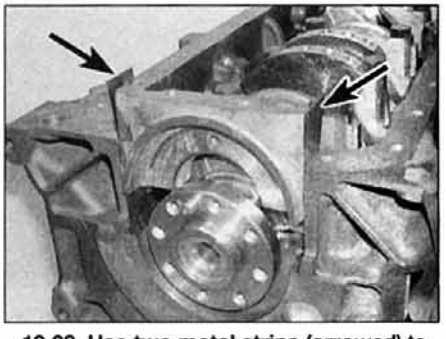
30 On the XU petrol engine, refit the centre main bearing side retaining bolts and sealing washers (one at the front of the block, and one at the rear) and tighten them both to the specified torque.



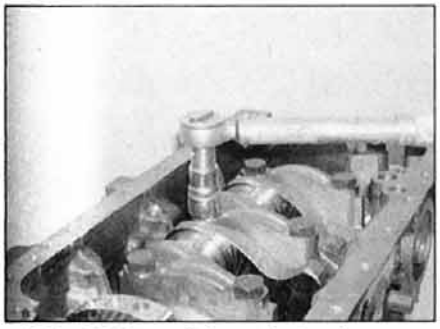
19.26 Apply sealant to the No 1 main bearing cap mating face on the cylinder block, around the sealing strip holes and in the corners



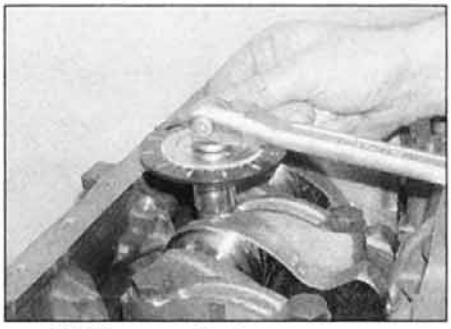
19.27 Fit the sealing strips to No 1 main bearing cap



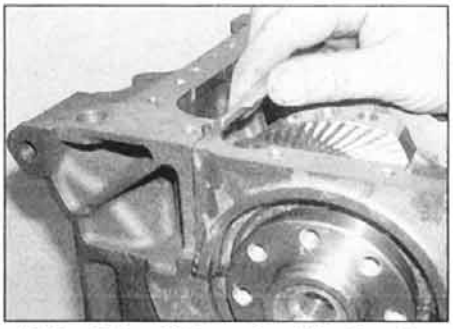
19.28 Use two metal strips (arrowed) to hold the sealing strips in place as the bearing cap is fitted



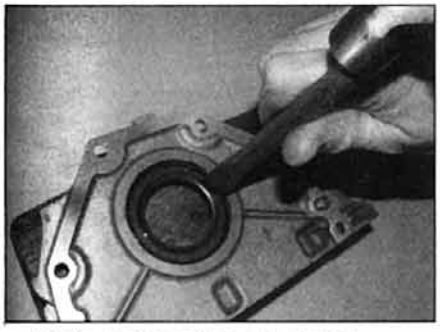
19.29a Tighten all the main bearing cap bolts to the specified torque ...



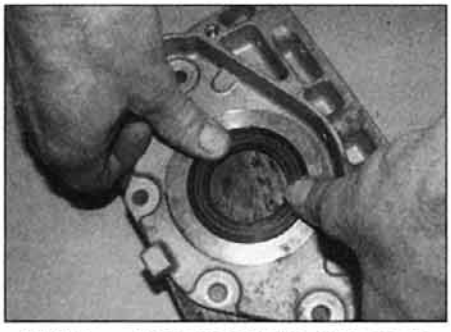
19.29b ... and, where necessary, additionally through the specified angle



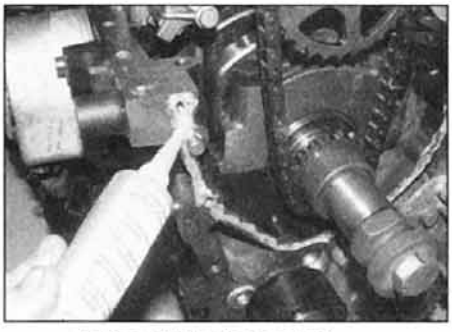
19.29c Trim off the ends of No 1 bearing cap sealing strips, so that they protrude by approximately 1.0 mm



19.34a Drive out the old oil seal ...



19.34b ... then press in the new one to the previously noted depth



19.35a Apply the sealant ...

31 Fit a new crankshaft left-hand oil seal as described in Part A or C of this Chapter (as applicable).

32 Refit the piston/connecting rod assemblies to the crankshaft as described in Section 20.

33 Refit the Woodruff key, then slide on the oil pump drive sprocket and spacer (where fitted), and locate the drive chain on the sprocket.

34 Ensure that the mating surfaces of the right-hand oil seal carrier and cylinder block are clean and dry. Note the correct fitted depth of the oil seal then, lever or drive out the old seal from the housing. If preferred, a new oil seal can be pressed into the housing at this stage **(see illustrations)**.

35 Apply a smear of suitable sealant to the oil seal carrier mating surface. Ensure that the locating dowels are in position, then slide the carrier over the end of the crankshaft and into position on the cylinder block **(see illustrations)**. Tighten the carrier retaining bolts to the specified torque.

36 If not already done, fit a new crankshaft right-hand oil seal as described in Part A or C of this Chapter.

37 Ensuring that the drive chain is correctly located on the sprocket, refit the oil pump and sump as described in Part A or C of this Chapter.

38 Where removed, refit the cylinder head as described in Part A or C, or this Part.

EW engines

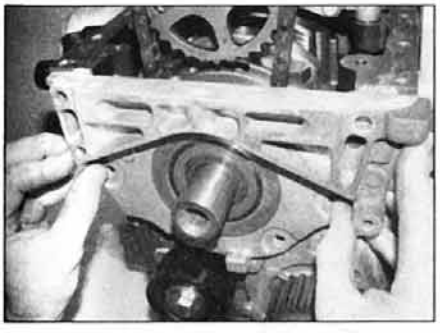
39 Carefully lift the crankshaft out of the cylinder block once more.

40 Place the bearing shells in their locations as described earlier. If new shells are being fitted, ensure that all traces of protective grease are cleaned off using paraffin. Wipe dry the shells with a lint-free cloth.

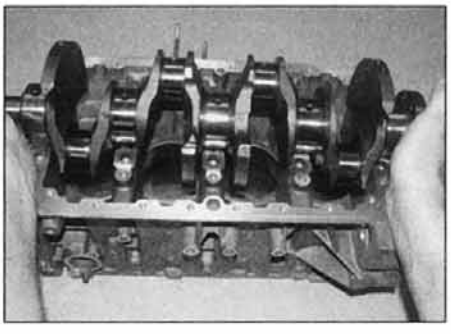
41 Liberally lubricate each bearing shell in the cylinder block with clean engine oil then lower the crankshaft into position **(see illustration)**.

42 Insert the thrustwashers to either side of No 2 main bearing upper location and push them around the bearing journal until their edges are horizontal **(see illustration)**. Ensure that the oil way grooves on each thrustwasher face outwards (away from the bearing journal).

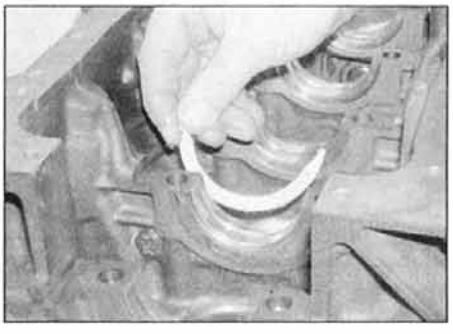
43 Thoroughly degrease the mating surfaces of the cylinder block and the crankshaft bearing cap housing. Apply a thin bead of RTV sealant to the bearing cap housing mating surface **(see illustration)**. Peugeot



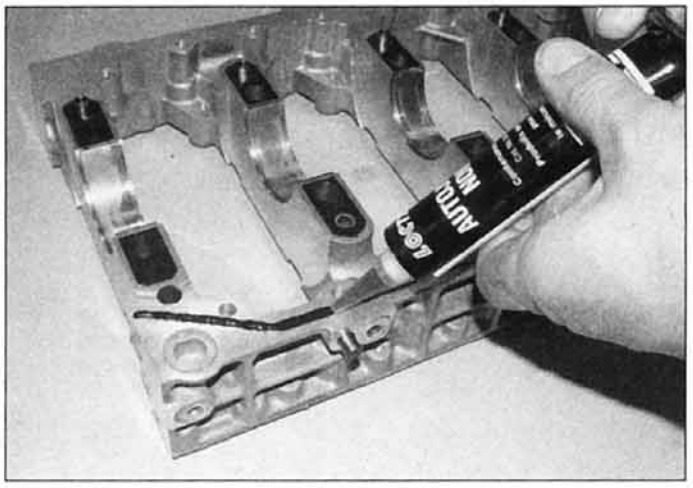
19.35b ... then fit the oil seal carrier ...



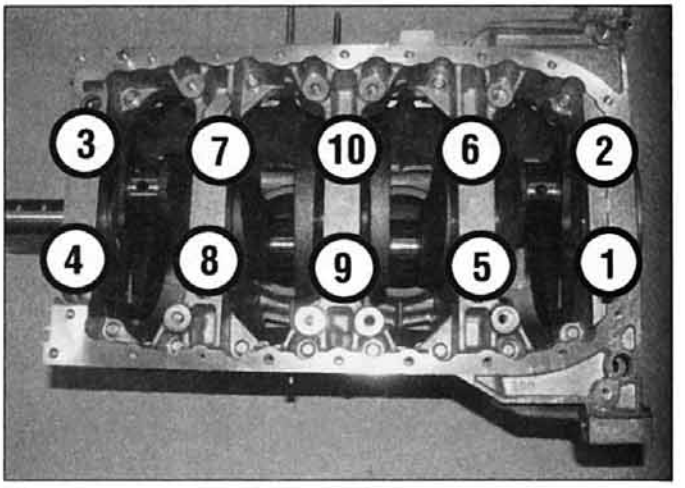
19.41 Lubricate the bearing shells and lower the crankshaft into the cylinder block



19.42 Insert the thrustwashers either side of No 2 main bearing upper location



19.43 Apply a thin bead of RTV sealant to the bearing cap housing mating surface



19.46 Crankshaft bearing cap housing retaining bolt tightening sequence

recommend the use of Loctite Autojoint Noir for this purpose.

44 Lubricate the lower bearing shells with clean engine oil, then refit the bearing cap housing, ensuring that the shells are not displaced, and that the locating dowels engage correctly.

45 Install the ten M11, and sixteen M6 crankshaft bearing cap housing retaining bolts, and screw them in until they are just making contact with the housing.

46 Working in the sequence shown, tighten all the M11 bolts to the Stage 1 torque setting given in the Specifications **(see illustration)**. Now tighten all the M6 bolts to the Stage 2 torque setting (finger-tight).

47 Fully slacken all the M11 bolts (Stage 3), then tighten them to the Stage 4 setting, working in the correct sequence.

48 Finally tighten all the M11 bolts, in the correct sequence, through the specified Stage 5 angle, using an angle tightening gauge.

49 The M6 bolts can now be tightened to the Stage 6 torque setting.

50 With the bearing cap housing in place, check that the crankshaft rotates freely.

51 Refit the piston/connecting rod assemblies to the crankshaft as described in Section 20.

52 Refit the oil pump and sump as described in Part B.

53 Fit a new crankshaft left-hand oil seal, then refit the flywheel as described in Part B.

54 Where removed, refit the cylinder head, crankshaft sprocket and timing belt also as described in Part B.

20 Pistons/connecting rods – refitting and big-end bearing running clearance check

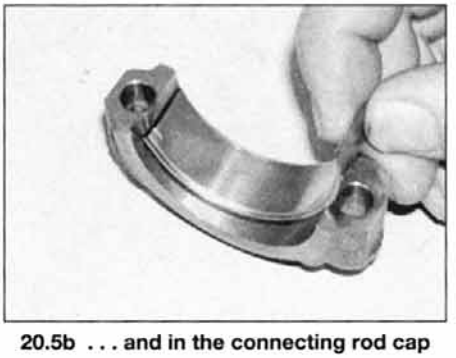
New big-end bearing shells

1 There are two sizes of big-end bearing shell available; a standard size for use with the standard crankshaft, and an undersize for use once the crankshaft journals have been reground.

2 Consult your Peugeot dealer for the latest information on parts availability. To be safe, always quote the diameter of the crankshaft big-end crankpins when ordering bearing shells.

3 Prior to refitting the piston/connecting rod assemblies, it is recommended that the big-end bearing running clearance is checked as follows.

20.5a Fit the big-end bearing shells ensuring that the tab engages in the notch in the connecting rod . . .



20.5b . . . and in the connecting rod cap

Running clearance check

4 Clean the backs of the bearing shells, and the bearing locations in both the connecting rod and bearing cap.

5 Press the bearing shells into their locations, ensuring that the tab on each shell engages in the notch in the connecting rod and cap. Take care not to touch any shell's bearing surface with your fingers **(see illustrations)**. If the original bearing shells are being used for the check, ensure they are refitted in their original locations. The clearance can be checked in either of two ways.

6 One method is to refit the big-end bearing cap to the connecting rod, ensuring they are fitted the correct way around, with the bearing shells in place. With the cap retaining nuts correctly tightened, use an internal micrometer or Vernier caliper to measure the internal diameter of each assembled pair of bearing shells. If the diameter of each corresponding crankshaft journal is measured and then subtracted from the bearing internal diameter, the result will be the big-end bearing running clearance.

7 The second, and more accurate method is to use Plastigauge (see Section 19).

8 Ensure that the bearing shells are correctly fitted. Place a strand of Plastigauge on each (cleaned) crankpin journal.

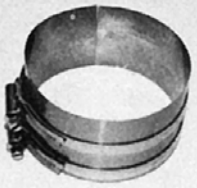
9 Refit the (clean) piston/connecting rod assemblies to the crankshaft, and refit the big-end bearing caps, using the marks made or noted on removal to ensure they are fitted the correct way around.

10 Tighten the bearing cap nuts as described later in this Section. Take care not to disturb the Plastigauge or rotate the connecting rod during the tightening sequence.

11 Dismantle the assemblies without rotating the connecting rods. Use the scale printed on the Plastigauge envelope to obtain the big-end bearing running clearance.

12 If the clearance is significantly different from that expected, the bearing shells may be

TOOL TiP



To make a piston ring compressing tool, cut a strip of thin steel packing so that when it is wrapped tightly around the piston, the ends of the strip abut each other. Wrap the strip around the piston and secure with two large worm-drive hose clips to compress the rings.

the wrong size (or excessively worn, if the original shells are being re-used). Make sure that no dirt or oil was trapped between the bearing shells and the caps or block when the clearance was measured. If the Plastigauge was wider at one end than at the other, the crankshaft journal may be tapered.

13 Note that Peugeot do not specify a recommended big-end bearing running clearance. The figure given in the Specifications is a guide figure, which is typical for this type of engine. Before condemning the components concerned, refer to your Peugeot dealer or engine reconditioning specialist for further information on the specified running clearance. Their advice on the best course of action to be taken can then also be obtained.

14 On completion, carefully scrape away all traces of the Plastigauge material from the crankshaft and bearing shells. Use your fingernail, or some other object which is unlikely to score the bearing surfaces.

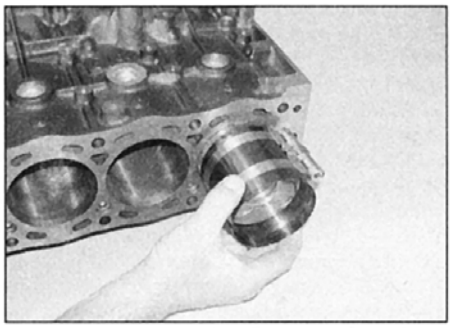
Piston/connecting rod refitting

15 Note that the following procedure assumes that the cylinder liners (where fitted) are in position in the cylinder block/crankcase, and that the crankshaft and main bearing caps are in place.

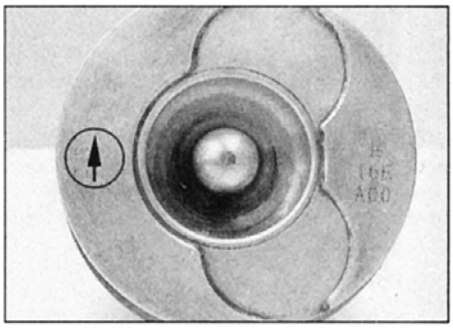
16 Ensure that the bearing shells are correctly fitted as described earlier. If new shells are being fitted, ensure that all traces of the protective grease are cleaned off using paraffin. Wipe dry the shells and connecting rods with a lint-free cloth.

17 Lubricate the cylinder bores, the pistons, and piston rings, then lay out each piston/connecting rod assembly in its respective position.

18 Start with assembly No 1. Make sure that the piston rings are still spaced as described in Section 18, then clamp them in position with a piston ring compressor. Due to the construction and small size of the oil control



20.19a Insert the piston/connecting rod assembly into the top of the relevant cylinder



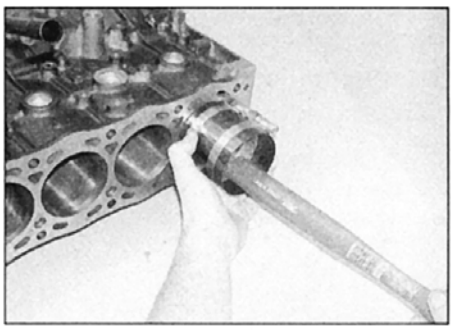
20.19b On 2.0 litre diesel engines the arrow on the piston crown must point towards the timing belt end of the engine

piston ring on the EW engines, it is very easy to damage the ring when fitting the piston/connecting rod assembly if a conventional piston ring compressor is used. The lower part of the ring slips out of the ring compressor just before it enters the cylinder bore and can easily be bent or distorted if the fitting process continues. Peugeot specify the use of a tapered cone type piston ring compressor tool, but a suitable alternative can easily be fabricated **(see Tool Tip)**.

19 Insert the piston/connecting rod assembly into the top of cylinder/liner No 1. On petrol engines, ensure that the arrow on the piston crown is pointing towards the timing belt end of the engine and on diesel engines, ensure that the cloverleaf-shaped cut-out on the piston crown is towards the front (oil filter side) of the cylinder block. Using a block of wood or hammer handle against the piston crown, tap the assembly into the cylinder/liner until the piston crown is flush with the top of the cylinder/liner **(see illustrations)**.

20 Ensure that the bearing shell is still correctly installed. Liberally lubricate the crankpin and both bearing shells. Taking care not to mark the cylinder/liner bores, pull the piston/connecting rod assembly down the bore and onto the crankpin.

21 Refit the big-end bearing cap, tightening its retaining nuts finger-tight at first. Note that the faces with the identification marks must match (which means that the bearing shell locating tabs abut each other).



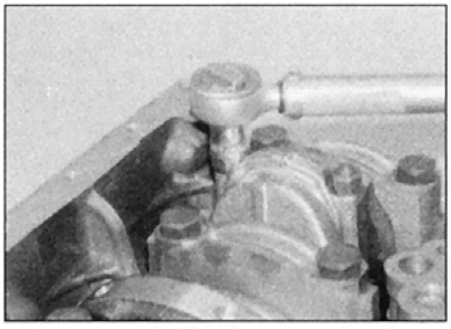
20.19c Tap the assembly into the cylinder bore until the piston crown is flush with the top of the block

22 Tighten the bearing cap retaining nuts evenly and progressively in the Stages given in the appropriate Specifications **(see illustrations)**.

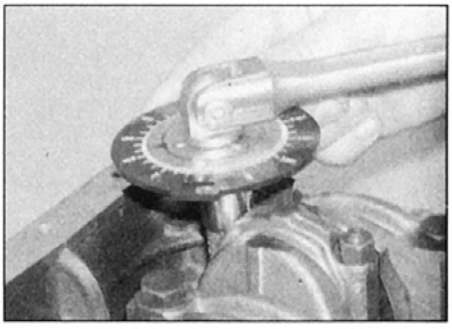
23 On all engines, once the bearing cap retaining nuts have been correctly tightened, rotate the crankshaft. Check that it turns freely; some stiffness is to be expected if new components have been fitted, but there should be no signs of binding or tight spots.

24 Refit the remaining three piston/connecting rod assemblies in the same way.

25 Refit the cylinder head and oil pump as described in Part A, B or C of this Chapter.



20.22a Tighten the bearing cap retaining nuts evenly and progressively to the torque setting . . .



20.22b . . . then angle-tighten them through the specified angle

21 Engine – initial start-up after overhaul

1 With the engine refitted in the vehicle, double-check the engine oil and coolant levels. Make a final check that everything has been reconnected, and that there are no tools or rags left in the engine compartment.

Petrol engine models

2 Remove the spark plugs and disable the fuel system by disconnecting the wiring connectors from the fuel injectors, referring to Chapter 4A for further information.

3 Turn the engine on the starter until the oil pressure warning light goes out. Refit the spark plugs, and reconnect the wiring.

Diesel engine models

4 On the models covered in this Manual, the oil pressure warning light is linked to the STOP warning light, and is not illuminated when the ignition is initially switched on. Therefore it is not possible to check the oil pressure warning light when turning the engine on the starter motor.

5 Prime the fuel system (refer to Chapter 4B). Although the system is self-priming, it will help if the ignition is switched on and off several times before attempting to start the engine in order to purge air from the system.

6 Fully depress the accelerator pedal, turn the ignition key to position M, and wait for the preheating warning light to go out.

All models

7 Start the engine, noting that this may take a little longer than usual, due to the fuel system components having been disturbed.

8 While the engine is idling, check for fuel, water and oil leaks. Don't be alarmed if there are some odd smells and smoke from parts getting hot and burning off oil deposits.

9 Assuming all is well, keep the engine idling until hot water is felt circulating through the top hose, then switch off the engine.

10 After a few minutes, recheck the oil and coolant levels as described in *Weekly Checks*, and top-up as necessary.

11 Note that there is no need to retighten the cylinder head bolts once the engine has first run after reassembly.

12 If new pistons, rings or crankshaft bearings have been fitted, the engine must be treated as new, and run-in for the first 500 miles (800 km). *Do not* operate the engine at full-throttle, or allow it to labour at low engine speeds in any gear. It is recommended that the oil and filter be changed at the end of this period.

Chapter 3
Cooling, heating and ventilation systems

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

General

Maximum system pressure	1.4 bar

Thermostat

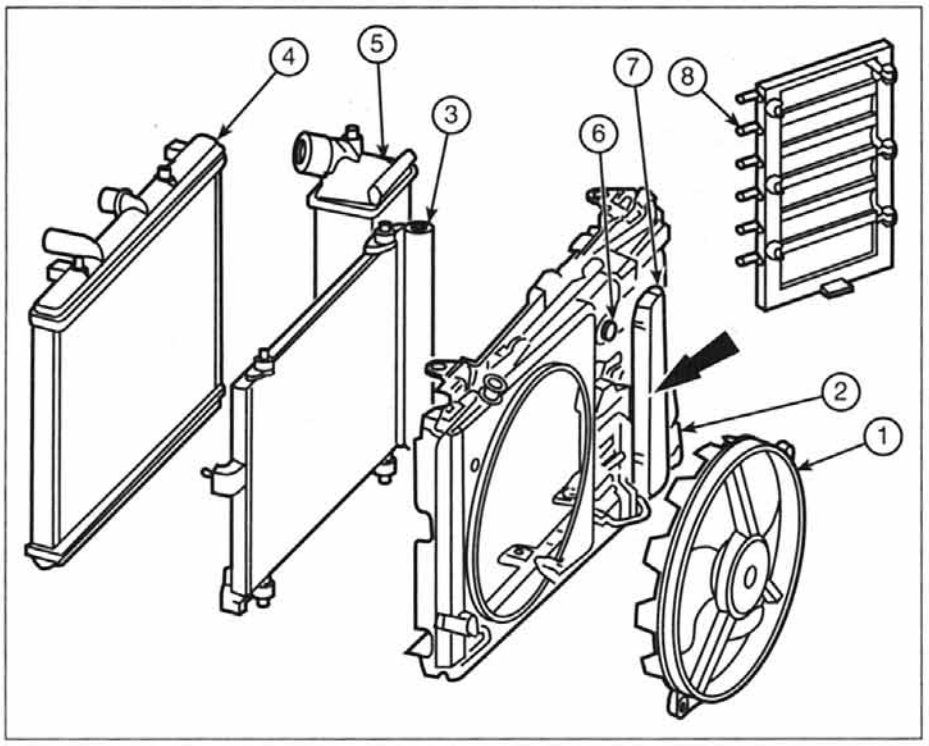
Opening temperature:	
Petrol models	89°C
Diesel models	83°C

Air conditioning system

Compressor:	
Petrol engines:	
Make	SANDEN
Model	SD7V16
Oil capacity	135 ± 15 cc
Oil type	SP10
Diesel engines:	
Make	DELPHI
Model	V5
Oil capacity	265 ± 15 cc
Oil type	UCON 488

Torque wrench settings

	Nm	lbf ft
Air conditioning pump to cylinder block:		
Bolts from crankshaft pulley side	42	31
Bolts from oil filter side	39	29
Coolant pump:		
XU petrol engines:		
Aluminium block:		
Smaller bolts	30	22
Larger bolts	65	48
Iron block	15	11
EW petrol engines	15	11
DW diesel engines	16	12
Coolant temperature sensor:		
EW petrol engines	18	13
Coolant cylinder block drain screw:		
EW petrol engines	25	18



1.1a Radiator fan assembly

1 *Fan*
2 *Fan cowling*
3 *Air conditioning condensor*
4 *Radiator*
5 *Intercooler (Turbo models)*
6 *Fan resistors*
7 *Relay housing*
8 *Anti-recirculation grille*

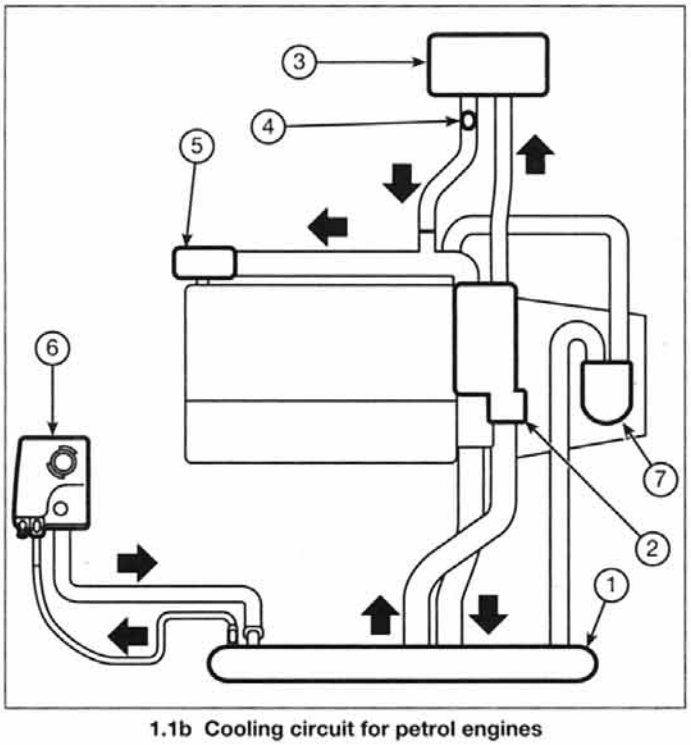
1 General information and precautions

General information

The cooling system is of pressurised type, comprising a coolant pump driven by the timing belt, an aluminium crossflow radiator, electric cooling fan, a thermostat, heater matrix, and all associated hoses and switches.

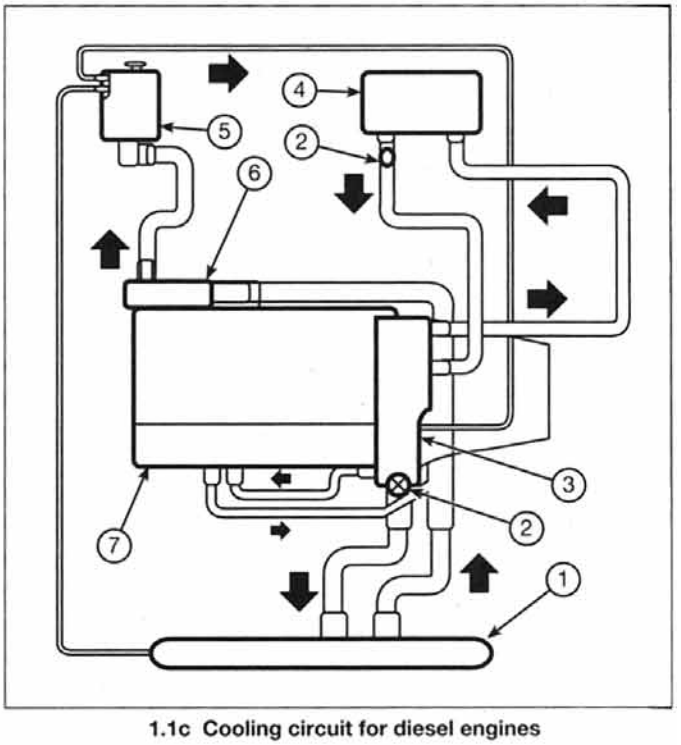
The system functions as follows. Cold coolant in the bottom of the radiator passes through the bottom hose to the coolant pump, where it is pumped around the cylinder block and head passages, and through the oil cooler(s) (where fitted). After cooling the cylinder bores, combustion surfaces and valve seats, the coolant reaches the underside of the thermostat, which is initially closed. The coolant passes through the heater, and is returned via the cylinder block to the coolant pump.

When the engine is cold, the coolant circulates only through the cylinder block, cylinder head, and heater. When the coolant reaches a predetermined temperature, the thermostat opens, and the coolant passes through the top hose to the radiator. As the coolant circulates through the radiator, it is cooled by the inrush of air when the car is in forward motion. The airflow is supplemented by the action of the electric cooling fan which



1.1b Cooling circuit for petrol engines

1 *Radiator*
2 *Coolant inlet manifold*
3 *Heater matrix*
4 *Bleed screw*
5 *Coolant pump*
6 *Expansion bottle*
7 *Oil cooler (automatic gearbox only)*



1.1c Cooling circuit for diesel engines

1 *Radiator*
2 *Bleed screw*
3 *Coolant inlet manifold*
4 *Heater matrix*
5 *Expansion bottle*
6 *Coolant outlet manifold*
7 *Coolant pump*

is controlled by the ECU and has three operating speeds. Upon reaching the bottom of the radiator, the coolant has now cooled, and the cycle is repeated.

When the engine is at normal operating temperature, the coolant expands, and some of it is displaced into the expansion tank. Coolant collects in the tank, and is returned to the radiator when the system cools.

On models with automatic transmission, a proportion of the coolant is recirculated from the bottom of the radiator through the transmission fluid cooler mounted on the transmission. On models fitted with an engine oil cooler, the coolant is also passed through the oil cooler.

The electric cooling fan in front of the radiator is controlled by a temperature sensor in the thermostat housing, which gives information to the ECU. **Note:** *On XU engines, the temperature sensor gives information to the air conditioning/coolant temperature unit before the ECU. The temperature unit is situated behind the left-hand front headlight unit.* At a predetermined coolant temperature, the engine management control unit (ECU) actuates the fan.

The fan cowling has an anti-recirculation grille, this has six flaps that open when the car is travelling forwards, when the fan starts to operate the flaps close. This is to improve cooling, and allow extra passages to the radiator when the fan is not operating. When the fan operates it draws the air through the fan aperture in the cowling, thus closing the flaps and allowing all the air drawn in to cool down the radiator **(see illustrations)**.

Precautions

Warning: Do not attempt to remove the expansion tank filler cap, or to disturb any part of the cooling system, while the engine is hot, as there is a high risk of scalding. If the expansion tank filler cap must be removed before the engine and radiator have fully cooled (even though this is not recommended), the pressure in the cooling system must first be relieved. Cover the cap with a thick layer of cloth to avoid scalding, and slowly unscrew the filler cap until a hissing sound is heard. When the hissing has stopped, indicating that the pressure has reduced, slowly unscrew the filler cap until it can be removed; if more hissing sounds are heard, wait until they have stopped before unscrewing the cap completely. At all times, keep well away from the filler cap opening, and protect your hands.

Warning: Do not allow antifreeze to come into contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately, with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.

Warning: If the engine is hot, the electric cooling fan may start rotating even if the engine is not running. Be careful to keep your hands, hair, and any loose clothing well clear when working in the engine compartment.

Warning: Refer to Section 10 for precautions to be observed when working on models equipped with air conditioning.

2 Cooling system hoses – disconnection and renewal

Note: *Refer to the warnings given in Section 1 of this Chapter before proceeding. Hoses should only be disconnected once the engine has cooled sufficiently to avoid scalding.*

1 If the checks described in Chapter 1A or 1B reveal a faulty hose, it must be renewed as follows.

2 First drain the cooling system (Chapter 1A or 1B). If the coolant is not due for renewal, it may be re-used, providing it is collected in a clean container.

3 To disconnect a hose, proceed as follows, according to the type of hose connection.

Standard hose connections

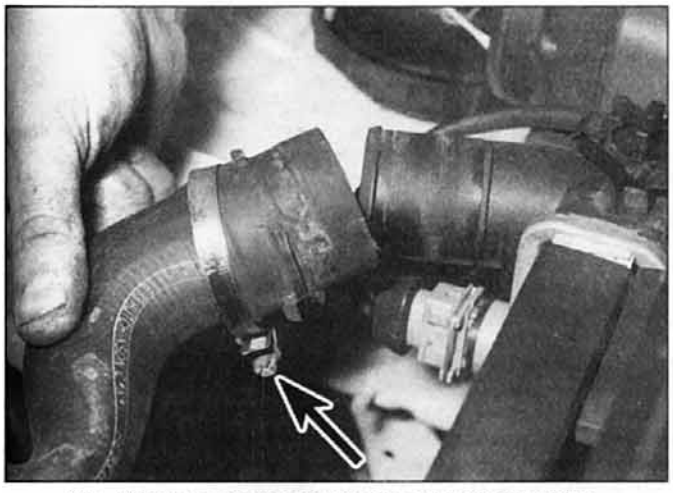
4 On conventional connections, the clips used to secure the hoses in position may be standard worm drive clips, spring clips or disposable crimped types. The crimped type of clip is not designed to be re-used, and a worm drive or spring clip type used on reassembly.

5 To disconnect a hose, use a screwdriver to slacken or release the worm drive clips, or squeeze the tags together with a pair of pliers on the spring type **(see illustrations)**. Move the clips along the hose, clear of the relevant inlet/outlet then carefully work the hose free. The hoses can be removed with relative ease when new – on an older car, they may have stuck.

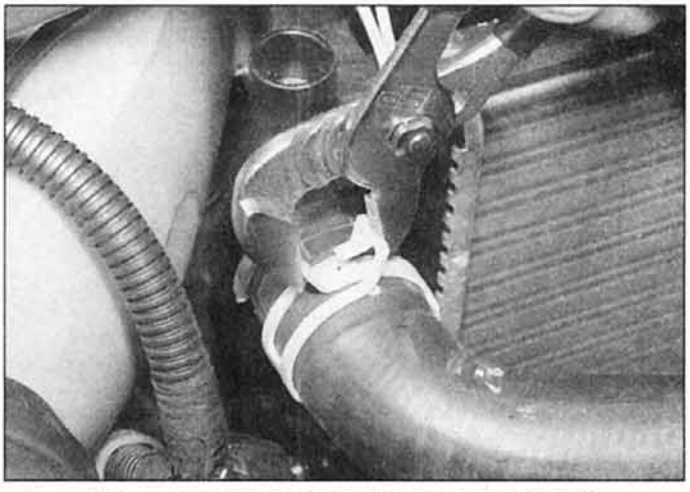
6 If a hose proves to be difficult to remove, try to release it by rotating its ends before attempting to free it. Gently prise the end of the hose with a blunt instrument (such as a flat-bladed screwdriver), but do not apply too much force, and take care not to damage the pipe stubs or hoses. Note in particular that the radiator inlet stub is fragile; do not use excessive force when attempting to remove the hose. If all else fails, cut the hose with a sharp knife, then slit it so that it can be peeled off in two pieces. Although this may prove expensive if the hose is otherwise undamaged, it is preferable to buying a new radiator. Check first, however, that a new hose is readily available.

HAYNES HINT

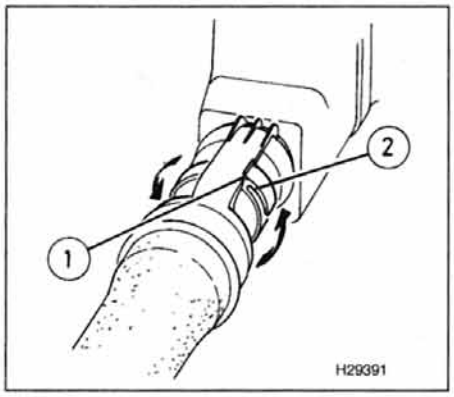
If the hose is stiff, use a little soapy water as a lubricant, or soften the hose by soaking it in hot water. Do not use oil or grease, which may attack the rubber.



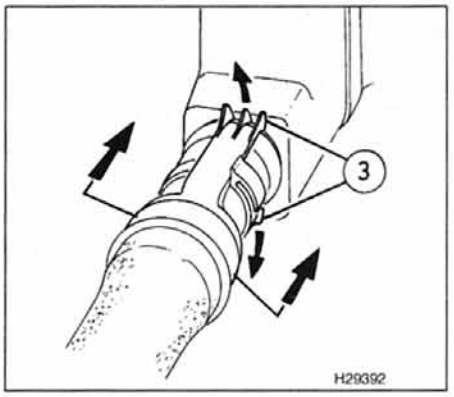
2.5a Disconnect a conventional coolant hose with a screwdriver . . .



2.5b . . . or the spring clip type with a pair of pliers



2.12 To release a bayonet-type hose, turn the locking ring (2) until it contacts the stop (1) . . .



2.13 . . . then press the connector away from the hose to ensure that the retaining lugs (3) are free

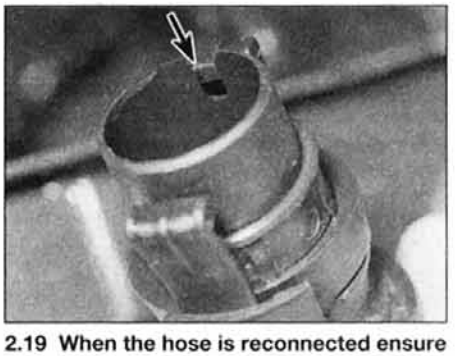
7 When fitting a hose, first slide the clips onto the hose, then work the hose into position. If crimped-type clips were originally fitted, use standard worm drive clips when refitting the hose.
8 Work the hose into position, checking that it is correctly routed, then slide each clip back along the hose until it passes over the flared end of the relevant inlet/outlet, before tightening the clip securely.
9 Refill the cooling system (see Chapter 1A or 1B).
10 Check thoroughly for leaks as soon as possible after disturbing any part of the cooling system.

Bayonet-type connections

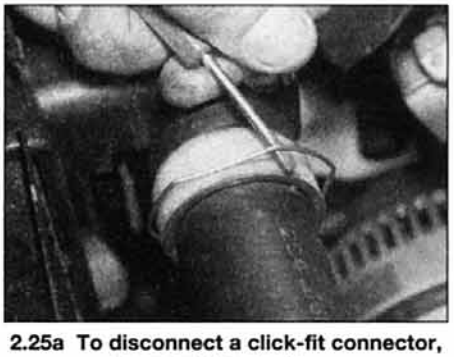
Note: *A new sealing ring should be used when reconnecting the hose.*

11 On certain models, some hoses may be secured in position using a plastic bayonet-type connection. To disconnect this type of connector, proceed as follows.
12 Turn the locking ring (2) anti-clockwise until it contacts the stop (1) **(see illustration)**.
13 Press the connector away from the hose, to ensure that the two retaining lugs (3) are free **(see illustration)**.
14 Pull the hose and its connector from the radiator.

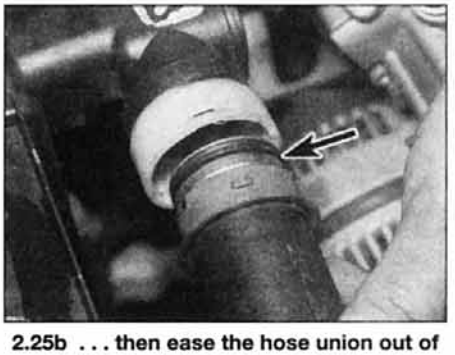
2.17 Prior to refitting, fit a new sealing ring (arrowed) to the hose union



2.19 When the hose is reconnected ensure its cut-out (arrowed) is correctly positioned



2.25a To disconnect a click-fit connector, lever out the circlip . . .



2.25b . . . then ease the hose union out of position and remove the sealing ring (arrowed)

15 Recover the sealing ring from the connector, and discard it; a new one must be used on refitting.
16 On refitting, wipe the connector and the stub on the radiator thoroughly with a clean, lint-free cloth.
17 Fit a new sealing ring to the male half of the connector, ensuring that it is correctly seated **(see illustration)**.
18 Turn the locking ring clockwise until it clicks.
19 Offer the hose to the union making sure the cut-out is correctly positioned to align with the locating lug **(see illustration)**.
20 Push the connector fully into position until both the retaining lugs click into position. Make sure that the sealing ring is not trapped.
21 Pull the connector rearwards (away from the stub) to adjust the position of the retaining lugs if necessary.
22 Refill the cooling system (see Chapter 1A or 1B).
23 Check thoroughly for leaks as soon as possible after disturbing any part of the cooling system.

Click-fit connections

Note: *A new sealing ring should be used when reconnecting the hose.*
24 On certain models, some cooling system hoses are secured in position with click-fit connectors where the hose union is retained by a large circlip.
25 To disconnect this type of hose, using a small flat-bladed screwdriver, carefully prise the circlip out of position. The hose connection can then be slid out of position and the sealing ring removed **(see illustrations)**. Once the hose is disconnected, refit the circlip to the female end of the connection.
26 On refitting, ensure that the circlip is correctly located in its groove in the female end of the connection, and fit the new sealing ring to the hose union. Push the hose connection into position, taking care not trap the sealing ring, until it clicks into position.
27 Ensure that the hose is securely retained by the circlip then refill the cooling system as described in Chapter 1A or 1B.
28 Check thoroughly for leaks as soon as possible after disturbing any part of the cooling system.

3 Radiator – removal, inspection and refitting

Note: *New sealing rings must be used when reconnecting bayonet-type/click-fit radiator hoses – see Section 2. If leakage is the reason for removing the radiator, bear in mind that minor leaks can often be cured using a radiator sealant with the radiator in situ.*

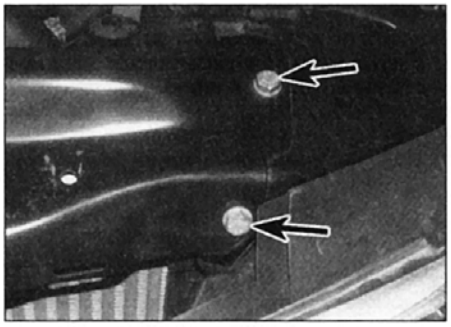
Removal

1 Disconnect the battery negative lead.

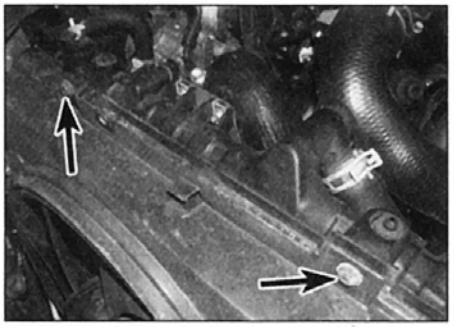
2 Drain the cooling system (see Chapter 1A or 1B).
3 Where necessary, disconnect the wiring connector from the cooling fan switch which is screwed into the radiator.
4 Disconnect the coolant hoses from the radiator with reference to Section 2.
5 Remove the radiator grille as described in Chapter 11.
6 Undo the four retaining bolts (two each side) and remove the front crossmember from across the top of the radiator **(see illustration)**. The bonnet release cable can be left attached to the lock, and the crossmember moved to one side of the engine bay
7 Working at the top of the radiator, undo the two retaining bolts and release the top radiator mounting brackets **(see illustration)**.
8 On diesel models, it will be necessary to free the intercooler from the side of the radiator as it is removed. Where applicable, undo the retaining bolts and remove the heat exchanger from the radiator **(see illustrations)**.
9 On all models, disengage the air conditioning condenser and the electric fan cowling from the radiator.
10 Lift the radiator out of position, taking care not to damage the radiator fins on surrounding components. Take care not to lose the radiator lower mounting rubbers.

Inspection

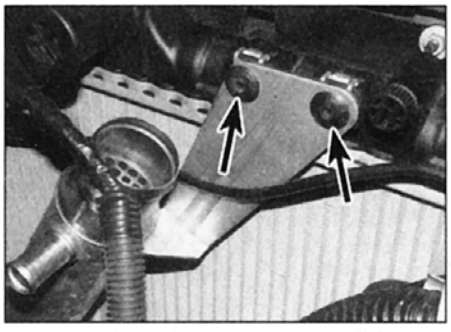
11 If the radiator has been removed due to suspected blockage, reverse-flush it as described in Chapter 1A or 1B. Clean dirt and debris from the radiator fins, using an air line (in which case, wear eye protection) or a soft brush. Be careful, as the fins are sharp, and easily damaged.
12 If necessary, a radiator specialist can perform a 'flow test' on the radiator, to establish whether an internal blockage exists.
13 A leaking radiator must be referred to a specialist for permanent repair. Do not attempt to weld or solder a leaking radiator, as damage to the plastic components may result.
14 If the radiator is to be sent for repair or renewed, remove all hoses and the cooling fan switch (where fitted).



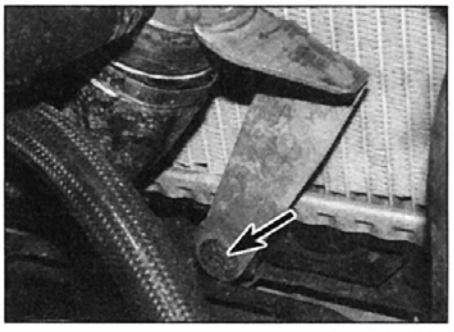
3.6 Undo the four crossmember retaining bolts (two on left-hand side arrowed)



3.7 Undo the two retaining bolts (arrowed) from the radiator top mountings



3.8a Undo the two upper mounting bolts (arrowed) . . .



3.8b . . . and the lower mounting bolt (arrowed) to release the heat exchanger from the radiator

15 Inspect the condition of the radiator mounting rubbers, and renew them if necessary.

Refitting

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

a) Ensure that the lower lugs on the radiator are correctly engaged with the mounting rubbers in the body panel. On diesel models, also ensure that the intercooler is correctly engaged with the radiator.

b) Reconnect the hoses with reference to Section 2, using new sealing rings where applicable.

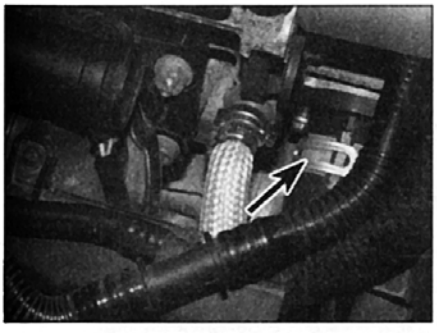
c) On completion, refill the cooling system as described in Chapter 1A or 1B.

4 Thermostat – removal, testing and refitting

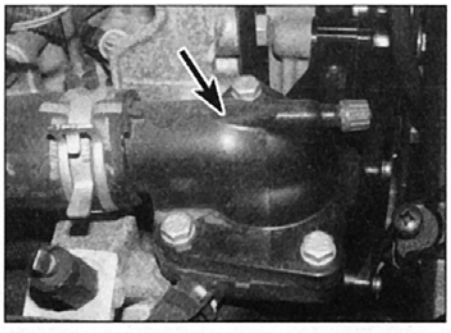
Note: *A new thermostat sealing ring/gasket will be required on refitting.*

Removal

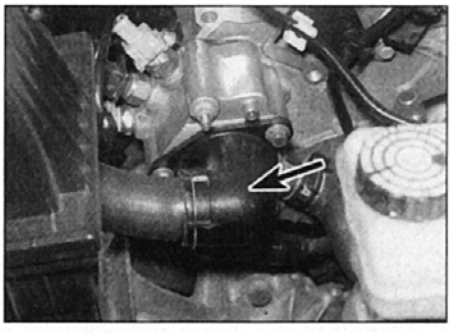
1 Disconnect the battery negative lead.
2 Drain the cooling system as described in Chapter 1A or 1B. On all models, the thermostat housing is mounted on the left-hand end of the cylinder head **(see illustrations)**.
3 Where necessary, release any relevant wiring and hoses from the retaining clips, and position clear of the thermostat housing to improve access.



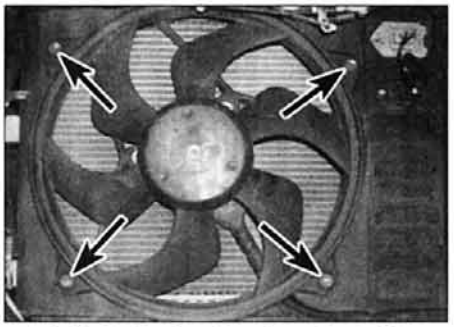
4.2a On petrol (EW engines) models, the thermostat housing (arrowed) is at the front . . .



4.2b . . . on diesel models it is on the top of the coolant housing on the left-hand side of the cylinder head (arrowed) . . .



4.2c . . . and on petrol (XU engines) it is on the side of the cylinder head (arrowed)



5.6 Undo the four fan shroud retaining bolts (arrowed)

4 Disconnect the coolant hose(s) from the thermostat housing (see Section 2).
5 Unscrew the retaining nuts/bolts (as applicable) and carefully withdraw the thermostat housing cover to expose the thermostat.
6 Lift the thermostat from the housing, and recover the sealing ring.

Testing

7 A rough test of the thermostat may be made by suspending it with a piece of string in a container full of water. Heat the water to bring it to the boil – the thermostat must open by the time the water boils. If not, renew it.
8 If a thermometer is available, the precise opening temperature of the thermostat may be determined; compare with the figures given in the Specifications. The opening temperature is also marked on the thermostat.
9 A thermostat which fails to close as the water cools must also be renewed.

Refitting

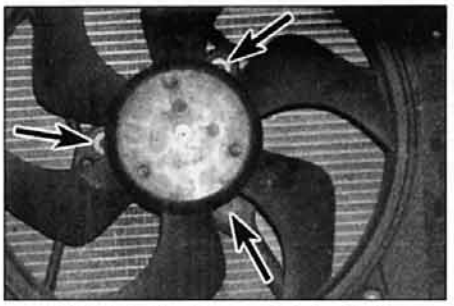
10 Refitting is a reversal of removal, bearing in mind the following points:

a) Always fit a new sealing ring and ensure that the thermostat is fitted the correct way round, with the spring(s) facing into the housing.
b) On models where the coolant hose is secured to the housing with a click-fit connector, renew the connector sealing ring (see Section 2).
c) On completion, refill the cooling system as described in Chapter 1A or 1B.

5 Electric cooling fan(s) – testing, removal and refitting

Testing

1 Current supply to the cooling fan(s) is via the ignition switch and a fuse (Chapter 12), and are controlled by the Bitron sensor – see Section 6.
2 If a fan does not appear to work, run the engine until normal operating temperature is reached, then allow it to idle. The fan should cut in within a few minutes (before the temperature gauge needle enters the red section, or before the coolant temperature warning light comes on).
3 If the fan fails to operate, check that battery voltage is available at the feed wire to the switch; if not, then there is a fault in the feed wire (possibly due to a fault in the fan motor, or a blown fuse).
4 If the switch and the wiring are in good condition, the fault must lie in the motor itself. The motor can be checked by disconnecting it from the wiring loom and connecting a 12 volt supply directly to it.



5.7 Undo the three retaining bolts (arrowed) to remove the fan motor from its mounting bracket

Removal

5 Remove the radiator grille as described in Chapter 11.
6 Slacken and remove the four retaining bolts **(see illustration)**, then remove the outer fan shroud from the radiator cowling.
7 Undo the three retaining bolts to release the fan motor from the mounting bracket **(see illustration)**, then manoeuvre it out from between the shroud and bumper (the wiring connector will disconnect automatically).
8 If necessary, slide off retaining clip/undo the retaining screw (as applicable) and remove the fan from the motor spindle.
9 If the motor is faulty, the complete unit must be renewed, as no spares were available at the time of writing.

Refitting

10 Refitting is a reversal of removal, noting the following points.

a) Prior to refitting, inspect the fan shroud mountings, renewing them if they show signs of wear or damage.

6.7a Remove the retaining clip . . .

b) Ensure that any wiring is correctly routed and secured in position with all the relevant clips and ties so that it is no danger of contacting the fan.
c) Refit the radiator grille as described in Chapter 11.

6 Cooling system electrical switches and sensors – testing, removal and refitting

Coolant temperature sensor

Testing

1 The coolant temperature sensor is screwed into the alloy thermostat/coolant housing. On models with a plastic thermostat/coolant housing it is held in place by a retaining clip. The thermostat/coolant housing is bolted onto the left-hand end of the cylinder head. The sensor can be identified by its green wiring connector.
2 The sensor is a thermistor (see paragraph 18). The fuel injection/engine management electronic control unit (ECU) supplies the sensor with a set voltage and then, by measuring the current flowing in the sensor circuit, it determines the engine's temperature. This information is then used, in conjunction with other inputs, to control the injector opening time (pulse width). On some models, the idle speed and/or ignition timing settings are also temperature-dependent.
3 If the sensor circuit should fail to provide adequate information, the ECU's back-up facility will override the sensor signal. In this event, the ECU assumes a predetermined setting which will allow the fuel injection/engine management system to run, albeit at reduced efficiency. When this occurs, the warning light on the instrument panel will come on, and the advice of a Peugeot dealer should be sought. The sensor itself can only be tested using special Peugeot diagnostic equipment. *Do not* attempt to test the circuit using any other equipment, as there is a high risk of damaging the ECU.

Removal

4 The sensor is located in the coolant housing on the left-hand side of the cylinder head. The engine and radiator should be cold before removing the sensor.
5 Disconnect the battery negative lead. On some models, access to the sensor is very poor, and certain components may need to be removed before the sensor can be reached.
6 Partially drain the cooling system to just below the level of the sensor (as described in Chapter 1A or 1B). Alternatively, have ready a suitable bung to plug the switch aperture when the sensor is removed.
7 On models with a plastic thermostat/coolant housing, disconnect the wiring plug from the sensor, then release the retaining clip and remove the sensor **(see illustrations)**. Recover the sealing ring on removal. If the system has not been drained, plug the switch aperture to prevent further coolant loss.

8 On models with an alloy thermostat/coolant housing, disconnect the wiring plug from the sensor, then carefully unscrew the sensor. Where fitted recover the sealing ring. If the system has not been drained, plug the switch aperture to prevent further coolant loss.

Refitting

9 Refitting is a reversal of removal, noting the following points:

a) Use a new sealing ring on refitting.
b) Make sure the sensor retaining clip is correctly located.
c) Refill (or top-up) the cooling system as described in Chapter 1A or 1B.

10 On completion, start the engine and run it until it reaches normal operating temperature. Continue to run the engine, and check that the cooling fan cuts in and out correctly.

Fan sensor – XU engine

11 The cooling fans are controlled by the air conditioning/coolant temperature unit which is located behind the left-hand front headlight unit. The coolant temperature sensor is located in the thermostat housing, which is bolted to the left-hand end of the cylinder head **(see illustration)**.

12 The sensor forms part of the air conditioning/coolant control system (see Section 10). Testing of the sensor should be entrusted to a Peugeot dealer.

Removal

13 Carry out the procedures as described in paragraphs 4 to 6.

14 Disconnect the wiring plug from the sensor, then carefully unscrew the sensor from the thermostat housing, where fitted recover the sealing ring. If the system has not been drained, plug the switch aperture to prevent further coolant loss.

Refitting

15 Refitting is a reversal of removal, noting the following points:

a) Where applicable, use a new sealing ring on refitting.
b) Make sure the sensor retaining clip is correctly located.
c) Refill (or top-up) the cooling system as described in Chapter 1A or 1B.

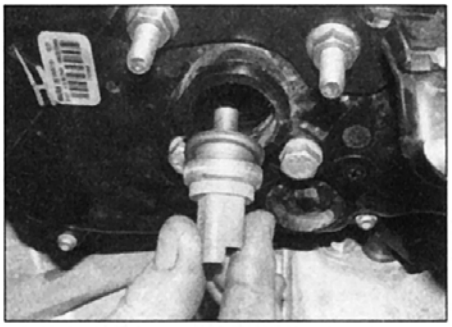
16 On completion, start the engine and run it until it reaches normal operating temperature. Continue to run the engine, and check that the cooling fan cuts in and out correctly.

Temperature gauge/warning light sender – XU engine

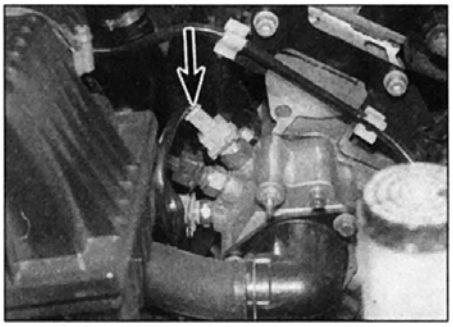
Testing

17 The coolant temperature gauge/warning light sender is screwed into the left-hand end of the cylinder head. The sender can be identified by its blue wiring connector **(see illustration 6.11)**.

18 The temperature gauge (where fitted) is fed with a stabilised voltage from the instrument panel feed (via the ignition switch and a fuse). The gauge earth is controlled by the sender. The sender contains a thermistor – an electronic component whose electrical resistance decreases at a predetermined rate as its temperature rises. When the coolant is cold, the sender resistance is high, current flow through the gauge is reduced, and the gauge needle points towards the blue (cold) end of the scale. As the coolant temperature rises and the sender resistance falls, current flow increases, and the gauge needle moves towards the upper end of the scale. If the sender is faulty, it must be renewed.



6.7b . . . and withdraw the temperature sensor (renew the sealing ring on refitting)



6.11 On XU engine models, the switches/senders are screwed into the thermostat housing (arrowed)

19 On models with a temperature warning light, the light is fed with a voltage from the instrument panel. The light earth is controlled by the sender. The sender is effectively a switch, which operates at a predetermined temperature to earth the light and complete the circuit. If the light is fitted in addition to a gauge, the senders for the gauge and light are incorporated in a single unit, with two wires, one each for the light and gauge earths.

20 If the gauge develops a fault, first check the other instruments; if they do not work at all, check the instrument panel electrical feed. If the readings are erratic, there may be a fault in the voltage stabiliser, which will necessitate renewal of the stabiliser (the stabiliser is integral with the instrument panel printed circuit board – see Chapter 12). If the fault lies in the temperature gauge alone, check it as follows.

21 If the gauge needle remains at the 'cold' end of the scale when the engine is hot, disconnect the sender wiring plug, and earth the relevant wire to the cylinder head. If the needle then deflects when the ignition is switched on, the sender unit is proved faulty, and should be renewed. If the needle still does not move, remove the instrument panel (Chapter 12) and check the continuity of the wire between the sender unit and the gauge, and the feed to the gauge unit. If continuity is shown, and the fault still exists, then the gauge is faulty, and the gauge unit should be renewed.

22 If the gauge needle remains at the 'hot' end of the scale when the engine is cold, disconnect the sender wire. If the needle then returns to the 'cold' end of the scale when the ignition is switched on, the sender unit is proved faulty, and should be renewed. If the needle still does not move, check the remainder of the circuit as described previously.

23 The same basic principles apply to testing the warning light. The light should illuminate when the relevant sender wire is earthed.

Removal and refitting

24 The procedure is similar to that described previously in this Section for the electric cooling fan thermostatic sensor. On some models, access to the switch is very poor, and other components may need to be removed before the sender unit can be reached.

7 Coolant pump – removal and refitting

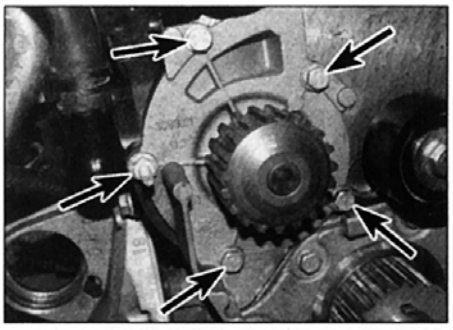
Removal

1 The coolant pump is located in a housing at the timing belt end of the engine and is driven by the timing belt.

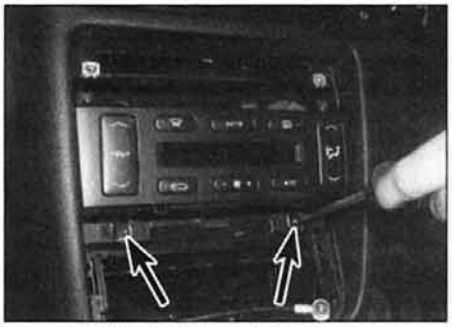
2 Drain the cooling system as described in Chapter 1A or 1B.

3 Remove the timing belt as described in the relevant part of Chapter 2.

4 Slacken and remove the retaining bolts **(see illustration)** and withdraw the pump assembly from the engine, along with its gasket/sealing ring. Discard the gasket/sealing ring, a new one must be used on refitting.



7.4 Undo the retaining bolts (arrowed) to remove the coolant pump – 2.2 litre diesel engine



9.3 Undo the retaining screws (arrowed) . . .

Refitting

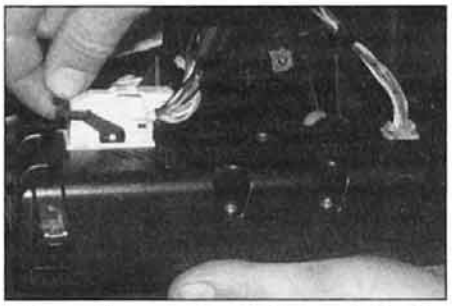
5 Ensure that the pump and cylinder block/housing mating faces are clean and dry.
6 Offer up the new gasket/sealing ring and fit the pump assembly, tighten its retaining bolts securely.
7 Refit the timing belt as described in the relevant Part of Chapter 2.
8 Refill the cooling system as described in Chapter 1A or 1B.

8 Heating and ventilation system – general information

The heating/ventilation system consists of a fully adjustable blower motor (housed behind the facia), face level vents in the centre and at each end of the facia, and air ducts to the front footwells.

The control unit is located in the facia, and the controls operate flap valves to deflect and mix the air flowing through the various parts of the heating/ventilation system. The flap valves are contained in the air distribution housing, which acts as a central distribution unit, passing air to the various ducts and vents.

Cold air enters the system through the grille at the rear of the engine compartment. If required, the airflow is boosted by the blower, and then flows through the various ducts, according to the settings of the controls. Stale air is expelled through ducts at the rear of the vehicle. If warm air is required, the cold air is



9.5 . . . then manoeuvre the control unit out of position, and disconnect its wiring connectors (fully automatic unit shown)

passed over the heater matrix, which is heated by the engine coolant.

A recirculation lever/switch enables the outside air supply to be closed off, while the air inside the vehicle is recirculated. This can be useful to prevent unpleasant odours entering from outside the vehicle, but should only be used briefly, as the recirculated air inside the vehicle will soon become stale.

9 Heater/ventilation components – removal and refitting

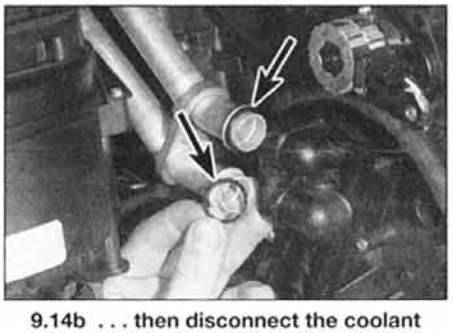
Note: *On models with fully automatic air conditioning system, there are no heater/ventilation control cables fitted.*

Control unit

Removal

1 Disconnect the battery negative lead.
2 Remove the radio/cassette unit and the facia centre switch panel unit as described in Chapter 12.
3 Remove the control unit retaining screws and carefully withdraw the control unit from the facia **(see illustration)**.
4 Working at the rear of the control unit, release the securing clips, and disconnect the control cables (where applicable) from the unit. Note the locations of the cables to ensure correct refitting.
5 Disconnect the wiring connector(s) from the rear of the control unit and withdraw the unit from the facia **(see illustration)**.

9.14a Undo the retaining screw (shown with the facia removed for clarity) . . .



9.14b . . . then disconnect the coolant pipes from the heater matrix and recover the sealing rings (arrowed)

Refitting

6 Refitting is a reversal of removal, but ensure that the control cables (where fitted) are securely reconnected to their original locations. Check the operation of the controls prior to refitting the radio/cassette and display units.

Control cables

Removal

7 Disconnect the cables from the heater/ventilation control unit, as described previously in this Section during the control unit removal procedure.
8 Working through the facia aperture or under the facia (it may be necessary to remove certain facia panels for access – refer to Chapter 11 – depending on which cable is to be removed), release the clips and disconnect the relevant cable from the heater assembly. Note the routing of the cable to ensure correct refitting.

Refitting

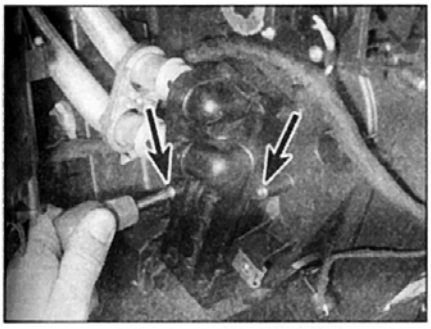
9 Refitting is a reversal of removal, ensuring that the cables are correctly routed, and securely reconnected. Check the cable operation before refitting the trim panels.

Heater matrix

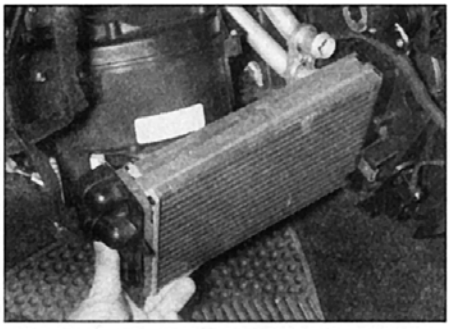
Note: *New heater matrix union sealing rings must be used on refitting. If leakage is the reason for removing the matrix, bear in mind that minor leaks can often be cured using a radiator sealant with the matrix in situ.*

Removal

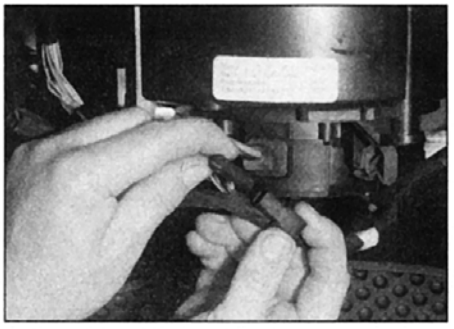
10 Drain the cooling system as described in Chapter 1A or 1B. Alternately, clamp the heater matrix hoses as close as possible to the engine compartment bulkhead.
11 On left-hand drive models, remove the steering column as described in Chapter 10. Undo the retaining bolts and remove the facia mounting support bracket to gain access to the heater matrix.
12 On right-hand drive models remove the glovebox as described in Chapter 11, Section 28. Remove the retaining clips and lower the undercover away from the passenger side of the facia.
13 Position a container beneath the unions on the side of the heater matrix, and place absorbent rags around the container as a precaution.
14 Slacken and remove the retaining bolt, and ease the coolant pipes away from the matrix, allowing the coolant to drain into the container. Remove the sealing rings from the pipe ends and discard them; new ones must be used on refitting **(see illustrations)**.
15 Slacken and remove the heater matrix screws, and slide the matrix out of position **(see illustrations)**. **Note:** *On some models, the end of the facia mounting bracket may prevent removal of the matrix. If so, trim the end of the bracket off to gain the necessary clearance.* As the matrix is being removed, try to keep the pipe unions uppermost to



9.15a Undo the retaining screws (arrowed) . . .



9.15b . . . then carefully slide the heater matrix out from its housing



9.19 Disconnect the wiring connectors, then undo the retaining screws . . .

minimise coolant spillage. Mop up any spilt coolant immediately with a damp cloth to prevent staining.

Refitting

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

a) Fit new sealing rings to the pipe unions.

b) Slide the matrix into position and engage the pipes fully with the matrix union. Refit the retaining bolts and union bolt, and tighten them securely. Remove the hose clamps (where fitted).

c) Refill/top-up the cooling system as described in Chapter 1A or 1B.

Heater blower motor

Removal

17 The blower motor assembly is located on the passenger side of the facia, in the base of the blower motor housing.

18 Disconnect the battery negative lead. Remove the retaining clips, and unclip the undercover from the bottom of the passenger side of the facia. If necessary, to further improve access remove the glovebox as described in Chapter 11, Section 28.

19 Disconnect the wiring connector(s) from the motor and release the wiring harness from its retaining clips **(see illustration)**.

20 Slacken and remove the motor retaining screws, and lower the motor assembly away from the housing **(see illustration)**.

Refitting

21 Refitting is a reversal of removal.

Blower motor control module

Removal

22 Remove the blower motor as described in paragraphs earlier in this Section.

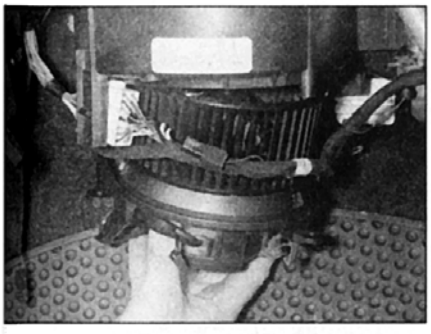
23 Release the wiring harness grommet from the base of the motor assembly. Disconnect the connector from the module/motor and remove the harness **(see illustration)**.

24 Depress the motor retaining clips and separate the motor from its mounting plate **(see illustrations)**.

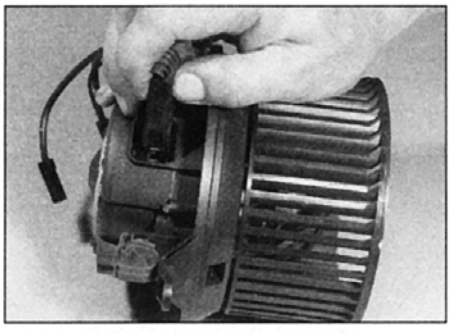
25 Slacken and remove the retaining screws and remove the control module from the mounting plate **(see illustration)**.

Refitting

26 Refitting is the reverse of removal, ensuring that the motor is clipped securely into position on the mounting plate. Also make sure that the wiring is correctly routed and retained by all the necessary clips.



9.20 . . . and lower the blower motor out of position (facia removed for clarity)



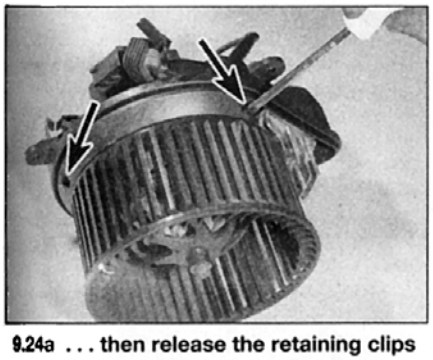
9.23 Disconnect the wiring connector . . .

10 Air conditioning system – general information and precautions

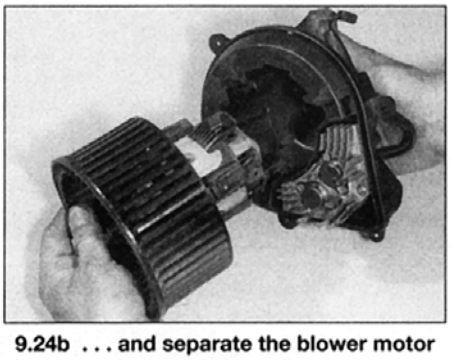
General information

1 An air conditioning system is available on all models. It enables the temperature of incoming air to be lowered, and also dehumidifies the air, which makes for rapid demisting and increased comfort.

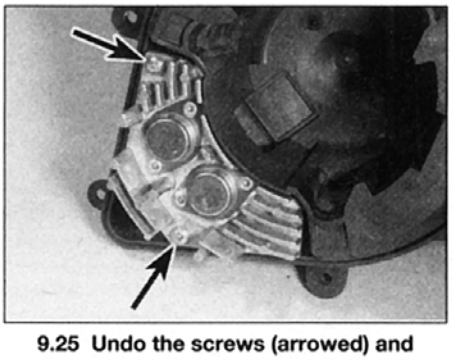
2 The cooling side of the system works in the same way as a domestic refrigerator. Refrigerant gas is drawn into a belt-driven compressor, and passes into a condenser mounted on the front of the radiator, where it loses heat and becomes liquid. The liquid passes through an expansion valve to an evaporator, where it changes from liquid



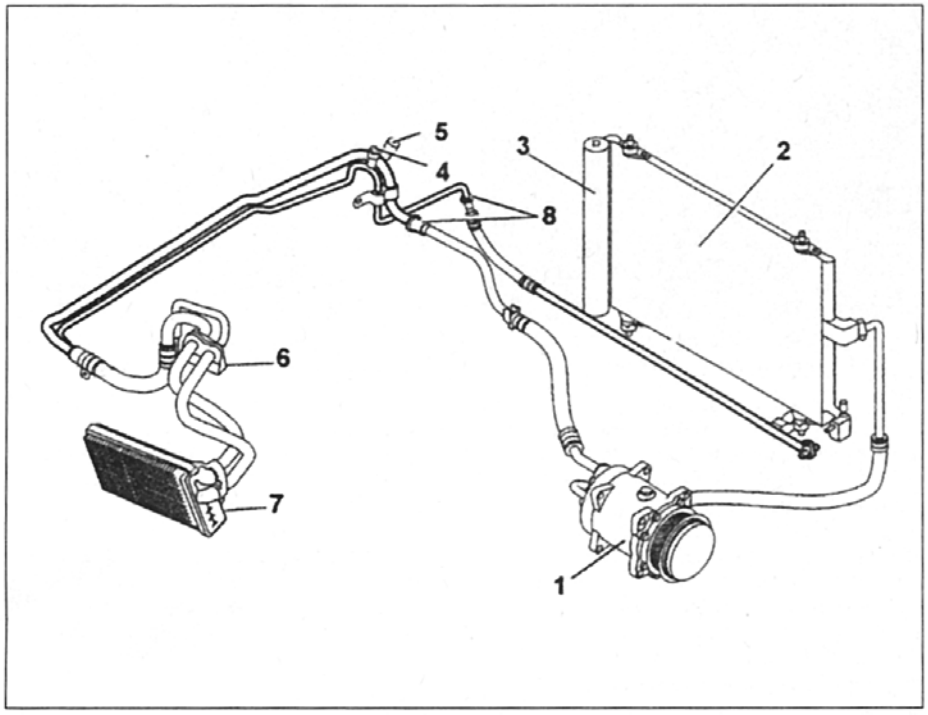
9.24a . . . then release the retaining clips (arrowed) . . .



9.24b . . . and separate the blower motor and mounting plate

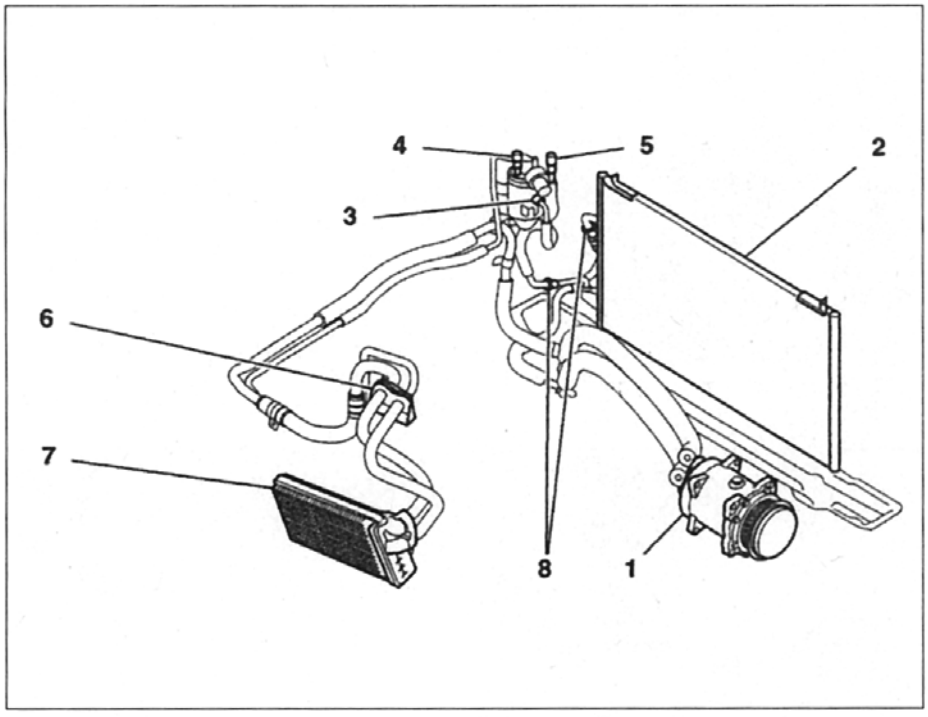


9.25 Undo the screws (arrowed) and remove the blower motor control module



10.2a Layout of the air conditioning system (XU engines)

1 Compressor
2 Condenser
3 Dehydrator reservoir
4 High pressure valve
5 Low pressure valve
6 Pressure relief valve
7 Evaporator
8 'Click-on' connections



10.2b Layout of the air conditioning system (EW and DW engines)

1 Compressor
2 Condenser
3 Dehydrator reservoir
4 High pressure valve
5 Low pressure valve
6 Pressure relief valve
7 Evaporator
8 'Click-on' connections

under high pressure to gas under low pressure. This change is accompanied by a drop in temperature, which cools the evaporator. The refrigerant returns to the compressor, and the cycle begins again **(see illustrations)**.

3 Air blown through the evaporator passes to the air distribution unit, where it is mixed with hot air blown through the heater matrix to achieve the desired temperature.

4 The heating side of the system works the same way as on models without air conditioning (see Section 8).

5 The operation of the system is controlled electronically by the ECU, which controls the electric cooling fan(s), the compressor and the facia-mounted warning light. Any problems with the system should be referred to a Peugeot dealer.

Precautions

6 When an air conditioning system is fitted, it is necessary to observe special precautions whenever dealing with any part of the system, or its associated components. If for any reason the system must be disconnected, entrust this task to your Peugeot dealer or a refrigeration engineer.

Warning: The refrigeration circuit contains a liquid refrigerant (Freon), and it is therefore dangerous to disconnect any part of the system without specialised knowledge and equipment.

7 The refrigerant is potentially dangerous, and it should therefore only be handled by qualified persons, such as your Peugeot dealer. If it is splashed onto the skin, it can cause frostbite. It is not itself poisonous, but in the presence of a naked flame (including a cigarette) it forms a poisonous gas. Uncontrolled discharging of the refrigerant is dangerous, and potentially damaging to the environment.

8 Do not operate the air conditioning system if it is known to be short of refrigerant, as this may damage the compressor.

11 Air conditioning system components – removal and refitting

Warning: Do not attempt to open the refrigerant circuit. Refer to the precautions in Section 10.

1 The only operation which can be carried out easily without discharging the refrigerant is the renewal of the compressor drivebelt. This is described in Chapter 1A or 1B. The temperature sensor may be renewed using the information in Section 6. All other operations must be referred to a Peugeot dealer or an air conditioning specialist.

2 If necessary, the compressor can be unbolted and moved aside, without disconnecting its flexible hoses, after removing the drivebelt.

Chapter 4 Part A:
Fuel and exhaust system – petrol models

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

System type

1.8 litre XU7JP4 models	Bosch Motronic MP5.1.1, MP7.3 or Sagem SL96
1.8 litre EW7J4 models	Sagem S2000 MPI
2.0 litre EW10J4 models	Magneti Marelli 4.8P

Fuel system data

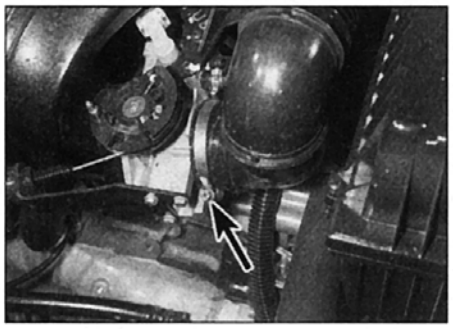
Fuel pump type	Electric, immersed in tank
Specified idle speed:	
1.8 litre engine	700 ± 50 rpm (not adjustable – controlled by ECU)
2.0 litre engine	850 ± 50 rpm (not adjustable – controlled by ECU)
Idle mixture CO content	Less than 0.4 % (not adjustable- controlled by ECU)

Recommended fuel

Minimum octane rating	95 RON unleaded (UK unleaded premium)

Torque wrench settings

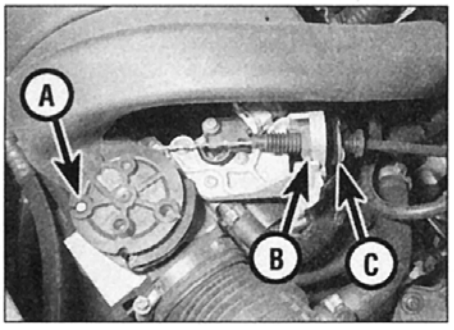
	Nm	lbf ft
Exhaust manifold nuts	35	26
Inlet manifold nuts	20	15



2.1 Slacken the clip (arrowed) and disconnect the intake duct from the throttle housing

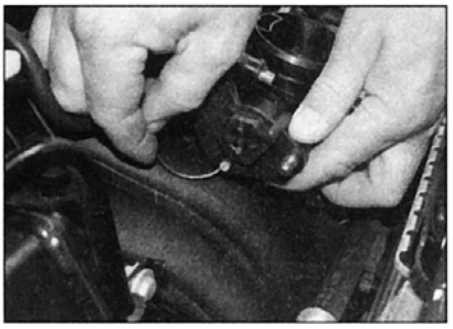
1 General information and precautions

The fuel supply system consists of a fuel tank (which is mounted under the rear of the car, with an electric fuel pump immersed in it), a fuel filter, fuel feed and return lines. The fuel pump supplies fuel to the fuel rail, which acts as a reservoir for the four fuel injectors which inject fuel into the inlet tracts. The fuel filter incorporated in the feed line from the pump to the fuel rail ensures that the fuel supplied to the injectors is clean.



3.1a Accelerator cable connections – 1.8 litre XU7 engine

A Inner cable attachment at throttle housing cam
B Mounting bracket rubber grommet
C Flat washer and spring clip



3.1b Releasing the inner cable from the throttle housing cam – 1.8 litre EW7 engine

Refer to Section 6 for further information on the operation of each fuel injection system. Throughout this Section, it is also occasionally necessary to identify vehicles by their engine codes rather than by engine capacity alone. Refer to the relevant Part of Chapter 2 for further information on engine code identification.

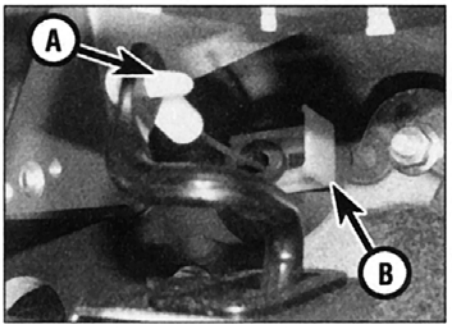
Warning: Many of the procedures in this Chapter require the removal of fuel lines and connections, which may result in some fuel spillage. Before carrying out any operation on the fuel system, refer to the precautions given in 'Safety first!' at the beginning of this manual, and follow them implicitly.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

Note: *Residual pressure will remain in the fuel lines long after the vehicle was last used. When disconnecting any fuel line, first depressurise the fuel system (see Section 7).*

2 Air cleaner assembly and intake ducts – removal and refitting

Removal

1 Slacken the retaining clips and disconnect the intake duct from the throttle housing and air cleaner housing lid **(see illustration)**.
2 Undo the screws securing the lid to the air cleaner housing body. Lift off the lid and take out the filter element.
3 Lift the housing body upward to disengage it from the lower locating lugs. On some models, as the housing is lifted up, it will be necessary to disengage a small plastic retaining tag at the front securing the housing to the cold air intake duct underneath.
4 To remove the cold air intake duct, undo the air cleaner housing mounting bracket bolts and withdraw the bracket. Release the cold air intake from the bracket as it is removed.
5 Release the other end of the cold air intake from its body attachments and manipulate the duct from the car.



3.4 Accelerator cable end fitting (A) and outer cable plastic retainer (B)

Refitting

6 Refitting is a reversal of the removal procedure, ensuring that all hoses are properly reconnected, and that all ducts are correctly seated and securely held by their retaining clips.

3 Accelerator cable – removal, refitting and adjustment

Removal

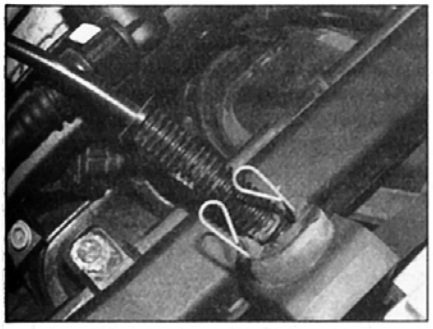
1 Working in the engine compartment, free the accelerator inner cable from the cam on the throttle housing, then pull the outer cable out from its mounting bracket rubber grommet. Slide the flat washer off the end of the cable, and remove the spring clip **(see illustrations)**.
2 Working back along the length of the cable, free it from any retaining clips or ties, noting its correct routing.
3 Working from inside the vehicle, rotate the fastener through 90° and lower the fusebox cover. Disconnect the wiring connector from the key pad then slacken and remove the retaining screws and remove the driver's side lower panel from the facia.
4 Release the retaining clip, and detach the inner cable from the top of the accelerator pedal **(see illustration)**.
5 Release the outer cable from its retainer on the pedal mounting bracket, then tie a length of string to the end of the cable.
6 Return to the engine compartment, release the cable grommet from the bulkhead and withdraw the cable. When the end of the cable appears, untie the string and leave it in position – it can then be used to draw the cable back into position on refitting.

Refitting

7 Tie the string to the end of the cable, then use the string to draw the cable into position through the bulkhead. Once the cable end is visible, untie the string, then clip the outer cable into its pedal bracket retainer, and clip the inner cable into position in the pedal end.
8 Check that the cable is securely retained, then refit the lower panel to the facia.
9 Within the engine compartment, ensure the outer cable is correctly seated in the bulkhead grommet, then work along the cable, securing it in position with the retaining clips and ties, and ensuring the cable is correctly routed.
10 Slide the flat washer onto the cable end, and refit the spring clip.
11 Pass the outer cable through the mounting bracket grommet on the throttle housing, and reconnect the inner cable to the throttle cam. Adjust the cable as described below.

Adjustment

12 Remove the spring clip from the accelerator outer cable **(see illustration)**.



3.12 Accelerator cable adjustment ferrule and spring clip – 2.0 litre EW10 engine

Ensuring that the throttle cam is fully against its stop, gently pull the cable out of its grommet until all free play is removed from the inner cable.

13 With the cable held in this position, refit the spring clip to the last exposed outer cable groove in front of the rubber grommet and washer. When the clip is refitted and the outer cable is released, there should be only a small amount of free play in the inner cable.

14 Have an assistant depress the accelerator pedal, and check that the throttle cam opens fully and returns smoothly to its stop.

4 Accelerator pedal – removal and refitting

Removal

1 Disconnect the accelerator cable from the pedal as described in Section 3.

2 According to type either remove the screws from the pedal pivot bush, or unscrew the nut (or remove the spring clip) from the end of the pedal pivot shaft. Where a pivot shaft and nut arrangement is used, unscrew the nut whilst retaining the pivot shaft with an open-ended spanner on the flats provided.

3 Remove the pedal, or pull the pedal and pivot shaft assembly from the support bracket according to type.

Refitting

4 Refitting is a reversal of the removal procedure, applying a little multi-purpose grease to the pedal pivot point. On completion, adjust the accelerator cable as described in Section 3.

5 Unleaded petrol – general information and usage

Note: *The information given in this Chapter is correct at the time of writing. If updated information is thought to be required, check with a Peugeot dealer. If travelling abroad, consult one of the motoring organisations (or a similar authority) for advice on the fuel available.*

1 All Peugeot 406 petrol engines are designed to run on unleaded fuel with a minimum octane rating of 95 (RON). All engines have a catalytic converter, and so must be run on unleaded fuel **only**. Under no circumstances should leaded fuel, or lead replacement petrol (LRP) be used, as this will damage the converter.

2 The manufacturer's do state, however, that for improved vehicle performance (and possibly increased fuel economy), 98 (RON) unleaded petrol may be used, where this is available.

6 Fuel injection systems – general information

Note: *The fuel injection ECU is of the 'self-learning' type, meaning that as it operates, it also monitors and stores the settings which give optimum engine performance under all operating conditions. When the battery is disconnected, these settings are lost and the ECU reverts to the base settings programmed into its memory at the factory. On restarting, this may lead to the engine running/idling roughly for a short while, until the ECU has relearned the optimum settings. This process is best accomplished by taking the vehicle on a road test (for approximately 15 minutes), covering all engine speeds and loads, concentrating mainly in the 2500 to 3500 rpm region.*

On all engines, the fuel injection and ignition functions are combined into a single engine management system. The systems fitted are manufactured by Bosch, Sagem Lucas and Magneti Marelli, and are very similar to each other in most respects, the only significant differences being within the system ECUs **(see illustrations overleaf)**. Each system incorporates a closed-loop catalytic converter and an evaporative emission control system, and complies with the latest emission control standards. Refer to Chapter 5B for information on the ignition side of each system; the fuel side of the system operates as follows.

The fuel pump supplies fuel from the tank to the fuel rail, via a renewable cartridge filter mounted underneath the rear of the vehicle. The pump itself is mounted inside the fuel tank, the pump motor is permanently immersed in fuel, to keep it cool. The fuel rail is mounted directly above the fuel injectors and acts as a fuel reservoir.

Fuel rail supply pressure is controlled by the pressure regulator, mounted at the end of the fuel rail or, on later Bosch systems, in front of the fuel tank. The regulator contains a spring-loaded valve, which lifts to allow excess fuel to return to the tank when the optimum operating pressure of the fuel system is exceeded (eg, during low speed, light load cruising). The regulator also contains a diaphragm which is supplied with vacuum from the inlet manifold. This allows the regulator to reduce the fuel supply pressure during light load, high manifold depression conditions (eg, during idling or deceleration) to prevent excess fuel being 'sucked' through the open injectors.

The fuel injectors are electromagnetic valves, which spray atomised fuel into the inlet manifold tracts under the control of the engine management system ECU. There are four injectors, one per cylinder, mounted in the inlet manifold close to the cylinder head. Each injector is mounted at an angle that allows it to spray fuel directly onto the back of the inlet valve(s). The ECU controls the volume of fuel injected by varying the length of time for which each injector is held open.

The fuel injection systems are typically of the simultaneous injection type, whereby all four injectors open at the same time and fuel is injected into each cylinder's inlet tract twice per engine cycle; once during the power stroke and once during the induction stroke. On later Bosch systems, however, sequential fuel injection is used whereby each injector operates individually in cylinder sequence.

The electrical control system consists of the ECU, along with the following sensors:

a) Throttle potentiometer – informs the ECU of the throttle valve position, and the rate of throttle opening/closing.

b) Coolant temperature sensor – informs the ECU of engine temperature.

c) Inlet air temperature sensor – informs the ECU of the temperature of the air passing through the throttle housing.

d) Lambda sensor – informs the ECU of the oxygen content of the exhaust gases (explained in greater detail in Part C of this Chapter).

e) Manifold pressure sensor – informs the ECU of the load on the engine (expressed in terms of inlet manifold vacuum).

f) Crankshaft sensor – informs the ECU of engine speed and crankshaft angular position.

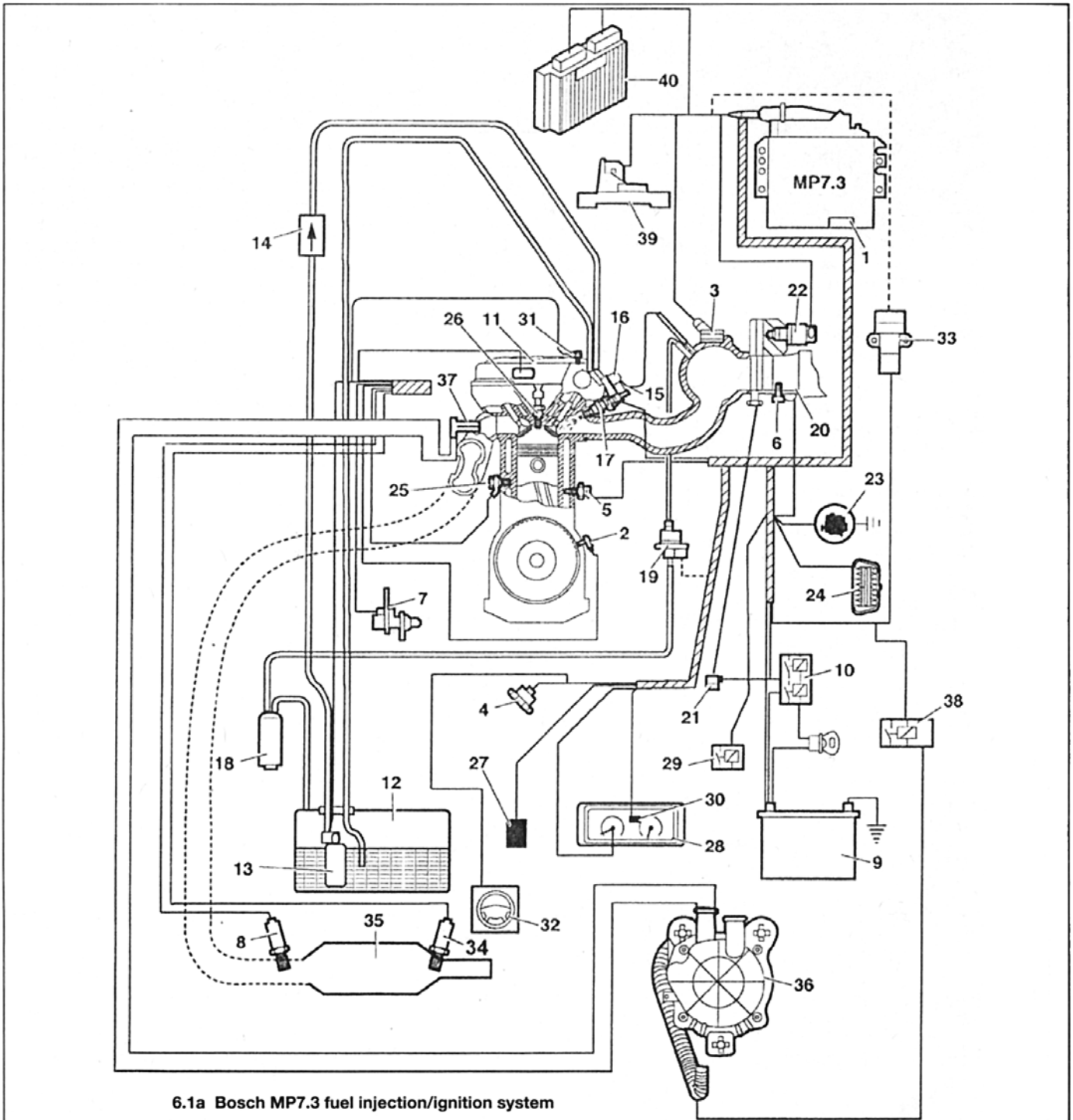
g) Vehicle speed sensor – informs the ECU of the vehicle speed.

h) Knock sensor – informs the ECU of pre-ignition (detonation) within the cylinders. Not all systems utilise this sensor.

i) Camshaft sensor – informs the ECU of which cylinder is on the firing stroke on later systems with sequential injection.

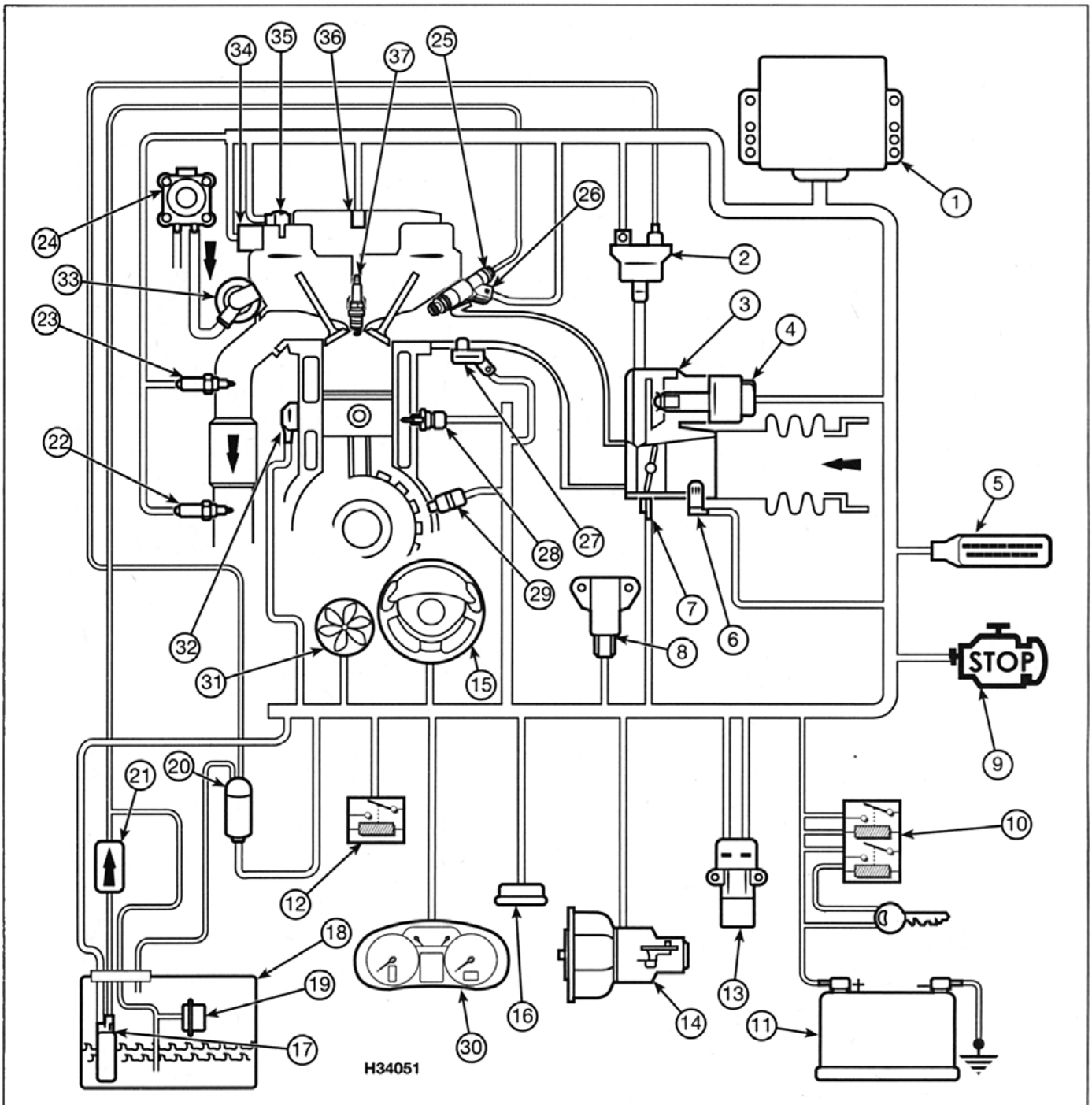
Signals from each of the sensors are compared by the ECU and, based on this information, the ECU selects the response appropriate to those values, and controls the fuel injectors (varying the pulse width – the length of time the injectors are held open – to provide a richer or weaker air/fuel mixture, as appropriate). The air/fuel mixture is constantly varied by the ECU, to provide the best settings for cranking, starting (with either a hot or cold engine) and engine warm-up, idle, cruising and acceleration.

The ECU also has full control over the engine idle speed, typically via a stepper



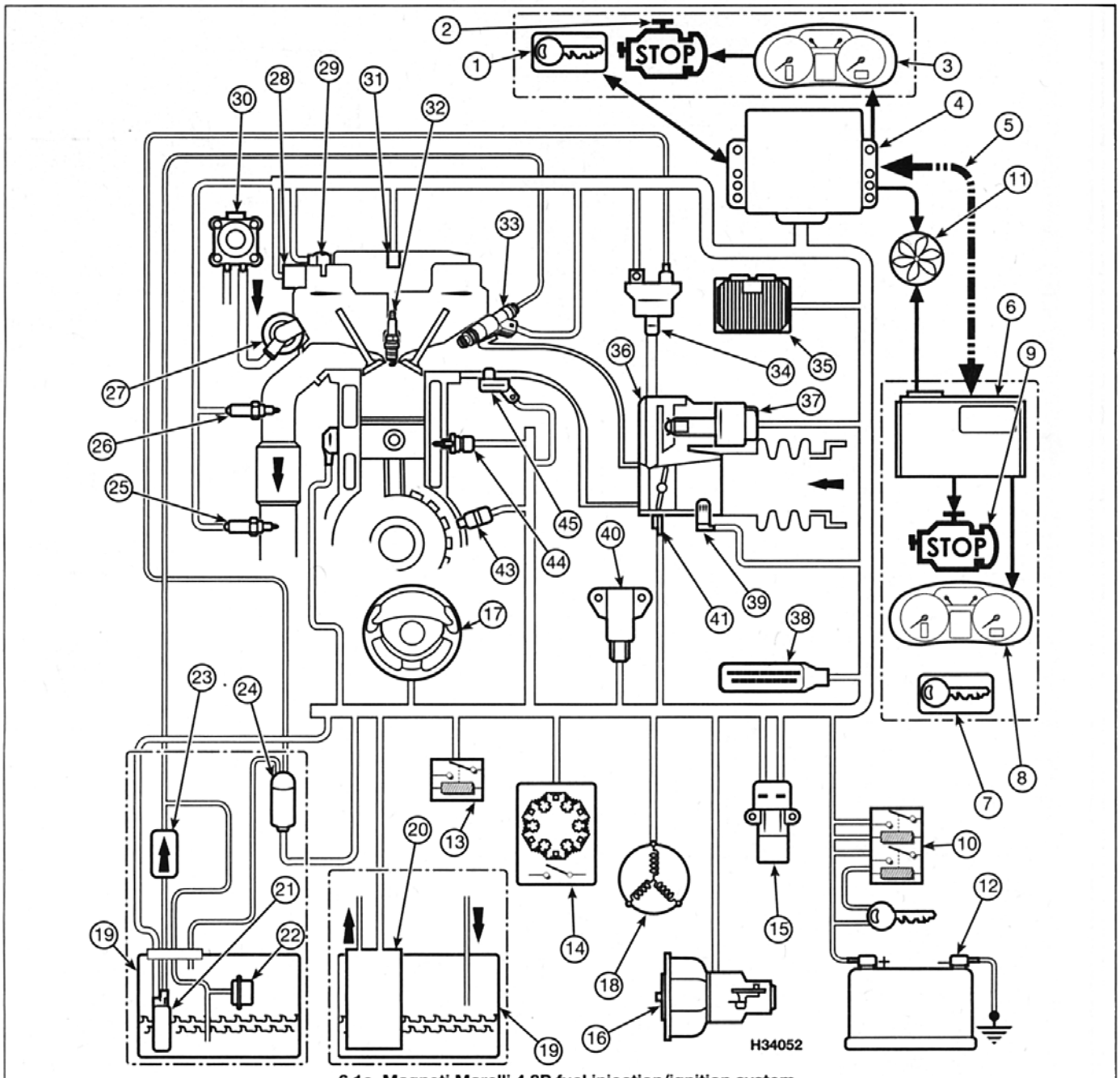
6.1a Bosch MP7.3 fuel injection/ignition system

1 *Ignition/injection ECU*
2 *Engine speed sensor*
3 *Induction air pressure sensor*
4 *Throttle position sensor*
5 *Coolant temperature sensor*
6 *Inlet air temperature sensor*
7 *Vehicle speed sensor*
8 *Upstream oxygen sensor*
9 *Battery*
10 *Engine management multi-function double relay*
11 *Ignition coil*
12 *Fuel tank*
13 *Fuel pump*
14 *Fuel filter*
15 *Fuel rail*
16 *Pressure regulator*
17 *Fuel injectors*
18 *Fuel evaporative system charcoal canister*
19 *Purge canister solenoid valve*
20 *Throttle housing*
21 *Throttle housing heating resistor*
22 *Idle control stepper motor*
23 *Engine diagnosis warning light*
24 *Diagnostic connector*
25 *Knock sensor*
26 *Spark plugs*
27 *Electronic immobiliser*
28 *Tachometer*
29 *Heating/ventilation*
30 *Fuel consumption data*
31 *Cylinder reference sensor*
32 *Power steering fluid pressure sensor*
33 *Inertia switch*
34 *Downstream oxygen sensor*
35 *Catalytic converter*
36 *Pulsair pump*
37 *Exhaust air injection valve*
38 *Pulsair relay*
39 *Body accelerometer*
40 *Automatic transmission ECU*



6.1b Sagem 2000 fuel injection/ignition system

1 *Ignition/injection ECU*
2 *Purge canister solenoid valve*
3 *Throttle housing*
4 *Idle control stepper motor*
5 *Diagnostic connector*
6 *Inlet air temperature sensor*
7 *Throttle housing heating resistor*
8 *Throttle position sensor*
9 *Engine diagnosis warning light*
10 *Engine management multi-function double relay*
11 *Battery*
12 *Air conditioning relay*
13 *Inertia switch*
14 *Vehicle speed sensor*
15 *Power steering fluid pressure sensor*
16 *Electronic immobiliser*
17 *Fuel pump*
18 *Fuel tank*
19 *Fuel pressure regulator*
20 *Fuel evaporative system charcoal canister*
21 *Fuel filter*
22 *Upstream oxygen sensor*
23 *Downstream oxygen sensor*
24 *Pulsair pump*
25 *Fuel rail*
26 *Fuel injectors*
27 *Induction air pressure sensor*
28 *Coolant temperature sensor*
29 *Crankshaft position sensor*
30 *Instrument panel*
31 *Electric cooling fans*
32 *Knock sensor*
33 *Secondary air valve*
34 *Camshaft position sensor*
35 *EGR valve*
36 *Ignition coil module*
37 *Spark plugs*



6.1c Magneti Marelli 4.8P fuel injection/ignition system

1 *Decoder – non-multiplexed*
2 *Engine management warning light – non-multiplexed*
3 *Rev counter and instrument panel – non-multiplexed*
4 *ECU*
5 *Multiplex network*
6 *Control box – multiplexed*
7 *Immobiliser – multiplexed*
8 *Instrument panel – multiplexed*
9 *Engine management warning light – non-multiplexed*
10 *Double relay or built-in systems interface*
11 *Fans*
12 *Battery*
13 *Air conditioning relay*
14 *Air conditioning pressure switch*
15 *Inertia switch (where fitted)*
16 *Vehicle speed transmitter (where fitted)*
17 *Power steering fluid pressure switch*
18 *Alternator*
19 *Fuel tank*
20 *Fuel pump*
21 *Fuel pump*
22 *Fuel pressure regulator*
23 *Fuel filter*
24 *Charcoal canister*
25 *Lambda (oxygen) sensor (downstream)*
26 *Lambda (oxygen) sensor (upstream)*
27 *Air inlet valve*
28 *Exhaust gas recirculation (EGR) valve*
29 *Camshaft position sensor*
30 *Secondary air pump*
31 *Ignition coil module*
32 *Spark plugs*
33 *Fuel injectors and supply rail*
34 *Purge valve*
35 *Automatic transmission ECU*
36 *Throttle body*
37 *Idle control stepper motor*
38 *Diagnostic socket*
39 *Inlet air temperature sensor*
40 *Throttle position potentiometer*
41 *Throttle body heating element*
42 *Knock sensor*
43 *Engine speed sensor*
44 *Coolant temperature sensor*
45 *Inlet air pressure sensor*

motor fitted to the throttle housing. The stepper motor pushrod controls the amount of air passing through a bypass drilling at the side of the throttle. When the throttle valve is closed (accelerator pedal released), the ECU uses the motor to alter the position of the pushrod, controlling the amount of air bypassing the throttle valve and so controlling the idle speed. The ECU also carries out 'fine tuning' of the idle speed by varying the ignition timing to increase or reduce the torque of the engine as it is idling. This helps to stabilise the idle speed when electrical or mechanical loads (such as headlights, air conditioning, etc) are switched on and off.

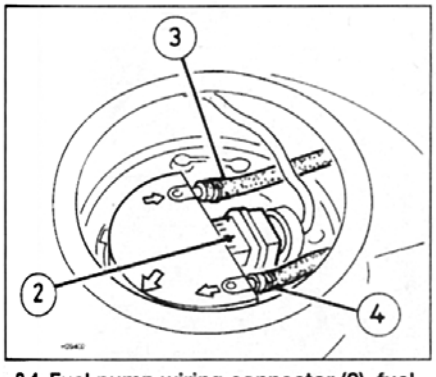
On certain Bosch systems, ECU control of the engine idle speed is by means of an auxiliary air valve which bypasses the throttle valve. When the throttle valve is closed, the ECU controls the opening of the air valve, which in turn regulates the amount of air entering the manifold, and so controls the idle speed.

The throttle housing on most engines is fitted with an electric heating element. The heater is supplied with current by the ECU, warming the throttle housing on cold-starts to help prevent icing of the throttle valve.

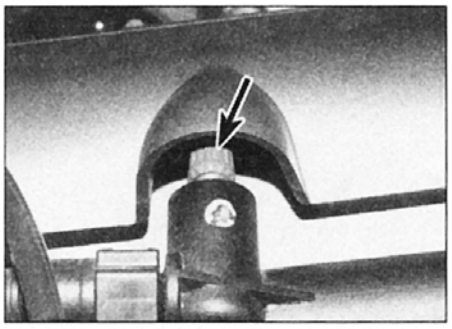
The exhaust and evaporative loss emission control systems are described in more detail in Chapter 4C.

If there is any abnormality in any of the readings obtained from the coolant temperature sensor, the inlet air temperature sensor or the lambda sensor, the ECU enters its 'back-up' mode. If this happens, the erroneous sensor signal is overridden, and the ECU assumes a pre-programmed 'back-up' value, which will allow the engine to continue running, albeit at reduced efficiency. If the ECU enters this mode, the warning lamp on the instrument panel will be illuminated, and the relevant fault code will be stored in the ECU memory.

If the warning light illuminates, the vehicle should be taken to a Peugeot dealer at the earliest opportunity. Once there, a complete test of the engine management system can be carried out, using a special electronic diagnostic test unit, which is plugged into the system's diagnostic connector.



8.4 Fuel pump wiring connector (2), fuel feed hose (3) and return hose (4)



7.2 Pressure release valve on the fuel rail

7 Fuel injection system – depressurisation

Note: *Refer to the warning note in Section 1 before proceeding.*

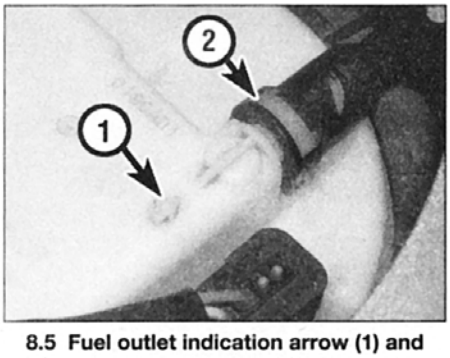
Warning: The following procedure will merely relieve the pressure in the fuel system – remember that fuel will still be present in the system components and take precautions accordingly before disconnecting any of them.

1 The fuel system referred to in this Section is defined as the tank-mounted fuel pump, the fuel filter, the fuel injectors, the fuel rail and the pressure regulator, and the metal pipes and flexible hoses of the fuel lines between these components. All these contain fuel which will be under pressure while the engine is running, and/or while the ignition is switched on. The pressure will remain for some time after the ignition has been switched off, and must be relieved in a controlled fashion when any of these components are disturbed for servicing work.

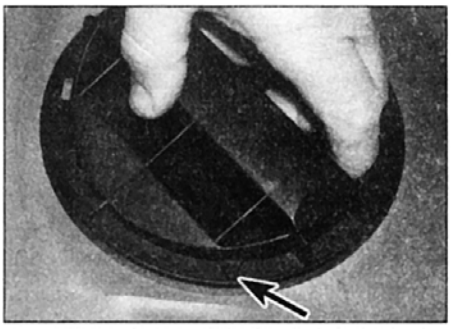
2 Peugeot technicians connect a special tube to the Schrader valve on the fuel rail in order to depressurize the fuel system **(see illustration)**. The tube incorporates a union nut which is screwed onto the valve, and an inner cable which is used to depress the valve core. If this tube is not available, cover the valve and surrounding area with cloth rag, and depress the valve with a screwdriver through the rag. Make sure that enough rag is used to soak up the fuel. Access to the valve is gained by first removing the engine top cover.

3 With the pressure released, refit the cap to the valve.

4 Note that pressure may increase again in the fuel system due to an increase in ambient temperature, so any work required on the system should be started immediately after releasing the pressure.



8.5 Fuel outlet indication arrow (1) and outlet hose (2)



8.3 Note the position of the arrow when removing the plastic access cover

8 Fuel pump – removal and refitting

Note: *Refer to the warning note in Section 1 before proceeding.*

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual). This is important, since any stray electrical discharge in the vicinity of the open fuel tank would be extremely dangerous.

2 For access to the fuel pump, remove the rear seat as described in Chapter 11.

3 Remove the plastic access cover from the floor to expose the fuel pump. Note the position of the arrow on the cover to assist refitting **(see illustration)**.

4 Disconnect the wiring connector from the top of the fuel pump **(see illustration)**.

HAYNES HINT

Tape the connector to the vehicle body in order to prevent it from disappearing behind the tank.

5 Mark the fuel supply hose (and, where applicable, the return hose) for identification purposes, then disconnect from the top of the pump. Note that quick-release unions are fitted. The supply hose is indicated by an arrow on the top of the pump **(see illustration)**.

6 Noting the alignment arrows on the tank, pump and locking ring **(see illustration)**, unscrew the locking ring and remove it from the tank. Although Peugeot recommend the use of tool 1601 to unscrew the locking ring,

this can be accomplished by using a screwdriver on the raised studs of the locking ring. Carefully tap the screwdriver to turn the ring anti-clockwise and release it. Alternatively, a home-made tool may be fabricated out of metal rod, bent to locate on the studs.

7 Lift the fuel pump assembly out of the fuel tank, taking great care not to damage the float arm, or to spill fuel inside the car. Recover the seal from the assembly and discard it; a new one must be obtained for the refitting procedure.

8 Note that the fuel pump is only available as a complete assembly – no components are available separately.

Refitting

9 Wipe clean the contact surfaces of the pump/gauge and tank, then locate a new seal on the tank. Manoeuvre the assembly into the fuel tank, ensuring that the alignment arrows are positioned correctly. Refit the locking ring and securely tighten it using the same method as for removal. The alignment arrow on the locking ring must be positioned pointing to the arrow on the tank.

10 Reconnect the supply and return hoses to the top of the fuel pump, then reconnect the wiring.

11 Refit the plastic access cover with its notch facing forwards, then refit the rear seat with reference to Chapter 11.

12 Reconnect the battery negative lead.

9 Fuel gauge sender unit – removal and refitting

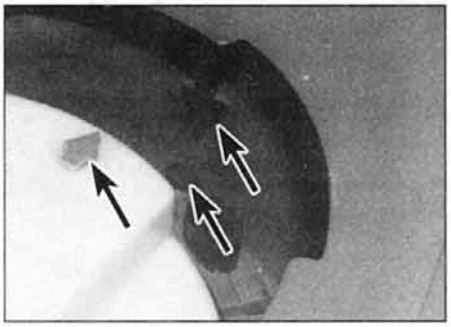
The fuel gauge sender unit is incorporated in the fuel pump – refer to Section 8.

10 Fuel tank – removal and refitting

Note: *Refer to the warning note in Section 1 before proceeding.*

Removal

1 Before removing the fuel tank, all fuel must



8.6 Note the alignment arrows on the tank, pump and locking ring

be drained from the tank. Since a fuel tank drain plug is not provided, it is preferable to carry out the removal operation when the tank is nearly empty. If there is any fuel remaining in the fuel tank, it can be removed by disconnecting the fuel supply hose and connecting a suitable hose leading to a container outside the vehicle.

2 Remove the fuel pump/gauge assembly as described in Section 8. Remove the fuel pump relay located in the engine compartment fuse/relay box, and connect a bridging wire between the terminals.

3 Chock the front wheels then jack up the rear of the vehicle and support on axle stands (see *Jacking and vehicle support*).

4 Remove the exhaust system from the catalytic converter rearward (see Section 17).

5 Unbolt and remove the exhaust heat shield from the underbody.

6 Disconnect the fuel filler pipe, breather pipe and vapour collection pipe at their tank attachments **(see illustration)**. Where the crimped-type Peugeot hose clips are fitted, cut the clips and discard them; use standard worm drive hose clips on refitting.

7 Disconnect the fuel supply and return pipes at their fuel tank connections **(see illustration)**.

8 Unclip the handbrake cable and move it aside as far as possible.

9 Place a trolley jack with an interposed block of wood beneath the tank, then raise the jack until it is supporting the weight of the tank. Position the jack so as to allow room to remove the fuel tank cradle.

10 Unscrew the fuel tank cradle mounting bolts and remove the cradle **(see illustration)**.

11 Lower the fuel tank and remove it from under the car.

12 If the tank is contaminated with sediment or water, remove the fuel pump and swill the tank out with clean fuel. The tank is injection-moulded from a synthetic material – if seriously damaged, it should be renewed. However, in certain cases, it may be possible to have small leaks or minor damage repaired. Seek the advice of a specialist before attempting to repair the fuel tank.

Refitting

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

a) When lifting the tank back into position, take care to ensure none of the hoses get trapped between the tank and body.

b) Ensure that all pipes and hoses are correctly routed, and securely held in position with their retaining clips.

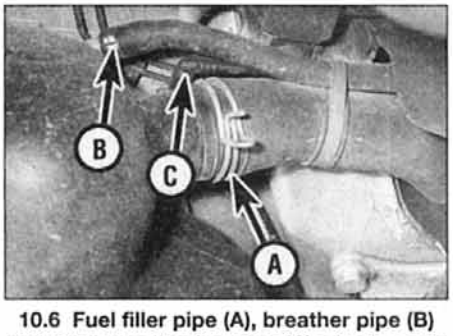
c) On completion, refill the tank with a small amount of fuel, and check for signs of leakage prior to taking the vehicle out on the road.

11 Fuel injection system – testing

Testing

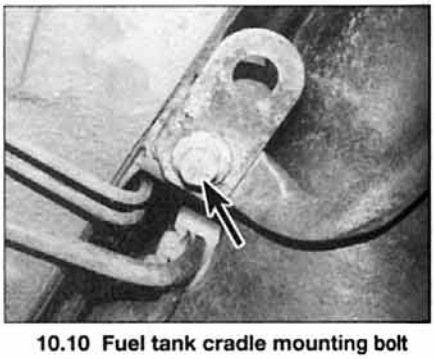
1 If a fault appears in the fuel injection/engine management system, first ensure that all the system wiring connectors are securely connected and free of corrosion. Ensure that the fault is not due to poor maintenance; ie, check that the air cleaner filter element is clean, the spark plugs are in good condition and correctly gapped, the cylinder compression pressures are correct, and that the engine breather hoses are clear and undamaged, referring to the relevant Parts of Chapters 1, 2 and 5 for further information.

2 If these checks fail to reveal the cause of the problem, the vehicle should be taken to a Peugeot dealer or suitably-equipped garage for testing. A diagnostic socket is located adjacent to the passenger compartment fusebox in which a fault code reader or other suitable test equipment can be connected. By



10.6 Fuel filler pipe (A), breather pipe (B) and vapour collection pipe (C) attachments at the fuel tank

10.7 Fuel supply and return pipe connections at the fuel tank



10.10 Fuel tank cradle mounting bolt

using the code reader or test equipment, the engine management ECU (and the various other vehicle system ECUs) can be interrogated, and any stored fault codes can be retrieved. This will allow the fault to be quickly and simply traced, alleviating the need to test all the system components individually, which is a time-consuming operation that carries a risk of damaging the ECU.

Adjustment

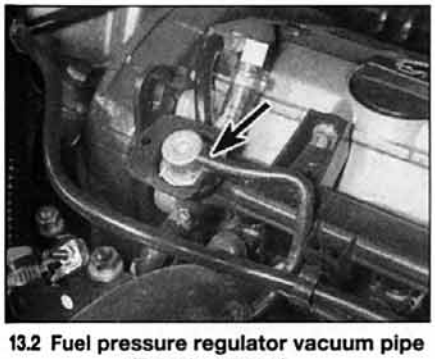
3 Experienced home mechanics with a considerable amount of skill and equipment (including a tachometer and an accurately calibrated exhaust gas analyser) may be able to *check* the exhaust CO level and the idle speed. However, if these are found to be outside the specified tolerance, the car must be taken to a suitably-equipped garage for further testing. Neither the mixture adjustment (exhaust gas CO level) nor the idle speed are adjustable, and should either be incorrect, a fault may be present in the engine management system.

12 Throttle housing – removal and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Remove the air cleaner-to-throttle housing duct as described in Section 2.



13.2 Fuel pressure regulator vacuum pipe (Bosch system)

3 Disconnect the accelerator inner cable from the throttle cam then withdraw the outer cable from the mounting bracket along with its flat washer and spring clip. Where applicable, also disconnect the arm from the diaphragm canister **(see illustration)**.

4 Depress the retaining clips, and disconnect the wiring connectors from the throttle potentiometer, the electric heating element, the inlet air temperature sensor and idle speed control stepper motor (as applicable).

5 Release the retaining clips (where fitted), and disconnect all the relevant vacuum and breather hoses from the throttle housing. Make identification marks on the hoses, to ensure that they are connected correctly on refitting.

6 Where necessary, undo the bolts or screws and release the accelerator cable bracket and housing support bracket.

7 Slacken and remove the retaining screws, and remove the throttle housing from the inlet manifold. Remove the O-ring from the manifold, and discard it – a new one must be used on refitting.

Refitting

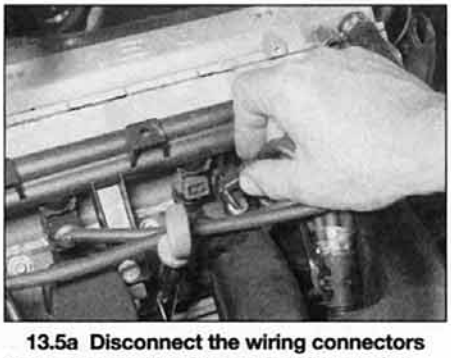
8 Refitting is a reversal of the removal procedure, noting the following points:

a) Fit a new O-ring to the manifold, then refit the throttle housing and securely tighten its retaining nuts or screws (as applicable).

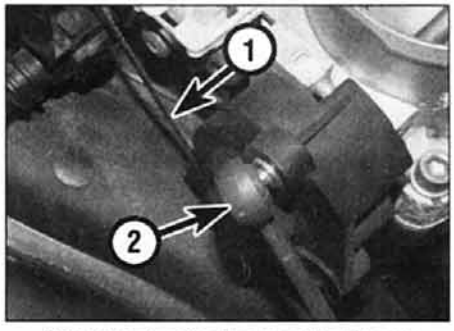
b) Ensure that all hoses are correctly reconnected and, where necessary, are securely held in position by the retaining clips.

13.3a Disconnecting the fuel feed and return hoses from the fuel rail and fuel pressure regulator on the XU7 engine . . .

13.3b . . . and on the EW7 engine



13.5a Disconnect the wiring connectors from the fuel injectors on the XU7 engine . . .



12.3 Accelerator inner cable (1) and diaphragm canister arm (2)

c) Ensure that all wiring is correctly routed, and that the connectors are securely reconnected.

d) On completion, adjust the accelerator cable as described in Section 3.

13 Bosch Motronic and Sagem Lucas system components – removal and refitting

Fuel rail and injectors

Note: *Refer to the warning note in Section 1 before proceeding. If a faulty injector is suspected, before condemning the injector, it is worth trying the effect of one of the proprietary injector-cleaning treatments which are available from car accessory shops.*

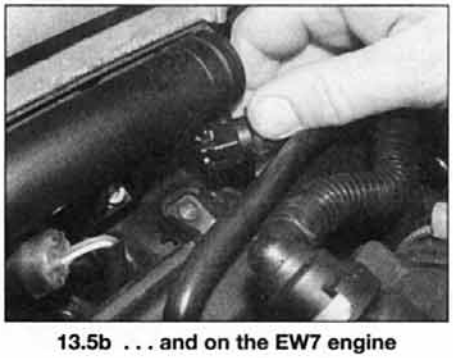
1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Disconnect the vacuum pipe from the fuel pressure regulator **(see illustration)**.

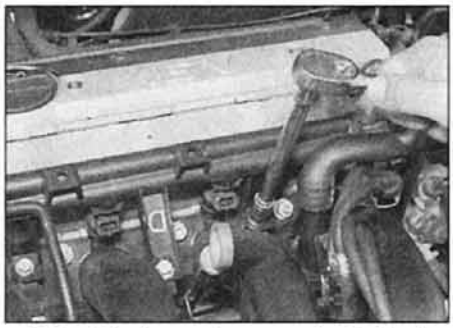
3 Bearing in mind the information given in Section 7, depress the catch on the fuel feed hose quick-release fitting, and disconnect the fuel feed (and return hoses, where applicable) from the fuel rail **(see illustrations)**. Suitably seal or plug the hose and the fuel rail union(s) after disconnection.

4 Open the retaining clips and release the wiring and hoses running along the front of the fuel rail.

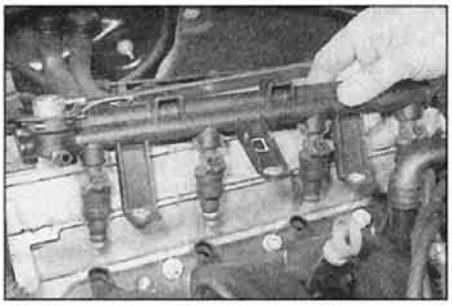
5 Depress the retaining tangs and disconnect the wiring connectors from the four injectors **(see illustrations)**.



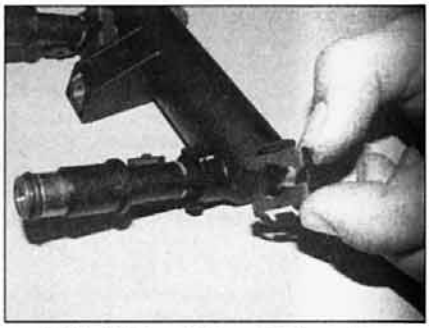
13.5b . . . and on the EW7 engine



13.6a Slacken and remove the fuel rail retaining bolts . . .

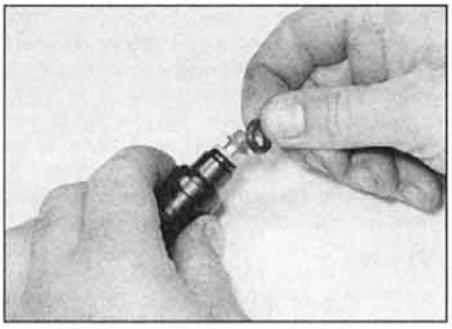


13.6b . . . then carefully ease the fuel rail and injector assembly from the inlet manifold on the XU7 engine

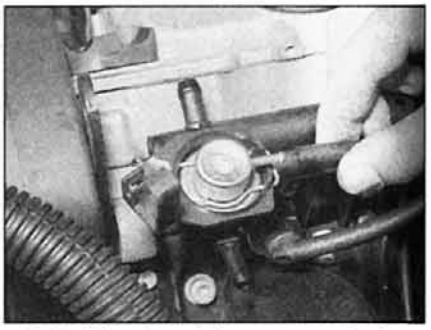


13.7a Slide out the retaining clip . . .

13.7b . . . and remove the injector from the fuel rail



13.8 Fit new O-rings to the injectors before refitting – 1.8 litre XU7 engines



13.11 Disconnect the vacuum pipe from the regulator – 1.8 litre XU7 engines

6 Slacken and remove the fuel rail retaining bolts then carefully ease the fuel rail and injector assembly out from the inlet manifold and remove it from the engine **(see illustrations)**. Remove the O-rings from the end of each injector and discard them; they must be renewed whenever they are disturbed.

7 Slide out the retaining clip(s) and remove the relevant injector(s) from the fuel rail **(see illustrations)**. Remove the upper O-ring from each disturbed injector and discard; all disturbed O-rings must be renewed.

8 Refitting is a reversal of the removal procedure, noting the following points.

a) Fit new O-rings to all disturbed injector unions ***(see illustration)****.*

b) Apply a smear of engine oil to the O-rings to aid installation then ease the injectors and fuel rail into position ensuring that none of the O-rings are displaced.

c) On completion start the engine and check for fuel leaks.

Fuel pressure regulator

Note 1: *Refer to the warning note in Section 1 before proceeding.*

Note 2: *On the S2000 MPI system, the pressure regulator is located in the fuel tank.*

9 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

10 Bearing in mind the information given in Section 7, slacken the retaining clips and disconnect the fuel feed and return hoses from the fuel rail and pressure regulator.

11 Disconnect the vacuum pipe from the regulator **(see illustration)**.

12 Place some rags under the regulator, to catch any spilt fuel. Remove the retaining clip and ease the regulator out from the fuel rail **(see illustrations)**.

13 Refitting is a reversal of the removal procedure. Examine the regulator seal for signs of damage or deterioration and renew it necessary.

Throttle potentiometer

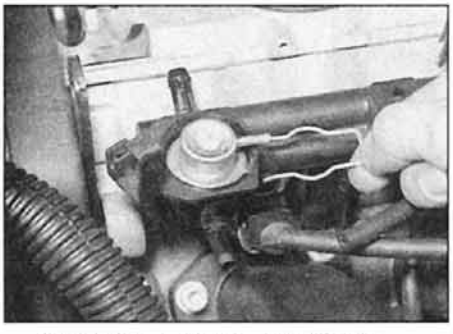
14 Depress the retaining clip and disconnect the wiring connector from the throttle potentiometer located beneath the throttle housing **(see illustrations)**.

15 Slacken and remove the two retaining screws then disengage the potentiometer from the throttle valve spindle and remove it from the vehicle.

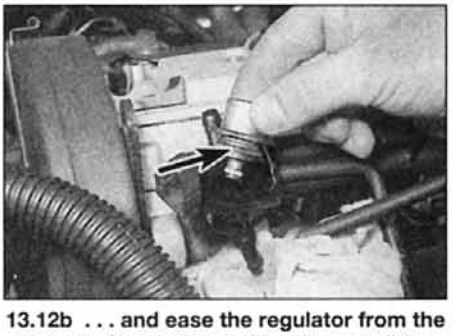
16 Refitting is a reverse of the removal procedure ensuring that the potentiometer is correctly engaged with the throttle valve spindle.

Electronic Control Unit

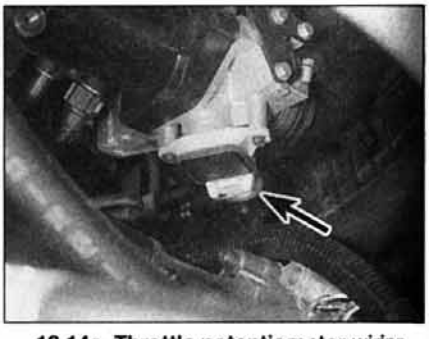
17 The ECU is located in a plastic box which is mounted on the right-hand front wheelarch.



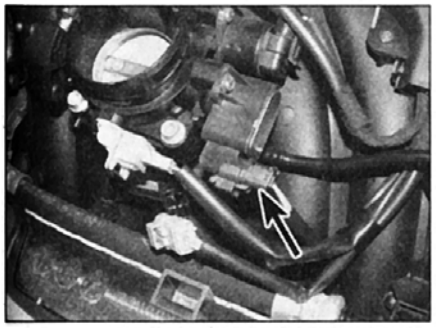
13.12a Remove the retaining clip . . .



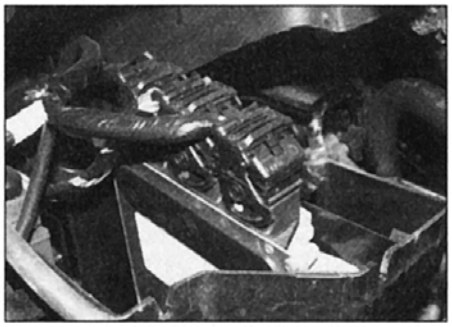
13.12b . . . and ease the regulator from the fuel rail. Check the sealing ring condition (arrowed) before refitting – XU7 engines



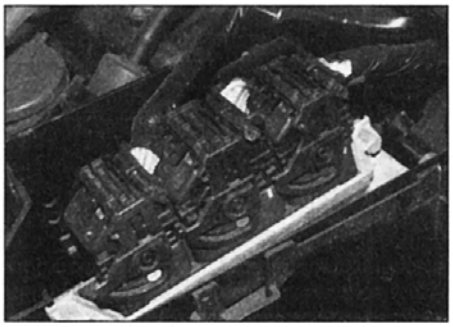
13.14a Throttle potentiometer wiring connector on the XU7 engine . . .



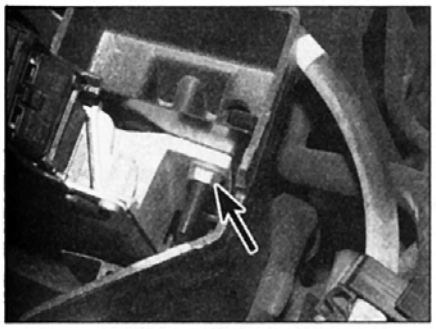
13.14b . . . and on the EW7 engine



13.18 Lift the lid for access to the ECU module

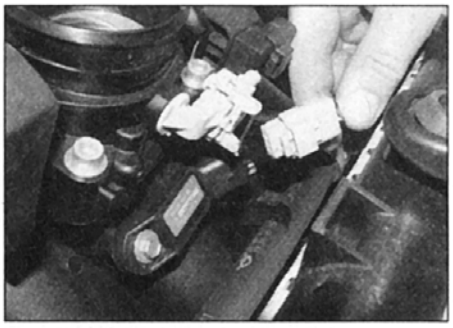


13.19 Wiring connector on the top of the Electronic Control Unit (ECU)



13.20 The ECU mounting bolts

13.23 Idle speed control stepper motor



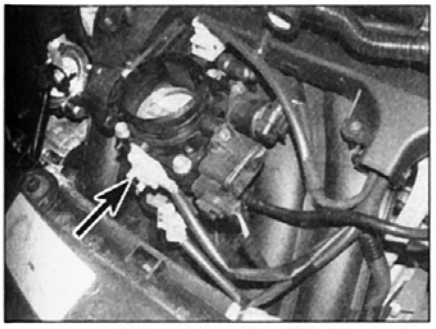
13.27 Disconnecting the wiring from the manifold absolute pressure sensor

18 Ensure that the ignition is switched off then lift off the ECU module box lid **(see illustration)**. On automatic transmission models there will be two ECUs in the box; the fuel injection/ignition ECU is the unit nearest to the engine.

19 Release the wiring connector by lifting the locking lever on top of the connector upwards. Lift the connector at the rear, disengage the tag at the front and carefully withdraw the connector from the ECU pins **(see illustration)**.

20 Unscrew the mounting bolts, then lift the ECU upwards and remove it from its location **(see illustration)**.

21 Refitting is a reversal of removal. Note that if a new ECU has been fitted, the vehicle should be taken on an extensive road test. Initially, engine performance may be less than acceptable, but should improve as the ECU control circuitry adapts to the engine parameters.



13.31 Inlet air temperature sensor

Idle speed stepper motor

22 The idle speed control stepper motor is located on the side of the throttle housing assembly.

23 Release the retaining clip, and disconnect the wiring connector from the motor **(see illustration)**.

24 Slacken and remove the two retaining screws, and withdraw the motor from the throttle housing.

25 Refitting is a reversal of the removal procedure.

Manifold absolute pressure sensor

26 The MAP sensor is situated on the underside of the inlet manifold.

27 Disconnect the wiring connector from the sensor **(see illustration)**.

28 Undo the securing screw, then pull the sensor out of the manifold.

29 Refitting is the reverse of the removal procedure.

Coolant temperature sensor

30 Refer to Chapter 3, Section 6.

Inlet air temperature sensor

31 The inlet air temperature sensor is located on the underside or front of the throttle housing **(see illustration)**.

32 Loosen the retaining clip, and release the air inlet duct from the throttle housing. The inlet air temperature sensor is visible in the top of the housing.

33 Trace the wiring back from the sensor to its wiring connector on the throttle housing, and unplug the connector.

34 The sensor itself can be pressed out of the throttle housing. Note that it is sealed in place, to prevent air leaks; a suitable sealant will be required for refitting.

35 Refitting is the reverse of removal.

Camshaft position sensor

36 The camshaft position sensor is located at the left-hand end of the exhaust camshaft cylinder head cover.

37 Undo the six screws and lift off the engine cover.

38 Disconnect the crankcase breather hose at the quick-fit connector on the rear cylinder head cover.

39 Disconnect the wiring connector at the camshaft position sensor, then undo the bolt and remove the sensor from the cylinder head cover **(see illustrations)**.

13.39a Disconnect the wiring . . .

13.39b . . . and remove the camshaft position sensor

40 Refitting is the reverse of removal but fit a new sealing O-ring to the sensor body.

Crankshaft (RPM) sensor

41 The crankshaft sensor is situated on the front face of the transmission clutch housing.

14.2 Removing the engine top cover – 2.0 litre EW engine

42 Trace the wiring back from the sensor to the wiring connector and disconnect it from the main harness.

43 Undo the retaining bolt and withdraw the sensor from the transmission.

44 Refitting is the reverse of the removal procedure.

Vehicle speed sensor

45 The vehicle speed sensor is an integral part of the transmission speedometer drive assembly. Refer to the relevant Part of Chapter 7 for removal and refitting details.

Knock sensor

46 Refer to Chapter 5B, Section 5.

Fuel injection relay unit

47 The relay unit is located in the ECU module box which is mounted on the right-hand front wheelarch.

48 Ensure that the ignition is switched off then lift off the ECU module box lid.

49 Disconnect the wiring connector and remove the relay unit from the mounting plate.

50 Refitting is the reverse of removal.

14 Magneti Marelli system components – removal and refitting

Fuel rail and injectors

Note: *Refer to the warning note in Section 1 before proceeding. If a faulty injector is suspected, before condemning the injector, it is worth trying the effect of one of the proprietary injector-cleaning treatments.*

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Unbolt and remove the engine top cover **(see illustration)**.

3 Disconnect the air duct from between the air cleaner and throttle body elbow **(see illustration)**.

4 Disconnect the wiring from the inlet air temperature sensor **(see illustration)**.

5 Loosen the clamp and remove the inlet elbow from the throttle body **(see illustrations)**.

6 Disconnect the accelerator cable from the throttle body with reference to Section 3.

7 Unbolt the wiring tray from the top of the inlet manifold, and position to one side.

8 Depress the retaining clip(s), and disconnect the wiring connector(s) from the injector(s) **(see illustration)**.

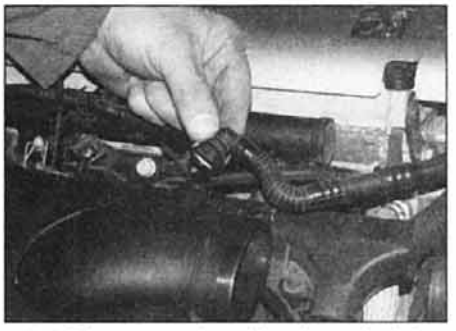
9 Unscrew the mounting bolts and carefully ease the fuel rail complete with injectors from the inlet manifold **(see illustration)**. Remove the O-rings from the end of each injector, and discard them; these must be renewed whenever they are disturbed.

10 Slide out the retaining clip(s) and remove the relevant injector(s) from the fuel rail. Remove the upper O-ring from each disturbed injector and discard; all disturbed O-rings must be renewed.

11 Refitting is a reversal of the removal procedure, noting the following points.

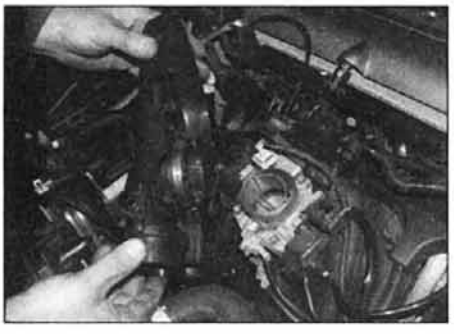
a) Fit new O-rings to all disturbed injector unions.

14.3 Removing the throttle body-to-air cleaner air duct – 2.0 litre EW engine



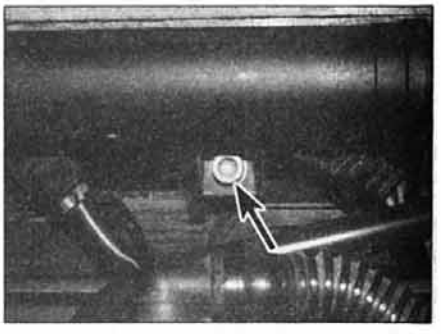
14.4 Disconnect the wiring from the inlet air temperature sensor . . .

14.5a . . . then loosen the clamp . . .

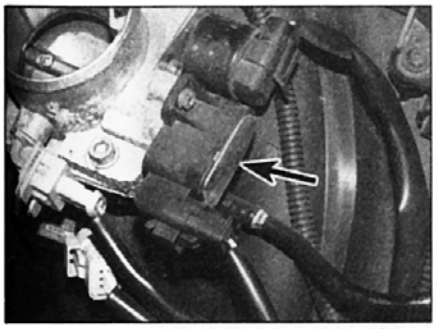


14.5b . . . and remove the inlet elbow from the throttle body – 2.0 litre EW engine

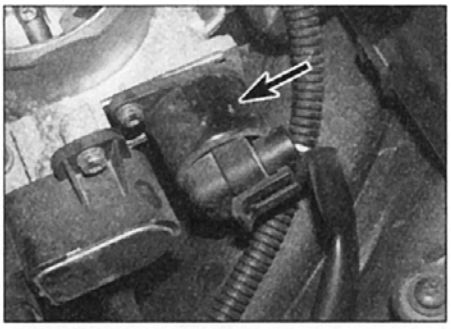
14.8 Disconnecting the wiring from the injectors – 2.0 litre EW engine



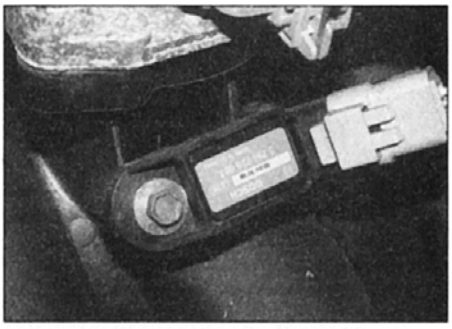
14.9 Fuel rail mounting bolt



14.13 Throttle potentiometer on the throttle body



14.18 Idle speed control stepper motor



14.22 Inlet air pressure sensor

b) Apply a smear of engine oil to the O-rings to aid installation then ease the injectors and fuel rail into position ensuring that none of the O-rings are displaced.
c) On completion start the engine and check for fuel leaks.

Fuel pressure regulator

12 The fuel pressure regulator is located in the fuel tank, and is removed together with the fuel pump and gauge sender.

Throttle potentiometer

13 The throttle potentiometer is fitted to the right-hand side of the throttle housing **(see illustration)**.
14 Release the retaining clip, and disconnect the potentiometer wiring connector.
15 Slacken and remove the two retaining screws, and remove the potentiometer from the throttle housing.
16 Refitting is the reverse of removal, ensuring that the potentiometer is correctly engaged with the throttle valve spindle.

Electronic Control Unit

17 Refer to Section 13.

Idle speed stepper motor

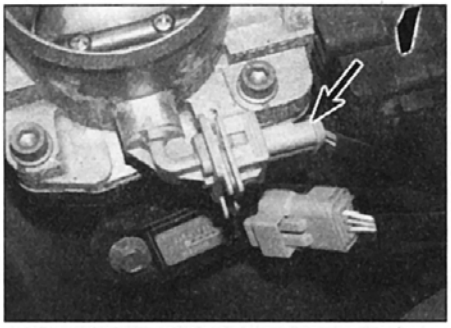
18 The idle speed control stepper motor is located on the front of the throttle housing assembly **(see illustration)**.
19 Release the retaining clip, and disconnect the wiring connector from the motor.
20 Slacken and remove the two retaining screws, and withdraw the motor from the throttle housing.
21 Refitting is a reversal of the removal procedure.

Inlet air pressure sensor

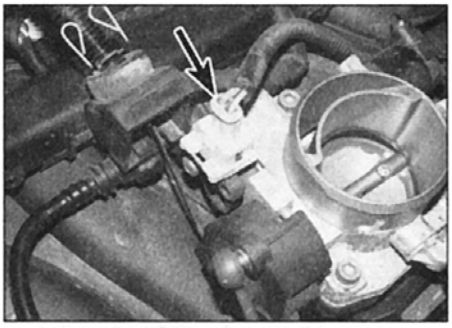
22 The inlet air pressure sensor is located on the inlet manifold, below the throttle housing **(see illustration)**.
23 Disconnect the wiring from the sensor.
24 Undo the screw and withdraw the sensor from the inlet manifold.
25 Refitting is the reverse of the removal procedure.

Coolant temperature sensor

26 Refer to Chapter 3, Section 6.



14.27 Inlet air temperature sensor



14.28 Throttle housing heating element wiring

Inlet air temperature sensor

27 The inlet air temperature sensor is located on the front of the throttle housing **(see illustration)** and cannot be removed separately.

Throttle housing heater

28 The throttle housing heating element is integral with the throttle housing and cannot be removed separately **(see illustration)**.

Crankshaft (RPM) sensor

29 Refer to Section 13.

Camshaft position sensor

30 Refer to Section 13.

Vehicle speed sensor

31 Refer to Section 13.

Knock sensor

32 Refer to Chapter 5B, Section 5.

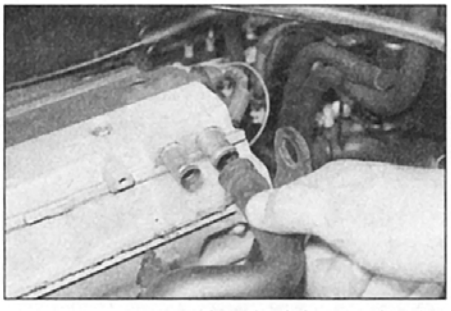
Fuel injection relay unit

33 Refer to Section 13.

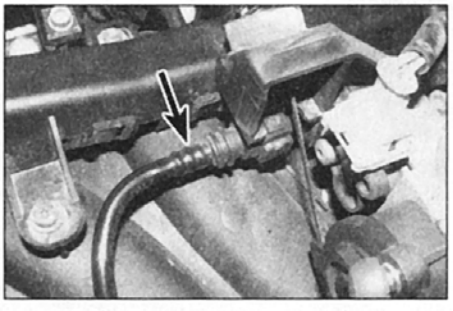
15 Inlet manifold – removal and refitting

Removal

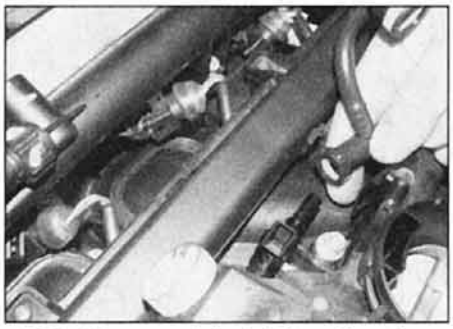
1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).
2 Remove the throttle housing as described in Section 12 and the fuel rail and injectors as described in Section 13 or 14.
3 Disconnect the braking system vacuum servo unit hose, and all the relevant vacuum/breather hoses, from the manifold **(see illustrations)**. Where necessary, make



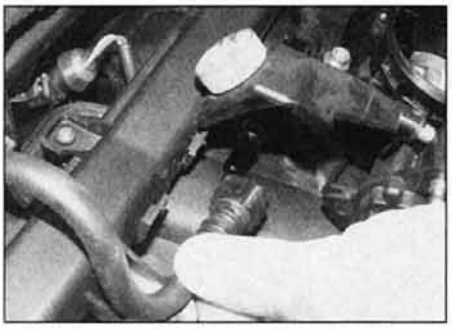
15.3a Disconnecting the inlet manifold breather hoses from the cylinder head cover – XU7 engine



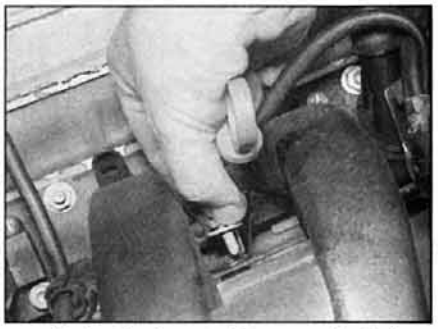
15.3b Brake vacuum servo hose connection to the inlet manifold – EW10 engine



15.3c Disconnect the left-hand breather hose . . .



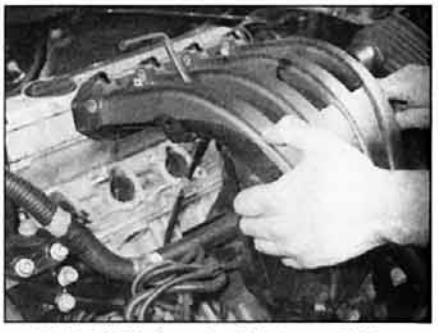
15.3d . . . and right-hand breather hose from their connections at the rear of the throttle housing – EW7 engine



15.4a Slacken and remove the bolt securing the dipstick tube to the rear of the manifold – XU7 engine

15.4b Throttle diaphragm canister on the inlet manifold

15.4c Disconnecting the EGR pipe from the cylinder head – EW7 engine



15.5a Withdraw the inlet manifold . . .

identification marks on the hoses, to ensure that they are correctly reconnected on refitting.

4 Where applicable, slacken and remove the bolt securing the dipstick tube to the side of the manifold, and also remove throttle diaphragm canister where fitted, and disconnect the EGR pipe **(see illustrations)**.

5 Undo the nuts and bolts securing the manifold to the cylinder head, and remove the manifold from the engine compartment **(see illustrations)**. Note the location of the engine top cover support bracket.

6 Recover the manifold gasket/seals, and discard them – new ones must be used on refitting **(see illustrations)**.

Refitting

7 Refitting is a reverse of the relevant removal procedure, noting the following points:

a) Ensure that the manifold and cylinder head mating surfaces are clean and dry, then locate the new gasket/seals on the manifold. Refit the manifold and tighten its retaining nuts and bolts to the specified torque setting.

b) Ensure that all relevant hoses are reconnected to their original positions and are securely held (where necessary) by the retaining clips.

c) Adjust the accelerator cable as described in Section 3.

16 Exhaust manifold – removal and refitting

Removal

1 Remove the top cover from the engine.

2 Disconnect the hot-air inlet hose from the manifold shroud and remove it from the vehicle.

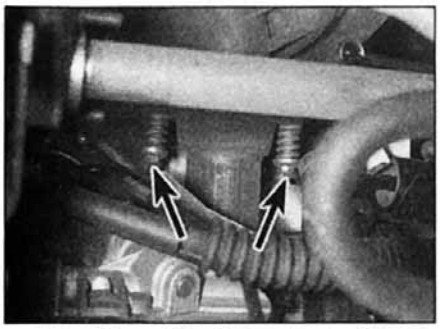
3 Slacken and remove the three retaining screws, and remove the shroud from the top of the exhaust manifold.

4 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

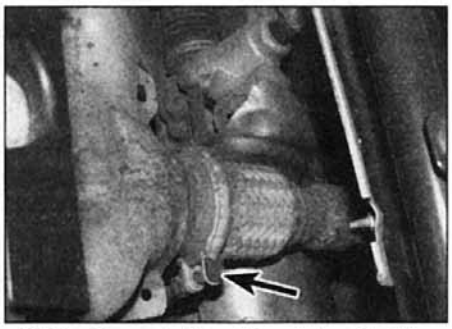
15.5b . . . and disconnect the manifold pressure sensor wiring connector – 1.8 litre XU7 engine

15.6a Recover the seals from the recesses in the manifold on the 1.8 litre XU7 engine . . .

15.6b . . . and on the 1.8 litre EW7 engine



17.6a Exhaust front pipe-to-manifold retaining nuts and springs – 1.8 litre XU7 engine



17.6b Clamp bolt and front pipe flexible exhaust section – 2.0 litre EW10 engine

17.8 Earth strap attachment at the exhaust intermediate pipe clamp

5 Where necessary, disconnect the wiring from the lambda (oxygen) sensor. Alternatively, support the exhaust front pipe, to avoid any strain being placed on the sensor wiring.

6 Undo the nuts securing the exhaust front pipe to the manifold and recover the springs. Note on some models a clamp ring is fitted. Where applicable, remove the bolt securing the front pipe to its mounting bracket. Disconnect the front pipe from the manifold, and recover the gasket.

7 Undo the retaining nuts securing the exhaust manifold to the cylinder head. Manoeuvre the manifold out of the engine compartment, and discard the manifold gaskets.

Refitting

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

a) Examine all the exhaust manifold studs for signs of damage and corrosion; remove all traces of corrosion, and repair or renew any damaged studs.

b) Ensure that the manifold and cylinder head sealing faces are clean and flat, and fit the new manifold gasket(s). Tighten the manifold retaining nuts to the specified torque setting.

c) Reconnect the front pipe to the manifold, using the information given in Section 17.

17 Exhaust system – general information, removal and refitting

General information

1 A multi-section exhaust system is fitted. The exhaust sections are joined by clamping rings or flanges, with a flexible section incorporated in the front pipe to cater for engine movement.

2 A catalytic converter is located on the front section of the exhaust. The system is suspended throughout its entire length by rubber mountings.

Removal

3 Each exhaust section can be removed individually, or the system can be removed complete, then separated after removal.

4 To remove part of the system, first jack up the front or rear of the car and support it on axle stands. Alternatively, position the car over an inspection pit or on car ramps.

Front pipe/catalytic converter

5 Trace the wiring back from the downstream lambda sensor to the wiring connector and disconnect the connector.

6 Where applicable, undo the nuts and bolts securing the front pipe flange joint to the manifold, and recover the springs. Separate the joint and recover the sealing ring. On the EW10 engine, unscrew the clamp bolt and release the ring, then separate the flexible exhaust pipe section from the exhaust manifold **(see illustrations)**.

7 Loosen the clamp bolt securing the front pipe flange joint to the intermediate pipe/rear pipe and separate the joint. Withdraw the front pipe from underneath the vehicle, and recover the sealing ring.

Intermediate pipe and silencer

8 Slacken the clamping ring bolts and disengage the clamps from the front and rear flange joints. Note that there may be an earth strap attached to one of the clamp bolts **(see illustration)**.

9 Unhook the intermediate pipe and silencer from its mounting rubber and remove it from underneath the vehicle.

Tailpipe and silencer

10 Slacken the clamping ring bolt and disengage the clamp from the flange joint.

11 Unhook the tailpipe and silencer from its mounting rubbers and remove it from the car.

Complete system

12 Disconnect the lambda sensor wiring connectors from the main wiring harness.

13 Undo the nut and remove the through bolt, then spread the clamping ring securing the front pipe flange joint to the exhaust manifold.

14 Free the system from all its mounting rubbers and lower it from under the vehicle.

Heat shield(s)

15 The heat shields are secured to the underbody by various nuts and bolts. Each shield can be removed once the relevant exhaust section has been removed. If a shield is being removed to gain access to a component located behind it, it may prove sufficient in some cases to remove the retaining nuts and/or bolts, and simply lower the shield, without disturbing the exhaust system.

Refitting

16 Each section is refitted by reversing the removal sequence, noting the following:

a) Ensure that all traces of corrosion have been removed from the flanges.

b) Inspect the rubber mountings for damage or deterioration, and renew as necessary.

c) Prior to assembling the spring-loaded joint, a smear of high-temperature grease should be applied to the joint mating surfaces.

d) Prior to tightening the exhaust system fasteners, ensure that all rubber mountings are correctly located, and that there is adequate clearance between the exhaust system and vehicle underbody.

e) Ensure that the lambda sensor wiring is reconnected correctly and secured to the underbody by the relevant retaining clips.

Chapter 4 Part B:
Fuel and exhaust systems – diesel models

Contents

Degrees of difficulty

Easy, suitable for novice with little experience

Fairly easy, suitable for beginner with some experience

Fairly difficult, suitable for competent DIY mechanic

Difficult, suitable for experienced DIY mechanic

Very difficult, suitable for expert DIY or professional

Specifications

General

System type	HDi (High-pressure Diesel injection) with full electronic control, direct injection and turbocharger
Designation	Bosch EDC 15C2
Firing order	1-3-4-2 (No 1 at flywheel end)
Fuel system operating pressure	200 to 1350 bars (according to engine speed)

High-pressure fuel pump

Type	Bosch CP 1
Direction of rotation	Clockwise, viewed from sprocket end

Injectors

Type	Electromagnetic

Turbocharger

Type:	
DW10 engine	Garrett GT15 or KKK K03
DW12 engine	Allied Signal GT 1549P
Boost pressure (approximate)	1 bar at 3000 rpm

Torque wrench settings	Nm	lbf ft
Accumulator rail mounting bolts	23	17
Accumulator rail-to-fuel injector fuel pipe unions	25	18
Clamping ring nuts	20	15
Exhaust manifold nuts	20	15
Exhaust system fasteners:		
Catalytic converter-to-manifold nuts	10	7
Fuel injector clamp nuts:		
DW10 engine	30	22
DW12 engine:		
Stage 1	4	3
Stage 2	Angle-tighten a further 45°	
Fuel injector clamp stud	7	5
Fuel pressure sensor to accumulator rail	45	33
Fuel pump-to-accumulator rail fuel pipe unions	20	15
High-pressure fuel pipe union nuts*:		
High-pressure fuel pump front mounting bolts and nut	20	15
High-pressure fuel pump rear mounting bolt and nut	22	16
High-pressure fuel pump sprocket nut	50	37

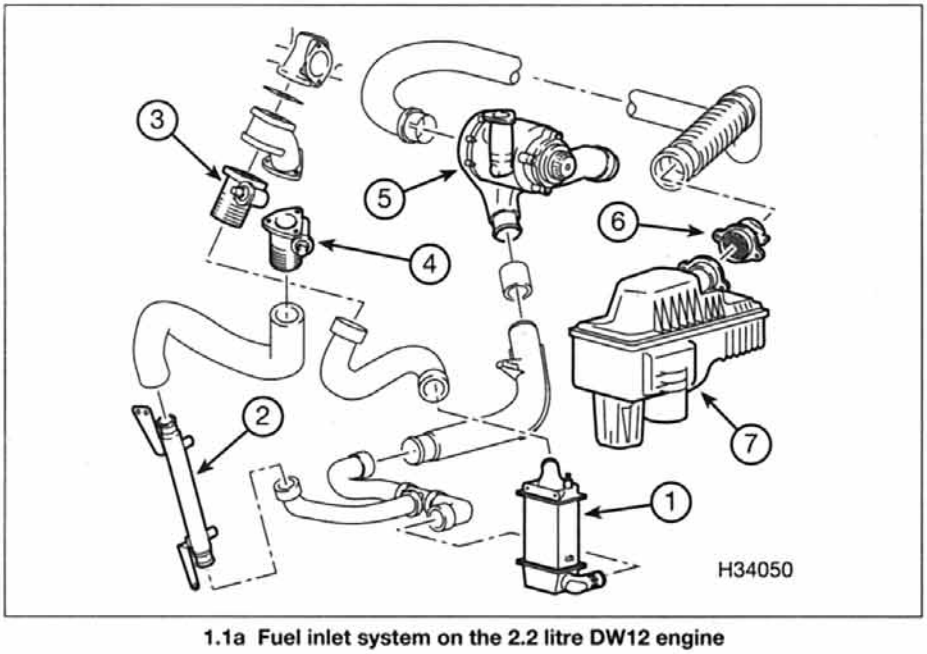
** These torque settings are using Peugeot crow's-foot adaptors – see Section 2*

1 General information and system operation

The fuel system consists of a rear-mounted fuel tank and fuel lift pump, a fuel filter with integral water separator, on some models a fuel cooler mounted under the car, and an electronically-controlled High-pressure Diesel injection (HDi) system, together with a turbocharger **(see illustrations)**.

The exhaust system is conventional, but to meet the latest emission levels an unregulated catalytic converter and an exhaust gas recirculation system are fitted to all models.

The HDi system (generally known as a 'common rail' system) derives its name from the fact that a common rail (referred to as an accumulator rail), or fuel reservoir, is used to supply fuel to all the fuel injectors. Instead of an in-line or distributor type injection pump, which distributes the fuel directly to each injector, a high-pressure pump is used, which generates a very high fuel pressure (1350 bars at high engine speed) in the accumulator rail. The accumulator rail stores fuel, and maintains a constant fuel pressure, with the aid of a pressure control valve. Each injector is supplied with high-pressure fuel from the accumulator rail, and the injectors are individually controlled via signals from the system electronic control unit (ECU). The injectors are electromagnetically-operated.



1.1a Fuel inlet system on the 2.2 litre DW12 engine

1 *Intercooler (air-to-air heat exchanger)*
2 *Water-to-air heat exchanger*
3 *Cold air inlet*
4 *Hot air inlet*
5 *Turbocharger*
6 *Airflow sensor*
7 *Air filter*

In addition to the various sensors used on models with a conventional fuel injection pump, common rail systems also have a fuel pressure sensor. The fuel pressure sensor allows the ECU to maintain the required fuel pressure, via the pressure control valve.

System operation

For the purposes of describing the operation of a common rail injection system, the components can be divided into three sub-systems; the low-pressure fuel system, the high-pressure fuel system and the electronic control system.

Low-pressure fuel system

The low-pressure fuel system consists of the following components:

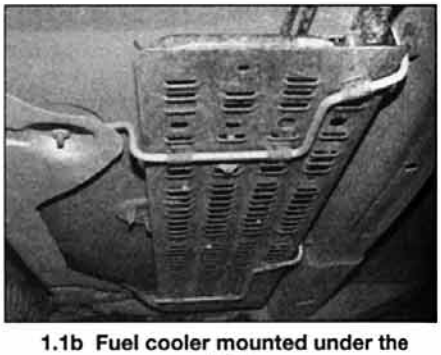
a) Fuel tank.
b) Fuel lift pump.
c) Fuel cooler (not all models).
d) Fuel filter/water trap.
e) Low-pressure fuel lines.

The low-pressure system (fuel supply system) is responsible for supplying clean fuel to the high-pressure fuel system.

High-pressure fuel system

The high-pressure fuel system consists of the following components:

a) High-pressure fuel pump with pressure control valve.



1.1b Fuel cooler mounted under the vehicle

b) High-pressure fuel accumulator rail.
c) Fuel injectors.
d) High-pressure fuel lines.

After passing through the fuel filter, the fuel reaches the high-pressure pump, which forces it into the accumulator rail. As diesel fuel has a certain elasticity, the pressure in the accumulator rail remains constant, even though fuel leaves the rail each time one of the injectors operates. Additionally, a pressure control valve mounted on the high-pressure pump ensures that the fuel pressure is maintained within preset limits.

The pressure control valve is operated by the ECU. When the valve is opened, fuel is returned from the high-pressure pump to the tank, via the fuel return lines, and the pressure in the accumulator rail falls. To enable the ECU to trigger the pressure control valve correctly, the pressure in the accumulator rail is measured by a fuel pressure sensor.

The electromagnetically-controlled fuel injectors are operated individually, via signals from the ECU, and each injector injects fuel directly into the relevant combustion chamber. The fact that high fuel pressure is always available allows very precise and highly flexible injection in comparison to a conventional injection pump: for example combustion during the main injection process can be improved considerably by the pre-injection of a very small quantity of fuel.

Electronic control system

The electronic control system consists of the following components:

a) Electronic control unit (ECU).
b) Crankshaft speed/position sensor.
c) Camshaft position sensor.
d) Accelerator pedal position sensor.
e) Coolant temperature sensor.
f) Fuel temperature sensor.
g) Air mass meter.
h) Fuel pressure sensor.
i) Fuel injectors.
j) Fuel pressure control valve.
k) Preheating control unit.
l) EGR solenoid valve.

The information from the various sensors is passed to the ECU, which evaluates the signals. The ECU contains electronic 'maps' which enable it to calculate the optimum quantity of fuel to inject, the appropriate start of injection, and even pre- and post-injection fuel quantities, for each individual engine cylinder under any given condition of engine operation.

Additionally, the ECU carries out monitoring and self-diagnostic functions. Any faults in the system are stored in the ECU memory, which enables quick and accurate fault diagnosis using appropriate diagnostic equipment (such as a suitable fault code reader).

System Components

Fuel lift pump

The fuel lift pump and integral fuel gauge sender unit is electrically-operated, and is mounted in the fuel tank.

High-pressure pump

The high-pressure pump is mounted on the engine in the position normally occupied by the conventional distributor fuel injection pump. The pump is driven at half engine speed by the timing belt, and is lubricated by the fuel which it pumps.

The fuel lift pump forces the fuel into the high-pressure pump chamber, via a safety valve.

The high-pressure pump consists of three radially-mounted pistons and cylinders. The pistons are operated by an eccentric cam mounted on the pump drive spindle. As a piston moves down, fuel enters the cylinder through an inlet valve. When the piston reaches bottom dead centre (BDC), the inlet valve closes, and as the piston moves back up the cylinder, the fuel is compressed. When the pressure in the cylinder reaches the pressure in the accumulator rail, an outlet valve opens, and fuel is forced into the accumulator rail. When the piston reaches top dead centre (TDC), the outlet valve closes, due to the pressure drop, and the pumping cycle is repeated. The use of multiple cylinders provides a steady flow of fuel, minimising pulses and pressure fluctuations.

As the pump needs to be able to supply sufficient fuel under full-load conditions, it will supply excess fuel during idle and part-load conditions. This excess fuel is returned from the high-pressure circuit to the low-pressure circuit (to the tank) via the pressure control valve.

The pump incorporates a facility to effectively switch off one of the cylinders to improve efficiency and reduce fuel consumption when maximum pumping capacity is not required. When this facility is operated, a solenoid-operated needle holds the inlet valve in the relevant cylinder open during the delivery stroke, preventing the fuel from being compressed.

Accumulator rail

As its name suggests, the accumulator rail acts as an accumulator, storing fuel and preventing pressure fluctuations. Fuel enters the rail from the high-pressure pump, and each injector has its own connection to the rail. The fuel pressure sensor is mounted in the rail, and the rail also has a connection to the fuel pressure control valve on the pump.

Pressure control valve

The pressure control valve is operated by the ECU, and controls the system pressure. The valve is integral with the high-pressure pump and cannot be separated.

If the fuel pressure is excessive, the valve opens, and fuel flows back to the tank. If the pressure is too low, the valve closes, enabling the high-pressure pump to increase the pressure.

The valve is an electromagnetically-operated ball valve. The ball is forced against its seat, against the fuel pressure, by a powerful spring, and also by the force provided by the electromagnet. The force generated by the electromagnet is directly proportional to the current applied to it by the ECU. The desired pressure can therefore be set by varying the current applied to the electromagnet. Any pressure fluctuations are damped by the spring.

Fuel pressure sensor

The fuel pressure sensor is mounted in the accumulator rail, and provides very precise information on the fuel pressure to the ECU.

Fuel injector

The injectors are mounted on the engine in a similar manner to conventional diesel fuel injectors. The injectors are electro-magnetically-operated via signals from the ECU, and fuel is injected at the pressure existing in the accumulator rail. The injectors are high-precision instruments and are manufactured to very high tolerances.

Fuel flows into the injector from the accumulator rail, via an inlet valve and an inlet throttle, and an electromagnet causes the injector nozzle to lift from its seat, allowing injection. Excess fuel is returned from the injectors to the tank via a return line. The injector operates on a hydraulic servo principle: the forces resulting inside the injector due to the fuel pressure effectively amplify the effects of the electromagnet, which does not provide sufficient force to open the injector nozzle directly. The injector functions as follows. Five separate forces are essential to the operation of the injector.

a) A nozzle spring forces the nozzle needle against the nozzle seat at the bottom of the injector, preventing fuel from entering the combustion chamber.
b) In the valve at the top of the injector, the valve spring forces the valve ball against the opening to the valve control chamber. The fuel in the chamber is unable to escape through the fuel return.
c) When triggered, the electromagnet exerts a force which overcomes the valve spring force, and moves the valve ball away from its seat. This is the triggering force for the start of injection. When the valve ball moves off its seat, fuel enters the valve control chamber.
d) The pressure of the fuel in the valve control chamber exerts a force on the valve control plunger, which is added to the nozzle spring force.
e) A slight chamfer towards the lower end of the nozzle needle causes the fuel in the control chamber to exert a force on the nozzle needle.

When these forces are in equilibrium, the injector is in its rest (idle) state, but when a voltage is applied to the electromagnet, the forces work to lift the nozzle needle, injecting fuel into the combustion chamber. There are four phases of injector operation as follows:

a) Rest (idle) state – all forces are in equilibrium. The nozzle needle closes off the nozzle opening, and the valve spring forces the valve ball against its seat.

1.26 The control vacuum servos on the bulkhead

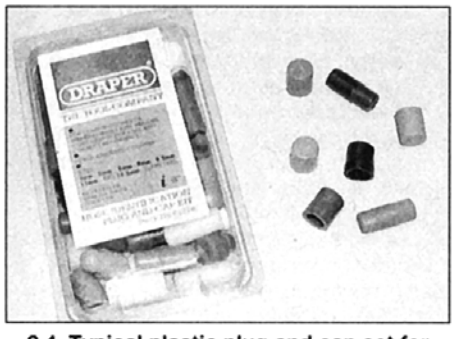
b) Opening – the electromagnet is triggered which opens the nozzle and triggers the injection process. The force from the electromagnet allows the valve ball to leave its seat. The fuel from the valve control chamber flows back to the tank via the fuel return line. When the valve opens, the pressure in the valve control chamber drops, and the force on the valve plunger is reduced. However, due to the effect of the input throttle, the pressure on the nozzle needle remains unchanged. The resulting force in the valve control chamber is sufficient to lift the nozzle from its seat, and the injection process begins.

c) Injection – within a few milliseconds, the triggering current in the electromagnet is reduced to a lower holding current. The nozzle is now fully open, and fuel is injected into the combustion chamber at the pressure present in the accumulator rail.

d) Closing – the electromagnet is switched off, at which point the valve spring forces the valve ball firmly against its seat, and in the valve control chamber, the pressure is the same as that at the nozzle needle. The force at the valve plunger increases, and the nozzle needle closes the nozzle opening. The forces are now in equilibrium once more, and the injector is once more in the idle state, awaiting the next injection sequence.

ECU and sensors

The ECU and sensors are described earlier in this Section – see *Electronic control system*.



2.4 Typical plastic plug and cap set for sealing disconnected fuel pipes and components

Air inlet sensor and turbocharger

An airflow sensor is fitted downstream of the air filter to monitor the quantity of air supplied to the turbocharger. On models with the 2.2 litre diesel engine (DW12), air from the high-pressure side of the turbocharger is channelled either through the intercooler and cold air throttle body, or through the coolant heat exchanger and hot air throttle body. The throttle bodies are controlled by the engine management ECU via vacuum servos located on the bulkhead **(see illustration)**.

2 High-pressure diesel injection system – special information

Warnings and precautions

1 It is essential to observe strict precautions when working on the fuel system components, particularly the high-pressure side of the system. 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 the following additional information.

Do not carry out any repair work on the high-pressure fuel system unless you are competent to do so, have all the necessary tools and equipment required, and are aware of the safety implications involved.

Before starting any repair work on the fuel system, wait at least 30 seconds after switching off the engine to allow the fuel circuit pressure to reduce.

Never work on the high-pressure fuel system with the engine running.

Keep well clear of any possible source of fuel leakage, particularly when starting the engine after carrying out repair work. A leak in the system could cause an extremely high-pressure jet of fuel to escape, which could result in severe personal injury.

Never place your hands or any part of your body near to a leak in the high-pressure fuel system.

Do not use steam cleaning equipment or compressed air to clean the engine or any of the fuel system components.

Procedures and information

2 Strict cleanliness must be observed at all times when working on any part of the fuel system. This applies to the working area in general, the person doing the work, and the components being worked on.

3 Before working on the fuel system components, they must be thoroughly cleaned with a suitable degreasing fluid. Specific cleaning products may be obtained from Peugeot dealers. Alternatively, a suitable brake cleaning fluid may be used. Cleanliness is particularly important when working on the fuel system connections at the following components:

a) Fuel filter.
b) High-pressure fuel pump.
c) Accumulator rail.
d) Fuel injectors.
e) High-pressure fuel pipes.

4 After disconnecting any fuel pipes or components, the open union or orifice must be immediately sealed to prevent the entry of dirt or foreign material. Plastic plugs and caps in various sizes are available in packs from motor factors and accessory outlets, and are particularly suitable for this application **(see illustration)**. Fingers cut from disposable rubber gloves should be used to protect components such as fuel pipes, fuel injectors and wiring connectors, and can be secured in place using elastic bands. Suitable gloves of this type are available at no cost from most petrol station forecourts.

5 Whenever any of the high-pressure fuel pipes are disconnected or removed, new pipes must be obtained for refitting.

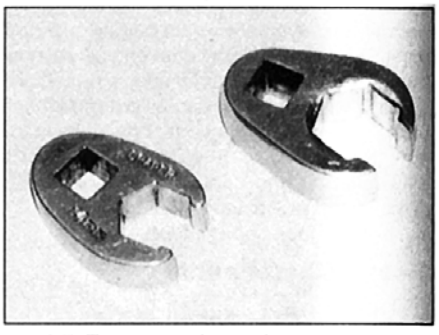
6 On the completion of any repair on the high-pressure fuel system, Peugeot recommend the use of a leak-detecting compound. This is a powder which is applied to the fuel pipe unions and connections and turns white when dry. Any leak in the system will cause the product to darken indicating the source of the leak.

7 The torque wrench settings given in the Specifications must be strictly observed when tightening component mountings and connections. This is particularly important when tightening the high-pressure fuel pipe unions. To enable a torque wrench to be used on the fuel pipe unions, two Peugeot crow-foot adaptors are required. Suitable alternatives are available from motor factors and accessory outlets **(see illustration)**.

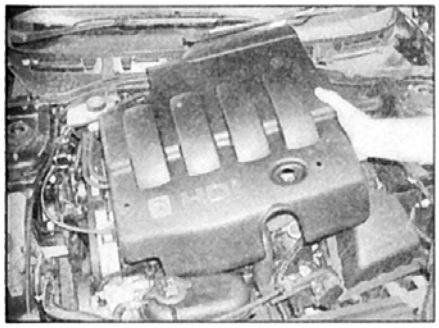
3 Fuel system – priming and bleeding

1 The fuel system is entirely self-bleeding because the fuel lift pump supplies fuel to the high-pressure pump whenever the ignition is switched on.

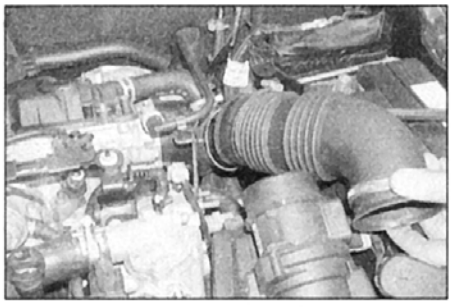
2 In the case of running out of fuel, or after



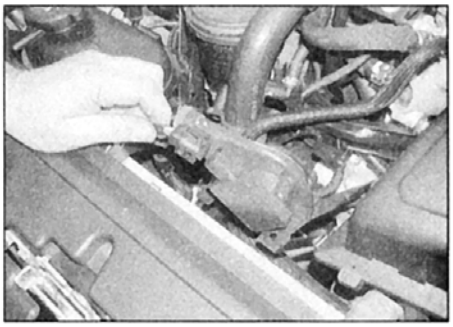
2.7 Two crow-foot adaptors will be necessary for tightening the fuel pipe unions



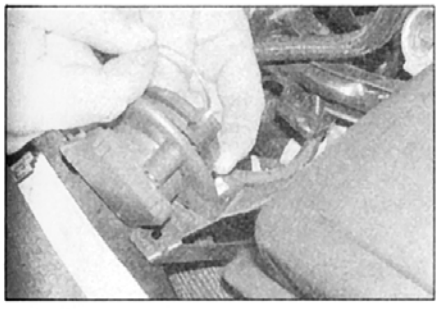
4.2 Undo the four plastic nuts and lift off the engine cover



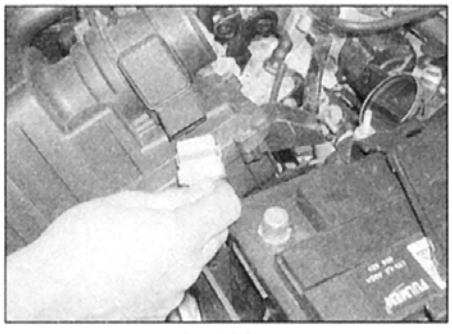
4.3 Disconnect the flexible air inlet duct from the air mass meter and turbocharger rigid inlet duct



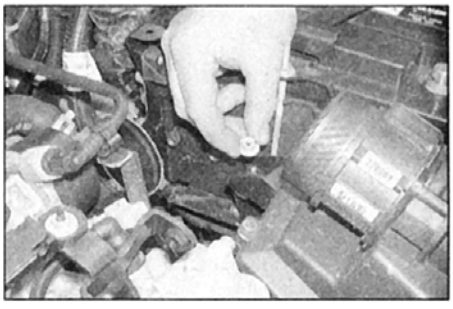
4.4 Disconnect the wiring plug from the accelerator pedal position sensor



4.5 Rotate the pedal position sensor quadrant, and release the accelerator inner cable



4.7 Disconnect the wiring connector from the air mass meter



4.8 Undo the nuts securing the base of the air cleaner housing to the front and rear support brackets

disconnecting any part of the fuel supply system, ensure that there is fuel in the tank, then start the engine in the normal way.

4 Air cleaner assembly and inlet ducts – removal and refitting

Removal

Air cleaner and front inlet ducts

1 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

2 Undo the four plastic nuts and lift off the engine cover **(see illustration)**.

3 Slacken the retaining clips and disconnect the flexible air inlet duct from the air mass meter and turbocharger rigid inlet duct **(see illustration)**. Plug or cover the turbocharger rigid inlet duct, using clean rag to prevent any dirt or foreign material from entering.

4 Disconnect the wiring plug from the accelerator pedal position sensor, adjacent to the air cleaner housing **(see illustration)**.

5 Rotate the accelerator pedal position sensor quadrant, and release the inner cable from the quadrant **(see illustration)**.

6 Withdraw the outer cable from the grommet in the pedal position sensor body, and recover the flat washer from the end of the cable.

7 Disconnect the wiring connector from the air mass meter on the side of the air cleaner lid **(see illustration)**.

8 Undo the nuts securing the base of the air cleaner housing to the front and rear support brackets **(see illustration)**.

9 Undo the bolt securing the wiring harness retaining clip to the air cleaner bracket.

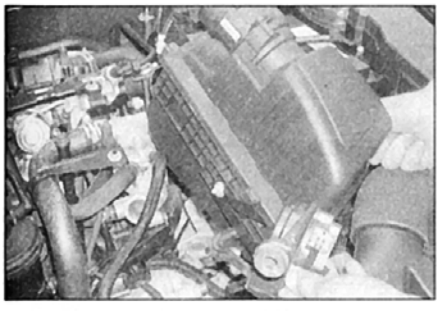
10 Lift the air cleaner housing upwards at the rear, disengage the two front locating lugs and remove the assembly from the engine compartment **(see illustration)**.

11 To remove the air cleaner air inlet duct, undo the bolt securing the front of the inlet duct to the front body panel **(see illustration)**. Detach and remove the duct from the flexible tube.

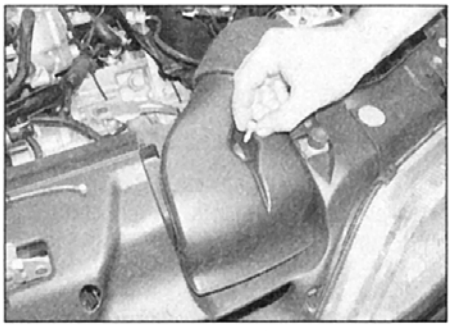
12 Undo the two bolts securing the flexible tube to the air cleaner support bracket and remove the tube from the engine compartment **(see illustration)**.

Turbocharger inlet and outlet ducts

13 The rigid ducts at the rear of the engine, connecting the turbocharger to the flexible air inlet duct and to the inlet manifold are inaccessible with the engine in the car. To gain access it will be necessary to remove the front suspension subframe as described in Chapter 10.

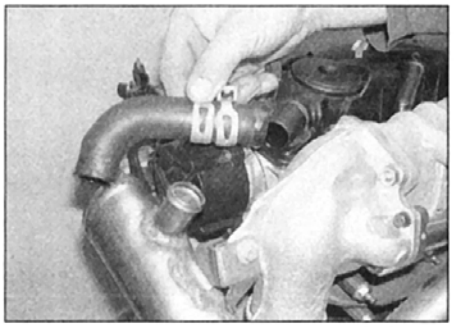


4.10 Lift the air cleaner housing upwards at the rear and disengage the two front locating lugs

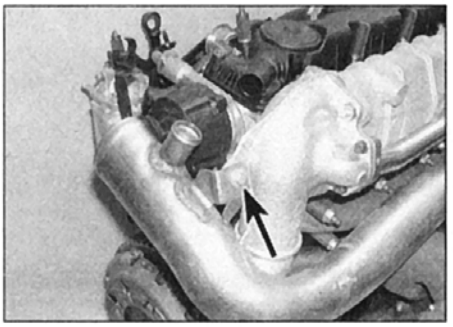


4.11 Undo the bolt securing the front of the air inlet duct to the front body panel

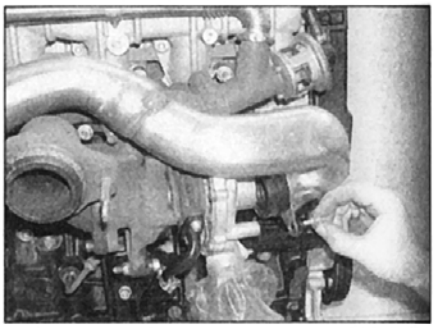
4.12 Undo the two bolts and remove the flexible tube from the engine compartment



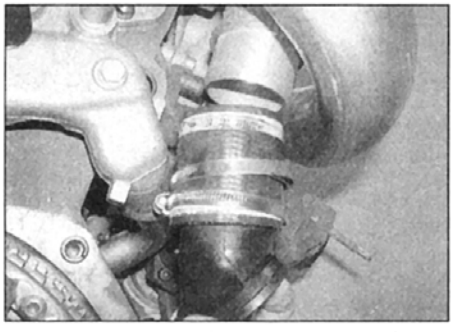
4.14 Disconnect the crankcase ventilation hose at the top of the turbocharger rigid inlet duct



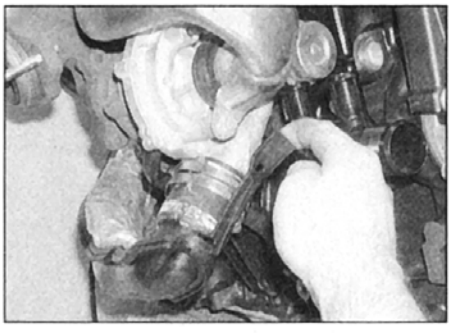
4.15 Undo the bolt (arrowed) securing the rigid inlet duct to the inlet manifold elbow



4.16 Undo the bolt securing the rigid inlet duct to the turbocharger and remove the duct



4.17 Slacken the clip and release the plastic duct connecting hose from the inlet manifold elbow



4.18 Slacken the connecting hose clip, release the attachment strap and withdraw the plastic duct from the engine

14 Once access has been gained, begin removal of the turbocharger rigid inlet duct by disconnecting the crankcase ventilation hose at the top of the duct **(see illustration)**.

15 Undo the bolt securing the duct to the inlet manifold elbow **(see illustration)**.

16 At the lower end, undo the bolt securing the duct to the turbocharger **(see illustration)**. Lift off the duct and recover the seal from the lower end.

17 To remove the turbocharger-to-inlet manifold rigid plastic duct, slacken the retaining clip and release the connecting hose from the inlet manifold elbow **(see illustration)**.

18 Slacken the clip securing the connecting hose at the lower end of the duct to the turbocharger. Release the attachment strap from the lug on the turbocharger and withdraw the duct from the engine **(see illustration)**.

Refitting

19 Refitting is a reverse of the removal procedure. Examine the condition of the seals and retaining clips and renew if necessary.

20 Where applicable, refit the front suspension subframe as described in Chapter 10.

21 Reconnect and adjust the accelerator cable as described in Section 5.

5 Accelerator cable – removal, refitting and adjustment

Removal

1 Undo the four plastic nuts and lift off the engine cover.

2 Rotate the accelerator pedal position sensor quadrant, and release the inner cable from the quadrant.

3 Withdraw the outer cable from the grommet in the pedal position sensor body, recover the flat washer from the end of the cable and remove the spring clip.

4 Release the cable from the remaining clips and brackets in the engine compartment, noting its routing.

5 Working in the passenger compartment, reach up under the facia, depress the ends of the cable end fitting, and detach the inner cable from the top of the accelerator pedal.

6 Release the outer cable grommet from the pedal mounting bracket, then tie a length of string to the end of the cable.

7 Return to the engine compartment, release the cable grommet from the bulkhead and withdraw the cable. When the end of the cable appears, untie the string and leave it in position – it can then be used to draw the cable back into position on refitting.

Refitting

8 Refitting is a reversal of removal, but ensure that the cable is routed as noted before removal and, on completion, adjust the cable as follows.

Adjustment

9 Remove the spring clip from the accelerator outer cable. Ensuring that the pedal position sensor quadrant is against its stop, gently pull the cable out of its grommet until all free play is removed from the inner cable.

10 With the cable held in this position, refit the spring clip to the last exposed outer cable groove in front of the rubber grommet and washer. When the clip is refitted and the outer cable is released, there should be only a small amount of free play in the inner cable.

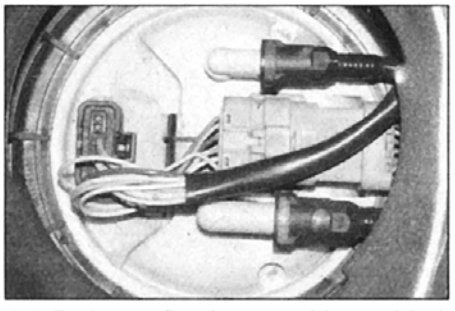
11 Have an assistant depress the accelerator pedal, and check that the pedal position sensor quadrant opens fully and returns smoothly to its stop.

12 Refit the engine cover on completion.

6 Accelerator pedal – removal and refitting

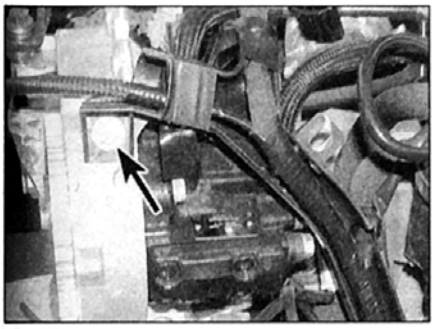
Refer to Chapter 4A.

7 Fuel lift pump – removal and refitting

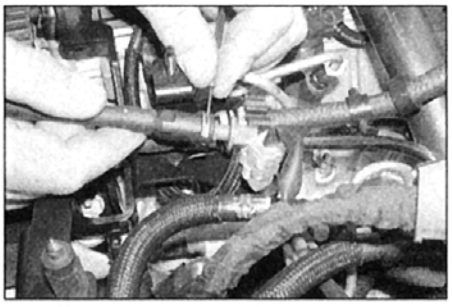


7.1 Fuel pump/level gauge wiring and fuel supply and return pipes on the fuel tank – DW12 engine

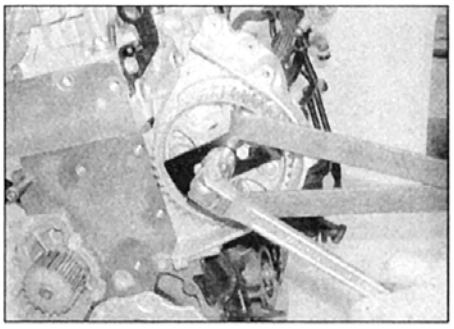
The diesel fuel lift pump is located in the same position as the conventional fuel pump on petrol models, and the removal and refitting procedures are virtually identical **(see illustration)**. Refer to Chapter 4A.



10.2 Undo the bolt (arrowed) to release the plastic wiring harness guide



10.4 Disconnect the fuel supply and return hose quick-release fittings at the connections above the fuel pump



10.6 Using the home-made tools to remove the fuel pump sprocket

8 Fuel gauge sender unit – removal and refitting

The fuel gauge sender unit is integral with the fuel lift pump. Refer to Section 7.

9 Fuel tank – removal and refitting

Refer to Chapter 4A.

10 High-pressure fuel pump – removal and refitting

Warning: Refer to the information contained in Section 2 before proceeding.

Note: *A new fuel pump-to-accumulator rail high-pressure fuel pipe will be required for refitting.*

Removal

1 Disconnect the battery negative lead and remove the timing belt as described in Chapter 2C. After removal of the timing belt, temporarily refit the right-hand engine mounting but do not fully tighten the bolts.

2 Undo the bolts securing the plastic wiring harness guide to the front of the engine **(see illustration)**. It will be necessary to lift up the wiring harness as far as possible for access to the rear of the fuel pump. If necessary, disconnect the relevant wiring connectors to enable the harness and guide assembly to be moved further for additional access.

3 Place a suitable container beneath the fuel filter, then loosen the drain plug and drain the fuel. Retighten the plug.

4 Clean the feed and supply lines to the fuel filter, then unclip the fuel filter from its bracket and disconnect the quick-release feed and supply lines **(see illustration)**. Tape over or plug the openings in the filter and lines, to prevent entry of dust and dirt. **Note:** *The fuel lines must be renewed every time they are removed, as it is possible for minute metal particles to enter them as a result of tightening the union nuts. If these particles enter the fuel injectors, fuel at high-pressure can enter the combustion chambers unrestricted.*

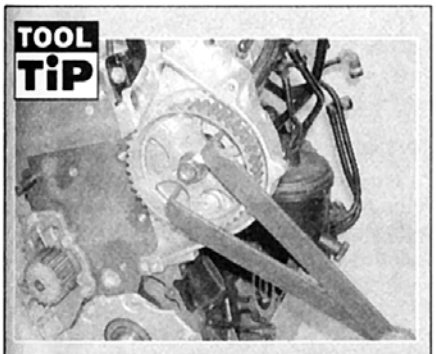
5 Unbolt and remove the fuel filter support bracket.

6 Hold the pump pulley/sprocket stationary, and loosen the centre nut securing it to the pump shaft. The manufacturers recommend using a pin inserted through the pulley and into the cylinder head, however, a home-made forked tool engaged with the pulley holes can be used instead **(see illustration and Tool Tip 1)**.

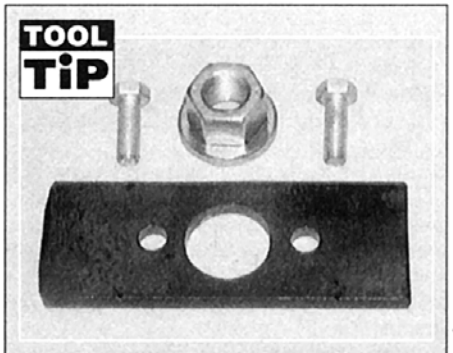
7 The fuel pump sprocket is a taper fit on the pump shaft and it will be necessary to make up a tool to release it from the taper **(see Tool Tip 2)**. Partially unscrew the sprocket retaining nut, fit the home-made tool, and secure it to the sprocket with two 7.0 mm bolts. Prevent the sprocket from rotating as before, and unscrew the sprocket retaining nut. The nut will bear against the tool as it is undone, forcing the sprocket off the shaft taper. Once the taper is released, remove the tool, unscrew the nut fully, and remove the sprocket from the pump shaft.

8 Thoroughly clean the high-pressure fuel pipe unions on the fuel pump and accumulator rail. Using an open-ended spanner, unscrew the union nuts securing the high-pressure fuel pipe to the fuel pump and accumulator rail. Counterhold the unions on the pump and accumulator rail with a second spanner, while unscrewing the union nuts. Withdraw the high-pressure fuel pipe and plug or cover the open unions to prevent dirt entry **(see illustration)**. Note that a new high-pressure fuel pipe will be required for refitting.

9 On the DW10 engine, unscrew the nut and bolt securing the fuel pump rear mounting to the mounting bracket. On the DW12 engine, unscrew the two bolts securing the mounting plate to the rear of the fuel pump, then loosen only the single bolt securing the plate to the bracket and tilt the plate outwards **(see illustrations)**.

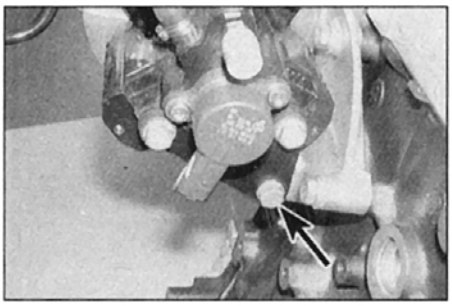


Tool Tip 1: A sprocket holding tool can be made from two lengths of steel strip bolted together to form a forked end. Bend the ends of the strip through 90° to form the fork 'prongs'.

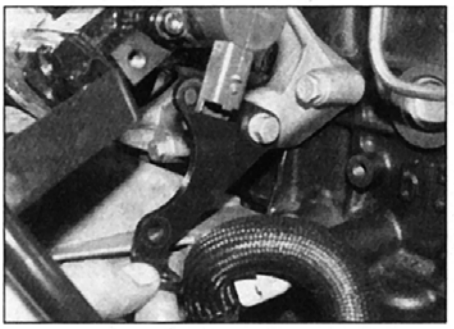


Tool Tip 2: Make a sprocket releasing tool from a short strip of steel. Drill two holes in the strip to correspond with the two 7.0 mm holes in the sprocket. Drill a third hole just large enough to accept the flats of the sprocket retaining nut.

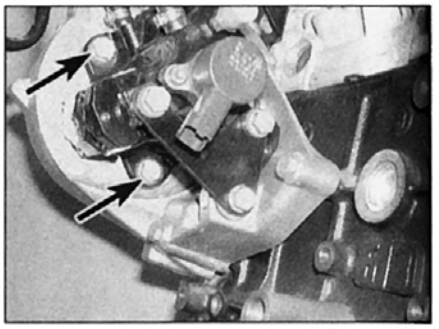
10.8 Unscrew the unions and remove the high pressure fuel pipe



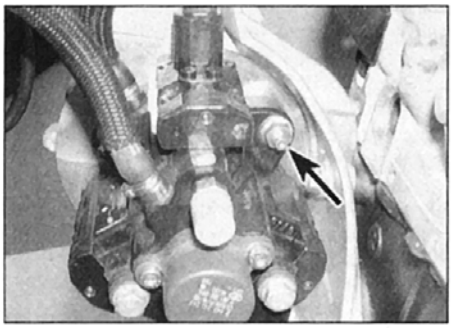
10.9a Undo the nut and bolt (arrowed) securing the fuel pump rear mounting to the mounting bracket – DW10



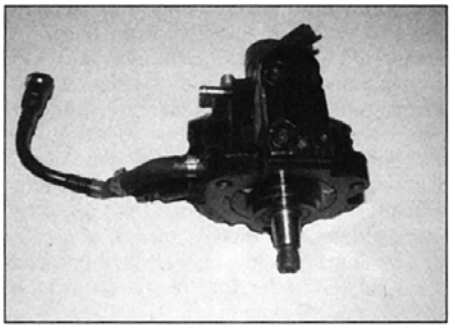
10.9b Move the rear mounting plate to one side – DW12 engine



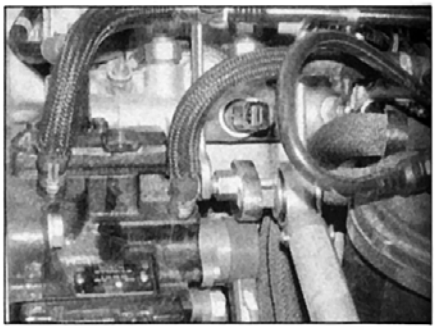
10.12a Fuel pump front mounting bolts (arrowed) . . .



10.12b . . . and mounting nut (arrowed) – DW10 engine



10.12c High-pressure fuel pump removed from the engine – DW12 engine



10.19 Tighten the fuel pipe union nuts using a torque wrench and crow-foot adaptor

10 Disconnect the wiring connector at the pressure control valve on the rear of the fuel pump (orange wire), and at the piston de-activator switch on the top of the pump.

11 Disconnect the low pressure hoses from the fuel pump, then tape over the openings. Move the hoses to one side.

12 Unscrew the nut and two bolts securing the front of the fuel pump to the mounting bracket **(see illustrations)**. Withdraw the pump and lift it off the engine.

Caution: The high-pressure fuel pump is manufactured to extremely close tolerances and must not be dismantled in any way. Do not unscrew the fuel pipe male union on the rear of the pump, or attempt to remove the pressure control valve, piston de-activator switch, or the seal on the pump shaft. No parts for the pump are available separately and if the unit is in any way suspect, it must be renewed.

Refitting

13 Locate the pump on the mounting bracket, and refit the front retaining nut and the two bolts. Refit the nut and bolt securing the fuel pump rear mounting to the mounting bracket, then tighten all the mountings to the specified torque.

14 Refit the low pressure hoses and tighten the clips.

15 Reconnect the wiring to the pressure control valve and piston de-activator switch.

16 Refit the mounting bracket to the rear of the fuel pump and tighten the bolts.

17 Remove the blanking plugs from the fuel pipe unions on the pump and accumulator rail. Locate a new high-pressure fuel pipe over the unions and screw on the union nuts finger tight at this stage.

18 Refit the pump sprocket and retaining nut and tighten the nut to the specified torque. Prevent the sprocket rotating as the nut is tightened using the sprocket holding tool.

19 Using a torque wrench and crow-foot adaptor, tighten the fuel pipe union nuts to the specified torque. Counterhold the unions on the pump and accumulator rail with an open-ended spanner, while tightening the union nuts **(see illustration)**.

20 Reposition and secure the plastic wiring harness guide to the front of the engine, and reconnect any additional wiring disconnected for access.

21 Refit the filter mounting bracket to the engine and securely tighten the retaining bolts. Locate the fuel filter back in position in the mounting bracket.

22 Remove the blanking plugs and reconnect the supply and return hose quick-release fittings at the fuel filter, and at the connections above the fuel pump. Secure the hoses with their respective retaining clips.

23 Refit the timing belt as described in Chapter 2C.

24 With everything reassembled and reconnected, and observing the precautions listed in Section 2, start the engine and allow it to idle. Check for leaks at the high-pressure fuel pipe unions with the engine idling. If satisfactory, increase the engine speed to 4000 rpm and check again for leaks.

25 Take the car for a short road test and check for leaks once again on return. If any leaks are detected, obtain and fit another new high-pressure fuel pipe. **Do not** attempt to cure even the slightest leak by further tightening of the pipe unions. During the road test, initialise the engine management ECU as follows. Engage third gear and stabilise the engine at 1000 rpm, then accelerate fully up to 3500 rpm.

11 Accumulator rail – removal and refitting

Warning: Refer to the information contained in Section 2 before proceeding.

Note: *A complete new set of high-pressure fuel pipes will be required for refitting.*

Removal

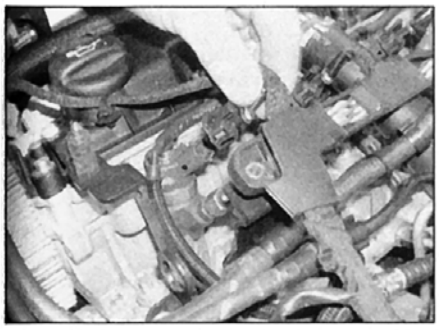
1 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

2 Undo the four plastic nuts and lift off the engine cover.

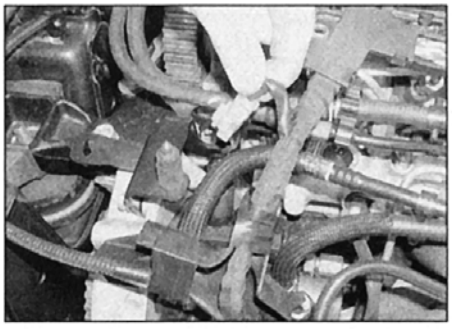
3 Disconnect the wiring connectors at the fuel injectors and at the piston de-activator switch on the top of the fuel pump **(see illustrations)**.

4 Release the retaining clip and disconnect the crankcase ventilation hose from the cylinder head cover. Position it to one side.

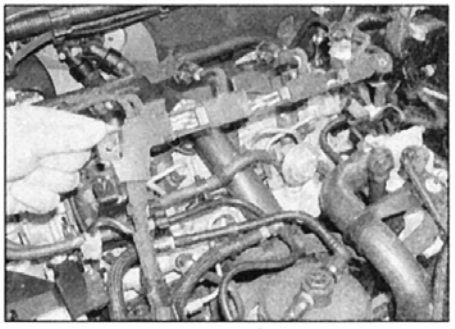
5 Undo the two nuts securing the plastic wiring harness guide to the cylinder head. Lift



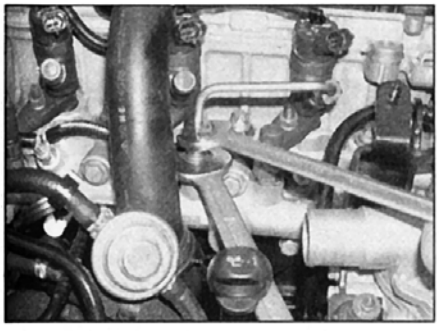
11.3a Disconnect the wiring connectors at the fuel injectors . . .



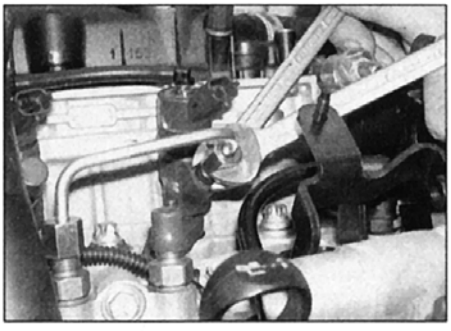
11.3b . . . and at the piston de-activator switch on top of the fuel pump



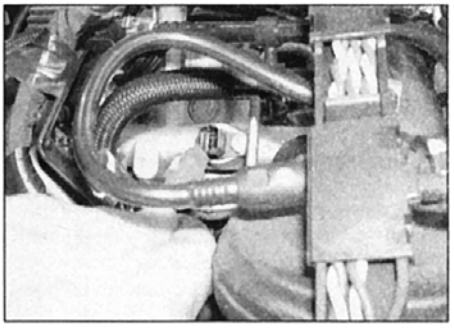
11.5 Undo the two nuts and lift off the plastic wiring harness guide



11.9a Using two spanners, unscrew the fuel pipe unions at the accumulator rail . . .



11.9b . . . and at each injector



11.10 Disconnect the wiring connector at the fuel temperature sensor

the guide off the two mounting studs and move it clear of the accumulator rail **(see illustration)**. Disconnect any additional wiring connectors as necessary to enable the harness and guide assembly to be moved further for increased access.

6 At the connections above the fuel pump, disconnect the fuel supply and return hose quick-release fittings using a small screwdriver to release the locking clip. Suitably plug or cover the open unions to prevent dirt entry.

7 Similarly disconnect the supply and return hose quick-release fittings at the fuel filter and plug or cover the open unions. Release the fuel hoses from the relevant retaining clips.

8 Thoroughly clean all the high-pressure fuel pipe unions on the accumulator rail, fuel pump and injectors. Using an open-ended spanner, unscrew the union nuts securing the high-pressure fuel pipe to the fuel pump and accumulator rail. Counterhold the unions on the pump and accumulator rail with a second spanner, while unscrewing the union nuts. Withdraw the high-pressure fuel pipe and plug or cover the open unions to prevent dirt entry.

9 Again using two spanners, hold the unions and unscrew the union nuts securing the high-pressure fuel pipes to the fuel injectors and accumulator rail **(see illustrations)**. Withdraw the high-pressure fuel pipes and plug or cover the open unions to prevent dirt entry.

10 Disconnect the wiring connectors at the fuel temperature sensor and fuel pressure sensor on the accumulator rail **(see illustration)**.

11 Undo the three bolts securing the accumulator rail to the cylinder head and withdraw the rail from its location **(see illustrations)**.

Caution: Do not attempt to remove the four high-pressure fuel pipe male unions from the accumulator rail. These parts are not available separately and if disturbed are likely to result in fuel leakage on reassembly.

12 Obtain a complete new set of high-pressure fuel pipes for refitting.

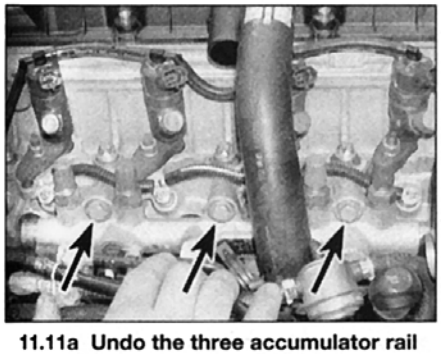
Refitting

13 Locate the accumulator rail in position, refit the three securing bolts and tighten to the specified torque.

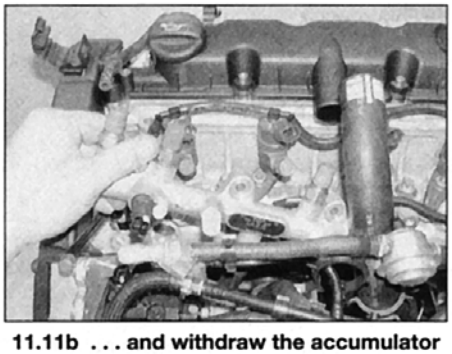
14 Reconnect the fuel temperature sensor and fuel pressure sensor wiring connectors.

15 Working on one fuel injector at a time, remove the blanking plugs from the fuel pipe unions on the accumulator rail and the relevant injector. Locate a new high-pressure fuel pipe over the unions and screw on the union nuts finger tight at this stage.

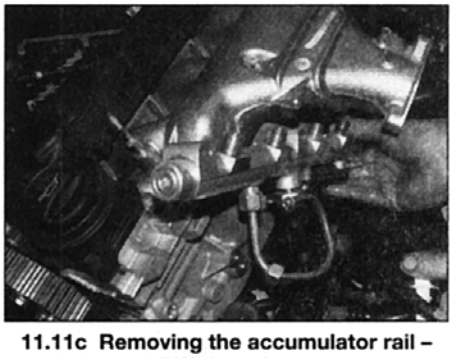
16 When all four fuel pipes are in place, hold the unions with a spanner and tighten the



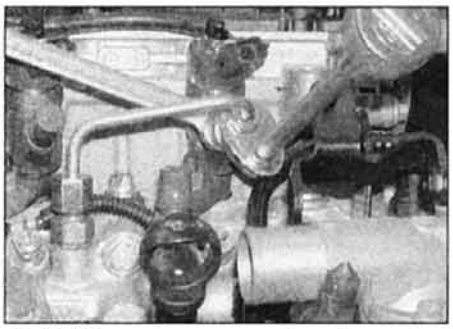
11.11a Undo the three accumulator rail retaining bolts (arrowed) . . .



11.11b . . . and withdraw the accumulator rail from the engine – DW10 engine



11.11c Removing the accumulator rail – DW12 engine



11.16 Using a torque wrench and crow-foot adaptor, tighten the fuel pipe union nuts

union nuts to the specified torque using a torque wrench and crow-foot adaptor **(see illustration)**.

17 Similarly, fit a new high-pressure fuel pipe to the fuel pump and accumulator rail, and tighten the union nuts to the specified torque.

18 Remove the blanking plugs and reconnect the supply and return hose quick-release fittings at the fuel filter, and at the connections above the fuel pump. Secure the hoses with their respective retaining clips.

19 Reconnect the crankcase ventilation hose to the cylinder head cover.

20 Reposition the plastic wiring harness guide over the two mounting studs and secure with the retaining nuts.

21 Reconnect the fuel injector and pump piston de-activator switch wiring connectors, and reconnect any additional wiring disconnected for access.

22 Check that everything has been reconnected and secured with the relevant retaining clips then reconnect the battery negative terminal.

23 Refit the engine cover on completion.

24 Observing the precautions listed in Section 2, start the engine and allow it to idle. Check for leaks at the high-pressure fuel pipe unions with the engine idling. If satisfactory, increase the engine speed to 4000 rpm and check again for leaks. Take the car for a short road test and check for leaks once again on return. If any leaks are detected, obtain and fit additional new high-pressure fuel pipes as required. **Do not** attempt to cure even the slightest leak by further tightening of the pipe unions. During the road test, initialise the engine management ECU as follows. Engage third gear and stabilise the engine at 1000 rpm, then accelerate fully up to 3500 rpm.

12 Fuel injectors – removal and refitting

Warning: Refer to the information contained in Section 2 before proceeding.

Note: *The following procedure describes the removal and refitting of the injectors as a complete set, however each injector may be removed individually if required. New copper washers, upper seals, injector clamp retaining nuts and a high-pressure fuel pipe will be required for each disturbed injector when refitting.*

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

2 Undo the four plastic nuts and lift off the engine top cover.

3 Disconnect the wiring connectors at the fuel injectors. If necessary, unclip the wiring conduit and move it to one side **(see illustration)**.

4 Release the retaining clip and disconnect the crankcase ventilation hose from the cylinder head cover. Position it to one side.

5 Undo the two nuts securing the plastic wiring harness guide to the cylinder head **(see illustration)**. Lift the guide off the two mounting studs and move it clear of the accumulator rail. Disconnect any additional wiring connectors as necessary to enable the harness and guide assembly to be moved to one side.

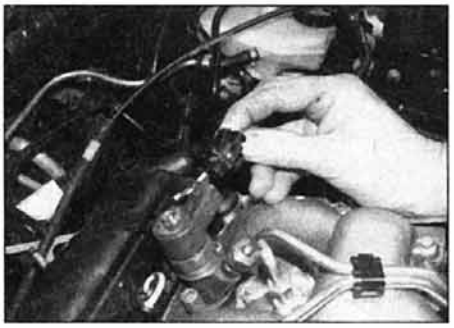
6 At the connections above the fuel pump, disconnect the fuel supply and return hose quick-release fittings using a small screwdriver to release the locking clip. Suitably plug or cover the open unions to prevent dirt entry, then release the fuel hoses from the relevant retaining clips.

7 Thoroughly clean all the high-pressure fuel pipe unions on the fuel injectors and accumulator rail. Using two open-ended spanners, unscrew the union nuts securing the high-pressure fuel pipes to the fuel injectors and accumulator rail **(see illustrations)**. Withdraw the high-pressure fuel pipes and plug or cover the open unions on the injectors and accumulator rail to prevent dirt entry. Note that a new high-pressure fuel pipe will be required for each removed injector when refitting.

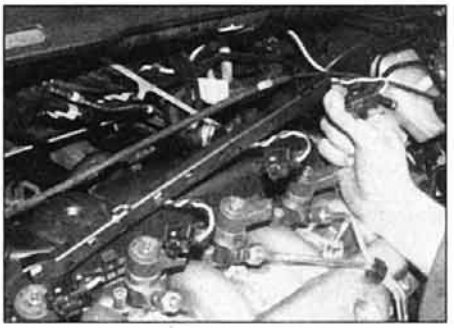
8 Extract the retaining circlip and disconnect the leak-off pipe from each fuel injector **(see illustration)**.

9 Unscrew the nut(s) and remove the washer(s) securing each injector clamp to its cylinder head stud(s) **(see illustrations)**. Note that new clamp nuts will be required for refitting.

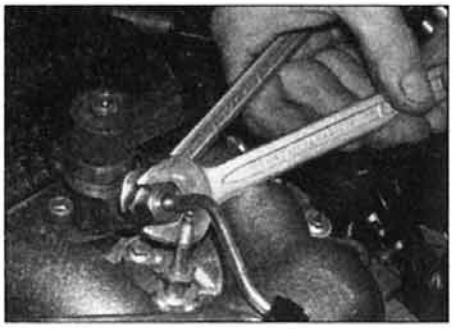
10 Withdraw the injectors, together with their clamps, from the cylinder head or inlet manifold, as applicable. Slide the clamp off the injector once it is clear of the mounting



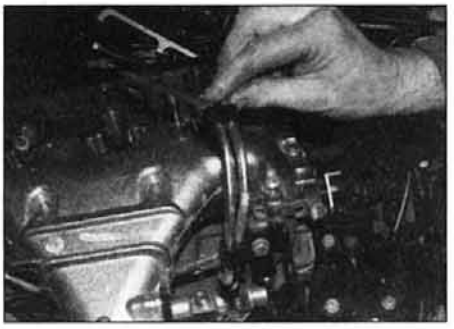
12.3 Disconnect the wiring . . .



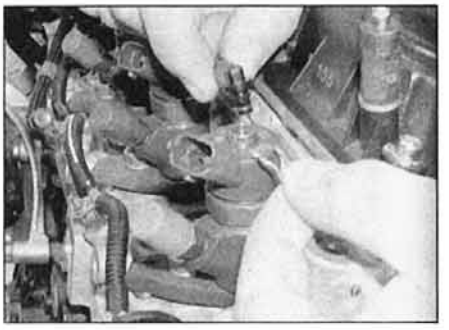
12.5 . . . and move the harness conduit to one side – DW12 engine



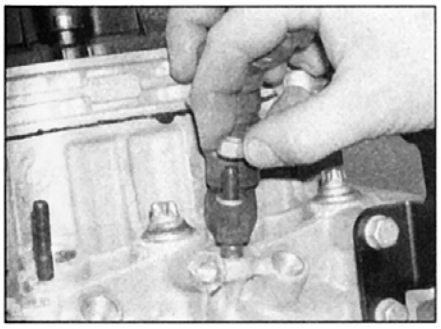
12.7a Unscrew the union nuts using two spanners . . .



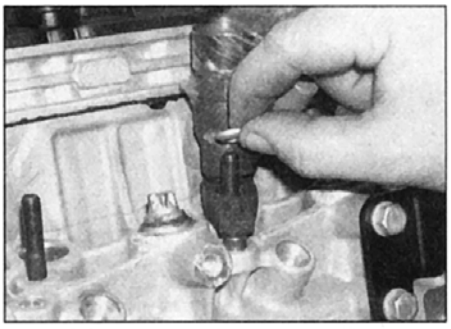
12.7b . . . and remove the two pairs of high-pressure fuel pipes



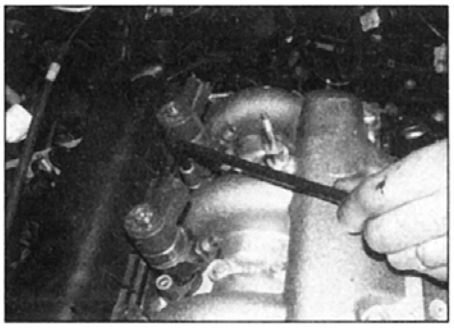
12.8 Extract the circlip and disconnect the injector leak-off pipes – DW10 engine



12.9a Unscrew the injector clamp retaining nut . . .



12.9b . . . and remove the washer – DW10 engine



12.9c Using a key to unscrew the injector clamp nuts – DW12 engine

stud. If the injectors are a tight fit in the cylinder head and cannot be released, two screwdrivers may be used to carefully lever them out **(see illustrations)**. Alternatively, unscrew one mounting stud using a stud extractor and slide off the injector clamp. Using an open-ended spanner engaged with the clamp locating slot on the injector body, free the injector by twisting it and at the same time lifting it upwards.

11 Recover the injector clamp locating dowel from the cylinder head **(see illustration)**.

12 Remove the copper washer and the upper seal from each injector, or from the cylinder head if they remained in place during injector removal. New copper washers and upper seals will be required for refitting.

13 Examine each injector visually for any signs of obvious damage or deterioration. If any defects are apparent, renew the injector(s).

Caution: The injectors are manufactured to extremely close tolerances and must not be dismantled in any way. Do not unscrew the fuel pipe union on the side of the injector, or separate any parts of the injector body. Do not attempt to clean carbon deposits from the injector nozzle or carry out any form of ultrasonic or pressure testing.

14 If the injectors are in a satisfactory condition, plug the fuel pipe union (if not already done) and suitably cover the electrical element and the injector nozzle.

15 Prior to refitting, obtain new copper washers, upper seals, injector clamp retaining nuts and high-pressure fuel pipes for each removed injector.

Refitting

16 Locate a new upper seal on the body of each injector, and place a new copper washer on the injector nozzle **(see illustrations)**.

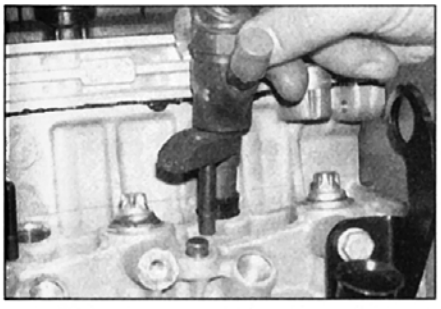
17 Refit the injector clamp locating dowels to the cylinder head.

18 Place the injector clamp in the slot on each injector body and refit the injectors to the cylinder head. Guide the clamp over the mounting stud and onto the locating dowel as each injector is inserted.

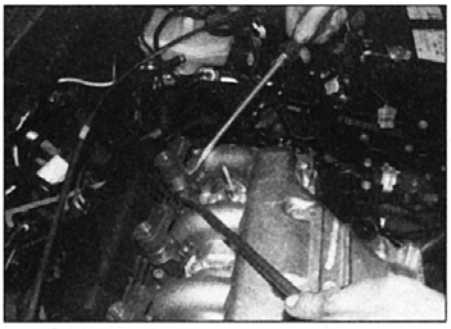
19 Fit the washer and a new injector clamp retaining nut to each mounting stud. Tighten the nuts finger tight only at this stage.

20 Working on one fuel injector at a time, remove the blanking plugs from the fuel pipe unions on the accumulator rail and the relevant injector. Locate a new high-pressure fuel pipe over the unions and screw on the union nuts. Take care not to cross-thread the nuts or strain the fuel pipes as they are fitted. Once the union nut threads have started, tighten the nuts moderately tight only at this stage.

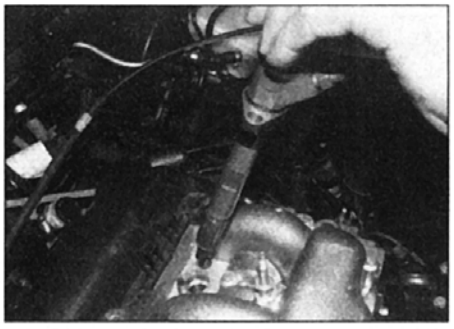
21 When all the fuel pipes are in place,



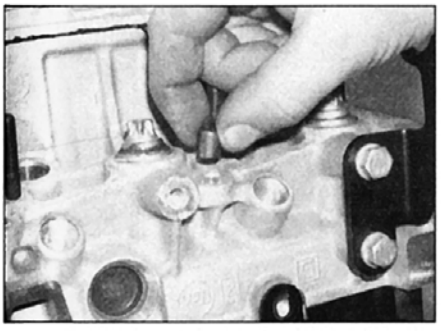
12.10a Withdraw the injectors, together with their clamps, from the cylinder head – DW10 engine



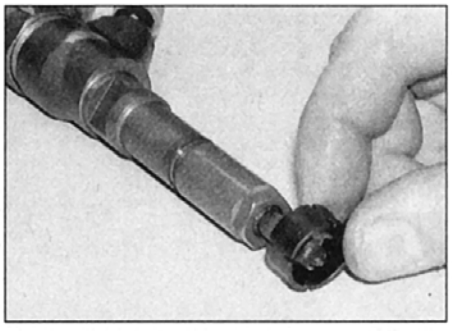
12.10b Using two screwdrivers . . .



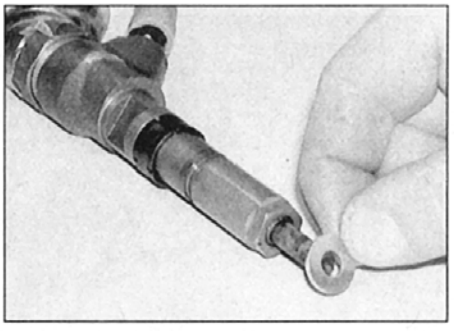
12.10c . . . to remove the injectors – DW12 engine



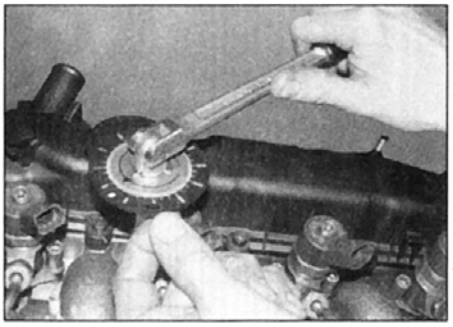
12.11 Recover the injector clamp locating dowel from the cylinder head – DW10 engine



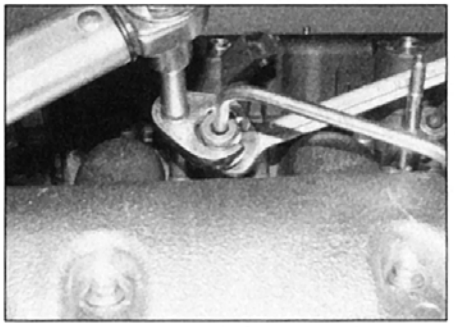
12.16a Locate a new upper seal on the body of each injector . . .



12.16b . . . and place a new copper washer on the injector nozzle – DW10 engine



12.21 Angle-tightening the injector clamp nuts – DW12 engine



12.22 Tightening the fuel pipe union nuts – DW12 engine

tighten the injector clamp retaining nuts to the specified torque (and angle where applicable) **(see illustration)**.

22 Using an open-ended spanner, hold each fuel pipe union in turn and tighten the union nut to the specified torque using a torque wrench and crow-foot adaptor **(see illustration)**. Tighten all the disturbed union nuts in the same way.

23 Connect the leak-off pipes to each fuel injector and secure with the retaining circlips.

24 Remove the blanking plugs and reconnect the supply and return hose quick-release fittings at the connections above the fuel pump. Secure the hoses with their respective retaining clips.

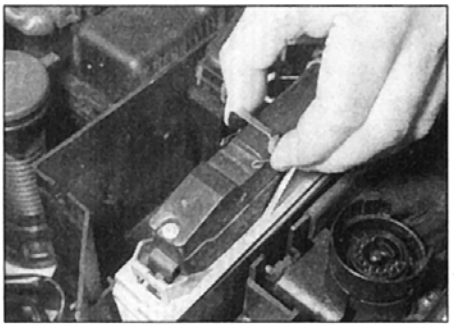
25 Reposition the plastic wiring harness guide over the two mounting studs and secure with the retaining nuts.

26 Reconnect the fuel injector wiring connectors, and reconnect any additional wiring disconnected for access.

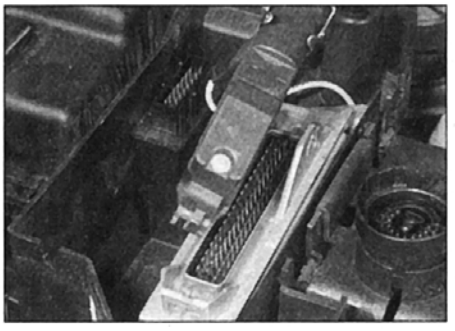
27 Check that everything has been reconnected and secured with the relevant retaining clips then reconnect the battery negative terminal.

28 Observing the precautions listed in Section 2, start the engine and allow it to idle. Check for leaks at the high-pressure fuel pipe unions with the engine idling. If satisfactory, increase the engine speed to 4000 rpm and check again for leaks. Take the car for a short road test and check for leaks once again on return. If any leaks are detected, obtain and fit additional new high-pressure fuel pipes as required. **Do not** attempt to cure even the slightest leak by further tightening of the pipe unions. During the road test, initialise the engine management ECU as follows. Engage third gear and stabilise the engine at 1000 rpm, then accelerate fully up to 3500 rpm.

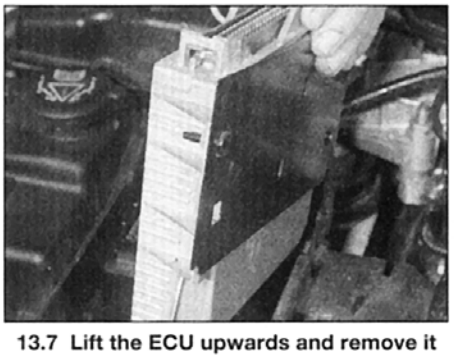
29 Refit the engine cover on completion.



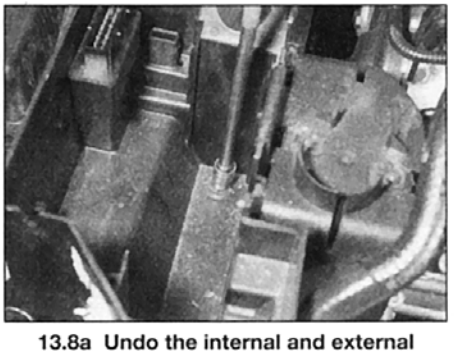
13.6a Lift the locking lever upwards . . .



13.6b . . . and disconnect the wiring connector



13.7 Lift the ECU upwards and remove it from the module box



13.8a Undo the internal and external retaining bolts . . .

13 Electronic control system components – testing, removal and refitting

Testing

1 If a fault is suspected in the electronic control side of the system, first ensure that all the wiring connectors are securely connected and free of corrosion. Ensure that the suspected problem is not of a mechanical nature, or due to poor maintenance; ie, check that the air cleaner filter element is clean, the engine breather hoses are clear and undamaged, and that the cylinder compression pressures are correct, referring to Chapters 1B and 2C for further information.

2 If these checks fail to reveal the cause of the problem, the vehicle should be taken to a Peugeot dealer or suitably-equipped garage for testing. A diagnostic socket is located adjacent to the passenger compartment fusebox in which a fault code reader or other suitable test equipment can be connected. By using the code reader or test equipment, the engine management ECU (and the various other vehicle system ECUs) can be interrogated, and any stored fault codes can be retrieved. This will allow the fault to be quickly and simply traced, alleviating the need to test all the system components individually, which is a time-consuming operation that carries a risk of damaging the ECU.

Removal and refitting

3 Before carrying out any of the following procedures, disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual). Reconnect the battery on completion of refitting.

Electronic control unit (ECU)

Note: *If a new ECU is to be fitted, this work must be entrusted to a Peugeot dealer. It is necessary to initialise the new ECU after installation, which requires the use of dedicated Peugeot diagnostic equipment.*

4 The ECU is located in a plastic box which is mounted on the right-hand front wheelarch.

5 Lift off the ECU module box lid.

6 Release the wiring connector by lifting the locking lever on top of the connector upwards. Lift the connector at the rear, disengage the tag at the front and carefully withdraw the connector from the ECU pins **(see illustrations)**

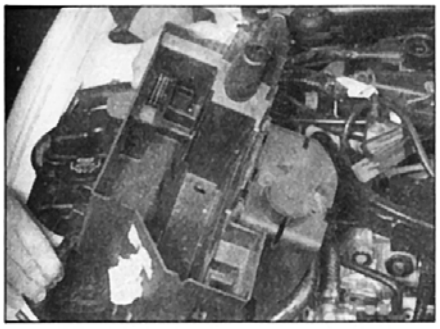
7 Lift the ECU upwards and remove it from its location **(see illustration)**.

8 To remove the ECU module box, undo the internal and external retaining bolts and remove the module box **(see illustrations)**.

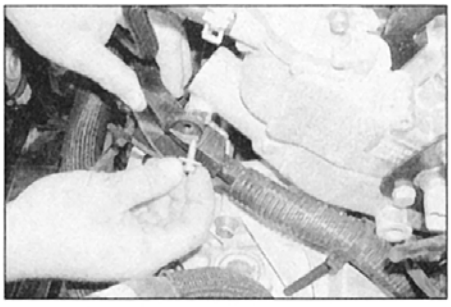
9 Refitting is a reversal of removal.

Crankshaft speed/position sensor

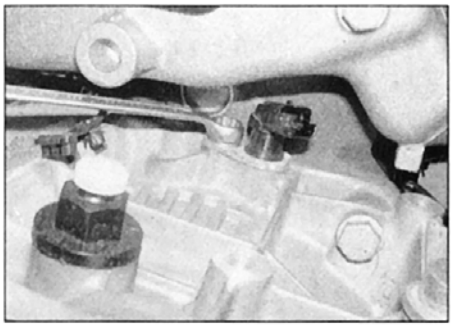
10 The crankshaft speed/position sensor is located at the top of the transmission bellhousing, directly above the engine flywheel.



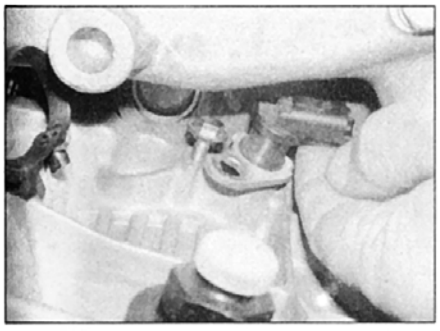
13.8b . . . and remove the module box



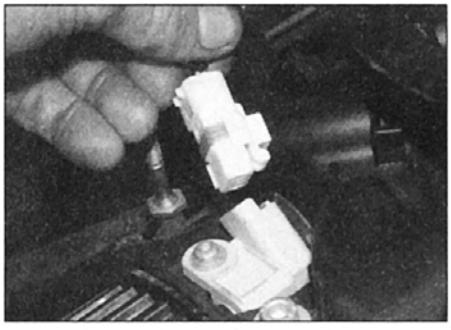
13.11 Release the plastic wiring harness guide for access to the crankshaft speed/position sensor



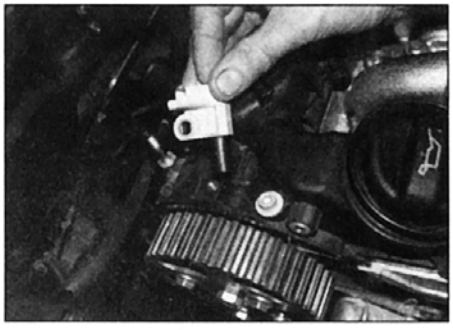
13.13 Slacken the bolt securing the sensor to the bellhousing



13.14 Turn the sensor body to clear the bolt and withdraw it from the bellhousing



13.18 Disconnect the wiring . . .



13.19 . . . and remove the camshaft position sensor

To gain access, remove the air cleaner assembly as described in Section 4, then remove the battery and battery tray as described in Chapter 5A.

11 Undo the retaining nuts and bolts and release the plastic wiring harness guide from its mountings **(see illustration)**.

12 Working below the thermostat housing, disconnect the wiring connector from the crankshaft speed/position sensor.

13 Slacken the bolt securing the sensor to the bellhousing **(see illustration)**. It is not necessary to remove the bolt completely as the sensor mounting flange is slotted.

14 Turn the sensor body to clear the mounting bolt, then withdraw the sensor from the bellhousing **(see illustration)**.

15 Refitting is reverse of the removal procedure ensuring the sensor retaining bolt is securely tightened.

Camshaft position sensor

16 The camshaft position sensor is mounted on the right-hand end of the cylinder head cover, directly behind the camshaft sprocket.

17 Remove the timing belt upper and intermediate covers as described in Chapter 2C.

18 Disconnect the sensor wiring connector **(see illustration)**.

19 Undo the retaining bolt and lift the sensor off the cylinder head cover **(see illustration)**.

20 To refit and adjust the sensor position, locate the sensor on the cylinder head cover and loosely refit the retaining bolt.

21 The air gap between the tip of the sensor and the target plate at the rear of the camshaft sprocket hub must be set to 1.2 mm, using feeler blades. Clearance for the feeler blades is limited with the timing belt and camshaft sprocket in place, but it is just possible if the feeler blades are bent through 90° so they can be inserted through the holes in the sprocket, to rest against the inner face of the target plate.

22 With the feeler blades placed against the target plate, move the sensor toward the sprocket until it just contacts the feeler blades. Hold the sensor in this position and tighten the retaining bolt **(see illustration)**.

23 With the gap correctly adjusted, reconnect the sensor wiring connector, then refit the timing belt upper and intermediate covers as described in Chapter 2C.

Accelerator pedal position sensor

24 The accelerator pedal position sensor is located on the left-hand side of the engine compartment, adjacent to the air cleaner housing.

25 Remove the air cleaner assembly as described in Section 4.

26 Undo the two nuts and bolts and remove the sensor assembly from the mounting bracket on the side of the air cleaner housing **(see illustration)**.

27 Refitting is reverse of the removal procedure.

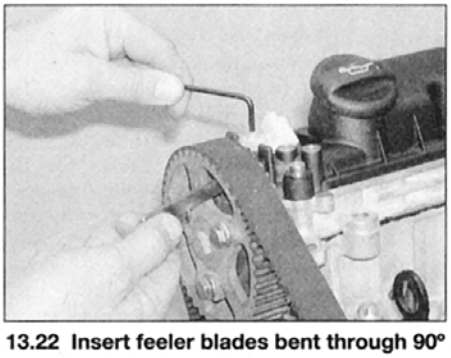
Coolant temperature sensor

28 Refer to Chapter 3, Section 6.

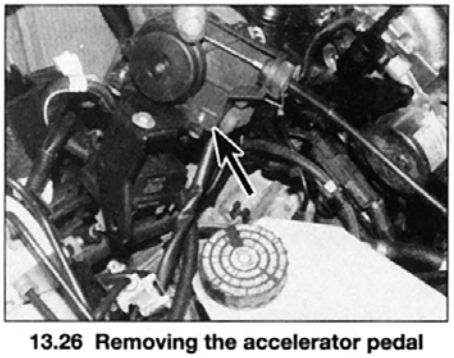
Fuel temperature sensor

Warning: Refer to the information contained in Section 2 before proceeding.

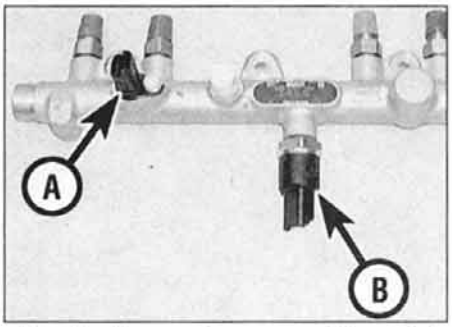
Note: *Do not remove the sensor from the accumulator rail unless there is a valid reason*



13.22 Insert feeler blades bent through 90° through the sprocket to measure the camshaft position sensor air gap



13.26 Removing the accelerator pedal position sensor



13.29 Fuel temperature sensor (A) and fuel pressure sensor (B) locations on the accumulator rail (shown removed for clarity)

to do so. At the time of writing there was no information as to the availability of the sensor seal as a separate item. Consult a Peugeot parts stockist for the latest information before proceeding.

29 The fuel temperature sensor is located towards the right-hand end of the accumulator rail **(see illustration)**.

30 Undo the four plastic nuts and lift off the engine cover.

31 Disconnect the fuel temperature sensor wiring connector.

32 Thoroughly clean the area around the sensor and its location on the accumulator rail.

33 Suitably protect the components below the sensor and have plenty of clean rags handy. Be prepared for considerable fuel spillage.

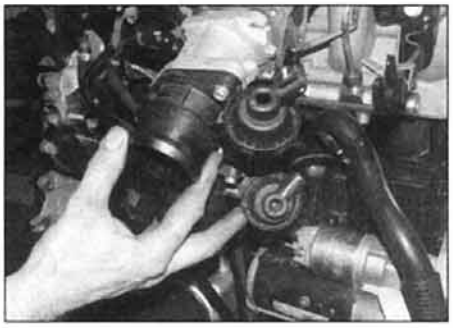
34 Undo the retaining bolt and withdraw the sensor from the accumulator rail. Plug the opening in the accumulator rail as soon as the sensor is withdrawn.

35 Prior to refitting, if the original sensor is to be refitted, renew the sensor seal, where applicable (see the note at the start of this sub-Section).

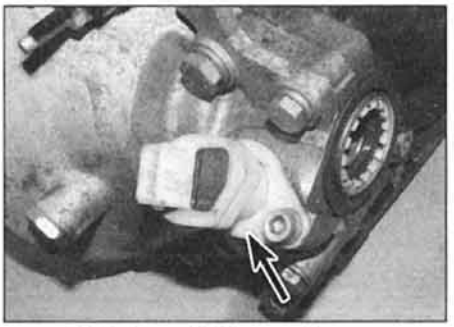
36 Locate the sensor in the accumulator rail and refit the retaining bolt, tightened securely.

37 Refit the sensor wiring connector.

38 Observing the precautions listed in Section 2, start the engine and allow it to idle. Check for leaks at the fuel temperature sensor with the engine idling. If satisfactory, increase the engine speed to 4000 rpm and check again for leaks. Take the car for a short road test and check for leaks once again on return.



13.67 Removing the throttle bodies from the inlet manifold



13.63 The vehicle speed sensor (speedometer transducer) is located on the final drive casing

If any leaks are detected, obtain and fit a new sensor.

39 Refit the engine cover on completion.

Air mass meter

40 The air mass meter is attached to the lid of the air cleaner housing.

41 Undo the four plastic nuts and lift off the engine cover.

42 Slacken the retaining clips and disconnect the flexible air inlet duct from the air mass meter and turbocharger rigid inlet duct. Suitably plug or cover the turbocharger rigid inlet duct, using clean rag to prevent any dirt or foreign material from entering.

43 Disconnect the wiring connector from the air mass meter.

44 Undo the screws securing the lid to the air cleaner housing and lift off the lid, complete with air mass meter.

45 Undo the two screws and withdraw the air mass meter from the air cleaner lid.

46 Refitting is reverse of the removal procedure.

Fuel pressure sensor

Warning: Refer to the information contained in Section 2 before proceeding.

Note: *Peugeot special tool (-).4220 TH (27 mm forked adaptor) or suitable equivalent will be required for this operation.*

47 The fuel pressure sensor is located centrally on the underside of the accumulator rail.

48 Undo the four plastic nuts and lift off the engine cover.

49 Release the retaining clip and disconnect the crankcase ventilation hose from the cylinder head cover.

50 Disconnect the fuel supply and return hose quick-release fittings at the fuel filter, using a small screwdriver to release the locking clip. Suitably plug or cover the open unions to prevent dirt entry. Release the fuel hoses from the relevant retaining clips.

51 Disconnect the fuel pressure sensor wiring connector.

52 Thoroughly clean the area around the sensor and its location on the accumulator rail.

53 Suitably protect the components below the sensor and have plenty of clean rags handy. Be prepared for considerable fuel spillage.

54 Using the Peugeot special tool (or suitable alternative 27 mm forked adaptor) and a socket bar, unscrew the fuel pressure sensor from the base of the accumulator rail.

55 Obtain and fit a new sealing ring to the sensor prior to refitting.

56 Locate the sensor in the accumulator rail and tighten it to the specified torque using the special tool (or alternative) and a torque wrench.

57 Refit the sensor wiring connector.

58 Observing the precautions listed in Section 2, start the engine and allow it to idle. Check for leaks at the fuel pressure sensor with the engine idling. If satisfactory, increase the engine speed to 4000 rpm and check again for leaks. Take the car for a short road test and check for leaks once again on return. If any leaks are detected, obtain and fit another new sensor sealing ring.

59 Refit the engine cover on completion.

Fuel pressure control valve

60 The fuel pressure control valve is integral with the high-pressure fuel pump and cannot be separated.

Preheating system control unit

61 Refer to Chapter 5C.

EGR solenoid valve

62 Refer to Chapter 4C, Section 2.

Vehicle speed sensor

63 The vehicle speed sensor is located on the final drive casing on the rear of the transmission **(see illustration)**. To remove it, unscrew the retaining screw and withdraw it from the transmission casing.

64 Refitting is a reversal of removal.

Throttle bodies (DW12 engine)

65 Remove the air cleaner and inlet air ducts with reference to Section 4.

66 Disconnect the vacuum hoses from the servos, and disconnect the air inlet ducts from the throttle bodies.

67 Unbolt the throttle body assembly from the inlet manifold, and withdraw from the engine compartment **(see illustration)**. Recover the gaskets.

68 If necessary, unbolt the throttle bodies from the elbow.

69 Refitting is a reversal of removal, but fit new gaskets.

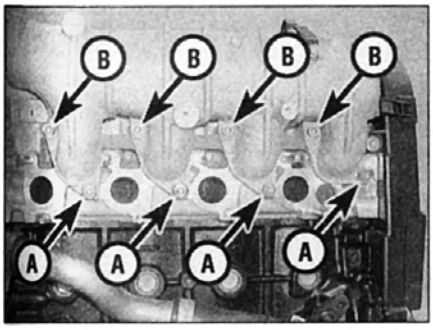
14 Inlet manifold – removal and refitting

DW10 engine

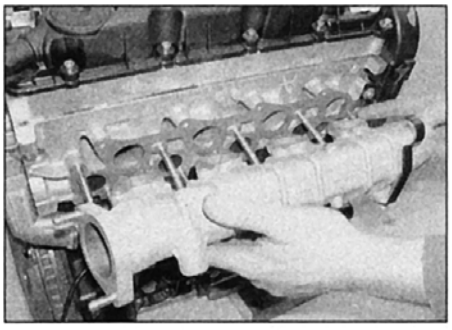
Note: *Renew the manifold gasket when refitting.*

Removal

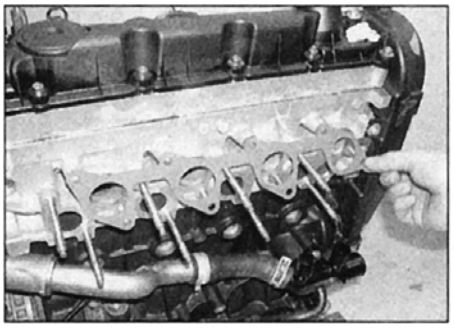
1 The inlet manifold is located on the rear of the cylinder head together with the exhaust



14.2 Inlet manifold retaining nuts (A) and bolts (B)



14.3a Lift the manifold off the cylinder head studs . . .



14.3b . . . and recover the gasket

manifold. First, remove the exhaust manifold as described in Section 15.

2 Undo the four bolts and four nuts securing the inlet manifolds flanges to the cylinder head **(see illustration)** and recover the washers. If preferred, the lower mounting nuts may be loosened and not removed, as the lower inlet manifold holes are slotted to allow the manifold to be lifted upwards once the upper bolts have been removed.

3 Lift the manifold off the cylinder head studs and recover the gasket **(see illustrations)**.

Refitting

4 Refitting is reverse of the removal procedure, bearing in mind the following points.

a) Ensure that the manifold and cylinder head mating faces are clean, with all traces of old gasket removed.

b) Use a new gasket when refitting the manifold.

c) Ensure that all fixings and attachments are securely tightened.

d) Refit the exhaust manifold as described in Section 15.

DW12 engine

Removal and refitting

5 The inlet manifold is located on the top of the cylinder head, and incorporates the camshaft bearing housing. Refer to Chapter 2C, and follow the procedure for removing and refitting the camshafts.

15 Exhaust manifold – removal and refitting

Removal

1 The exhaust manifold is located on the rear of the cylinder head and access is very limited. On the DW10 engine, the inlet manifold is also located on the rear of the cylinder head, however on the DW12 engine access is easier since the inlet manifold is located on the front of the engine. First, apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

2 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

3 Remove the catalytic converter with reference to Section 19.

4 Remove the turbocharger inlet and outlet ducts as described in Section 4.

5 Unscrew the union nut securing the turbocharger oil feed pipe to the cylinder block, then withdraw the pipe from its location **(see illustration)**.

6 Remove the filter from the end of the oil feed pipe, and examine it for contamination **(see illustration)**. Clean or renew if necessary.

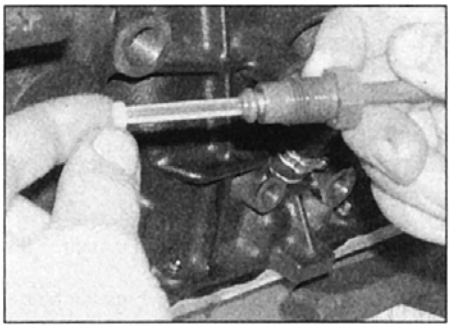
7 Undo the two bolts securing the oil return pipe flange to the turbocharger. Separate the flange and recover the gasket **(see illustrations)**.

8 Remove the exhaust gas recirculation (EGR) valve and connecting pipe from the exhaust manifold as described in Chapter 4C.

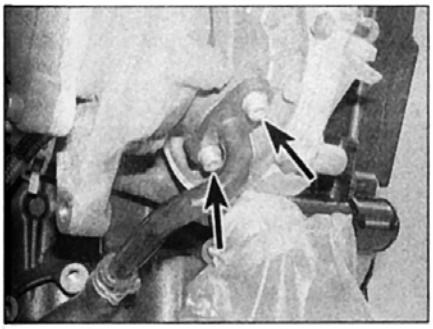
9 Undo the exhaust manifold retaining nuts and recover the spacers from the studs **(see illustrations)**.

10 Undo the nut and bolt securing the base of the turbocharger to the support bracket on the cylinder block.

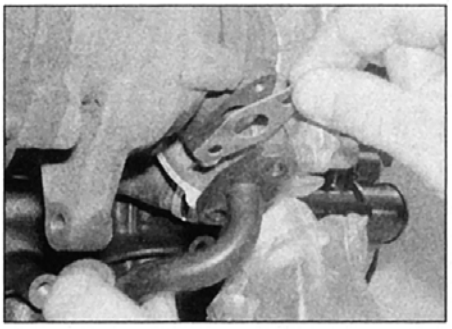
15.5 Unscrew the turbocharger oil feed pipe union nut



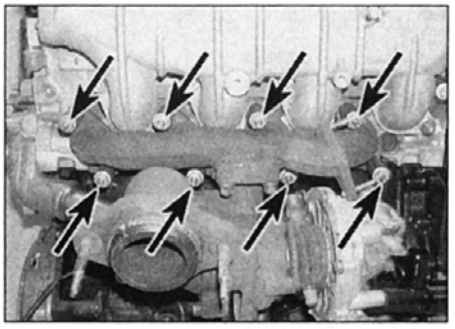
15.6 Withdraw the oil feed pipe and remove the filter



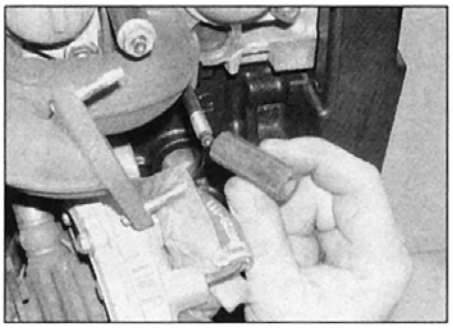
15.7a Undo the oil return pipe flange securing bolts . . .



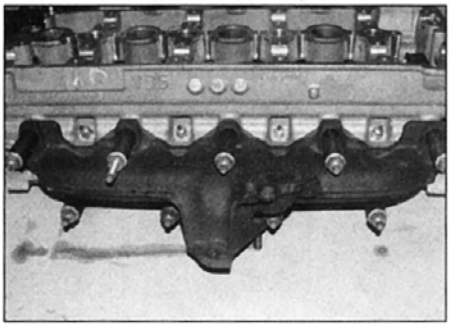
15.7b . . . separate the flange and recover the gasket



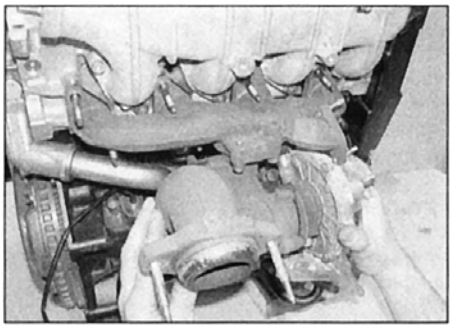
15.9a Undo the exhaust manifold retaining nuts . . .



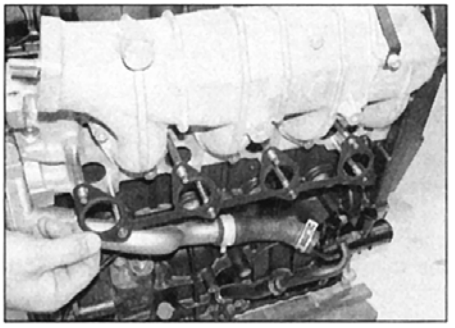
15.9b . . . and recover the spacers from the studs – DW10 engine



15.9c Exhaust manifold – DW12 engine



15.11a Withdraw the turbocharger and exhaust manifold off the mounting studs . . .



15.11b . . . and recover the gasket

11 Withdraw the turbocharger and exhaust manifold off the mounting studs and remove the assembly from the engine. Recover the manifold gasket **(see illustrations)**.

Refitting

12 Refitting is a reverse of the removal procedure, bearing in mind the following points:

a) Ensure that the manifold and cylinder head mating faces are clean, with all traces of old gasket removed.
b) Use new gaskets when refitting the manifold to the cylinder head and the oil return pipe flange to the turbocharger.
c) Tighten the exhaust manifold retaining nuts to the specified torque.
d) Refit the EGR valve and connecting pipe as described in Chapter 4C, Section 2.
e) Refit the turbocharger rear inlet and outlet ducts as described in Section 4.
f) Refit the catalytic converter as described in Section 19.

16 Turbocharger – description and precautions

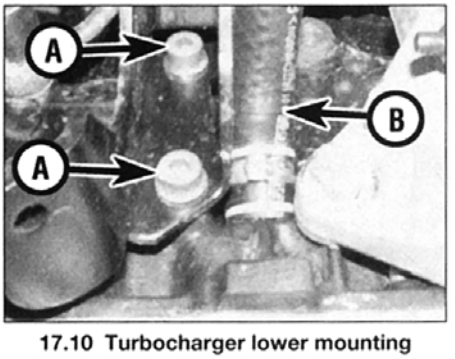
Description

1 A turbocharger is fitted to increase 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.

2 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.

3 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 2.2 litre engines, the turbocharger is controlled by the ECU, however on the 2.0 litre engine, it is controlled by a conventional wastegate.

4 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.



17.10 Turbocharger lower mounting bracket bolts (A) and oil drain pipe (B)

Precautions

5 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.

6 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.

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

8 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.

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

10 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.

17 Turbocharger – removal, inspection and refitting

Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the engine compartment undertray where fitted.

2 Remove the exhaust system as described in Section 19. **Note:** *This is necessary to prevent damage to the exhaust flexible joint, when the engine mountings are disconnected.*

3 On models with an intercooler, loosen the clips and remove the intercooler air hose from beneath the engine.

4 Unbolt and remove the torque reaction link from between the cylinder block and subframe.

5 From under the engine, unscrew the turbocharger air inlet pipe mounting bolt, then disconnect and remove the pipe.

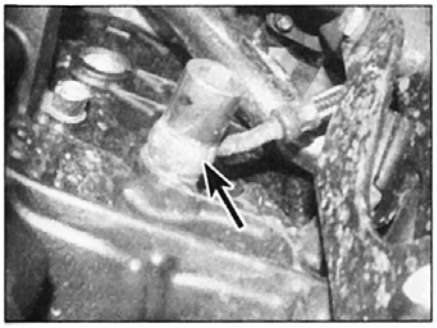
6 On models without an intercooler, unclip the power steering pipes and tie them to one side. Also disconnect the transmission control cables (see Chapter 7A) for access to the turbocharger.

7 Remove the engine top cover, and the air cleaner assembly (see Section 4).

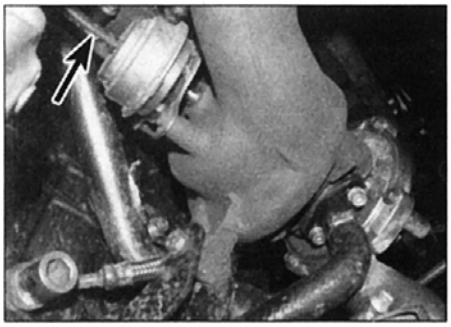
8 Unbolt the EGR solenoid valve assembly and move it to one side.

9 Unscrew the bolt securing the turbocharger inlet air duct to the left-hand rear of the cylinder head, then remove both air ducts. Access to the lower duct is best from under the car. Tape over the turbocharger openings to prevent dirt entry.

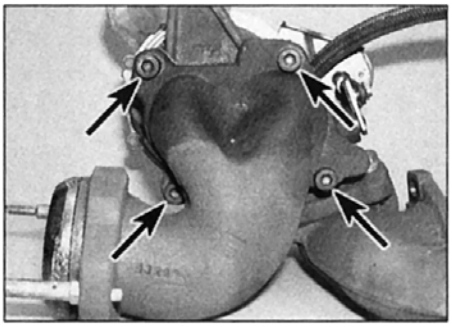
10 Unbolt the turbocharger upper and lower mounting brackets **(see illustration)**.



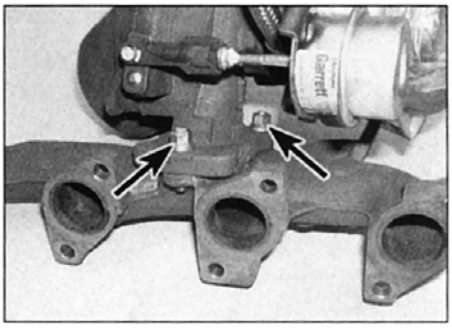
17.11 Turbocharger oil supply pipe banjo on the rear of the cylinder block



17.12 Turbocharger vacuum control pipe



17.14a Exhaust outlet elbow-to-turbocharger retaining bolts



17.14b Turbocharger-to-exhaust manifold retaining nuts

11 Unscrew the union nuts and disconnect the oil supply and return pipes from the turbocharger and engine cylinder block **(see illustration)**. Tape over the openings.

12 On models with an intercooler, disconnect the vacuum control pipe **(see illustration)**.

13 On models without an intercooler, unscrew the three retaining nuts and withdraw the turbocharger from the exhaust manifold studs.

14 On DW10 engines with an intercooler, first loosen only the three nuts securing the turbocharger to the exhaust manifold, then unscrew the nuts securing the exhaust manifold to the cylinder head, and recover the spacers. Withdraw the turbocharger together with the exhaust manifold from the cylinder head, then fully unscrew the nuts and separate the turbocharger from the manifold **(see illustrations)**. Recover the gasket from the cylinder head.

15 On DW12 engines, improved access can be gained by removing the front suspension subframe (see Chapter 10). Unscrew the three nuts (2 from below and 1 from above) securing the turbocharger to the exhaust manifold, then unscrew the bolt securing the turbocharger to the bracket and lower the unit from under the engine.

Inspection

16 With the turbocharger removed, inspect the housing for cracks or other visible damage.

17 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, since in use, the shaft is 'floating' on a film of oil. Check that the wheel vanes are undamaged.

18 If oil contamination of the exhaust or induction passages is apparent, it is likely that turbo shaft oil seals have failed.

19 No DIY repair of the turbo is possible and none of the internal or external parts are available separately. If the turbocharger is suspect in any way a complete new unit must be obtained.

Refitting

20 Refitting is a reverse of the removal procedure, bearing in mind the following points:

a) Renew the turbocharger retaining nuts and gaskets.

b) If a new turbocharger is being fitted, change the engine oil and filter. Also renew the filter in the oil feed pipe.

c) Prime the turbocharger by injecting clean engine oil through the oil feed pipe union before reconnecting the union.

18 Intercooler – removal and refitting

Removal

1 The intercooler is located at the front of the engine compartment, on the left-hand side of the radiator. First apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

2 Remove the engine top cover(s).

3 Remove the air filter assembly as described in Section 4.

4 Remove the battery as described in Chapter 5A.

5 Loosen the clip and disconnect the outlet air duct from the intercooler.

6 Working under the car, loosen the clip and disconnect the inlet air duct from the intercooler.

7 Unbolt the upper mounting plate from the engine compartment front crossmember.

8 Lift the intercooler from its lower mountings and remove from the vehicle.

Refitting

9 Refitting is a reversal of removal.

19 Exhaust system – general information and component renewal

General information

1 According to model, the exhaust system consists of either two, three or four sections. Three section systems consist of a catalytic converter, an intermediate pipe, and a tailpipe. The four section system fitted to the DW12 diesel engine, consists of a particulate filter with flexible coupling, catalytic converter, intermediate pipe, and tailpipe. On two section systems, the catalytic converter and intermediate pipe are combined to form a single section.

2 The exhaust joints are of either the spring-loaded ball type (to allow for movement in the exhaust system) or clamp-ring type.

3 The system is suspended throughout its entire length by rubber mountings.

Removal

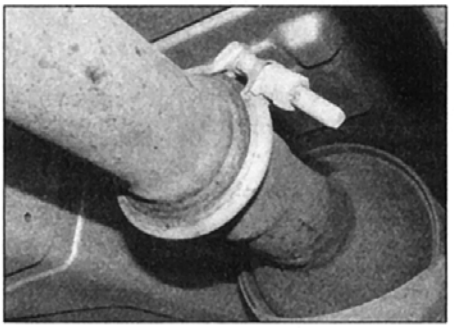
4 Each exhaust section can be removed individually, or alternatively, the complete system can be removed as a unit. Even if only one part of the system needs attention, it is often easier to remove the whole system and separate the sections on the bench.

5 To remove the system or part of the system, first jack up the front or rear of the car, and support it on axle stands (see *Jacking and vehicle support)*. Alternatively, position the car over an inspection pit, or on car ramps.

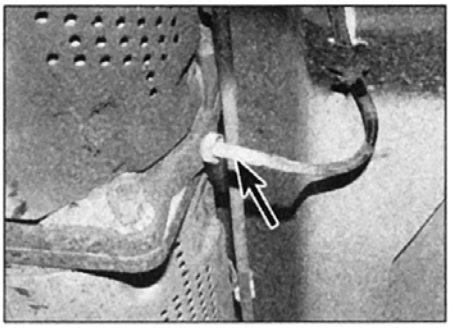
Catalytic converter

6 Unscrew the catalytic converter rear clamp ring bolt, and disengage the rear of the converter from the intermediate section. On the DW12 engine, also disconnect the wiring from the lambda/temperature sensors **(see illustrations)**. If the converter is being renewed, unscrew and remove the sensor(s).

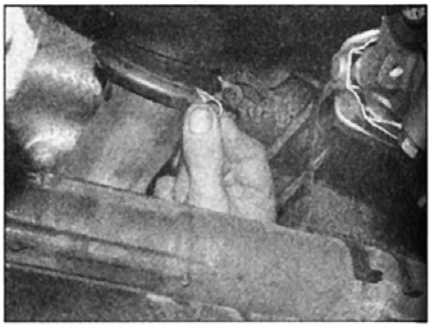
7 Except on the DW12 engine, unscrew the front clamp ring bolt, and disengage the converter from the turbocharger. Remove the catalytic converter from underneath the vehicle. On the DW12 engine, unscrew the front clamp ring bolt and



19.6a Catalytic converter rear clamp

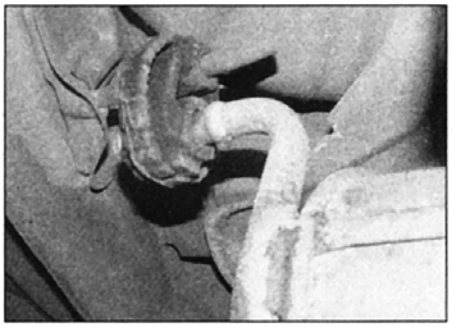


19.6b Lambda sensor on the DW12 exhaust

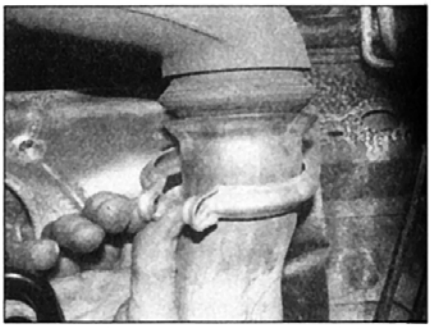


19.7a Removing the front clamp ring

19.7b Particulate filter mounted on the front of the catalytic converter – DW12 engine



19.11 Tailpipe mounting rubber



19.13 Disconnecting the front pipe from the turbocharger – DW12 engine

disengage the particulate filter from the flexible coupling, then remove the catalytic converter and unbolt the particulate filter on the bench **(see illustrations)**.

Intermediate pipe

8 Slacken the clamping ring bolts, and disengage both clamps from the flange joints.

9 Release the pipe from its mounting rubber and remove it from underneath the vehicle.

Tailpipe

10 Slacken the tailpipe clamping ring bolts, and disengage the clamp from the flange joint.

11 Unhook the tailpipe from its mounting rubbers, and remove it from the vehicle **(see illustration)**.

Particulate filter (DW12 engine)

12 The procedure is identical to that for the removal of the catalytic converter.

Complete system

13 Unscrew the front clamp ring bolt and release the catalytic converter or front pipe from the turbocharger **(see illustration)**. Free the system from its mounting rubbers and remove it from underneath the vehicle.

Heat shield(s)

14 The heat shields are secured to the underside of the body by various nuts and bolts. Each shield can be removed once the relevant exhaust section has been removed. If a shield is being removed to gain access to a component located behind it, it may prove sufficient in some cases to remove the retaining nuts and/or bolts, and simply lower the shield, without disturbing the exhaust system.

Refitting

15 Each section is refitted by reversing the removal sequence, noting the following points:

a) Ensure that all traces of corrosion have been removed from the flanges, and renew all necessary gaskets.

b) Inspect the rubber mountings for signs of damage or deterioration, and renew as necessary.

c) On joints secured together by a clamping ring, apply a smear of exhaust system jointing paste to the flange joint, to ensure a gas-tight seal. Tighten the clamping ring nuts evenly and progressively, so that the clearance between the clamp halves remains equal on either side.

d) Prior to tightening the exhaust system fasteners, ensure that all rubber mountings are correctly located, and that there is adequate clearance between the exhaust system and vehicle underbody.

Chapter 4 Part C:
Emission control systems

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

1 General information

All petrol engines use unleaded petrol and also have various other features built into the fuel system to help minimise harmful emissions. In addition, all engines are equipped with the crankcase emission control system described below. All engines are also equipped with a catalytic converter and an evaporative emission control system. 1.8 litre engines equipped to emission standard L4 also utilise a secondary air injection system to quickly bring the catalytic converter up to normal working temperature.

All diesel engines are also designed to meet the strict emission requirements and are equipped with a crankcase emission control system and a catalytic converter. To further reduce exhaust emissions, all diesel engines are also fitted with an exhaust gas recirculation (EGR) system. Additionally, 2.2 litre diesel models are equipped with a particulate emission filter which uses porous silicon carbide substrate to trap particulates of carbon as the exhaust gases pass through.

The emission control systems function as follows.

Petrol engines

Crankcase emission control

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.

Under all conditions 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.

Exhaust emission control

To minimise the amount of pollutants which escape into the atmosphere, a catalytic converter is fitted in the exhaust system. On all models where a catalytic converter is fitted, the system is of the closed-loop type, in which a lambda (oxygen) sensor in the exhaust system provides the fuel-injection/ignition system ECU with constant feedback, enabling the ECU to adjust the mixture to provide the best possible conditions for the converter to operate.

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 an efficient operating temperature. The sensor's tip is sensitive to oxygen and sends the ECU a varying voltage depending on the amount of oxygen in the exhaust gases; if the inlet 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 inlet 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 inlet air/fuel mixture accordingly by altering the fuel injector pulse width.

Evaporative emission control

To minimise the escape into the atmosphere of unburned hydrocarbons, an evaporative emission control system is fitted to models equipped with a catalytic converter. The fuel tank filler cap is sealed and a charcoal canister is mounted behind the

radiator on the left-hand side of the engine compartment to collect the petrol vapours generated in the tank when the car is parked. It stores them until they can be cleared from the canister (under the control of the fuel-injection/ignition system ECU) via the purge valve into the inlet tract to be burned by the engine during normal combustion.

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 is 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.

Secondary air injection

1.8 litre engines equipped to emission standard L4 are also equipped with a secondary air injection system. This system is designed to reduce exhaust emissions in the period between first starting the engine, and until the catalytic converter reaches operating (functioning) temperature. Introduction of air into the exhaust system during the initial start-up period, creates an 'afterburner' effect which quickly increases the temperature in the exhaust system front pipe, thus bringing the catalytic converter up to normal operating temperatures very quickly.

The system consists of an air pump, mounted at the front left-hand side of the car, an air injection valve, mounted on a bracket at the front of the cylinder head, a connecting pipe linking the valve to the exhaust manifold, and interconnecting air hoses.

The system operates for between 10 and 45 seconds after engine start-up, dependant on coolant temperature.

Diesel models

Crankcase emission control

Refer to the description for petrol engines.

Exhaust emission control

To minimise the level of exhaust pollutants released into the atmosphere, a catalytic converter is fitted in the exhaust system of all models.

The catalytic converter consists of a canister containing a fine mesh impregnated with a catalyst material, over which the hot exhaust gases pass. The catalyst speeds up the oxidation of harmful carbon monoxide, unburnt hydrocarbons and soot, effectively reducing the quantity of harmful products released into the atmosphere via the exhaust gases.

Exhaust gas recirculation system

This system is designed to recirculate small quantities of exhaust gas into the inlet tract, and therefore into the combustion process. This process reduces the level of oxides of nitrogen present in the final exhaust gas which is released into the atmosphere.

The volume of exhaust gas recirculated is controlled by the system electronic control unit.

A vacuum-operated valve is fitted to the exhaust manifold, to regulate the quantity of exhaust gas recirculated. The valve is operated by the vacuum supplied by the solenoid valve.

Particulate filter system

The particulate emission filter is located upstream of the catalytic converter in the exhaust system, and its purpose it to trap particulates of carbon (soot) as the exhaust gases pass through, in order to comply with latest emission regulations.

The filter can be automatically regenerated (cleaned) by a Peugeot dealership using a special diagnostic tool in conjunction with the system's ECU on-board the vehicle. The engine's high pressure injection system is utilized to inject fuel into the exhaust gases during the post-injection period; this causes the filter temperature to increase sufficient to oxidize the particulates, leaving an ash residue. The regeneration period is automatically controlled by the on-board ECU. Subsequently, every 48 000 miles (80 000 km), the filter must be removed from the exhaust system, and the ash residue flushed away with water.

To assist the combustion of the trapped carbon (soot) during the regeneration process, a fuel additive (cerium-based Eolys) is automatically mixed with the diesel fuel in the fuel tank. The additive is stored in a 5 litre container attached to the bottom of the fuel tank, and the ECU regulates the amount of additive to send to the fuel tank by means of an additive injector located on the top of the fuel tank.

2 Emission control systems – testing and component renewal

Petrol models

Crankcase emission control

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

Evaporative emission control

2 If the system is thought to be faulty, disconnect the hoses from the charcoal canister and purge control valve and check that they are clear by blowing through them. If the purge control valve or charcoal canister are thought to be faulty, they must be renewed.

Charcoal canister renewal

3 The charcoal canister is located under the wheelarch on the right-hand side. To gain access, jack up the front of the car and support it on axle stands. Remove the roadwheel and the wheelarch liner (where necessary).

4 Identify the location of the two hoses then disconnect them from the top of the canister. Where the crimped-type hose clips are fitted, cut the clips and discard them, replace them with standard worm drive hose clips on refitting. Where the hoses are equipped with quick-release fittings depress the centre collar of the fitting with a small flat-bladed screwdriver then detach the hose from the canister.

5 Unscrew the mounting nuts and remove the canister from its mounting bracket. If necessary unbolt and remove the mounting bracket.

6 Refitting is a reverse of the removal procedure ensuring that the hoses are correctly reconnected.

Purge valve renewal

7 The purge valve is located in the right-hand side of the engine compartment near the front suspension strut tower.

8 To renew the purge valve, disconnect the battery negative terminal then depress the retaining clip and disconnect the wiring connector from the valve.

9 Disconnect the hoses from either end of the valve then release the valve from its retaining clip and remove it from the engine compartment, noting which way around it is fitted.

10 Refitting is a reversal of the removal procedure ensuring that the valve is fitted the correct way around and the hoses are securely connected.

Exhaust emission control

11 The performance of the catalytic converter can be checked only by measuring the exhaust gases using a good-quality, carefully-calibrated exhaust gas analyser.

12 If the CO level at the tailpipe is too high, the vehicle should be taken to a Peugeot dealer so that the complete fuel injection and ignition systems, including the lambda sensor, can be thoroughly checked using the special diagnostic equipment. Once these have been checked and are known to be free from faults, the fault must be in the catalytic converter, which must be renewed as described in Part A of this Chapter.

Catalytic converter renewal

13 Refer to Part A of this Chapter.

Lambda sensor renewal

Note: *The lambda sensor is delicate and will not work if it is dropped or knocked, if its power supply is disrupted, or if any cleaning materials are used on it.*

14 Trace the wiring back from the lambda sensor, which is screwed into the top of the exhaust front pipe, to the top of the transmission. Disconnect both wiring connectors and free the wiring from any relevant retaining clips or ties.

15 Unscrew the sensor from the exhaust system front pipe and remove it along with its sealing washer.

16 Refitting is a reverse of the removal procedure using a new sealing washer. Prior

to installing the sensor apply a smear of high temperature grease to the sensor threads. Ensure that the sensor is securely tightened and that the wiring is correctly routed and in no danger of contacting either the exhaust system or engine.

Testing secondary air injection

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

18 Accurate testing of the system operation entails the use of diagnostic test equipment and should be entrusted to a Peugeot dealer.

Air pump renewal

19 The air pump is located at the front left-hand side of the engine compartment.

20 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

21 Slacken and remove the three nuts and withdraw the pump from the mounting bracket.

22 Disconnect the air hoses and wiring connector and remove the pump.

23 Refitting is a reverse of the removal procedure, ensuring that the hoses are correctly reconnected.

Air injection valve renewal

24 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

25 Slacken and remove the retaining screws, and remove the shroud from the top of the exhaust manifold.

26 Undo the two bolts securing the connecting pipe flange to the exhaust manifold.

27 Undo the two bolts securing the valve mounting bracket to the cylinder head.

28 Withdraw the valve and connecting pipe, disconnect the air hose and remove the air injection valve and connecting pipe as an assembly.

29 If necessary, the air pipe can be removed from the valve and the valve removed from the mounting bracket after undoing the two retaining nuts. Collect the flange gasket after removal.

30 Refitting is a reverse of the removal procedure, but use a new gasket between the valve and mounting bracket.

Diesel models

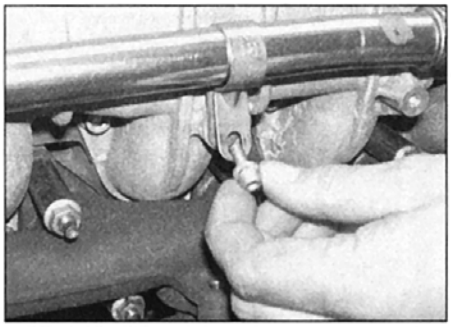
Crankcase emission control

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

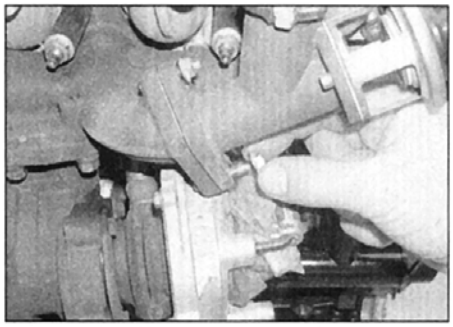
Exhaust emission control

32 The performance of the catalytic converter can be checked only by measuring the exhaust gases using a good-quality, carefully-calibrated exhaust gas analyser.

33 If the catalytic converter is thought to be faulty, before assuming the catalytic converter is faulty, it is worth checking the problem is not due to a faulty injector(s). Refer to your Peugeot dealer for further information.



2.36 On 2.0 litre diesel engines, undo the bolts securing the EGR pipe support clips to the inlet manifold . . .



2.37 . . . then undo the nuts securing the EGR valve to the exhaust manifold

Catalytic converter renewal

34 Refer to Part B of this Chapter.

Exhaust gas recirculation system

35 Testing of the system should ideally be entrusted to a Peugeot dealer since a vacuum pump and vacuum gauge are required.

EGR valve renewal (DW10)

36 Undo the bolts securing the EGR pipe support clips to the inlet manifold **(see illustration)**.

37 Disconnect the vacuum hose, then undo the two nuts securing the EGR valve to the exhaust manifold **(see illustration)**.

38 Undo the two bolts securing the EGR pipe to the inlet manifold elbow. Withdraw the EGR valve and pipe assembly from the manifold and recover the gasket at the EGR pipe-to-inlet manifold flange **(see illustrations)**.

39 To separate the EGR pipe from the valve, remove the clip securing the upper flexible portion of the pipe to the valve. If the original crimped clip is still in place, cut it off; new clips are supplied by Peugeot 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.

40 To remove the EGR solenoid valve, disconnect the two vacuum hoses and the wiring connector. Undo the mounting bracket bolts and remove the valve from the engine compartment.

41 Refitting is a reversal of removal.

EGR valve and heat exchanger renewal (DW12)

42 Drain the cooling system with reference to Chapter 1B. Alternatively, fit hose clamps to the hoses connected to the EGR heat exchanger.

43 Remove the engine top cover, then remove the air filter assembly and inlet ducts.

44 Loosen the clips and disconnect the coolant hoses from the EGR heat exchanger.

45 Disconnect the vacuum hose from the EGR valve.

46 Unscrew the bolts securing the EGR valve to the exhaust manifold.

47 Unscrew the nut securing the heat exchanger to the exhaust manifold.

48 Unscrew the bolts securing the flexible pipe to the inlet manifold.

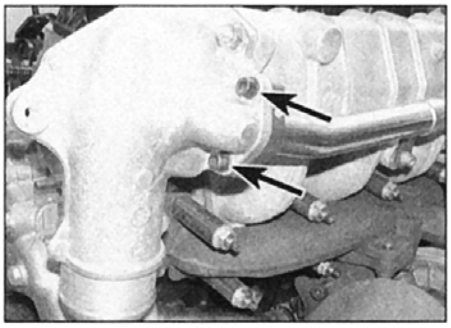
49 Unscrew the remaining mounting bolts and withdraw the assembly of the EGR valve together with the heat exchanger and pipe from the engine.

50 With the assembly on the bench, loosen the clips and separate the heat exchanger from the EGR valve.

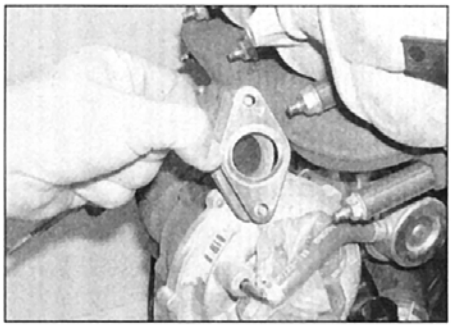
51 Refitting is a reversal of removal, but renew the gaskets.

Fuel additive system (DW12)

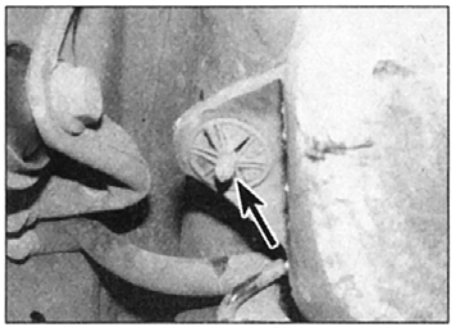
52 It is possible to check the fuel additive pump delivery pressure, however, this should be made by a Peugeot dealer.



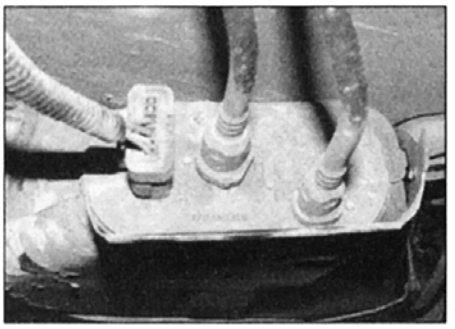
2.38a Undo the two bolts (arrowed) securing the EGR pipe to the inlet manifold elbow . . .



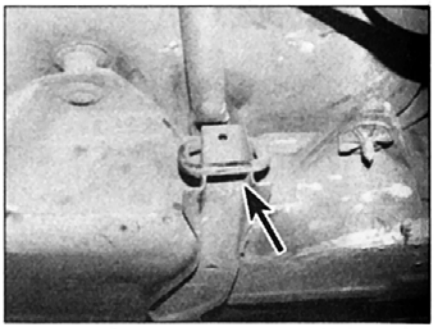
2.38b . . . then withdraw the valve and pipe assembly and recover the gasket at the EGR pipe flange



2.55 Additive reservoir heat shield retaining bolt



2.56 Injector pipes and wiring plug on the rear of the additive reservoir



2.59 Additive reservoir retaining bracket

Fuel additive reservoir renewal

Note: *Ideally, the additive reservoir should be empty before removing it, otherwise take precautions against spillage.*

Warning: Wear protective gloves and eye protection when handling the reservoir.

53 To remove the fuel additive reservoir, chock the front wheels then jack up the rear of the vehicle and support on axle stands (see *Jacking and vehicle support*).

54 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

55 Remove the heat shield from beneath the additive reservoir **(see illustration)**.

56 Note the location of the two additive injector pipes on the rear of the reservoir, then disconnect them **(see illustration)**. Tape over or plug the openings.

57 Disconnect the tank top-up pipe, and tape over or plug the openings.

58 Disconnect the wiring from the level sensor on the rear of the reservoir.

59 Unbolt the bracket from under the reservoir **(see illustration)**.

60 Have a suitable container available to catch spilled additive. Unscrew the single outer mounting bolt, then tilt the reservoir to release it from the inner fixings. Withdraw the reservoir from under the vehicle, and pour any remaining additive into the container.

61 Refitting is a reversal of removal.

62 Have the reservoir refilled by a Peugeot dealer.

3 Catalytic converter – general information and precautions

1 The catalytic converter is a reliable and simple device which needs no maintenance in itself, but there are some facts of which an owner should be aware if the converter is to function properly for its full service life.

Petrol models

a) DO NOT use leaded petrol in a car equipped with a catalytic converter – the lead will coat the precious metals, and will eventually destroy the converter.

b) Always keep the ignition and fuel systems well-maintained to the service schedule.

c) 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.

d) 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.

e) DO NOT switch off the ignition at high engine speeds.

f) DO NOT use fuel or engine oil additives – these may contain substances harmful to the catalytic converter.

g) DO NOT continue to use the car if the engine burns oil to the extent of leaving a visible trail of blue smoke.

h) Remember that the catalytic converter operates at very high temperatures. DO NOT, therefore, park the car in dry undergrowth, over long grass or piles of dead leaves after a long run.

i) Remember that the catalytic converter is FRAGILE – do not strike it with tools.

j) 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 and once the car has covered a few thousand miles the problem should disappear.

k) If the converter is no longer effective it must be renewed.

Diesel models

2 Refer to parts f, g, h and i of the *petrol models* information given above.

Chapter 5 Part A:
Starting and charging systems

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

System type	12 volt, negative earth
Battery	
Type	Low maintenance or 'maintenance-free' sealed for life
Charge condition:	
Poor	12.5 volts
Normal	12.6 volts
Good	12.7 volts
Alternator	
Type	Valeo or Mitsubishi (depending on model)
Starter motor	
Type	Valeo or Bosch (depending on model)

Torque wrench settings	**Nm**	**lbf ft**
Battery mounting plate retaining bolts	45	33
Starter motor	35	26

1 General information and precautions

General information

The engine electrical system consists mainly of the charging and starting systems. Because of their engine-related functions, these components are covered separately from the body electrical devices such as the lights, instruments, etc (which are covered in Chapter 12). On petrol engine models refer to Part B for information on the ignition system, and on diesel models refer to Part C for information on the preheating system.

The electrical system is of the 12 volt negative earth type.

The battery is of the low maintenance or 'maintenance-free' (sealed for life) type and is charged by the alternator, which is belt-driven from the crankshaft pulley.

The starter motor is of the pre-engaged type incorporating an integral solenoid. On starting, the solenoid moves the drive pinion into engagement with the flywheel ring gear before the starter motor is energised. Once the engine has started, a one-way clutch prevents the motor armature being driven by the engine until the pinion disengages from the flywheel.

Precautions

Further details of the various systems are given in the relevant Sections of this Chapter. While some repair procedures are given, the usual course of action is to renew the component concerned. The owner whose interest extends beyond mere component renewal should obtain a copy of the *Automotive Electrical & Electronic Systems Manual*, available from the publishers of this manual.

It is necessary to take extra care when working on the electrical system to avoid damage to semi-conductor devices (diodes and transistors), and to avoid the risk of personal injury. In addition to the precautions given in *Safety first!* at the beginning of this manual, observe the following when working on the system:

Always remove rings, watches, etc, before working on the electrical system. Even with the battery disconnected, capacitive discharge could occur if a component's live terminal is earthed through a metal object. This could cause a shock or nasty burn.

Do not reverse the battery connections. Components such as the alternator, electronic control units, or any other components having semi-conductor circuitry could be irreparably damaged.

If the engine is being started using jump leads and a slave battery, connect the batteries positive-to-positive and negative-to-negative (see 'Jump starting'). This also applies when connecting a battery charger.

Never disconnect the battery terminals, the alternator, any electrical wiring or any test instruments when the engine is running.

Do not allow the engine to turn the alternator when the alternator is not connected.

Never 'test' for alternator output by 'flashing' the output lead to earth.

Never use an ohmmeter of the type incorporating a hand-cranked generator for circuit or continuity testing.

Always ensure that the battery negative lead is disconnected when working on the electrical system.

Before using electric-arc welding equipment on the car, disconnect the battery, alternator and components such as the fuel injection/ignition electronic control unit to protect them from the risk of damage.

Several systems fitted to the vehicle require battery power to be available at all times, either to ensure their continued operation (such as the clock) or to maintain control unit memories of security codes which would be wiped if the battery were to be disconnected. To ensure that there are no unforeseen consequences of this action, refer to 'Disconnecting the battery' in the Reference Section of this manual for further information.

2 Electrical fault finding – general information

Refer to Chapter 12.

3 Battery – testing and charging

Testing

Standard and low maintenance battery

1 If the vehicle covers a small annual mileage, it is worthwhile checking the specific gravity of the electrolyte every three months to determine the state of charge of the battery. Use a hydrometer to make the check and compare the results with the following table. Note that the specific gravity readings assume an electrolyte temperature of 15°C (60°F); for every 10°C (18°F) below 15°C (60°F) subtract 0.007. For every 10°C (18°F) above 15°C (60°F) add 0.007.

	Above 25°C	Below 25°C
Fully-charged	*1.210 to 1.230*	*1.270 to 1.290*
70% charged	*1.170 to 1.190*	*1.230 to 1.250*
Discharged	*1.050 to 1.070*	*1.110 to 1.130*

2 If the battery condition is suspect, first check the specific gravity of electrolyte in each cell. A variation of 0.040 or more between any cells indicates loss of electrolyte or deterioration of the internal plates.

3 If the specific gravity variation is 0.040 or more, the battery should be renewed. If the cell variation is satisfactory but the battery is discharged, it should be charged as described later in this Section.

Maintenance-free battery

4 In cases where a 'sealed for life' maintenance-free battery is fitted, topping-up and testing of the electrolyte in each cell is not possible. The condition of the battery can therefore only be tested using a battery condition indicator or a voltmeter.

5 Certain models may be fitted with a 'Delco' type maintenance-free battery, with a built-in charge condition indicator. The indicator is located in the top of the battery casing, and indicates the condition of the battery from its colour. If the indicator shows green, then the battery is in a good state of charge. If the indicator shows black, then the battery requires charging, as described later in this Section. If the indicator shows blue, then the electrolyte level in the battery is too low to allow further use, and the battery should be renewed.

Caution: Do not attempt to charge, load or jump start a battery when the indicator shows clear/yellow.

6 If testing the battery using a voltmeter, connect the voltmeter across the battery and compare the result with those given in the Specifications under 'charge condition'. The test is only accurate if the battery has not been subjected to any kind of charge for the previous six hours. If this is not the case, switch on the headlights for 30 seconds, then wait four to five minutes before testing the battery after switching off the headlights. All other electrical circuits must be switched off, so check that the doors, boot and/or tailgate are fully shut when making the test.

7 If the voltage reading is less than 12.2 volts, then the battery is discharged, whilst a reading of 12.2 to 12.4 volts indicates a partially discharged condition.

8 If the battery is to be charged, remove it from the vehicle (Section 4) and charge it as described later in this Section.

Charging

Standard and low maintenance battery

Note: *The following is intended as a guide only. Always refer to the manufacturer's recommendations (often printed on a label attached to the battery) before charging a battery.*

9 Charge the battery at a rate of 3.5 to 4 amps and continue to charge the battery at this rate until no further rise in specific gravity is noted over a four hour period.

10 Alternatively, a trickle charger charging at the rate of 1.5 amps can safely be used overnight.

11 Specially rapid 'boost' charges which are claimed to restore the power of the battery in 1 to 2 hours are not recommended, as they can cause serious damage to the battery plates through overheating.

12 While charging the battery, note that the temperature of the electrolyte should never exceed 37.8°C (100°F).

Maintenance-free battery

Note: *The following is intended as a guide only. Always refer to the manufacturer's recommendations (often printed on a label attached to the battery) before charging a battery.*

13 This battery type takes considerably longer to fully recharge than the standard type, the time taken being dependent on the extent of discharge, but it can take anything up to three days.

14 A constant voltage type charger is required to be set, when connected, to 13.9 to 14.9 volts with a charger current below 25 amps. Using this method, the battery should be usable within three hours, giving a voltage reading of 12.5 volts, but this is for a partially discharged battery and, as mentioned, full charging can take considerably longer.

15 If the battery is to be charged from a fully discharged state (condition reading less than 12.2 volts), have it recharged by your Peugeot dealer or local automotive electrician, as the charge rate is higher and constant supervision during charging is necessary.

4 Battery – removal and refitting

Note: *The radio/cassette/CD player/auto-changer unit fitted as standard equipment by Peugeot is equipped with an anti-theft system, to deter thieves. If the power source is disconnected, the radio/cassette will automatically recode itself as long as it is still fitted to the correct vehicle. If the unit is removed it will not operate in another vehicle.*

Removal

1 The battery is located on the front left-hand side of the engine compartment.

2 Lift off the battery cover then slacken the battery negative (earth) terminal connector (coloured green). Lift the terminal connector off the battery post.

3 Disconnect the positive terminal connector (coloured red) in the same way.

4 Unscrew the two bolts and remove the battery retaining clamp.
5 Lift the battery out of the engine compartment.
6 To remove the battery box, remove the air cleaner assembly as described in the relevant Part of Chapter 4.
7 On models equipped with air conditioning, undo the screw securing the dehydrator retaining strap to the front of the battery box **(see illustration)**.
8 Undo the internal bolts securing the battery box and metal base to the mounting bracket, and the single outer bolt securing the box to the air cleaner mounting bracket **(see illustrations)**.
9 Carefully move aside all cables and hoses, then lift the battery box out of the engine compartment **(see illustration)**.

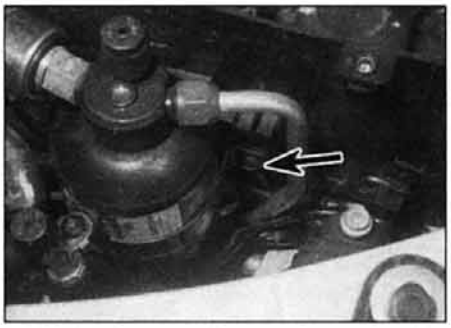
Refitting

10 Refitting is a reversal of removal, but smear petroleum jelly on the terminals after reconnecting the leads, and always reconnect the positive lead first, and the negative lead last.
11 With the battery reconnected, switch on the ignition and wait ten seconds before starting the engine. This will allow the vehicle electronic systems and control units to stabilise.

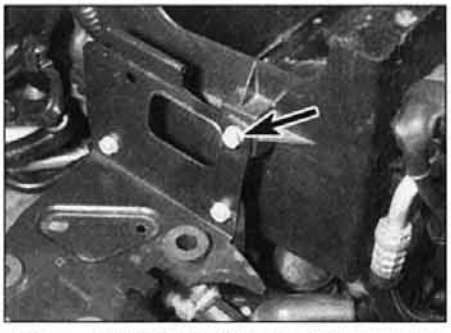
5 Charging system – testing

Note: *Refer to the warnings given in 'Safety first!' and in Section 1 of this Chapter before starting work.*

1 If the ignition warning light fails to illuminate when the ignition is switched on, first check the alternator wiring connections for security. If satisfactory, check that the warning light bulb has not blown, and that the bulbholder is secure in its location in the instrument panel. If the light still fails to illuminate, check the continuity of the warning light feed wire from the alternator to the bulbholder. If all is satisfactory, the alternator is at fault and should be renewed or taken to an auto-electrician for testing and repair.
2 If the ignition warning light illuminates when the engine is running, stop the engine and check that the drivebelt is correctly fitted and tensioned (see Chapter 1A or 1B) and that the alternator connections are secure. If all is so far satisfactory, have the alternator checked by an auto-electrician for testing and repair.
3 If the alternator output is suspect even though the warning light functions correctly, the regulated voltage may be checked as follows.
4 Connect a voltmeter across the battery terminals and start the engine.
5 Increase the engine speed until the voltmeter reading remains steady; the reading should be approximately 12 to 13 volts, and no more than 14 volts.



4.7 Undo the screw (arrowed) securing the air conditioning dehydrator retaining strap to the front of the battery box

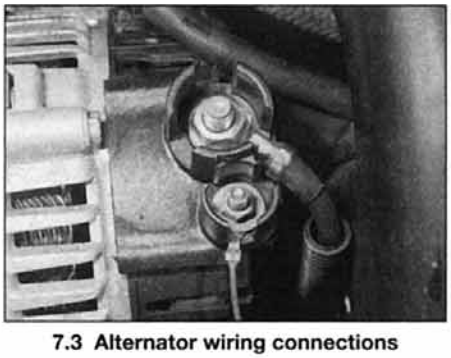


4.8b . . . and the single outer bolt securing the box to the air cleaner mounting bracket

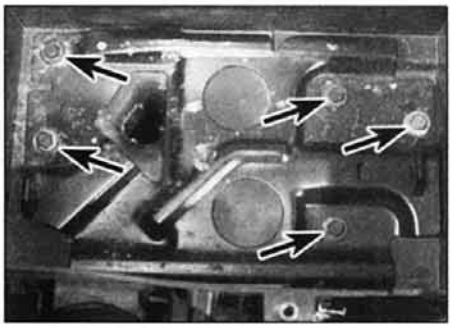
6 Switch on as many electrical accessories (eg, the headlights, heated rear window and heater blower) as possible, and check that the alternator maintains the regulated voltage at around 13 to 14 volts.
7 If the regulated voltage is not as stated, the fault may be due to worn brushes, weak brush springs, a faulty voltage regulator, a faulty diode, a severed phase winding or worn or damaged slip rings. The alternator should be renewed or taken to an auto-electrician for testing and repair.

6 Alternator drivebelt – removal, refitting and tensioning

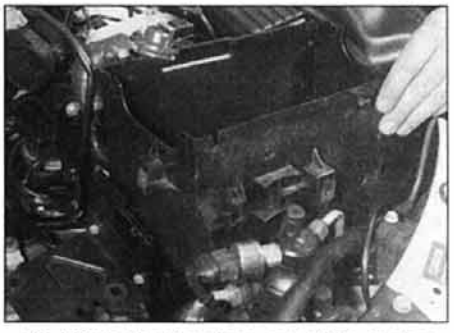
Refer to the procedure given for the auxiliary drivebelt in Chapter 1A or 1B.



7.3 Alternator wiring connections



4.8a Undo the internal bolts (arrowed) securing the battery box and metal base to the mounting bracket . . .

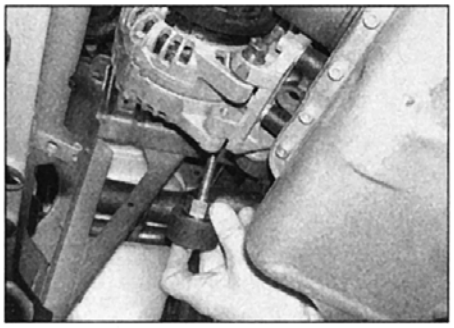


4.9 Lift the battery box out of the engine compartment

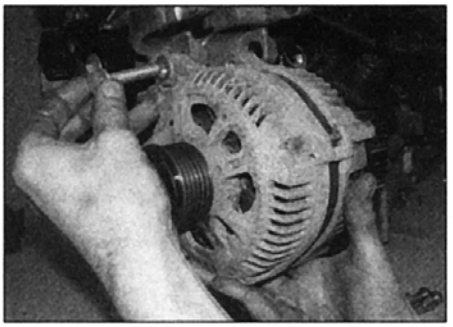
7 Alternator – removal and refitting

Removal

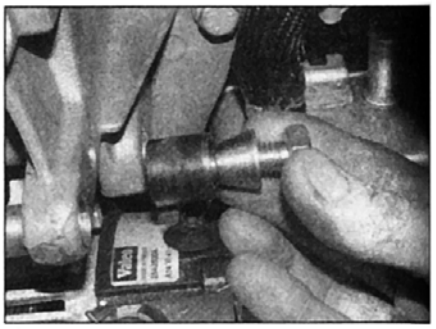
1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).
2 Remove the auxiliary drivebelt as described in Chapter 1A or 1B.
3 Remove the rubber covers (where fitted) from the alternator terminals, then unscrew the retaining nuts and disconnect the wiring from the rear of the alternator **(see illustration)**.
4 Where applicable on diesel models, unbolt the power steering pump and move it to one side without disconnecting any hydraulic pipes or hoses (see Chapter 10).
5 Unscrew the nut(s) and/or bolt(s) securing the alternator to the upper mounting bracket.
6 Unscrew the lower nut(s) and/or mounting bolt(s), or undo the nut securing the adjuster bolt bracket to the alternator (as applicable). Note that, where a long through-bolt is used to secure the alternator in position, the bolt does not need to be fully removed; the alternator can be disengaged from the bolt once it has been slackened sufficiently. On some models, it may be necessary to remove the drivebelt idler/tensioner pulley to gain access to the alternator mounting nuts and bolts (depending on specification). On diesel models, the lower front mounting bolt also



7.6 On diesel models, the lower mounting bolt also carries the auxiliary drivebelt pulley



7.7 Removing the alternator from its bracket



7.8 On diesel engines, the upper bolt acts as a centraliser

carries the auxiliary drivebelt idler pulley which can be left in position on the bolt as it is removed **(see illustration)**.

7 Manoeuvre the alternator away from its mounting brackets and out from the engine compartment **(see illustration)**.

Refitting

8 Refitting is a reversal of removal, tensioning the auxiliary drivebelt as described in Chapter 1A or 1B, and ensuring that the alternator mountings are securely tightened. Note that on diesel models, the upper bolt acts as a centraliser and should be tightened first **(see illustration)**.

8 Alternator – testing and overhaul

If the alternator is thought to be suspect, it should be removed from the vehicle and taken to an auto-electrician for testing. Most auto-electricians will be able to supply and fit brushes at a reasonable cost. However, check on the cost of repairs before proceeding as it may prove more economical to obtain a new or exchange alternator.

9 Starting system – testing

Note: *Refer to the precautions given in 'Safety first!' and in Section 1 of this Chapter before starting work.*

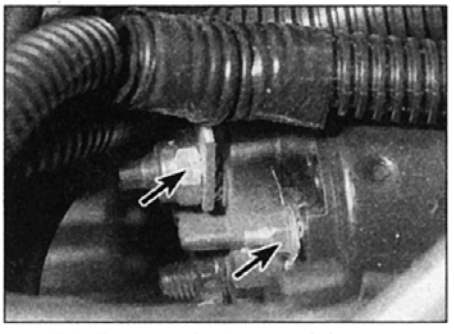
1 If the starter motor fails to operate when the ignition key is turned to the appropriate position, the following possible causes may be to blame.

a) The coded anti-start system is engaged.
b) The battery is faulty.
c) The electrical connections between the switch, solenoid, battery and starter motor are somewhere failing to pass the necessary current from the battery through the starter to earth.
d) The solenoid is faulty.
e) The starter motor is mechanically or electrically defective.

2 To check the battery, switch on the headlights. If they dim after a few seconds, this indicates that the battery is discharged – recharge (see Section 3) or renew the battery. If the headlights glow brightly, operate the ignition switch and observe the lights. If they dim, then this indicates that current is reaching the starter motor, therefore the fault must lie in the starter motor. If the lights continue to glow brightly (and no clicking sound can be heard from the starter motor solenoid), this indicates that there is a fault in the circuit or solenoid – see following paragraphs. If the starter motor turns slowly when operated, but the battery is in good condition, then this indicates that either the starter motor is faulty, or there is considerable resistance somewhere in the circuit.

3 If a fault in the circuit is suspected, disconnect the battery leads (including the earth connection to the body), the starter/solenoid wiring and the engine/transmission earth strap. Thoroughly clean the connections, and reconnect the leads and wiring, then use a voltmeter or test lamp to check that full battery voltage is available at the battery positive lead connection to the solenoid, and that the earth is sound. Smear petroleum jelly around the battery terminals to prevent corrosion – corroded connections are amongst the most frequent causes of electrical system faults.

4 If the battery and all connections are in good condition, check the circuit by disconnecting the wire from the solenoid blade terminal. Connect a voltmeter or test lamp between the wire end and a good earth (such as the battery negative terminal), and check that the wire is live when the ignition switch is turned to the 'start' position. If it is, then the circuit is sound – if not the circuit wiring can be checked as described in Chapter 12.



10.3 Remove the two retaining nuts (arrowed) and disconnect the wiring from the starter motor solenoid

5 The solenoid contacts can be checked by connecting a voltmeter or test lamp between the battery positive feed connection on the starter side of the solenoid, and earth. When the ignition switch is turned to the 'start' position, there should be a reading or lighted bulb, as applicable. If there is no reading or lighted bulb, the solenoid is faulty and should be renewed.

6 If the circuit and solenoid are proved sound, the fault must lie in the starter motor. In this event, it may be possible to have the starter motor overhauled by a specialist, but check on the cost of spares before proceeding, as it may prove more economical to obtain a new or exchange motor.

10 Starter motor – removal and refitting

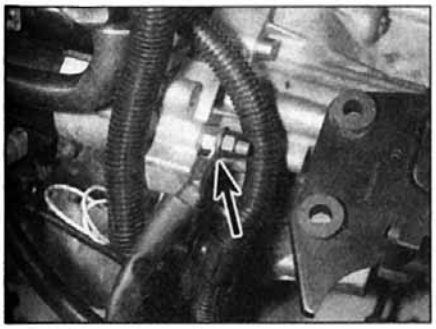
Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

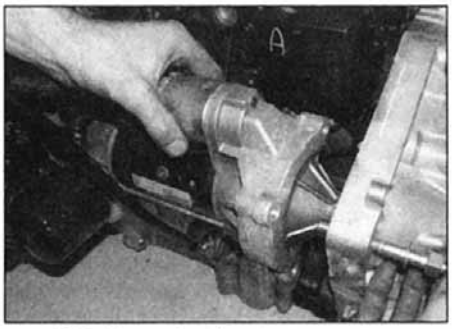
2 So that access to the motor can be gained both from above and below, apply the handbrake then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Where applicable, to improve access to the motor, remove the air cleaner and ducting as necessary as described in the relevant Part of Chapter 4.

3 Slacken and remove the two retaining nuts and disconnect the wiring from the starter motor solenoid. Recover the washers under the nuts **(see illustration)**.

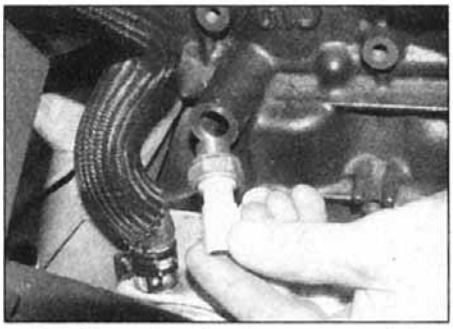
4 Undo the three mounting bolts (two at the rear of the motor, and one which comes through from the top of the transmission housing), supporting the motor as the bolts are withdrawn. Recover the washers from



10.4 Note the main engine earth strap connection on one of the starter motor mounting bolts



10.5 Removing the starter motor – DW12 engine



13.4 Removing the oil pressure switch from the block

under the bolt heads and note the locations of any wiring or hose brackets secured by the bolts **(see illustration)**.

5 Manoeuvre the starter motor out from underneath the engine and recover the locating dowel(s) from the motor/transmission (as applicable) **(see illustration)**.

Refitting

6 Refitting is a reversal of removal, ensuring that the locating dowel(s) are correctly positioned. Also make sure that any wiring or hose brackets are in place under the bolt heads as noted prior to removal.

11 Starter motor – testing and overhaul

If the starter motor is thought to be suspect, it should be removed from the vehicle and taken to an auto-electrician for testing. Most auto-electricians will be able to supply and fit brushes at a reasonable cost. However, check on the cost of repairs before proceeding as it may prove more economical to obtain a new or exchange motor.

12 Ignition switch – removal and refitting

The ignition switch is integral with the steering column lock, and can be removed as described in Chapter 10.

13 Oil pressure warning light switch – removal and refitting

Removal

1 The switch is located at the front of the cylinder block, above the oil filter mounting. Note that on some models access to the switch may be improved if the vehicle is jacked up and supported on axle stands so that the switch can be reached from underneath (see *Jacking and vehicle support*).

2 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).

3 Remove the protective sleeve from the wiring plug (where applicable), then disconnect the wiring from the switch.

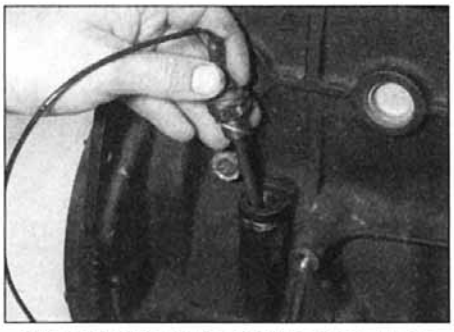
4 Unscrew the switch from the cylinder block, and recover the sealing washer **(see illustration)**. Be prepared for oil spillage, and if the switch is to be left removed from the engine for any length of time, plug the hole in the cylinder block.

Refitting

5 Examine the sealing washer for signs of damage or deterioration and if necessary renew.

6 Refit the switch, complete with washer, and tighten it securely. Reconnect the wiring connector.

7 Lower the vehicle to the ground then check and, if necessary, top-up the engine oil as described in *Weekly Checks*.



14.2 Removing the oil level sensor from the cylinder block – XU engine

14 Oil level sensor – removal and refitting

1 The sensor is located on the front side of the cylinder block, just to the right of the oil filter.

2 The removal and refitting procedure is as described for the oil pressure switch in Section 13. Access is most easily obtained from underneath the vehicle **(see illustration)**.

Chapter 5 Part B:
Ignition system (petrol models)

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

System type	Static (distributorless) ignition system controlled by engine management ECU	
Firing order	1-3-4-2 (number 1 cylinder at transmission end)	
Spark plugs	See Chapter 1A Specifications	
Ignition timing	Controlled by engine management ECU	
Torque wrench settings	**Nm**	**lbf ft**
Ignition coil block (XU7 engine)	10	7
Knock sensor securing bolt	20	15

1 Ignition system – general information

On all models, the ignition system is integrated with the fuel injection system to form a combined engine management system under the control of one ECU (see Chapter 4A for further information).

The ignition side of the system is of the static (distributorless) type and consists of ignition coils located in a module fitted over the centre of the cylinder head. The coils are integral with the spark plug caps and are pushed directly onto the spark plugs, one for each plug. This removes the need for any HT leads connecting the coils to the plugs.

Under the control of the ECU, the ignition coils operate on the 'wasted spark' principle, ie, each spark plug sparks twice for every cycle of the engine, once on the compression stroke and once on the exhaust stroke. The spark voltage is greatest in the cylinder which is under compression; in the cylinder on its exhaust stroke the compression is low, and this produces a very weak spark which has no effect on the exhaust gases.

The ECU uses its inputs from the various sensors to calculate the required ignition advance setting and coil charging time, depending on engine temperature, load and speed. At idle speeds, the ECU varies the ignition timing to alter the torque characteristic of the engine, enabling the idle speed to be controlled. This system operates in conjunction with the idle speed stepper motor – see Chapter 4A for additional details.

A knock sensor is also incorporated into the ignition system. Mounted onto the cylinder block, the sensor detects the high-frequency vibrations caused when the engine starts to pre-ignite, or 'pink'. Under these conditions, the knock sensor sends an electrical signal to the ECU which in turn retards the ignition advance setting in small steps until the 'pinking' ceases.

2 Ignition system – testing 

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

1 If a fault appears in the engine management (fuel injection/ignition) system first ensure that the fault is not due to a poor electrical connection or poor maintenance; ie, check that the air cleaner filter element is clean, the spark plugs are in good condition and correctly gapped, that the engine breather hoses are clear and undamaged, referring to Chapter 1A for further information. Also check that the accelerator cable is correctly adjusted as described in Chapter 4A. If the engine is running very roughly, check the compression pressures as described in Chapter 2A or 2B.

2 If these checks fail to reveal the cause of the problem, the car should be taken to a Peugeot dealer for testing. A wiring block connector is incorporated in the engine management circuit into which a special electronic diagnostic tester can be plugged. The tester will locate the fault quickly and simply, alleviating the need to test all the system components individually which is a time consuming operation that carries a high risk of damaging the ECU.

3 The only ignition system checks which can be carried out by the home mechanic are those described in Chapter 1A relating to the spark plugs. If necessary, the system wiring and wiring connectors can be checked as described in Chapter 12 ensuring that the ECU wiring connector(s) have first been disconnected.

3 Ignition coil module – removal, testing and refitting

Removal

1 Disconnect the battery negative lead (refer to *Disconnecting the battery* at the end of this manual).
2 Unplug the wiring connector from the end of the ignition coil module **(see illustration)**.
3 Unscrew the retaining bolts then carefully lift the ignition module from the spark plugs and withdraw it from the top of the cylinder head.

Testing

4 The circuitry arrangement of the ignition coils and the coil unit on these engines is such that testing in isolation from the remainder of the engine management system is unlikely to prove effective in diagnosing a particular fault. Should there be any reason to suspect a faulty individual coil, the engine management system should be tested by a Peugeot dealer using diagnostic test equipment (see Section 2).

Refitting

5 Refitting is a reversal of the removal procedure ensuring that the wiring connector is securely reconnected.

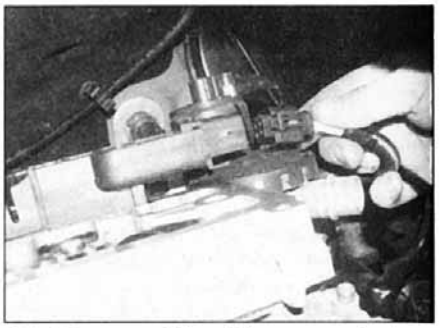
4 Ignition timing – checking and adjustment

1 There are no timing marks on the flywheel or crankshaft pulley. The timing is constantly being monitored and adjusted by the engine management ECU, and nominal values cannot be given. Therefore, it is not possible for the home mechanic to check the ignition timing.
2 The only way in which the ignition timing can be checked is using special electronic test equipment, connected to the engine management system diagnostic connector.

5 Knock sensor – removal and refitting

Removal

1 The knock sensor is screwed into the front face of the cylinder block.
2 To gain access to the sensor, apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the splash guard from under the engine.
3 Trace the wiring back from the sensor to its wiring connector, and disconnect it from the main loom.



3.2 Disconnect the wiring connector from the ignition coil unit – EW7 engine

4 Undo the bolt securing the sensor to the cylinder block, and remove it from under the vehicle.

Refitting

5 Refitting is a reversal of the removal procedure. Ensure that the sensor and its seating on the cylinder block are completely clean and tighten the sensor securing bolt to the specified torque wrench setting. It is essential that these measures are scrupulously observed as if the sensor is not correctly secured to a clean mating surface it may not be able to detect the impulses caused by pre-ignition. If this were to happen the correction of ignition timing would not take place, with the consequent risk of severe engine damage.