Chapter 2 Part C:
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 

2C

Specifications

Note: *At the time of writing, many specifications for the 1761 cc and 1998 cc (16-valve) 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	0.05 mm
Cylinder head height:	
Standard:	
1360 cc engines	111.2 ± 0.08 mm
1580 cc, 1761 cc, 1905 cc (8-valve) and 1998 cc (8-valve and 16-valve) engines	158.93 ± 0.05 mm
1905 cc (16-valve) engines	132.0 ± 0.15 mm
Minimum after refinishing:	
1360 cc engines	111.0 mm
1580 cc, 1761 cc, 1905 cc (8-valve) and 1998 cc (8-valve and 16-valve) engines	158.73 mm
1905 cc (16-valve) engines	131.8 mm

Valves

Valve head diameter:	
Inlet:	
1360 cc engines	36.8 mm
1580 cc engine	41.6 mm
1761 cc engine	Not available
1905 cc 8-valve engine	41.8 mm
1998 cc 8-valve engine	42.6 mm
1905 cc and 1998 cc 16-valve engines	34.7 mm
Exhaust:	
1360 cc engines	29.4 mm
1580 cc and 1905 cc (8-valve) engines	34.7 mm
1761 cc engine	Not available
1998 cc 8-valve engine	34.5 mm
1905 cc and 1998 cc 16-valve engines	29.7 mm

Valves (continued)

Valve stem diameter:	
Inlet:	
1360 cc engines	6.84 to 6.99 mm
1580 cc and 1905 cc (8-valve) engines	7.83 to 7.98 mm
1761 cc engine	Not available
1998 cc (8-valve) engine	7.83 to 8.13 mm
1905 cc and 1998 cc 16-valve engines	6.83 to 6.98 mm
Exhaust:	
1360 cc engines	6.83 to 6.98 mm
1580 cc and 1905 cc (8-valve) engines	7.83 to 7.98 mm
1761 cc engine	Not available
1998 cc (8-valve) engine	7.82 to 8.12 mm
1905 cc and 1998 cc 16-valve engines	6.83 to 6.98 mm
Overall length:	
Inlet:	
1360 cc engines	112.76 ± 0.25 mm
1580 cc and 1905 cc (8-valve) and 1998 cc (8-valve) engines	108.79 ± 0.1 mm
1761 cc engine	Not available
1905 cc and 1998 cc 16-valve engines	104.48 ± 0.1 mm
Exhaust:	
1360 cc engines	112.56 ± 0.25 mm
1580 cc and 1905 cc (8-valve) and 1998 cc (8-valve) engines	108.37 ± 0.1 mm
1761 cc engine	Not available
1905 cc and 1998 cc 16-valve engines	103.00 ± 0.1 mm

Cylinder block

Cylinder bore diameter:	
1360 cc engine:	
Size group A	75.000 to 75.010 mm
Size group B	75.010 to 75.020 mm
Size group C	75.020 to 75.030 mm
1580 cc, 1761 cc and 1905 cc (8-valve) engines:	
Size group A	83.000 to 83.010 mm
Size group B	83.010 to 83.020 mm
Size group C	83.020 to 83.030 mm
1998 cc (8-valve) engines:	
Size group A	86.000 to 83.018 mm
Size group B	86.250 to 86.268 mm
Size group C	86.600 to 86.618 mm
1905 cc (16-valve) engine:	
Size group A	83.000 to 83.010 mm
Size group B	83.010 to 83.020 mm
Size group C	83.020 to 83.030 mm
1998 cc (16-valve) engine	Not available
Liner protrusion above block mating surface - aluminium-block engine only (ie all except 1998 cc):	
Standard	0.03 to 0.10 mm
Maximum difference between any two liners:	
8-valve engines	0.05 mm
16-valve engine	0.02 mm

Pistons

Piston diameter:	
1360 cc engine:	
Size group A	74.950 ± 0.010 mm
Size group B	74.960 ± 0.010 mm
Size group C	74.970 ± 0.010 mm
1580 cc, 1761 cc and 1905 cc (8-valve) engines:	
Size group A	82.960 ± 0.007 mm
Size group B	82.970 ± 0.007 mm
Size group C	82.980 ± 0.007 mm
1905 cc 16-valve engine:	
Size group A	82.963 to 82.977 mm
Size group B	82.973 to 82.987 mm
Size group C	82.983 to 82.997 mm
1998 cc 16-valve engines	Not available

Connecting rods

Maximum weight difference between any two piston/connecting rod assemblies:	
1360 cc engines	5.0 g
1580 cc, 1761 cc and 1905 cc engines	13.0 g
1998 cc engines	7.0 g

Crankshaft

Endfloat:	
8-valve engines	0.07 to 0.32 mm
16-valve engines	0.07 to 0.27 mm
Main bearing journal diameter:	
1360 cc engines:	
Standard	49.965 to 49.981 mm
Undersize	49.665 to 49.681 mm
1580 cc, 1905 cc and 1998 cc engines:	
Standard	59.981 to 60.000 mm
Undersize	59.681 to 59.700 mm
1761 cc engine	Not available
Big-end bearing journal diameter:	
1360 cc engines:	
Standard	44.975 to 45.000 mm
Undersize	44.675 to 44.700 mm
1580 cc, 1905 cc and 1998 cc engines:	
Standard	49.984 to 50.000 mm
Undersize	49.684 to 49.700 mm
1761 cc engine	Not available
Maximum bearing journal out-of-round (all models)	0.007 mm
Main bearing running clearance:	
1360 cc models*:	
Pre-February 1992 models	0.023 to 0.083 mm
February 1992-on models	0.023 to 0.048 mm
1580 cc, 1761 cc and 1905 cc engines**	0.025 to 0.050 mm
1998 cc engines	0.038 to 0.069 mm
Big-end bearing running clearance - all models**	0.025 to 0.050 mm

**On 1360 cc models, the main bearing shells were modified in February 1992, resulting in a reduction in the specified running clearance - see text for further information.*

***These are suggested figures, typical for this type of engine - no exact values are stated by Peugeot.*

Piston rings

Note: *The following are suggested figures - no exact values are stated by Peugeot.*

End gaps:	
Top compression ring:	
1360 cc engine	0.3 to 0.5 mm
1580 cc engine	0.4 to 0.6 mm
1905 cc engine	0.2 to 0.4 mm
1761 cc and 1998 cc engines	0.3 to 0.5 mm
Second compression ring:	
1360 cc engine	0.3 to 0.5 mm
1580 cc and 1905 cc engines	0.15 to 0.35 mm
1761 cc and 1998 cc engines	0.3 to 0.5 mm
Oil control ring:	
All models	0.3 to 0.5 mm

Torque wrench settings

TU series engine

Refer to Chapter 2A Specifications

XU series engine

Refer to Chapter 2B 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 replacement 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 or B of this Chapter (as applicable) and to Section 6. Ignore any preliminary dismantling operations described in Part A or B 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 or B (as applicable), all specifications relating to engine overhaul are at the beginning of this Part of Chapter 2.

2 Engine overhaul - general information

1 It is not always easy to determine when, or if, an engine should be completely overhauled, as a number of factors must be considered.

2 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.

3 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 of this Chapter, to determine the likely cause of the problem.

4 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.

5 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 remedy the situation, major mechanical work is the only solution.

6 An engine overhaul involves restoring all internal parts to the specification of a new engine. During an overhaul, the cylinder liners (where applicable), 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 water 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.*

7 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 all of the instructions carefully, 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.

Note: *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.*

8 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

1 If you have decided that the engine must be removed for overhaul or major repair work, several preliminary steps should be taken.

2 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.

3 Cleaning the engine compartment and engine/transmission before beginning the removal procedure will help keep tools clean and organised.

4 An engine hoist or A-frame will also be necessary. Ensure the equipment is rated in excess of the combined weight of the engine and transmission. Safety is of primary importance, considering the potential hazards in lifting the engine/transmission out of the car.

5 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 lifting the engine out of the car.

6 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 as described in the front of this manual, 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.

7 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.

8 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.

4 Engine and manual transmission - removal, separation and refitting

Note: *Peugeot recommend that 8-valve XU engines are removed by lowering from the engine compartment, however in practise we found that on models not fitted with air conditioning, there is ample room to lift the engine upwards. Lowering the engine would involve raising the front of the vehicle onto axle stands approximately 21 inches high and also removing the engine subframe. On models fitted with air conditioning the engine may be lowered, or alternatively it can be lifted after removing the condenser and front panel (the refrigerant must first be evacuated by a qualified engineer if this method is used).*

Removal

Note: *The engine can be removed from the car only as a complete unit with the transmission; the two are then separated for overhaul.*

1 Park the vehicle on firm, level ground. Chock the rear wheels, then firmly apply the handbrake. Jack up the front of the vehicle, and securely support it on axle stands (see "*Jacking and Vehicle Support*"). Remove both front roadwheels.

2 Set the bonnet in the upright position, and remove the battery and tray as described in Chapter 5A.

3 On 8-valve XU engines remove the front cross panel with reference to Chapter 11 (see note at the beginning of this Section).

4 Remove the complete air cleaner housing and duct assembly, as described in the relevant Part of Chapter 4 **(see illustration)**.

5 If the engine is to be dismantled, working as described in Chapter 1, first drain the oil and remove the oil filter. Clean and refit the drain plug, tightening it securely.

6 Drain the transmission oil as described in Chapter 7A. Refit the drain and filler plugs, and tighten them to their specified torque settings.

7 Remove the alternator as described in Chapter 5A.

8 Where applicable, remove the power steering pump as described in Chapter 10.

9 On models with air conditioning, unbolt the compressor, and position it clear of the engine. Support the weight of the compressor by tying it to the vehicle body, to prevent any excess strain being placed on the compressor lines whilst the engine is removed. Do not disconnect the refrigerant lines from the compressor (refer to the warnings given in Chapter 3).

10 Drain the cooling system as described in Chapter 1. Where necessary on 8-valve XU engines, remove the radiator (see Chapter 3).

11 On carburettor models, carry out the following operations, using the information given in Chapter 4A:

a) Disconnect the fuel feed hose from the anti-percolation chamber.
b) Disconnect the accelerator and choke cables from the carburettor.
c) Disconnect the braking system servo vacuum hose from the inlet manifold.
d) Remove the exhaust system front pipe.

12 On fuel injection models, carry out the following operations, using the information given in Chapter 4B or 4C (as applicable):

a) Depressurise the fuel system, and disconnect the fuel feed and return hoses.
b) Disconnect the accelerator cable.
c) Disconnect the fuel system wiring connectors.
d) Disconnect the purge valve and/or braking system servo vacuum hoses from the inlet manifold (as applicable).
e) Remove the exhaust system front pipe.

13 Referring to Chapter 3, release the retaining clip and disconnect the heater matrix hoses from their connection on the engine compartment bulkhead.

14 Working as described in Chapter 6, disconnect the clutch cable from the transmission, and position it clear of the working area **(see illustration)**.

15 Trace the wiring harness back from the engine to the wiring connector(s) in the engine compartment. Release the locking ring(s) by twisting them anti-clockwise and disconnect the connectors. Also trace the harness lead(s) back to the relay box, situated beside the battery. Unclip the wiring connector plate from the front of the relay box cover then undo the retaining nut and remove the cover. Lift up the engine harness lead cover then undo the nut(s) and release the lead(s) from the relay box. Check that all the relevant connectors have been disconnected, and that the wiring is released from any relevant clips or ties, so that it is free to be removed with the engine/transmission.

16 From underneath the vehicle, slacken and remove the nuts and bolts securing the rear mounting link to the mounting assembly and subframe, and remove the link.

17 Remove both driveshafts as described in Chapter 8.

18 Carry out the following operations, using the information given in Chapter 7A:

a) Disconnect the gearchange selector rod/link rods (as applicable) from the transmission.
b) Disconnect the speedometer cable from the speedometer drive.
c) Disconnect the wiring connector(s) from the reversing light switch and speedometer drive (as applicable).

19 Manoeuvre the engine hoist into position, and attach it to the lifting brackets bolted onto the cylinder head. Raise the hoist until it is supporting the weight of the engine.

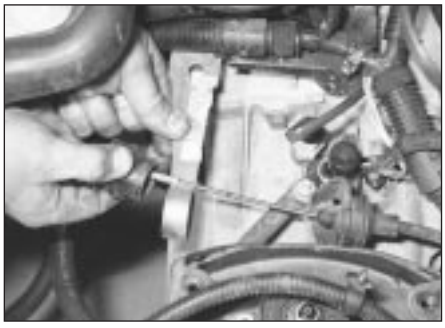
20 Remove the right-hand engine mounting with reference to Chapter 2A.

Note: *On certain models, if the right-hand engine mounting hydro-elastic unit is to be renewed because of wear/perishing, a special tool is needed to unscrew it from the wing panel, and for refitting and tightening to the specified torque* ***(see illustration)****.*

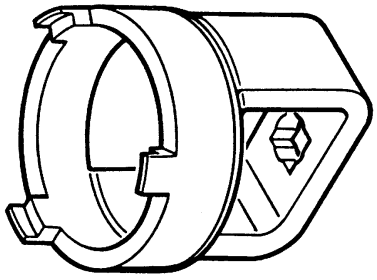
21 Slacken and remove the centre nut and washer from the engine/transmission left-hand mounting. Undo the two nuts and washers securing the mounting to its bracket and remove the mounting from the engine compartment and recover the spacer (where fitted). To improve clearance, (where possible) undo the two retaining bolts and remove the bracket from the body.

22 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 rod are secured so that they cannot be damaged on removal.

4.4 Inlet air duct connection to the front crossmember



4.14 Disconnecting the clutch cable



4.20 Special tool for removing and refitting right-hand engine mounting hydro-elastic unit

23 Lift the engine/transmission out of the car, ensuring that nothing is trapped or damaged. Enlist the help of an assistant during this procedure, as it will be necessary to tilt the assembly slightly to clear the body panels. On models equipped with anti-lock brakes, great care must be taken to ensure that the anti-lock braking system unit is not damaged during the removal procedure.

24 Once the engine is high enough, lift it out over the front of the body, and lower the unit to the ground.

Separation

25 With the engine/transmission assembly removed, support the assembly on suitable blocks of wood, on a workbench (or alternatively, on a clean area of the workshop floor).

26 Undo the retaining bolts, and remove the flywheel lower cover plate (where fitted) from the transmission.

27 On models with a "pull-type" clutch release mechanism (see Chapter 6 for further information), tap out the retaining pin or unscrew the retaining bolt (as applicable), and remove the clutch release lever from the top of the release fork shaft. This is necessary to allow the fork shaft to rotate freely, so that it disengages from the release bearing as the transmission is pulled away from the engine. Make an alignment mark across the centre of the clutch release fork shaft, using a scriber, paint or similar, and mark its relative position on the transmission housing (see Chapter 7A for further information).

28 Slacken and remove the retaining bolts, and remove the starter motor from the transmission.

29 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.

30 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.

31 If they are loose, remove the locating dowels from the engine or transmission, and keep them in a safe place.

32 On models with a "pull-type" clutch, make a second alignment mark on the transmission housing, marking the relative position of the release fork mark after removal. This should indicate the angle at which the release fork is positioned. The mark can then be used to position the release fork prior to installation, to ensure that the fork correctly engages with the clutch release bearing as the transmission is installed.

Refitting

33 If the engine and transmission have been separated, perform the operations described below in paragraphs 34 to 42. If not, proceed as described from paragraph 43 onwards.

34 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 plate.

35 Ensure that the locating dowels are correctly positioned in the engine or transmission.

36 On models with a "pull-type" clutch, before refitting, position the clutch release bearing so that its arrow mark is pointing upwards (bearing fork slots facing towards the front of the engine), and align the release fork shaft mark with the second mark made on the transmission housing (release fork positioned at approximately 60° to clutch housing face). This will ensure that the release fork and bearing will engage correctly as the transmission is refitted to the engine.

37 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.

38 On models with a "pull-type" clutch, with the transmission fully engaged with the engine, check that the release fork and bearing are correctly engaged. If the release fork and bearing are correctly engaged, the mark on the release fork should be aligned with the original mark made on the transmission housing (see Chapter 7A for further information).

39 Refit the transmission housing-to-engine bolts, ensuring that all the necessary brackets are correctly positioned, and tighten them to the specified torque setting.

40 Refit the starter motor, and securely tighten its retaining bolts.

41 On models with a "pull-type" clutch release mechanism, refit the clutch release lever to the top of the release fork shaft, securing it in position with its retaining pin or bolt (as applicable).

42 Where necessary, refit the lower flywheel cover plate to the transmission, and securely tighten its retaining bolts.

43 Reconnect the hoist and lifting tackle to the engine lifting brackets. With the aid of an assistant, lift the assembly over the engine compartment.

44 The assembly should be tilted as necessary to clear the surrounding components, as during removal; lower the assembly into position in the engine compartment, manipulating the hoist and lifting tackle as necessary.

45 With the engine/transmission in position, refit the right-hand engine/transmission mounting bracket, tightening its retaining nuts and bolts (as applicable) by hand only at this stage.

46 Working on the left-hand mounting, refit the mounting bracket (where removed) to the body and tighten its retaining bolts to the specified torque. Refit the mounting rubber and refit the mounting retaining nuts and washers and the centre nut and washer, tightening them lightly only.

47 From underneath the vehicle, refit the rear mounting link and install both its bolts.

48 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. Where necessary, once the right-hand mounting bracket nuts have been tightened, refit the rubber damper and curved retaining plate, tightening its retaining bolts to the specified torque. The hoist can then be detached from the engine and removed.

49 The remainder of the refitting procedure is a direct 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 7A.
c) Ensure that all coolant hoses are correctly reconnected, and securely retained by their retaining clips.
d) Adjust the clutch cable as described in Chapter 6.
e) Adjust the choke cable and/or accelerator cable (as applicable) as described in the relevant Part of Chapter 4.
f) Refill the engine and transmission with correct quantity and type of lubricant, as described in Chapter 7A.
g) Refill the cooling system as described in Chapter 1.

5 Engine and automatic transmission - removal, separation and refitting

Removal

Note: *The engine can be removed from the car only as a complete unit with the transmission; the two are then separated for overhaul.*

1 Carry out the relevant operations described in paragraphs 1 to 24 of Section 4, noting that the transmission oil draining procedure is given in Chapter 1. Before lifting the engine from the engine compartment, carry out the following operations, using the information given in Chapter 7B:

a) Remove the transmission dipstick tube.
b) Disconnect the wiring from the starter inhibitor/reversing light switch and the speedometer drive housing. Release the earth strap(s) from the top of the transmission housing.
c) Disconnect the selector cable.
d) Release the power steering pipe from the transmission.
e) Disconnect the speedometer cable.

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 Detach the kickdown cable from the throttle cam. Work back along the cable, freeing it from any retaining clips, and noting its correct routing.
4 Undo the retaining bolts and remove the driveplate lower cover plate from the transmission, to gain access to the torque converter retaining bolts. Slacken and remove the visible bolt. Rotate the crankshaft using a socket and extension bar on the pulley bolt, and undo the remaining bolts securing the torque converter to the driveplate as they become accessible. There are three bolts in total.
5 Slacken and remove the retaining bolts, and remove the starter motor from the transmission.
6 To ensure that the torque converter does not fall out as the transmission is removed, secure it in position using a length of metal strip bolted to one of the starter motor bolt holes.
7 Ensure that both the 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 any relevant brackets) as they are removed, to use as a reference on refitting.
8 Carefully withdraw the transmission from the engine. If the locating dowels are a loose fit in the engine/transmission, remove them and keep them in a safe place.

Refitting

9 If the engine and transmission have been separated, perform the operations described below in paragraphs 10 to 16. If not, proceed as described from paragraph 17 onwards.
10 Ensure that the bush fitted to the centre of the crankshaft is in good condition. Apply a little Molykote G1 grease (available from your Peugeot dealer) to the torque converter centring pin. Do not apply too much, otherwise there is a possibility of the grease contaminating the torque converter.
11 Ensure that the locating dowels are correctly positioned in the engine or transmission.
12 Carefully offer the transmission to the engine, until the locating dowels are engaged.
13 Refit the transmission housing-to-engine bolts, ensuring that all the necessary brackets are correctly positioned, and tighten them to the specified torque setting.
14 Remove the torque converter retaining strap installed prior to removal. Align the torque converter threaded holes with the retaining plate, and refit the three retaining bolts.
15 Tighten the torque converter retaining bolts to the specified torque setting, then refit the driveplate lower cover.
16 Refit the starter motor, and securely tighten its retaining bolts.
17 Refit the engine to the vehicle with reference to Section 4.
18 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 selector cable and kickdown cable as described in Chapter 7B.
e) Adjust the accelerator cable as described in Chapter 4.
f) Refill the engine and transmission with correct quantity and type of lubricant, as described in Chapter 1.
g) Refill the cooling system as described in Chapter 1.

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 replacement engine (just as they will if you are doing a complete engine overhaul yourself). These components include the following:

a) Alternator mounting brackets.
b) Power steering pump and air conditioning compressor brackets (where fitted).
c) Thermostat and housing, and coolant outlet chamber/elbow (Chapter 3).
d) Dipstick tube.
e) Carburettor/fuel system components (Chapter 4).
f) All electrical switches and sensors.
g) Inlet and exhaust manifolds (Chapter 4).
h) Oil filter (Chapter 1).
i) Fuel pump - carburettor engines only (Chapter 4).
j) Flywheel/driveplate (Part A or B of this Chapter).

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 or B of this Chapter unless otherwise stated.

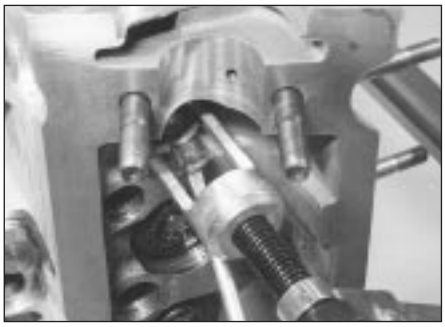
a) Inlet and exhaust manifolds (Chapter 4).
b) Timing belt, sprockets and tensioner(s).
c) Cylinder head.
d) Flywheel/driveplate.
e) Sump.
f) Oil pump.
g) Piston/connecting rod assemblies (Section 10).
h) Crankshaft (Section 11).

6 Before beginning the dismantling and overhaul procedures, make sure that you have all of the correct tools necessary. Refer to *"Tools and working facilities"* for further information.

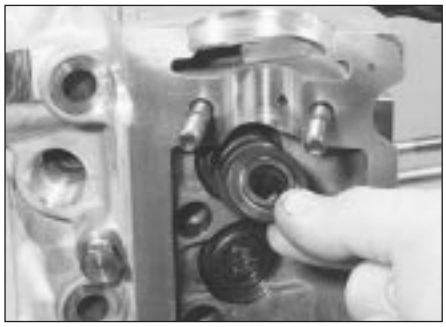
7 **Cylinder head** - dismantling

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 or B of this Chapter (as applicable).
2 If not already done, remove the inlet and exhaust manifolds with reference to the relevant Part of Chapter 4.
3 Remove the camshaft(s), followers and shims (as applicable) as described in Part A or B of this Chapter.
4 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 spring seat. Using a pair of pliers, carefully extract the valve stem seal from the top of the guide **(see illustrations)**.
5 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.

7.4a Compress the valve spring using a spring compressor . . .



7.4b . . . then extract the collets and release the spring compressor



7.4c Remove the spring retainer . . .

7.4d . . . followed by the valve spring . . .

7.4e . . . and the spring seat

7.4f Remove the valve stem oil seal using a pair of pliers

7.7 Place each valve and its associated components in a labelled polythene bag

7.8 Oil filter partly withdrawn from the oil gallery in the cylinder head

6 Withdraw the valve through the combustion chamber.

7 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.

8 On XU engines extract the gauze oil filter from the oil gallery in the cylinder head **(see illustration)**.

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.*

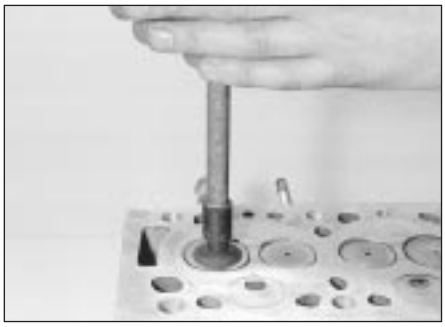
Cylinder head

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.

6 Use a straight-edge and feeler blade to check that the cylinder head surface is not distorted **(see illustration)**. If it is, it may be possible to have it machined, provided that

8.6 Checking the cylinder head gasket surface for distortion

8.11 Measuring a valve stem diameter



8.14 Grinding-in a valve

the cylinder head is not reduced to less than the specified height.

7 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 re-cut 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.

8 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.

9 If renewing the valve guides, the valve seats should be re-cut or re-ground only *after* the guides have been fitted.

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(s) 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 re-cut, 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 re-cutting, or even the renewal of the valve or seat insert (where possible) is required.

13 Valve grinding is done 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.

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 Lubricate the stems of the valves, and insert the valves into their original locations **(see illustration)**. If new valves are being fitted, insert them into the locations to which they have been ground.

2 Refit the spring seat then, working on the first valve, dip the new valve stem seal in fresh engine oil. Carefully locate it over the valve and onto the guide. Take care not to damage the seal as it is passed over the valve stem. Use a suitable socket or metal tube to press the seal firmly onto the guide **(see illustration)**.

3 Locate the valve spring on top of its seat, then refit the spring retainer.

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.

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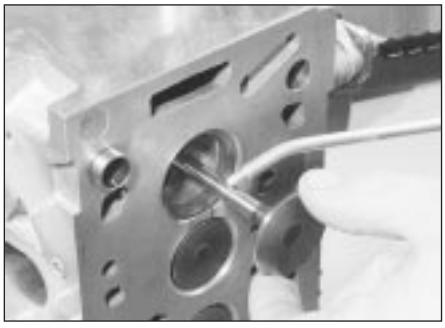
Use a little dab of grease to hold the collets on the valve stem while the spring compressor is released.

5 With all the valves installed, place the cylinder head flat on the bench and, using a hammer and interposed block of wood, tap the end of each valve stem to settle the components.

6 Refit the camshaft(s), followers and shims (as applicable) as described in Part A or B of this Chapter.

7 On XU engines refit the gauze oil filter (clean) to the oil gallery in the cylinder head. If the filter is damaged fit a new one.

8 The cylinder head can then be refitted as described in Part A or B of this Chapter.



9.1 Lubricate the valve stems prior to refitting

9.2 Fitting a valve stem oil seal using a socket

10.3 Connecting rod and big-end bearing cap marked for identification (No 3 cylinder shown)

10.5 Removing a big-end bearing cap and shell

10.6 To protect the crankshaft journals, tape over the connecting rod stud threads prior to removal

10 Piston/connecting rod assembly - removal

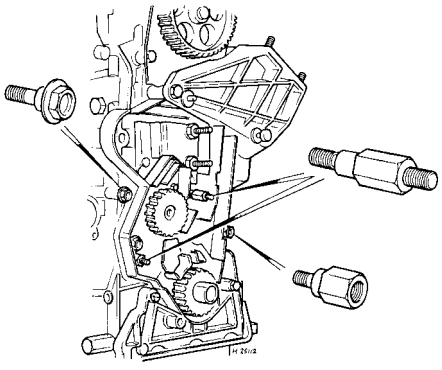
1 Remove the cylinder head, sump and oil pump as described in Part A or B of this Chapter (as applicable).
2 If there is a pronounced wear ridge at the top of any bore, it may be necessary to remove it with a scraper or ridge reamer, to avoid piston damage during removal. Such a ridge indicates excessive wear of the cylinder bore.
3 Using a hammer and centre-punch, paint or similar, mark each connecting rod 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 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, 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 - 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.

11 Crankshaft - removal

1 Remove the crankshaft sprocket and the oil pump as described in Part A or B of this Chapter (as applicable). Also unbolt and remove the timing belt rear cover noting the position of the special retaining studs **(see illustration)**.
2 Remove the pistons and connecting rods, as described in Section 10. 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 enough up the bores that they are positioned clear of the crankshaft journals.
3 Check the crankshaft endfloat as described in Section 14, then proceed as follows.

TU series aluminium block engines

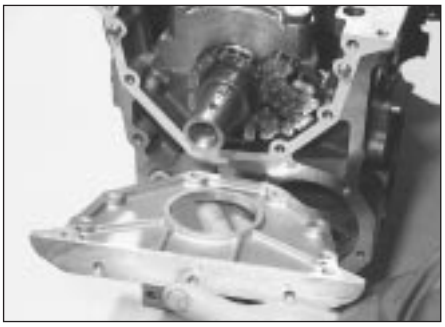
4 Work around the outside of the cylinder block, and unscrew all the small (6 mm) bolts securing the main bearing ladder to the base of the cylinder block. Note the correct fitted depth of both the front and rear crankshaft oil seals in the cylinder block/main bearing ladder.
5 Working in a diagonal sequence, evenly and progressively slacken the ten large (11 mm) main bearing ladder retaining bolts by a turn at a time. Once all the bolts are loose, remove them from the ladder.
6 With all the retaining bolts removed, carefully lift the main bearing ladder casting away from the base of the cylinder block. Recover the lower main bearing shells, and tape them to their respective locations in the casting. If the two locating dowels are a loose fit, remove them and store them with the casting for safe-keeping.
7 Lift out the crankshaft, and discard both the oil seals. Remove the oil pump drive chain from the end of the crankshaft. Where necessary, slide off the drive sprocket, and recover the Woodruff key.
8 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.



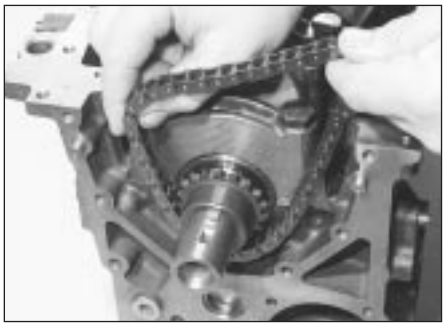
11.1 Timing belt rear cover special studs

TU series cast-iron block engines

9 Unbolt and remove the crankshaft front and rear oil seal housings from each end of the cylinder block, noting the correct fitted locations of the locating dowels. If the locating dowels are a loose fit, remove them and store them with the housings for safe-keeping.
10 Remove the oil pump drive chain, and slide the drive sprocket off the end of the crankshaft. Remove the Woodruff key, and store it with the sprocket for safe-keeping.
11 The main bearing caps should be numbered 1 to 5 from the transmission (flywheel) end of the engine. If not, mark them accordingly using a centre-punch or paint.
12 Unscrew and remove the main bearing cap bolts, and withdraw the caps. Recover the lower main bearing shells, and tape them to their respective caps for safe-keeping.
13 Carefully lift out the crankshaft, taking care not to displace the upper main bearing shell.
14 Recover the upper bearing shells from the cylinder block, and tape them to their respective caps for safe-keeping. Remove the thrustwasher halves from the side of No 2 main bearing, and store them with the bearing cap.



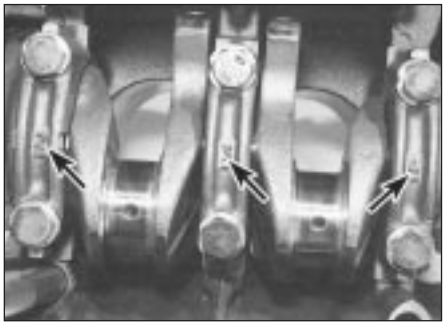
11.15 Removing the oil seal carrier from the front of the cylinder block - XU engine



11.16a Remove the oil pump drive chain . . .

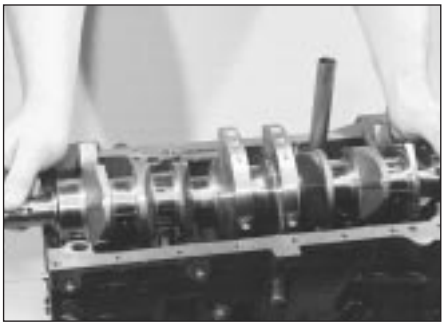
11.16b . . . then slide off the drive sprocket . . .

11.16c . . . and remove the Woodruff key from the crankshaft



11.17 Main bearing cap identification markings (arrowed)

11.19 Removing No 2 main bearing cap. Note the thrustwasher (arrowed)



11.20 Lifting out the crankshaft - XU series engine

11.21 Remove the upper main bearing shells from the cylinder block/crankcase, and store them with their lower shells

XU series engines

15 Slacken and remove the retaining bolts, and remove the oil seal carrier from the front (timing belt) end of the cylinder block, along with its gasket (where fitted) **(see illustration)**.

16 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)**.

17 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 a centre-punch. Also note the correct fitted depth of the rear crankshaft oil seal in the bearing cap.

18 On 1761 cc engines, 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.

19 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.

20 Lift out the crankshaft, and discard the rear oil seal **(see illustration)**.

21 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 Cylinder block/crankcase - cleaning and inspection

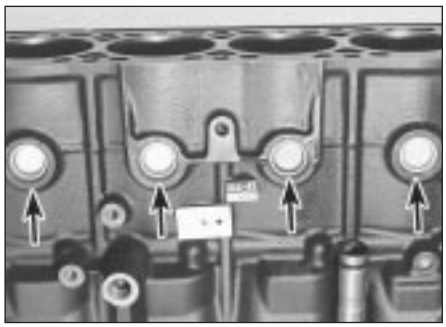
Cleaning

1 Remove all external components and electrical switches/sensors from the block. For complete cleaning, the core plugs should ideally be removed **(see illustration)**. 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 bolt and remove the piston oil jet spray tube from inside the cylinder block.

4 Scrape all traces of gasket from the cylinder block/crankcase, and from the main bearing



12.1 Cylinder block core plugs (arrowed)

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 re-tapped. Use new plugs when the engine is reassembled.

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.

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A good alternative is to inject aerosol-applied water-dispersant lubricant into each hole, using the long spout usually supplied.

Warning: Wear eye protection when cleaning out these holes in this way!

10 Apply suitable sealant to the new oil gallery plugs, and insert them into the holes in the block. Tighten them securely.

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.

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 a wear ridge at the top of the cylinder, indicating that the bore is badly 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. Where no figures are stated by Peugeot, 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 fit the oversize pistons. If it proves oversize pistons are not available, and the bores are worn, renewal of the block seems to be the only option.

Aluminium cylinder block with wet liners

18 Remove the liner clamps (where used), 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 **(see illustrations)**.

19 Check each cylinder liner for scuffing and scoring. Check for signs of a wear ridge at the top of the liner, indicating that the bore is excessively 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.

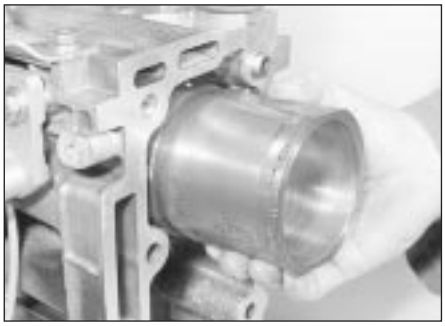
22 Repeat the procedure for the remaining cylinder liners.

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

12.9 Cleaning a cylinder block threaded hole using a suitable tap



12.18a On aluminium block engines, remove each liner . . .

12.18b . . . and recover the bottom O-ring seal (arrowed)

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 position. 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. 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.

13 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're 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. Keep each set of rings with its piston if the old rings are to be re-used.

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.

13.2 Removing a piston ring with the aid of a feeler gauge

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 not to cut your fingers - piston rings are sharp). 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. The causes may include incorrect ignition/injection pump timing, or a faulty injector (as applicable).

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 (see Section 12). On iron-block engines, pistons can be purchased from a Peugeot dealer.

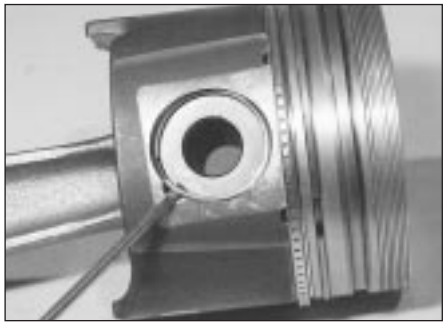
11 Examine each connecting rod carefully for signs of damage, such as cracks around the big-end and small-end bearings. Check that the rod is not bent or distorted. Damage is highly unlikely, unless the engine has been seized or badly overheated. Detailed checking of the connecting rod assembly can only be carried out by a Peugeot dealer or engine repair specialist with the necessary equipment.

12 On XU series engines, due to the tightening procedure for the connecting rod big-end cap retaining nuts, it is highly recommended that the big-end cap nuts and bolts are renewed as a complete set prior to refitting.

13 On all 8-valve 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 16-valve 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 follows.

15 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



13.15a On 16-valve engines, prise out the circlip . . .

13.15b . . . and withdraw the gudgeon pin

13.15c Piston and connecting rod components

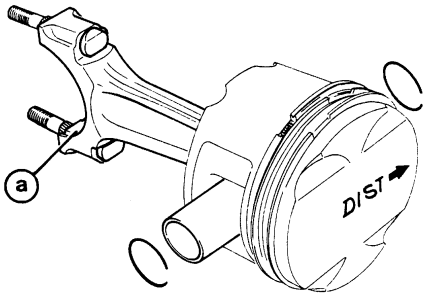
correct reassembly. Discard the circlips - new ones *must* be used on refitting.

16 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.

17 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.

18 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.

19 Position the piston so that the arrow on the piston crown is positioned as shown in relation to the connecting rod big-end bearing shell cutouts **(see illustration)**. Apply a smear of clean engine oil to the gudgeon pin. 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.



13.19 On 16-valve engines, on refitting ensure that the piston arrow is positioned as shown, in relation to the connecting rod bearing shell cutout (a)

14 Crankshaft - inspection

Checking crankshaft endfloat

1 If the crankshaft endfloat is to be checked, this must be done when the crankshaft is still installed in the cylinder block/crankcase, but is free to move (see Section 11).

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 blades can be used. First push the crankshaft fully towards the flywheel/driveplate end of the engine, then use feeler blades 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 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.

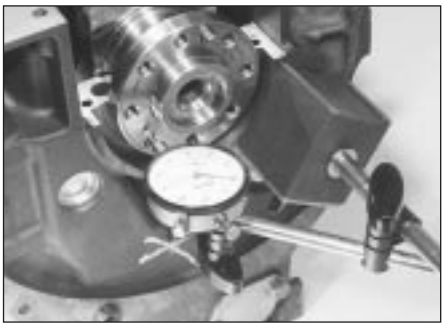
8 Check the bearing journal for roughness by running a finger lightly over the bearing surface. Any roughness (which will be accompanied by obvious bearing wear) indicates that the crankshaft requires regrinding (where possible) or renewal.

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.

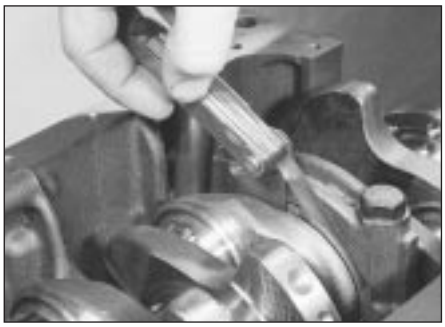
10 Using a micrometer, measure the diameter of the main and big-end bearing journals, and compare the results with the Specifications **(see illustration)**. By measuring the diameter at a number of points around each journal's circumference, you will be able to determine whether or not the journal is 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. Where no specified journal diameters are quoted, seek the advice of a Peugeot dealer.

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 At the time of writing, it was not clear whether Peugeot produce oversize bearing shells for all of these engines. On some engines, if the crankshaft journals have not already been reground, it may be possible to have the crankshaft reconditioned, and to fit



14.2 Checking crankshaft endfloat using a dial gauge



14.3 Checking crankshaft endfloat using feeler gauges

14.10 Measuring a crankshaft big-end journal diameter

undersize shells (see Section 18). If no undersize shells are available and the crankshaft has worn beyond the specified limits, it will have to be renewed. Consult your Peugeot dealer or engine specialist for further information on parts availability.

15 Main and big-end bearings - inspection

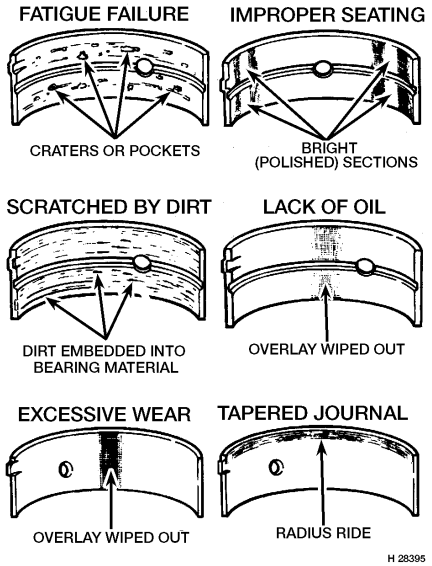
1 Even though the main and big-end bearings should be renewed during the engine overhaul, the old bearings should be retained for close examination, as they may reveal valuable information about the condition of the engine. The bearing shells are graded by thickness, the grade of each shell being indicated by the colour code marked on it.

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 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.



15.2 Typical bearing failures

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 Section 18 for details of bearing shell selection.

16 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 carefully 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 product(s) are used, which are specially formulated for this purpose.

2 In order to save time and avoid problems, engine reassembly can be carried out in the following order:

a) Crankshaft (Section 18).
b) Piston/connecting rod assemblies (Section 19).
c) Oil pump .
d) Sump (See Part A or B - as applicable).
e) Flywheel (See Part A or B - as applicable).
f) Cylinder head (See Part A or B - as applicable).
g) Timing belt tensioner and sprockets, and timing belt (See Part A or B - as applicable).
h) 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.

17 Piston rings - refitting

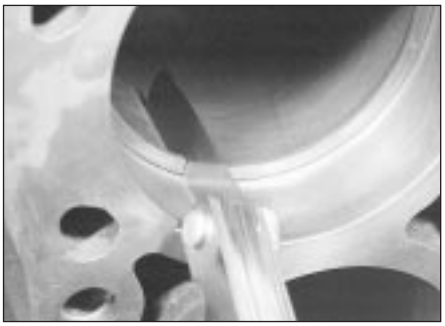
1 Before fitting new piston rings, the ring end gaps must be checked as follows.

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 blades.

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



17.5 Measuring a piston ring end gap

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.

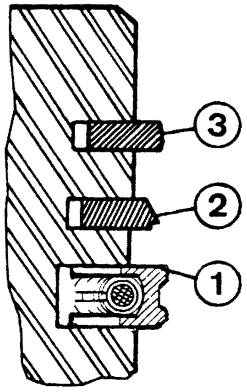
6 If the gap is too small (unlikely if genuine Peugeot parts are used), it must be enlarged, or the ring ends may contact each other during engine operation, causing serious damage. Ideally, new piston rings providing the correct end gap should be fitted. As a last resort, the end gap can be increased 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.*



17.10 Piston ring fitting diagram (typical)

1 Oil control ring
2 Second compression ring
3 Top compression ring

18 Crankshaft - refitting and main bearing running clearance check

Selection of new bearing shells

TU series engine

1 On early engines, both upper and lower main bearing shells were of the same thickness, with only two sizes of bearing shells being available: a standard size for use with the standard crankshaft, and a set of oversize bearing shells for use once the crankshaft bearing journals have been reground.

2 However, since February 1992, the specified main bearing running clearance has been significantly reduced. This has been achieved by the introduction of three different grades of bearing shell, in both standard sizes and oversizes. The grades are indicated by a colour-coding marked on the edge of each shell, which denotes the shell's thickness, as listed in the following table. The upper shell on all bearings is of the same size (class B, colour code black), and the running clearance is controlled by fitting a lower bearing shell of the required thickness. This arrangement has been fitted to all engines produced since February 1992 and, if possible, should also be fitted to earlier engines during overhaul. Seek the advice of your Peugeot dealer on parts availability and the best course of action when ordering new bearing shells.

Aluminium block engine

Bearing colour code	Thickness (mm) Standard	Undersize
Blue (class A)	1.823	1.973
Black (class B)	1.835	1.985
Green (class C)	1.848	1.998

Cast-iron block engine

Bearing colour code	Thickness (mm) Standard	Undersize
Blue (class A)	1.844	1.994
Black (class B)	1.858	2.008
Green (class C)	1.869	2.019

3 On early engines, the correct size of bearing shell must be selected by measuring the running clearance as described under the sub-heading below.

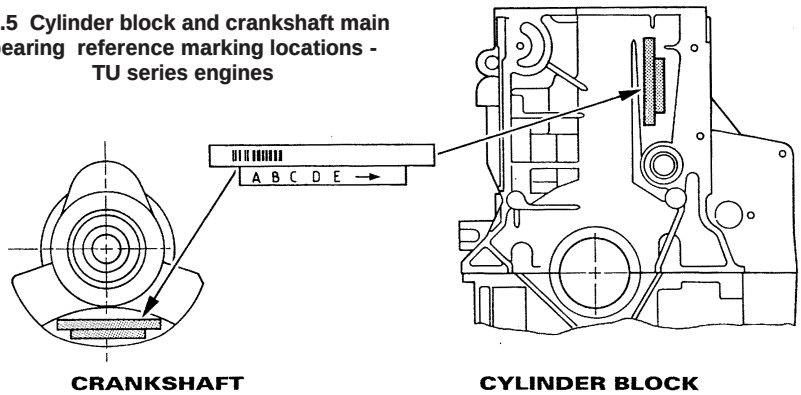
4 On engines produced since February 1992, when the new bearing shell sizes were introduced, the crankshaft and cylinder block/crankcase have reference marks on them, to identify the size of the journals and bearing bores.

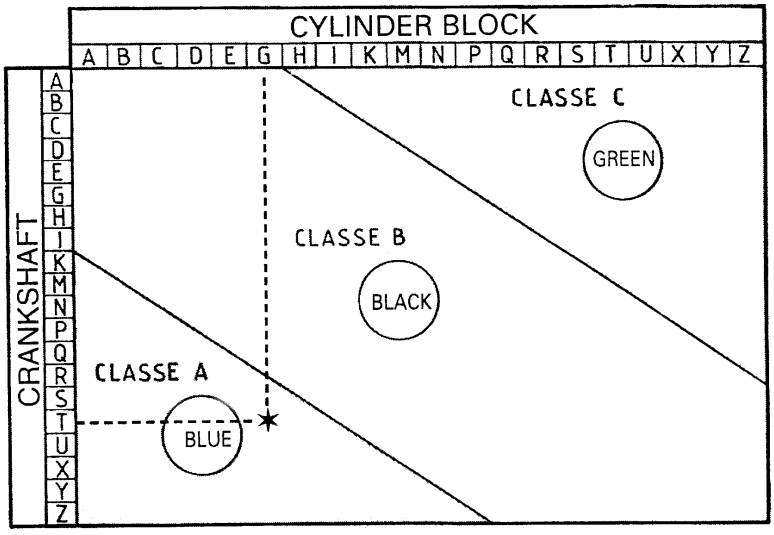
5 The cylinder block reference marks are on the right-hand (timing belt) end of the block, and the crankshaft reference marks are on the right-hand (timing belt) end of the crankshaft, on the right-hand web of No 4 crankpin **(see illustration)**. These marks can be used to select bearing shells of the required thickness as follows.

6 On both the crankshaft and block there are two lines of identification: a bar code, which is used by Peugeot during production, and a row of five letters. The first letter in the sequence refers to the size of No 1 bearing (at the flywheel/driveplate end). The last letter in the sequence (which is followed by an arrow) refers to the size of No 5 main bearing. These marks can be used to select the required bearing shell grade as follows.

7 Obtain the identification letter of both the relevant crankshaft journal and the cylinder block bearing bore. Noting that the cylinder

18.5 Cylinder block and crankshaft main bearing reference marking locations - TU series engines





18.7 Main bearing shell selection chart, for use with TU series engines - see text for further information

block letters are listed across the top of the chart, and the crankshaft letters down the side, trace a vertical line down from the relevant cylinder block letter, and a horizontal line across from the relevant crankshaft letter, and find the point at which both lines cross. This crossover point will indicate the grade of lower bearing shell required to give the correct main bearing running clearance. For example, the illustration shows cylinder block reference G, and crankshaft reference T, crossing at a point within the area of Class A, indicating that a blue-coded (Class A) lower bearing shell is required to give the correct main bearing running clearance **(see illustration)**.

8 Repeat this procedure so that the required bearing shell grade is obtained for each of the five main bearing journals.

XU series engine

9 On some early engines, both the upper and lower bearing shells were of the same thickness.

10 However, on later engines the main bearing running clearance was significantly reduced. To enable this to be done, four different grades of bearing shell were introduced. The grades are indicated by a colour-coding marked on the edge of each shell, which denotes the shell's thickness, as listed in the following table. The upper shell on all bearings is of the same size, and the running clearance is controlled by fitting a lower bearing shell of the required thickness.

Note: *On all XU series engines, upper shells are easily distinguished from lower shells, by their grooved bearing surface; the lower shells have a plain surface. It was not clear at the time of writing whether undersize bearing shells are available for 1998 cc engine. Refer to your Peugeot dealer for the latest information.*

1580 cc, 1761 cc and 1905 cc engines

Bearing colour code	Thickness (mm) Standard	Undersize
Upper bearing:		
Yellow	1.856	2.006
Lower bearing:		
Blue (Class A)	1.836	1.986
Black (Class B)	1.848	1.998
Green (Class C)	1.859	2.009
Red (Class D)	1.870	2.020

1998 cc engines

Bearing colour code	Thickness (mm) Standard	Undersize
Upper bearing:		
Black	1.847	N/A
Lower bearing:		
Blue (Class A)	1.844	N/A
Black (Class B)	1.857	N/A
Green (Class C)	1.866	N/A
Red (Class D)	1.877	N/A

11 On most later engines, new bearing shells can be selected using the reference marks on the cylinder block/crankcase. The cylinder block marks identify the diameter of the bearing bores, and the crankshaft marks the diameter of the crankshaft journals. Where no marks are present, the bearing shells can only be selected by checking the running clearance (see below).

12 The cylinder block reference marks are on the left-hand (flywheel/driveplate) end of the block, and the crankshaft reference marks are on the end web of the crankshaft **(see illustration)**. These marks can be used to select bearing shells of the required thickness as follows.

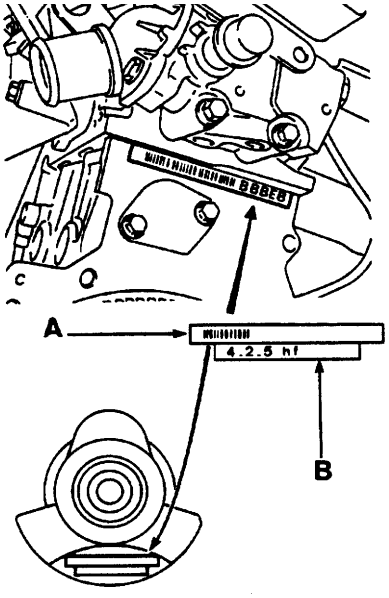
13 On both the crankshaft and block there are two lines of identification: a bar code, which is used by Peugeot during production, and a row of five letters. The first letter in the sequence refers to the size of No 1 bearing (at the flywheel/driveplate end). The last letter in the sequence (which is followed by an arrow) refers to the size of No 5 main bearing. These marks can be used to select the required bearing shell grade as follows.

14 Obtain the identification number/letter of both the relevant crankshaft journal and the cylinder block bearing bore. Noting that the crankshaft references are listed across the top of the chart, and the cylinder block references down the side, trace a vertical line down from the relevant crankshaft reference, and a horizontal line across from the relevant cylinder block reference, and find the point at which both lines cross. This crossover point will indicate the grade of lower bearing shell required to give the correct main bearing running clearance. For example, the illustration shows crankshaft reference 6, and cylinder block reference H, crossing at a point within the RED area, indicating that a Red-coded (Class D) lower bearing shell is required to give the correct main bearing running clearance **(see illustration)**.

15 Repeat this procedure so that the required bearing shell grade is obtained for each of the five main bearing journals.

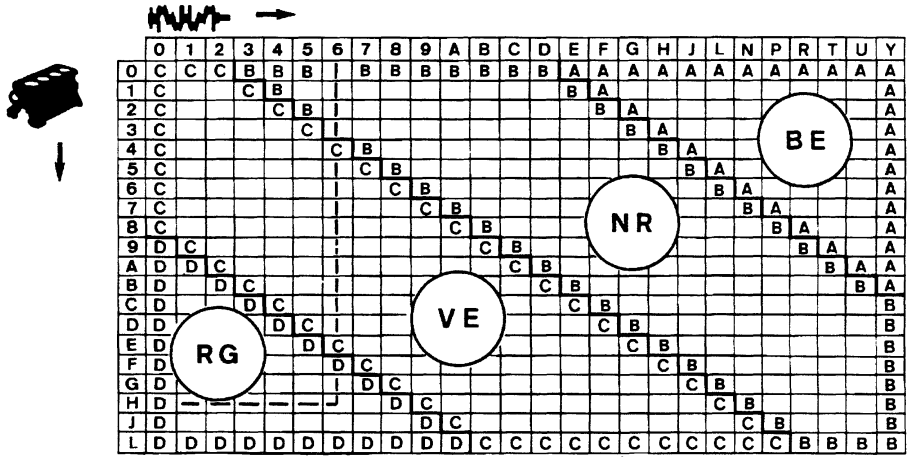
16 Seek the advice of your Peugeot dealer on parts availability, and on the best course of action when ordering new bearing shells.

Note: *On early models, at overhaul it is recommended that the later bearing shell arrangement is fitted. This, however, should only be done if the lubrication system components are upgraded (necessitating replacement of the oil pump relief valve piston and spring as well as the pump sprocket and*



18.12 Cylinder block and crankshaft main bearing reference marking locations - XU series engines

A Bar Code (for production use only)
B Reference marks



18.14 Main bearing shell selection chart, for use with XU series engines - see text for further information

drive chain) at the same time. If the new bearing arrangement is to be used without uprating the lubrication system, Peugeot state that Blue (Class A) lower bearing shells should be fitted. Refer to your Peugeot dealer for further information.

17 Since there are no bearing identification marks, the relevant main bearing shell grade must be selected by measuring the main bearing running clearance.

Main bearing running clearance check

TU series engine

18 On early engines, if the modified bearing shells are to be fitted, obtain a set of new black (Class B) upper bearing shells and new blue (Class A) lower bearing shells. On later (February 1992-on) engines where the modified bearing shells are already fitted, 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.

19 Clean the backs of the bearing shells, and the bearing locations in both the cylinder block/crankcase and the main bearing ladder.

20 Press the bearing shells into their locations, ensuring that the tab on each shell engages in the notch in the cylinder block/crankcase or main bearing ladder location. Take care not to touch any shell's bearing surface with your fingers. Note that the grooved bearing shells, both upper and lower, are fitted to Nos 2 and 4 main bearings **(see illustration)**. If the original bearing shells are being used for the check, ensure that they are refitted in their original locations. The clearance can be checked in either of two ways.

21 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 ladder casting to the cylinder block/crankcase, with the bearing shells in place. With the casting retaining bolts correctly tightened, 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.

22 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.

23 With the main bearing upper shells in place, carefully lay the crankshaft in position. Do not use any lubricant; the crankshaft journals and bearing shells must be perfectly clean and dry.

24 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)**.

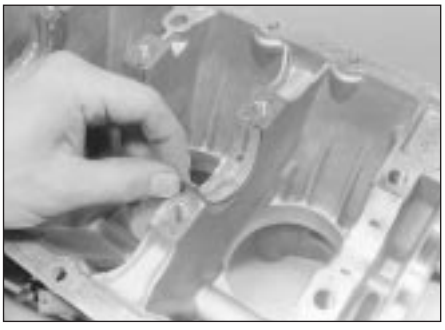
25 With the main bearing lower shells in position, refit the main bearing ladder casting, tightening its retaining bolts as described in paragraph 45. Take care not to disturb the Plastigauge, and *do not* rotate the crankshaft at any time during this operation.

26 Remove the main bearing ladder casting, again taking great care not to disturb the Plastigauge or rotate the crankshaft.

27 Compare the width of the crushed Plastigauge on each journal to the scale printed on the Plastigauge envelope, to obtain the main bearing running clearance **(see illustration)**. Compare the clearance measured with that given in the Specifications at the start of this Chapter.

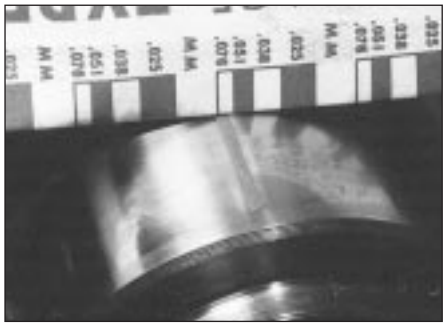
28 If the clearance is significantly different from that expected, the bearing shells may be the wrong size (or excessively worn, if the original shells are being re-used). Before deciding that different-size shells are required, make sure that no dirt or oil was trapped between the bearing shells and 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.

29 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

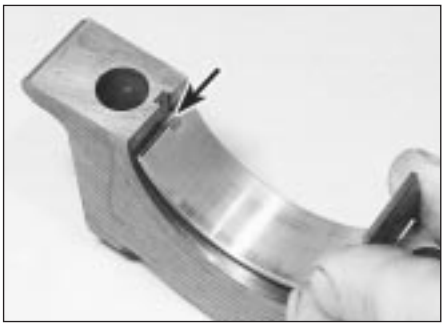


18.20 On TU series engines, note that the grooved bearing shells are fitted to Nos 2 and 4 main bearing journals

18.24 Plastigauge in place on a crankshaft main bearing journal

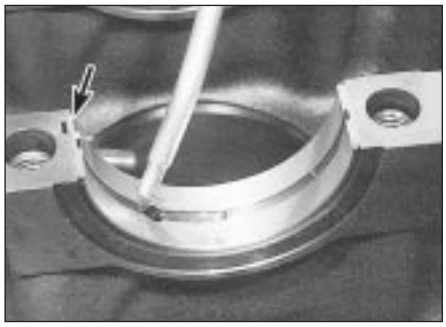


18.27 Measuring the width of the deformed Plastigauge using the scale on the card provided



18.34 On XU engines, all the lower shells have a plain bearing surface. Ensure tab (arrowed) is correctly located in the cap

18.40 Refitting a crankshaft thrustwasher - TU series aluminium block engine



18.41 Ensure each bearing shell tab (arrowed) is correctly located, and apply clean engine oil

lower end of the specified range, to allow for wear in use.

30 Where necessary, obtain the required grades of bearing shell, and repeat the running clearance checking procedure as described above.

31 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.

XU series engine

32 On early engines, if the later bearing shells are to be fitted, obtain a set of new upper bearing shells, and new green or grey (as applicable) lower bearing shells (see paragraph 10). On later engines where the modified bearing shells are already fitted, 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.

33 Clean the backs of the bearing shells, and the bearing locations in both the cylinder block/crankcase and the main bearing caps.

34 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. 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 **(see illustration)**. If the original bearing shells are being used for the check, ensure that they are refitted in their original locations.

35 The clearance can be checked in two ways.

36 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.

37 The second, and more accurate, method is to use Plastigauge. The method is as described above in paragraphs 17 to 26, substituting "main bearing caps" for all references to the main bearing ladder casting.

38 Note that Peugeot do not specify a main bearing running clearance for 1905 cc engines. The figure given in the Specifications is a guide figure which is typical for this type of engine. On these engines, therefore, always refer to your Peugeot dealer for details of the exact running clearance before condemning the components concerned.

Final crankshaft refitting

TU aluminium block engines

39 Carefully lift the crankshaft out of the cylinder block once more.

40 Using a little grease, stick the upper thrustwashers to each side of the No 2 main bearing upper location; ensure that the oilway grooves on each thrustwasher face outwards (away from the cylinder block) **(see illustration)**.

41 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 with clean engine oil **(see illustration)**.

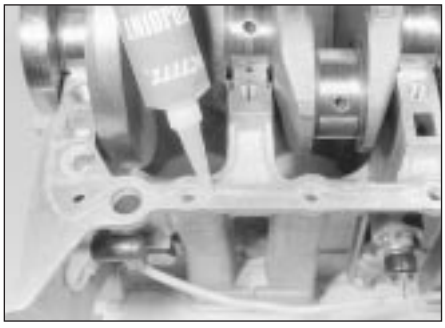
42 Refit the Woodruff key, then slide on the oil pump drive sprocket, and locate the drive chain on the sprocket **(see illustration)**. Lower the crankshaft into position so that Nos 2 and 3 cylinder crankpins are at TDC; Nos 1 and 4 cylinder crankpins will be at BDC, ready for fitting No 1 piston. Check the crankshaft endfloat as described in Section 13.

43 Thoroughly degrease the mating surfaces of the cylinder block/crankcase and the main bearing ladder. Apply a thin bead of suitable sealant to the cylinder block/crankcase mating surface of the main bearing ladder casting, then spread to an even film **(see illustration)**.

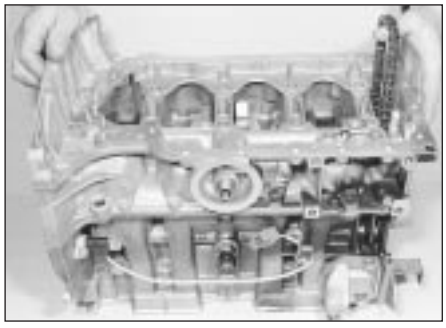
44 Lubricate the lower bearing shells with clean engine oil, then refit the main bearing ladder, ensuring that the shells are not displaced, and that the locating dowels engage correctly **(see illustration)**.

45 Install the ten 11 mm main bearing ladder

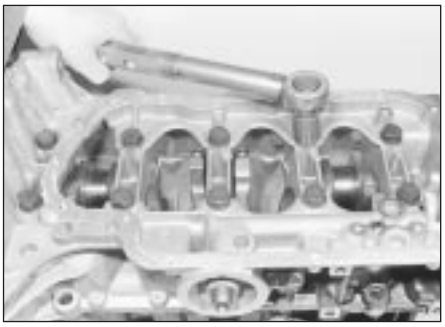
18.42 Refitting the oil pump drive chain and sprocket - TU aluminium block engine



18.43 Apply a film of suitable sealant to cylinder block/crankcase mating surface . . .

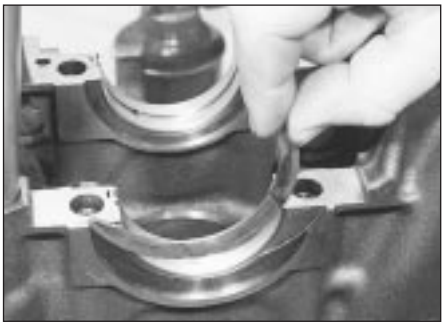


18.44 . . . then lower the main bearing ladder into position

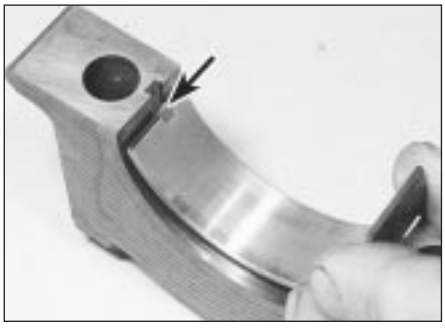


18.45a Tighten ten 11 mm main bearing bolts to the stage 1 torque setting . . .

18.45b . . . then angle-tighten them through the specified stage 2 angle



18.53 Fitting a thrustwasher to No 2 main bearing upper location



18.54 Ensure tab (arrowed) is located in the cap when fitting the bearing shells

retaining bolts, and tighten them all by hand only. Working progressively outwards from the centre bolts, tighten the ten bolts, by a turn at a time, to the specified Stage 1 torque wrench setting. Once all the bolts have been tightened to the Stage 1 setting, angle-tighten the bolts through the specified Stage 2 angle using a socket and extension bar. It is recommended that an angle-measuring gauge is used during this stage of the tightening, to ensure accuracy **(see illustrations)**. If a gauge is not available, use a dab of white paint to make alignment marks between the bolt head and casting prior to tightening; the marks can then be used to check that the bolt has been rotated sufficiently during tightening.

46 Refit all the 6 mm bolts securing the main bearing ladder to the base of the cylinder block, and tighten them to the specified torque. Check that the crankshaft rotates freely.

47 Refit the piston/connecting rod assemblies to the crankshaft as described in Section 18.

48 Ensuring that the drive chain is correctly located on the sprocket, refit the oil pump and sump as described in Part A of this Chapter.

49 Fit two new crankshaft oil seals as described in Part A.

50 Refit the flywheel as described in Part A of this Chapter.

51 Where removed, refit the cylinder head as described in Part A. Also refit the crankshaft sprocket and timing belt as described in Part A.

TU series cast-iron block engine

52 Carefully lift the crankshaft out of the cylinder block once more.

53 Using a little grease, stick the upper thrustwashers to each side of No 2 main bearing upper location. Ensure the oilway grooves on each thrustwasher face outwards (away from the cylinder block) **(see illustration)**.

54 Place the bearing shells in their locations as described earlier **(see illustration)**. 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.

55 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. Check the crankshaft endfloat, referring to Section 14.

56 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.

57 Fit the main bearing caps to their correct locations, ensuring that they are fitted the correct way round (the bearing shell lug recesses in the block and caps must be on the same side). Insert the bolts loosely.

58 Tighten the main bearing cap bolts to the specified Stage 1 torque wrench setting. Once all the bolts have been tightened to the Stage 1 setting, angle-tighten the bolts through the specified Stage 2 angle, using a socket and extension bar. It is recommended that an angle-measuring gauge is used during this stage of the tightening, to ensure accuracy. If a gauge is not available, use a dab of white paint to make alignment marks between the bolt head and casting prior to tightening; the marks can then be used to check that the bolt has been rotated sufficiently during tightening.

59 Check that the crankshaft rotates freely.

60 Refit the piston/connecting rod assemblies to the crankshaft as described in Section 19.

61 Refit the Woodruff key to the crankshaft groove, and slide on the oil pump drive sprocket. Locate the drive chain on the sprocket.

62 Ensure that the mating surfaces of front oil seal housing and cylinder block are clean and dry. Note the correct fitted depth of the front oil seal then, using a large flat-bladed screwdriver, lever the seal out of the housing.

63 Apply a smear of suitable sealant to the oil seal housing mating surface, and make sure that the locating dowels are in position. Slide the housing over the end of the crankshaft, and into position on the cylinder block. Tighten the housing retaining bolts securely.

64 Repeat the operations in paragraphs 62 and 63, and fit the rear oil seal housing.

65 Fit a new front and rear crankshaft oil seal as described in Part A of this Chapter.

66 Ensuring that the chain is correctly located on the drive sprocket, refit the oil pump and sump as described in Part A of this Chapter.

67 Refit the flywheel (Part A of this Chapter).

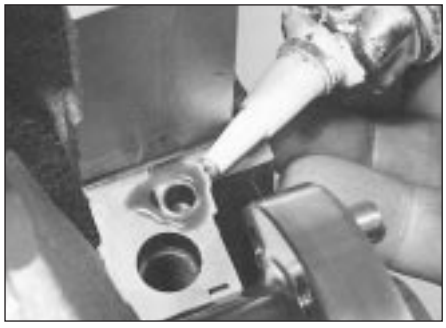
68 Where removed, refit the cylinder head and install the crankshaft sprocket and timing belt - see the relevant Sections of Part A.

XU series engines

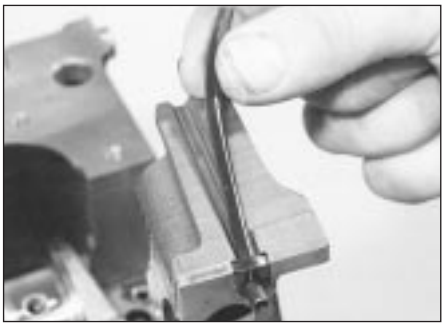
69 Carry out the operations described above in paragraphs 52 to 56.

70 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.

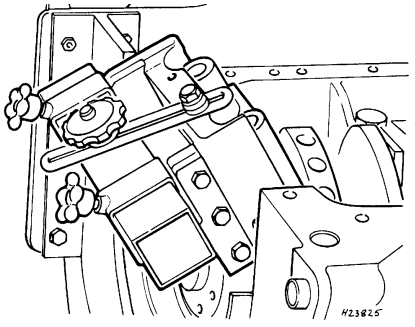
71 Apply a small amount of sealant to No 1 main bearing cap face mating on the cylinder block, around the sealing strip holes **(see illustration)**.



18.71 Applying sealant to the cylinder block No 1 main bearing cap mating face

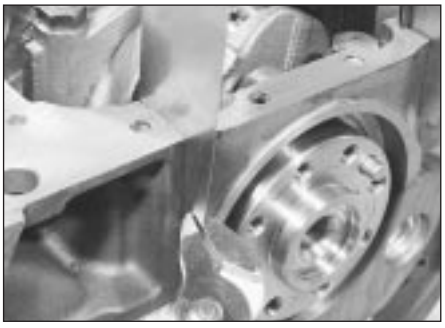


18.72a Fitting a sealing strip to No 1 main bearing cap



18.72b Using the Peugeot special tool to fit No 1 main bearing cap

18.73a Fitting No 1 main bearing cap, using metal strips to retain the side seals



18.73b Removing a metal strip from No 1 main bearing cap using a pair of pliers

18.74a With all bearing caps correctly installed, tighten their retaining nuts and bolts to the specified torque . . .

18.74b . . . then trim the sealing strips, so that they protrude above the cylinder block mating surface by approximately 1 mm

72 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 illustrations)**.

73 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 illustrations)**.

74 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)**.

75 On 1580 cc, 1761 cc and 1905 cc engines, 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.

76 Fit a new crankshaft rear oil seal as described in Part B of this Chapter.

77 Refit the piston/connecting rod assemblies to the crankshaft as described in Section 19.

78 Refit the Woodruff key, then slide on the oil pump drive sprocket and spacer (where fitted), and locate the drive chain on the sprocket.

79 Ensure that the mating surfaces of the front oil seal carrier and cylinder block are clean and dry. Note the correct fitted depth of the oil seal then, using a large flat-bladed screwdriver, lever the old seal out of the housing.

80 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. Tighten the carrier retaining bolts to the specified torque.

81 Fit a new crankshaft front oil seal as described in Part B of this Chapter.

82 Ensuring that the drive chain is correctly located on the sprocket, refit the oil pump and sump -refer to Part B or C of this Chapter.

83 Where removed, refit the rear timing cover and cylinder head as described in Part B.

19 Piston/connecting rod assembly - refitting and big-end bearing clearance check

Selection of bearing shells

1 On most engines, there are two sizes of big-end bearing shell produced by Peugeot; a standard size for use with the standard crankshaft, and an oversize for use once the crankshaft journals have been reground.

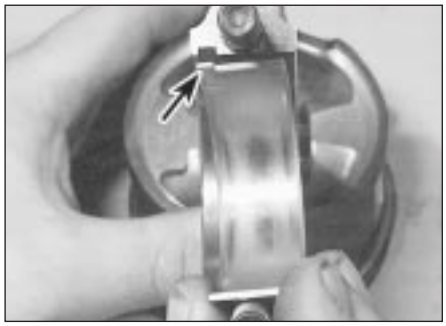
2 Consult your Peugeot dealer for the latest information on parts availability. To be safe, always quote the diameter of the crankshaft big-end crankpins when ordering bearing shells.

3 Prior to refitting the piston/connecting rod assemblies, the big-end bearing running clearance should be checked as follows.

Big-end bearing 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 illustration)**. If the



19.5 Fitting a bearing shell to a connecting rod - ensure tab (arrowed) engages with the recess in the connecting rod

19.19 Tap the piston into the bore using a hammer handle

19.22a On XU series engines, tighten the big-end bearing cap nuts to the stage 1 specified torque, then fully slacken them and tighten them to the stage 2 torque . . .

19.22b . . . then through the angle specified for stage 3

original bearing shells are being used for the check, ensure that 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 that they are fitted the correct way around (see paragraph 20), 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 18).

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 that they are fitted the correct way around.

10 Tighten the bearing cap nuts as described below in paragraph 21 or 22 (as applicable). 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 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.

Final 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 as described in Section 12, and that the crankshaft and main bearing ladder/caps are in place (see Section 18).

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 17, then clamp them in position with a piston ring compressor.

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 illustration)**.

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. 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).

21 On TU series engines, tighten the bearing cap retaining nuts evenly and progressively to the specified torque setting.

22 On XU series engines, tighten the bearing cap retaining nuts evenly and progressively to the stage 1 torque setting. Fully slacken both nuts, then tighten them to the stage 2 torque setting. Once both nuts have been tightened to the stage 2 setting, angle-tighten them 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 the tightening, to ensure accuracy **(see illustrations)**. If a gauge is not available, use a dab of white paint to make alignment marks between the nut and bearing cap prior to tightening; the marks can then be used to check that the nut has been rotated sufficiently during tightening.

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 or B of this Chapter (as applicable).

20 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.

2 Remove the spark plugs. On models with a distributor, disable the ignition system by

disconnecting the ignition HT coil lead from the distributor cap, and earthing it on the cylinder block. Use a jumper lead or similar wire to make a good connection. On models with a static (distributorless) ignition system, disable the ignition system by disconnecting the LT wiring connector from the ignition HT coil, referring to Chapter 5B for information.

3 Turn the engine on the starter until the oil pressure warning light goes out. Refit the spark plugs, and reconnect the spark plug (HT) leads, referring to Chapter 1 for further information. Reconnect any HT leads or wiring which was disconnected in paragraph 2.

4 Start the engine, noting that this may take a little longer than usual, due to the fuel system components having been disturbed.

5 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. On 16-valve engines, some valvegear noise may be heard at first; this should disappear as the oil circulates fully around the engine, and normal pressure is restored in the hydraulic tappet mechanism.

6 Assuming all is well, keep the engine idling until hot water is felt circulating through the top hose, then switch off the engine.

7 Check the ignition timing and the idle speed settings, then switch the engine off.

8 After a few minutes, recheck the oil and coolant levels as described in Chapter 1, and top-up as necessary.

9 If they were tightened as described, there is no need to re-tighten the cylinder head bolts once the engine has first run after reassembly.

10 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.